



## LMTOE78\_0.5 series

Wide input, non-isolated & regulated, single output, SMD package

## Switching Regulator

- ⊕ Economical open frame power supply
- ⊕ High efficiency up to 95%
- ⊕ No-load input current as low as 0.2mA

- ⊕ Operating ambient temp. range: -40°C to +85°C
- ⊕ Output short-circuit protection
- ⊕ EN62368 approved

The LMTOE78\_0.5 series are high efficiency switching regulators. The converters feature high efficiency, low loss and short-circuit protection in a compact SMD package. These products are widely used in applications such as industrial control, instrumentation and electric power.



### Common specifications

Short circuit protection:	Continuous, self-recovery
Operating temperature range:	-40°C ~ +85°C (See Fig. 1)
Storage temperature range:	-55°C ~ +125°C
Storage humidity range:	5% ~ 95% RH
Reflow soldering temperature:	Peak temp. ≤245°C, maximum duration time ≤60s over 217°C. For actual application, please refer to IPC/JEDEC J-STD-020D.1.
MTBF (MIL-HDBK-217F, +25°C):	> 2,000,000 hours
Weight:	0.75g (Typ.)
Cooling Method	Free air convection
Dimensions:	12 x 12 x 4.5mm

### Input specifications

Item	Test conditions	Min	Typ	Max	Units
No-load input current			0.2	1.5	mA
Reverse polarity at input	Avoid / not protected				
Input filter	Capacitance filter				

### Example:

#### LMTOE78\_15-0.5

LM = Series; T = SMT case; O = Open frame; E = Economic;  
15 = 15VDC out; 0.5 = 0.5A

### Output specifications

Item	Test conditions	Min	Typ	Max	Units
Voltage accuracy	Full load, input voltage range • 3.3VDC input • Others		±2 ±2	±4 ±3	% %
Output voltage accuracy				±2	
Line regulation	Full load, input voltage range		±0.3	±0.5	%
Load regulation	Nominal input voltage, 10% -100% load		±0.6	±1.0	%
Ripple & Noise*	20MHz bandwidth, nominal input voltage • 3.3VDC, 30-100% load • Others, 20-100% load		50 50	100 100	mVp-p mVp-p
Temperature coefficient	Full load		±0.02		%/°C
Transient response deviation	Nominal input voltage, 25% load step change		±50	±250	mV
Transient recovery time	Normal Vin, 25% load step change		0.2	1	ms
Switching frequency	Full load, nominal input		700		KHz

- The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information;
- With light loads at or below 30%, Ripple & Noise for 3.3V output parts increase to 200mVp-p max, and a load below 20% for 5V/6.5V/9V/12V/15V output parts levels increase to 250mVp-p max.

### Note:

- The maximum capacitive load offered were tested at nominal input voltage and full load;
- All specifications measured at Ta = 25°C, humidity <75%, nominal input voltage and rated output load unless otherwise specified.
- All index testing methods in this datatable are based on our company corporate standards;
- We can provide product customization service, please contact our technicians directly for specific information;
- Products are related to laws and regulations: see „Features“ and „EMC“;
- Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

### EMC specifications

Emissions	CE	CISPR32/EN55032 CLASS B (see Fig. 4-② for recommended circuit)
Emissions	RE	CISPR32/EN55032 CLASS B (see Fig. 4-② for recommended circuit)
Immunity	ESD	IEC/EN 61000-4-2 Contact ±4kV perf. Criteria B
Immunity	RS	IEC/EN 61000-4-3 10V/m perf. Criteria B
Immunity	EFT	IEC/EN 61000-4-4 100kHz ±1kV (see Fig. 4-③ for recommended circuit) perf. Criteria B
Immunity	Surge	IEC/EN 61000-4-5 line to line ±1kV (see Fig. 4-④ for recommended circuit) perf. Criteria B
Immunity	CS	IEC/EN 61000-4-6 3Vr.m.s perf. Criteria B

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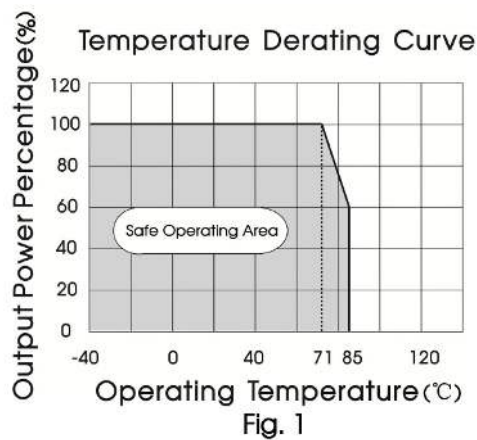
Wide input, non-isolated & regulated, single output, SMD package

### Product Selection Guide

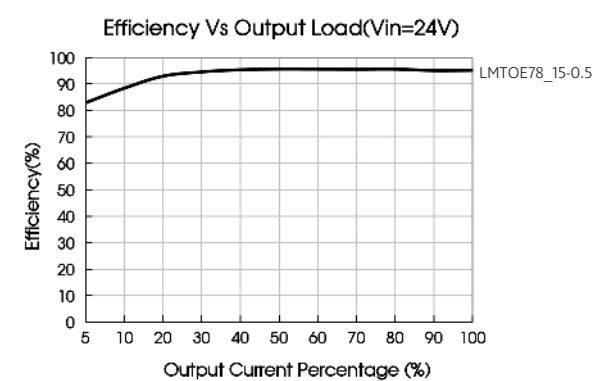
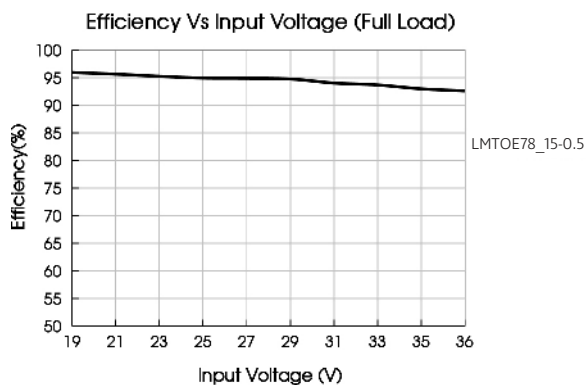
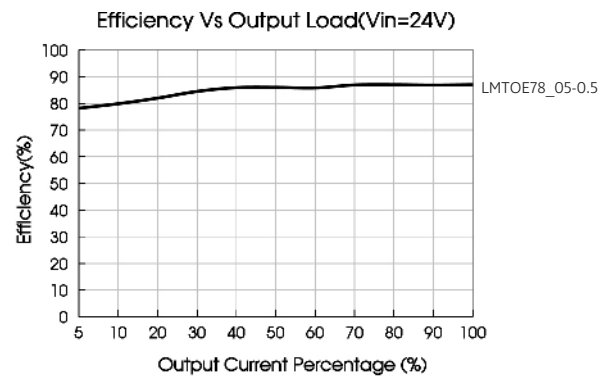
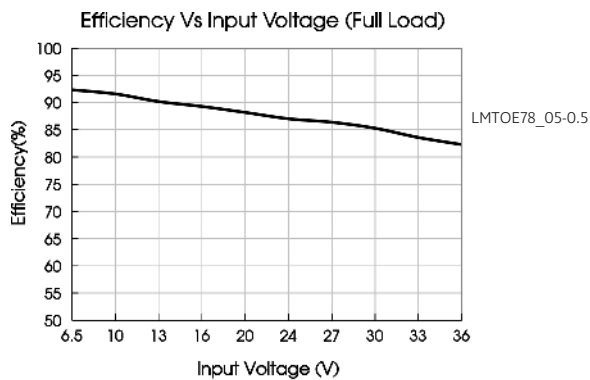
Part Number	Input Voltage [VDC]		Output Voltage [VDC]	Output Current [mA, Max]	Efficiency [Vin. max]	Capacitive load [ $\mu$ F, max]
	Nominal	Range				
LMTOE78_03-0.5	24	4.75-36	3.3	500	85/76	680
LMTOE78_05-0.5	24	6.5-36	5	500	90/81	680
LMTOE78_07-0.5	24	8-36	6.5	500	91/83	680
LMTOE78_09-0.5	24	12-36	9	500	93/87	680
LMTOE78_12-0.5	24	15-36	12	500	94/88	680
LMTOE78_15-0.5	24	19-36	15	500	95/90	680

\*For input voltage exceeding 30 VDC, an input electrolytic capacitor of 22 $\mu$ F/50V is required to prevent the module from being damaged by voltage spikes.

### Typical characteristics



### Efficiency



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### Typical application circuit

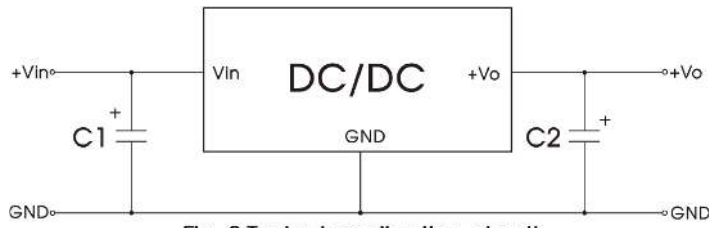


Fig. 2 Typical application circuit

Part number	C1 (ceramic capacitor)	C2 (ceramic capacitor)
LMTOE78_03-0.5	10 $\mu$ F/50V	22 $\mu$ F/10V
LMTOE78_05-0.5	10 $\mu$ F/50V	22 $\mu$ F/10V
LMTOE78_07-0.5	10 $\mu$ F/50V	22 $\mu$ F/16V
LMTOE78_09-0.5	10 $\mu$ F/50V	22 $\mu$ F/16V
LMTOE78_12-0.5	10 $\mu$ F/50V	22 $\mu$ F/25V
LMTOE78_15-0.5	10 $\mu$ F/50V	22 $\mu$ F/25V

#### Notes:

1. The required C1 and C2 capacitors must be connected as close as possible to the terminals of the module;
2. Refer to Table 1 for C1 and C2 capacitor values. For certain applications, increased values and/or tantalum or low ESR electrolytic capacitors may also be used instead;
3. Converter cannot be used for hot swap and with output in parallel;
4. To further reduce the output ripple and noise, we suggested the use of a "LC" filter at the output terminals, with an inductor value (L) of 10 $\mu$ H-47 $\mu$ H, see Fig. 3

### External "LC" output filter circuit diagram

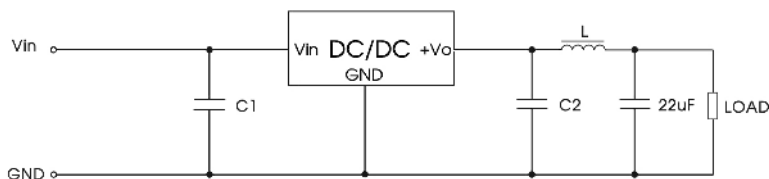


Fig. 3 External "LC" output filter circuit diagram

### EMC solution-recommended circuit

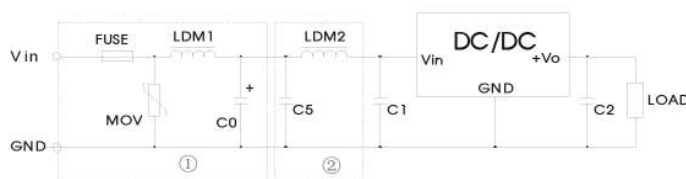


Fig.4 Recommended compliance circuit

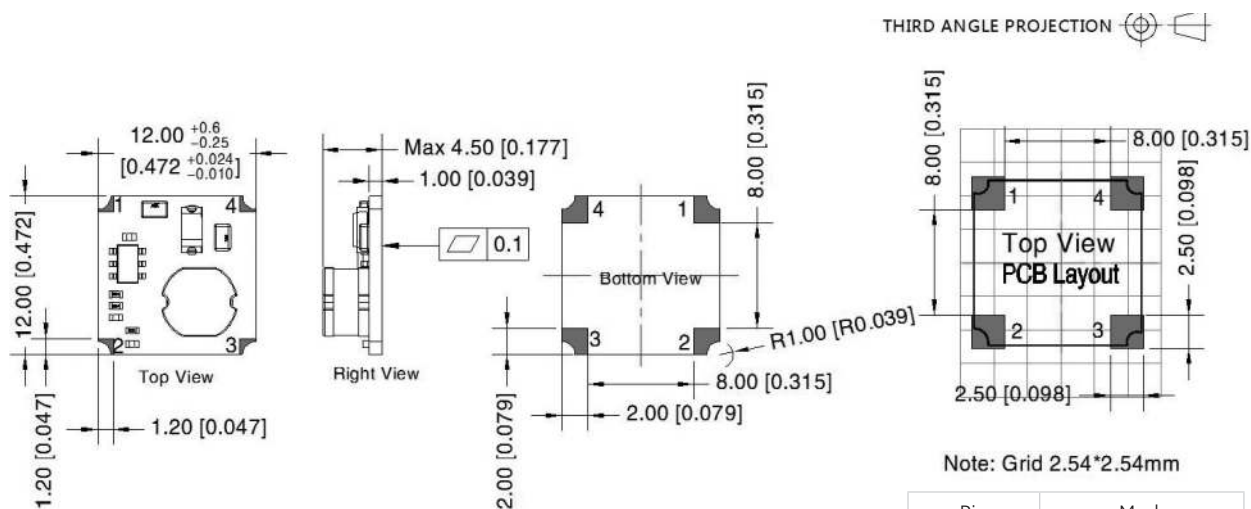
FUSE	MOV	LDM1	C0	C1/C2	C5	LDM2
Selecting based on the actual Input current in application	S20K30	82 $\mu$ H	680 $\mu$ F /50V	Refer to table 1	4.7 $\mu$ F /50V	22 $\mu$ H

Note: For EMC tests we use Part ① in Fig. 4 for immunity and part ② for emissions test. Selecting based on needs.

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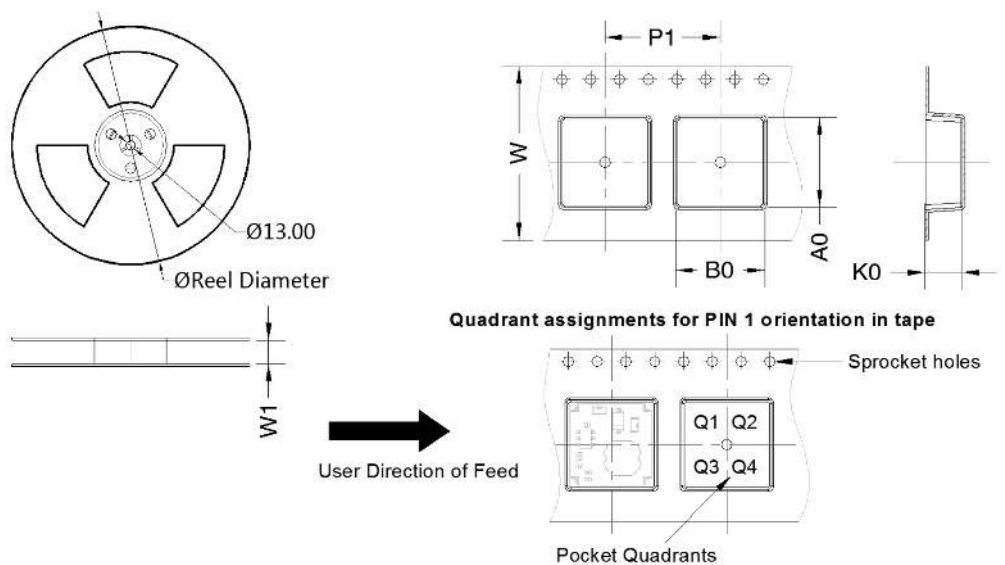
## Mechanical dimensions



Note:  
Unit: mm[inch]  
General tolerances:  $\pm 0.25[\pm 0.010]$   
The layout of the device is for reference only,  
please refer to the actual product

Pin	Mark
1	Vin
2	NC
3	+Vout
4	GND

## Tape and reel info



Package Type	Pin	MPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SMD	4	700	330.0	24.4	12.47	12.47	5.1	16	24.0	Q1