

W7 Family

of 5 to 7 Watt Isolated SMD converters



1400 PROVIDENCE HIGHWAY • BUILDING 2
NORWOOD, MASSACHUSETTS 02062-5015
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Features

- * Efficiency to 83%
- * Regulated output
- * Continuous short circuit protection
- * 24-Pin SMD package
- * 2: 1 input range
- * Pi input filter



Model Number	Input Voltage	Output		Input current		EFF. %
		Voltage	Current	NO load	Full load	
W7-12S5	9-18VDC	5VDC	1500mA	25mA	801mA	78
W7-12S12		12VDC	625mA	25mA	762mA	82
W7-12S15		15VDC	500mA	25mA	762mA	82
W7-12D5		±5VDC	±750mA	30mA	791mA	79
W7-12D12		±12VDC	±310mA	30mA	753mA	83
W7-12D15		±15VDC	±250mA	30mA	753mA	83
W7-12S3.3		3.3VDC	1500mA	25mA	557mA	74
W7-24S5	18-36VDC	5VDC	1500mA	20mA	396mA	79
W7-24S12		12VDC	625mA	20mA	381mA	82
W7-24S15		15VDC	500mA	20mA	381mA	82
W7-24D5		±5VDC	±750mA	25mA	386mA	81
W7-24D12		±12VDC	±310mA	25mA	377mA	83
W7-24D15		±15VDC	±250mA	25mA	377mA	83
W7-24S3.3		3.3VDC	1500mA	20mA	271mA	76
W7-48S5	36-72VDC	5VDC	1500mA	10mA	195mA	80
W7-48S12		12VDC	625mA	10mA	190mA	82
W7-48S15		15VDC	500mA	10mA	190mA	82
W7-48D5		±5VDC	±750mA	15mA	193mA	81
W7-48D12		±12VDC	±310mA	15mA	188mA	83
W7-48D15		±15VDC	±250mA	15mA	188mA	83
W7-48S3.3		3.3VDC	1500mA	10mA	136mA	76

Note : 1. Nominal input voltage 12, 24, 48 VDC

2. All specifications are typical are nominal input, full load at 25 °C unless otherwise stated

3. AS case

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Absolute maximum rating

Characteristic	Min.	Max.	Unit
Case temperature	--	100	°C
Operating temperature	-25	71	°C
Storage temperature	-40	100	°C
I/O isolation voltage	1500	--	VDC
I/O isolation resistance	10 ⁻⁹	--	ohms

Output specification

Characteristic	Max.	Unit	Note
Voltage accuracy	±2	%	
Voltage balance(dual)	±1	%	
Temperature coefficient	±0.05	% / °C	
Ripple and noise	100	mVp-p	20MHz bandwidth
Line regulation	±0.2	%	Measure from high line to low line
Load regulation(3.3/5Vdc)	±1.5	%	Measure from full load to 10% load
Load regulation(12/15Vdc)	±0.5	%	Measure from full load to 10% load
Load regulation(dual)	±1	%	Measure from full load to 25% load

Case material

Black coated copper with Non-conductive base. Five-sided metal case.

Case dimensions

1.25x1.0x0.45 inches(31.9x25.4x11.5mm)

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Characterization

General information

The W7 unit has many operational characterized aspects, including efficiency, start up delay time, overshoot, output ripple & noise, dynamic response to load , and over current limit.

Efficiency

Efficiency at nominal input, maximum lout. The ambient temperature is 25 °C, airfolw is 20LFM(0.1m/s).

Model	Min.	Typ.	Max.	Units	Note
W7-12S5	77	78	--	%	
W7-12S12	81	82	--	%	
W7-12S15	81	82	--	%	
W7-12D5	78	79	--	%	
W7-12D12	82	83	--	%	
W7-12D15	82	83	--	%	
W7-12S3.3	73	74	--	%	
W7-24S5	78	79	--	%	
W7-24S12	81	82	--	%	
W7-24S15	81	82	--	%	
W7-24D5	80	81	--	%	
W7-24D12	82	83	--	%	
W7-24D15	82	83	--	%	
W7-24S3.3	75	76	--	%	
W7-48S5	79	80	--	%	
W7-48S12	81	82	--	%	
W7-48S15	81	82	--	%	
W7-48D5	80	81	--	%	
W7-48D12	82	83	--	%	
W7-48D15	82	83	--	%	
W7-48S3.3	75	76	--	%	

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Start up delay time

Start up input power, measuring the time between input power is turn on and output voltage go within 90% Vout. At nominal input and maximum load.

Model	Min.	Typ.	Max.	Units	Note
W7-12S5	--	0.4	0.8	ms	
W7-12S12	--	2.2	4.4	ms	The waveforms see fig.1
W7-12S15	--	2.5	5	ms	
W7-12D5	--	1.7	3.4	ms	
W7-12D12	--	5	10	ms	
W7-12D15	--	10	20	ms	
W7-12S3.3	--	0.5	1	ms	
W7-24S5	--	15	30	ms	
W7-24S12	--	20	40	ms	
W7-24S15	--	20	40	ms	
W7-24D5	--	20	40	ms	The waveforms see fig.2
W7-24D12	--	20	40	ms	
W7-24D15	--	25	50	ms	
W7-24S3.3	--	20	40	ms	
W7-48S5	--	15	30	ms	
W7-48S12	--	20	40	ms	
W7-48S15	-- <td 20	40	ms		
W7-48D5	--	20	40	ms	
W7-48D12	--	20	40	ms	
W7-48D15	--	25	50	ms	
W7-48S3.3	--	20	40	ms	

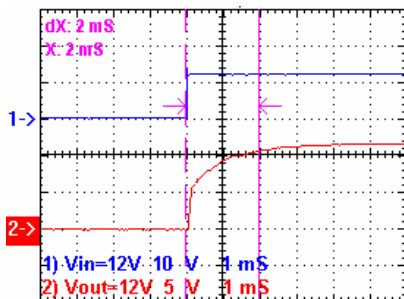


Fig. 1 : W7-12S12 start up delay time

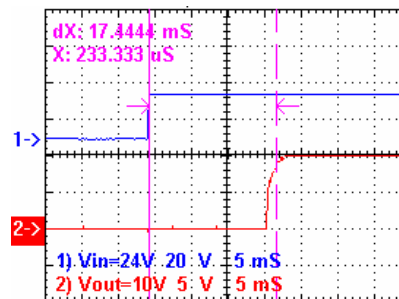


Fig. 2 : W7-24S12 start up delay time

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Overshoot

Start up input power, measuring the deviation which over the output. At nominal input and maximum load.

Model	Min.	Typ.	Max.	Units	Note
W7-12S5	--	5	10	%	
W7-12S12	--	2	10	%	The waveforms see fig.3
W7-12S15	--	2	10	%	
W7-12D5	--	4	10	%	
W7-12D12	--	2	10	%	
W7-12D15	--	2	10	%	
W7-12S3.3	--	10	15	%	
W7-24S5	--	5	10	%	
W7-24S12	--	2	10	%	
W7-24S15	--	2	10	%	
W7-24D5	--	4	10	%	The waveforms see fig.4
W7-24D12	--	2	10	%	
W7-24D15	--	2	10	%	
W7-24S3.3	--	10	15	%	
W7-48S5	--	5	10	%	
W7-48S12	--	2	10	%	
W7-48S15	--	2	10	%	
W7-48D5	--	4	10	%	
W7-48D12	--	2	10	%	
W7-48D15	--	2	10	%	
W7-48S3.3	--	10	15	%	

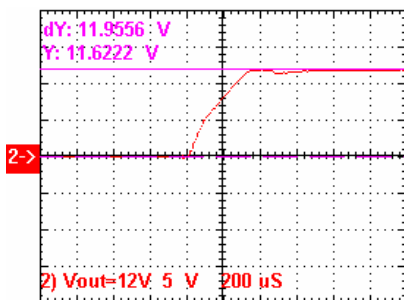


Fig.3 : W7-12S12 overshoot

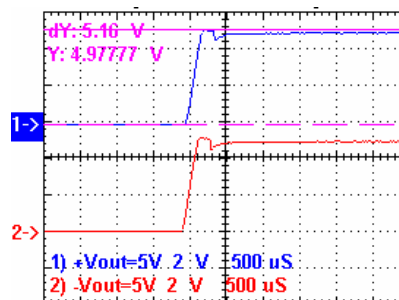


Fig. 4 : W7-24S12 overshoot

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Rise time

Start up input power, measuring the time between 0% to 90% of output. At nominal input and maximum load.

Model	Min.	Typ.	Max.	Units	Note
W7-12S5	--	0.2	--	ms	
W7-12S12	--	2	--	ms	The waveforms see fig.5
W7-12S15	--	2.3	--	ms	
W7-12D5	--	1.5	--	ms	
W7-12D12	--	4.5	--	ms	
W7-12D15	--	6	--	ms	
W7-12S3.3	--	0.4	--	ms	
W7-24S5	--	0.2	--	ms	
W7-24S12	--	2	--	ms	
W7-24S15	--	2.3	--	ms	
W7-24D5	--	1.5	--	ms	The waveforms see fig.6
W7-24D12	--	4.5	--	ms	
W7-24D15	--	6	--	ms	
W7-24S3.3	--	0.4	--	ms	
W7-48S5	--	0.2	--	ms	
W7-48S12	--	2	--	ms	
W7-48S15	--	2.3	--	ms	
W7-48D5	--	1.5	--	ms	
W7-48D12	--	4.5	--	ms	
W7-48D15	--	6	--	ms	
W7-48S3.3	--	0.4	--	ms	

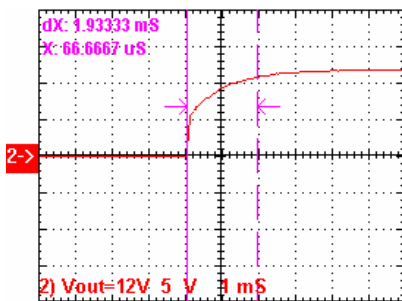


Fig. 5 : W7-12S12 rise time

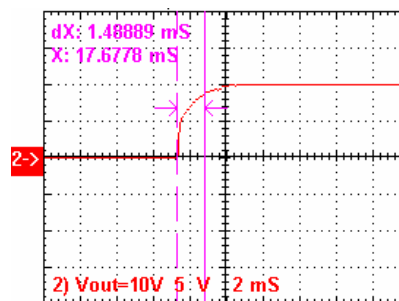


Fig. 6 : W7-24S12 rise time

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Hold time

Measure from the power supply end to when Vout drop down to 95% output. At nominal input and maximum load.

Model	Min.	Typ.	Max.	Units	Note
W7-12S5	--	100	200	us	
W7-12S12	--	100	200	us	The waveforms see fig.7
W7-12S15	--	100	200	us	
W7-12D5	--	100	200	us	
W7-12D12	--	100	200	us	
W7-12D15	--	100	200	us	
W7-12S3.3	--	100	200	us	
W7-24S5	--	100	200	us	
W7-24S12	--	100	200	us	
W7-24S15	--	100	200	us	
W7-24D5	--	100	200	us	The waveforms see fig.8
W7-24D12	--	100	200	us	
W7-24D15	--	100	200	us	
W7-24S3.3	--	100	200	us	
W7-48S5	--	200	400	us	
W7-48S12	--	200	400	us	
W7-48S15	--	200	400	us	
W7-48D5	--	200	400	us	
W7-48D12	--	200	400	us	
W7-48D15	--	200	400	us	
W7-48S3.3	--	200	400	us	

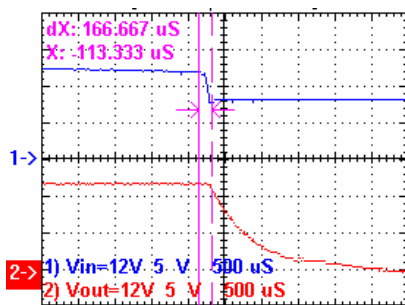


Fig. 7 : W7-12S12 hold time

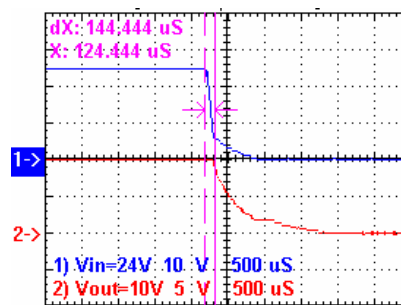


Fig. 8 : W7-24S12 hold time

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Dynamic response

Output voltage dynamic response at nominal input and different load condition (load change 100% load to 75% load). Load current=0.1A/us, Ton=Toff=2.5ms.

Peak Deviation

Model	Typ.	Max.	Units	Note
W7 series	2	--	%	The waveforms see fig.9, fig.10

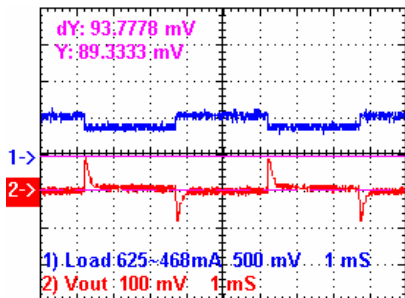


Fig. 9 : W7-12S12 peak deviation

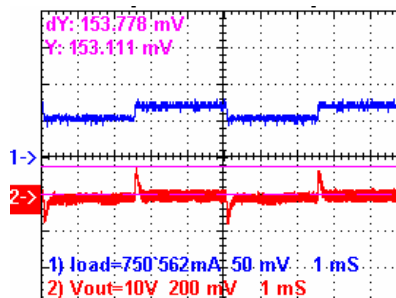


Fig. 10 : W7-24S12 peak deviation

Recovery time

Model	Typ.	Max.	Units	Note
W7 series	300	600	us	The waveforms see fig.11, fig.12

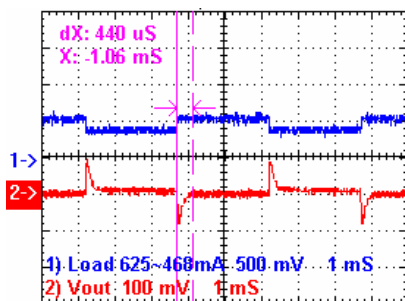


Fig. 11 : W7-12S12 recovery time

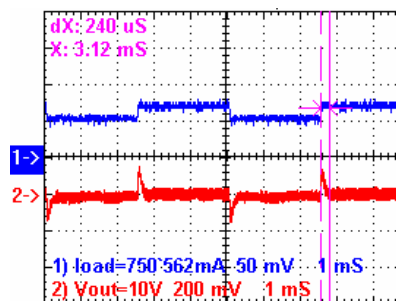


Fig. 12 : W7-24S12 recovery time

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Output ripple and noise

Measuring output ripple waveform peak to peak. Measurement bandwidth 20 MHz. At nominal input, maximum load and output with a 0.1uF ceramic capacitor.

Model	Min.	Typ.	Max.	Units	Note
W7 single	--	50	100	mVp-p	The waveforms see fig.13
W7 dual	--	60	100	mVp-p	The waveforms see fig.14

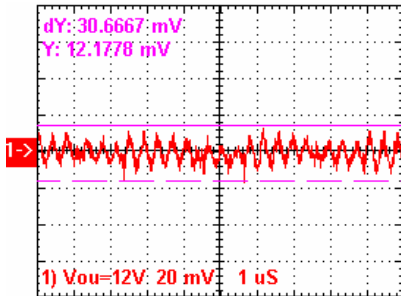


Fig. 13 : W7-12S12 output ripple & noise

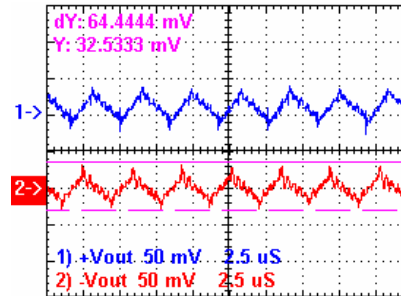


Fig. 14 : W7-24S12 output ripple & noise

Switch frequency

Model	Min.	Typ.	Max.	Units	Note
W7 series	270	300	330	KHz	

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Input ripple current

Measure input ripple current. At nominal input and maximum load. (current probe with 10mA/div)

Model	Min.	Typ.	Max.	Units	Note
W7 series	--	80	--	mA	The waveforms see fig.15, fig.16

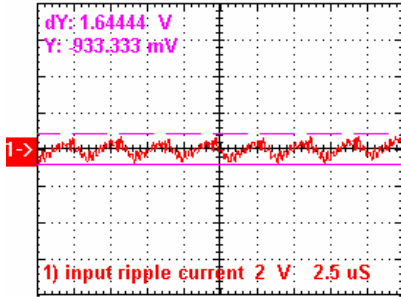


Fig. 15 : W7-12S12 input ripple current

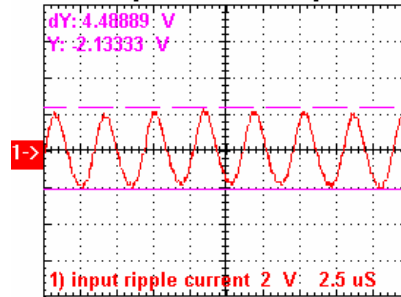


Fig. 16 : W7-24S12 input ripple current

Output current limit

Increase the output current until output voltage is out of specification. At nominal input.

Model	Min.	Typ.	Max.	Units	Note
W7 series	120	140	180	%	The waveforms see fig.17, fig.18

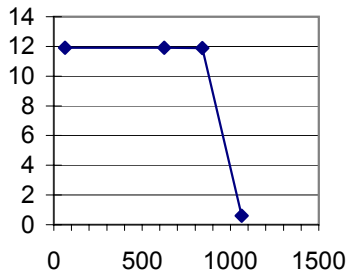


Fig. 17 : W7-12S12 current limit

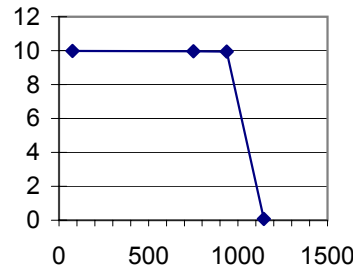


Fig. 18 : W7-24S12 current limit

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Load regulation

Model	Min.	Typ.	Max.	Units	Note
W7-12S5	--	1.1	1.5	%	
W7-12S12	--	0.2	0.5	%	
W7-12S15	--	0.1	0.5	%	
W7-12D5	--	0.5	1	%	
W7-12D12	--	0.1	1	%	
W7-12D15	--	0.1	1	%	
W7-12S3.3	--	1.1	1.5	%	
W7-24S5	--	1.1	1.5	%	
W7-24S12	--	0.2	0.5	%	
W7-24S15	--	0.1	0.5	%	
W7-24D5	--	0.5	1	%	
W7-24D12	--	0.1	1	%	
W7-24D15	--	0.1	1	%	
W7-24S3.3	--	1.1	1.5	%	
W7-48S5	--	1.1	1.5	%	
W7-48S12	--	0.2	0.5	%	
W7-48S15	--	0.1	0.5	%	
W7-48D5	--	0.5	1	%	
W7-48D12	--	0.1	1	%	
W7-48D15	--	0.1	1	%	
W7-48S3.3	--	1.1	1.5	%	

Line regulation

Model	Min.	Typ.	Max.	Units	Note
W7 series	--	0.05	0.2	%	

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Protection Features

Input under voltage lockout(IUV)

Input under voltage lockout(IUV) is standard with the W7 unit. The unit will shut down when the input voltage drops below a threshold(minimum), and the unit will turn on when the input voltage goes to the upper threshold(maximum).

Input voltage	Min.	Typ.	Max.	Units	Note
9-18VDC	7.5	--	8.5	V	
18-36VDC	16	--	17	V	
36-72VDC	31	--	34	V	

Output over current protection(OCP) & Short circuit protection

The unit will auto recovery current limit when the over current or short circuit condition exists.

Once the OCP happens, the unit has auto recovery current limit. The attempted restart will continue indefinitely until the over current or short circuit condition is removed. When OCP happens, the output voltage drops below 0V.(see fig.19, fig. 20)

Input voltage has almost no effect on the current limit point.

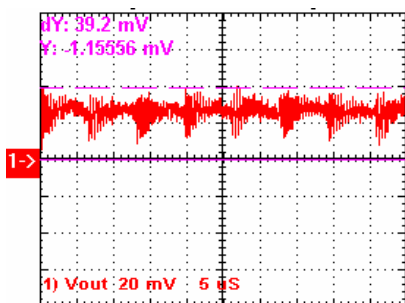


Fig. 19 : W7-12S12 output waveform

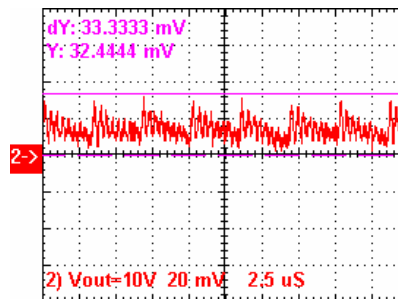


Fig. 20 : W7-24S12 output waveform

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Basic operation connection

Input (V_{i+} , V_{i-})

Input power V_{in+} must be connected to Positive input voltage (V_{i+}) ; Input power V_{in-} must be connected to Negative voltage (V_{i-}) , (see Fig.18, Fig.19 and Fig.20)

Output (V_{o+} , V_{o-})

Output power V_{out+} must be connected to Positive output voltage (V_{o+}) ; Output power V_{out-} must be Negative output voltage (V_{o-}). (see Fig.21, Fig.22 and Fig.23)

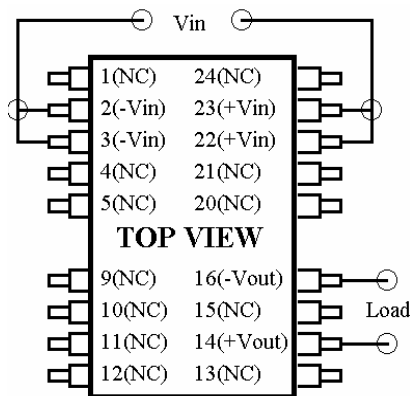


Fig. 21 : Single output typical connection

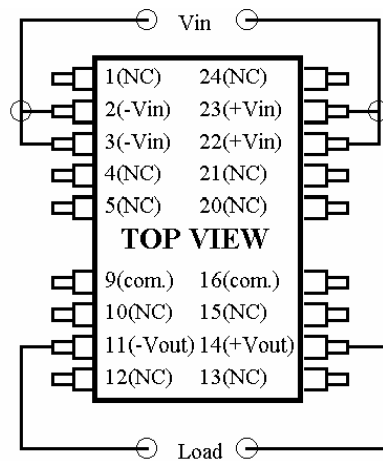


Fig. 22 : Dual output typical connector

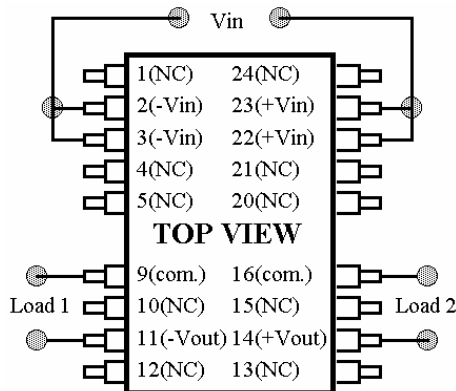


Fig. 23 : Dual output typical connection

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Outline diagram

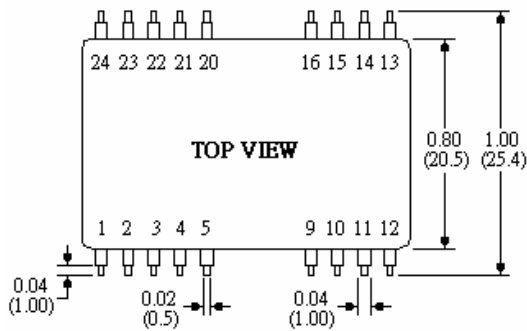


Fig. 24 : Outline diagram

Recommend land pattern

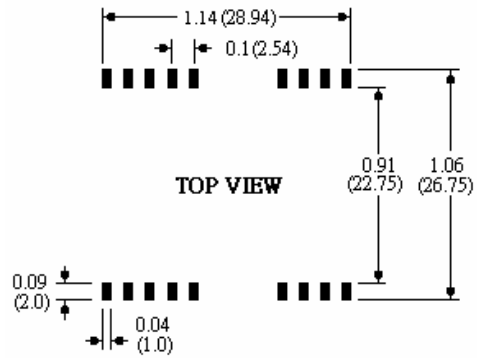
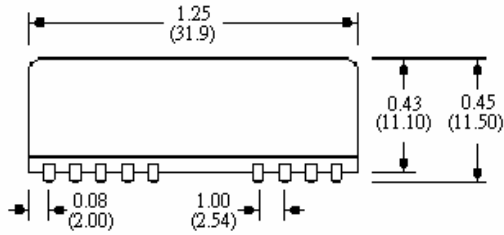


Fig. 25 : Recommend land pattern



*. All dimenons in inches(mm)
tolerance .xx=±.010

Recommend reflow profile

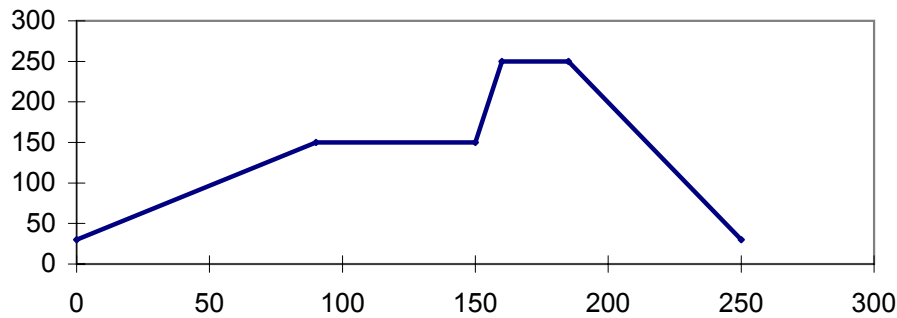


Fig. 26 : Recommend reflow profile

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of 5 to 7 Watt Isolated SMD converters



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Derating curve

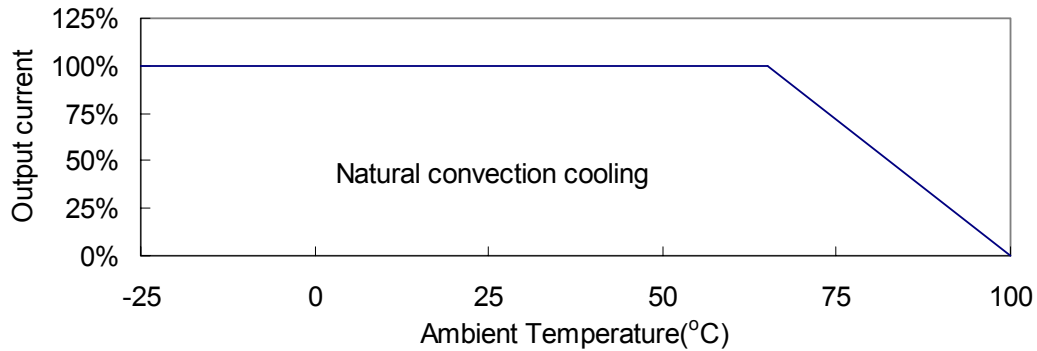


Fig. 27 : Derating curve

Thermal image

Measure case temperature. At nominal input , maximum load , ambient temperature 25°C and airflow is natural convection(20LFM).

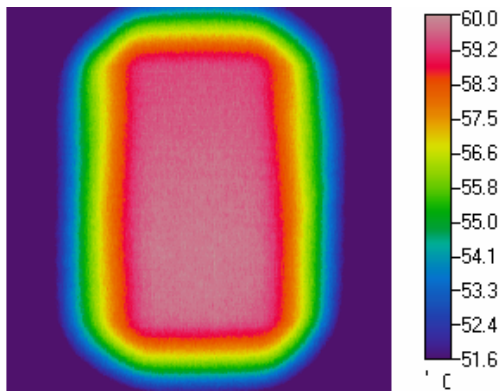


Fig. 28 : W7-48S3.3 case thermal image