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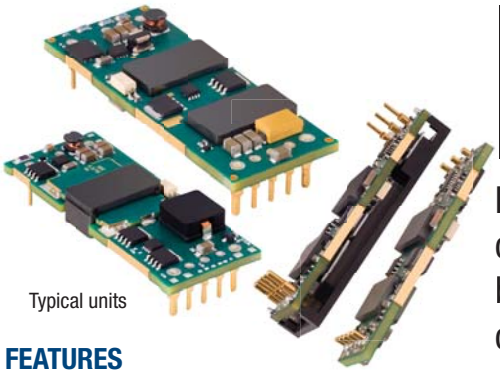
Murata Power Solutions

UEE 150W Series

Isolated, High-Density, Eighth-Brick
DOSA Low Profile DC-DC Converters



Typical units

Output (V)	Current (A)	Nominal Input (V)
3.3	45	48
5	30	48
12	12.5	48

For efficient, fully isolated DC power in the smallest space, the UEE open frame DC-DC converter series fit in industry-standard “eighth brick” outline dimensions and mounting pins (on quarter-brick pinout) or surface mount option.

FEATURES

- Synchronous rectification yields high efficiency over 90%
- 36 to 75 Vdc input range (48V nominal)
- Outstanding thermal performance and derating
- Low profile 0.42" height with 0.9" x 2.3" outline dimensions
- Fully isolated, 2250 Vdc (BASIC) insulation
- Industry standard DOSA eighth-brick pinout and package and surface mount (SMT) option
- Extensive self-protection and short circuit features
- On/Off control, trim and sense functions
- Fully protected against temperature and voltage limits
- RoHS-6 compliant
- UL/IEC 60950-1 and CAN/CSA C22.2 No. 60950-1, 2nd Edition safety approvals
- Monotonic startup into normal and pre-biased loads

PRODUCT OVERVIEW

Units are offered with a fixed output voltage and current up to 45 Amps. UEEs operate over a wide temperature range (up to +85 degrees Celsius at moderate airflow) with full rated power. Synchronous rectifier topology yields excellent efficiency.

UEEs achieve these impressive mechanical and environmental specs while delivering excellent electrical performance in an industry standard DOSA compatible through-hole package or surface mount option. The unit is fully protected against input undervoltage, output overcurrent and short circuit. An on-board temperature sensor shuts down the converter if thermal limits are reached and automatically restarts the converter when the fault is removed.

An On/Off control input enables phased startup and shutdown in multi-voltage applications. UEEs include a Sense input to correct for ohmic losses. A trim input may be connected to a user’s adjustment potentiometer or trim resistors for output voltage calibration.

UEEs include industry-standard safety certifications and BASIC I/O insulation provides input/output isolation to 2250V. Radiation and conducted emission testing is performed to widely accepted EMC standards.

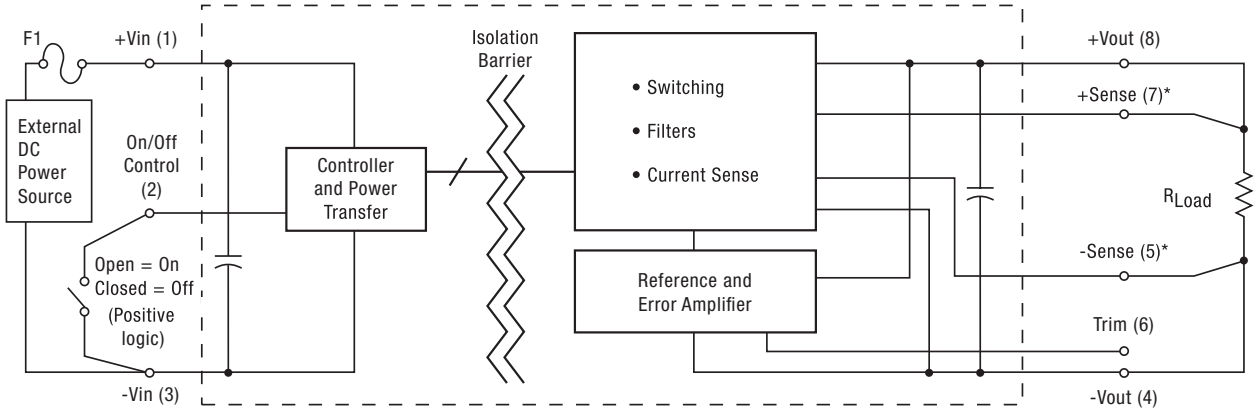


Figure 1. Connection Diagram
Typical topology is shown. Murata Power Solutions recommends an external fuse.

RoHS COMPLIANT

For full details go to
www.murata-ps.com/rohs

PERFORMANCE SPECIFICATIONS SUMMARY AND ORDERING GUIDE

Model Family	Output							Input				Efficiency		Dimensions	
	V_{OUT} (V)	I_{OUT} (A)	Power (W)	Ripple & Noise (mVp-p) Typ.	Ripple & Noise (mVp-p) Max.	Regulation (max.) Line	Regulation (max.) Load	V_{IN} Nom. (V)	Range (V)	I_{IN}, no load (mA)	I_{IN}, full load (A)	Min.	Typ.	Inches	Millimeters
UEE-3.3/45-D48	3.3	45.5	150	45	80	±0.1%	±0.25%	48	36-75	80	3.4	91%	92%	2.3 x 0.9 x 0.42	58.42 x 22.9 x 10.7
UEE-5/30-D48	5	30	150	50	80	±0.1%	±0.1%	48	36-75	100	3.4	91%	92%	2.3 x 0.9 x 0.42	58.42 x 22.9 x 10.7
UEE-12/12.5-D48	12	12.5	150	100	150	±0.1%	±0.25%	48	36-75	120	3.36	92%	93%	2.3 x 0.9 x 0.42	58.42 x 22.9 x 10.7

① Please refer to the model number structure for additional ordering part numbers and options.
② All specifications are typical unless noted. General conditions for Specifications are +25 deg.C, Vin=nominal, Vout=nominal (no trim installed), full rated load. Adequate airflow must be supplied for extended testing under power.

All models are tested and specified with external 1µF and 10 µF paralleled output capacitors and no external input capacitor. All capacitors are low ESR types. Caps are layout dependent. These capacitors are necessary to accommodate our test equipment and may not be required in your applications. All models are stable and regulate within spec under no-load conditions.

PART NUMBER STRUCTURE

U EE - 3.3 / 45 - D48 N M B H Lx - C

Output Configuration:
U = Unipolar/Single

Eighth-Brick Package

Nominal Output Voltage

Maximum Rated Output
Current in Amps

Input Voltage Range:
D48 = 36-75V,
48V nominal

On/Off Control Logic
N = Negative logic, standard
P = Positive logic, optional

Surface Mount (SMT models cannot accept the baseplate)
Blank = Thru-hole pin mount, no SMT
M = Surface mount (MSL Rating 2a) ②

Baseplate (optional, not available on SMT models)
Blank = No baseplate, standard
B = Baseplate installed, optional, special quantity order

Conformal coating (optional)
Blank = no coating, standard
H = Coating added, optional, special quantity order
(not available on SMT models)

Pin Length Option (Through-hole packages only)
Blank = Standard pin length 0.180 inches (4.6mm)
L1 = Pin length 0.110 inches (2.79mm) ①
L2 = Pin length 0.145 inches (3.68mm) ①

RoHS Hazardous Materials compliance
C = RoHS6 (does not claim EU RoHS exemption 7b–lead in solder), standard

① **Special quantity order is required; samples available with standard pin length only.**
② **SMT (M) versions not available in sample quantities.**
③ **Some model number combinations may not be available. See website or contact your local Murata sales representative.**

FUNCTIONAL SPECIFICATIONS, UEE-3.3/45-D48

ABSOLUTE MAXIMUM RATINGS	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Input Voltage, Continuous		0		80	Vdc
Input Voltage, Transient	100 mS max. duration			100	Vdc
Isolation Voltage	Input to output, continuous			2250	Vdc
On/Off Remote Control	Power on, referred to -Vin	0		15	Vdc
Output Power		0		151.65	W
Output Current	Current-limited, no damage, short-circuit protected	0		45.5	A
Storage Temperature Range	Vin = Zero (no power)	-55		125	°C
Absolute maximums are stress ratings. Exposure of devices to greater than any of these conditions may adversely affect long-term reliability. Proper operation under conditions other than those listed in the Performance/Functional Specifications Table is not implied or recommended.					
INPUT	**Conditions ① ③**				
Operating Voltage Range		36	48	75	Vdc
Recommended External Fuse	Fast blow			10	A
Start-Up Threshold	Rising input voltage	33.5	34.5	35.5	Vdc
Undervoltage Shutdown	Falling input voltage	32	33	34	Vdc
Overvoltage Shutdown			None		Vdc
Internal Filter Type			Pi		
Input Current					
Full Load Conditions	Vin = nominal		3.4	3.51	A
Low Line Input Current	Vin = minimum		4.63	4.79	A
Inrush Transient			0.05	0.1	A^2-Sec.
Short Circuit Input Current			300	500	mA
No Load	Iout = minimum, unit = ON		80	120	mA
Shut-Down Input Current (Off, UV, OT)			7	10	mA
Reflected (back) ripple current ②	Measured at input with specified filter		20	40	mA, P-P
Pre-biased startup	External output voltage < Vset		Monotonic		
GENERAL and SAFETY					
Efficiency	Vin = 48V, full load	91	92		%
Isolation					
Isolation Voltage	Input to output, continuous	2250			Vdc
Isolation Voltage	Input to baseplate, continuous	1500			Vdc
Isolation Voltage	Output to baseplate, continuous	1500			Vdc
Insulation Safety Rating			basic		
Isolation Resistance			10		MΩ
Isolation Capacitance			1000		pF
Safety	Certified to UL-60950-1, CSA-C22.2 No.60950-1, IEC 60950-1, 2nd edition		Yes		
Calculated MTBF	Per Telcordia SR-332, issue 1, class 1, ground fixed, Tcase = +25°C		2.5		Hours x 10^6
DYNAMIC CHARACTERISTICS					
Fixed Switching Frequency			400		KHz
Startup Time			6	10	mS
Rise Time			15	25	mS
Dynamic Load Response	50-75-50% load step, settling time to within ±1% of Vout		2500	3000	µSec
Dynamic Load Peak Deviation	same as above		±250	±350	mV
FEATURES and OPTIONS					
Remote On/Off Control ④					
"N" suffix:					
Negative Logic, ON state	ON = Ground pin or external voltage	-0.1		0.8	Vdc
Negative Logic, OFF state	OFF = Pin open or external voltage	2.5		15	Vdc
Control Current	Open collector/drain		0.2	1	mA
"P" suffix:					
Positive Logic, ON state	ON = Pin open or external voltage	2.5		15	V
Positive Logic, OFF state	OFF = Ground pin or external voltage	0		1	V
Control Current	Open collector/drain		0.2	1	mA
Remote Sense	Sense connected to load		10		%
Base Plate	"B" suffix		optional		
SMT Mounting	"M" suffix		optional		

FUNCTIONAL SPECIFICATIONS, UEE-3.3/45-D48 (CONT.)

OUTPUT	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Total Output Power	See Derating		150.15	151.65	W
Voltage					
Nominal Output Voltage	No trim	3.267	3.3	3.333	Vdc
Setting Accuracy	At 50% load, no trim	-1		1	% of Vnom
Output Voltage Range	User-adjustable	-20		10	% of Vnom.
Overvoltage Protection	Via magnetic feedback		4.3	6.3	Vdc
Current					
Output Current Range		0	45.5	45.5	A
Current Limit Inception	10% of Vnom., after warmup	52	60	70	A
Short Circuit					
Short Circuit Current	Hiccup technique, autorecovery within ±1.25% of Vout		4	8	A
Short Circuit Duration (remove short for recovery)	Output shorted to ground, no damage		Continuous		
Short circuit protection method	Current limiting		Yes		
Regulation					
Line Regulation	Vin = min. to max., Vout = nom., Iout = nom.			±0.1	% of Vout
Load Regulation	Iout = min. to max.,			±0.25	% of Vout
Ripple and Noise ②	5 Hz- 20 MHz BW		45	80	mV pk-pk
Temperature Coefficient	At all outputs		0.008	0.02	% of Vout./°C
Maximum Capacitive Loading	Low ESR, resistive load only			20000	µF
MECHANICAL (Through Hole Models)					
Outline Dimensions			2.3 x 0.9 x 0.42		Inches
(Please refer to outline drawing)	L x W x H		58.42 x 22.9 x 10.7		mm
Weight	No baseplate		0.88		Ounces
			25		Grams
	With baseplate		1.3		Ounces
			37		Grams
Through Hole Pin Diameter			0.04 & 0.062		Inches
			1.016 & 1.575		mm
Through Hole Pin Material			Copper alloy		
TH Pin Plating Metal and Thickness	Nickel subplate		100-299		µ-inches
	Gold overplate		10-31		µ-inches
ENVIRONMENTAL					
Operating Ambient Temperature Range	With Derating	-40		85	°C
Operating Case Temperature Range	No derating.	-40		115	°C
Storage Temperature	Vin = Zero (no power)	-55		125	°C
Thermal Protection/Shutdown	Measured in center	115	125	130	°C
Electromagnetic Interference	External filter is required				
Conducted, EN55022/CISPR22			A		Class
RoHS rating			RoHS-6		

Notes

① Unless otherwise noted, all specifications are at nominal input voltage, nominal output voltage and full load.
General conditions are +25° Celsius ambient temperature, near sea level altitude, natural convection airflow.
All models are tested and specified with external parallel 1 µF and 10 µF multi-layer ceramic output capacitors.
A 220µF external input capacitor is used. All capacitors are low-ESR types wired close to the converter.

② Input (back) ripple current is tested and specified over 5 Hz to 20 MHz bandwidth. Input filtering is Cbus=220 µF, Cin=33 µF and Lbus=12 µH.

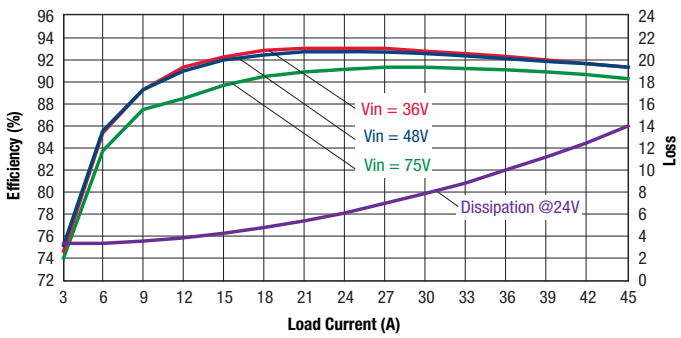
③ All models are stable and regulate to specification under no load.

④ The Remote On/Off Control is referred to -Vin. For external transistor control, use open collector logic or equivalent.

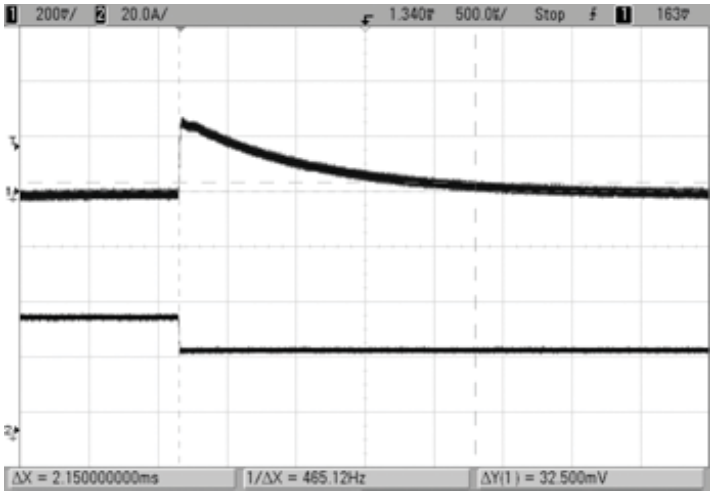
⑤ NOTICE—Please use only this customer data sheet as product documentation when laying out your printed circuit boards and applying this product into your application. Do NOT use other materials as official documentation such as advertisements, product announcements, or website graphics.
We strive to have all technical data in this customer data sheet highly accurate and complete. This customer data sheet is revision-controlled and dated. The latest customer data sheet revision is normally on our website (www.murata-ps.com) for products which are fully released to Manufacturing. Please be especially careful using any data sheets labeled "Preliminary" since data may change without notice. The pinout (Pxx) and case (Cxx) designations (typically P32 or C56) refer to a generic family of closely related information. It may not be a single pinout or unique case outline. Please be aware of small details which may affect your application and PC board layouts. Study the Mechanical Outline drawings, Input/Output Connection table and all footnotes very carefully. Please contact Murata Power Solutions if you have any questions.

TYPICAL PERFORMANCE DATA AND OSCILLOGRAMS, UEE-3.3/45-D48

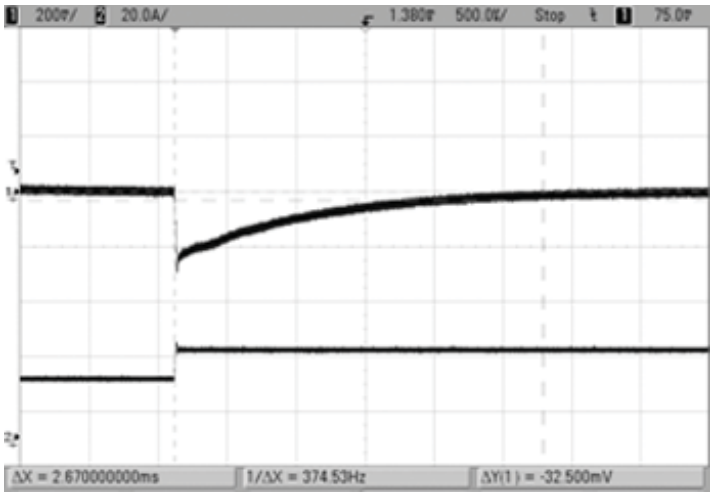
Efficiency and Power Dissipation @ 25°C



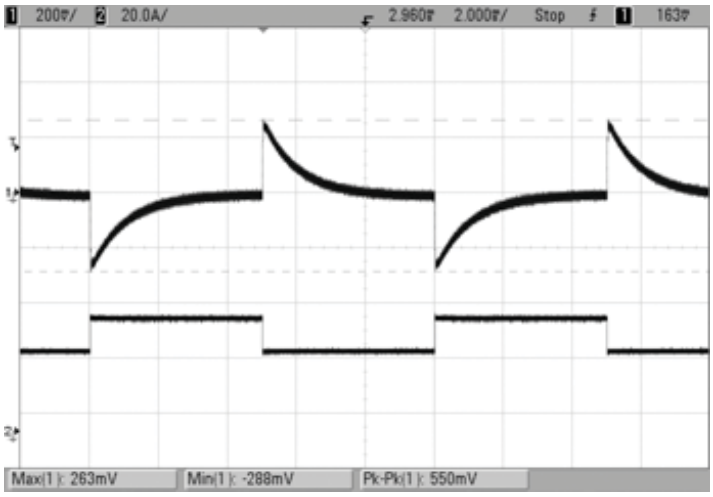
Step Load Transient Response (Vin=48V, Vout=nom, Cload=1uF || 10uF, Iout=75% to 50% of full load, Ta=+25°C) Ch1=Vout, Ch2=Iout



Step Load Transient Response (Vin=48V, Vout=nom, Cload=1uF || 10uf, Iout=50% to 75% of full load, Ta=+25°C) Ch1=Vout, Ch2=Iout

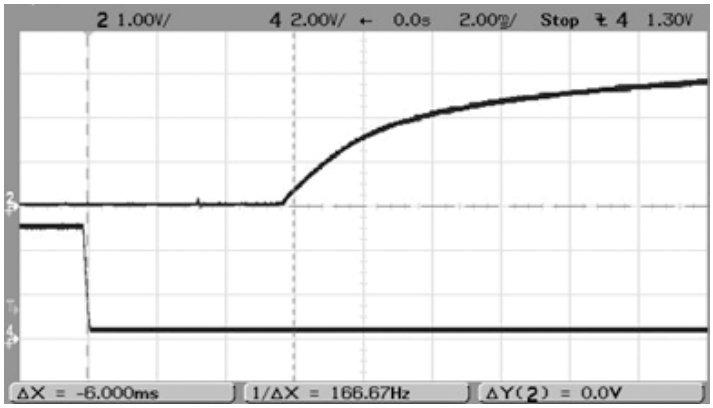


Step Load Transient Response (Vin=48V, Vout=nom, Cload= 1uF || 10uF, Iout=50 to 75 to 50% of full load, Ta=+25°C) Ch1=Vout, Ch2=Iout.

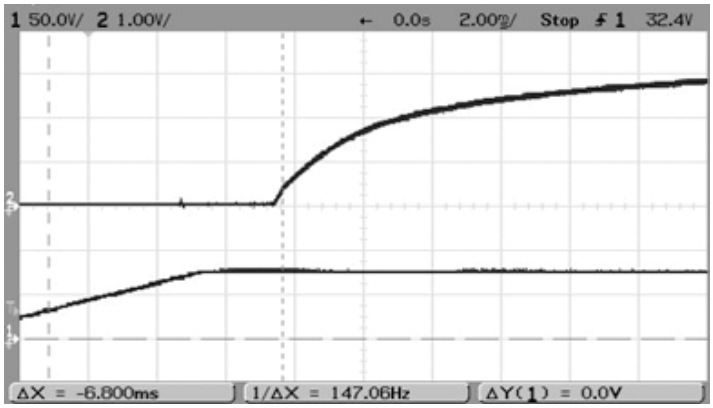


TYPICAL PERFORMANCE DATA AND OSCILLOGRAMS, UEE-3.3/45-D48

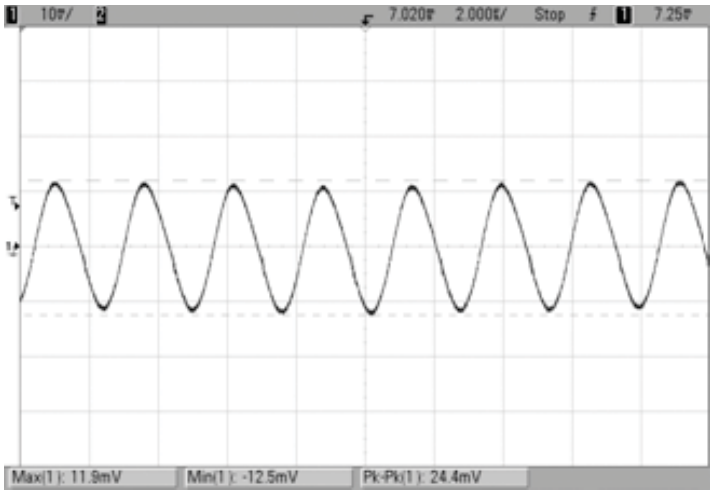
Enable Start Up Delay (Vin=48V, Vout=nom, Iout=45.5A, Cload=20000uF, Ta=+25°C)
Ch2= Vout, Ch4=Enable.



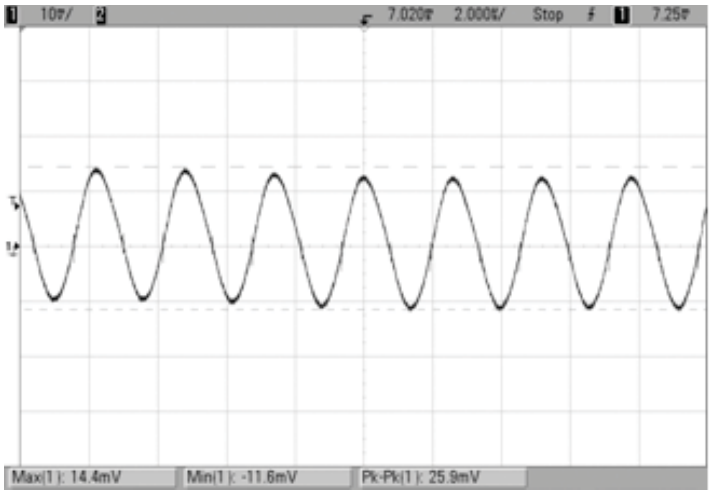
Vin Start Up Delay(Vin=48V, Vout=nom, Iout=45.5A, Cload=20000uF, Ta=+25°C)
Ch2= Vout, Ch1=Enable.



Output Ripple and noise (Vin=48V, Vout=nom, Iout=0A, Cload= 1uf || 10uF,
Ta=+25°C, ScopeBW=20Mhz)

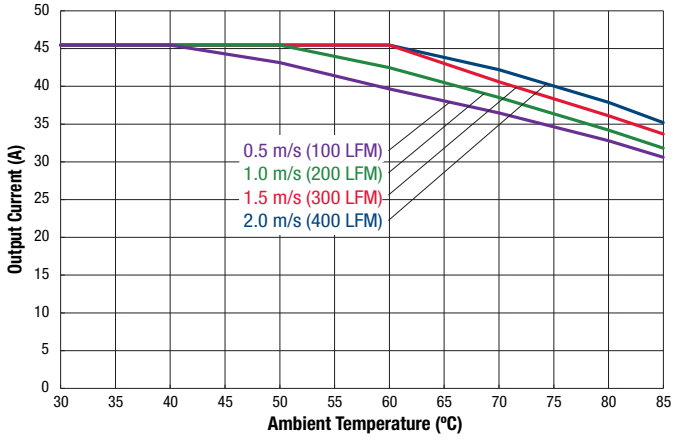


Output Ripple and noise (Vin=48V, Vout=nom, Iout=45.5A, Cload= 1uf || 10uF,
Ta=+25°C, ScopeBW=20Mhz)

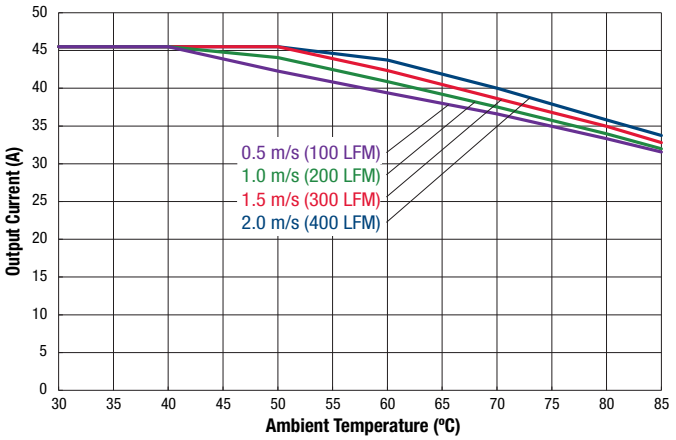


TYPICAL PERFORMANCE DATA AND OSCILLOGRAMS, UEE-3.3/45-D48

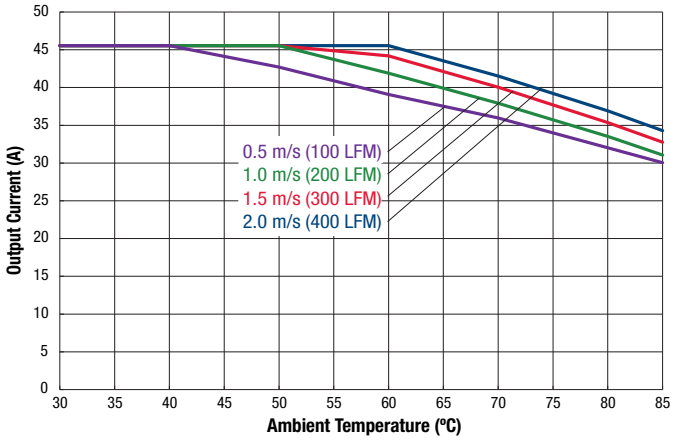
Maximum Current Temperature Derating at Sea Level
(Vin = 36V, with baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)



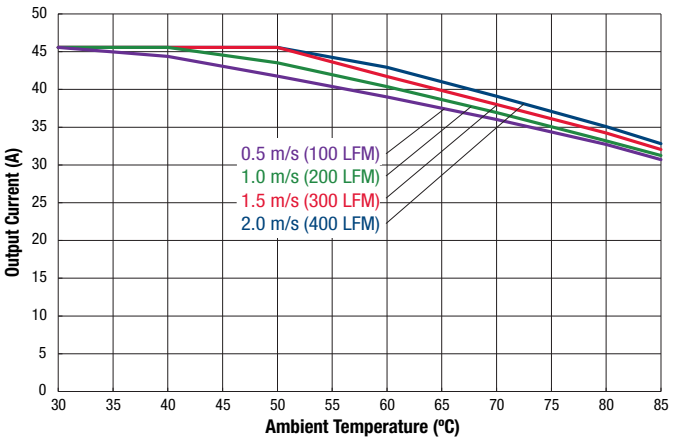
Maximum Current Temperature Derating at Sea Level
(Vin = 36V, with baseplate. Airflow Direction Is Longitudinal from Vin to Vout.)



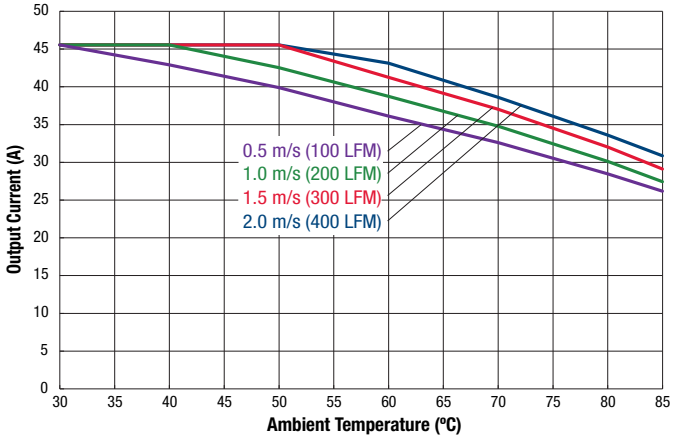
Maximum Current Temperature Derating at Sea Level
(Vin = 48V, with baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)



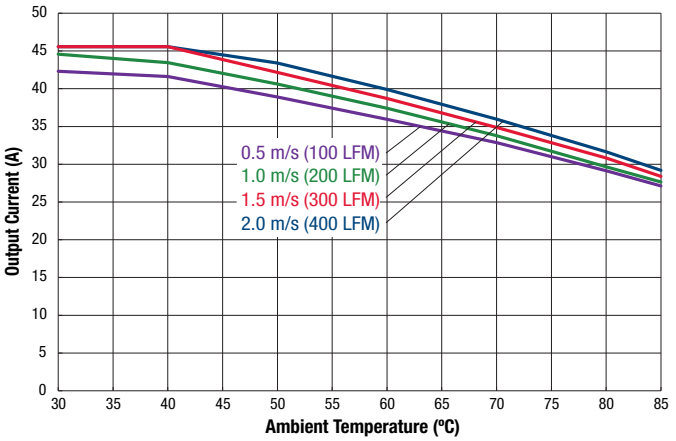
Maximum Current Temperature Derating at Sea Level
(Vin = 48V, with baseplate. Airflow Direction Is Longitudinal from Vin to Vout.)



Maximum Current Temperature Derating at Sea Level
(Vin = 75V, with baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)

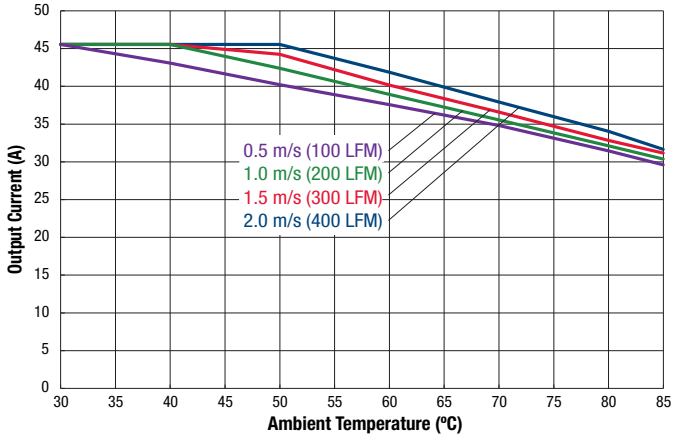


Maximum Current Temperature Derating at Sea Level
(Vin = 75V, with baseplate. Airflow Direction Is Longitudinal from Vin to Vout.)

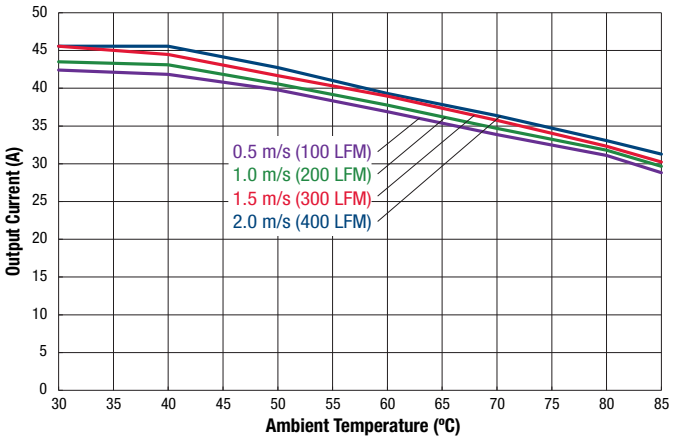


TYPICAL PERFORMANCE DATA AND OSCILLOGRAMS, UEE-3.3/45-D48

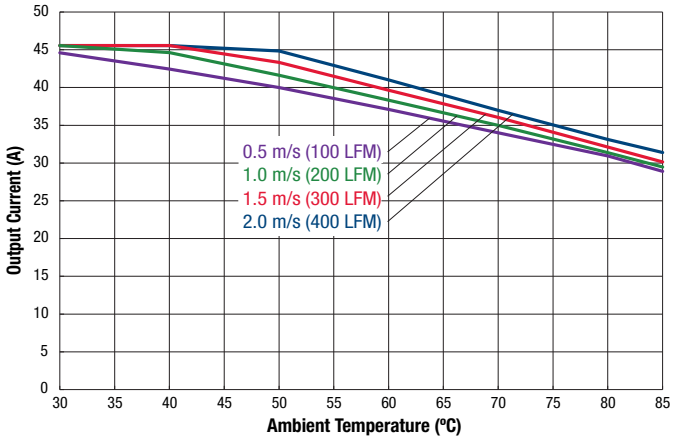
Maximum Current Temperature Derating at Sea Level
(Vin = 36V, without baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)



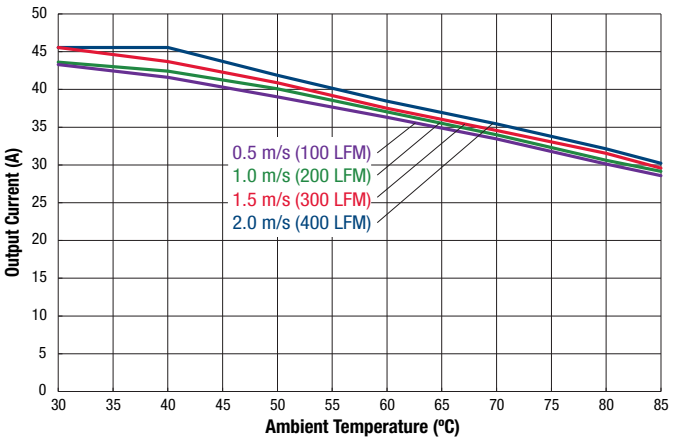
Maximum Current Temperature Derating at Sea Level
(Vin = 36V, without baseplate. Airflow Direction Is Longitudinal from Vin to Vout.)



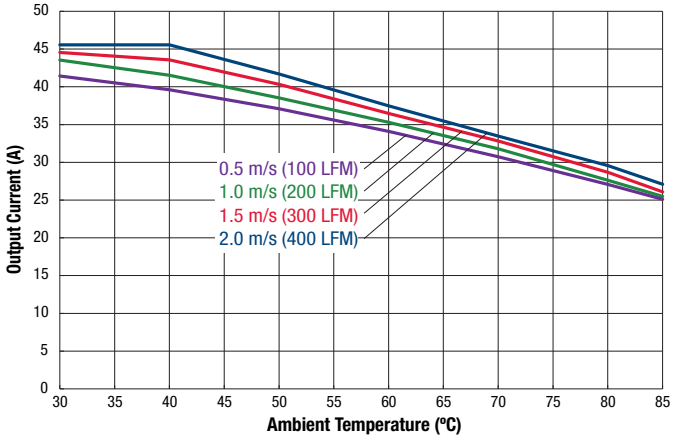
Maximum Current Temperature Derating at Sea Level
(Vin = 48V, without baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)



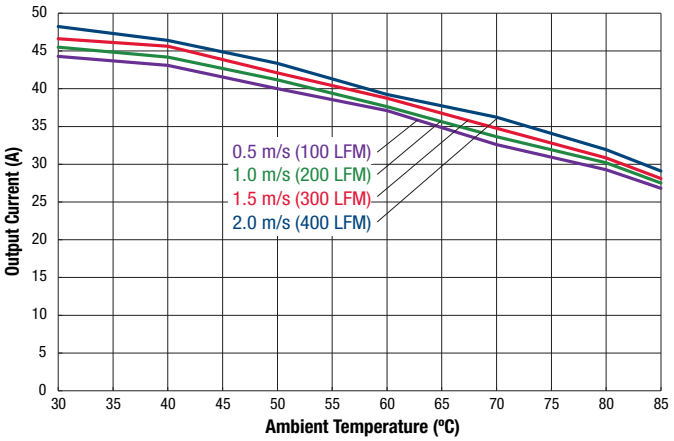
Maximum Current Temperature Derating at Sea Level
(Vin = 48V, without baseplate. Airflow Direction Is Longitudinal from Vin to Vout.)



Maximum Current Temperature Derating at Sea Level
(Vin = 75V, without baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)



Maximum Current Temperature Derating at Sea Level
(Vin = 75V, without baseplate. Airflow Direction Is Longitudinal from Vin to Vout.)



Emissions Performance, Model UEE-3.3/45-D48

Murata Power Solutions measures its products for radio frequency 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. Please refer to the fundamental switching frequency. All of this information is listed in the Product Specifications. An external discrete filter is installed and the circuit diagram is shown below.

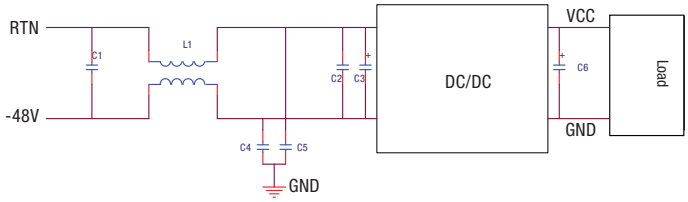


Figure 2. Conducted Emissions Test Circuit

[1] Conducted Emissions Parts List

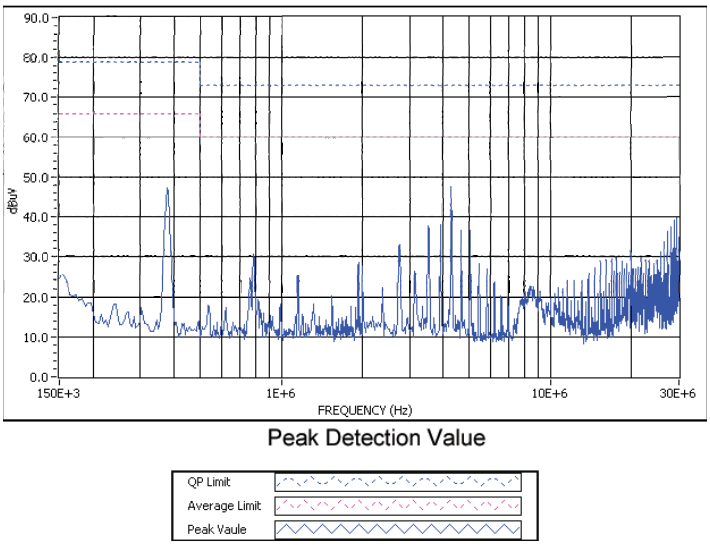
[2] Conducted Emissions Test Equipment Used

Spectrum Analyzer – Hewlett Packard HP8594L

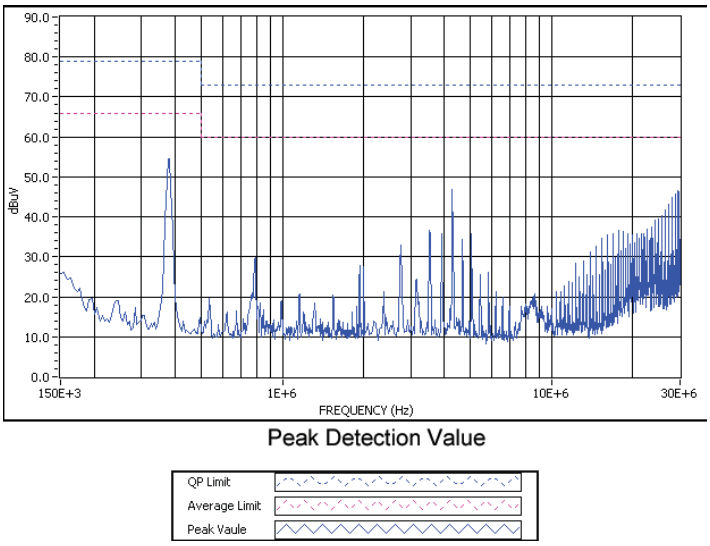
Line Impedance Stabilization Network (LISN) – 2 Line V-Networks LS1-15V, 50 Ω, 50 µH

Designation	Value	Part Number	Description	Vendor
C1	1 µF	GRM32ER72A105KA01L	SMD Ceramic, 100V, 1000nF, X7R-1210	Murata
C2	100 nF	GRM319R72A104KA01D	SMD Ceramic, 100V, 100nF ±10%, X7R-1206	Murata
L1	1320 µH	LB16H1324	Common Mode choke, 1320 µH, ±25%, 4A, R5K, *21*21*12.5mm	High Light
C4, C5	0.022 µF	GRM32DR73A223KW01L	SMD Ceramic, 1000V, 0.022 µF, ±10%, X7R-1210	Murata
C3	220 µF	UHE2A221MHD	Alum. electrolytic, 100V, 220 µF, ±10%, long lead	Nichicon
C6	Not used		Not used for this model	

[3] Conducted Emissions Test Results



Graph 1. Conducted emissions performance, Positive Line, CISPR 22, Class A, 48 Vin, full load



Graph 2. Conducted emissions performance, Negative Line, CISPR 22, Class A, 48 Vin, full load

FUNCTIONAL SPECIFICATIONS, UEE-5/30-D48

ABSOLUTE MAXIMUM RATINGS	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Input Voltage, Continuous		0		80	Vdc
Input Voltage, Transient	100 mS max. duration			100	Vdc
Isolation Voltage	Input to output, continuous			2250	Vdc
On/Off Remote Control	Power on, referred to -Vin	0		15	Vdc
Output Power		0		151.5	W
Output Current	Current-limited, no damage, short-circuit protected	0		30	A
Storage Temperature Range	Vin = Zero (no power)	-55		125	°C
Absolute maximums are stress ratings. Exposure of devices to greater than any of these conditions may adversely affect long-term reliability. Proper operation under conditions other than those listed in the Performance/Functional Specifications Table is not implied or recommended.					
INPUT	**Conditions ① ③**				
Operating Voltage Range		36	48	75	Vdc
Recommended External Fuse	Fast blow			10	A
Start-Up Threshold	Rising input voltage	33	34	35	Vdc
Undervoltage Shutdown	Falling input voltage	32	33	34	Vdc
Overvoltage Shutdown			None		Vdc
Internal Filter Type			Pi		
Input Current					
Full Load Conditions	Vin = nominal		3.4	3.51	A
Low Line Input Current	Vin = minimum		4.58	4.73	A
Inrush Transient				0.5	A^2-Sec.
Short Circuit Input Current			150		mA
No Load	Iout = minimum, unit = ON		100	120	mA
Shut-Down Input Current (Off, UV, OT)			6	10	mA
Reflected (back) ripple current ②	Measured at input with specified filter		50		mA, P-P
Pre-biased startup	External output voltage < Vset		Monotonic		
GENERAL and SAFETY					
Efficiency	Vin = 48V, full load	91	92		%
Isolation					
Isolation Voltage	Input to output, continuous	2250			Vdc
Isolation Voltage	Input to baseplate, continuous	1500			Vdc
Isolation Voltage	Output to baseplate, continuous	1500			Vdc
Insulation Safety Rating			basic		
Isolation Resistance			10		MΩ
Isolation Capacitance			1000		pF
Safety	Certified to UL-60950-1, CSA-C22.2 No.60950-1, IEC 60950-1, 2nd edition		Yes		
Calculated MTBF	Per Telcordia SR-332, issue 1, class 1, ground fixed, Tcase = +25°C		2.5		Hours x 10^6
DYNAMIC CHARACTERISTICS					
Fixed Switching Frequency			400		KHz
Startup Time			5	10	mS
Rise Time			8	15	mS
Dynamic Load Response	50-75-50% load step, settling time to within ±1% of Vout		2000	2500	µSec
Dynamic Load Peak Deviation	same as above		±300	±450	mV
FEATURES and OPTIONS					
Remote On/Off Control ④					
"N" suffix:					
Negative Logic, ON state	ON = Ground pin or external voltage	-0.1		0.8	Vdc
Negative Logic, OFF state	OFF = Pin open or external voltage	2.5		15	Vdc
Control Current	Open collector/drain		1	2	mA
"P" suffix:					
Positive Logic, ON state	ON = Pin open or external voltage	3.5		15	V
Positive Logic, OFF state	OFF = Ground pin or external voltage	0		1	V
Control Current	Open collector/drain		1	2	mA
Remote Sense	Sense connected to load		10		%
Base Plate	"B" suffix		optional		
SMT Mounting	"M" suffix		optional		

FUNCTIONAL SPECIFICATIONS, UEE-5/30-D48 (CONT.)

OUTPUT	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Total Output Power	See Derating		150	151.5	W
Voltage					
Nominal Output Voltage	No trim	4.95	5	5.05	Vdc
Setting Accuracy	At 50% load, no trim	-1		1	% of Vnom
Output Voltage Range	User-adjustable	-20		10	% of Vnom.
Overvoltage Protection	Via magnetic feedback		6.5	7.5	Vdc
Current					
Output Current Range		0	30	30	A
Current Limit Inception	10% of Vnom., after warmup	35	40	45	A
Short Circuit					
Short Circuit Current	Hiccup technique, autorecovery within ±1.25% of Vout		3	4	A
Short Circuit Duration (remove short for recovery)	Output shorted to ground, no damage		Continuous		
Short circuit protection method	Current limiting		Yes		
Regulation					
Line Regulation	Vin = min. to max., Vout = nom., Iout = nom.			±0.1	% of Vout
Load Regulation	Iout = min. to max., Vin = 48V			±0.1	% of Vout
Ripple and Noise ②	5 Hz- 20 MHz BW		50	80	mV pk-pk
Temperature Coefficient	At all outputs			0.02	% of Vout./°C
Maximum Capacitive Loading	Low ESR	220		10000	µF
MECHANICAL (Through Hole Models)					
Outline Dimensions			2.3 x 0.9 x 0.42		Inches
(Please refer to outline drawing)	L x W x H		58.42 x 22.9 x 10.7		mm
Weight	No baseplate		1.09		Ounces
			31		Grams
	With baseplate		tbd		Ounces
			tbd		Grams
Through Hole Pin Diameter			0.04 & 0.062		Inches
			1.016 & 1.575		mm
Through Hole Pin Material			Copper alloy		
TH Pin Plating Metal and Thickness	Nickel subplate		100-299		µ-inches
	Gold overplate		10-31		µ-inches
ENVIRONMENTAL					
Operating Ambient Temperature Range	With Derating	-40		85	°C
Operating Case Temperature Range	No derating.	-40		115	°C
Storage Temperature	Vin = Zero (no power)	-55		125	°C
Thermal Protection/Shutdown	Measured in center	115	125	130	°C
Electromagnetic Interference	External filter is required				
Conducted, EN55022/CISPR22			A		Class
RoHS rating			RoHS-6		

Notes

① Unless otherwise noted, all specifications are at nominal input voltage, nominal output voltage and full load.
General conditions are +25° Celsius ambient temperature, near sea level altitude, natural convection airflow.
All models are tested and specified with external parallel 1 µF and 10 µF multi-layer ceramic output capacitors.
A 220µF external input capacitor is used. All capacitors are low-ESR types wired close to the converter.

② Input (back) ripple current is tested and specified over 5 Hz to 20 MHz bandwidth. Input filtering is Cbus=220 µF, Cin=33 µF and Lbus=12 µH.

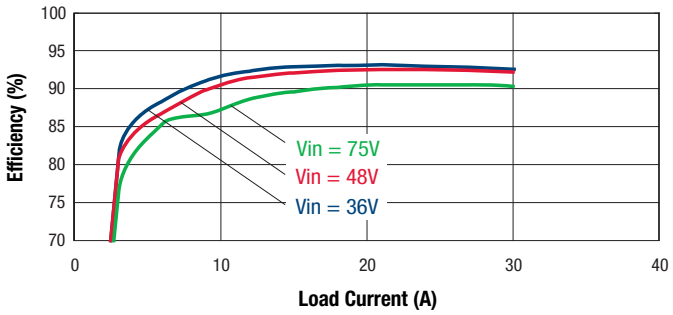
③ All models are stable and regulate to specification under no load.

④ The Remote On/Off Control is referred to -Vin. For external transistor control, use open collector logic or equivalent.

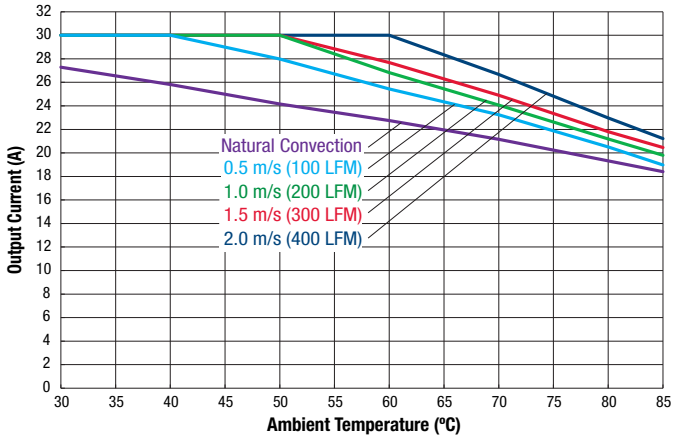
⑤ NOTICE—Please use only this customer data sheet as product documentation when laying out your printed circuit boards and applying this product into your application. Do NOT use other materials as official documentation such as advertisements, product announcements, or website graphics.
We strive to have all technical data in this customer data sheet highly accurate and complete. This customer data sheet is revision-controlled and dated. The latest customer data sheet revision is normally on our website (www.murata-ps.com) for products which are fully released to Manufacturing. Please be especially careful using any data sheets labeled "Preliminary" since data may change without notice. The pinout (Pxx) and case (Cxx) designations (typically P32 or C56) refer to a generic family of closely related information. It may not be a single pinout or unique case outline. Please be aware of small details which may affect your application and PC board layouts. Study the Mechanical Outline drawings, Input/Output Connection table and all footnotes very carefully. Please contact Murata Power Solutions if you have any questions.

TYPICAL PERFORMANCE DATA AND OSCILLOGRAMS, UEE-5/30-D48

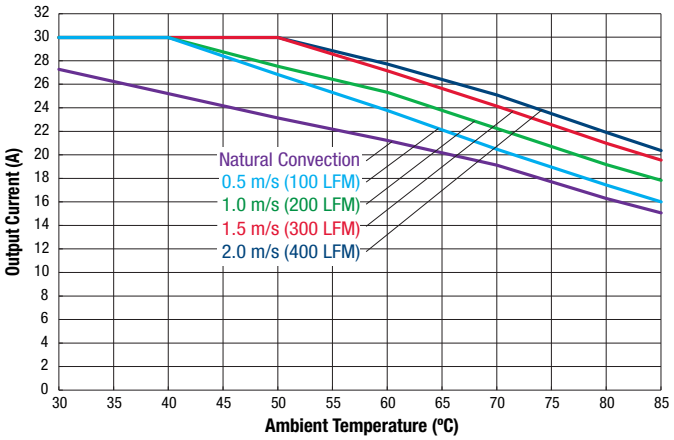
Efficiency vs. Line Voltage and Load Current @ +25°C



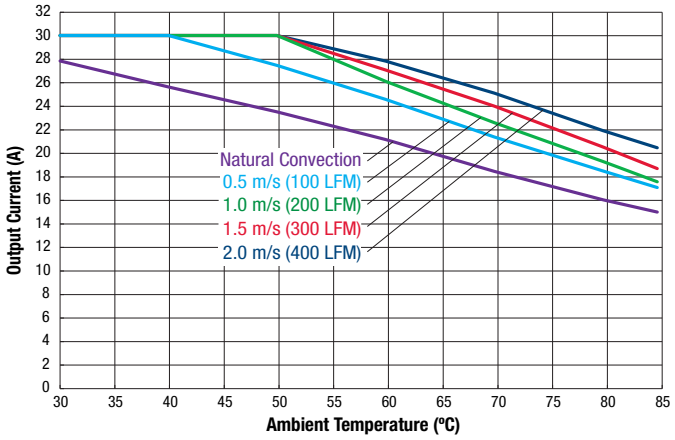
Maximum Current Temperature Derating at Sea Level
(Vin = 36V, no baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)



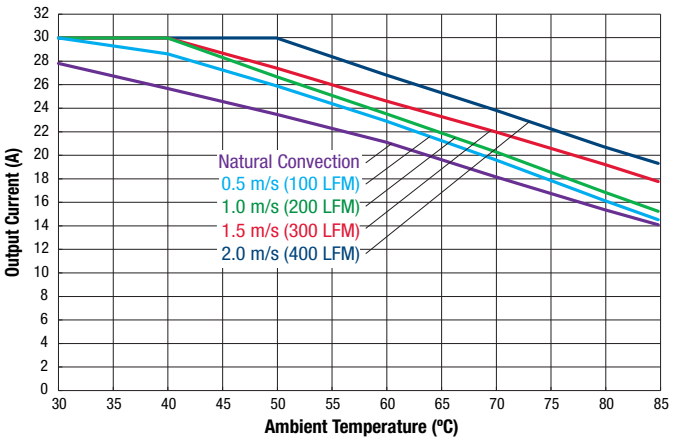
Maximum Current Temperature Derating at Sea Level
(Vin = 36V, no baseplate. Airflow Direction Is Longitudinal from -Vin to +Vin.)



Maximum Current Temperature Derating at Sea Level
(Vin = 48V, no baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)

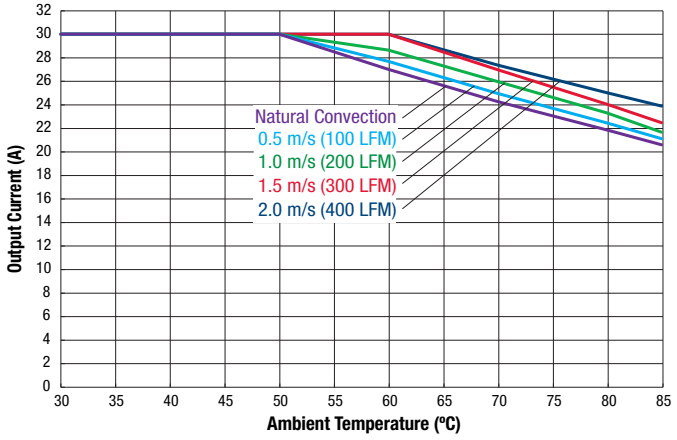


Maximum Current Temperature Derating at Sea Level
(Vin = 48V, no baseplate. Airflow Direction Is Longitudinal from -Vin to +Vin.)

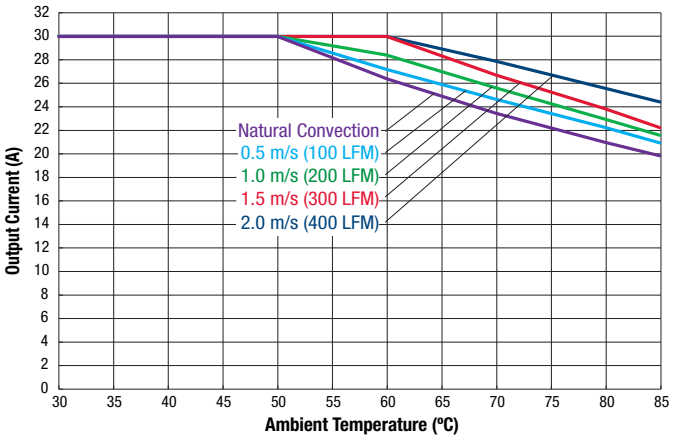


TYPICAL PERFORMANCE DATA AND OSCILLOGRAMS, UEE-5/30-D48

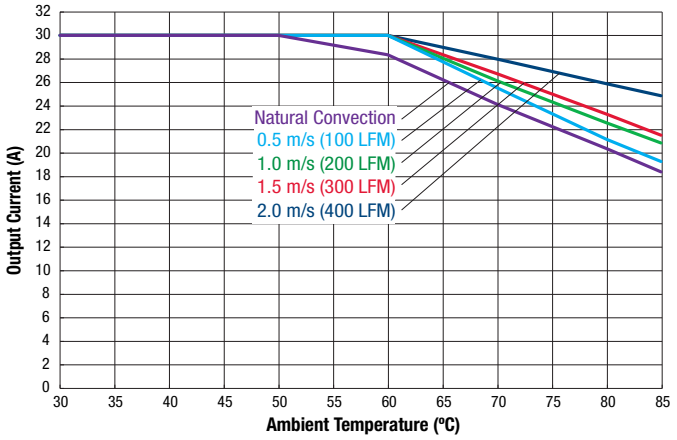
Maximum Current Temperature Derating at Sea Level
(Vin = 36V, with baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)



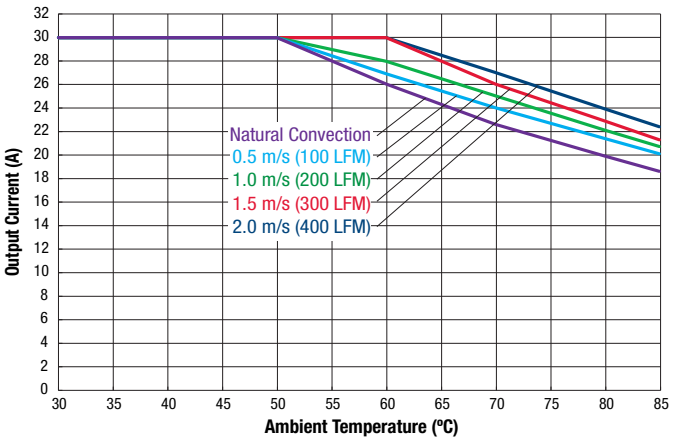
Maximum Current Temperature Derating at Sea Level
(Vin = 36V, with baseplate. Airflow Direction Is Longitudinal from Vin to Vout.)



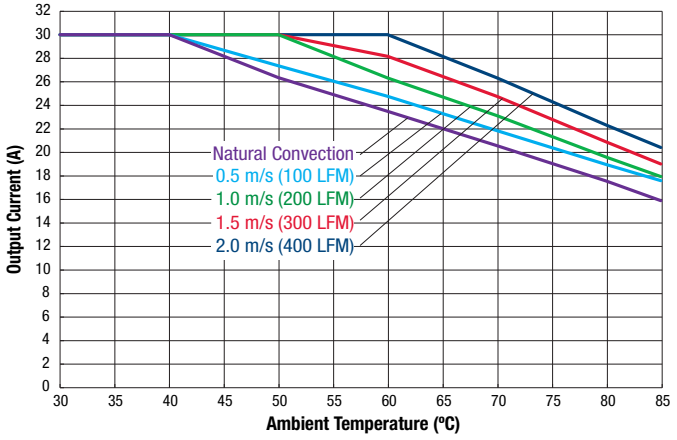
Maximum Current Temperature Derating at Sea Level
(Vin = 48V, with baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)



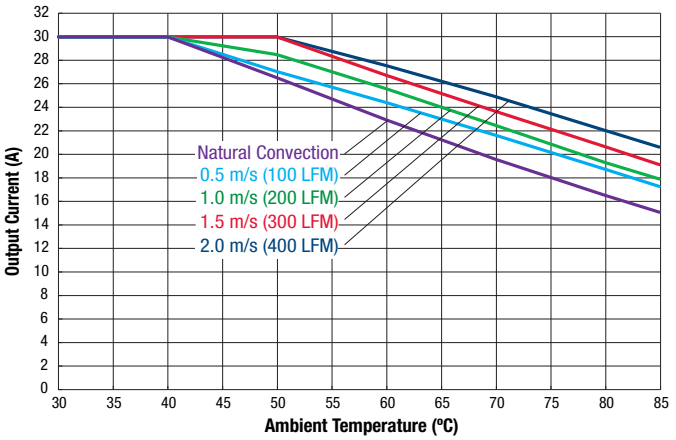
Maximum Current Temperature Derating at Sea Level
(Vin = 48V, with baseplate. Airflow Direction Is Longitudinal from Vin to Vout.)



Maximum Current Temperature Derating at Sea Level
(Vin = 75V, with baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)

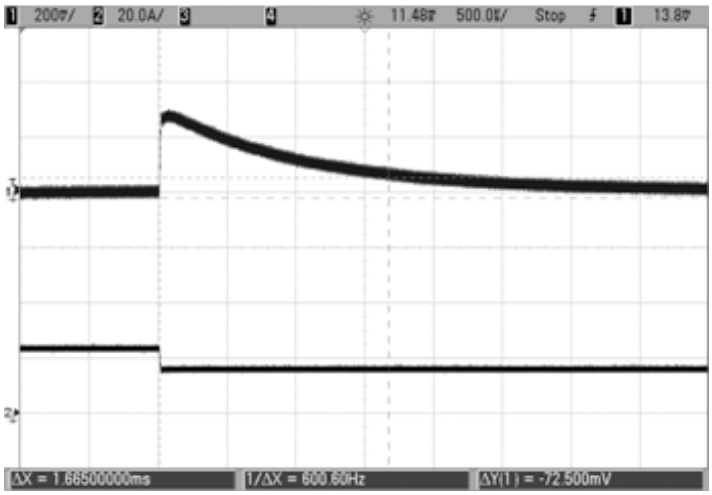


Maximum Current Temperature Derating at Sea Level
(Vin = 75V, with baseplate. Airflow Direction Is Longitudinal from Vin to Vout.)

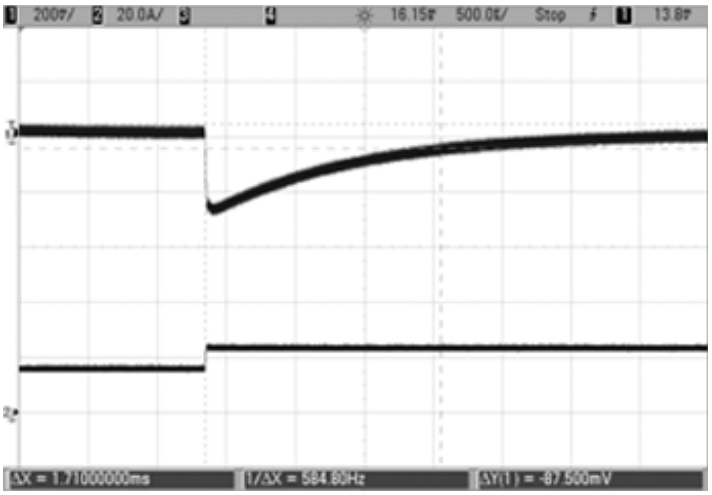


TYPICAL PERFORMANCE DATA AND OSCILLOGRAMS, UEE-5/30-D48

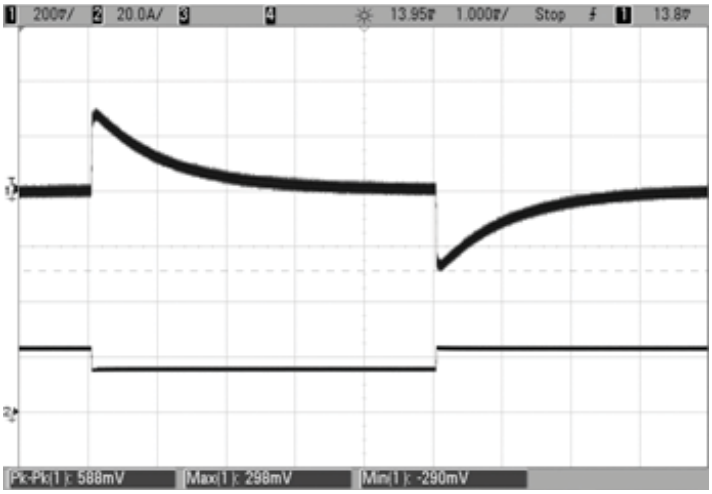
Step Load Transient Response (Vin = 48V, Vout = nom, Cload = 1uF || 10uF, Iout = 75% to 50% of full load, Ta = +25°C) Ch1 = Vout, Ch2 = Iout



Step Load Transient Response (Vin = 48V, Vout = nom, Cload = 1uF || 10uf, Iout = 50% to 75% of full load, Ta = +25°C) Ch1 = Vout, Ch2 = Iout

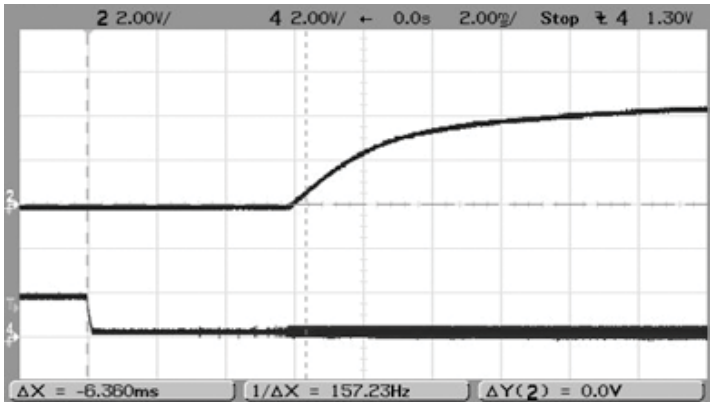


Step Load Transient Response (Vin = 48V, Vout = nom, Cload = 1uF || 10uF, Iout = 50 to 75 to 50% of full load, Ta = +25°C) Ch1 = Vout, Ch2 = Iout.

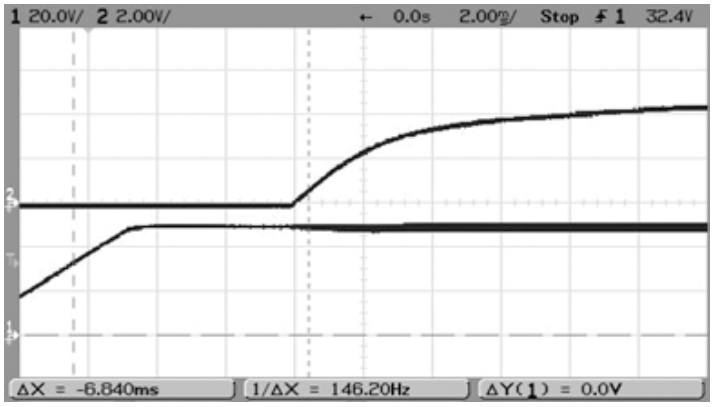


TYPICAL PERFORMANCE DATA AND OSCILLOGRAMS, UEE-5/30-D48

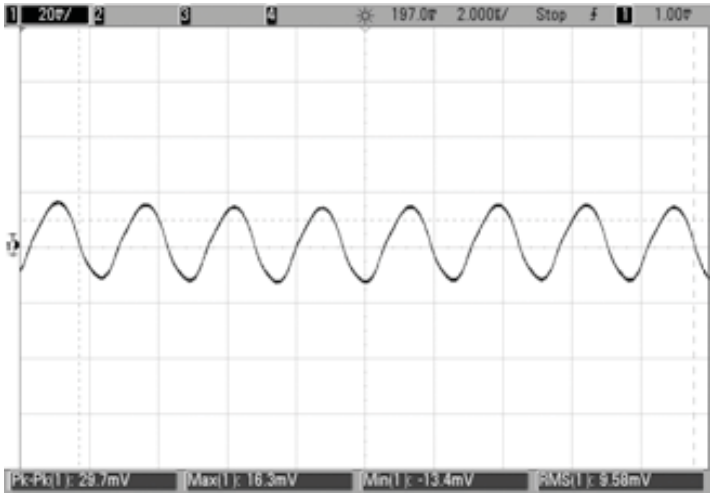
Enable Start Up Delay (Vin = 48V, Vout = nom, Iout = 30A, Cload = 10000uF, Ta = +25°C)
Ch2 = Vout, Ch4 = Enable.



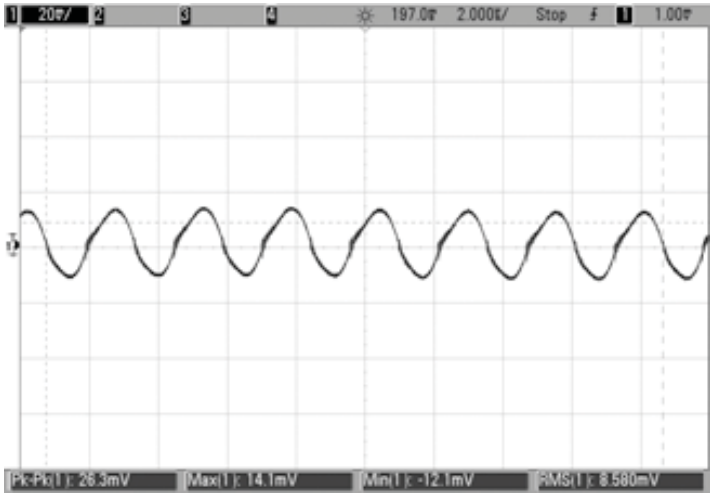
Vin Start Up Delay(Vin = 48V, Vout = nom, Iout = 30A, Cload = 10000uF, Ta = +25°C)
Ch2 = Vout, Ch4 = Enable.



Output Ripple and noise (Vin = 48V, Vout = nom, Iout = 0A, Cload = 1uf || 10uF,
Ta = +25°C, ScopeBW = 20Mhz)



Output Ripple and noise (Vin = 48V, Vout = nom, Iout = 30A, Cload = 1uf || 10uF,
Ta = +25°C, ScopeBW = 20Mhz)



Emissions Performance, Model UEE-5/30-D48

Murata Power Solutions measures its products for radio frequency 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. Please refer to the fundamental switching frequency. All of this information is listed in the Product Specifications. An external discrete filter is installed and the circuit diagram is shown below.

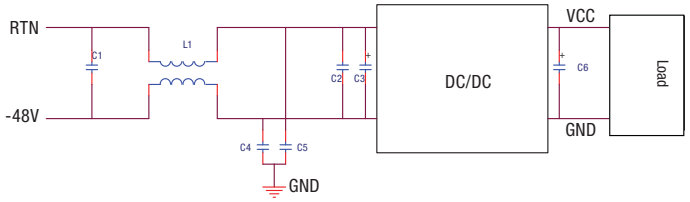


Figure 3. Conducted Emissions Test Circuit

[1] Conducted Emissions Parts List

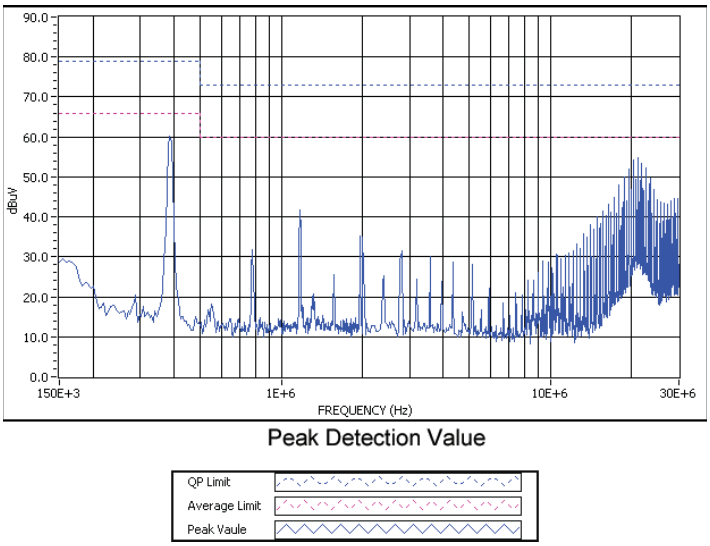
[2] Conducted Emissions Test Equipment Used

Spectrum Analyzer – Hewlett Packard HP8594L

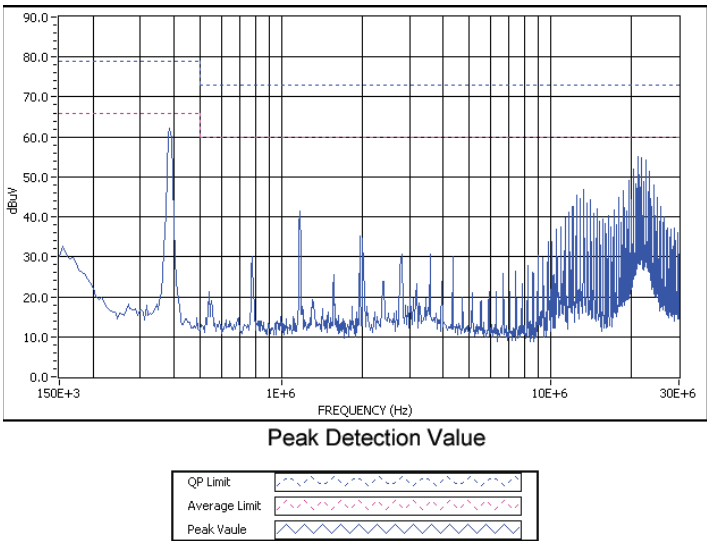
Line Impedance Stabilization Network (LISN) – 2 Line V-Networks LS1-15V, 50 Ω, 50 µH

Designation	Value	Part Number	Description	Vendor
C1	1 µF	GRM32ER72A105KA01L	SMD Ceramic, 100V, 1000nF, X7R-1210	Murata
C2	100 nF	GRM319R72A104KA01D	SMD Ceramic, 100V, 100nF ±10%, X7R-1206	Murata
L1	1320 µH	LB16H1324	Common Mode choke, 1320 µH, ±25%, 4A, R5K, *21*21*12.5mm	High Light
C4, C5	0.022 µF	GRM32DR73A223KW01L	SMD Ceramic, 1000V, 0.022 µF, ±10%, X7R-1210	Murata
C3	220 µF	UHE2A221MHD	Alum. electrolytic, 100V, 220 µF, ±10%, long lead	Nichicon
C6	Not used		Not used for this model	

[3] Conducted Emissions Test Results



Graph 3. Conducted emissions performance, Positive Line, CISPR 22, Class A, 48 Vin, full load



Graph 4. Conducted emissions performance, Negative Line, CISPR 22, Class A, 48 Vin, full load

[4] Layout Recommendations

Most applications can use the filtering which 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 will depend on the user's PC board layout, the chassis shielding environment and choice of external components. Please refer to Application Note GEAN02 for further discussion.

Since many factors affect both the amplitude and spectra of emissions, we recommend using an engineer who is experienced at emissions suppression.

FUNCTIONAL SPECIFICATIONS, UEE-12/12.5-D48

ABSOLUTE MAXIMUM RATINGS	Conditions ①	Minimum	Typical/Nominal	Maximum	Units
Input Voltage, Continuous		0		80	Vdc
Input Voltage, Transient	100 mS max. duration			100	Vdc
Isolation Voltage	Input to output, continuous			2250	Vdc
Input Reverse Polarity	None, install external fuse		None		Vdc
On/Off Remote Control	Power on, referred to -Vin	0		15	Vdc
Output Power		0		152.25	W
Output Current		0		12.5	A
Storage Temperature Range	Vin = Zero (no power)	-55		125	°C
Absolute maximums are stress ratings. Exposure of devices to greater than any of these conditions may adversely affect long-term reliability. Proper operation under conditions other than those listed in the Performance/Functional Specifications Table is not implied or recommended.					
INPUT	**Conditions ① ③**				
Operating Voltage Range		36	48	75	Vdc
Recommended External Fuse	Fast blow			10	A
Start-Up Threshold	Rising input voltage	33.5	34.5	35.5	Vdc
Undervoltage Shutdown	Falling input voltage	31.5	32.5	33.5	Vdc
Overvoltage Shutdown			None		Vdc
Reverse Polarity Protection	None, install external fuse		None		Vdc
Internal Filter Type			Pi		
Input current					
Full Load Conditions	Vin = nominal		3.36	3.45	A
Low Line Input Current	Vin = minimum		4.63	4.81	A
Inrush Transient			0.01	0.02	A^2-Sec.
Short Circuit Input Current			50		mA
No Load	Iout = minimum, unit = ON		120	150	mA
Shut-Down Input Current (Off, UV, OT)			6	10	mA
Reflected (back) ripple current ②	Measured at input with specified filter			100	mA, p-p
Pre-biased startup	External output voltage < Vset		Monotonic		
GENERAL and SAFETY					
Efficiency	Vin = 48V, full load	92	93		%
Isolation					
Isolation Voltage	Input to output, continuous	2250			Vdc
Isolation Voltage	Input to baseplate, continuous	1500			Vdc
Isolation Voltage	Output to baseplate, continuous	1500			Vdc
Insulation Safety Rating			basic		
Isolation Resistance			10		MΩ
Isolation Capacitance			1000		pF
Safety	Certified to UL-60950-1, CSA-C22.2 No. 60950-1, IEC 60950-1, 2nd edition		Yes		
Calculated MTBF	Per Telcordia SR332, issue 1, class 1, ground fixed, Tambient = +25°C		2.5		Hours x 10^6
DYNAMIC CHARACTERISTICS					
Fixed Switching Frequency			400		KHz
Startup Time (startup delay)	Power on to Vout regulated		15	20	mS
Startup Time (rise time)	Remote ON to Vout regulated		28	30	mS
Dynamic Load Response	50-75-50% load step, settling time to within 1% of Vout (1 A/uS)			1500	µSec
Dynamic Load Peak Deviation	same as above			±450	mV
FEATURES and OPTIONS					
Remote On/Off Control ④					
"N" suffix:					
Negative Logic, ON state	ON = Ground pin or external voltage	-0.1		0.8	Vdc
Negative Logic, OFF state	OFF = Pin open or external voltage	2.5		15	Vdc
Control Current	Open collector/drain		1	2	mA
"P" suffix:					
Positive Logic, ON state	ON = Pin open or external voltage	3.5		15	V
Positive Logic, OFF state	OFF = Ground pin or external voltage	0		1	V
Control Current	Open collector/drain		1	2	mA
SMT Mounting	"M" suffix		optional		

FUNCTIONAL SPECIFICATIONS, UEE-12/12.5-D48 (CONT.)

OUTPUT					
Total Output Power		147	150	152.25	W
Voltage					
Nominal Output Voltage	No trim	11.82	12	12.18	Vdc
Setting Accuracy	At 50% load, no trim	-1.5		1.5	% of Vnom
Output Voltage Range	User-adjustable	-20		10	% of Vnom.
Overvoltage Protection	Via magnetic feedback	14.4	16		Vdc
Current					
Output Current Range		0	12.5	12.5	A
Minimum Load					
Current Limit Inception	98% of Vnom., after warmup	14	16	20	A
Short Circuit					
Short Circuit Current	Hiccup technique, autorecovery within ±1.25% of Vout		1	2	A
Short Circuit Duration (remove short for recovery)	Output shorted to ground, no damage		Continuous		
Short circuit protection method	Current limiting				
Regulation					
Line Regulation	Vin = min. to max., Vout = nom., Iout = nom.			±0.1	% of Vout
Load Regulation	Iout = min. to max., Vin = 48V			±0.25	% of Vout
Ripple and Noise ②	5 Hz- 20 MHz BW		100	150	mV pk-pk
Temperature Coefficient	At all outputs		0.008	0.02	% of Vout./°C
Maximum Capacitive Loading	Low ESR, resistive load only	220		5000	µF
MECHANICAL (Through Hole Models)					
Outline Dimensions (no baseplate)			2.3 x 0.9 x 0.42		Inches
(Please refer to outline drawing)	W x L x H		58.42 x 22.9 x 10.7		mm
Weight			TBD		Ounces
			TBD		Grams
Through Hole Pin Diameter			0.04 & 0.062		Inches
			1.016 & 1.575		mm
Through Hole Pin Material			Copper alloy		
TH Pin Plating Metal and Thickness	Nickel subplate		50		µ-inches
	Gold overplate		5		µ-inches
ENVIRONMENTAL					
Operating Ambient Temperature Range	With Derating	-40		85	°C
Operating Case Temperature	No derating.	-40		115	°C
Storage Temperature	Vin = Zero (no power)	-55		125	°C
Thermal Protection/Shutdown	Measured in center	115	125	130	°C
Electromagnetic Interference	External filter is required				
Conducted, EN55022/CISPR22			A		Class
RoHS rating			RoHS-6		

Notes

① Unless otherwise noted, all specifications are at nominal input voltage, nominal output voltage and full load.
General conditions are +25˚ Celsius ambient temperature, near sea level altitude, natural convection airflow.
All models are tested and specified with external parallel 1 µF and 10 µF multi-layer ceramic output capacitors.
A 220uF external input capacitor is used. All capacitors are low-ESR types wired close to the converter.

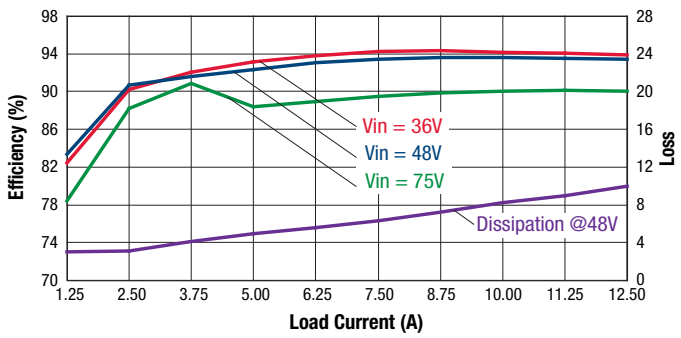
② Input (back) ripple current is tested and specified over 5 Hz to 20 MHz bandwidth. Input filtering is Cbus=220 µF, Cin=33 µF and Lbus=12 µH.

③ All models are stable and regulate to specification under no load.

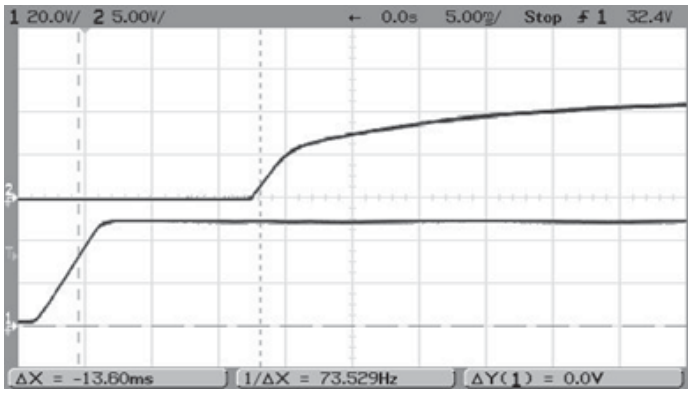
④ The Remote On/Off Control is referred to -Vin. For external transistor control, use open collector logic or equivalent.

TYPICAL PERFORMANCE DATA AND OSCILLOGRAMS, UEE-12/12.5-D48

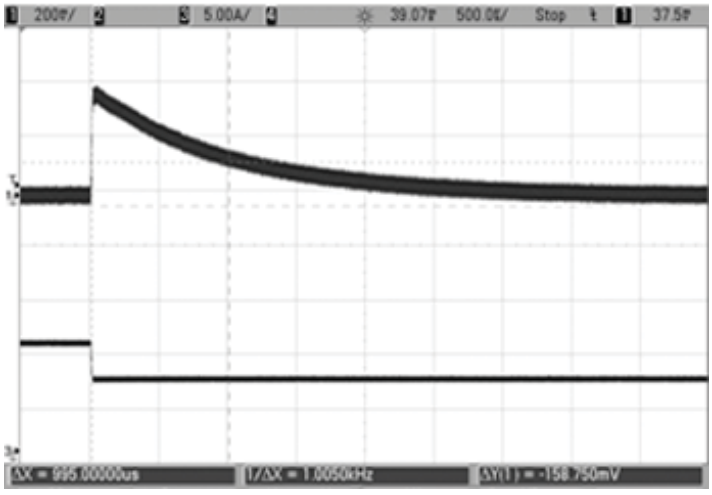
Efficiency and Power Dissipation @ 25°C



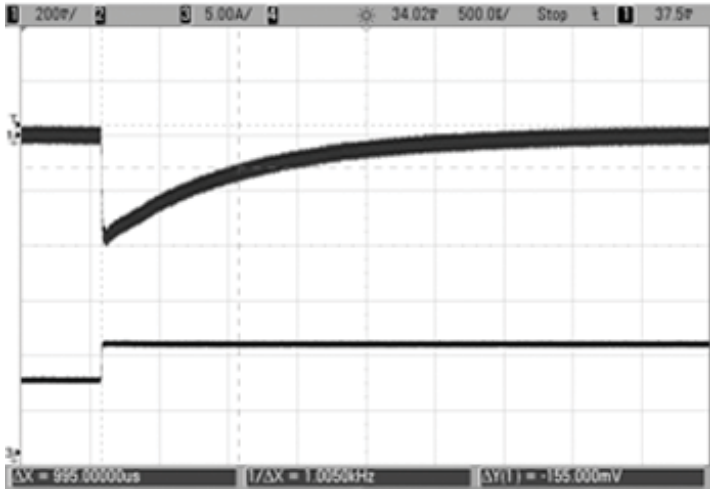
Startup Delay (Vin=48V, Vout=nom, Iout=12.5A, Cload=5000µF, Ta=+25°C) Trace 1=Vin, Trace 2=Vout



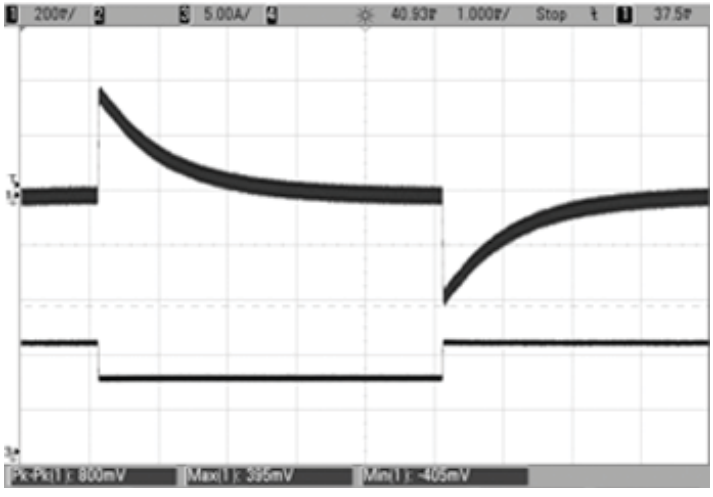
Step Load Transient Response (Vin = 48V, Vout = nom, Cload = 1uF || 10uF, Iout = 75% to 50% of full load, Ta = +25°C) Ch1 = Vout, Ch2 = Iout



Step Load Transient Response (Vin = 48V, Vout = nom, Cload = 1uF || 10uf, Iout = 50% to 75% of full load, Ta = +25°C) Ch1 = Vout, Ch2 = Iout

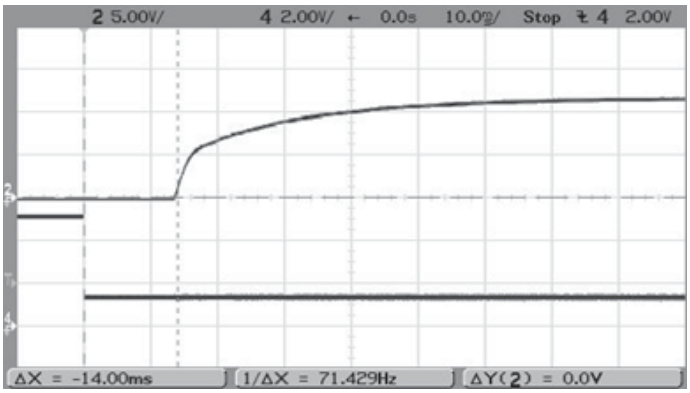


Step Load Transient Response (Vin = 48V, Vout = nom, Cload = 1uF || 10uF, Iout = 50 to 75 to 50% of full load, Ta = +25°C) Ch1 = Vout, Ch2 = Iout.

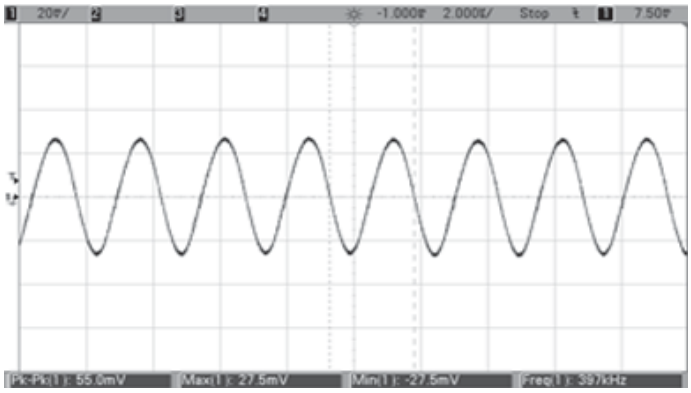


TYPICAL PERFORMANCE DATA AND OSCILLOGRAMS, UEE-12/12.5-D48

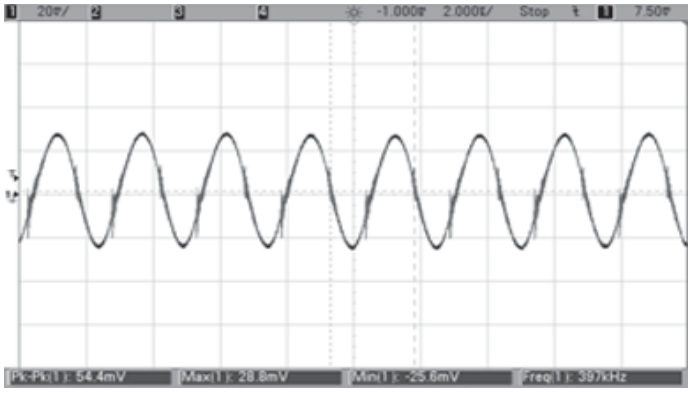
On/Off Enable Startup Delay (Vin=48V, Vout=nom, Iout=12.5A, Cload=5000uF, Ta=+25°C) Trace 2=Vout, Trace 4=Enable



Output Ripple and noise (Vin=48V, Vout=nom, Iout=0A, Cload= 1µF || 10µF, Ta=+25°C)

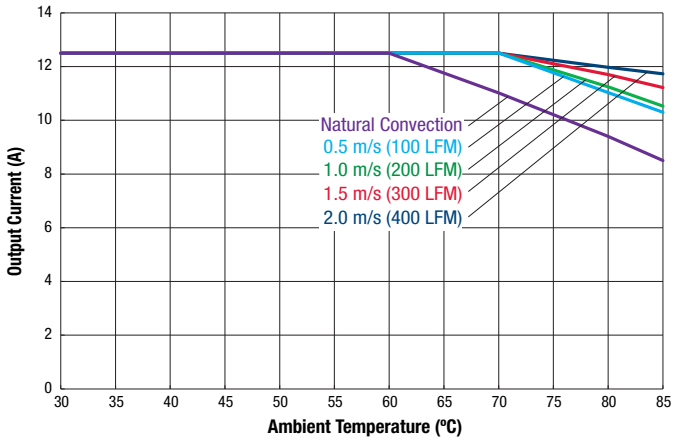


Output Ripple and noise (Vin=48V, Vout=nom, Iout=12.5A, Cload= 1µF || 10µF, Ta=+25°C)

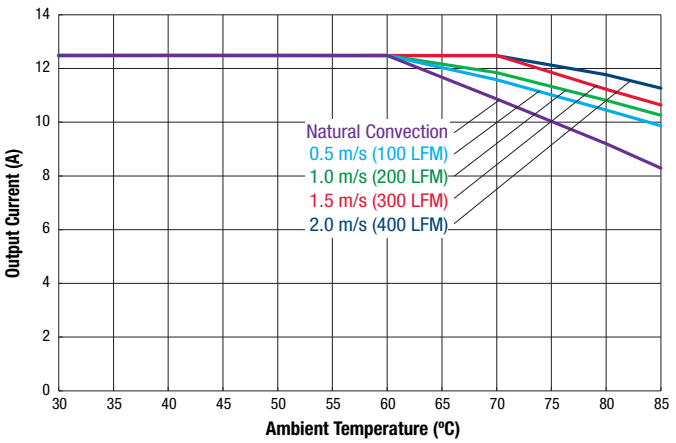


TYPICAL PERFORMANCE DATA AND OSCILLOGRAMS, UEE-12/12.5-D48

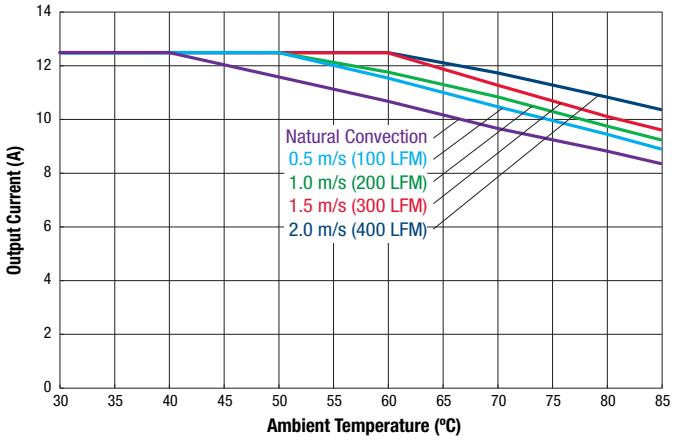
Maximum Current Temperature Derating at Sea Level
(Vin = 36V, no baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)



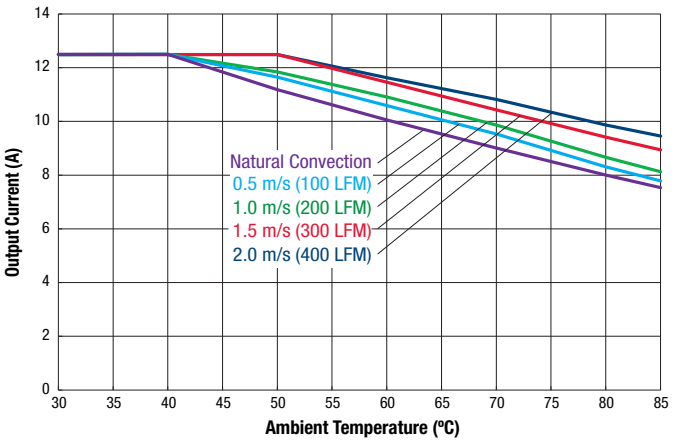
Maximum Current Temperature Derating at Sea Level
(Vin = 36V, no baseplate. Airflow Direction Is Longitudinal from Vin to Vout.)



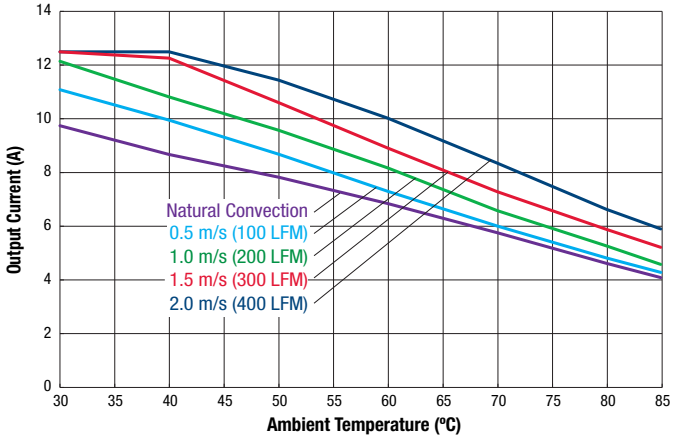
Maximum Current Temperature Derating at Sea Level
(Vin = 48V, no baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)



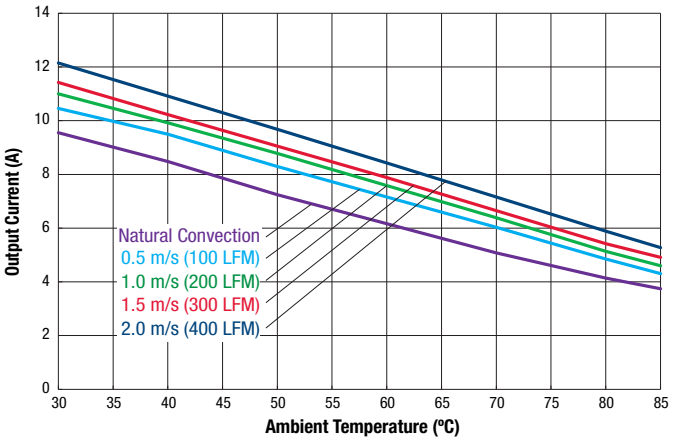
Maximum Current Temperature Derating at Sea Level
(Vin = 48V, no baseplate. Airflow Direction Is Longitudinal from Vin to Vout.)



Maximum Current Temperature Derating at Sea Level
(Vin = 75V, no baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)

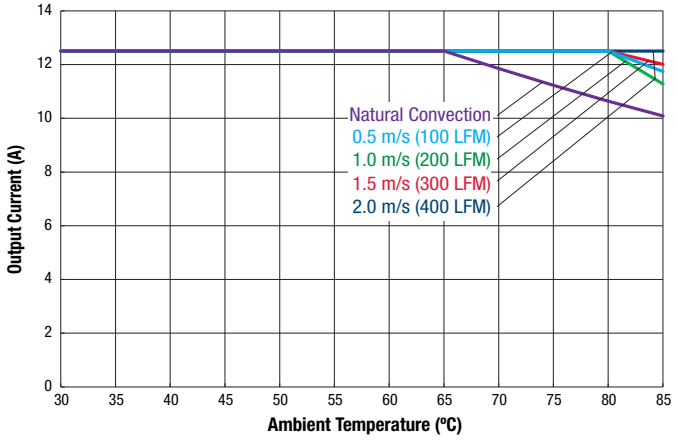


Maximum Current Temperature Derating at Sea Level
(Vin = 75V, no baseplate. Airflow Direction Is Longitudinal from Vin to Vout.)

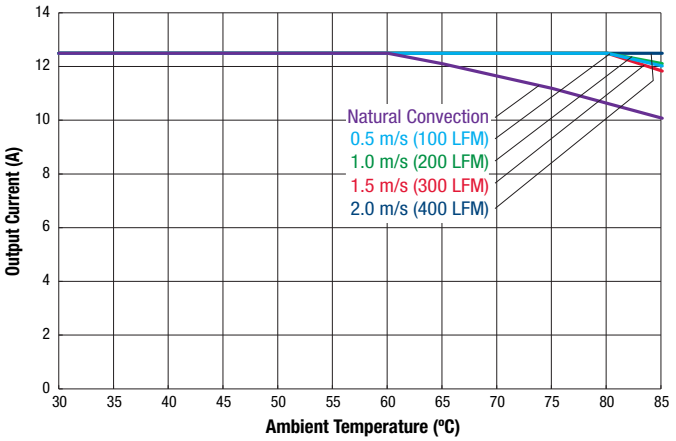


TYPICAL PERFORMANCE DATA AND OSCILLOGRAMS, UEE-12/12.5-D48

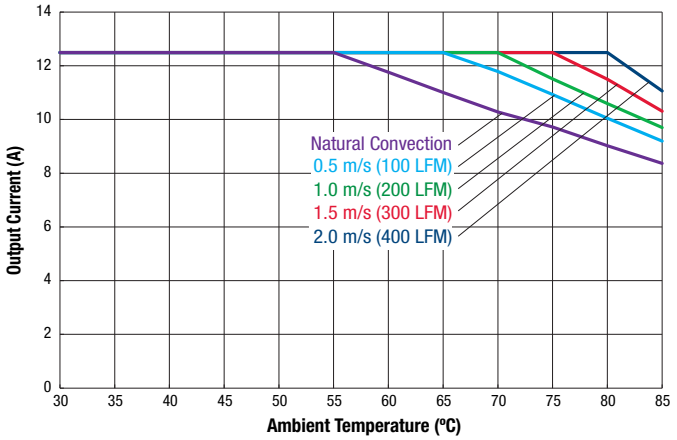
Maximum Current Temperature Derating at Sea Level
(Vin = 36V, with baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)



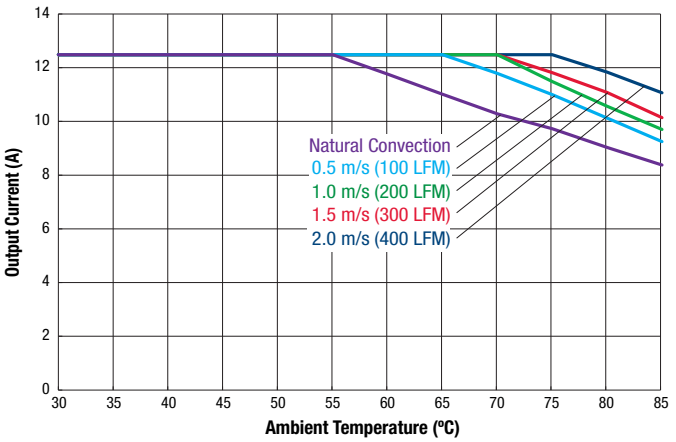
Maximum Current Temperature Derating at Sea Level
(Vin = 36V, with baseplate. Airflow Direction Is Longitudinal from Vin to Vout.)



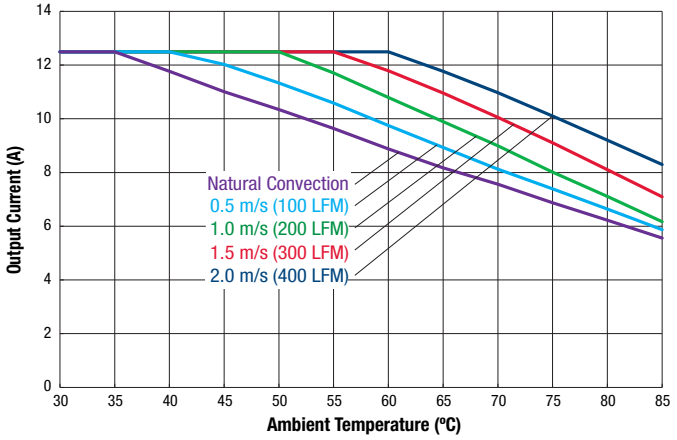
Maximum Current Temperature Derating at Sea Level
(Vin = 48V, with baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)



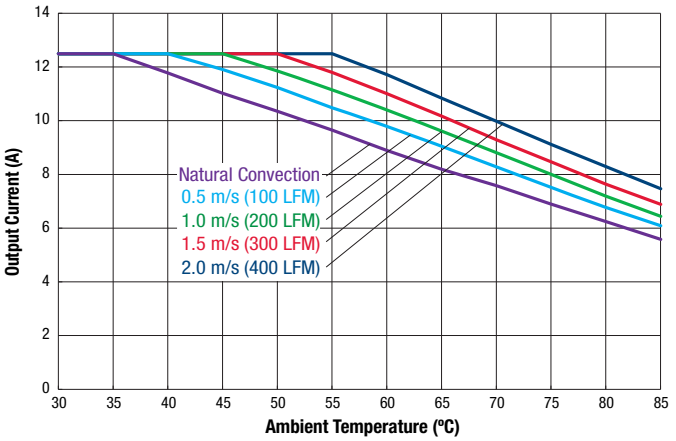
Maximum Current Temperature Derating at Sea Level
(Vin = 48V, with baseplate. Airflow Direction Is Longitudinal from Vin to Vout.)



Maximum Current Temperature Derating at Sea Level
(Vin = 75V, with baseplate. Airflow Direction Is Transverse from -Vin to +Vin.)



Maximum Current Temperature Derating at Sea Level
(Vin = 75V, with baseplate. Airflow Direction Is Longitudinal from Vin to Vout.)



Emissions Performance, Model UEE-12/12.5-D48

Murata Power Solutions measures its products for radio frequency 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. Please refer to the fundamental switching frequency. All of this information is listed in the Product Specifications. An external discrete filter is installed and the circuit diagram is shown below.

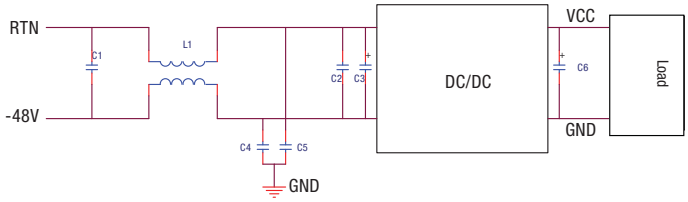


Figure 4. Conducted Emissions Test Circuit

[1] Conducted Emissions Parts List

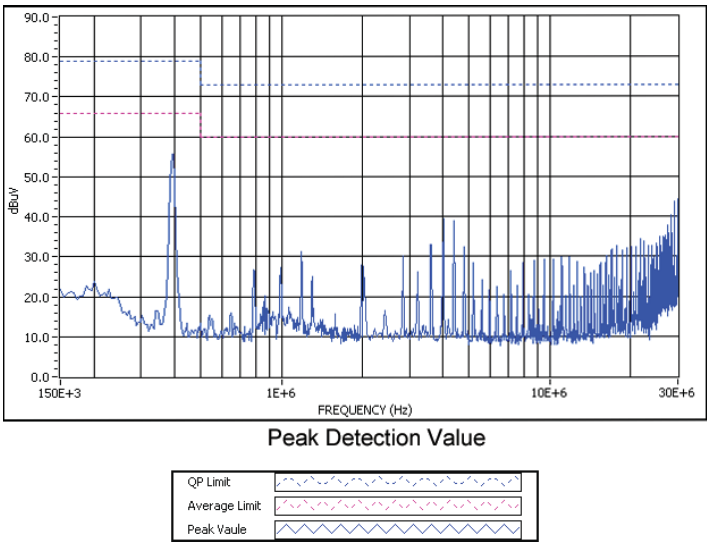
[2] Conducted Emissions Test Equipment Used

Spectrum Analyzer – Hewlett Packard HP8594L

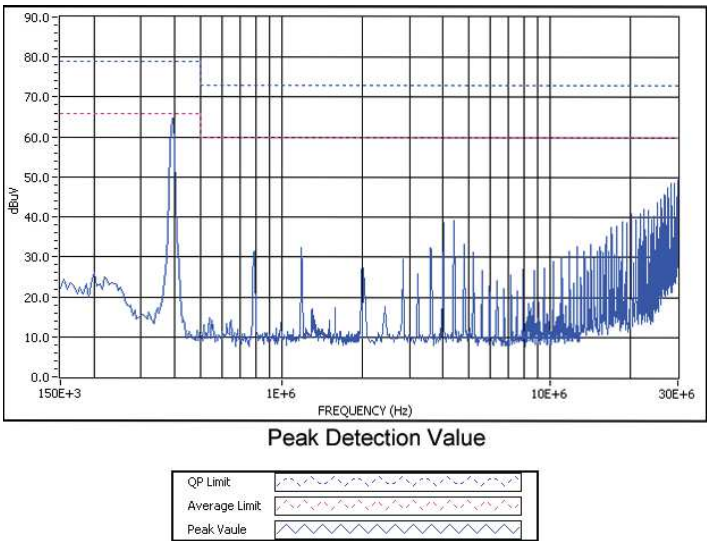
Line Impedance Stabilization Network (LISN) – 2 Line V-Networks LS1-15V, 50 Ω, 50 µH

Designation	Value	Part Number	Description	Vendor
C1	1 µF	GRM32ER72A105KA01L	SMD Ceramic, 100V, 1000nF, X7R-1210	Murata
C2	100 nF	GRM319R72A104KA01D	SMD Ceramic, 100V, 100nF ±10%, X7R-1206	Murata
L1	1320 µH	LB16H1324	Common Mode choke, 1320 µH, ±25%, 4A, R5K, *21*21*12.5mm	High Light
C4, C5	0.022 µF	GRM32DR73A223KW01L	SMD Ceramic, 1000V, 0.022 µF, ±10%, X7R-1210	Murata
C3	220 µF	UHE2A221MHD	Alum. electrolytic, 100V, 220 µF, ±10%, long lead	Nichicon
C6	Not used		Not used for this model	

[3] Conducted Emissions Test Results



Graph 5. Conducted emissions performance, Positive Line, CISPR 22, Class A, 48 Vin, full load



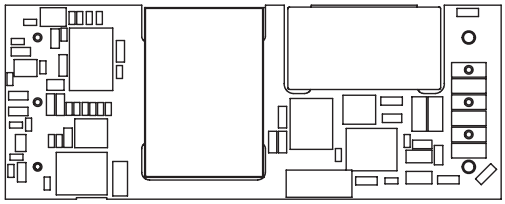
Graph 6. Conducted emissions performance, Negative Line, CISPR 22, Class A, 48 Vin, full load

[4] Layout Recommendations

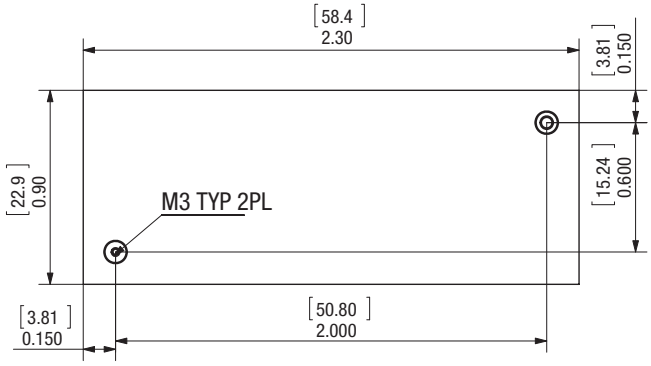
Most applications can use the filtering which is already installed inside the converter or with the addition of the recommended external capacitors. For greater emissions suppression, consider additional filter components and/or shielding. Emissions performance will depend on the user's PC board layout, the chassis shielding environment and choice of external components. Please refer to Application Note GEAN02 for further discussion.

Since many factors affect both the amplitude and spectra of emissions, we recommend using an engineer who is experienced at emissions suppression.

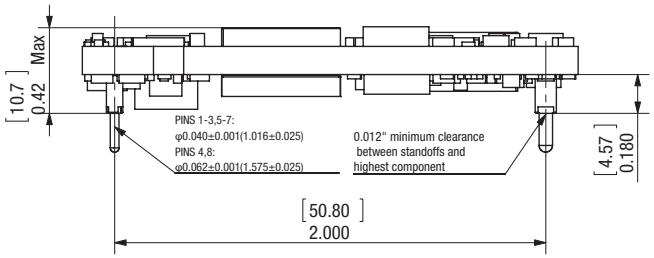
MECHANICAL SPECIFICATIONS, UEE-3.3/45-D48 (THROUGH-HOLE MOUNT)

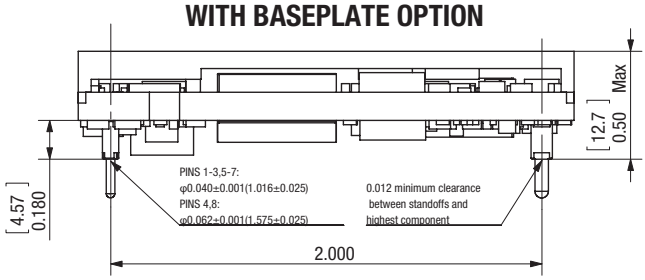


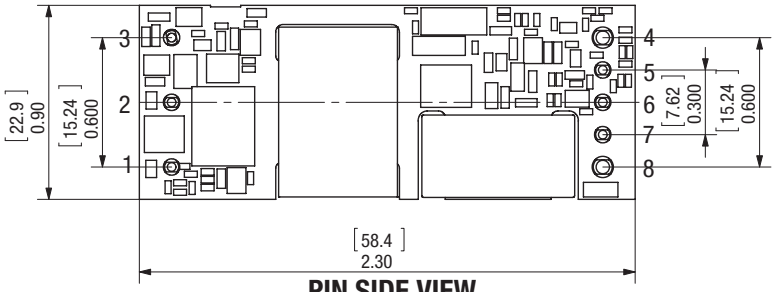
OPEN FRAME



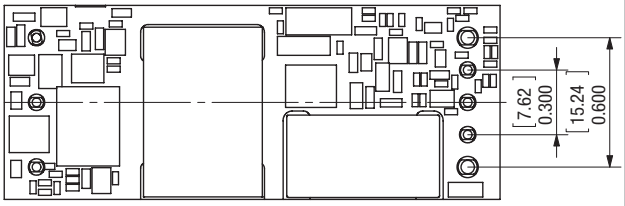
WITH BASEPLATE OPTION







PIN SIDE VIEW

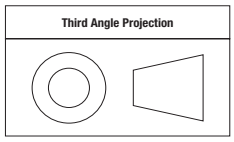


PIN SIDE VIEW

NOTES:
UNLESS OTHERWISE SPECIFIED:
1:M3 SCREW USED TO BOLT UNIT'S BASEPLATE TO OTHER SURFACES (SUCH AS HEATSINK) MUST NOT EXCEED 0.118''(3.0mm) DEPTH BELOW THE SURFACE OF BASEPLATE.
2:APPLIED TORQUE PER SCREW SHOULD NOT EXCEED 5.3In-lb (0.6Nm).
3:ALL DIMENSION ARE IN INCHES [MILLIMETERS].
4:ALL TOLERANCES: ×.××in ,±0.02in(×.×mm,±0.5mm)
×.×××in ,±0.01in(×.××mm,±0.25mm).
5:COMPONENTS WILL VARY BETWEEN MODELS.
6:STANDARD PIN LENGTH: 0.180 Inch
FOR L2 PIN LENGTH OPTION PLEASE REFER TO PART NUMBER STRUCTURE.

DOSA-Compatible INPUT/OUTPUT CONNECTIONS	
Pin	**Function**
1	+Vin
2	On/Off Control
3	-Vin
4	-Vout
5	Sense (-)
6	Trim
7	Sense (+)
8	+Vout

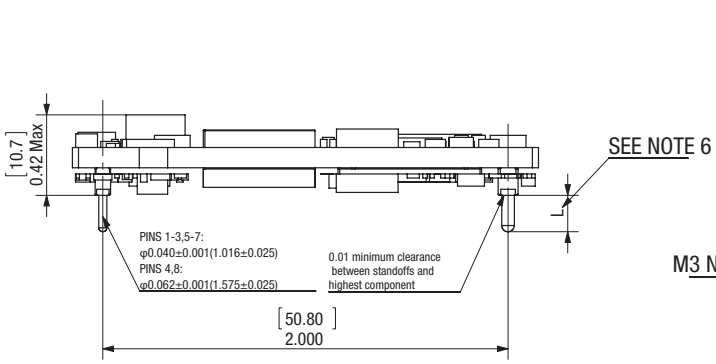
Dimensions are in inches (mm shown for ref. only).



Tolerances (unless otherwise specified):
.XX ± 0.02 (0.5)
.XXX ± 0.010 (0.25)
Angles ± 2˚

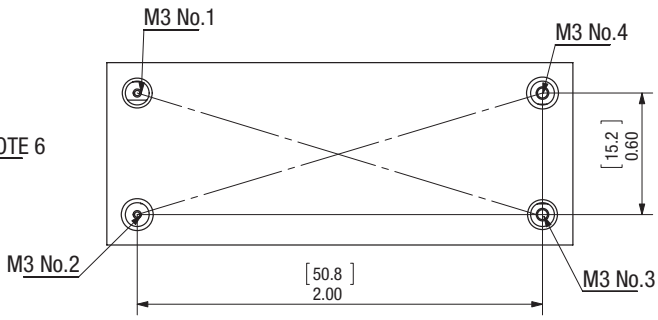
Components are shown for reference only and may vary between units.

MECHANICAL SPECIFICATIONS, UEE-5/30-D48 AND UEE-12/12.5-D48 (THROUGH-HOLE MOUNT)

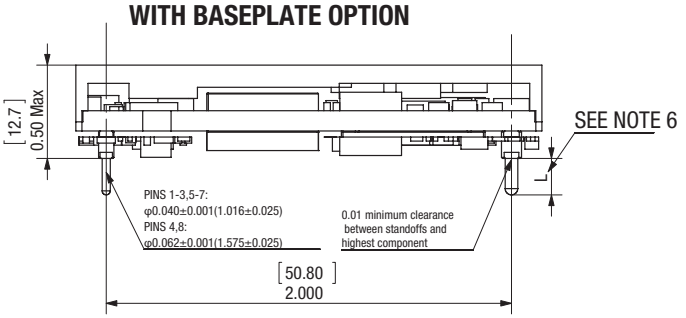


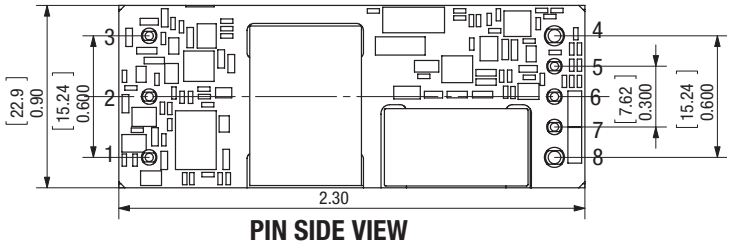
OPEN FRAME

PIN SIDE VIEW



WITH BASEPLATE OPTION



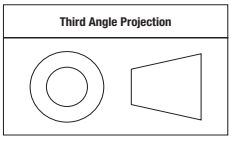


PIN SIDE VIEW

NOTES:
UNLESS OTHERWISE SPECIFIED:
1:For M3 THREAD HOLE No.1,No3;M3 SCREW USED TO BOLT UNIT'S BASEPLATE TO OTHER SURFACES (SUCH AS HEATSINK) MUST NOT EXCEED 0.118''(3.0mm) DEPTH BELOW THE SURFACE OF BASEPLATE; For SCREW HOLE No.2, No.4 NOT EXCEED 0.098''(2.5MM)
2:APPLIED TORQUE PER SCREW SHOULD NOT EXCEED 5.3In-lb (0.6Nm).
3:ALL DIMENSION ARE IN INCHES [MILLIMETERS].
4:ALL TOLERANCES: ×.××in ,±0.02in(×.×mm,±0.5mm)
×.×××in ,±0.01in(×.××mm,±0.25mm).
5:COMPONENTS WILL VARY BETWEEN MODELS.
6:STANDARD PIN LENGTH: 0.180 Inch
FOR L2 PIN LENGTH OPTION PLEASE REFER TO PART NUMBER STRUCTURE.

DOSA-Compatible INPUT/OUTPUT CONNECTIONS	
Pin	**Function**
1	+Vin
2	On/Off Control
3	-Vin
4	-Vout
5	Sense (-)
6	Trim
7	Sense (+)
8	+Vout

Dimensions are in inches (mm shown for ref. only).



Tolerances (unless otherwise specified):
.XX ± 0.02 (0.5)
.XXX ± 0.010 (0.25)
Angles ± 2˚

Components are shown for reference only and may vary between units.