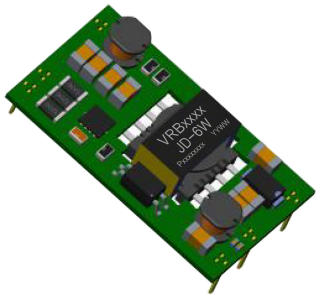
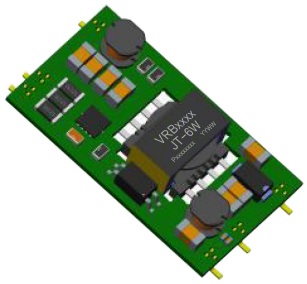
6W isolated DC-DC converter in DIP/SMD package
Wide input and regulated single output


Patent Protection

3 years Warranty

UL62368-1 EN62368-1 BS EN62368-1 IEC62368-1

FEATURES

- Wide input voltage range (2:1)
- High efficiency up to 86%
- No-load power consumption as low as 0.12W
- Isolation test voltage 500VAC/1500VDC
- Operating ambient temperature range: -40℃ to +85℃
- Input under-voltage protection, output short-circuit, over-current, over-voltage protection
- Industry standard pin-out

VRB_J(M)D/T-6W series are isolated 6W DC-DC products feature with 2:1 input voltage, 500VAC/1500VDC isolation, input under-voltage protection, output over-voltage, over-current, short-circuit protection, which make them widely applied in industrial control, electricity, instruments, communication fields.

Selection Guide

Certification	Part No. ①	Input Voltage (VDC)		Output		Full Load Efficiency③ (%) Min./Typ.	Capacitive Load (μF)Max.
		Nominal (Range)	Max. ②	Voltage(VDC)	Current (mA) Max./Min.		
UL/EN/BS EN/IEC	VRB1205J(M)D/T-6W	12 (9-18)	20	5	1200/0	79/81	1000
	VRB1212J(M)D/T-6W			12	500/0	83/85	680
	VRB1215J(M)D/T-6W			15	400/0	84/86	470
	VRB2403J(M)D/T-6W	24 (18-36)	40	3.3	1500/0	77/79	1800
	VRB2405J(M)D/T-6W			5	1200/0	81/83	1000
	VRB2412J(M)D/T-6W			12	500/0	83/85	680
	VRB2415J(M)D/T-6W			15	400/0	84/86	470

Notes:
① VRBxxxxJ(M)D/T-6W contains 4 types of products, include VRBxxxxJD-6W (DIP package without case), VRBxxxxJMD-6W (DIP package with case), VRBxxxxJT-6W (SMD package without case) and VRBxxxxJMT-6W (SMD package with case);
② Exceeding the maximum input voltage may cause permanent damage;
③ Efficiency is measured In nominal input voltage and rated output load.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	12VDC nominal input series, nominal input voltage	5V output	--	617/7	633/25	mA
		12V output	--	588/10	602/30	
		15V output	--	581/9	595/30	
	24VDC nominal input series, nominal input voltage	3.3V output	--	316/3	325/15	
		5V output	--	301/4	309/18	
		12V output	--	294/5	301/20	
		15V output	--	291/5	298/20	

Reflected Ripple Current		--	20	--	mA
Surge Voltage (1sec. max.)	12VDC nominal input series	-0.7	--	25	VDC
	24VDC nominal input series	-0.7	--	50	
Start-up Voltage	12VDC nominal input series	--	--	9	
	24VDC nominal input series	--	--	18	
Input Under-voltage Protection	12VDC nominal input series	5.5	6.5	--	
	24VDC nominal input series	13	15	--	
Input Filter		Pi filter			
Hot Plug		Unavailable			
Ctrl *	Module on	Ctrl pin open or pulled low to GND(0-0.3VDC)			
	Module off	Ctrl pin pulled high(2-12VDC)			
	Input current when off	--	5	10	mA

Note: *The Ctrl pin voltage is referenced to input GND.

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	0% -100% load		--	±1	±3	%
Linear Regulation	Input voltage variation from low to high at full load		--	±0.2	±0.5	
Load Regulation①	5% -100% load		--	±0.5	±1	
Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	μs
Transient Response Deviation	25% load step change, nominal input voltage	3.3V, 5V output	--	±5	±8	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Ripple & Noise②	20MHz bandwidth, 5% -100% load		--	50	100	mVp-p
Over-voltage Protection	Input voltage range		110	--	160	%Vo
Over-current Protection			110	140	200	%Io
Short-circuit Protection			Hiccup, continuous, self-recovery			

Note: ① Load regulation for 0%-100% load is ±5%;
②Under 0% -5% load conditions, ripple & noise does not exceed 5%Vo. The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information.

General Specification

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input-output Electric Strength test for 1 minute with a leakage current of 1mA max.	1500	--	--	VDC
	Input-output Electric Strength test for 1 minute with a leakage current of 5mA max.	500	--	--	VAC
	Input/Output-case Electric Strength test for 1 minute with a leakage current of 5mA max. (Only for VRB_JMD/JMT-6W series products)	500	--	--	
Insulation Resistance	Input-output insulation at 500VDC	100	--	--	MΩ
	Input/Output-case insulation at 500VDC (Only for VRB_JMD/JMT-6W series products)	100	--	--	
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	--	1000	--	pF
Operating Temperature	see Fig. 1	-40	--	85	℃
Storage Temperature		-55	--	125	
Storage Humidity	Non-condensing	5	--	95	%RH
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	300	℃
Reflow Soldering Temperature	Only for VRB_J(M)T-6W series products	Peak temp.≤245℃, maximum duration time≤60s at 217℃. For actual application, please refer to IPC/JEDEC J-STD-020D.1.			
Vibration		10-55Hz, 2G, 30 Min. along X, Y and Z			

Switching Frequency *	PWM mode	--	330	--	kHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	k hours
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1	Level 1			
Note: *Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.					

Mechanical Specifications

Case Material		Aluminum alloy
Dimensions	VRB_JD-6W series	31.60 x 18.10 x 6.10mm
	VRB_JT-6W series	33.78 x 18.10 x 6.30mm
	VRB_JMD-6W series	32.60 x 19.10 x 6.80mm
	VRB_JMT-6W series	33.78 x 19.10 x 7.00mm
Weight	VRB_JD/JT-6W series	4.7g(Typ.)
	VRB_JMD/JMT-6W series	5.7g(Typ.)
Cooling method		Free air convection（20LFM）

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS A (without external components)/ CLASSB (see Fig.3-② for recommended circuit)	
	RE	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6kV	perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2kV (see Fig.3-① for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±2kV (see Fig.3-① for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A
Note: It is suggested to connect case to ground during EMC testing (only for VRB_JMD/T-6W series).				

Typical Characteristic Curves

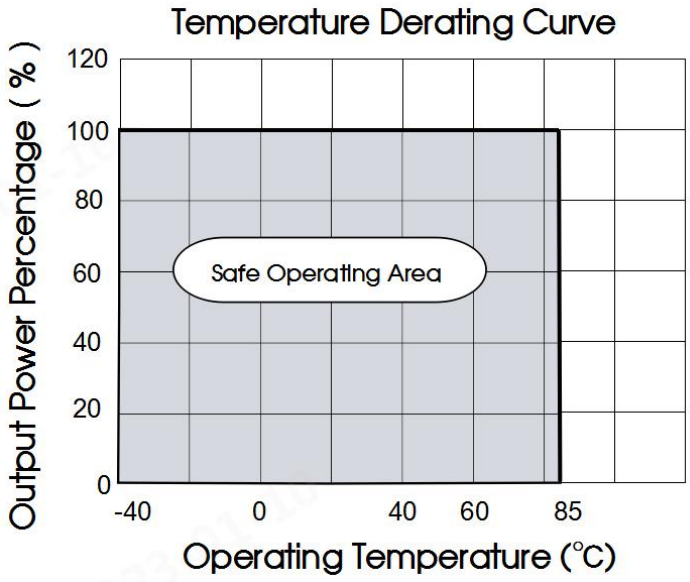


Fig. 1

Design Reference

1. Typical application

All the DC/DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.
Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values Cin and Cout and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.

Fig. 2

Vin (VDC)	Vout (VDC)	Cin	Cout
12	5	100μF/35VDC	10μF/16VDC
	12/15	100μF/35VDC	10μF/25VDC
24	3.3/5	100μF/50VDC	10μF/16VDC
	12/15	100μF/50VDC	10μF/25VDC

2. EMC compliance circuit

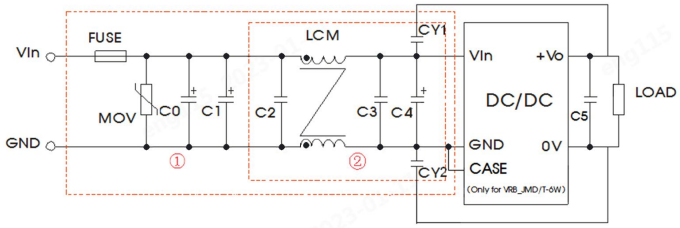


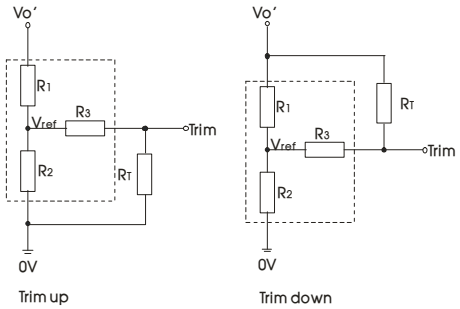
Fig. 3

Notes: For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting based on needs.

Parameter description:

Model	Vin: 12VDC/24VDC
FUSE	Choose according to actual input current
MOV	S20K30
C0	680μF/100V
C1	330μF/100V
C2/C3	4.7μF/50V
C4	330μF/50V
C5	10μF/25V
LCM	2.2 mH, recommended to use MORNSUN's FL2D-10-222
CY1/CY2	1000pF/≥500VAC

3. Trim resistor connection (dashed line shows internal resistor network)



Applied circuits of Trim (Part in broken line is the interior of models)

Calculating Trim resistor values:

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \qquad a = \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1$$

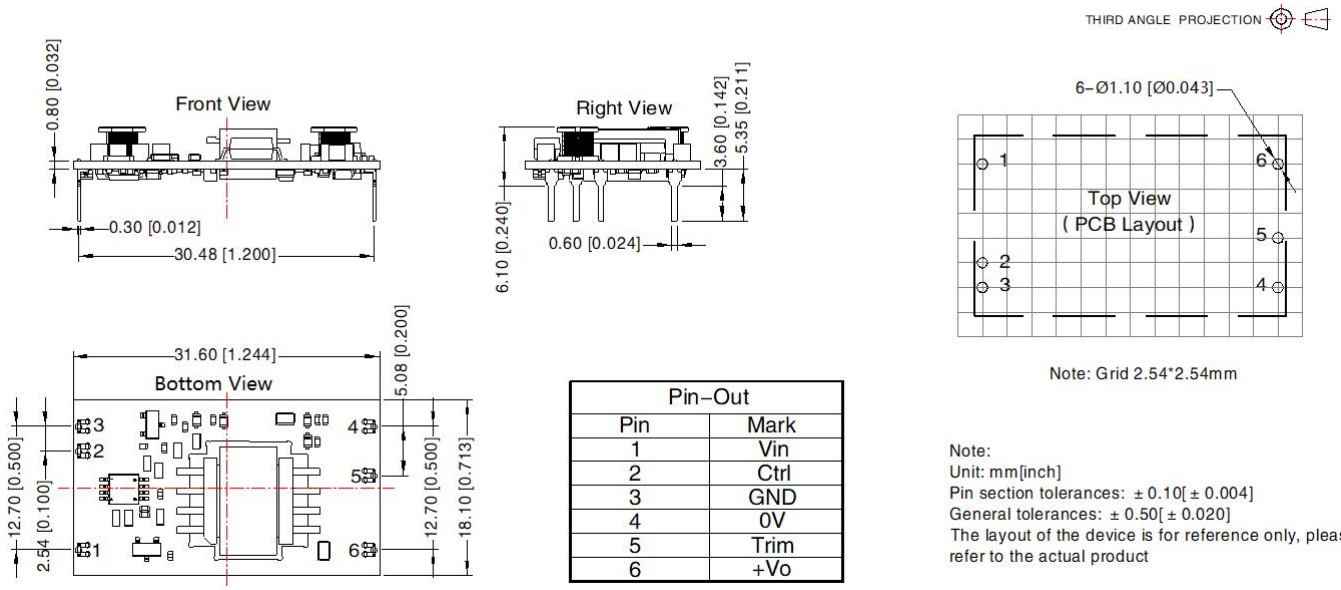
$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \qquad a = \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2$$

R_T is Trim resistance
a is a self-defined parameter, with no real meaning.
Vo' for the actual needs of the up or down regulated voltage

Part No.	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
VRB2403J(M)D/T-6W	4.8	2.87	12	1.24
VRB2405J(M)D/T-6W	2.94	2.87	15	2.5
VRB2412J(M)D/T-6W	11	2.87	33	2.5
VRB2415J(M)D/T-6W	14.5	2.87	15	2.5
VRB1205J(M)D/T-6W	2.94	2.87	10	2.5
VRB1212J(M)D/T-6W	11	2.87	15	2.5
VRB1215J(M)D/T-6W	14.5	2.87	15	2.5

4. The products do not support parallel connection of their output
5. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

VRB_JD-6W (DIP package without case) Dimensions and Recommended Layout

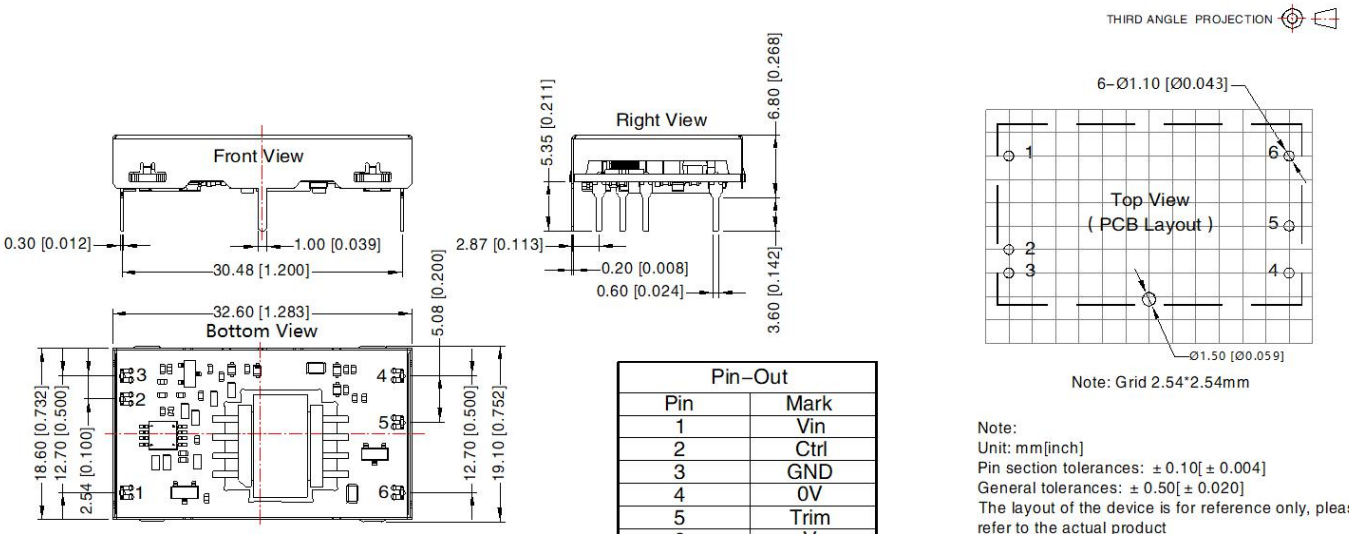


Pin-Out	
Pin	Mark
1	Vin
2	Ctrl
3	GND
4	0V
5	Trim
6	+Vo

Note: Grid 2.54*2.54mm

Note:
Unit: mm[inch]
Pin section tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]
The layout of the device is for reference only, please refer to the actual product

VRB_JMD-6W (DIP package with case) Dimensions and Recommended Layout

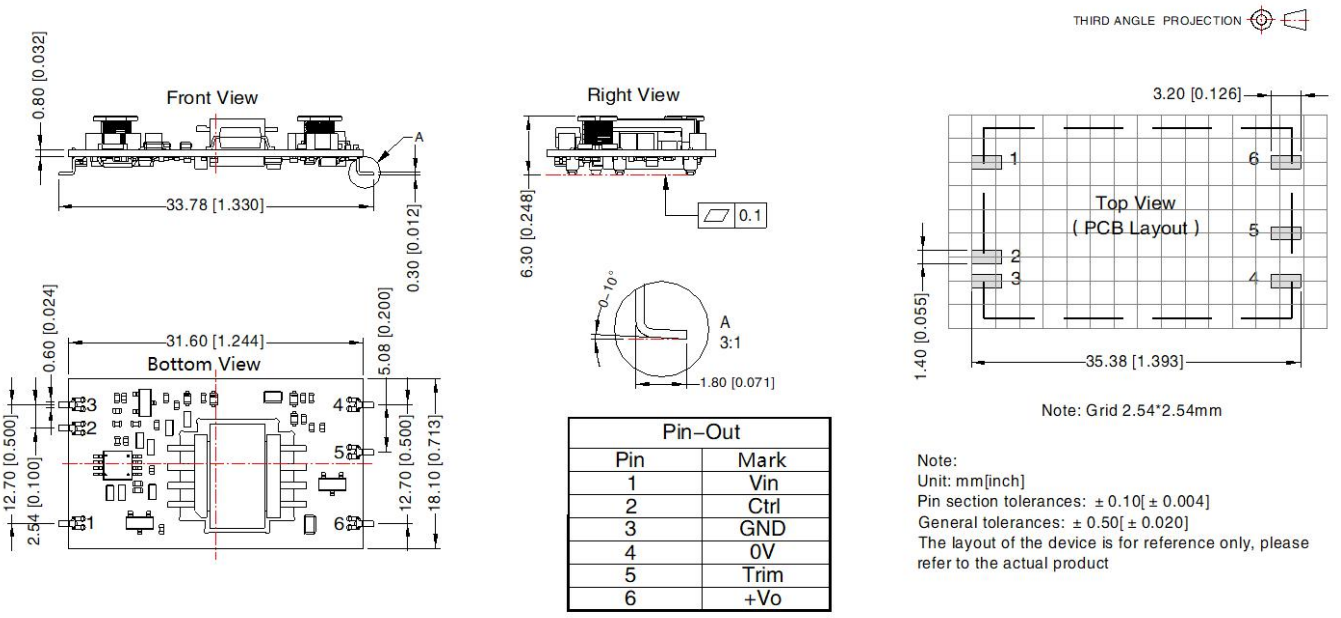


Pin-Out	
Pin	Mark
1	Vin
2	Ctrl
3	GND
4	0V
5	Trim
6	+Vo

Note: Grid 2.54*2.54mm

Note:
Unit: mm[inch]
Pin section tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]
The layout of the device is for reference only, please refer to the actual product

VRB_JT-6W (SMD package without case) Dimensions and Recommended Layout

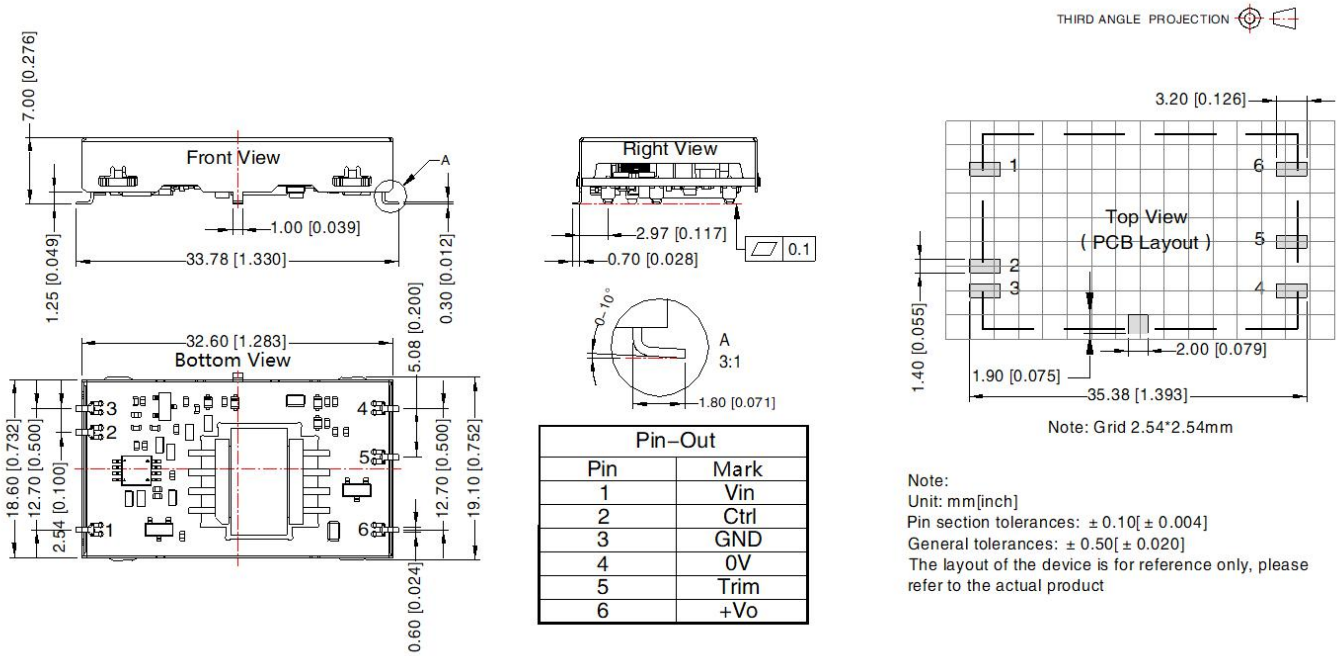


Note: Grid 2.54*2.54mm

Pin–Out	
Pin	Mark
1	Vin
2	Ctrl
3	GND
4	0V
5	Trim
6	+Vo

Note:
Unit: mm[inch]
Pin section tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]
The layout of the device is for reference only, please refer to the actual product

VRB_JMT-6W (SMD package with case) Dimensions and Recommended Layout



Note: Grid 2.54*2.54mm

Pin–Out	
Pin	Mark
1	Vin
2	Ctrl
3	GND
4	0V
5	Trim
6	+Vo

Note:
Unit: mm[inch]
Pin section tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]
The layout of the device is for reference only, please refer to the actual product

Note:
1. For additional information on Product Packaging please refer to www.mornsun-power.com.The Packaging bag number: 58210125;
2. The maximum capacitive load offered were tested at input voltage range and full load;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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