

M40A Series

40W 4:1 Regulated Single & Dual output

Features

- Wide 4:1 Input Range
- Full SMD Technology
- 1600 VDC Isolation
- Efficiency up to 92%
- -40 ~ 85°C Operation Temperature Range
- Adjustable Output Voltage
- Remote On/Off Control (CTRL)
- Continuous Short Circuit Protection
- Over Current Protection
- Over Voltage Protection
- Over Temperature Protection
- Soft Start
- Optional Heat-sink



The M40A series is a family of cost effective 40W single & dual output DC-DC converters. These converters combine nickel-coated copper package in a 2"x2" case with high performance features such as Active Clamp Technology, continuous short circuit protection with automatic restart and tight line / load regulation. Devices are encapsulated using flame retardant resin. Input voltages of 24 and 48 with output voltage of 3.3, 5, 12, 15, ± 12 , ± 15 Vdc. High performance features include high efficiency operation up to 92% and output voltage accuracy of $\pm 1\%$ maximum.

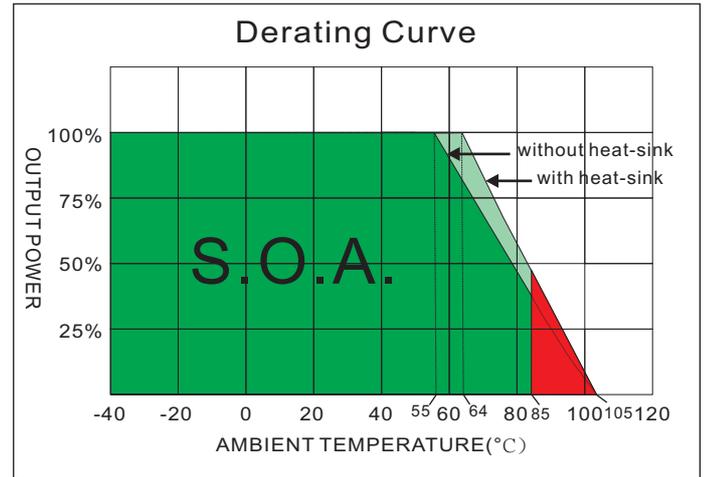
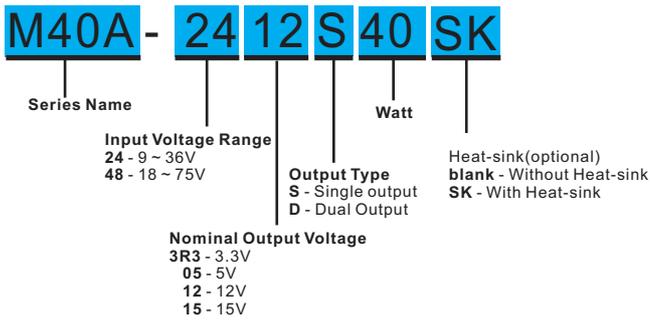
ALL SPECIFICATIONS ARE TYPICAL AT 25°C, NOMINAL INPUT AND FULL LOAD UNLESS OTHERWISE NOTED.

| OUTPUT SPECIFICATIONS | | GENERAL SPECIFICATIONS | |
|---------------------------------------------------------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Output Voltage Accuracy | $\pm 1\%$, max. | Efficiency | See table, typ. |
| Output Voltage Adjustability (Trim) (1) | $\pm 10\%$, max. | I/O Isolation Voltage(60sec) | |
| Output Current | See table, max. | Input/Output | 1600Vdc |
| Line Regulation | $\pm 0.5\%$, max. | Case/Input & Output | 1600Vdc |
| Load Regulation(Single, $I_o=0\%$ to 100%) | $\pm 0.5\%$, max. | Isolation Resistance | 1000 M Ω , min. |
| Load Regulation(Dual, $I_o=1\%$ to 100%) | $\pm 1.0\%$, max. | Isolation Capacitance | 2500 pF, max. |
| Cross Regulation (Dual Output) (2) | $\pm 5\%$, max. | Switching frequency | 270kHz, typ. |
| Ripple&Noise (3) | | Humidity | 95% rel H |
| 3.3V&5.0V output: | 50mVpk-pk, max. | Reliability Calculated MTBF(MIL-HDBK-217 F) | >151 khrs |
| Dual output: | 150mVpk-pk, max. | Safety Standard (design to meet) | IEC/EN 60950-1 |
| All other output: | 75mVpk-pk, max. | | |
| 3.3V output | 3.9V | EMC CHARACTERISTICS | |
| 5V output | 6.2V | Radiated Emissions(8) | EN55032 CLASSA |
| Over Voltage Protection (Zener diode clamp) | | Conducted Emissions(8) | EN55032 CLASSA |
| 12V output | 15V | ESD | IEC 61000-4-2 Perf. Criteria A |
| 15V output | 18V | RS | IEC 61000-4-3 Perf. Criteria A |
| ± 12 V output | ± 15 V | EFT(9) | IEC 61000-4-4 Perf. Criteria A |
| ± 15 V output | ± 18 V | Surge (9) | IEC 61000-4-5 Perf. Criteria A |
| Over Load Protection | 130% of FL, typ. | CS | IEC 61000-4-6 Perf. Criteria A |
| Short Circuit Protection | Indefinite(hiccup) (Automatic Recovery) | PFMF | IEC 61000-4-8 Perf. Criteria A |
| Temperature Coefficient | $\pm 0.02\%/^{\circ}\text{C}$ | ENVIRONMENTAL SPECIFICATIONS | |
| Capacitive Load (4) | See table, max. | Operating Ambient Temperature | -40°C ~ +85°C(See Derating Curve) -40°C ~ +55°C(For 100% load) |
| Transient Recovery Time (5) | 250 μs , typ. | Maximum Case Temperature | 105°C |
| Transient Response Deviation(5) | $\pm 3\%$, max. | Thermal Impedance (Nature Convection) | Without Heat-sink 10.8°C/W With Heat-sink 8.8°C/W |
| INPUT SPECIFICATIONS | | Storage Temperature | -55°C ~ +125°C |
| Input Voltage Range | See table | Over Temperature Protection (Case) | 110°C, typ. |
| Under Voltage Lockout | | Cooling | Nature Convection |
| 24V Modes Module ON / OFF | 8.6Vdc / 7.9Vdc, typ. | ABSOLUTE SPECIFICATIONS (10) | |
| 48V Modes Module ON / OFF | 17.8Vdc / 16Vdc, typ. | These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability. | |
| Start up Time (Nominal Vin and constant resistive load) | 25mS, typ. | Input Surge Voltage(100mS) | |
| Input Filter | Pi Type | 24 Models | 50 Vdc, max. |
| Input Current(No-Load) | See table, typ. | 48 Models | 100 Vdc, max. |
| Input Current(Full-Load) | See table, max. | Soldering Temperature (1.5mm from case 10sec max.) | 260°C, max. |
| Input Reflected Ripple Current(6) | 20mApk-pk, typ. | PHYSICAL SPECIFICATIONS | |
| Remote On/Off (CTRL)(7) | | Case Material | Nickel-coated Copper |
| ON: 3.0 ... 12Vdc or open circuit | | Pin Material | $\Phi 1.0$ mm Brass Solder-coated |
| OFF: 0 ... 1.2Vdc or Short circuit pin2 and pin 3 | | Potting Material | Epoxy (UL94V-0 rated) |
| OFF idle current: 5.0 mA, typ. | | Weight | 87.0g |
| | | Dimensions | 2.00"x2.00"x0.40" |

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M40A - 40W 4:1 Regulated Single & Dual output

PART NUMBER STRUCTURE



MODEL SELECTION GUIDE

| MODEL NUMBER | INPUT Voltage Range (Vdc) | INPUT Current | | OUTPUT Voltage (Vdc) | OUTPUT Current | | EFFICIENCY @FL (% , typ.) | Capacitor Load @FL (µF, max.) |
|---------------|---------------------------|--------------------|----------------------|----------------------|----------------|----------------|---------------------------|-------------------------------|
| | | No-Load (mA, max.) | Full Load (mA, typ.) | | Min. load (mA) | Full load (mA) | | |
| M40A-243R3S40 | 9-36 | 80 | 1598 | 3.3 | 0 | 10000 | 89 | 25000 |
| M40A-2405S40 | 9-36 | 100 | 1893 | 5 | 0 | 8000 | 91 | 13000 |
| M40A-2412S40 | 9-36 | 50 | 1925 | 12 | 0 | 3350 | 90 | 2300 |
| M40A-2415S40 | 9-36 | 50 | 1904 | 15 | 0 | 2650 | 90 | 1500 |
| M40A-483R3S40 | 18-75 | 60 | 799 | 3.3 | 0 | 10000 | 89 | 25000 |
| M40A-4805S40 | 18-75 | 60 | 936 | 5 | 0 | 8000 | 92 | 13000 |
| M40A-4812S40 | 18-75 | 30 | 963 | 12 | 0 | 3350 | 90 | 2300 |
| M40A-4815S40 | 18-75 | 30 | 941 | 15 | 0 | 2650 | 91 | 1500 |
| M40A-2412D40 | 9-36 | 60 | 1919 | ±12 | 0 | ±1650 | 89 | ±1200 |
| M40A-2415D40 | 9-36 | 60 | 1962 | ±15 | 0 | ±1350 | 89 | ±750 |
| M40A-4812D40 | 18-75 | 30 | 948 | ±12 | 0 | ±1650 | 90 | ±1200 |
| M40A-4815D40 | 18-75 | 30 | 970 | ±15 | 0 | ±1350 | 90 | ±750 |

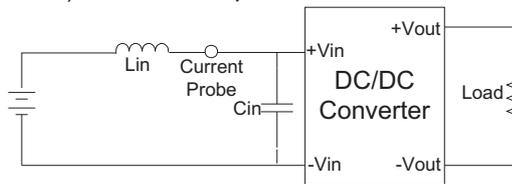
NOTE

- For the Single output: Maximum output deviation is 10% inclusive of remote sense and trim. If remote sense is not being used, the +sense should be connected to its corresponding +OUTPUT and likewise the -sense should be connected to its corresponding -OUTPUT.
- One load is 25% to 100% load, the other load is 100% load, the output voltage variable rate is within ±5%.
- Measured with 20MHz bandwidth and 1.0uF ceramic capacitor.
- Tested by minimal Vin and constant resistive load.
- Tested by normal Vin and 25% load step change (75%-50%-25% of Io).
- Measured Input reflected ripple current with a simulated source inductance of 12uH.
- The remote on/off control pin is referenced to -Vin(pin2).
- The M40A-40W series can meet EN55032 Class A With an external filter in parallel with the input pins .
- An external filter capacitor is required if the module has to meet IEC61000-4-4 and IEC61000-4-5.
The filter capacitor Motien suggest: Nippon chemi-con KY series, 220uF/100V.
- Exceeding the absolute ratings of the unit could cause damage.
It is not allowed for continuous operating.

TEST CONFIGURATIONS

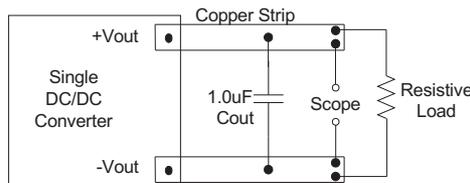
Input Reflected Ripple Current Test Step

Input reflected ripple current is measured through a source inductor L_{in} (12uH) and a source capacitor C_{in} (47uF, ESR<1.0Ω at 100KHz) at nominal input and full load.



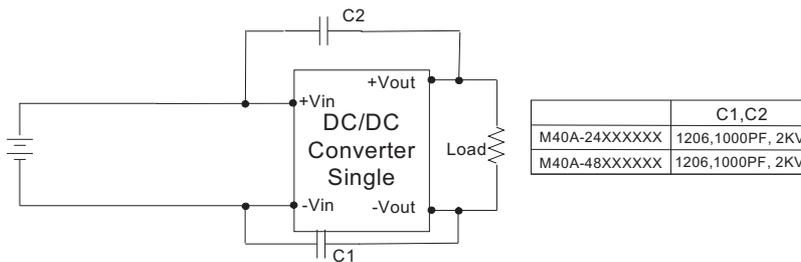
Output Ripple & Noise Measurement Test

Use a capacitor C_{out} (1.0uF) measurement. The Scope measurement bandwidth is 0-20MHz.

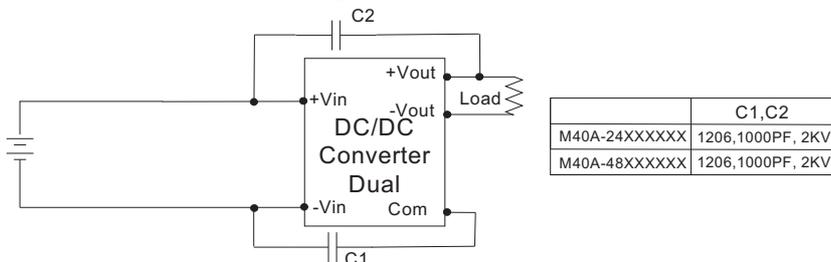


EMI Filter

Input filter components (C_1, C_2) are used to help meet radiated emissions requirement for the module. These components should be mounted as close as possible to the module; And all leads should be minimized to decrease radiated noise.



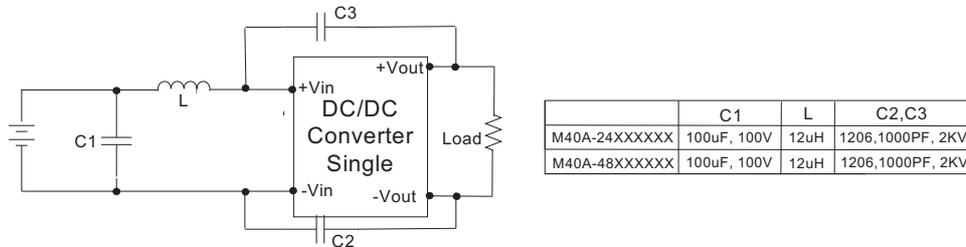
| C1,C2 | |
|---------------|------------------|
| M40A-24XXXXXX | 1206,1000PF, 2KV |
| M40A-48XXXXXX | 1206,1000PF, 2KV |



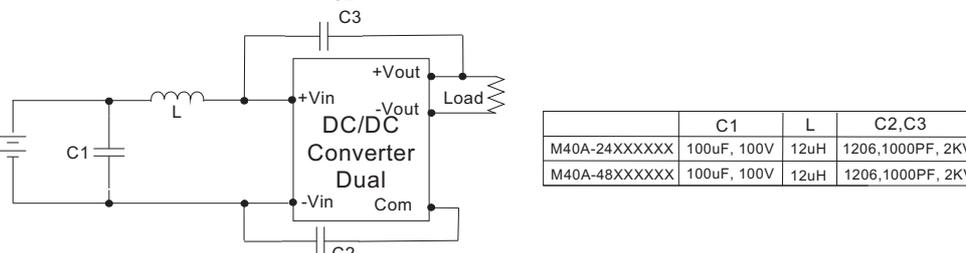
| C1,C2 | |
|---------------|------------------|
| M40A-24XXXXXX | 1206,1000PF, 2KV |
| M40A-48XXXXXX | 1206,1000PF, 2KV |

EMI Filter

Input filter components (C_1, C_2, C_3, L) are used to help meet conducted emissions requirement for the module. These components should be mounted as close as possible to the module; And all leads should be minimized to decrease radiated noise.



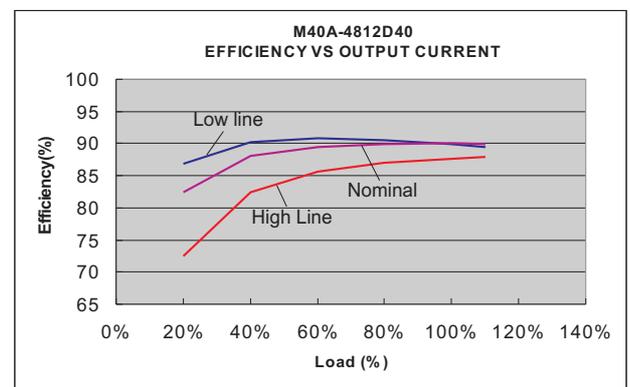
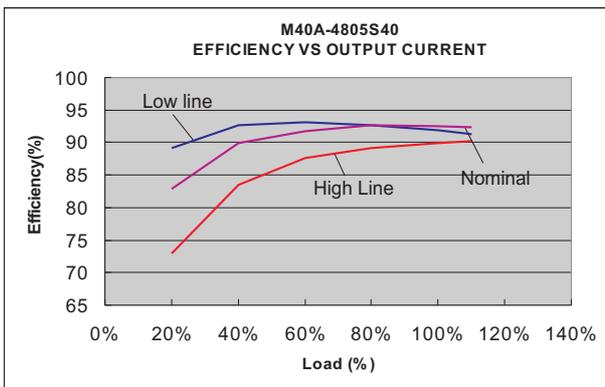
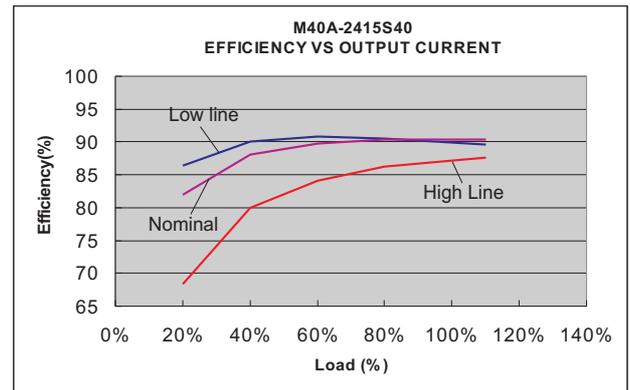
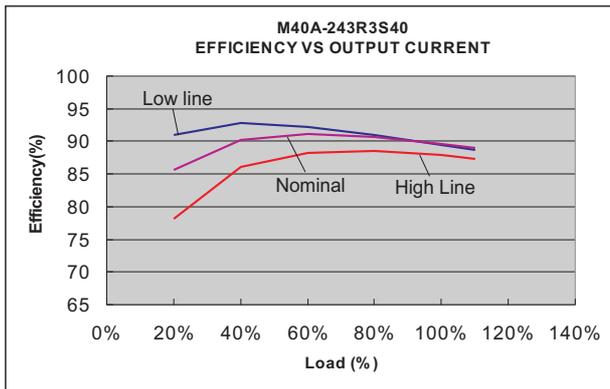
| | C1 | L | C2,C3 |
|---------------|-------------|------|------------------|
| M40A-24XXXXXX | 100uF, 100V | 12uH | 1206,1000PF, 2KV |
| M40A-48XXXXXX | 100uF, 100V | 12uH | 1206,1000PF, 2KV |



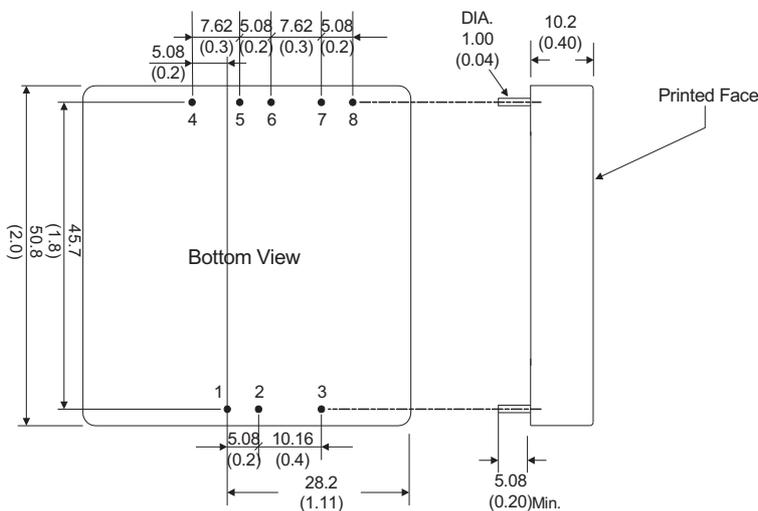
| | C1 | L | C2,C3 |
|---------------|-------------|------|------------------|
| M40A-24XXXXXX | 100uF, 100V | 12uH | 1206,1000PF, 2KV |
| M40A-48XXXXXX | 100uF, 100V | 12uH | 1206,1000PF, 2KV |

M40A - 40W 4:1 Regulated Single & Dual output

ELECTRICAL CHARACTERISTIC CURVES



MECHANICAL SPECIFICATIONS

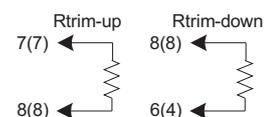


- All dimensions are typical in millimeters (inches).
1. Pin diameter: 1.0 ± 0.05 (0.04 ± 0.002)
 2. Pin pitch and length tolerance: ± 0.35 (± 0.014)
 3. Case Tolerance: ± 0.5 (± 0.02)

| PIN CONNECTIONS | | |
|-----------------|--------|-------|
| PIN NUMBER | SINGLE | DUAL |
| 1 | +Vin | +Vin |
| 2 | -Vin | -Vin |
| 3 | CTRL | CTRL |
| 4 | -Sense | +Vout |
| 5 | +Sense | Com |
| 6 | +Vout | Com |
| 7 | -Vout | -Vout |
| 8 | Trim | Trim |

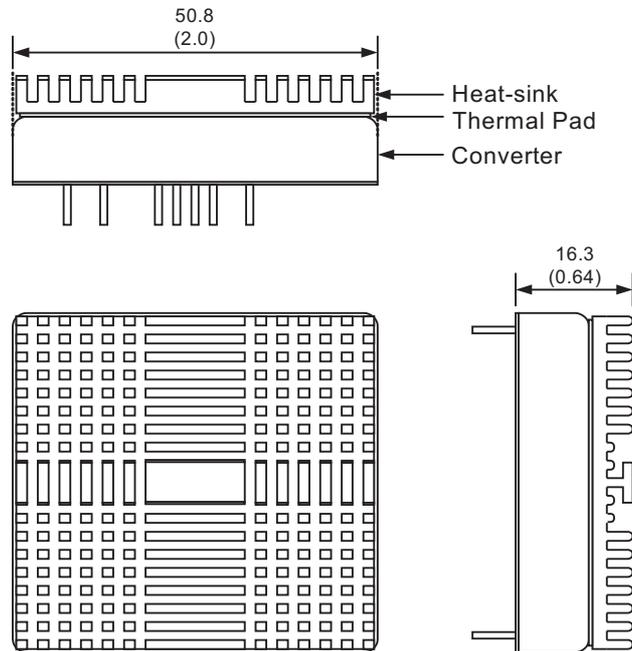
EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed by using the method as below. () for dual output trim.



MECHANICAL SPECIFICATIONS

With Heat-sink



Order code: M40-XXXXS40SK(contain: heat-sink, thermal pad)
 Material: Aluminum
 Finish: Anodic treatment (black)
 Weight: 22 g (0.78oz) (without converter)

Note:

1. Converters will be supplied with heat-sinks already mounted.
 Please contact factory for quotation.