

Typical unit

## FEATURES

- 700 KHz operation
- 5.5-13.8 Vdc input voltage range
- Programmable output voltage from 0.591-6.0 VDC
- High power conversion efficiency at 95%
- Outstanding thermal derating performance
- Over temperature and over current protection
- Forced Positive On/off option for EMC
- 1.2 x 0.61 x 0.71 inches (30.5 x 15.5 x 18.1 mm)
- Meets UL/EN/IEC 60950-1 safety certification (pending)
- RoHS-6 hazardous substance compliance
- Power Good

## PRODUCT OVERVIEW

The OKR-T/30-W12-C model is a miniature SIP non-isolated Point-of-Load (PoL) DC-DC power converters measuring only 1.2 x 0.61 x 0.71 inches (30.5 x 15.5 x 18.1 mm). The wide input range is 5.5 to 13.8 Volts DC. Based on 700 KHz synchronous buck topology, the high power conversion efficient Point of Load (PoL) module features programmable output voltage and On/Off control, under voltage lock out (UVLO), overcurrent and over temperature protections. These units meet all standard UL/EN/ IEC 60950-1 safety certifications (pending) and RoHS-6 hazardous substance compliance.

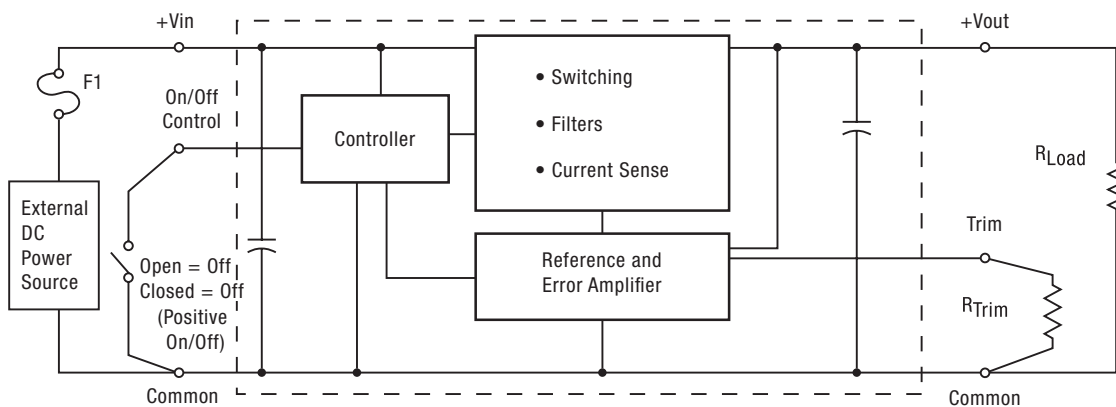


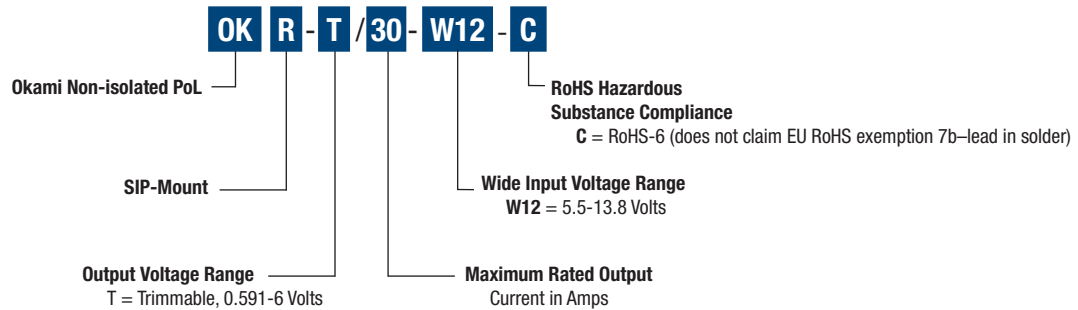
Figure 1. Simplified Block Diagram



PERFORMANCE SPECIFICATIONS SUMMARY AND ORDERING GUIDE													
Root Model	Output						Input				Efficiency		Package
	Vout (Volts)	Iout (Amps max)	Power (Watts)	R/N (mVp-p)	Regulation (Max.)		Vin Nom. (Volts)	Range (Volts)	Iin, no load (mA)	Iin, full load (Amps)	Min.	Typ.	Dimensions: inches (mm)
				Max.	Line	Load							
OKR-T/30-W12-C	0.591-6	30	180	15	±0.15%	±0.15%	12	5.5-13.8	150	13.2	93%	95%	1.2 x 0.61 x 0.71 (30.5 x 15.5 x 18.1)

- ① Dimensions are in inches (mm).
- ② Ripple and Noise is shown at Vout=1V. See specs for details.
- ③ All specifications are at nominal line voltage, Vout = 5V and full load, +25 °C unless otherwise noted. Models are tested with an external 22µF input capacitor and external 22µF (1) ceramic/100µF (1) polymer output capacitors.
- ④ Vin must be a minimum of 2V higher than Vout.

**PART NUMBER STRUCTURE**



### Performance/Functional Specifications

All specifications are typical unless noted. See Note 1.

Input	
Input Voltage Range	See Ordering Guide
Recommended External Fuse	40 Amps
Reverse Polarity Protection (Note 9)	None. Use an external fuse.
Isolation	Not isolated. The input and output commons are internally connected.
Start-Up Voltage	5.4 Volts
Undervoltage Shutdown	4.35 Volts
Reflected (Back) Ripple Current (Note 2)	20 mA pk-pk
Internal Input Filter Type	Capacitive
Input Current:	
Full Load Conditions	See Ordering Guide
Inrush Transient	1 A <sup>2</sup> Sec.
Shutdown Mode (Off, UV, OT)	20 mA
Short Circuit Current	N/A
No Load, 5V out	150 mA
Low Line (Vin=Vmin, 5Vout)	22.3 Amps
Remote On/Off Control (Note 5)	
Positive Logic	ON = +2 V. to +Vin max. 49.2 kΩ pulldown to ground
Current	1 mA
Turn-on Time:	
Vin on to Vout regulated	4 mSec
Remote On to Vout regulated	4 mSec
Output	
Minimum Loading	No minimum load
Output Current Range (to rated specifications)	0 to 30 Amps
Accuracy (50% load, no trim)	±2 % of Vnom
Temperature Coefficient	±0.02% per °C of Vout range
Ripple/Noise (20 MHz bandwidth)	See Ordering Guide and note 14
Line/Load Regulation	See Ordering Guide and note 10
Efficiency	See Ordering Guide and performance graphs
Maximum Capacitive Loading	Low ESR; > 1 mΩ 1000 μF ESR > 15 mΩ 2400 μF
Current Limit Inception (98% of Vout setting @12V input, 1.8V output, after warm up)	39.7 Amps
Short Circuit Mode (Notes 6, 12)	
Short Circuit Current Output	2.87 Amps
Protection Method	Hiccup autorecovery upon overload removal. (Note 8)
Short Circuit Duration	Continuous, no damage (output shorted to ground)
Overvoltage protection	None
Power Good	
PGOOD, Open Drain Configuration, Sinking	23 mA
Vout window for PGOOD (Rising)	-9% Vset
Vout window for PGOOD (Falling)	-15% Vset
PGOOD Low Output voltage (5mA)	0.05 Vdc

Environmental	
Calculated MTBF (Note 4)	A: 6,737,187 B: 9,074,537
Operating Temperature Range	-40 to +70°C, See derating curves
Operating PC Board Range, no derating	-40 to +100°C
Storage Temperature Range	-55 to +125°C
Thermal Protection/Shutdown	+130 °C
Relative Humidity	to 85%/+85°C
Restriction of Hazardous Substances	RoHS-6 (does not claim EU RoHS exemption 7b-lead in solder)
Physical	
Outline Dimensions	See Mechanical Specifications
Weight	0.44 ounces (12.4 grams)
Safety (pending)	Meets UL/cUL 60950-1 CSA-C22.2 No. 60950-1 IEC/EN 60950-1
Absolute Maximum Ratings	
Input Voltage Continuous or transient	TBD Volts max.
Output Power	180 Watts max.
On/Off Control	0 Volts. min. to +Vin. max.
Input Reverse Polarity Protection	See Fuse section
Output Current	Current-limited. Devices can withstand sustained short circuit without damage.
Storage Temperature	-40 to +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. CAUTION: This product is not internally fused. To comply with safety agency certifications and to avoid injury to personnel or equipment, the user <b>must</b> supply an external fast-blow fuse to the input terminals.	

**Notes**

- (1) All specifications are typical unless noted. General conditions for Specifications are +25 °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 an external 22µF input capacitor and external 22µF (1) ceramic/100µF (1) polymer output capacitors. 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.
- (2) Input Back Ripple Current is tested and specified over a 5 Hz to 20 MHz bandwidth. Input filtering is Cin=2 x 100 µF, 100V tantalum, Cbus=1000 µF, 100V electrolytic, Lbus=1 µH. All caps are low ESR types.
- (3) Note that Maximum Power Derating curves indicate an average current at nominal input voltage. At higher temperatures and/or lower airflow, the DC-DC converter will tolerate brief full current outputs if the total RMS current over time does not exceed the Derating curve. All Derating curves are presented at sea level altitude. Be aware of reduced power dissipation with increasing altitude.
- (4a) Mean Time Before Failure is calculated using the Telcordia (Belcore) SR-332 Method 1, Case 3, ground fixed conditions, Tpcboard=+25 °C, full output load, natural air convection.
- (4b) Mean Time Before Failure is calculated using the MIL-HDBK-217N2 method, ground benign, +25°C., full output load, natural convection.
- (5) The On/Off Control is normally controlled by a switch or open collector or open drain transistor. But it may also be driven with external logic or by applying appropriate external voltages which are referenced to Input Common.
- (6) Short circuit shutdown begins when the output voltage degrades approximately 2% from the selected setting.
- (7) The outputs are not intended to sink appreciable reverse current.
- (8) “Hiccup” overcurrent operation repeatedly attempts to restart the converter with a brief, full-current output. If the overcurrent condition still exists, the restart current will be removed and then tried again. This short current pulse prevents overheating and damaging the converter. Once the fault is removed, the converter immediately recovers normal operation.
- (9) Input Fusing: If reverse polarity is accidentally applied to the input, to ensure reverse input protection with full output load, always connect an external input fast-blow fuse in series with the +Vin input. Use approximately twice the full input current rating with nominal input voltage.
- (10) Regulation specifications describe the deviation as the line input voltage or output load current is varied from a nominal midpoint value to either extreme.
- (11) CAUTION: Since the converter is mounted on the end by its pins, do not subject it to high vibration, shock or acceleration.
- (12) Output current limit and short circuit protection is non-latching. When the overcurrent fault is removed, the converter will immediately recover.
- (13) Do not exceed maximum power specifications when adjusting the output trim. All published specifications are listed at rated nominal output current using published Derating curves. The maximum power specifications indicate brief operation before overcurrent shutdown occurs. Note particularly that current must be limited at higher output voltage in order to comply with maximum power requirements.
- (14) At zero output current, the output may contain low frequency components which exceed the ripple specification. The output may be operated indefinitely with no load.
- (15) The input and output are not isolated. They share a single COMMON power and signal return.
- (16) Vin must be 2V or higher than Vout for 3.3 to 6V outputs: Vin >= (2V + Vout)

**Trim Connections**

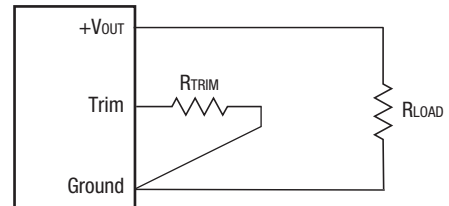
**Output Voltage Adjustment**

The output voltage may be adjusted over a limited range by connecting an external trim resistor (Rtrim) between the Trim pin and Ground. The Rtrim resistor must be a 1/10 Watt precision metal film type, ±0.5% accuracy or better with low temperature coefficient, ±100 ppm/oC. or better. Mount the resistor close to the converter with very short leads or use a surface mount trim resistor.

In the tables below, the calculated resistance is given. Do not exceed the specified limits of the output voltage or the converter’s maximum power rating when applying these resistors. Also, avoid high noise at the Trim input. However, to prevent instability, you should never connect any capacitors to Trim.

**OKR-T/30-W12-C**

Output Voltage	Calculated Rtrim (Ω)
6 V.	218.5
5 V.	268
3.3 V.	436
2.5 V.	619
1.8 V.	978
1.5 V.	1300
1.2 V.	1940
1.0 V.	2890
0.591 V.	∞ (open)



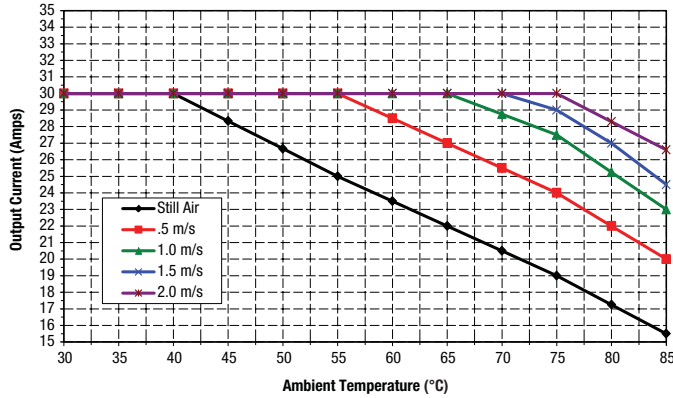
$$R_{TRIM} (k\Omega) = \frac{1.182}{V_{OUT} - 0.591}$$

**Resistor Trim Equation, OKR-T/30-W12-C:**

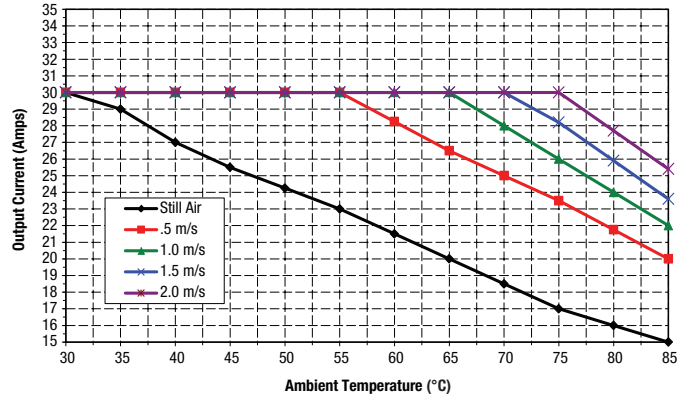
$$R_{TRIM} (k\Omega) = \frac{1.182}{(V_{OUT} - 0.591)}$$

**OKR-T/30-W12-C PERFORMANCE DATA**

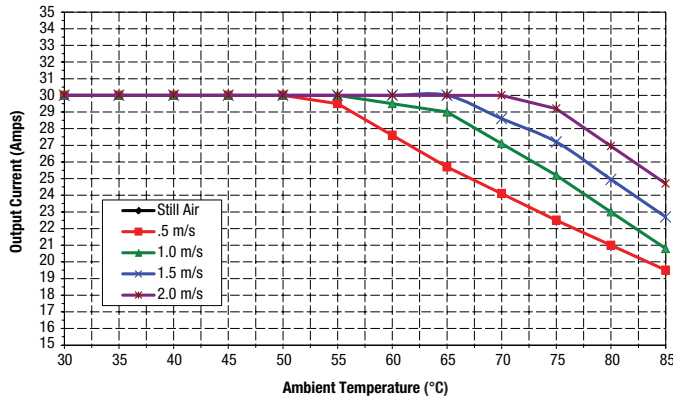
Temperature Derating @1Vout  
Vin 12V (air flow from Pin 13 (input) to Pin 1 (output) on PCB)



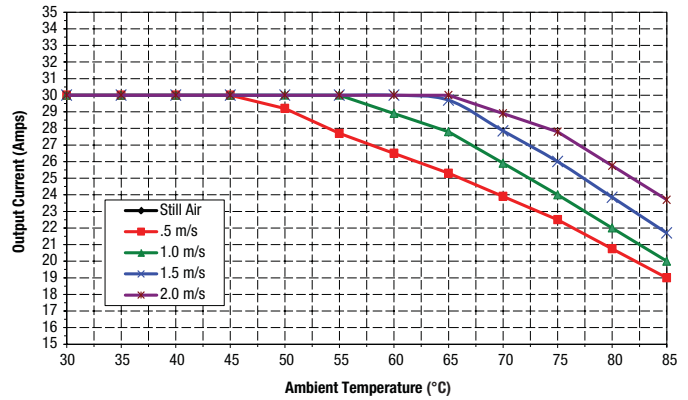
Temperature Derating @1.8Vout  
Vin 12V (air flow from Pin 13 to Pin 1 on PCB)



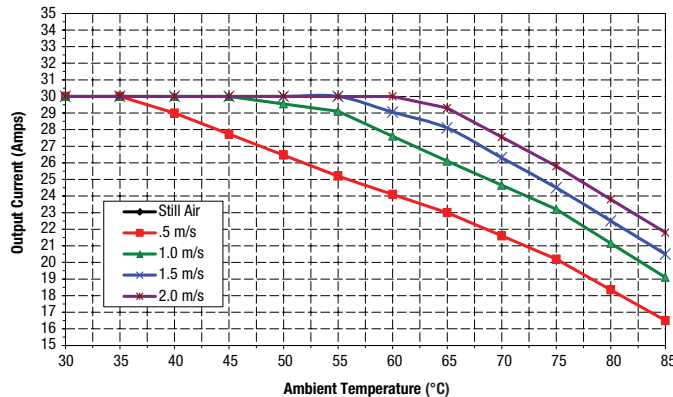
Temperature Derating @2.5Vout  
Vin 12 (air flow from Pin 13 to Pin 1 on PCB)



Temperature Derating @3.3Vout  
Vin 12 (air flow from Pin 13 to Pin 1 on PCB)

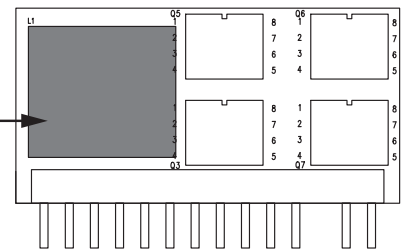


Temperature Derating @5Vout  
Vin 12 (air flow from Pin 13 to Pin 1 on PCB)



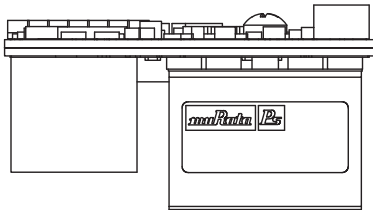
Thermal Reference Point

Thermal reference point  
115°C max. (L1)

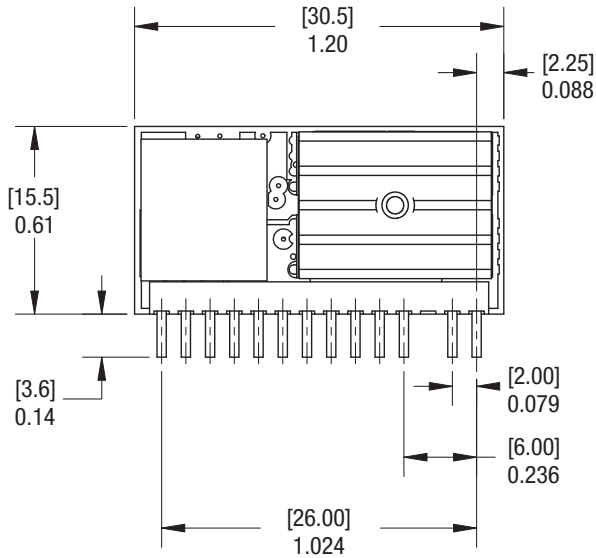


**MECHANICAL SPECIFICATIONS**

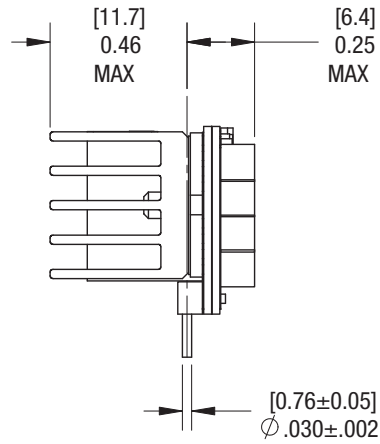
**TOP VIEW**



**FRONT VIEW**



**END VIEW**



**INPUT/OUTPUT CONNECTIONS  
OKR-T/30-W12-C**

Pin	Function
J1-1	Vout
J1-2	Vout
J1-3	Vout
J1-4	PGND
J1-5	PGND
J1-6	Enable
J1-7	-Trim
J1-8	+Trim
J1-9	PGood
J1-10	-Sense
J1-11	+Sense
J1-12	Vin
J1-13	Vin

DIMENSIONS ARE IN INCHES [mm]

TOLERANCES:  
2 PLACE ±.02      ANGLES: ±1°  
3 PLACE ±.010

COMPONENTS SHOWN ARE FOR REFERENCE ONLY

MATERIAL:  
Ø.030 HEADER PINS: COPPER ALLOY  
SUPPORT PINS: TIN PLATED BRASS

FINISH: (ALL HEADER PINS)  
200µ" MIN MATTE TIN OVER NICKEL (40µ" MIN)

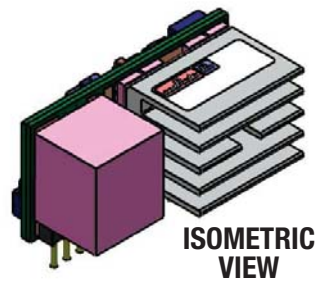
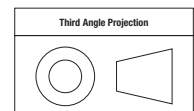


Figure 3. OKR-T/30-W12-C  
Component locations are typical.

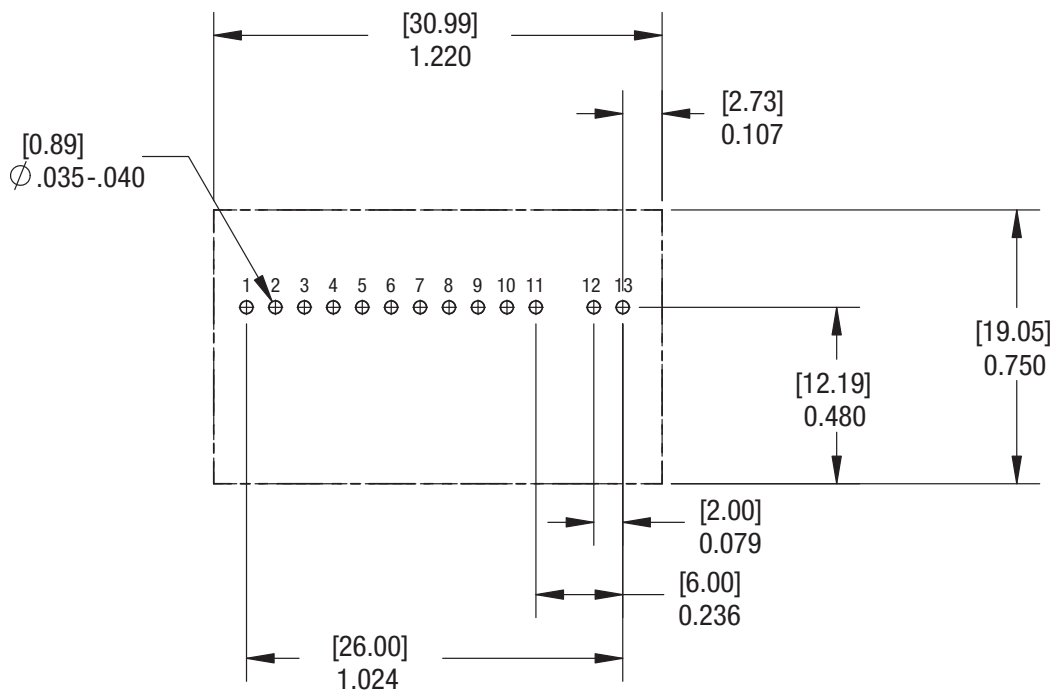
Dimensions are in inches (mm shown for ref. only).



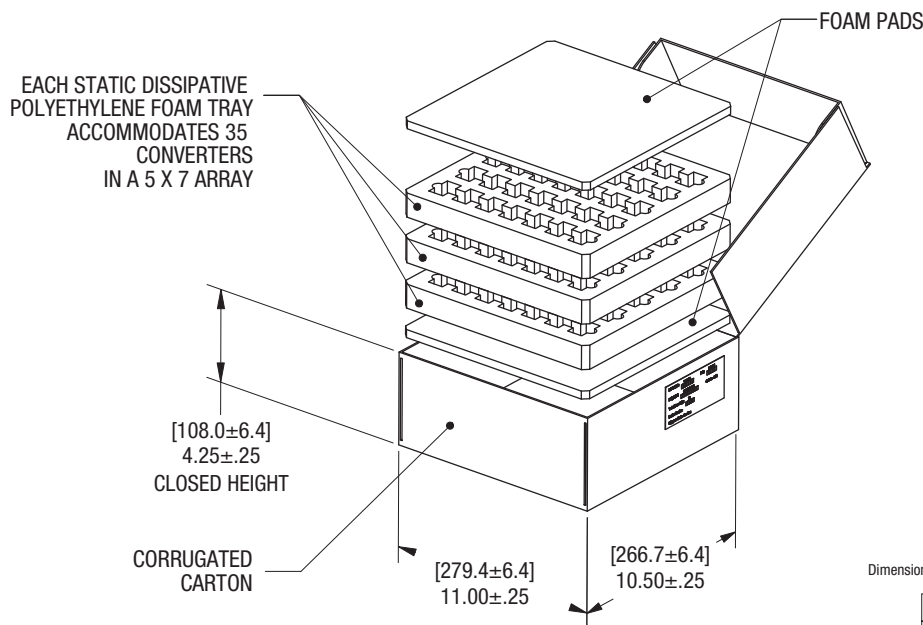
Tolerances (unless otherwise specified):  
.XX ± 0.02 (0.5)  
.XXX ± 0.010 (0.25)  
Angles ± 2°

Components are shown for reference only.

**RECOMMENDED FOOTPRINT (VIEW FROM TOP)**



**STANDARD PACKAGING**



EACH STATIC DISSIPATIVE  
POLYETHYLENE FOAM TRAY  
ACCOMMODATES 35  
CONVERTERS  
IN A 5 X 7 ARRAY

FOAM PADS

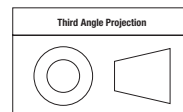
[108.0±6.4]  
4.25±.25  
CLOSED HEIGHT

CORRUGATED  
CARTON

[279.4±6.4]  
11.00±.25

[266.7±6.4]  
10.50±.25

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.

35 UNITS PER TRAY  
3 TRAYS PER CARTON

MPQ = 105 UNITS

**TECHNICAL NOTES**

**Input Fusing**

Certain applications and/or safety agencies may 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 current-limited. For greatest safety, we recommend a fast blow fuse installed in the ungrounded input supply line.

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, i.e. IEC/EN/UL 60950-1.

**Input Under-Voltage Shutdown and Start-Up Threshold**

Under normal start-up conditions, converters will not begin to regulate properly until the ramping-up input voltage exceeds and remains at the Start-Up Threshold Voltage (see Specifications). Once operating, converters will not turn off until the input voltage drops below the Under-Voltage Shutdown Limit. Subsequent restart will 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 Time**

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 ramping input voltage crosses the Start-Up Threshold and the fully loaded regulated output voltage enters and remains within its specified accuracy band. Actual measured times will vary 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 its PWM controller at power up, thereby limiting the input inrush current.

The On/Off Remote Control interval from On command 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 accuracy band. The specification assumes that the output is fully loaded at maximum rated current. Similar conditions apply to the On to Vout regulated specification such as external load capacitance and soft start circuitry.

**Recommended Input Filtering**

The user must assure that the input source has low AC impedance to provide dynamic stability and that the input supply has little or no inductive content, including long distributed wiring to a remote power supply. The converter will operate with no additional external capacitance if these conditions are met.

For best performance, we recommend installing a low-ESR capacitor immediately adjacent to the converter's input terminals. The capacitor should be a ceramic type such as the Murata GRM32 series or a polymer type. Initial

suggested capacitor values are 10 to 22  $\mu\text{F}$ , rated at twice the expected maximum input voltage. Make sure that the input terminals do not go below the undervoltage shutdown voltage at all times. More input bulk capacitance may be added in parallel (either electrolytic or tantalum) if needed.

**Recommended Output Filtering**

The minimum external output capacitance required for proper operation is 50 $\mu\text{F}$  ceramic type. The maximum external output capacitance is 100 $\mu\text{F}$  ceramic and 470 $\mu\text{F}$  POSCAP. Operating outside of these minimum and maximum limits may affect the performance of the unit.

**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. In the figure below, the Cbus and Lbus components simulate a typical DC voltage bus. Please note that the values of Cin, Lbus and Cbus will vary according to the specific converter model.

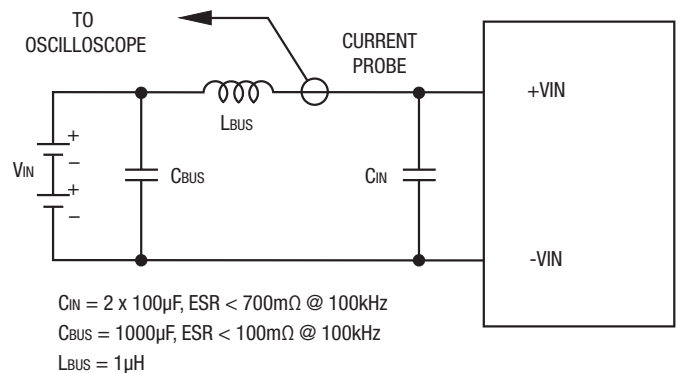


Figure 4: Measuring Input Ripple Current

In the figure below, the two copper strips simulate real-world printed circuit impedances between the power supply and its load. In order to minimize circuit errors and standardize tests between units, scope measurements should be made using BNC connectors or the probe ground should not exceed one half inch and soldered directly to the test circuit.

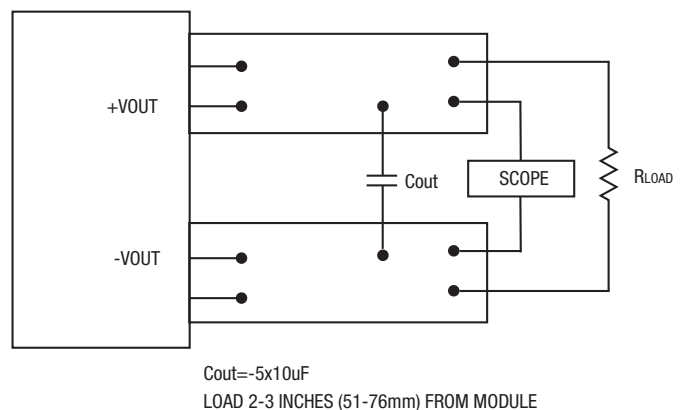


Figure 5: Measuring Output Ripple and Noise (PARD)

**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.

**Thermal Shutdown**

To prevent many over temperature problems and damage, these converters include thermal shutdown circuitry. If environmental conditions cause the temperature of the DC-DC's to rise above the 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 may shut down suddenly without warning. Be sure to thoroughly test your application to avoid unplanned thermal shutdown.

**Temperature Derating Curves**

The graphs in this data sheet illustrate typical operation 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 will accept 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 makes Characterization measurements in a closed cycle wind tunnel with calibrated airflow. We use both thermocouples and an infrared camera system to observe thermal performance.

**CAUTION:** If you routinely or accidentally exceed these Derating guidelines, the converter may have an unplanned Over Temperature shut down. Also, these graphs are all collected at slightly above Sea Level altitude. Be sure to reduce the derating for higher density altitude.

**Output Current 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 may briefly rise above its rated value in normal

**Soldering Guidelines**

Murata Power Solutions recommends the specifications below when installing these converters. These specifications vary depending on the solder type. Exceeding these specifications may cause damage to the product. Your production environment may differ; therefore please thoroughly review these guidelines with your process engineers.

Wave Solder Operations for through-hole mounted products (THMT)			
For Sn/Ag/Cu based solders:		For Sn/Pb based solders:	
Maximum Preheat Temperature	115° C.	Maximum Preheat Temperature	105° C.
Maximum Pot Temperature	270° C.	Maximum Pot Temperature	250° C.
Maximum Solder Dwell Time	7 seconds	Maximum Solder Dwell Time	6 seconds

operation as long as the average output power is not exceeded. This enhances reliability and continued operation of your application. If the output current is too high, the converter will enter the short circuit condition.

**Output Short Circuit Condition**

When a converter is in current-limit mode, the output voltage will drop 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 primary side voltages will also drop, thereby shutting down the PWM controller. Following a time-out period, the PWM will restart, causing the output voltage to begin ramping up 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. A short circuit can be tolerated indefinitely.

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 will automatically restore operation as soon as the short circuit condition is removed.

**External Enable On/Off Control**

The forced On/Off enable option uses positive logic for the external control. The converter may be powered ON by applying a positive voltage (logic HI) between the On/Off pin and the negative power input (-Vin). This positive voltage is referred to -Vin and must be in the range of at least +1.5V and not to exceed the power supply input voltage (+Vin). The current drain is 1 mA max. when turned on.

If the On/Off pin is left open, an internal 100 KΩ pulldown resistor will turn the converter OFF. The OFF condition may also be commanded by grounding the pin or from an external logic LO voltage not to exceed +0.4 Volts. All voltages are referred to the -Vin negative power input.

If you wish to control the On/Off circuit by external logic rather than a switch, carefully compare your logic threshold voltages with that of the On/Off input.

The circuit below indicates the equivalent input. Please avoid false signals from ground bounce errors on the On/Off control. Also note that the external control signal is wired directly into the Q3 BSS138W gate which can be damaged by electrostatic transient voltages. Do not exceed the specifications.

**Additional Performance/Functional Specifications**

General Conditions for Device under Test unless otherwise specified:

Ambient Temperature +25°C

Vin typical; Vout nominal load

With two external 22µF input capacitors and an external 50µF ceramic output capacitor

Note: External Capacitors are application/layout dependent and may not be required, as the internal capacitors are rated to handle input/output RMS ripple currents.

INPUT	MIN.	TYP	MAX.	UNITS
Internal (built-in) FILTER:		C-TYPE		
External Input FUSE (Recommended):			40	A
Input Reverse Polarity Protection:		NA		
<b>VOLTAGE</b>				
Operating Input Voltage Range: ***	5.5	12.0	13.8	Vdc
Max. Voltage (Continuous or Transient):			TBD	Vdc
Start up Voltage:	5.25	5.40	5.55	Vdc
Undervoltage Shutdown:	4.25	4.35	4.55	Vdc
Overvoltage Shutdown:		NA		Vdc
*** Vin ≥ Vout +2V for 3.3V and 5V ***				
<b>CURRENT</b>				
Input Current: (5Vo set)		13.16	13.71	A
Low Line Input Current (Vin @ Min., 5Vout):		22.32	23.13	A
Short Circuit Input Current:		N/A		mA
Inrush Transient:		1		A <sup>2</sup> sec
No Load Input Current (5V, Iout @ 0):		150	190	mA
No Load Input Current (0.59V, Iout @ 0):		155	195	mA
Shut-Down Mode Input Current:		20		mA
Back Ripple Current:		10	20	mAp-p
Measured at module input: Cin = 2x100µF, Cbus = 1000µF, Lbus = 1µH				
<b>GENERAL &amp; SAFETY 12Vin @ 10Amp load current)</b>				
EFFICIENCY : @ Vin nom, 5Vout	93.0	95.0		%
EFFICIENCY : @ Vin min, 5Vout	94.5	96.0		%
EFFICIENCY : @ Vin nom, 3.3Vout	91.0	93.0		%
EFFICIENCY : @ Vin nom, 2.5Vout	89.5	91.5		%
EFFICIENCY : @ Vin nom, 1.8Vout	87.0	89.0		%
EFFICIENCY : @ Vin nom, 1.5Vout	85.0	87.0		%
EFFICIENCY : @ Vin nom, 1.2Vout	83.0	85.0		%
EFFICIENCY : @ Vin nom, 1Vout	82.0	84.0		%
EFFICIENCY : @ Vin nom, 0.59Vout	TBD	TBD		%
SWITCHING FREQUENCY:	630	700	770	kHz
<b>TURN ON TIME</b>				
Vin On to Vout Regulated		4	10	ms
Remote On to Vout Regulated		4	10	ms
ISOLATION:		NON ISOLATED		
<b>SAFETY (Designed to meet following Requirements)</b>				
UL60950, CSA-C22.2 No.60950		Yes		
IEC/EN60950		Yes		
CALCULATED MTBF: (Belcore, Telcordia SR-332, Method 1, Class 3, Gf, Tcase xx°C, Full Load )		TBC		Hours

OUTPUT	MIN.	NOM.	MAX.	UNITS
POWER: Total Output Power	0.00	180	180	W
VOLTAGE ADJUSTMENT RANGE	0.591		6.0	Vdc
50% Load				
Rtrim or Vtrim connected between Trim and GND	Trim Formula: $R_{trim} (k\Omega) = 1.182 / (V_{out} - 0.591)$			
5Vout set : Rt = 268 Ω	4.900	5.00	5.100	Vdc
3.3Vout set : Rt = 436 Ω	3.234	3.30	3.366	Vdc
2.5Vout set : Rt = 619 Ω	2.450	2.50	2.550	Vdc
1.8Vout set: Rt = 978 Ω	1.764	1.80	1.836	Vdc
1.5Vout set: Rt = 1.300K	1.470	1.50	1.530	Vdc
1.2Vout set: Rt = 1.940K	1.176	1.20	1.224	Vdc
1Vout set: Rt = 2.890K	0.980	1.00	1.020	Vdc
0.591Vout set: Rt, Vt = open	0.579	0.59	0.603	Vdc
Setting Accuracy @50% Load within (measured @ 50% Load):		2		%Vo nom
Output Voltage Overshoot - Startup:			5	%Vo set
Output Over-Voltage Protection:	Optional			
<b>CURRENT</b>				
Output Current Range:	0.00	30.00	30.00	A
Current Limit Inception @ 98% of Vout:				
Cold condition: 1.8Vout	33.0	40.0	48.0	A
After warm up:	32.7	39.7	47.7	A
Short Circuit Current:		2.87		A
Hiccup technique - Auto recovery to within 1% Vout				
Short Circuit Duration:		Continuous		
Output Shorted to Ground, no damage				
<b>REGULATION</b>				
Total Regulation Band over all Line, Load and Temp conditions	-3	Vo set	3	%Vo set
LINE Regulation: (Vin = min to max, output @ nominal load)			±0.15	%
Same Measured as Slope 5Vout			0.3	%
LOAD Regulation: (min load to max load)			±0.15	%
Same Measured as Slope 5Vout			0.3	%
<b>DYNAMIC LOAD RESPONSE: (Iout 50% - 100% nom, within 2% of Vout set, di/dt = 5A/μSec)</b>				
Settling time			50	μSec
Peak deviation			150	mV
RIPPLE / NOISE (20 MHz Bw): 5Vo, 12Vi			35	mV Pk/Pk
RIPPLE / NOISE (20 MHz Bw): 3.3Vo, 12Vi			30	mV Pk/Pk
RIPPLE / NOISE (20 MHz Bw): 1.8Vo, 12Vi			25	mV Pk/Pk
RIPPLE / NOISE (20 MHz Bw): 1Vo, 12Vi			15	mV Pk/Pk
TEMPERATURE COEFFICIENT @ All Outputs:		0.02		%/°C
Maximum Output Capacitance:				
Low ESR; > 1 mΩ		1,000		μF
ESR > 15 mΩ		2,400		μF
<b>POWER GOOD</b>				
PGOOD, Open Drain Configuration, Sinking			23	mA
Vout window for PGOOD (Rising)	-7%	-9%	-11%	Vset
Vout window for PGOOD (Falling)	-13%	-15%	-17%	Vset
PGOOD Low Output voltage (5mA)		0.05	0.15	Vdc

Murata Power Solutions, Inc.  
 11 Cabot Boulevard, Mansfield, MA 02048-1151 U.S.A.  
 ISO 9001 and 14001 REGISTERED



This product is subject to the following [operating requirements](#) and the [Life and Safety Critical Application Sales Policy](#):  
 Refer to: <http://www.murata-ps.com/requirements/>

Murata Power Solutions, Inc. makes no representation that the use of its products in the circuits described herein, or the use of other technical information contained herein, will not infringe upon existing or future patent rights. The descriptions contained herein do not imply the granting of licenses to make, use, or sell equipment constructed in accordance therewith. Specifications are subject to change without notice. © 2015 Murata Power Solutions, Inc.