

M10A Series

10W 4:1 Regulated Single & Dual output



Features

- Ultra Wide 4:1 Input Range
- 1600 VDC Isolation
- Efficiency up to 87%
- Extended Operation Temperature Range -40 ~ +100°C
- No Minimum Load Required
- Continuous Short Circuit Protection
- Over Load Protection
- Under Voltage Lockout
- Adjustable Output Voltage
- High Power Density: 10W in DIL-16 Package
- Built-in EMI filter meets EN55032 Class A

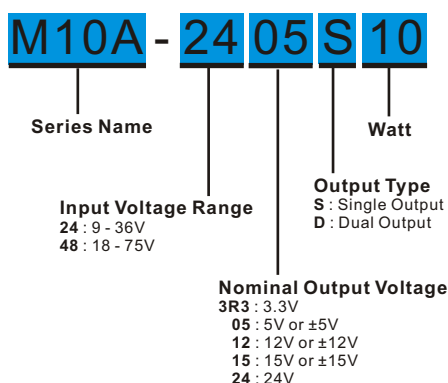


The M10A series is a family of high performance 10W single & dual output DC-DC converters. These converters are built in copper package in a 16-pin DIP miniature compact case with high performance features wide range devices operate over 4:1 input voltage range providing stable output voltage which is much smaller than package of DIP-24. Devices are encapsulated using flame retardant resin. Input voltages are 24 Vdc and 48 Vdc with output voltage of 3.3, 5, 12, 15, 24, ± 12 , ± 15 Vdc. Featuring new PWM construction, no minimum load required and precise 1% output voltage accuracy.

All specifications typical at Ta=25°C, nominal input voltage and full load unless otherwise specified.

OUTPUT SPECIFICATIONS		GENERAL SPECIFICATIONS	
Voltage Accuracy	$\pm 1\%$, max.	Efficiency	See table, typ.
Output Voltage Adjustability(Trim)	$\pm 10\%$, max.	I/O Isolation Voltage (60sec)	
Output Current	See table, max.	Input / Output	1600Vdc
Line Regulation	$\pm 0.5\%$, max.	Case / Input & Output	1000Vdc
Load Regulation	Single : $\pm 1\%$, max.	I/O Isolation Resistance	1G Ω , min.
(From 0% to 100% Load)	(Output Voltage Balance) Dual : $\pm 1\%$, max.	I/O Isolation Capacity	1200pF, max.
Cross Regulation (Dual Output) (1)	$\pm 5\%$, max.	Switching Frequency	370kHz, typ.
Ripple & Noise (20MHz bandwidth)(2)	3.3V & 5V : 60mV _{pk-pk} , max.	Humidity	5-95% rel H
	Others : 80mV _{pk-pk} , max.	Reliability Calculated MTBF (MIL-HDBK-217 F)	485khrs, min.
Over Load Protection	160%, typ.	Safety Standard	UL/cUL 62368-1
Short Circuit Protection	Indefinite (Automatic Recovery)		IEC/EN 60950-1, 62368-1
Temperature Coefficient	$\pm 0.02\%/^{\circ}\text{C}$	Safety Approvals	UL/cUL 62368-1
Capacitive Load(3)	See table, max.		IEC/EN 60950-1, 62368-1
Transient Recovery Time(4)	250 μs , typ.	PHYSICAL SPECIFICATIONS	
Transient Response Deviation(4)	Output 3.3V & 5V : $\pm 5\%$, max.	Case Material	Copper
	Others : $\pm 3\%$, max.	Base Material	Non-conductive Black Plastic (UL94V-0 rated)
		Potting Material	Epoxy (UL94V-0 rated)
		Pin Material	$\Phi 0.5\text{mm}$ Brass Solder-coated
		Weight	10g, typ.
		Dimensions	0.94"x0.54"x0.41"
INPUT SPECIFICATIONS		ENVIRONMENT SPECIFICATIONS	
Voltage Range	See table	Operating Temperature	-40°C ~ +100°C (See Derating Curve)
Start up Time(Nominal Vin and constant resistive load)	20ms, typ.	Maximum Case Temperature	105°C
Input Filter	Pi Type	Thermal Impedance	18°C/W, min.
Input Current (No-Load)	See table, typ.	Storage Temperature	-55°C ~ +125°C
Input Current (Full-Load)	See table, typ.	Cooling(7)	Nature Convection
Input Reflected Ripple Current(5)	20mA _{pk-pk} , max.	EMC CHARACTERISTICS	
Under voltage lockout		Radiated Emissions	EN55032 CLASS A
24V Module ON / OFF	8.8Vdc / 7.0Vdc, typ.	Conducted Emissions	EN55032 CLASS A
48V Module ON / OFF	17.8Vdc / 16.0Vdc, typ.	ESD	IEC61000-4-2 Perf. Criteria A
		RS	IEC61000-4-3 Perf. Criteria A
		EFT(8)	IEC61000-4-4 Perf. Criteria A
		Surge(8)	IEC61000-4-5 Perf. Criteria A
		CS	IEC61000-4-6 Perf. Criteria A
		PFMF	IEC61000-4-8 Perf. Criteria A
ABSOLUTE MAXIMUM RATINGS(6)			
These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.			
Input Surge Voltage (100ms max.)			
24 Models	50Vdc, max.		
48 Models	100Vdc, max.		
Soldering Temperature	260°C, max.		
(1.5mm from case 10sec max.)			

PART NUMBER STRUCTURE



MODEL SELECTION GUIDE

MODEL NUMBER	INPUT Voltage Range (Vdc)	INPUT Current (mA)		OUTPUT Voltage (Vdc)	OUTPUT Current		Efficiency @FL (% , typ.)	Capacitor Load @FL (μF , max.)
		No-Load (mA, max.)	Full-Load (mA, typ.)		No load (mA)	Full load (mA)		
M10A-243R3S10	24 (9 - 36)	10	464	3.3	0	2700	80	3300
M10A-2405S10	24 (9 - 36)	10	502	5	0	2000	83	2200
M10A-2412S10	24 (9 - 36)	10	479	12	0	833	87	1000
M10A-2415S10	24 (9 - 36)	10	479	15	0	666	87	680
M10A-2424S10	24 (9 - 36)	10	479	24	0	416	87	330
M10A-2412D10	24 (9 - 36)	10	478	± 12	0	± 416	87	680#
M10A-2415D10	24 (9 - 36)	10	478	± 15	0	± 333	87	470#
M10A-483R3S10	48 (18 - 75)	7	232	3.3	0	2700	80	3300
M10A-4805S10	48 (18 - 75)	7	251	5	0	2000	83	2200
M10A-4812S10	48 (18 - 75)	7	239	12	0	833	87	1000
M10A-4815S10	48 (18 - 75)	7	239	15	0	666	87	680
M10A-4824S10	48 (18 - 75)	7	239	24	0	416	87	330
M10A-4812D10	48 (18 - 75)	7	239	± 12	0	± 416	87	680#
M10A-4815D10	48 (18 - 75)	7	239	± 15	0	± 333	87	470#

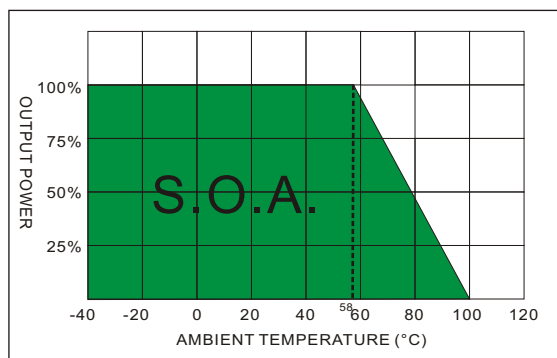
For each output

NOTE

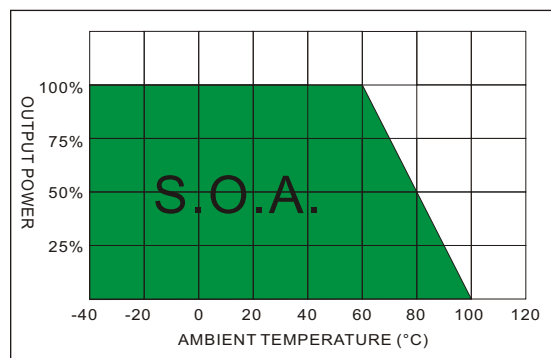
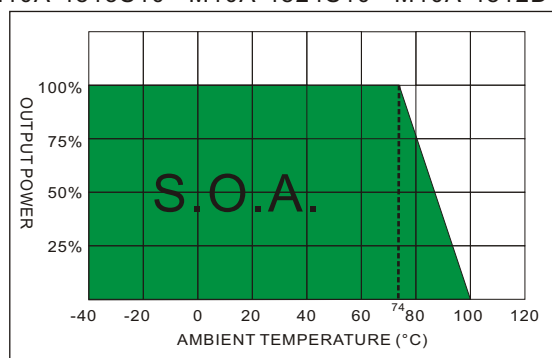
- One load is 25% to 100% load, the other load is 100% load, the output voltage variable rate is within $\pm 5\%$.
- Measured with a $1\mu F$ ceramic capacitor and a $10\mu F$ electrolytic capacitor.
- Tested by minimal V_{in} and constant resistive load.
- Tested by normal V_{in} and 100%~25% load, 25% load step change.
- Measured with a simulated source inductance of $8.2\mu H$ and a source capacitor $C_{in}(47\mu F, ESR < 1.0\Omega \text{ at } 100KHz)$.
- Exceeding the absolute ratings of the unit could cause damage. It's not allowed for continuous operating ratings.
- "Nature Convection" is usually about 30~65 LFM but is not equal to still air (0 LFM).
- An external filter is required if the module has to meet IEC61000-4-4 and IEC61000-4-5.
The filter capacitor Motien suggest: 24V_{in} models : Nippon - chemi - con KY series, $220\mu F/100V$ and a TVS, 58V, 3kW.
48V_{in} models : Nippon - chemi - con KY series, $220\mu F/100V$ and a TVS, 120V, 3kW.

POWER DERATING CURVE

M10A-243R3S10、M10A-483R3S10



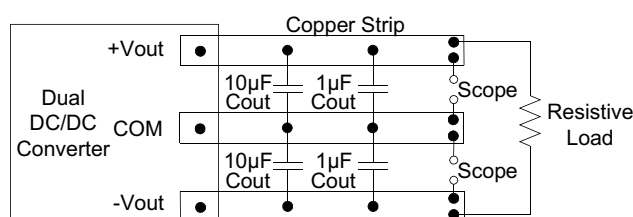
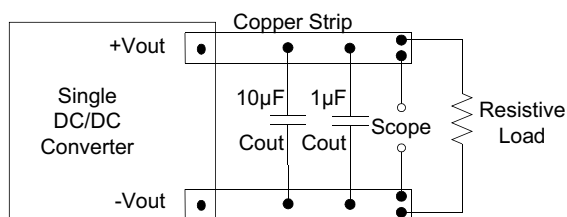
M10A-2405S10、M10A-4805S10


M10A-2412S10、M10A-2415S10、M10A-2424S10、M10A-2412D10、M10A-2415D10、
M10A-4812S10、M10A-4815S10、M10A-4824S10、M10A-4812D10、M10A-4815D10


TEST CONFIGURATIONS

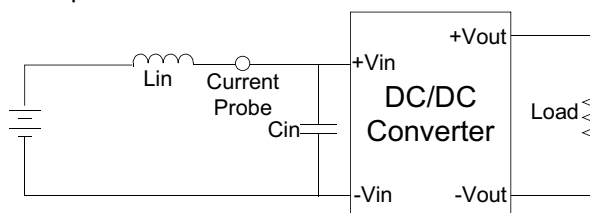
Output Ripple & Noise Measurement Test

To reduce ripple and noise, it's recommended to connect a $1\mu\text{F}$ ceramic disk capacitor and a $10\mu\text{F}$ electrolytic capacitor to output.



Input Reflected Ripple Current Test

Input reflected ripple current is measured with a source inductor L_{in} ($8.2\mu\text{H}$) and a source capacitor C_{in} ($47\mu\text{F}$, $\text{ESR} < 1.0\Omega$ at 100KHz) at nominal input and full load.



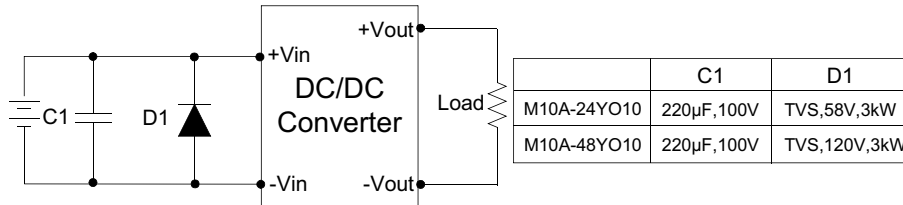
TEST CONFIGURATIONS

EFT & Surge Test

The filter capacitor Motien suggest:

24Vin models : Nippon - chemi - con KY series, 220 μ F/100V and a TVS,58V,3kW.

48Vin models : Nippon - chemi - con KY series, 220 μ F/100V and a TVS,120V,3kW.

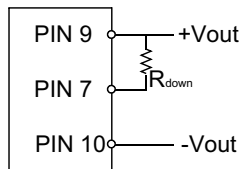


DESIGN CONFIGURATIONS

Output Voltage Adjustment (Single output models only)

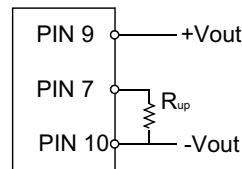
Pin 7 via a resistor to Pin 9(+Vout), Vo trim down. Pin 7 via a resistor to Pin 10(-Vout), Vo trim up.

DC/DC Converter



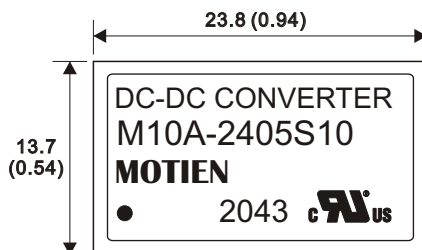
Trim down

DC/DC Converter

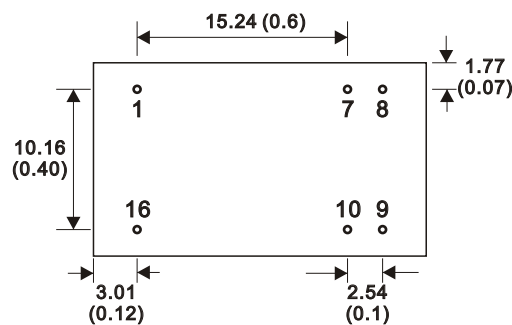


Trim up

MECHANICAL SPECIFICATIONS

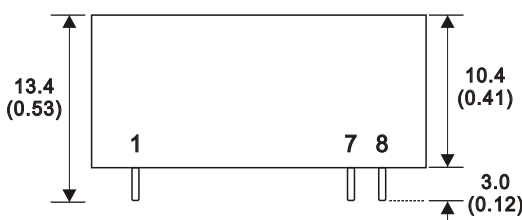


Top view



Bottom view

PIN CONNECTIONS		
PIN NUMBER	SINGLE	DUAL
1	-V Input	-V Input
7	Trim	NC
8	NC	Common
9	+V Output	+V Output
10	-V Output	-V Output
16	+V Input	+V Input



Side view (Front)

16 Pin DIL Package

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