

MA10H Series

10W, Encapsulated DIP2"x1" Package DC/DC Converters



Features

- Rated power: 10W Max
- Input voltage 40...160VDC
- Regulated output
- High efficiency up to 85%
- Isolation voltage 2250VDC
- Low ripple and noise
- Operating temperature range: -40 ~ +85°C ambient
- RoHS compliant
- Standard 2"x1" package
- Under voltage, over voltage, over current, and short circuit protection
- Meet IEC/EN 62368-1, EN50155 standards
- Designed for railway apps
- 3 year warranty



Model Numbers

Model Number	Input Voltage [VDC]			V _{OUT} [VDC]	Output Current [mA]		Efficiency [%] Typ.	Capacitive Load [uF] Max.
	Nom.	Range	*Max.		Max.	Min.		
MA10H-033	110	40-160	170	3.3	2400	0	76	5400
MA10H-050	110	40-160	170	5	2000	0	80	5400
MA10H-120	110	40-160	170	12	833	0	84	470
MA10H-150	110	40-160	170	15	667	0	84	330
MA10H-240	110	40-160	170	24	417	0	85	100

* Input voltage exceed the Max. value may cause permanent damage.

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

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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	$V_{OUT}=3.3\text{V}$ Others	-	95 110	-	mA	
Input current No load			3	8	mA	
Reflected ripple current		-	25	-	mA	
Input voltage surge 1 second max		-0.7	-	180	VDC	
Startup input voltage	Full load	-	-	40	VDC	
Startup time	Resistive load	-	10	-	mS	
Input under voltage shutdown		28	33	-	VDC	
Output voltage accuracy	$I_{OUT}=5\%$ to 100%	-	± 1	± 3	%	
Line regulation Full load, $V_{IN}=V_{IN, Min}$ to $V_{IN, Max}$		-	± 0.4	± 1.0	%	
Load regulation $I_{OUT}=5\%$ to 100% of $I_{OUT, rated}$		-	± 0.5	± 1.0	%	
Output ripple and noise	20MHz bandwidth	-	50	100	mVp-p	
Temperature coefficient	Full load	-	-	0.03	%/ $^{\circ}\text{C}$	
Dynamic load response $I_{OUT}=25\%\sim 50\%\sim 75\%$ of $I_{OUT, rated}$	Peak deviation* Peak deviation Recovery time	-	± 3 ± 3 300	± 8 ± 5 500	% V_{OUT} % V_{OUT} μS	* $V_{OUT}=3.3, 5\text{V}$
Output over voltage protection		110	-	160	% V_{OUT}	
Output over current protection		120	-	210	% I_{OUT}	
Output short circuit protection		Continuous, automatic recovery				
Input filter		PI filter				
Hot plug		None				

* Operating with less than 5% of rated load will not cause damage to the converters, but the performances data may not fall into the specifications, and stable operating is not assured.

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General Specifications

Parameters	Conditions	Min.	Typ.	Max.	Unit	Note
Isolation voltage 1 minute, leakage current 1mA max.	I/P to O/P I/P & O/P to Case	2250 1600	-	-	VDC	
Isolation resistance Tested at 500VDC	I/P to O/P	1000	-	-	M ohm	
Isolation capacitance 100KHz, 0.1V	I/P to O/P	-	2200	-	pF	
Switching frequency*	Full load	-	300	-	KHz	PWM mode
Operating temperature	See "Derating Curve"	-40	-	85	°C	
Storage temperature		-55	-	125	°C	
Storage humidity	None condensing	5	-	95	%RH	
Pin soldering resistance 1.5mm away from case for 10 sec		-	-	300	°C	
Cooling method		Free air convection				
Case material		Aluminum alloy				
Vibration		IEC/EN61373 – Category 1, Grade B				
MTBF	MIL-HDBK-217F	>1,000,000 Hours, T _A =25°C				
Design based on standards		IEC/EN 62368-1, EN50155				
Safety certifications		IEC/EN 62368-1				
EMC		CISPR32, EN55032 Class B, IEC/EN61000-4-2, 3, 4, 5, 6 EN50155, IEC/EN50121-3-2, EN55016-2-1				
Size, and Weight		50.8 x 25.4 x 12 mm, 41g				

* Switching frequency is measured at full load. The converter reduces the switching frequency at low load [less than 50% load] for better efficiency.

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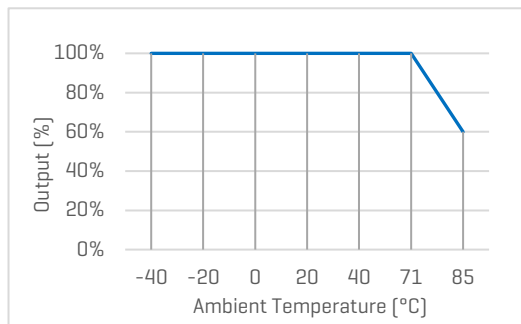


Characteristic Curves

Derating Curve

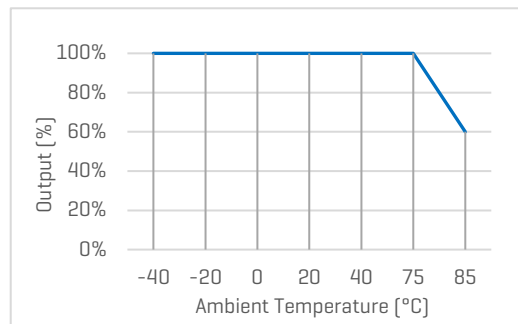
Output vs Ambient Temperature

No heatsink



Output vs Input Voltage

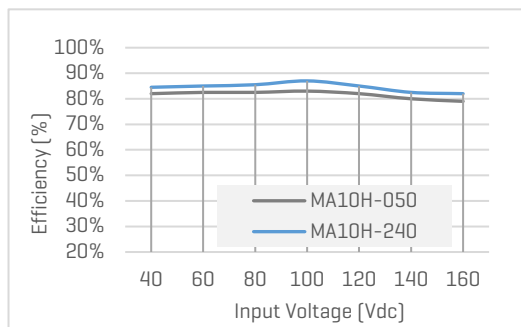
With heatsink



Efficiency Curve

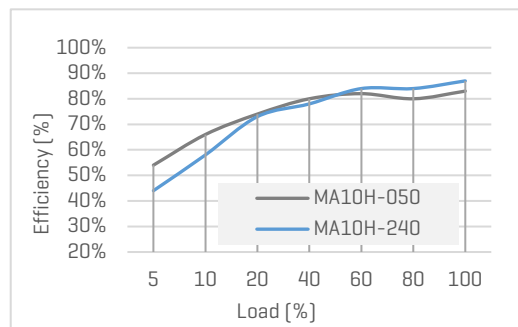
Efficiency vs Input Voltage

Full load



Efficiency vs Load

$V_{IN}=110V_{dc}$



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Recommended Application Circuit

Typical External Circuit

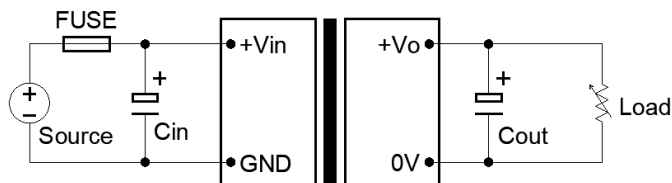


Figure 1. Typical external circuit

Note

*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.

[Table 1] Recommended component spec

V_{OUT}	3.3, 5V	12, 15V	24V
C_{OUT}	100uF	47uF	22uF

*Recommended FUSE to be 2A slow blow, and C_{IN} to be 10...47uF

Circuit for EMC Enhancement

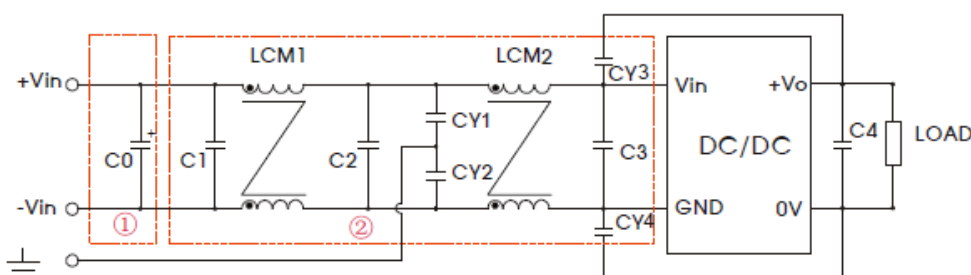


Figure 2: Circuit for EMC Enhancement

[Table 2] Recommended component specifications

Symbol	Condition	Recommended value
Fuse		2A, slow blow
LCM1		2.2mH
LCM2		1.1mH
C0		100uF, 200V
C1, C2		0.22uF, 250V
C3		10~47uF
C4		Refer to C_{OUT} in Table 1
CY1 ... CY4		1000pF, 400VAC

* Do not use two converters in parallel to supply higher power.

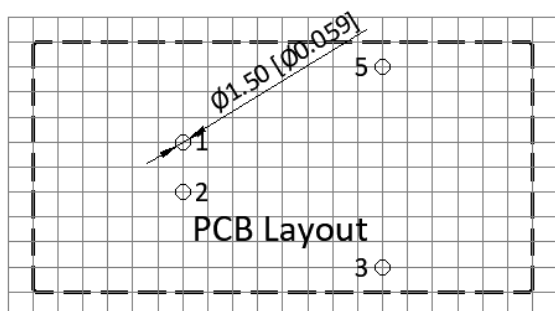
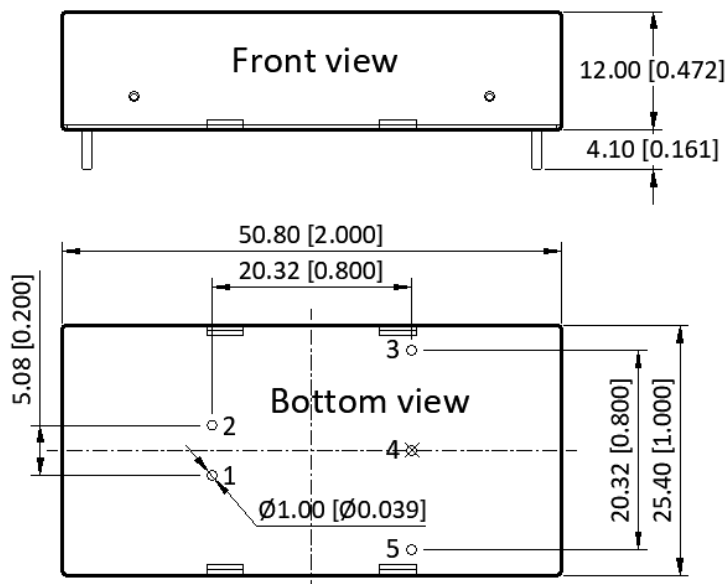
* Consult our technical staff for more information about application.

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Mechanical Specifications



Pin Definition

Pin #	Single Out
1	GND
2	V _{IN}
3	+V _{OUT}
4	No Pin
5	0V

* 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