

**Wall Industries, Inc.**

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# SP24S12-50

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50W DC-DC Converter  
18-36 Vdc Input  
12 Vdc Output at 4.16A  
Half-Brick Package

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**Features:**

- **82% Efficient at Full Load**
- **Fast Transient Response**
- **Operation to No Load**
- **100% Burn In**
- **Remote ON/OFF (Active High/Low)**
- **Remote Sense Compensation**
- **UL 1950 Listed - CE Mark**
- **Low Output Ripple**
- **Fixed Switching Frequency**
- **Output Over Current Protection**
- **Output Short Circuit Protection**
- **Over Temperature Protection**
- **1500 Vdc Isolation**
- **Test Board Available**

**Description:**

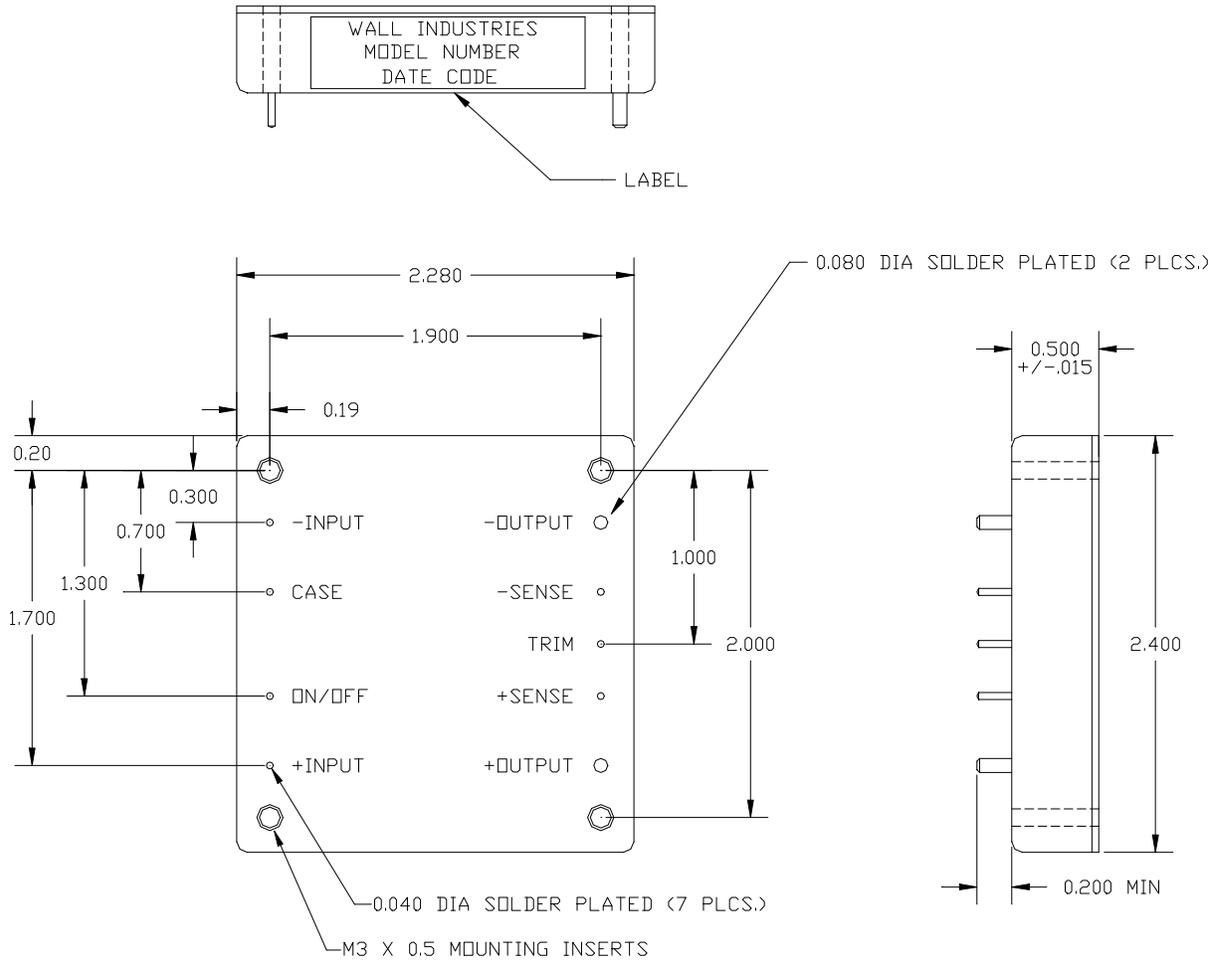
The SP & SPW series is a high-density half brick converter that incorporates the desired features required in today's demanding applications. When performance, reliability, and low cost are needed, the SP & SPW series delivers.

Technical Specifications		Model No.		SP24S12-50			
All specifications are based on 25C, Nominal Line and Full Load unless otherwise noted. We reserve the right to change specifications based on technological advances.							
SPECIFICATION		Related condition		MIN	NOM	MAX	Unit Measured
<b>INPUT</b>							
Turn on at					17		Volt DC
Turn off at					16		Volt DC
Input Over voltage Shutdown							
Turn off at					38		Volt DC
Turn on at					37		Volt DC
Operating Voltage Range		Rated Input Voltage		18	24	36	Volt DC
Maximum Input Current		Low Line 100% load			3.3		A
No Load Input Current					60		mA
Input Current under "LOGIC OFF"					<1		mA
Inrush Current Transient Rating					1		A <sup>2</sup> Sec
Reflected Ripple Current		12uH / 33uF input filter			14		mA
<b>OUTPUT</b>							
Output Voltage Set point				11.88	12	12.12	Volt DC
Output Voltage Regulation							
Over Load					± 0.1		%
Over Line					± 0.1		%
Over Temperature					0.02		% / °C
Output Voltage Ripple and Noise							
Basic Ripple					42		mV
Spikes P-P					78	180	mV
Output Current Ranges		Rated Output Current		0		4.166	A
Output Current Limit		Self Resetting		5	5.83	6.667	A
Short Term Output Current Surge							A/sec
<b>DYNAMIC CHARACTERISTICS</b>							
Input Voltage Ripple Rejection		120 Hz			60		dB
Output Transient and Load Changes							
Load step / ΔV		X	50 to 75%		50 to 100%	94	mV
Load step / ΔV		X	75 to 50%		100 to 50 %	84	mV
Recovery Time		To within 1% Rated Vo			140		μsec
Turn on Delay		From Vin(nom) to 90% Vout (nom)			225		msec
Overshoot of Output Voltage		Full Load Resistive			0		%
<b>EFFICIENCY</b>							
@ 100% load					85		%
@ 75% load					85		%
@ 50% load					84		%
@ 25% load					79		%
<b>TEMPERATURE CONSIDERATIONS</b>							
Thermal Resistance							
Normal Convection		Rθc-a			7.5		°C/Watt
100 lfm					6.2		°C/Watt
200 lfm					5.1		°C/Watt
300 lfm					4.3		°C/Watt
400 lfm					3.5		°C/Watt
Heatsink Considerations		Available, Contact Factory					
<b>General Technical Data</b>							
Switching Frequency		Fixed			400		KHz
Remote ON OFF Control (See Note Below)		Active HIGH, Open Collector					TTL
Trimmability				10.8		13.2	Volt DC
Over Temperature Shutdown		Case Temperature				105	°C
<b>MTBF</b>							
		Bellcore TR-332			3.51E6		Hours

Note: Positive Remote ON/OFF control is standard. To order negative logic Remote ON/OFF control add the suffix "R" to the part number.

**Figure 1: Mechanical Dimensions**

Unit: inches



Tolerance: X.XX ±0.020  
 X.XXX±0.010

## Output Voltage Trim

The following information is provided to allow quick calculation of the trim resistor value for a desired output voltage. The general procedure for calculating a trim resistor is as follows:

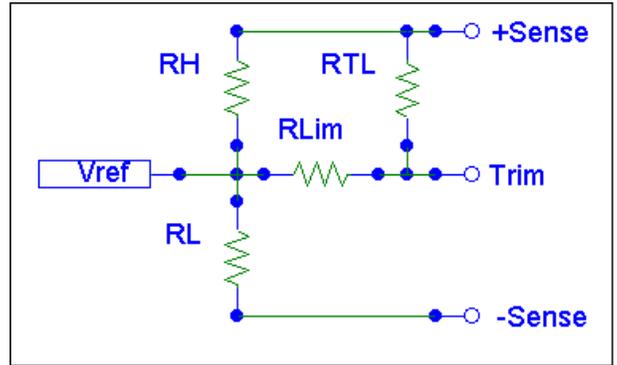
1. Determine the desired output voltage (Vo)
2. Select Equation. (Trim Low/Trim High)
3. Use the data in Table 1 to complete the equation.
4. Evaluate.

In order to trim low use Equation 1 and Table 1 to calculate resistor RTL for the desired output voltage.

### Equation 1: Trim Low

$$RT_L = \left[ \frac{V_o - V_{REF}}{\left(\frac{V_{REF}}{R_L}\right) - \left(\frac{1}{R_H} \cdot (V_o - V_{REF})\right)} \right] - R_{LIM}$$

*Vo - Desired output voltage.  
All resistor values in K ohms.*



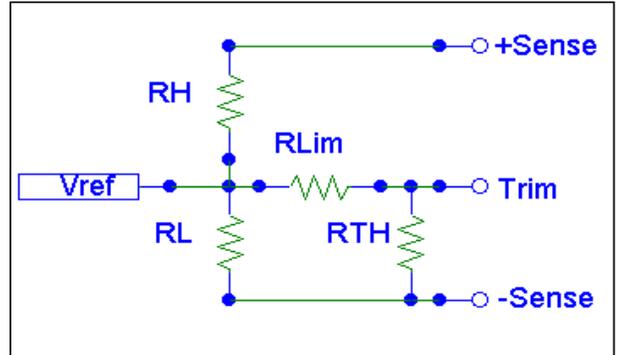
**Schematic 1: Trim Low**

In order to trim high use Equation 2 and Table 1 to calculate resistor RTH for the desired output voltage.

### Equation 2: Trim High

$$RT_H = \left[ \frac{V_{REF}}{\left(\frac{V_o - V_{REF}}{R_H}\right) - \left(\frac{V_{REF}}{R_L}\right)} \right] - R_{LIM}$$

*Vo - Desired output voltage.  
All resistor values in K ohms.*

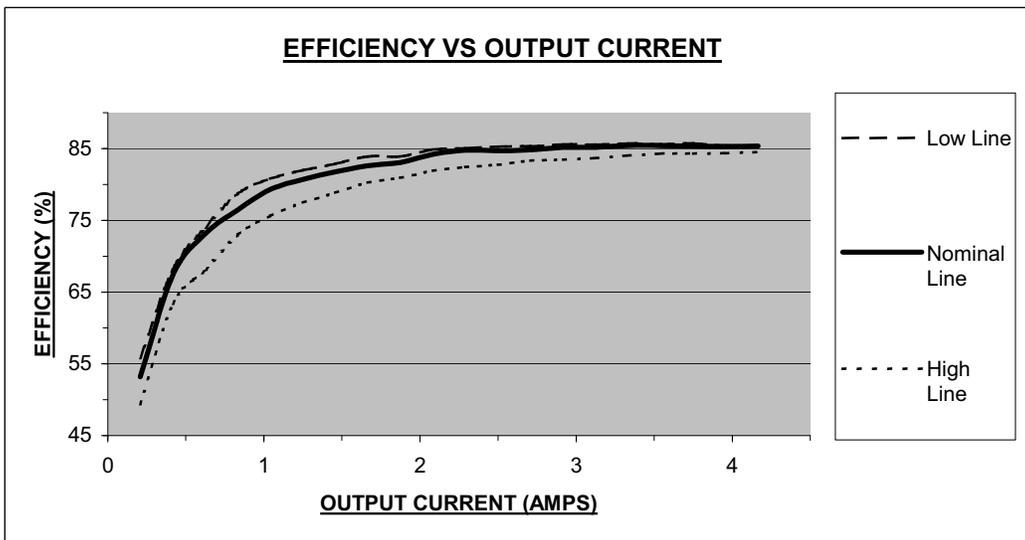
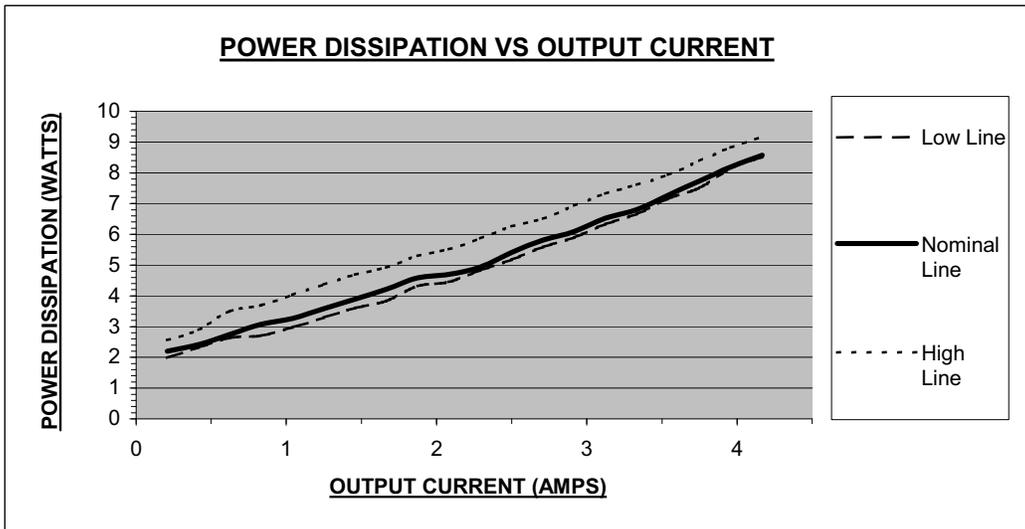
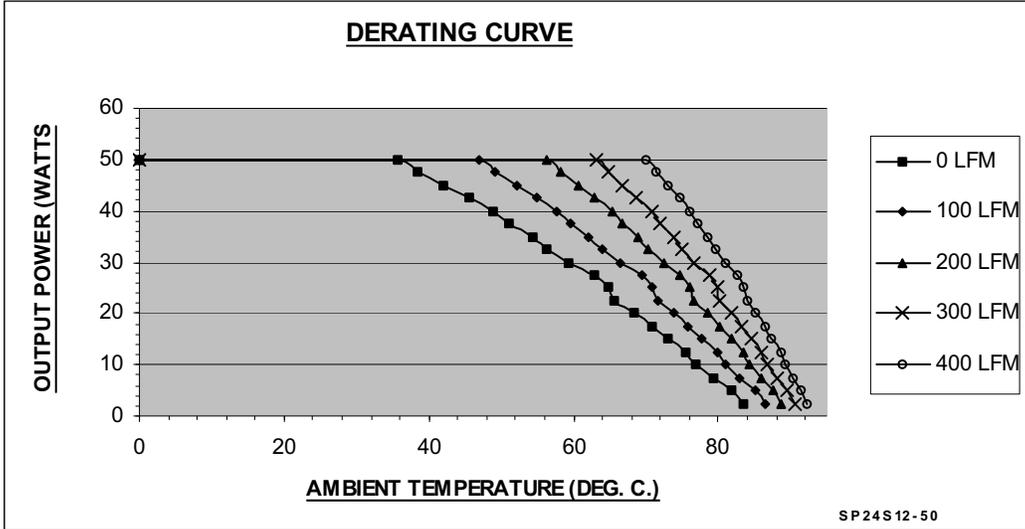


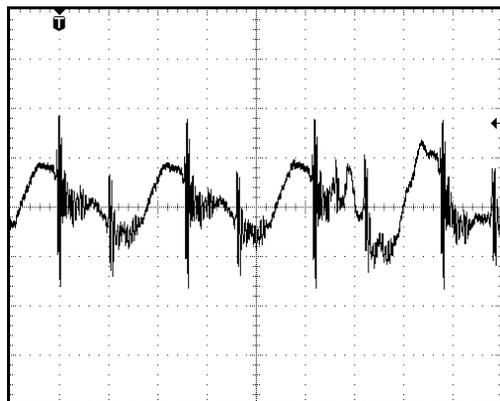
**Schematic 2: Trim High**

MODEL (Output Voltage)	R <sub>H</sub> (K OHMS)	R <sub>LIM</sub> (K OHMS)	R <sub>L</sub> (K OHMS)	V <sub>REF</sub> (VOLTS)
3.3V	0.750	0.499	2.32	2.495
5.0V	2.49	10.0	2.49	2.495
8.0V	5.49	10.0	2.49	2.495
9.0V	6.49	10.0	2.49	2.495
12.0V	9.53	13.7	2.49	2.495
15.0V	12.4	13.7	2.49	2.495
24.0V	21.5	15.4	2.49	2.495
26.0V	17.6	15.4	1.87	2.495
32.0V	23.7	12.7	2.00	2.495

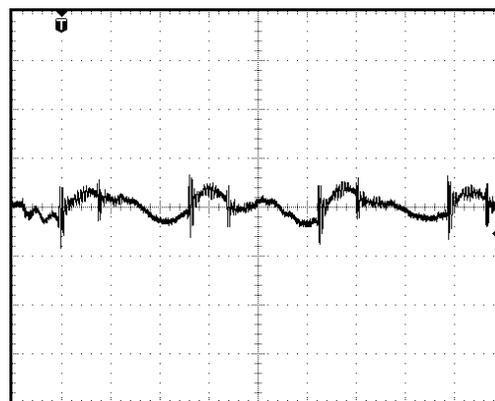
**Table 1 : Trim Low/High Data Table.**

Note: Output trim +/- 10% max.

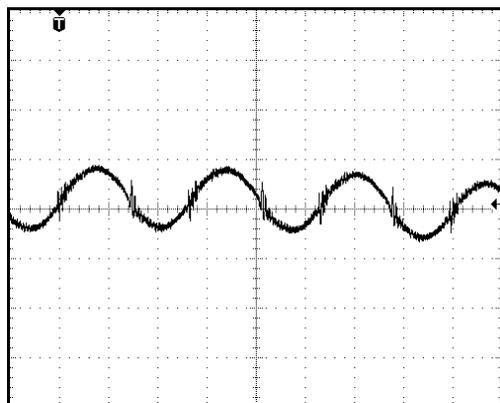




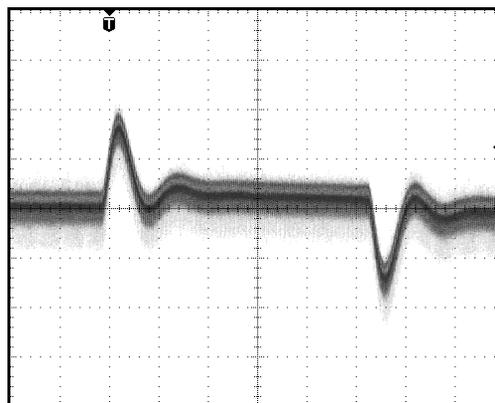
TYPICAL OUTPUT RIPPLE  
20mV/div, 1 $\mu$ S/div, full load, 18Vin  
10 $\mu$ F // 0.1 $\mu$ F decoupling cap at room temp



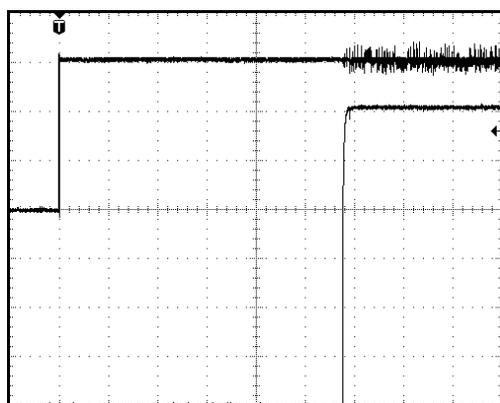
TYPICAL OUTPUT RIPPLE  
50mV/div, 1 $\mu$ S/div, full load 36Vin  
10 $\mu$ F // 0.1 $\mu$ F decoupling cap at room temp



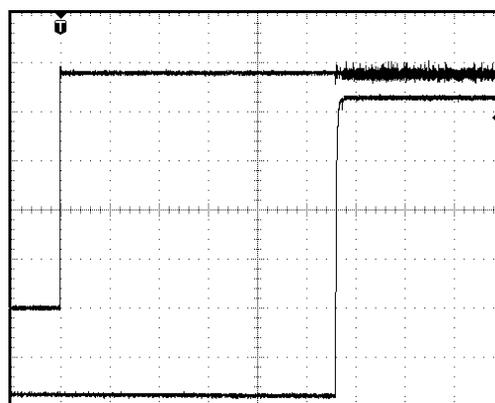
TYPICAL INPUT RIPPLE CURRENT  
10mA/div, 1 $\mu$ S/div, full load 24Vin at  
room temp with a 12 $\mu$ H / 33 $\mu$ F input filter



TYPICAL TRANSIENT RESPONSE  
50mV/div, 200 $\mu$ S/div, 50% full load  
to 75% full load 24Vin room temp



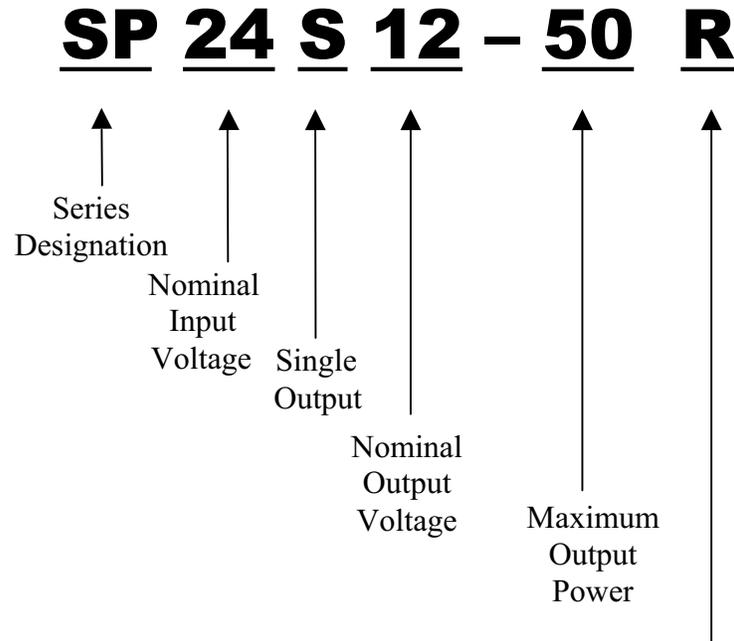
TYPICAL RISE TIME & TURN-ON DELAY  
USING LOGIC ENABLE  
2V/div, 40mS/div (Vout), 2V/div 40mS/div (logic  
enable) 18Vin, full load at room temp



TYPICAL RISE TIME & TURN-ON DELAY  
WITH Vin 0-24V  
2V/div, 40mS/div (Vout), 5V/div, 40mS/div (Vin)  
at room temp

**Ordering Information:**

Part Number Example:



Options	
Blank	Leave Blank for Active High Enable
R	Active Low Enable

**Company Information:**

Wall Industries, Inc. has created custom and modified units for over 40 years. Our in-house research and development engineers will provide a solution that exceeds your performance requirements on time and on budget. Our ISO9001-2000 certification is just one example of our commitment to producing a high quality, well documented product for our customers.

Our past projects demonstrate our commitment to you, our customer. Wall Industries, Inc. has a reputation for working closely with its customers to ensure each solution meets or exceeds form, fit and function requirements. We will continue to provide ongoing support for your project above and beyond the design and production phases. Give us a call today to discuss your future projects.

Contact **Wall Industries** for further information:

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