

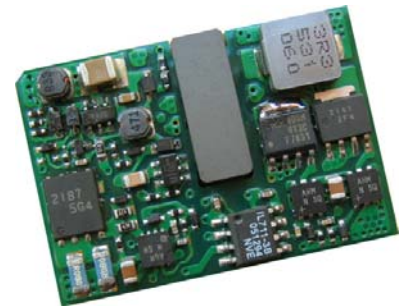
## ISOLATED DC/DC CONVERTERS

24 Vdc/48 Vdc Input 1.2 Vdc - 12 Vdc / 18 A - 3.5 A Outputs, 1/16 Brick



### xRSB-40U Series RoHS Compliant Rev.B

- Isolated
- Fixed Frequency
- High Efficiency
- High Power Density
- Low Cost
- Output Voltage Trim
- Basic Insulation
- Remote On/Off Logic (Option)
- UL60950-1 Recognized (UL/cUL) (Pending)
- Input Under Voltage Lockout
- Output Over Voltage Shutdown
- OCP/SCP
- Over Temperature Protection
- Wide Input Voltage
- Positive/Negative Remote Sense
- Through Hole and SMT(Option)
- Input Over Voltage Protection



### Description

The xRSB-40U series are isolated dc/dc converters that operate from a nominal 24 Vdc or 48 Vdc source. These units will provide up to 40 W of output power from an 18 Vdc - 75 Vdc wide input range. These units are designed to be highly efficient and low cost. Features include remote on/off, over current protection and under voltage lockout. These converters are provided in an industry standard sixteenth brick package.

### Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active Low	Model Number Active High
1.2 Vdc	18 Vdc - 75 Vdc	18 A	22 W	82%	xRSB-40UV2L	xRSB-40UV20
1.5 Vdc	18 Vdc - 75 Vdc	16 A	24 W	84%	xRSB-40UV5L	xRSB-40UV50
1.8 Vdc	18 Vdc - 75 Vdc	14 A	25 W	85%	xRSB-40UV8L	xRSB-40UV80
2.5 Vdc	18 Vdc - 75 Vdc	12 A	30 W	86%	xRSB-40U02L	xRSB-40U025
3.3 Vdc	18 Vdc - 75 Vdc	10 A	33 W	87.5%	xRSB-40U03L	xRSB-40U033
5.0 Vdc	18 Vdc - 75 Vdc	8 A	40 W	87%	xRSB-40U05L	xRSB-40U050
12 Vdc	18 Vdc - 75 Vdc	3.5 A	42 W	85%	xRSB-40U12L	xRSB-40U120

**Note:** Add "G" suffix at the end of the model number to indicate Tray Packaging.

### Part Number Explanation

$\frac{x}{1} \frac{R}{2} \frac{SB}{3} - \frac{40}{4} \frac{U}{5} \frac{xx}{6} \frac{x}{7}$

1---Replace "x" with "S" to indicate SMT package, or "0" to indicate through hole package

2---RoHS 6, change "R" to "7" means RoHS 5

3---Series name, 1/16 Brick

4---Series code

5---Input range (18-75V)

6---Output voltage, V2=1.2Vout, V5=1.5Vout, V8=1.8Vout, O2=2.5Vout, O3=3.3Vout, O5=5.0Vout, 12=12Vout

7---Option, "x" of the model part number to be 0-9, A-Z, which will represent the special request of customer.

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### Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3 V	-	80 V	
Remote On/Off	-0.3 V	-	18 V	
I/O Isolation Voltage	-	-	1500 V	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

### Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	18 V	48 V	75 V	
Input Current (full load)				
Vo=1.2 V - 1.8 V	-	-	2.5 A	
Vo=2.5 V - 3.3 V	-	-	3.0 A	
Vo=5.0 V - 12 V	-	-	3.5 A	
Input Current (no load)	-	60 mA	120 mA	
Remote Off Input Current	-	1 mA	3 mA	
Input Reflected Ripple Current (pk-pk)	-	20 mA	50 mA	Tested with simulated source impedance of 15 uH, 5 Hz to 20 MHz; use a 100 uF/100 V electrolytic capacitor with ESR=1 ohm max at 200 kHz at the input.
Input Reflected Ripple Current (rms)	-	3 mA	7 mA	
I <sup>2</sup> t Inrush Current Transient	-	0.01 A <sup>2</sup> s	0.02 A <sup>2</sup> s	
Turn On Voltage Threshold	16.6 V	17.2 V	17.8 V	
Turn Off Voltage Threshold	16.2 V	16.8 V	17.4 V	

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

### Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point				Test conditions: Vin=48 V; Io=50% load
Vo=1.2 V	1.182 V	1.2 V	1.218 V	
Vo=1.5 V	1.478 V	1.5 V	1.523 V	
Vo=1.8 V	1.773 V	1.8 V	1.827 V	
Vo=2.5 V	2.463 V	2.5 V	2.538 V	
Vo=3.3 V	3.250 V	3.3 V	3.350 V	
Vo=5.0 V	4.925 V	5.0 V	5.075 V	
Vo=12 V	11.750 V	12 V	12.250 V	
Line Regulation				
Vo=1.2 V - 1.8 V	-	±0.5 mV	±3 mV	
Vo=2.5 V	-	±1.0 mV	±4 mV	
Vo=3.3 V	-	±3.0 mV	±8 mV	
Vo=5.0 V	-	±4.0 mV	±9 mV	
Vo=12 V	-	±6.0 mV	±15 mV	
Load Regulation				
Vo=1.2 - 2.5 V	-	±3 mV	±5 mV	
Vo=3.3 - 5.0 V	-	±4 mV	±9 mV	
Vo=12 V	-	±9 mV	±18 mV	

## ISOLATED DC/DC CONVERTERS

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### Output Specifications (continued)

Parameter	Min	Typ	Max	Notes
Regulation Over Temperature(-40 °C to +85 °C)				
Vo=1.2 V	-	±4 mV	±9 mV	
Vo=1.5 - 1.8 V	-	±6 mV	±14 mV	
Vo=2.5 - 3.3 V	-	±9 mV	±16 mV	
Vo=5.0 V	-	±15 mV	±30 mV	
Vo=12 V	-	±20 mV	±35 mV	
Output Current				
Vo=1.2 V	0 A	-	18 A	
Vo=1.5 V	0 A	-	16 A	
Vo=1.8 V	0 A	-	14 A	
Vo=2.5 V	0 A	-	12 A	
Vo=3.3 V	0 A	-	10 A	
Vo=5.0 V	0 A	-	8 A	
Vo=12 V	0 A	-	3.5 A	
Short Circuit Surge Transient	-	0.5 A <sup>2</sup> s	1 A <sup>2</sup> s	
Current Limit Threshold				
Vo=1.2 V	21 A	25 A	33 A	
Vo=1.5 V	19 A	22 A	26 A	
Vo=1.8 V	17 A	20 A	23 A	
Vo=2.5 V	14 A	17 A	20 A	
Vo=3.3 V	11 A	14 A	16 A	
Vo=5.0 V	8.8 A	10 A	12.5 A	
Vo=12 V	3.7 A	5 A	6 A	
Ripple and Noise (rms)				Tested at 0-20 MHz BW, with a 1 uF ceramic capacitor and a 10 uF Tantalum capacitor at the output.
Vo=1.2 V - 1.8 V	-	6 mV	12 mV	
Vo=2.5 V	-	10 mV	20 mV	
Vo=3.3 V	-	12 mV	25 mV	
Vo=5.0 V	-	25 mV	50 mV	
Ripple and Noise (pk-pk)				
Vo=1.2 V - 1.8 V	-	40 mV	70 mV	
Vo=2.5 V	-	45 mV	80 mV	
Vo=3.3 V	-	55 mV	90 mV	
Vo=5.0 V	-	70 mV	120 mV	
Vo=12 V	-	90 mV	180 mV	
Turn on Time	-	25 mS	50 mS	
Overshoot at Turn on	-	0%	5%	
Output Capacitance				Recommend to use AVX TPS series Tantalum capacitor as min capacitor.
Vo=1.2 V	470 uF	-	15000 uF	
Vo=1.5 V	470 uF	-	10000 uF	
Vo=1.8 V	470 uF	-	10000 uF	
Vo=2.5 V	470 uF	-	5600 uF	
Vo=3.3 V	330 uF	-	4700 uF	
Vo=5.0 V	150 uF	-	2200 uF	
Vo=12 V	10 uF	-	220 uF	

# ISOLATED DC/DC CONVERTERS

24 Vdc/48 Vdc Input 1.2 Vdc - 12 Vdc / 18 A - 3.5 A Outputs, 1/16 Brick



## Output Specifications (continued)

Parameter		Min	Typ	Max	Notes	
<b>Transient Response</b>						
25% ~ 50% Max Load	Overshoot	Vo=1.2 V	-	60 mV	110 mV	Test conditions: di/dt = 0.1 A/uS, Vin=48 V, with a 1 uF ceramic capacitor and a Min Capacitance of Tantalum capacitor at the output
	Settling Time		-	80 uS	150 uS	
50% ~ 25% Max Load	Overshoot	Vo=1.5 -1.8 V	-	60 mV	110 mV	
	Settling Time		-	80 uS	150 uS	
25% ~ 50% Max Load	Overshoot	Vo=1.5 -1.8 V	-	90 mV	180 mV	
	Settling Time		-	80 uS	150 uS	
50% ~ 25% Max Load	Overshoot	Vo=2.5 -3.3 V	-	90 mV	180 mV	
	Settling Time		-	80 uS	150 uS	
25% ~ 50% Max Load	Overshoot	Vo=2.5 -3.3 V	-	180 mV	250 mV	
	Settling Time		-	80 uS	150 uS	
50% ~ 25% Max Load	Overshoot	Vo=2.5 -3.3 V	-	180 mV	250 mV	
	Settling Time		-	80 uS	150 uS	
25% ~ 50% Max Load	Overshoot	Vo=5.0 V	-	250 mV	350 mV	
	Settling Time		-	100 uS	200 uS	
50% ~ 25% Max Load	Overshoot	Vo=5.0 V	-	250 mV	350 mV	
	Settling Time		-	100 uS	200 uS	
25% ~ 50% Max Load	Overshoot	Vo=12 V	-	400 mV	650 mV	
	Settling Time		-	150 uS	300 uS	
50% ~ 25% Max Load	Overshoot	Vo=12 V	-	400 mV	650 mV	
	Settling Time		-	150 uS	300 uS	

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

## General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				
Vo=1.2 V	78%	82%	-	Vin=48 V, full load
Vo=1.5 V	79%	84%	-	
Vo=1.8 V	81%	85%	-	
Vo=2.5 V	83%	86%	-	
Vo=3.3 V	85%	87.5%	-	
Vo=5.0 V	85%	87%	-	
Vo=12 V	83%	85%	-	
Switching Frequency				
Vo=1.2 V -12 V	450 kHz	500 kHz	550 kHz	
Vo=1.8 V	500 kHz	550 kHz	600 kHz	
Isolation Capacitance	-	3900 pF	-	
Over Temperature Protection	-	125 °C	-	
Output Voltage Trim Range	90% Vo	-	110% Vo	
Over Voltage Protection	-	130% Vo	160% Vo	Test conditions: Vin=48 V, full load and short the feedback optocoupler.
MTBF	TBD			Calculated Per Bell Core SR-332 (Io = Nominal; Ta = 25 °C)
Dimensions	1.30 x 0.90 x 0.493 33.02 x 22.86 x 12.53			SRSB-40Uxxx
Inches (L x W x H)	1.30 x 0.90 x 0.507 33.02 x 22.86 x 12.89			0RSB-40Uxxx
Weight	-	14 g	-	

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

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## Control Specifications

Parameter	Min	Typ	Max	Notes
<b>Remote On/Off</b>				
Signal Low (Unit On)	Active Low	-0.3 V	-	When Remote On/Off pin is open, for active low option, unit is off; for active high option, unit is on
Signal High (Unit Off)		2.4 V	-	
Signal Low (Unit Off)	Active High	-0.3 V	-	
Signal High (Unit On)		2.4 V	-	
Current Sink	-	0 mA	-	1 mA

## Output Trim Equations

Equations for calculating the trim resistor are shown below (Unit: kΩ). The Trim Down resistor should be connected between the Trim pin and Ground pin. The Trim Up resistor should be connected between the Trim pin and the Vout. Only one of the resistors should be used for any given application.

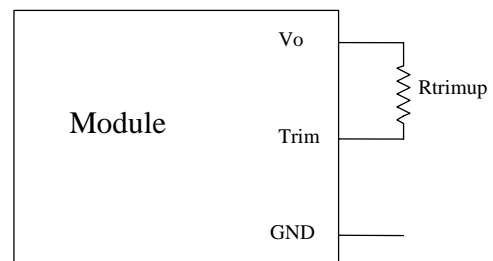
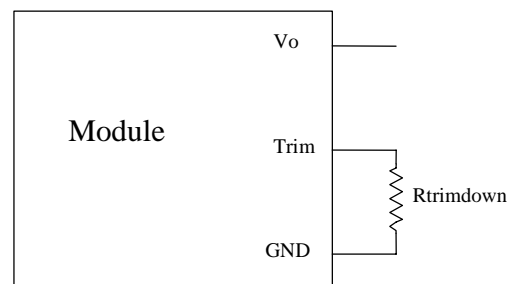
### 1) Trim Equations for Vo=1.2 V

$$R_{trimdown} = \frac{511}{|\delta|} - 10.22$$

$$R_{trimup} = \frac{(100 + \delta) \cdot V_o \cdot 5.11 - 313}{0.6125 \cdot \delta} - 10.22$$

**Note:** 
$$\delta = \frac{(V_o_{req} - V_o)}{V_o} \times 100[\%]$$

V<sub>o\_req</sub>=Desired (trimmed) output voltage [V]    V<sub>o</sub>=1.202 V



### 2) Trim Equations for Vo=1.5 V - 12 V

$$R_{trimdown} = \frac{511}{|\delta|} - 10.22$$

$$R_{trimup} = \frac{(100 + \delta) \cdot V_o \cdot 5.11 - 626}{1.225 \cdot \delta} - 10.22$$

**Note:** 
$$\delta = \frac{(V_o_{req} - V_o)}{V_o} \times 100[\%]$$

V<sub>o\_req</sub>=Desired (trimmed) output voltage [V]

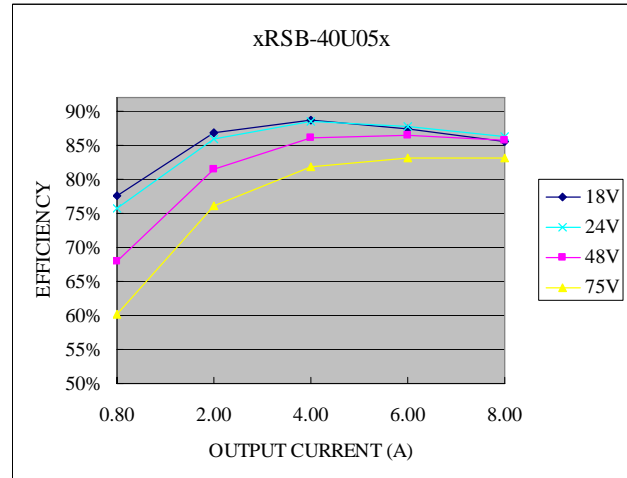
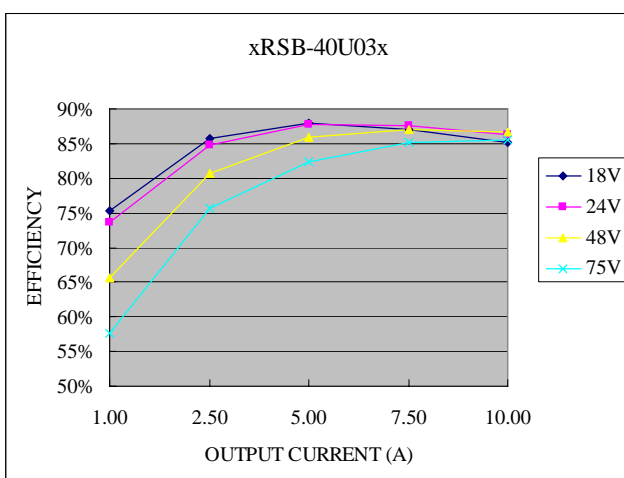
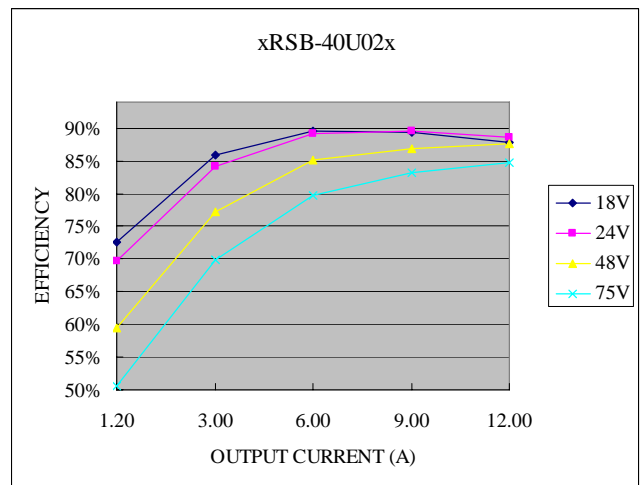
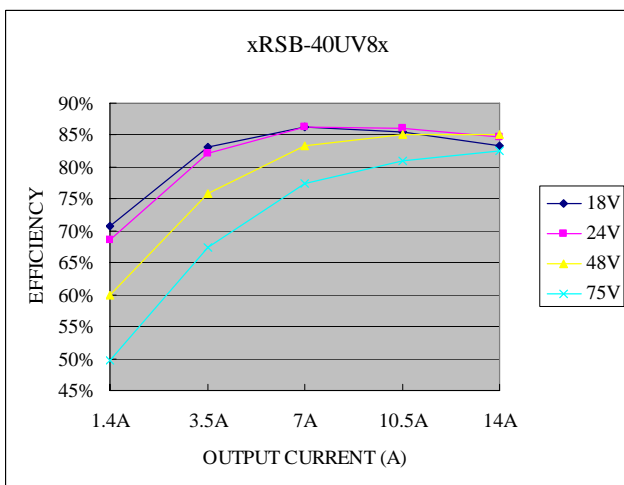
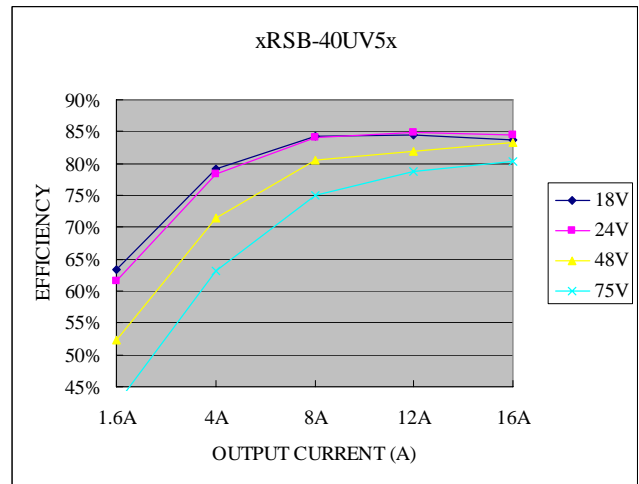
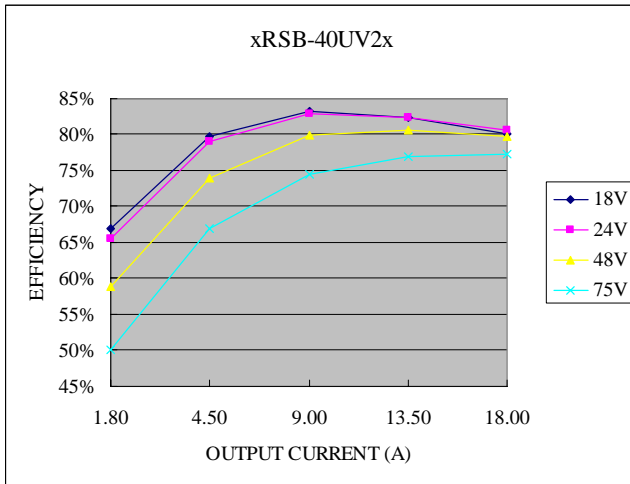
V<sub>o</sub>=1.503V, V<sub>o</sub>=1.800V, V<sub>o</sub>=2.505V, V<sub>o</sub>=3.308V, V<sub>o</sub>=5.002V, V<sub>o</sub>=12.007V

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## Efficiency Data

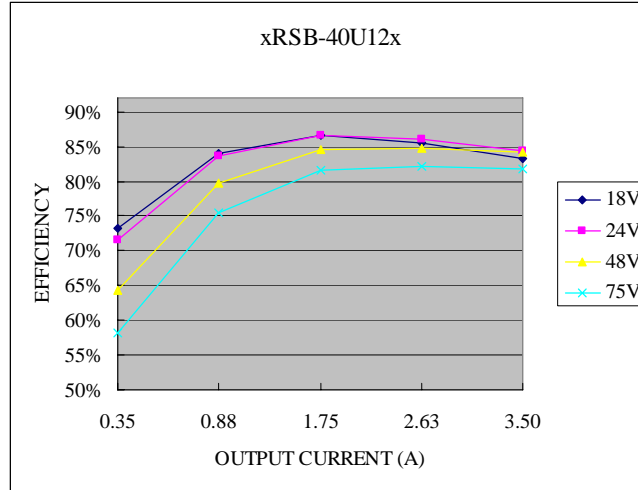


# ISOLATED DC/DC CONVERTERS

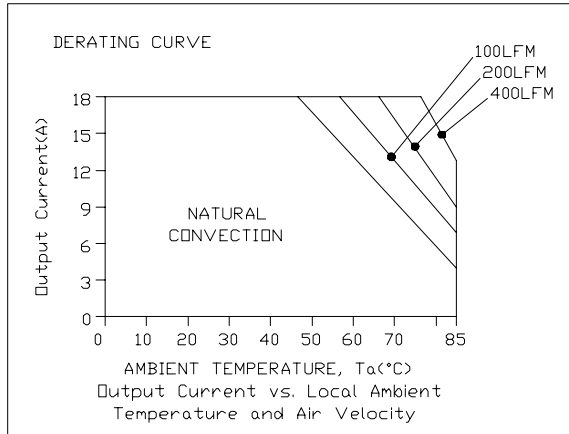
24 Vdc/48 Vdc Input 1.2 Vdc - 12 Vdc / 18 A - 3.5 A Outputs, 1/16 Brick



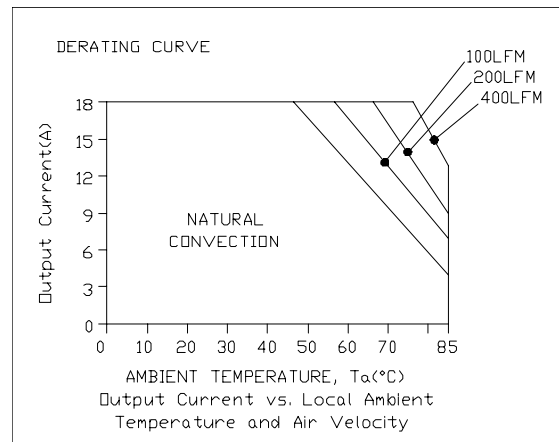
## Efficiency Data (continued)



## Thermal Derating Curves



xRSB-40UV2x, Vin=48V



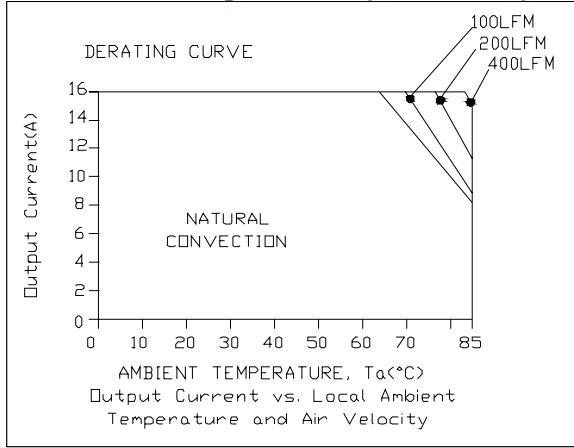
xRSB-40UV2x, Vin=24V

# ISOLATED DC/DC CONVERTERS

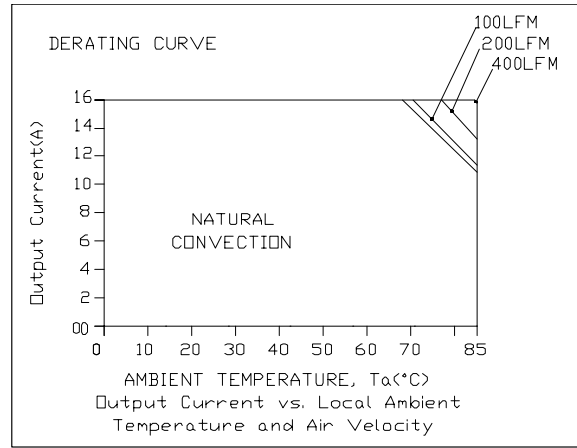
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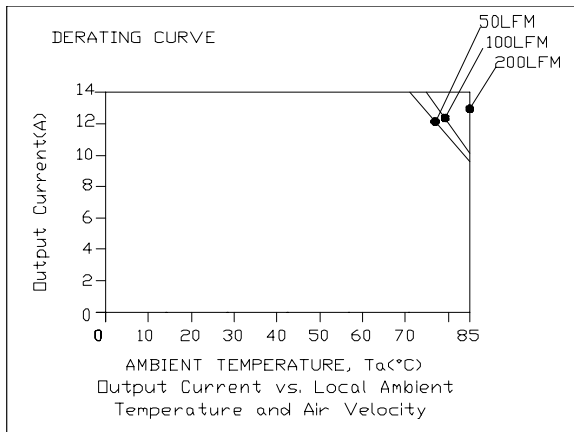
## Thermal Derating Curves (continued)



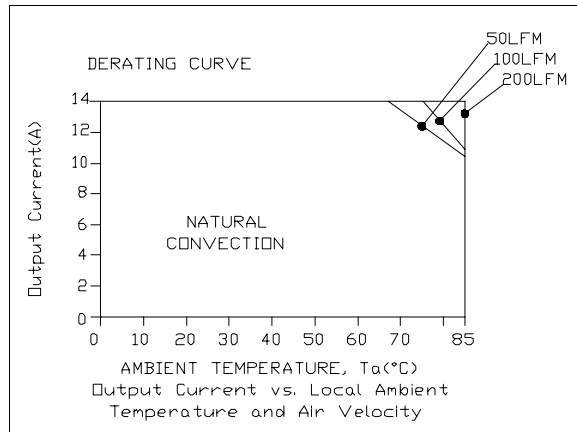
xRSB-40UV5x,  $V_{in}=48V$



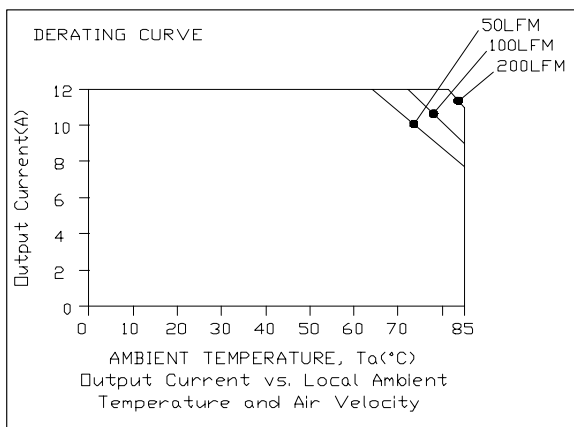
xRSB-40UV5x,  $V_{in}=24V$



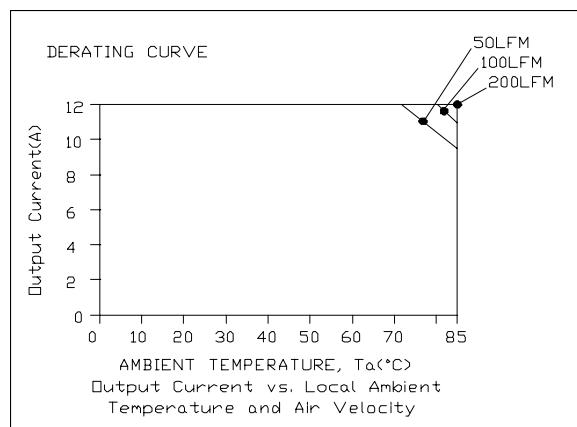
xRSB-40UV8x,  $V_{in}=48V$



xRSB-40UV8x,  $V_{in}=24V$



xRSB-40U02x,  $V_{in}=48V$



xRSB-40U02x,  $V_{in}=24V$

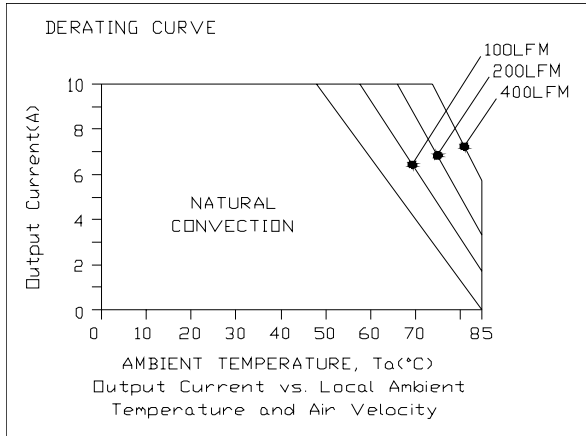


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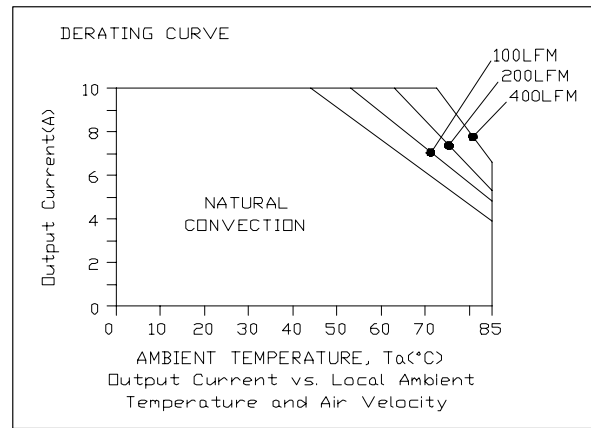
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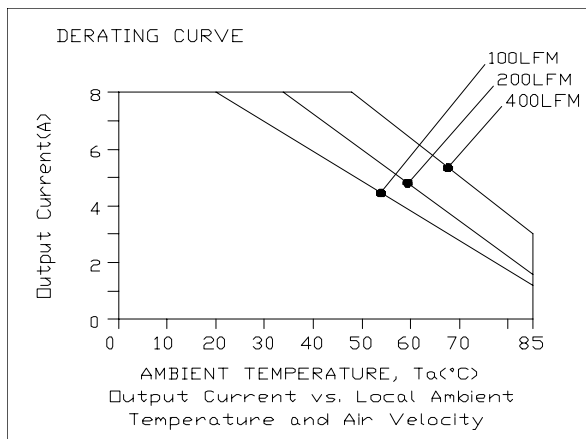
## Thermal Derating Curves (continued)



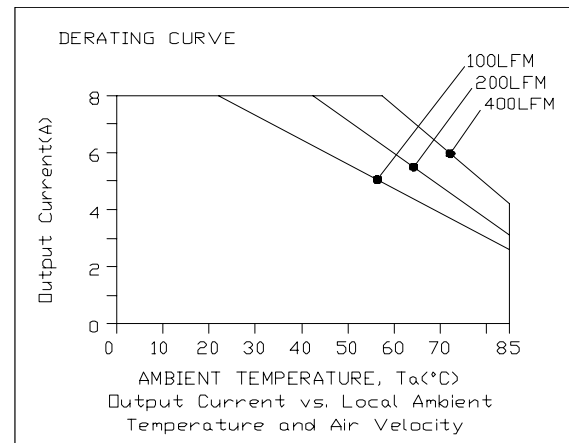
xRSB-40U03x, Vin=48V



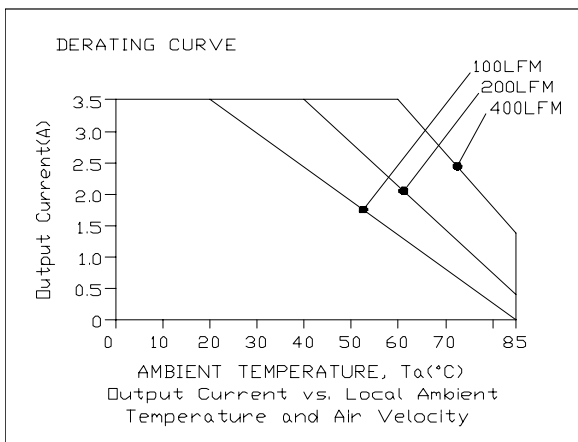
xRSB-40U03x, Vin=24V



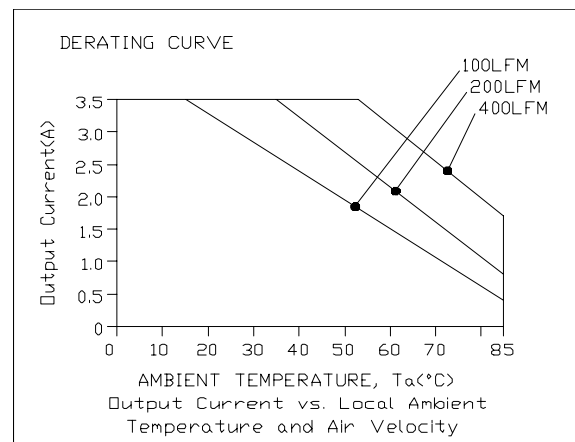
xRSB-40U05x, Vin=48V



xRSB-40U05x, Vin=24V



xRSB-40U12x, Vin=48V



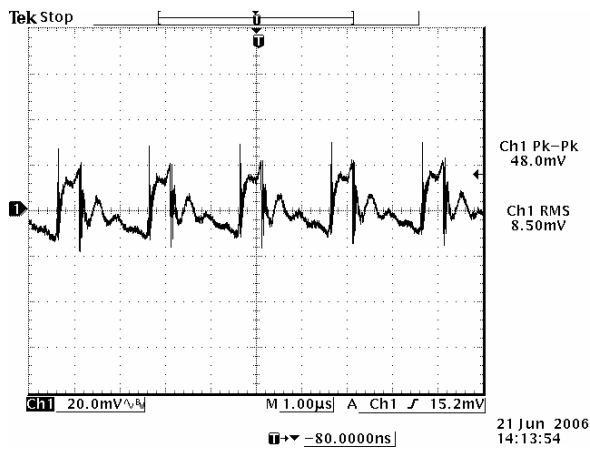
xRSB-40U12x, Vin=24V

# ISOLATED DC/DC CONVERTERS

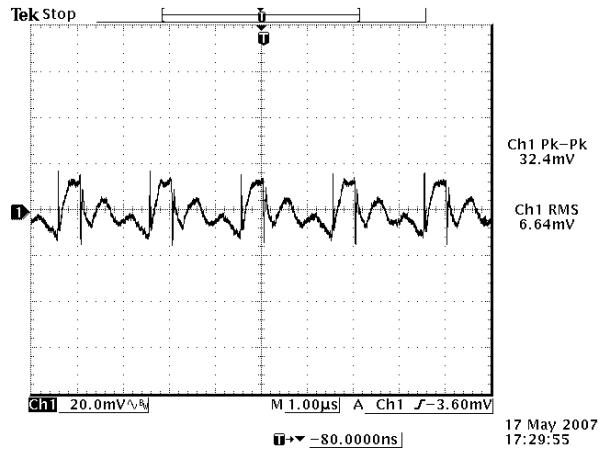
24 Vdc/48 Vdc Input 1.2 Vdc - 12 Vdc / 18 A - 3.5 A Outputs, 1/16 Brick



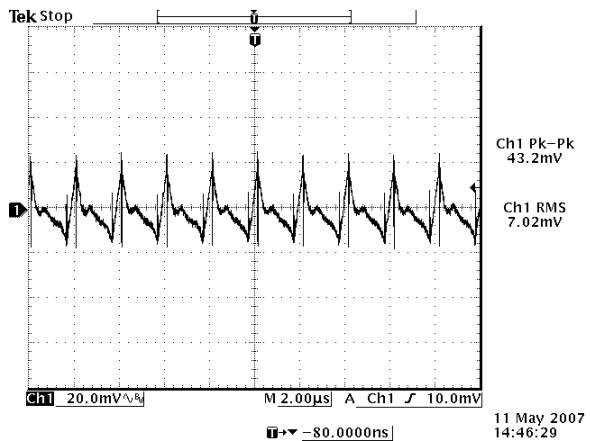
## Ripple and Noise Waveforms



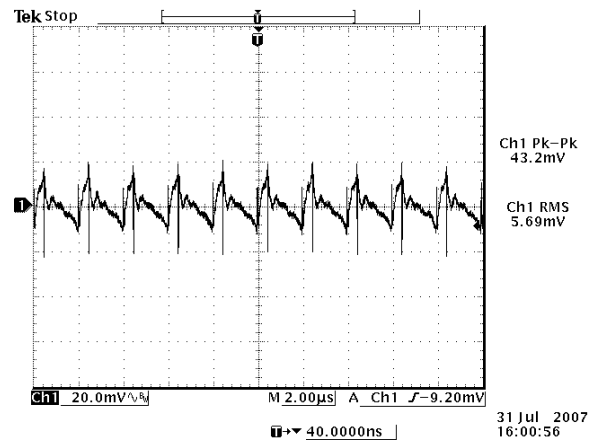
48 Vdc input, 1.2 Vdc output



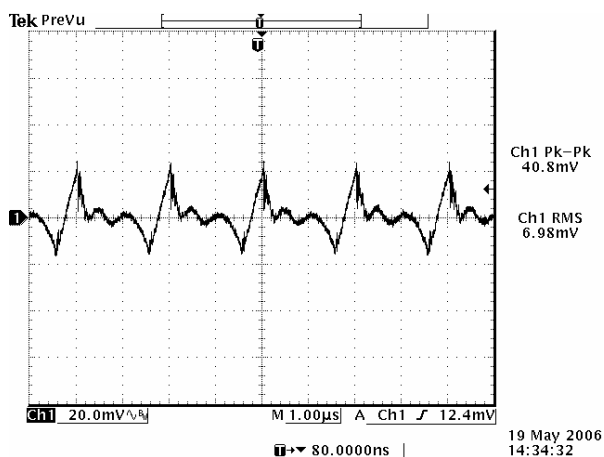
48 Vdc input, 1.5 Vdc output



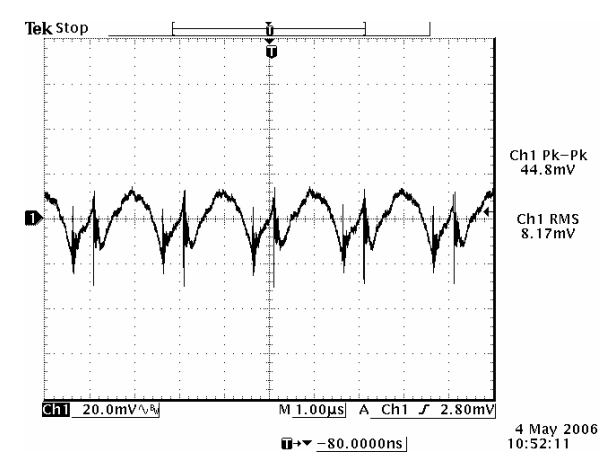
48 Vdc input, 1.8 Vdc output



48 Vdc input, 2.5 Vdc output



48 Vdc input, 3.3 Vdc output



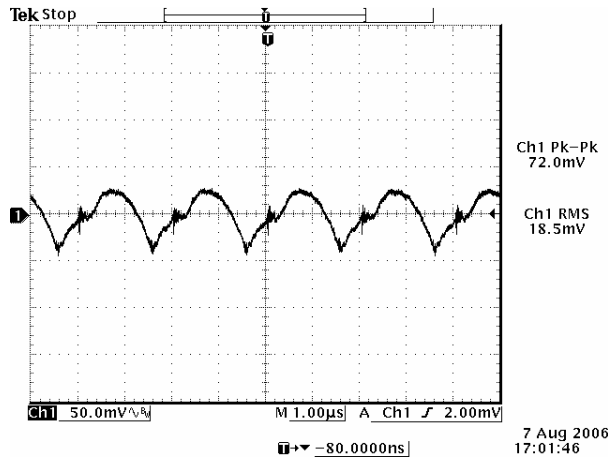
48 Vdc input, 5.0 Vdc output

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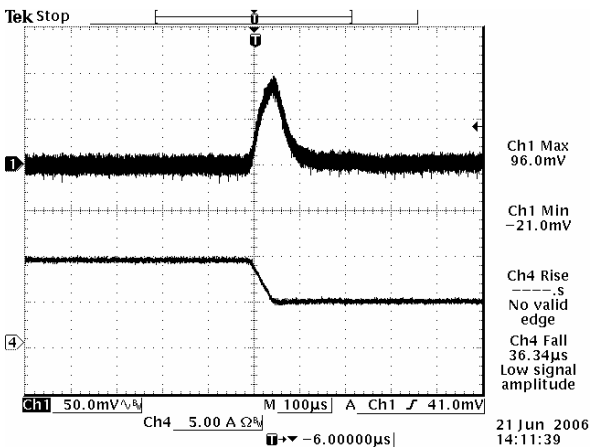
## Ripple and Noise Waveforms (continued)



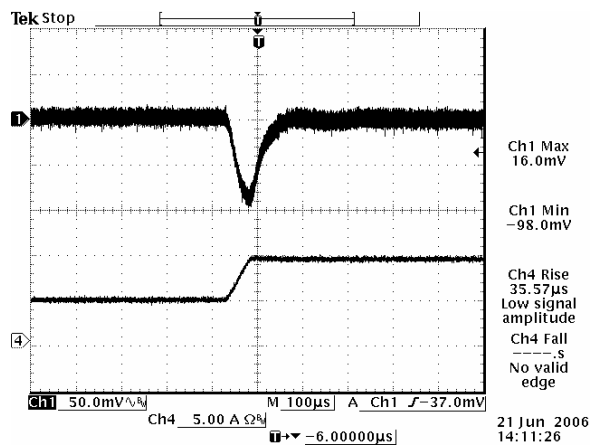
48 Vdc input, 12 Vdc output

**Note:** Ripple and noise at full load, with external a 1 uF ceramic cap and a 470 uF Tantalum cap for 1.2-1.8V output, with external a 1 uF ceramic cap and a 10 uF Tantalum cap for 2.5V and 12V output, with external a 1 uF ceramic cap and a 220 uF Tantalum cap for 3.3V output, with external a 1 uF ceramic cap and a 100 uF Tantalum cap for 5V output, Ta=25 deg C.

## Transient Response Waveforms



Vout=1.2 V 50% to 25% Load Transients



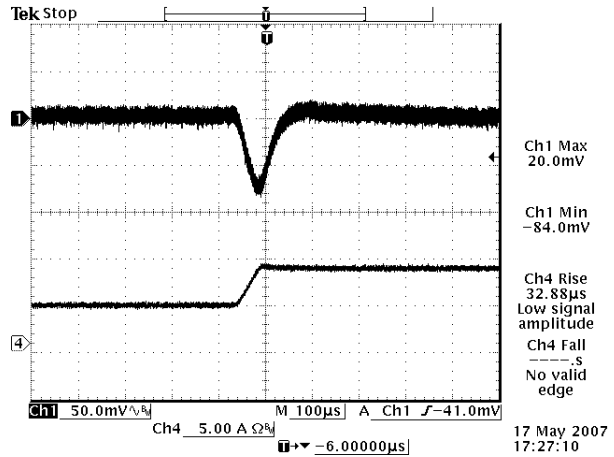
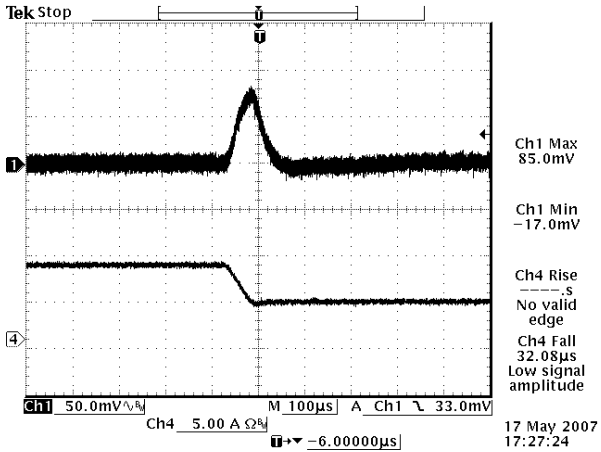
Vout=1.2 V 25% to 50% Load Transients

# ISOLATED DC/DC CONVERTERS

24 Vdc/48 Vdc Input 1.2 Vdc - 12 Vdc / 18 A - 3.5 A Outputs, 1/16 Brick

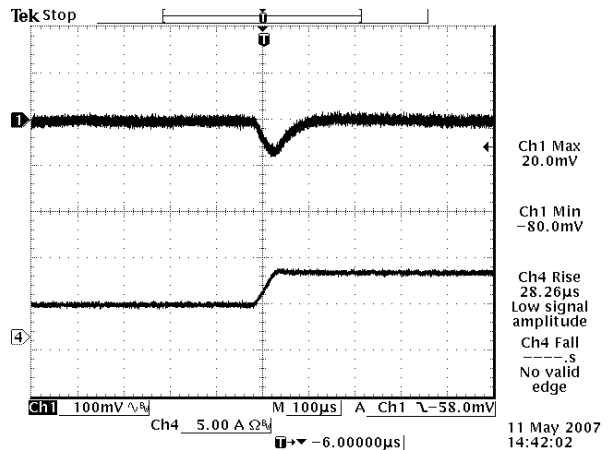
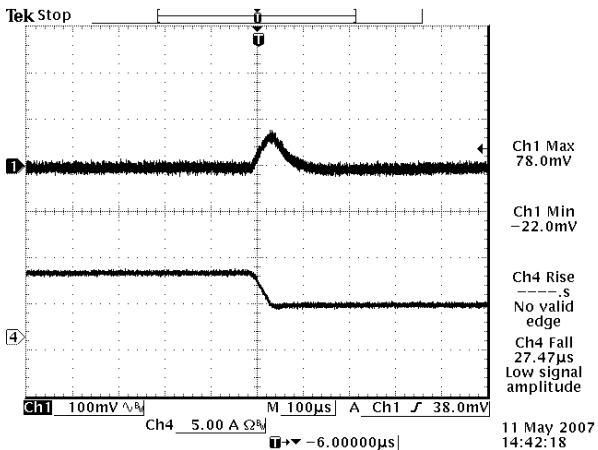


## Transient Response Waveforms (continued)



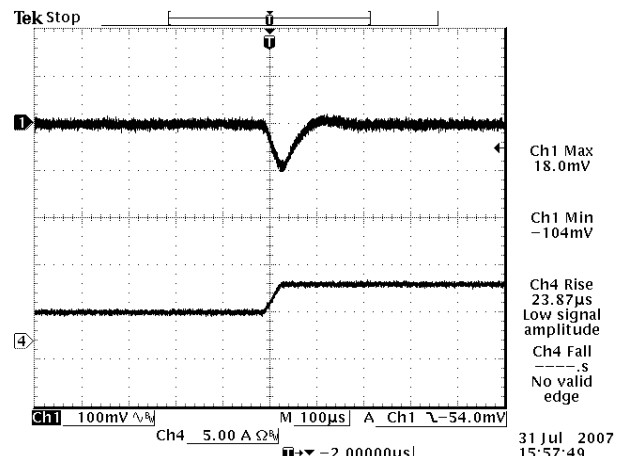
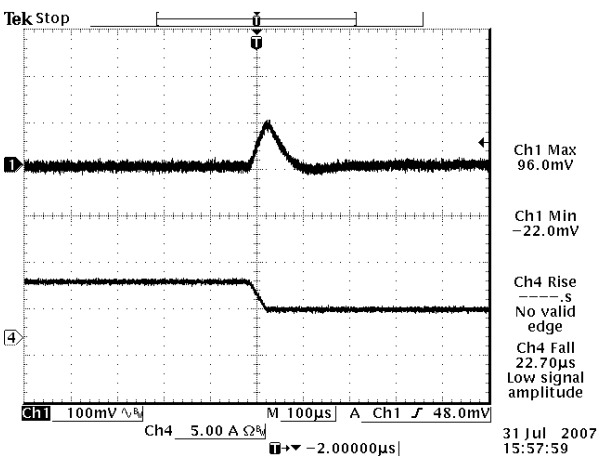
Vout=1.5 V 50% to 25% Load Transients

Vout=1.5 V 25% to 50% Load Transients



Vout=1.8 V 50% to 25% Load Transients

Vout=1.8 V 25% to 50% Load Transients



Vout=2.5 V 50% to 25% Load Transients

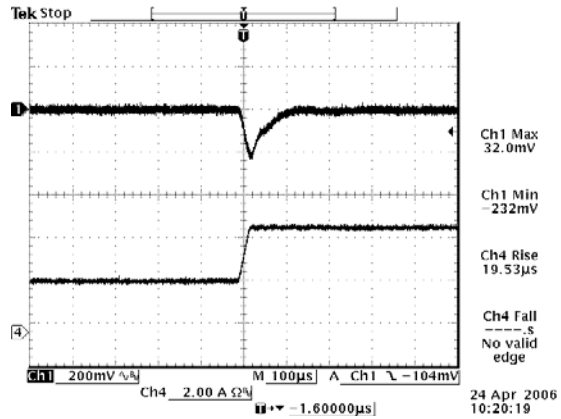
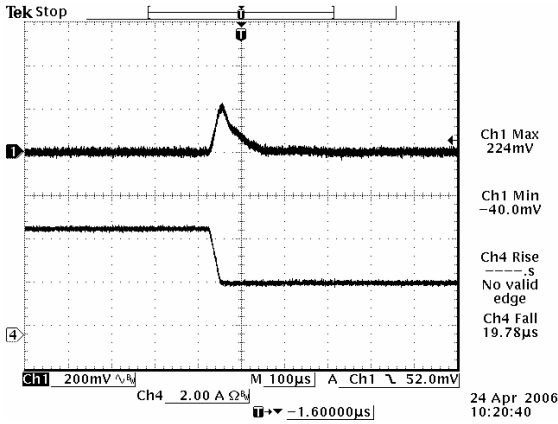
Vout=2.5 V 25% to 50% Load Transients

# ISOLATED DC/DC CONVERTERS

24 Vdc/48 Vdc Input 1.2 Vdc - 12 Vdc / 18 A - 3.5 A Outputs, 1/16 Brick

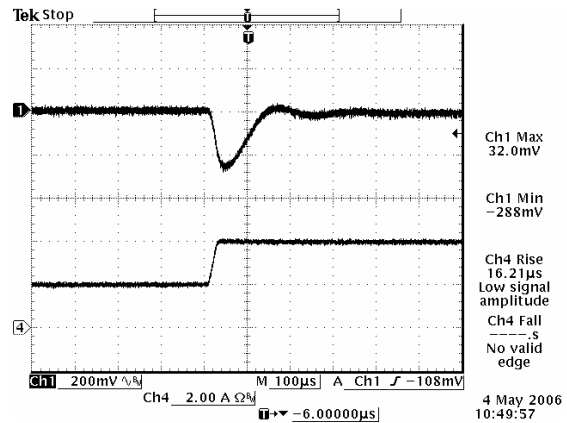
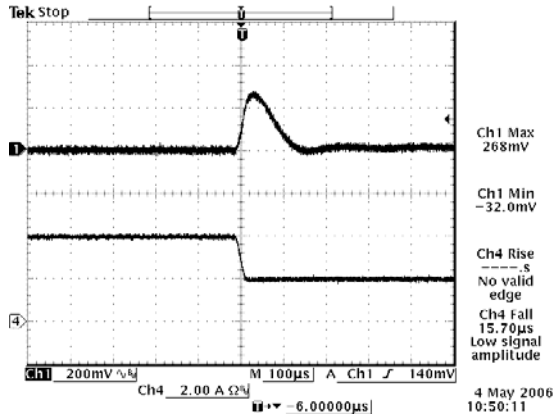


## Transient Response Waveforms (continued)



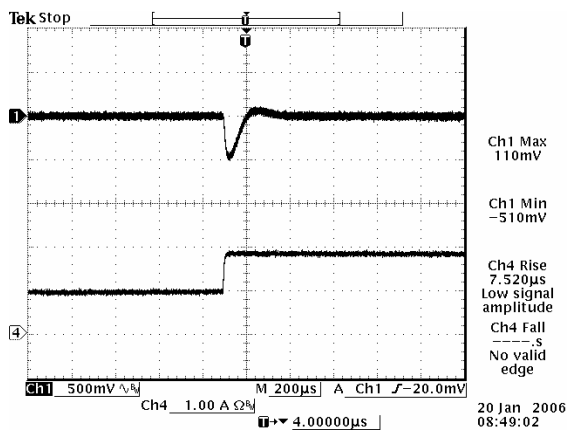
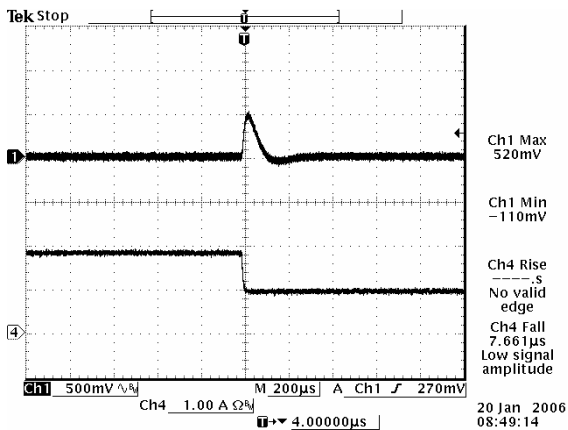
Vout=3.3 V 50% to 25% Load Transients

Vout=3.3 V 25% to 50% Load Transients



Vout=5.0 V 50% to 25% Load Transients

Vout=5.0 V 25% to 50% Load Transients



Vout=12 V 50% to 25% Load Transients

Vout=12 V 25% to 50% Load Transients

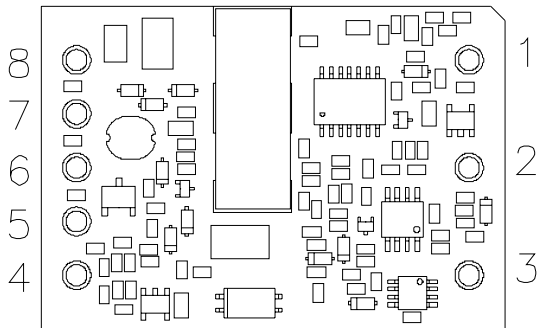
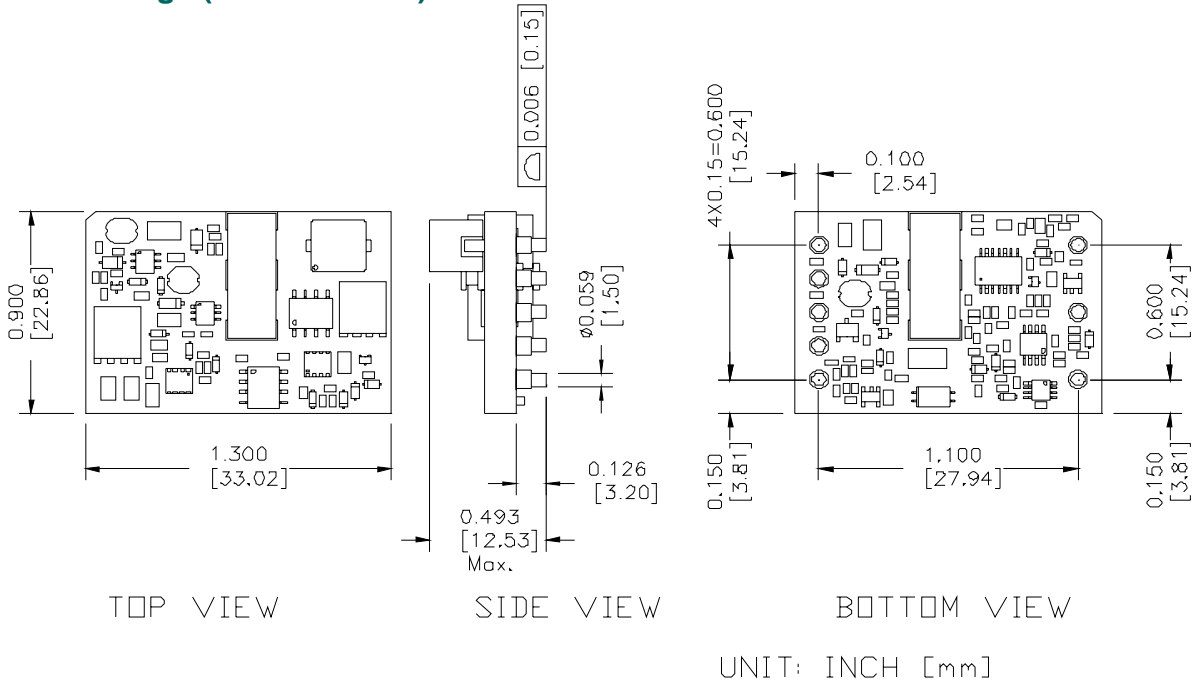
**Note:** Transient Response at Vin=48 V, di/dt=0.1 A/uS, with external a 1 uF ceramic cap and a 470 uF Tantalum cap for 1.2-1.8V output, with external a 1 uF ceramic cap and a 10 uF Tantalum cap for 2.5V and 12V output, with external a 1 uF ceramic cap and a 220 uF Tantalum cap for 3.3V output, with external a 1 uF ceramic cap and a 100 uF Tantalum cap for 5V output, Ta=25 deg C.

# ISOLATED DC/DC CONVERTERS

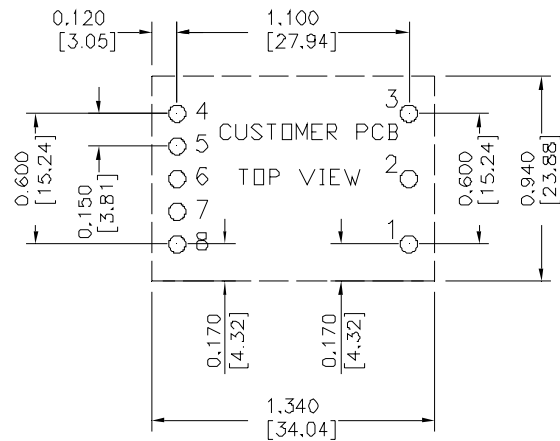
24 Vdc/48 Vdc Input 1.2 Vdc - 12 Vdc / 18 A - 3.5 A Outputs, 1/16 Brick



## SMT Package (SRSB-40Uxxx)



### RECOMMENDED PCB PAD LAYOUT



### Pin Connections

Pin	Function
1	Vin (+)
2	Remote On/Off
3	Vin (-)
4	Vout (-)
5	Remote Sense (-)
6	Trim
7	Remote Sense (+)
8	Vout (+)

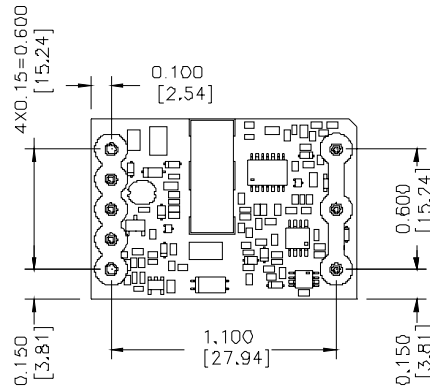
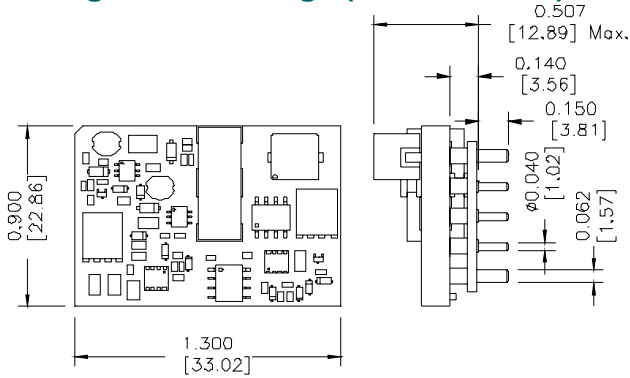
Recommended Surface Mount Pads  
 Min.  $\phi 0.080$ " [2.03]  
 Max.  $\phi 0.092$ " [2.34]

# ISOLATED DC/DC CONVERTERS

24 Vdc/48 Vdc Input 1.2 Vdc - 12 Vdc / 18 A - 3.5 A Outputs, 1/16 Brick



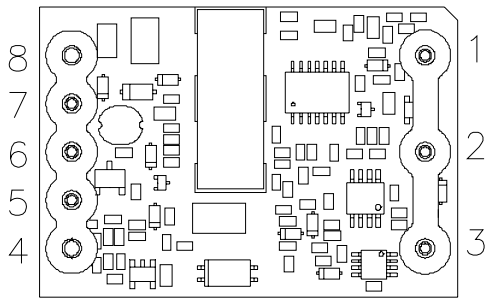
## Through Hole Package (0RSB-40Uxxx)



TOP VIEW

SIDE VIEW

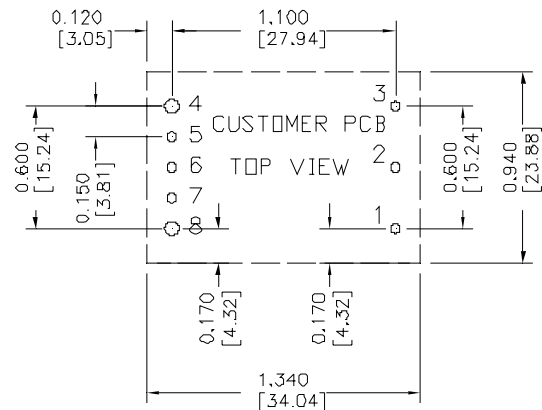
BOTTOM VIEW



BOTTOM VIEW

UNIT: INCH [mm]

### RECOMMENDED PCB PAD LAYOUT



HOLE SIZE: 1-3, 5-7  $\phi$ 0.047[1.19],  
4,8  $\phi$ 0.07 [1.78]  
PAD SIZE: 1-3, 5-7  $\phi$ 0.08[2.03]  
4,8  $\phi$ 0.10 [2.54]

### Pin Connections

Pin	Function
1	Vin (+)
2	Remote On/Off
3	Vin (-)
4	Vout (-)
5	Remote Sense (-)
6	Trim
7	Remote Sense (+)
8	Vout (+)

### RoHS Compliance

Complies with the European Directive 2002/95/EC, calling for the elimination of lead and other hazardous substances from electronic products.



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#### CORPORATE

Bel Fuse Inc.  
206 Van Vorst Street  
Jersey City, NJ 07302  
Tel 201-432-0463  
Fax 201-432-9542  
[www.belfuse.com](http://www.belfuse.com)

#### FAR EAST

Bel Fuse Ltd.  
8F/ 8 Luk Hop Street  
San Po Kong  
Kowloon, Hong Kong  
Tel 852-2328-5515  
Fax 852-2352-3706  
[www.belfuse.com](http://www.belfuse.com)

#### EUROPE

Bel Fuse Europe Ltd.  
Preston Technology Management Centre  
Marsh Lane, Suite G7, Preston  
Lancashire, PR1 8UD, U.K.  
Tel 44-1772-556601  
Fax 44-1772-888366  
[www.belfuse.com](http://www.belfuse.com)