

# MEK1TL Series

1W, Unregulated Output, 3KV Isolation, SMD DC/DC Converters



## Features

- Rated power: 1W max
- Input voltage range  $\pm 10\%$
- Unregulated output
- High efficiency up to 85%
- Isolation voltage 3KVDC
- Small no load input current, only about 3mA
- Operating temperature range:  $-40 \sim +105^{\circ}\text{C}$  ambient
- RoHS compliant
- Compact SMD package
- Continuous short circuit protection
- Meet IEC/EN/UL 62368-1 CISPR32, EN55032
- 3 year warranty



## Overview

The MEK1TL series are unregulated DC/DC converters offered in compact SMD package with 3KVDC isolation. These converters feature high efficiency, low ripple and noise, continuous short circuit protection, and wide operating temperature range  $-40 \sim +105^{\circ}\text{C}$ . They are widely used in distributed power system in industrial applications where isolation and voltage converting is needed.

## Model Numbers

| Model Number | Input Voltage [VDC] $\pm 10\%$ | Output Voltage [VDC] | Output Current [mA] |          | Efficiency [%] Typ. | Capacitive Load [ $\mu\text{F}$ ] Max. |
|--------------|--------------------------------|----------------------|---------------------|----------|---------------------|----------------------------------------|
|              |                                |                      | Max.                | Min.     |                     |                                        |
| MEK1TL-0503  | 5                              | 3.3                  | 303                 | 30       | 74                  | 2400                                   |
| MEK1TL-0505  | 5                              | 5                    | 200                 | 20       | 82                  | 2400                                   |
| MEK1TL-0509  | 5                              | 9                    | 111                 | 12       | 83                  | 1000                                   |
| MEK1TL-0512  | 5                              | 12                   | 84                  | 9        | 83                  | 560                                    |
| MEK1TL-0515  | 5                              | 15                   | 67                  | 7        | 83                  | 560                                    |
| MEK1TL-0524  | 5                              | 24                   | 42                  | 4        | 85                  | 220                                    |
| MEK1TL-0503D | 5                              | $\pm 3.3$            | $\pm 151$           | $\pm 15$ | 74                  | 1200                                   |
| MEK1TL-0505D | 5                              | $\pm 5$              | $\pm 100$           | $\pm 10$ | 82                  | 1200                                   |
| MEK1TL-0509D | 5                              | $\pm 9$              | $\pm 56$            | $\pm 6$  | 83                  | 470                                    |
| MEK1TL-0512D | 5                              | $\pm 12$             | $\pm 42$            | $\pm 5$  | 83                  | 220                                    |
| MEK1TL-0515D | 5                              | $\pm 15$             | $\pm 34$            | $\pm 4$  | 83                  | 220                                    |
| MEK1TL-0524D | 5                              | $\pm 24$             | $\pm 21$            | $\pm 2$  | 85                  | 100                                    |

\* Only typical models are listed. Other models may be available upon request.

\* Operating with less than 10% of rated load will not cause permanent damage to the converters, but the performances data may not fall into the specifications, and reliable operating is not assured.

## Electrical Specifications

Unless otherwise indicated, specifications are measured at  $T_A=25^{\circ}\text{C}$ , nominal input voltage, full load after warm up.

| Parameters                                                              | Conditions                                                                                                                                  | Min.                                                | Typ.                         | Max.                             | Unit                  | Note |
|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------------------------------|----------------------------------|-----------------------|------|
| <b>Input current</b><br>Full load                                       | $V_{OUT}=3.3, 5\text{V}$<br>Others                                                                                                          | -                                                   | 270<br>241                   | -                                | mA                    |      |
| <b>Input current</b><br>No load                                         | $V_{OUT}=3.3, 5\text{V}$<br>$V_{OUT}=9, 12\text{V}$<br>$V_{OUT}=15, 24\text{V}$                                                             | -                                                   | 5<br>12<br>18                | -                                | mA                    |      |
| <b>Reflected Ripple Current</b>                                         |                                                                                                                                             | -                                                   | 15                           | -                                | mA                    |      |
| <b>Surge voltage</b><br>1 second max                                    | $V_{IN}=5\text{V}$                                                                                                                          | -0.7                                                | -                            | 9                                | VDC                   |      |
| <b>Output voltage accuracy</b>                                          | All models                                                                                                                                  | Refer to graphic in "Characteristic Curves" section |                              |                                  |                       |      |
| <b>Line regulation</b><br>For $V_{IN}$ change of $\pm 1\%$              | $V_{OUT}=3.3\text{V}$<br>All others                                                                                                         | -                                                   | -                            | $\pm 1.5$<br>$\pm 1.2$           | %                     |      |
| <b>Load regulation</b><br>$I_{OUT}=10\%$ to $100\%$ of $I_{OUT, rated}$ | $V_{OUT}=3.3\text{V}$<br>$V_{OUT}=5\text{V}$<br>$V_{OUT}=9\text{V}$<br>$V_{OUT}=12\text{V}$<br>$V_{OUT}=15\text{V}$<br>$V_{OUT}=24\text{V}$ | -                                                   | 15<br>10<br>8<br>7<br>6<br>5 | 20<br>15<br>10<br>10<br>10<br>10 | %                     |      |
| <b>Temperature coefficient</b>                                          | Full load                                                                                                                                   | -                                                   | $\pm 0.03$                   | -                                | $\%/^{\circ}\text{C}$ |      |
| <b>Output ripple and noise</b><br>20MHz bandwidth                       | $V_{OUT}=24\text{V}$<br>Others                                                                                                              | -                                                   | 50<br>30                     | 100<br>75                        | mVp-p                 |      |
| <b>Output short circuit protection</b>                                  |                                                                                                                                             | Continuous, automatic recovery                      |                              |                                  |                       |      |
| <b>Input filter</b>                                                     |                                                                                                                                             | Capacitor                                           |                              |                                  |                       |      |
| <b>Hot plug</b>                                                         |                                                                                                                                             | None                                                |                              |                                  |                       |      |

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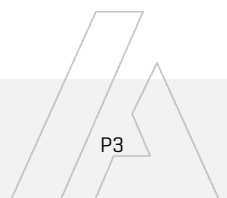
1W, Unregulated Output, 3KV Isolation, SMD DC/DC Converters



## General Specifications

| Parameters                                                 | Conditions                       | Min.                                                                 | Typ.     | Max. | Unit  | Note |
|------------------------------------------------------------|----------------------------------|----------------------------------------------------------------------|----------|------|-------|------|
| <b>Isolation voltage</b><br>1 minute, leakage current <1mA | Input to Output                  | 3000                                                                 | -        | -    | VDC   |      |
| <b>Isolation resistance</b><br>Tested at 500VDC            | Input to Output                  | 1000                                                                 | -        | -    | M ohm |      |
| <b>Isolation capacitance</b><br>100KHz, 0.1V               | Input to Output                  | -                                                                    | 20       | -    | pF    |      |
| <b>Operating temperature</b>                               | See "Derating Curve"             | -40                                                                  | -        | +105 | °C    |      |
| <b>Storage temperature</b>                                 |                                  | -55                                                                  | -        | +125 | °C    |      |
| <b>Temperature rise at case</b><br>Full load               | V <sub>OUT</sub> =3.3V<br>Others | -                                                                    | 25<br>15 | -    | °C    |      |
| <b>Storage humidity</b>                                    | Non-condensing                   | 5                                                                    | -        | 95   | %RH   |      |
| <b>Switching frequency</b>                                 | Full load                        | -                                                                    | 270      | -    | KHz   |      |
| <b>Reflow soldering temperature</b>                        |                                  | Peak temp. 217 - 245°C, maximum duration 60s                         |          |      |       |      |
| <b>Cooling method</b>                                      |                                  | Free air convection                                                  |          |      |       |      |
| <b>Vibration</b>                                           |                                  | 10-150Hz, 5G, 0.75mm along X, Y and Z                                |          |      |       |      |
| <b>Moisture sensitivity level [MSL]</b>                    |                                  | IPC/JEDEC J-STD-020D.1 Level 1                                       |          |      |       |      |
| <b>MTBF</b>                                                | MIL-HDBK-217F                    | >3,500,000 Hours, T <sub>A</sub> =25°C                               |          |      |       |      |
| <b>Design based on standards</b>                           |                                  | IEC/EN/UL 62368-1                                                    |          |      |       |      |
| <b>Safety certifications</b>                               |                                  | IEC/EN 62368-1                                                       |          |      |       |      |
| <b>EMC</b>                                                 | Emissions<br>Immunity            | CISPR32, EN55032 Class B*<br>IEC/EN61000-4-2, air ±8kV, contact ±4kV |          |      |       |      |
| <b>Size</b>                                                |                                  | 15.24 x 11.4 x 7.25 mm                                               |          |      |       |      |
| <b>Weight</b>                                              |                                  | 1.6g Typ.                                                            |          |      |       |      |

\*External circuit is required in order to meet Class B, refer to Figure 2 in Recommended External Circuit



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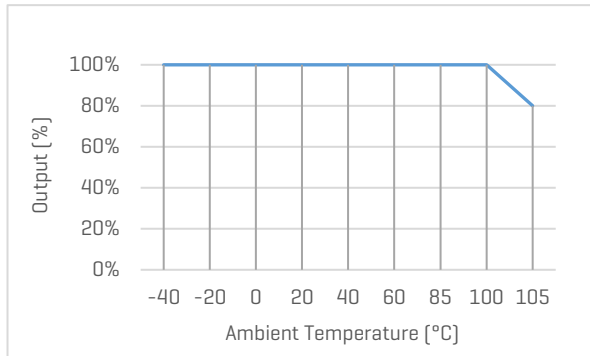
1W, Unregulated Output, 3KV Isolation, SMD DC/DC Converters



## Characteristic Curves

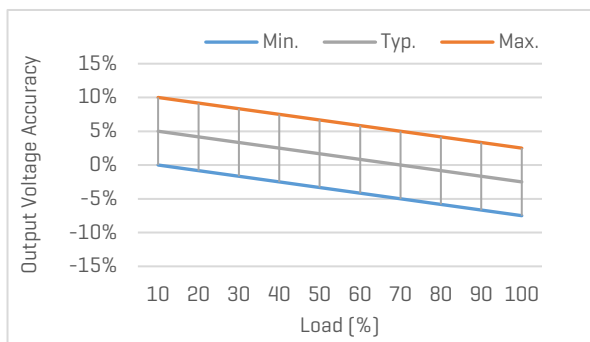
### Derating Curve

#### Output vs Ambient Temperature

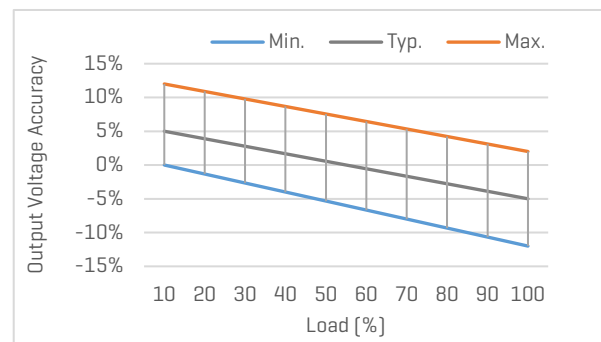


### Output Voltage Accuracy vs Load

#### None 3.3V output models



#### 3.3V output models



## Recommended External Circuit

### Typical Application Circuit

\*Typical application circuit is to further lower the input and output ripple. It is not required for general use.

\*Recommended component specifications are typical values. Excessive external capacitive load may cause startup problem.

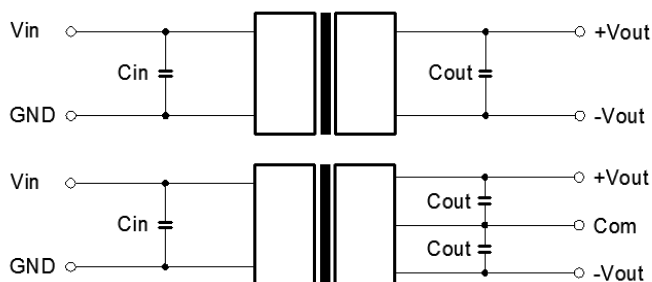


Figure 1. Typical external circuit

[Table 1] Recommended component spec

|               |                  |
|---------------|------------------|
| Input voltage | 5V               |
| $C_{IN}$      | 4.7 $\mu$ F, 16V |

[Table 2] Recommended component spec

| Output voltage | 3.3, 5V         | 9V               | 12V              | 15V            | 24V               |
|----------------|-----------------|------------------|------------------|----------------|-------------------|
| $C_{OUT}$      | 10 $\mu$ F, 16V | 4.7 $\mu$ F, 16V | 2.2 $\mu$ F, 25V | 1 $\mu$ F, 25V | 0.47 $\mu$ F, 50V |

\*For dual output models, recommended  $C_{OUT}$  spec is for each output

### Circuit for EMC Enhancement

\*Use this application circuit to meet Class B EMC performance.

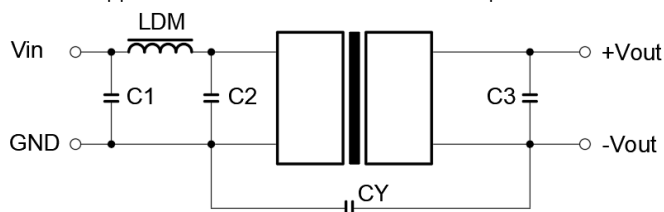


Figure 2. Circuit for EMC enhancement

[Table 3] Recommended component spec

| Component | LDM         | C1, C2           | CY [ $V_{OUT}=3.3, 5, 9$ ] | CY [ $V_{OUT}=12, 15, 24$ ] |
|-----------|-------------|------------------|----------------------------|-----------------------------|
| $C_{OUT}$ | 6.8 $\mu$ H | 4.7 $\mu$ F, 50V | -                          | 1nF, 4KV                    |

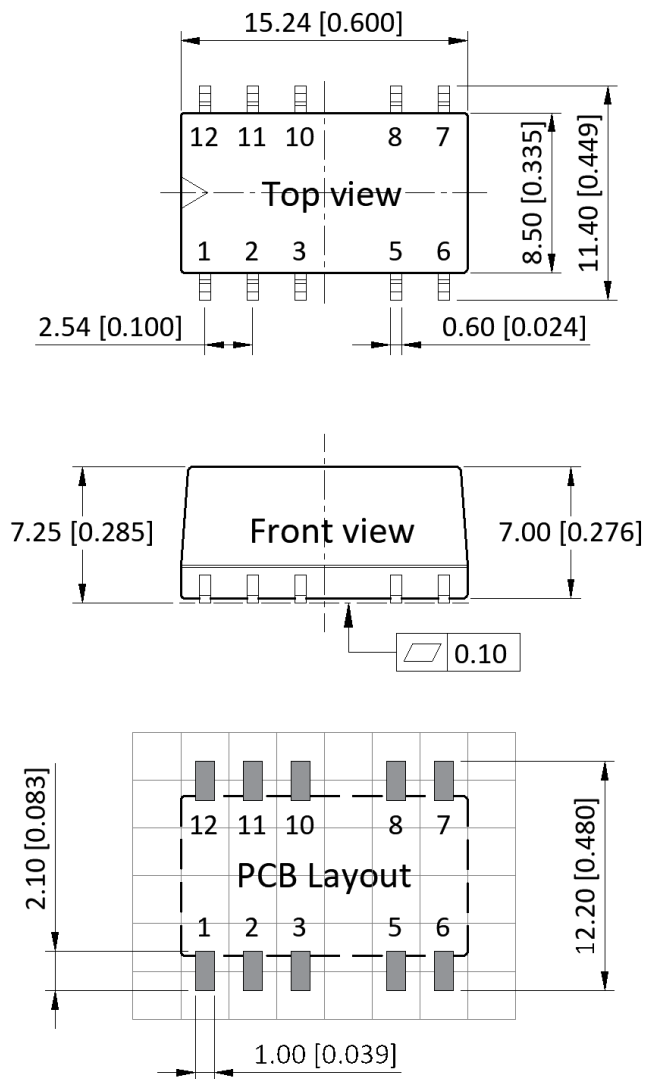
\* C3 refer to  $C_{OUT}$  in Table 2

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## Mechanical Specifications



### Pin Definition

| Pin #      | Single Out        | Dual Out          |
|------------|-------------------|-------------------|
| 1          | GND               | GND               |
| 2          | V <sub>IN</sub>   | V <sub>IN</sub>   |
| 3          | NC                | NC                |
| 5          | OV                | COM               |
| 6          | NC                | -V <sub>OUT</sub> |
| 7          | NC                | NC                |
| 8          | +V <sub>OUT</sub> | +V <sub>OUT</sub> |
| 10, 11, 12 | NC                | NC                |

\* Unless otherwise specified unit: mm [inch]

\* General tolerance:  $\pm 0.50$  [ $\pm 0.020$ ]

\* Pin thickness:  $\pm 0.10$  [ $\pm 0.004$ ]

\* Footprint grid 2.54 x 2.54 mm