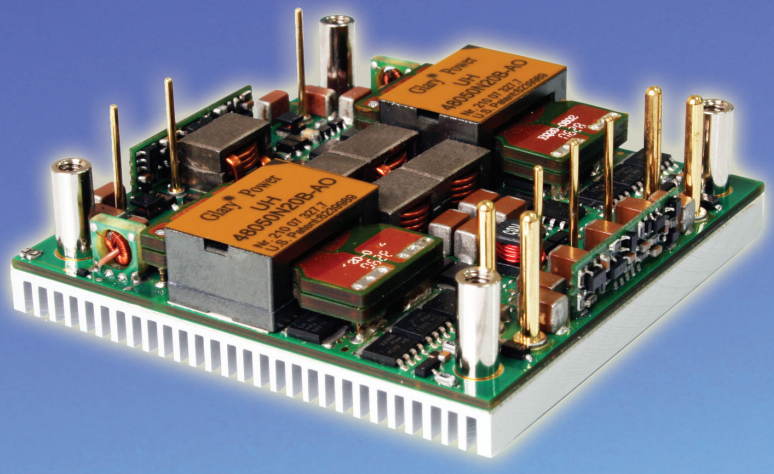
Glary Power Technology

High Performance Power Converters

1/2 Bricks 250W~800W

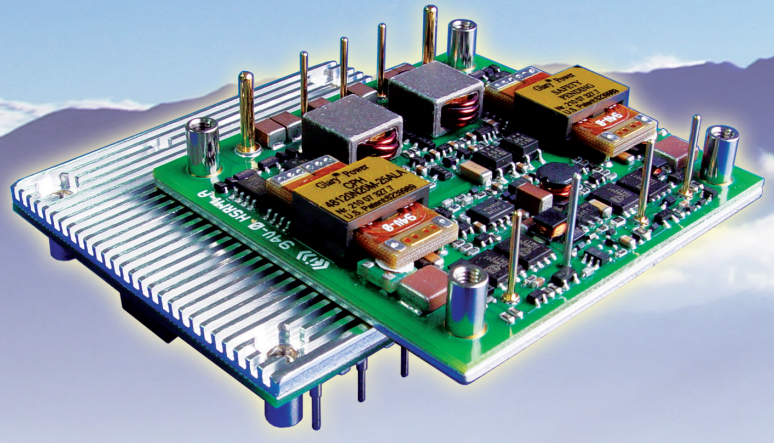


UH Series 1/2 Brick 800W /67A:

Input: 48V
Outputs: 12V, 28V and 48V

600W/120A :

Inputs: 24V and 48V
Outputs: 3.3V, 5V, 12V, 28V and 48V

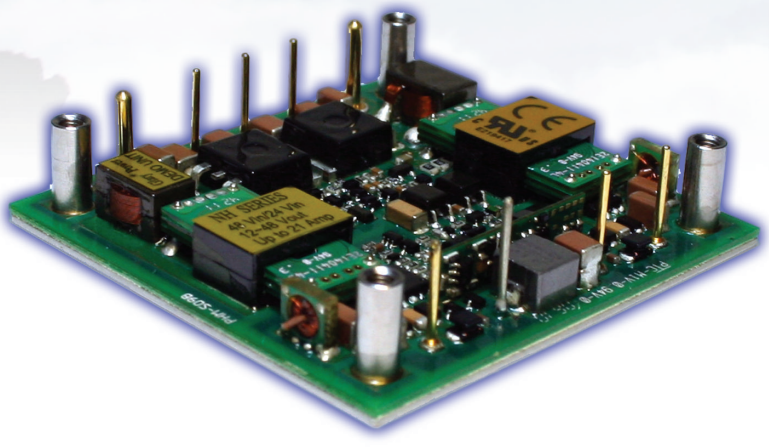


CPH and CBH 1/2 Brick 350W /100A:

Input: 24V and 48V
Outputs: 1.5V, 1.8V, 2.5V, 3.3V and 5V

250W/60A :

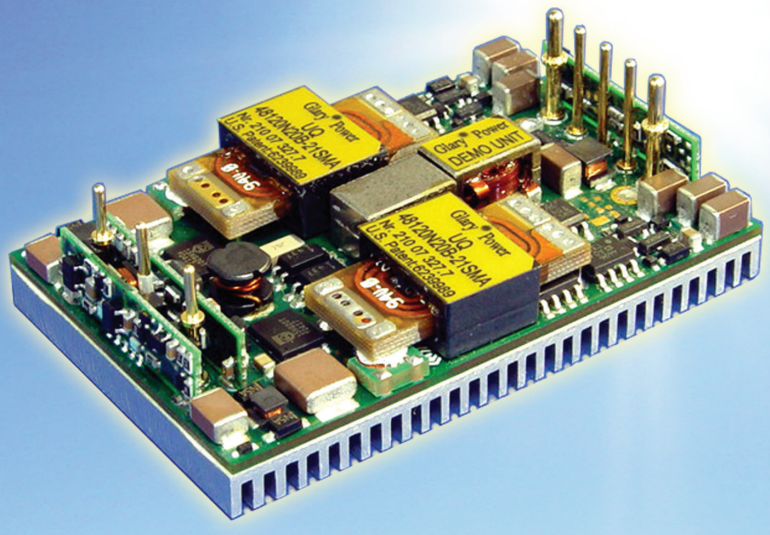
Inputs: 24V and 48V
Outputs: 1.5V, 1.8V, 2.5V, 3.3V and 5V



NH Series 1/2 Brick 336W /21A:

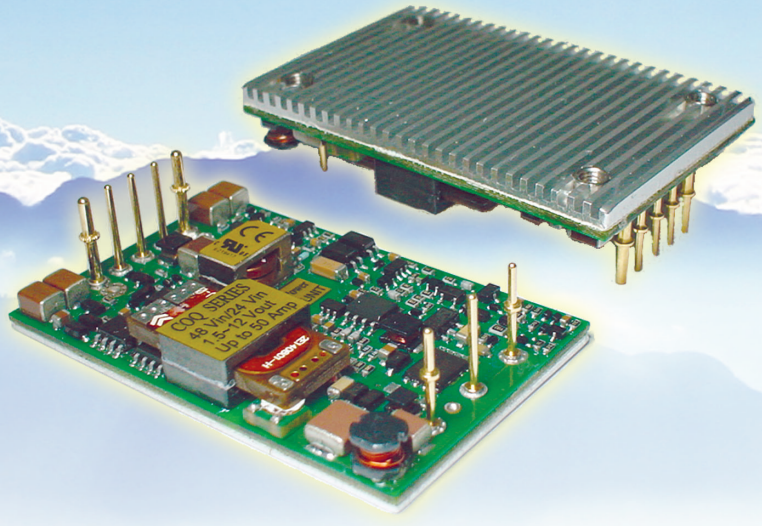
Input: 24V and 48V
Outputs: 12V, 24V, 28V and 48V

1/4 and 1/8 Bricks 130W~300W



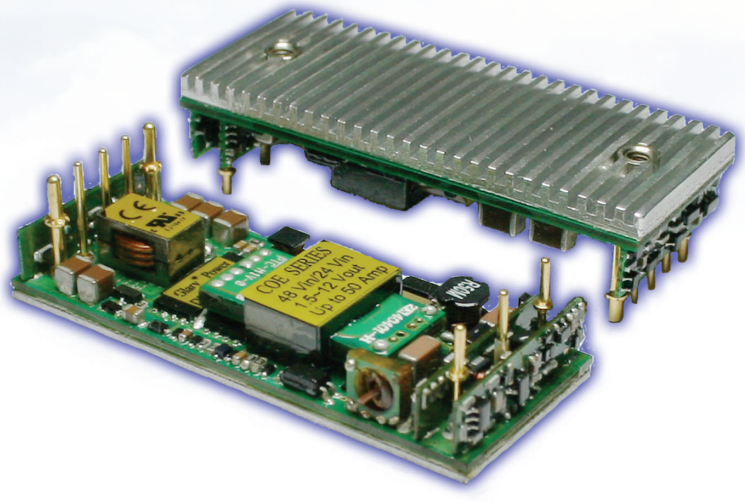
UQ Series 1/4 Brick 300W /60A:

Inputs: 24V and 48V
Outputs: 3.3V, 5V, 7V and 12V



COQ Series 1/4 Brick 175W /50A:

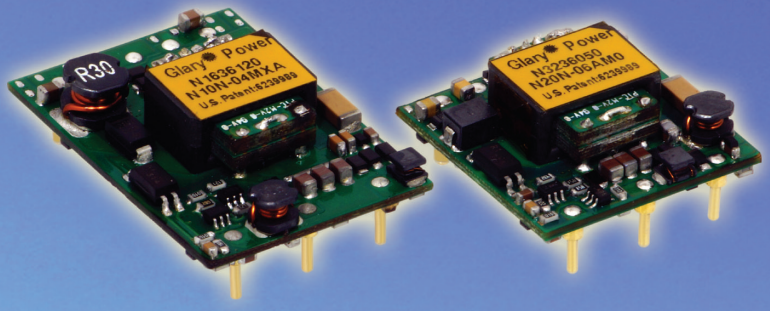
2X Inputs: 24V and 48V
4X Inputs: 18V and 36V
Outputs: 1.5V, 1.8V, 2.5V, 3.3V, 5V, 7V and 12V



COE Series 1/8 Brick 132W /50A:

2X Inputs: 24V and 48V
4X Inputs: 18V and 36V
Outputs: 1.5V, 1.8V, 2.5V, 3.3V, 5V, 7V and 12V

1/16 Bricks and Smaller 20W~50W

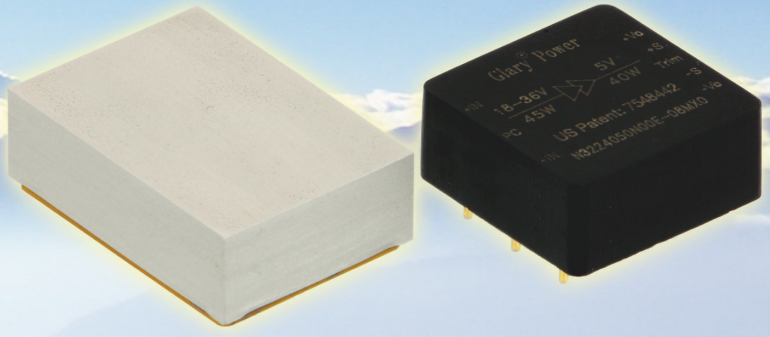


N16, N32 and N64 Series

2X Inputs: 24V and 48V
4X Inputs: 18V and 36V
Outputs: 2.5V, 3.3V, 5V and 12V

Open Frame:

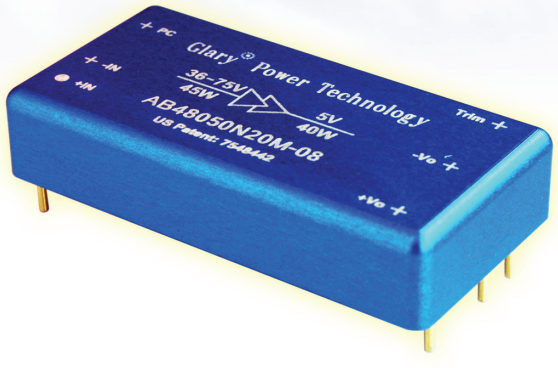
N16: 0.91" X 1.30" (1/16 Brick)
N32: 0.91" X 0.91" (Micro Brick)
N64: 0.71" X 0.71" (Nano Brick)



Enclosed and Molded

N16: 1.01" X 1.40" (1/16 Brick)
N32: 1.01" X 1.01" (Micro Brick)
N64: 0.81" X 0.81" (Nano Brick)

Metal Enclosed 50W



AB Series 2" X 1"

50W /12A:

Input: 24V and 48V
Outputs: 2.5V, 3.3V, 5V and 12V

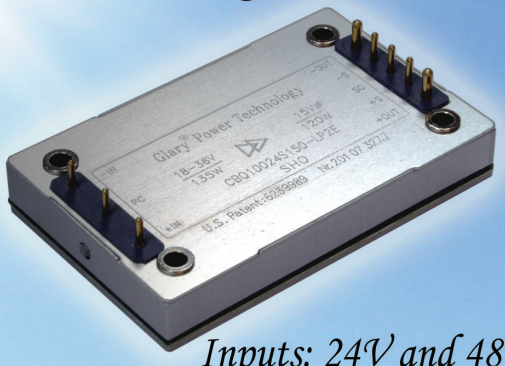
For more information, please contact to Glary Power Technology at:
ww.glary.com E-mail: service@glary.com Tel:+886 4 23507467 Fax: +886 4 23506841

Metal Enclosed 125W~2kW

1/8 Brick 130W/50A Enclosed COE

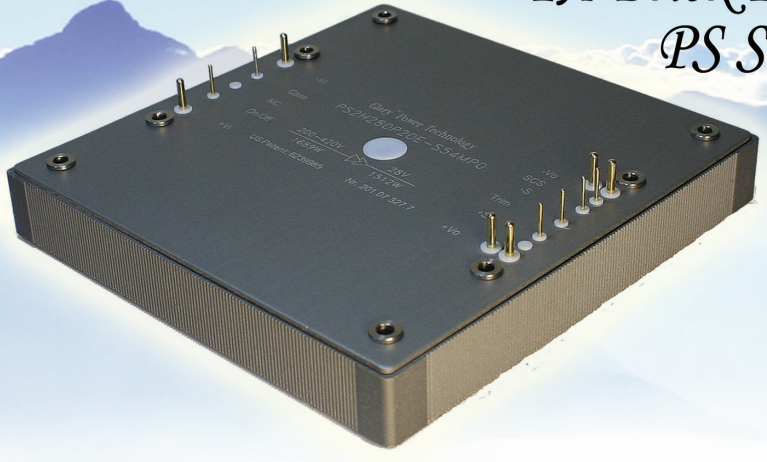
Inputs: 24V and 48V
Outputs: 1.5V, 1.8V, 2.5V, 3.3V, 5V, 7V and 12V

1/4 Brick 125W/25A CBQ Series



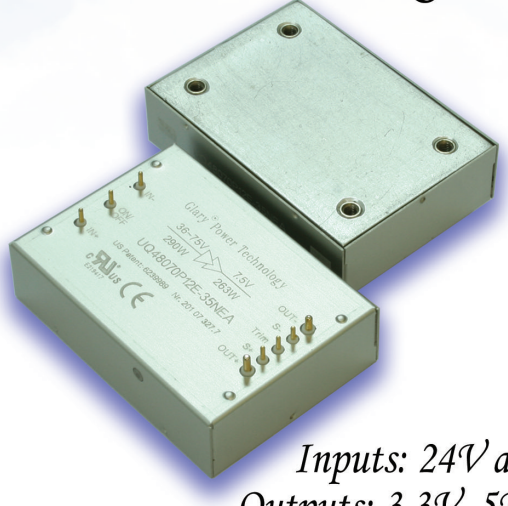
Inputs: 24V and 48V
Outputs: 1.5V, 1.8V, 2.5V, 3.3V and 5.0V

2X Brick 2kW/120A PS Series



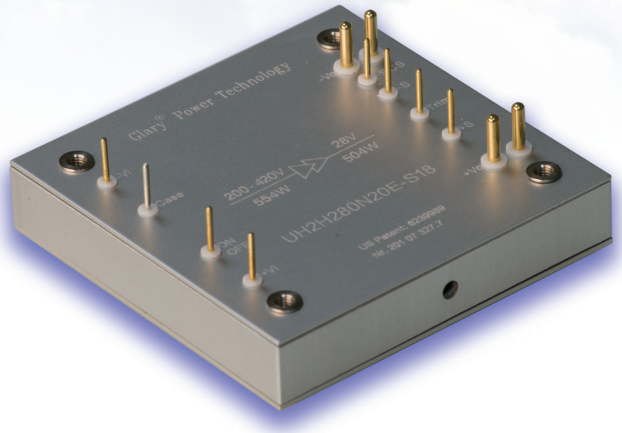
Input: 200V~420V
Outputs: 12V, 24V, 28V and 48V

1/4 Brick 300W/60A Enclosed UQ



Inputs: 24V and 48V
Outputs: 3.3V, 5V, 7V and 12V

1/2 Brick 500W/42A UH2H Series



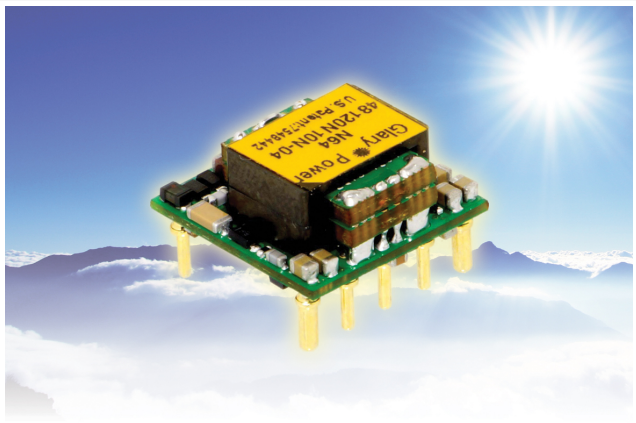
Input: 200V~420V
Outputs: 12V, 28V and 48V

Efficiency >91% | 291W/in³ | INPUT 2:1/4:1 | Remote ON OFF | Full Metal Package

Molded Package | Open Frame Package | OVP | OTP | OCP

6.4Mhrs MTBF

Pb | RoHS 2002/95/EC



The N64 series power module provides 50W maximum outputs in 0.70"× 0.70" footprint with industry standard 1/32 brick compatible pin assignment. The efficient SR stage is combined with patented "Coupled-inductor SR" topology that would reduce power loss to achieve 291W/in³ power density. The multi-layer single side circuit board design plus the fully metal-enclosed package would enhance the thermal performance and improve its reliability. The module is designed for Telecom, Servers, Networking equipments and other industry applications that use a 24V or 48V input bus.

PART NUMBER SYSTEM (Total height = standoff height + module thickness)

Preliminary Data Sheet

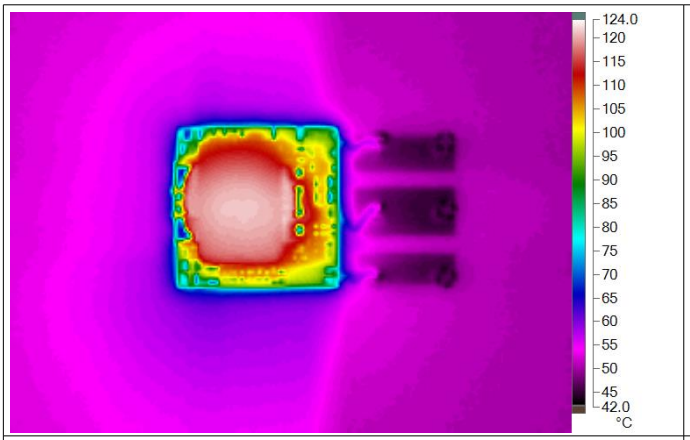
N64	48	120	a	b	c	d	-	XX	XX	X
Series Name	Rated Input	Rated Output	Enable Logic	Pin Length	Standoff Height	Base-Plate / module thickness		Setting	Suffix	Version
N64	**18**=9V~36V **24**=18V~36V **36**=18V~75V **48**=36V~75V	**Unit:** 0.1V Increments 120= 12V 033= 3.3V	**P:** Positive **N:** Negative	**-:** SMD **0:** 0.12" **1:** 0.16" **2:** 0.20" **3:** 0.24"	**-:** SMD **0:** 0.02" **1:** 0.08" **2:** 0.16"	**N:** Open Frame / 0.35" **E:** Metal Enclosed / 0.40" **M:** Molding / 0.40"	-	For customer function only	For marketing purpose only	

MODEL LIST (Contact to factory for 4X input models or special specifications)

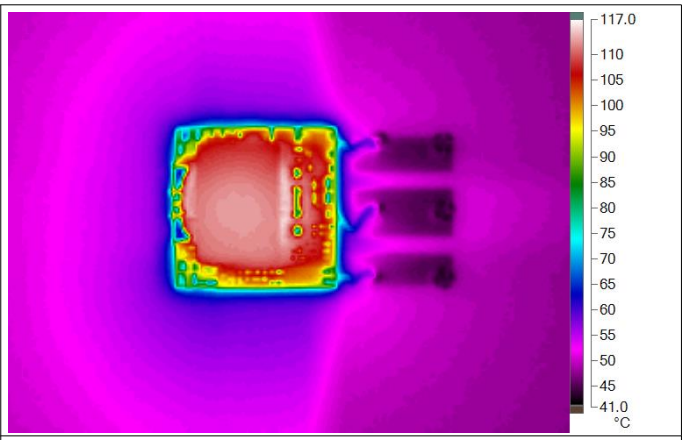
Part Number *	Maximum Input		Maximum Output		Efficiency
N6424120abcd-XXXXX	18V~36V	57W	12.0V/4.2A	50W	90%
N6424050abcd-XXXXX	18V~36V	59W	5.0V/10A	50W	89%
N6424033abcd-XXXXX	18V~36V	47W	3.3V/12A	40W	87%
N6424025abcd-XXXXX	18V~36V	37W	2.5V/12A	30W	85%

Part Number *	Maximum Input		Maximum Output		Efficiency
N6448120abcd-XXXXX	36V~75V	57W	12.0V/4.2A	50W	91%
N6448050abcd-XXXXX	36V~75V	59W	5.0V/10A	50W	90%
N6448033abcd-XXXXX	36V~75V	47W	3.3V/12A	40W	88%
N6448025abcd-XXXXX	36V~75V	37W	2.5V/12A	30W	86%

REFERENCED THERMAL IMAGES



N6448120N00N-04 (Io= 3.4A@50°C/200LFM)



N6448120N00N-04 (Io= 2.8A@50°C/20LFM)

SPECIFICATIONS

Absolute Maximum Ratings

Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 18V/24V Models 36V/48V Models Transient (100mS): 18V/24V Models 36V/48V Models	 -0.5V to +40Vdc -0.5V to +80Vdc 50V Maximum 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

General Parameters

Conversion Efficiency	Typical	See table
Switching Frequency	Typical	450KHz
MTBF	Bellcore TR-332 issue 6	6.40×10^6 hrs @GB/25°C (N6448050abcd-10XXX)
OTP	T_{AVG} or T_C	110°C ±5°C for standard setting
Weight	Packaging related	6~16g

Control Functions

Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

Input

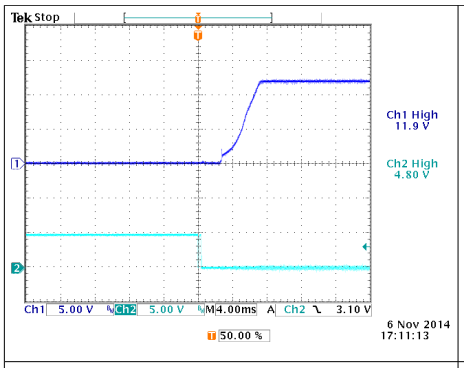
Operation Voltage Range	18V(24V) Models 36V(48V) Models	+9V(+18V) to +36Vdc +18V(+36V) to +75Vdc
Reflected Ripple Current	L_{EXT} = 10uH	20mA rms/60mAp-p
Power ON Voltage Ranges	18V Models 24V/36V Models 48V Models	+8.5V to + 9.0Vdc +17.0V to +18.0Vdc +34.0V to +36.0Vdc
Power OFF Voltage Ranges	18V Models 24V/36V Models 48V Models	+7.8V to 8.3Vdc +15.6V to +16.6Vdc +31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	18V/24V Models 36V/48V Models	20.0uF Max 14.0uF Max

Output

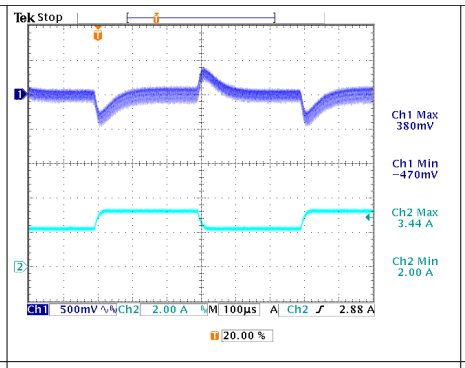
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.2%
Load Regulation	0%~100%	±0.2%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

8.45

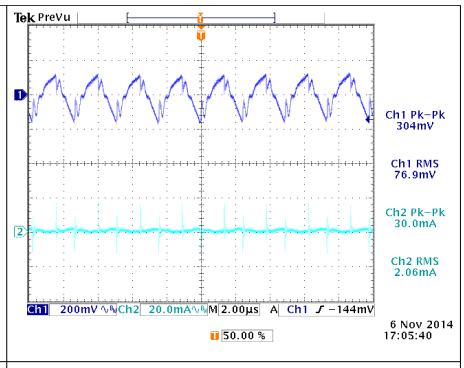
TYPICAL WAVES AND CURVES



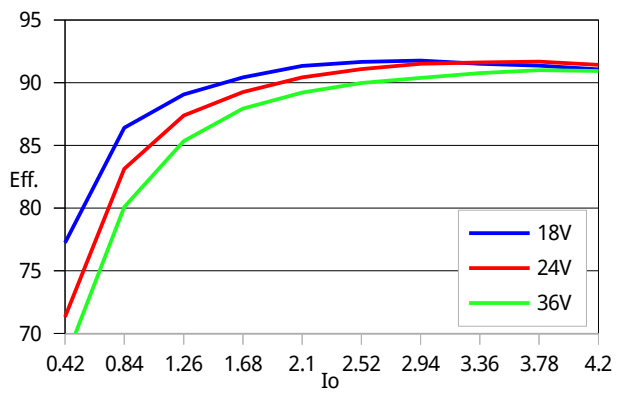
Start-up waveform of N3236050N20N-06
(V_{IN}: 36V, Load: 6A)



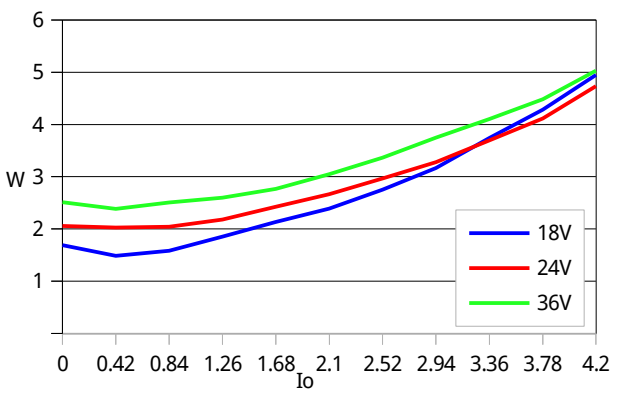
Transient response of N3236050N20N-06
(V_{IN}: 36V, Load: 4.5A/3.0A@2.5A/µS)



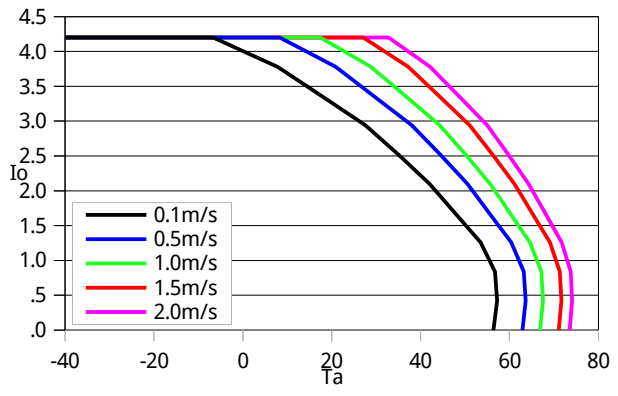
Input/Output ripples of N3236050N20N-06
(V_{IN}: 36V, Load: 6A, L_{IN}=10uH)



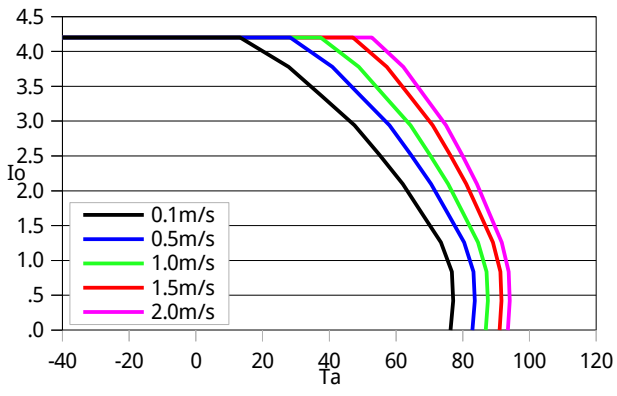
Efficiency plot of N6424120N10N-04



Power loss curves of N6424120N10N-04

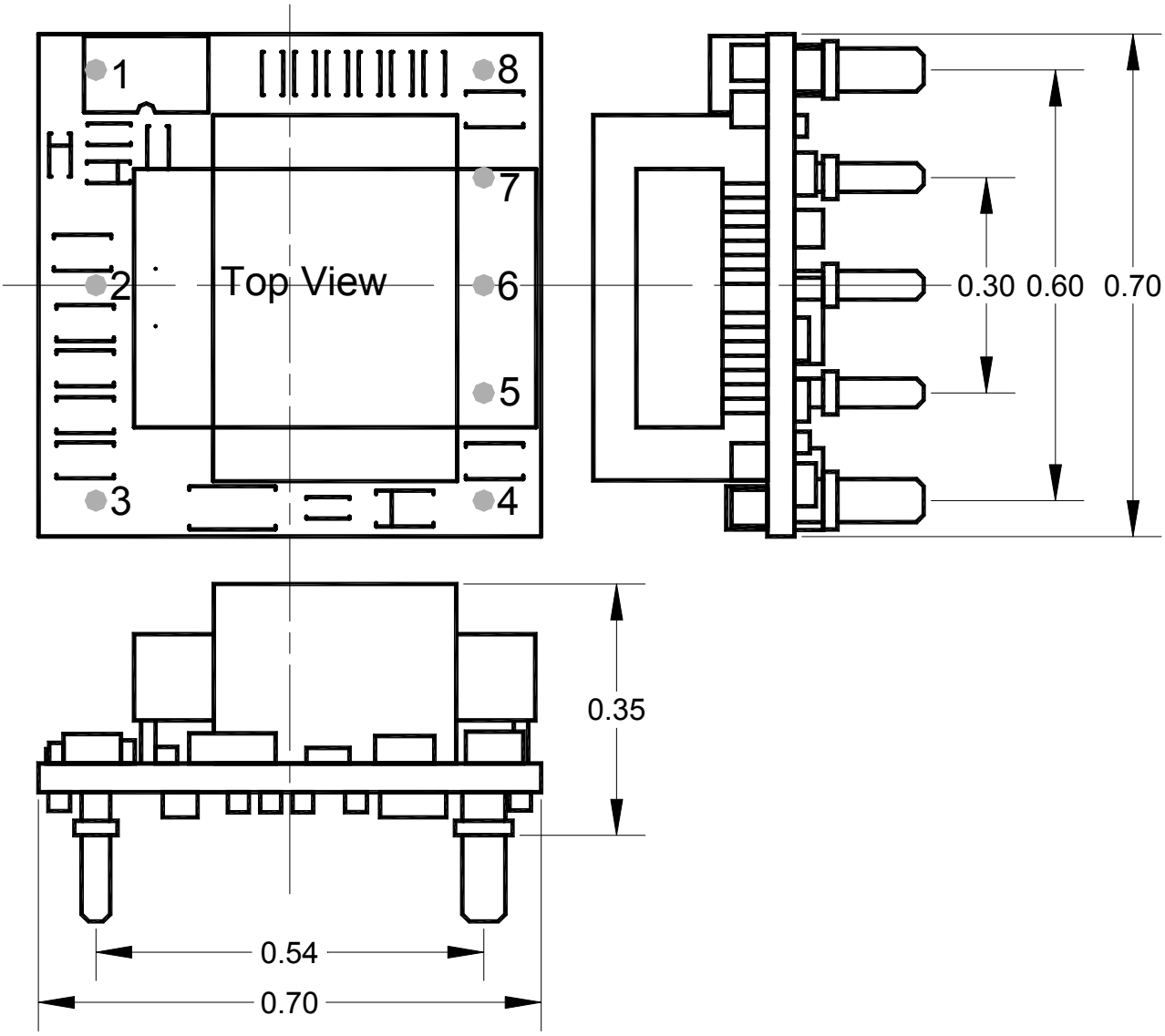


Calculated derating of N3236050N20N-06 (T_C= 105ºC)



Calculated derating of N3236050N20N-06 (T_C= 125ºC)

OPEN FRAME



Dimensions and Pin Connections

Designation	Function Description	Pin #
+IN	Positive input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
-IN	Negative input	**3**
-Vo	Negative output	**4**
-S	Negative remote sense	**5**
TRIM	Output voltage adjust	**6**
+S	Positive remote sense	**7**
+Vo	Positive output	**8**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 6g / Nano Brick

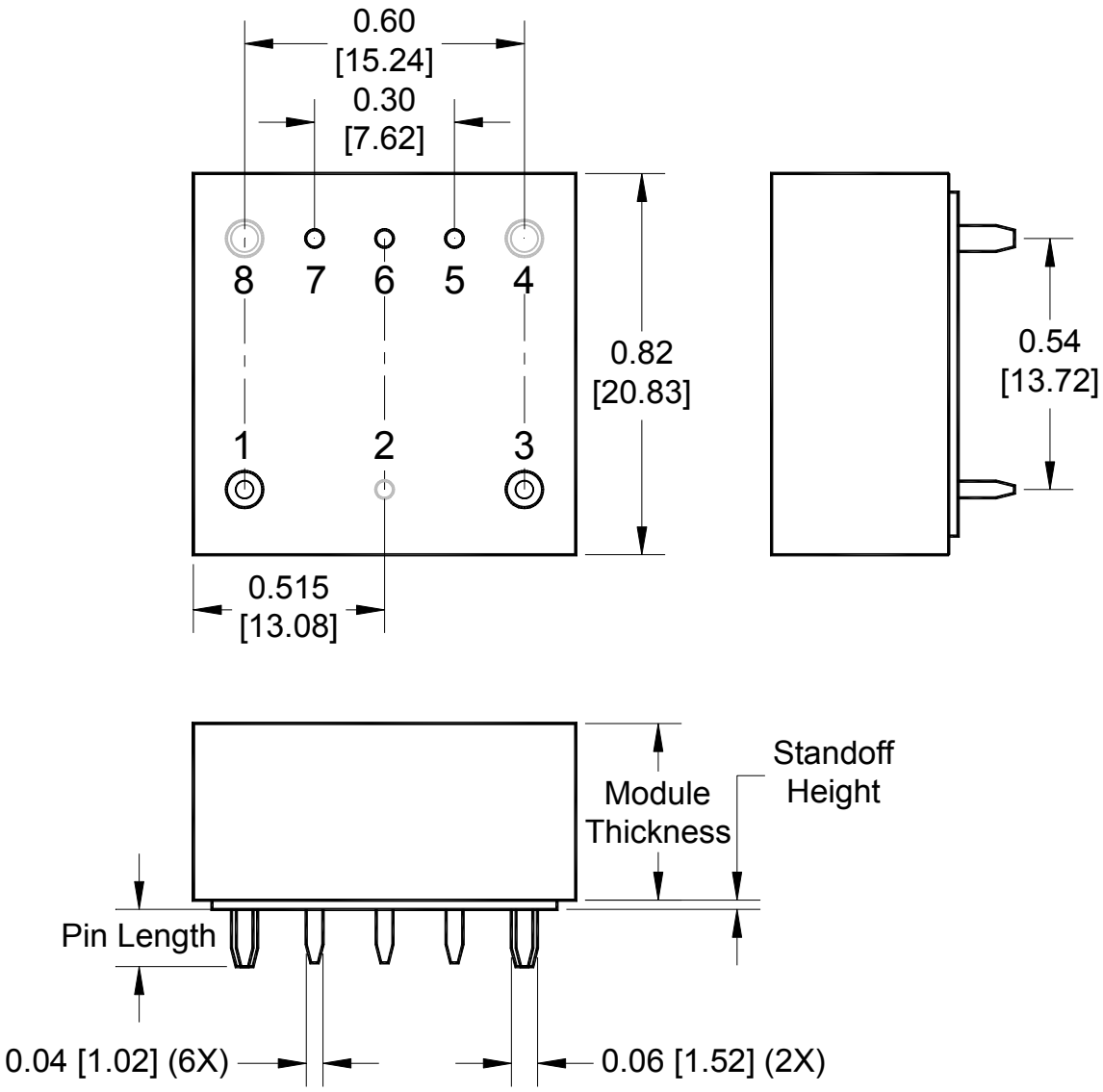
Base-plate: None

Maximum torque: NA

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

METAL ENCLOSED



Dimensions and Pin Connections

Designation	Function Description	Pin #
+IN	Positive input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
-IN	Negative input	**3**
-Vo	Negative output	**4**
-S	Negative remote sense	**5**
TRIM	Output voltage adjust	**6**
+S	Positive remote sense	**7**
+Vo	Positive output	**8**

Dimensions: inches (mm)
Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)
Weight: 16g

Base plate: None-conductive
Mounting inserts: None
Maximum torque: NA
Pin material: Copper alloy or Brass
Pin plating: Gold over Nickel

Efficiency >91% | 165W/in³ | INPUT 2:1/4:1 | Remote ON OFF | Full Metal Package

Molded Package | Open Frame Package | OVP | OTP | OCP

6.4Mhrs MTBF

Pb | RoHS 2002/95/EC

The N32 series power module provides 50W maximum outputs in 0.91"× 0.91" footprint with industry standard compatible pin assignment. The efficient SR stage is combined with patented "Coupled-inductor SR" topology that would reduce power loss to achieve 165W/in^3 power density. The multi-layer single side circuit board design plus the fully metal-enclosed package would enhance the thermal performance and improve its reliability. The module is designed for Telecom, Servers, Networking equipments and other industry applications that use a 24V or 48V input bus.

PART NUMBER SYSTEM (Total height = standoff height + module thickness)

Preliminary Data Sheet

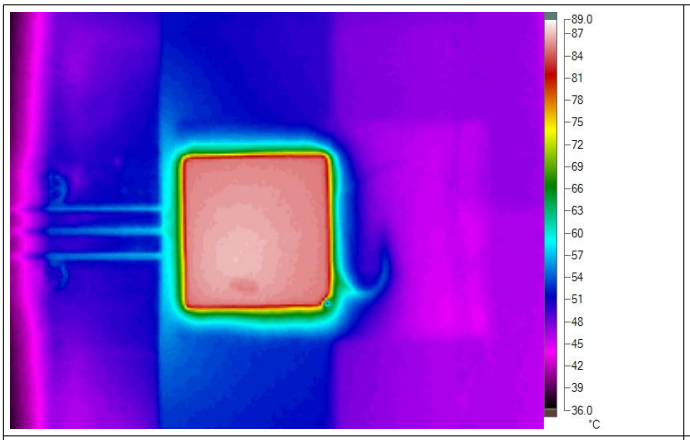
N32	48	120	a	b	c	d	-	XX	XX	X
Series Name	Rated Input	Rated Output	Enable Logic	Pin Length	Standoff Height	Base-Plate / module thickness		Setting	Suffix	Version
N32	**18=**9V~36V **24=**18V~36V **36=**18V~75V **48=**36V~75V	**Unit:** 0.1V Increments 120= 12V 033= 3.3V	**P:** Positive **N:** Negative	**-:** SMD **0:** 0.12" **1:** 0.16" **2:** 0.20" **3:** 0.24"	**-:** SMD **0:** 0.02" **1:** 0.08" **2:** 0.16"	**N:** Open Frame / 0.35" **E:** Metal Enclosed / 0.40" **M:** Molding / 0.40"	-	For customer function only	For marketing purpose only	

MODEL LIST (Contact to factory for 4X input models or special specifications)

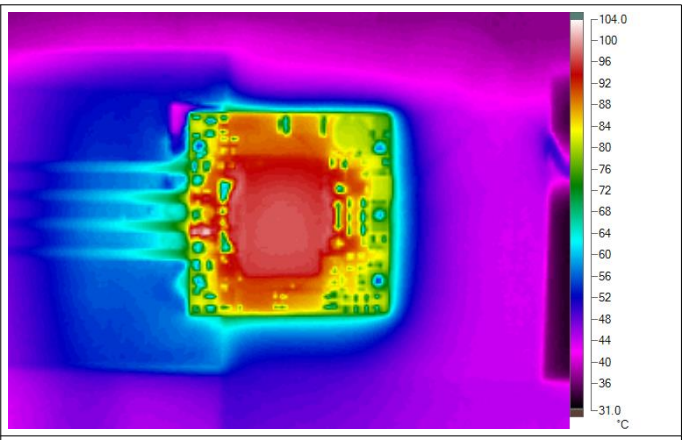
Part Number *	Maximum Input		Maximum Output		Efficiency
N3224120abcd-XXXXX	18V~36V	57W	12.0V/4.2A	50W	90%
N3224050abcd-XXXXX	18V~36V	59W	5.0V/10A	50W	89%
N3224033abcd-XXXXX	18V~36V	47W	3.3V/12A	40W	87%
N3224025abcd-XXXXX	18V~36V	37W	2.5V/12A	30W	85%

Part Number *	Maximum Input		Maximum Output		Efficiency
N3248120abcd-XXXXX	36V~75V	57W	12.0V/4.2A	50W	91%
N3248050abcd-XXXXX	36V~75V	59W	5.0V/10A	50W	90%
N3248033abcd-XXXXX	36V~75V	47W	3.3V/12A	40W	88%
N3248025abcd-XXXXX	36V~75V	37W	2.5V/12A	30W	86%

REFERENCED THERMAL IMAGES



N3224050N00E-08 (Io= 7.0A@50˚C/20LFM)



N3236050N20N-06 (Io= 5.9A@50˚C/20LFM)

SPECIFICATIONS

Absolute Maximum Ratings

Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 18V/24V Models 36V/48V Models Transient (100mS): 18V/24V Models 36V/48V Models	 -0.5V to +40Vdc -0.5V to +80Vdc 50V Maximum 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

General Parameters

Conversion Efficiency	Typical	See table
Switching Frequency	Typical	450KHz
MTBF	Bellcore TR-332 issue 6	6.40×10^{6} hrs @GB/25°C (N3248050abcd-10XXX)
OTP	T_{AVG} or T_C	110°C ±5°C for standard setting
Weight	Packaging related	7~18g

Control Functions

Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

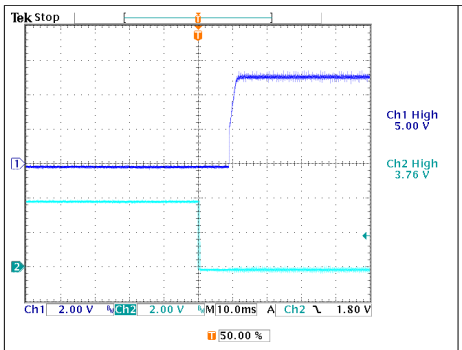
Input

Operation Voltage Range	18V(24V) Models 36V(48V) Models	+9V(+18V) to +36Vdc +18V(+36V) to +75Vdc
Reflected Ripple Current	L_{EXT} = 10uH	20mA rms/60mAp-p
Power ON Voltage Ranges	18V Models 24V/36V Models 48V Models	+8.5V to + 9.0Vdc +17.0V to +18.0Vdc +34.0V to +36.0Vdc
Power OFF Voltage Ranges	18V Models 24V/36V Models 48V Models	+7.8V to 8.3Vdc +15.6V to +16.6Vdc +31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	18V/24V Models 36V/48V Models	20.0uF Max 14.0uF Max

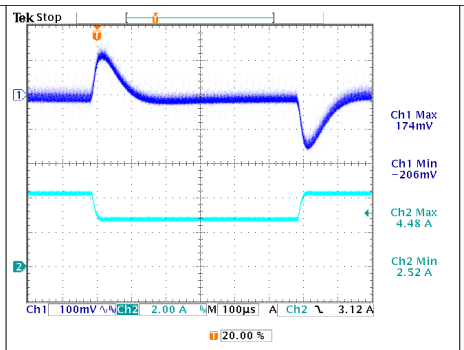
Output

Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.2%
Load Regulation	0%~100%	±0.2%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

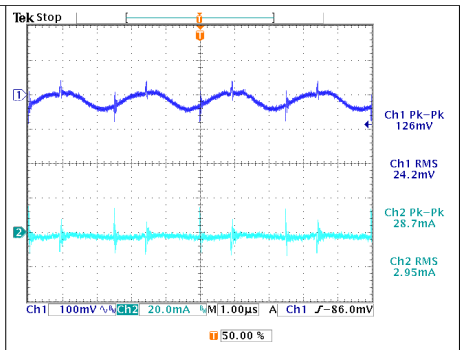
TYPICAL WAVES AND CURVES



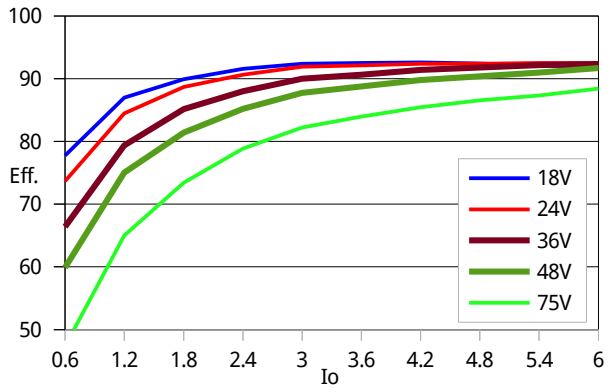
Start-up waveform of N3236050N20N-06
(V_{IN}: 36V, Load: 6A)



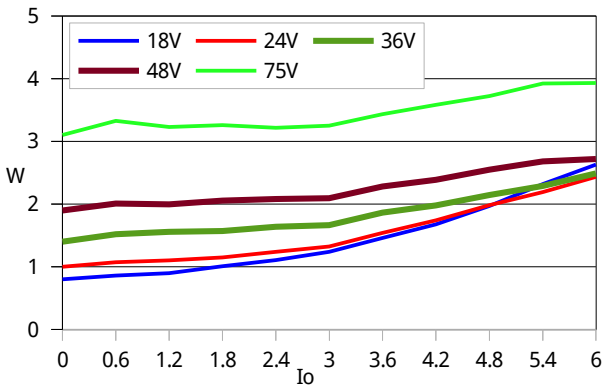
Transient response of N3236050N20N-06
(V_{IN}: 36V, Load: 4.5A/3.0A@2.5A/µS)



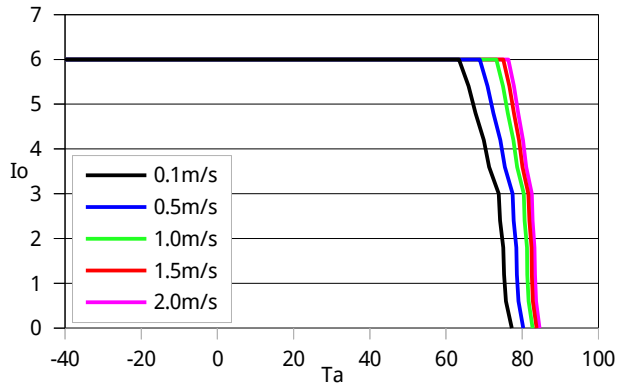
Input/Output ripples of N3236050N20N-06
(V_{IN}: 36V, Load: 6A, L_{IN}=10uH)



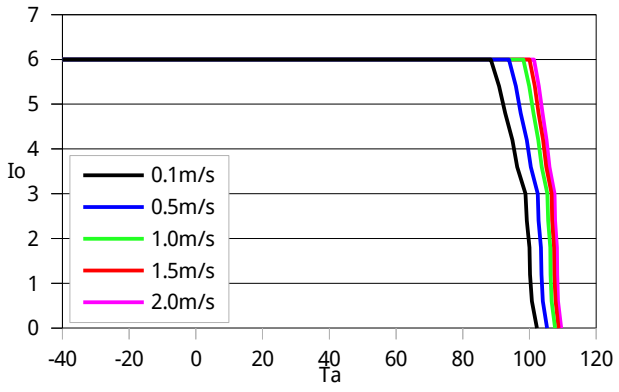
Efficiency plot of N3236050N20N-06



Power loss curves of N3236050N20N-06

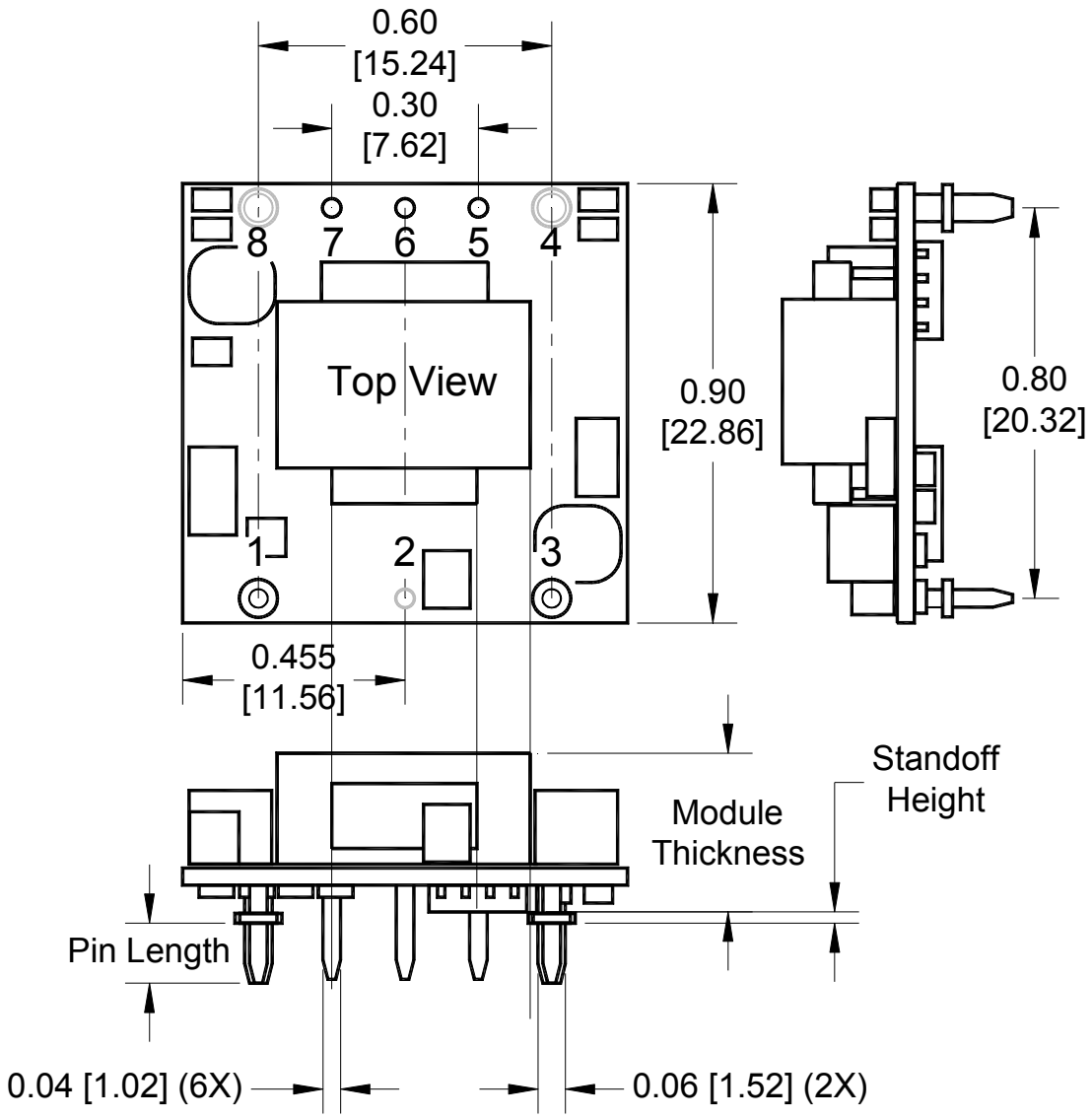


Calculated derating of N3236050N20N-06 (T_C= 95ºC)



Calculated derating of N3236050N20N-06 (T_C= 125ºC)

OPEN FRAME



Dimensions and Pin Connections

Designation	Function Description	Pin #
+IN	Positive input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
-IN	Negative input	**3**
-Vo	Negative output	**4**
-S	Negative remote sense	**5**
TRIM	Output voltage adjust	**6**
+S	Positive remote sense	**7**
+Vo	Positive output	**8**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 7g / Sixteenth Brick

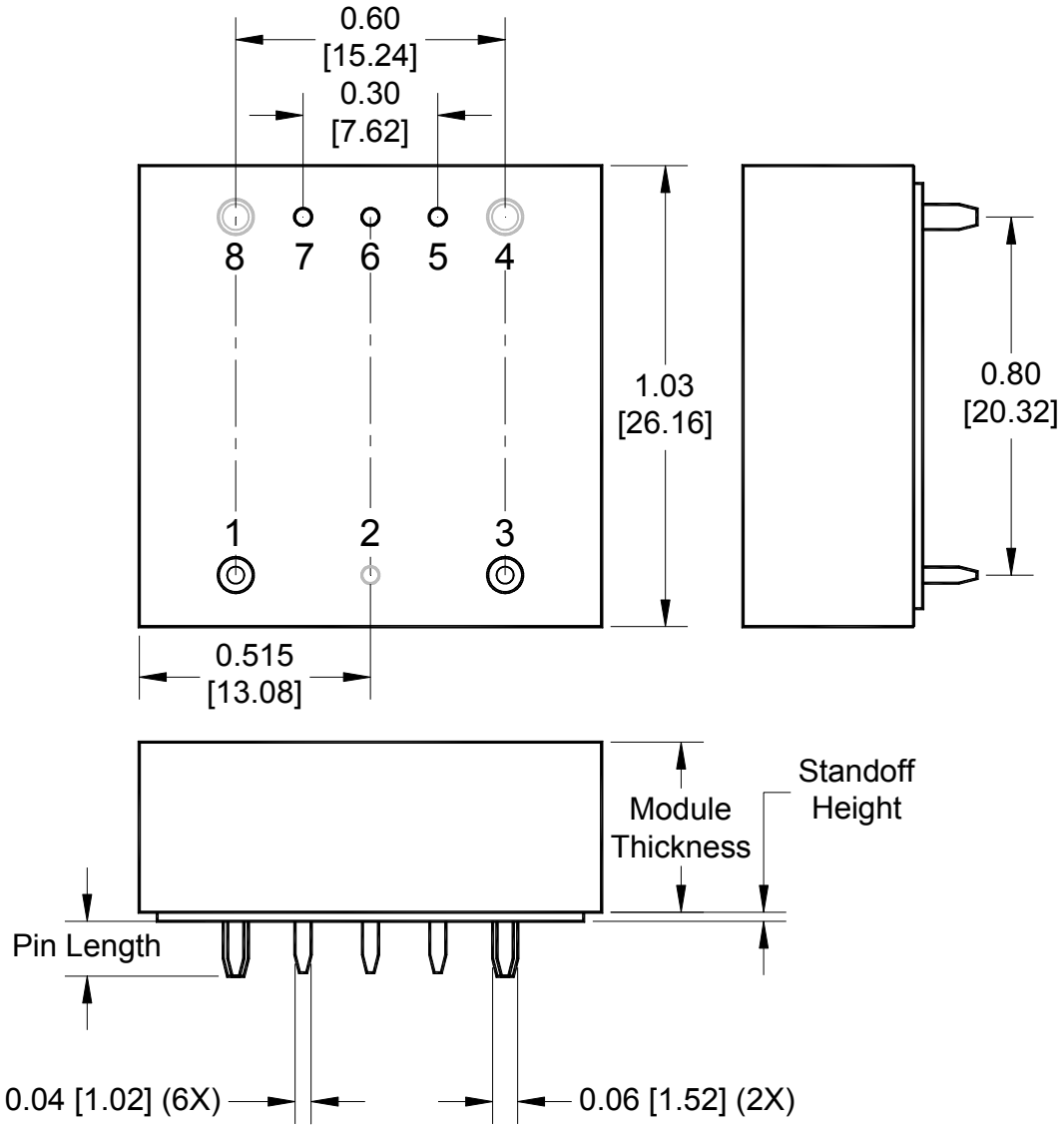
Base-plate: None

Maximum torque: NA

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

METAL ENCLOSED



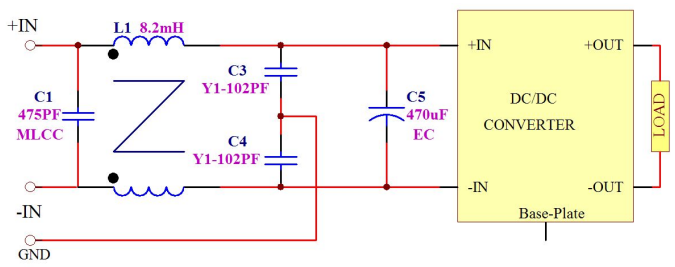
Dimensions and Pin Connections

Designation	Function Description	Pin #
+IN	Positive input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
-IN	Negative input	**3**
-Vo	Negative output	**4**
-S	Negative remote sense	**5**
TRIM	Output voltage adjust	**6**
+S	Positive remote sense	**7**
+Vo	Positive output	**8**

Dimensions: inches (mm)
Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)
Weight: 18g

Base plate: None-conductive
Mounting inserts: None
Maximum torque: NA
Pin material: Copper alloy or Brass
Pin plating: Gold over Nickel

REFERENCED EMC CIRCUIT



Referenced input filter circuit

Referenced Input Filter Circuit

The circuit shown in left-hand side can be used as a design reference for customer system. The EMC performance of customer's system depends on the whole system design. It should be noted that modifications on the circuit parameters and fine adjustment of the final layout affect the final EMC performance. Since no components are ideal for infinite frequency range. The bandwidth of EMC components should be taking into consideration when designing an EMC filter circuit.

EXTERNAL OUTPUT CAPACITANCE

For reducing the ripple/noise voltage on the load or the peak voltage deviation caused by a step load, additional capacitor is required for decoupling the unwanted voltage components from the load. Since the step load performance is mainly dominated by the feedback loop performance, which also affected by the additional output capacitance. To put some low-bandwidth high capacitance Electrolytic capacitors very close to the power module help nothing and even introduces unwanted effects on the feedback performance, sinking or sourcing surge current damaging the power module. Glary suggest to put a low ESR capacitor with simply sufficient capacitance to handle the short duration high frequency component of ripple/noise or voltage peak deviation, and the capacitor needs to be as close as possible to the load. Do not add capacitor for no reason.

NOTE:

1. **It is recommended that the input should be protected by fuses or other protection devices.**
2. All specifications are typical at nominal input, full load and 25°C unless otherwise noted.
3. Specifications are subject to change without notice.
4. Printed or downloaded datasheets are not subject to Glary document control.
5. Product labels shown, including safety agency certificates, may vary based on the date of manufacture.
6. Information provided in this documentation is for ordering purposes only.
7. This product is not designed for use in critical life support systems, equipment used in hazardous environments, nuclear control systems or other such applications, which necessitate specific safety and regulatory standards other than the ones listed in this datasheet.

IMPORTANT

※ General specifications and the performances are related to standard series only, no special customer specification display here except requested items.

※ In order to secure effective usage of converter and the validity of Glary's service and warranty coverage, please refer to the application notes for general usage. For needs of usage beyond the application notes, please contact to Glary headquarter or our regional sales representative office for help.

Efficiency >91% | 121W/in³ | INPUT 2:1/4:1 | Remote ON OFF | Full Metal Package

Molded Package | Open Frame Package | OVP | OTP | OCP

6.4Mhrs MTBF

Pb | RoHS 2002/95/EC

The N16 series power module provides 50W maximum outputs with industry standard sixteenth brick pin assignment. The efficient SR stage is combined with patented "Coupled-inductor SR" topology that would reduce power loss to achieve 90W/in³ power density. The multi-layer single side circuit board design plus the fully metal-enclosed package would enhance the thermal performance and improve its reliability. The module is designed for Telecom, Servers, Networking equipments and other industry applications that use a 24V or 48V input bus.

PART NUMBER SYSTEM (Total height = standoff height + module thickness)

Preliminary Data Sheet

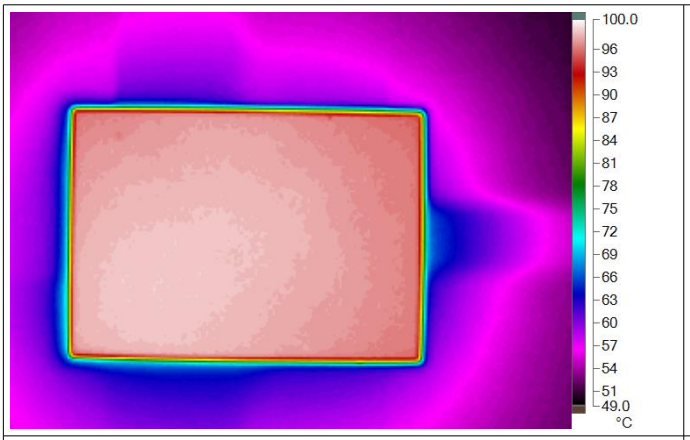
N16	48	120	a	b	c	d	-	XX	XX	X
Series Name	Rated Input	Rated Output	Enable Logic	Pin Length	Standoff Height	Base-Plate / module thickness		Setting	Suffix	Version
N16	**18**=9V~36V **24**=18V~36V **36**=18V~75V **48**=36V~75V	**Unit:** 0.1V Increments 120= 12V 033= 3.3V	**P:** Positive **N:** Negative	**-:** SMD **0:** 0.12" **1:** 0.16" **2:** 0.20" **3:** 0.24"	**-:** SMD **0:** 0.02" **1:** 0.08" **2:** 0.16"	**N:** Open Frame / 0.36" **E:** Metal Enclosed / 0.40" **M:** Molding / 0.40"	-	For customer function only	For marketing purpose only	

MODEL LIST (Contact to factory for 4X input models or special specifications)

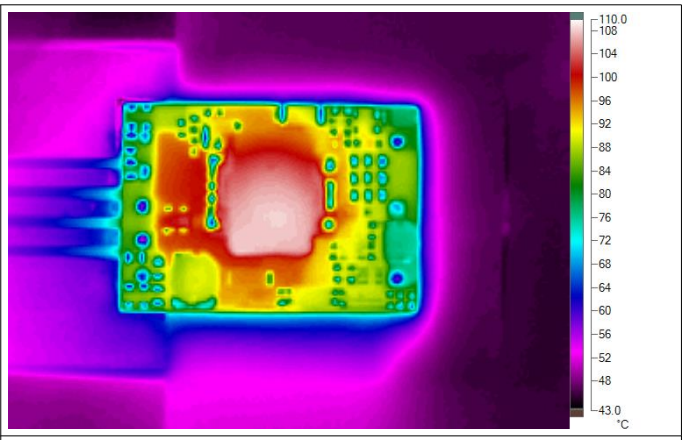
Part Number *	Maximum Input		Maximum Output		Efficiency
N1624120abcd-XXXXX	18V~36V	57W	12.0V/4.2A	50W	90%
N1624050abcd-XXXXX	18V~36V	59W	5.0V/10A	50W	89%
N1624033abcd-XXXXX	18V~36V	47W	3.3V/12A	40W	87%
N1624025abcd-XXXXX	18V~36V	37W	2.5V/12A	30W	85%

Part Number *	Maximum Input		Maximum Output		Efficiency
N1648120abcd-XXXXX	36V~75V	57W	12.0V/4.2A	50W	91%
N1648050abcd-XXXXX	36V~75V	59W	5.0V/10A	50W	90%
N1648033abcd-XXXXX	36V~75V	47W	3.3V/12A	40W	88%
N1648025abcd-XXXXX	36V~75V	37W	2.5V/12A	30W	86%

REFERENCED THERMAL IMAGES



N1648120P20E-04 (Io= 4A@50˚C/20LFM)



N1636120N10N-04 (Io= 3.1A@50˚C/100LFM)

SPECIFICATIONS

Absolute Maximum Ratings

Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 18V/24V Models 36V/48V Models Transient (100mS): 18V/24V Models 36V/48V Models	 -0.5V to +40Vdc -0.5V to +80Vdc 50V Maximum 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

General Parameters

Conversion Efficiency	Typical	See table
Switching Frequency	Typical	450KHz
MTBF	Bellcore TR-332 issue 6	6.40×10^6 hrs @GB/25°C (N1648050abcd-10XXX)
OTP	T_{AVG} or T_C	110°C ±5°C for standard setting
Weight	Packaging related	8~26g

Control Functions

Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

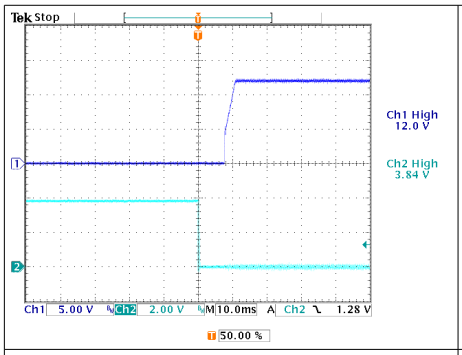
Input

Operation Voltage Range	18V(24V) Models 36V(48V) Models	+9V(+18V) to +36Vdc +18V(+36V) to +75Vdc
Reflected Ripple Current	L_{EXT} = 10uH	20mA rms/60mAp-p
Power ON Voltage Ranges	18V Models 24V/36V Models 48V Models	+8.5V to + 9.0Vdc +17.0V to +18.0Vdc +34.0V to +36.0Vdc
Power OFF Voltage Ranges	18V Models 24V/36V Models 48V Models	+7.8V to 8.3Vdc +15.6V to +16.6Vdc +31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	18V/24V Models 36V/48V Models	20.0uF Max 14.0uF Max

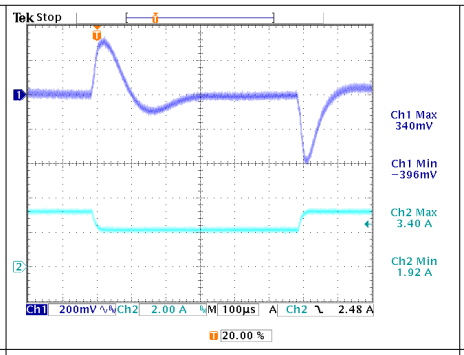
Output

Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.2%
Load Regulation	0%~100%	±0.2%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

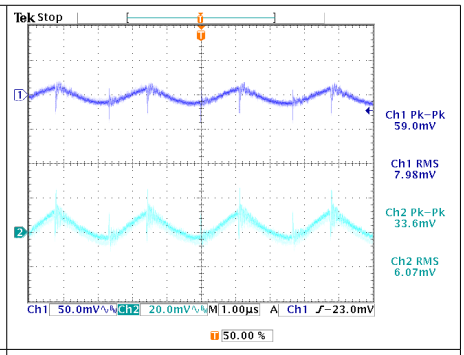
TYPICAL WAVES AND CURVES



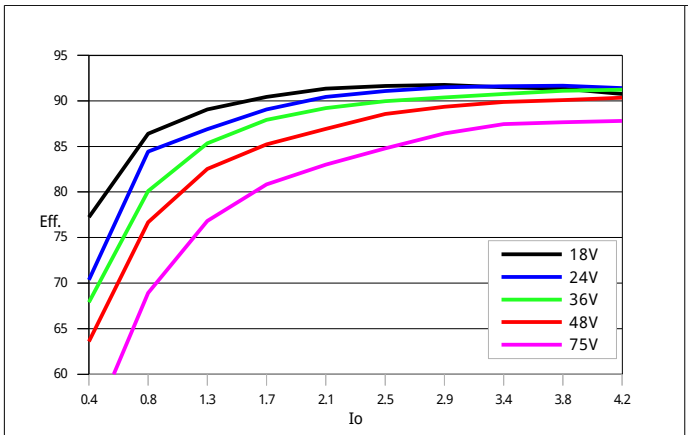
Start-up waveform of N1636120abcd-04
(V_{IN}: 36V, C_{OUT}= 0uF, Load: 4.2A)



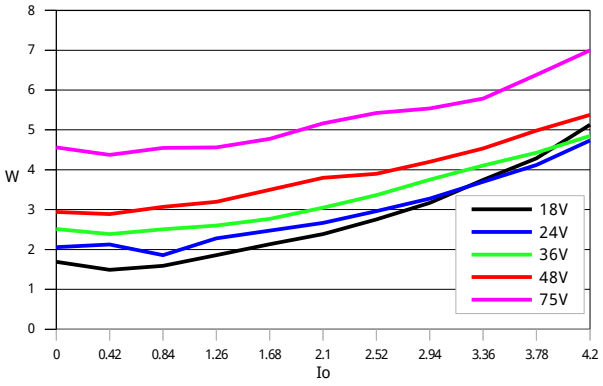
Transient response of N1636120abcd-04
(V_{IN}: 36V, C_{OUT}= 0uF, Load: 3.15A/2.1A@2.5A/µS)



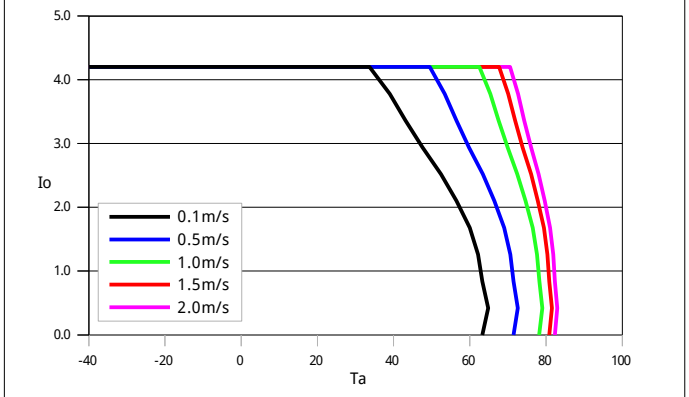
Input/Output ripples of N1636120abcd-04
(V_{IN}: 36V, C_{OUT}= 0uF, Load: 4.2A, L_{IN}=10uH)



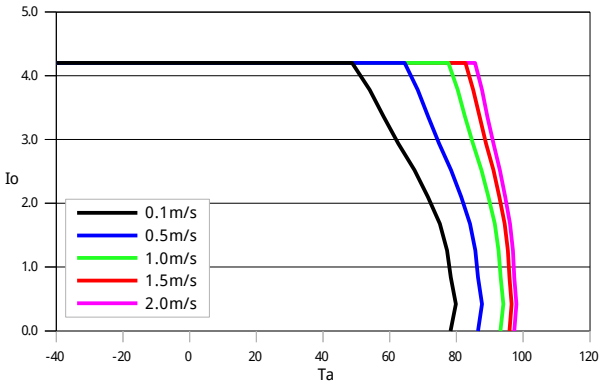
Efficiency plot of N1636120N10N-04



Power loss curves of N1636120N10N-04

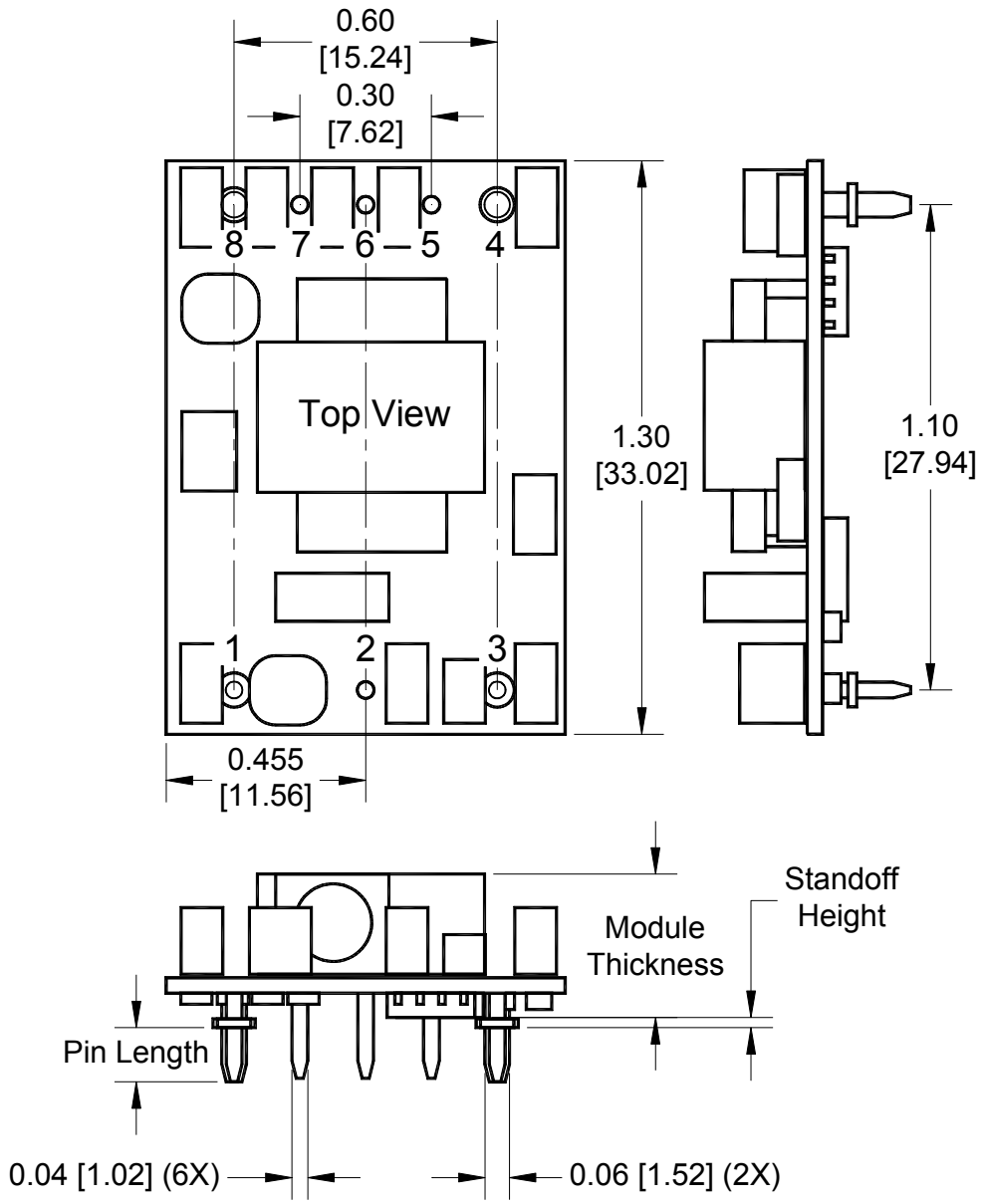


Calculated derating of N1636120N10N-04 (T_{OTP}= 90°C)



Calculated derating of N1636120N10N-04 (T_{OTP}= 110°C)

OPEN FRAME



Dimensions and Pin Connections

Designation	Function Description	Pin #
+IN	Positive input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
-IN	Negative input	**3**
-Vo	Negative output	**4**
-S	Negative remote sense	**5**
TRIM	Output voltage adjust	**6**
+S	Positive remote sense	**7**
+Vo	Positive output	**8**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 8g / Sixteenth Brick

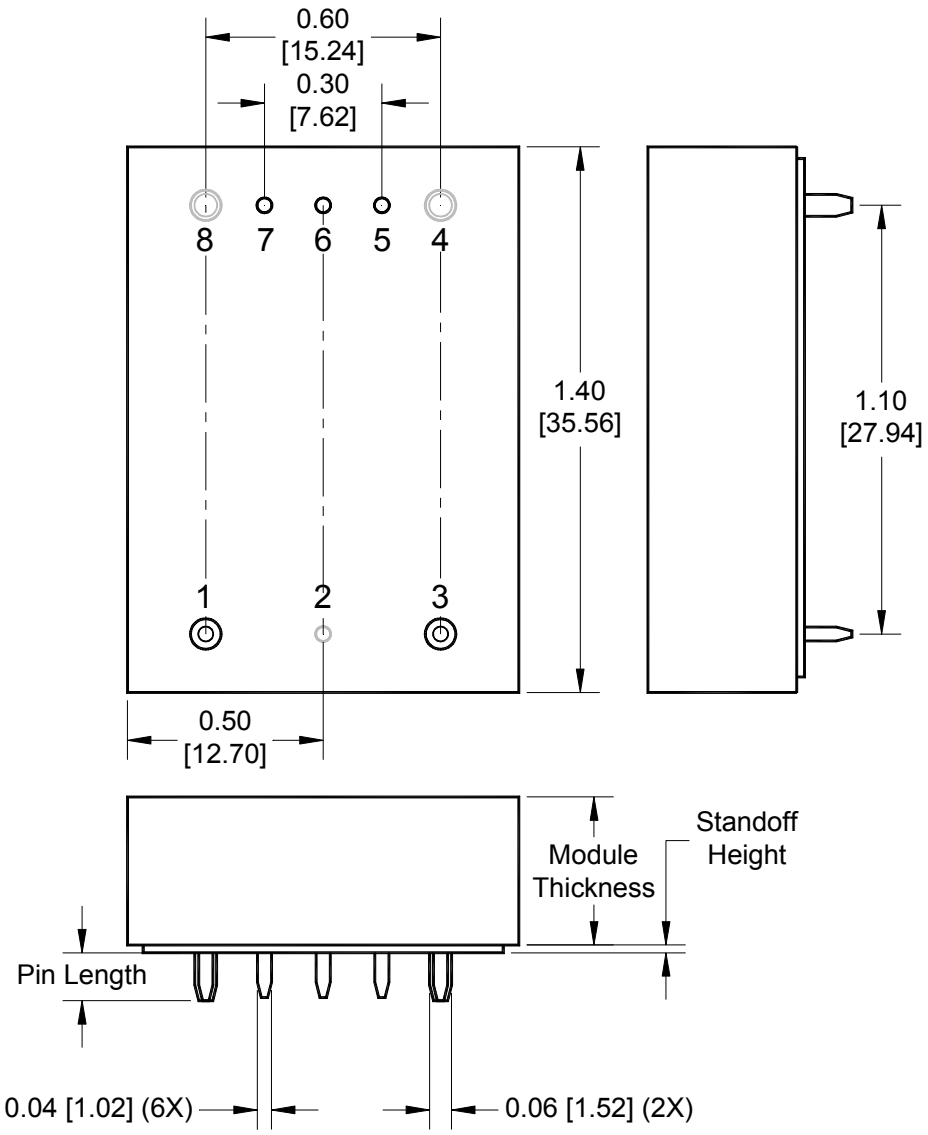
Base-plate: None

Maximum torque: NA

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

METAL ENCLOSED



Dimensions and Pin Connections

Designation	Function Description	Pin #
+IN	Positive input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
-IN	Negative input	**3**
-Vo	Negative output	**4**
-S	Negative remote sense	**5**
TRIM	Output voltage adjust	**6**
+S	Positive remote sense	**7**
+Vo	Positive output	**8**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 26g

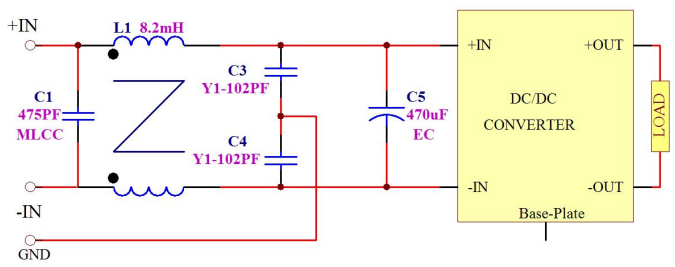
Base plate: None-conductive

Mounting inserts: None
Maximum torque: NA

Pin material: Copper alloy or Brass

Pin plating: Gold over Nickel

REFERENCED EMC CIRCUIT



Referenced input filter circuit

Referenced Input Filter Circuit

The circuit shown in left-hand side can be used as a design reference for customer system. The EMC performance of customer's system depends on the whole system design. It should be noted that modifications on the circuit parameters and fine adjustment of the final layout affect the final EMC performance. Since no components are ideal for infinite frequency range. The bandwidth of EMC components should be taking into consideration when designing an EMC filter circuit.

EXTERNAL OUTPUT CAPACITANCE

For reducing the ripple/noise voltage on the load or the peak voltage deviation caused by a step load, additional capacitor is required for decoupling the unwanted voltage components from the load. Since the step load performance is mainly dominated by the feedback loop performance, which also affected by the additional output capacitance. To put some low-bandwidth high capacitance Electrolytic capacitors very close to the power module help nothing and even introduces unwanted effects on the feedback performance, sinking or sourcing surge current damaging the power module. Glary suggest to put a low ESR capacitor with simply sufficient capacitance to handle the short duration high frequency component of ripple/noise or voltage peak deviation, and the capacitor needs to be as close as possible to the load. Do not add capacitor for no reason.

NOTE:

1. **It is recommended that the input should be protected by fuses or other protection devices.**
2. All specifications are typical at nominal input, full load and 25°C unless otherwise noted.
3. Specifications are subject to change without notice.
4. Printed or downloaded datasheets are not subject to Glary document control.
5. Product labels shown, including safety agency certificates, may vary based on the date of manufacture.
6. Information provided in this documentation is for ordering purposes only.
7. This product is not designed for use in critical life support systems, equipment used in hazardous environments, nuclear control systems or other such applications, which necessitate specific safety and regulatory standards other than the ones listed in this datasheet.

IMPORTANT

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※ In order to secure effective usage of converter and the validity of Glary's service and warranty coverage, please refer to the application notes for general usage. For needs of usage beyond the application notes, please contact to Glary headquarter or our regional sales representative office for help.

Efficiency >93%	414W/in³	INPUT 2:1/4:1	Remote ON OFF	Full Metal Package
4.5Mhrs MTBF	Open Frame Package	OVP	OTP	OCP
			Pb	RoHS 2002/95/EC

The U32 series power module provides 120W maximum outputs with industry standard sixteenth brick pin assignment. The efficient SR stage is combined with patented "Buck-reset Forward" topology that would reduce power loss to achieve 414W/in³ power density. The multi-layer single side circuit board design plus the fully metal-enclosed package would enhance the thermal performance and improve its reliability. The module is designed for Telecom, Servers, Networking equipments and other industry applications that use a 24V or 48V input bus.

PART NUMBER SYSTEM (Total height = standoff height + module thickness)

Preliminary Data Sheet

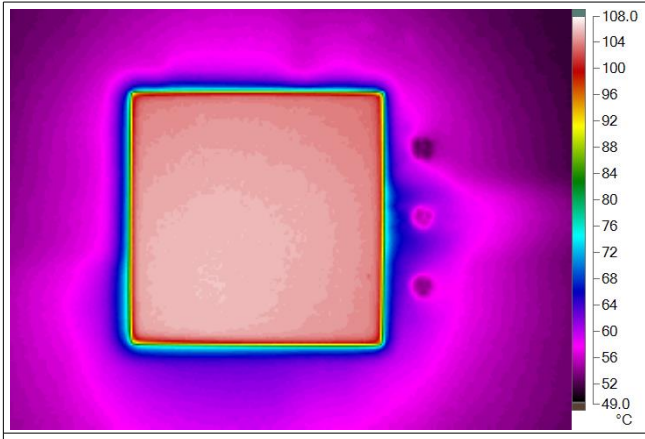
U32	48	120	a	b	c	d	-	XX	XX	X
Series Name	Rated Input	Rated Output	Enable Logic	Pin Length	Standoff Height	Base-Plate / module thickness		Setting	Suffix	Version
U32	**18=**9V~36V **24=**18V~36V **36=**18V~75V **48=**36V~75V	**Unit:** 0.1V Increments 120= 12V 033= 3.3V	**P:** Positive **N:** Negative	**-:** SMD **0:** 0.12" **1:** 0.16" **2:** 0.20" **3:** 0.24"	**-:** SMD **0:** 0.02" **1:** 0.08" **2:** 0.16"	**N:** Open Frame / 0.35" **E:** Metal Enclosed / 0.40" **M:** Molding / 0.40"	-	For customer function only	For marketing purpose only	

MODEL LIST (Contact to factory for 4X input models or special specifications)

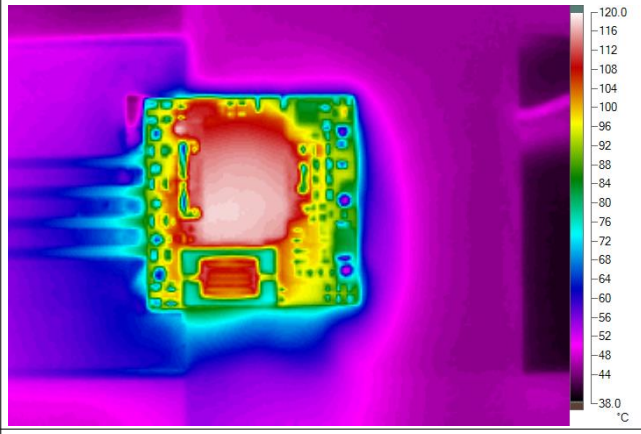
Part Number *	Maximum Input		Maximum Output		Efficiency
U3224120abcd-XXXXX	18V~36V	134W	12.0V/10A	120W	92%
U3224050abcd-XXXXX	18V~36V	113W	5.0V/20A	100W	91%
U3224033abcd-XXXXX	18V~36V	95W	3.3V/25A	83W	89%
U3224025abcd-XXXXX	18V~36V	74W	2.5V/25A	63W	87%

Part Number *	Maximum Input		Maximum Output		Efficiency
U3248120abcd-XXXXX	36V~75V	133W	12.0V/10A	120W	93%
U3248050abcd-XXXXX	36V~75V	112W	5.0V/20A	100W	92%
U3248033abcd-XXXXX	36V~75V	94W	3.3V/25A	83W	90%
U3248025abcd-XXXXX	36V~75V	73W	2.5V/25A	63W	88%

REFERENCED THERMAL IMAGES



U3224120N00E-10 (Io= 7.5A@50°C/200LFM)



U3224050N10N-20 (Io= 10.6A@50°C/200LFM)

SPECIFICATIONS

Absolute Maximum Ratings

Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 18V/24V Models 36V/48V Models Transient (100mS): 18V/24V Models 36V/48V Models	 -0.5V to +40Vdc -0.5V to +80Vdc 50V Maximum 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

General Parameters

Conversion Efficiency	Typical	See table
Switching Frequency	Typical	400KHz
MTBF	Bellcore TR-332 issue 6	4.50×10^{6} hrs @GB/25°C (U3248050abcd-20XXX)
OTP	T_{AVG} or T_C	110°C ±5°C for standard setting
Weight	Packaging related	9~20g

Control Functions

Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

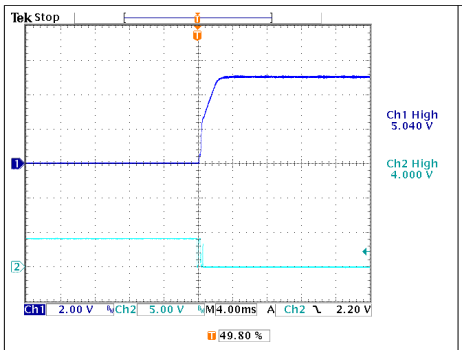
Input

Operation Voltage Range	18V(24V) Models 36V(48V) Models	+9V(+18V) to +36Vdc +18V(+36V) to +75Vdc
Reflected Ripple Current	L_{EXT} = 10uH	20mA rms/60mAp-p
Power ON Voltage Ranges	18V Models 24V/36V Models 48V Models	+8.5V to + 9.0Vdc +17.0V to +18.0Vdc +34.0V to +36.0Vdc
Power OFF Voltage Ranges	18V Models 24V/36V Models 48V Models	+7.8V to 8.3Vdc +15.6V to +16.6Vdc +31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	18V/24V Models 36V/48V Models	20.0uF Max 14.0uF Max

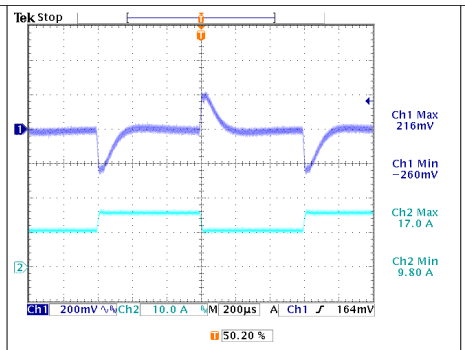
Output

Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.2%
Load Regulation	0%~100%	±0.2%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

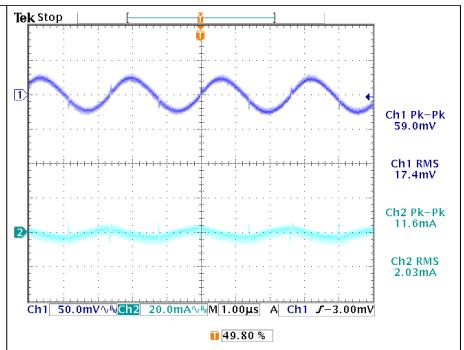
TYPICAL WAVES AND CURVES



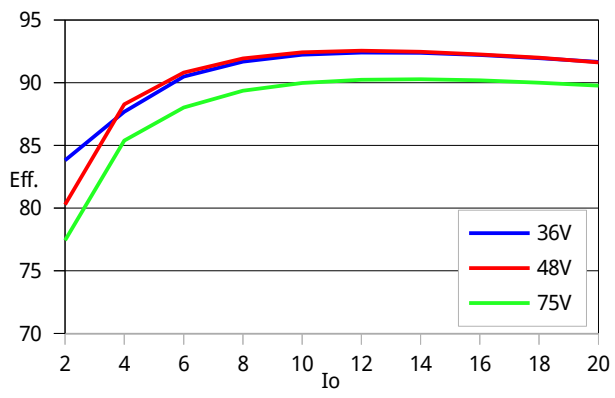
Start-up waveform of U3224050N10N-20
(V_{IN}: 24V, Load: 20A)



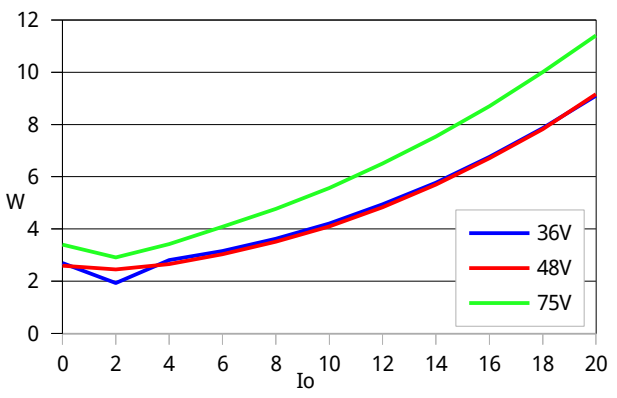
Transient response of U3224050N10N-20
(V_{IN}: 24V, Load: 10A/17A@2.5A/µS)



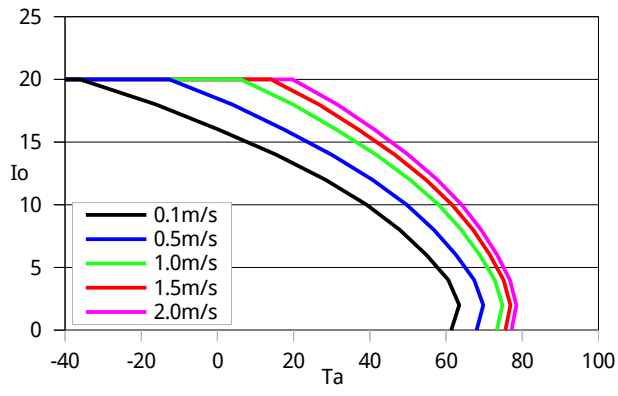
Input/Output ripples of U3224050N10N-20
(V_{IN}: 24V, Load: 20A, L_{IN}=10uH)



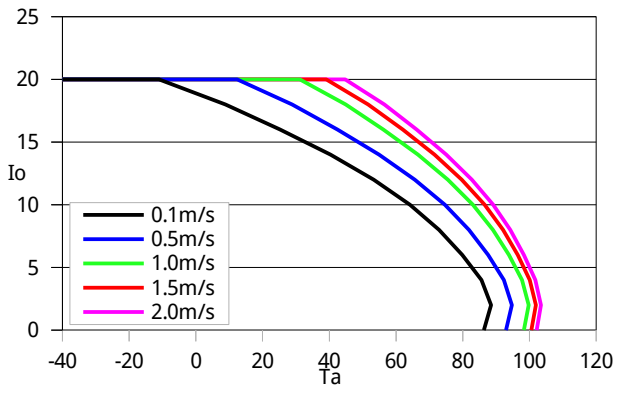
Efficiency plot of U3224050N10N-20



Power loss curves of U3224050N10N-20

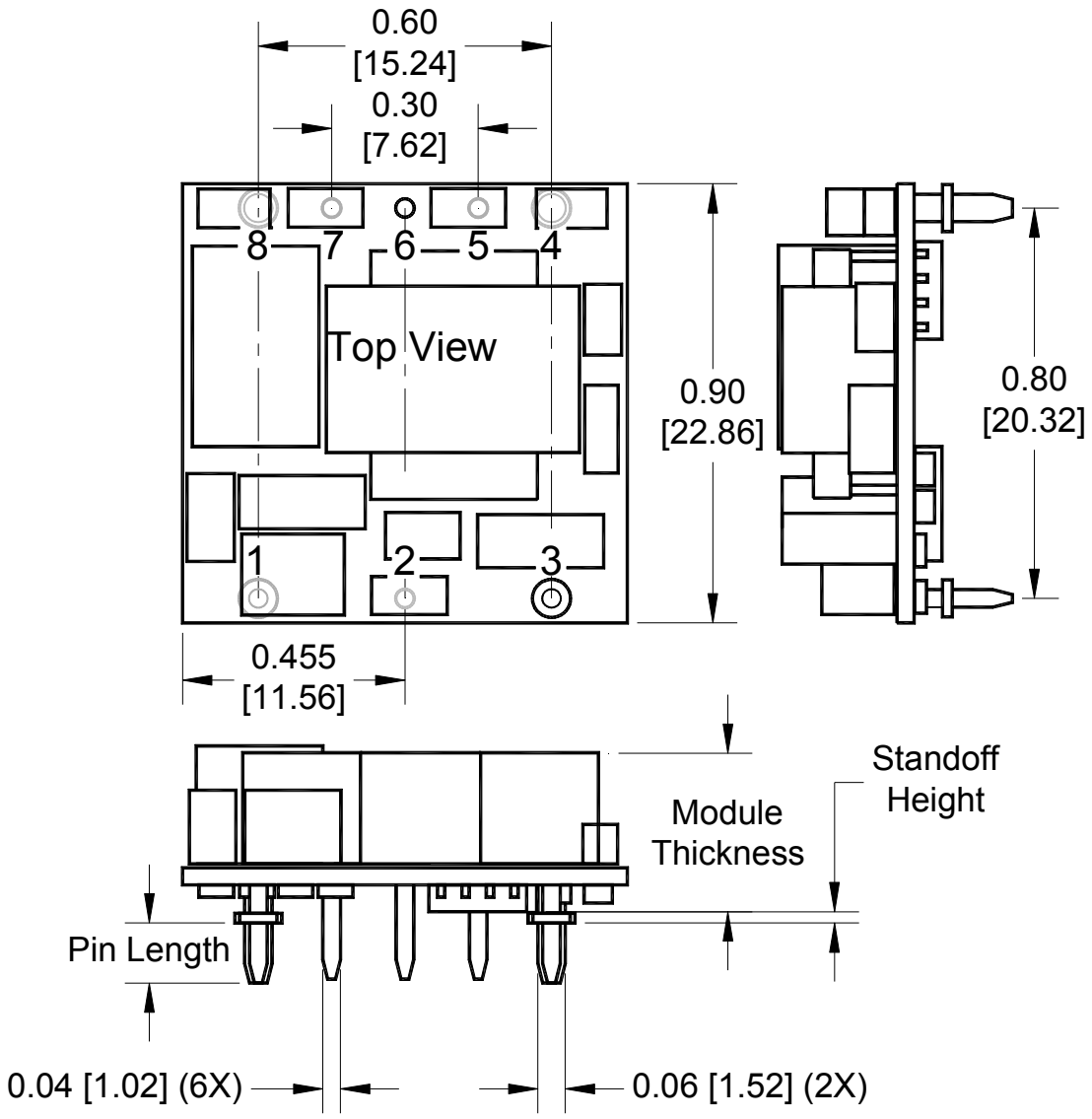


Calculated derating of U3224050N10N-20 (T_{OTP}= 100ºC)



Calculated derating of U3224050N10N-20 (T_{OTP}= 125ºC)

OPEN FRAME



Dimensions and Pin Connections

Designation	Function Description	Pin #
+IN	Positive input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
-IN	Negative input	**3**
-Vo	Negative output	**4**
-S	Negative remote sense	**5**
TRIM	Output voltage adjust	**6**
+S	Positive remote sense	**7**
+Vo	Positive output	**8**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 9g / Micro Brick

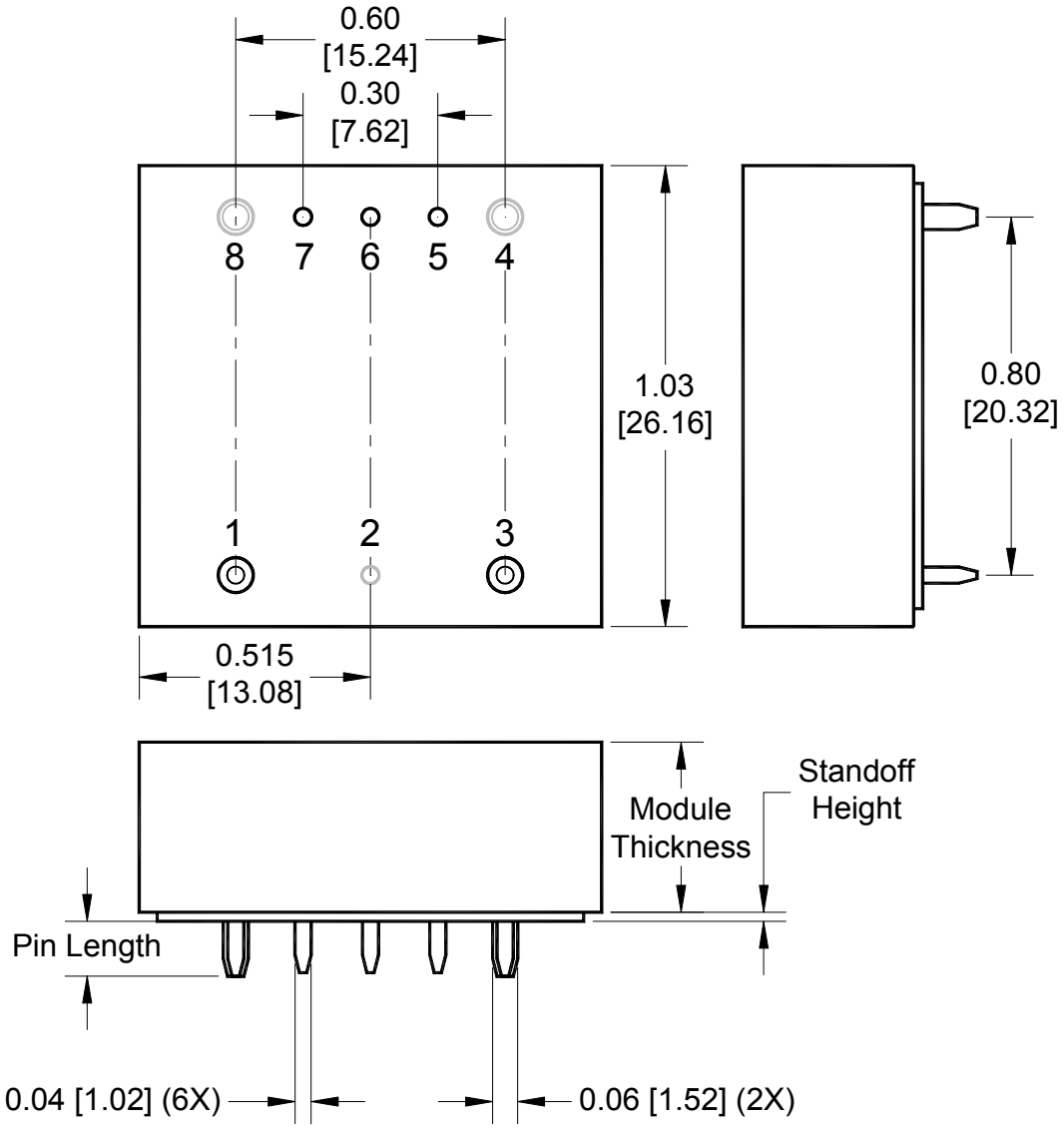
Base-plate: None

Maximum torque: NA

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

METAL ENCLOSED



Dimensions and Pin Connections

Designation	Function Description	Pin #
+IN	Positive input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
-IN	Negative input	**3**
-Vo	Negative output	**4**
-S	Negative remote sense	**5**
TRIM	Output voltage adjust	**6**
+S	Positive remote sense	**7**
+Vo	Positive output	**8**

Dimensions: inches (mm)
Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)
Weight: 20g

Base plate: None-conductive
Mounting inserts: None
Maximum torque: NA
Pin material: Copper alloy or Brass
Pin plating: Gold over Nickel

Efficiency >93% | 405W/in³ | INPUT 2:1/4:1 | Remote ON OFF | Full Metal Package

4.5Mhrs MTBF | Open Frame Package | OVP | OTP | OCP

Pb | RoHS 2002/95/EC

The U16 series power module provides 150W maximum outputs with industry standard sixteenth brick pin assignment. The efficient SR stage is combined with patented "Buck-reset Forward" topology that would reduce power loss to achieve 405W/in³ power density. The multi-layer single side circuit board design plus the fully metal-enclosed package would enhance the thermal performance and improve its reliability. The module is designed for Telecom, Servers, Networking equipments and other industry applications that use a 24V or 48V input bus.

PART NUMBER SYSTEM (Total height = standoff height + module thickness)

Preliminary Data Sheet

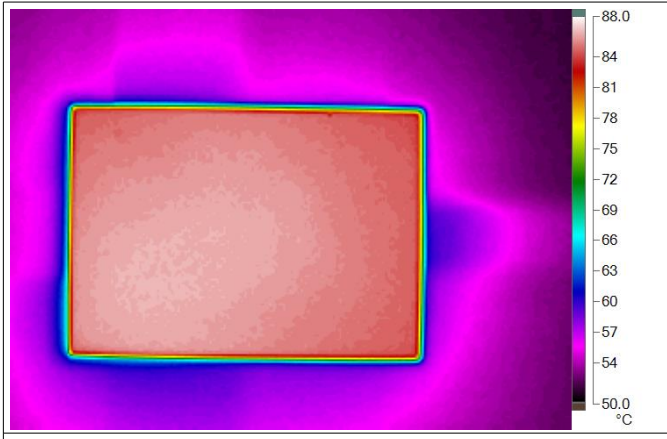
U16	48	120	a	b	c	d	-	XX	XX	X
Series Name	Rated Input	Rated Output	Enable Logic	Pin Length	Standoff Height	Base-Plate / module thickness		Setting	Suffix	Version
U16	**18**=9V~36V **24**=18V~36V **36**=18V~75V **48**=36V~75V	**Unit:** 0.1V Increments 120= 12V 033= 3.3V	**P:** Positive **N:** Negative	**-:** SMD **0:** 0.12" **1:** 0.16" **2:** 0.20" **3:** 0.24"	**-:** SMD **0:** 0.02" **1:** 0.08" **2:** 0.16"	**N:** Open Frame / 0.35" **E:** Metal Enclosed / 0.40" **M:** Molding / 0.40"	-	For customer function only	For marketing purpose only	

MODEL LIST (Contact to factory for 4X input models or special specifications)

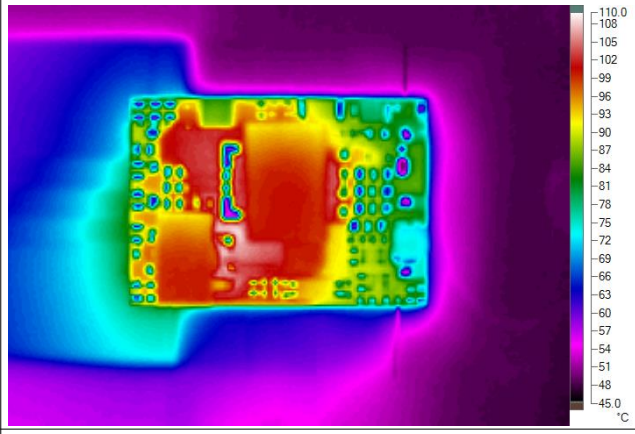
Part Number *	Maximum Input		Maximum Output		Efficiency
U1624120abcd-XXXXX	18V~36V	161W	12.0V/12A	144W	92%
U1624050abcd-XXXXX	18V~36V	141W	5.0V/25A	125W	91%
U1624033abcd-XXXXX	18V~36V	115W	3.3V/30A	99W	89%
U1624025abcd-XXXXX	18V~36V	89W	2.5V/30A	75W	87%

Part Number *	Maximum Input		Maximum Output		Efficiency
U1648120abcd-XXXXX	36V~75V	186W	12.0V/14A	168W	93%
U1648050abcd-XXXXX	36V~75V	168W	5.0V/30A	150W	92%
U1648033abcd-XXXXX	36V~75V	132W	3.3V/35A	115W	90%
U1648025abcd-XXXXX	36V~75V	102W	2.5V/35A	88W	88%

REFERENCED THERMAL IMAGES



U1648033N10E-20 (Io= 20A@50°C/200LFM)



U1648033N10N-20 (Io= 16.7A@50°C/200LFM)

SPECIFICATIONS

Absolute Maximum Ratings

Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 18V/24V Models 36V/48V Models Transient (100mS): 18V/24V Models 36V/48V Models	 -0.5V to +40Vdc -0.5V to +80Vdc 50V Maximum 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

General Parameters

Conversion Efficiency	Typical	See table
Switching Frequency	Typical	400KHz
MTBF	Bellcore TR-332 issue 6	4.50×10^{6} hrs @GB/25°C (U1648050abcd-25XXX)
OTP	T_{AVG} or T_C	110°C ±5°C for standard setting
Weight	Packaging related	11~28g

Control Functions

Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

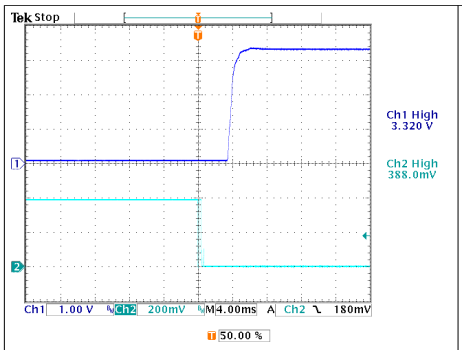
Input

Operation Voltage Range	18V(24V) Models 36V(48V) Models	+9V(+18V) to +36Vdc +18V(+36V) to +75Vdc
Reflected Ripple Current	L_{EXT} = 10uH	20mA rms/60mAp-p
Power ON Voltage Ranges	18V Models 24V/36V Models 48V Models	+8.5V to + 9.0Vdc +17.0V to +18.0Vdc +34.0V to +36.0Vdc
Power OFF Voltage Ranges	18V Models 24V/36V Models 48V Models	+7.8V to 8.3Vdc +15.6V to +16.6Vdc +31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	18V/24V Models 36V/48V Models	20.0uF Max 14.0uF Max

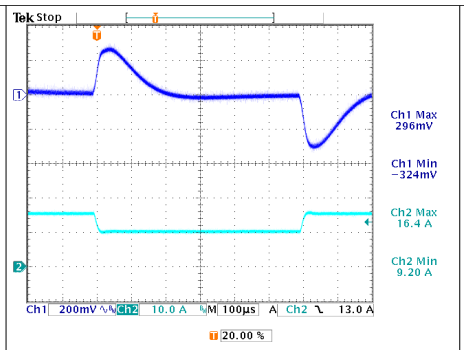
Output

Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.2%
Load Regulation	0%~100%	±0.2%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

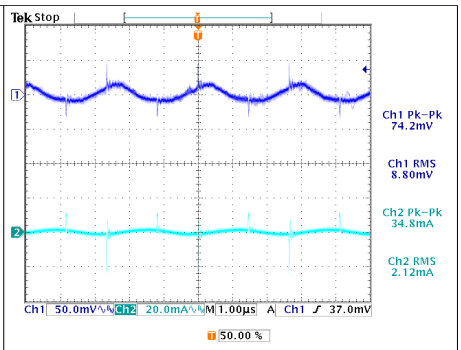
TYPICAL WAVES AND CURVES



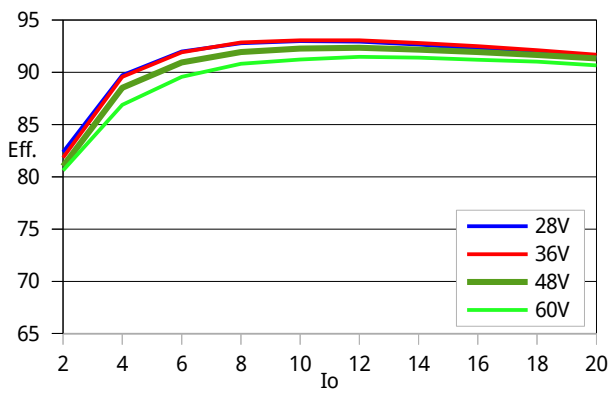
Start-up waveform of U1648033N10E-20
(V_{IN}: 36V, Load: 20A)



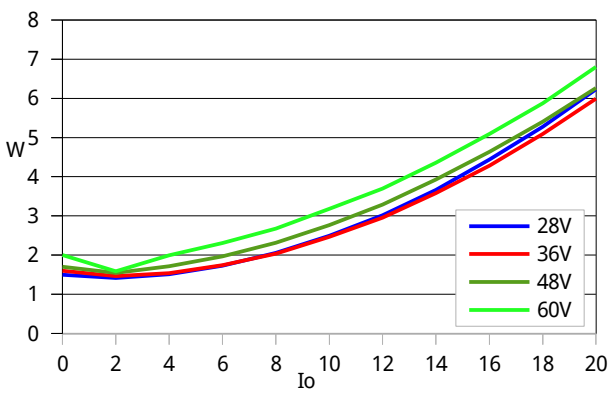
Transient response of U1648033N10E-20
(V_{IN}: 36V, Load: 15A/10A@2.5A/µS)



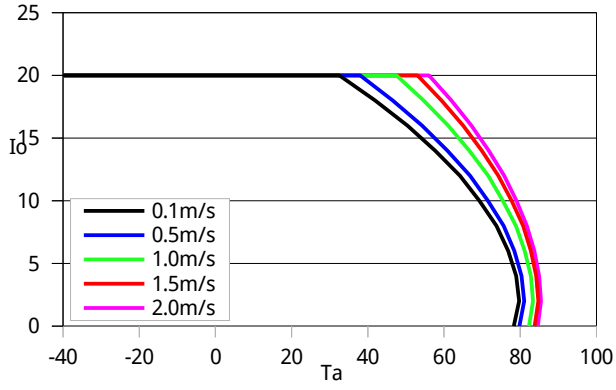
Input/Output ripples of U1648033N10E-20
(V_{IN}: 36V, Load: 20A, L_{IN}=10uH)



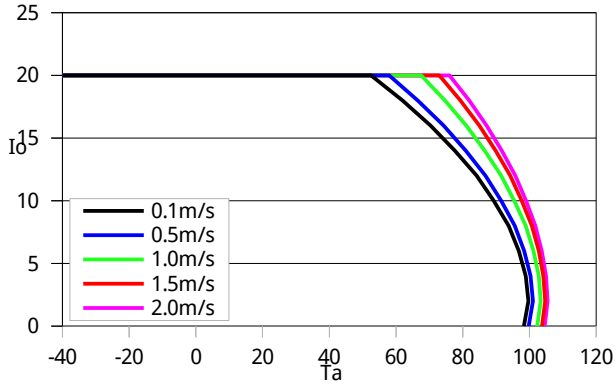
Efficiency plot of U1648033N10E-20



Power loss curves of U1648033N10E-20

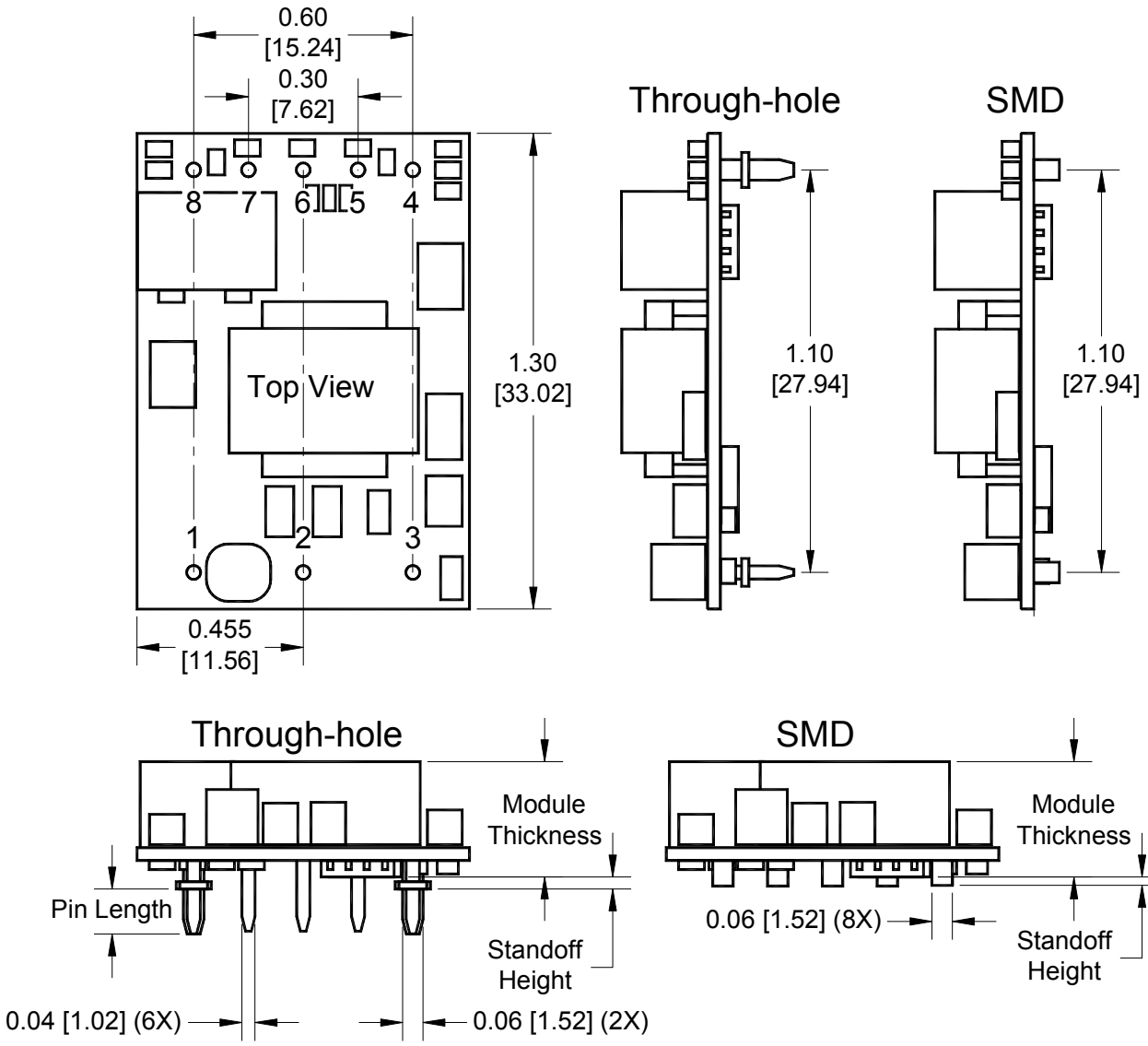


Calculated derating of U1648033N10E-20 (T_C= 95ºC)



Calculated derating of U1648033N10E-20 (T_C= 115ºC)

OPEN FRAME



Dimensions and Pin Connections

Designation	Function Description	Pin #
+IN	Positive input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
-IN	Negative input	**3**
-Vo	Negative output	**4**
-S	Negative remote sense	**5**
TRIM	Output voltage adjust	**6**
+S	Positive remote sense	**7**
+Vo	Positive output	**8**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 11g / Sixteenth Brick

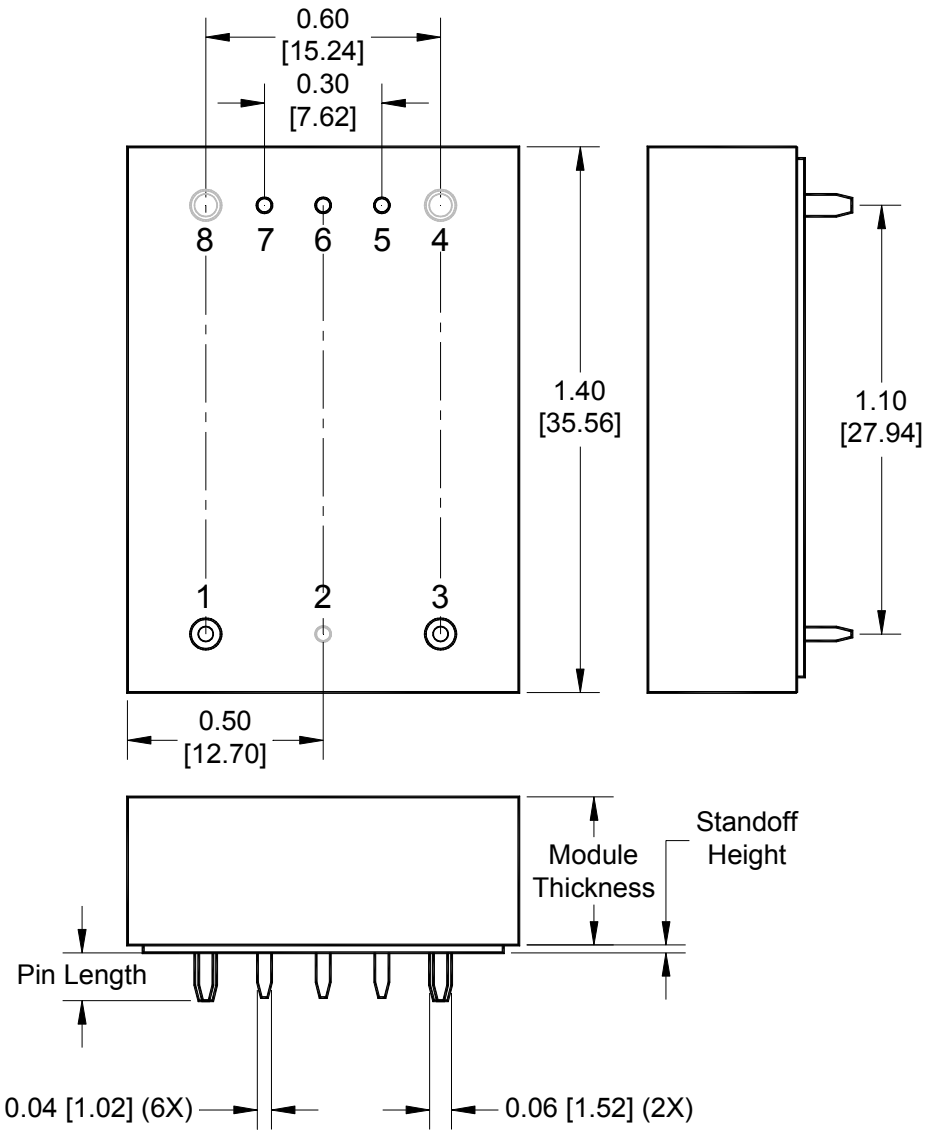
Base-plate: None

Maximum torque: NA

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

METAL ENCLOSED



Dimensions and Pin Connections

Designation	Function Description	Pin #
+IN	Positive input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
-IN	Negative input	**3**
-Vo	Negative output	**4**
-S	Negative remote sense	**5**
TRIM	Output voltage adjust	**6**
+S	Positive remote sense	**7**
+Vo	Positive output	**8**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 28g

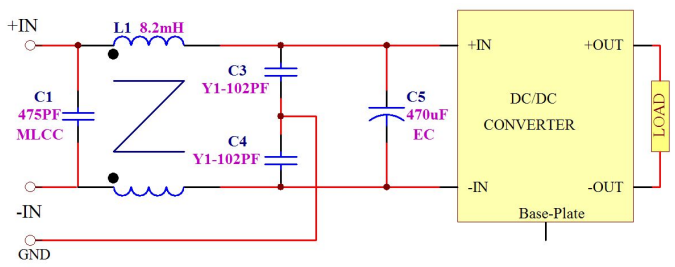
Base plate: None-conductive

Mounting inserts: None
Maximum torque: NA

Pin material: Copper alloy or Brass

Pin plating: Gold over Nickel

REFERENCED EMC CIRCUIT



Referenced input filter circuit

Referenced Input Filter Circuit

The circuit shown in left-hand side can be used as a design reference for customer system. The EMC performance of customer's system depends on the whole system design. It should be noted that modifications on the circuit parameters and fine adjustment of the final layout affect the final EMC performance. Since no components are ideal for infinite frequency range. The bandwidth of EMC components should be taking into consideration when designing an EMC filter circuit.

EXTERNAL OUTPUT CAPACITANCE

For reducing the ripple/noise voltage on the load or the peak voltage deviation caused by a step load, additional capacitor is required for decoupling the unwanted voltage components from the load. Since the step load performance is mainly dominated by the feedback loop performance, which also affected by the additional output capacitance. To put some low-bandwidth high capacitance Electrolytic capacitors very close to the power module help nothing and even introduces unwanted effects on the feedback performance, sinking or sourcing surge current damaging the power module. Glary suggest to put a low ESR capacitor with simply sufficient capacitance to handle the short duration high frequency component of ripple/noise or voltage peak deviation, and the capacitor needs to be as close as possible to the load. Do not add capacitor for no reason.

NOTE:

1. **It is recommended that the input should be protected by fuses or other protection devices.**
2. All specifications are typical at nominal input, full load and 25°C unless otherwise noted.
3. Specifications are subject to change without notice.
4. Printed or downloaded datasheets are not subject to Glary document control.
5. Product labels shown, including safety agency certificates, may vary based on the date of manufacture.
6. Information provided in this documentation is for ordering purposes only.
7. This product is not designed for use in critical life support systems, equipment used in hazardous environments, nuclear control systems or other such applications, which necessitate specific safety and regulatory standards other than the ones listed in this datasheet.

IMPORTANT

※ General specifications and the performances are related to standard series only, no special customer specification display here except requested items.

※ In order to secure effective usage of converter and the validity of Glary's service and warranty coverage, please refer to the application notes for general usage. For needs of usage beyond the application notes, please contact to Glary headquarter or our regional sales representative office for help.

Efficiency >94% | 410W/in³ | INPUT 2:1/4:1 | Remote ON OFF | Open Frame Package

4.5Mhrs MTBF | OVP | OTP | OCP

Pb | RoHS 2002/95/EC

The U08 series power module provides 300W maximum outputs with industry standard sixteenth brick pin assignment. The efficient SR stage is combined with patented "Buck-reset Forward" topology that would reduce power loss to achieve 410W/in³ power density. The multi-layer single side circuit board design plus the fully metal-enclosed package would enhance the thermal performance and improve its reliability. The module is designed for Telecom, Servers, Networking equipments and other industry applications that use a 24V or 48V input bus.

PART NUMBER SYSTEM (Total height = standoff height + module thickness)

Preliminary Data Sheet

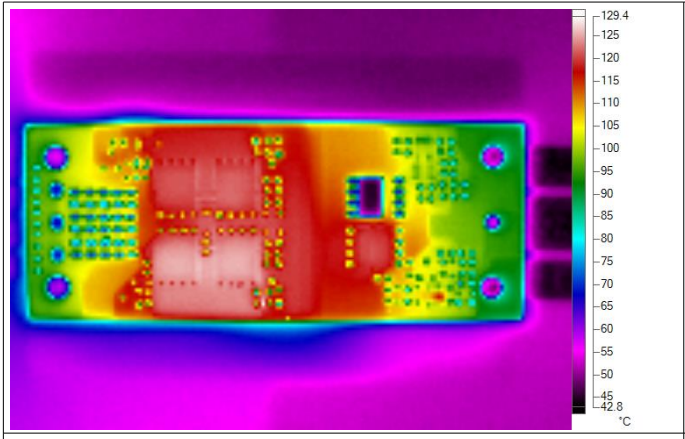
U08	48	120	a	b	c	d	-	XX	XX	X
Series Name	Rated Input	Rated Output	Enable Logic	Pin Length	Standoff Height	Base-Plate / module thickness		Setting	Suffix	Version
U08	**18=**9V~36V **24=**18V~36V **36=**18V~75V **48=**36V~75V	**Unit:** 0.1V Increments 120= 12V 033= 3.3V	**P:** Positive **N:** Negative	**-:** SMD **0:** 0.12" **1:** 0.16" **2:** 0.20" **3:** 0.24"	**-:** SMD **0:** 0.02" **1:** 0.08" **2:** 0.16"	**N:** No Metal Plate / 0.35" **M:** 1.0mm Metal Plate / 0.40" **S:** 3.0mm Metal Plate / 0.50" **A:** 3.0mm Sink-Plate / 0.50" **B:** 5.0mm Sink-Plate / 0.58"	-	For customer function only	For marketing purpose only	

MODEL LIST (Contact to factory for 4X input models or special specifications)

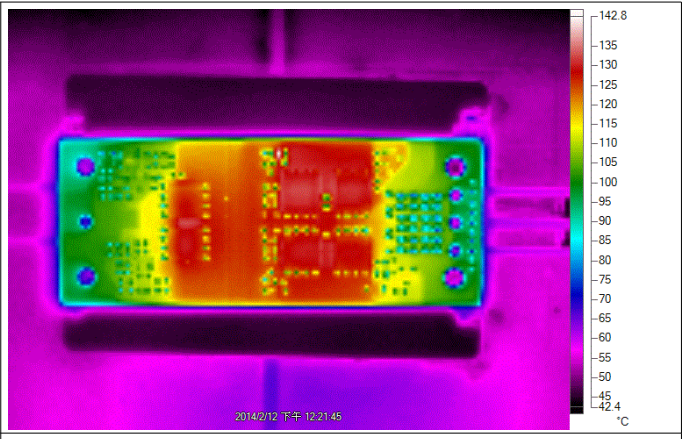
Part Number *	Maximum Input		Maximum Output		Efficiency
U0824120abcd-XXXXX	18V~36V	306W	12.0V/23A	276W	93%
U0824050abcd-XXXXX	18V~36V	226W	5.0V/40A	200W	91%
U0824033abcd-XXXXX	18V~36V	191W	3.3V/50A	165W	89%
U0824025abcd-XXXXX	18V~36V	148W	2.5V/50A	125W	87%

Part Number *	Maximum Input		Maximum Output		Efficiency
U0848120abcd-XXXXX	36V~75V	329W	12.0V/25A	300W	94%
U0848050abcd-XXXXX	36V~75V	252W	5.0V/45A	225W	92%
U0848033abcd-XXXXX	36V~75V	189W	3.3V/50A	165W	90%
U0848025abcd-XXXXX	36V~75V	146W	2.5V/50A	125W	88%

REFERENCED THERMAL IMAGES



U0848033N10N-35 (Io= 22A@50˚C/20LFM)



U0848120N10N-12 (Io= 10.8A@50˚C/200LFM)

SPECIFICATIONS

Absolute Maximum Ratings

Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 18V/24V Models 36V/48V Models Transient (100mS): 18V/24V Models 36V/48V Models	 -0.5V to +40Vdc -0.5V to +80Vdc 50V Maximum 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

General Parameters

Conversion Efficiency	Typical	See table
Switching Frequency	Typical	400KHz
MTBF	Bellcore TR-332 issue 6	4.50×10^{6} hrs @GB/25°C (U0848050abcd-25XXX)
OTP	T_{AVG} or T_C	110°C ±5°C for standard setting
Weight	Model related	16~40g

Control Functions

Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

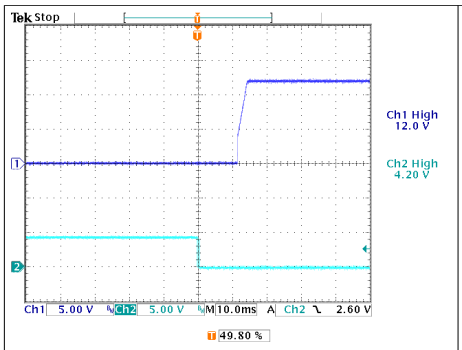
Input

Operation Voltage Range	18V(24V) Models 36V(48V) Models	+9V(+18V) to +36Vdc +18V(+36V) to +75Vdc
Reflected Ripple Current	L_{EXT} = 10uH	20mA rms/60mAp-p
Power ON Voltage Ranges	18V Models 24V/36V Models 48V Models	+8.5V to + 9.0Vdc +17.0V to +18.0Vdc +34.0V to +36.0Vdc
Power OFF Voltage Ranges	18V Models 24V/36V Models 48V Models	+7.8V to 8.3Vdc +15.6V to +16.6Vdc +31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	18V/24V Models 36V/48V Models	68.0uF Max 30.0uF Max

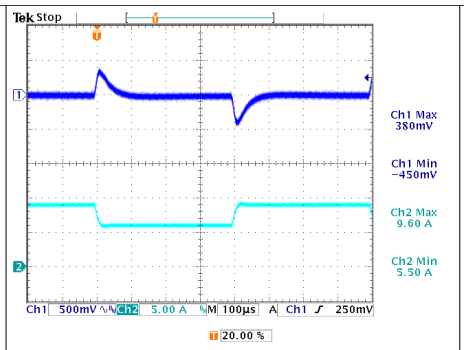
Output

Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.2%
Load Regulation	0%~100%	±0.2%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

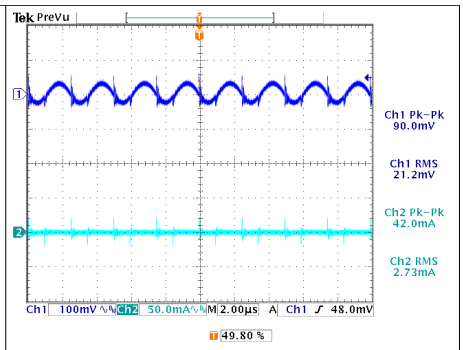
TYPICAL WAVES AND CURVES



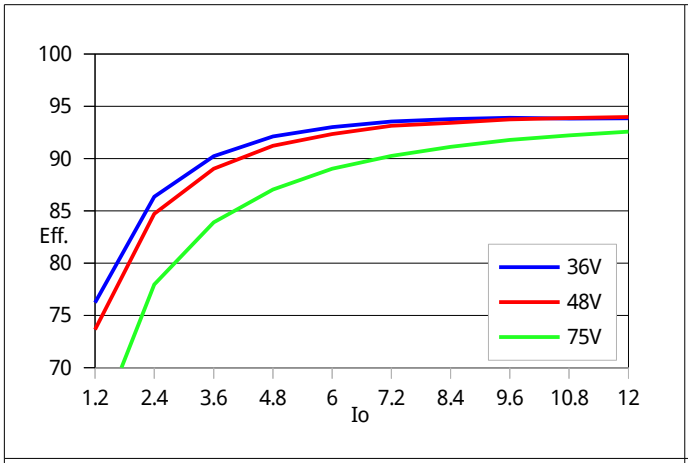
Start-up waveform of U0848120N10N-12
(V_{IN}: 48V, Load: 12A)



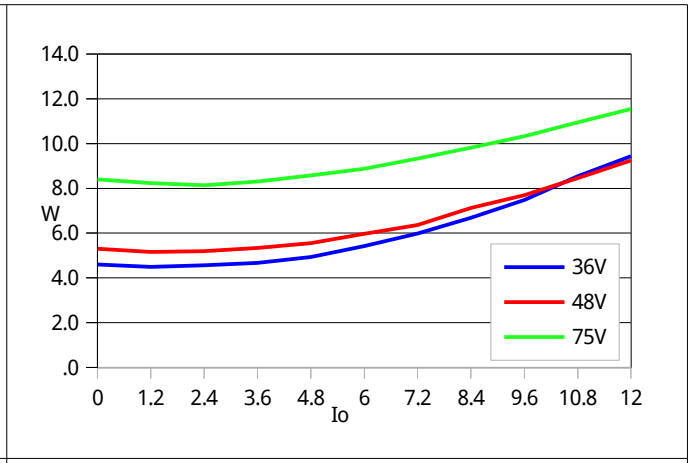
Transient response of U0848120N10N-12
(V_{IN}: 48V, Load: 6.0A/9.0A@2.5A/µS)



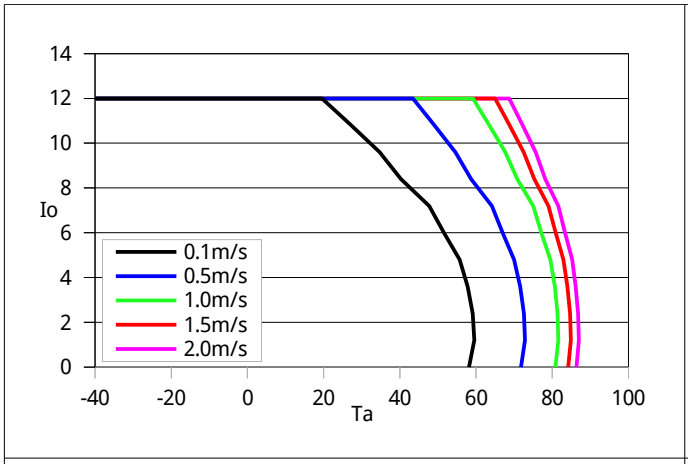
Input/Output ripples of U0848120N10N-12
(V_{IN}: 48V, Load: 12A, L_{IN}=10uH)



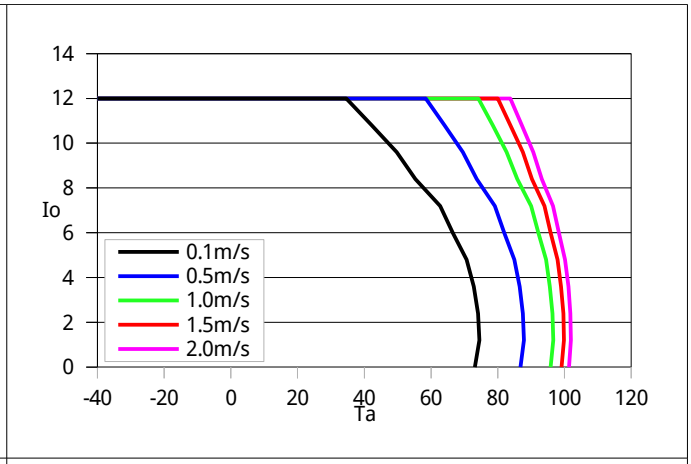
Efficiency plot of U0848120N10N-12



Power loss curves of U0848120N10N-12

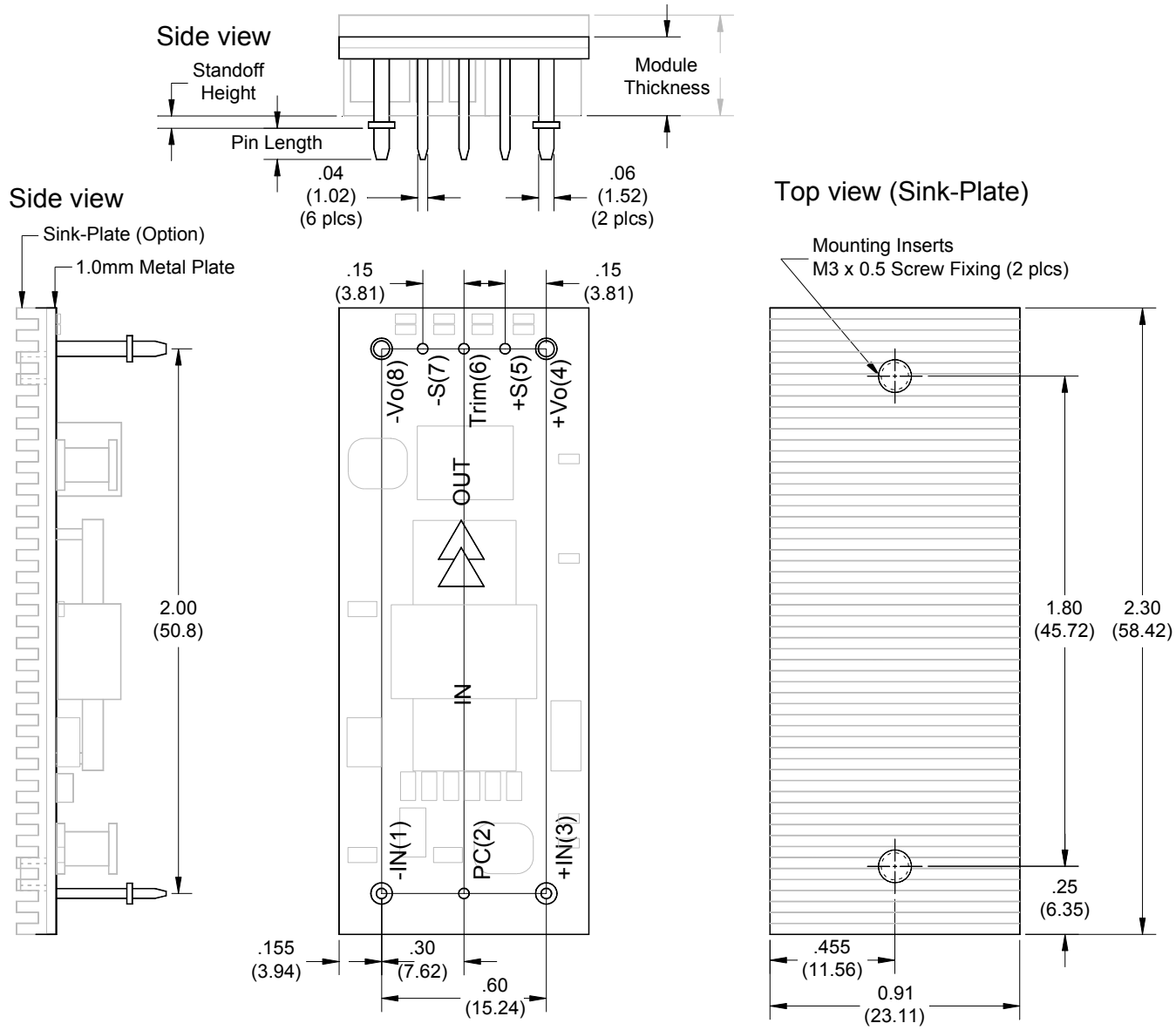


Calculated derating of U0848120N10N-12 (T_{AVG}= 105ºC)



Calculated derating of U0848120N10N-12 (T_{AVG}= 115ºC)

MECHANICAL DRAWING



Dimensions and Pin Connections

Designation	Function Description	Pin #
-IN	Negative input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
+IN	Positive input	**3**
+Vo	Positive output	**4**
+S	Positive remote sense	**5**
TRIM	Output voltage adjust	**6**
-S	Negative remote sense	**7**
-Vo	Negative output	**8**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 27g / 1.0mm metal plate
32g / 3.0mm metal plate

Base plate: Anode oxide aluminum alloy with anode oxide

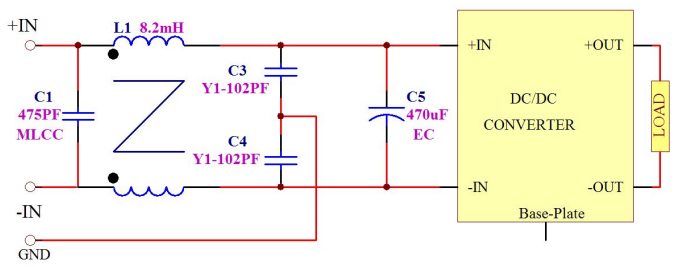
Mounting inserts: Stainless steel for 5mm Sink-plate only

Maximum torque: 3.9 in-lb (0.44Nm)

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

REFERENCED EMC CIRCUIT



Referenced input filter circuit

Referenced Input Filter Circuit

The circuit shown in left-hand side can be used as a design reference for customer system. The EMC performance of customer's system depends on the whole system design. It should be noted that modifications on the circuit parameters and fine adjustment of the final layout affect the final EMC performance. Since no components are ideal for infinite frequency range. The bandwidth of EMC components should be taking into consideration when designing an EMC filter circuit.

EXTERNAL OUTPUT CAPACITANCE

For reducing the ripple/noise voltage on the load or the peak voltage deviation caused by a step load, additional capacitor is required for decoupling the unwanted voltage components from the load. Since the step load performance is mainly dominated by the feedback loop performance, which also affected by the additional output capacitance. To put some low-bandwidth high capacitance Electrolytic capacitors very close to the power module help nothing and even introduces unwanted effects on the feedback performance, sinking or sourcing surge current damaging the power module. Glary suggest to put a low ESR capacitor with simply sufficient capacitance to handle the short duration high frequency component of ripple/noise or voltage peak deviation, and the capacitor needs to be as close as possible to the load. Do not add capacitor for no reason.

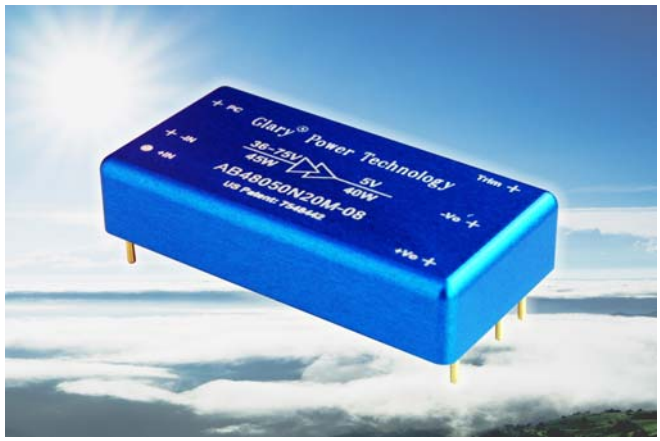
NOTE:

1. **It is recommended that the input should be protected by fuses or other protection devices.**
2. All specifications are typical at nominal input, full load and 25°C unless otherwise noted.
3. Specifications are subject to change without notice.
4. Printed or downloaded datasheets are not subject to Glary document control.
5. Product labels shown, including safety agency certificates, may vary based on the date of manufacture.
6. Information provided in this documentation is for ordering purposes only.
7. This product is not designed for use in critical life support systems, equipment used in hazardous environments, nuclear control systems or other such applications, which necessitate specific safety and regulatory standards other than the ones listed in this datasheet.

IMPORTANT

※ General specifications and the performances are related to standard series only, no special customer specification display here except requested items.

※ In order to secure effective usage of converter and the validity of Glary's service and warranty coverage, please refer to the application notes for general usage. For needs of usage beyond the application notes, please contact to Glary headquarter or our regional sales representative office for help.



The high efficiency ***Aurora*** Converter provides up to 50W/10A output with industry standard "B" case (2" × 1") package. The power stage is designed with the efficiently patented "Coupled-Inductor SR" topology, which results in very high efficiency. The low profile module design with silicone potted metal package eliminates the hot spots and further secures better thermal performance.

PART NUMBER SYSTEM

AB	48	050	a	b	c	d	-	10	XX	X
Series Name	Input Voltage	Output Voltage	Enable Logic	Pin Dimension	Standoff Height	Base-Plate		Output Current	Suffix	Version
AB	**48=**36V~75V **24=**18V~36V	**Unit:** 0.1V Increments **120=**12V **050=**5V	**P:** Positive **N:** Negative	**0**：0.12" **1**：0.16"	**0**：0.00"	**E**：Enclosed standard type	**-**	**00~12**：For output current rating	For marketing purpose only	

MODEL LIST (Contact to factory for special input / output)

Part Number *	Maximum Input		Maximum Output		Efficiency
AB48120abcd-04XXX	36V~75V	55W	12.0V/4.2A	50W	91%
AB48050abcd-10XXX	36V~75V	56W	5.0V/10A	50W	90%
AB48033abcd-12XXX	36V~75V	45W	3.3V/12A	40W	88%
AB48025abcd-12XXX	36V~75V	35W	2.5V/12A	30W	86%

Part Number *	Maximum Input		Maximum Output		Efficiency
AB24120abcd-04XXX	18V~36V	55W	12.0V/4.2A	50W	91%
AB24050abcd-10XXX	18V~36V	56W	5.0V/10A	50W	90%
AB24033abcd-12XXX	18V~36V	45W	3.3V/12A	40W	88%
AB24025abcd-12XXX	18V~36V	35W	2.5V/12A	30W	86%

REFERENCED THERMAL IMAGES

To be updated in next version	To be updated in next version

SPECIFICATIONS

Absolute Maximum Ratings		
Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 24V Models 48V Models Transient (100mS): 24V Models 48V Models	 -0.5V to +40Vdc -0.5V to +80Vdc 50V Maximum 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 0.5KV Minimum
Remote Control		-0.5V to +12Vdc

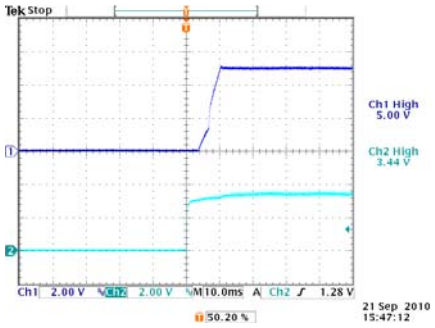
General Parameters		
Conversion Efficiency	Typical	See table
Switching Frequency	Typical	400KHz
MTBF	Bellcore TR-332 issue 6	7.6×10^6 hrs @GB/25°C (AB48050abcd-08)
OTP	Internal	110°C(Tc) ±5°C
Weight		35g

Control Functions		
Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

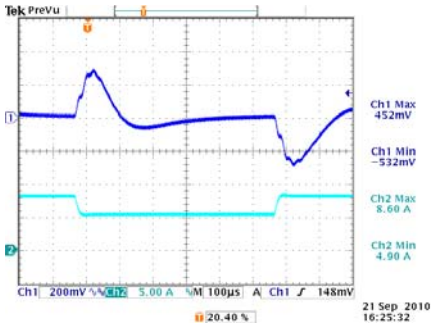
Input		
Operation Voltage Range	24V Models 48V Models	+18V to +36Vdc +36V to +75Vdc
Reflected Ripple Current	L_{EXT} = 10uH	20mA Max
Power ON Voltage Ranges	24V Models 48V Models	+17.0V to +18.0Vdc +34.0V to +36.0Vdc
Power OFF Voltage Ranges	24V Models 48V Models	+15.6V to +16.6Vdc +31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	3mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	24V Models 48V Models	10.0uF Max 6uF Max

Output		
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.2%
Load Regulation	0%~100%	±0.2%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±8%Vo /500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

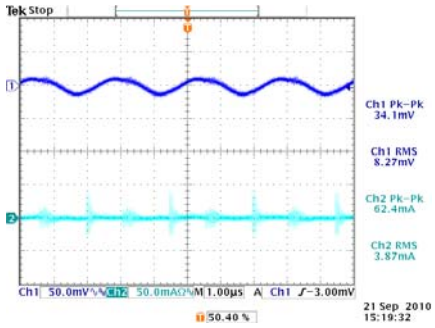
TYPICAL WAVES AND CURVES



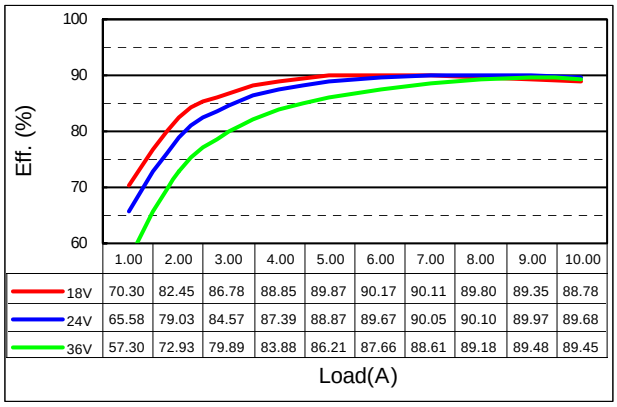
Start-up waveform of AB24050abcd-10XXX
(V_{IN}: 24V, Load: 10A)



Transient response of AB24050abcd-10XXX
(V_{IN}: 24V, Load: 8.5A/5A@2.5A/µS)

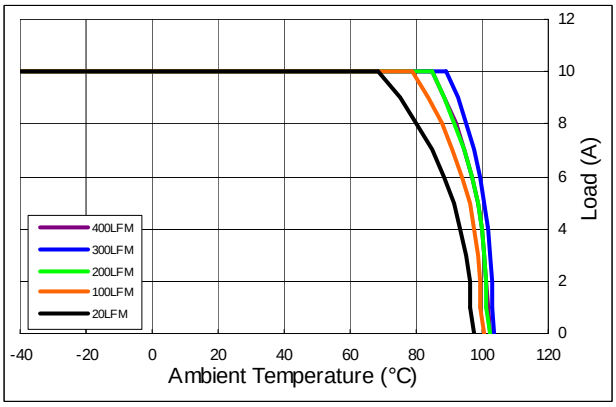


Input/Output ripples of AB24050abcd-10XXX
(V_{IN}: 24V, Load: 10A, L_{IN}=10uH)

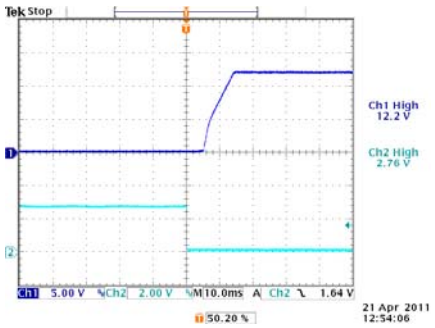


	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
18V	70.30	82.45	86.78	88.85	89.87	90.17	90.11	89.80	89.35	88.78
24V	65.58	79.03	84.57	87.39	88.87	89.67	90.05	90.10	89.97	89.68
36V	57.30	72.93	79.89	83.88	86.21	87.66	88.61	89.18	89.48	89.45

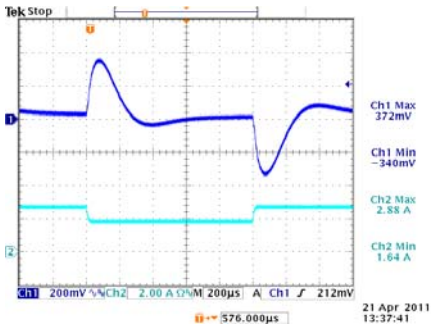
Efficiency Plot of AB24050abcd-10XXX



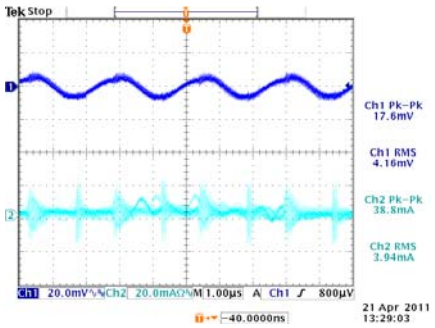
Derating Curves of AB24050abcd-10XXX for T_C= 110°C



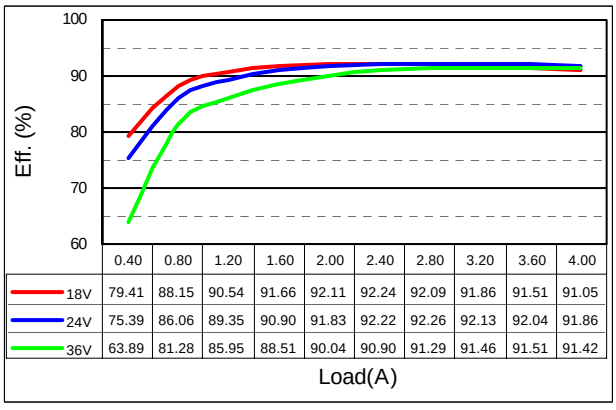
Start-up waveform of AB24120abcd-04XXX
(V_{IN}: 24V, Load: 4.2A)



Transient response of AB24120abcd-04XXX
(V_{IN}: 24V, Load: 3A/2A@2.5A/µS)

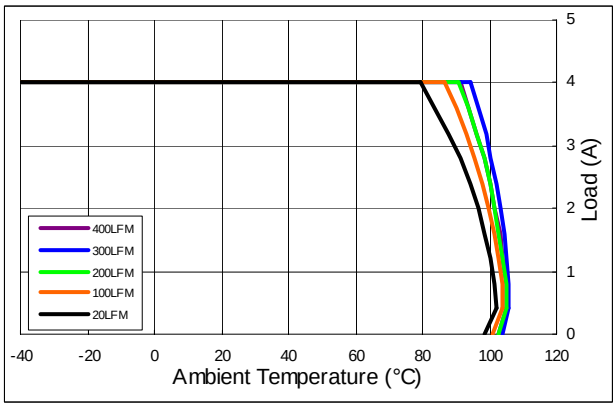


Input/Output ripples of AB24120abcd-04XXX
(V_{IN}: 24V, Load: 4.2A, L_{IN}=10uH)



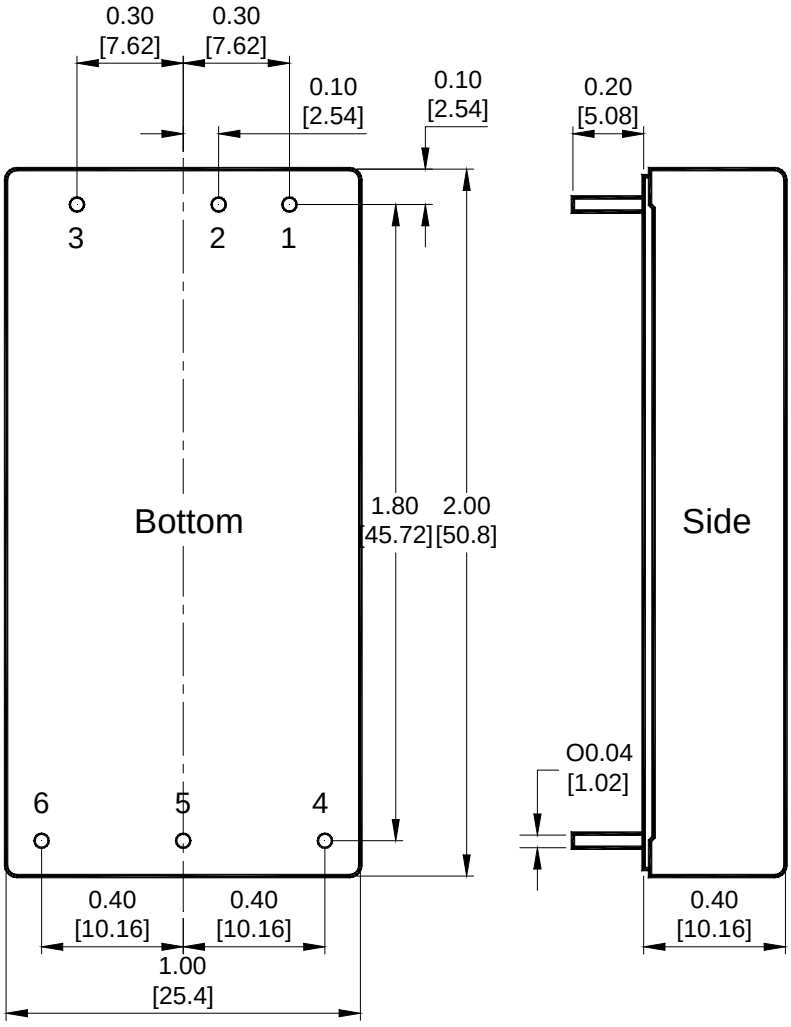
	0.40	0.80	1.20	1.60	2.00	2.40	2.80	3.20	3.60	4.00
18V	79.41	88.15	90.54	91.66	92.11	92.24	92.09	91.86	91.51	91.05
24V	75.39	86.06	89.35	90.90	91.83	92.22	92.26	92.13	92.04	91.86
36V	63.89	81.28	85.95	88.51	90.04	90.90	91.29	91.46	91.51	91.42

Efficiency plot of AB24120abcd-04XXX



Derating curves of AB24120abcd-04XXX for T_C= 110°C

METAL ENCLOSED PACKAGE



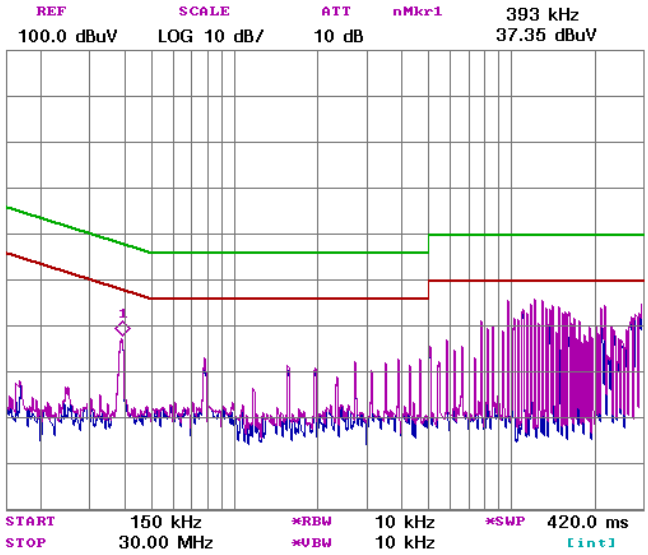
Dimensions and Pin Connections

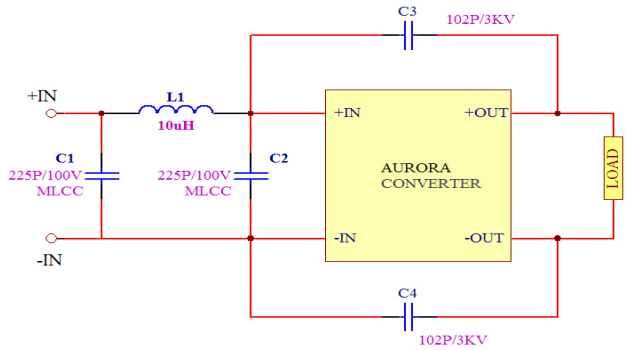
Designation	Function Description	Pin #
+Vi	Positive input	**1**
-IN	Negative input	**2**
Remote	ON/OFF control	**3**
+Vo	Positive output	**4**
-Vo	Negative output	**5**
TRIM	Output voltage adjust	**6**

Dimensions: inches (mm)
Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 35g
Base plate: Non-conductive
Pin material: Copper alloy or Brass
Pin plating: Golden over Nickel

REFERENCED EMC CIRCUIT





Measured conductive level of AB48050abcd-08XXX and referenced filter circuit

Referenced EMC Performance

The tested result shown in left-hand side is obtained by loading the power module with a resistive load only. It can be used as a design reference for customer system. However! The performance of customer's system depends on the whole system design. It should be noted that modifications on the circuit parameters and fine adjustment of the final layout affect the final EMC performance greatly.

Bandwidth of EMC Components

No components are ideal for infinite frequency range. The bandwidth of EMC components should be taking into consideration when designing an EMC filter circuit. To connect ceramic capacitor with electricity capacitor in parallel and connect low inductance inductor with big one could get a better bandwidth.

NOTE:

1. **It is recommended that the input should be protected by fuses or other protection devices.**
2. All specifications are typical at nominal input, full load and 25°C unless otherwise noted.
3. Specifications are subject to change without notice.
4. Printed or downloaded datasheets are not subject to Glary document control.
5. Product labels shown, including safety agency certificates, may vary based on the date of manufacture.
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7. This product is not designed for use in critical life support systems, equipment used in hazardous environments, nuclear control systems or other such applications, which necessitate specific safety and regulatory standards other than the ones listed in this datasheet.

IMPORTANT

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Glary Power Technology

Enclosed CBQ Series

Quarter Brick up to 125W／25A

The ***Enclosed CBQ*** series provides up to 125W/25A outputs with six-sides metal package. The efficient SR stage is combined with patented “Buck Reset” topology that would reduce power loss to achieve 101W/in^3 power density. The multi-layer single side circuit board design would enhance the thermal performance and improve its reliability. Modules are designed for Telecom, Servers, Networking equipments and other applications that use a 24V or 48V input bus.

PART NUMBER SYSTEM

CBQ100	48S	5V0	-L	a	b	c	XX	X
Series Name	Input Voltage	Output Voltage		Enable Logic	Pin Dimension	Base-Plate	Suffix	Version
CBQ100	**48S=**36V~75V **24S=**18V~36V	**Unit:** 0.1V Increments **050=**5V **033=**3.3V	**-L**	**P:** Positive **N:** Negative	**0**：0.12” **1**：0.16” **2**：0.20” **3**：0.24”	**E**：Metallic enclosure (1.0mm Metal Plate)	For marketing purpose only	

MODEL LIST (Contact to factory for special input / output)

Part Number *	Maximum Input		Maximum Output		Efficiency
CBQ10048S5V0-LabcXXX	36V~75V	139W	5.0V/25A	125W	90%
CBQ10048S3V3-LabcXXX	36V~75V	94W	3.3V/25A	83W	89%
CBQ10048S2V5-LabcXXX	36V~75V	73W	2.5V/25A	63W	87%
CBQ10048S2V0-LabcXXX	36V~75V	59W	2.0V/25A	50W	85%
CBQ10048S1V8-LabcXXX	36V~75V	53W	1.8V/25A	45W	85%
CBQ10048S1V5-LabcXXX	36V~75V	46W	1.5V/25A	38W	83%

Part Number *	Maximum Input		Maximum Output		Efficiency
CBQ10024S5V0-LabcXXX	18V~36V	141W	5.0V/25A	125W	89%
CBQ10024S3V3-LabcXXX	18V~36V	94W	3.3V/25A	83W	88%
CBQ10024S2V5-LabcXXX	18V~36V	74W	2.5V/25A	63W	86%
CBQ10024S2V0-LabcXXX	18V~36V	59W	2.0V/25A	50W	85%
CBQ10024S1V8-LabcXXX	18V~36V	54W	1.8V/25A	45W	84%
CBQ10024S1V5-LabcXXX	18V~36V	46W	1.5V/25A	38W	83%

REFERENCED THERMAL IMAGES

To be updated in next version	To be updated in next version

SPECIFICATIONS

Absolute Maximum Ratings		
Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 24V Models 48V Models Transient (100mS): 24V Models 48V Models	 -0.5V to +40Vdc -0.5V to +80Vdc 50V Maximum 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

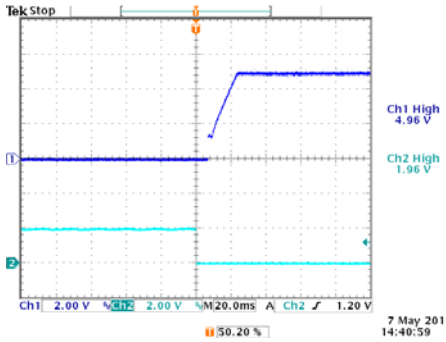
General Parameters		
Conversion Efficiency	Typical	See table
Switching Frequency	Typical	330KHz
MTBF	Bellcore TR-332 issue 6	4.57×10^6 hrs @GB/25°C (CBQ10048S5V0-LabcXXX)
OTP	Internal	110°C(Tc) ±5°C
Weight	Metallic enclosure	55g

Control Functions		
Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

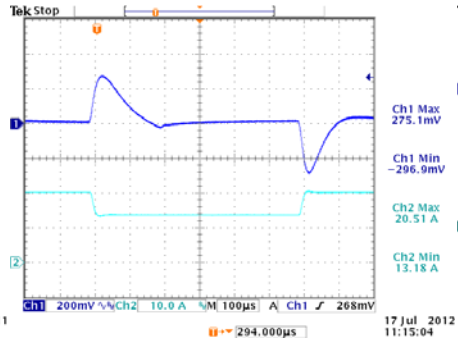
Input		
Operation Voltage Range	24V Models 48V Models	+18V to +36Vdc +36V to +75Vdc
Reflected Ripple Current	L_{EXT} = 10uH	20mA rms/60mAp-p
Power ON Voltage Ranges	24V Models 48V Models	+17.0V to +18.0Vdc +34.0V to +36.0Vdc
Power OFF Voltage Ranges	24V Models 48V Models	+15.6V to +16.6Vdc +31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	24V Models 48V Models	22.0uF Max 10.0uF Max

Output		
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.3%
Load Regulation	0%~100%	±0.3%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

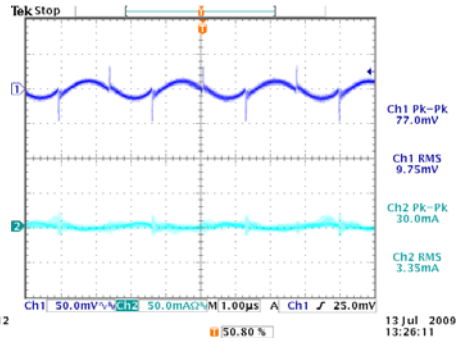
TYPICAL WAVES AND CURVES



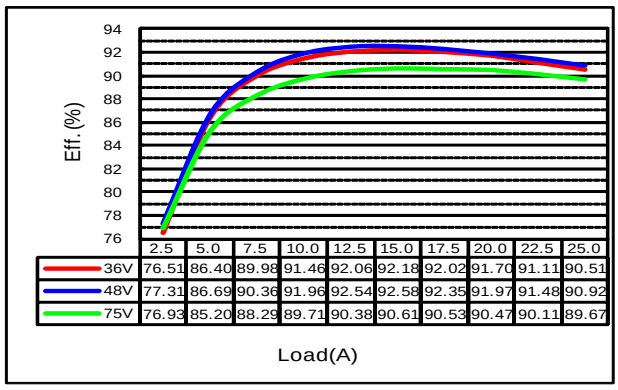
Start-up waveform of CBQ10048S5V0-LabcXXX
(V_{IN}: 48V, Load: 25A)



Transient response of CBQ10048S5V0-LabcXXX
(V_{IN}: 48V, Load: 20.5A/13.0A@2.5A/µS)

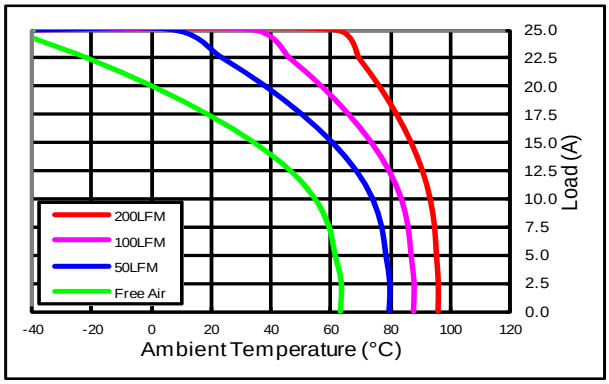


Input/Output ripples of CBQ10048S5V0-LabcXXX
(V_{IN}: 48V, Load: 25A, L_{IN}=10uH, C_{IN}=100uH)

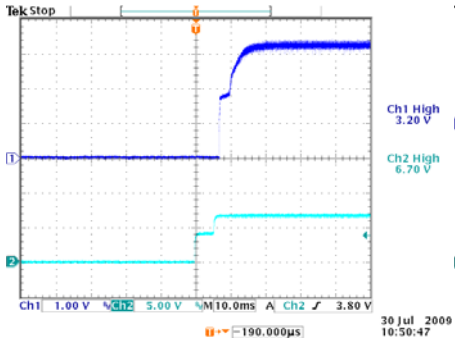


	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5	25.0
36V	76.51	86.40	89.98	91.46	92.06	92.18	92.02	91.70	91.11	90.51
48V	77.31	86.69	90.36	91.96	92.54	92.58	92.35	91.97	91.48	90.92
75V	76.93	85.20	88.29	89.71	90.38	90.61	90.53	90.47	90.11	89.67

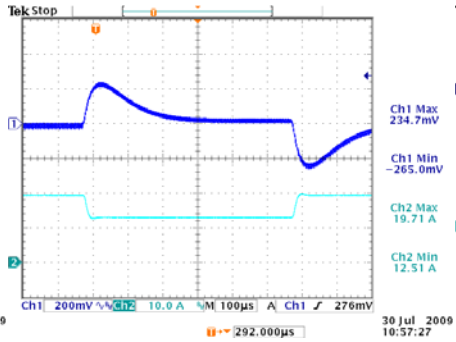
Efficiency plot of CBQ10048S5V0-LabcXXX



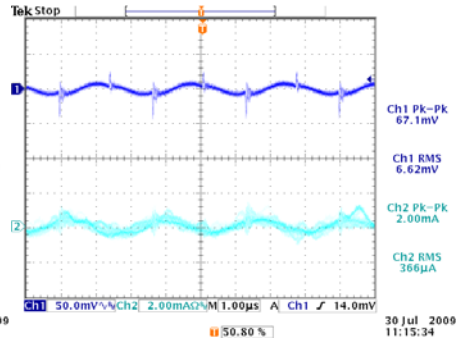
Derating curves of CBQ10048S5V0-LabcXXX for T_C= 110°C



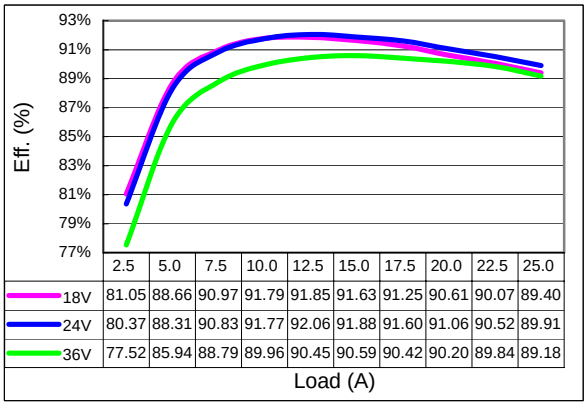
Start-up waveform of CBQ10024S3V3-LabcXXX
(V_{IN}: 24V, Load: 25A)



Transient response of CBQ10024S3V3-LabcXXX
(V_{IN}: 24V, Load: 20A/12.5A@2.5A/µS)

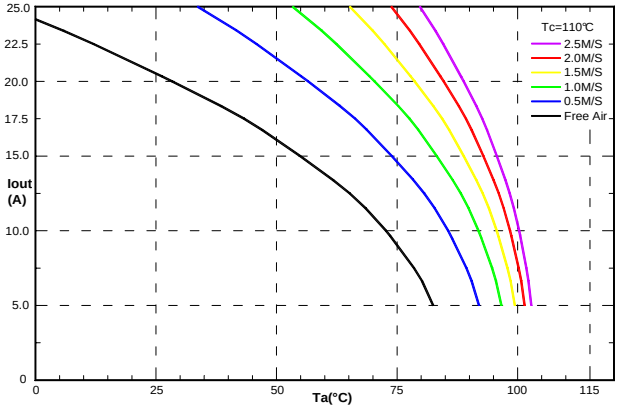


Input/Output ripples of CBQ10024S3V3-LabcXXX
(V_{IN}: 24V, Load: 25A, L_{IN}=10uH)



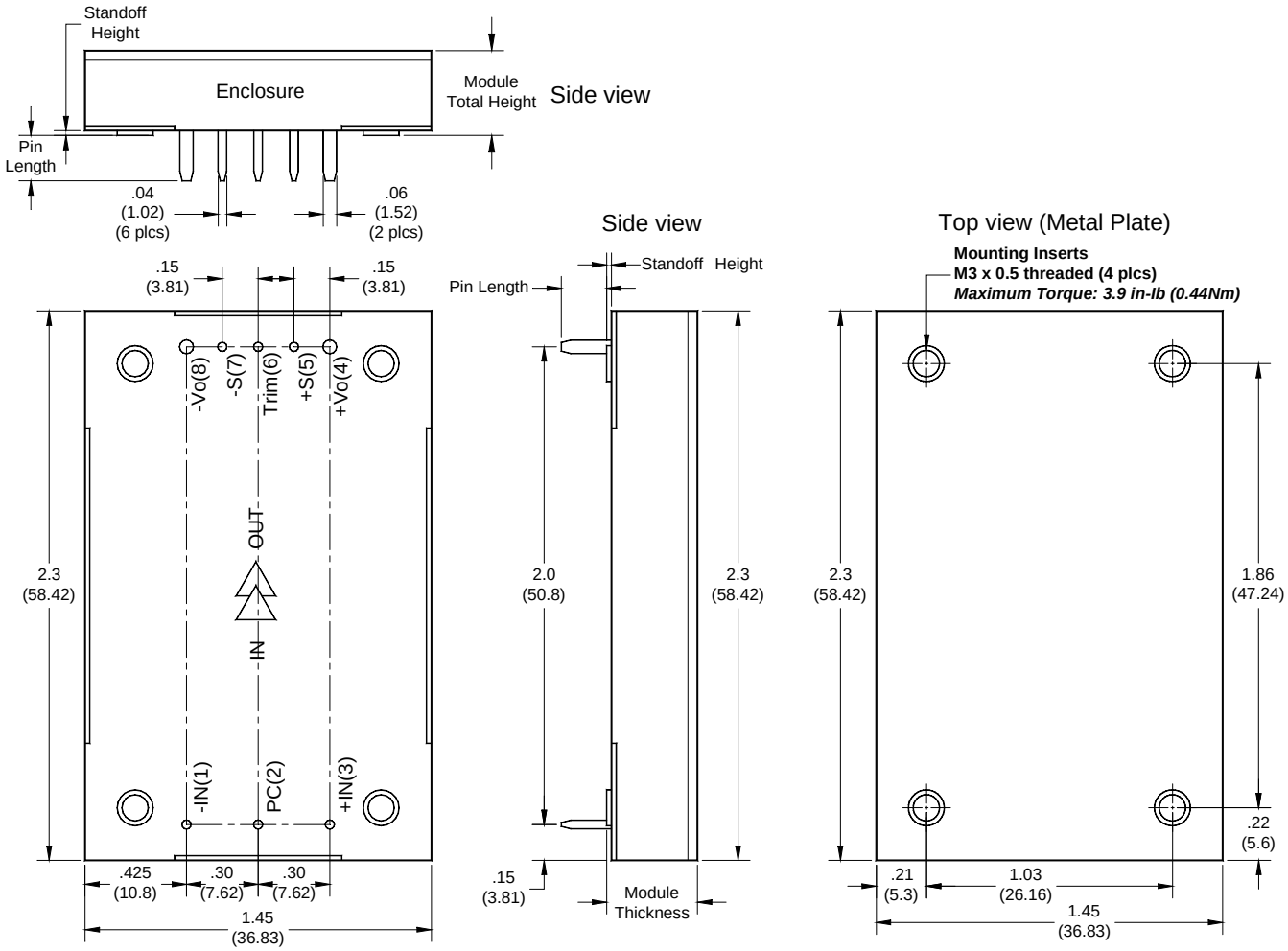
	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5	25.0
18V	81.05	88.66	90.97	91.79	91.85	91.63	91.25	90.61	90.07	89.40
24V	80.37	88.31	90.83	91.77	92.06	91.88	91.60	91.06	90.52	89.91
36V	77.52	85.94	88.79	89.96	90.45	90.59	90.42	90.20	89.84	89.18

Efficiency plot of CBQ10024S3V3-LabcXXX



Derating curves of CBQ10024S3V3-LabcXXX

METAL ENCLOSED PACKAGE



Dimensions and Pin Connections

Designation	Function Description	Pin #
-IN	Negative input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
+IN	Positive input	**3**
+Vo	Positive output	**4**
+S	Positive remote sense	**5**
TRIM	Output voltage adjust	**6**
-S	Negative remote sense	**7**
-Vo	Negative output	**8**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

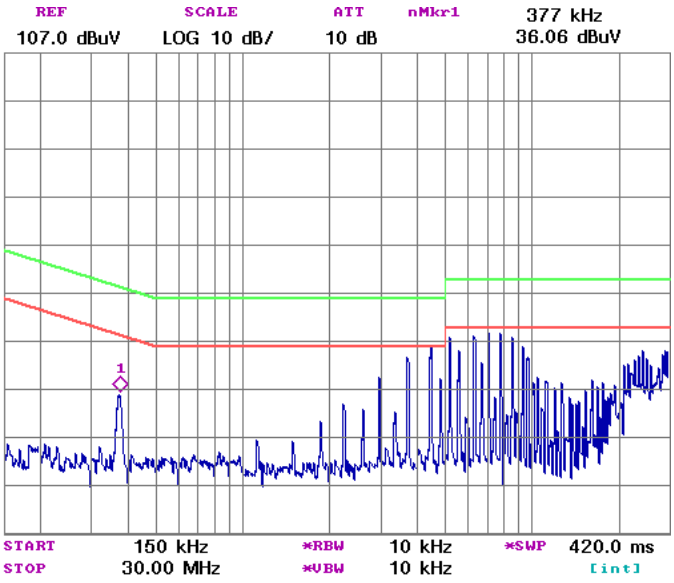
Weight: 55g
Base plate: Aluminum alloy with anode oxide

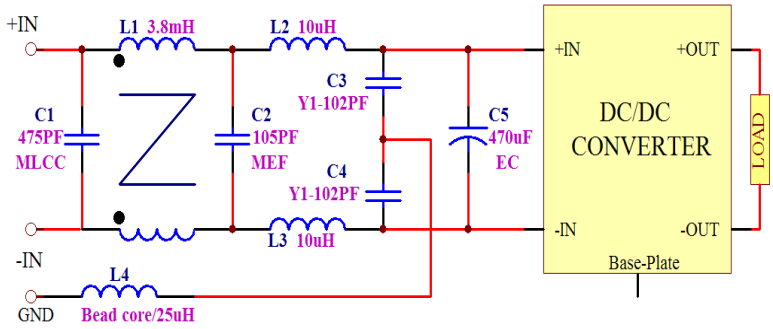
Mounting inserts: Stainless steel
Maximum torque: 3.9 in-lb (0.44Nm)

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

REFERENCED EMC CIRCUIT





Measured conductive level of CBQ10048S5V0-LabcXXX and referenced filter circuit

Referenced EMC Performance

The tested result shown in left-hand side is obtained by loading the power module with a resistive load only. It can be used as a design reference for customer system. However! The performance of customer's system depends on the whole system design. It should be noted that modifications on the circuit parameters and fine adjustment of the final layout affect the final EMC performance greatly.

Bandwidth of EMC Components

No components are ideal for infinite frequency range. The bandwidth of EMC components should be taking into consideration when designing an EMC filter circuit. To connect ceramic capacitor with electricity capacitor in parallel and connect low inductance inductor with big one could get a better bandwidth.

NOTE:

1. **It is recommended that the input should be protected by fuses or other protection devices.**
2. All specifications are typical at nominal input, full load and 25°C unless otherwise noted.
3. Specifications are subject to change without notice.
4. Printed or downloaded datasheets are not subject to Glary document control.
5. Product labels shown, including safety agency certificates, may vary based on the date of manufacture.
6. Information provided in this documentation is for ordering purposes only.
7. This product is not designed for use in critical life support systems, equipment used in hazardous environments, nuclear control systems or other such applications, which necessitate specific safety and regulatory standards other than the ones listed in this datasheet.

IMPORTANT

※ General specifications and the performances are related to standard series only, no special customer specification display here except requested items.

※ In order to secure effective usage of converter and the validity of Glary's service and warranty coverage, please refer to the application notes for general usage. For needs of usage beyond the application notes, please contact to Glary headquarter or our regional sales representative office for help.

Glary Power Technology

COE Series

Eighth Brick up to 132W／50A

Efficiency >92% | 175W/in³ | Open Frame Package | OCP | 4.8Mhrs MTBF | Remote ON OFF | INPUT 2:1 | OVP | OTP | c UL us E219417 | CE | Pb | RoHS 2002/95/EC

The ***COE*** series provides up to 132W/50A outputs with industry standard eighth brick pin assignment. The efficient SR stage is combined with patented “Buck Reset” topology that would reduce power loss to achieve 175W/in^3 power density. The multi-layer single side circuit board design plus the Sink-plate technology would enhance the thermal performance and improve its reliability. Modules are designed for Telecom, Servers, Networking equipments and other applications that use a 24V or 48V input bus.

PART NUMBER SYSTEM

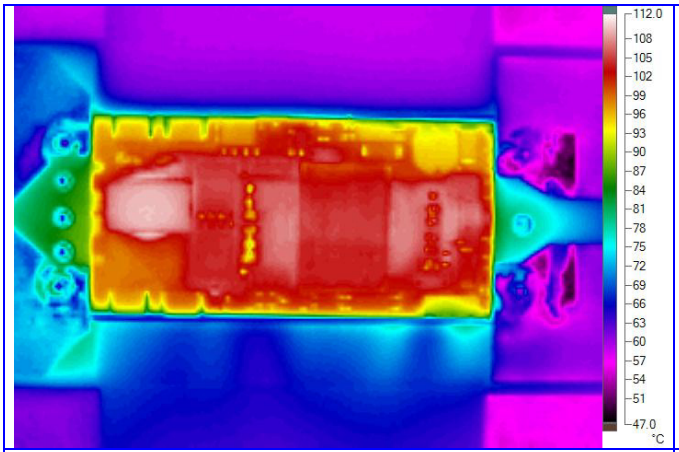
COE	48	120	a	b	c	d	-	11	XX	X
Series Name	Input Voltage	Output Voltage	Enable Logic	Pin Dimension	Standoff Height	Base-Plate		Output Current	Suffix	Version
COE	**48=**36V~75V **24=**18V~36V	**Unit:** 0.1V Increments **120=**12V **050=**5V	**P:** Positive **N:** Negative	**0**：0.12” **1**：0.16” **2**：0.20” **3**：0.24”	**0**：0.02” **1**：0.08” **2**：0.16”	**M**：1.0mm Metal Plate **S**：3.0mm Metal Plate **A**：3.0mm Sink-Plate **B**：5.0mm Sink-Plate	-	**00~50**： For output current rating	For marketing purpose only	

MODEL LIST (Contact to factory for special input / output)

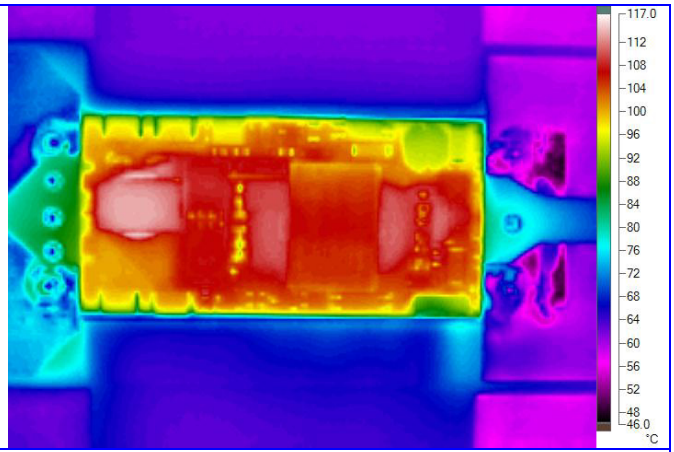
Part Number *	Maximum Input		Maximum Output		Efficiency
COE48120abcd-11XXX	36V~75V	145W	12.0V/11A	132W	92%
COE48070abcd-18XXX	36V~75V	138W	7.0V/18A	126W	91%
COE48050abcd-25XXX	36V~75V	138W	5.0V/25A	125W	91%
COE48033abcd-30XXX	36V~75V	111W	3.3V/30A	99W	90%
COE48025abcd-40XXX	36V~75V	114W	2.5V/40A	100W	89%
COE48018abcd-50XXX	36V~75V	106W	1.8V/50A	90W	87%
COE48015abcd-50XXX	36V~75V	90W	1.5V/50A	75W	85%

Part Number *	Maximum Input		Maximum Output		Efficiency
COE24120abcd-10XXX	18V~36V	133W	12.0V/10A	120W	92%
COE24050abcd-25XXX	18V~36V	139W	5.0V/25A	125W	91%
COE24033abcd-30XXX	18V~36V	111W	3.3V/30A	99W	90%
COE24025abcd-40XXX	18V~36V	114W	2.5V/40A	100W	89%
COE24018abcd-50XXX	18V~36V	106W	1.8V/50A	90W	87%
COE24015abcd-50XXX	18V~36V	90W	1.5V/50A	75W	85%

REFERENCED THERMAL IMAGES



COE48050N20M-25 (Io= 13.5A@65°C/100LFM)



COE48050N20M-25 (Io= 16A@65°C/200LFM)

SPECIFICATIONS

Absolute Maximum Ratings		
Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 24V Models 48V Models Transient (100mS): 24V Models 48V Models	 -0.5V to +40Vdc -0.5V to +80Vdc 50V Maximum 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

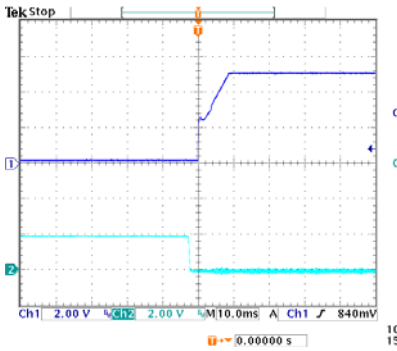
General Parameters		
Conversion Efficiency	Typical	See table
Switching Frequency	Typical	330KHz
MTBF	Bellcore TR-332 issue 6	4.80×10^{6} hrs @GB/25°C (COE48050abcd-25XXX)
OTP	Internal	110°C(Tc) ±5°C
Weight	1.0mm metal plate 3.0mm metal plate	27g 32g

Control Functions		
Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

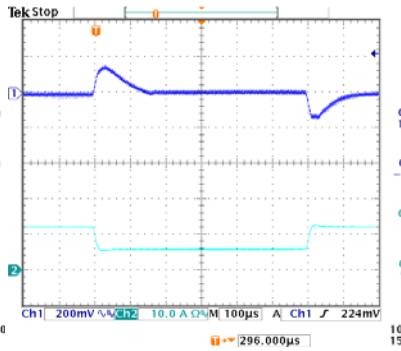
Input		
Operation Voltage Range	24V Models 48V Models	+18V to +36Vdc +36V to +75Vdc
Reflected Ripple Current	L_{EXT} = 10uH	20mA rms/60mAp-p
Power ON Voltage Ranges	24V Models 48V Models	+17.0V to +18.0Vdc +34.0V to +36.0Vdc
Power OFF Voltage Ranges	24V Models 48V Models	+15.6V to +16.6Vdc +31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	24V Models 48V Models	22.0uF Max 10.0uF Max

Output		
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.2%
Load Regulation	0%~100%	±0.2%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

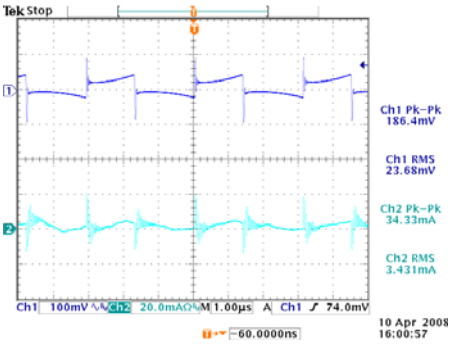
TYPICAL WAVES AND CURVES



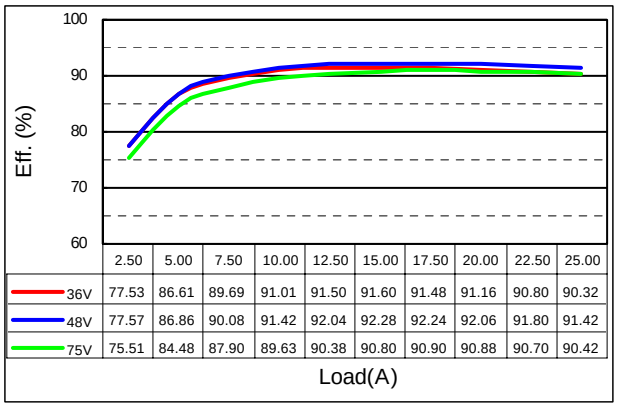
Start-up waveform of COE48050abcd-25XXX
(V_{IN}: 50V, Load: 25A)



Transient response of COE48050abcd-25XXX
(V_{IN}: 50V, Load: 12.5A/5.0A@2.5A/µS)

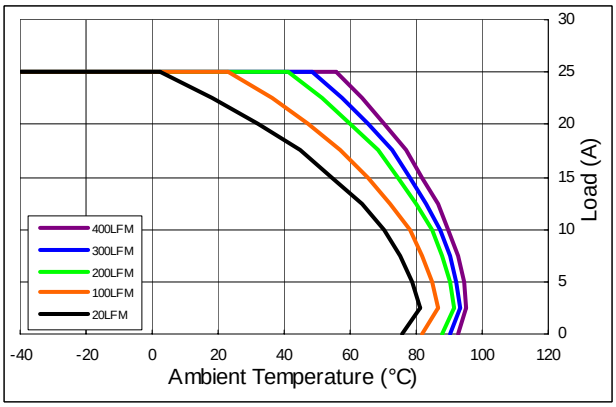


Input/Output ripples of COE48050abcd-25XXX
(V_{IN}: 50V, Load: 25A, L_{IN}=10uH)

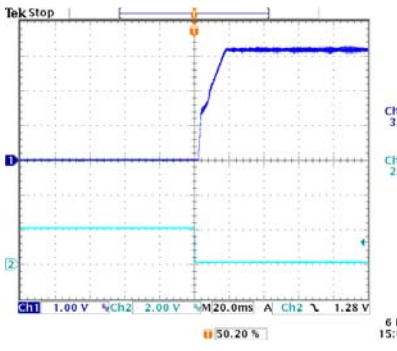


	2.50	5.00	7.50	10.00	12.50	15.00	17.50	20.00	22.50	25.00
36V	77.53	86.61	89.69	91.01	91.50	91.60	91.48	91.16	90.80	90.32
48V	77.57	86.86	90.08	91.42	92.04	92.28	92.24	92.06	91.80	91.42
75V	75.51	84.48	87.90	89.63	90.38	90.80	90.90	90.88	90.70	90.42

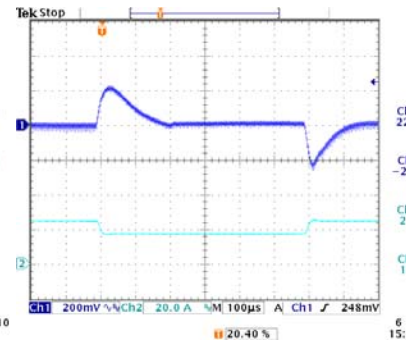
Efficiency plot of COE48050abcA-25XXX



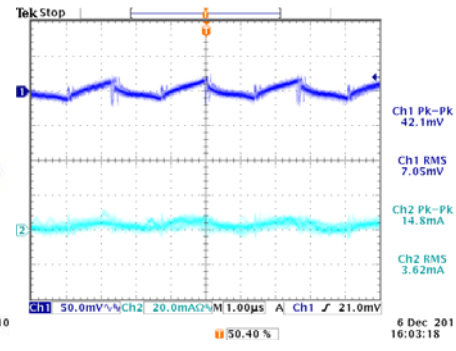
Derating curves of COE48050abcA-25XXX for T_C= 110°C



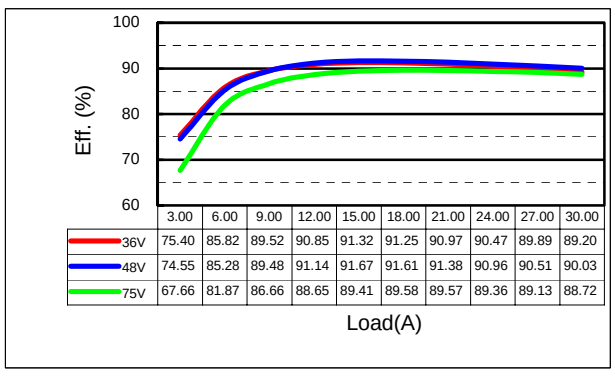
Start-up waveform of COE48033abcd-30XXX
(V_{IN}: 48V, Load: 30A)



Transient response of COE48033abcd-30XXX
(V_{IN}: 48V, Load: 25A/16 A@2.5A/µS)

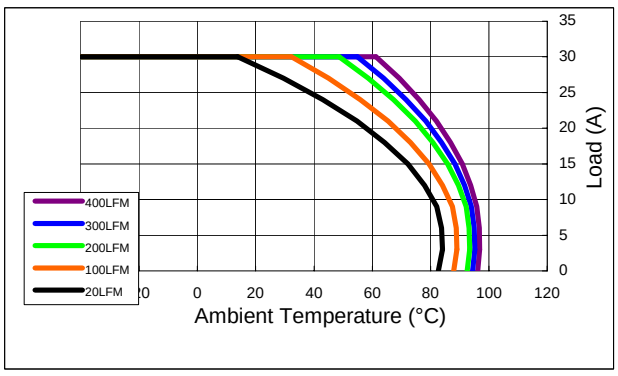


Input/Output ripples of COE48033abcd-30XXX
(V_{IN}: 48V, Load: 30A, L_{IN}=10uH)



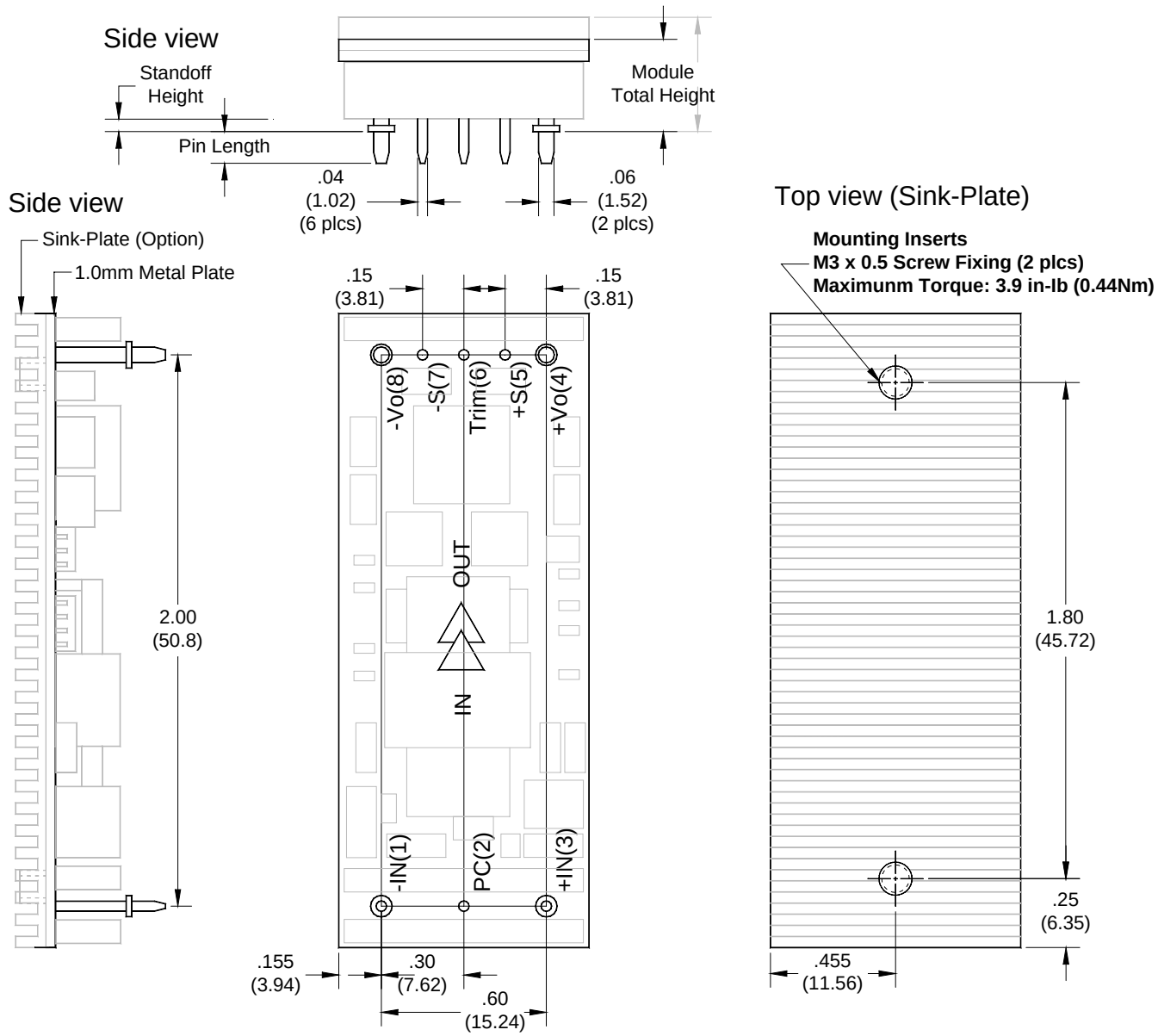
	3.00	6.00	9.00	12.00	15.00	18.00	21.00	24.00	27.00	30.00
36V	75.40	85.82	89.52	90.85	91.32	91.25	90.97	90.47	89.89	89.20
48V	74.55	85.28	89.48	91.14	91.67	91.61	91.38	90.96	90.51	90.03
75V	67.66	81.87	86.66	88.65	89.41	89.58	89.57	89.36	89.13	88.72

Efficiency plot of COE48033abcA-30XXX



Derating curves of COE48033abcA-30XXX for T_C= 110°C

OPEN FRAME PACKAGE



Dimensions and Pin Connections

Designation	Function Description	Pin #
-IN	Negative input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
+IN	Positive input	**3**
+Vo	Positive output	**4**
+S	Positive remote sense	**5**
TRIM	Output voltage adjust	**6**
-S	Negative remote sense	**7**
-Vo	Negative output	**8**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 27g / 1.0mm metal plate
32g / 3.0mm metal plate

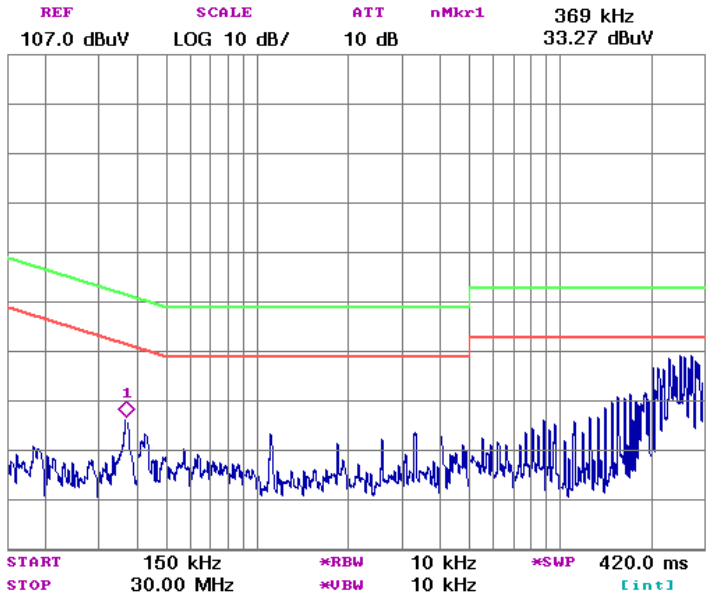
Base plate: Aluminum alloy with anode oxide

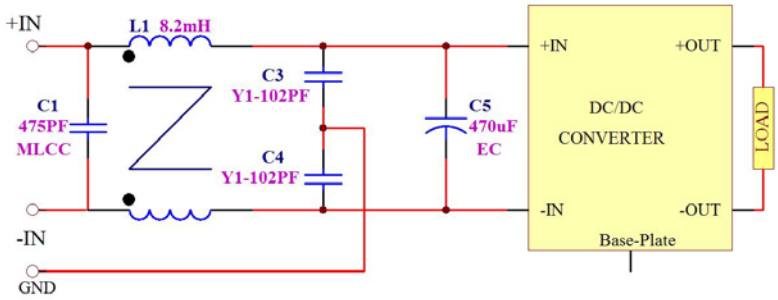
Mounting inserts: Stainless steel
Maximum torque: 3.9 in-lb (0.44Nm)

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

REFERENCED EMC CIRCUIT





Measured conductive level of COE48050abcd-25XXX and referenced filter circuit

Referenced EMC Performance

The tested result shown in left-hand side is obtained by loading the power module with a resistive load only. It can be used as a design reference for customer system. However! The performance of customer's system depends on the whole system design. It should be noted that modifications on the circuit parameters and fine adjustment of the final layout affect the final EMC performance greatly.

Bandwidth of EMC Components

No components are ideal for infinite frequency range. The bandwidth of EMC components should be taking into consideration when designing an EMC filter circuit. To connect ceramic capacitor with electricity capacitor in parallel and connect low inductance inductor with big one could get a better bandwidth.

NOTE:

1. **It is recommended that the input should be protected by fuses or other protection devices.**
2. All specifications are typical at nominal input, full load and 25°C unless otherwise noted.
3. Specifications are subject to change without notice.
4. Printed or downloaded datasheets are not subject to Glary document control.
5. Product labels shown, including safety agency certificates, may vary based on the date of manufacture.
6. Information provided in this documentation is for ordering purposes only.
7. This product is not designed for use in critical life support systems, equipment used in hazardous environments, nuclear control systems or other such applications, which necessitate specific safety and regulatory standards other than the ones listed in this datasheet.

IMPORTANT

※ General specifications and the performances are related to standard series only, no special customer specification display here except requested items.

※ In order to secure effective usage of converter and the validity of Glary's service and warranty coverage, please refer to the application notes for general usage. For needs of usage beyond the application notes, please contact to Glary headquarter or our regional sales representative office for help.

Glary Power Technology

Enclosed COE Series

Eighth Brick up to 130W／50A

The ***Enclosed COE*** series provides up to 130W/50A outputs with industry standard eighth brick pin assignment. The high thermal conductivity silicone potted six-sides metal package is designed for applications under extreme environmental conditions. The efficient SR stage is combined with patented “Buck Reset” topology that would reduce power loss to achieve 102W/in^3 power density. The multi-layer single side circuit board design plus the metal-plate technology would enhance the thermal performance and improve its reliability. Modules are designed for Telecom, Servers, Networking equipments and other applications that use a 24V or 48V input bus.

PART NUMBER SYSTEM

COE	48	120	a	b	c	d	-	11	XX	X
Series Name	Input Voltage	Output Voltage	Enable Logic	Pin Dimension	Standoff Height	Base-Plate		Output Current	Suffix	Version
COE	**48=**36V~75V **24=**18V~36V	**Unit:** 0.1V Increments **120=**12V **050=**5V	**P:** Positive **N:** Negative	**0**：0.12” **1**：0.16” **2**：0.20” **3**：0.24”	**0**：0.02”	**U**：3.0mm Metal Plate **V**：5.0mm Metal Plate **W**：3.0mm Sink Plate	-	**00~50**：For output current rating	For marketing purpose only	

MODEL LIST (Contact to factory for special input / output)

Part Number *	Maximum Input		Maximum Output		Efficiency
COE48120abcd-11XXX	36V~75V	145W	12.0V/11A	132W	92%
COE48070abcd-18XXX	36V~75V	138W	7.0V/18A	126W	91%
COE48050abcd-25XXX	36V~75V	138W	5.0V/25A	125W	91%
COE48033abcd-30XXX	36V~75V	111W	3.3V/30A	99W	90%
COE48025abcd-40XXX	36V~75V	114W	2.5V/40A	100W	89%
COE48018abcd-50XXX	36V~75V	106W	1.8V/50A	90W	87%
COE48015abcd-50XXX	36V~75V	90W	1.5V/50A	75W	85%

Part Number *	Maximum Input		Maximum Output		Efficiency
COE24120abcd-10XXX	18V~36V	133W	12.0V/10A	120W	92%
COE24050abcd-25XXX	18V~36V	139W	5.0V/25A	125W	91%
COE24033abcd-30XXX	18V~36V	111W	3.3V/30A	99W	90%
COE24025abcd-40XXX	18V~36V	114W	2.5V/40A	100W	89%
COE24018abcd-50XXX	18V~36V	106W	1.8V/50A	90W	87%
COE24015abcd-50XXX	18V~36V	90W	1.5V/50A	75W	85%

REFERENCED THERMAL IMAGES

To be updated in next version	To be updated in next version

Glary Power Technology

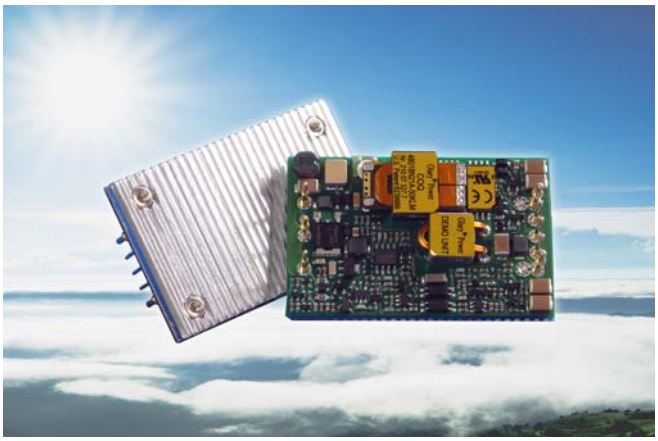
COQ Series

Quarter Brick up to 175W／50A

Efficiency >91% | 145W/in³ | Open Frame Package | OCP | 4.41Mhrs MTBF

Remote ON OFF | INPUT 2:1 | OVP | OTP

c UL us E219417 | CE | Pb | RoHS 2002/95/EC



The ***COQ*** series provides up to 175W/50A outputs with industry standard quarter brick pin assignment. The efficient SR stage is combined with patented “Buck Reset” topology that would reduce power loss to achieve 145W/in**3** power density. The multi-layer single side circuit board design plus the Sink-plate technology would enhance the thermal performance and improve its reliability. Modules are designed for Telecom, Servers, Networking equipments and other applications that use a 24V or 48V input bus.

PART NUMBER SYSTEM

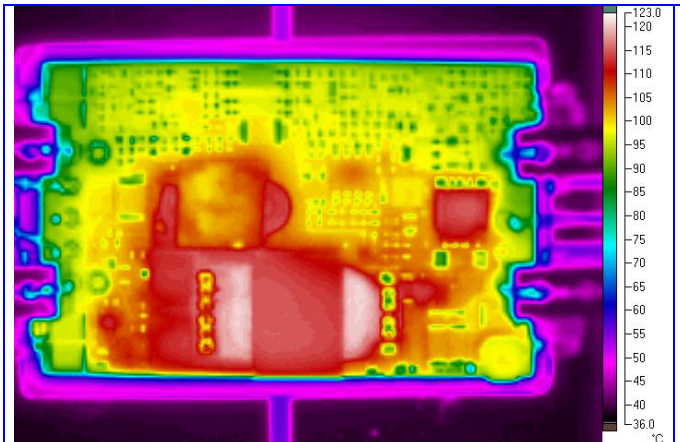
COQ	48	120	a	b	c	d	-	14	XX	X
Series Name	Input Voltage	Output Voltage	Enable Logic	Pin Dimension	Standoff Height	Base-Plate		Output Current	Suffix	Version
COQ	**48=**36V~75V **24=**18V~36V	**Unit:** 0.1V Increments **120=**12V **050=**5V	**P:** Positive **N:** Negative	**0**：0.12” **1**：0.16” **2**：0.20” **3**：0.24”	**0**：0.02” **1**：0.08” **2**：0.16”	**M**：1.0mm metal plate **S**：3.0mm metal plate **A**：3.0mm sink-plate **B**：5.0mm sink-plate	-	**00~50**： For output current rating	For marketing purpose only	

MODEL LIST (Contact to factory for special input / output)

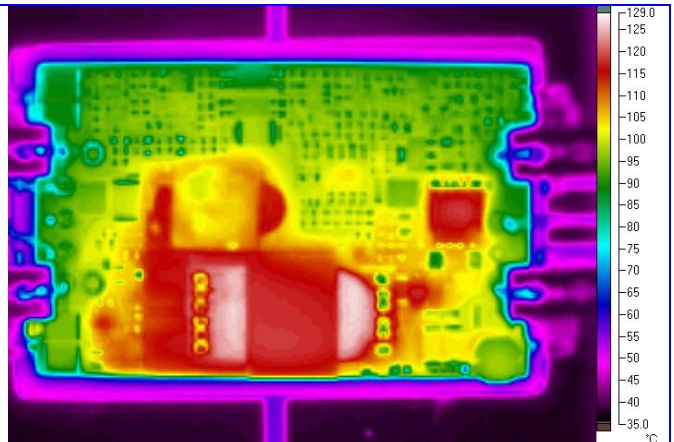
Part Number *	Maximum Input		Maximum Output		Efficiency
COQ48120abcd-14XXX	36V~75V	184W	12.0V/14A	168W	91%
COQ48070abcd-21XXX	36V~75V	163W	7.0V/21A	147W	90%
COQ48050abcd-35XXX	36V~75V	195W	5.0V/35A	175W	90%
COQ48033abcd-35XXX	36V~75V	131W	3.3V/35A	116W	89%
COQ48025abcd-50XXX	36V~75V	146W	2.5V/50A	125W	86%
COQ48018abcd-50XXX	36V~75V	106W	1.8V/50A	90W	86%
COQ48015abcd-50XXX	36V~75V	90W	1.5V/50A	75W	84%

Part Number *	Maximum Input		Maximum Output		Efficiency
COQ24120abcd-12XXX	18V~36V	160W	12.0V/12A	144W	91%
COQ24050abcd-30XXX	18V~36V	168W	5.0V/30A	150W	90%
COQ24033abcd-35XXX	18V~36V	131W	3.3V/35A	116W	89%
COQ24025abcd-40XXX	18V~36V	146W	2.5V/40A	100W	86%
COQ24018abcd-50XXX	18V~36V	106W	1.8V/50A	90W	86%
COQ24015abcd-50XXX	18V~36V	90W	1.5V/50A	75W	84%

REFERENCED THERMAL IMAGES



COQ48050N10M-35XXX (Io= 23A@65°C/100LFM)



COQ48050N10M-35XXX (Io= 27.5A@65°C/200LFM)

SPECIFICATIONS

Absolute Maximum Ratings		
Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 24V Models 48V Models Transient (100mS): 24V Models 48V Models	 -0.5V to +40Vdc -0.5V to +80Vdc 50V Maximum 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 0.5KV Minimum
Remote Control		-0.5V to +12Vdc

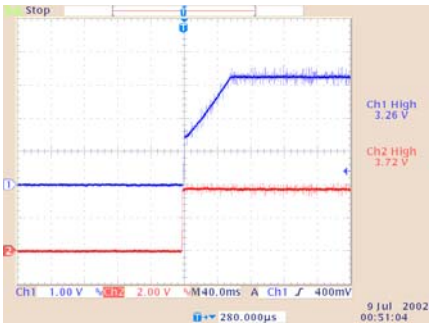
General Parameters		
Conversion Efficiency	Typical	See table
Switching Frequency	Typical	330KHz
MTBF	Bellcore TR-332 issue 6	4.41×10^6 hrs @GB/25°C. (COQ48033abcd-35XXX)
OTP	Internal	110°C(Tc) ±5°C
Weight	1.0mm metal plate 3.0mm metal plate	29g 43g

Control Functions		
Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

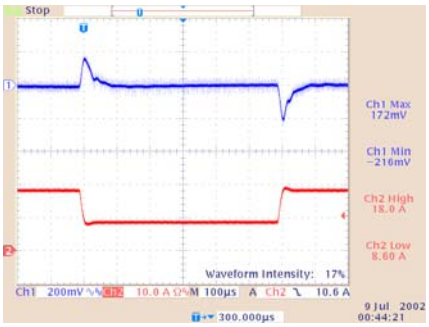
Input		
Operation Voltage Range	24V Models 48V Models	+18V to +36Vdc +36V to +75Vdc
Reflected Ripple Current	L_{EXT} = 10uH	30mA rms/100mAp-p
Power ON Voltage Ranges	24V Models 48V Models	+17.0V to +18.0Vdc +34.0V to +36.0Vdc
Power OFF Voltage Ranges	24V Models 48V Models	+15.6V to +16.6Vdc +31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	24V Models 48V Models	22.0uF Max 10.0uF Max

Output		
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.2%
Load Regulation	0%~100%	±0.2%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

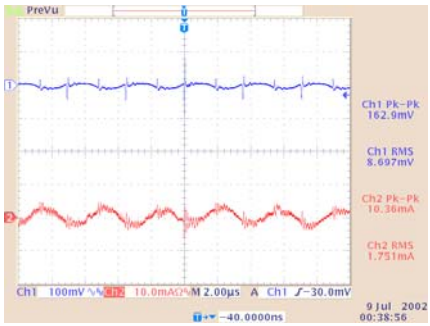
TYPICAL WAVES AND CURVES



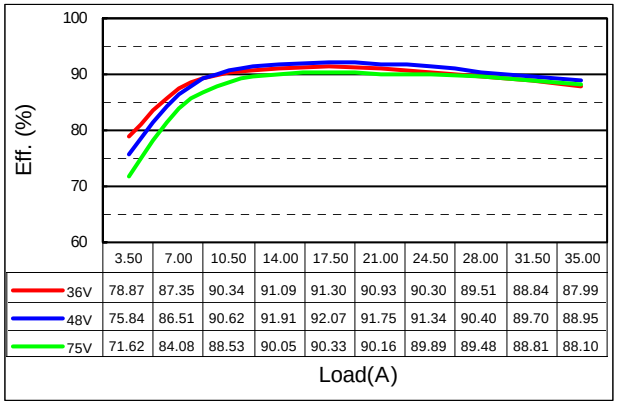
Start-up waveform of COQ48033abcd-35XXX
(V_{IN}: 50V, Load: 35A)



Transient response of COQ48033abcd-35XXX
(V_{IN}: 48V, Load: 18A/9A@2.5A/µS)

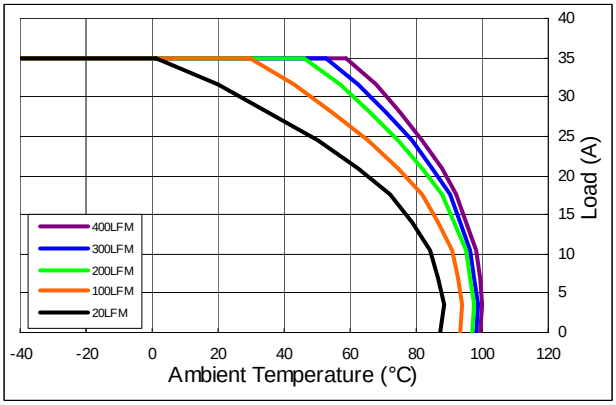


Input/Output ripples of COQ48033abcd-35XXX
(V_{IN}: 50V, Load: 35A, L_{IN}=10uH)

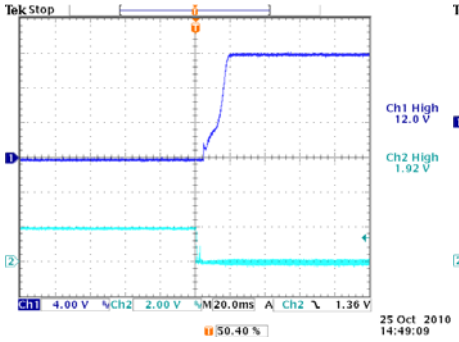


	3.50	7.00	10.50	14.00	17.50	21.00	24.50	28.00	31.50	35.00
36V	78.87	87.35	90.34	91.09	91.30	90.93	90.30	89.51	88.84	87.99
48V	75.84	86.51	90.62	91.91	92.07	91.75	91.34	90.40	89.70	88.95
75V	71.62	84.08	88.53	90.05	90.33	90.16	89.89	89.48	88.81	88.10

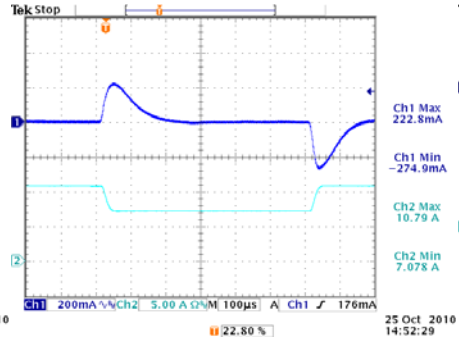
Efficiency plot of COQ48033abcA-35XXX



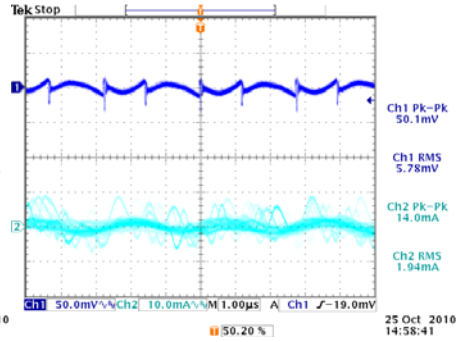
Derating curves of COQ48033abcA-35XXX for T_C= 110°C



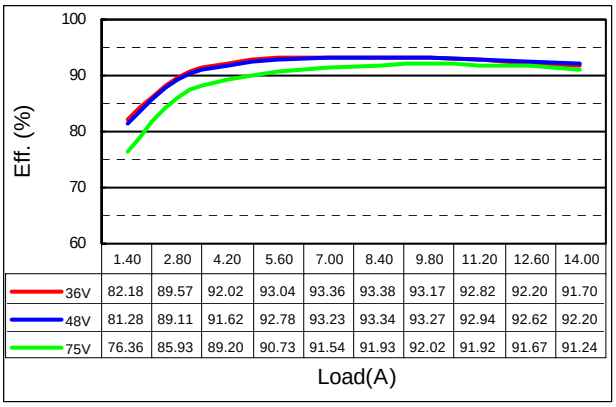
Start-up waveform of COQ48120abcd-14XXX
(V_{IN}: 48V, Load: 14A)



Transient response of COQ48120abcd-14XXX
(V_{IN}: 48V, Load: 10.5A/7.5A@2.5A/µS)

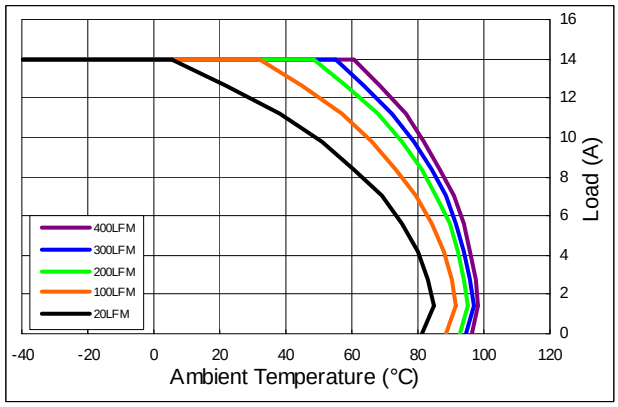


Input/Output ripples of COQ48120abcd-14XXX
(V_{IN}: 48V, Load: 14A, L_{IN}=10uH)



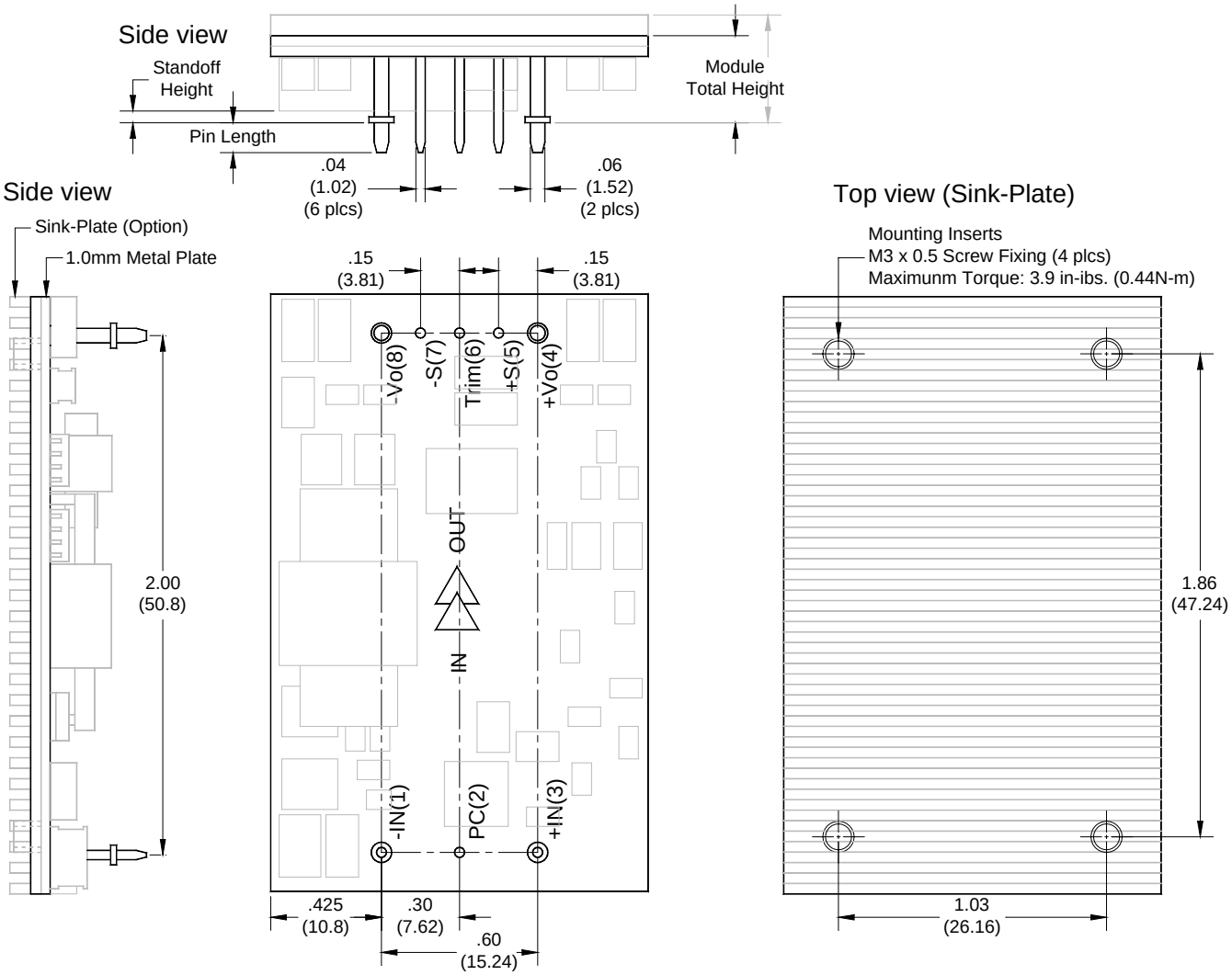
	1.40	2.80	4.20	5.60	7.00	8.40	9.80	11.20	12.60	14.00
36V	82.18	89.57	92.02	93.04	93.36	93.38	93.17	92.82	92.20	91.70
48V	81.28	89.11	91.62	92.78	93.23	93.34	93.27	92.94	92.62	92.20
75V	76.36	85.93	89.20	90.73	91.54	91.93	92.02	91.92	91.67	91.24

Efficiency plot of COQ48120abcA-14XXX



Derating curves of COQ48120abcA-14XXX for T_C= 110°C

OPEN FRAME PACKAGE



Dimensions and Pin Connections

Designation	Function Description	Pin #
-IN	Negative input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
+IN	Positive input	**3**
+Vo	Positive output	**4**
+S	Positive remote sense	**5**
TRIM	Output voltage adjust	**6**
-S	Negative remote sense	**7**
-Vo	Negative output	**8**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 29g / 1.0mm metal plate
43g / 3.0mm metal plate

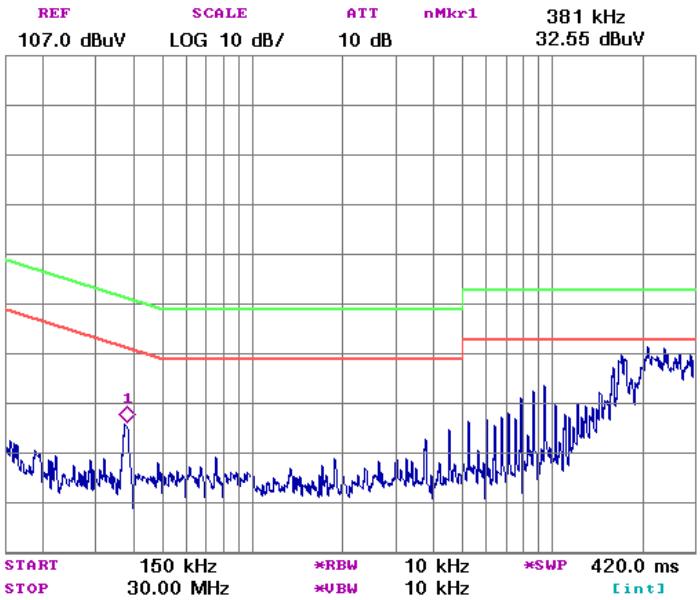
Base plate: Aluminum alloy with anode oxide

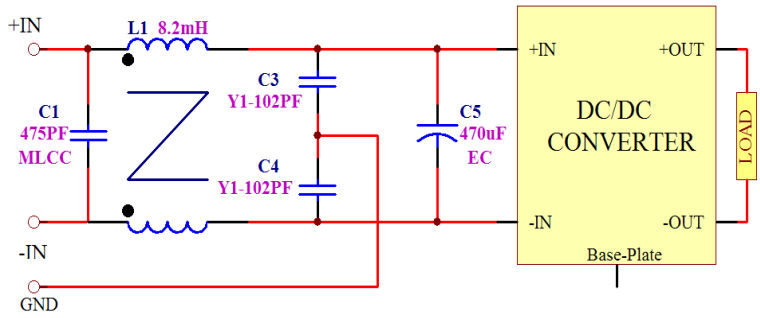
Mounting inserts: Stainless steel
Maximum torque: 3.9 in-lb (0.44Nm)

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

REFERENCED EMC CIRCUIT





Measured conductive level of COQ48050abcd-25XXX and referenced filter circuit

Referenced EMC Performance

The tested result shown in left-hand side is obtained by loading the power module with a resistive load only. It can be used as a design reference for customer system. However! The performance of customer's system depends on the whole system design. It should be noted that modifications on the circuit parameters and fine adjustment of the final layout affect the final EMC performance greatly.

Bandwidth of EMC Components

No components are ideal for infinite frequency range. The bandwidth of EMC components should be taking into consideration when designing an EMC filter circuit. To connect ceramic capacitor with electricity capacitor in parallel and connect low inductance inductor with big one could get a better bandwidth.

NOTE:

1. **It is recommended that the input should be protected by fuses or other protection devices.**
2. All specifications are typical at nominal input, full load and 25°C unless otherwise noted.
3. Specifications are subject to change without notice.
4. Printed or downloaded datasheets are not subject to Glary document control.
5. Product labels shown, including safety agency certificates, may vary based on the date of manufacture.
6. Information provided in this documentation is for ordering purposes only.
7. This product is not designed for use in critical life support systems, equipment used in hazardous environments, nuclear control systems or other such applications, which necessitate specific safety and regulatory standards other than the ones listed in this datasheet.

IMPORTANT

※ General specifications and the performances are related to standard series only, no special customer specification display here except requested items.

※ In order to secure effective usage of converter and the validity of Glary's service and warranty coverage, please refer to the application notes for general usage. For needs of usage beyond the application notes, please contact to Glary headquarter or our regional sales representative office for help.

Glary Power Technology

UQ Series

Quarter Brick up to 300W／60A

Efficiency >92% | 235W/in³ | Open Frame Package | OCP | 2.96Mhrs MTBF | Remote ON OFF | INPUT 2:1 | OVP | OTP | Pb | RoHS 2002/95/EC

The ***UQ*** series provides up to 300W/60A outputs with industry standard quarter brick package. The efficient SR stage is combined with patented “Buck Reset” topology that would reduce power loss to achieve 235W/in**3** power density. The multi-layer single side circuit board design plus the patented Sink-Plate technology would enhance the thermal performance and improve its reliability. Modules are designed for Telecom, Servers, Networking equipments and other applications that use a 24V or 48V input bus.

PART NUMBER SYSTEM

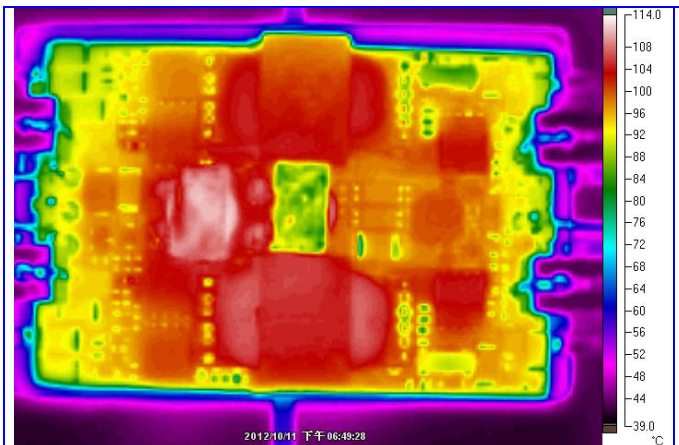
UQ	48	120	a	b	c	d	-	25	XX	X
Series Name	Input Voltage	Output Voltage	Enable Logic	Pin Dimension	Standoff Height	Base-Plate		Output Current	Suffix	Version
UQ	**48=**36V~75V **24=**18V~36V	**Unit:** 0.1V Increments **120=12**V **050=**5V	**P:** Positive **N:** Negative	**0**：0.12” **1**：0.16” **2**：0.20” **3**：0.24”	**0**：0.02” **1**：0.08” **2**：0.16”	**M**：1.0mm Metal Plate **S**：3.0mm Metal Plate **Z**：5.0mm Metal Plate **A**：3.0mm Sink-Plate **B**：5.0mm Sink-Plate	-	**00~60**： For output current rating	For marketing purpose only	

MODEL LIST (Contact to factory for special input / output)

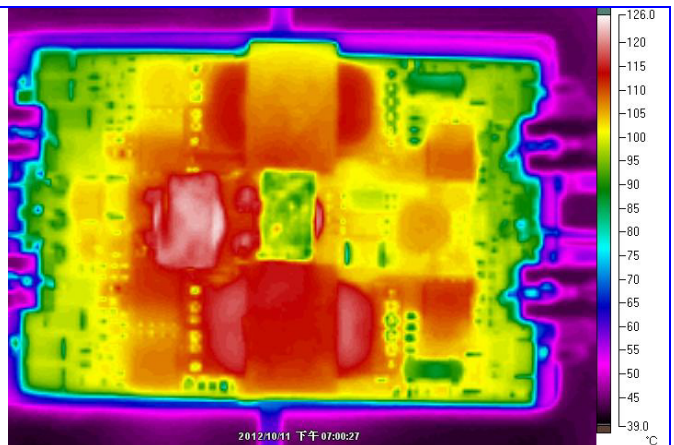
Part Number *	Maximum Input		Maximum Output		Efficiency
UQ48120abcd-25XXX	36V~75V	326W	12.0V/25A	300W	92%
UQ48070abcd-40XXX	36V~75V	308W	7.0V/40A	280W	91%
UQ48050abcd-60XXX	36V~75V	330W	5.0V/60A	300W	91%
UQ48033abcd-60XXX	36V~75V	221W	3.3V/60A	198W	90%

Part Number *	Maximum Input		Maximum Output		Efficiency
UQ24120abcd-25XXX	18V~36V	330W	12.0V/25A	300W	91%
UQ24070abcd-40XXX	18V~36V	308W	7.0V/40A	280W	91%
UQ24050abcd-60XXX	18V~36V	330W	5.0V/60A	300W	90%
UQ24033abcd-60XXX	18V~36V	221W	3.3V/60A	198W	90%

REFERENCED THERMAL IMAGES



UQ48070N20M-40XXX (Io= 23A@55°C/100LFM)



UQ48070N20M-40XXX (Io= 30.4A@55°C/200LFM)

SPECIFICATIONS

Absolute Maximum Ratings		
Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 24V Models 48V Models Transient (100mS): 24V Models 48V Models	 -0.5V to +40Vdc -0.5V to +80Vdc 50V Maximum 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

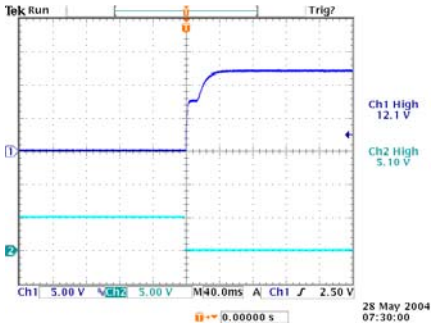
General Parameters		
Conversion Efficiency	Typical	See table
Switching Frequency	Typical	330KHz
MTBF	Bellcore TR-332 issue 6	2.96×10^6 hrs @GB/25°C (UQ48050abcd-60XXX)
OTP	Internal	110°C(Tc) ±5°C
Weight	1.0mm metal plate 3.0mm metal plate	43g 56g

Control Functions		
Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

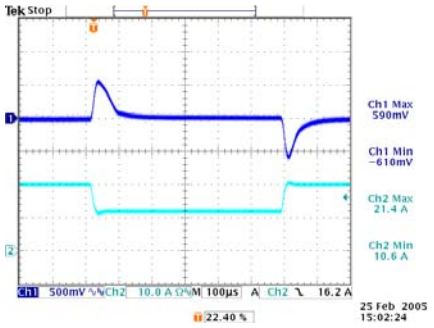
Input		
Operation Voltage Range	24V Models 48V Models	+18V to +36Vdc +36V to +75Vdc
Reflected Ripple Current	L_{EXT} = 10uH	30mA rms/100mAp-p
Power ON Voltage Ranges	24V Models 48V Models	+17.0V to +18.0Vdc +34.0V to +36.0Vdc
Power OFF Voltage Ranges	24V Models 48V Models	+15.6V to +16.6Vdc +31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	24V Models 48V Models	33.0uF Max 12.0uF Max

Output		
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.3%
Load Regulation	0%~100%	±0.3%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

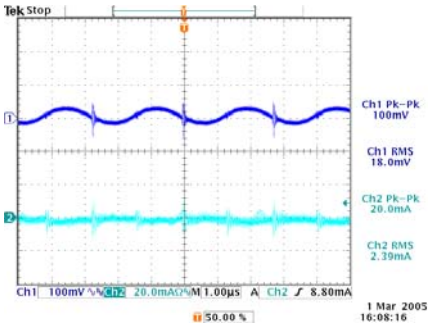
TYPICAL WAVES AND CURVES



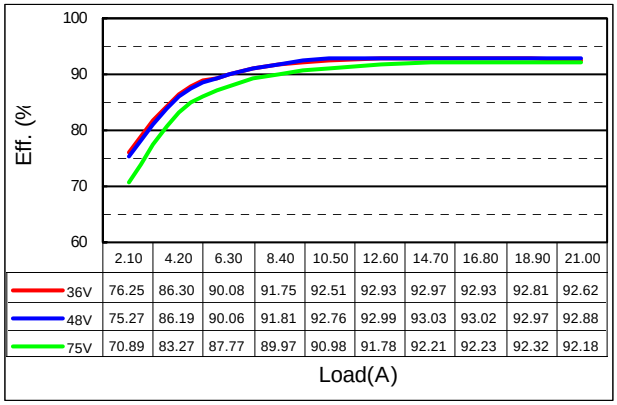
Start-up waveform of UQ48120abcd-21XXX
(V_{IN}: 50V, Load: 21A)



Transient response of UQ48120abcd-21XXX
(V_{IN}: 50V, Load: 20A/10A@2.5A/µS)

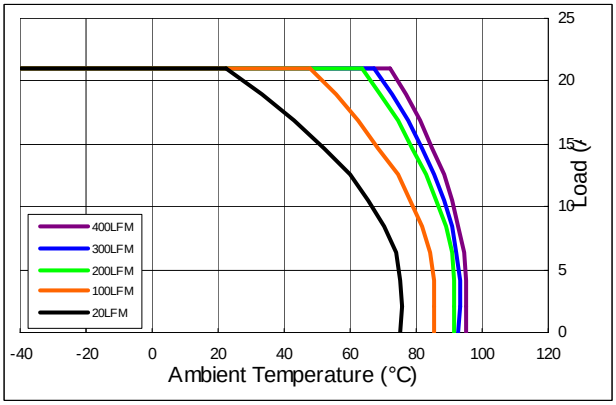


Input/Output ripples of UQ48120abcd-21XXX
(V_{IN}: 50V, Load: 21A, L_{IN}=10uH)

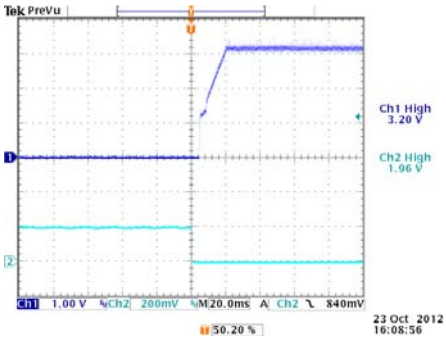


	2.10	4.20	6.30	8.40	10.50	12.60	14.70	16.80	18.90	21.00
36V	76.25	86.30	90.08	91.75	92.51	92.93	92.97	92.93	92.81	92.62
48V	75.27	86.19	90.06	91.81	92.76	92.99	93.03	93.02	92.97	92.88
75V	70.89	83.27	87.77	89.97	90.98	91.78	92.21	92.23	92.32	92.18

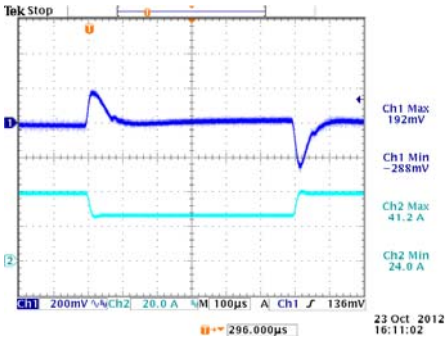
Efficiency plot of UQ48120abcM-21XXX



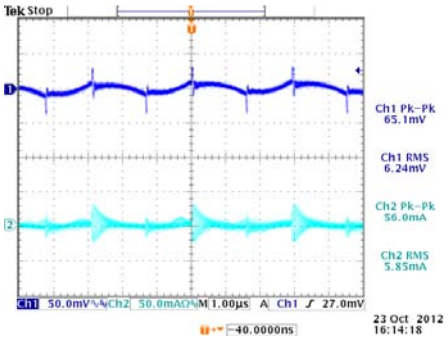
Derating curves of UQ48120abcM-21XXX for T_C= 110°C



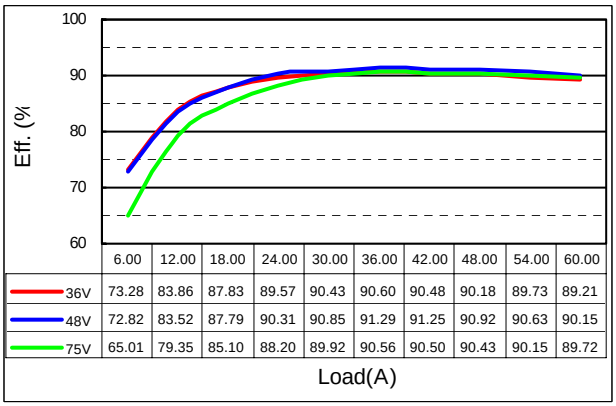
Start-up waveform of UQ48033abcd-60XXX
(V_{IN}: 48V, Load: 60A)



Transient response of UQ48033abcd-60XXX
(V_{IN}: 48V, Load: 41.0A/24.0A@2.5A/µS)

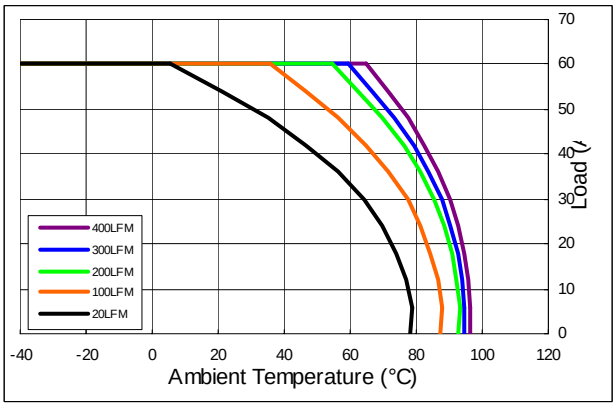


Input/Output ripples of UQ48033abcd-60XXX
(V_{IN}: 48V, Load: 60A, L_{IN}=10uH)



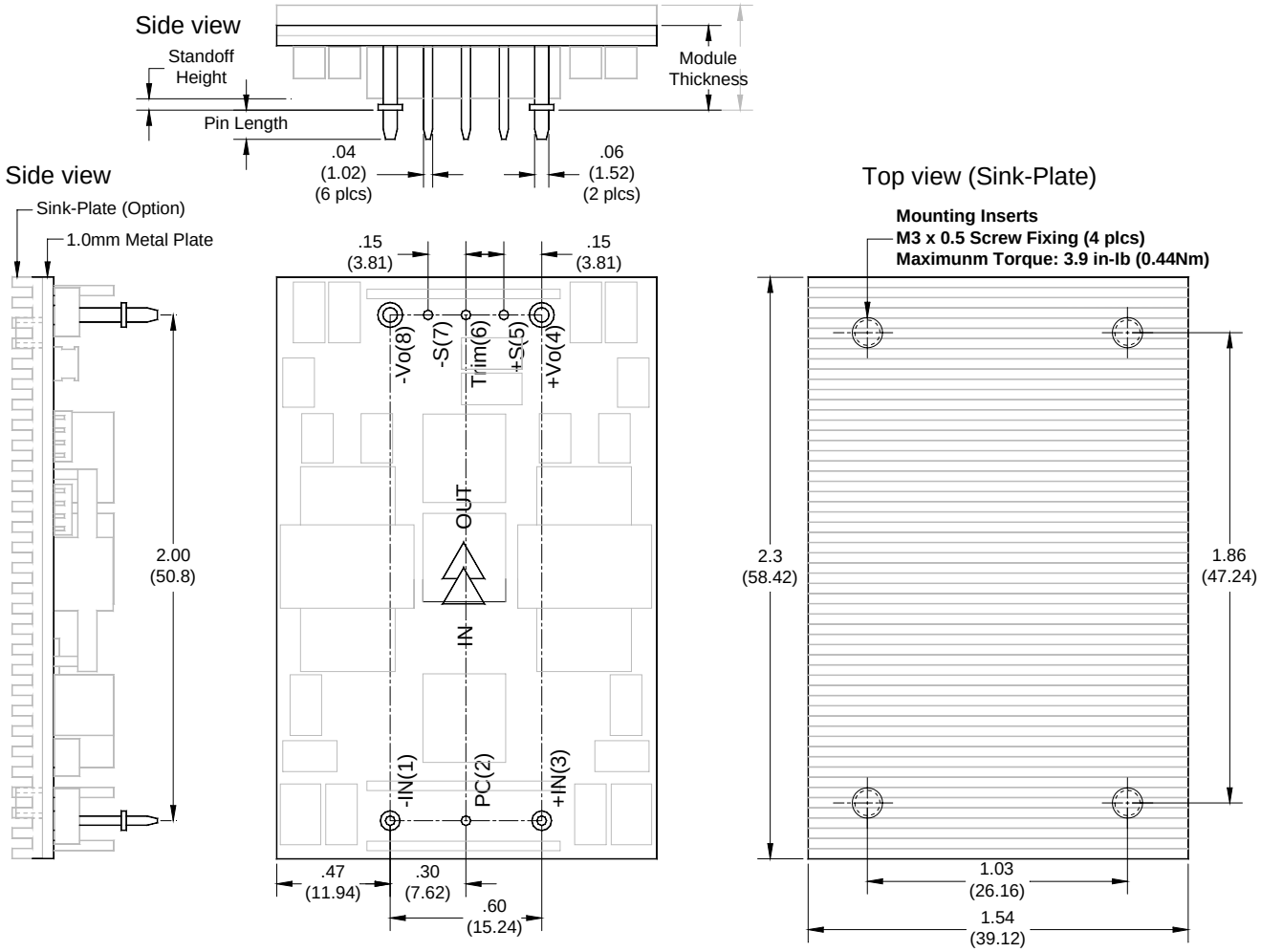
	6.00	12.00	18.00	24.00	30.00	36.00	42.00	48.00	54.00	60.00
36V	73.28	83.86	87.83	89.57	90.43	90.60	90.48	90.18	89.73	89.21
48V	72.82	83.52	87.79	90.31	90.85	91.29	91.25	90.92	90.63	90.15
75V	65.01	79.35	85.10	88.20	89.92	90.56	90.50	90.43	90.15	89.72

Efficiency plot of UQ48033abcM-60XXX



Derating curves of UQ48033abcM-60XXX for T_C= 110°C

OPEN FRAME PACKAGE



Dimensions and Pin Connections

Designation	Function Description	Pin #
-IN	Negative input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
+IN	Positive input	**3**
+Vo	Positive output	**4**
+S	Positive remote sense	**5**
TRIM	Output voltage adjust	**6**
-S	Negative remote sense	**7**
-Vo	Negative output	**8**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 43g / 1.0mm metal plate
56g / 3.0mm metal plate

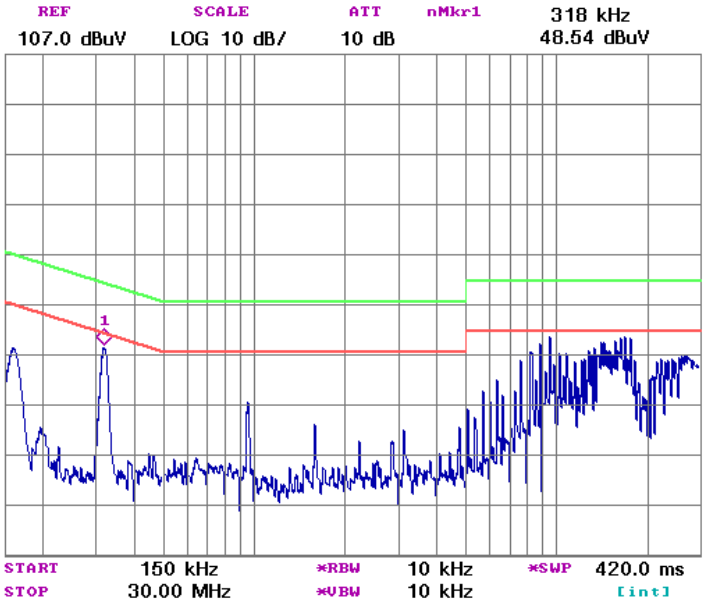
Base plate: Aluminum alloy with anode oxide

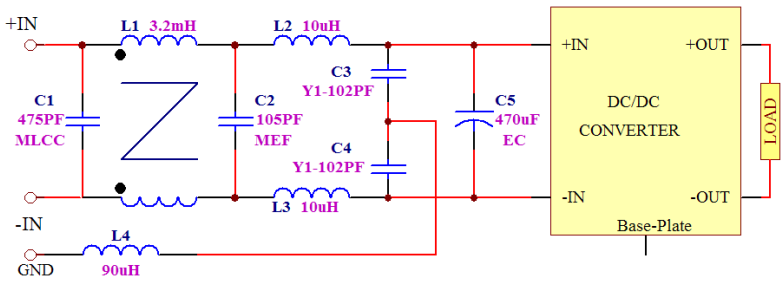
Mounting inserts: Stainless steel
Maximum torque: 3.9 in-lb (0.44Nm)

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

REFERENCED EMC CIRCUIT





Measured conductive level of UQ48070abcd-35XXX and referenced filter circuit

Referenced EMC Performance

The tested result shown in left-hand side is obtained by loading the power module with a resistive load only. It can be used as a design reference for customer system. However! The performance of customer's system depends on the whole system design. It should be noted that modifications on the circuit parameters and fine adjustment of the final layout affect the final EMC performance greatly.

Bandwidth of EMC Components

No components are ideal for infinite frequency range. The bandwidth of EMC components should be taking into consideration when designing an EMC filter circuit. To connect ceramic capacitor with electricity capacitor in parallel and connect low inductance inductor with big one could get a better bandwidth.

NOTE:

1. **It is recommended that the input should be protected by fuses or other protection devices.**
2. All specifications are typical at nominal input, full load and 25°C unless otherwise noted.
3. Specifications are subject to change without notice.
4. Printed or downloaded datasheets are not subject to Glary document control.
5. Product labels shown, including safety agency certificates, may vary based on the date of manufacture.
6. Information provided in this documentation is for ordering purposes only.
7. This product is not designed for use in critical life support systems, equipment used in hazardous environments, nuclear control systems or other such applications, which necessitate specific safety and regulatory standards other than the ones listed in this datasheet.

IMPORTANT

※ General specifications and the performances are related to standard series only, no special customer specification display here except requested items.

※ In order to secure effective usage of converter and the validity of Glary's service and warranty coverage, please refer to the application notes for general usage. For needs of usage beyond the application notes, please contact to Glary headquarter or our regional sales representative office for help.

Glary Power Technology

Enclosed UQ Series

Quarter Brick up to 300W／60A

Efficiency >92% | 145W/in³ | Full Metal Package | OCP | 2.96Mhrs MTBF | Remote ON OFF | INPUT 2:1 | OVP | OTP | Pb | RoHS 2002/95/EC

The ***Enclosed UQ*** series provides up to 300W/60A outputs with industry standard quarter brick pin assignment. The high thermal conductivity silicone potted six-sides metal package is designed for applications under extreme environmental conditions. The efficient SR stage is combined with patented “Buck Reset” topology for reduce power loss to achieve 145W/in**3** power density. The multi-layer single side circuit board design plus the metal-plate technology would enhance the thermal performance and improve its reliability. Modules are designed for Telecom, Servers, Networking equipments and other applications that use a 24V or 48V input bus.

PART NUMBER SYSTEM

UQ	48	050	a	b	c	d	-	25	XX	X
Series Name	Input Voltage	Output Voltage	Enable Logic	Pin Dimension	Standoff Height	Base-Plate		Output Current	Suffix	Version
UQ	**48=**36V~75V **24=**18V~36V	**Unit:** 0.1V Increments **120=**12V **050=**5V	**P:** Positive **N:** Negative	**0**：0.12” **1**：0.16” **2**：0.20” **3**：0.24”	**0**：0.02”	**U**：3.0mm Metal Plate **V**：5.0mm Metal Plate	-	**00~60**： For output current rating	For marketing purpose only	

MODEL LIST (Contact to factory for special input / output)

Part Number *	Maximum Input		Maximum Output		Efficiency
UQ48120abcd-25XXX	36V~75V	326W	12.0V/25A	300W	92%
UQ48070abcd-40XXX	36V~75V	308W	7.0V/40A	280W	91%
UQ48050abcd-60XXX	36V~75V	330W	5.0V/60A	300W	91%
UQ48033abcd-60XXX	36V~75V	221W	3.3V/60A	198W	90%

Part Number *	Maximum Input		Maximum Output		Efficiency
UQ24120abcd-25XXX	18V~36V	330W	12.0V/25A	300W	92%
UQ24070abcd-40XXX	18V~36V	308W	7.0V/40A	280W	91%
UQ24050abcd-60XXX	18V~36V	330W	5.0V/60A	300W	90%
UQ24033abcd-60XXX	18V~36V	221W	3.3V/60A	198W	90%

REFERENCED THERMAL IMAGES

To be updated in next version	To be updated in next version

Glary Power Technology

NH Series

Half Brick up to 336W／21A

Efficiency >90% | 169W/in³ | Open Frame Package | Full Metal Package | 4.11Mhrs MTBF

Remote ON OFF | INPUT 2:1 | OVP | OTP | OCP

The ***NH*** series provides up to 336W/21A outputs with industry standard half brick package. The efficient Non-SR technology is combined with ultra low leakage inductance magnetic design to gives converters “SR-like” conversion efficiency. The multi-layer single side circuit board design plus the Sink-plate technology would enhance the thermal performance and improve its reliability. Modules are designed for Telecom, Servers, Networking equipments and other applications that use a 24V or 48V input bus.

PART NUMBER SYSTEM

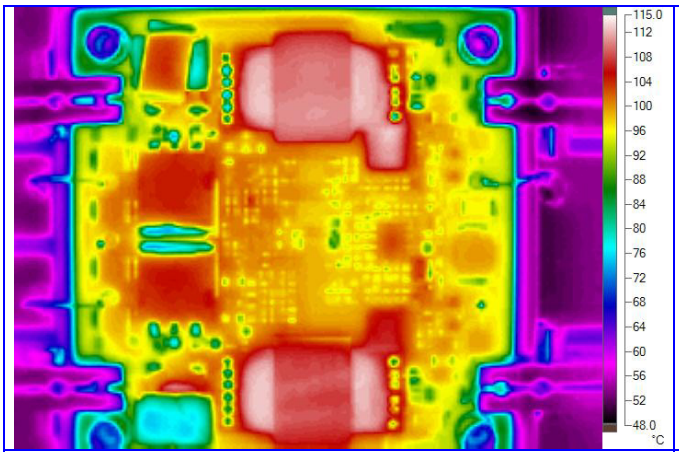
NH	48	480	a	b	c	d	-	07	XX	X
Series Name	Input Voltage	Output Voltage	Enable Logic	Pin Dimension	Standoff Height	Base-Plate		Output Current	Suffix	Version
NH	**48=**36V~75V **24=**18V~36V	**Unit:** 0.1V Increments **480=**48V **120=**12V	**P:** Positive **N:** Negative	**0**：0.12” **1**：0.16” **2**：0.20” **3**：0.24”	**0**：0.02” **1**：0.08” **2**：0.16”	**M**：1.0mm Metal Plate **A**：3.0mm Sink-Plate **B**：5.0mm Sink-Plate **E**：Metallic enclosure (1.0mm metal plate)	-	**00~21**：For output current rating	For marketing purpose only	

MODEL LIST (Contact to factory for special input / output)

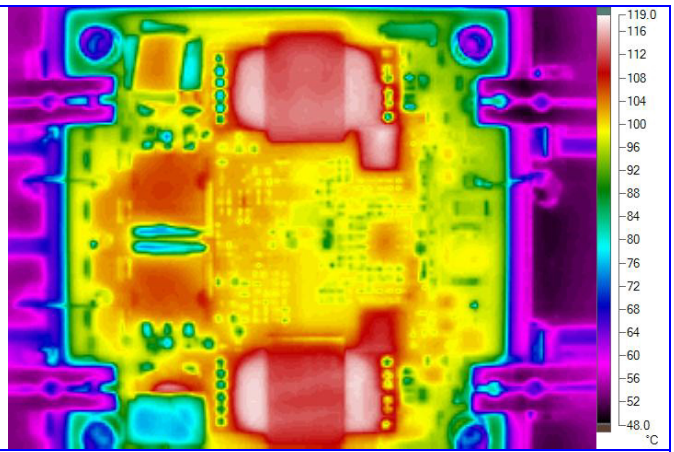
Part Number *	Maximum Input		Maximum Output		Efficiency
NH48480abcd-07XXX	36V~75V	378W	48V/7.0A	336W	89%
NH48280abcd-11XXX	36V~75V	342W	28V/11A	308W	90%
NH48240abcd-12XXX	36V~75V	323W	24V/12A	288W	89%
NH48240abcd-07XXX	36V~75V	174W	24V/6.5A	156W	90%
NH48120abcd-21XXX	36V~75V	280W	12V/21A	252W	90%

Part Number *	Maximum Input		Maximum Output		Efficiency
NH24480abcd-07XXX	18V~36V	381W	48V/7.0A	336W	88%
NH24280abcd-11XXX	18V~36V	342W	28V/11A	308W	90%
NH24240abcd-12XXX	18V~36V	323W	24V/12A	288W	89%
NH24120abcd-21XXX	18V~36V	280W	12V/21A	252W	90%

REFERENCED THERMAL IMAGES



NH48070N20B-07 (Io= 5.1A@55°C/100LFM)



NH48070N20B-07 (Io= 6.1A@55°C/200LFM)

SPECIFICATIONS

Absolute Maximum Ratings		
Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 24V Models 48V Models Transient (100mS): 24V Models 48V Models	 -0.5V to +40Vdc -0.5V to +80Vdc 50V Maximum 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

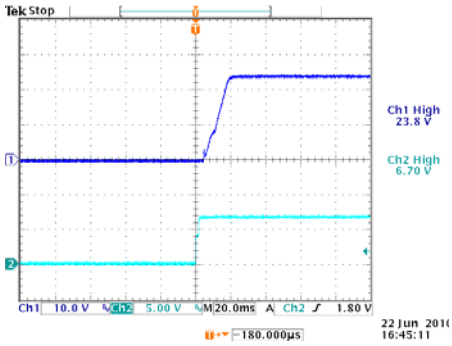
General Parameters		
Conversion Efficiency	Typical	See table
Switching Frequency	Typical	340KHz
MTBF	Bellcore TR-332 issue 6	4.11×10^6 hrs @GB/25°C. (NH24280abcd-11XXX)
OTP	Internal	110°C(Tc) ±5°C
Weight	Open frame Metallic enclosure	60g / 1.0mm metal plate 95g / 1.0mm metal plate

Control Functions		
Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

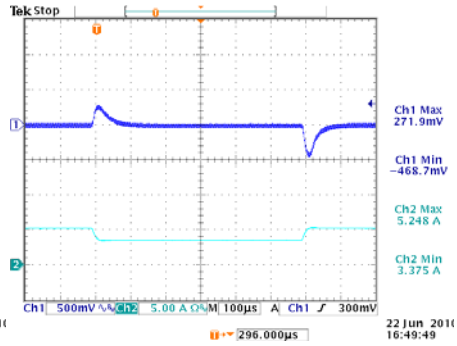
Input		
Operation Voltage Range	24V Models 48V Models	+18V to +36Vdc +36V to +75Vdc
Reflected Ripple Current	L_{EXT} = 10uH	30mA rms/100mAp-p
Power ON Voltage Ranges	24V Models 48V Models	+17.0V to +18.0Vdc +34.0V to +36.0Vdc
Power OFF Voltage Ranges	24V Models 48V Models	+15.6V to +16.6Vdc +31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	24V Models 48V Models	42.0uF Max 15.0uF Max

Output		
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.3%
Load Regulation	2%~100%	±0.3%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

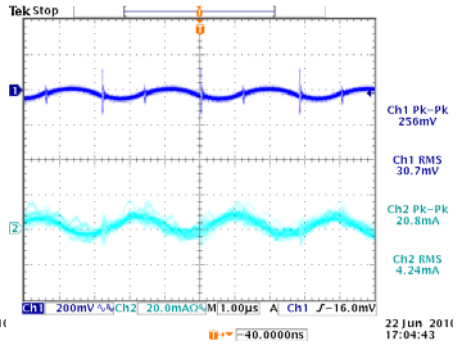
TYPICAL WAVES AND CURVES



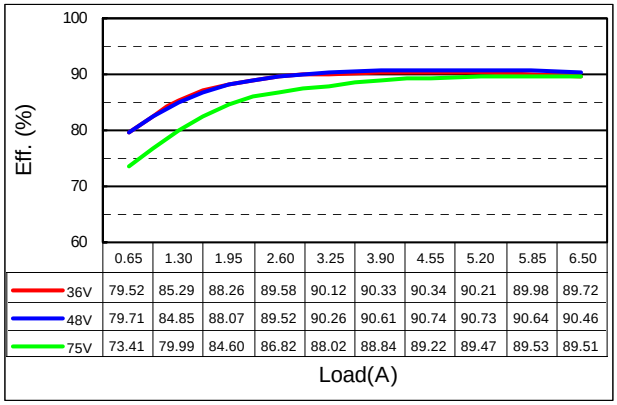
Start-up waveform of NH48240abcd-07XXX
(V_{IN}: 48V, Load: 6.5A)



Transient response of NH48240abcd-07XXX
(V_{IN}: 48V, Load: 5.0A/3.3A@2.5A/µS)

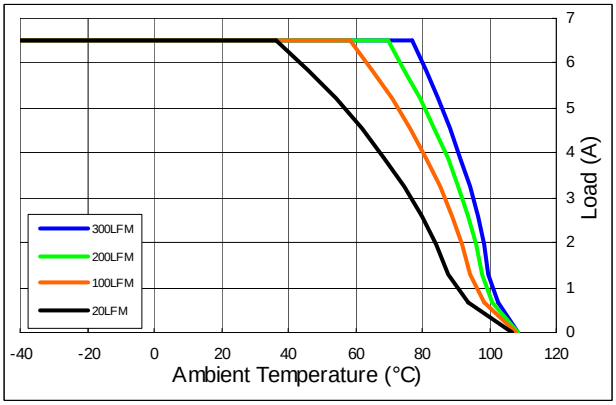


Input/Output ripples of NH48240abcd-07XXX
(V_{IN}: 48V, Load: 6.5A, L_{IN}=10uH)

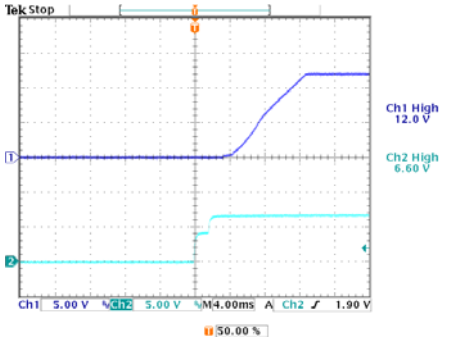


	0.65	1.30	1.95	2.60	3.25	3.90	4.55	5.20	5.85	6.50
36V	79.52	85.29	88.26	89.58	90.12	90.33	90.34	90.21	89.98	89.72
48V	79.71	84.85	88.07	89.52	90.26	90.61	90.74	90.73	90.64	90.46
75V	73.41	79.99	84.60	86.82	88.02	88.84	89.22	89.47	89.53	89.51

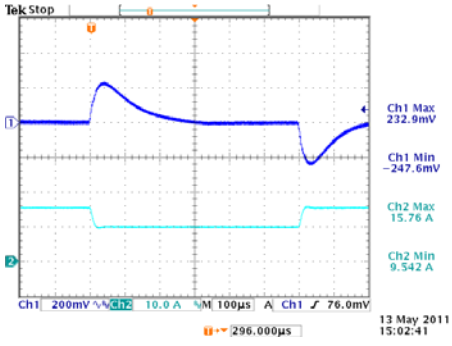
Efficiency plot of NH48240abcB-07XXX



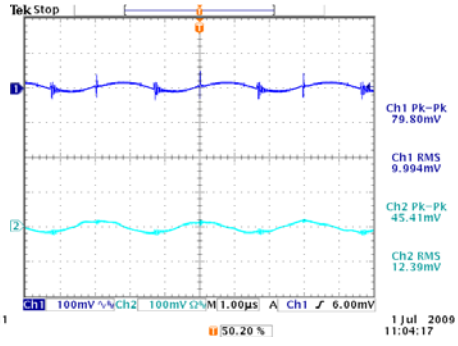
Derating curves of NH48240abcB-07XXX for T_C= 110°C



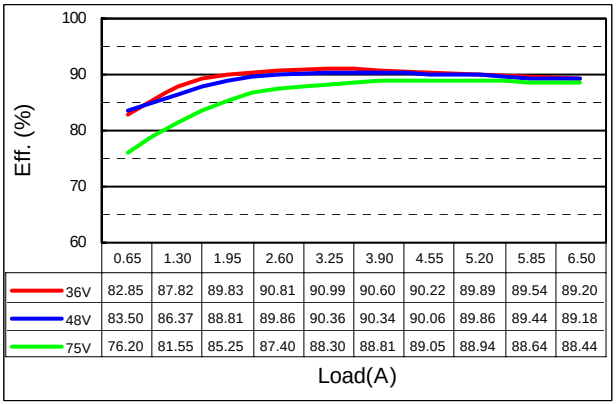
Start-up waveform of NH48120abcd-21XXX
(V_{IN}: 48V, Load: 21A)



Transient response of NH48120abcd-21XXX
(V_{IN}: 48V, Load: 15.5A/9.5A@2.5A/µS)

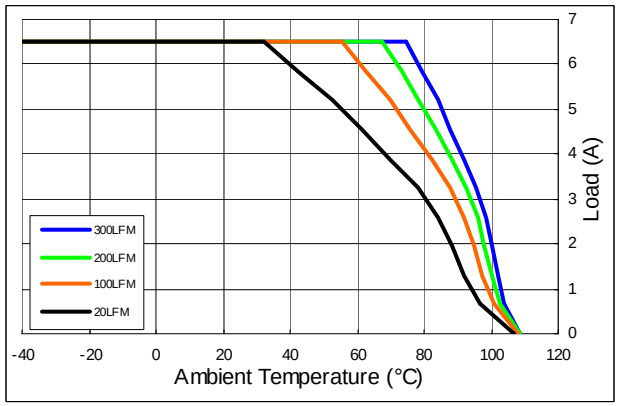


Input/Output ripples of NH48120abcd-21XXX
(V_{IN}: 48V, Load: 21A, L_{IN}=10uH)



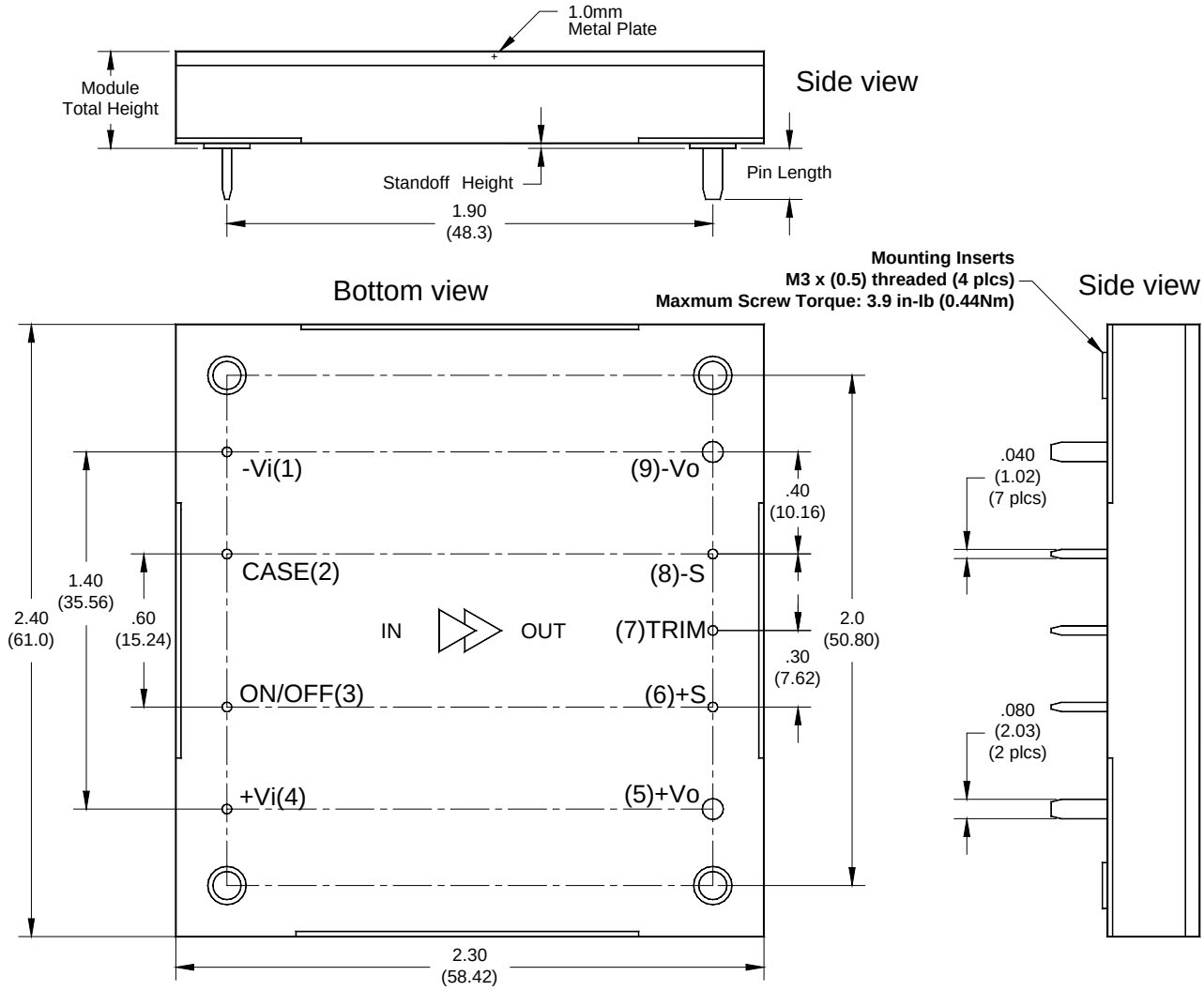
	0.65	1.30	1.95	2.60	3.25	3.90	4.55	5.20	5.85	6.50
36V	82.85	87.82	89.83	90.81	90.99	90.60	90.22	89.89	89.54	89.20
48V	83.50	86.37	88.81	89.86	90.36	90.34	90.06	89.86	89.44	89.18
75V	76.20	81.55	85.25	87.40	88.30	88.81	89.05	88.94	88.64	88.44

Efficiency plot of NH48120abcB-21XXX



Derating curves of NH48120abcB-21XXX for T_C= 110°C

METAL ENCLOSED PACKAGE



Dimensions and Pin Connections

Designation	Function Description	Pin #
-Vi	Negative input	**1**
CASE	Connected to base plate	**2**
ON/OFF	Remote control. To turn-on and turn-off output.	**3**
+Vi	Positive input	**4**
+Vo	Positive output	**5**
+S	Positive remote sense	**6**
TRIM	Output voltage adjust	**7**
-S	Negative remote sense	**8**
-Vo	Negative output	**9**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 95g / 1.0mm metal plate

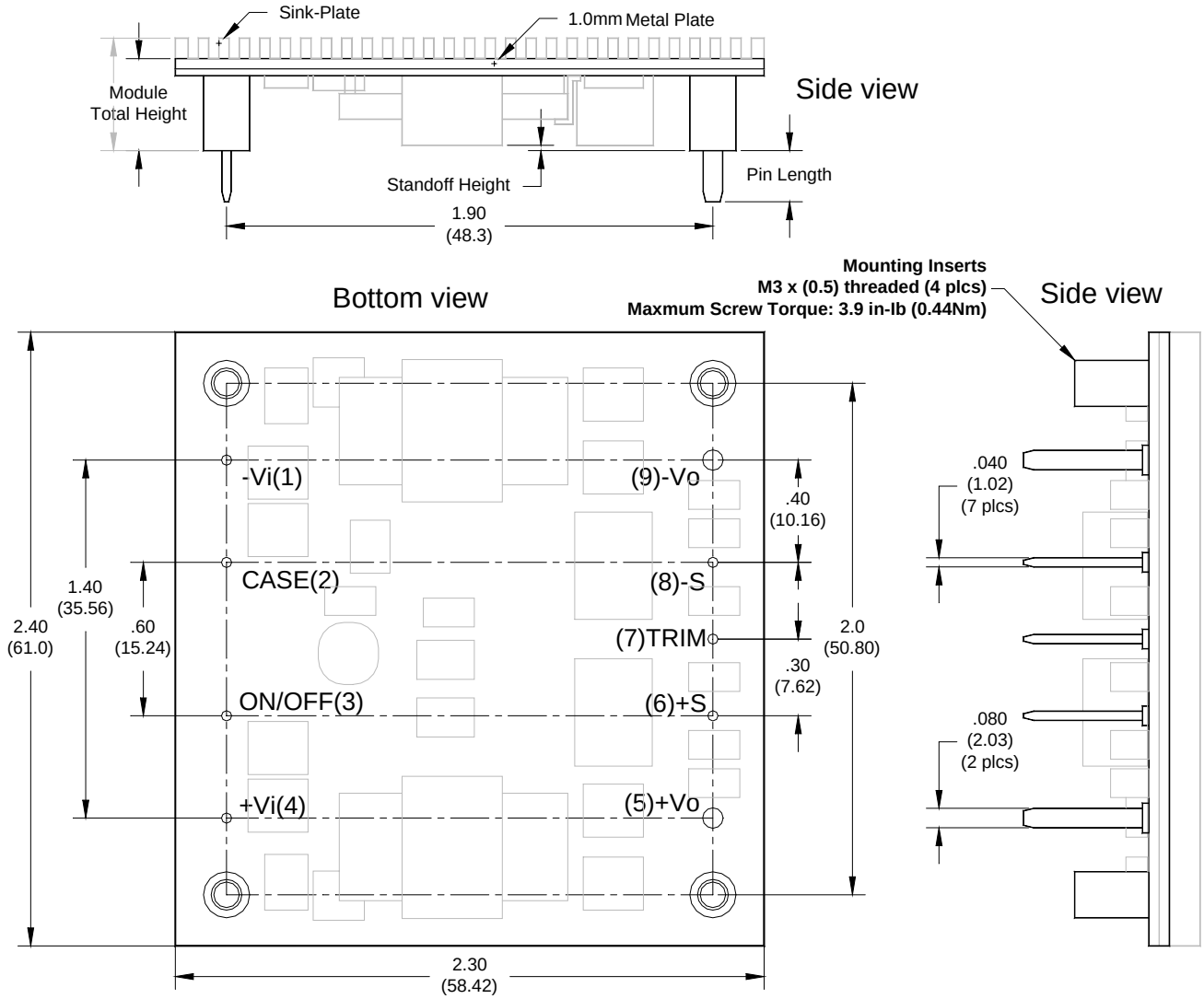
Base plate: Aluminum alloy with anode oxide

Mounting inserts: Stainless steel
Maximum torque: 3.9 in-lb (0.44Nm)

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

OPEN FRAME PACKAGE



Dimensions and Pin Connections

Designation	Function Description	Pin #
-Vi	Negative input	**1**
CASE	Connected to base plate	**2**
ON/OFF	Remote control. To turn-on and turn-off output.	**3**
+Vi	Positive input	**4**
+Vo	Positive output	**5**
+S	Positive remote sense	**6**
TRIM	Output voltage adjust	**7**
-S	Negative remote sense	**8**
-Vo	Negative output	**9**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 60g / 1.0mm metal plate

Base plate: Aluminum alloy with anode oxide

Mounting inserts: Stainless steel
Maximum torque: 3.9 in-lb (0.44Nm)

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

Glary Power Technology

CBH Series
Half Brick up to 250W／60A

Efficiency >91% | 126W/in³ | Open Frame Package | Full Metal Package | 3.3Mhrs MTBF

Remote ON OFF | INPUT 2:1 | OVP | OTP | OCP

The ***CBH*** series provides up to 250W/60A outputs with industry standard half brick package. The efficient SR stage is combined with patented “Buck Reset” topology that would reduce power loss to achieve 126W/in**3** power density. The single side component and multi-layer circuit board circuit board design plus the patented Sink-Plate technology would enhance the thermal performance and improve its reliability. Modules are designed for Telecom, Servers, Networking equipments and other applications that use a 24V or 48V input bus.

PART NUMBER SYSTEM

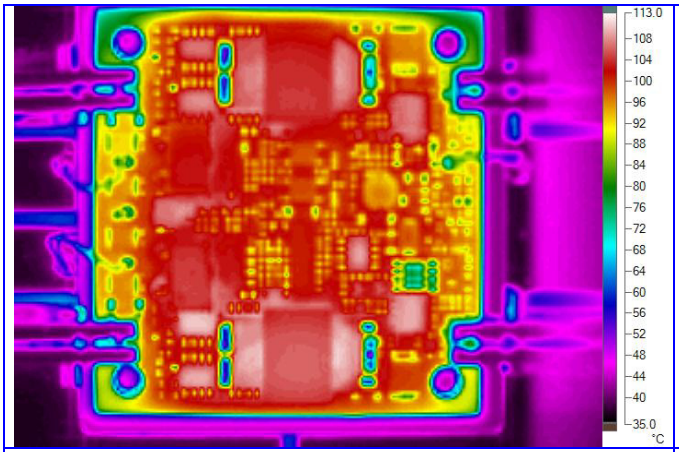
CBH	48	050	a	b	c	d	-	50	XX	X
Series Name	Input Voltage	Output Voltage	Enable Logic	Pin Dimension	Standoff Height	Base-Plate		Output Current	Suffix	Version
CBH	**48=**36V~75V **24=**18V~36V	**Unit:** 0.1V Increments **050=**5V **033=**3.3V	**P:** Positive **N:** Negative	**0**：0.12” **1**：0.16” **2**：0.20” **3**：0.24”	**0**：0.02” **1**：0.08” **2**：0.16”	**M**：1.0mm Metal Plate **A**：3.0mm Sink-Plate **B**：5.0mm Sink-Plate **E**：Metallic enclosure (1.0mm metal plate)	-	**00~60**：For output current rating	For marketing purpose only	

MODEL LIST (Contact to factory for special input / output)

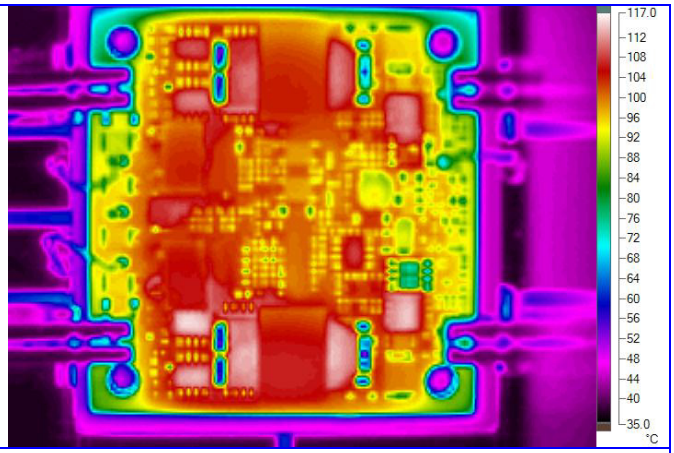
Part Number *	Maximum Input		Maximum Output		Efficiency
CBH48050abcd-50XXX	36V~75V	280W	5.0V/50A	250W	91%
CBH48033abcd-50XXX	36V~75V	186W	3.3V/50A	165W	90%
CBH48025abcd-60XXX	36V~75V	173W	2.5V/60A	150W	87%
CBH48018abcd-60XXX	36V~75V	127W	1.8V/60A	108W	85%
CBH48015abcd-60XXX	36V~75V	109W	1.5V/60A	90W	83%

Part Number *	Maximum Input		Maximum Output		Efficiency
CBH24050abcd-50XXX	18V~36V	280W	5.0V/50A	250W	90%
CBH24033abcd-50XXX	18V~36V	186W	3.3V/50A	165W	89%
CBH24025abcd-60XXX	18V~36V	173W	2.5V/60A	150W	87%
CBH24018abcd-60XXX	18V~36V	127W	1.8V/60A	108W	85%
CBH24015abcd-60XXX	18V~36V	109W	1.5V/60A	90W	83%

REFERENCED THERMAL IMAGES



CBH48050N20M-50 (Io= 28A@50˚C/100LFM)



CBH48050N20M-50 (Io= 36A@50˚C/200LFM)

SPECIFICATIONS

Absolute Maximum Ratings		
Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 24V Models 48V Models Transient (100mS): 24V Models 48V Models	 -0.5V to +40Vdc -0.5V to +80Vdc 50V Maximum 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

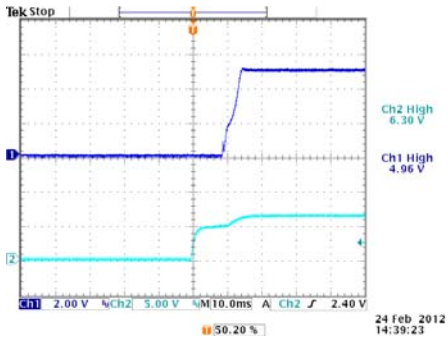
General Parameters		
Conversion Efficiency	Typical	See table
Switching Frequency	Typical	330KHz
MTBF	Bellcore TR-332 issue 6	3.30×10^6 hrs @GB/25°C (CBH48050abcd-50XXX)
OTP	Internal	110°C(Tc) ±5°C
Weight	Open frame Metallic enclosure	60g / 1.0mm metal plate 95g / 1.0mm metal plate

Control Functions		
Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

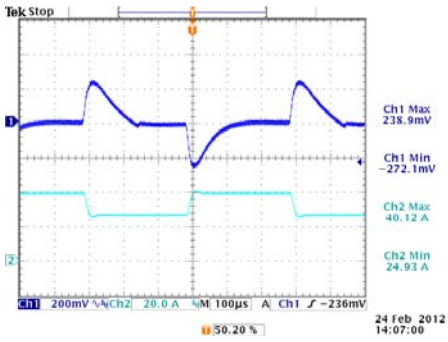
Input		
Operation Voltage Range	24V Models 48V Models	+18V to +36Vdc +36V to +75Vdc
Reflected Ripple Current	L_{EXT} = 10uH	30mA rms/100mAp-p
Power ON Voltage Ranges	24V Models 48V Models	+17.0V to +18.0Vdc +34.0V to +36.0Vdc
Power OFF Voltage Ranges	24V Models 48V Models	+15.6V to +16.6Vdc +31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	24V Models 48V Models	42.0uF Max 15.0uF Max

Output		
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.3%
Load Regulation	0%~100%	±0.3%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

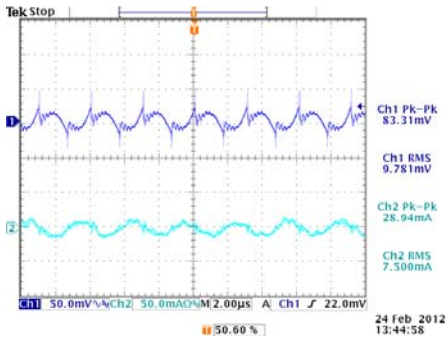
TYPICAL WAVES AND CURVES



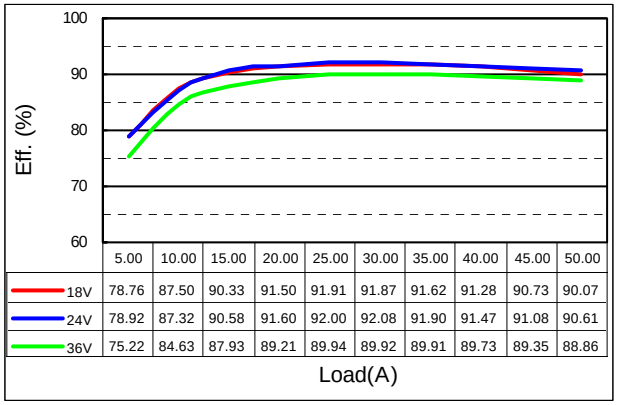
Start-up waveform of CBH24050abcd-50XXX
(V_{IN}: 24V, Load: 50A)



Transient response of CBH24050abcd-50XXX
(V_{IN}: 24V, Load: 39A/24A@2.5A/μS)

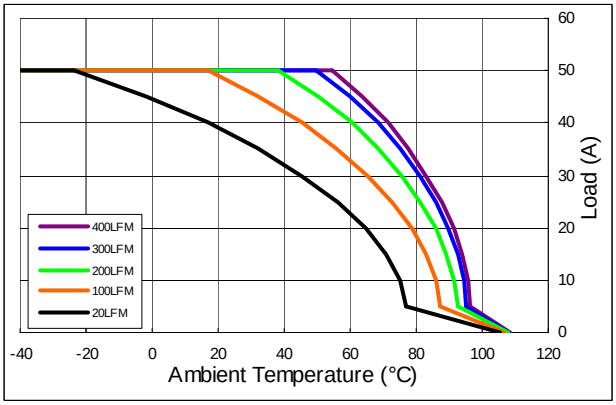


Input/Output ripples of CBH24050abcd-50XXX
(V_{IN}: 24V, Load: 50A, L_{IN}=10uH)

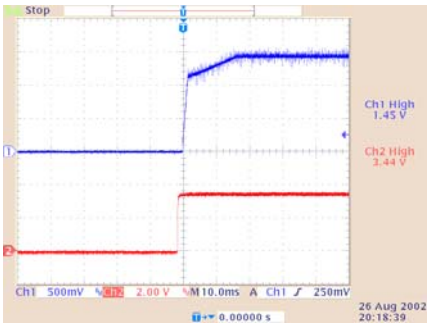


	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00
18V	78.76	87.50	90.33	91.50	91.91	91.87	91.62	91.28	90.73	90.07
24V	78.92	87.32	90.58	91.60	92.00	92.08	91.90	91.47	91.08	90.61
36V	75.22	84.63	87.93	89.21	89.94	89.92	89.91	89.73	89.35	88.86

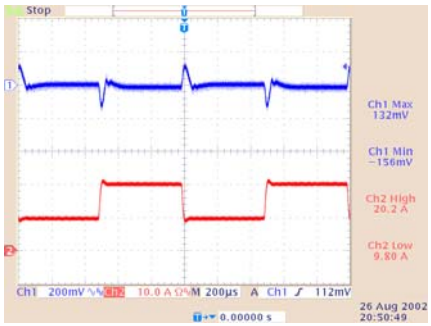
Efficiency plot of CBH24050abcA-50XXX



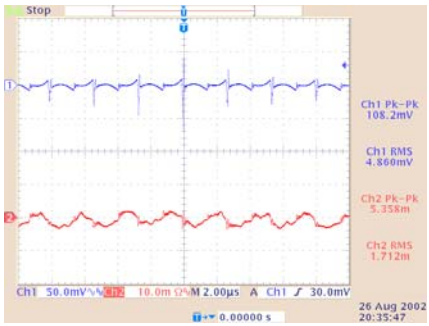
Derating curves of CBH24050abcA-50XXX for T_C= 110°C



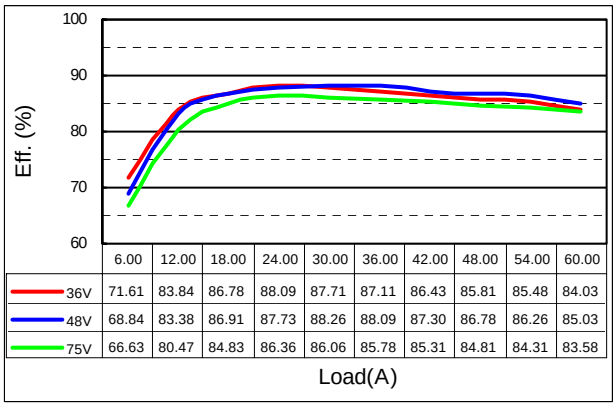
Start-up waveform of CBH48015abcd-60XXX
(V_{IN}: 48V, Load: 60A)



Transient response of CBH48015abcd-60XXX
(V_{IN}: 48V, Load: 20A/10A@2.5A/μS)

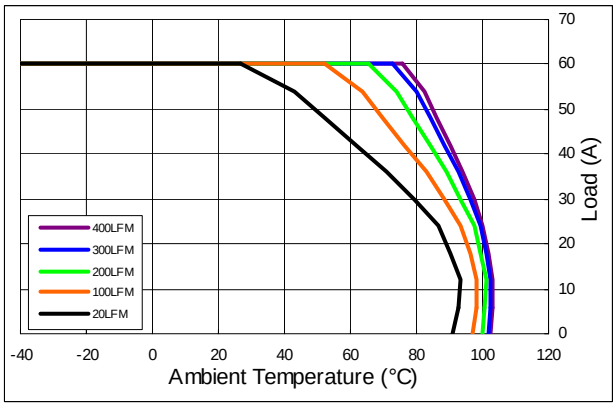


Input/Output ripples of CBH48015abcd-60XXX
(V_{IN}: 48V, Load: 60A, L_{IN}=10uH)



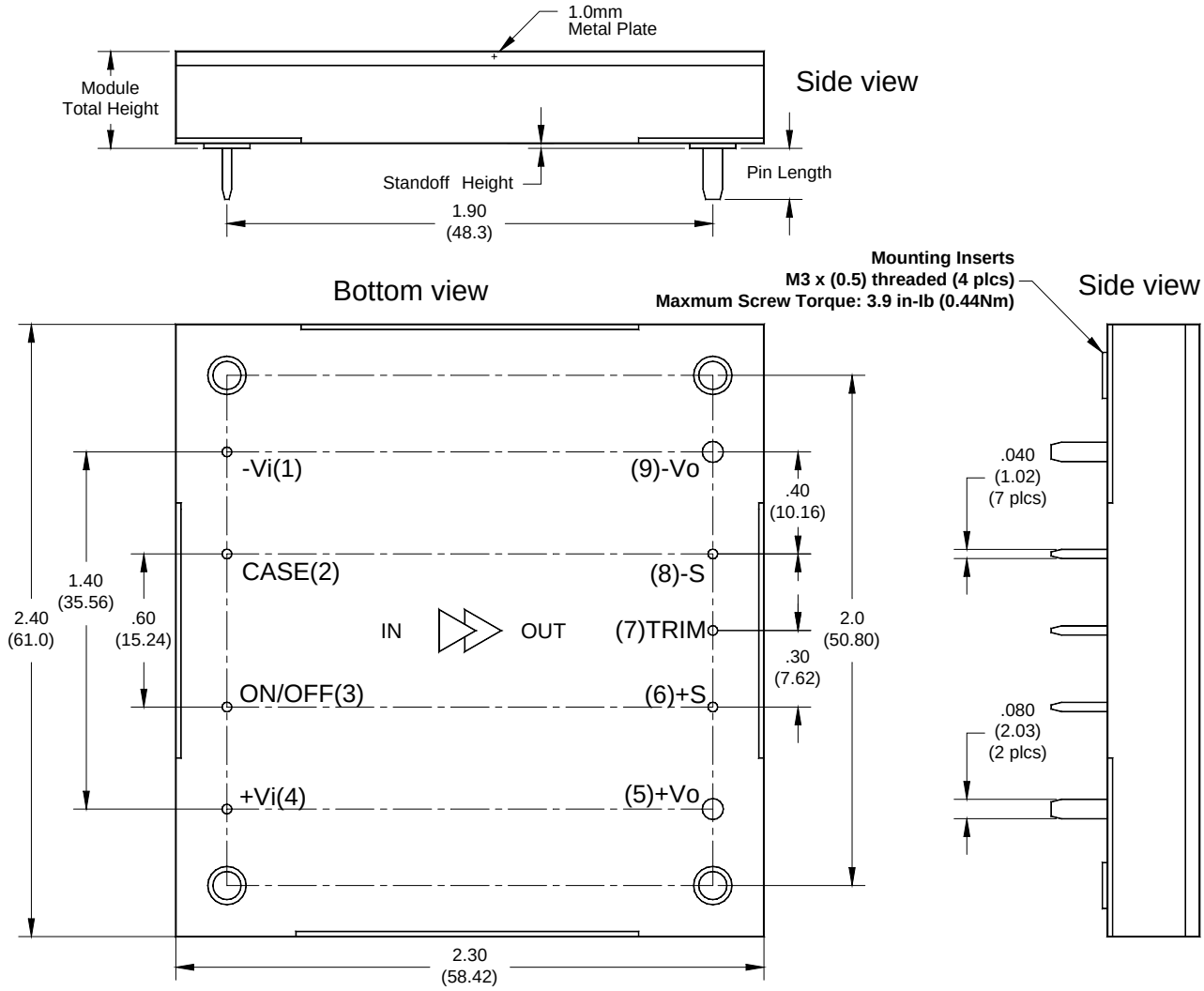
	6.00	12.00	18.00	24.00	30.00	36.00	42.00	48.00	54.00	60.00
36V	71.61	83.84	86.78	88.09	87.71	87.11	86.43	85.81	85.48	84.03
48V	68.84	83.38	86.91	87.73	88.26	88.09	87.30	86.78	86.26	85.03
75V	66.63	80.47	84.83	86.36	86.06	85.78	85.31	84.81	84.31	83.58

Efficiency plot of CBH48015abcA-60XXX



Derating curves of CBH48015abcA-60XXX for T_C= 110°C

METAL ENCLOSED PACKAGE



Dimensions and Pin Connections

Designation	Function Description	Pin #
-Vi	Negative input	**1**
CASE	Connected to base plate	**2**
ON/OFF	Remote control. To turn-on and turn-off output.	**3**
+Vi	Positive input	**4**
+Vo	Positive output	**5**
+S	Positive remote sense	**6**
TRIM	Output voltage adjust	**7**
-S	Negative remote sense	**8**
-Vo	Negative output	**9**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 95g / 1.0mm metal plate

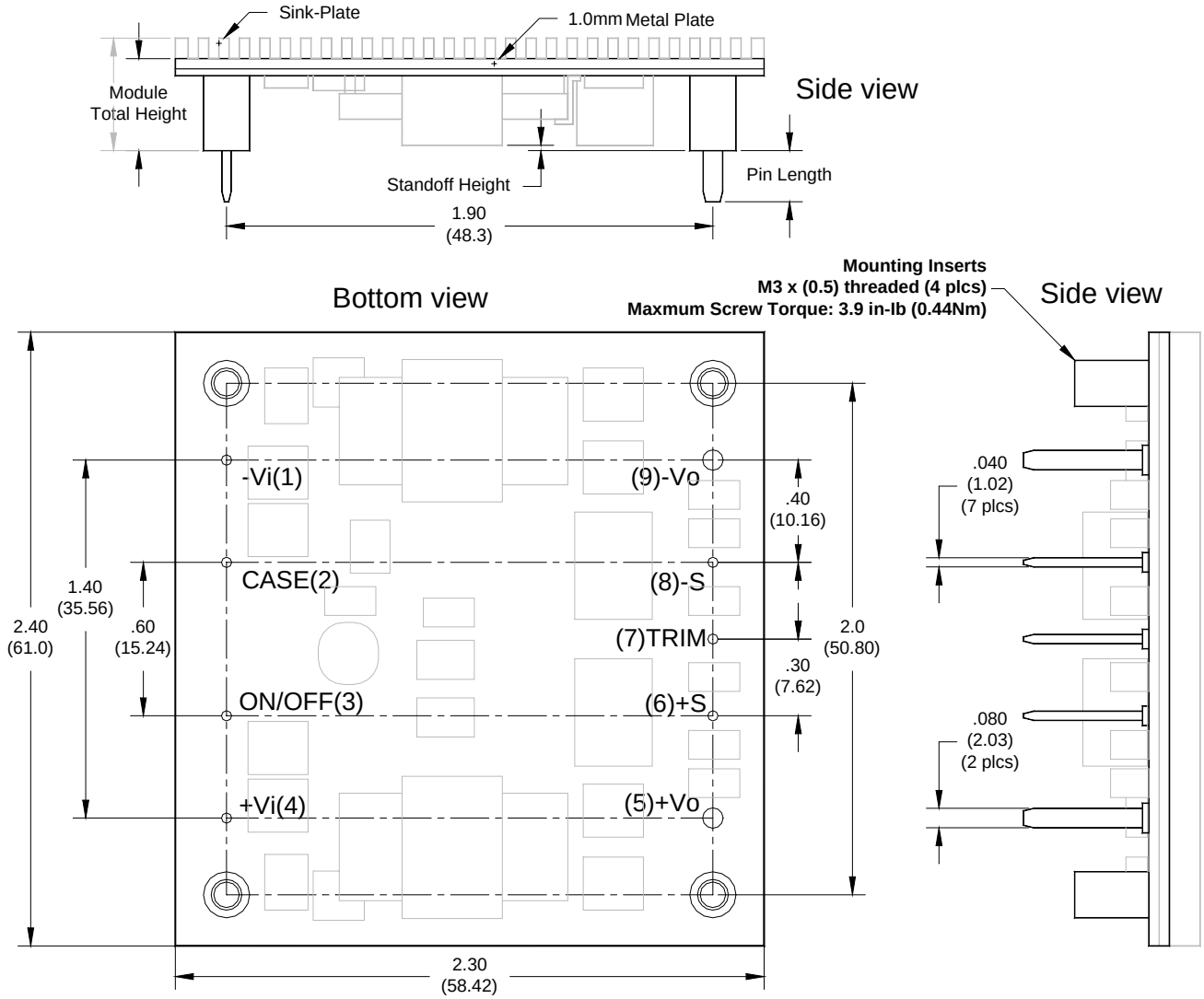
Base plate: Aluminum alloy with anode oxide

Mounting inserts: Stainless steel
Maximum torque: 3.9 in-lb (0.44Nm)

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

OPEN FRAME PACKAGE



Dimensions and Pin Connections

Designation	Function Description	Pin #
-Vi	Negative input	**1**
CASE	Connected to base plate	**2**
ON/OFF	Remote control. To turn-on and turn-off output.	**3**
+Vi	Positive input	**4**
+Vo	Positive output	**5**
+S	Positive remote sense	**6**
TRIM	Output voltage adjust	**7**
-S	Negative remote sense	**8**
-Vo	Negative output	**9**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 60g / 1.0mm metal plate

Base plate: Aluminum alloy with anode oxide

Mounting inserts: Stainless steel
Maximum torque: 3.9 in-lb (0.44Nm)

Pin material: Copper alloy or Brass

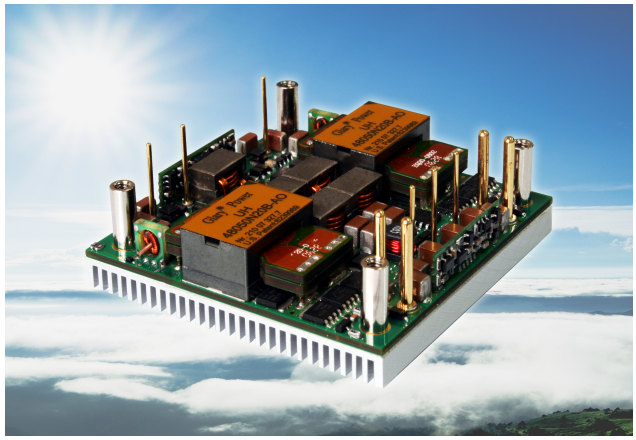
Pin plating: Golden over Nickel

Efficiency >94% | 2.51Mhrs MTBF | No Load P_D<2W | Current Share | Anti Back-Drive

219W/in³ | Open Frame Package | OCP | OTP | OVP

INPUT 2:1 | Remote ON OFF

Pb | RoHS 2002/95/EC



The UH series provides up to 800W/67A outputs with industry standard half brick package. The efficient SR stage is combined with patented "Buck Reset" topology that would reduce power loss to achieve 219W/in3 power density. The multi-layer single side circuit board design plus the patented Sink-Plate technology would enhance the thermal performance and improve its reliability. Modules are designed for Telecom, Servers, Networking equipments and other applications that use a 48V input bus.

PART NUMBER SYSTEM (Total height = standoff height + module thickness)

Preliminary Data Sheet

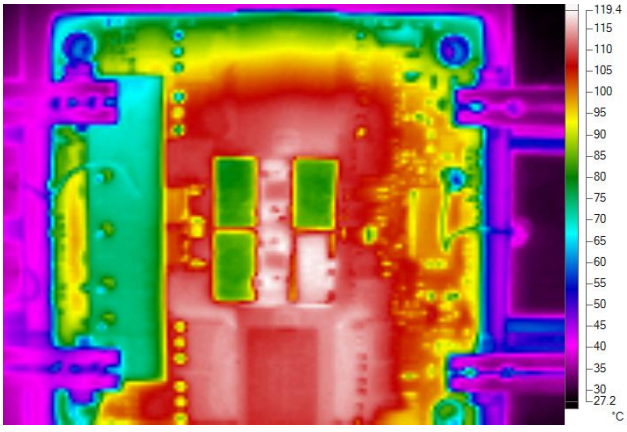
UH	48	033	a	b	c	d	-	N	29	XX	X
Series Name	Rated Input	Rated Output	Enable Logic	Pin Length	Standoff Height	Base-Plate / module thickness		Current Share	Output Current	Suffix	Version
UH	**24=**18V~36V **48=**36V~75V	**Unit:** 0.1V Increments **120=** 12V **033= 3.3**V	**P:** Positive **N:** Negative	**0:** 0.12" **1:** 0.16" **2:** 0.20" **3:** 0.24"	**0:** 0.02" **1:** 0.08" **2:** 0.16"	M: 1.0mm Metal Plate/0.46" S: 3.0mm Metal-Plate/0.54" A: 3.0mm Sink-Plate/0.54" B: 5.0mm Sink-Plate/0.62"	-	**N:** without Current share **S:** secondary Current share	**00~C0:** for output current rating	For marketing purpose only	

MODEL LIST (Contact to factory for special input / output)

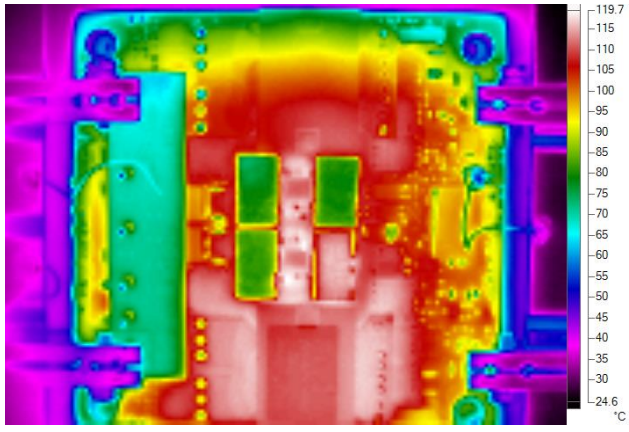
Part Number *	Maximum Input		Maximum Output		Efficiency
UH48480abcd-N17XXX	36V~75V	887W	48V/17A	816W	93%
UH48280abcd-N29XXX	36V~75V	883W	28V/29A	812W	93%
UH48120abcd-N67XXX	36V~75V	874W	12V/67A	804W	94%

Part Number *	Maximum Input		Maximum Output		Efficiency

REFERENCED THERMAL IMAGES



UH48280N20M-S29 (Io= 15A@50°C/200LFM)



UH48280N20M-S29 (Io= 19.5A@50°C/400LFM)

SPECIFICATIONS

Absolute Maximum Ratings

Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 48V Models Transient (100mS): 48V Models	 -0.5V to +80Vdc 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

General Parameters

Conversion Efficiency	Typical	See table
Switching Frequency	Typical	330KHz
MTBF	Bellcore TR-332 issue 6	2.51×10^6 hrs @GB/25°C (UH48280abcd-N29XXX)
OTP	T_{AVG} or T_C	110°C ±5°C for standard setting
Weight	1mm Metal-plate 3mm Sink-plate	87g 94g

Control Functions

Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

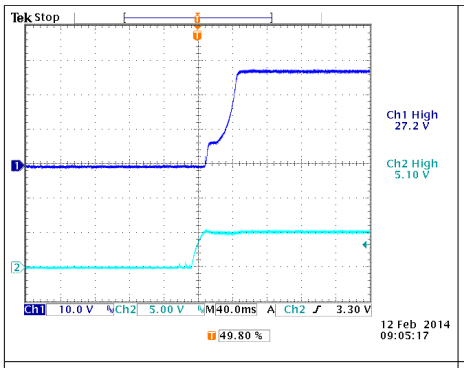
Input

Operation Voltage Range	48V Models	+36V to +75Vdc
Reflected Ripple Current	L_{EXT} = 10uH	50mA rms/200mAp-p
Power ON Voltage Ranges	48V Models	+34.0V to +36.0Vdc
Power OFF Voltage Ranges	48V Models	+31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	48V Models	22.0uF Max

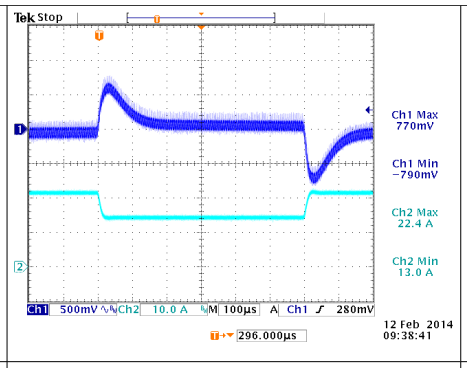
Output

Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.3%
Load Regulation	0%~100%	±0.3%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	50mS/250mS

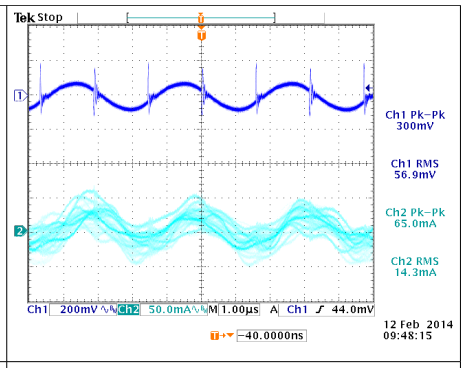
TYPICAL WAVES AND CURVES



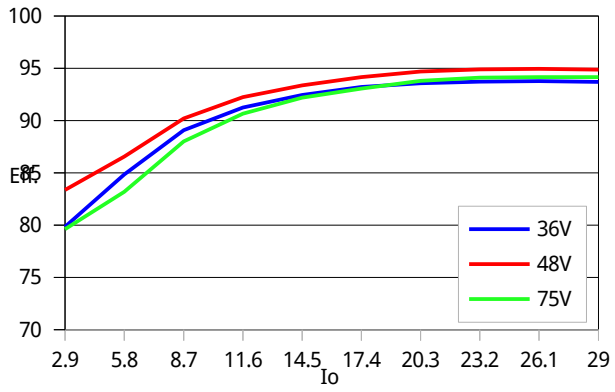
Start-up waveform of UH48280P20S-S29
(VIN: 48V, Load: 29A)



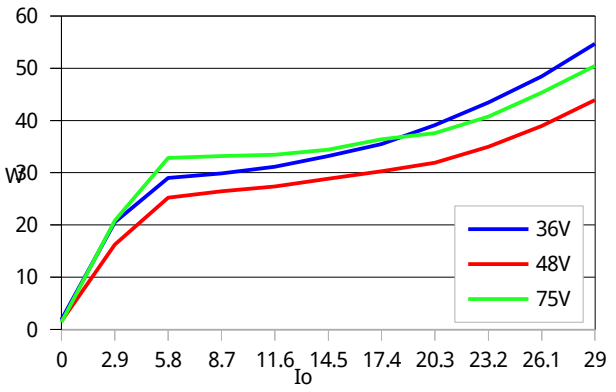
Transient response of UH48280P20S-S29
(VIN: 48V, Load: 22.5A/13.0A@2.5A/µS)



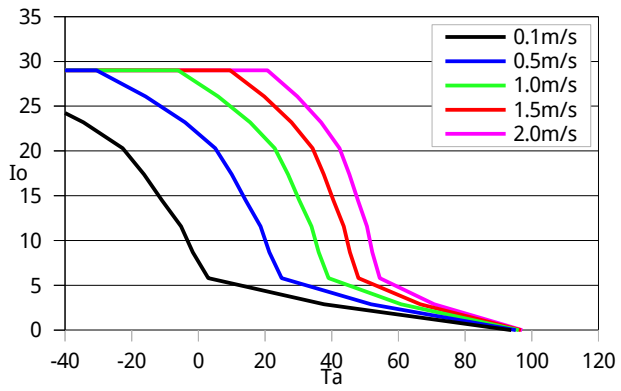
Input/Output ripples of UH48280P20S-S29
(VIN: 48V, Load: 29A, LIN=10uH)



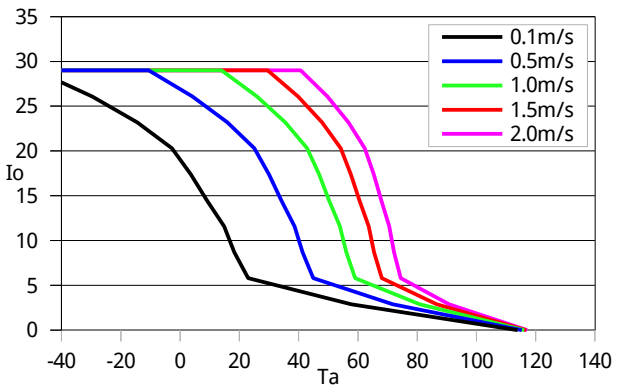
Efficiency plot of UH48280P20S-S29



Power loss curves of UH48280P20S-S29

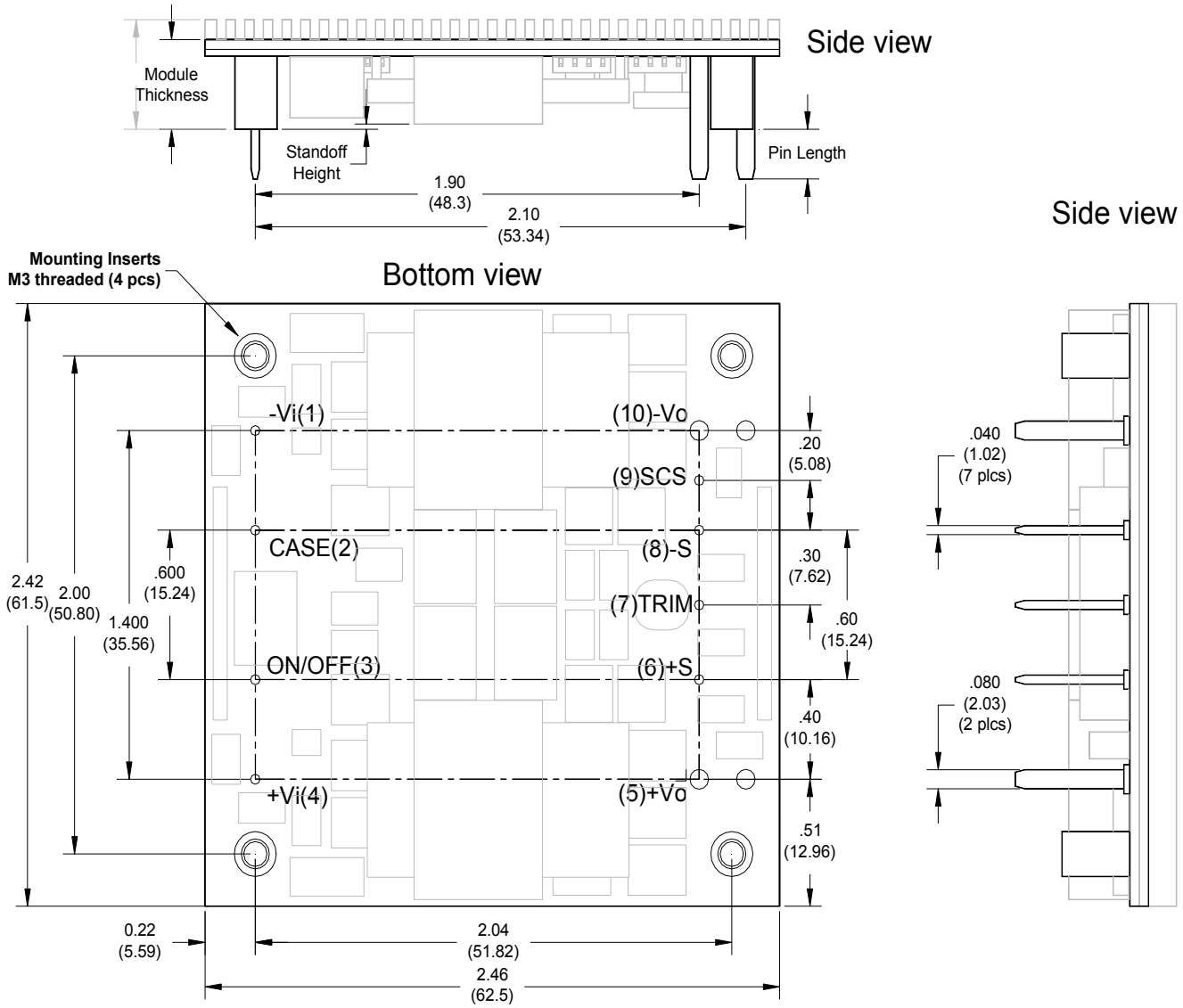


Calculated derating of UH48280P20S-S29 (T_{AVG}= 100ºC)



Calculated derating of UH48280P20S-S29 (T_{AVG}= 120ºC)

MECHANICAL DRAWING

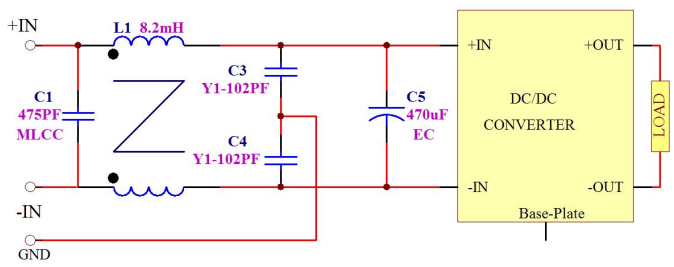


Dimensions and Pin Connections

Designation	Function Description	Pin #
+IN	Positive input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
-IN	Negative input	**3**
-Vo	Negative output	**4**
-S	Negative remote sense	**5**
TRIM	Output voltage adjust	**6**
+S	Positive remote sense	**7**
+Vo	Positive output	**8**

Dimensions: inches (mm)
Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)
Mass: 87g / 1.0mm Metal Plate
94g / 3.0mm Sink Plate
Base plate: Aluminum alloy with anode oxide
Mounting inserts: Stainless steel
Maximum torque: 3.9 in-lb (0.44Nm)
Pin material: Copper alloy or Brass
Pin plating: Golden over Nickel

REFERENCED EMC CIRCUIT



Referenced input filter circuit

Referenced Input Filter Circuit

The circuit shown in left-hand side can be used as a design reference for customer system. The EMC performance of customer's system depends on the whole system design. It should be noted that modifications on the circuit parameters and fine adjustment of the final layout affect the final EMC performance. Since no components are ideal for infinite frequency range. The bandwidth of EMC components should be taking into consideration when designing an EMC filter circuit.

EXTERNAL OUTPUT CAPACITANCE

For reducing the ripple/noise voltage on the load or the peak voltage deviation caused by a step load, additional capacitor is required for decoupling the unwanted voltage components from the load. Since the step load performance is mainly dominated by the feedback loop performance, which also affected by the additional output capacitance. To put some low-bandwidth high capacitance Electrolytic capacitors very close to the power module help nothing and even introduces unwanted effects on the feedback performance, sinking or sourcing surge current damaging the power module. Glary suggest to put a low ESR capacitor with simply sufficient capacitance to handle the short duration high frequency component of ripple/noise or voltage peak deviation, and the capacitor needs to be as close as possible to the load. Do not add capacitor for no reason.

NOTE:

1. **It is recommended that the input should be protected by fuses or other protection devices.**
2. All specifications are typical at nominal input, full load and 25°C unless otherwise noted.
3. Specifications are subject to change without notice.
4. Printed or downloaded datasheets are not subject to Glary document control.
5. Product labels shown, including safety agency certificates, may vary based on the date of manufacture.
6. Information provided in this documentation is for ordering purposes only.
7. This product is not designed for use in critical life support systems, equipment used in hazardous environments, nuclear control systems or other such applications, which necessitate specific safety and regulatory standards other than the ones listed in this datasheet.

IMPORTANT

※ General specifications and the performances are related to standard series only, no special customer specification display here except requested items.

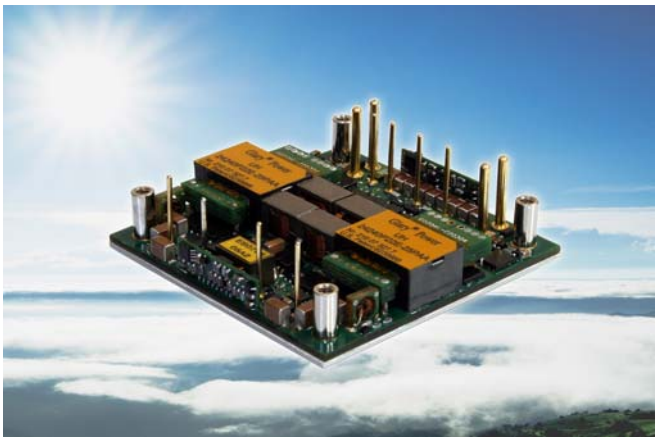
※ In order to secure effective usage of converter and the validity of Glary's service and warranty coverage, please refer to the application notes for general usage. For needs of usage beyond the application notes, please contact to Glary headquarter or our regional sales representative office for help.

Glary Power Technology

UH Series

Half Brick up to 600W／120A

Efficiency >92% | 219W/in³ | Open Frame Package | OCP | 2.51Mhrs MTBF | Remote ON OFF | INPUT 2:1 | OVP | OTP | Pb | RoHS 2002/95/EC



The ***UH*** series provides up to 600W/120A outputs with industry standard half brick package. The efficient SR stage is combined with patented "Buck Reset" topology that would reduce power loss to achieve 219W/in³ power density. The multi-layer single side circuit board design plus the patented Sink-Plate technology would enhance the thermal performance and improve its reliability. Modules are designed for Telecom, Servers, Networking equipments and other applications that use a 24V or 48V input bus.

PART NUMBER SYSTEM

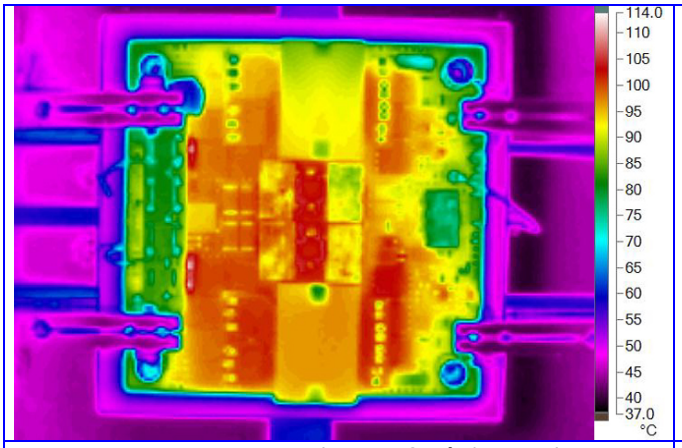
UH	48	480	a	b	c	d	-	N	12	xx	x
Series Name	Input Voltage	Output Voltage	Enable Logic	Pin Dimension	Standoff Height	Base-Plate / module thickness (Total Height = c + d)		Current Share	Output Current	Suffix	Version
UH	**48=**36V~75V **24=**18V~36V	**Unit:** 0.1V Increments **280=**28V **120=**12V	**P:** Positive **N:** Negative	**0**：0.12" **1**：0.16" **2**：0.20" **3**：0.24"	**0**：0.02" **1**：0.08" **2**：0.16"	**M**：1.0mm Metal Plate/0.46" **S**：3.0mm Metal-Plate/0.54" **A**：3.0mm Sink-Plate/0.54" **B**：5.0mm Sink-Plate/0.62"	-	**N**：without Current share **S**：secondary Current share	**00~C0**：for output current rating	For marketing purpose only	

MODEL LIST (Contact to factory for special input / output)

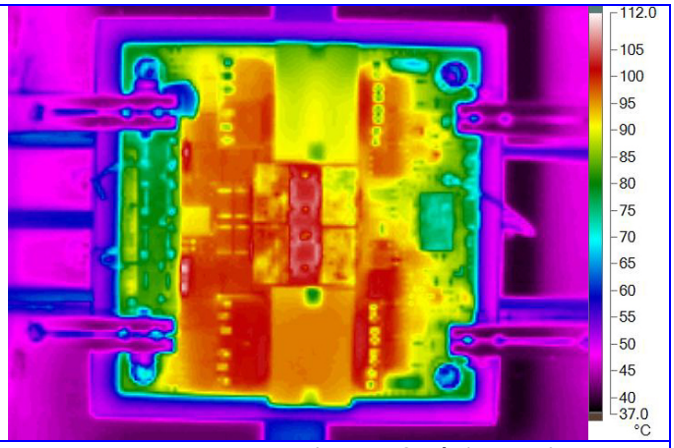
Part Number *	Maximum Input		Maximum Output		Efficiency
UH48480abcd-N12xxx	36V~75V	627W	48V/12A	576W	92%
UH48280abcd-N21xxx	36V~75V	640W	28V/21A	588W	92%
UH48120abcd-N50xxx	36V~75V	653W	12V/50A	600W	92%
UH48050abcd-NA0xxx	36V~75V	550W	5V/100A	500W	91%
UH48033abcd-NC0xxx	36V~75V	440W	3.3V/120A	396W	90%

Part Number *	Maximum Input		Maximum Output		Efficiency
UH24480abcd-N11xxx	18V~36V	548W	48V/10.5A	504W	92%
UH48280abcd-N18xxx	18V~36V	548W	28V/18A	504W	92%
UH24120abcd-N42xxx	18V~36V	548W	12V/42A	504W	92%
UH48050abcd-NA0xxx	18V~36V	550W	5V/100A	500W	91%
UH24033abcd-NC0xxx	18V~36V	440W	3.3V/120A	396W	90%

REFERENCED THERMAL IMAGES



UH48050P00B-NA0 (Io= 50A@50°C/200LFM)



UH48050P00B-NA0 (Io= 61A@50°C/400LFM)

SPECIFICATIONS

Absolute Maximum Ratings		
Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 24V Models 48V Models Transient (100mS): 24V Models 48V Models	 -0.5V to +40Vdc -0.5V to +80Vdc 50V Maximum 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

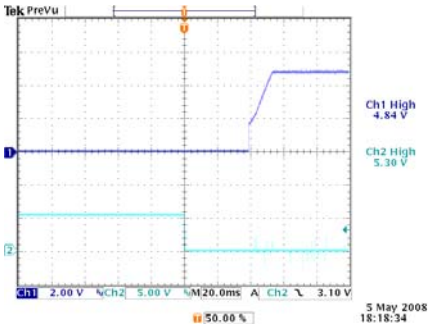
General Parameters		
Conversion Efficiency	Typical	See table
Switching Frequency	Typical	300KHz
MTBF	Bellcore TR-332 issue 6	2.51×10^6 hrs @GB/25°C (UH48050abcd-NA0xxx)
OTP	Internal	110°C(Tc) ±5°C
Weight	1.0mm Metal Plate 3.0mm Sink Plate	87g 94g

Control Functions		
Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

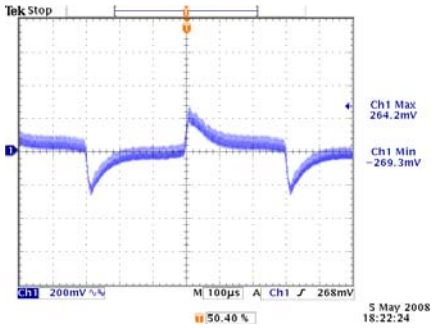
Input		
Operation Voltage Range	24V Models 48V Models	+18V to +36Vdc +36V to +75Vdc
Reflected Ripple Current	L_{EXT} = 10uH	80mA rms/300mAp-p
Power ON Voltage Ranges	24V Models 48V Models	+17.0V to +18.0Vdc +34.0V to +36.0Vdc
Power OFF Voltage Ranges	24V Models 48V Models	+15.6V to +16.6Vdc +31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	24V Models 48V Models	48.0uF Max 20.0uF Max

Output		
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.3%
Load Regulation	0%~100%	±0.3%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	50mS/250mS

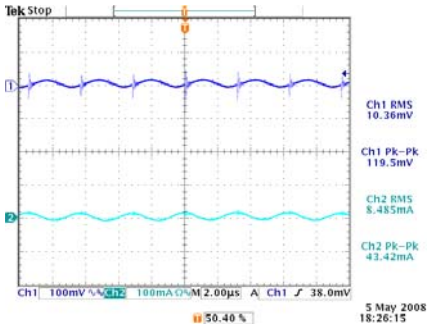
TYPICAL WAVES AND CURVES



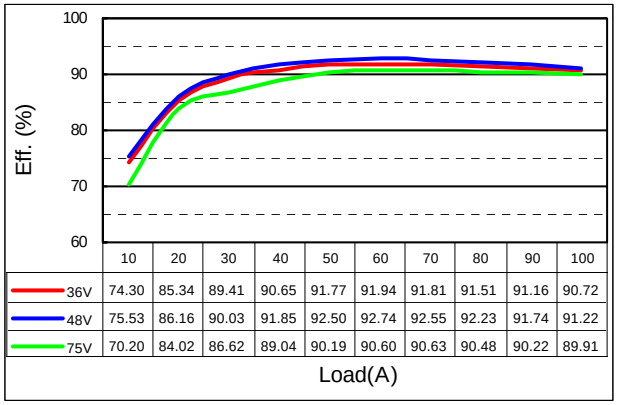
Start-up waveform of UH48050abcd-NA0xxx
(V_{IN}: 50V, Load: 100A)



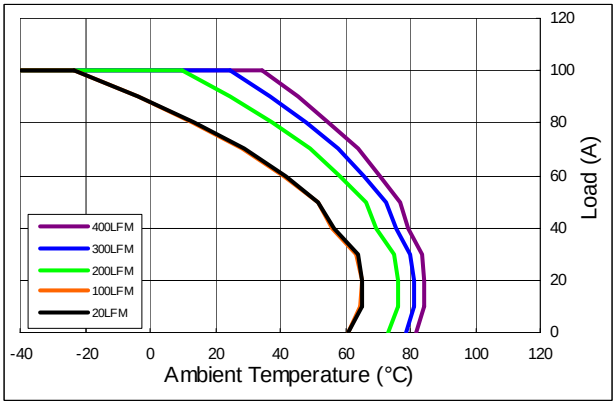
Transient response of UH48050abcd-NA0xxx
(V_{IN}: 50V, Load: 70.0A/50.0A@2.5A/μS)



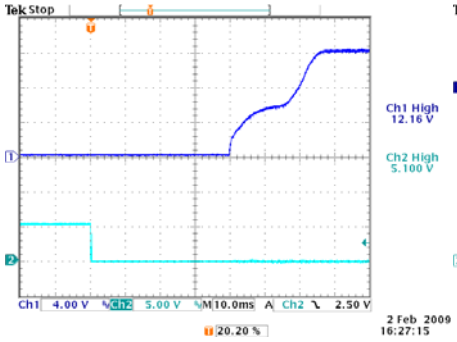
Input/Output ripples of UH48050abcd-NA0xxx
(V_{IN}: 50V, Load: 100A, L_{IN}=10uH)



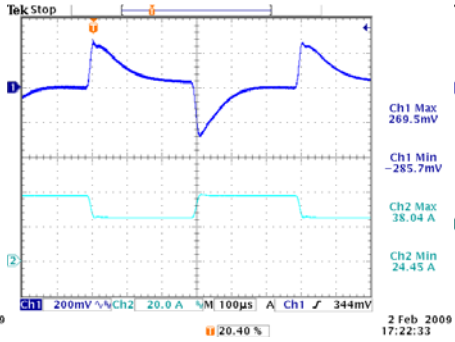
Efficiency plot of UH48050abcB-NA0xxx



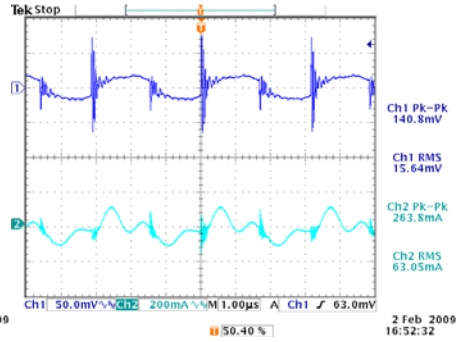
Derating curves of UH48050abcB-NA0xxx for T_C= 110°C



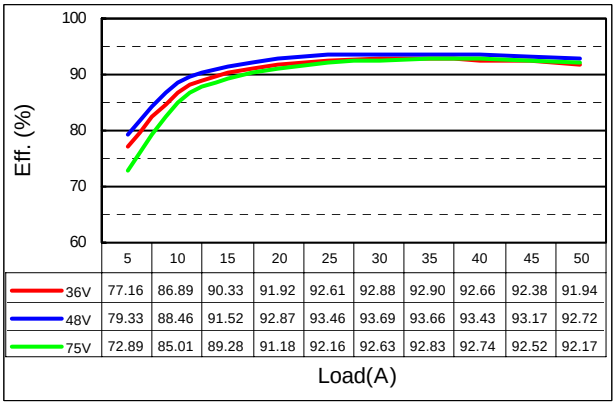
Start-up waveform of UH48120abcd-N50xxx
(V_{IN}: 48V, Load: 50A)



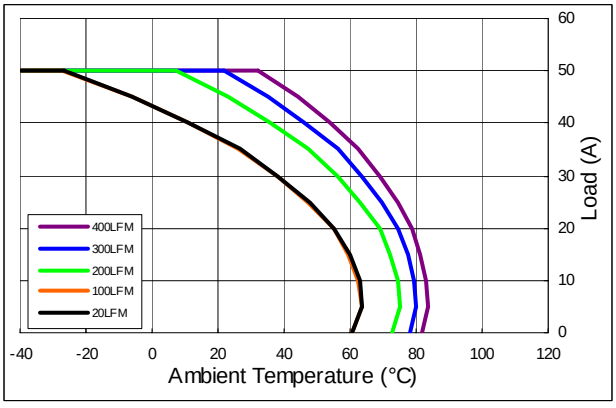
Transient response of UH48120abcd-N50xxx
(V_{IN}: 48V, Load: 38.0A/25.0A@2.5A/μS)



Input/Output ripples of UH48120abcd-N50xxx
(V_{IN}: 48V, Load: 50A, L_{IN}=10uH)

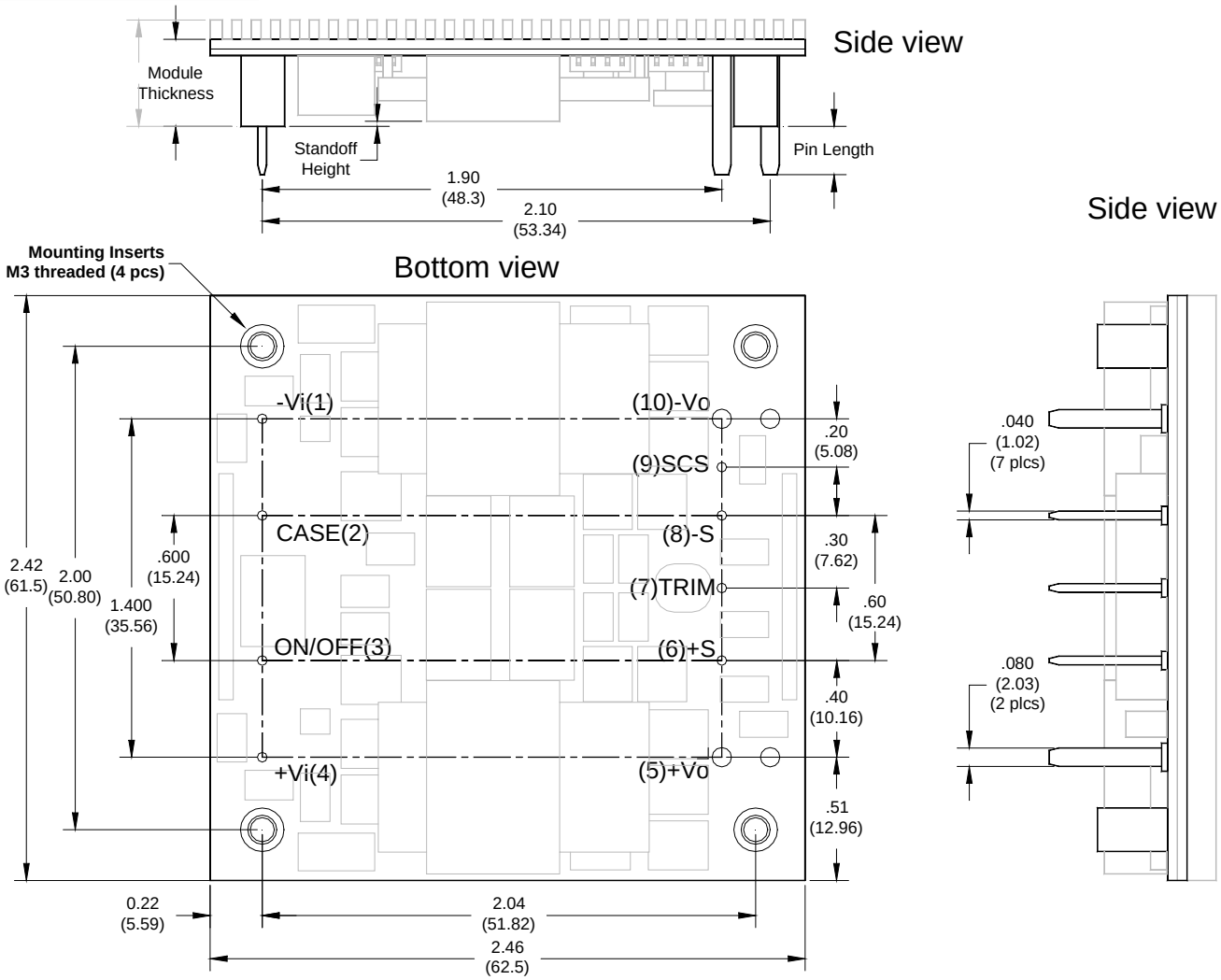


Efficiency plot of UH48120abcB-N50xxx



Derating curves of UH48120abcB-N50xxx for T_C= 110°C

OPEN FRAME PACKAGE



Dimensions and Pin Connections

Designation	Function Description	Pin #
-Vi	Negative input	**1**
CASE	Connected to base plate	**2**
ON/OFF	Remote control. To turn-on and turn-off output.	**3**
+Vi	Positive input	**4**
+Vo	Positive output	**5**
+S	Positive remote sense	**6**
TRIM	Output voltage adjust	**7**
-S	Negative remote sense	**8**
SCS	Secondary current share bus	**9**
-Vo	Negative output	**10**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Mass: 87g / 1.0mm metal plate
94g / 3.0 mm metal plate

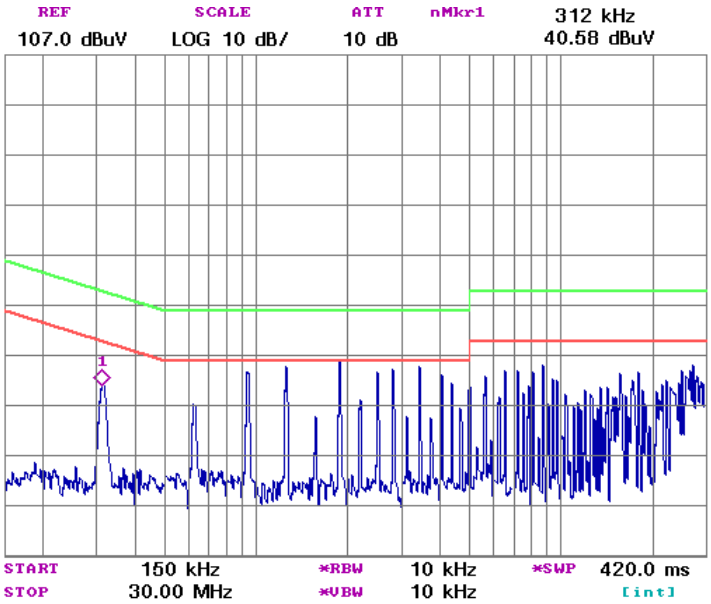
Base plate: Aluminum alloy with anode oxide

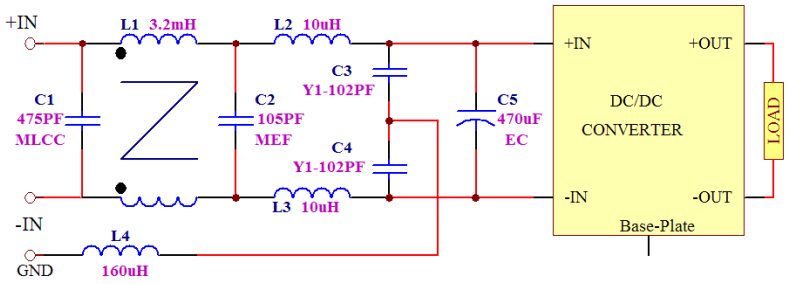
Mounting inserts: Stainless steel
Maximum torque: 3.9 in-lb (0.44Nm)

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

REFERENCED EMC CIRCUIT





Measured conductive level of UH48120abcd-S50xxx and referenced filter circuit

Referenced EMC Performance

The tested result shown in left-hand side is obtained by loading the power module with a resistive load only. It can be used as a design reference for customer system. However! The performance of customer's system depends on the whole system design. It should be noted that modifications on the circuit parameters and fine adjustment of the final layout affect the final EMC performance greatly.

Bandwidth of EMC Components

No components are ideal for infinite frequency range. The bandwidth of EMC components should be taking into consideration when designing an EMC filter circuit. To connect ceramic capacitor with electricity capacitor in parallel and connect low inductance inductor with big one could get a better bandwidth.

NOTE:

1. **It is recommended that the input should be protected by fuses or other protection devices.**
2. All specifications are typical at nominal input, full load and 25°C unless otherwise noted.
3. Specifications are subject to change without notice.
4. Printed or downloaded datasheets are not subject to Glary document control.
5. Product labels shown, including safety agency certificates, may vary based on the date of manufacture.
6. Information provided in this documentation is for ordering purposes only.
7. This product is not designed for use in critical life support systems, equipment used in hazardous environments, nuclear control systems or other such applications, which necessitate specific safety and regulatory standards other than the ones listed in this datasheet.

IMPORTANT

※ General specifications and the performances are related to standard series only, no special customer specification display here except requested items.

※ In order to secure effective usage of converter and the validity of Glary's service and warranty coverage, please refer to the application notes for general usage. For needs of usage beyond the application notes, please contact to Glary headquarter or our regional sales representative office for help.

The ***UH2H*** series provides up to 504W/42A output with industry standard half brick package. The efficient SR stage is combined with patented “Buck Reset” topology that would reduce power loss to achieve 144W/in**3** power density. The multi-layer single side circuit board design plus the patented Sink-Plate technology would enhance the thermal performance and improve its reliability. Modules are designed for Telecom, Servers, Networking equipments and other applications that use a 300V (200~400V) input bus.

PART NUMBER SYSTEM

UH	2H	480	a	b	c	d	-	N	10	XX	X
Series Name	Input Voltage	Output Voltage	Enable Logic	Pin Dimension	Standoff Height	Base-Plate		Current Share	Output Current	Suffix	Version
UH	200V~420V	**Unit:** 0.1V Increments **480=**48V **120=**12V	**P:** Positive **N:** Negative	**0**：0.12” **1**：0.16” **2**：0.20” **3**：0.24”	**0**：0.02”	**E**：1.0mm Metal Plate	-	**N**：without Current share **S**：secondary Current share	**00~A0**：for output current rating	For marketing purpose only	

MODEL LIST (Contact to factory for special input / output)

Part Number *	Maximum Input		Maximum Output		Efficiency
UH2H480abcd-N10XXX	200V~420V	554W	48V/10.5A	504W	91%
UH2H280abcd-N18XXX	200V~420V	554W	28V/18.0A	504W	91%
UH2H120abcd-N42XXX	200V~420V	554W	12V/42.0A	404W	91%
UH2H480abcd-N10XXX	200V~420V	554W	48V/10.5A	504W	91%

REFERENCED THERMAL IMAGES

To be updated in next version	To be updated in next version

SPECIFICATIONS

Absolute Maximum Ratings		
Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 300V Models Transient (100mS): 300V Models	+190V to +420Vdc 450V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	3.0KV Minimum 1.5KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

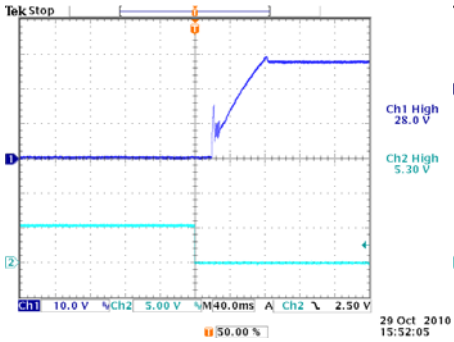
General Parameters		
Conversion Efficiency	Typical	See table
Switching Frequency	Typical	160KHz
MTBF	Bellcore TR-332 issue 6	2.23×10^6 hrs @GB/25°C. (UH2H280abcd-N18XXX)
OTP	Internal	110°C(Tc) ±5°C
Weight	1.0mm metal plate	163g

Control Functions		
Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

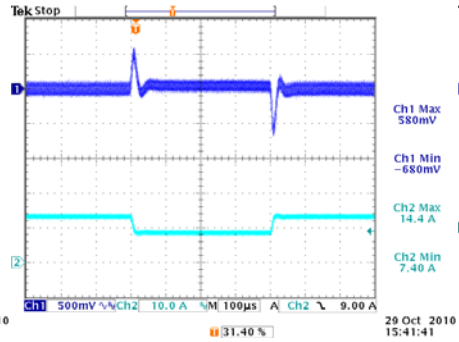
Input		
Operation Voltage Range	300V Models	+200V to +400Vdc
Reflected Ripple Current	L_{EXT} = 20uH	30mA rms/200mAp-p
Input Over Voltage Protection		+435Vmax.
Turn-On Voltage Threshold	300V Models	+190V to +198Vdc
Turn-Off Voltage Threshold	300V Models	+185V to +194Vdc
Off State Input Current	V_{NOM}	8mA Max
Latch-State Input Current	V_{NOM}	12mA Max
Input Capacitance	300V Models	4.7uF Max

Output		
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.3%
Load Regulation	5%~100%	±0.3%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	100mS/250mS

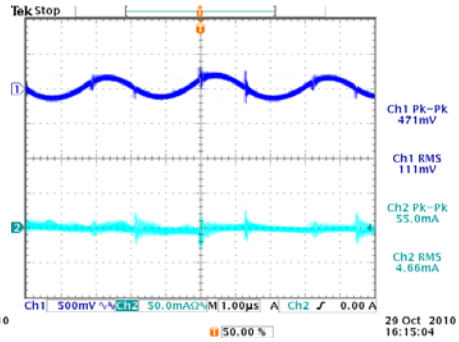
TYPICAL WAVES AND CURVES



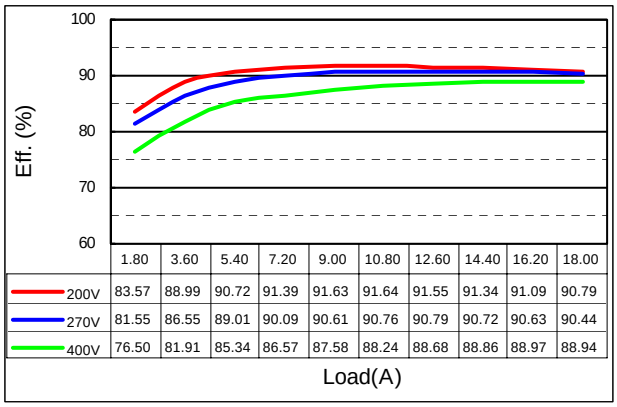
Start-up waveform of UH2H280abcd-S18XXX
(V_{IN}: 270V, Load: 18A) (External CAP100uF/100V)



Transient response of UH2H280abcd-S18XXX
(V_{IN}: 270V, Load: 14.5A/7.5A@2.5A/µS)
(External CAP100uF/100V)

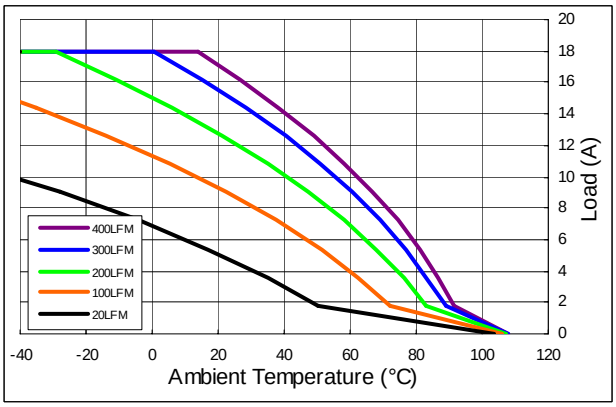


Input/Output ripples of UH2H280abcd-S18XXX
(V_{IN}: 270V, Load: 18A, L_{IN}=20uH, CIN=270uF)
(External CAP100uF/100V)



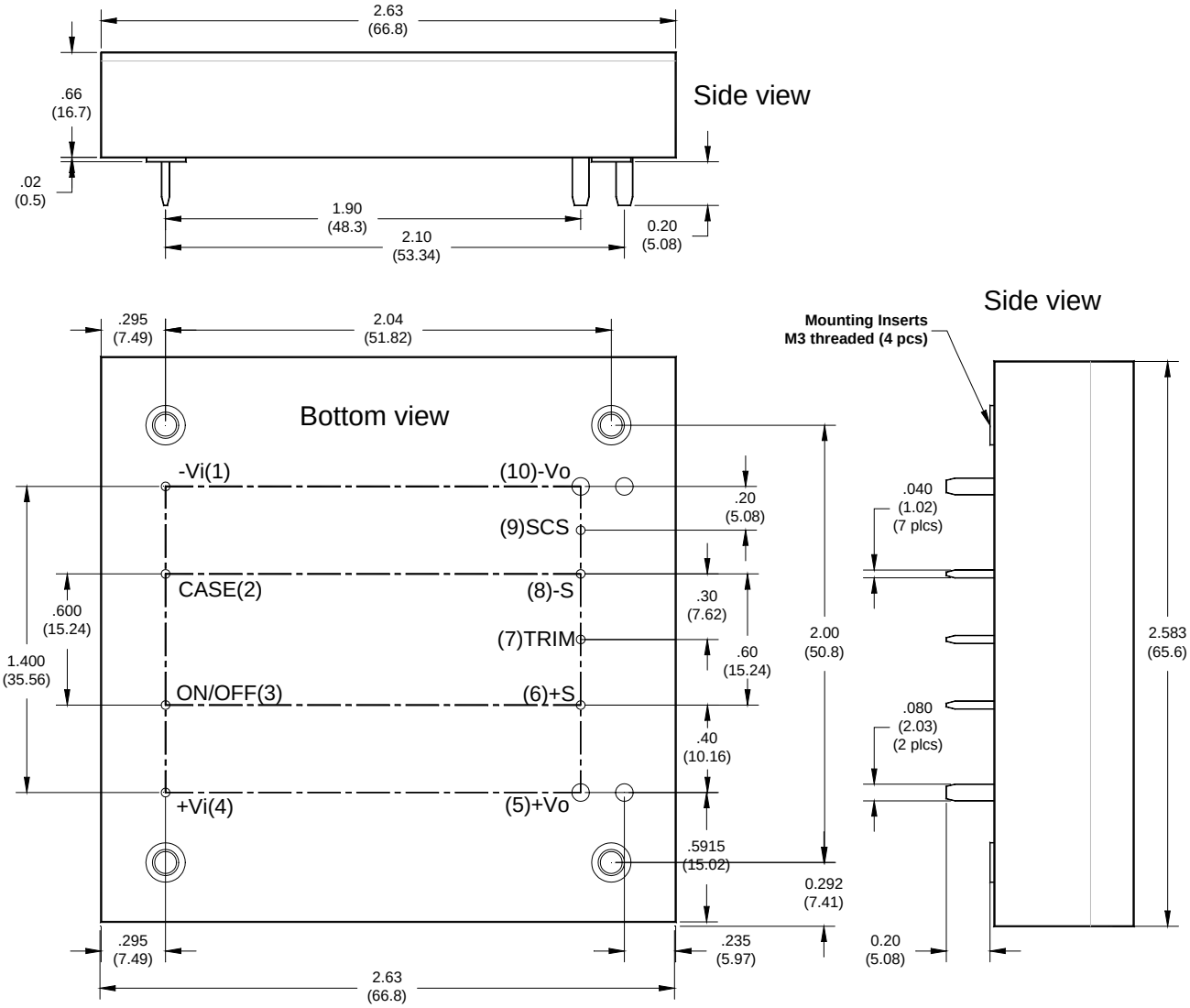
	1.80	3.60	5.40	7.20	9.00	10.80	12.60	14.40	16.20	18.00
200V	83.57	88.99	90.72	91.39	91.63	91.64	91.55	91.34	91.09	90.79
270V	81.55	86.55	89.01	90.09	90.61	90.76	90.79	90.72	90.63	90.44
400V	76.50	81.91	85.34	86.57	87.58	88.24	88.68	88.86	88.97	88.94

Efficiency plot of UH2H280abcE-S18XXX



Derating curves of UH2H280abcE-S18XXX for T_C= 110°C

METAL ENCLOSED PACKAGE



Dimensions and Pin Connections

Designation	Function Description	Pin #
-Vi	Negative input	**1**
CASE	Connected to base plate	**2**
ON/OFF	Remote control. To turn-on and turn-off output.	**3**
+Vi	Positive input	**4**
+Vo	Positive output	**5**
+S	Positive remote sense	**6**
TRIM	Output voltage adjust	**7**
-S	Negative remote sense	**8**
SCS	Secondary current share bus	**9**
-Vo	Negative output	**10**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 163g

Base plate: Aluminum alloy with anode oxide

Mounting inserts: Stainless steel
Maximum torque: 3.9 in-lb (0.44Nm)

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

REFERENCED EMC CIRCUIT

Referenced EMC Performance

The tested result shown in left-hand side is obtained by loading the power module with a resistive load only. It can be used as a design reference for customer system. However! The performance of customer's system depends on the whole system design. It should be noted that modifications on the circuit parameters and fine adjustment of the final layout affect the final EMC performance greatly.

To be updated in next version

Bandwidth of EMC Components

No components are ideal for infinite frequency range. The bandwidth of EMC components should be taking into consideration when designing an EMC filter circuit. To connect ceramic capacitor with electricity capacitor in parallel and connect low inductance inductor with big one could get a better bandwidth.

NOTE:

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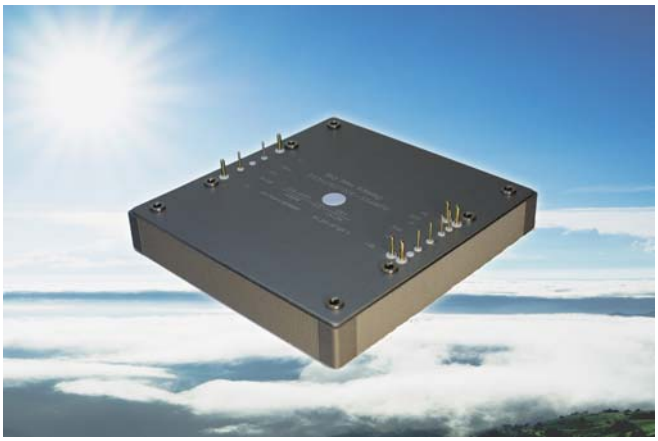
2. All specifications are typical at nominal input, full load and 25°C unless otherwise noted.
3. Specifications are subject to change without notice.
4. Printed or downloaded datasheets are not subject to Glary document control.
5. Product labels shown, including safety agency certificates, may vary based on the date of manufacture.
6. Information provided in this documentation is for ordering purposes only.
7. This product is not designed for use in critical life support systems, equipment used in hazardous environments, nuclear control systems or other such applications, which necessitate specific safety and regulatory standards other than the ones listed in this datasheet.

IMPORTANT

※ General specifications and the performances are related to standard series only, no special customer specification display here except requested items.

※ In order to secure effective usage of converter and the validity of Glary's service and warranty coverage, please refer to the application notes for general usage. For needs of usage beyond the application notes, please contact to Glary headquarter or our regional sales representative office for help.



The ***PowerSquare*** series provides up to 2000W/120A outputs with industry standard full brick pin assignment. The high thermal conductivity silicone potted six-sides metal package is designed for applications under extreme environmental conditions. The efficient SR stage is combined with patented “Buck Reset” topology that would reduce power loss to achieve 102W/in**3** power density. The multi-layer single side circuit board design plus the unique module structure would enhance the thermal performance and improve its reliability. Modules are designed for Industrial, Telecom, Servers, Networking equipments and other applications that use a 300V (200~400V) input bus.

PART NUMBER SYSTEM

PS	2H	480	a	b	c	d	-	N	42	XX	X
Series Name	Input Voltage	Output Voltage	Enable Logic	Pin Dimension	Standoff Height	Base-Plate		Current Share	Output Current	Suffix	Version
PS	200V~420V	**Unit:** 0.1V Increments **480=**48V **120=**12V	**P:** Positive **N:** Negative	**0**：0.12” **1**：0.16” **2**：0.20” **3**：0.24”	**0**：0.04”	**E**：1.5mm Metal Plate	-	**N**：without Current share **S**：secondary Current share	**00~C0**：for output current rating	For marketing purpose only	

MODEL LIST (Contact to factory special input / output)

Part Number *	Maximum Input		Maximum Output		Efficiency
PS2H480abcd-N42XXX	200V~420V	2191W	48V/42A	2016W	92%
PS2H280abcd-N72XXX	200V~420V	2191W	28V/72A	2016W	92%
PS2H240abcd-N83XXX	200V~420V	2191W	24V/83A	2016W	92%
PS2H120abcd-NC0XXX	200V~420V	2191W	12V/120A	2016W	92%

REFERENCED THERMAL IMAGES

To be updated in next version	To be updated in next version

SPECIFICATIONS

Absolute Maximum Ratings		
Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 48V Models Transient (100mS): 48V Models	 +190V to +420Vdc 450V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	3.0KV Minimum 1.5KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

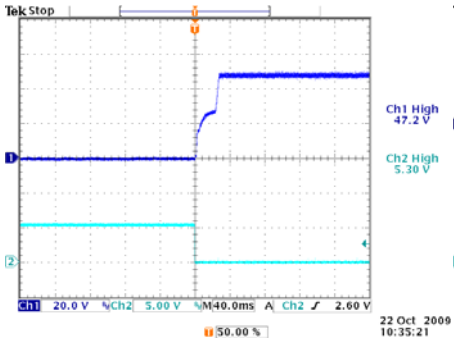
General Parameters		
Conversion Efficiency	Typical	See table
Switching Frequency	Typical	160KHz
MTBF	Bellcore TR-332 issue 6	1.55×10^6 hrs @GB/25°C. (PS2H480abcd-N42XXX)
OTP	Internal	110°C(Tc) ±5°C
Weight	1.5mm metal plate	870g

Control Functions		
Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

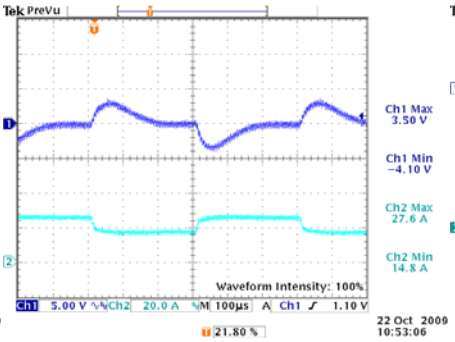
Input		
Operation Voltage Range	300V Models	+200V to +400Vdc
Reflected Ripple Current	L_{EXT} = 20uH	30mA rms/200mAp-p
Input Over Voltage Protection		+435Vmax.
Turn-On Voltage Threshold	300V Models	+190V to +198Vdc
Turn-Off Voltage Threshold	300V Models	+185V to +194Vdc
Off State Input Current	V_{NOM}	12mA Max
Latch-State Input Current	V_{NOM}	20mA Max
Input Capacitance	300V Models	10.0uF Max

Output		
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.3%
Load Regulation	5%~100%	±0.3%
Temperature Drift	-40°C ~100°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	100mS/250mS

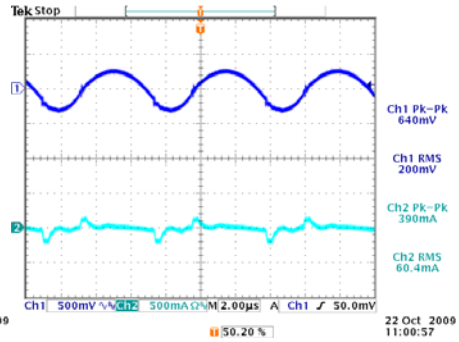
TYPICAL WAVES AND CURVES



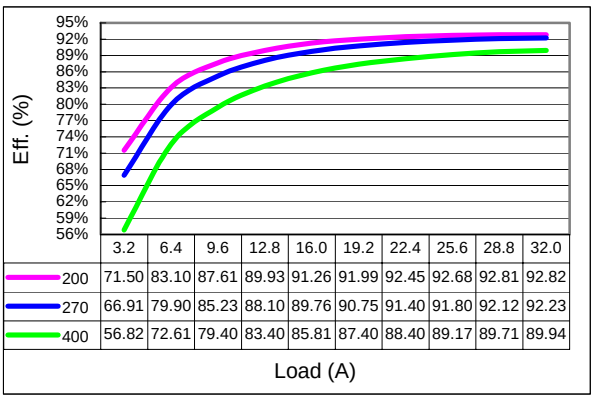
Start-up waveform of PS2H480abcd-S32XXX
(V_{IN}: 270V, Load: 32A)



Transient response of PS2H480abcd-S32XXX
(V_{IN}: 270V, Load: 28A/15A@2.5A/µS)

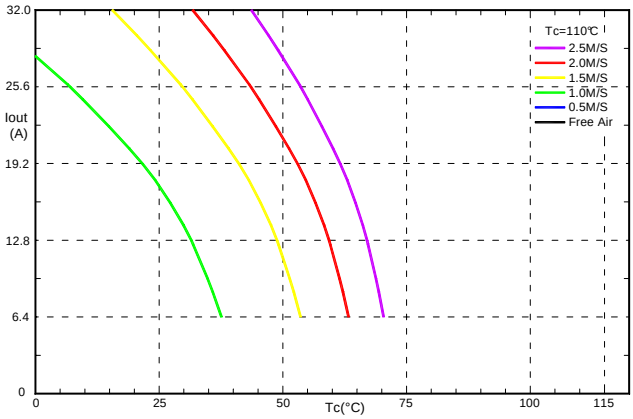


Input/Output ripples of PS2H480abcd-S32XXX
(V_{IN}: 270V, Load: 32A, L_{IN}=10uH)

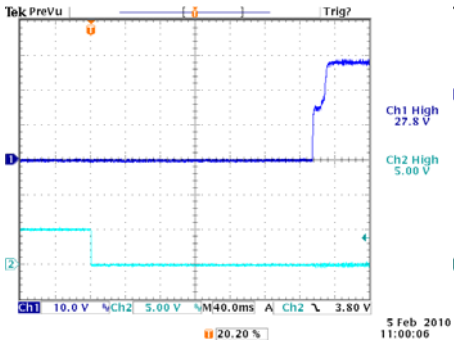


	3.2	6.4	9.6	12.8	16.0	19.2	22.4	25.6	28.8	32.0
200	71.50	83.10	87.61	89.93	91.26	91.99	92.45	92.68	92.81	92.82
270	66.91	79.90	85.23	88.10	89.76	90.75	91.40	91.80	92.12	92.23
400	56.82	72.61	79.40	83.40	85.81	87.40	88.40	89.17	89.71	89.94

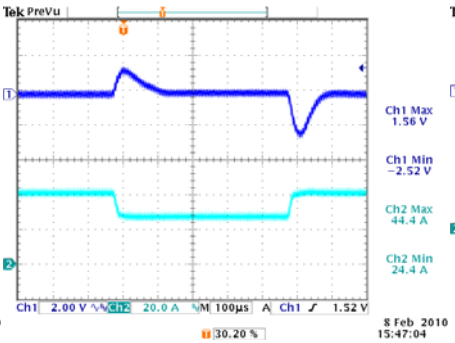
Efficiency plot of PS2H480abcd-S32XXX



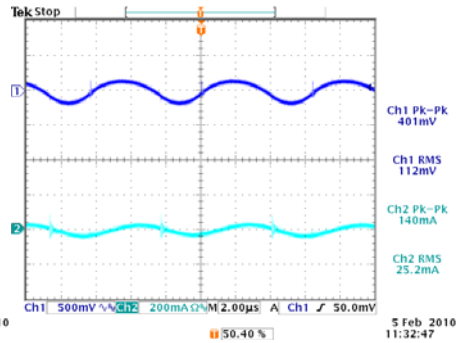
Derating curves of PS2H480abcd-S32XXX for T_C= 110°C



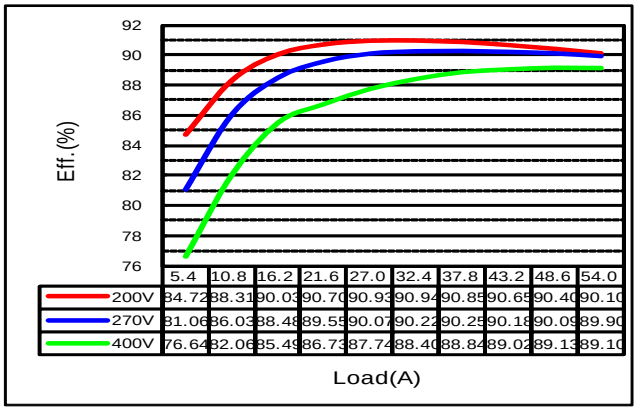
Start-up waveform of PS2H280abcd-S54XXX
(V_{IN}: 270V, Load: 54A)



Transient response of PS2H280abcd-S54XXX
(V_{IN}: 270V, Load: 45A/24A@2.5A/µS)

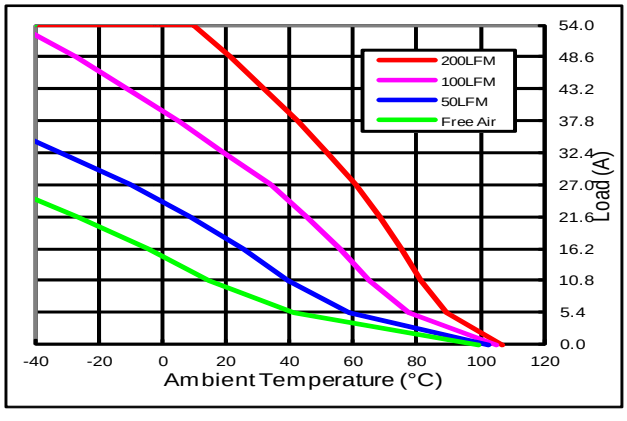


Input/Output ripples of PS2H280abcd-S54XXX
(V_{IN}: 270V, Load: 54A, L_{IN}=10uH)



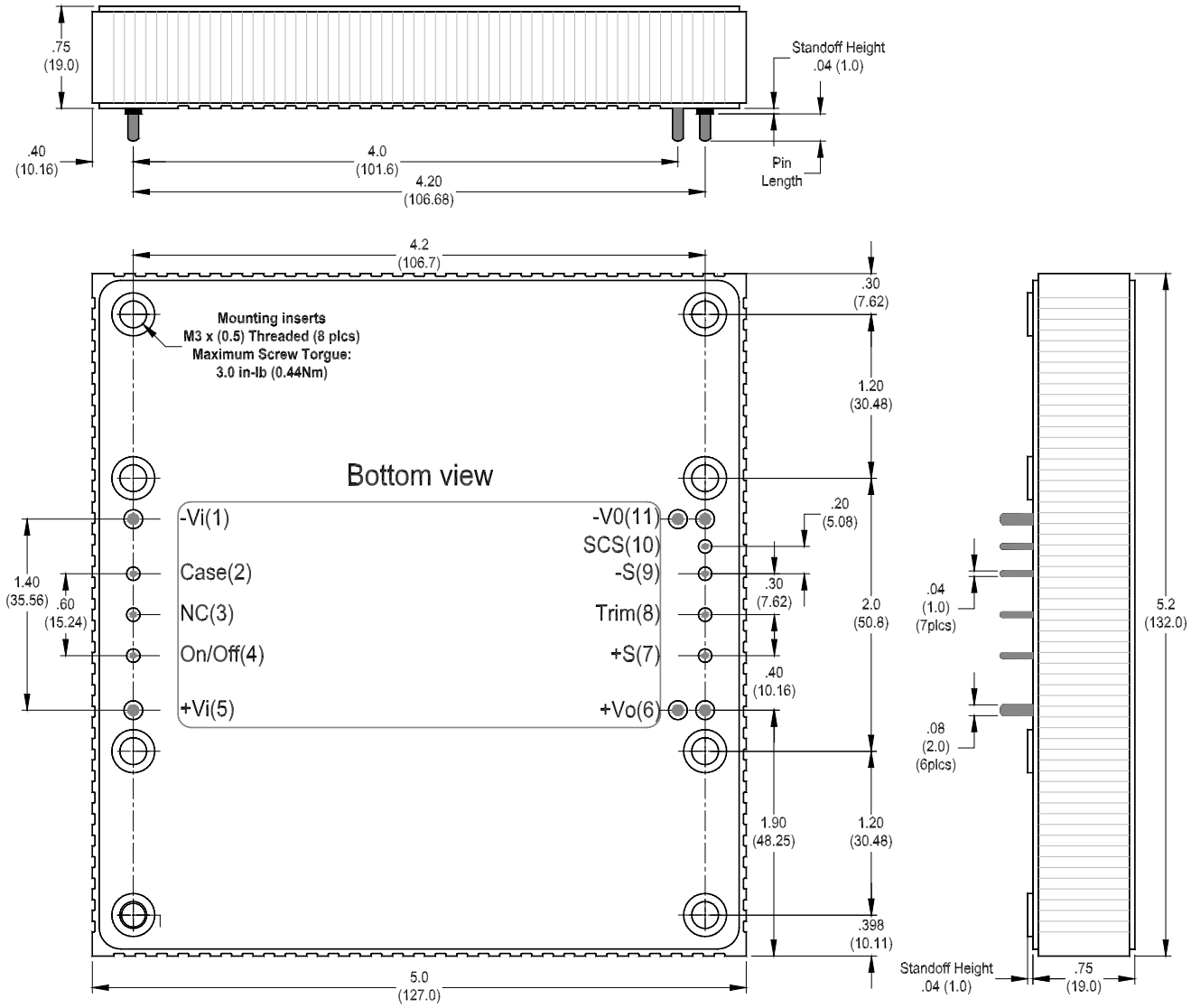
	5.4	10.8	16.2	21.6	27.0	32.4	37.8	43.2	48.6	54.0
200V	84.72	88.31	90.03	90.70	90.93	90.94	90.85	90.65	90.40	90.10
270V	81.06	86.03	88.48	89.55	90.07	90.22	90.25	90.18	90.09	89.90
400V	76.64	82.06	85.49	86.73	87.74	88.40	88.84	89.02	89.13	89.10

Efficiency plot of PS2H280abcd-S54XXX



Derating curves of PS2H280abcd-S54XXX for T_C= 110°C

METAL ENCLOSED PACKAGE



Dimensions and Pin Connections

Designation	Function Description	Pin #
-Vi	Negative input	**1**
CASE	Connected to base plate	**2**
NC	No connection	**3**
ON/OFF	Remote control. To turn-on and turn-off output.	**4**
+Vi	Positive input	**5**
+Vo	Positive output	**6**
+S	Positive remote sense	**7**
TRIM	Output voltage adjust	**8**
-S	Negative remote sense	**9**
SCS	Secondary current share bus	**10**
-Vo	Negative output	**11**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 870g

Base plate: Aluminum alloy with anode oxide

Mounting inserts: Stainless steel
Maximum torque: 3.9 in-lb (0.44Nm)

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

REFERENCED EMC CIRCUIT

Referenced EMC Performance

The tested result shown in left-hand side is obtained by loading the power module with a resistive load only. It can be used as a design reference for customer system. However! The performance of customer's system depends on the whole system design. It should be noted that modifications on the circuit parameters and fine adjustment of the final layout affect the final EMC performance greatly.

To be updated in next version

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No components are ideal for infinite frequency range. The bandwidth of EMC components should be taking into consideration when designing an EMC filter circuit. To connect ceramic capacitor with electricity capacitor in parallel and connect low inductance inductor with big one could get a better bandwidth.

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General Operating Information

General

Absolute Maximum Ratings

Some ratings, shown in ABSOLUTE MAXIMUM RATINGS, are the absolute maximum ratings referring to no destruction or design limits, normally tested with one parameter while exceeding the limits of absolute maximum ratings or electrical characteristics.

The stress exceeding the absolute maximum ratings may cause permanent damage, function and performance degraded. As far as design margin and enhancing system reliability are concerned, it is recommended that Glary DC/DC converters operate below 90˚C of case temperature. The over temperature protection set point is 5˚C ~10˚C higher of maximum operation base plate temperature.

Safety

Standards

All product series of Glary DC/DC converters are designed to comply with UL in accordance with EN60950 safety of information technology equipment including electrical business equipment. These DC/DC converters meet the U.S. and Canadian Standard for safety of information technology equipment, including electrical business equipment applicable requirement in CSA/UL60950. Most product series of Glary DC/DC converters are recognized by UL, CSA and TUV.

Isolation

Operational or Basic insulation is performed in accordance with EN60950. All product series, built in DC-to-DC converter power supplies, should be installed in end-use equipment for printed wiring board or chassis mountable, and intend to be supplied by isolated secondary circuit. Consideration should be given to measure the case temperature to comply with maximum case temperature during module operation.

When the supply to DC/DC converter meets all requirements for SELV, the output is considered to remain SELV limit. For supply voltage from 60V to 75V DC, reinforced insulation must be provided in the 75V power source that isolates the input from the mains. Single fault testing in the 75V supply circuit will be performed in combining with the DC/DC converter to demonstrate that the output meets the requirement for SELV. One pole of the input and the other one of the output are going to be grounded or both circuits are to be kept floated.

The isolation, withstanding 1500V or 2000 DC between input and output depending on different series, 1000V DC between input/output and case with all series, is verified in an electrical strength test.

Flammability

The flammability ratings of plastic parts and PCBs meet UL-94V-0.

Fusing

A fuse should be used at the input of each converter to isolate the failed one from others, keeping the system continue to operate and prevent the damage of power distribution wiring from over heating. A fast blow fuse should be used with 10A~20A rating or less, it is recommended using a fuse with the lowest current rating.

Input Side

Input (+IN, -IN)

Voltage Range

The input voltage range of 36V~75V meets the requirement of European Telecom Standard ETS 300 132-2 for normal input voltage range in -48V (-40.5V~ -57.0V) and –60V (-50.0V~ -72.0V) DC power systems. The absolute maximum continuous input voltage is 75V DC and withstands 100V DC/100ms maximum transient voltage. The range 18V~36V for 24V version is also available.

Input Capacitance

The input characteristic of a DC/DC converter may be referred as a negative-incremental impedance element in its input voltage range. Sometimes, oscillation will be occurred when high impedance power source is applied to supply power to a DC/DC converter. An external input capacitor is recommended to reduce the characteristic impedance and eliminate the oscillation between the DC/DC converter and the source.

Generally speaking, a 220uF~470uF capacitor across the input of all DC/DC converter product series will help to insure stability.

ON/OFF Control (ON/OFF or PC)

These product series of DC/DC converter has the remote on/off control pin can be connected to an external ON/OFF control signal for turning ON and OFF. The control signal of ON/OFF pin is referred to the negative power input pin and two control logic options are available.

Negative Logic

ON: Short to negative power input pin or apply voltage of logic low.

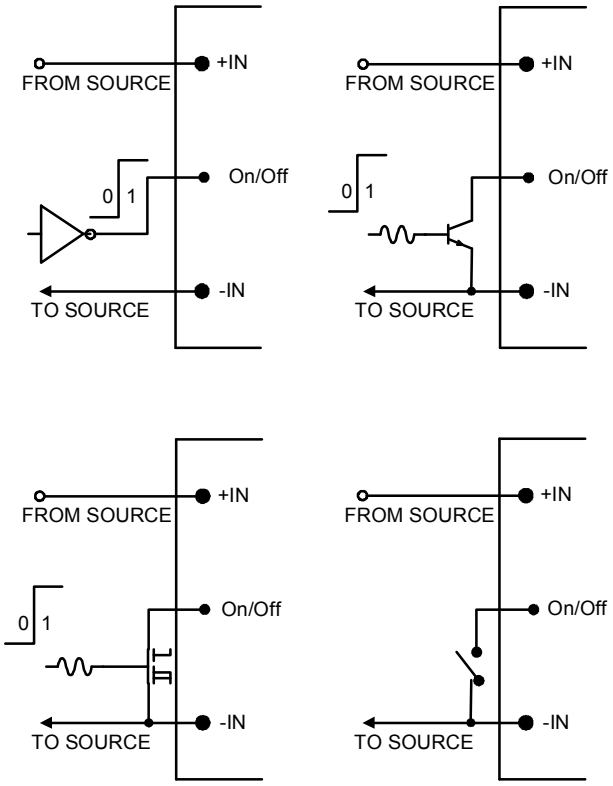
OFF: Opening circuit or apply the voltage of logic high.

Positive Logic

ON: Opening circuit or apply the voltage of logic high.

OFF: Short to negative power input pin or apply voltage of logic low.

A mechanical switch or an open collector NPN transistor (open drain N channel FET) can be used to drive the ON/OFF pin. The device must be capable of sinking 1mA minimum at a logic low voltage 1.0V and withstands 12V DC minimum.



Output Side

Output (+OUT, -OUT)

Ripple & Noise

The ripple of DC/DC converters is measured as peak-to-peak voltage from 0 to 20MHz including the noise and the fundamental ripple. The ripple and noise can be reduced significantly by paralleling a de-coupling capacitor to the output terminal.

Over Current Protection (OCP)

These DC/DC converters provide OCP function to withstand continuous overload or short circuit condition in the output. The converter will recover to normal operation after the overload is removed. The OCP set point of these DC/DC converters is 108%~125% of rated output current.

Output Over Voltage Protection (OVP)

These DC/DC converters provide OVP lockout function to prevent the damage of load from over voltage condition on the output. The converter will restart after recycling the input power or control signal of primary control pin. The OVP set point of these DC/DC converters is 115%~130% of rated output voltage.

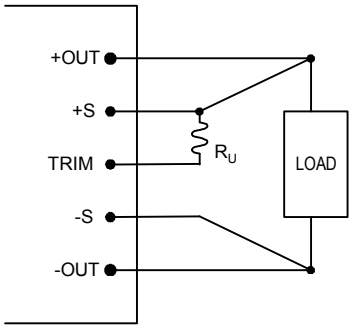
Remote Sense (+S, -S)

These DC/DC converters have the remote sense pins that can be used to compensate voltage drop due to the resistance in the distribution system. It allows the output voltage can be regulated at the load or a selected point. It should be noted that the sense line must be located close to a ground trace or a ground panel to reduce noise, a twisted wire pair is recommended for discrete wiring. The sense pin will compensate 0.5V maximum of voltage drop between the sensed voltage and the voltage of output pins.

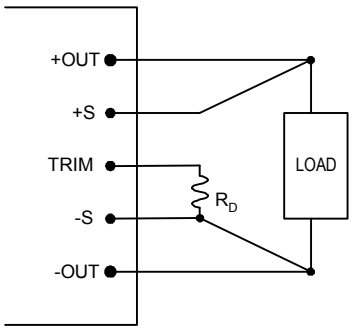
Output Voltage Adjust (TRIM or SC)

These DC/DC converters have the secondary control pin used to adjust output voltage beyond or below nominal output voltage. It should be noted that trim up to be above OVP set point may cause a converter to enter the over voltage protection state. The TRIM pin is noise sensitivity and the external resistors should be located within 1cm of the converter. If not using the trim feature, leave the TRIM pin open.

TRIM UP: connect a trim resistor (R_U) between TRIM pin and +S pin.



TRIM DOWN: connect a trim resistor (R_D) between SC pin and -S pin.



Output Capacitance

The extra output capacitance is required to improve the voltage regulation when powering a load with significant dynamic current requirement. Putting a low ESR capacitor to the load as close as possible to handle the short duration high frequency component of dynamic load current. Since the mid-frequency voltage deviation caused by step load is mainly dominated by the feedback loop performance, which also affected by the additional output capacitance. Do not put any low-bandwidth high capacitance Electrolytic capacitors very close to the power module because doing so help nothing and even introduces unwanted effects on the feedback performance, sinking or sourcing surge current damaging the power module. It should be noted that the capacitance, resistance and inductance of power distribution loop are used as feedback components that would affect stability and dynamic response performance of power converter.

In generally, 47uF~68uF/A of output current can be used for 3.3V output power module without additional analysis. For example, a 3.3V/35A DC/DC converter, the de-coupling capacitor up to 4700uF can be used on the premise of not affecting the stability. Other than that, capacitance of higher than sufficient value is however not encouraged as it may result in stability risks to the converters. Since the stored energy of the capacitor is proportional to V^2, which result in the de-coupling capacitance to be reduced by a factor of $(Vo/3.3)^2$ for modules with higher output voltage.

Moreover, the recent modern technology has been advanced enough to allow low ESR on some specific type of capacitors (such as MLCC), which features very high reliability and nearly eliminates the needs of paralleling numerous life span constrained electrolytic caps at the system end to achieve low ESR, and further allows more simplified external output filter design for the power system. Therefore, for Glary Power's full series of product lines, simply adding a MLCC of a few to a few tens of uF close to the load should be sufficient enough. Do note that an exceeded high value of external output capacitance would result in other negative impacts to the converter's feed back loop. Please as well consult with Glary Power if higher external output capacitance is needed for the system design.

Reliability

For example, calculated MTBF in accordance with Bellcore TR-332 issue 6, December 1997 of COE series, is 4,801,570hours (+25ºC), 2,015,270hours (+50ºC), or 940,807hours (+70ºC) to demonstrate the reliability of our products. This represents an average failure rate of 280.265 (+25ºC), 486.211 (+50ºC) and 1,062.918 (+70ºC) failures per million unit hours of operations. The assumptions are full load at +25ºC, +50ºC and +70ºC case temperature under ground benign (GB) environment condition.

Warranty

Glary Power Technology warrants to the original purchaser or the end user that the products conform to this data sheet are free from material and workmanship defects for a period of two years since the date of manufacturing, when the product is used within specified condition and not opened.

Handling

Open frame converters can be damaged from poor handling, excessive mechanical shock, or from a static electric discharge. The units should be:

- Carefully handled and not subjected to mechanical stress
- Treated as an ESD sensitive component
- Stored in a static protective container which physically protects the converter
- The converters should not be stored in plastic bags, or stacked on top of one another in any way

Limitation of Liability

Glary Power Technology does not make any warranties, express or imply including any warranty of merchantability or fitness for a particular purpose (including, but not limited to use in life support applications, where malfunction of product can cause injury to a person’s health or life).

General Module Thermal Considerations

General

The Glary DC/DC converter product series are designed to operate in a variety of thermal environments; however sufficient cooling should be helpful for reliable operation. General speaking, the heat is removed from module by conduction, convection and radiation to the surrounding but convection is the most important method for the normal application at sea level. Increased airflow may strongly influence the module thermal performance. Proper cooling can be verified by measuring the temperature of base plate.

The available load current with different ambient air temperature and airflow at nominal input voltage for each model is according to real test done in a wind tunnel. However the actual derating performance of each module may slightly vary compared with the derating curves given by test performed in the data sheet, the 90% of available current shown in the derating curves is the highest recommended value for reliable system design. The actual system design would in fact strongly affect the derating performance and generally result in three variable factors to affect the module derating performance described as below:

Conversion Efficiency

The heat is generated by power loss, board mount power module convert input power for output to the load always has an efficiency between 0%~100%. The synchronous rectification technology can make power module converting the required power with dramatic efficiency and dissipating fewer power compared with traditional technology. This leads to a lower temperature rise if the module thermal resistance is the same; it means higher efficiency is better for any kind of cooling conditions because the temperature is always lower and the reliability could also be better secured.

However, most data sheet shows high efficiency with full load condition and not with the real load condition for a practical system. It is better to select a power module that has highest efficiency with specified load condition. This almost leads to a solid answer that to choose a power module rated about 1.2~1.5 times of the required power would be reliable than a power module rated at double of the actual required power or even higher, because large derating always has poor efficiency and more temperature rise. Higher derating always reduces the operation life because the temperature factor has more negative effect on MTBF to further eliminate the positive effect due to the reduced electrical stress.

Roughly calculations of Glary COQ module by changing the temperature stress and electrical stress to have different results as below could be used as an example of reference of power module selection in system design stage. At 25ºC, a 10% increasing of module case temperature (Tc= 90ºC to Tc= 96.5ºC) will reduce the life to about 75% of its originally designed figure. However! Module derating from 100% to 75% will cause life improve by about 2%.

Efficiency change between different modules also has significant effect on the temperature rise to affect the derating performance. This effect can be seen more clearly especially in high temperature operation.

For example, a 200LFM/83ºC of airflow is used for cooling and the maximum case temperature of power module was set as 110ºC. A COQ48050N11M-10 module with 90.2% efficiency can have a 9.5A output current with 5.16W power loss. If the efficiency is 2% lower (88.2%) at 9.5A output, it may loss 6.35W of power and further ~~to~~ cause over temperature to Tc=114ºC or the maximum operable temperature should reduced to Ta=75ºC.

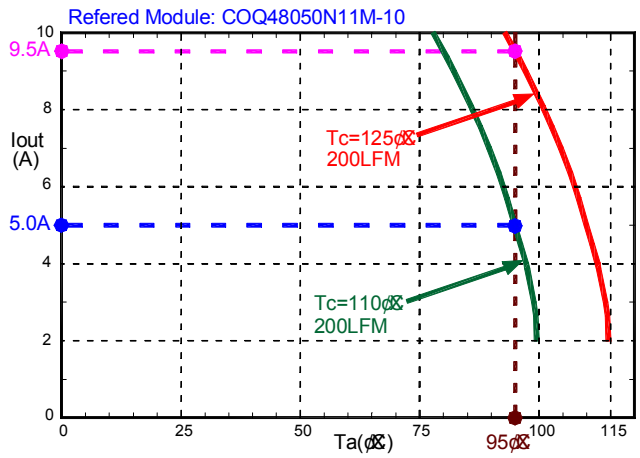
Module Temperature

Follow the result of conversion efficiency section; some power module makers provide derating curves by increasing the maximum board temperature and semiconductor junction temperature to 125ºC to have better derating performance. This method pushes converter operating at high temperature environment, which results in two effects on the thermal characteristics:

The first effect of increasing maximum allowable temperature is that it would increase~~s~~ the temperature rise between module and the air may cause more heat flow through module surface to air ~~if~~ assuming module thermal resistance is constant. Typically the thermal resistance of specified form factor is determined by the properties of air and the contacted surface area. The properties of air are fixed when the temperature and pressure ware specified. The only variable is the air contacted surface area of power module, but same form factor has almost same construction and the same contacted surface area due to no big difference on the components selection and its counts, so that the thermal resistance can be at the same level.

The second effect is to reduce thermal resistance by increasing nature convection due to increased temperature rise. It has about 8% improvement for thermal resistance with nature convection by changing the maximum allowable temperature from Tc=110ºC to Tc=125ºC.

Simple calculations of Glary COQ module by changing the maximum allowable temperature from Tc= 110ºC to Tc= 125ºC would demonstrate the improvement of derating performance. By operating a COQ48050N11M-10 module under conditions of Ta= 95ºC, Tc= 110ºC and Airflow=200LFM with 90.9% of conversion efficiency, it can deliver 5.0A output current with 2.50W power loss. If the allowable maximum temperature is Tc= 125ºC, the allowable power loss will go to 4.76W and the available current could be 9.5A. Plot-1 shows comparison of derating curves for reference.



Plot-1: Derating curves for Tc=110ºC and Tc=125ºC

However, even to increase the maximum allowable temperature from Tc= 110ºC to Tc= 125ºC would make dramatic improvement for derating performance. It pays too much for operation life, most of the circuit components used in modern power modules may reduced its life significantly due to operation under Tc= 125ºC condition and the total effect is to reduce module life about 50%. Generally derating rule request 38ºC derating for power semiconductor junction temperature and 15ºC derating for Tg= 130ºC rated PCB that means the maximum operation temperature is 112ºC. All Glary products are limited under 110ºC for safe operation and longer life. Set the case temperature of Glary module below 90ºC during operation would be better for high reliability system.

Module Thermal Resistance

Follow the result of module temperature section; the maximum allowable temperature for operation is limited under Tc= 110ºC. Glary provide Sink-Plate technology for almost all Glary modules to reduce the module thermal resistance, and further improve thermal performance such as the derating performance and temperature deviation among the components. By choosing the Sink-Plate, the derating performance was improved dramatically and no any compromise for the reliability and operation life because it can be used as integrated heat sink to reduce module thermal resistance when no additional cooling assemblies were attached to the module.

In general Glary modules were design for board mount application but the Sink-Plate has at least 2pcs of M3 screws to allow module to be attached to the casing, or with its heat sink to extent its thermal performance to meet the requirements of high temperature operated system. The Sink-Plate is able to reduce the deflection that it has special geometry to hold flowed gap filler due mounting force during screw mounting process and improve the thermal contact to has unified temperature map to improve the reliability again.

The simple calculations for COQ with different type of base plate are described as below, which may reflected to all Glary products and give better understanding about thermal performance and derating for specified application conditions:

For the 1.0mm metal plate:

The module thermal resistance θ_M of COQ with 1.0mm metal plate is similar to traditional power module can be listed as below:

θ_M = 11.29 (Free-Air), 7.36 (100LFM), 5.65(200LFM)
4.20 (300LFM), 3.47 (400LFM), 3.03 (500LFM)

The thermal resistance data and efficiency plot in the data sheet can be applied to the equation below to determine the available power with specified operation ambient temperature.

$P_O = (110-Ta)/ (\theta_M)(1/\eta-1)$

For example: 200LFM at Ta= 80ºC for COQ with 1.0mm metal plate. The available power is P_O= (110-80)/ (5.65)(1/0.9-1)= 47.6W, or equal to 5.0V/9.5A output also can be seen in the derating plot in the data sheet directly.

For the3.0mm Sink-Plate:

The module thermal resistance θ_{S3} of COQ with 3.0mm Sink-Plate is about 30% lower compared to 1.0mm metal plate COQ module, which is listed as below:

Θ_{S3} =
9.13 (Free-Air), 5.95 (100LFM), 4.49 (200LFM)
3.40 (300LFM), 2.81 (400LFM), 2.45 (500LFM)

Parallel connection / operations and current share application note

Overview

This document will examine method for active load sharing, basic criteria and performances of such a function on Glary UH and PS module series.

This application note provides also a brief summary about some general guidelines to help accomplishing the task.

System requirements and premises

The basic requirements of a power supply system, consisting of a number of paralleled sources, to increase the total load current are:

-to maintain a regulated output voltage under variations in line or load;

-to control the output current of each supply just to share the total load current equally;

To maximize reliability of the system there are the following features:

-Achieve redundancy, so that a failure of any one supply can be tolerated as long as there is sufficient current capacity available from the remaining power units;

-Implement a load sharing method without any external control system.

In addition, these are the following desirable features:

-to have a common, low bandwidth share bus interconnecting all power units;

-to achieve good load sharing transient response;

-the ability to margin the system output voltage with one control.

In other words, the combination of power supplies behaves like one large supply with equal stress on each of the units. Also, reliability can be better secured by taking advantage of load sharing to incorporate modular redundancy.

Load sharing techniques

There are a number of schemes to achieve load sharing.

Six methods are possible: the following method is passive method while all the rest are active methods.

O-ring diode method

This is the most passive common method of paralleling power modules by using an O-Ring diode on each unit. By using power modules with adjustable outputs, it is possible to 'Balance' the current sharing of the units. By taking a 'differential' voltage measurement at the anodes of the O-Ring diodes current will be shared more equally the closer the differential voltage is to zero. This method has the disadvantage of an additional power loss in the diodes and dissipation of the heat generated in the diodes.

The droop method

The Droop method programs the output impedance of the power supplies to achieve load sharing. It is a simple open loop method, but is not accurate.

The dedicated master

This approach is to select a master module to perform the voltage control and force the remaining modules (slaves) to act as current sources. A dedicated Master approach with current mode supplies will facilitate current sharing but it does not achieve redundancy.

External controller

This method is to use an external controller to perform the load sharing. This is achieved by comparing all loads sharing signals from the individual power units and adjusts the corresponding feedback signal to balance the load currents. This system does perform well but requires an additional controller and multiple connections between the controller and each supply.

Automatic current sharing – average current method

For automatic current sharing no external controller is required and a single share bus interconnects all the supplies. This requires an adjustment amplifier that compares a current signal from the share bus to the individual units current and adjusts the reference of the voltage amp until equal load current distribution is achieved.

The average Current method is a patented technique where each power module's current monitor drives a common share bus via a resistor. While this scheme performs accurate current sharing, it can result in a specific application problem. An example is when a supply runs into current limit, causing the share bus to be loaded down and the output voltage to regulate to the lower adjust limit. A similar failure mode will exist if the share bus is shorted or if any unit on the share bus is inoperative.

Automatic current sharing – highest current method

This technique for automatic current sharing shown compares the highest current module to each individual current, and adjusts the reference voltage accordingly to correct the imbalance of load current.

This technique is similar to the average current method except that the resistor is replaced with a diode, allowing only one unit to communicate on the share bus. This method provides for excellent sharing among the slaves with an error in the master's load current contribution because of the diode.

Internal IC Load Share Regulator has improved this function by replacing the diode with a unidirectional buffer to reduce the master's error. An inoperative or insufficient capacity supply will not effect the sharing of the operational units.

A shorted share bus will disable the reference adjustment section used for load sharing, making the units operate as stand-alone.

A generic load share system with the basic bus connections required performing accurate output voltage control and load sharing is shown in Fig 1. The output voltage is sensed with a fully differential, high-impedance voltage amplifier.

Each individual power supply current is sensed with a differential current amplifier, and it is used for the load share portion of the circuit.

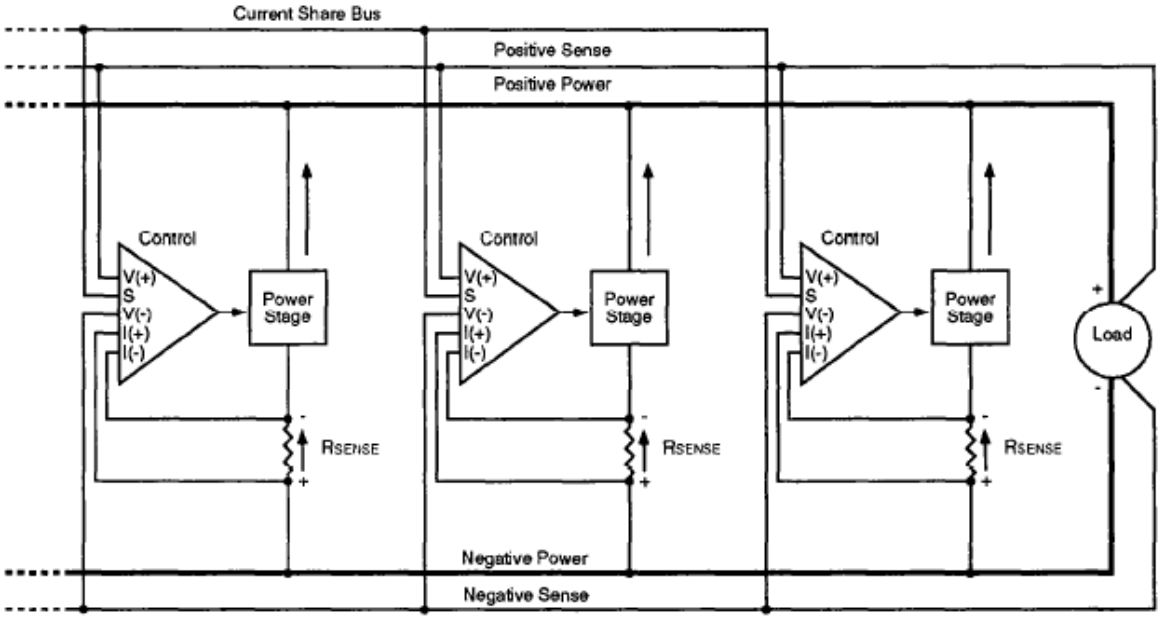


Fig. 1. Basic bus connections required performing accurate output voltage control and load sharing

The share bus signal interconnecting all the paralleled modules is a low-impedance, noise insensitive line. The connection diagram is shown in FIG 2. The following discussion of the voltage and current sharing loops should help the user to understand the operation and features of this technique.

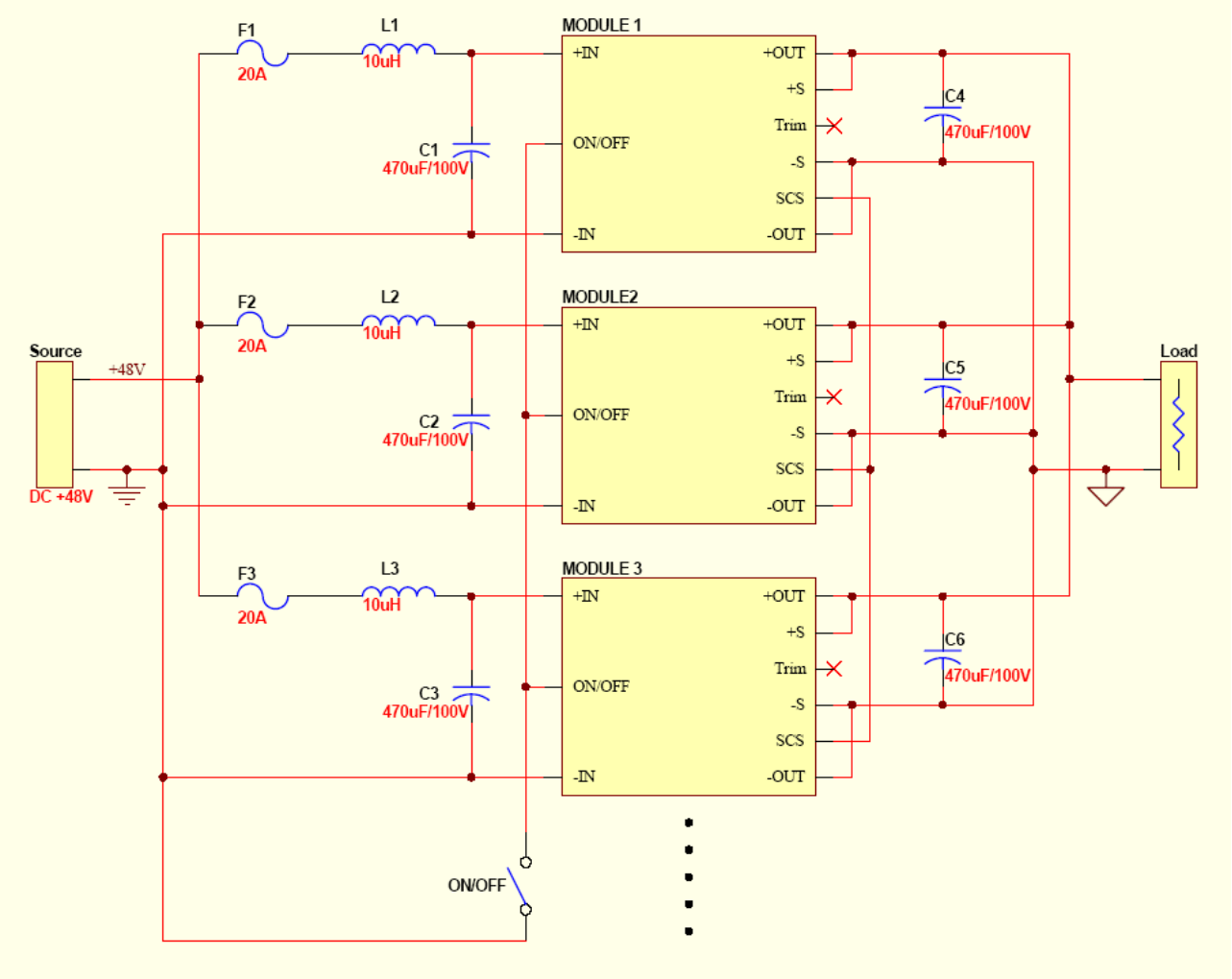


Fig. 2. System connections for modules with independent load sharing

External design basic criteria, design rules, suggestions and reached performances

Layout considerations

It is quite imperative to adopt a symmetrical and “star node” layout of the power circuit with minimum loop area and impedance for each PCB track between modules and load. This basic criterion is also to avoid loop noise generation.

Basic connection diagram to be followed is shown on Fig. 2.

When using units connected in parallel, best suggestion is to not connect **sense pins** unless load is far away from output pin’s module; basic criteria to decide about this issue is related to voltage drop across PCB tracks that is suggested to be less than 0,5% of the output voltage; just in case output voltage drop is higher than what is suggested, sense pins can be conveniently connected to load as shown on Fig. 2

Important issue is: **do not connect trim pins and circuitry** when parallel configuration is adopted in order to not defeat parallel performances.

Electrical ratings and thermal suggestions of power modules connected in parallel

All modules connected in parallel are suggested to be mounted on the same heat sink in order to achieve the best possible thermal coupling. It is the best to space the modules apart over the whole surface of the heat sink to avoid creation of hot spots on the heat sink and to minimize heat density.

The current rating of the whole assembly must not exceed 80% to 90% of the total current capability of the modules just to compensate for unavoidable parameter variations between the modules.

Modules must have very symmetrical designs with very short connections both for power and control terminals. Parasitic resistance of connections has to be very low in order to facilitate a parallel module layout with minimum loop impedance.

Additional external components

External delayed fuse type is suggested to be connected on each output DC/DC lines as close as possible to output pins. This suggested solution is to prevent any burns on the system just in case one module goes on hypothetical short circuit failure and so may sink all the current of the entire system. Alternative or equivalent solution to fuse is OK.

A suggested alternative active solution can be implemented by using the Linear Technology IC LTC4357 (Positive High Voltage Ideal Diode Controller) driving N-channel MOSFETs placed in parallel as substitution of above fuse.

This simple solution enhances system reliability and prevents hazard situations.

The suggested best current trip value of fuse could be around 160% of the maximum output current of each module.

General considerations

Paralleling of power modules with good current sharing can be achieved by following some important guidelines. The above recommendations and greater care and maximum precautions are necessary if the number of paralleled modules increases and become very high.

Theoretically speaking the **maximum number of paralleled modules limitation does not exist; however the maximum quantity suggested is over 16-18 pieces**; the only precaution that is necessary to adopt is a safe and reliable design for the entire system and particular attention to electrical power point of view.

Overall electrical Performances for parallel

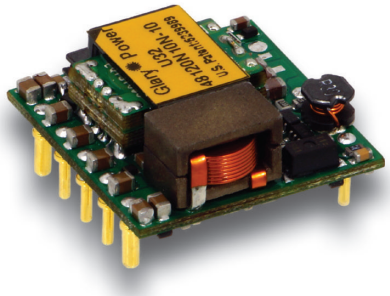
-Current share tolerance: **+/-5%**

-Voltage tolerance with current share: **+/-1%**

New Products

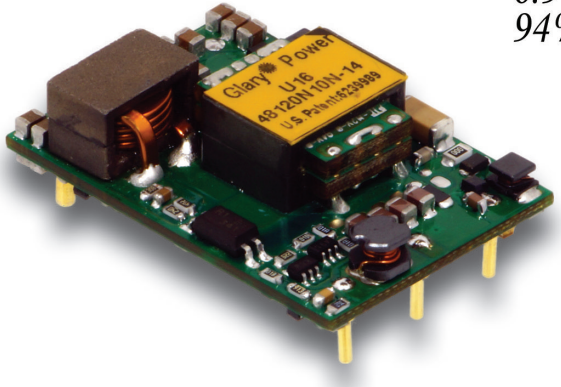
U32 Micro Brick

30W~120W
0.70" X 0.70"
93% Efficiency



U16 1/16 Brick

40W~150W
0.91" X 1.30"
94% Efficiency



U08 1/8 Brick

50W~300W
0.91" X 2.30"
95% Efficiency