

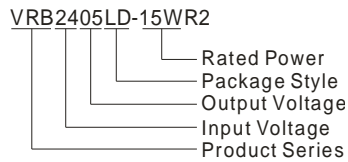
# MORNSUN®

## VRA\_LD-15WR2 & VRB\_LD-15WR2 SERIES 15W, WIDE INPUT, ISOLATED & REGULATED DUAL/SINGLE OUTPUT DC-DC CONVERTER



Patent Protection RoHS

### PART NUMBER SYSTEM



### FEATURES

- Efficiency up to 90%
- 2:1 wide input voltage range
- Low temperature rise
- Short circuit protection
- 1.5KVDC isolation
- Operating temperature range: -40°C ~ +85°C
- Six-sided metal shield
- Industry standard pinout
- Industrial level specifications
- Meet CISPR22/EN55022 CLASS A

### APPLICATION

VRA\_LD-15WR2 & VRB\_LD-15WR2 series are applied to wide voltage range input situation such as data transmission device, battery power supply device, telecommunication device, distributed power supply system, remote control system, industrial robot system etc.

### SELECTION GUIDE

Model Number	Input Voltage(VDC)		Output Voltage (VDC)	Output Current (mA)		Input Current (mA)(typ.)		Reflected Ripple Current (mA,typ.)	Max. Capacitive Load# (μF)	Efficiency (% , typ.) @Max. Load
	Nominal (Range)	Max**		Max.	Min.	@Max. Load	@No Load			
*VRA1205LD-15WR2	12 (9-18)	20	±5	±1500	±75	1453	30	30	1020	86
*VRA1212LD-15WR2			±12	±625	±32	1420	25		495	88
*VRA1215LD-15WR2			±15	±500	±25	1420	25		165	88
*VRA1224LD-15WR2			±24	±313	±16	1420	20		200	88
VRB1203LD-15WR2			3.3	4000	200	1465	65		10500	87
VRB1205LD-15WR2			5	3000	150	1405	60		4020	89
VRB1212LD-15WR2			12	1250	63	1405	25		1035	89
VRB1215LD-15WR2			15	1000	50	1405	25		705	89
VRB1224LD-15WR2			24	625	32	1389	30		250	90
*VRA2405LD-15WR2			24 (18-36)	40	±5	±1500	±75		727	25
*VRA2412LD-15WR2	±12	±625			±32	710	20	495	88	
*VRA2415LD-15WR2	±15	±500			±25	710	20	165	88	
*VRA2424LD-15WR2	±24	±313			±16	710	20	200	88	
VRB2403LD-15WR2	3.3	4000			200	625	35	10500	88	
VRB2405LD-15WR2	5	3000			150	695	35	4020	90	
VRB2412LD-15WR2	12	1250			63	703	20	1035	89	
VRB2415LD-15WR2	15	1000			50	695	20	705	90	
VRB2424LD-15WR2	24	625			32	695	25	250	90	
*VRA4805LD-15WR2	48 (36-75)	80			±5	±1500	±75	363	20	1020
*VRA4812LD-15WR2			±12	±625	±32	355	15	495	88	
*VRA4815LD-15WR2			±15	±500	±25	355	15	165	88	
*VRA4824LD-15WR2			±24	±313	±16	355	15	200	88	
VRB4803LD-15WR2			3.3	4000	200	316	35	10500	87	
VRB4805LD-15WR2			5	3000	150	360	35	4020	87	
VRB4812LD-15WR2			12	1250	63	352	25	1035	89	
VRB4815LD-15WR2			15	1000	50	348	15	705	90	
*VRB4824LD-15WR2			24	625	32	352	15	250	89	

Note: 1. \*Designing. \*\*Input voltage can't exceed this value, or will cause the permanent damage.  
2. # For each output.  
3. Add suffix "H" for heat sink mounted, for example VRA2405LD-15WHR2.

## INPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage (1sec.max.)	12VDC input	--	--	25	VDC
	24VDC input	--	--	50	
	48VDC input	--	--	100	
Start-up Voltage	12VDC input	--	--	9	
	24VDC input	--	--	17.8	
	48VDC input	--	--	35.8	
Under Voltage Shutdown	12VDC input	7.5	--	--	
	24VDC input	16	--	--	
	48VDC input	32	--	--	
Start-up Time	Nominal input& constant resistance load	--	10	--	ms
Ctrl	Models ON	Ctrl open or connect TTL high level (2.5-12VDC)			
	Models OFF	Ctrl connect GND or low level (0-1.2VDC)			
	Input current (Models OFF)	--	1	--	mA
Input Filter		π Filter			
Note: *The CTRL control pin voltage is refer to GND.					

## OUTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Output Power		0.75	--	15	W
Positive Voltage Accuracy	Refer to recommended circuit	--	±1	±3	%
Negative Voltage Accuracy					
Output Voltage Balance	Dual output, balanced loads	--	±0.5	±1	
Line Regulation	Full load, input voltage from low to high	--	±0.2	±0.5	
Load Regulation	10% to 100% load	--	±0.5	±1	
Cross Regulation	Dual output, main output 50% load, Supplement output from 10% to 100% load	--	--	±5	
Transient Recovery Time	25% load step change	--	300	500	μs
Transient Response Deviation		--	±3	±5	%
Temperature Drift	Full load	--	±0.02	--	%/°C
Ripple & Noise*	20MHz bandwidth	--	70	100	mVp-p
Trim		--	±10%	--	VDC
Output Over Voltage Protection	3.3VDC output	--	3.9	--	
	5VDC output	--	6.2	--	
	12VDC output	--	15	--	
	15VDC output	--	18	--	
	24VDC output	--	30	--	
Over Current Protection	Input voltage range	--	150	--	%
Short Circuit Protection		Hiccup, Continuous, automatic recovery			
Note: * Ripple and noise tested by "parallel cable" method. See detailed operation instructions at Testing of Power Converter section, application notes.					

## COMMON SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit	
Isolation Voltage	Tested for 1 minute and leakage current less than 1 mA	1500	--	--	VDC	
Isolation Resistance	Test at 500VDC	1000	--	--	MΩ	
Isolation Capacitance	Input/Output, 100KHz/0.1V	24VDC output	--	2000	--	pF
		Others	--	1000	--	
Switching Frequency		--	300	--	KHz	
MTBF	MIL-HDBK-217F@25°C	1000	--	--	K hours	
Case Material		Aluminum Alloy				
Weight	Without heatsink	--	28	--	g	
	With heatsink	--	36	--		

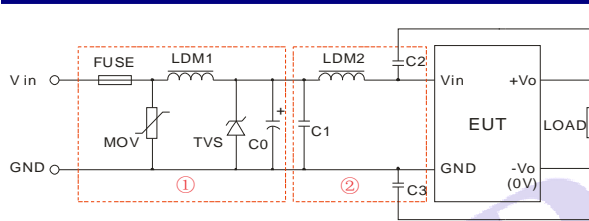
## ENVIRONMENTAL SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non condensing	5	--	95	%
Operating Temperature	See Temperature Derating Curve	-40	--	85	°C
Storage Temperature		-55	--	125	
The Max. Case Temperature	Operating Temperature curve range	--	--	105	
Lead Temperature	1.5mm from case for 10 seconds	--	--	300	
Cooling		Free air convection			
Shake		10-55Hz, 10G, 30 Min. along X, Y and Z			

## EMC SPECIFICATIONS

EMI	CE	CISPR22/EN55022	CLASS A (Without External Circuit) / CLASS B (External Circuit Refer to Figure1-②)	
	RE	CISPR22/EN55022	CLASS A (Without External Circuit) / CLASS B (External Circuit Refer to Figure1-②)	
EMS	ESD	IEC/EN61000-4-2	Contact ±4KV	perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV	perf. Criteria B (External Circuit Refer to Figure1-①)
	Surge	IEC/EN61000-4-5	±2KV	perf. Criteria B (External Circuit Refer to Figure1-①)
	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A
	Voltage dips, short and interruptions immunity	IEC/EN61000-4-29	0%-70%	perf. Criteria B

## EMC RECOMMENDED CIRCUIT



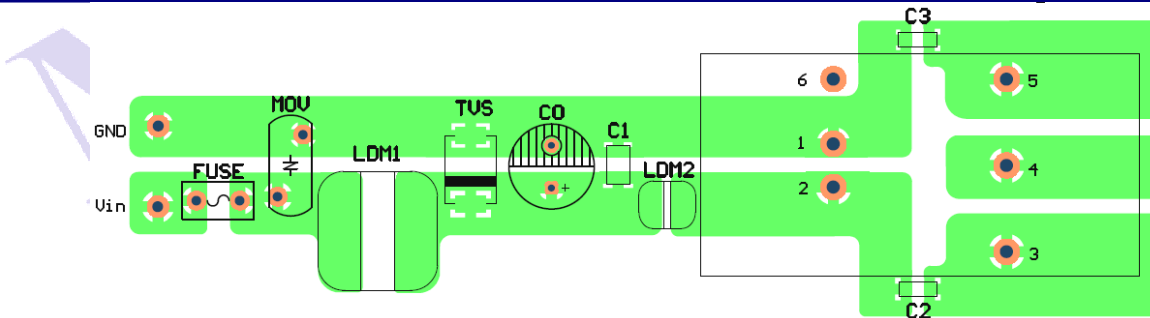
(Figure 1)

- Note: 1. In Figure 1, part ① is EMS Recommended external circuit, part ② is EMI recommended external circuit. Choose according to requirements.  
 2. If there is no recommended parameters, the model no require the external component.

Recommended external circuit parameters:

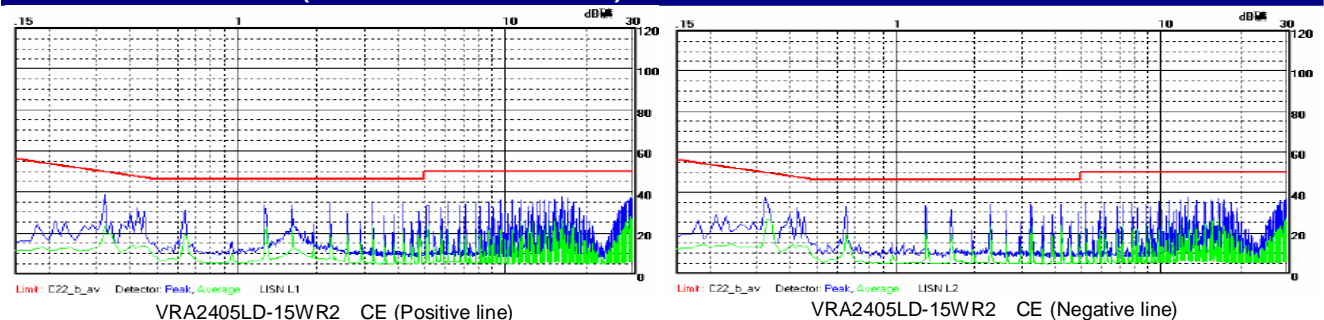
Model	Vin:12V	Vin:24V	Vin:48V
FUSE	Choose according to practical input current		
MOV	--	10D560	10D101
LDM1	--	56μH	
TVS	SMCJ28A	SMCJ48A	SMCJ90A
C0	680μF/25V	120μF/50V	120μF/100V
C1	1μF /50V	1μF /50V	1μF /100V
LDM2	4.7μH		
C2, C3	1000pF/2KV		

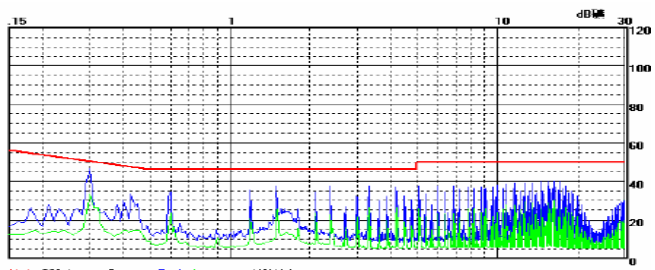
## EMC RECOMMENDED CIRCUIT PCB LAYOUT



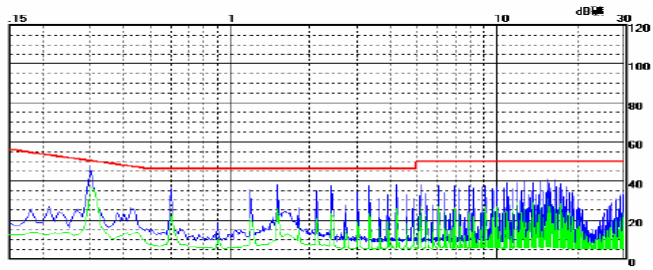
(Figure 2)

## EMC TEST WAVEFORM (CLASS B TEST CIRCUIT)

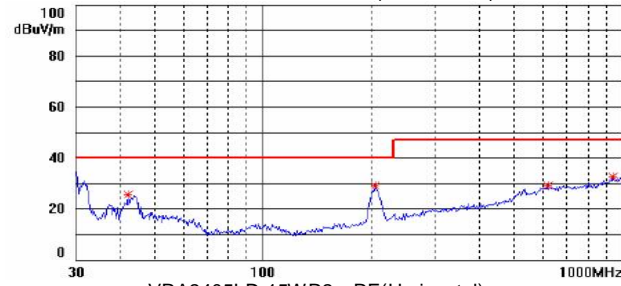




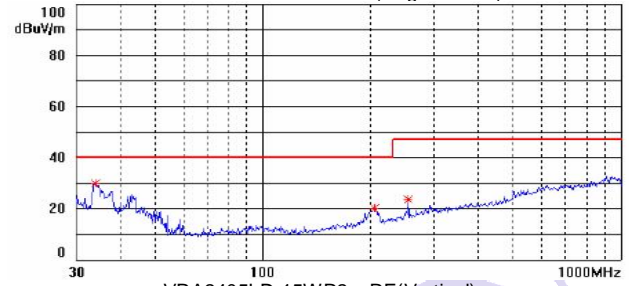
VRA4815LD-15WR2 CE (Positive line)



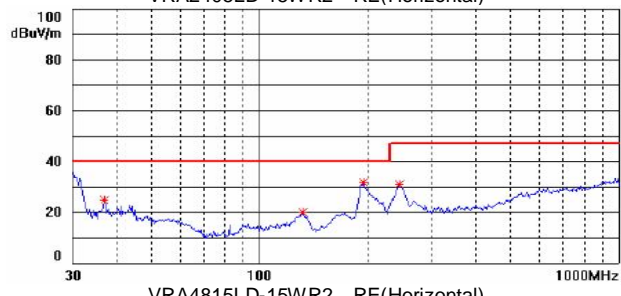
VRA4815LD-15WR2 CE (Negative line)



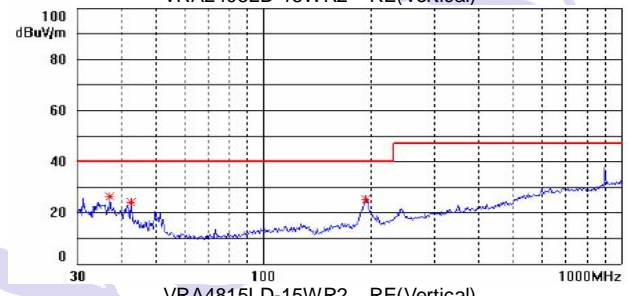
VRA2405LD-15WR2 RE(Horizontal)



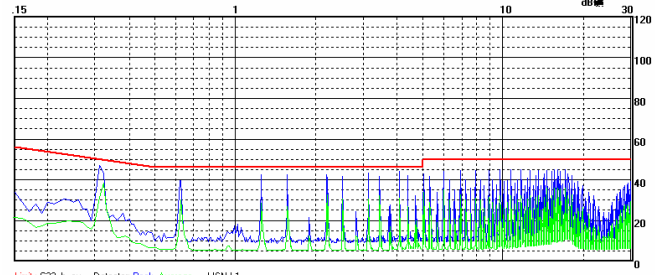
VRA2405LD-15WR2 RE(Vertical)



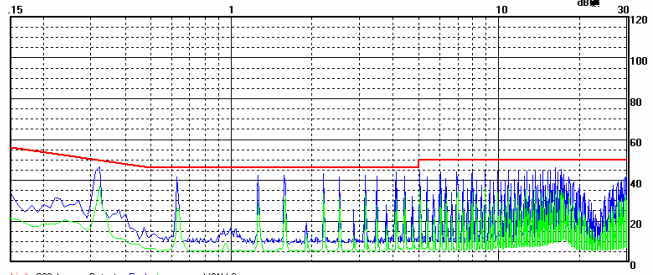
VRA4815LD-15WR2 RE(Horizontal)



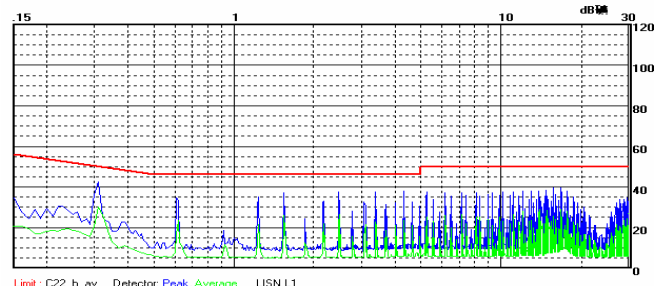
VRA4815LD-15WR2 RE(Vertical)



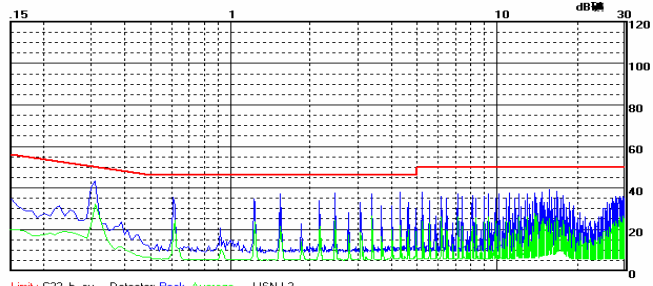
VRB2405LD-15WR2 CE (Positive line)



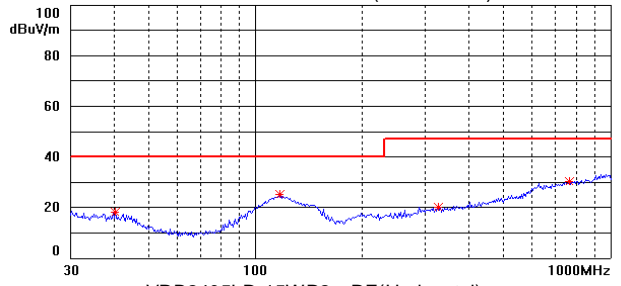
VRB2405LD-15WR2 CE (Negative line)



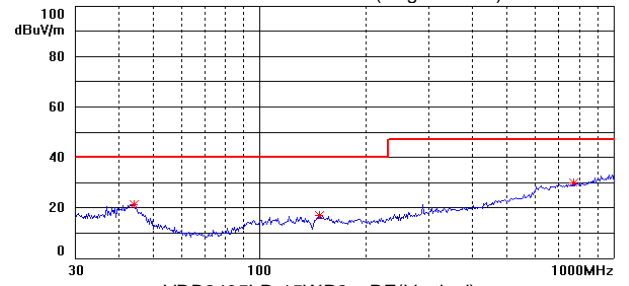
VRB4815LD-15WR2 CE (Positive line)



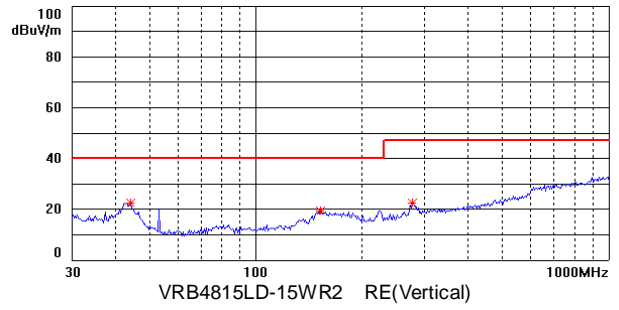
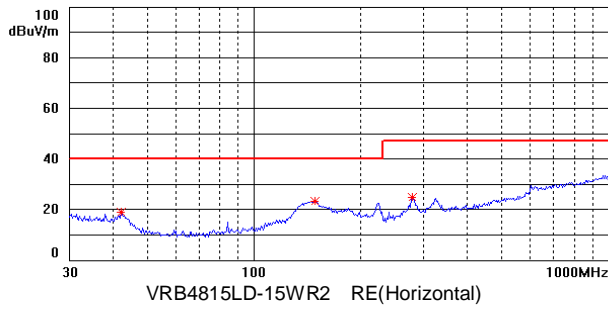
VRB4815LD-15WR2 CE (Negative line)



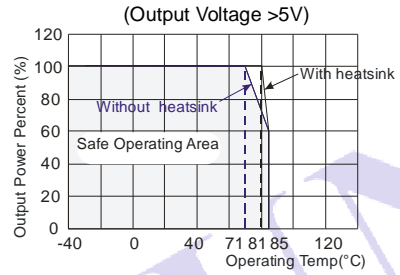
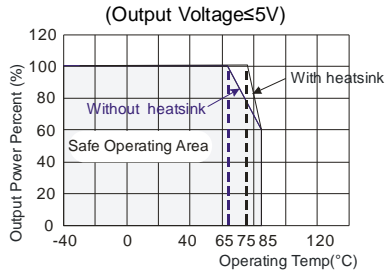
VRB2405LD-15WR2 RE(Horizontal)



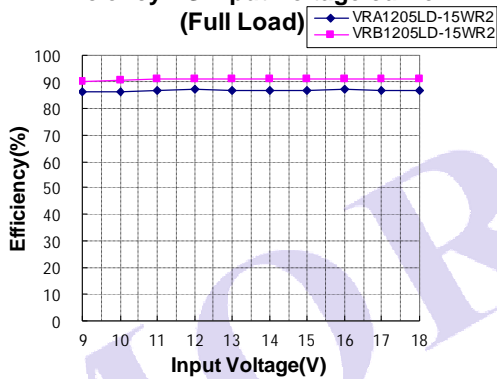
VRB2405LD-15WR2 RE(Vertical)



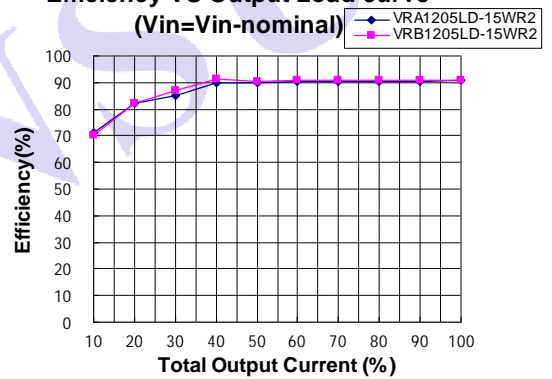
**PRODUCT TYPICAL CURVE**



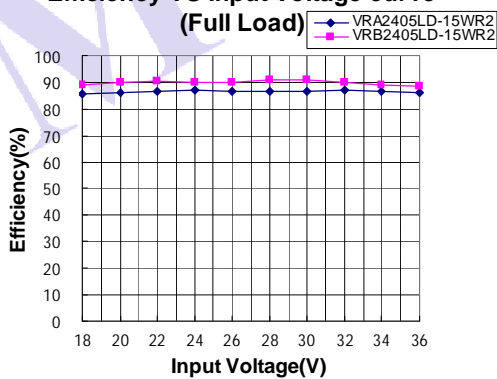
**Efficiency VS Input Voltage curve (Full Load)**



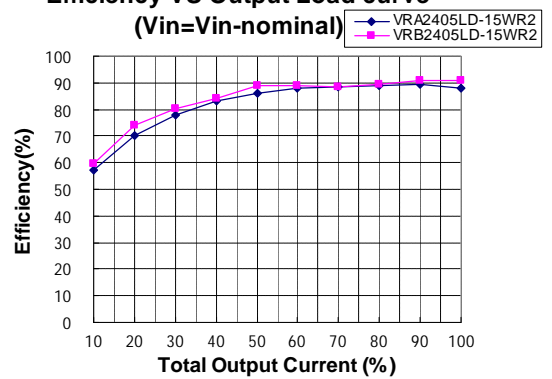
**Efficiency VS Output Load curve (Vin=Vin-nominal)**



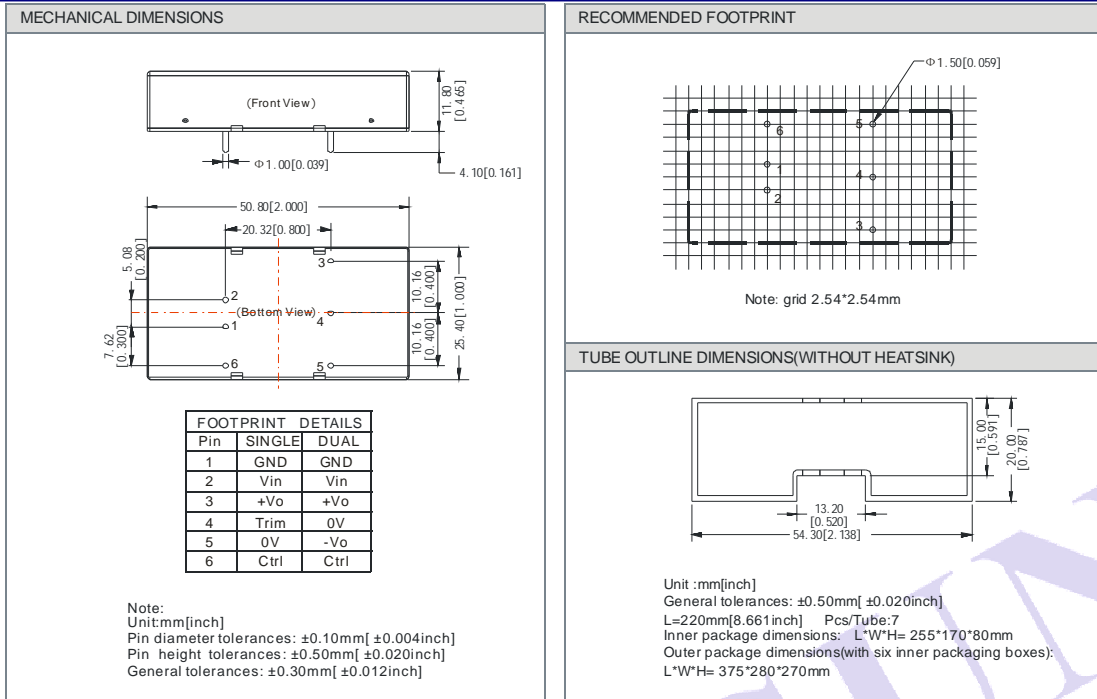
**Efficiency VS Input Voltage curve (Full Load)**



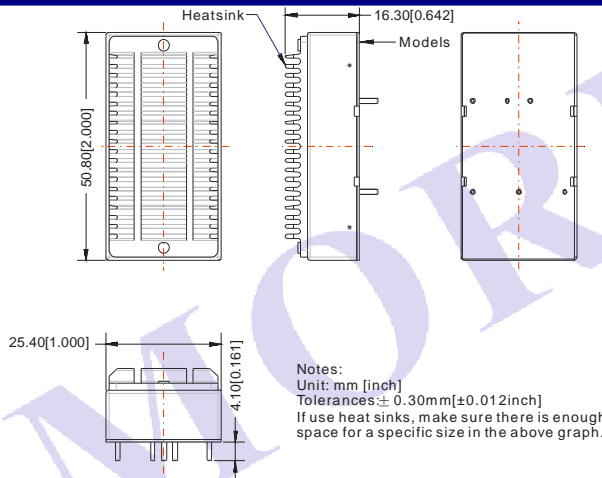
**Efficiency VS Output Load curve (Vin=Vin-nominal)**



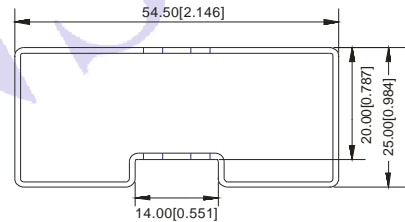
## OUTLINE DIMENSIONS, RECOMMENDED FOOTPRINT & PACKAGING



## HEATSINK ASSEMBLY



## TUBE OUTLINE DIMENSIONS (WITH HEATSINK)

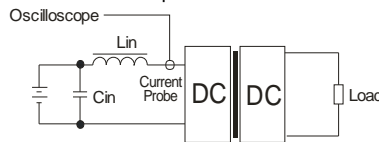


Unit :mm[inch]  
 General tolerances: ± 0.50mm[± 0.020inch]  
 L=220mm[8.661inch] Pcs/Tube:7  
 Inner package dimensions: L\*W\*H= 255\*170\*80mm  
 Outer package dimensions(with six inner packaging boxes)  
 L\*W\*H= 375\*280\*270mm

## TEST CONFIGURATIONS

### Input Reflected-Ripple Current Test Setup

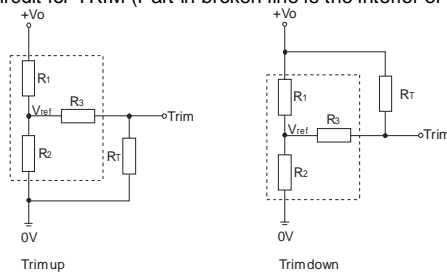
Input reflected-ripple current is measured with an inductor Lin and Capacitor Cin to simulate source impedance.



Lin(4.7μH)    Cin(220μF, ESR < 1.0Ω at 100 KHz)

## TRIM APPLICATION & TRIM RESISTANCE

Application circuit for TRIM (Part in broken line is the interior of models)



Formula for resistance of TRIM

$$\begin{aligned} \text{up: } R_T &= \frac{aR_2}{R_2-a} - R_3 & a &= \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{aR_1}{R_1-a} - R_3 & a &= \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

Note: Leave open if not used. Value for R1, R2, R3, and Vref refer to the above table 1. RT: Resistance of Trim. a: User-defined parameter, no actual meanings. Vo': The trim up/down voltage.

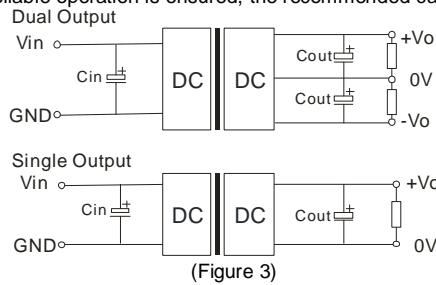
(Table 1)

Vo Parameter	3.3(VDC)	5(VDC)	12(VDC)	15(VDC)	24 (VDC)
R1(K $\Omega$ )	4.801	2.883	10.971	14.497	24.872
R2(K $\Omega$ )	2.863	2.864	2.864	2.864	2.863
R3(K $\Omega$ )	15	10	17.8	17.8	20
Vref(V)	1.24	2.5	2.5	2.5	2.5

## RECOMMENDED CIRCUIT

If you want to further decrease the input surge voltage and the output ripple etc, an capacitor filtering network may be connected to the input and output ends of the DC/DC converter, see (Figure 3).

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 2).



EXTERNAL CAPACITOR TABLE (Table 2)

Single Vout (VDC)	Cout ( $\mu$ F)	Cin ( $\mu$ F)	Dual Vout (VDC)	Cout# ( $\mu$ F)	Cin ( $\mu$ F)
3.3/5	470	100	$\pm$ 5	220	100
12/15	220		$\pm$ 12/ $\pm$ 15	100	
24	100		$\pm$ 24	47	

Note: # For each output.

### Cannot use in parallel and hot swap

Note:

1. Input voltage can't exceed this value, or will cause the permanent damage.
2. Min. load shouldn't be less than 5%, otherwise ripple maybe increase dramatically. Operation under minimum load will not damage the converter, however, they may not meet all specification listed.
3. Max. Capacitive Load tested at nominal input voltage and constant resistive load .
4. All specifications measured at Ta=25°C, humidity<75%, nominal input voltage and rated output load unless otherwise specified.
5. In this datasheet, all the test methods of indications are based on our corporate standards.
6. All characteristics are for listed model, non-standard models may perform differently, please contact our technical person for more detail.
7. Contact us for your specific requirement.
8. Specifications subject to change without prior notice.

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