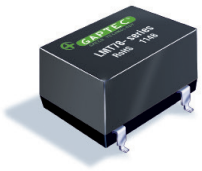
THIS SERIES IS NOT recommended for new design-ins and this series is discontinued



LMT78_0.5 series

Wide Input, Non-Isolated & Regulated, Single Output, SMD Package

Switching Regulator

- Efficiency up to 96%
- No need for heat sinks
- 0.5AMP SMD package
- Wide input voltage range (4.5V~28V)
- Adjustable output voltage
- Remote ON/OFF control
- Short circuit protection (SCP), Thermal shutdown
- Very low shutdown current
- Super low ripple and noise

The LMT78_0.5 Series with high efficiency switching regulators are an ideally supply for space constrained mobile applications. There is no need for any heat sinks, even if operated at +85°C. The additional features include remote ON/OFF control and adjustable output voltage.

Super low ripple and noise of typically only 10mV and a shutdown in-

Common specifications	
Cooling:	Free air convection
Short circuit protection mode:	Hiccup mode
Short circuit protection:	tinuous, automatic recovery
Operating temperature range:	-40°C~+85°C
Storage temperature range:	-55°C ~+125°C
Lead temperature:	300°C MAX, 1.5mm from case for 10 sec
Operating case temperature:	100°C MAX
Reflow Soldering Temperature:	Peak temp. ≤240°C,maximum duration time ≤60s at 220°C. For actual application, please refer to IPC/JEDEC J-STD-020D.1
Storage humidity range:	< 95%
Case material:	Plastic [UL94-V0]
MTBF (MIL-HDBK-217F,+25°C):	>2,000,000 hours
Package weight:	2.3g

Example:
LMT78_05-0.5
LM = Series; T = SMT case; 05 = 5Vout; 0.5 = 0.5A

Input/Output specifications					
Item	Test conditions	Min	Typ	Max	Units
Input voltage range	See selection guide	4.8	12/24	28	V
Output voltage adjust range	See selection guide	1.8		15.5	V
Output voltage accuracy	Input voltage range at full load		±2	±3	%
Line regulation	Input voltage range at full load		±0.2	±0.5	%
Load regulation	Nominal input, 10% to 100% load		±0.3	±0.75	%
Ripple + Noise	20MHz bandwidth		10	25	mVp-p
Output current limit			1.8		A
Dynamic load stability	100% <-> 10% load		±30	±75	mV
Quiescent current	Normal input (3.3V, 5V output)		15		mA
Thermal shutdown	Internal IC junction		160		°C
Temperature coefficient	-40 °C to +85 °C ambient			±0.02	%/°C
Max capacitance load				1000	µF
ON/OFF control current	ON: open or 1.5<Vc≤6V OFF: GND or 0V<Vc<1V		2		µA
Shutdown input current			15	30	µA
ON/OFF shutdown threshold voltage		1.1	1.25	1.4	V

Note:
1. All specifications measured at Ta = 25°C, humidity <75%, nominal input voltage and rated output load unless otherwise specified.
2. In this datasheet, all the test methods of indications are based on corporate standards.

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA, Max]	Efficiency [Vin. min]	Efficiency [Vin. max]
LMT78_03-0.5	4.5-28	3.3	500	90	75
LMT78_05-0.5	6.0-28	5.0	500	94	81
LMT78_09-0.5	11-28	9.0	500	95	87
LMT78_12-0.5	14-28	12	500	95	90
LMT78_15-0.5	17-28	15	500	96	92

Note:
1. Answer for Vin-Vo>2V if needed to adjust the output voltage;
2. If input voltage above specified may cause permanent damage to the device.
3. LMT78_12-0.5, LMT78_15-0.5 is not allowed to operate under no load.

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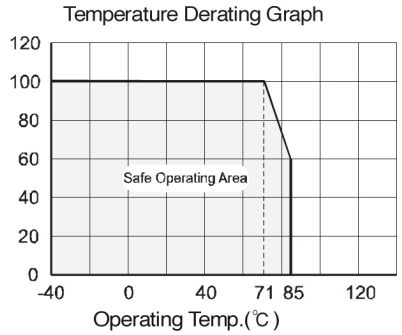
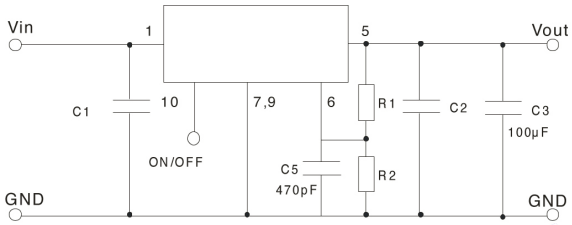
Typical characteristics



External capacitor rable

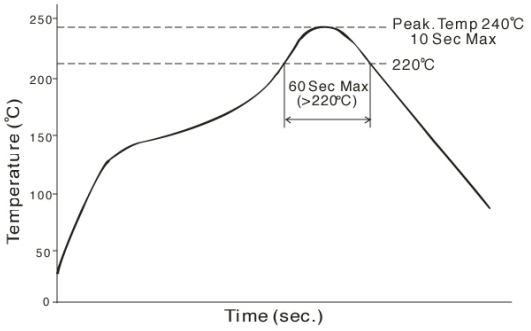
Part Number	C1 (ceramic capacitor)	SC2 (ceramic capacitor)
LMT78_03-0.5	10μF/50V	22μF/16V
LMT78_05-0.5	10μF/50V	22μF/16V
LMT78_09-0.5	10μF/50V	22μF/16V
LMT78_12-0.5	10μF/50V	10μF/16V
LMT78_15-0.5	10μF/50V	10μF/16V

Standard application circuit



Note:
1. C1,C2: Choose a ceramic type capacitors; C3 is required, for best performance use a 100μF or more capacitor please.
2. C1,C2 are require and should be placed close to the pins of the converter, with shortest possible traces.
3. No parallel connection or plug and play.

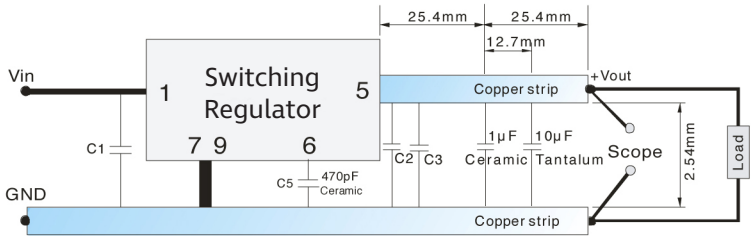
Recommended reflow soldering profile



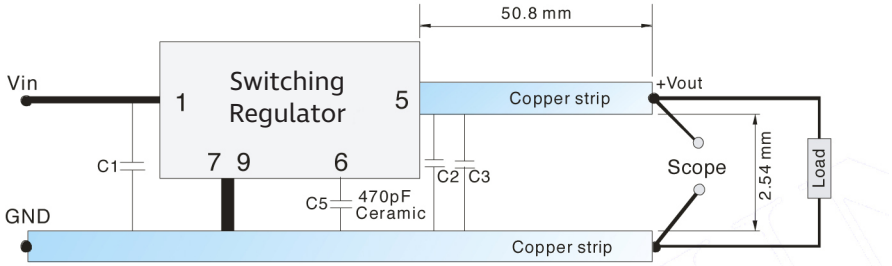
Remark:
The curve applies only to the hot air reflow soldering

Test configurations (TA=25°C)

1 Efficiency and Output Voltage Ripple Test



2 Start-up and Load Transient Response Test



Adjustment resistor values

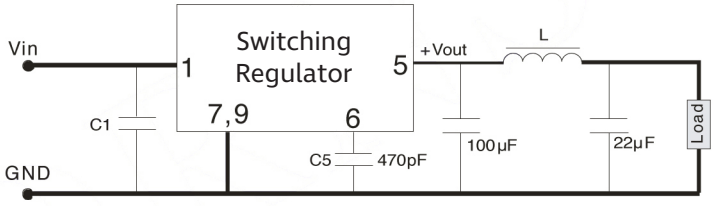
Model	LMT78_03-0.5		LMT78_05-0.5		LMT78_09-0.5		LMT78_12-0.5		KLMT78_15-0.5	
Vo (nominal)	3.3V		5.0V		9V		12V		15V	
Adjusted range	1.8V-5.5V		2.5V-8V		3V-11.5V		4.5V-13.5V		4.5V-15.5V	
Regulated voltage	R1(kΩ)	R2(kΩ)	R1(kΩ)	R2(kΩ)	R1(kΩ)	R2(kΩ)	R1(kΩ)	R2(kΩ)	R1(kΩ)	R2(kΩ)
1.8V	24.31									
2.5V	98.9		25.28							
3.0V	364		47.6		3.1					
3.3V			67.3		5.79					
3.6V		129.1	95.8		8.47					
3.9V		59.1	140.9		11.8					
4.5V		24.3	411		19.14		4.55		2.69	
4.9V		15.25	2060		25.77		8.05		5.55	
5.0V		14.05			27.3		9.16		6.17	
5.1V		12.8		208.5	29.22		10.41		6.98	
5.5V		8.65		58.5	37.8		15		10	
6.5V				15.57	70.8		29.8		18.5	
7.2V				7.8	115.3		43.5		26.2	
8.0V				3.15	243.1		64.8		36.7	
9.0V							105		52.9	
10.0V						18.84	180.6		76.3	
11.0V						4.47	370		111	
11.5V						1.61	635		134.1	
12.0V									167.7	
13.0V								40.6	277.8	
13.5V								15	385	
14.0V									586	
14.5V									1128	
15.0V										
15.5V										88.2

Note: The above dates only are as reference, you could make corresponding adjustment with actual output when they are at practical application.

Application example

1. To reduce output ripple, it is recommended to add a LC filter to output port.

L: Recommended parameter 10μH ~ 47μH.



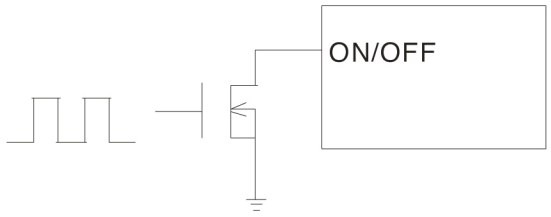
Shutdown control

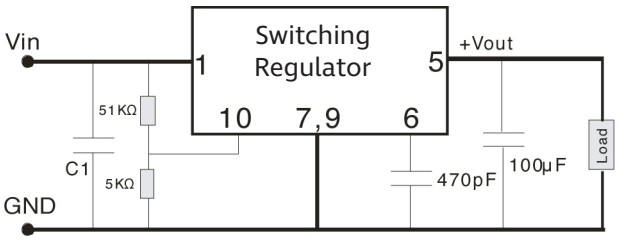
The ON/OFF pin provides several features for adjusting and sequencing the power supply, a user has the flexibility of using the ON/OFF pin as:

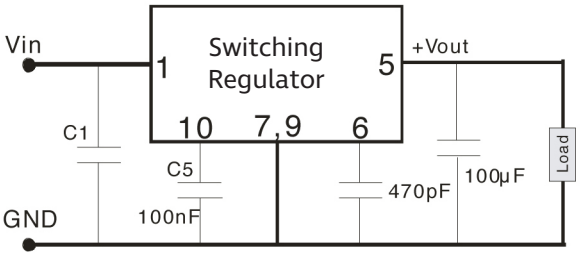
1) A digital on/off control by pulling down the ON/OFF pin with an open-drain transistor.

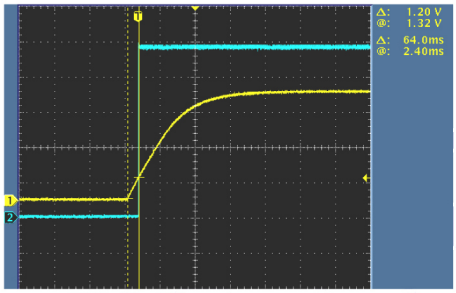
2) Line UVLO. If desired to achieve a UVLO voltage, an resistor divider from Vin to ON/OFF to GND can be used to disable the converter until a higher input voltage is achieved. For example, it is not useful for a converter with 12V output to start up with a 12V input voltage, as the output cannot teach regulation. To enable the converter when the input voltage reaches 14V, a 51kΩ/5kΩ resistor divider from Vin to GND can be connected to the ON/OFF pin. Both the precision 1.25V threshold and 150mV hysteresis are multiplied by the resistor ratio, providing a proportional 12% hysteresis for any startup threshold. So, the turn off threshold would be between 12.3V to 15.7V.

3) Power supply sequencing. By connecting a small capacitor from ON/OFF to GND, the 2μA current source and 1.25V threshold can provide a stable and predictable delay between startup of multiple power supplies. For example, a startup delay of roughly 64mS is provided using 100nF, and roughly 136mS by using 200nF.

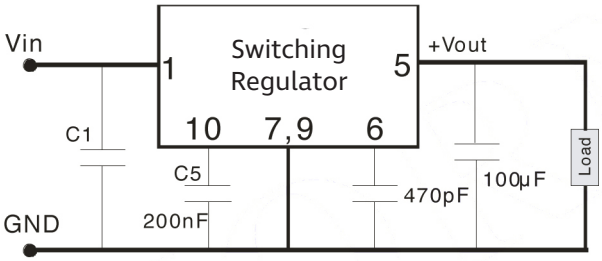


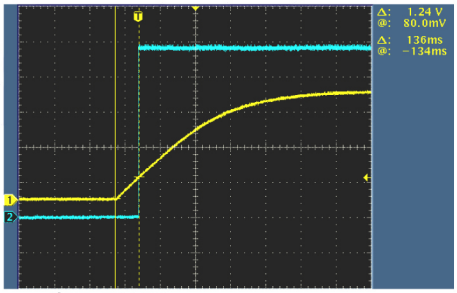






CH1: Von/off
CH2: Vo
Delay time: 64mS

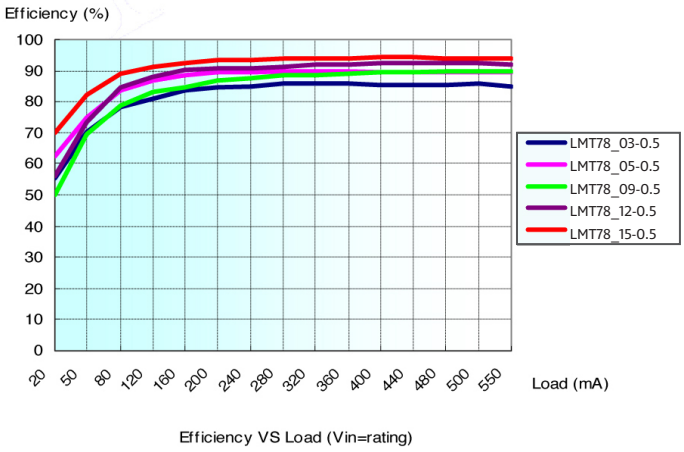




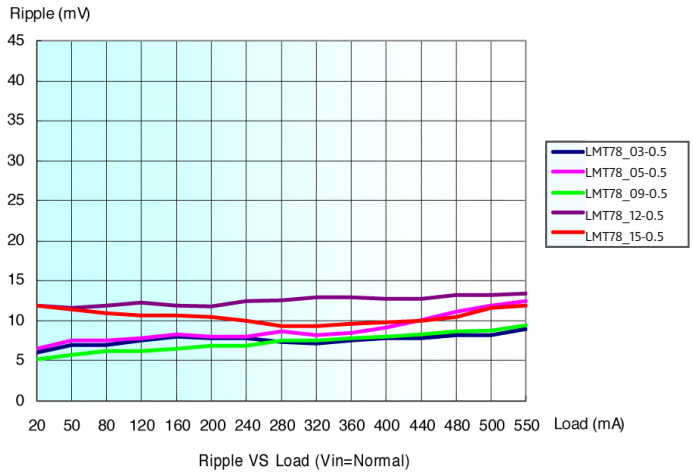
CH1: Von/off
CH2: Vo
Delay time: 136mS

Characteristics curve (TA=25°C)

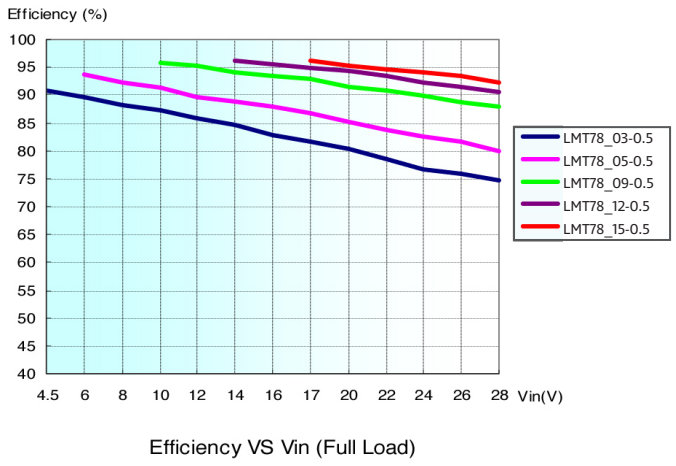
Efficiency and Output Voltage Ripple



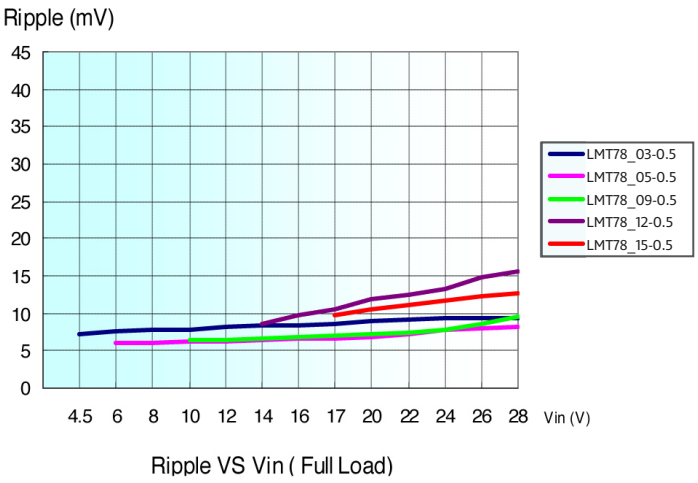
Efficiency VS Output Load (Vin=Norm)



Output Voltage Ripple VS Output Load (Vin=Norm)

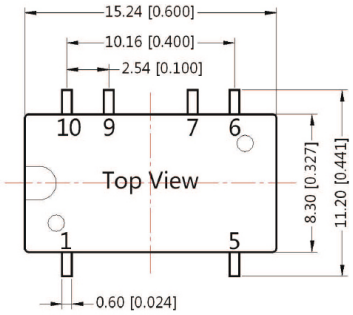


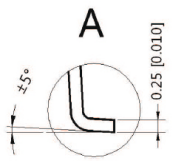
Efficiency VS Input Voltage (Full Load)

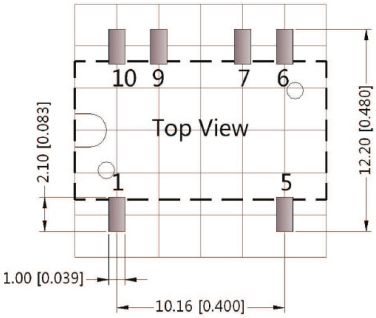


Output Voltage Ripple VS Input Voltage (Full Load)

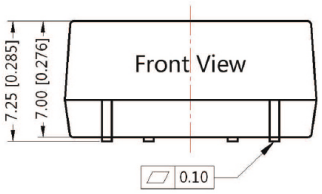
Mechanical dimensions

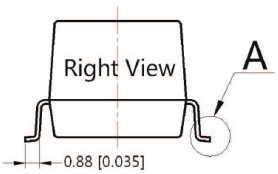






Note: Grid 2.54*2.54mm





Pin-Out	
Pin	Function
1	Vin
7,9	GND
5	Vout
6	Vadj
10	ON/OFF

NC: No Connection

Note:
Unit: mm[inch]
Pin selection tolerances: ±0.10mm [±0.004inch]
General tolerances: ±0.25mm [±0.010inch]