











LME78_2.0 Series

Wide Input Non-Isolated & Regulated, Single Output

Switching Regulator

-  High efficiency up to 96%
-  Operating temperature range: -40°C ~ +100°C
-  Short circuit protection (SCP)
-  High voltage input range, up to 36V
-  3PIN SIP package
-  Non isolated
-  Very low standby current
-  UL94V-0 package material

The LME78_2.0 are high efficiency switching regulators and ideal substitutes of LM78xx series three-terminal linear regulators. The product is featured with high efficiency, low loss, short circuit protection and no heat sink requirement. They are widely used in industrial control, instrumentation, and electric power applications.



Common specifications	
Short circuit protection:	Hiccup, automatic recovery
Thermal impedance:	34°C/W, MIN Mounting at FR4 (1.18*1.18inch) PCB
Cooling:	Nature convection
Operation temperature range:	-40°C~+100°C (see temperature derating curve)
Storage temperature range:	-55°C ~+125°C
Soldering temperature:	260°C MAX, 1.5mm from case for 10 sec
Maximum case temperature:	105°C
Storage humidity range:	< 95%RH
Package material:	Plastic [UL94-V0]
MTBF (MIL-HDBK-217F @25°C):	• 5VDC input: 16Mhrs, min • 24VDC input: 2.6Mhrs, min
Safety standard (design to meet):	IEC/EN 60950-1, IEC/EN 62368-1
Weight:	2.4g
Dimensions:	14*7.5*10.1mm

Input specifications						
Item	Test conditions	Min	Typ	Max	Units	
Input surge voltage	• 5VDC input • 24VDC input		6 40		VDC VDC	
Start up time	nominal Vin, constant resistive load		5		ms	
Input reflected ripple current*			35		mA pk-pk	
Input Filter	Capacitor Filter					

* Measured through a source indicator L1 (12μH) and a source capacitor C1 (10μH) at nominal input and full load.

Example:
LME78_05-2.0
 LM= Series; E= cost effective, 05= 5Vout; pp=2.0A

- Note:**
- Do not operate exceeding the absolute maximum rating, it will cause damage;
 - Operation under no-load conditions will not damage these devices, however they may not meet all listed specifications;
 - Unless otherwise specified, data in this datasheet should be tested under the conditions of Ta = 25°C, humidity <75% when inputting nominal voltage and outputting rated load;
 - All index testing methods in this datasheet are based on our Company's corporate standards;
 - Specifications subject to change without prior notice.

Output specifications						
Item	Test conditions	Min	Typ	Max	Units	
Voltage accuracy				±2	%	
Line regulation				±0.5	%	
Load regulation	0% to 100% load • 5VDC input • 24VDC input - for Vo≥5.0VDC - for Vo≤3.3VDC			±1.0	%	
	10% to 100% load • 24VDC input			±1.0	%	
Ripple + Noise*	20MHz bandwidth - for Vo≤6.5VDC - for Vo≥9VDC		50 75		mVpk-pk mVpk-pk	
Switching frequency	• 5VDC input • 24VDC input		1200		KHz	
			410		KHz	
Temperature Drift Coefficient			±0.02		%/°C	
Transient response deviation	Nominal input, 25% load step change (75%-50%-25% of Io)			±3	%	
Transient recovery time	Nominal input, 25% load step change (75%-50%-25% of Io)		150		μs	
Over load protection	• 5VDC input • 24VDC input		8.5		A	
			3.5		A	

* Ripple and noise measured with a 0.1μF ceramic capacitor.

EMC specifications			
EMI	CE	EN55032	CLASS B
EMI	RE	EN55032	CLASS B
EMS	ESD	IEC61000-4-2	perf. Criteria A
EMS	RS	IEC61000-4-3	perf. Criteria A
EMS	EFT*	IEC61000-4-4	perf. Criteria A
EMS	Surge*	IEC61000-4-5	perf. Criteria A
EMS	CS	IEC61000-4-6	perf. Criteria A
EMS	PFMF	IEC61000-4-8	perf. Criteria A

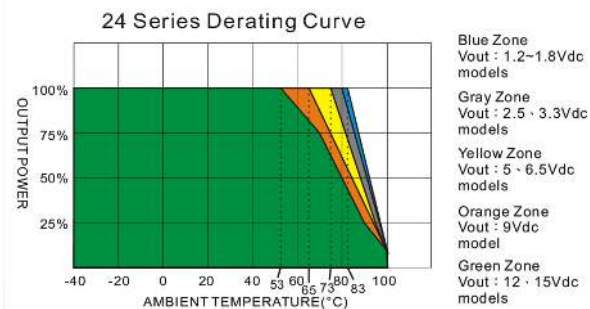
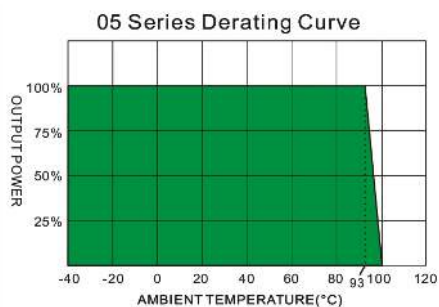
* An external filter capacitor and TVS is required if the module has to meet IEC61000-4-4 and IEC61000-4-5.

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Part Number	Input Voltage [VDC] Nominal (Range)	Input Current [@full load, mA typ] min/max Vin	Output Voltage [VDC]	Output Current [mA]	Capacitive load [μ F, max.]	Efficiency [% , min/max Vin]
LME78_051.2-2.0	5 (3-5.5)	889/507	1.2	2000	4200	90/86
LME78_051.5-2.0	5 (3-5.5)	1099/620	1.5	2000	3700	91/88
LME78_051.8-2.0	5 (3-5.5)	1304/727	1.8	2000	3300	92/90
LME78_052.5-2.0	5 (3-5.5)	1385/988	2.5	2000	1800	95/92
LME78_1.2-2.0	24 (4.6-36)	621/89	1.2	2000	2500	84/75
LME78_1.5-2.0	24 (4.6-36)	758/108	1.5	2000	2000	86/77
LME78_1.8-2.0	24 (4.6-36)	900/127	1.8	2000	1600	87/79
LME78_2.5-2.0	24 (4.6-36)	1221/167	2.5	2000	1200	89/83
LME78_03-2.0	24 (4.75-36)	1527/213	3.3	2000	900	91/86
LME78_05-2.0	24 (6.5-36)	1637/312	5	2000	600	94/89
LME78_6.5-2.0	24 (9-36)	1537/397	6.5	2000	470	94/91
LME78_09-2.0	24 (12-36)	1579/544	9	2000	330	95/92
LME78_12-2.0	24 (15-36)	1684/717	12	2000	270	95/93
LME78_15-2.0	24 (18-36)	1736/887	15	2000	200	96/94

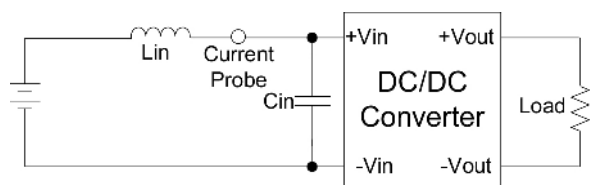
Typical characteristics



Test configurations

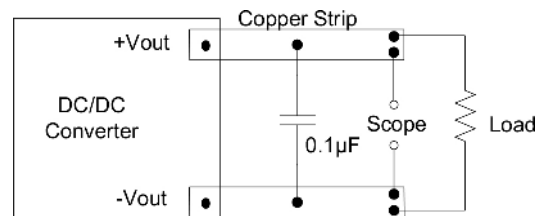
Input reflected ripple current test step:

Input reflected ripple current is measured through a source inductor L_{in} (12 μ H) and a source capacitor C_{in} (10 μ F, ESR<1.0 Ω at 100KHz) at nominal input and full load.



Output ripple & noise measurement test:

Measured with a 0.1 μ F ceramic capacitor. The scope measurement bandwidth is 0-20MHz.



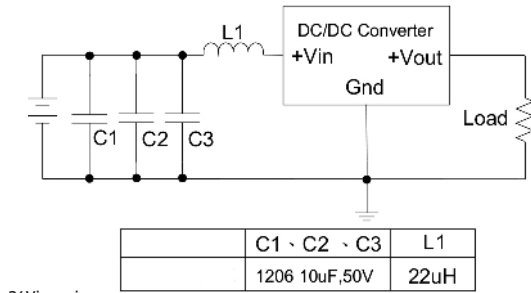
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EMC countmeasures

EMI countermeasures

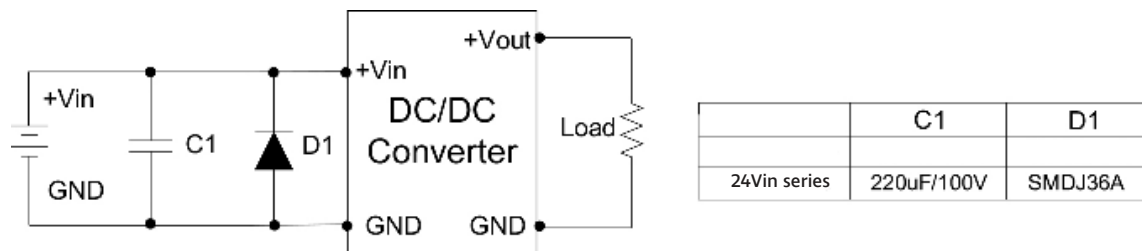
Input filter components (C1, C2, C3, L1) are used to help meet EMI requirement for the module. These components should be mounted as close as possible to the module; and all leads should be minimized to decrease radiated noise.



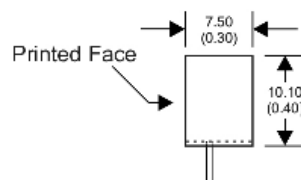
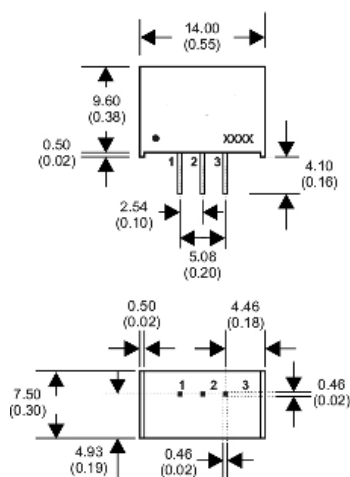
EFT / Surge test countermeasures

Filter suggestion:

24Vin models: Nippon - chemi - con KY series, 220uF/10V and a TVS, 3KW, 36V



Mechanical dimensions



- Notes : All dimensions are typical in millimeters (inches).
1. Pin diameter: 0.65 ± 0.15 (0.03 ± 0.006)
 2. Pin pitch and length tolerance: ± 0.35 (± 0.014)
 3. Pin to case tolerance: ± 0.5 (± 0.02)
 4. Case Tolerance: ± 0.5 (± 0.02)

PIN CONNECTIONS	
PIN NUMBER	SINGLE
1	+V Input
2	GND
3	+V Output