

## LMS78\_2.0R Series

Wide Input Non-Isolated & Regulated, Single Output

## Switching Regulator

- ⊕ Operating temperature: -40°C ~ +85°C
- ⊕ Short circuit protection
- ⊕ No-load input current as low as 0.1mA
- ⊕ Efficiency up to 95%
- ⊕ Pin-out compatible with LM78XX Linear
- ⊕ Meets EN62368 standards

The LMS78\_2.0R series are high efficiency switching regulators and ideal substitutes of LM78xx series three-terminal linear regulators. The product is featured with high efficiency, low loss and no heat sink requirement. They are widely used in industrial control, instrumentation, and electric power applications.



Common specifications	
Short circuit protection:	Continuous, self-recovery
Cooling:	Free air convection
Operating temperature range:	-40°C~+85°C
Storage temperature range:	-55°C ~+125°C
Pin Soldering Resistance Temperature:	260°C - Soldering time: 10s (Max.)
Operating case temperature:	100°C Max.
Storage humidity range:	< 95%
Package material:	Plastic [UL94-V0]
MTBF (@25°C, MIL-HDBK-217F):	>2,000,000 hours
Dimensions:	11.50*9.00*17.50 mm
Package weight:	3.8g

Input specifications					
Item	Test conditions	Min	Typ	Max	Units
No-load input current	Nominal input voltage, 2.5V output		0.2	0.5	mA
	Positive output		0.1	1	mA
Reverse Polarity Input	Avoid / Not protected				
Input Filter	Capacitance filter				

**Example:**  
**LMS78\_05-2.0R**  
 LM = Series; S = SIP Case; 05 = 5Vout; 2.0 = 2A; R = Revised

### Note:

- The maximum capacitive load offered were tested at input voltage range and full load;
- Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta = 25°C, humidity <75% with nominal input voltage and rated output load;
- All index testing methods in this datasheet are based on our Company's corporate standards;
- We can provide product customization service, please contact our technicians directly for specific information;
- Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

Output specifications					
Item	Test conditions	Min	Typ	Max	Units
Output voltage accuracy	• LMS78_03-2.0R • Others		±2 ±2	±4 ±3	% %
Line regulation	Full load, input voltage range		±0.4	±0.8	%
Load regulation	10% to 100% load		±0.5	±1.5	%
Ripple + Noise*	20MHz Bandwidth Nominal input voltage, 100% load		30	75	mVp-p
Temperature coefficient	Operating temperature -40 °C to +85 °C			±0.03	%/°C
Transient response deviation	2.5V output Nominal input, 25% load step (25%-50%- 25%, 50%-75%-50% step)		±80 ±50	±150 ±150	mV mV
Transient recovery time	Nominal input, 25% load step (25%-50%- 25%, 50%-75%-50% step)		0.2	1	ms
Switching frequency	Full load, nominal input		400		KHz

\*Test ripple and noise by "parallel cable" method.

EMC specifications					
EMI	CE	CISPR32/EN55032 CLASS B	(refer to EMC recommended circuit, ②)		
EMI	RE	CISPR32/EN55032 CLASS B	(refer to EMC recommended circuit, ②)		
EMS	ESD	IEC/EN61000-4-2	Contact ±6KV	perf. Criteria B	
EMS	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A	
EMS	EFT	IEC/EN61000-4-4	±1KV (External Circuit Refer to recommended circuit, ③)	perf. Criteria B	
EMS	Surge	IEC/EN61000-4-5	line to line ±1KV (External Circuit Refer to recommended circuit, ③)	perf. Criteria B	
EMS	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A	

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Part Number	Input Voltage [VDC]		Output Voltage [VDC]	Output Current [mA]	Efficiency @full load [Vin. min/max]	Capacitive load [ $\mu$ F; max]
	nominal	Range				
LMS78_02-2.0R	24	4.5-36	2.5	2000	89/83	2000
LMS78_03-2.0R	24	6-36	3.3	2000	89/85	1800
LMS78_05-2.0R	24	8-36	5	2000	92/89	1000
LMS78_09-2.0R	24	13-36	9	2000	95/92	680
LMS78_12-2.0R	24	16-36	12	2000	96/94	470
LMS78_15-2.0R	24	18-36	15	2000	96/94	470

Add suffix "L" for 90° bend pins, for example: LMS78\_05-2.0RL.

## Typical characteristics

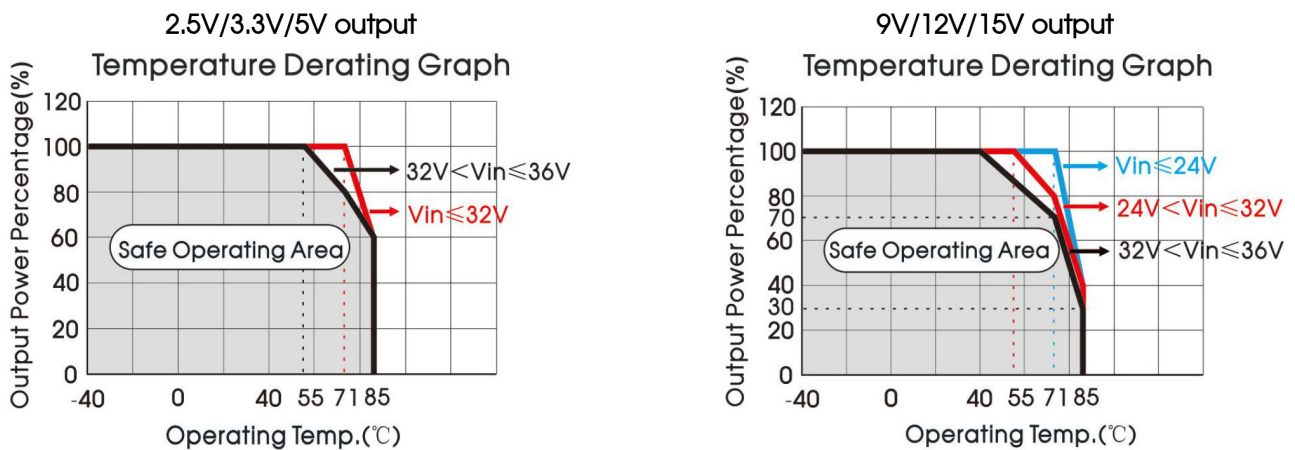
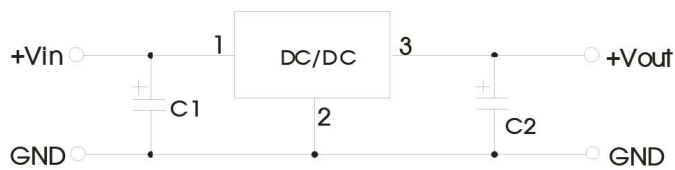


Fig. 1

## Typical application circuit



Part Number	C1 (Ceramic Capacitor)	C2 (Ceramic Capacitor)
LMS78_02-2.0R	22 $\mu$ F/50V	22 $\mu$ F/10V
LMS78_03-2.0R	22 $\mu$ F/50V	22 $\mu$ F/10V
LMS78_05-2.0R	22 $\mu$ F/50V	22 $\mu$ F/10V
LMS78_09-2.0R	22 $\mu$ F/50V	22 $\mu$ F/16V
LMS78_12-2.0R	22 $\mu$ F/50V	22 $\mu$ F/25V
LMS78_15-2.0R	22 $\mu$ F/50V	22 $\mu$ F/25V

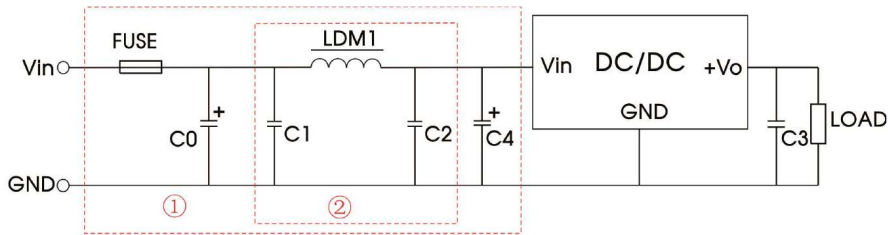
### Note:

1. C1 and C2 are required and should be connected close to the pin terminal of the module.
2. The capacitance of C1 and C2 refer to Sheet 1.
3. To reduce the output ripple furtherly, C2 can be increased properly if required, tantalum capacitor and aluminum electrolytic capacitor of low ESR may also suffice.
4. Cannot be used in parallel to enlarge the power for output and hot swap.

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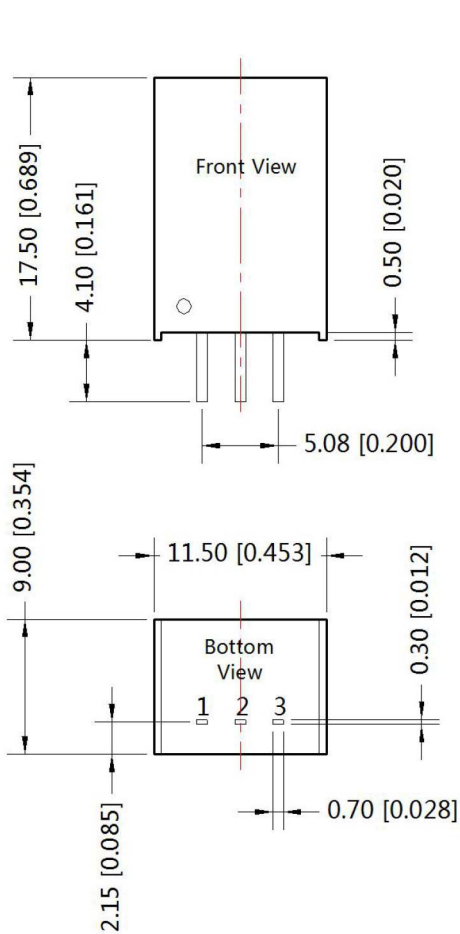
### EMC recommended circuit



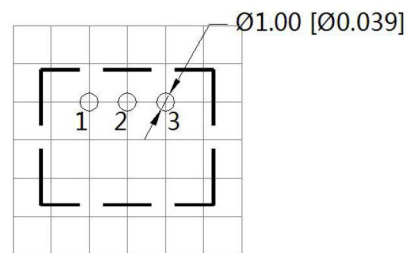
FUSE	C0	LDM1	C4	C1/C2	C3
Selected based on the actual input current from the customer	100 $\mu$ F / 100V	22 $\mu$ H	680 $\mu$ F / 50V	10 $\mu$ F / 50V	22 $\mu$ F / 25V

Note: Part ① in the Fig. 4 is for EMS test, part ② is for EMI filtering; parts ① and ② can be added based on actual requirement.

### Mechanical dimensions



THIRD ANGLE PROJECTION



Note : Grid 2.54\*2.54mm

Pin-Out	
Pin	Positive Output
1	V <sub>in</sub>
2	GND
3	+V <sub>o</sub>

Note:  
 Unit :mm[inch]  
 Pin diameter tolerances : $\pm 0.10[\pm 0.004]$   
 General tolerances: $\pm 0.25[\pm 0.010]$