

## A\_(X)T-1W Series

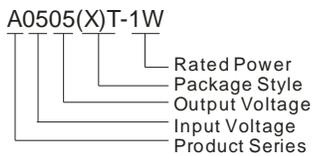
### 1W, FIXED INPUT, ISOLATED & UNREGULATED DUAL OUTPUT DC-DC CONVERTER

#### ULTRAMINIATURE SMD PACKAGE



Patent Protection RoHS CE cULus

### MODEL SELECTION



### PRODUCT FEATURES

- Small Footprint
- SMD Package
- High Efficiency up to 79%
- 1KVDC Isolation
- Temperature Range: -40°C ~ +85°C
- Industry Standard Pinout
- No Heatsink Required
- Internal SMD construction
- No External Component Required
- RoHS Compliance

### APPLICATIONS

The A\_(X)T-1W series are specially designed for applications where a group of polar power supplies are isolated from the input power supply in a distributed power supply system on a circuit board. These products apply to:

- 1) Where the voltage of the input power supply is fixed (voltage variation  $\leq \pm 10\%$ );
- 2) Where isolation is necessary between input and output (isolation voltage  $\leq 1000\text{VDC}$ );
- 3) Where the regulation of the output voltage and the output ripple noise are not demanding.

Such as: purely digital circuits, ordinary low frequency analog circuits, and IGBT power device driving circuits.

### PRODUCT PROGRAM

Model Number	Input Voltage(VDC) Nominal (Range)	Output Voltage (VDC)	Output Current (mA)		Input Current (mA)(typ.)		Reflected Ripple Current (mA,typ.)	Max. Capacitive Load( $\mu\text{F}$ )	Efficiency (%, typ.) @Max. Load	Approval
			Max.	Min.	@Max. Load	@No Load				
A0305(X)T-1W	3.3 (2.97-3.63)	$\pm 5$	$\pm 100$	$\pm 10$	427	44	19	100	71	
A0312(X)T-1W		$\pm 12$	$\pm 42$	$\pm 5$	368	33	29		79	
A0315(X)T-1W		$\pm 15$	$\pm 33$	$\pm 4$	361	27.4	45		79	
A0505(X)T-1W	5 (4.5-5.5)	$\pm 5$	$\pm 100$	$\pm 10$	280	34	20		71	UL
A0509(X)T-1W		$\pm 9$	$\pm 56$	$\pm 6$	249	27	20		77	UL
A0512(X)T-1W		$\pm 12$	$\pm 42$	$\pm 5$	258	33	19		78	UL
A0515(X)T-1W		$\pm 15$	$\pm 33$	$\pm 4$	250	31	19		78	UL
A1205(X)T-1W	12 (10.8-13.2)	$\pm 5$	$\pm 100$	$\pm 10$	112	11	18		71	UL
A1209(X)T-1W		$\pm 9$	$\pm 56$	$\pm 6$	112	17	17		73	UL
A1212(X)T-1W		$\pm 12$	$\pm 42$	$\pm 5$	109	18	19	74	UL	
A1215(X)T-1W		$\pm 15$	$\pm 33$	$\pm 4$	110	22	16	74	UL	
A1515(X)T-1W	15(13.5-16.5)	$\pm 15$	$\pm 33$	$\pm 4$	80	11	14	79		
A2405(X)T-1W	24 (21.6-26.4)	$\pm 5$	$\pm 100$	$\pm 10$	57	7	14	72		
A2409(X)T-1W		$\pm 9$	$\pm 56$	$\pm 6$	53	7	18	74		
A2412(X)T-1W		$\pm 12$	$\pm 42$	$\pm 5$	51	7	20	76		
A2415(X)T-1W		$\pm 15$	$\pm 33$	$\pm 4$	51	7	16	77		
A2424(X)T-1W		$\pm 24$	$\pm 21$	$\pm 2$	49	6	20	78		

Note: 1. The A\_XT-1W series have no 3,6,8,9 pin. For example A0505XT-1W.  
2. A\_XT-1W series: UL-609501 Pending.

## INPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Units
Input Surge Voltage (1sec. max.)	3.3VDC Input Models	-0.7	--	5	VDC
	5VDC Input Models	-0.7	--	9	
	12VDC Input Models	-0.7	--	18	
	15VDC Input Models	-0.7	--	21	
	24VDC Input Models	-0.7	--	30	
Reverse Polarity Input Current*		--	--	0.4	A
Input Filter		C Filter			

Note: \*If the product reverse did not seek to limit current, may result in injury or permanent damage, testing is not recommended.

## OUTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Units	
Output Power		0.1	--	1	W	
Output Voltage Accuracy		See tolerance envelope graph				
Output Voltage Balance	Dual Output, Balanced Loads	--	±0.5	±1.0	%	
Line Regulation	For Vin change of ±1%	--	--	±1.2		
Load Regulation	10% to 100% load	5V output	--	12.8		15
		9V output	--	8.3		10
		12V output	--	6.8		10
		15V output	--	6.3	10	
		24V output	--	6.0	10	
Temperature Drift	100% full load	--	--	±0.03	%/°C	
Ripple & Noise*	20MHz Bandwidth	--	50	75	mVp-p	
Short Circuit Protection**		--	--	1	s	

Note: Dual output models unbalanced load: ±5%.  
 \*Test ripple and noise by "parallel cable" method. See detailed operation instructions at Testing of Power Converter section, application notes.  
 \*\*Supply voltage must be discontinued at the end of short circuit duration.

## COMMON SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	Tested for 1 minute and 1mA max	1000	--	--	VDC
Isolation Resistance	Test at 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input/Output, 100KHz/1V	A2424(X)T-1W	100	--	pF
		Other Models	--	30	
Switching Frequency	Full load, nominal input (5V/12V)	--	100	--	KHz
	Full load, nominal input (15V/24V)	--	500	--	
MTBF	MIL-HDBK-217F @25°C	3500	--	--	K hours
Case Material		Epoxy Resin (UL94-V0)			
Weight		--	1.70	--	g

## ENVIRONMENTAL SPECIFICATIONS

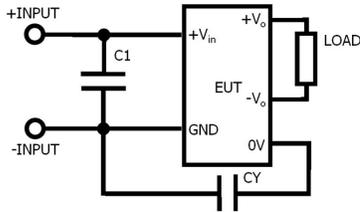
Item	Test Conditions	Min.	Typ.	Max.	Units
Storage Humidity		--	--	95	%
Operating Temperature	Power derating (above 85°C)	-40	--	85	°C
Storage Temperature		-55	--	125	
Temp. rise at full load		--	25	--	
Lead Temperature	1.5mm from case for 10 seconds	--	--	300	
Cooling		Free air convection			

## EMC SPECIFICATIONS

EMI	CE	CISPR22/EN55022 CLASS A (External Circuit Refer to Figure1)
EMS	ESD	IEC/EN61000-4-2 Contact ±8KV perf. Criteria B

# EMC RECOMMENDED CIRCUIT

EMI Recommended External Circuit (CLASS A):



(Figure 1)

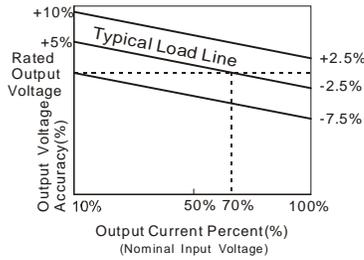
Recommended external circuit parameters:

- ①Vin: 15V
- C1: 2.2μF/50V 1210
- ②Vin: 24V
- C1: 4.7μF/50V 1210
- CY: 100pF/2000V 1206

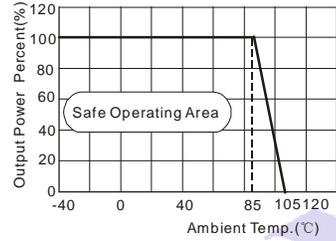
Remarks: Product bare input of 3.3V、5V、12V can be tested by the CLASS A.

# PRODUCT TYPICAL CURVE

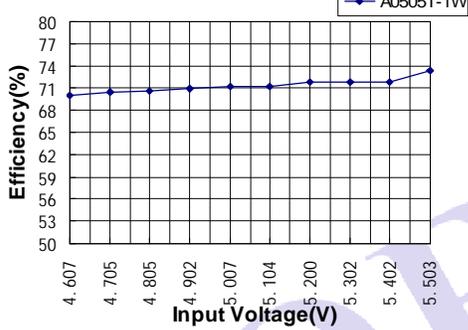
Tolerance Envelope Graph



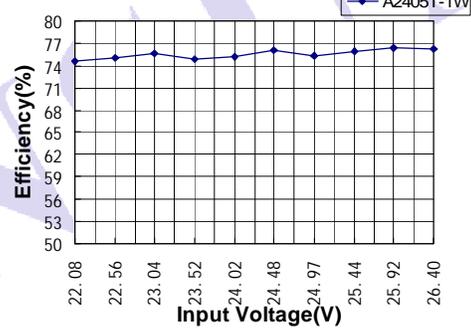
Temperature Derating Graph



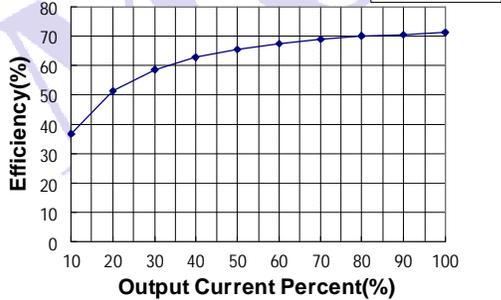
Efficiency VS Input Voltage curve (Full Load)



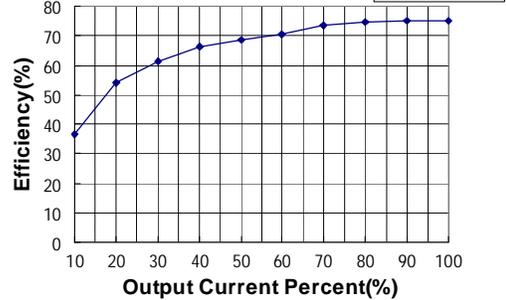
Efficiency VS Input Voltage curve (Full Load)



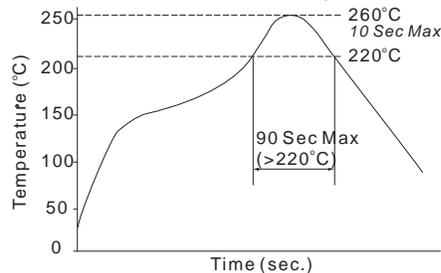
Output Load VS Efficiency curve (Vin=Vin-nominal)



Output Load VS Efficiency curve (Vin=Vin-nominal)



Recommended reflow Soldering Profile



Remark: The curve applies only to the hot air reflow soldering

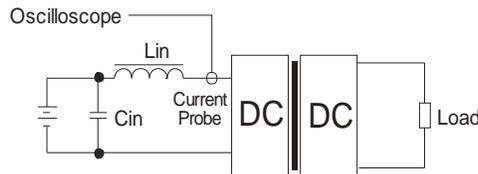
# OUTLINE DIMENSIONS, RECOMMENDED FOOTPRINT & PACKAGING

MECHANICAL DIMENSIONS	RECOMMENDED FOOTPRINT																											
<p>(Side View)</p> <p>6.50 [0.256] 6.25 [0.246]</p> <p>0.25 [0.010] 0.60 [0.024]</p> <p>15.24 [0.600] 10.16 [0.400] 2.54 [0.100]</p> <p>(Top View)</p> <p>7.50 [0.295] 11.20 [0.441]</p> <p>8.50 [0.335] 1.35 [0.053] 5<sup>max</sup></p> <p>Note: Unit: mm[inch] Pin section tolerances: ± 0.10mm [± 0.004inch] General tolerances: ± 0.25mm [± 0.010inch]</p>	<p>A_T-1W</p> <p>A_XT-1W</p> <table border="1"> <thead> <tr> <th colspan="3">FOOTPRINT DETAILS</th> </tr> <tr> <th>Pin</th> <th>A_T-1W</th> <th>A_XT-1W</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>GND</td> <td>GND</td> </tr> <tr> <td>2</td> <td>V<sub>in</sub></td> <td>V<sub>in</sub></td> </tr> <tr> <td>4</td> <td>0V</td> <td>0V</td> </tr> <tr> <td>5</td> <td>-V<sub>o</sub></td> <td>-V<sub>o</sub></td> </tr> <tr> <td>7</td> <td>+V<sub>o</sub></td> <td>+V<sub>o</sub></td> </tr> <tr> <td>10</td> <td>NC</td> <td>NC</td> </tr> <tr> <td>3,6,8,9</td> <td>NC</td> <td>No Pin</td> </tr> </tbody> </table> <p>NC: No Connection</p>	FOOTPRINT DETAILS			Pin	A_T-1W	A_XT-1W	1	GND	GND	2	V <sub>in</sub>	V <sub>in</sub>	4	0V	0V	5	-V <sub>o</sub>	-V <sub>o</sub>	7	+V <sub>o</sub>	+V <sub>o</sub>	10	NC	NC	3,6,8,9	NC	No Pin
FOOTPRINT DETAILS																												
Pin	A_T-1W	A_XT-1W																										
1	GND	GND																										
2	V <sub>in</sub>	V <sub>in</sub>																										
4	0V	0V																										
5	-V <sub>o</sub>	-V <sub>o</sub>																										
7	+V <sub>o</sub>	+V <sub>o</sub>																										
10	NC	NC																										
3,6,8,9	NC	No Pin																										
TUBE OUTLINE DIMENSIONS	REEL PACKING OUTLINE DIMENSIONS																											
<p>14.10 [0.555] 8.90 [0.350] 7.40 [0.291]</p> <p>6.50 [0.256] 4.30 [0.169]</p> <p>14.10 [0.555]</p> <p>Note: Unit: mm[inch] General tolerances: ± 0.50mm [± 0.020inch] L=530mm [20.866inch] Devices per tube quantity: 33pcs L=220mm [8.661inch] Devices per tube quantity: 12pcs Short tube inner packaging dimensions: L*W*H=255*170*80mm; Short tube outer packaging dimensions (with six inner packaging boxes): L*W*H=375*280*270mm; Long tube inner packaging dimensions: L*W*H=580*200*100mm; Long tube outer packaging dimensions (with two inner packaging boxes): L*W*H=600*215*220mm; Long tube outer packaging dimensions (with three inner packaging boxes): L*W*H=600*215*325mm.</p>	<p>Taping dimension:</p> <p>1.75 [0.069] 11.50 [0.453] 0.50 [0.020]</p> <p>15.65 [0.616] 2.00 [0.079] 11.60 [0.457] 16.00 [0.630] 1.50 [0.059] 24.00 [0.945] 7.35 [0.289]</p> <p>Taping reel dimension:</p> <p>29.40 [1.157] 100.00 [3.937] 330.00 [12.992] 13.00 [0.512] 21.50 [0.846]</p> <p>Note: Unit: mm[inch] General tolerances: ± 0.50mm [± 0.020inch] per reel of packing quantity: 500pcs Inner packaging dimensions: L*W*H=365*350*105mm Tube quantity: 2000pcs Outer packaging dimensions: L*W*H=365*350*105mm Tube quantity: 4000pcs</p>																											

## TEST CONFIGURATIONS

### Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor  $L_{in}$  and  $C_{in}$  to simulate source impedance.



$L_{in}(4.7\mu H)$   $C_{in}(220\mu F, ESR < 1.0\Omega \text{ at } 100 \text{ KHz})$

## DESIGN & APPLY CONSIDERATIONS

### 1) Requirement on output load

To ensure this module can operate efficiently and reliably, During operation, the minimum output load **could not be less than 10% of the full load**. If the actual output power is very small, please connect a resistor with proper resistance at the output end in parallel to increase the load, or use our company's products with a lower rated output power (A\_(X)T-W2 series).

## 2) Overload Protection

Under normal operating conditions, the output circuit of these products has no protection against overload. The simplest method is to connect a self-recovery fuse in series at the input end or add a circuit breaker to the circuit.

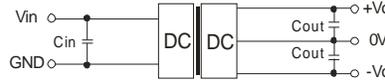
### Input Fuse Selection Guide

3.3VDC Input Models	500mA slow-Blow Type	15VDC Input Models	200mA slow-Blow Type
5VDC Input Models	500mA slow-Blow Type	24VDC Input Models	100mA slow-Blow Type
12VDC Input Models	200mA slow-Blow Type		

## 3) Recommended circuit

If you want to further decrease the input/output ripple, an capacitor filtering network may be connected to the input and output ends of the DC/DC converter, see (Figure 2).

It should also be noted that the capacitance of filter capacitor must be proper. If the capacitance is too big, a startup problem might arise. For every channel of output, provided the safe and reliable operation is ensured, the recommended capacitance of its filter capacitor sees (Table 1).



(Figure 2)

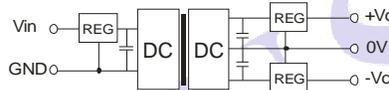
EXTERNAL CAPACITOR TABLE (TABLE 1)

Vin (VDC)	Cin (μF)	Vout (VDC)	Cout (μF)
5	4.7	±5	4.7
12	2.2	±9	2.2
24	1	±12	2.2
--	--	±15	1

It's not recommended to connect any external capacitor in the application field with less than 0.5 watt output.

## 4) Output Voltage Regulation and Over-voltage Protection Circuit

The simplest device for output voltage regulation, over-voltage and over-current protection is a linear regulator and an capacitor filtering network with overheat protection that is connected to the input or output end in series (Figure 3), the recommended capacitance of its filter capacitor sees (Table 1), linear regulator based on the actual voltage and current to reasonable selection.



(Figure 3)

## 5) No parallel connection or plug and play

Note:

1. Operation under minimum load will not damage the converter; However, they may not meet all specification listed, and that will reduce the life of product.
2. All specifications measured at Ta=25°C, humidity<75%, nominal input voltage and rated output load unless otherwise specified.
3. In this datasheet, all the test methods of indications are based on corporate standards.
4. Only typical models listed, other models may be different, please contact our technical person for more details.
5. Our company offer custom products.
6. Specifications subject to change without notice.

### MORNSUN Science & Technology Co.,Ltd.

Address: No. 5, Kehui St. 1, Kehui development center, Science Ave., Guangzhou Science City, Luogang district, Guangzhou,P.R.China.

Tel: 86-20-28203030

Fax:86-20-38601272

[Http://www.mornsun-power.com](http://www.mornsun-power.com)