CUI INC®

SERIES: VWRBS1 | DESCRIPTION: DC-DC CONVERTER

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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%

RoHS

MODEL

MODEL	input voltage typ (Vdc)	input voltage range (Vdc)	output voltage (Vdc)	output current min (mA)	output current max (mA)	output power max (W)	ripple and noise[1] typ (mVp-p)	efficiency typ (%)
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

- VWRBS1 — Base Number
- DXX — Input Voltage
- SXX — Output Voltage
- SIP — Packaging Style

INPUT

parameter	conditions/description		min	typ	max	units
input surge voltage	for 1,000 ms	5 Vdc model 12 Vdc model 24 Vdc model 48 Vdc model	-0.7 -0.7 -0.7 -0.7		12 25 50 100	Vdc Vdc Vdc 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 negative	refer to recommended circuit		±1 ±2	±3 ±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 15 V model			25 80	75 150	mVp-p 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 all other models 15 V model		 15 80	 35 150	 °C °C
lead temperature	1.5 mm from case for 10 seconds			300	°C

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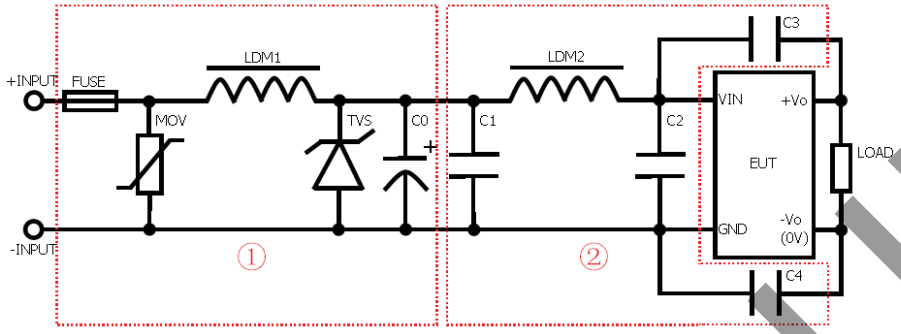
EMC RECOMMENDED CIRCUIT



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

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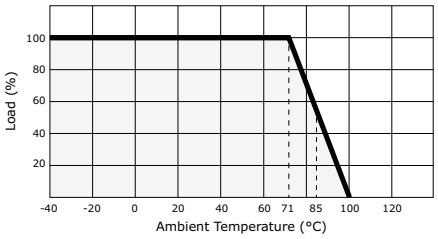
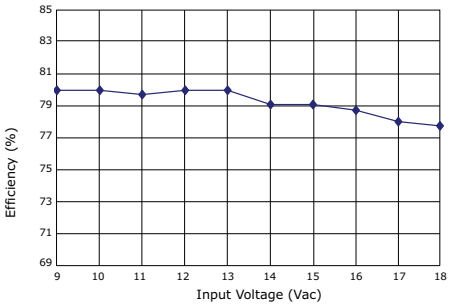
DERATING CURVES

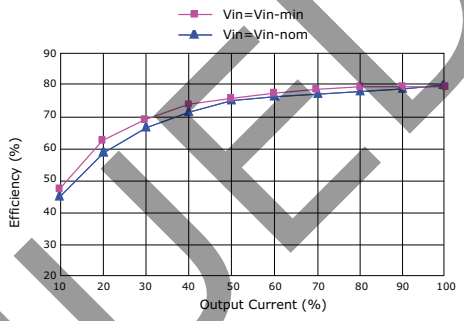
1. output power vs. ambient temperature



2. efficiency vs. output power



3. efficiency vs. output current

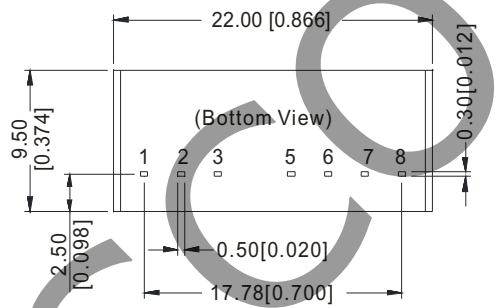


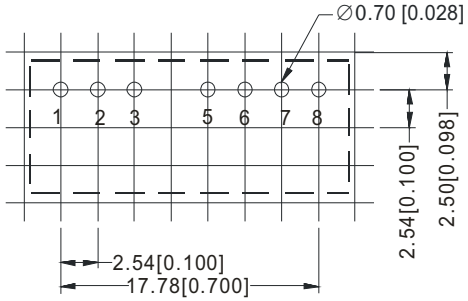
MECHANICAL

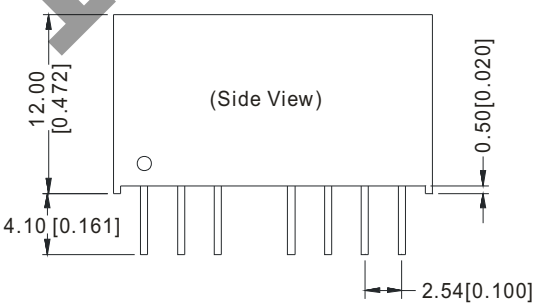
parameter	conditions/description	min	typ	max	units
dimensions	0.866 x 0.472 x 0.374 (22.00 x 12.00 x 9.50 mm)				inch
case material	UL94-V0 epoxy resin				
weight			5		g

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

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APPLICATION NOTES

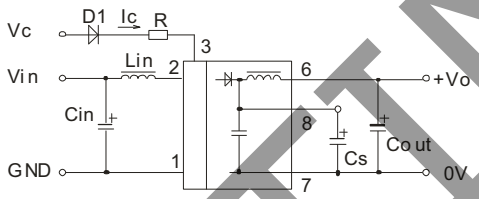
1. **Requirement on Output Load**
In order to ensure the product operates efficiently and reliably, make sure the specified range of input voltage is not exceeded and the minimum output load is not less than 10% load. If the actual load is less than the specifi ed minimum load, the output ripple may increase sharply while its effi ciency 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).

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 μF
	24, 48 V	10 μF
Cout	47 μF typ.	
Lin	4.7~120 μH	
Lout	2.2~10 μH	
Cs	10~22 μF	

Table 1

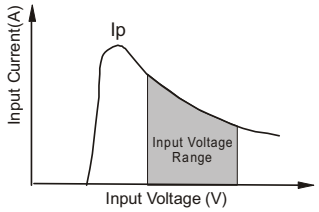
Vout (Vdc)	Cout (μF)
3.3	2,200
5	1,000
9	680
12	470
15	330

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 excced indexes of the converter. The preceding power source must be able to provide for converter sufficient starting current Ip.

General: Ip ≤1.4*Iin-max



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

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REVISION HISTORY

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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CUI offers a two (2) year limited warranty. Complete warranty information is listed on our website.

CUI reserves the right to make changes to the product at any time without notice. Information provided by CUI is believed to be accurate and reliable. However, no responsibility is assumed by CUI for its use, nor for any infringements of patents or other rights of third parties which may result from its use.

CUI products are not authorized or warranted for use as critical components in equipment that requires an extremely high level of reliability. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.