

## LME78\_1.0 Series

Wide Input Non-Isolated & Regulated, Single Positive/Negative Output

## Switching Regulator

- ⊕ High efficiency up to 96%
- ⊕ Operating temperature range: -40°C ~ +85°C
- ⊕ Short circuit protection (SCP)
- ⊕ No-load input current as low as 0.3mA
- ⊕ 3PIN SIP package
- ⊕ Non isolated, no need for heatsink
- ⊕ UL94V-0 package material
- ⊕ Meets IEC62368, UL62368, EN62368 standards (Pending)

The LME78\_1.0 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                      |
| No-load input current:              | 2mA TYP, 5mA MAX                                |
| Temperature rise at full load:      | 25°C MAX, 15°C TYP                              |
| Cooling:                            | Free air convection                             |
| Operation temperature range:        | -40°C~+85°C<br>(see temperature derating curve) |
| Storage temperature range:          | -55°C ~+125°C                                   |
| Pin welding resistance temperature: | 260°C MAX, 1.5mm from case for 10 sec           |
| Operating case temperature:         | 100°C   |
| Storage humidity range:             | < 95%RH   |
| Package material:                   | Plastic [UL94-V0]                               |
| MTBF (MIL-HDBK-217F @25°C):         | 2000 K hours                                    |
| Weight:                             | 1.9g  |

| Input specifications   |  |     |          |        |          |
|------------------------|--|-----|----------|--------|----------|
| Item                   | Test conditions                        | Min | Typ      | Max    | Units    |
| No-load input current  | • positive output<br>• negative output |     | 0.3<br>1 | 1<br>4 | mA<br>mA |
| Reverse polarity input | Forbidden                              |     |          |        |          |
| Input Filter           | Capacitor Filter                       |     |          |        |          |

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

**Example:**  
**LME78\_05-1.0**  
**LM= Series; S= SIP Case; ###= 5Vout; pp=1.0A**

### Note:

- The max. capacitive load should be tested within the input voltage range and under full load conditions;
- Without any special statement, all indexes are only specific to positive output application;
- 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;
- The performance indexes of the product models listed in this manual are as above, but some indexes of non-standard model products will exceed the above-mentioned requirements, and please directly contact with our technician for specific information;
- Specifications subject to change without prior notice.

| Output specifications         |  |     |              |              |       |        |
|-------------------------------|--|-----|--------------|--------------|-------|--------|
| Item                          | Test conditions  | Min | Typ          | Max          | Units |        |
| Voltage accuracy              | Full load, input voltage range                           |     |              |              |       |        |
|                               | • LME78_03-1.0<br>• Others                               |     | ±2<br>±1.5   | ±4<br>±3     |       | %<br>% |
| Line regulation               | Full load, input voltage range                           |     | ±0.2         | ±0.4         |       | %      |
| Load regulation               | 10% to 100% load   |     |              |              |       |        |
|                               | • positive output<br>• negative output                   |     | ±0.4<br>±0.4 | ±0.6<br>±0.8 |       | %<br>% |
| Ripple + Noise*               | 20MHz bandwidth, nominal input, 20% -100% load           |     | 25           | 75           |       | mVp-p  |
| Switching frequency           |  |     | 520          |              |       | KHz    |
| Temperature Drift Coefficient |  |     |              | ±0.03        |       | %/°C   |
| Transient response deviation  | Nominal input, 25%-50%-25%, 50%-75%-50% load step change |     | ±60          | ±200         |       | mV     |
| Transient recovery time       | Nominal input, 25%-50%-25%, 50%-75%-50% load step change |     |              | 1            |       | ms     |

\* Test ripple and noise by "parallel cable" method. With the load lower than 20%, the maximum ripple and noise of 3.3V/5V output products will be 100mVp-p, 9V/12V/15V output products will be 2%Vo.

| EMC specifications |       |                 |   |
|--------------------|-------|-----------------|---|
| EMI                | CE    | CISPR32/EN55032 | CLASS B<br>(see EMC rec. circuit ②)                               |
| EMI                | RE    | CISPR32/EN55032 | CLASS B<br>(see EMC rec. circuit ②)                               |
| EMS                | ESD   | IEC/EN61000-4-2 | Contact ±4KV<br>perf. Criteria A                                  |
| EMS                | RS    | IEC/EN61000-4-3 | 10V/m<br>perf. Criteria A   |
| EMS                | EFT   | IEC/EN61000-4-4 | ±1KV<br>perf. Criteria A<br>(see EMC rec. circuit ①)              |
| EMS                | Surge | IEC/EN61000-4-5 | line to line ±1KV<br>perf. Criteria A<br>(see EMC rec. circuit ①) |
| EMS                | CS    | IEC/EN61000-4-6 | 3Vr.m.s<br>perf. Criteria A                                       |

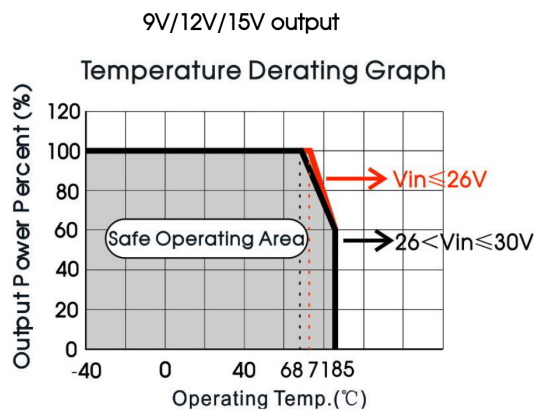
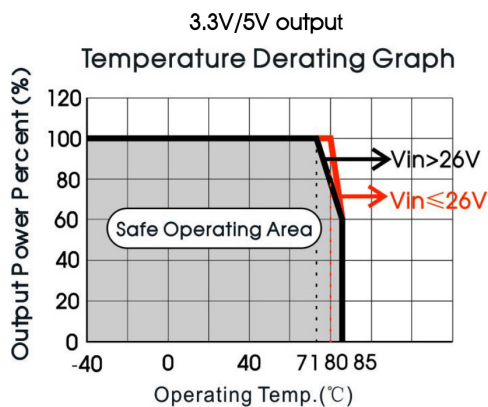
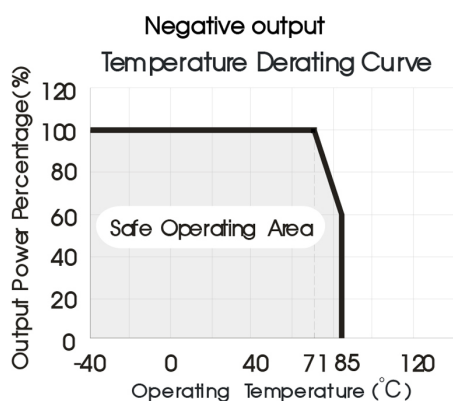
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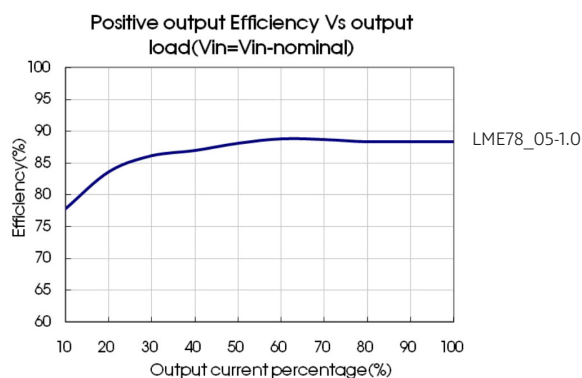
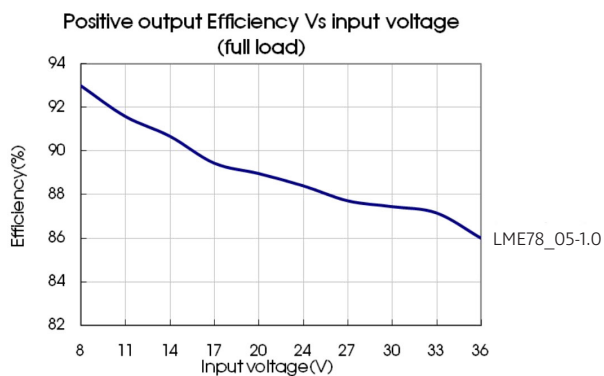
| Part Number  | Input Voltage [VDC]<br>Nominal (Range) | Output Voltage [VDC] | Output Current [mA] | Capacitive load [ $\mu$ F, max.] | Efficiency [%, min/max Vin] |
|--------------|--|----------------------|---------------------|----------------------------------|-----------------------------|
| LME78_03-1.0 | 24 (6-36)                              | 3.3                  | 1000                | 680                              | 90/80                       |
| LME78_05-1.0 | 24 (8-36)<br>12 (8-27)                 | 5<br>-5              | 1000<br>-500        | 680<br>330                       | 93/95<br>85/81              |
| LME78_09-1.0 | 24 (13-36)                             | 9                    | 1000                | 680                              | 94/89                       |
| LME78_12-1.0 | 24 (16-36)<br>12 (8-20)                | 12<br>-12            | 1000<br>-300        | 680<br>330                       | 95/92<br>88/87              |
| LME78_15-1.0 | 24 (20-36)<br>12 (8-18)                | 15<br>-15            | 1000<br>-300        | 680<br>330                       | 96/93<br>87/88              |

Note: For input voltage higher than 30 VDC, a 22 $\mu$ F/50V input capacitor is required.

## Typical characteristics



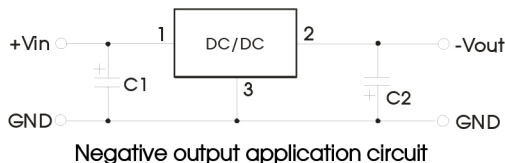
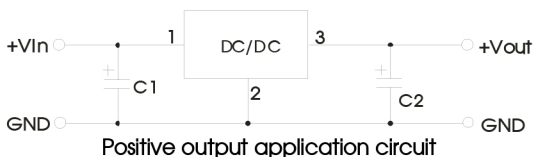
## Efficiency



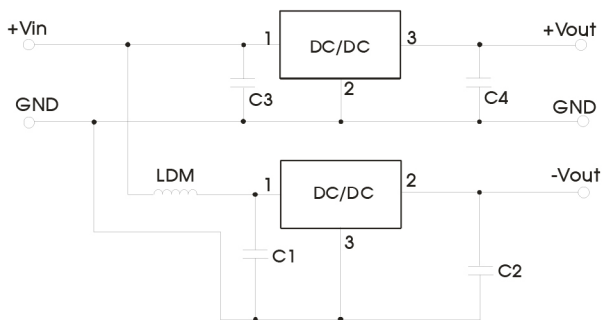
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## Typical application circuit



Typical application circuit



Sheet 1

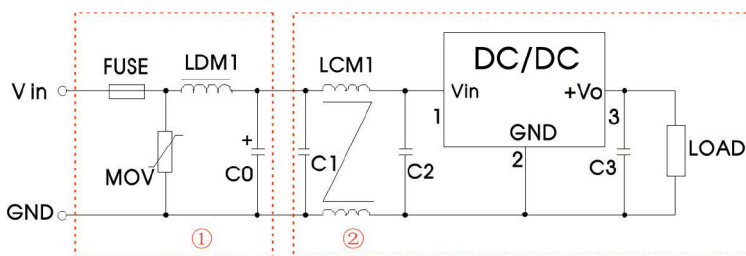
| Part No. | C1/C3<br>(ceramic capacitor) | C2/C4<br>(ceramic capacitor) |
|----------|------------------------------|------------------------------|
|          | 10μF/50V                     | 22μF/10V                     |
|          |                              | 22μF/10V                     |
|          |                              | 22μF/16V                     |
|          |                              | 22μF/25V                     |
|          |                              | 22μF/25V                     |

**Note:**

- C1 and C2 (C3 and C4) are required and should be connected close to the pin terminal of the module.
- The capacitance of C1 and C2 (C3 and C4) refer to Sheet 1.
- To reduce the output ripple further, C2 and C4 can be increased properly if required, tantalum capacitor and aluminum electrolytic capacitor of low ESR may also suffice.
- When the products used as the circuit like figure 3, an inductor named as LDM up to 10μH is recommended in the circuit to reduce the mutual interference.
- Cannot be used in parallel to enlarge the power for output and hot swap.

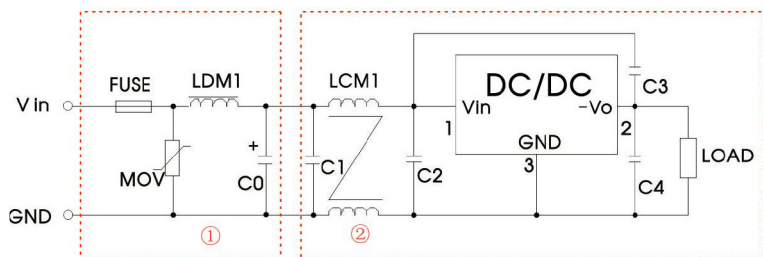
## EMC solution recommended circuit

**positive output**



|       |   |
|-------|---|
| FUSE  | According to the customer actual input current choice |
| MOV   | 20D470K   |
| LDM1  | 82μH  |
| C0    | 680μF /50V  |
| LCM1  | 4.7mH   |
| C1/C2 | 4.7μF /50V  |
| C3    | Refer to the Cout in Sheet 1                          |

**negative output**



|          |   |
|----------|---|
| FUSE     | According to the customer actual input current choice |
| MOV      | 20D470K   |
| LDM1     | 82μH  |
| C0       | 680μF /50V  |
| LCM1     | 4.7mH   |
| C1/C3/C4 | 4.7μF /50V  |
| C2       | 10μF /50V   |

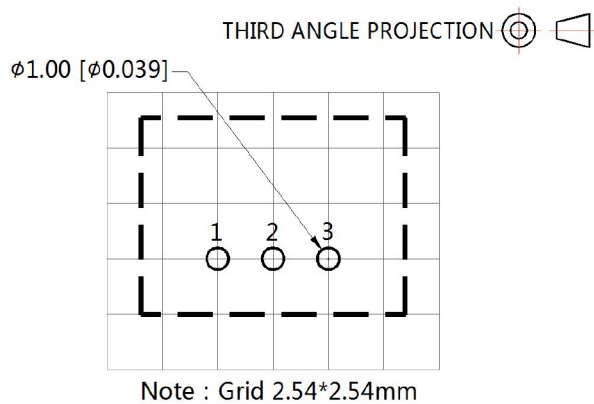
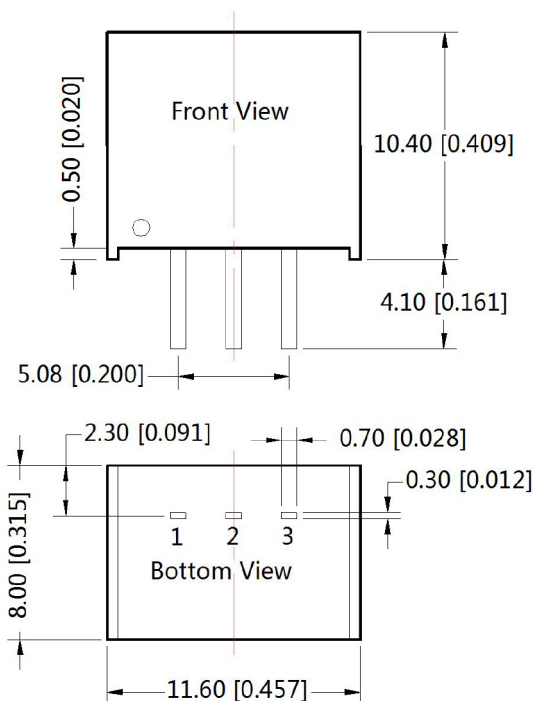
**Note:**

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.

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### Mechanical dimensions



| Pin-Out |                 |                 |
|---------|-----------------|-----------------|
| Pin     | Positive Output | Negative Output |
| 1       | Vin             | Vin             |
| 2       | GND             | -Vo             |
| 3       | +Vo             | GND             |

Note:

Unit: mm[inch]

Pin section tolerances:  $\pm 0.10$  [ $\pm 0.004$ ]

General tolerances:  $\pm 0.50$  [ $\pm 0.020$ ]