

**SERIES:** VHS1-SIP | **DESCRIPTION:** DC-DC CONVERTER

**FEATURES**

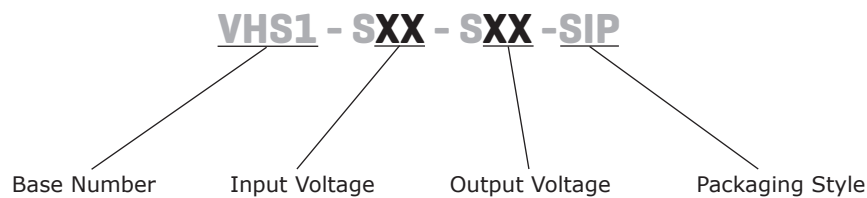
- 1 W isolated output
- industry standard 7 pin SIP package
- single unregulated outputs
- 6,000 V isolation
- short circuit protection
- UL safety approvals
- wide temperature (-40~105°C)
- efficiency up to 82%



MODEL	input voltage		output voltage	output current		output power	ripple and noise <sup>1</sup>	efficiency
	typ (Vdc)	range (Vdc)	(Vdc)	min (mA)	max (mA)	max (W)	max (mVp-p)	typ (%)
VHS1-S5-S5-SIP	5	4.5~5.5	5	20	200	1	200	78
VHS1-S5-S9-SIP	5	4.5~5.5	9	12	111	1	200	79
VHS1-S5-S12-SIP	5	4.5~5.5	12	9	84	1	200	79
VHS1-S5-S15-SIP	5	4.5~5.5	15	7	67	1	200	79
VHS1-S12-S5-SIP	12	10.8~13.2	5	20	200	1	200	80
VHS1-S12-S9-SIP	12	10.8~13.2	9	12	111	1	200	82
VHS1-S12-S12-SIP	12	10.8~13.2	12	9	84	1	200	81
VHS1-S12-S15-SIP	12	10.8~13.2	15	7	67	1	200	82

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

**PART NUMBER KEY**



**INPUT**

parameter	conditions/description	min	typ	max	units
operating input voltage	5 V model	4.5	5	5.5	Vdc
	12 V model	10.8	12	13.2	Vdc

**OUTPUT**

parameter	conditions/description	min	typ	max	units	
line regulation	for Vin change of 1%			±1.2	%	
load regulation	measured from 10% load to full load	5 V model	12.8	15	%	
		9 V model	8.3	15	%	
		12 V model	6.8	15	%	
		15 V model	6.3	15	%	
voltage accuracy	see derating curves					
switching frequency	100% load, input	5 V input models	35	40	65	kHz
	voltage range	12 V input models	35	50	65	kHz
temperature coefficient			±0.03		%/°C	

**PROTECTIONS**

parameter	conditions/description	min	typ	max	units
short circuit protection	continuous			1	s

**SAFETY AND COMPLIANCE**

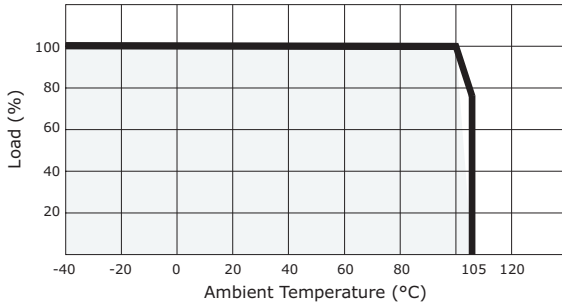
parameter	conditions/description	min	typ	max	units
isolation voltage	for 1 minute at 1 mA max.	6,000			Vdc
isolation resistance	at 500 Vdc	1,000			MΩ
safety approvals	UL 60950-1				
MTBF		3,500,000			hours
RoHS	2011/65/EU				

**ENVIRONMENTAL**

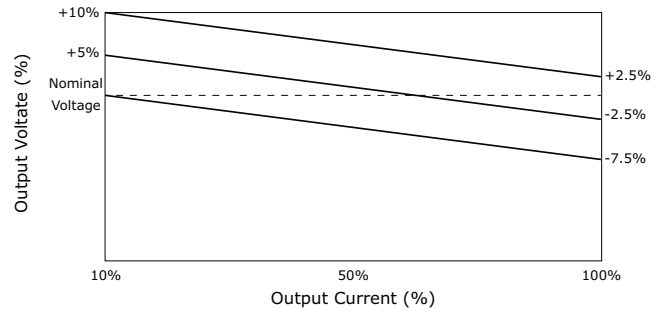
parameter	conditions/description	min	typ	max	units
operating temperature	see derating curve	-40		105	°C
storage temperature		-55		125	°C
storage humidity	non-condensing			95	%
temperature rise	at full load		15	25	°C
lead temperature	1.5 mm from case for 10 seconds			300	°C

## DERATING CURVES

1. output power vs. ambient temperature



2. output voltage vs. output current

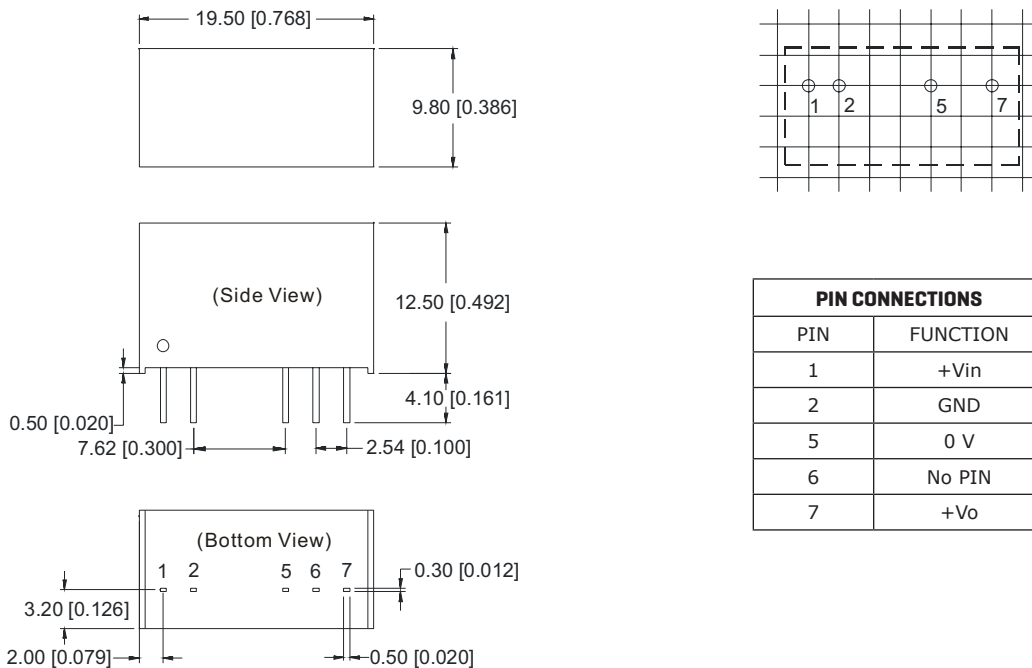


## MECHANICAL

parameter	conditions/description	min	typ	max	units
dimensions	19.50 x 9.80 x 12.50 (0.768 x 0.386 x 0.492 inch)				mm
case material	plastic (UL94-V0)				
weight			4.2		g

## MECHANICAL DRAWING

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



## 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.

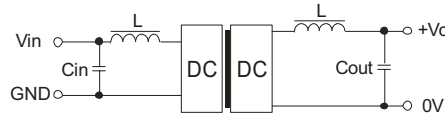
### 2. Overload Protection

Under normal operating conditions, the output circuit of these products has no protection against over-current and short-circuits. The simplest method is to connect a self-recovery fuse in series at the input end or add a circuit breaker to the circuit.

### 3. Filtering

In some circuits which are sensitive to noise and ripple, a filtering capacitor may be added to the DC/DC output end and input end to reduce the noise and ripple. 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 the external capacitor table. To get an extremely low ripple, an "LC" filtering network may be connected to the input and output ends of the DC/DC converter, which may produce a more significant filtering effect. It should also be noted that the inductance and the frequency of the "LC" filtering network should be staggered with the DC/DC frequency to avoid mutual interference (Figure 1).

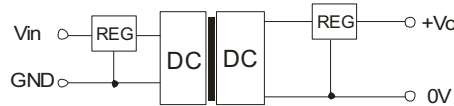
Figure 1



### 4. Output Voltage Regulation and Over-voltage Protection Circuit

The simplest device for output voltage regulation, over-voltage and over-current protection is a linear voltage regulator with overheat protection that is connected to the input or output end in series (Figure 2).

Figure 2



### 5. External Capacitor Table

It is not recommended to connect any external capacitor in the application field with less than 0.5 W output.

Table 1

Vin (Vdc)	Cout (μF)	Vout (Vdc)	Cout (μF)
5	4.7	5	10
12	2.2	9	4.7
--	--	12	2.2
--	--	15	1

## REVISION HISTORY

rev.	description	date
1.0	initial release	01/03/2011
1.01	new template applied	04/12/2012
1.02	V-Infinity branding removed	09/05/2012
1.03	added 9 and 15 V load regulation data	11/05/2012
1.04	5 V input models changed efficiency, switching frequency, short circuit protection, and operating temperature	06/17/2013
1.05	updated datasheet	12/02/2014

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



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