

VRB_LD-30W Series

30W, WIDE INPUT, ISOLATED & REGULATED SINGLE OUTPUT DC-DC CONVERTER

RoHS

FEATURES

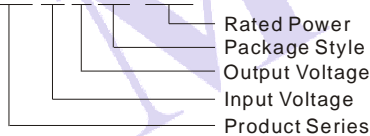
- High efficiency up to 88%
- 2:1 wide input voltage range
- 1.5KVDC input/output isolation
- Six-sided metal shield
- Short circuit protection (automatic recovery)
- Operating temperature: -40°C ~ +85°C
- Internal SMD construction
- Industry standard pinout
- MTBF>1,000,000 hours
- Low ripple and noise
- EMC compliance

APPLICATION

The VRB_LD-30W series offer 30W of output, with 2:1 wide input voltage of 18-36VDC, 36-75VDC and features 1500VDC isolation, over current and short-circuit protection, as well as six-sided metal shielding. All models are particularly suited to tele-communications, industrial, test equipments power.

MODEL SELECTION

VRB4812LD-30W



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PRODUCT PROGRAM

Part Number	Input			Output		Efficiency (%)	Capacitor Load ⁽³⁾ (max,µF)
	Voltage (VDC)			Voltage (VDC)	Current ⁽²⁾ (mA)		
	Nominal	Range	Max ⁽¹⁾				
VRB2403LD-30W*	24	18 - 36	40	3.3	6000	86	6800
VRB2405LD-30W*				5	6000	86	6800
VRB2412LD-30W*				12	2500	88	680
VRB2415LD-30W				15	2000	88	680
VRB4803LD-30W*	48	36-75	80	3.3	6000	84	6800
VRB4805LD-30W				5	6000	86	6800
VRB4812LD-30W*				12	2500	88	680
VRB4815LD-30W*				15	2000	88	680
VRB4824LD-30W*				24	1250	88	470

Note:

1. Add suffix "H" for heatsink mounted, for example VRB4812LD-30WH.
2. Add "*" mean EMC compliance of the products under development..

INPUT SPECIFICATIONS

Item	Test conditions		Min.	Typ.	Max.	Units
Start-up time			--	10	--	ms
Under voltage lock out	Nominal (24V)	Models ON	--	--	17.8	VDC
		Models OFF	16	--	--	
	Nominal (48V)	Models ON	--	--	35.8	
		Models OFF	32	--	--	
Input filter			Pi			
Input reflection ripple current	Nominal full-load		5% lin p-p			
No-load input current (mA)	24V input		3.3/5V output: 120mA, typ			
	48V input		3.3/5V output: 80mA, typ			
Full-load input current (mA)	24V input		5V output: 1460mA, typ			
			Other voltage output: 1440mA, typ			
	48V input		3.3V output: 500mA, typ			
			5V output: 730mA, typ			
			Other voltage output: 720mA, typ			
			Other voltage output: 1440mA, typ			
Ctrl ⁽⁴⁾	Models ON	Refer to GND	3-40VDC or open			
	Models OFF		0-1.2VDC or short			
	Input current (Models OFF)		--	--	1	mA
No Load power	Other voltage output		--	0.4	--	W
	3.3/5.5V output		--	1.2	--	

OUTPUT SPECIFICATIONS

Item	Test conditions	Min.	Typ.	Max.	Units
Output power	See product program	0	--	30	W
Output voltage accuracy	Refer to recommended circuit	--	±1	±3	%
Load regulation	From 10% to 100% load Nominal input	--	±0.5	±1	
Line regulation	Input voltage from low to high 100% load	--	±0.2	±0.5	mV
Ripple and noise	20MHz bandwidth	--	50	120	
Transient recovery time	25%~ 50%~25% load or	--	300	500	µs
Transient peak deviation	50%~75%~50%load step change	--	±3	±5	
Over current protection	Input voltage range	120	130	150	%
Short circuit protection	Input voltage range	Hiccup, automatic recovery			
Over voltage protection	3.3V output	--	3.9	--	VDC
	5V output	--	6.2	--	
	12V output	--	15	--	
	15V output	--	18	--	
	24V output	--	28	--	
Temperature drift (Vout)	Refer to recommended circuit	--	±0.02	--	%/°C
Trim		--	±10%Vo	--	VDC

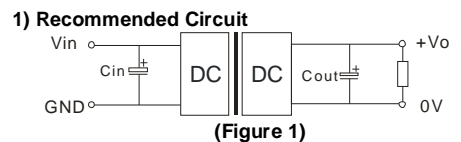
COMMON SPECIFICATIONS

Item	Test conditions	Min.	Typ.	Max.	Units
Storage humidity		5	--	95	%
Operating temperature		-40	--	85	
Storage temperature		-55	--	125	°C
Maximum Case temp.	On work temperature curve	--	--	105	
Lead temperature	1.5mm from case for 10 seconds	--	--	300	°C/Watt
Thermal resistance	With heatsink		12		
	Without heatsink		14		
Isolation voltage	Test for 1 minute and 1mA max	1500	--	--	VDC
Isolation resistance	Test at 500VDC	1000	--	--	MΩ
Isolation capacitance	100kHz/0.1V	--	2000	--	pF
Switching frequency	Nominal, full load	--	300	--	kHz
Cooling		Free Air Convection			
Case material		Nickel- coated copper(Six-sided)			
MTBF	MIL-HDBK-217F(25°C)	1000	--	--	k hours
Weight	Without heatsink	--	40	--	g
	With heatsink	--	55	--	

OTHER SPECIFICATIONS

Item	Test conditions	Standard	Level
EMI(CE)	Refer to figure 9	CISPR22/EN55022	CLASS A / CLASS B
EMI(RE)		CISPR22/EN55022	CLASS A / CLASS B
ESD		IEC/EN61000-4-2	Air ±8KV / Contact ±6KV perf. Criteria B
Radiated immunity		IEC/EN61000-4-3	10V/m perf. Criteria A
EFT	Refer to figure 10	IEC/EN61000-4-4	±2KV perf. Criteria A
Surge		IEC/EN61000-4-5	±4KV perf. Criteria B
Conducted immunity		IEC/EN61000-4-6	10 Vr.m.s perf. Criteria A
Power-frequency magnetic field		IEC/EN61000-4-8	30A/m perf. Criteria A
Voltage dips, drop and interruptions		IEC/EN61000-4-29	0%-40% perf. Criteria B
Safety approvals			UL/EN60950(Pending)

RECOMMENDED CIRCUIT



In order to obtain better performance for the DC/DC models, it's recommended that use input and output filters as (Figure 1).

2) Recommended capacitance

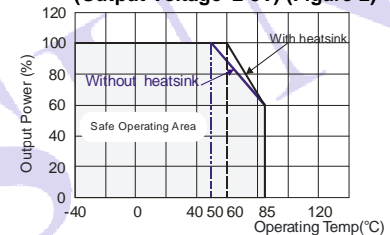
Output Voltage	Capacitance Cout (µF)	Cin(µF)(24V, 48V input)
3.3V、5V	220	100
12V、15V	100	
24V	47	

(Table 1)

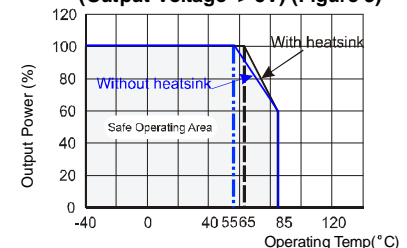
3) No parallel connection or plug and play.

DERATING & EFFICIENCY CURVE

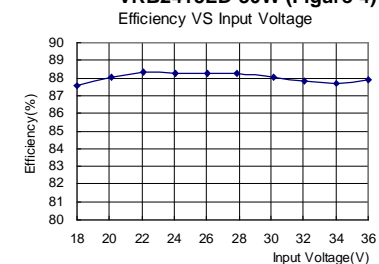
1) Temperature derating curve (Output Voltage ≤ 5V) (Figure 2)



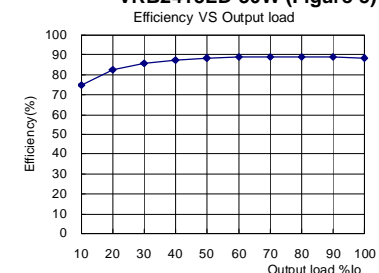
(Output Voltage > 5V) (Figure 3)



2) Efficiency Vs Input voltage(Full Load) VRB2415LD-30W (Figure 4)

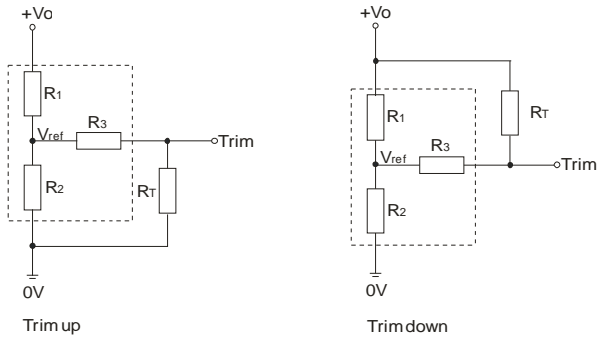


3) Efficiency Vs Output Load(Nominal input) VRB2415LD-30W (Figure 5)



TRIM APPLICATION & TRIM RESISTANCE

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



(Figure 6)

Formula for resistance of Trim

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

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

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

(Table 2)

Note: Value for R1, R2, R3, and Vref refer to the above table (please refer to above table for the value of R1, R2, R3 & Vref (value above are calculated based on internal circuits, the actual value can be available value that similar to the suggested one).

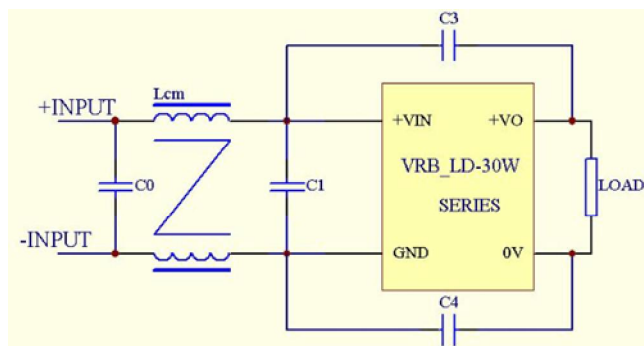
R_T: Resistance of Trim

a: User-defined parameter, no actual meanings.

V_o: The trim up/down voltage.

EMC RECOMMENDED CIRCUIT

VRB_LD-30W(EMI)



EMI recommended external circuit (Figure 7)

EMI recommended external circuit parameters

CLASS A :(Refer to EMI test result figure 9,13)

C1: 2.2μF/100V 1812 MLCC

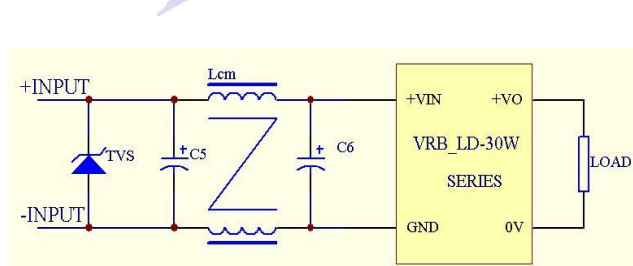
CLASS B :(Refer to EMI test result figure 10,11, 12, 14,15,16)

C0, C1: 4.7μF/100V 1812 MLCC

C3, C4: 1000pF/2KV 1206 MLCC

LCM: 393μH (0.1V/100KHz) CORE:T9*5*4 A05

VRB_LD-30W(EMS)



EMS recommended external circuit(Figure 8)

EMS recommended external circuit parameters

24V Vin:

TVS: SMCJ48A,1500W

C5: CapXon KF series ,470μF/50V ,ESR:55m Ω

C6: CapXon KF series ,1000μF/50V , ESR:36m Ω

Lcm: 393μH (0.1V/100KHz) CORE:T9*5*4 A05

48V Vin:

TVS: SMCJ90A,1500W

C5: CapXon KF series,470μF/100V,ESR:90m Ω

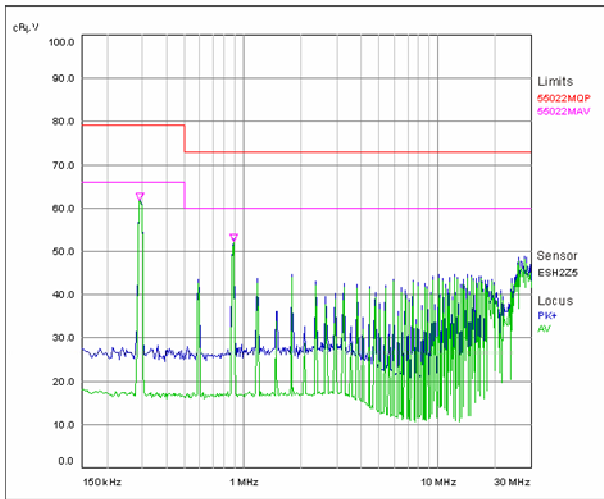
C6: CapXon KF series,1000μF/100V,ESR:66m Ω

Lcm: 393μH (0.1V 100KHz) CORE:T9*5*4 A05

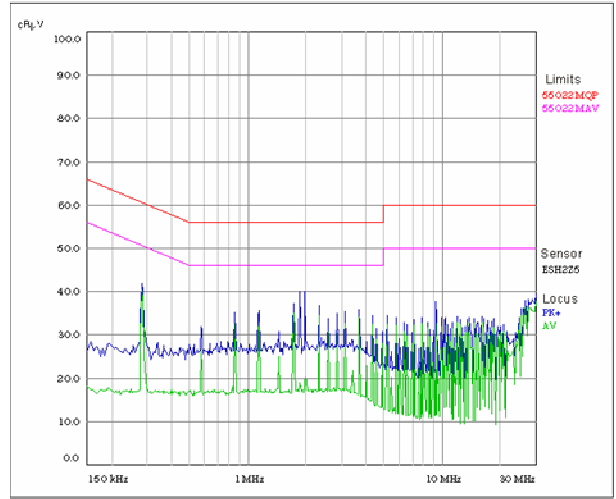
EMC remark:

When both EMS and EMI standards are critical, C0, C1, C3 & C4 with recommended value is to be added to external EMS circuit.

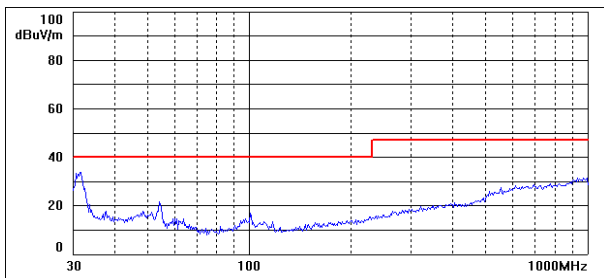
EMI TEST RESULT CHART(NOMINAL INPUT FULL LOAD)



(Figure 9)VRB2415LD-30W(CLASS A)

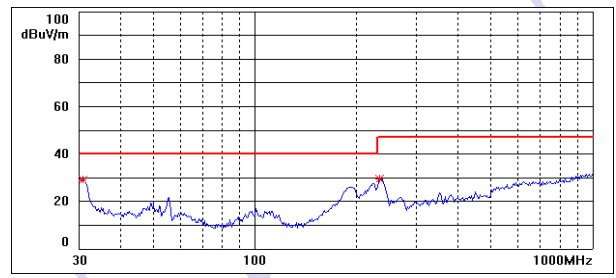


(Figure 10)VRB2415LD-30W(CLASS B)



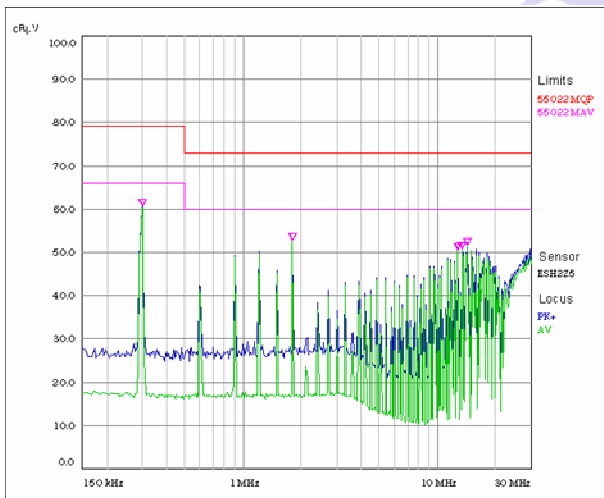
(Figure 11)

VRB2415LD-30W Horizontally polarized radiation(CLASS B)

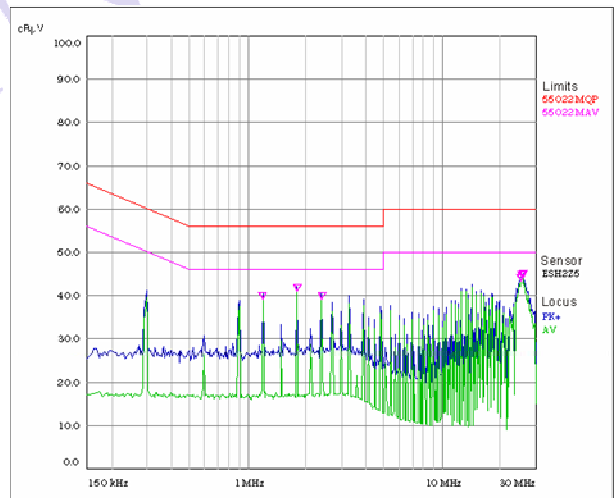


(Figure 12)

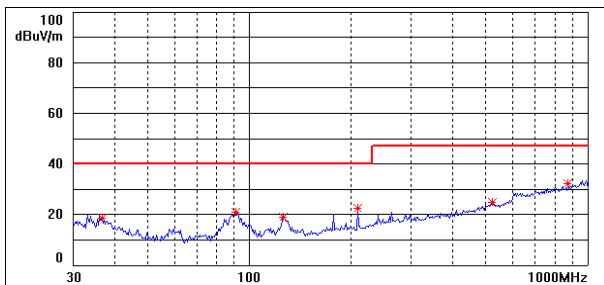
VRB2415LD-30W Vertically polarized radiation(CLASS B)



(Figure 13)VRB4805LD-30W(CLASS A)

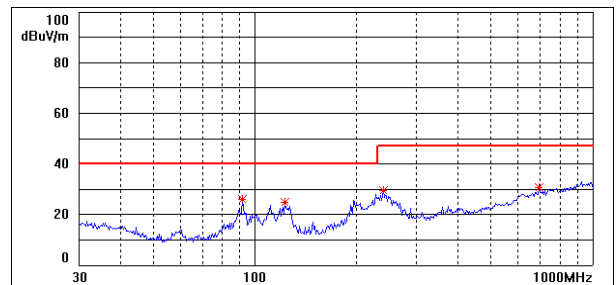


(Figure 14)VRB4805LD-30W(CLASS B)



(Figure 15)

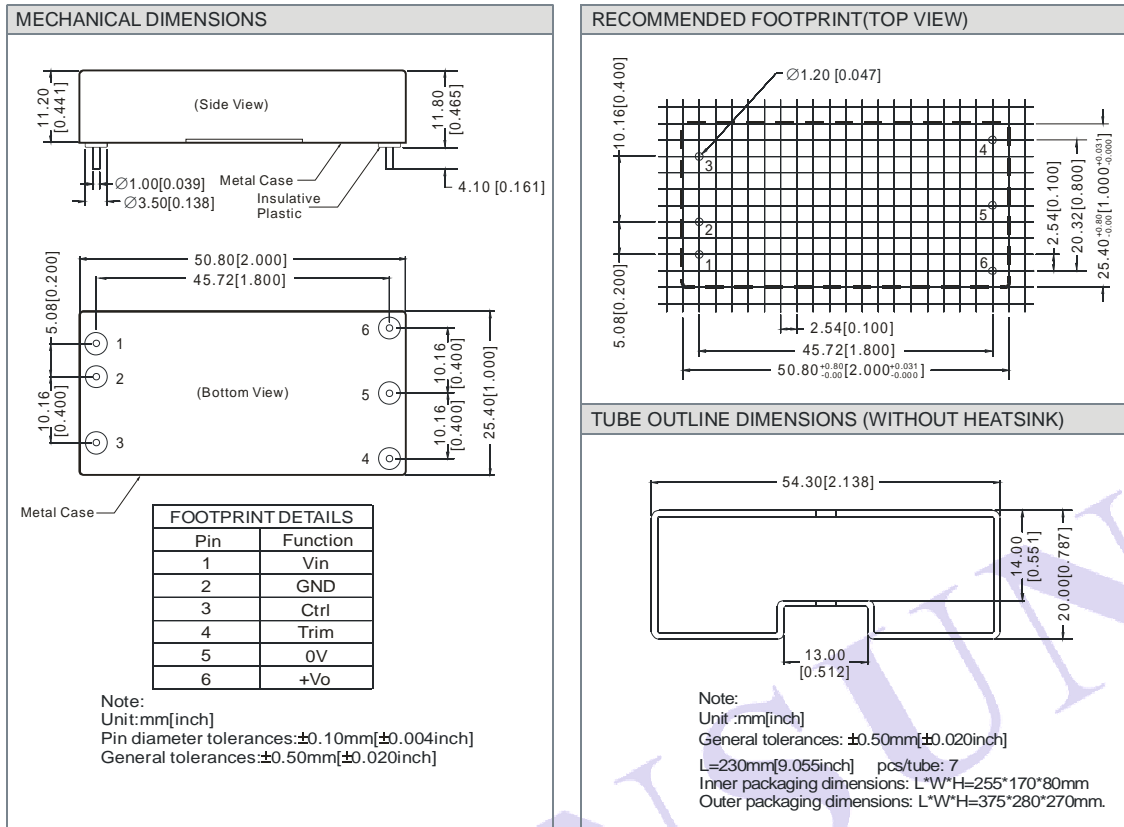
VRB4805LD-30W Horizontally polarized radiation(CLASS B)



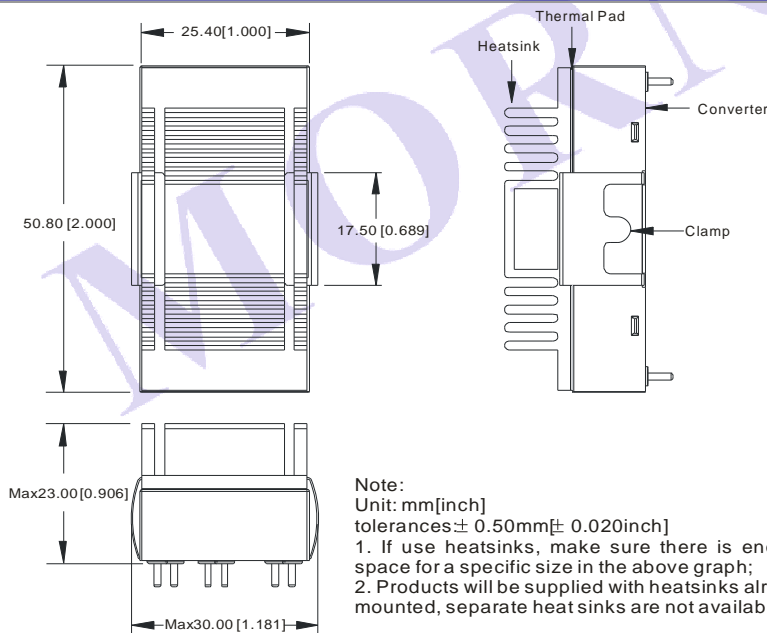
(Figure 16)

VRB4805LD-30W Vertically polarized radiation(CLASS B)

OUTLINE DIMENSIONS & FOOTPRINT DETAILS



HEATSINK ASSEMBLY



PACKAGE DIAGRAM(WITH HEATSINK)



Inner packaging dimensions:
L*W*H=255*170*80mm
Packaging quantity: 24pcs
Outer packaging dimensions:
L*W*H=375*280*270mm
Packaging quantity:144pcs

NOTE

1. Input voltage above it may cause permanent damage to the device.
2. If Minimum operating current less than 10% rated current, output ripple may increase rapidly, the amplitude $\leq 1V$.
3. Capacitor Max load tested at nominal input voltage, full load and constant resistive load.
4. The Ctrl control pin voltage is referenced to GND.
5. Only typical model listed. Non-standard models will be different from the above, please contact us for more details.
6. All specifications are measured at TA=25°C, humidity<75%, nominal input voltage and rated output load unless otherwise specified.
7. In this datasheet, all the test methods of indications are based on corporate standards.