

DC-DC CONVERTERS

4.6-36 VDC WIDE INPUT RANGE UP TO 1 WATT

SINGLE OUTPUT, NON-ISOLATION

LM1 SERIES



FEATURES

- Pin-out Compatible with LM78XX Linear Regulators
- 3 PIN SIP Package
- Small Size and Low Profile, 0.46" × 0.30" × 0.40"
- No Minimum Load Required
- Up to 96% Efficiency
- Operating Temperature: -40 to +100°C
- Wide Input Voltage Range
- Built in Filter Capacitor
- Non-Isolated
- No Heat Sink Required
- Safety Meets UL60950-1, EN60950-1 & IEC60950-1
- CE Mark Meets 2006/95/EC, 2011/95/EC and 2004/108/EC
- RoHS Compliant to EU Directive 2011/65/EU

SELECTION GUIDE All specifications are typical at nominal input, full load and 25°C, unless otherwise noted.

Input Voltage Range Vdc	Output Voltage Vdc	Output Current at Full Load A	Input Current at No Load mA	Efficiency %		Model Number*	Maximum Capacitor Load µF
				Min. Vin	Max. Vin		
4.6 - 36	1.2	1	1	74	62	LM1-1.2	470
4.6 - 36	1.5	1	1	78	65	LM1-1.5	470
4.6 - 36	1.8	1	1	82	69	LM1-1.8	470
4.6 - 36	2.5	1	1	87	75	LM1-2.5	470
4.75 - 36	3.3	1	2	91	78	LM1-3.3	470
6.5 - 36	5	1	1	94	84	LM1-5	470
9 - 36	6.5	1	1	93	87	LM1-6.5	470
12 - 36	9	1	1	95	90	LM1-9	470
15 - 36	12	1	1	95	92	LM1-12	470
18 - 36	15	1	1	96	94	LM1-15	470



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Input Specifications

Operating input voltage range, Vdc	With an external input capacitor C1 (22μF/50V) for input voltage > 32Vdc. It allows the module to operate from 32 to 36Vdc.	
	4.6 Min., 9 Typ., 36 Max.	LM1-1.2
	4.6 Min., 9 Typ., 36 Max.	LM1-1.5
	4.6 Min., 9 Typ., 36 Max.	LM1-1.8
	4.6 Min., 9 Typ., 36 Max.	LM1-2.5
	4.75 Min., 9 Typ., 36 Max.	LM1-3.3
	6.5 Min., 12 Typ., 36 Max.	LM1-5
	9 Min., 12 Typ., 36 Max.	LM1-6.5
	12 Min., 24 Typ., 36 Max.	LM1-9
	15 Min., 24 Typ., 36 Max.	LM1-12
	18 Min., 24 Typ., 36 Max.	LM1-15
Rise time, ms	2	Time for Vout rises from 10% to 90% of Vout
Input filter	Capacitor type	
Input reflected ripple current, mA _{p-p}	150	

Output Specifications

Voltage accuracy, %	-2 Min., +2 Max.	
Line regulation, %	-0.2 Min., +0.2 Max.	Low Line to High Line at Full Load
Load regulation, %		10% to 100% of Full Load
	-0.6 Min., +0.6 Max.	1.2Vout, 1.5Vout, Vertical mounting
	-0.4 Min., +0.4 Max.	Others, Vertical mounting
	-1.2 Min., +1.2 Max.	1.2Vout, 1.5Vout, 1.8Vout, Horizontal mounting
	-0.4 Min., +0.4 Max.	Others, Horizontal mounting
Ripple and noise, mV _{p-p}		Measured by 20MHz bandwidth
	50 Typ.	Vout ≤ 6.5Vdc
	75 Typ.	Vout ≥ 9Vdc
Temperature coefficient, %/°C	-0.015 Min., +0.015 Max.	
Dynamic load response		50% load step change
	150mV	Peak deviation
	250μs	Recovery time
Over load protection, A	2.5 Typ.	% of Iout rated; Hiccup mode
Short circuit protection	Continuous, automatic recovery	

General Specifications

Switching frequency, kHz	400 Min.	500 Typ.	600 Max.
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Environmental Specifications

Operating ambient temperature, °C	With derating	-40 Min.	+100 Max.
Over temperature protection, °C	Internal IC junction		+150 Typ.
Storage temperature range, °C		-55 Min.	+125 Max.
Thermal shock		MIL-STD-810F	
Vibration		MIL-STD-810F	
Relative humidity		5% to 95% RH	

Physical Specifications

Design meet safety standard	IEC60950-1, UL60950-1, EN60950-1		
Case material	Non-conductive black plastic		
Potting material	Silicone (UL94 V-0)		
Dimensions	0.46 × 0.30 × 0.40 inch (11.68 × 7.62 × 10.16 mm)		
Weight	1.9g (0.067oz)		
MTBF	2.571 × 10 ⁷ hrs, MIL-HDBK-217F, Full load		

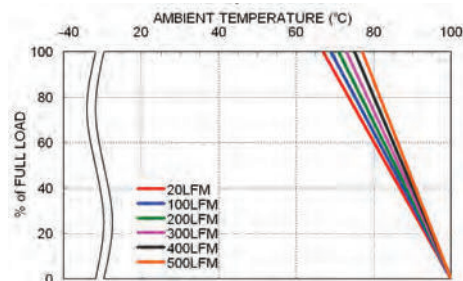
LM1 SERIES

Note:

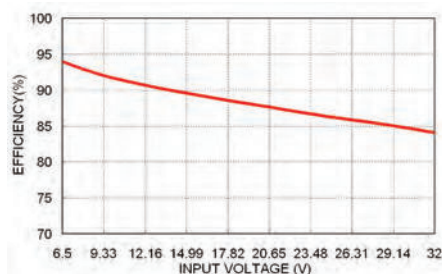
1. Tested with minimum input voltage and constant resistive load.

CAUTION: This power module is not internally fused. An input line fuse must always be used.

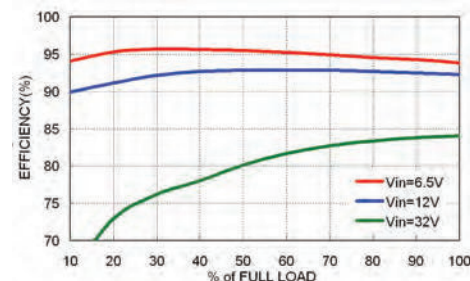
Characteristic Curve



LM1-1.5 Derating Curve



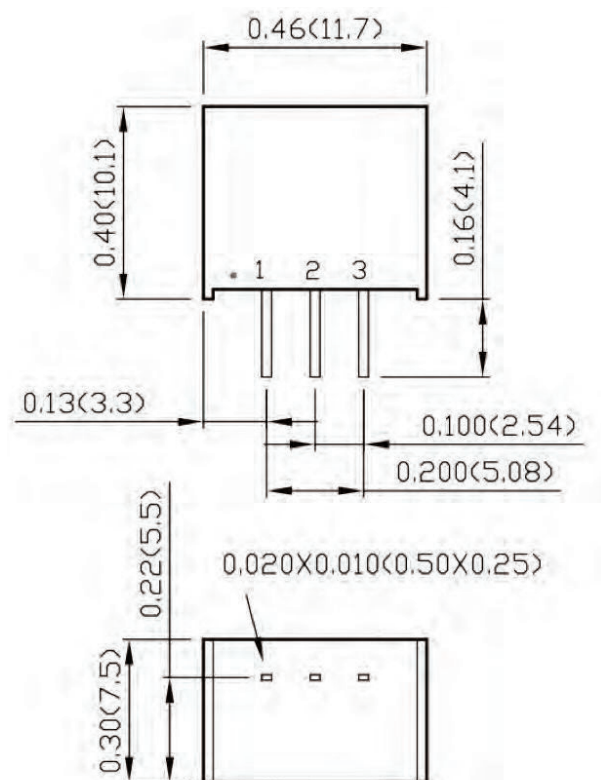
LM1-1.5 Efficiency vs. Input Voltage



LM1-1.5 Efficiency vs. Output Load

Mechanical Drawing

Standard Type: Vertical Mounting



BOTTOM VIEW

PIN CONNECTION

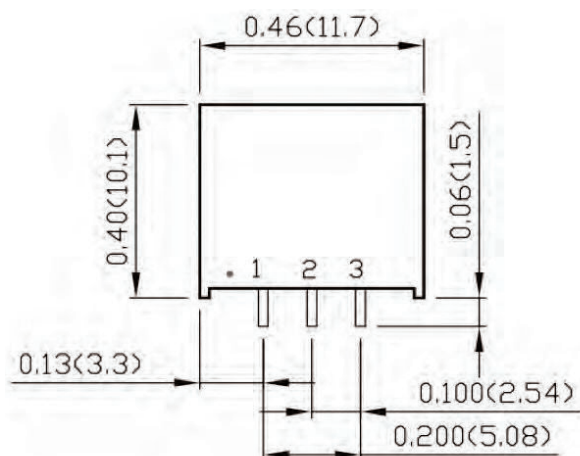
PIN	DEFINE
1	-Vin
2	GND
3	+Vout

1. All dimensions in inch (mm)
2. Tolerance : $x.xx \pm 0.02$ ($x.x \pm 0.5$)
 $x.xxx \pm 0.01$ ($x.xx \pm 0.25$)
3. Pin pitch tolerance ± 0.01 (0.25)
4. Pin dimension tolerance ± 0.004 (0.1)

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Mechanical Drawing

Suffix-H: Horizontal Mounting



PIN CONNECTION

PIN	DEFINE
1	-Vin
2	GND
3	+Vout

1. All dimensions in inch (mm)
2. Tolerance : $x.xx \pm 0.02$ ($x.x \pm 0.5$)
 $x.xxx \pm 0.01$ ($x.xx \pm 0.25$)
3. Pin pitch tolerance ± 0.01 (0.25)
4. Pin dimension tolerance ± 0.004 (0.1)

