

**SERIES: VWRBS1 | DESCRIPTION: DC-DC CONVERTER**
**FEATURES**

- 1 W isolated output
- wide input (2:1)
- industry standard 8 pin SIP package style
- single unregulated outputs
- 1,500 V isolation
- short circuit protection
- wide temperature (-40~85°C)
- efficiency up to 80%



MODEL	input voltage		output voltage (Vdc)	output current		output power max (W)	ripple and noise <sup>1</sup> typ (mVp-p)	efficiency typ (%)
	typ (Vdc)	range (Vdc)		min (mA)	max (mA)			
VWRBS1-D5-S5-SIP	5	4.5~9	5	20	200	1	35	70
VWRBS1-D5-S9-SIP	5	4.5~9	9	11	111	1	35	71
VWRBS1-D5-S12-SIP	5	4.5~9	12	8	83	1	35	76
VWRBS1-D5-S15-SIP	5	4.5~9	15	7	67	1	35	75
VWRBS1-D12-S5-SIP	12	9~18	5	20	200	1	30	76
VWRBS1-D12-S9-SIP	12	9~18	9	11	111	1	30	78
VWRBS1-D12-S12-SIP	12	9~18	12	8	83	1	30	79
VWRBS1-D12-S15-SIP	12	9~18	15	7	67	1	30	80
VWRBS1-D15-S5-SIP	15	9~18	5	20	200	1	80	75
VWRBS1-D15-S9-SIP	15	9~18	9	11	111	1	80	79
VWRBS1-D15-S12-SIP	15	9~18	12	8	83	1	80	80
VWRBS1-D15-S15-SIP	15	9~18	15	7	67	1	80	81
VWRBS1-D24-S5-SIP	24	18~36	5	20	200	1	55	76
VWRBS1-D24-S9-SIP	24	18~36	9	11	111	1	55	78
VWRBS1-D24-S12-SIP	24	18~36	12	8	83	1	55	80
VWRBS1-D24-S15-SIP	24	18~36	15	7	67	1	55	80
VWRBS1-D48-S5-SIP	48	36~72	5	20	200	1	382	76
VWRBS1-D48-S9-SIP	48	36~72	9	11	111	1	382	78
VWRBS1-D48-S12-SIP	48	36~72	12	8	83	1	382	80
VWRBS1-D48-S15-SIP	48	36~72	15	7	67	1	382	80

Notes: 1. ripple and noise are measured at 20 MHz BW

**PART NUMBER KEY**
**VWRBS1 - DXX - SXX - SIP**

Base Number

Input Voltage

Output Voltage

Packaging Style

**INPUT**

parameter	conditions/description	min	typ	max	units
input surge voltage	for 1,000 ms	5 Vdc model		12	Vdc
		12 Vdc model	-0.7	25	Vdc
		24 Vdc model	-0.7	50	Vdc
		48 Vdc model	-0.7	100	Vdc
internal power dissipation				1.6	W
short circuit input power			1		W
input filter	C filter				

**OUTPUT**

parameter	conditions/description	min	typ	max	units
voltage accuracy	positive		±1	±3	%
	negative		±2	±5	%
line regulation	measured from low line to high line		±0.2	±0.5	%
load regulation	measured from 10% to 100% full load		±0.5	±0.75	%
transient recovery time	25% load step change		8	10	ms
transient response deviation	25% load step change		±3	±5	%
ripple & noise	all other models		25	75	mVp-p
	15 V model		80	150	mVp-p
switching frequency	100% load, nominal input voltage		300		kHz
temperature coefficient				±0.03	%/°C

**PROTECTIONS**

parameter	conditions/description	min	typ	max	units
short circuit protection	continuous, automatic recovery				

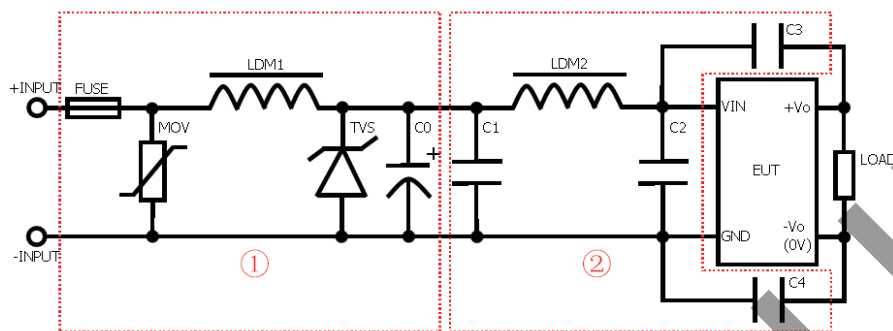
**SAFETY AND COMPLIANCE**

parameter	conditions/description	min	typ	max	units
isolation voltage	tested for 1 minute at 1 mA max.	1,500			Vdc
insulation resistance	at 500 Vdc	1,000			MΩ
isolation capacitance	input to output		35		pF
RoHS compliant	yes				
MTBF	MIL-HDBK-217F, 25°C	1,000,000			hours

**ENVIRONMENTAL**

parameter	conditions/description	min	typ	max	units
operating temperature		-40		85	°C
storage temperature		-50		125	°C
storage humidity	non-condensing			95	%
temperature rise	at full load, 25°C		15	35	°C
	all other models		80	150	°C
lead temperature	1.5 mm from case for 10 seconds			300	°C

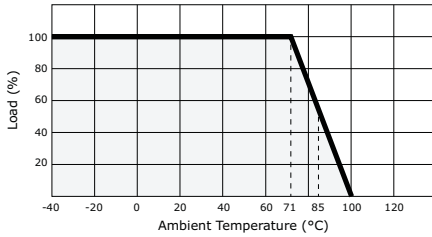
## EMC RECOMMENDED CIRCUIT



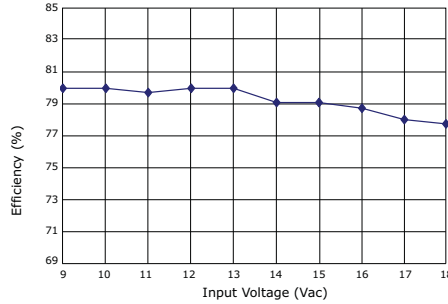
RECOMMENDED EXTERNAL CIRCUIT PARAMETERS	Vin = 5V	Vin = 12V	Vin = 24V	Vin = 48V
FUSE	choose according to load			
MOV	---	---	10D560K	10D121K
LDM1	---	---	82 $\mu$ H, CD53	
TVS	SMCJ13A	SMCJ28A	SMCJ48A	SMCJ100A
C0	680 $\mu$ F / 16 V	680 $\mu$ F / 25 V	120 $\mu$ F / 50 V	120 $\mu$ F / 100 V
C1	4.7 $\mu$ F / 50 V, 1210	2.2 $\mu$ F / 50 V, 1210	4.7 $\mu$ F / 50 V, 1210	4.7 $\mu$ F / 100 V, 1210
LDM2	12 $\mu$ H, CD43			
C2	1 $\mu$ F / 50 V, 1210	1 $\mu$ F / 50 V, 1210	1 $\mu$ F / 50 V, 1210	1 $\mu$ F / 100 V, 1210
C4	100 pF / 2 kV, 1206		100 pF / 2 kV, 1206	100 pF / 2 kV, 1206

## DERATING CURVES

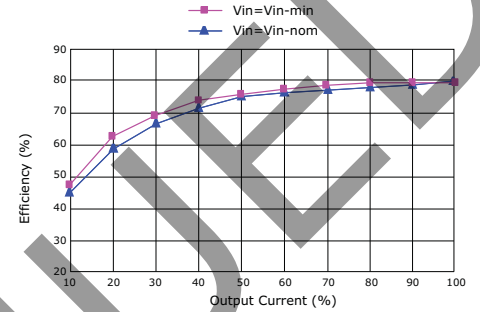
1. output power vs. ambient temperature



2. efficiency vs. output power



3. efficiency vs. output current

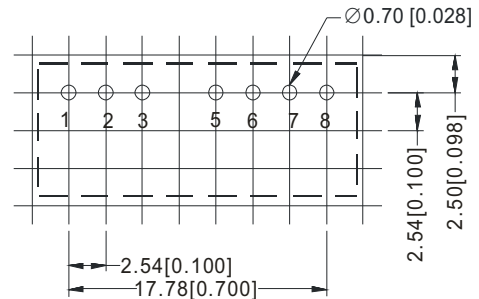
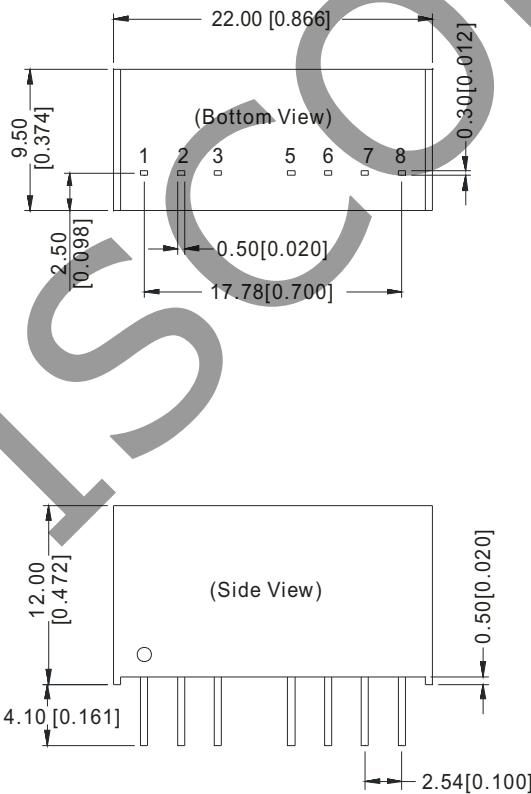


## MECHANICAL

parameter	conditions/description	min	typ	max	units
dimensions	0.866 x 0.472 x 0.374 (22.00 x 12.00 x 9.50 mm)				inch
case material	UL94-V0 epoxy resin				
weight			5		g

## MECHANICAL DRAWING

units: mm [inches]  
 tolerance: ±0.25 [±0.010]  
 pin section tolerance: ±0.10 mm [±0.004]



PIN CONNECTIONS	
PIN	FUNCTION
1	GND
2	Vin
3	CTRL
5	NC
6	+Vo
7	0 V
8	CS

## APPLICATION NOTES

### 1. Requirement on Output Load

In order to ensure the product operates efficiently and reliably, make sure the specified range of input voltage is not exceeded and the minimum output load is not less than 10% load. If the actual load is less than the specified minimum load, the output ripple may increase sharply while its efficiency and reliability will reduce greatly. If the actual output power is very small, please add an appropriate resistor as extra loading.

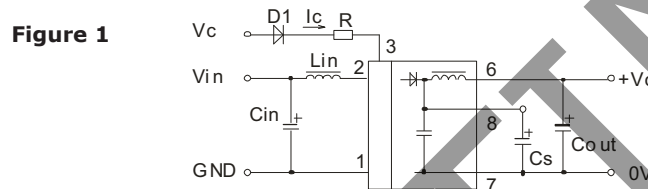
### 2. Overload Protection

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 end or add a circuit breaker to the circuit.

5 Vdc models	12 Vdc models	24 Vdc models	48 Vdc models
1,000 mA slow-blow type	500 mA slow-blow type	250 mA slow-blow type	120 mA slow-blow type

### 3. Recommended Circuit

All VWRBS1 converters have been tested according to the following recommended testing circuit before leaving the factory. This series should be tested under load, never under no load (Figure 1).



However, the capacitance of the output 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 greatest capacitance of its filter capacitor sees (Table 1).

General:

Cin	5, 12 V	100 $\mu$ F
	24, 48 V	10 $\mu$ F
Cout	47 $\mu$ F typ.	
Lin	4.7~120 $\mu$ H	
Lout	2.2~10 $\mu$ H	
Cs	10~22 $\mu$ F	

**Table 1**

Vout (Vdc)	Cout ( $\mu$ F)
3.3	2,200
5	1,000
9	680
12	470
15	330

### 4. CTRL Terminal

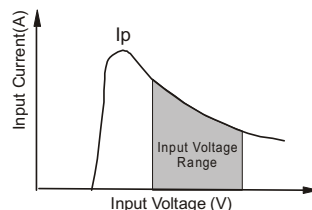
When open or high impedance, the converter work well; When this pin is 'high'; the converter shutdown; It should be note that the input current should between 5~10 mA, exceeding the maximum 20 mA will cause permanence damage to the converter. The value of R can be derived as follows:

$$R = \frac{V_C - V_D - 1.0}{I_C}$$

### 5. Input Current

While using unstable power source, please ensure the output voltage and ripple voltage do not exceed indexes of the converter. The preceding power source must be able to provide for converter sufficient starting current  $I_p$ .

General:  $I_p \leq 1.4 * I_{in-max}$



### 6. No parallel connection or plug and play

## REVISION HISTORY

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rev.	description	date
1.0	initial release	09/10/2008
1.01	new template applied	05/23/2012
1.02	V-Infinity branding removed	09/04/2012

The revision history provided is for informational purposes only and is believed to be accurate.



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