

MR1A Series

0.75W, Regulated Output, 1.5KV Isolation, SIP4 DC/DC Converters



Features

- Rated power: 0.75W Max
- Input voltage range $\pm 5\%$
- Regulated output
- High efficiency up to 74%
- Isolation voltage 1.5KVDC
- Operating temperature range: $-40 \sim +85^{\circ}\text{C}$ ambient
- RoHS compliant
- Compact SIP4 package
- Continuous short circuit protection
- Meet IEC/EN/UL 62368-1
- 3 year warranty



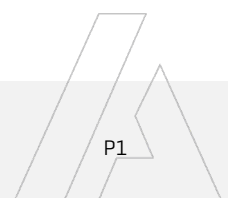
Overview

The MR1A series are SIP4 package DC/DC converters with tightly regulated single output, and 1.5KVDC isolation. These converters feature high efficiency, low ripple and noise, short circuit protection, and wide operating temperature range. They are widely used in distributed power system in industrial applications where isolation and voltage converting is needed.

Model Numbers

Model Number	Input Voltage [VDC] $\pm 5\%$	Output Voltage [VDC]	Output Current [mA]		Efficiency [%] Typ.	Capacitive Load [μF] Max.
			Max.	Min.		
MR1A-0503	5	3.3	200	20	68	2400
MR1A-0505	5	5	150	15	72	2400
MR1A-0509	5	9	83	9	72	1000
MR1A-0512	5	12	62	7	73	560
MR1A-0515	5	15	50	5	74	560
MR1A-1203	12	3.3	200	20	68	2400
MR1A-1205	12	5	150	15	72	2400
MR1A-1212	12	12	62	7	73	560
MR1A-1215	12	15	50	5	74	560
MR1A-2403	24	3.3	200	20	68	2400
MR1A-2405	24	5	150	15	72	2400
MR1A-2412	24	12	62	7	73	560
MR1A-2415	24	15	50	5	74	560

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

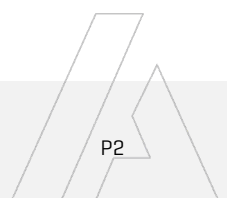


Electrical Specifications

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	$V_{IN}=5\text{V}$ $V_{IN}=12\text{V}$ $V_{IN}=24\text{V}$	-	209 89 45	-	mA	
Input current No load	$V_{IN}=5\text{V}$ $V_{IN}=12\text{V}$ $V_{IN}=24\text{V}$	-	15 8 4	-	mA	
Reflected ripple current		-	15	-	mA	
Output voltage accuracy		-	-	± 3	%	
Line regulation For V_{IN} change of $\pm 1\%$		-	-	± 0.25	%	
Load regulation $I_{OUT}=10\%$ to 100% of $I_{OUT, \text{rated}}$	$V_{OUT}=3.3\text{V}$ Others	-	-	± 3 ± 2	%	
Temperature coefficient	Full load	-	± 0.02	-	%/ $^{\circ}\text{C}$	
Output ripple and noise 20MHz bandwidth	$V_{OUT}=15\text{V}$ Others	-	80 50	150 100	mVp-p	
Output short circuit protection		Continuous, automatic recovery				
Input filter		Capacitor				
Hot plug		None				

* Operating with less than 10% of rated load will not cause permanent damage to the converters, but the performances data may not fall into the specifications, and reliable operating is not assured.



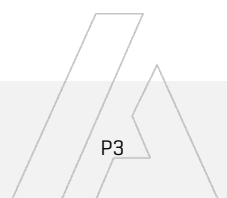
MR1A Series

0.75W, Regulated Output, 1.5KV Isolation, SIP4 DC/DC Converters



General Specifications

Parameters	Conditions	Min.	Typ.	Max.	Unit	Note
Isolation voltage 1 minute, leakage current 1mA max	Input to Output	1500	-	-	VDC	
Isolation resistance 500VDC	Input to Output	1000	-	-	M ohm	
Isolation capacitance 100KHz, 0.1V	Input to Output	-	20	-	pF	
Operating temperature	See "Derating Curve"	-40	-	+85	°C	
Storage temperature		-55	-	+125	°C	
Temperature rise at full load		-	25	-	°C	
Storage humidity		5	-	95	%RH	
Switching frequency	Full load	-	220	-	KHz	
Pin soldering resistance 1.5mm away from case for 10 sec		-	-	300	°C	
Case material		Black plastic UL94-V0				
Cooling method		Free air convection				
Vibration		10-150Hz, 5G, 0.75mm along X, Y and Z				
Design based on standards		IEC/EN/UL 62368-1				
Safety certifications		IEC/EN 62368-1				
EMC	Emissions Immunity	CISPR32, EN55032 Class B* IEC/EN61000-4-2				
MTBF	MIL-HDBK-217F	>3,500,000 Hours, T _A =25°C				
Size & Weight		11.6 x 6 x 10.2 mm, 1.3g Typ.				



MR1A Series

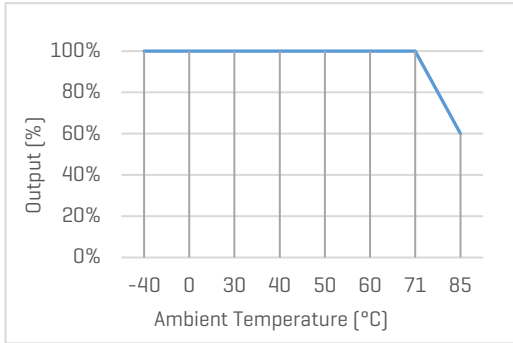
0.75W, Regulated Output, 1.5KV Isolation, SIP4 DC/DC Converters



Characteristic Curves

Derating Curve

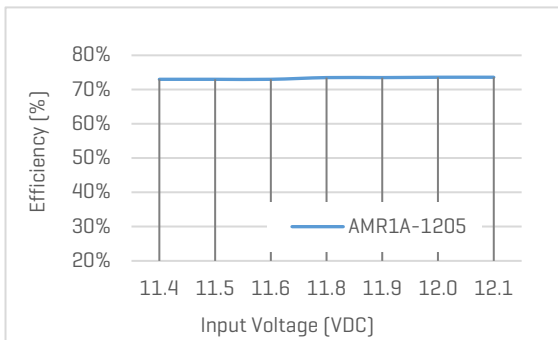
Output vs Ambient Temperature



Efficiency Curves

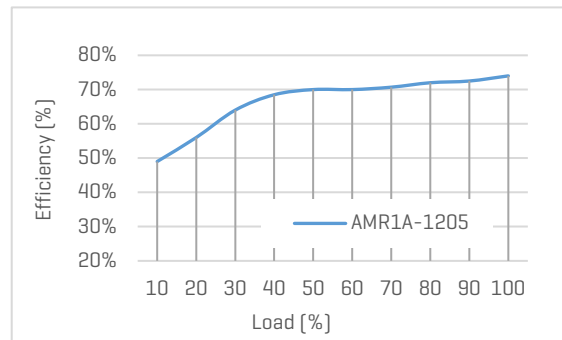
Efficiency vs Input Voltage

Full load

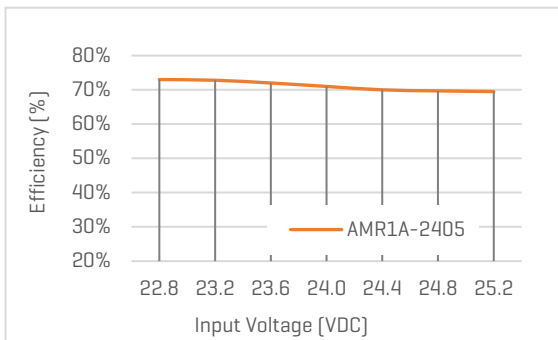


Efficiency vs Load

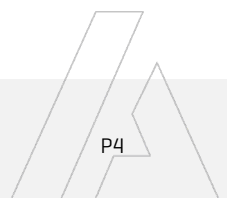
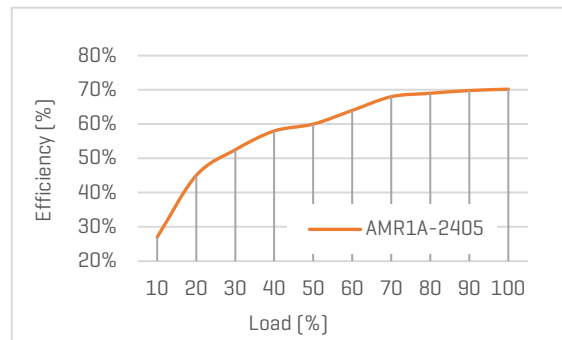
Nominal input voltage



Full load



Nominal input voltage



Recommended External Circuit

Typical Application Circuit

*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.



Figure 1. Typical external circuit

[Table 1] Recommended component spec

Input voltage	5V	12V	24V
C _{IN}	4.7uF, 16V	2.2uF, 25V	1uF, 50V

[Table 2] Recommended component spec

Output voltage	3.3V	5V	12V	15V
C _{OUT}	10uF, 16V	10uF, 16V	2.2uF, 25V	1uF, 25V

EMC Enhancement for EN55032 Class B

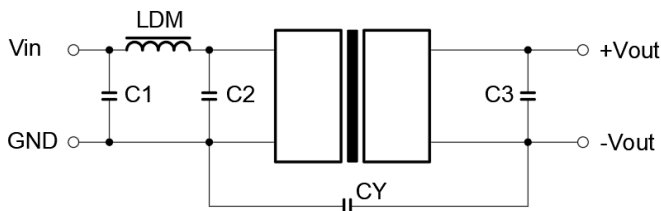


Figure 2. Circuit for EMC enhancement

[Table 3] Recommended component spec

Component	LDM	C1, C2	CY*
V _{IN} =5V	6.8uH	4.7uF, 25V	1nF, 2KV
V _{IN} =12, 24V	6.8uH	4.7uF, 50V	270pF, 2KV

*CY is omitted for 5V_{IN} models, with V_{OUT} = 3.3 ... 9V

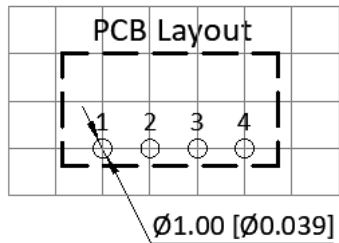
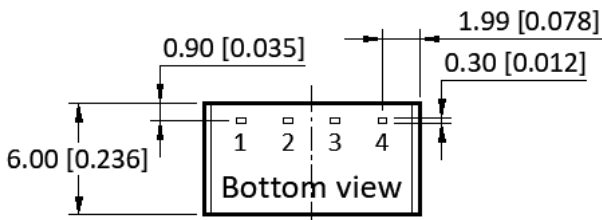
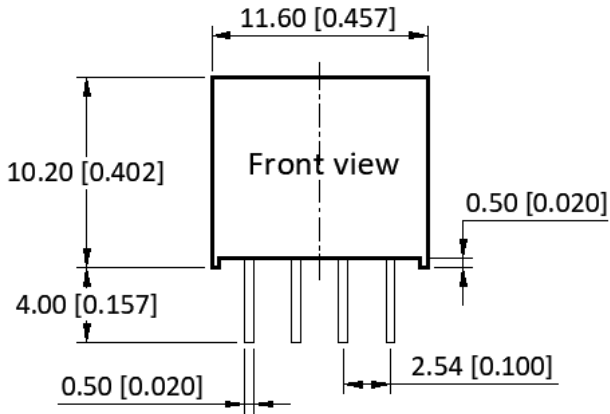
*C3 refer to C_{OUT} in [Table 2]

MR1A Series

0.75W, Regulated Output, 1.5KV Isolation, SIP4 DC/DC Converters



Mechanical Specifications



Pin Definition

Pin #	Single Out
1	GND
2	V _{IN}
3	0V
4	+V _{OUT}

* Unless otherwise specified unit: mm [inch]

* General tolerance: ± 0.25 [± 0.010]

* Pin thickness: ± 0.10 [± 0.004]

* Footprint grid 2.54 x 2.54 mm

