

MA6G Series

6W, Encapsulated DIP1"x1" Package DC/DC Converters



Features

- Rated power: 6W Max
- Input voltage 40...160VDC
- Regulated output
- High efficiency up to 86%
- Isolation voltage 2250VDC
- Low ripple and noise
- Operating temperature range: -40 ~ +85°C ambient
- RoHS compliant
- Standard 1"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.		
MA6G-050	110	40-160	170	5.0	1200	0	80	1000
MA6G-120	110	40-160	170	12	500	0	84	470
MA6G-150	110	40-160	170	15	400	0	85	220
MA6G-240	110	40-160	170	24	250	0	86	100
MA6G-050D	110	40-160	170	±5	±600	0	80	470
MA6G-120D	110	40-160	170	±12	±250	0	84	100
MA6G-150D	110	40-160	170	±15	±200	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.

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	-	68	-	mA	
Input current	No load		3	-	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	
Remote On/Off control "Ctrl" pin open or logic high [ON] "Ctrl" pin grounded or logic low [OFF]	Logic high Logic low Ctrl pin current	3.5 0 -	- - 3	12 1.2 8	VDC VDC mA	Positive Logic
Output voltage accuracy	$I_{OUT}=5\%$ to 100%	-	± 1	± 3	%	
Line regulation Full load, $V_{IN}=V_{IN, Min}$ to $V_{IN, Max}$		-	± 0.5	± 1.0	%	
Load regulation $I_{OUT}=5\%$ to 100% of $I_{OUT, rated}$	Main output Others	-	± 0.5 ± 0.5	± 1.0 ± 1.5	%	
Cross regulation $+I_{OUT}=50\%$, $-I_{OUT}=25\%$ to 100%	Dual output models	-	-	± 10	%	
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	* $V_{OUT}=5\text{V}$, $\pm 5\text{V}$
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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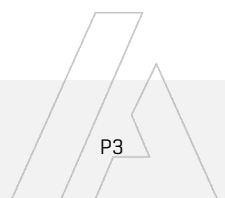
6W, Encapsulated DIP1"X1" Package DC/DC Converters



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	-	1000	-	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		25.4 x 25.4 x 12 mm, 21g				

* 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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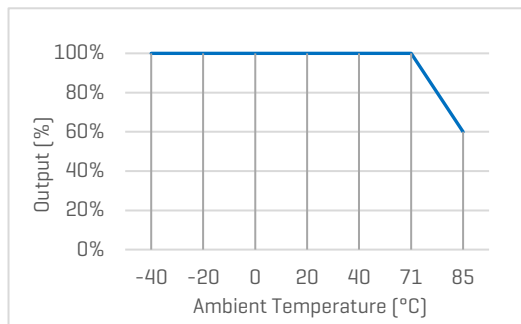


Characteristic Curves

Derating Curve

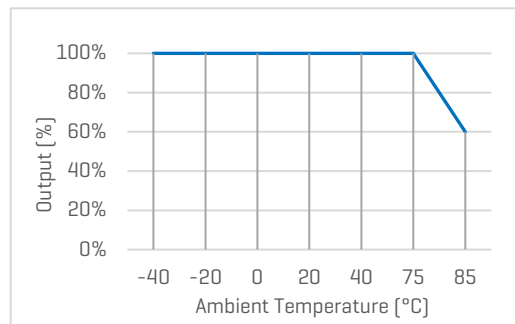
Output vs Ambient Temperature

No heatsink



Output vs Input Voltage

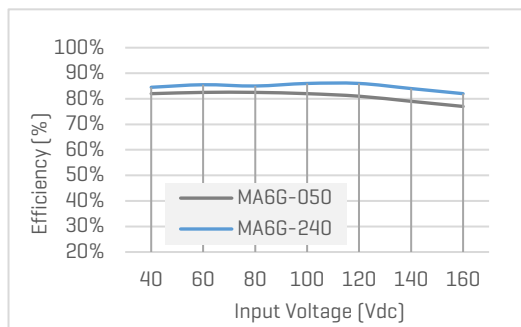
With heatsink



Efficiency Curve

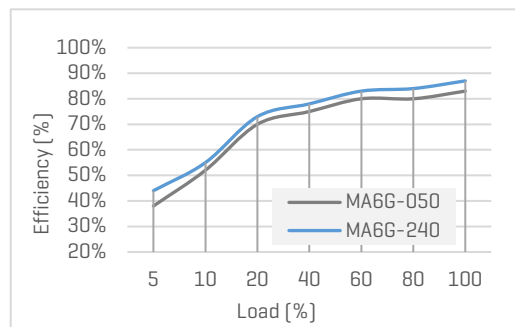
Efficiency vs Input Voltage

Full load



Efficiency vs Load

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



Recommended Application Circuit

Typical External Circuit

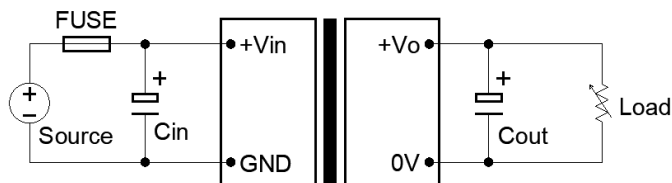


Figure 1. Typical external circuit

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

FUSE	2A, slow blow
C _{IN}	10...47uF
C _{OUT}	10uF

Circuit for EMC Enhancement

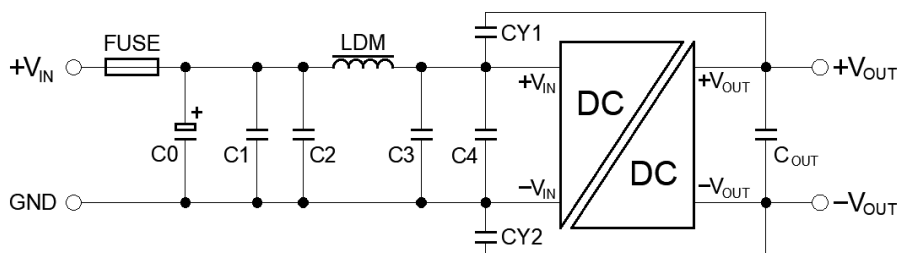


Figure 2: Circuit for EMC Enhancement

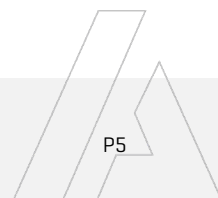
[Table 2] Recommended component specifications

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Items	LDM	C0	C1 ... C4	CY1, CY2
Spec	68uH	100uF, 200V	0.22uF, 250V	1nF, 3KV

* "Fuse" to be selected according to application needs. "C_{OUT}" refer to the same in Table 1.

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

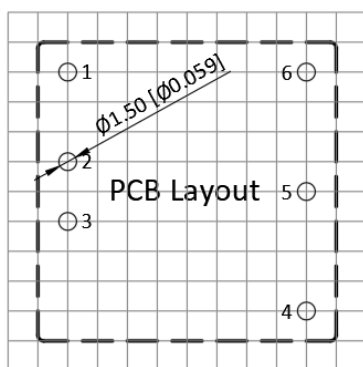
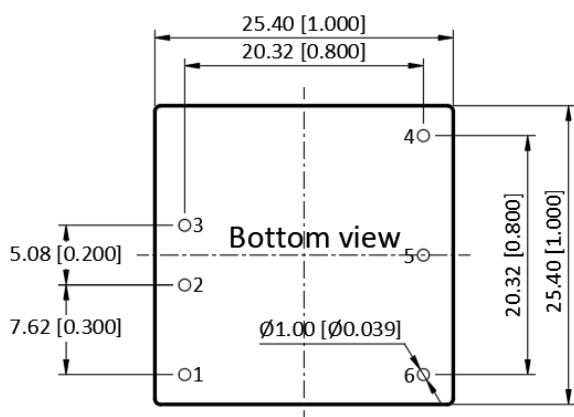
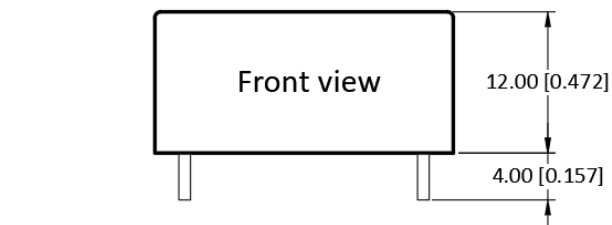


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Mechanical Specifications



Pin Definition

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