Murata Power Solutions


With Baseplate


Without Baseplate

FEATURES

- 36-75V input voltage range
- Regulated 12V/17A output
- Industry standard Sixteenth-Brick with baseplate (optional)
- Optimized thermal performance
- High efficiency up to 95%
- Over-current, Over-temperature, and Over-voltage protection
- Remote On/Off enable (negative logic)
- Output trim adjustment (-20%, 10%)
- 2250Vdc isolation (Input-to-Output)
- RoHS compliant

RoHS COMPLIANT

For full details please visit our website: www.murata-ps.com/rohs

SAFETY APPROVALS

- UL 62368-1 3rd edition
- IEC 62368-1:2018
- CSA-C22.2 No. 62368-1-19
- CE and UKCA approved

APPLICATIONS

- Power-over-Ethernet (PoE)
- Server, storage, and networks (SSN)
- Telecom and industrial

PRODUCT OVERVIEW

MPS0117V2NBC is a highly efficient, 200W, isolated DC/DC converter that converts 36-75Vdc input into an isolated regulated 12Vdc/17Amp output. The MPS0117V2NBC is fully protected from overcurrent, overtemperature, and overvoltage faults and is packaged within the industry standard sixteenth-brick format with baseplate. Cooling options for all applications. Safety features include 2,250Vdc I/O isolation with basic insulation suitable for POE applications.

ORDERING GUIDE[1]

Part Number[2]	Vin Range	Vout (Nominal)	Output Power	Length inch (mm)	Width inch (mm)	Height inch (mm)
MPS0117V2NBC	36-75Vdc	12Vdc	204W	1.3 (33.0)	0.9 (22.9)	0.50 (12.7)
MPS0117V2NC	36-75Vdc	12Vdc	180W	1.3 (33.0)	0.9 (22.9)	0.42 (10.7)

[1] Contact Murata Power Solutions for special pin lengths. Minimum order quantity required.
[2] The "B" suffix indicates baseplate version. Blank = No baseplate.

Common Specifications: MPS0117V2NBC and MPS011702NC

ABSOLUTE MAXIMUM RATING

Parameter	Notes	Min.	Nom.	Max.	Units
Input Voltage		36	-	75	Vdc
Output Current		0	-	17	A
On/Off Pin Voltage		0	-	15	Vdc
Operating Ambient Temperature		-40	-	85	°C
Storage Ambient Temperature		-55	-	125	°C
Isolation Voltage, Input to Output		-	-	2250	Vdc

INPUT CHARACTERISTICS, Ta= 25°C, Vin=48V. Nominal Vout, unless otherwise specified

Parameter	Conditions[1]	Min.	Nom.	Max.	Units
External Input FUSE (recommended)				12	A
Vin Operating Range	Steady state	36	48	75	Vdc
Voltage Transients	100ms duration	-	-	100	
Start-up Voltage		33.5	34.5	35.5	

ON/OFF CONTROL

Parameter	Notes	Min.	Nom.	Max.	Units
Negative Logic ("N" Suffix)	2				
Unit OFF: On/Off Pin open or:		2.5	-	15	Vdc
Unit ON: On/Off Pin		-0.1	-	0.8	
Control Pin Shutdown Current			1	2	mA

[1] Enable signal is referenced to Vin(-).Designed to be driven with open collector logic.
[2] Unit disabled via control pin, open collector configuration.

ENVIRONMENTAL CHARACTERISTICS

Parameter	Notes	Min.	Nom.	Max.	Units
Operating Ambient Temperature		-40	-	85	°C
Operating Case Temperature	1	-40		120	
Thermal Protection/Shutdown, measure center of baseplate		115	125	130	
Storage Temperature		-55	-	125	
Altitude, Operating		-500		13120	feet
EMI					
Conducted (FCC part 15, EN55022)			Class B		
Radiated (FCC part 15, EN55022)			Class B		

[1] Case temperature: measured in the center.

GENERAL & SAFETY

Parameter	Conditions[1]	Min.	Nom.	Max.	Units
Efficiency	50% Max load	-	94.5	-	%
	Max load	-	94.0	-	
Switching Frequency		418	465	511	kHz
Turn On Time					
Vin On to 10% of Vout		-	-	20	ms
Remote On to 10% Vout		-	-	20	
Rise time		-	35	50	
Isolation					
Input to Output Test Voltage		-	-	2250	Vdc
Input to Baseplate Test Voltage		-	-	1500	
Baseplate to Output Test Voltage		-	-	1500	
Safety Rating		-	Basic	-	
Isolation Resistance		-	100	-	MOhm
Isolation Capacitance		-	3300	-	pF
Safety Approvals					
Designed to meet the following requirements:	UL62368-1 3rd Edition, CSA-C22.2 No. 62368-1-19, IEC 62368-1:2018		Yes		
Calculated MTBF	Belcore, Telcordia SR-332, Issue2, Method 1, Class 3, Gf		2600		kHours

MECHANICAL INFORMATION

Parameter	Notes	Min.	Nom.	Max.	Units
Dimensions – Baseplate version (L x W x H)			1.3 x 0.9 x 0.5		Inches
			33.02 x 22.86 x 12.7		mm
Dimensions – No Baseplate (L x W x H)			1.3 x 0.9 x 0.42		Inches
			33.02 x 22.86 x 10.7		mm
Weight (Baseplate version)			0.85		Ounces
Weight (Open Frame version)			0.63		Ounces
			18		Grams
Pin Diameter			0.062 & 0.040		Inches
			1.524 & 1.016		mm
Pin Length	1		0.180		Inches
			4.57		mm
Baseplate Material			Black anodized aluminum		

[1] Standard pin length = 0.180", special order for 0.110" and 0.145" pin lengths. Contact Murata Power Solutions for details. Minimum order quantity required.

Murata Power Solutions

MPS0117V2NBC - Baseplate Model

INPUT CURRENT					
Parameter	**Notes**	**Min.**	**Typ.**	**Max.**	**Units**
Full Load Conditions	Vin = 48 V, Iout = 17 A	-	4.6	5.0	Adc
Low Line Input Current	Vin = 36 V, Iout = 17 A	-	6.2	6.7	
No Load Input Current	Vin = 48 V, Iout = 0 A	-	50	100	mA
Shut-Down Mode Input Current		-	5	30	
Reflected Ripple Current[2]	With external input filter	-	15	160	
Reflected Ripple Current	No filtering	-	300	500	mA p-p

[1] General Conditions for Device under Test unless otherwise specified:
- Ambient Temperature +25°C
- Vin typical; Vout nominal load
- With 1 µF ceramic & 10 µF tantalum & 220 µF electrolytic capacitors across output pins; 220 µF/100 V external input capacitors.

[2] Measured at the input of module with a simulated source impedance of 12 µH, 220 µF, 100 V, across source, 33 µF, 100 V external capacitors across input pins.

MPS0117V2NBC with Baseplate

OUTPUT CHARACTERISTICS, Ta= 25°C, Vout Nominal Load, unless otherwise specified					
Parameter	**Notes**	**Min.**	**Typ.**	**Max.**	**Units**
Output Power		0	-	204	W
Output Voltage	Output Voltage Setting Accuracy (measured @ 50% Load)	11.76	12.00	12.24	Vdc
	Output Adjust Range (Hardware TRIM)	9.60	-	13.20	
	Over Voltage Protection	13.30	14.50	18.00	
Line Regulation	Vin = 36-75V, Vout = nominal, full load	0	5	30	mV
Load Regulation	Iout = min. to max., Vin = 48V, |Vout@min_load-out@max_load|	0	10	30	
Trim Down	Trim (pin #6) to -Vout (pin #5), Rt down (kΩ) = 5.11/((Vonom-Vo)/Vonom)-10.22	-20	-	-	%
Trim Up[3]	Trim (pin #6) to +Vout (pin #4), Rt up(kΩ) = 5.11*Vonom*(1+Δ)/(1.225*Δ)-5.11/Δ-10.22 Δ=|(Vonom-Vo)/Vonom|	-	-	10	
Output Current		0	-	17	A
Current Limit Inception	98% of Vout	18.0	23.0	27.0	
Short Circuit Current	RMS current at OCP in hiccup mode	-	8.0	-	
Short Circuit Duration	Output Shorted to Ground		Continuous		
DYNAMIC LOAD RESPONSE					
	Iout 50-75-50% nom, 1 A/µs, 5ms within 2% of Vout	-	-	100	µSec
Peak Deviation		-	±250	±300	mV
	Iout 25-75-25% nom, 1 A/µs, 5ms within 2% of Vout	-	-	200	µSec
Peak Deviation		-	±500	±600	mV
Ripple/Noise[1]	(Vin = Vin_nom and Io = Io_min to Io_max, tested with a 1.0 µF ceramic, 10 µF tantalum and 100 µF low ESR polymer capacitor across the load.)	-	80	140	mVpp
Temperature Coefficient		-	0.02	-	%/°C
Output Capacitance[2]		100	-	5,000	µF

[1] Cout=100uF minimum, typically 50% ceramic, 50% Oscon or POSCAP. Measured at output pins, bandwidth = 20MHz
[2] Typically 50% ceramic, 50% Oscon or POSCAP
[3] VM 36V to 40Vdc, trim up limited to 5%.

MPS0117V2NBC - Baseplate Model

ELECTRICAL CHARACTERISTICS CURVES (Ta=25°C)

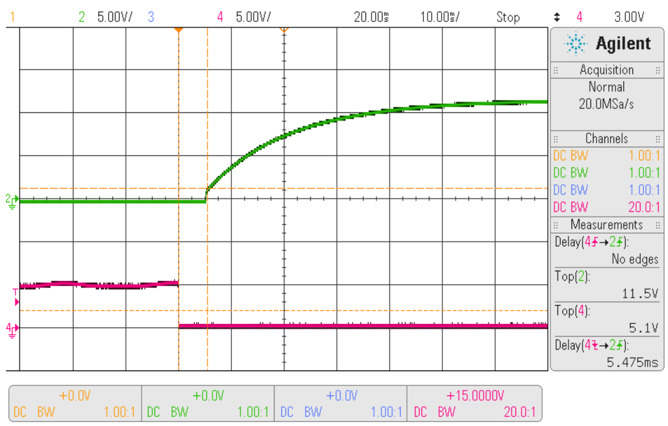


Figure 1. Enable ON
48Vin, 17A Load, 100µF min cap load

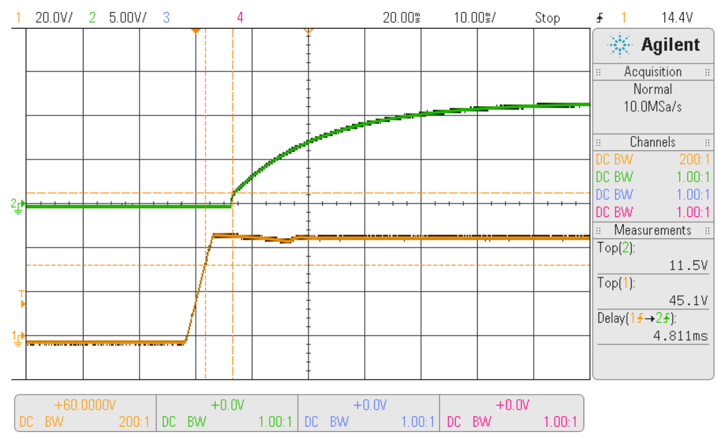


Figure 2. Vin ON
48Vin, 17A Load, 100µF min cap load

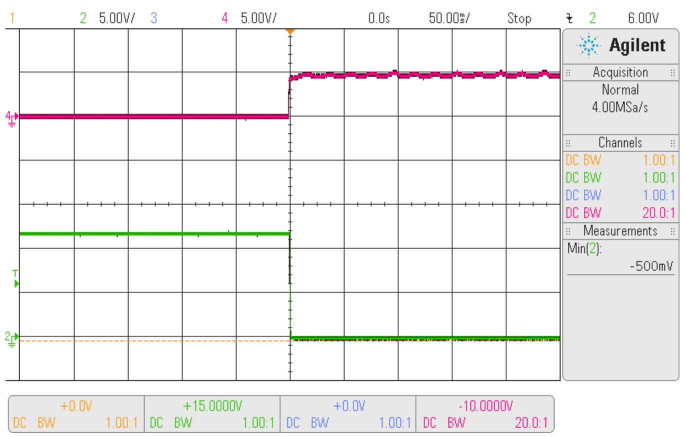


Figure 3. Enable OFF
48Vin, 17A Load, 100µF min cap load

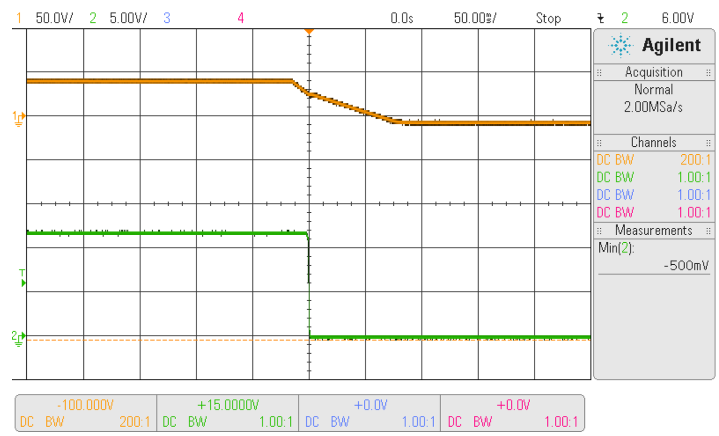


Figure 4. Vin OFF
48Vin, 17A Load, 100µF min cap load

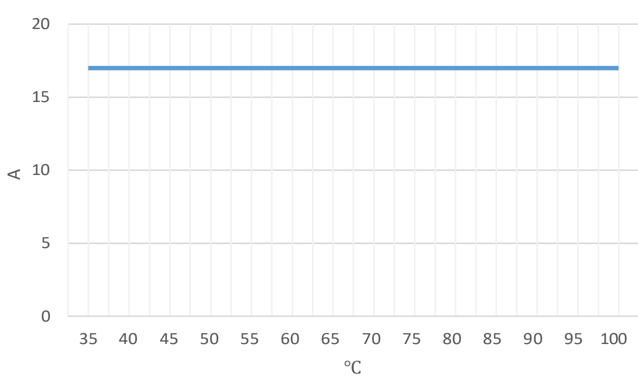


Figure 5. Output Current Derating – Cold Wall
Vin = 48V

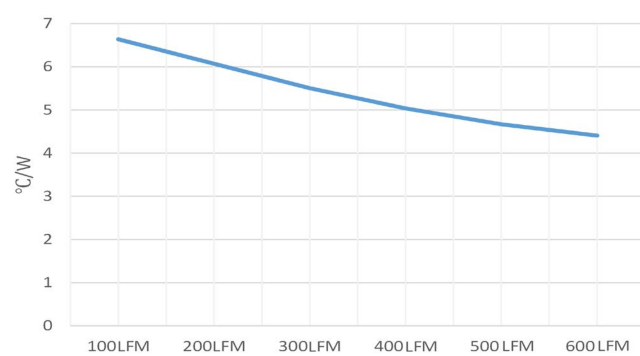


Figure 6. Thermal Resistance – Baseplate
Vin = 48V

MPS0117V2NBC - Baseplate Model

ELECTRICAL CHARACTERISTICS CURVES (Ta=25°C) - continued

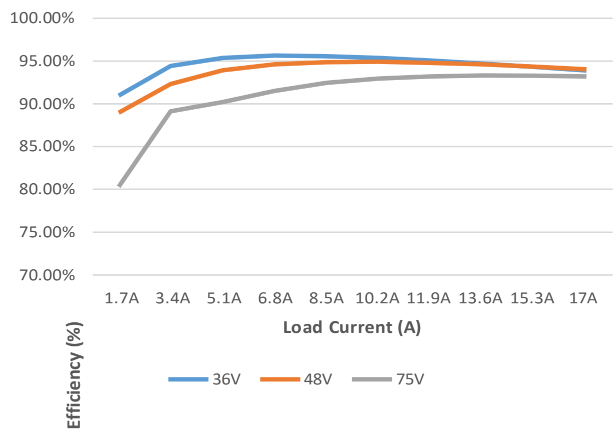


Figure 7. Efficiency Vs. Line Voltage & Load Current @ 25°C

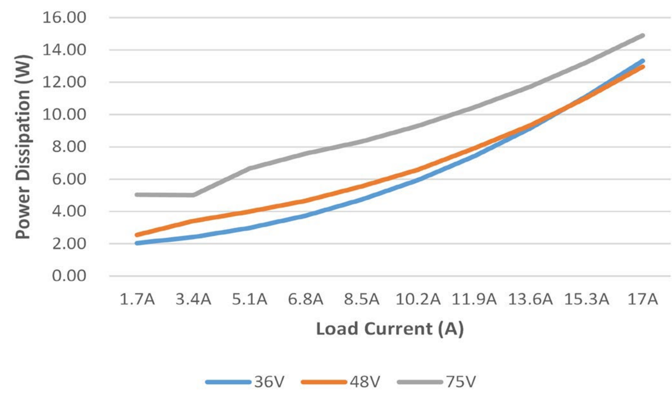


Figure 8. Power Dissipation Vs. Load Current @ 25°C

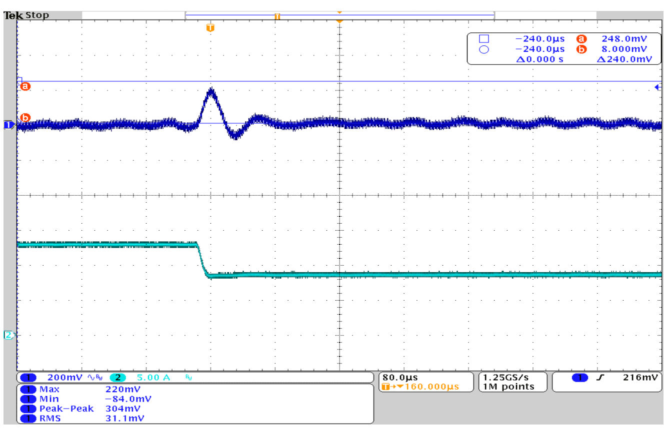


Figure 9. Output Transient Response
48Vin, 50%-75% Load

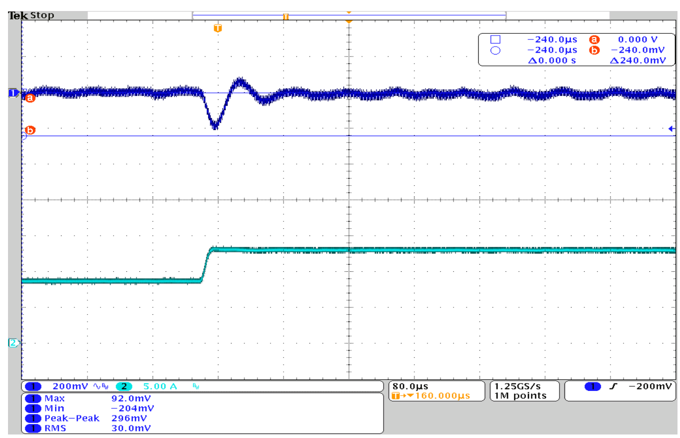


Figure 10. Output Transient Response
48Vin, 50%-75% Load2

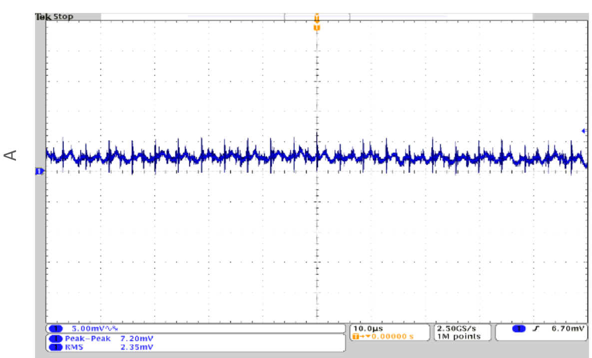


Figure 11. Ripple & Noise
48Vin, 0A Load, 1µF+10µF

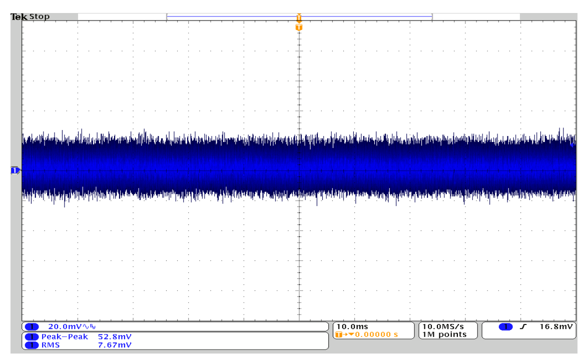


Figure 12. Ripple & Noise
48Vin, 17A Load, 1µF+10µF

MPS0117V2NBC - Baseplate Model

ELECTRICAL CHARACTERISTICS CURVES (Ta=25°C) - continued

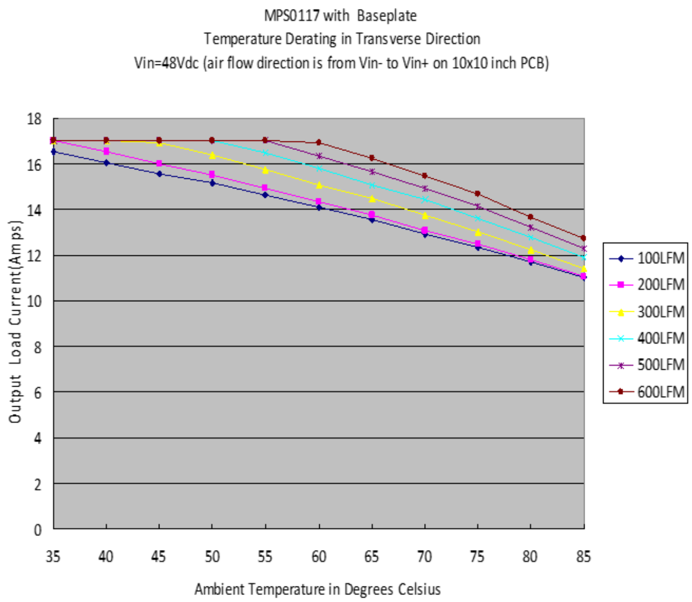


Figure 13. Temperature Derating – Transverse Direction
Vin=48Vdc (airflow is from Vin- to Vin+ on 10"x10" PCB)

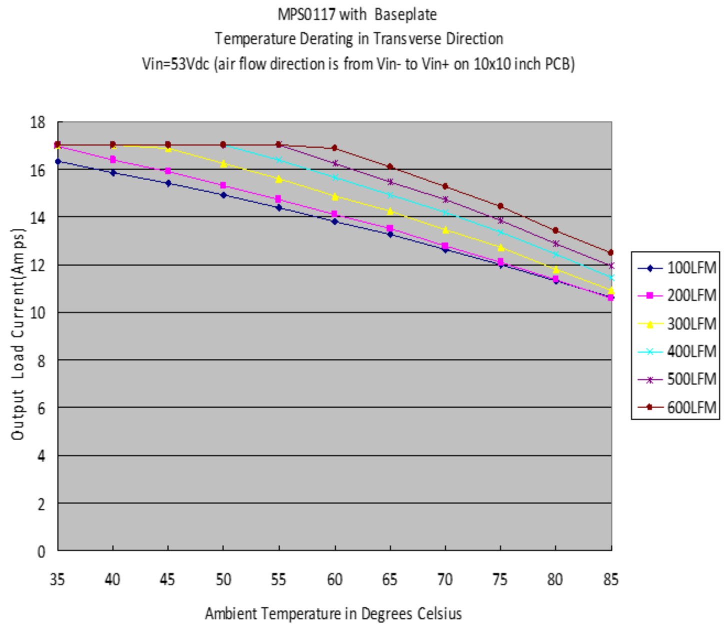


Figure 14. Temperature Derating – Transverse Direction
Vin=53Vdc (airflow is from Vin- to Vin+ on 10"x10" PCB)

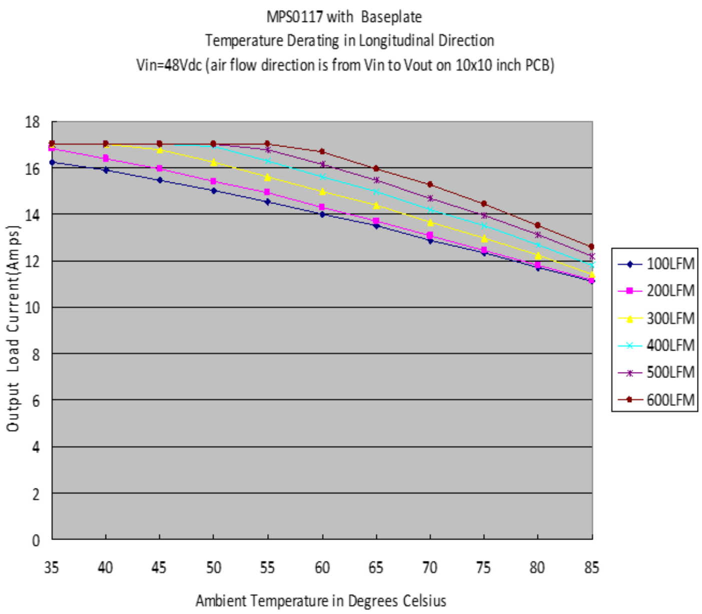


Figure 15. Temperature Derating – Longitudinal Direction
Vin=48Vdc (air flow direction is from Vin to Vout on 10x10 inch PCB

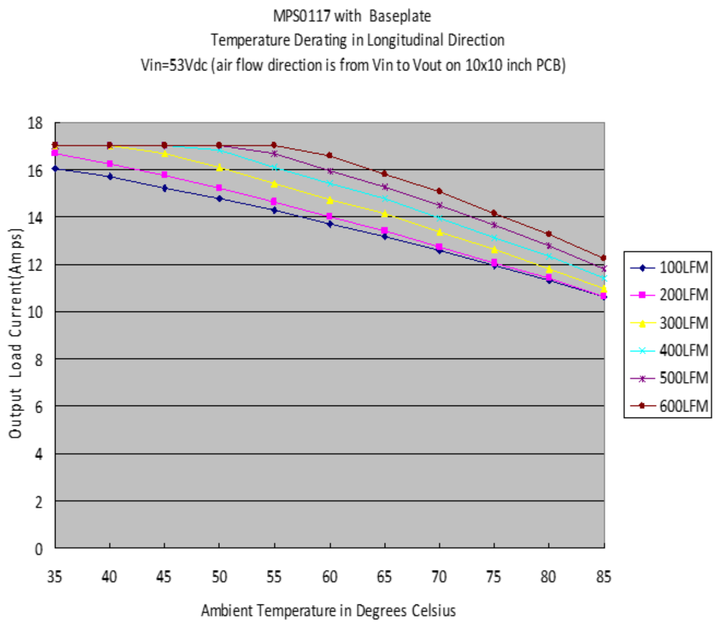


Figure 16. Temperature Derating – Longitudinal Direction
Vin=53Vdc (air flow direction is from Vin to Vout on 10x10 inch PCB)

MPS0117V2NC - Open Frame Model

INPUT CURRENT					
Parameter	**Notes**	**Min.**	**Typ.**	**Max.**	**Units**
Full Load Conditions	Vin = 48 V, Iout = 15 A	-	4.3	4.8	Adc
Low Line Input Current	Vin = 36 V, Iout = 15 A	-	5.5	6.0	
No Load Input Current	Vin = 48 V, Iout = 0 A	-	50	100	mA
Shut-Down Mode Input Current		-	5	30	
Reflected Ripple Current[2]	With external input filter	-	15	160	
Reflected Ripple Current	No filtering	-	300	500	mA p-p

[1] General Conditions for Device under Test unless otherwise specified:
- Ambient Temperature +25°C
- Vin typical; Vout nominal load
- With 1 µF ceramic & 10 µF tantalum & 220 µF electrolytic capacitors across output pins; 220 µF/100 V external input capacitors.

[2] Measured at the input of module with a simulated source impedance of 12 µH, 220 µF, 100 V, across source, 33 µF, 100 V external capacitors across input pins.

OUTPUT CHARACTERISTICS, Ta= 25°C, Vout Nominal Load, unless otherwise specified					
Parameter	**Notes**	**Min.**	**Typ.**	**Max.**	**Units**
Output Power		0	-	180	W
Output Voltage	Output Voltage Setting Accuracy (measured @ 50% Load)	11.76	12.00	12.24	Vdc
	Output Adjust Range (Hardware TRIM)	9.60	-	13.20	
	Over Voltage Protection	13.30	14.50	18.00	
Line Regulation	Vin = 36-75V, Vout = nominal, full load	0	5	30	mV
Load Regulation	Iout = min. to max., Vin = 48V, |Vout@min_load-out@max_load|	0	10	30	
Trim Down	Trim (pin #6) to -Vout (pin #5), Rt down (kΩ) = 5.11/((Vonom-Vo)/Vonom)-10.22	-20	-	-	%
Trim Up3	Trim (pin #6) to +Vout (pin #4), Rt up(kΩ) = 5.11*Vonom*(1+Δ)/(1.225*Δ)-5.11/Δ-10.22 Δ=|(Vonom-Vo)/Vonom|	-	-	10	
Output Current		0	-	15	A
Current Limit Inception	98% of Vout	16.0	21.0	25	
Short Circuit Current	RMS current at OCP in hiccup mode	-	8.0	-	
Short Circuit Duration	Output Shorted to Ground		Continuous		
DYNAMIC LOAD RESPONSE					
	Iout 50-75-50% nom, 1 A/µs, 5ms within 2% of Vout	-	-	100	µSec
Peak Deviation		-	±280	±350	mV
	Iout 25-75-25% nom, 1 A/µs, 5ms within 2% of Vout	-	-	200	µSec
Peak Deviation		-	±500	±600	mV
Ripple/Noise1	(Vin = Vin_nom and Io = Io_min to Io_max, tested with a 1.0 µF ceramic, 10 µF tantalum and 100 µF low ESR polymer capacitor across the load.)	-	80	140	mVpp
Temperature Coefficient		-	0.02	-	%/°C
Output Capacitance2		100	-	5,000	µF

[1] Cout=100uF minimum, typically 50% ceramic, 50% Oscon or POSCAP. Measured at output pins, bandwidth = 20MHz
[2] Typically 50% ceramic, 50% Oscon or POSCAP
[3] VM 36V to 40Vdc, trim up limited to 5%.

ELECTRICAL CHARACTERISTICS CURVES (Ta=25°C) - continued

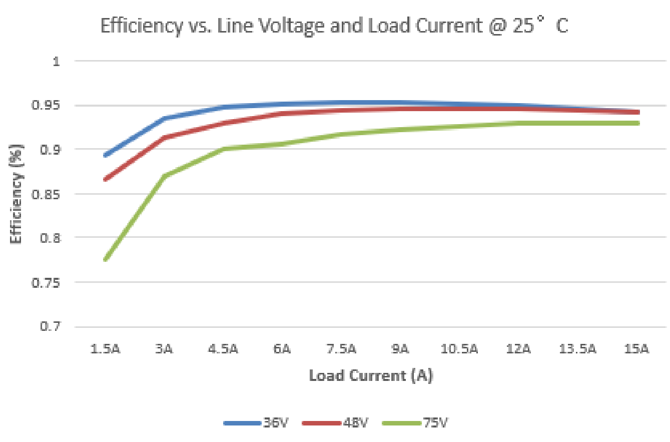


Figure 17. Efficiency vs. Line Voltage and Load Current @ 25°c

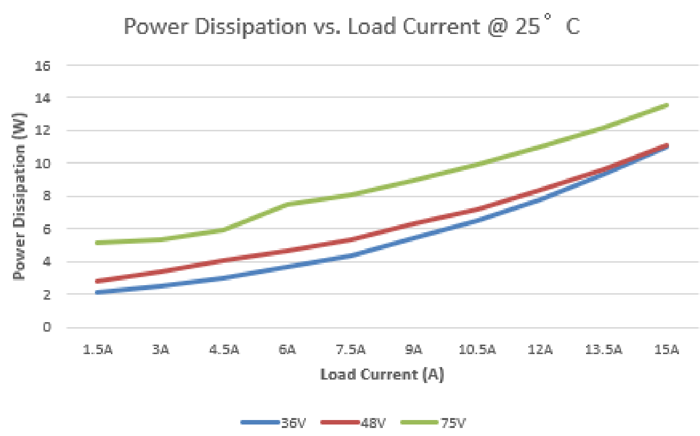


Figure 18. Power Dissipation vs. Load Current @ 25°c

MPS0117V2NC – Open Frame Model

ELECTRICAL CHARACTERISTICS CURVES (Ta=25°C)

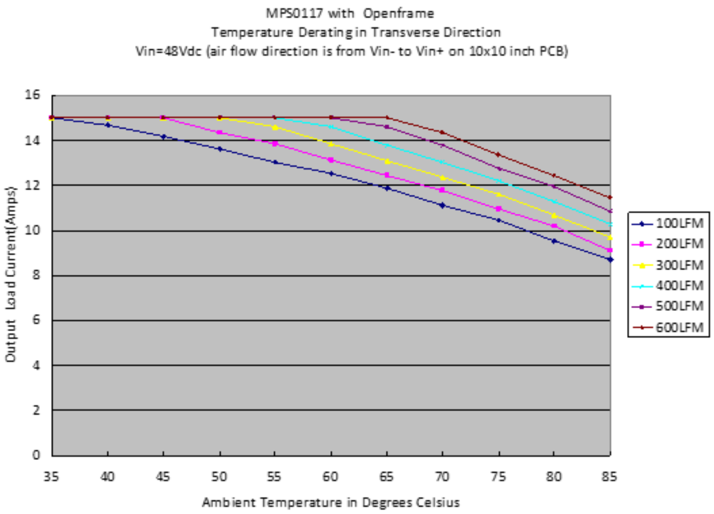


Figure 19. Temperature Derating – Transverse Direction Vin=48Vdc (airflow is from Vin- to Vin+ on 10"x10" PCB)

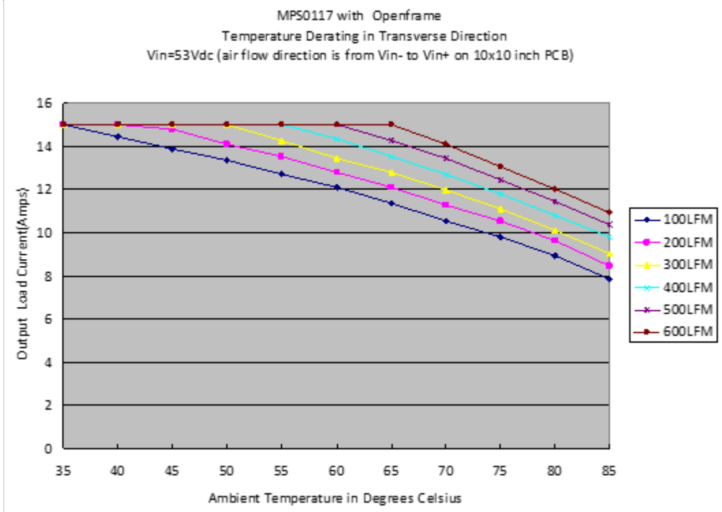


Figure 20. Temperature Derating – Transverse Direction Vin=53Vdc (air flow direction is from Vin- to Vin+ on 10x10 inch PCB)

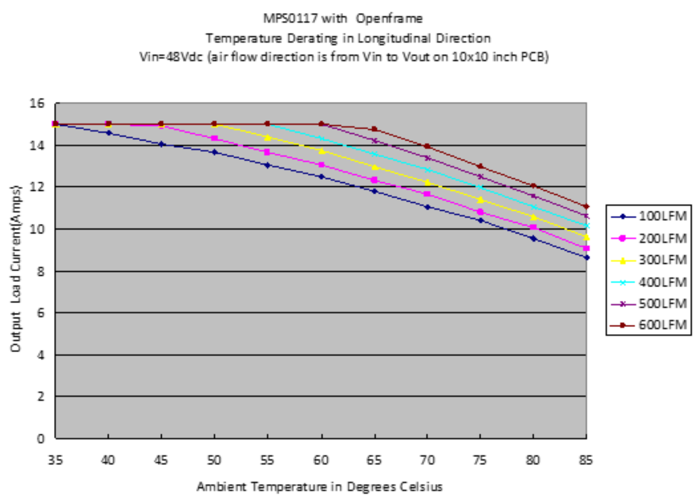


Figure 21. Temperature Derating in Longitudinal Direction Vin=48Vdc (air flow direction is from Vin to Vout on 10x10 inch PCB)

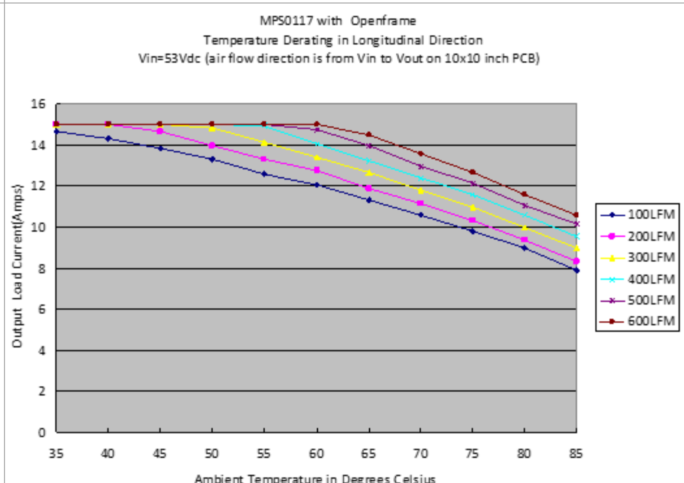
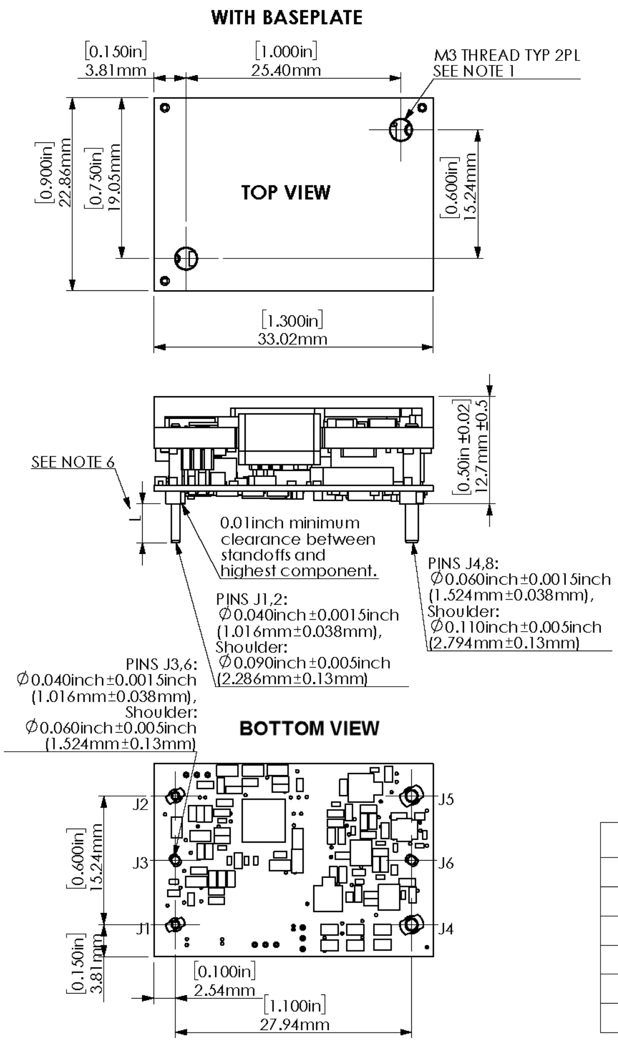
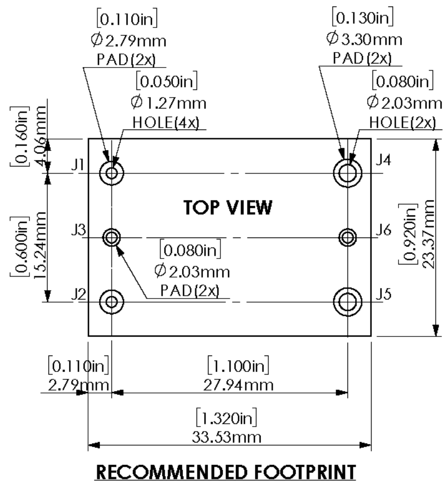


Figure 22. Temperature Derating – Longitudinal Direction Vin=53Vdc (air flow direction is from Vin to Vout on 10x10 inch PCB)

MPS0117V2NBC - Baseplate Model

MECHANICAL OUTLINE





NOTES:
UNLESS OTHERWISE SPECIFIED:
1: M3 SCREW USED TO BOLT UNIT'S BASEPLATE TO OTHER SURFACES MUST NOT EXCEED 0.094"(2.4mm) DEPTH BELOW THE SURFACE OF BASEPLATE. APPLIED TORQUE PER SCREW SHOULD NOT EXCEED 5.3In-lb(0.6Nm)

2: FOR COSMETIC SPECIFICATION AND PRODUCTION WORKMANSHIP STANDARD, PLS FOLLOW THE FILE No. 60887.

3: ALLDIMENSION ARE IN INCHES[MILIMETER].
4: ALL TOLERANCES: x.xxin, ±0.02in(x.xmm, ±0.5mm),
x.xxxin, ±0.01in(x.xxmm, ±0.25mm).

6: STANDARD PIN LENGTH: 0.180inch,
FOR L1 PIN LENGTH OPTION IN MODEL NAME,
USE L1 PIN WITH PIN LENGTH TO 0.110inch,
FOR L2 PIN LENGHT OPTION IN MODEL NAME,
USE L2 PIN WITH PIN LENGTH TO 0.145inch.

Pin	Designation
J1	Vin+
J2	Vin-
J3	On/Off
J4	Vout+
J5	Vout-
J6	Trim

Note: This mechanical outline represents the likeness of an actual product and might not include all fine details.

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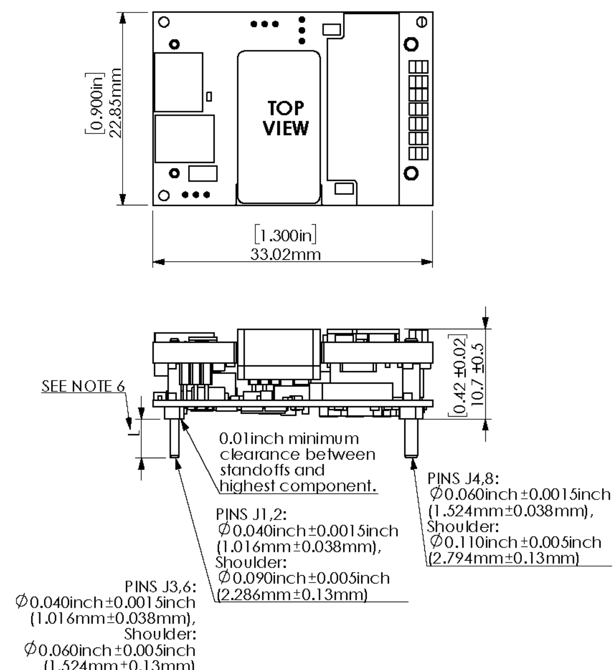
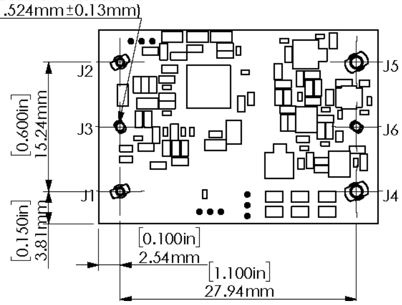
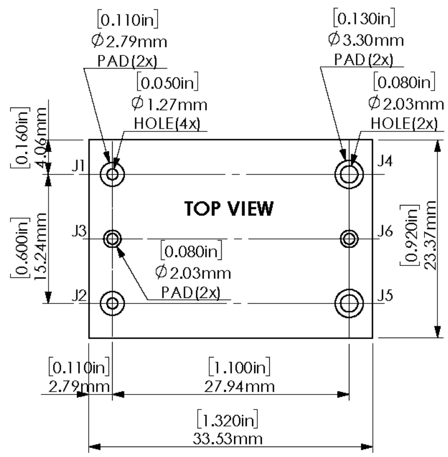
MPS0117V2NC – Open Frame Model

MECHANICAL OUTLINE







RECOMMENDED FOOTPRINT

NOTES:
UNLESS OTHERWISE SPECIFIED:
1: M3 SCREW USED TO BOLT UNIT'S BASEPLATE TO OTHER SURFACES MUST NOT EXCEED 0.094"(2.4mm) DEPTH BELOW THE SURFACE OF BASEPLATE. APPLIED TORQUE PER SCREW SHOULD NOT EXCEED 5.3In-lb(0.6Nm)

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4: ALL TOLERANCES: x.xxin, ±0.02in(x.xmm, ±0.5mm),
x.xxxin, ±0.01in(x.xxmm, ±0.25mm).

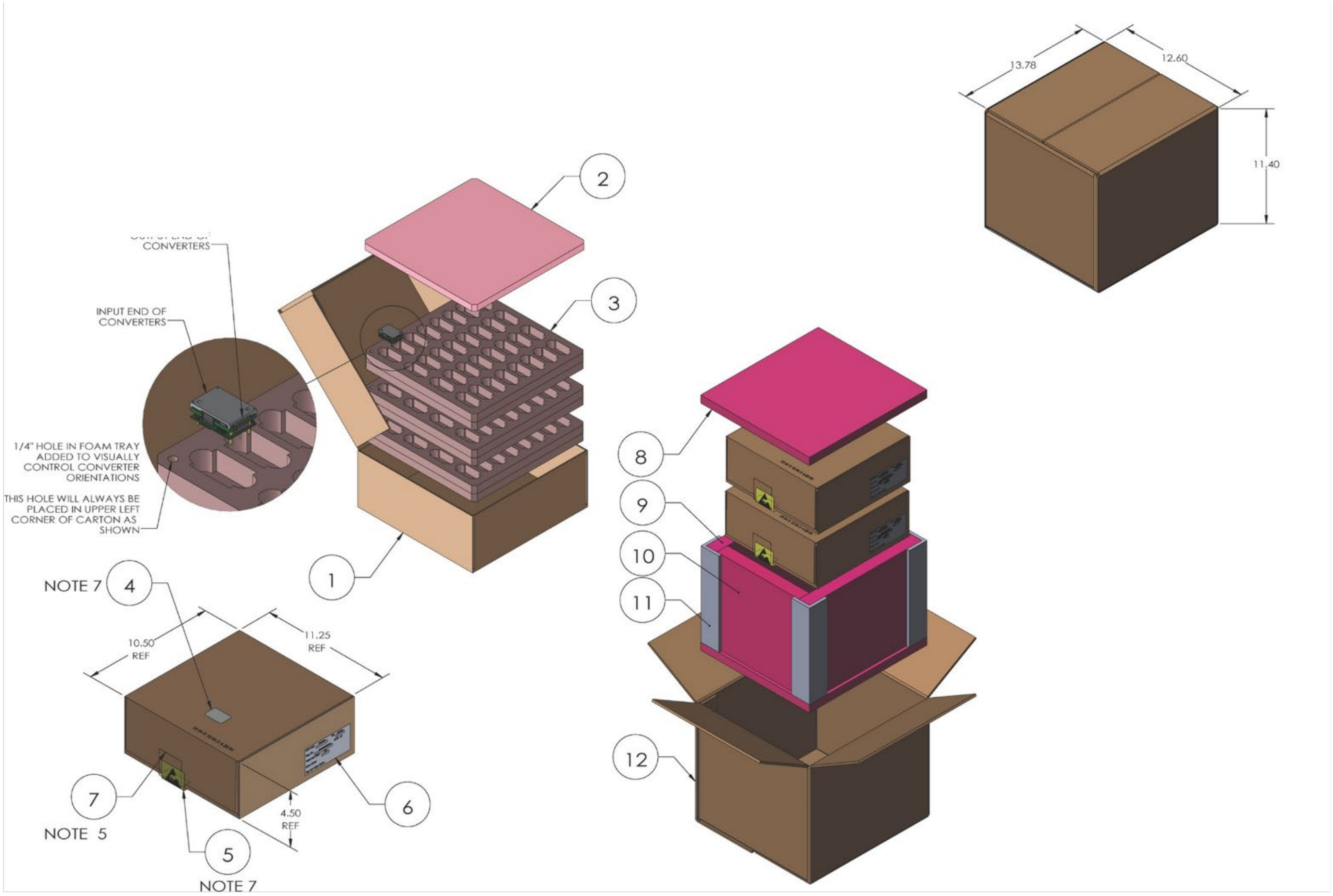
6: STANDARD PIN LENGTH: 0.180inch,
FOR L1 PIN LENGTH OPTION IN MODEL NAME,
USE L1 PIN WITH PIN LENGTH TO 0.110inch,
FOR L2 PIN LENGHT OPTION IN MODEL NAME,
USE L2 PIN WITH PIN LENGTH TO 0.145inch.

Pin	Designation
J1	Vin+
J2	Vin-
J3	On/Off
J4	Vout+
J5	Vout-
J6	Trim

Note: This mechanical outline represents the likeness of an actual product and might not include all fine details.

A

SHIPPING PACKAGING DETAILS



96 Pieces/Internal Box

192 Pieces/Carton

TECHNICAL NOTES

SOLDERING GUIDELINES

Murata Power Solutions recommends the following specifications when installing these converters. These specifications vary depending on the solder type. Exceeding these specifications can cause damage to the product. Be cautious when there is high atmospheric humidity. A mild pre- bake (100° C for 30 minutes) is recommended. Your production environment might differ; therefore, thoroughly review these guidelines with process engineers.

Wave Solder Operation for Through-Hole Mounted Products (THMT)	
For Sn/Ag/Cu based solders:	
Maximum Preheat Temperature	115
Maximum Pot Temperature	270
Maximum Solder Dwell Time	7 seconds
For Sn/Pb based solders:	
Maximum Preheat Temperature	105
Maximum Pot Temperature	250
Maximum Solder Dwell Time	6 seconds

Input Fusing

Certain applications and safety agencies might require fuses at the inputs of power conversion components. Fuses should also be used when there is the possibility of sustained input voltage reversal, which is not currently limited. For greatest safety, it is recommended to use a fast blow fuse installed in the ungrounded input supply line with a value which is approximately twice the maximum line current, calculated at the lowest input voltage. The installer must observe all relevant safety standards and regulations. For safety agency approvals, install the converter in compliance with the end-user safety standard.

Input Under-Voltage Shutdown and Start-Up Threshold

Under normal start-up conditions, converters do not begin to regulate properly until the rising input voltage exceeds and remains at the Start-Up Threshold Voltage (see Specifications). Once operating, converters do not turn off until the input voltage drops below the Under-Voltage Shutdown Limit. Subsequent restart does not occur until the input voltage rises again above the Start-Up Threshold. This built-in hysteresis prevents any unstable on/off operation at a single input voltage.
Users should be aware however of input sources near the Under-Voltage Shutdown whose voltage decays as input current is consumed (such as capacitor inputs), the converter shuts off and then restarts as the external capacitor recharges. Such situations could oscillate. To prevent this, make sure the operating input voltage is well above the UV Shutdown voltage at all times.

Start-Up Delay

Assuming that the output current is set at the rated maximum, the Vin to Vout Start-Up Time (see Specifications) is the time interval between the point when the rising input voltage crosses the Start-Up Threshold and the fully loaded regulated output voltage enters and remains within its specified regulation band. Actual measured times varies with input source impedance, external input capacitance, input voltage slew rate and final value of the input voltage as it appears at the converter.

These converters include a soft start circuit to moderate the duty cycle of the PWM controller at power up, thereby limiting the input inrush current. The On/Off remote control interval from inception to Vout regulated assumes that the converter already has its input voltage stabilized above the Start-Up Threshold before the On command. The interval is measured from the On command until the output enters and remains within its specified regulation band. The specification assumes that the output is fully loaded at maximum rated current.

Input Source Impedance

To ensure peak performance and stability of this module in all applications, the input source impedance and load conditions must be understood. The input source and load conditions will affect the performance of the module in the application. The input source must have a low impedance and to ensure this, a minimum input capacitor of 270uF is recommended, mounted as close as possible to the input pins of the module. The type of capacitor should also be considered, an electrolytic capacitor will degrade at lower temperatures therefore, the chosen capacitor should allow for temperature variations during operation of the module and maintain 270uF. If the input source is inductive, additional low ESR ceramic capacitors in the range of 22-100pF will be required across the Vin terminals to ensure stable operation. The output load also influences the minimum input capacitor requirements. Higher power, dynamic loading conditions may require higher input capacitance to ensure stable operation.

I/O Filtering, Input Ripple Current, and Output Noise

All models in this converter series are tested and specified for input reflected ripple current and output noise using designated external input/output components, circuits and layout as shown in the figures below. External input capacitors (Cin in the figure) serve primarily as energy storage elements, minimizing line voltage variations caused by transient IR drops in the input conductors. Users should select input capacitors for bulk capacitance (at appropriate frequencies), low ESR and high RMS ripple current ratings. In the figure below, the Cbus and Lbus components simulate a typical DC voltage bus. Your specific system configuration may require additional considerations. Note that the values of Cin, Lbus and Cbus varies according to the specific converter model.

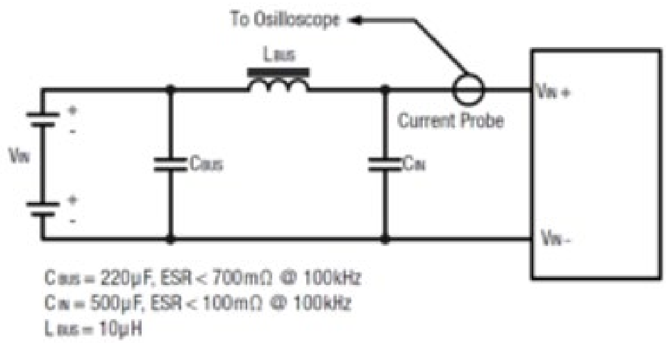


Figure 23. Measuring Input Ripple Current

Emissions Performance

Murata Power Solutions measures its products for conducted emissions against the EN 55022 and CISPR 22 standards. Passive resistance loads are employed and the output is set to the maximum voltage. If you set up your own emissions testing, make sure the output load is rated at continuous power while doing the tests.

The recommended external input and output capacitors (if required) are included. Refer to the fundamental switching frequency. This information is detailed in the Product Specifications. An external discrete filter is installed.

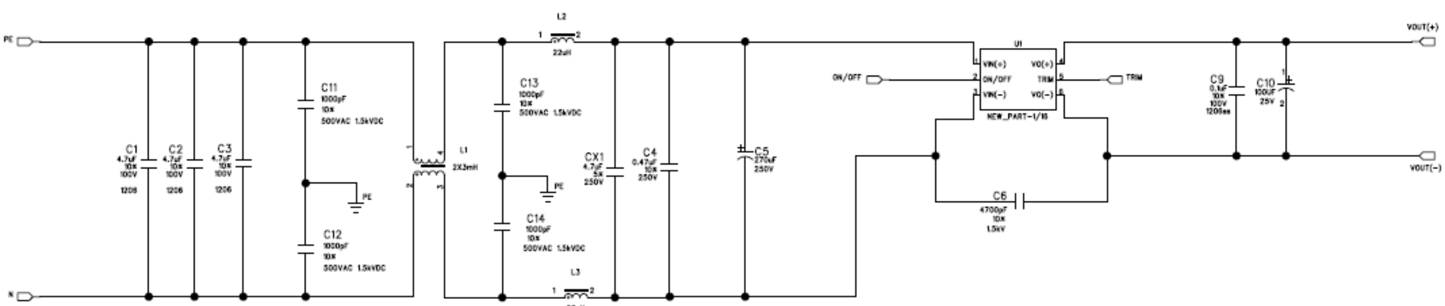
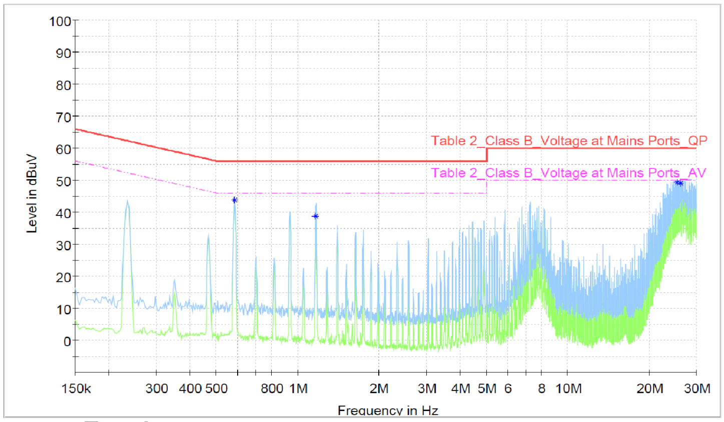


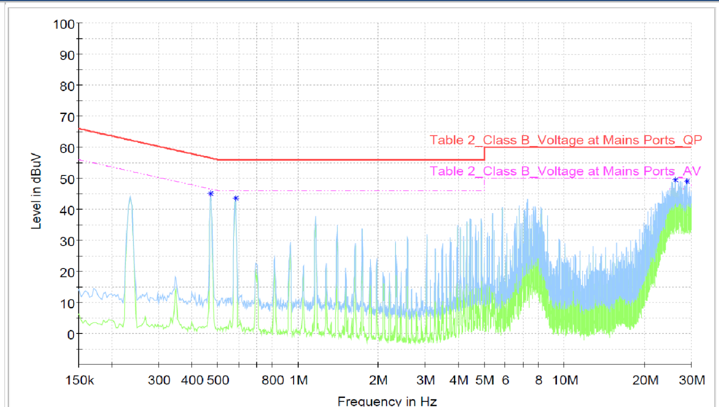
Figure 24. Recommended Input Filter

CONDUCTED EMISSIONS TEST RESULTS



Frequency (MHz)	MaxPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Comment
0.585000	---	42.82	46.00	3.18	---	---	N	10.3	
1.167000	---	38.83	46.00	7.17	---	---	N	10.3	
25.506000	---	46.24	50.00	3.76	---	---	N	10.9	
26.211000	---	46.12	50.00	3.88	---	---	N	11.0	

Figure 26. Vin = 48V, Class B, N-Line



Frequency (MHz)	MaxPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Comment
0.468000	---	42.69	46.55	3.86	---	---	L3	10.2	
0.582000	---	42.58	46.00	3.42	---	---	L3	10.2	
25.518000	---	47.00	50.00	3.00	---	---	L3	10.9	
29.220000	---	45.21	50.00	4.79	---	---	L3	10.9	

Figure 27. Vin = 48V, Class B, L-Line

[1] Layout Recommendations

Most applications can use the filtering that is already installed inside the converter or with the addition of the recommended external capacitors. For greater emissions suppression, consider additional filter components and/or shielding. Emissions performance depend on the user's PC board layout, the chassis shielding environment, and choice of external components. Since many factors affect both the amplitude and spectra of emissions, it is recommended to use an engineer who is experienced at emissions suppression.

Minimum Output Loading Requirements

All models regulate within specification and are stable under no load to full load conditions. Operation under no load might however slightly increase output ripple and noise.

Product Operating Temperature

Product operating temperature is used to monitor the temperature of the product, and proper thermal conditions can be verified by measuring the temperature at position. Temperature at these positions (Tref_point) should not exceed the maximum temperature in the table below. The number of measurement points might vary with different thermal design and topology. Temperatures above maximum Tref_point, measured at the reference point are not allowed and can cause permanent damage.

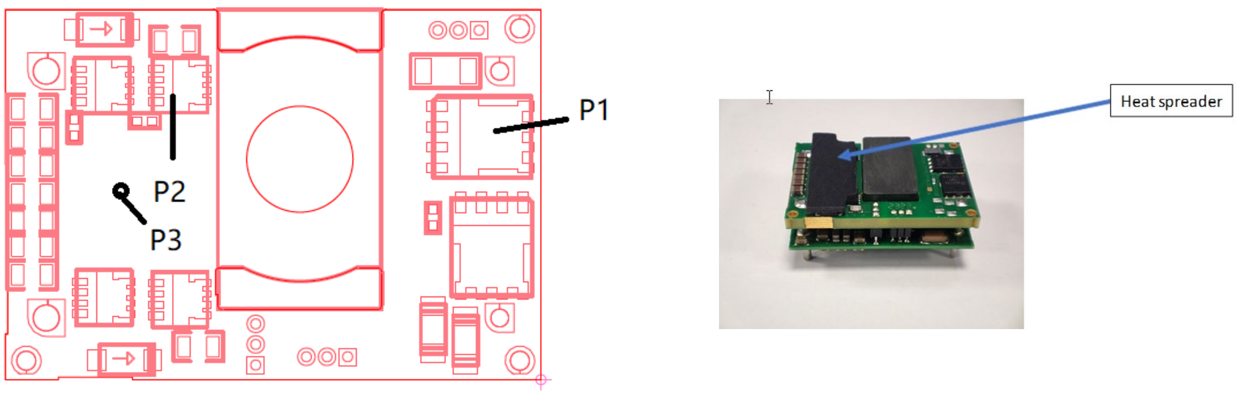


Figure 25. Top View MPS0117V2NC – Open Frame Model

Notes: P1, P2, and P3 should not exceed 125 °c.
P3 = center of heat

Thermal Shutdown

To protect against thermal overstress, these converters include thermal shutdown circuitry. If environmental conditions cause the temperature of the DC/DC's to rise above their operating temperature range (up to the shutdown temperature) an on-board electronic temperature sensor will power down the unit. When the temperature decreases below the turn-on threshold, the converter will automatically restart. There is a small amount of hysteresis to prevent rapid on/off cycling. The temperature sensor is typically located adjacent to the switching controller, approximately in the center of the unit. See the Performance and Functional Specifications.

CAUTION: If you operate too close to the thermal limits, the converter might shut down suddenly without warning. Be sure to thoroughly test your application to the fan flowrate specifications.

Temperature Derating Curves

The graphs in this data sheet illustrate typical operations under a variety of conditions. The Derating curves show the maximum continuous ambient air temperature and decreasing maximum output current, which is acceptable under increasing forced (airflow measured in Linear Feet per Minute "LFM"). Note that these are AVERAGE measurements. The converter accepts brief increases in current or reduced airflow as long as the average is not exceeded.

Note that the temperatures are of the ambient airflow, not the converter itself which is obviously running at higher temperature than the outside air. Also note that very low flow rates (below about 25 LFM) are similar to "natural convection," that is, not using fan-forced airflow.

Murata Power Solutions performs characterization measurements in a closed cycle wind tunnel with calibrated airflow. Both thermocouples and an infrared camera system are used to observe thermal performance. As a practical matter, it is quite difficult to insert an anemometer to precisely measure airflow in most applications. Sometimes it is possible to estimate the effective airflow if you thoroughly understand the enclosure geometry, entry/exit orifice areas and the fan flowrate specifications.

CAUTION: If you exceed the derating guidelines, the converter might have an unplanned Over Temperature shut down. Also, these graphs are all collected near sea level altitude. Ensure to reduce the derating for higher altitude.

Output Current Limiting

As soon as the output current increases to approximately 125% to 150% of its maximum rated value, the DC/DC converter shall enter current limiting mode. The output voltage shall decrease proportionally with increase in output current, thereby maintaining a somewhat constant power output. This is also commonly referred to as power limiting.

Current limiting inception is defined as the point at which full power falls below the rated tolerance. See the Performance/Functional Specifications. Note particularly that the output current might briefly rise above its rated value in normal operation as long as the average power is not exceeded. This enhances reliability and continued operation of your application. If the output current is too high the converter shall enter short circuit protection.

Output Short Circuit Protection

When a converter is in current-limit mode, the output voltage drops as the output current demand increases. If the output voltage drops too low (approximately 98% of nominal output voltage for most models), the magnetically coupled voltage used to develop the PWM bias voltage will also drop, thereby shutting down the PWM controller.

Following a time-out period, the PWM will restart, causing the output voltage to begin rising to its appropriate value. If the short-circuit condition persists, another shutdown cycle will initiate. This rapid on/off cycling is called “hiccup mode.” The hiccup cycling reduces the average output current, thereby preventing excessive internal temperatures and/or component damage. The “hiccup” system differs from older latching short circuit systems because you do not have to power down the converter to make it restart. The system automatically restores operation as soon as the short circuit condition is removed.

Remote On/Off Control

On the input side, a remote On/Off Control can be used with negative logic.

Negative: Models with negative logic are on (enabled) when the On/Off is grounded or brought to within a low voltage (see Specifications) with respect to –Vin. The device is off (disabled) when the On/Off is left open or is pulled high to approximately +15V with respect to –Vin.

Dynamic control of the On/Off function should be able to sink the specified signal current when brought low and withstand appropriate voltage when brought high. There is a finite time in milliseconds (see Specifications) between the time of On/Off Control activation and a stable, regulated output. This time will vary slightly with output load type and current and input conditions.

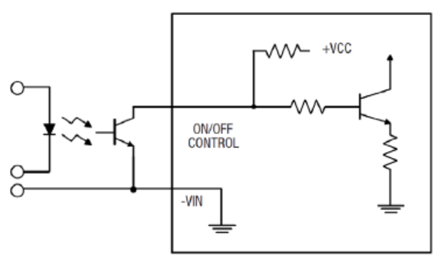


Figure 26. Driving the On/Off Control Pin (suggested circuit)

Output Capacitive Load

These converters do not require added external capacitance to achieve rated specifications. Users should only consider adding capacitance to reduce switching noise and/or to handle spike current step loads. Install only enough capacitance to achieve noise objectives. Excess external capacitance may cause regulation problems, slower transient response and possible instability. Proper wiring of the Sense inputs will improve these factors under capacitive load.

The maximum rated output capacitance and ESR specification is given for a capacitor installed immediately adjacent to the converter. Any extended output wiring or smaller wire gauge or less ground plane may tolerate somewhat higher capacitance. Also, capacitors with higher ESR can use a larger capacitance.

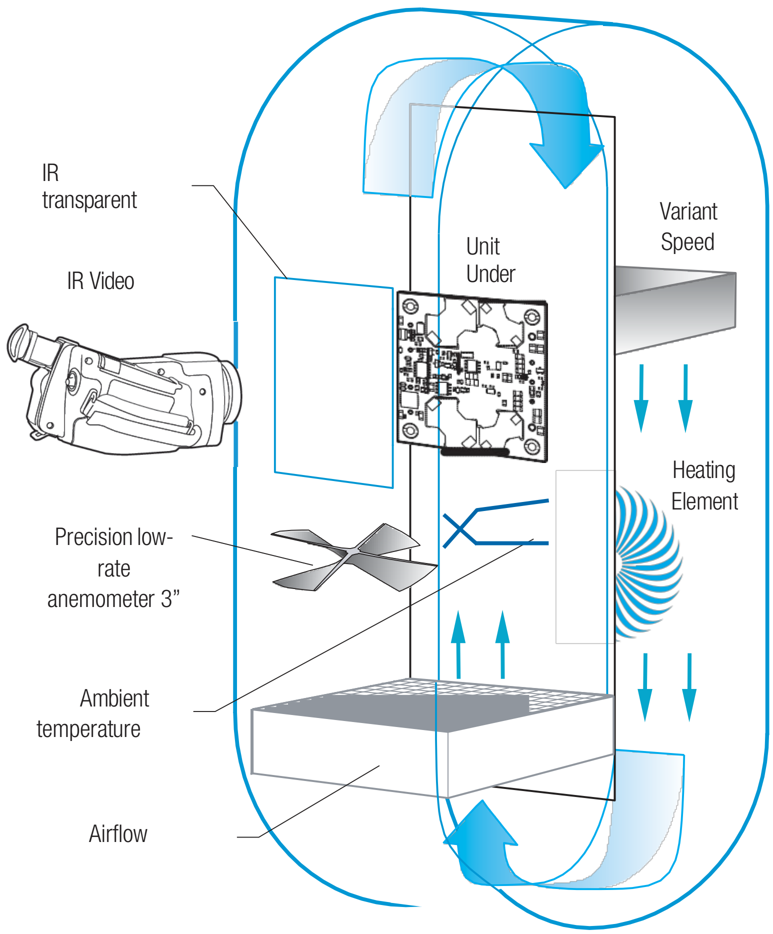


Figure 27. Vertical Wind Tunnel

Vertical Wind Tunnel

Murata Power Solutions employs a computer controlled custom designed closed loop vertical wind tunnel, infrared video camera system, and test instrumentation for accurate airflow and heat dissipation analysis of power products.

The system includes a precision low flow-rate anemometer, variable speed fan, power supply input and load controls, temperature gauges, and adjustable heating element.

The IR camera monitors the thermal performance of the Unit Under Test (UUT) under static steady-state conditions. A special optical port is used which is transparent to infrared wavelengths.

Both through-hole and surface mount converters are soldered down to a 10" x 10" host carrier board, for realistic heat absorption and spreading. Both longitudinal and transverse airflow studies are possible by rotation of this carrier board since there are often significant differences in the heat dissipation in the two airflow directions.

The combination of adjustable airflow, adjustable ambient heat, and adjustable Input/Output currents and voltages mean that a very wide range of measurement conditions can be studied.

The collimator reduces the amount of turbulence adjacent to the UUT. Such turbulence influences the effective heat transfer characteristics and gives false readings. Excess turbulence removes more heat from some surfaces and less heat from others, possibly causing uneven overheating.

Both sides of the UUT are studied since there are different thermal gradients on each side. The adjustable heating element and fan, built-in temperature gauges, and no-contact IR camera mean that power supplies are tested in real-world conditions.

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