

## FUNCTIONAL SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS	Conditions (1)	Minimum	Typical/Nominal	Maximum	Units
Input Voltage, Continuous	Full power operation	0		15	Vdc
Output Power		0		110	W
Output Current	Current-limited, no damage, short-circuit protected	0		20	A
On/Off Control				14	Vdc
Power Good Pin				6	Vdc
Synchronized Pin				12	Vdc
Sequence Pin				Vin max	Vdc
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					
Operating voltage range (7)	See output voltage vs input voltage	4.5	12	14	Vdc
Recommended External Fuse	Fast blow			36	A
Turn On/Start-up threshold	Rising input voltage	3.9	4.2	4.5	Vdc
Undervoltage Shutdown		3.7	4	4.3	
Internal Filter Type			C-TYPE		
Input current					
Full Load Conditions	Vin = nominal (5Vo set)		8.87	9.29	A
Low Line	Vin @ min, 5Vout		15.12	15.85	A
Inrush Transient			TBD		A <sup>2</sup> -Sec.
Short Circuit Input Current			TBD		mA
No Load Input Current	5Vout, Iout @ 0		75	150	mA
No Load Input Current	1V, Iout @ 0		35	70	
Shut-Down Mode Input Current			1		mA
Reflected (back) ripple current (2)	Measured at input with specified filter		TBD		mA, pk-pk

## GENERAL and SAFETY

EFFICIENCY (12Vin @ 12A load current)	@ Vin nom, 5Vout	91	94		%
	@ Vin min=8Vin, 5Vout	91.5	94.5		
	@ Vin nom, 3.3Vout	89	92		
	@ Vin nom, 2.5Vout		90		
	@ Vin nom, 1.8Vout	83.5	88		
Safety	Certified to UL-60950-1, CSA-C22.2 No.60950-1, IEC/60950-1, 2nd edition (pending)		Yes		
Calculated MTBF (4a)	Per Telcordia SR332, issue 1 class 3, ground fixed, Tambient=+25°C		8,068,510		Hours
Calculated MTBF (4b)	Per Mil-HDBK-217N2 Method		4,514,048		Hours

## DYNAMIC CHARACTERISTICS

Fixed Switching Frequency			400		KHz
Synchronization frequency range		420		600	KHz
High level input voltage		3		12	Vdc
Low level input voltage		0		0.8	Vdc
Input current SYNC pin	VSYNC = 3.0V			1	mA
Minimum pulse width, SYNC		250			nS
Minimum pulse set-up/hold time	SYNC pin (note 15)	250			nS
Startup Time	Power On to Vout regulated			6	mS
Startup Time	Remote ON to Vout regulated			6	mS
Dynamic Load Response	50-100-50% load step, settling time to within ±2% of Vout di/dt = 1 A/μSec		100		μSec
Dynamic Load Peak Deviation	same as above		±200		mV

## FEATURES and OPTIONS

Remote On/Off Control (5)					
"N" suffix					
Negative Logic, ON state	Pin open=ON	0		0.7	V
Negative Logic, OFF state		2		+Vin-max	V
Control Current	open collector/drain			3	mA
"P" suffix					
Positive Logic, ON state	Pin open=ON	+Vin-0.8V		Vin-max	V
Positive Logic, OFF state		0		2.5	V
Control Current	open collector/drain			3	mA
Remote Sense				500	mV

### FUNCTIONAL SPECIFICATIONS (CONT.)

FEATURES and OPTIONS, CONT.	Conditions (1)	Minimum	Typical/Nominal	Maximum	Units
<b>Tracking/Sequencing(optional)</b>					
Slew Rate				TBD	V/mS
Tracking Accuracy	Rising input (0.5V/ms)		TBD		mV
Tracking Accuracy	Falling input(0.5V/ms)		TBD		mV
<b>Power Good Option</b>					
<b>PGOOD, Open Drain Configuration, Sinking:</b>					
Vout window for PGOOD: True		-10%		10%	Vset
Vout window for PGOOD: False			0.05		Vdc
<b>OUTPUT</b>					
Total Output Power		0	100	110	W
<b>Voltage</b>					
Nominal Output Voltage Range (13)	See trim formula	0.69		5.5	Vdc
Setting Accuracy	At 50% load	-1.5		1.5	% of Vnom.
Output Voltage Overshoot-Startup				3	% Vo set
<b>Current</b>					
Output Current Range		0	20	20	A
Minimum Load			No minimum load		
Current Limit Inception (6)	98% of Vnom., after warmup	20.2	32		A
<b>Short Circuit</b>					
Short Circuit Current (17)	Hiccup technique, autorecovery within $\pm 1\%$ of Vout		0.02		A
Short Circuit Duration (remove short for recovery)	Output shorted to ground, no damage		Continuous		
Short circuit protection method	Current limiting				
<b>Regulation (10)</b>					
Total Regulation Band		-2.5	Vo set	2.5	% Vo set
Line Regulation	Vin=min. to max. Vout=nom.			$\pm 0.4$	%
Load Regulation	Iout=min. to max.			$\pm 0.3$	%
Ripple and Noise (8)	5Vo, 12Vin		45	100	mV pk-pk
	3.3Vo, 12Vin		35	80	
	1.8Vo, 12Vin		35	80	
	0.69Vo, 7Vin		30	70	
Temperature Coefficient	At all outputs		$\pm 0.02$		% of Vnom./ $^{\circ}$ C
Maximum Capacitive Loading (14)	Low ESR; $>0.001$ , $<0.01$ ohm	188		1000	$\mu$ F
	ESR $> 0.01$ ohm			10000	
<b>MECHANICAL</b>					
Outline Dimensions			1.3 x 0.53 x 0.34		Inches
			33.02 x 13.46 x 8.75		mm
Weight			0.2		Ounces
			5.4		Grams
<b>ENVIRONMENTAL</b>					
Operating Ambient Temperature Range (9)	full power, all output voltages, see derating curves	-40		85	$^{\circ}$ C
Storage Temperature	Vin = Zero (no power)	-55		125	$^{\circ}$ C
Thermal Protection/Shutdown	Measured in center		TBD		$^{\circ}$ C
RoHS rating			RoHS-6		

### Notes

- Specifications are typical at +25  $^{\circ}$ C, Vin = nominal (+12V), Vout = nominal (+5V), full load, external caps and natural convection unless otherwise indicated. Extended tests at full power must supply substantial forced airflow. All models are tested and specified with external 188 $\mu$ F ceramic output capacitors and a 44  $\mu$ F external input capacitor. All capacitors are low ESR types. These capacitors are necessary to accommodate our test equipment and may not be required to achieve specified performance in your applications. However, Murata Power Solutions recommends installation of these capacitors. All models are stable and regulate within spec under no-load conditions.
- Input Back Ripple Current is tested and specified over a 5 Hz to 20 MHz bandwidth. Input filtering is Cin = 2 x 100  $\mu$ F ceramic, Cbus = 1000  $\mu$ F electrolytic, Lbus = 1  $\mu$ H.
- 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.
- Mean Time Before Failure is calculated using the Telcordia (Belcore) SR-332 Method 1, Case 3, ground fixed conditions, Tpcboard = +25  $^{\circ}$ C, full output load, natural air convection.
- Mean Time Before Failure is calculated using the MIL-HDBK-217N2 method, ground benign, +25 $^{\circ}$ C., full output load, natural convection.
- The On/Off Control Input should use either a switch or an open collector/open drain transistor referenced to -Input Common. A logic gate may also be used by applying appropriate external voltages which do not exceed +Vin.
- Short circuit shutdown begins when the output voltage degrades approximately 2% from the selected setting.
- Please observe the voltage input and output specifications in the voltage range graph.
- Output noise may be further reduced by adding an external filter. 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.
- All models are fully operational and meet published specifications, including "cold start" at -40 $^{\circ}$  C.
- Regulation specifications describe the deviation as the line input voltage or output load current is varied from a nominal midpoint value to either extreme.