

MK-6W Series

6W 4:1 Regulated Single & Dual output

Features

- Wide 4:1 Input Range
- Full SMD Technology
- 1500VDC Isolation, Up to 3000VDC
- Continuous Short Circuit Protection
- Efficiency up to 85%
- Operation Temperature Range -40 ~ 97°C max.
- EMC filter meets EN55032 Class A without adding external components
- Non-conductive Black Plastic DIP24 case



PART NUMBER STRUCTURE

MK - **24** **05** **S** **6** **H**
(1) (2) (3) (4) (5) (6)

(1) Series

(2) Input Voltage Range

24 - 9-36 V
48 - 18-75 V

(4) Output Type

S - Single Output
D - Dual Output

(3) Output Voltage

3R3 - 3.3 V
05 - 5.0 V
12 - 12 V
15 - 15 V
24 - 24 V

(5) Watt

(6) Isolation Voltage (Optional)

Blank - 1500 VDC
H - 3000 VDC

ALL SPECIFICATIONS ARE TYPICAL AT 25°C, NOMINAL INPUT AND FULL LOAD UNLESS OTHERWISE NOTED

| Model Number | Input Voltage Range (VDC) | Input Current | | Output Voltage (VDC) | Output Current | | Efficiency @FL (% , typ.) | Capacitive Load @FL (μF, max.) |
|--------------|---------------------------|--------------------|----------------------|----------------------|----------------|----------------|---------------------------|--------------------------------|
| | | No-Load (mA, max.) | Full Load (mA, typ.) | | Min. load (mA) | Full load (mA) | | |
| MK-243R3S6 | 9-36 | 10 | 253 | 3.3 | 0 | 1400 | 76 | 470 |
| MK-2405S6 | 9-36 | 10 | 313 | 5 | 0 | 1200 | 80 | 470 |
| MK-2412S6 | 9-36 | 10 | 298 | 12 | 0 | 500 | 84 | 100 |
| MK-2415S6 | 9-36 | 10 | 294 | 15 | 0 | 400 | 85 | 100 |
| MK-2424S6 | 9-36 | 10 | 294 | 24 | 0 | 250 | 85 | 47 |
| MK-243R3D6 | 9-36 | 10 | 320 | ±3.3 | 0 | ±909 | 78 | ±220 |
| MK-2405D6 | 9-36 | 10 | 309 | ±5 | 0 | ±600 | 81 | ±220 |
| MK-2412D6 | 9-36 | 10 | 294 | ±12 | 0 | ±250 | 85 | ±100 |
| MK-2415D6 | 9-36 | 15 | 298 | ±15 | 0 | ±200 | 84 | ±100 |
| MK-2424D6 | 9-36 | 20 | 305 | ±24 | 0 | ±125 | 82 | ±47 |
| MK-483R3S6 | 18-75 | 7 | 125 | 3.3 | 0 | 1400 | 77 | 470 |
| MK-4805S6 | 18-75 | 7 | 152 | 5 | 0 | 1200 | 82 | 470 |
| MK-4812S6 | 18-75 | 7 | 147 | 12 | 0 | 500 | 85 | 100 |
| MK-4815S6 | 18-75 | 7 | 147 | 15 | 0 | 400 | 85 | 100 |
| MK-4824S6 | 18-75 | 7 | 147 | 24 | 0 | 250 | 85 | 47 |
| MK-483R3D6 | 18-75 | 7 | 158 | ±3.3 | 0 | ±909 | 79 | ±220 |
| MK-4805D6 | 18-75 | 7 | 151 | ±5 | 0 | ±600 | 83 | ±220 |
| MK-4812D6 | 18-75 | 7 | 149 | ±12 | 0 | ±250 | 84 | ±100 |
| MK-4815D6 | 18-75 | 7 | 151 | ±15 | 0 | ±200 | 83 | ±100 |
| MK-4824D6 | 18-75 | 10 | 152 | ±24 | 0 | ±125 | 82 | ±47 |

| INPUT SPECIFICATIONS | | | | | | |
|---|---|------------|------|------|------|---------|
| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
| Input Voltage Range | 24V Input | | 9 | 24 | 36 | VDC |
| | 48V Input | | 18 | 48 | 75 | |
| Under Voltage Protection | 24V Input | Module ON | | 8.5 | | VDC |
| | | Module OFF | | 7.0 | | |
| | 48V Input | Module ON | | 16.5 | | |
| | | Module OFF | | 14.5 | | |
| Input Filter | Pi Type | | | | | |
| Input Reflected Ripple Current (1) | | | | 20 | | mApk-pk |
| Start up Time | Nominal Vin and constant resistive load | | | 20 | | ms |
| Recommended input fuse (slow blow) | 24V Input | | 1.5 | | | A |
| | 48V Input | | 0.75 | | | |
| Note : | | | | | | |
| 1. Measured with a simulated source inductance of 12 μ H and a source capacitor Cin (47 μ F, ESR<1.0 Ω at 100kHz). | | | | | | |

| OUTPUT SPECIFICATIONS | | | | | | |
|--------------------------------------|--|--------------------|--|------|-------|-----------------|
| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
| Output Voltage Accuracy | | | -2.0 | | +2.0 | % |
| Output Voltage Balance | Dual Output | | -2.0 | | +2.0 | % |
| Line Regulation | | | -0.5 | | +0.5 | % |
| Load Regulation | From 0% to 100% Load | | -1.2 | | +1.2 | % |
| Cross Regulation | Asymmetrical Load 25% / 100% for Dual Output | | -5 | | +5 | % |
| Ripple & Noise (1) | 20MHz bandwidth | 24V Dual Output | | | 100 | mVpk-pk |
| | | Other Output | | | 80 | |
| Over Current Protection | | | | 160 | | % of FL |
| Short Circuit Protection | | | Indefinite (hiccup) (Automatic Recovery) | | | |
| Temperature Coefficient | | | -0.02 | | +0.02 | %/ $^{\circ}$ C |
| Maximum Capacitive Load | Minimum Vin and constant resistive load | | See Table | | | |
| Transient Recovery Time | Nominal Vin and 25% load step change (75%-50%-25% of Io) | For All models | | 300 | | μ s |
| Transient Response Deviation | | 3.3V Single Output | -5 | | +5 | % |
| | | Other Output | -3 | | +3 | |
| Note : | | | | | | |
| 1. Measured with a 1.0 μ F MLCC. | | | | | | |

| ABSOLUTE MAXIMUM RATINGS | | | | | | |
|---|----------------------------|--|------|------|------|--------------|
| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
| Input Surge Voltage (100 ms) | 24V Input | | | | 50 | VDC |
| | 48V Input | | | | 100 | |
| Soldering Temperature | 1.5mm from case 10sec max. | | | | 260 | $^{\circ}$ C |
| Note : These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability. | | | | | | |

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| GENERAL SPECIFICATIONS | | | | | |
|--------------------------|-----------------------------------|----------------------|------|------|---------|
| Parameter | Conditions | Min. | Typ. | Max. | Unit |
| Isolation Voltage | Input-output, and rated for 60sec | 1500 | | 3000 | VDC |
| Isolation Resistance | Input-output | 1000 | | | MΩ |
| Isolation Capacitance | Input-output | | 1000 | | pF |
| Switching Frequency | | | 330 | | kHz |
| MTBF | MIL-HDBK-217 F @ 25°C | 800 | | | k hours |
| Safety Approval | IEC / EN / UL 62368-1 | DK-89653-UL, E252573 | | | |
| Environmental compliance | | RoHS | | | |

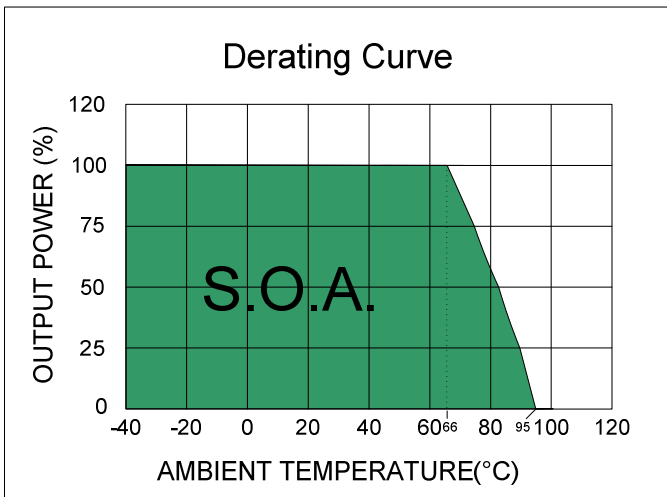
| ENVIRONMENT SPECIFICATIONS | | | | | |
|-------------------------------|------------------------|-----------|------|------|----------|
| Parameter | Conditions | Min. | Typ. | Max. | Unit |
| Operating Ambient Temperature | See the Derating Curve | -40 | | 97 | °C |
| Maximum Case Temperature | | | | 100 | °C |
| Thermal Impedance | 3.3V Single output | 20.45 | | | °C/W |
| | Others | 19.86 | | | |
| Storage Humidity | | | | 95 | % rel. H |
| Storage Temperature | | -55 | | 125 | °C |
| Cooling | Natural Convection | 30-65 LFM | | | |

| EMC SPECIFICATIONS | | | |
|---------------------|---------------|-------------------------------|-----------|
| Parameter | Standard | Condition | Criterion |
| Conducted Emissions | EN55032 | | A |
| Radiated Emissions | EN55032 | | A |
| ESD | IEC 61000-4-2 | Air: ± 8kV Contact: ± 6kV | A |
| RS | IEC 61000-4-3 | 10V/m | A |
| EFT | IEC 61000-4-4 | ±2kV with external components | A |
| Surge | IEC 61000-4-5 | ±1kV with external components | A |
| CS | IEC 61000-4-6 | 10Vrms | A |
| PFMF | IEC 61000-4-8 | 1A/m | A |

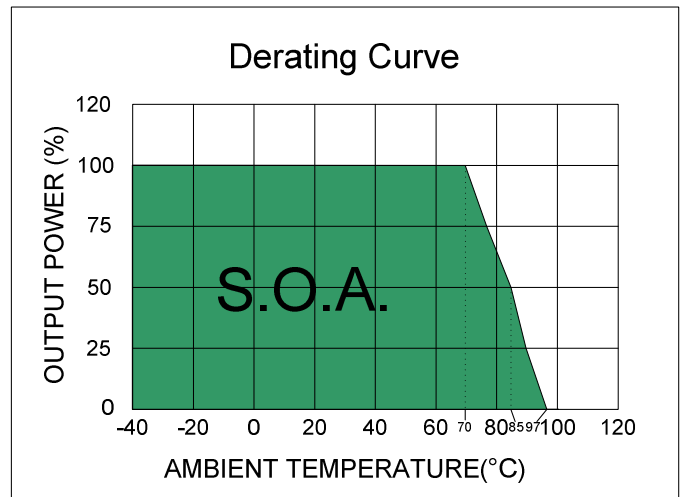
| PHYSICAL SPECIFICATIONS | |
|-------------------------|---|
| Parameter | Value |
| Case Material | Nonconductive Black Plastic (UL94V-0 rated) |
| Base Material | Nonconductive Black Plastic (UL94V-0 rated) |
| Pin Material | Ø0.5mm Brass Solder-coated |
| Potting Material | Epoxy (UL94V-0 rated) |
| Weight | 13.0 g, typ. |
| Dimensions | 1.25" x 0.8" x 0.4" |

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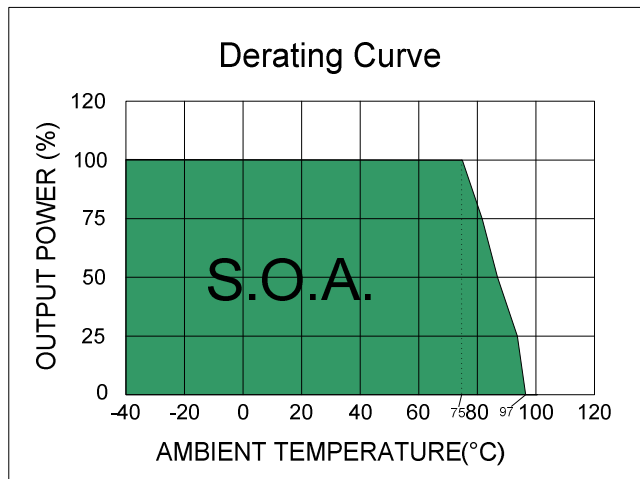
ELECTRICAL CHARACTERISTIC CURVES



MK-243R3D6、MK-483R3D6



Efficiency : 76% ~ 82%

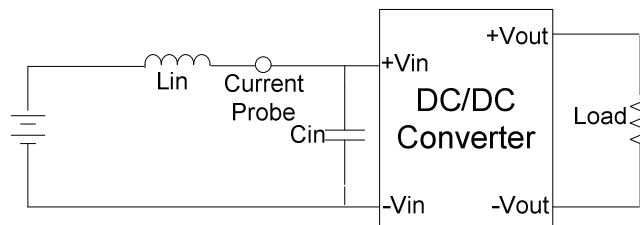


Other models

TEST CONFIGURATIONS

Input Reflected Ripple Current Test Step

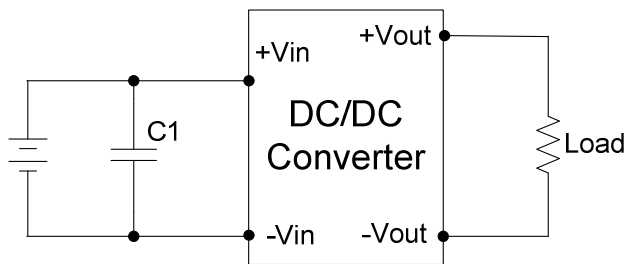
Input reflected ripple current is measured with a source inductor L_{in} (12 μ H) and a source capacitor C_{in} (47 μ F, ESR<1.0 Ω at 100kHz) at nominal input and full load.



DESIGN & FEATURE CONFIGURATIONS

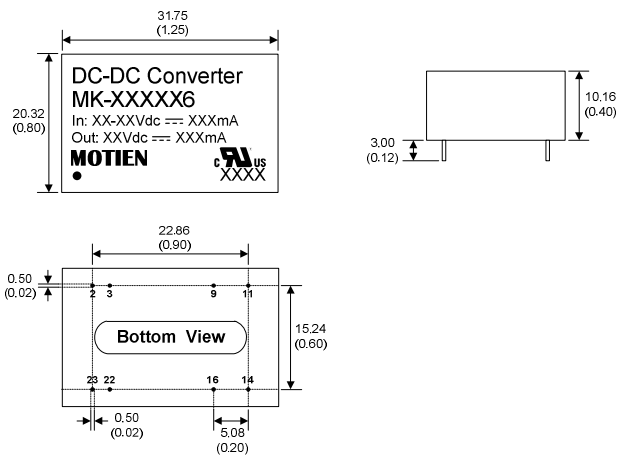
EMC Filter

The Circuit is used to meet Surge & EFT test.



| | |
|-----------|----------------------------------|
| | C1 |
| MK-24XXX6 | NIPPON Chemi-con KY series |
| MK-48XXX6 | 220μF, 100V |

MECHANICAL SPECIFICATIONS



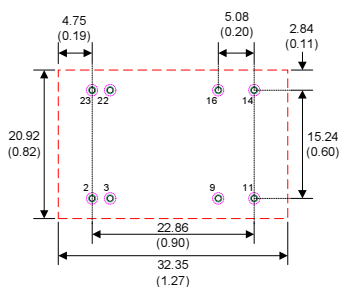
| PIN CONNECTIONS | | |
|-----------------|--------|-------|
| PIN NUMBER | SINGLE | DUAL |
| 2 | -Vin | -Vin |
| 3 | -Vin | -Vin |
| 9 | N.P. | COM |
| 11 | N.C. | -Vout |
| 14 | +Vout | +Vout |
| 16 | -Vout | COM |
| 22 | +Vin | +Vin |
| 23 | +Vin | +Vin |

**DIP24 Package
Non-Conductive Plastic**

- Notes : All dimensions are typical in millimeters (inches).
1. Pin diameter: 0.5±0.05 (0.02±0.002)
 2. Pin pitch and length tolerance: ±0.35 (±0.014)
 3. Case Tolerance: ±0.5 (±0.02)

*N.P. : No PIN
*N.C. : No Connection

RECOMMENDED FOOTPRINT DETAILS



- Notes : 1. All dimensions are typical in millimeters (inches).
- Through hole (black) 2 ~ 23: Ø0.80 (0.031)
 - Top view pad (green) 2 ~ 23: Ø1.00 (0.039)
 - Bottom view pad (pink) 2 ~ 23: Ø1.60 (0.063)