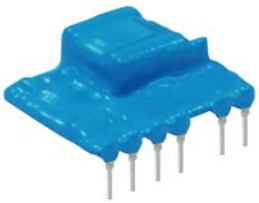
MEGA ELECTRONICS INC.

MA01-S (-F) Series

1W, AC-DC(HIGH VOLTAGE DC-DC) CONVERTER



RoHS

MA01-S (-F) Series are high efficiency green power modules with miniature packaging. The features of this series are: wide input voltage, DC and AC all in one, high efficiency, high reliability, low loss, safety isolation etc, meet UL60950/EN60950 standards. All models are particularly suitable for the applications demanding on the volume, need to meet UL/CE standard, less demanding on EMC like industrial, electric power, instrumentation, and smart home. For harsh EMC environment, this series of products must use the referred application circuit.

FEATURES

1. Wide input voltage:85 ~ 264VAC(70 ~ 400VDC)
2. Over current protection and short circuit protection
3. High efficiency, high density
4. Low loss, green power
5. Industrial design
6. Ultra-Miniature package
7. 90 degree curved series, minimizing product height
8. Certificate UL60950/EN60950 standards

SELECTION GUIDE

Approval	Model	Power	Output (Vo/Io)	Max. Capacitive Load (μF)	Ripple and Noise (Max.)	Efficiency (%) (230VAC,Typ.)	Standby Power(Max.)
UL/CE (beside "-F")	MA01-S15B05S(-F)*	1W	5V/200mA	220	120mV	66	0.5W
	MA01-S15B09S(-F)		9V/111mA	100		67	
	MA01-S15B12S(-F)		12V/83mA	100		70	
	MA01-S15B15S(-F)		15V/67mA	100		69	
	MA01-S15B24S(-F)		24V/42mA	100		68	

Note: *The model of 90 degrees of corner is with F. For example the MA01-S15B12S of 90 degrees of corner product is MA01-S15B12S-F.

INPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	AC Input	85	--	264	V
	DC Input	70	--	400	
Input Frequency		47	--	440	Hz
Input Current	115VAC	--	--	0.12	A
	230VAC	--	--	0.04	
Inrush Current	115VAC	--	10	--	
	230VAC	--	20	--	

OUTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	MA01-S15B05S(-F)	--	--	±10.0	%
	MA01-S15B09S(-F)	--	--	±5.0	
	MA01-S15B12S(-F)				
	MA01-S15B15S(-F)				
	MA01-S15B24S(-F)				
Line Regulation	full load	--	±1.5	--	
Load Regulation	5% to 100%	--	±2.5	--	

Ripple& Noise(p-p) 20MHz bandwidth	MA01-S15B05S(-F)	--	50	120	mV
	MA01-S15B09S(-F)				
	MA01-S15B12S(-F)				
	MA01-S15B15S(-F)				
	MA01-S15B24S(-F)				
Min Load		5	--	--	%
Hold-up Time	115VAC	80	--	--	ms
	230VAC	300	--	--	
Short Circuit Protection		Continuous, and auto recovery			
Over Current Protection		Auto recovery			

COMMON SPECIFICATIONS

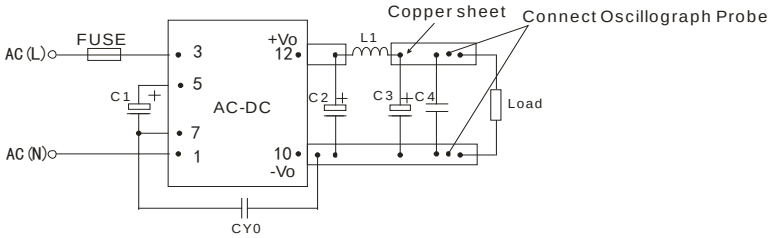
Item	Test Conditions		Min.	Typ.	Max.	Unit
Operating Temperature			-40	--	+85	°C
Storage Temperature			-40	--	+105	
Case temperature			--	--	+90	
Storage Humidity			--	--	85	%RH
Temperature coefficient			--	±0.1	--	%
Power derating	-40°C～-20°C		1	--	--	
	+55°C~+85°C		0.67	--	--	
Isolation Resistance			100	--	--	MΩ
Isolation Voltage	input-output	Tested for 1 minute	3000	--	--	VAC
Switching Frequency			--	--	50	kHz
Weight			--	8	--	g
Welding Temperature	Wave-soldering		260± 5℃; time:5~10s			
	Manual-welding		360± 10℃; time:3~5s			
Safety approvals			UL60950/EN60950			
Safety Class			CLASS II			
Safety standards			UL60950/EN60950			
Hot swap			Forbid			
Case Material Grade			UL 94V-0			
Install			PCB			
Cooling			Free air convection			
MTBF			>300,000 h @ 25°C			

Note: 1. External electrolytic capacitors are required to modules; more details refer to typical applications.
2. Ripple and Noise measuring refer to “ripple and noise measure figure”.
3. All specifications were measured at Ta=25°C, humidity<75%, nominal input voltage （115VAC or 230VAC） and rated output load unless otherwise specified.
4. In this datasheet, all the test methods of indications are based on corporate standards.
5. Module required dispensing fixed after assembled.

EMC SPECIFICATIONS

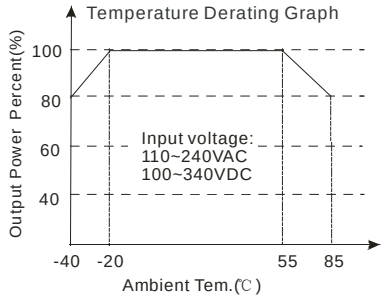
EMI	CE	CISPR22/EN55022, CLASS A (Typical Application Circuit Refer to Figure 1)	
		CISPR22/EN55022, CLASS B (Recommended Circuit Refer to Figure 3)	
	RE	CISPR22/EN55022, CLASS A (Typical Application Circuit Refer to Figure 1)	
		CISPR22/EN55022, CLASS B (Recommended Circuit Refer to Figure 3)	
EMS	ESD	IEC/EN61000-4-2 Contact ±4KV	perf. Criteria B
	RS	IEC/EN61000-4-3 10V/m (Recommended Circuit Refer to Figure 3)	perf. Criteria A
	EFT	IEC/EN61000-4-4 ±2KV (Typical Application Circuit Refer to Figure 1)	perf. Criteria B
		IEC/EN61000-4-4 ±4KV (Recommended Circuit Refer to Figure 3)	perf. Criteria B
	Surge	IEC/EN61000-4-5 ±1KV/±2KV (Recommended Circuit Refer to Figure 3)	perf. Criteria B
	CS	IEC/EN61000-4-6 3 Vr.m.s (Recommended Circuit Refer to Figure 3)	perf. Criteria A
	PFM	IEC/EN61000-4-8 10A/m	perf. Criteria A
	Voltage dips, short and interruptions immunity	IEC/EN61000-4-11 0%-70%	perf. Criteria B

RIPPLE AND NOISE MEASURE FIGURE RIPPLE

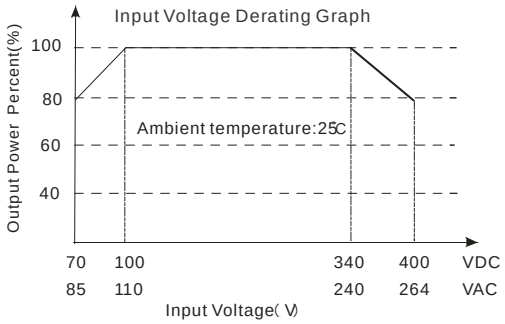


Note：CY0 is 1nF/400VAC Y1 capacitor, C1,C2,L1,C3,C4 refer to" EXTERNAL CIRCUIT PARAMETERS"

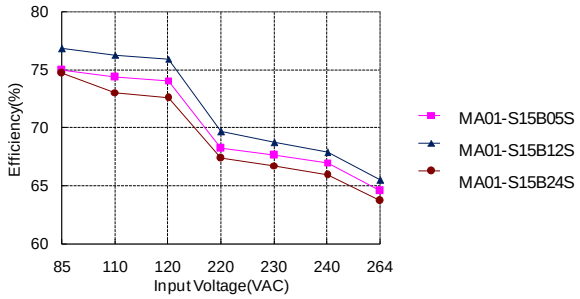
PRODUCT TYPICAL CURVE



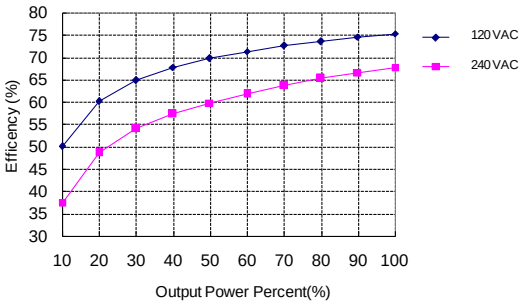
Note: When input 85~110VAC /240~264VAC/70~100VDC/340~400VDC, it need to be voltage derated on basis of temperature derating.



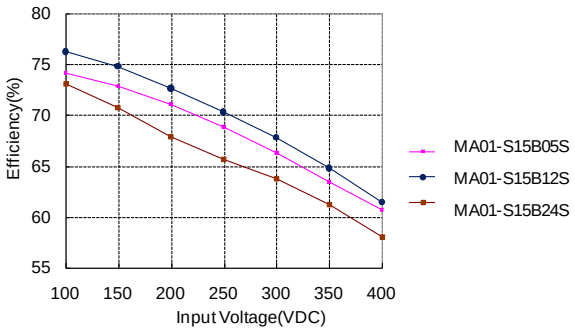
MA01-S (-F) AC Input Efficiency VS Input load curve (Full Load)



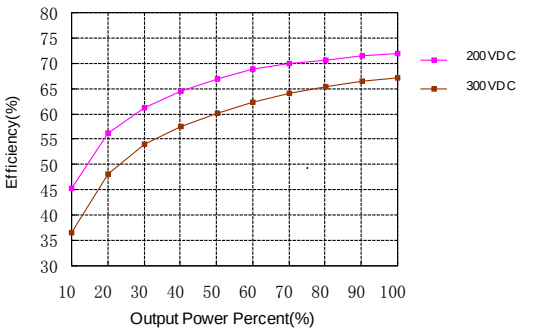
MA01-S15B12S (-F) AC Input Efficiency VS Output Load curve



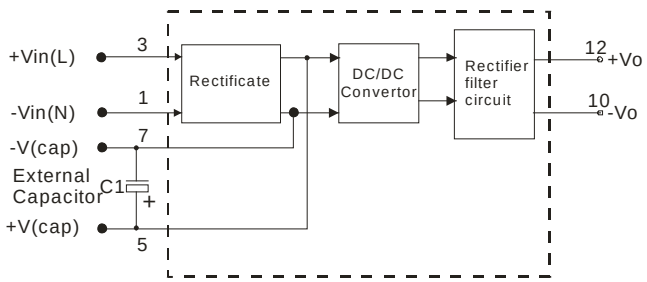
MA01-S (-F) DC Input Efficiency VS Input load curve (Full Load)



MA01-S15B12S (-F) DC Input Efficiency VS Output Load curve



STRUCTURE FIGURE



TYPICAL APPLICATIONS

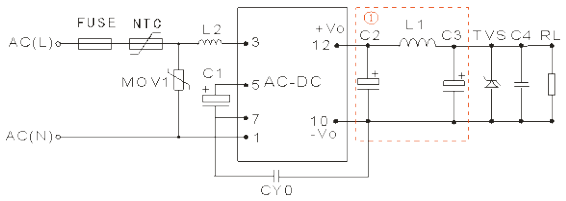
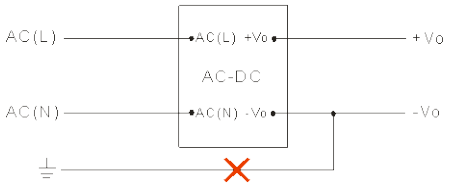
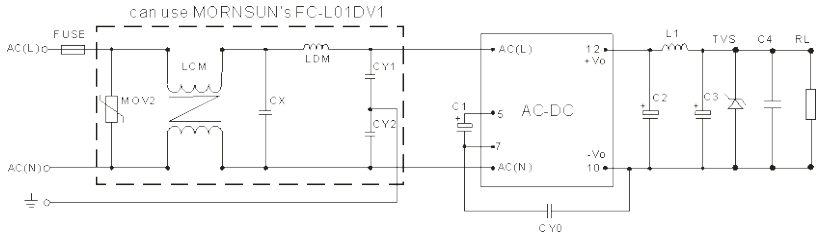


Figure 1: Typical application circuit
Note: ①is Pi filter circuit.



(Figure 2): This application is not available for this series.
Note: If you have such application, please consult to our FAE department.

EMC RECOMMENDED CIRCUIT



(Figure 3): series recommended circuit for applications which require higher EMC standard

EMC RECOMMENDED CIRCUIT PCB LAYOUT

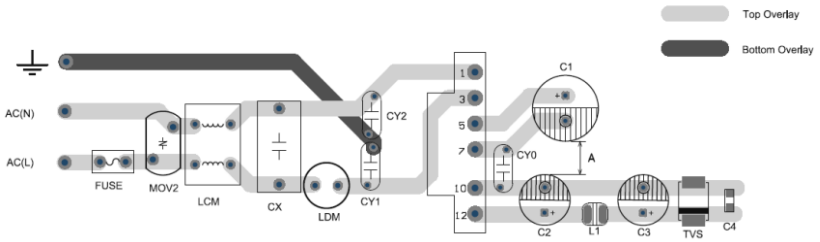


Figure 4: EMC application circuit PCB layout
Safety and recommend wiring: line width ≥3mm, line-line distance≥6mm, line- ground distance≥6mm,A≥6.4mm

EXTERNAL CIRCUIT PARAMETERS								
Model	C1 (Required)	L2	C2 (Required)	L1 (Required)	C3 (Required)	C4	CY0	FUSE (Required)	TVS
MA01-S15B05S(-F)	10μF/400V	1mH	150μF/35V	2.2μH	68μF/35V	0.1μF/50V	1nF/400V AC	1A/250V	SMBJ7.0A
MA01-S15B09S(-F)									SMBJ12A
MA01-S15B12S(-F)			100μF/35V						SMBJ20A
MA01-S15B15S(-F)									
MA01-S15B24S(-F)									SMBJ30A

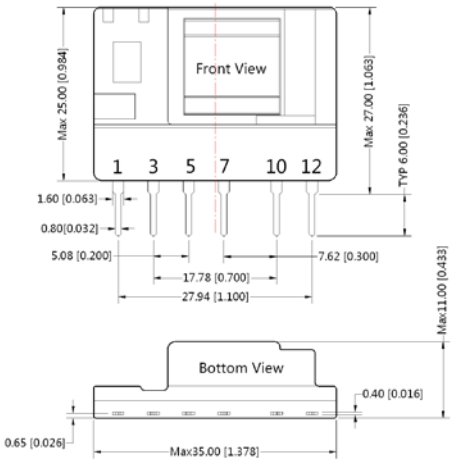
Note:

1. C1 and C3 are electrolytic capacitors. They are required both AC input and DC input.
   When AC input, C1 is used as filter capacitor, the value of C1 is recommended to be 10μF /400V. When DC input, C1 is used as EMC filter capacitor, the value of C1 is recommended to be 10μF/400V(when the input voltage is above 370VDC, the recommended value of C1 is 10μF/450V). C2 and C3 are output filer capacitors, they are recommended to be high frequency and low impedance electrolytic capacitors. Capacitance and rated ripple current of capacitors refer to the datasheets provided by the manufactures. Voltage derating of capacitors should be 80% or above. C4 is a ceramic capacitor, which is used to filter high frequency noise. C2,C3 and L1 form a pi-type filter circuit. Current of L1 and L2 refer to the datasheets provided by the manufactures, current derating should be 80% or above. TVS is a recommended component to protect post-circuits (if converter fails). External input NTC is recommended to use 5D-9. External input MOV1 is recommended to use S14K350.
2. For standard EMC requirement, please refer to figure 1. If higher EMC requirement ,please refer to figure 3, recommended parameters are shown in the table below.

Recommend Parameter For Higher EMC Standard Circuit	
Components	Recommend Parameter
MOV2	S10K300
CY1, CY2	1nF/400VAC
CX	0.1μF/275VAC
LCM	3.5mH
LDM	5mH
FC-L01DV1	1KV/2KV Surge protector
FUSE	1A/250V, slow blow, it must be connected to FUSE

MA01-S DIMENSIONS, RECOMMENDED FOOTPRINT&PACKAGING

MECHANICAL DIMENSIONS



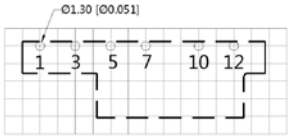
PIN CONNECTION	
Pin	Function
1	-Vin(N)
3	+Vin(L)
5	+V(cap)
7	-V(cap)
10	-Vo
12	+Vo

1.It is necessary to add C1 between pin5 and pin7
2.It is necessary to add pi-type filter circuit to the output,such as the typical application of Figure 1

Note:
Unit :mm[inch]
Pin section tolerances :±0.10[±0.004]
General tolerances:±0.50[±0.020]

THIRD ANGLE PROJECTION

RECOMMENDED FOOTPRINT DETAILS



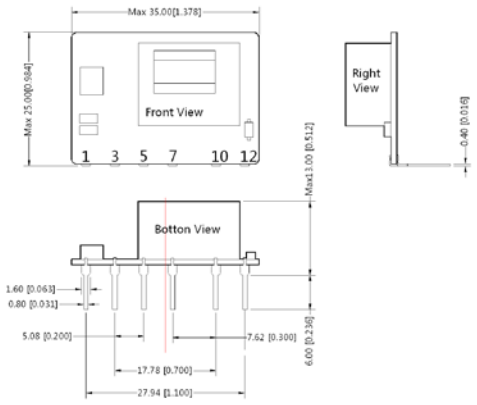
Note:Grid 2.54*2.54mm

PACKAGE DIAGRAM

Note:
Unit :mm[inch]
Inner carton dimensions: L*W*H=355*192*93
Packaging quantity: 100pcs
Outer carton dimensions: L*W*H=405*380*305
Packaging quantity: 600pcs

MA01-S (-F) DIMENSIONS, RECOMMENDED FOOTPRINT&PACKAGING

MECHANICA DIMENSIONS



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Pin	Function
1	-Vin (N)
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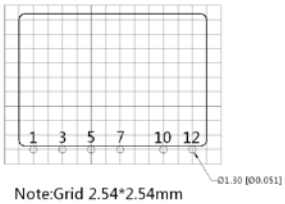
Note:
Unit :mm[inch]
Pin section tolerances :±0.10[±0.004]
General tolerances:±0.50[±0.020]

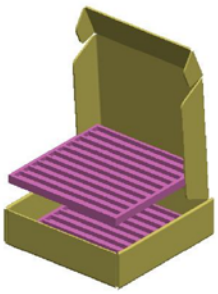
THIRD ANGLE PROJECTION

RECOMMENDED FOOTPRINT DETAILS



Note:Grid 2.54*2.54mm

PACKAGE DIAGRAM



Note:
Unit :mm[inch]
Inner carton dimensions: L*W*H=365*350*105
Packaging quantity : 360pcs
Outer carton dimensions : L*W*H=390*360*245
Packaging quantity: 720pcs