

MEK1S Series

1W, Unregulated Single or Dual Output, 3KV Isolation, SIP7 Package DC/DC Converters

Features

- ▶ Rated power: 1W Max
- ▶ Input voltage range $\pm 10\%$
- ▶ Unregulated single or dual output
- ▶ High efficiency, up to 89%
- ▶ Small no load input current
- ▶ Isolation voltage 3KVDC
- ▶ Operating temperature range: $-40 \sim +105^{\circ}\text{C}$ ambient
- ▶ RoHS compliant
- ▶ Compact SIP7 package
- ▶ Continuous short circuit protection
- ▶ Designed to meet EN/IEC 62368-1
- ▶ 3 year warranty



Overview

The MEK1S series are unregulated SIP7 package DC/DC converters with single or dual outputs, and 3KVDC isolation. These converters feature high efficiency, low ripple and noise, continuous short circuit protection, and wide operating temperature range. 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 [μF] Max. |
|--------------|--------------------------------|----------------------|---------------------|------|---------------------|--|
| | | | Max. | Min. | | |
| MEK1S-0303 | 3.3 | 3.3 | 303 | 30 | 82 | 4000 |
| MEK1S-0305 | 3.3 | 5 | 200 | 20 | 83 | 4000 |
| MEK1S-0309 | 3.3 | 9 | 111 | 11 | 84 | 2000 |
| MEK1S-0312 | 3.3 | 12 | 84 | 8 | 85 | 1000 |
| MEK1S-0503 | 5 | 3.3 | 303 | 30 | 83 | 4000 |
| MEK1S-0505 | 5 | 5 | 200 | 20 | 86 | 4000 |
| MEK1S-0509 | 5 | 9 | 111 | 12 | 86 | 2000 |
| MEK1S-0512 | 5 | 12 | 84 | 9 | 88 | 1000 |
| MEK1S-0515 | 5 | 15 | 67 | 7 | 88 | 680 |
| MEK1S-0524 | 5 | 24 | 42 | 4 | 89 | 560 |
| MEK1S-1203 | 12 | 3.3 | 303 | 30 | 84 | 4000 |
| MEK1S-1205 | 12 | 5 | 200 | 20 | 86 | 4000 |
| MEK1S-1209 | 12 | 9 | 111 | 12 | 87 | 2000 |
| MEK1S-1212 | 12 | 12 | 84 | 9 | 87 | 1000 |
| MEK1S-1215 | 12 | 15 | 67 | 7 | 88 | 680 |
| MEK1S-1224 | 12 | 24 | 42 | 5 | 89 | 560 |

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Model Numbers [continued]

| Model Number | Input Voltage [VDC] $\pm 10\%$ | Output Voltage [VDC] | Output Current [mA] | | Efficiency [%] Typ. | Capacitive Load [μ F] Max. |
|--------------|--------------------------------|----------------------|---------------------|----------|---------------------|---------------------------------|
| | | | Max. | Min. | | |
| MEK1S-1505 | 15 | 5 | 200 | 20 | 86 | 4000 |
| MEK1S-1509 | 15 | 9 | 111 | 12 | 87 | 2000 |
| MEK1S-1512 | 15 | 12 | 84 | 9 | 87 | 1000 |
| MEK1S-1515 | 15 | 15 | 67 | 7 | 88 | 680 |
| MEK1S-2403 | 24 | 3.3 | 303 | 30 | 84 | 4000 |
| MEK1S-2405 | 24 | 5 | 200 | 20 | 87 | 4000 |
| MEK1S-2409 | 24 | 9 | 111 | 12 | 88 | 2000 |
| MEK1S-2412 | 24 | 12 | 84 | 9 | 88 | 1000 |
| MEK1S-2415 | 24 | 15 | 67 | 7 | 88 | 680 |
| MEK1S-2424 | 24 | 24 | 42 | 5 | 89 | 560 |
| MEK1S-0503D | 5 | ± 3.3 | ± 152 | ± 15 | 84 | 2000 |
| MEK1S-0505D | 5 | ± 5 | ± 100 | ± 10 | 86 | 2000 |
| MEK1S-0509D | 5 | ± 9 | ± 56 | ± 6 | 86 | 1000 |
| MEK1S-0512D | 5 | ± 12 | ± 42 | ± 5 | 88 | 560 |
| MEK1S-0515D | 5 | ± 15 | ± 34 | ± 4 | 88 | 220 |
| MEK1S-1203D | 12 | ± 3.3 | ± 152 | ± 15 | 84 | 2000 |
| MEK1S-1205D | 12 | ± 5 | ± 100 | ± 10 | 86 | 2000 |
| MEK1S-1209D | 12 | ± 9 | ± 56 | ± 5 | 87 | 1000 |
| MEK1S-1212D | 12 | ± 12 | ± 42 | ± 5 | 87 | 560 |
| MEK1S-1215D | 12 | ± 15 | ± 34 | ± 4 | 88 | 220 |
| MEK1S-1505D | 15 | ± 5 | ± 100 | ± 10 | 86 | 2000 |
| MEK1S-1512D | 15 | ± 12 | ± 42 | ± 5 | 87 | 560 |
| MEK1S-1515D | 15 | ± 15 | ± 34 | ± 4 | 88 | 220 |
| MEK1S-2405D | 24 | ± 5 | ± 100 | ± 10 | 87 | 2000 |
| MEK1S-2409D | 24 | ± 9 | ± 56 | ± 5 | 88 | 1000 |
| MEK1S-2412D | 24 | ± 12 | ± 42 | ± 5 | 88 | 560 |
| MEK1S-2415D | 24 | ± 15 | ± 34 | ± 4 | 88 | 220 |

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

* For dual output models, max capacitive load stipulated in the above list is for each output.

* Standard models in this series are 3KVDC isolation single and dual output models. See MEK1S-B series for bipolar output models, ME1S series for 1KVDC isolation models, and MEG1S series for 6KVDC isolation models.

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 |
|--|-----------------------|---|------------|-----------|-----------------------|------|
| Input current Full load | $V_{IN}=3.3\text{V}$ | | 370 | | mA | |
| | $V_{IN}=5\text{V}$ | - | 235 | - | | |
| | $V_{IN}=12\text{V}$ | | 99 | | | |
| | $V_{IN}=24\text{V}$ | | 51 | | | |
| Input current No load | | - | 3 | 15 | mA | |
| Reflected Ripple Current | | - | 15 | - | mA | |
| Surge voltage 1 second max | $V_{IN}=3.3\text{V}$ | -0.7 | | 5 | VDC | |
| | $V_{IN}=5\text{V}$ | -0.7 | | 9 | | |
| | $V_{IN}=12\text{V}$ | -0.7 | - | 18 | | |
| | $V_{IN}=24\text{V}$ | -0.7 | | 30 | | |
| Output voltage accuracy | All models | Refer to graphic in "Characteristic Curves" section | | | | |
| Line regulation For V_{IN} change of $\pm 1\%$ | $V_{OUT}=3.3\text{V}$ | - | - | ± 1.5 | % | |
| | All others | | | ± 1.2 | | |
| Load regulation $I_{OUT}=10\%$ to 100% of $I_{OUT, rated}$ $V_{IN}=3.3\text{V}$ | $V_{OUT}=3.3\text{V}$ | | 10 | | % | |
| | $V_{OUT}=5\text{V}$ | | 8 | | | |
| | $V_{OUT}=12\text{V}$ | - | 7 | - | | |
| | $V_{OUT}=15\text{V}$ | | 6 | | | |
| | $V_{OUT}=24\text{V}$ | | 6 | | | |
| Temperature coefficient | Full load | - | ± 0.03 | - | $\%/^{\circ}\text{C}$ | |
| Output ripple and noise | 20MHz bandwidth | - | 45 | 100 | mVp-p | |
| Output short circuit protection | | Continuous, automatic recovery | | | | |
| Input filter | | Capacitor | | | | |
| Hot plug | | None | | | | |

* 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.

* Dual output models need to operate with balanced load. The load difference between two outputs over 10% may cause unstable operating of the converter.

General Specifications

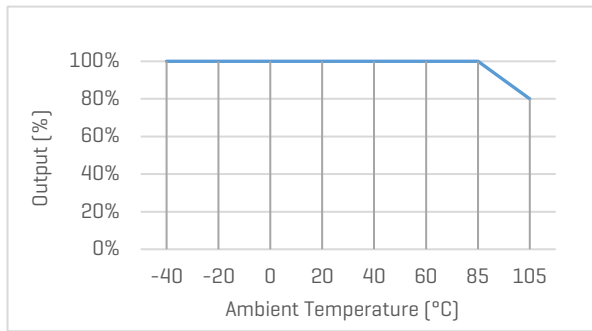
| Parameters | Conditions | Min. | Typ. | Max. | Unit | Note |
|--|-----------------------|--|------|------|-------|------|
| Isolation voltage Tested for 1 minute, leakage current less than 1mA | Input to Output | 3000 | - | - | VDC | |
| Isolation resistance Tested at 500VDC | | 1000 | - | - | M ohm | |
| Isolation capacitance Tested between input and output, test condition 100KHz, 0.1V | | - | 20 | - | pF | |
| Operating temperature | See "Derating Curve" | -40 | - | +105 | °C | |
| Storage temperature | | -55 | - | +125 | °C | |
| Temperature rise at case | | - | 25 | - | °C | |
| Storage humidity | Non-condensing | 5 | - | 95 | %RH | |
| Switching frequency | Full load | - | 220 | - | KHz | |
| Pin soldering resistance 1.5mm away from case for 10 sec | | - | - | 300 | °C | |
| Vibration | | 10-150Hz, 5G, 0.75mm along X, Y and Z | | | | |
| Case material | | Black plastic UL94-V0 | | | | |
| Cooling method | | Free air convection | | | | |
| Design based on standards | | UL/EN/IEC 62368-1 | | | | |
| Safety certifications | | EN/IEC 62368-1 | | | | |
| EMC | Emissions Immunity | CISPR32, EN55032 Class B* IEC/EN61000-4-2 | | | | |
| MTBF | MIL-HDBK-217F | >3,500,000 Hours, T _A =25°C | | | | |
| Size | | 19.65 x 6.0 x 10.16 mm | | | | |
| Weight | | 2.1g Typ. | | | | |

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

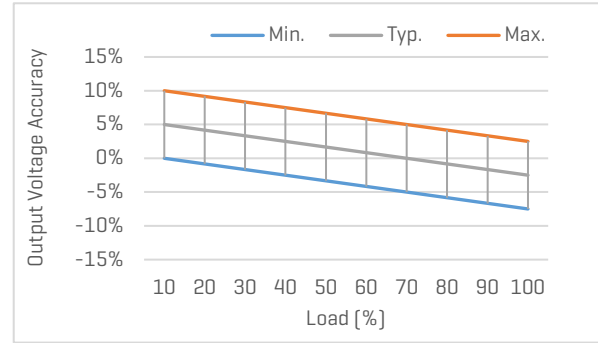
Characteristic Curves

Derating Curve

Output vs Ambient Temperature



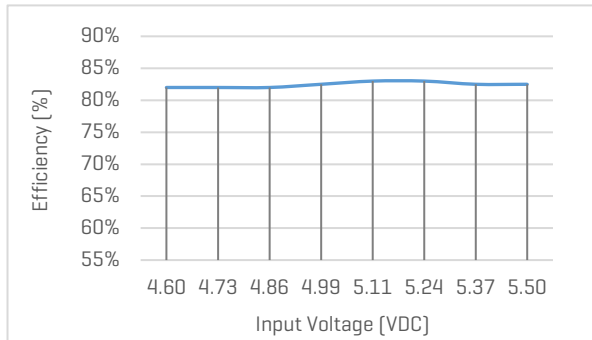
Output Voltage Accuracy vs Load



Efficiency Curves

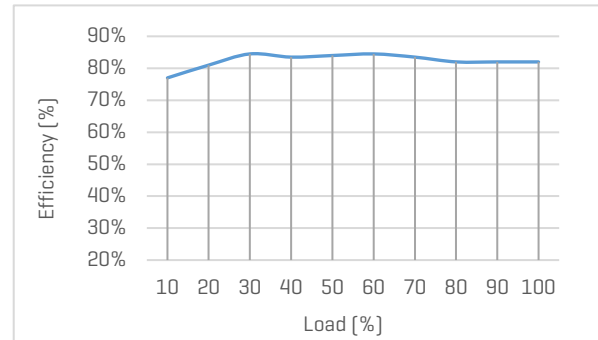
Efficiency vs Input Voltage

MEK1S-0505, with full Load



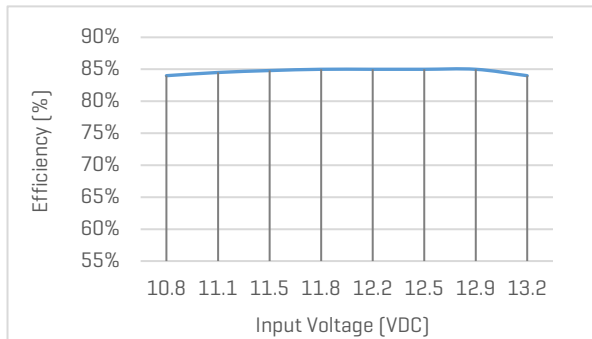
Efficiency vs Load

MEK1S-0505, with nominal input voltage



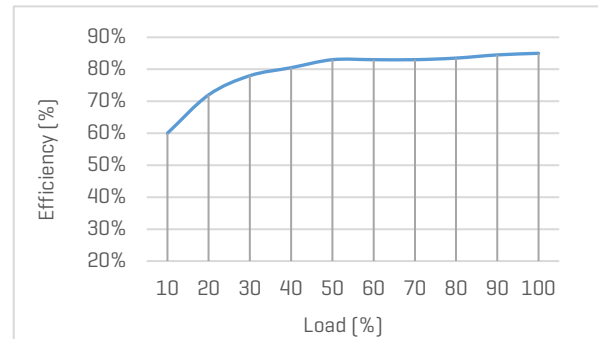
Efficiency vs Input Voltage

MEK1S-1205, with full Load



Efficiency vs Load

MEK1S-1205, with nominal input voltage

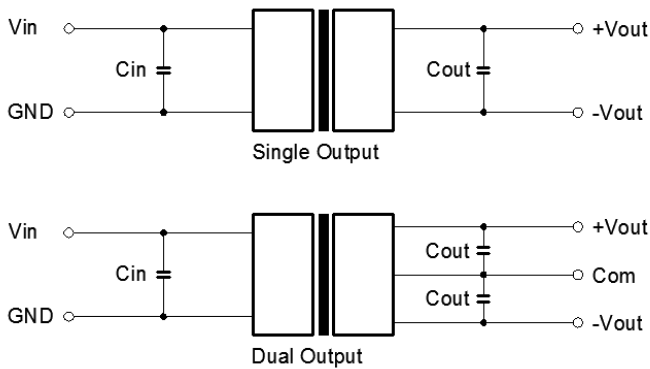


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Recommended External Circuit

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 | 3.3, 5V | 12V | 15V | 24V |
|---------------|------------------|------------------|------------------|------------------|
| C_{IN} | 4.7 μ F, 16V | 2.2 μ F, 25V | 2.2 μ F, 25V | 1.0 μ F, 50V |

[Table 2] Recommended component spec

| Output voltage | 3.3, 5V | 12V | 15V | 24V |
|----------------|-----------------|------------------|----------------|-------------------|
| C_{OUT} | 10 μ F, 16V | 2.2 μ F, 25V | 1 μ F, 50V | 0.47 μ F, 50V |

Circuit for EMC Enhancement

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

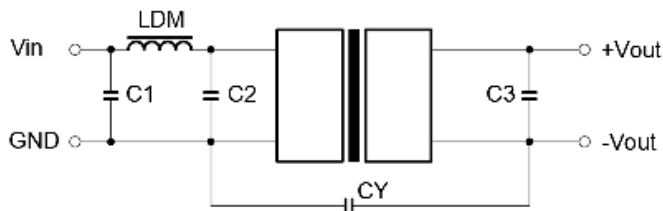


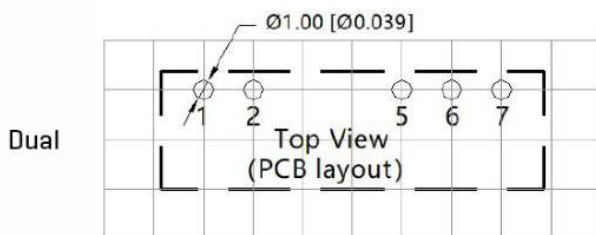
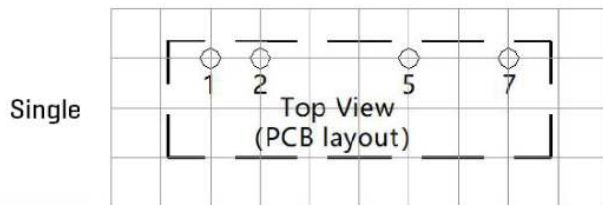
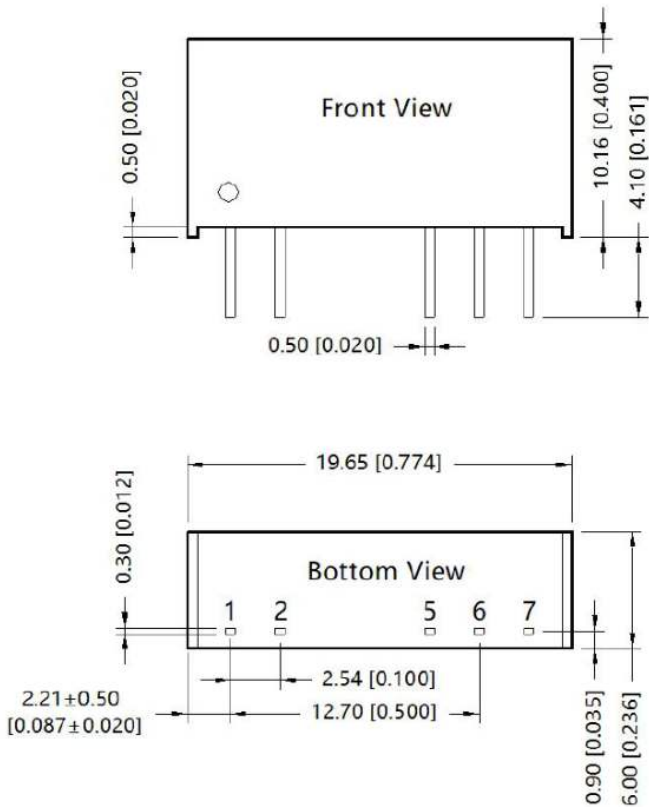
Figure 2. Circuit for EMC enhancement

[Table 3] Recommended component spec

| Component | LDM | C1, C2 | CY* |
|-----------|-------------|------------------|----------|
| Spec | 6.8 μ H | 4.7 μ F, 50V | 1nF, 2KV |

*C3 refer to C_{OUT} in [Table 2]

Mechanical Specifications



Recommended Footprint

Pin Definition

| Pin # | Single Out | Dual Out |
|-------|-------------------|-------------------|
| 1 | V _{IN} | V _{IN} |
| 2 | GND | GND |
| 5 | 0V | -V _{OUT} |
| 6 | No Pin | 0V |
| 7 | +V _{OUT} | +V _{OUT} |

* Unless otherwise specified unit: mm [inch]

* General tolerance: ± 0.50 [± 0.020]

* Pin thickness: ± 0.10 [± 0.004]

* Footprint grid 2.54 x 2.54 mm

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