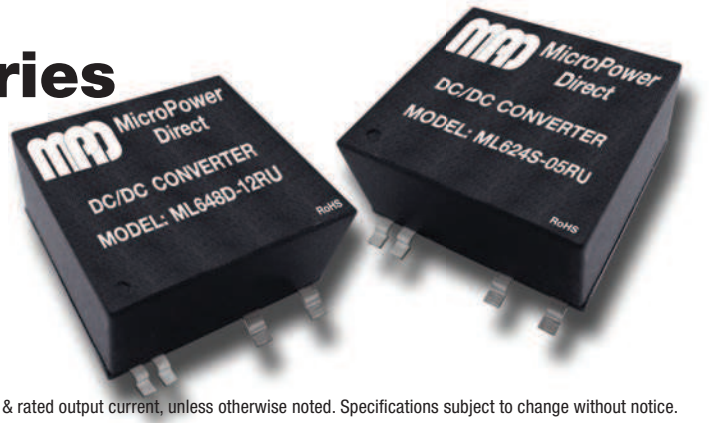


# ML600RU Series

## Ultra-Compact, 6W Wide 4:1 Input, SMT DC/DC Converters



### Key Features:

- 6W Output Power
- Ultra-Compact SMT Case
- Wide 4:1 Input
- 1,500 VDC Isolation
- Single & Dual Outputs
- -40°C to +80°C Operation
- 16 Standard Models
- Tight Line/Load Regulation
- Available on Tape/Reel



### Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

#### Input

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Range	24 VDC Input	9.0	24	36.0	VDC
	48 VDC Input	18.0	48	75.0	
Start Up Voltage	24 VDC Input			9.0	VDC
	48 VDC Input			18.0	
Under Voltage Shutdown	24 VDC Input	8.5			VDC
	48 VDC Input	17.0			
Short Circuit Input Power				3,000	mW
Input Filter	π (Pi) Filter - Meets EN 55022 Class A				

#### Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy	At 50% Load		±1.0	±2.0	%
Output Voltage Balance	Dual Output, Balanced Loads		±1.0		
Line Regulation	For V <sub>IN</sub> = Min to Max		±0.5	±1.0	%
Load Regulation	For I <sub>OUT</sub> = 15% to 100%		±0.5	±1.2	%
Ripple & Noise (20 MHz)	See Note 1		60	100	mV P - P
Transient Response Time, See Note 2			300	600	µS
Transient Response Deviation	25% Load Step Change		±3		%
Temperature Coefficient			±0.01	±0.02	%/°C
Overload Protection	Foldback Type	110	150		%
Output Short Circuit	Continuous (Autorecovery)				

#### General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 Seconds	1,500			VDC
Isolation Resistance	500 VDC	1,000			MΩ
Isolation Capacitance	100 kHz, 1V		1,200	1,500	pF
Switching Frequency			330		kHz

#### Remote On/Off (See Note 3)

Parameter	Conditions	Min.	Typ.	Max.	Units
Supply On		2.5		50.0	VDC
Supply Off		-0.7		0.8	VDC
Standby Input Current				10	mA
Control Common		Referenced to Negative Input (pin 2)			

#### Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40		+80	°C
Operating Temperature Range	Case			+105	°C
Storage Temperature Range		-50		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%

#### Physical

Case Size	0.87 x 0.80 x 0.40 Inches (22.0 x 20.3 x 10.2 mm)				
Case Material	Molding (UL94-V0)				
Weight	0.27 Oz (7.8g)				

#### Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	350			kHours
Moisture Sensitivity Level (MSL)		IPC/JEDEC J-STD-020D Level 2			

#### Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	24 VDC Input	-0.7		50.0	VDC
	48 VDC Input	-0.7		100.0	
Lead Temperature	1.5 mm From Case For 10 Sec.			260	°C

**Caution:** Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.

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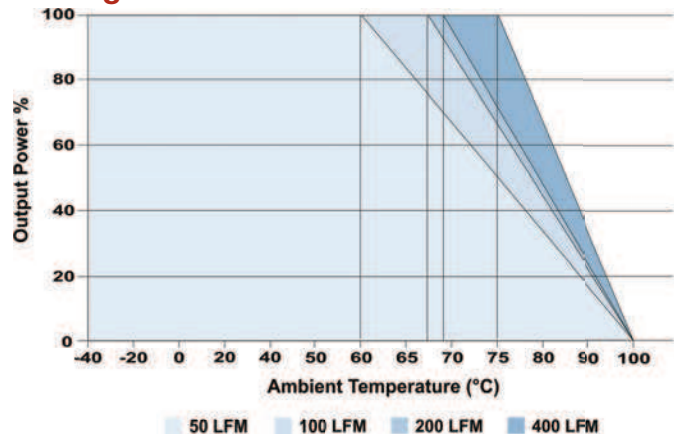
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Model Number	Input				Output			Efficiency (% , Typ)	Output Capacitive Load (μF, Max)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)			
	Nominal	Range	Full-Load	No-Load						
ML624S-03RU	24	9.0 - 36.0	262	30	3.3	1,450	218	76	330	1,500
ML624S-05RU	24	9.0 - 36.0	316	30	5.0	1,200	180	79	330	1,500
ML624S-12RU	24	9.0 - 36.0	301	30	12.0	500	75	83	100	1,500
ML624S-15RU	24	9.0 - 36.0	301	30	15.0	400	60	83	100	1,500
ML624S-24RU	24	9.0 - 36.0	301	30	24.0	250	38	83	100	1,500
ML624D-05RU	24	9.0 - 36.0	301	30	±5.0	±600	±90	82	100	1,500
ML624D-12RU	24	9.0 - 36.0	301	30	±12.0	±250	±38	83	100	1,500
ML624D-15RU	24	9.0 - 36.0	301	30	±15.0	±200	±30	83	100	1,500
ML648S-03RU	48	18.0 - 75.0	131	20	3.3	1,450	218	76	330	750
ML648S-05RU	48	18.0 - 75.0	158	20	5.0	1,200	180	79	330	750
ML648S-12RU	48	18.0 - 75.0	151	20	12.0	500	75	83	100	750
ML648S-15RU	48	18.0 - 75.0	151	20	15.0	400	60	83	100	750
ML648S-24RU	48	18.0 - 75.0	151	20	24.0	250	38	83	100	750
ML648D-05RU	48	18.0 - 75.0	151	20	±5.0	±600	±90	82	100	750
ML648D-12RU	48	18.0 - 75.0	151	20	±12.0	±250	±38	83	100	750
ML648D-15RU	48	18.0 - 75.0	151	20	±15.0	±200	±30	83	100	750

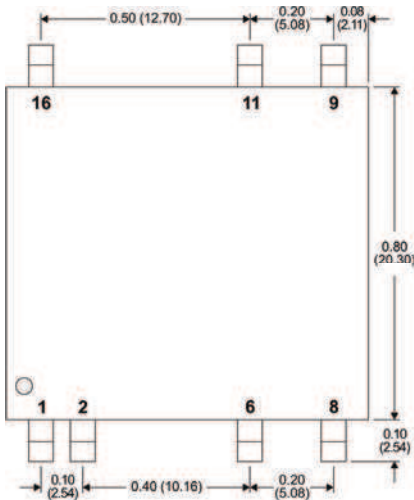
Notes:

- When measuring output ripple, it is recommended that an external 0.47 μF ceramic capacitor be placed from +V<sub>OUT</sub> to -V<sub>OUT</sub> for single output models or from each output to common for dual output models. For noise sensitive applications, the use of 3.3 μF capacitors will reduce the output ripple.
- Transient recovery is measured to within a 1% error band for a load step change of 75% to 100%.
- The maximum control current at the on/off input (pin 1) during a logic high (+5V) is 500 μA. The maximum control current to the on/off pin at logic low (0V) is -500 μA. If the on/off pin is left open, the unit operates. If grounded, the unit will shut off.
- Operation at no-load will not damage these units. However, they may not meet all specifications.
- The converter should be connected to a low ac-impedance source. An input source with a highly inductive impedance may affect the stability of the converter. In applications where the converter output loading is high and input power is supplied over long lines, it may be necessary to use a capacitor on the input to insure start-up. In this case, it is recommended that a low ESR (<1.0Ω at 100 kHz) capacitor be mounted close to the converter. For 24V input units a 4.7 μF is recommended and for 48V input models, a 2.2 μF.
- It is recommended that a fuse be used on the input of a power supply for protection. See the table above for the correct rating.

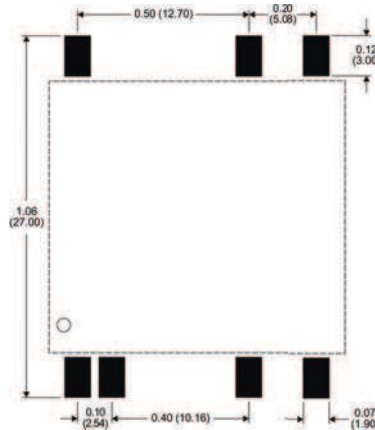
Derating Curve



Mechanical Dimensions



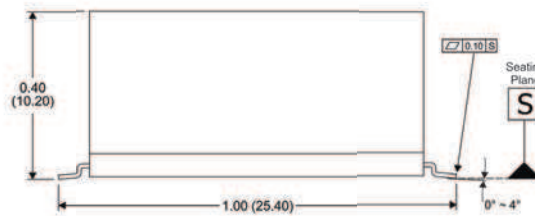
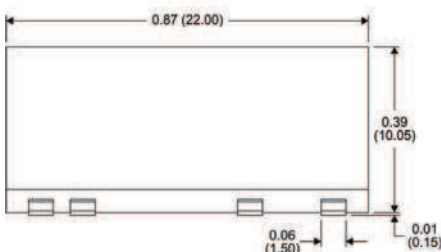
Board Layout



Pin Connections

Pin	Single	Pin	Dual
1	Remote On/Off	1	Remote On/Off
2	-VIN	2	-VIN
6	NC	6	Common
8	NC	8	-VOUT
9	+VOUT	9	+VOUT
11	-VOUT	11	Common
16	+VIN	16	+VIN

NC = No connection



Notes:

- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.01 (±0.25)
- Pin 1 is marked by a "dot" or indentation on the unit



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