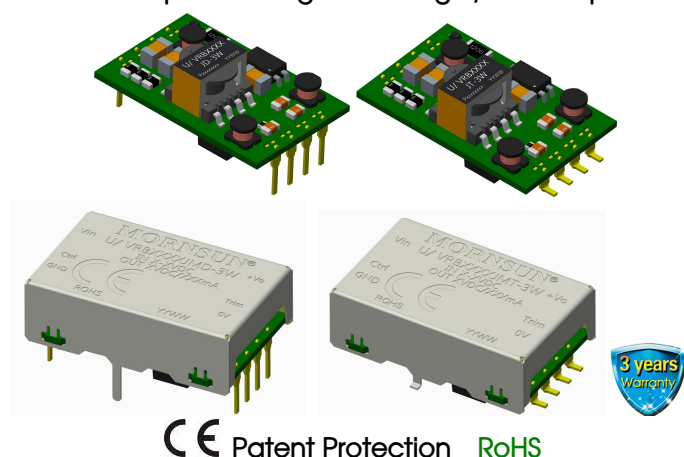


DC/DC Converter

U/VRB_J(M)T/D-3W & VRA_JMD-3W Series

MORNSUN®

3W isolated DC-DC converter in DIP/SMD package
Ultra-wide input and regulated single/dual output



FEATURES

- Ultra-wide input voltage range
- High efficiency up to 83%
- No-load power consumption as low as 0.1W
- I/O isolation test voltage 500VAC / 1500VDC
- Operating ambient temperature range:
-40°C ~ +85°C
- Input under-voltage protection, output short circuit, over-current, over-voltage protection
- Optional package: DIP/SMD
- 8.2mm ultra-thin package
- EN62368 approved

U/VRB_J(M)T/D-3W & VRA_JMD-3W series of isolated 3W DC-DC converter products have an ultra-wide input voltage and feature efficiencies of to 83%, input to output isolation is tested with 500VAC / 1500VDC, input under-voltage protection, output over-voltage, over-current, short circuit protection and they are widely used in applications such as industrial control, electricity, instruments and communication fields.

Selection Guide

Certification	Part No. ①	Input Voltage (VDC)		Output		Full Load Efficiency ^③ (%) Min./Typ.	Max. Capacitive Load (μF)
		Nominal (Range)	Max. ②	Voltage (VDC)	Current (mA) Max./Min.		
CE	VRA2412JMD-3W	24 (18-36)	40	±12	±130/0	81/83	330
	VRB0505J(M)T/D-3W	5 (4.5-9)	12	5	600/0	72/74	220
	VRB0512J(M)T/D-3W			12	250/0	74/76	220
	VRB0515J(M)T/D-3W			15	200/0	75/77	100
	VRB0524J(M)T/D-3W			24	125/0	74/76	47
	URB2403J(M)T/D-3W	24 (9-36)	40	3.3	600/0	72/74	1000
	URB2405J(M)T/D-3W			5	600/0	77/79	1000
	URB2412J(M)T/D-3W			12	250/0	79/81	470
	URB2415J(M)T/D-3W			15	200/0	80/82	330
	URB2424J(M)T/D-3W			24	125/0	79/81	100

Notes:

- ① U/VRBxxxJ(M)D/T-3W contains 4 types of products, include U/VRBxxxJD-3W (DIP package without case), U/VRBxxxJMD-3W (DIP package with case), U/VRBxxxJT-3W (SMD package without case) and U/VRBxxxJMT-3W (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)	Nominal input voltage	5VDC input	--	789/20	833/45	mA
		24VDC input	--	154/4	162/15	
Reflected Ripple Current	Nominal input voltage		--	100	--	
Surge Voltage (1sec. max.)	5VDC input		-0.7	--	16	VDC
	24VDC input		-0.7	--	50	
Start-up Voltage	VRB05xxJ(M)D/T-3W series		--	--	4.5	
	VRA2412JMD-3W		--	--	18	
	URB24XXJ(M)D/T-3W series		--	--	9	
Input Filter	VRB05xxJ(M)D/T-3W series		LC filter			
	VRA2412JMD-3W		PI filter			

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	URB24XXJ(M)D/T-3W series	C filter			
Hot Plug		Unavailable			
Ctrl*	Module on	Ctrl pin pulled low to GND (0-0.3VDC)			
	Module off	Ctrl pin open or pulled high (2-12VDC)			
	Input current when switched 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	Vo1	--	±1	±2	%
		Vo2	--	±1	±3	
Linear Regulation	Input voltage variation from low to high at full load		--	±0.2	±0.5	
Load Regulation ^①	5% -100% load	Vo1	--	--	±1	
		Vo2	--	--	±1.5	
Cross Regulation	Dual output, main circuit with 50% load, auxiliary circuit with 25%-100% load		--	--	±5	
Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	μs
Transient Response Deviation	25% load step change, nominal input voltage	3.3 VDC output	--	±5	±10	%
		5 VDC output	--	±5	±8	
		others output	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/°C
Ripple & Noise ^②	20MHz bandwidth, 5% -100% load		--	50	100	mVp-p
Trim			--	±5	--	%Vo
Over-voltage Protection	Input voltage range		110	--	160	%Vo
Over-current Protection			110	160	250	%Io
Short-circuit Protection			Hiccup, continuous, self-recovery			

Note:
^①Load regulation for 0%-100% load is ±5%;
^②Ripple & Noise at <5% load is 5%Vo max. 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 5mA max	500	--	--	VAC
	Input-case		500	--	--	
	Output-case		500	--	--	
	Input-output	Electric Strength Test for 1 minute with a leakage current of 1mA max	1500	--	--	VDC
	Input-case		1500	--	--	
	Output-case		1500	--	--	
Insulation Resistance	Input-output	Resistance at 500VDC, 70%RH @25℃	100	--	--	MΩ
	Input-case		100	--	--	
	Output-case		100	--	--	
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V		--	1000	--	pF
Operating Temperature	See Fig. 1		-40	--	+85	℃
Storage Humidity	Non-condensing		5	--	95	%RH
Storage Temperature			-55	--	+125	℃
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds		--	--	300	
Reflow soldering Temperature	Only for U/VRB_J(M)T series products		Peak temp.≤245℃, maximum duration time≤60s over 217℃. For actual application, please refer to IPC/JEDEC J-STD-020D.1.			

Vibration		10-150Hz, 5G, 90Min. along X, Y and Z
Switching Frequency ^①	PWM mode	-- 330 -- KHz
MTBF	MIL-HDBK-217F@25℃	1000 -- -- K hours

Note:①Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

Mechanical Specifications

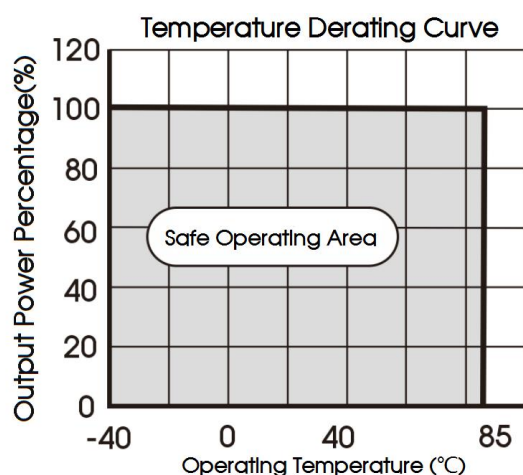
Case Material	Aluminum alloy	
Dimensions	JD series	24.00 x 15.10 x 8.20mm
	JT series	26.20 x 15.10 x 8.20mm
	JMD series	25.00 x 16.40 x 9.00mm
	JMT series	26.20 x 16.40 x 9.00mm
Weight	JD/JT series	2.2g (Typ.)
	JMD/JMT series	4.0g (Typ.)
Cooling method	Free air convection (20LFM)	

Electromagnetic compatibility (EMC)

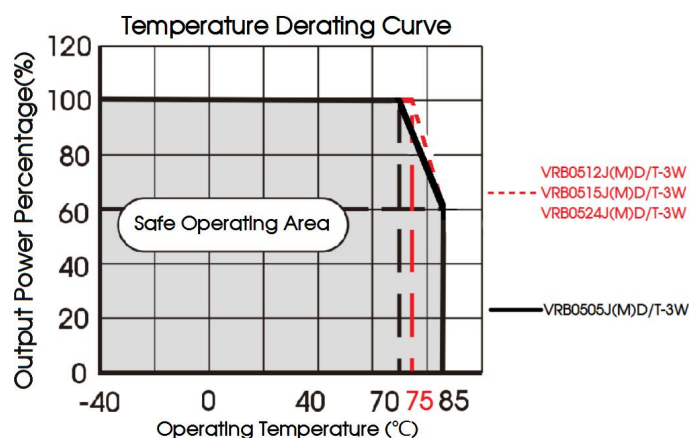
Emissions	CE	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)
	RE	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)
Immunity	ESD	IEC/EN61000-4-2	Contact ±6KV perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV (see Fig.3-① for recommended circuit) 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: *For U/VRBxxxxJMD/T-3W series, the case should be connected to input pin GND when testing EMC performance

Typical Characteristic Curves

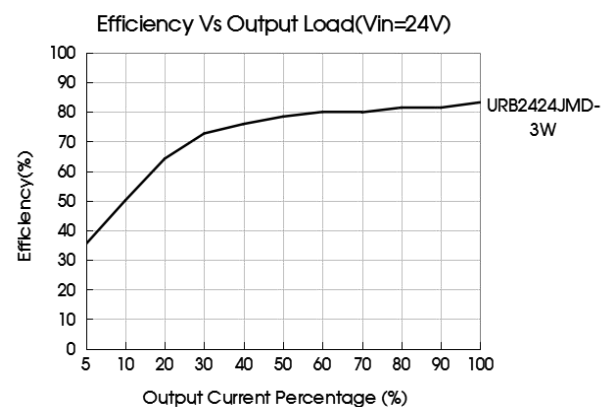
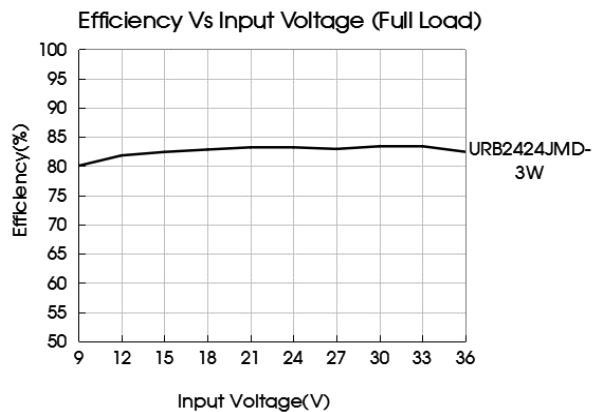
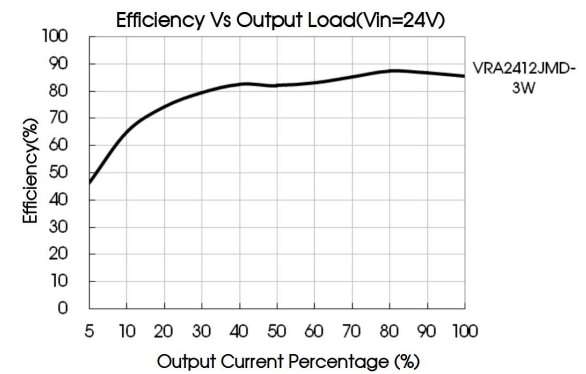
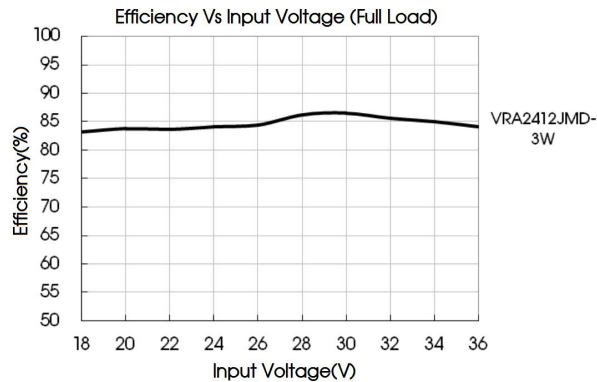
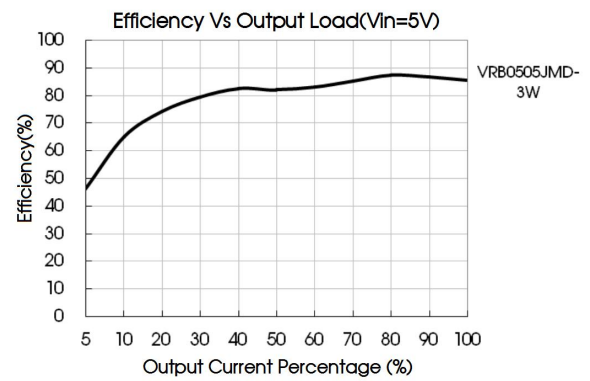
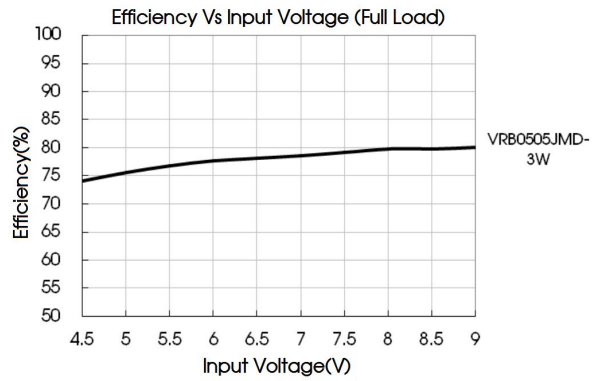


URB24xxJ(M)T/D-3W & VRA2412JMD-3W



VRB05xxJ(M)T/D-3W

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 C_{in} and C_{out} and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the max. capacitive load value of the product.

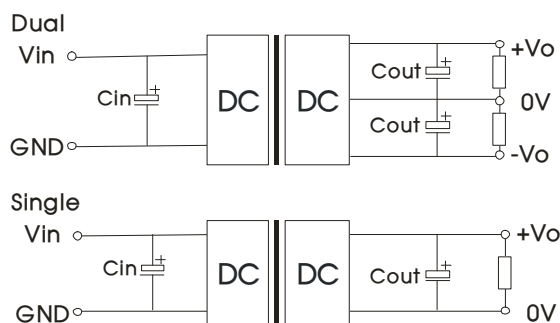


Fig. 2

Vout (VDC)	Cout (μF)	Cin (μF)
3.3	10	100
5		
±12		
15		
24		

2. EMC compliance circuit

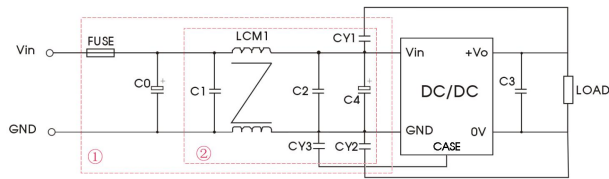


Fig. 3

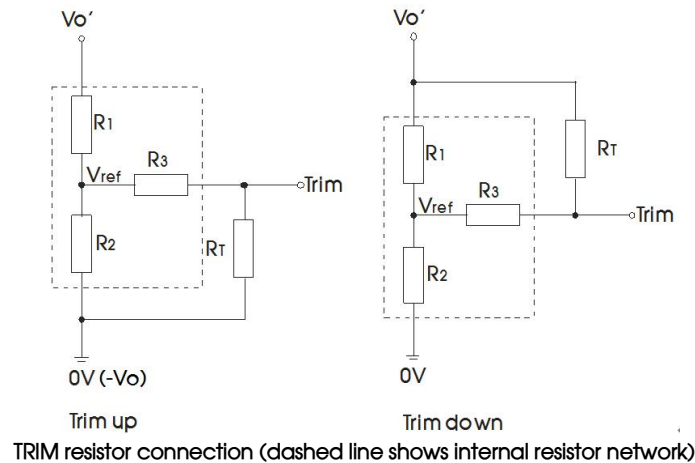
Notes:

- For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test.
- CASE pin only refer to U/VRBxxxJMD/T-3W.

lists of components:

Model	Vin: 5VDC	Vin: 24VDC
FUSE	Choose according to actual input current	
C0	2200μF/35V	1000μF/50V
C1	4.7μF/50V	
C2	4.7μF/50V	
C4	100μF/50V	
C3	Refer to the Cout in Fig.2	
LCM1	2.2mH, recommended to use MORNSUN P/N: FL2D-30-222	
CY1/CY2/CY3	2.2nF/2KV	

3. Trim Function for Output Voltage Adjustment (open if unused)



Calculating Trim resistor values:

$$\begin{aligned} \text{up: } R_T &= \frac{\alpha R_2}{R_2 - \alpha} - R_3 & \alpha &= \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{\alpha R_1}{R_1 - \alpha} - R_3 & \alpha &= \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

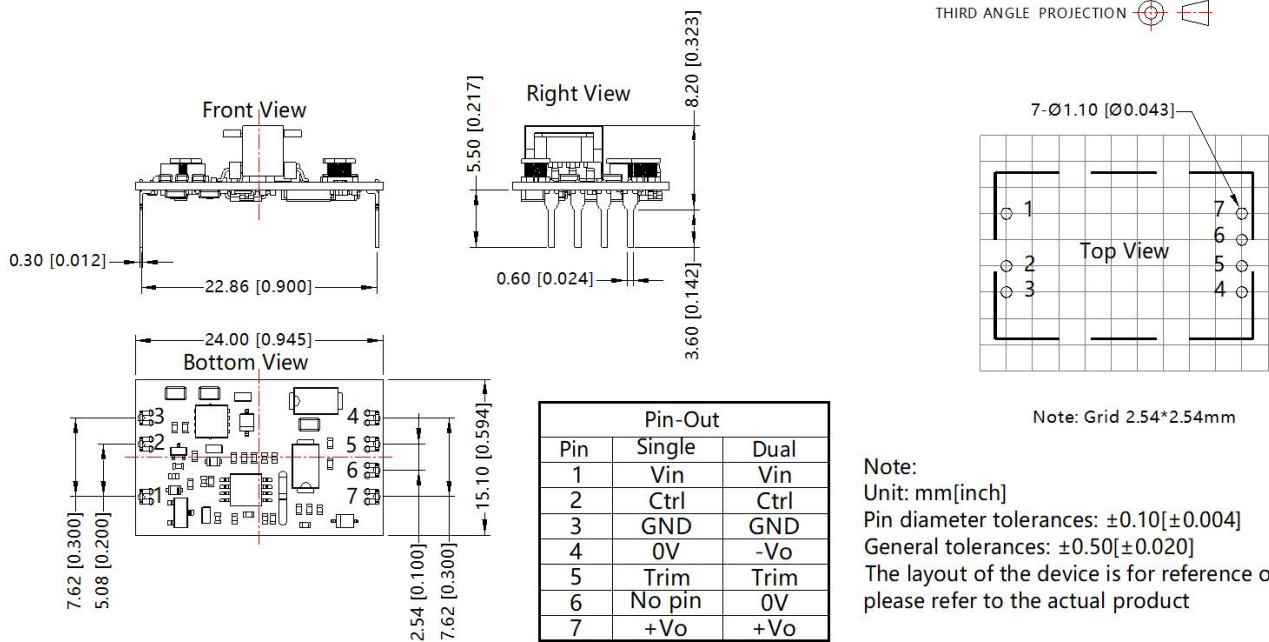
R_T = Trim Resistor value;
 α = self-defined parameter;
 V_o' = desired output voltage.
 VRA2412JMD-3W Trim up need to connect to "-Vo"
 U/VRBxxxJMD-3W Trim up need to connect to "0V".

Vout(VDC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
VRA2412JMD-3W	44.23	5.1	51	2.5
3.3	4.80	2.87	10	1.25
5	2.87	2.87	10	2.5
12	10.91	2.87	15	2.5
15	14.35	2.87	15	2.5
24	24.77	2.87	17.4	2.5

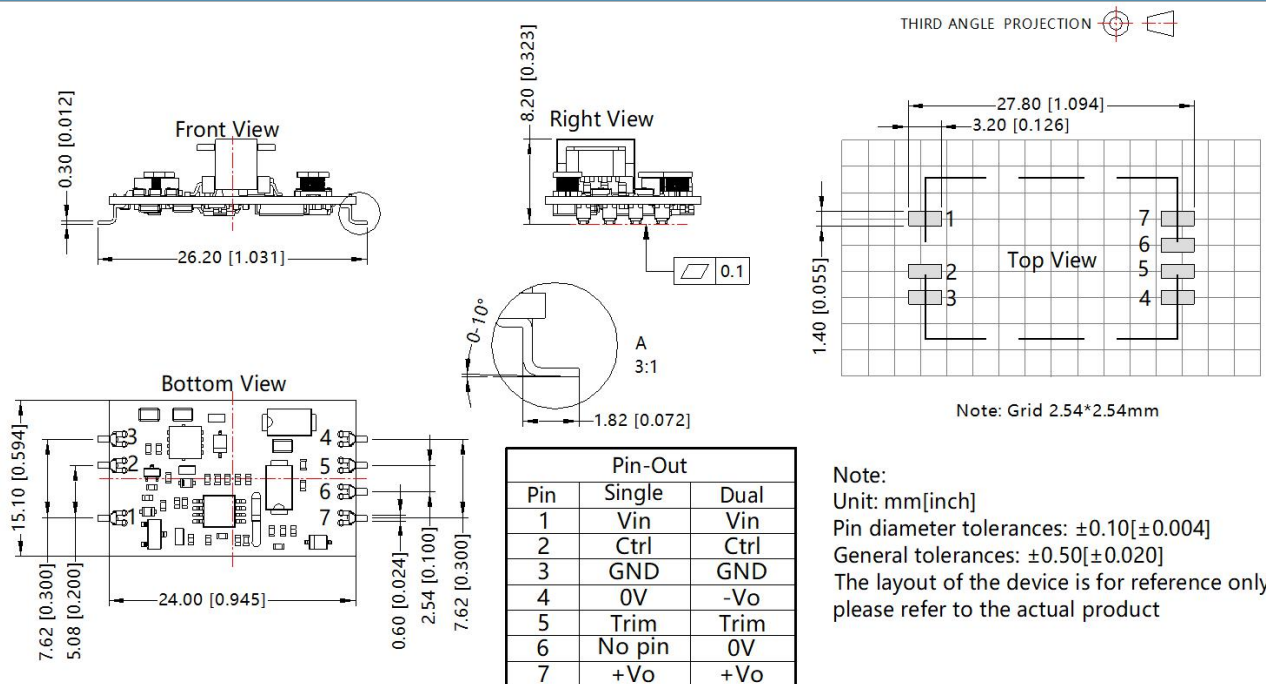
4. It is not allowed to connect modules output in parallel to enlarge the power

5. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

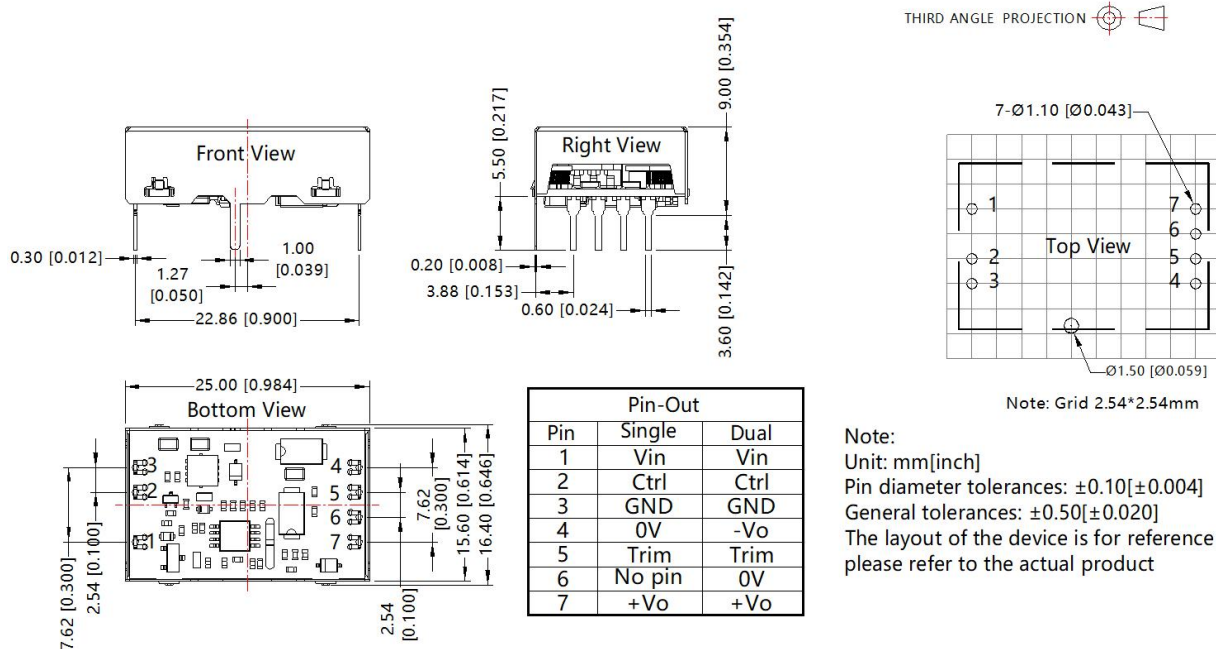
U/VRA/B_JD-3W Dimensions and Recommended Layout



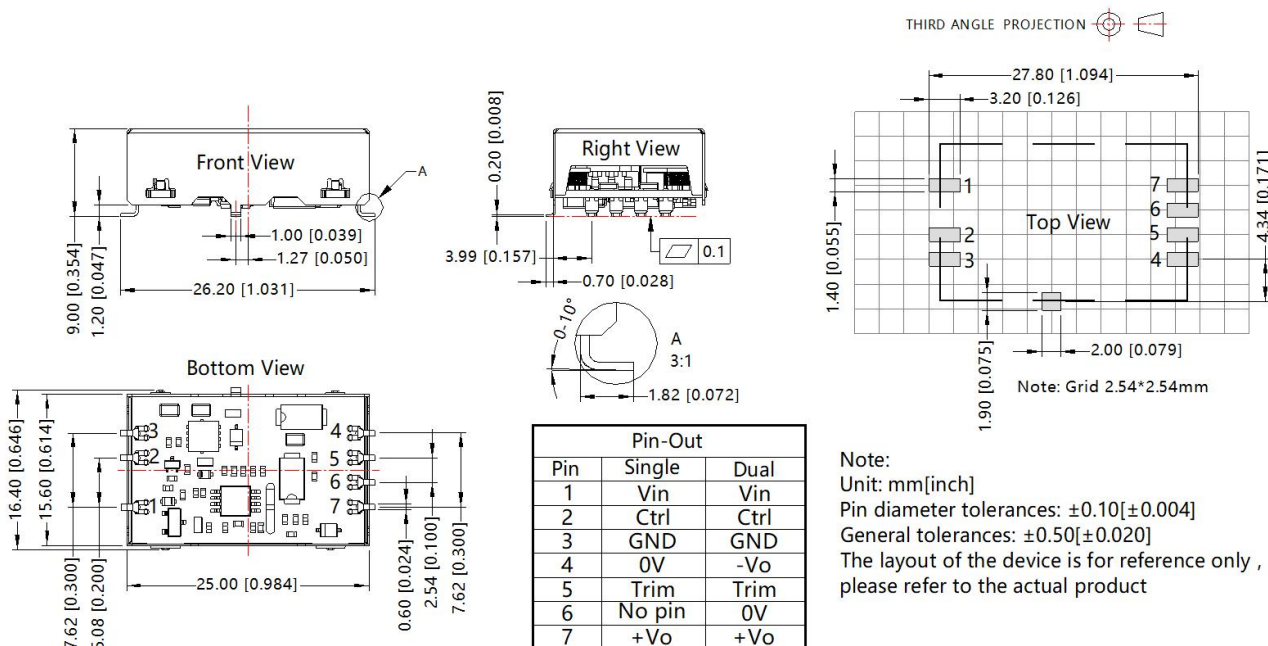
U/VRA/B_JT-3W Dimensions and Recommended Layout



U/VRA/B_JMD-3W Dimensions and Recommended Layout



U/VRA/B_JMT-3W Dimensions and Recommended Layout



Note:

- For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number :58210088;
- The maximum capacitive load offered were tested at input voltage range and full load;
- Unless otherwise specified, parameters in this datasheet were measured under the conditions of $T_a=25^\circ\text{C}$, humidity<75%RH with nominal input voltage and rated output load;
- All index testing methods in this datasheet are based on company corporate standards;
- We can provide product customization service, please contact our technicians directly for specific information;
- Products are related to laws and regulations: see "Features" and "EMC";
- Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

Mornsun Guangzhou Science & Technology Co., Ltd.

Address: No. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Huangpu District, Guangzhou, P. R. China
Tel: 86-20-38601850 Fax: 86-20-38601272 E-mail: info@mornsun.cn www.mornsun-power.com