

## NON-ISOLATED DC/DC CONVERTER

9.0 Vdc - 34 Vdc Input

10 Vdc - 12 Vdc/3.5 A Output

**bel**  
POWER PRODUCTS

**SRDB-04HX20**

**RoHS Compliant**

**Rev.A**

- Non-Isolated
- Fixed Frequency (340 kHz)
- Over Current Protection
- SCP
- Remote Sense
- Low Profile Package (8.5mm)
- Remote On/Off (Active Low)



### Description

The SRDB-04HX20 is part of the low cost non-isolated dc/dc converter. The module uses a DIP package for ease of layout and space savings, with a low profile of 8.5 mm. The output is closely regulated and the efficiency of 12 V is typically 86% at full load. Features include remote sense, over current protection and remote on/off.

### Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number
10 V - 12 V	9.0 V - 34 V	3.5 A	42 W	86%	SRDB-04HX20

- Notes:** 1. Add "R" suffix at the end of the model number to indicate "Reel Packaging", and "G" for "Tray Packaging".  
2. All part numbers above indicate RoHS 6. Change the second letter "R" to "7" for RoHS 5 part numbers.

### Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3 V	-	36 V	
Output Enable Voltage	-0.3 V	-	12 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

### Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	9 V	20 V	34 V	
Input Current (Full load)	-	-	5.6 A	
Input Current (No load)	-	50 mA	100 mA	
Remote Off Input Current	-	1 mA	3 mA	
Input Reflected Ripple Current (pk-pk)	-	500 mA	750 mA	Tested with simulated source impedance of 500 nH, 5 Hz to 20 MHz; and two 100 uF/50 V electrolytic capacitors and a 3.3 uF/50 V ceramic capacitor at the input.
Input Reflected Ripple Current (rms)	-	170 mA	250 mA	
I <sup>2</sup> t Inrush Current Transient	-	0.05 A <sup>2</sup> s	0.1 A <sup>2</sup> s	
Turn-on Voltage Threshold	-	8.5 V	9.0 V	

**Note:** All specifications are typical at 25 °C unless otherwise stated.

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## Output Specifications

Parameter	Min	Typ	Max	Notes	
Output Voltage Set Point	11.89 V	12.13 V	12.37 V	Vin=20 V, Iout=50% full load	
Line Regulation	-	±12 mV	±24 mV		
Load Regulation	-	±12 mV	±24 mV		
Regulation Over Temperature (-40 °C to 85 °C)	-	±30 mV	±50 mV		
Ripple and Noise (rms)	-	2.5 mV	5 mV	Test conditions: 0-20 MHz BW; with 33 uF-0.5 uH-33 uF second stage filter.	
Ripple and Noise (pk-pk)	-	10 mV	20 mV		
Output Current	0 A	-	3.5 A		
Output Current Limit Threshold	4 A	-	7 A		
Short Circuit Surge Transient	-	0.2 A <sup>2</sup> s	0.5 A <sup>2</sup> s		
Turn on Time	-	3.5 mS	10 mS		
Overshoot at Turn on	-	2%	5%		
Output Capacitance	0 uF		220 uF		
<b>Transient Response</b>					
50% ~ 100% Max Load	Overshoot	-	220 mV	250 mV	Tested at di/dt=0.5 A/us, Vin=20 V, with 33uF-0.5 uH- 33 uF second stage filter.
	Settling Time	-	300 uS	500 uS	
100% ~ 50% Max Load	Overshoot	-	130 mV	250 mV	
	Settling Time	-	300 uS	500 uS	

**Note:** All specifications are typical at 20 V input, full load at 25 °C unless otherwise stated.

## General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency	83%	86%	-	Vin=20 V, full load
Switching Frequency	310 kHz	340 kHz	370 kHz	
Output Voltage Trim Range	80%Vo	-	105%Vo	
Remote Sense Compensation	-	-	5%	
MTBF	5,373,282 hours			Calculated Per Bell Core SR-332 (Io = 2 A, Vo=12 V, Vin=20 V; Ta = 25 °C)
Dimensions	Inches 1.22 x 0.827 x 0.345 millimeters 30.99 x 21.00 x 8.76			
Weight	-	11 g	-	

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

## Control Specifications

Parameter	Min	Typ	Max	Notes
<b>Remote On/Off</b>				
Signal Low (Unit On)	-0.3 V	-	1 V	Remote on/off pin open, unit on.
Signal High (Unit Off)	2.8 V	-	12 V	

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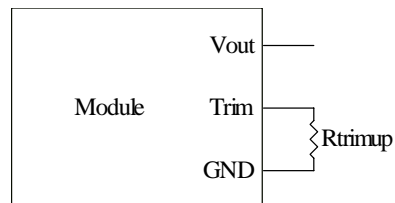
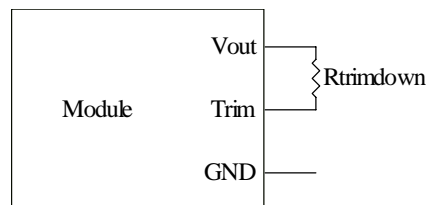
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### Output Trim Equations

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage ( $V_{adj}$ ) and the nominal output voltage of the converter ( $V_{nom}$ ) are shown below. The Trim Down resistor should be connected between the Trim pin and  $V_{out}$ . The Trim Up resistor should be connected between the Trim pin and Ground. Only one of the resistors should be used for any given application.

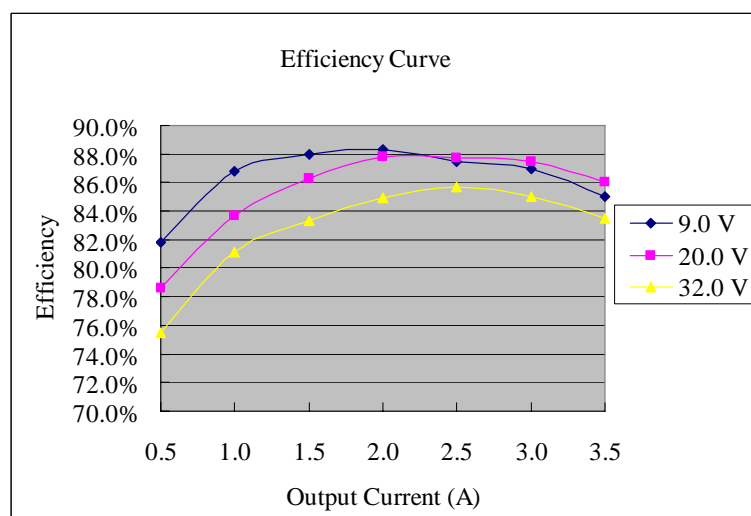
$$R_{trimdown} = \frac{83.408}{V_{nom} - V_{adj}} - 8.66$$

$$R_{trimup} = \frac{21.65}{V_{adj} - V_{nom}}$$



**Note:** The output voltage  $V_{nom} = 12.13$  V.

### Efficiency Data



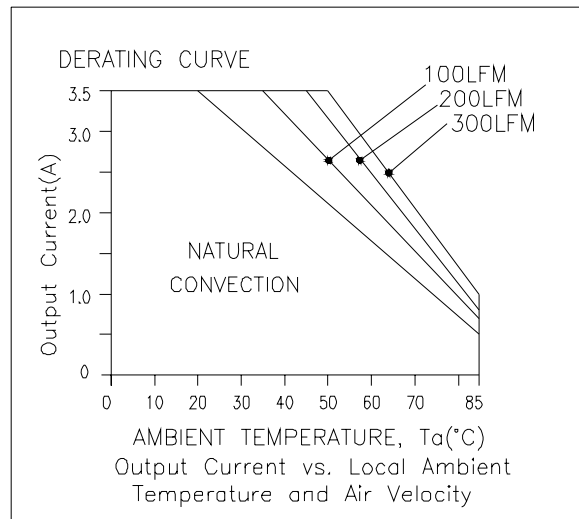
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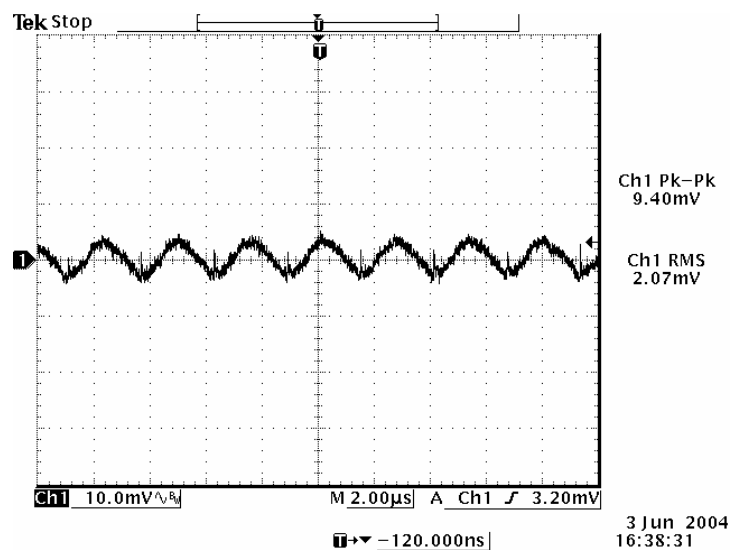
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### Thermal Derating Curve



**Note:** Derating curve is for 12 V output and tested at nominal input voltage.

### Ripple and Noise Waveform



**Note:** Ripple and noise at max load, 0-20 MHz BW, 20 V input, 12 V output,  $T_a=25$  deg C.

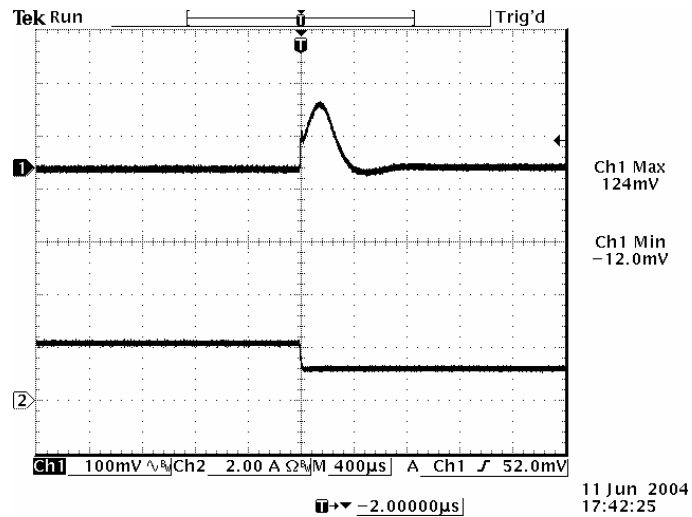
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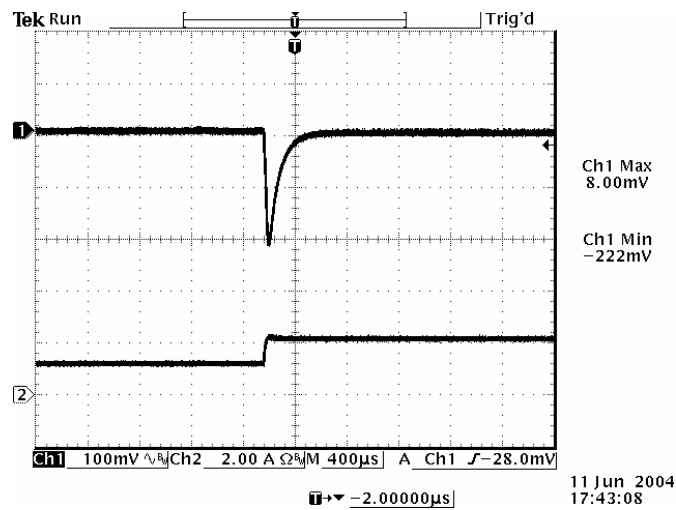
10 Vdc - 12 Vdc/3.5 A Output



## Transient Response Waveforms



Transients 2 A to 1 A, 20 V input, 12.0 V output



Transients 1 A to 2 A, 20 V input, 12.0 V output

**Note:** Transient Response at  $di/dt=0.5 \text{ A}/\mu\text{S}$ ,  $T_a=25 \text{ deg C}$ .

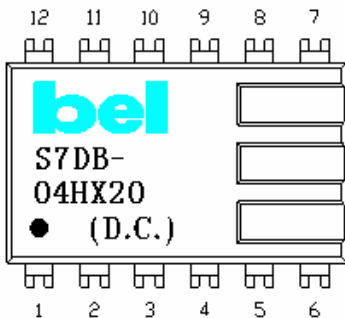
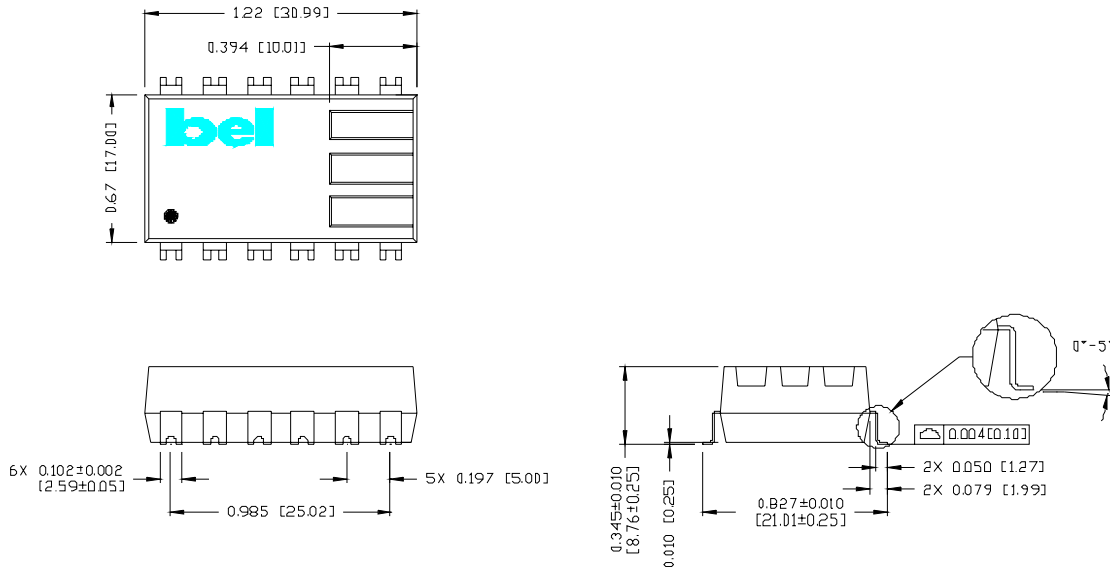
# NON-ISOLATED DC/DC CONVERTERS

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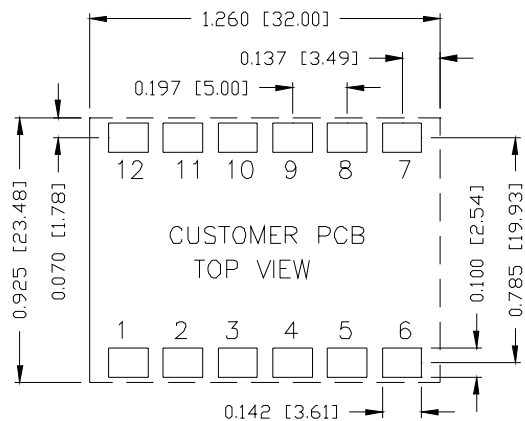
## Mechanical Outline



## Pin Connections

Pin	Function
1	Trim
2	Remote On/Off
3	Remote Sense
4	Vo
5	Vo
6	Vo
7	Ground
8	Ground
9	Ground
10	N/A (Leave this pin unconnected)
11	Vin
12	Vin

## RECOMMENDED PAD LAYOUT



DON'T PLACE OTHER COMPONENTS IN THIS DASHED AREA

## RoHS Compliance

Complies with the European Directive 2002/95/EC, calling for the elimination of lead and other hazardous substances from electronic products. These parts are not however compatible with the higher temperatures associated with lead free solder processes and must be soldered using a reflow profile with a peak temperature of no more than 240 °C.



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