

Performance/Functional Specifications⁽¹⁾

INPUT	
Input Voltage Range	See Ordering Guide
Isolation	Not isolated, input and output commons are internally connected
Start-Up Threshold	
W3 Models	2.2 Volts
12V Models	8 Volts
Undervoltage Shutdown	
W3 Models	2.0 Volts
12V Models	7.5 Volts
Overvoltage Shutdown	None
Reflected (Back) Ripple Current ⁽²⁾	10-70mAp-p (model dependent)
Internal Input Filter Type	Capacitive
Reverse Polarity Protection	See fuse information
Input Current:	
Full Load Conditions	See Ordering Guide
Inrush Transient	0.1A ² sec
Shutdown Mode (Off, UV, OT)	5mA
Output Short Circuit	60mA
No Load	
W3 models	50mA
12V models	100mA
Low Line ($V_{IN} = V_{MIN}$)	
LSN2-T/6-W3	5.54 Amps
LSN2-T/6-D12	3.85 Amps
LSN2-T/10-W3	9.14 Amps
LSN2-T/10-D12	6.31 Amps
LSN2-T/16-W3	14.63 Amps
LSN2-T/16-D12	10.2 Amps
Remote On/Off Control: ⁽⁵⁾	
Positive Logic (no model suffix)	OFF = ground pin to +0.8V max. ON = open pin or +2.5V min. to + V_{IN} max.
Negative Logic ("N" model suffix)	ON = open pin to +0.3V max. OFF = +2.5V min. to + V_{IN} max.
Current	1mA max.
OUTPUT	
Voltage Output Range	See Ordering Guide
Minimum Loading	No minimum load
Accuracy (50% load)	±2% of V_{NOM}
Voltage Adjustment Range ⁽¹³⁾	See Ordering Guide
Temperature Coefficient	±0.02% of V_{OUT} range per °C
Ripple/Noise (20 MHz bandwidth)	See Ordering Guide and ⁽⁶⁾
Line/Load Regulation (See Tech Notes)	See Ordering Guide and ⁽¹⁰⁾
Efficiency	See Ordering Guide
Maximum Capacitive Loading: ⁽¹⁵⁾	
LSN2-T/6 models:	
Cap-ESR = 0.001 to 0.01Ω	3000μF
Cap-ESR >0.01Ω	5000μF
LSN2-T/10 and -T/16 models:	
Cap-ESR = 0.001 to 0.01Ω	5000μF
Cap-ESR >0.01Ω	10,000μF

Current Limit Inception: (98% of V_{OUT})	
LSN2-T/6 models	11-13 Amps (cold startup) 11 Amps (after warm up)
LSN2-T/10 models	18.75 Amps (cold startup) 16.75 Amps (after warm up)
LSN2-T/16 models	24 Amps (cold startup) 21 Amps (after warm up)
Short Circuit Mode ⁽⁶⁾	
Short Circuit Current Output	600mA
Protection Method ⁽¹⁷⁾	Hiccup autorecovery on overload removal
Short Circuit Duration	Continuous, no damage (output shorted to ground)
Prebias Startup ⁽¹⁶⁾	Converter will start up if the external output voltage is less than V_{NOM}
Sequencing	
Slew Rate	2V max. per millisecond
Startup delay until sequence start	10 milliseconds
Tracking accuracy, rising input	$V_{OUT} = \pm 100mV$ of Sequence In
Tracking accuracy, falling input	$V_{OUT} = \pm 200mV$ of Sequence In
Sequence pin input impedance	400kΩ to 1MΩ
Remote Sense to V_{OUT}	0.5V max. ⁽⁷⁾
Power Good Output ⁽¹⁴⁾	TRUE (OK) = open drain FALSE (not OK) = Signal Ground to 0.4V
("G" suffix)	MOSFET to ground with external user pullup, 10mA max. sink
Power_Good Configuration	

DYNAMIC CHARACTERISTICS

Dynamic Load Response	25μsec to ±2% of final value (50-100-50% load step, di/dt = 20A/msec)
Start-Up Time	4-7msec for V_{OUT} = nominal (V_{IN} on to V_{OUT} regulated or On/Off to V_{OUT})
Switching Frequency	
LSN2-T/6 models	315kHz
LSN2-T/10 and -T/16 models	230kHz

ENVIRONMENTAL

Calculated MTBF ⁽⁴⁾	TBC Hours
Operating Temperature Range (Ambient)	
No derating, natural convection	-40 to +63°C, vertical mount, 2.5 V_{OUT} ⁽⁹⁾
With derating	See Derating Curves
Operating PC Board Temperature	-40 to +100°C max. ⁽¹²⁾
Storage Temperature Range	-55 to +125°C
Thermal Protection/Shutdown	+115°C
Relative Humidity	To +85% / +85°C

PHYSICAL

Outline Dimensions	See Mechanical Specifications
Removable Heat Shield	Nylon 46
Pin Material	Tin-plated copper alloy
Weight	0.28 ounces (7.8 grams)
Electromagnetic Interference	FCC part 15, class B, EN55022 (conducted and radiated) (may need external filter)
Safety	UL/cUL 60950-1, CSA-C22.2 No.234 IEC/EN 60950-1
Flammability Rating	UL94V-0

PERFORMANCE/FUNCTIONAL SPECIFICATION NOTES

- (1) All models are tested and specified with external 1 || 10 μ F ceramic/tantalum output capacitors and a 22 μ 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. All models are stable and regulate within spec under no-load conditions.
General conditions for Specifications are +25°C, V_{IN} = nominal, V_{OUT} = nominal, full load. "Nominal" output voltage is +5V for D12 models and +3.3V for W3 models.
- (2) Input Back Ripple Current is tested and specified over a 5-20MHz bandwidth. Input filtering is C_{IN} = 2 x 100 μ F tantalum, C_{BUS} = 1000 μ F electrolytic, L_{BUS} = 1 μ H.
- (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.
- (4) Mean Time Before Failure is calculated using the Telcordia (Belcore) SR-332 Method 1, Case 3, ground fixed conditions, T_{PCBOARD} = +25°C, full output load, natural air convection.
- (5) The On/Off Control may be driven with external logic or by applying appropriate external voltages which are referenced to -Input Common. The On/Off Control Input should use either an open collector/open drain transistor or logic gate which does not exceed +V_{IN}. A 68K Ω external pullup resistor to +V_{IN} will cause the "ON" state for negative logic models.
- (6) Short circuit shutdown begins when the output voltage under increasing load degrades approximately 2% from the selected setting.
- (7) If Sense is connected remotely at the load, up to 0.5 Volts difference is allowed between the Sense and +V_{OUT} pins to compensate for ohmic voltage drop in the power lines. A larger voltage drop may cause the converter to exceed maximum power dissipation.
- (8) Output noise may be further reduced by adding an external filter. See I/O Filtering and Noise Reduction.
- (9) All models are fully operational and meet published specifications, including "cold start" at -40°C. V_{OUT} is nominal.
- (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) Other input or output voltage ranges are available under scheduled quantity special order.
- (12) Maximum PC board temperature is measured with the sensor in the center.
- (13) Do not exceed maximum power specifications when adjusting the output trim.
- (14) When Sequencing is not used, the Power Good output is TRUE at any time the output is within approximately $\pm 10\%$ of the voltage set point. Power Good basically indicates if the converter is in regulation. Power Good detects Over Temperature if the PWM has shut down due to OT. Power Good does not directly detect Over Current.
If Sequencing is in progress, Power Good will falsely indicate TRUE (valid) before the output reaches its setpoint. Ignore Power Good if Sequencing is in transition.
- (15) The maximum output capacitive loads depend on the the Equivalent Series Resistance (ESR) of the external output capacitor.
- (16) Do not use Pre-bias startup and sequencing together. See Technical Notes below.
- (17) After short circuit shutdown, if the load is partially removed such that the load still exceeds the overcurrent (OC) detection, the converter will remain in hiccup restart mode.
- (18) For best noise performance, leave the Track/Sequence pin OPEN when not used.

ABSOLUTE MAXIMUM RATINGS

Input Voltage (Continuous or transient)	
W3 models	+7 Volts
12V models	+15 Volts
On/Off Control	-0.3V min. to +V _{IN} max.
Input Reverse Polarity Protection	See Fuse section
Output Current ⁽⁷⁾	Current-limited. Devices can withstand sustained short circuit without damage.
Storage Temperature	-55 to +125°C
Lead Temperature	See soldering guidelines
These 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.	

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. Be cautious when there is high atmospheric humidity. We strongly recommend a mild pre-bake (100° C. for 30 minutes). 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:

Maximum Preheat Temperature	115° C.
Maximum Pot Temperature	270° C.
Maximum Solder Dwell Time	7 seconds

For Sn/Pb based solders:

Maximum Preheat Temperature	105° C.
Maximum Pot Temperature	250° C.
Maximum Solder Dwell Time	6 seconds