



LMS78_0.5R series

SIP3 switching regulator; Negative/positive output

Switching Regulator

- ⊕ Compact SIP3 package
- ⊕ Operating temperature range: -40°C to +85°C
- ⊕ Support for negative output

- ⊕ Up to 95% efficiency
- ⊕ Short circuit protection (SCP)
- ⊕ MTBF 2,000,000hrs

Introducing our new high-performance power solution in a compact SIP3 package LMS78_0.5R series. Designed to excel in demanding environments, it offers a wide operating temperature range from -40°C to +85°C, full support for negative output, and delivers up to 95% efficiency. With built-in short circuit protection (SCP) and an impressive MTBF of 2,000,000 hours, it ensures maximum reliability and long-term performance.



Common specifications

Short circuit protection	Nominal input voltage continuous, self-recovery
Switching frequency	550kHz (min.) 850kHz (max.)
Operating temperature	-40°C - +85°C (with derating)
Storage temperature	-55°C - +125°C
Pin welding resistance temperature	300°C (soldering spot is 1.5mm away from case for 10 seconds)
Relative humidity	95%RH (non-condensing)
MTBF (MIL-HDBK-217F@25°C)	>2,000,000 hours
Reverse the input	Avoid / not protected
Input filter	Capacitance filter
Case material	Black plastic; flame-retardant and heat-resistant (UL94V-0 rated)
Package dimensions	11.60 x 7.55 x 10.16 mm
Weight	1.8g (typ.)
Cooling method	Free air convection

Output specifications

Item	Operating condition	Min	Typ	Max	Units
Output voltage accuracy (full load, input voltage range)	LMS78_03-0.5R		±2	±4	%
	Others		±2	±3	
Linear regulation rate	Full load, input voltage range		±0.2	±0.4	%
Load Regulation (Nominal input voltage, 10% to 100% load)	3.3/5VDC outputs		±0.6		%
	Others		±0.3		
Ripple & Noise	20MHz bandwidth, Nominal input voltage, 10% to 100% load		20	75	mVp-p
Instantaneous Recovery Time	Nominal input voltage, 25% load step change		0.2	1	ms
Transient response deviation	Nominal input voltage, 25% load step change		50	250	mv
Temperature drift coefficient	Operating temperature -40 to +85°C			±0.03	%/°C

Input specifications

Item	Operating condition	Min	Typ	Max	Units
No-load input current	Positive output		0.2	1.5	mA

1. Maximum capacitive loads are tested in the input voltage range and under full load conditions.
2. Unless otherwise specified, the parameters in this datasheet were measured at 25°C, humidity 40%~75%, input nominal voltage and output pure resistance mode under full load.
3. Our company can provide product customization, specific needs can directly contact our technical personnel.
4. All index test methods are based on our company's standards.
5. The copyright and the right of final interpretation of the product belongs to GAPTEC.

Example:

LMS78_05-0.5R

LM = Series; S = SIP Case; 05 = 5Vout; 0.5 = 0.5A; R = Revised

EMC specifications

EMI	CE	CISPR32/EN55032 CLASS B (the recommended circuit is shown in Figure 5-②)		
EMI	RE	CISPR32/EN55032 CLASS B (the recommended circuit is shown in Figure 5-②)		
EMS	ESD	IEC/EN61000-4-2	Contact ±4kV	Perf. criteria B
EMS	RS	IEC/EN61000-4-3	10V/m	Perf. criteria A
EMS	EFT	IEC/EN61000-4-4	±1kV (the recommended circuit is shown in Figure 5-①)	Perf. criteria B
EMS	Surge	IEC/EN61000-4-5	line to line ±1kV (the recommended circuit is shown in Figure 5-①)	Perf. criteria B
EMS	CS	IEC/EN61000-4-6	3Vr.m.s	Perf. criteria A

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Product Selection Guide

Approval	Part number	Input Voltage Nominal Range (VDC)	Output Voltage (VDC)	Output Current (mA) Min	Output Current (mA) Max.	Full Load Efficiency (%) typ.	Capacitive Load (μF) Max.
	LMS78_03-0.5R	24	3.3	0	500	86	680
	LMS78_05-0.5R	24 12	5 -5	0 0	500 -300	90 81	680 330
	LMS78_09-0.5R	24	9	0	500	93	680
	LMS78_12-0.5R	24 12	12 -12	0 0	500 -150	94 85	680 330
	LMS78_15-0.5R	24 12	15 -15	0 0	500 -150	95 87	680 330

Product characteristic curve

Temperature derating graph

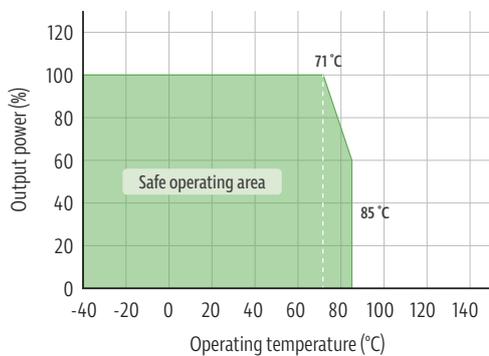
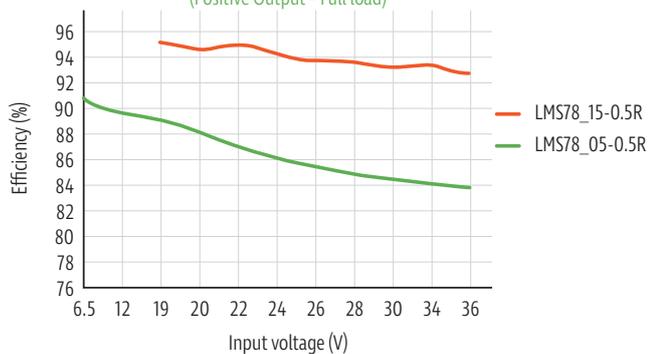
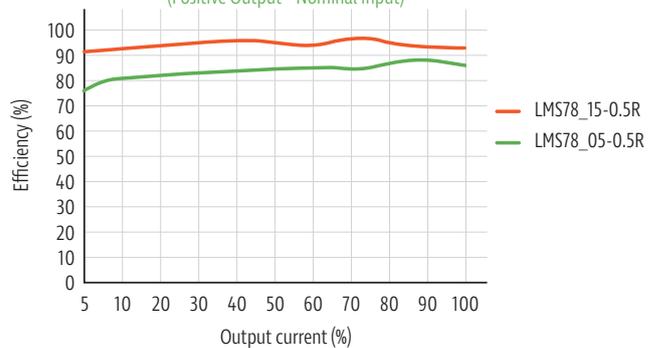


Fig.1

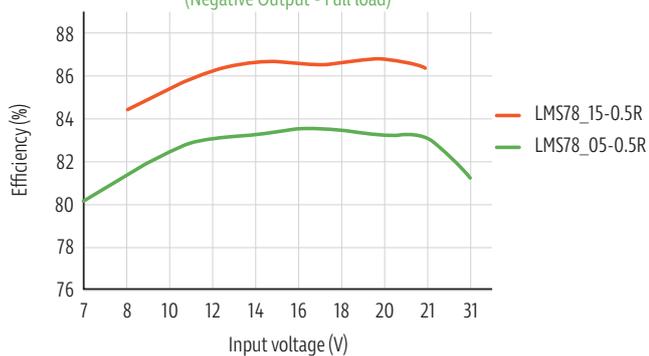
Efficiency vs input voltage (Positive Output - Full load)



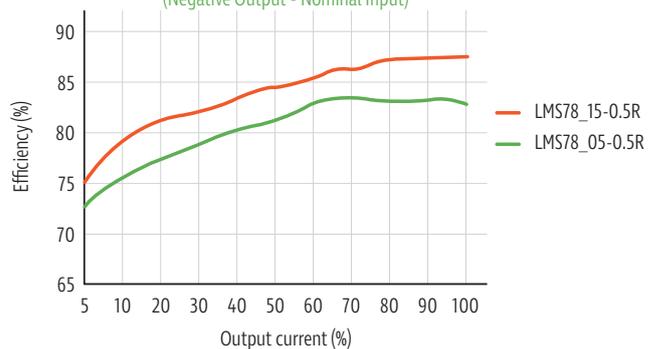
Efficiency vs output load (Positive Output - Nominal Input)



Efficiency vs input voltage (Negative Output - Full load)



Efficiency vs output load (Negative Output - Nominal Input)



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Design and application circuit reference

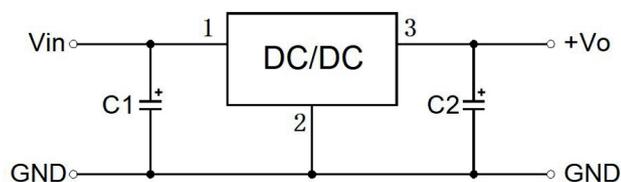


Figure 2-1 positive output application circuit

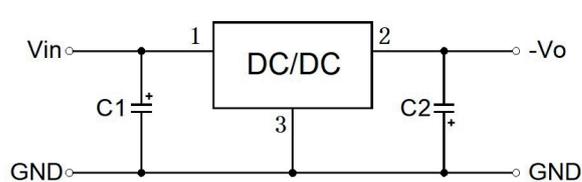


Figure 2-2 negative output application circuit

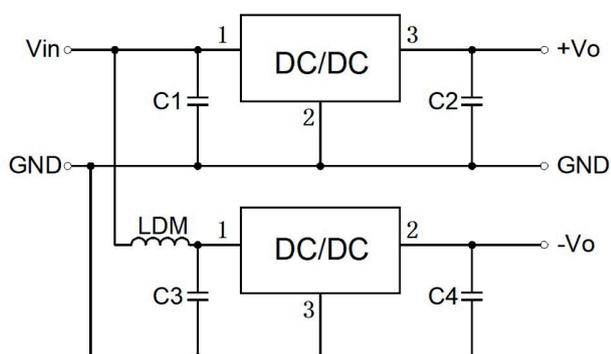


Figure 3
Parallel application circuit with positive and negative outputs

Capacity Value Reference Table

Vout version	C1/C3 (Ceramic Capacitor)	C2/C4 (Ceramic Capacitor)
3.3	10uF/50V	22uF/10V
5	10uF/50V	22uF/10V
9	10uF/50V	22uF/16V
12	10uF/50V	22uF/25V
15	10uF/50V	22uF/25V

„LC“ Filter application circuit

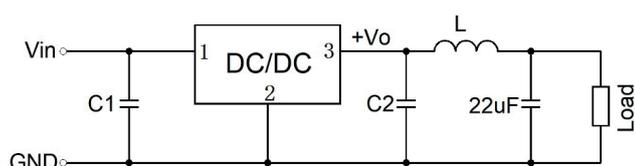


Figure 4-1 positive output

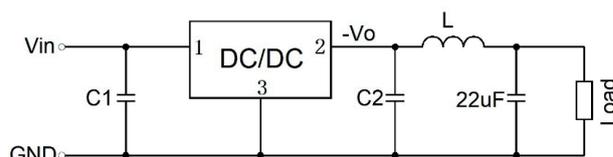


Figure 4-2 negative output

- Note:
- In general, we can be combined with the use of the product environment external capacitor C1 and C2 (C3 and C4), and the capacitor position should be close to the pin end of the product.
 - Capacity Value Reference Table is C1 and C2 (C3 and C4). The capacity can be appropriately increased according to the need, or the tantalum capacitor with low ESR and electrolytic capacitor can be used;
 - When the product is used in the application circuit shown in Figure 3, it is recommended to add inductor LDM to reduce the interference between products. The recommended value of LDM is 10μH.
 - This product does not support hot swap and the output terminals cannot be used in parallel.
 - If the output ripple needs to be further reduced, we can attach an „LC“ filter network to the output, the recommended value of L is 10μH-47μH, this is shown in Figure 4.

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EMC recommended circuit

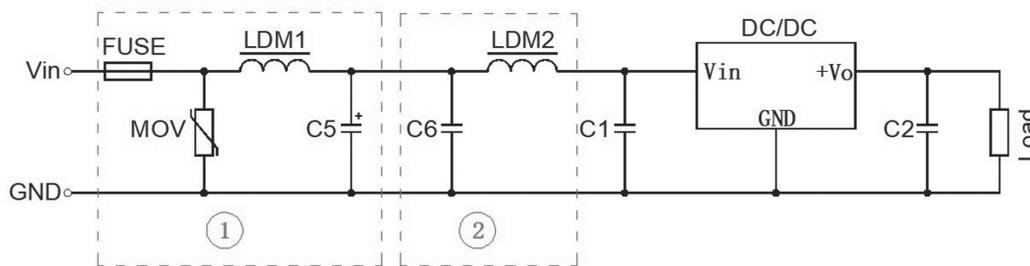
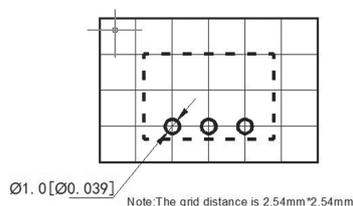
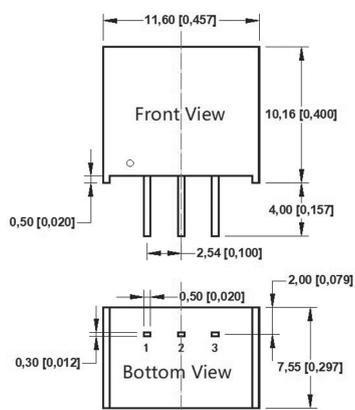


Figure 5

FUSE	MOV	LDM1	C5	C1/C2	C6	LDM2
According to the customer's actual input	20D470K	82 μ H	680 μ F/50V	Refer to Capacity Value Reference Table	4.7 μ F/50V	12 μ H

Note: Part ① in Figure 5 is for EMS test; Part ② in Figure 5 is used for EMI filtering, which can be selected according to the demand.

Mechanical dimensions



Note:
Unit: mm [inch]
Pin section tolerances: ± 0.10 [± 0.004]
General tolerances: ± 0.50 [± 0.020]

Pin Definition Table

Pin	Positive output	Negative output
1	Vin	Vin
2	GND	-Vo
3	+Vo	GND