NON-ISOLATED DC/DC CONVERTERS

5 Vdc - 13.8 Vdc Input 0.8375 Vdc – 5.0 Vdc/80 A Output

Jun. 02, 2011

Bel Power Inc., a subsidiary of Bel Fuse Inc.

xRP4-80E1A0 RoHS Compliant Rev.I

Features

- Non-Isolated
- High Efficiency
- Fixed Switching Frequency
- Low Cost
- Excellent Thermal Performance
- Over Temperature Protection
- Output Voltage Trim
- UL60950-1 2nd Edition Recognized (UL/cUL)
- Output Over-Voltage Shutdown
- OCP/SCP
- Low Output Ripple
- Power Good Signal
- Remote On/Off
- Current Share

Applications

- Networking
- Computers and peripherals
- Telecommunications

Description

The xRP4-80E1A0 is a non-isolated dc/dc converter that operates from a nominal 12 V source. This unit can provide a precisely regulated output voltage from 0.8375 Vdc to 5.0 Vdc and can deliver up to 80 A of output current. This unit is designed to be highly efficient and low cost. The converter is provided in an industry standard package.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency (Vo=1.8 Vdc)	Model Number Active High
0.8375 Vdc - 5.0 Vdc	5 Vdc - 13.8 Vdc	80 A	400 W	90%	xRP4-80E1A0

Note: Add “G” suffix at the end of the model numbers listed above to indicate “Tray Packaging”.

Part Number Explanation

x R P4 – 80 E 1A 0
1 2 3 4 5 6 7

1---Change “x” to “0” indicated Horizontal mount, Change “x” to “V” indicated Vertical mount
2---RoHS 6, change “R” to “7” means RoHS 5
3---Series name (SIP)
4---Series code (output current 80A)
5---Input range (5-13.8V)
6---Output voltage (0.8375-5.0V)
7---Enable, active high

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3 V	-	15 V	
Output Enable Terminal Voltage	-0.3 V	-	15 V	
Ambient Temperature	0 °C	-	70 °C	
Storage Temperature	-55 °C	-	125 °C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage Vo≤ 2.5 V Vo ＞2.5 V	 5 V 1.8*Vo	 12 V 12 V	 13.8 V 13.8 V	
Input Current (full load)	-	-	48 A	
Input Reflected Ripple Current (pk-pk)	-	20 mA	35 mA	With simulated source impedance of 1 uH, 5 Hz to 20 MHz. Use a 1000 uF/16 V electrolytic capacitor with ESR=0.1 ohm max, at 100 kHz at 25°C.
Input Reflected Ripple Current (rms)	-	5 mA	10 mA	
I^2t Inrush Current Transient	-	-	1 A^2s	
Turn-on Voltage Threshold	-	4.6 V	4.8 V	
Under Voltage Threshold	-	4.3 V	4.5 V	

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

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point Vo≥1 V Vo＜1 V	 -1.5 % Vo -10 mV	 - -	 +1.5 % Vo +10 mV	Vin=Vinmin, Io=Iomax
Load Regulation Vo≥2.5 V Vo＜2.5 V	 - -	 - -	 0.6% Vo 12 mV	
Line Regulation Vo≥2.5 V Vo＜2.5 V	 - -	 - -	 0.6% Vo 9 mV	
Regulation Over Temperature (0 °C to +70 °C)	-	-	0.02% Vo/C	
Output Current Range	0 A	-	80 A	
Output DC Current Limit	90 A	110 A	150 A	
Total Regulation Vo≥2.5 V Vo＜2.5 V	 - -	 - -	 2 % Vo 15 mV	
Output Ripple and Noise (pk-pk) Vo=5.0 V Vo=3.3 V Vo=2.5 V Vo=1.5 V Vo=1.0 V Vo=0.8375 V	 - - - - - -	 - - - - - -	 80 mV 80 mV 60 mV 60 mV 50 mV 50 mV	Test conditions: 0-20 MHz BW, with a 1 µF ceramic capacitor and a 10 uF Tantalum cap at output.

Output Specifications (continued)

Parameter	Min	Typ	Max	Notes
Output Ripple and Noise (rms)				
Vo=5.0 V	-	-	40 mV	Test conditions: 0-20 MHz BW, with a 1 µF ceramic capacitor and a 10 uF Tantalum cap at output.
Vo=3.3 V	-	-	40 mV	
Vo=2.5 V	-	-	30 mV	
Vo=1.5 V	-	-	30 mV	
Vo=1.0 V	-	-	25 mV	
Vo=0.8375 V	-	-	25 mV	
Rise Time				
Vo=5.0 V	-	8.4 mS	10 mS	
Vo=3.3 V	-	6.6 mS	8.0 mS	
Vo=2.5 V	-	5.6 mS	8.0 mS	
Vo=1.5 V	-	4.6 mS	6.0 mS	
Vo=1.0 V	-	4.4 mS	6.0 mS	
Vo=0.8375 V	-	4.3 mS	6.0 mS	
Turn On Time				
Vo=5.0 V	-	10 mS	15 mS	
Vo=3.3 V	-	8.8 mS	15 mS	
Vo=2.5 V	-	7.8 mS	12 mS	
Vo=1.5 V	-	6.8 mS	10 mS	
Vo=1.0 V	-	6.6 mS	10 mS	
Vo=0.8375 V	-	6.4 mS	10 mS	
Output Power	-	-	0 W≤ Po ≤ 400 W	9 V≤Vin≤13.8 V 0.8375 V ≤ Vo ≤ 5 V
	-	-	0 W ≤ Po ≤ (Vin*80)/1.8 W	5 V≤Vin<9 V 0.8375 V ≤ Vo ≤ Vin/1.8
Overshoot at Turn on and off	-	-	0.5%	
Output Capacitance ESR≥1 mΩ	470 uF	-	4700 uF	
Transient Response				
0% ~ 50% Max Load	-	-	300 mV	Test conditions: di/dt = 2.5 A/uS; Vin =12 V, Co=4700uF;
Settling Time	-	-	180 uS	
50% ~ 0% Max Load	-	-	300 mV	
Settling Time	-	-	180 uS	

Vo=All

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

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				
Vo=5.0 V	91%	95%	-	Measured at Vin=12 V, full load.
Vo=3.3 V	89%	93%	-	
Vo=2.5 V	88%	92%	-	
Vo=1.8 V	86%	90%	-	
Vo=1.5 V	85%	89%	-	
Vo=1.2 V	81%	86%	-	
Vo=1.0 V	79%	83%	-	
Vo=0.8375 V	70%	75%	-	
Switching Frequency	-	250 kHz	-	
Output Voltage Trim Range	0.8375 V	-	5 V	Trim pin is open, Vo = 0.8375 V.

General Specifications (continued)

Parameter	Min	Typ	Max	Notes
Over Voltage Protection	110% Vo,set	115%Vo,set	130%Vo,set	Vin=12 V, Io=full load.
Over Temperature Protection	-	105 °C	-	
MTBF	2,198,818 hours			
Dimensions Inches (L × W × H) Millimeters (L × W × H)	2.58 x 1.25 x 0.648 65.53 x31.75 x 16.46			0RP4-80E1A0
Dimensions Inches (L × W × H) Millimeters (L × W × H)	2.58 x 1.25 x 0.61 65.53 x31.75 x 15.44			VRP4-80E1A0
Weight	-	42 g	-	

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

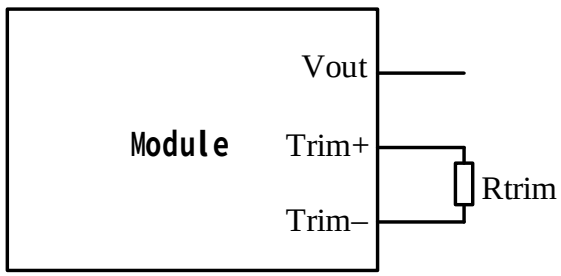
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off (Active High)				
Signal Low (Unit Off)	-0.3 V	-	0.8 V	Remote On/Off pin is open, unit is on.
Signal High (Unit On)	2 V	-	Vin,max	
Current Source/Sink	0 mA	-	3.3 mA	
PwGood (PowerGood)				
PwGood = High = Power Good	2.4 V	-	5.25 V	
	-	-	2 mA	
PwGood = Low = Power Not Good	0 V	-	0.4 V	
	-	-	4 mA	

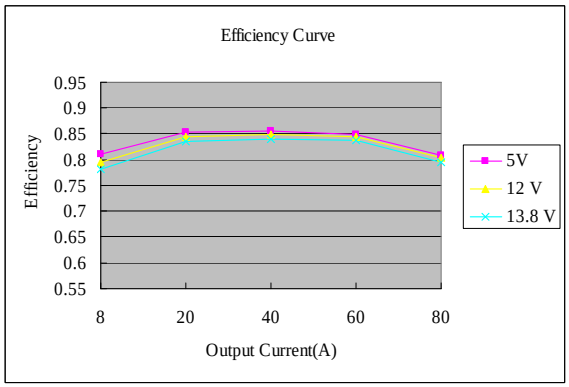
Output Trim Equation

The Trim resistor should be connected between the Trim+ pin and Trim- pin.

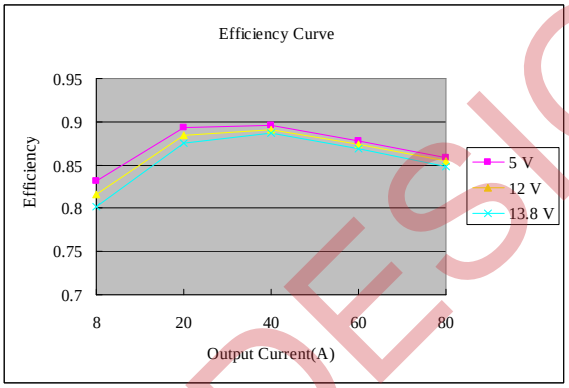
$$R_{trim} = \frac{1.675}{Vo - 0.8375} (K\Omega)$$



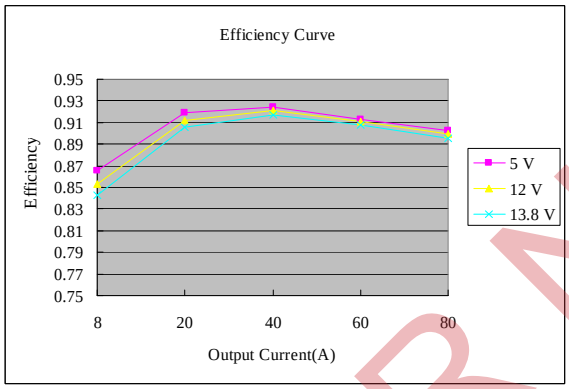
Efficiency Data



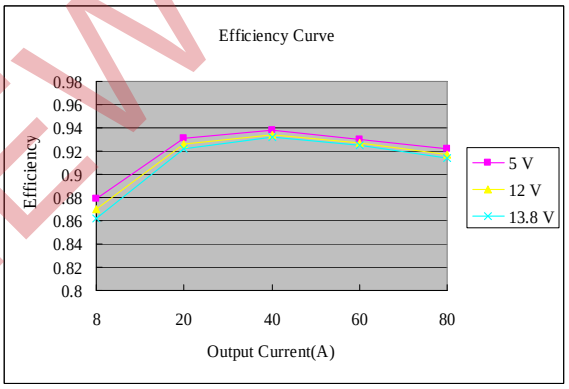
Vout =0.8375 V



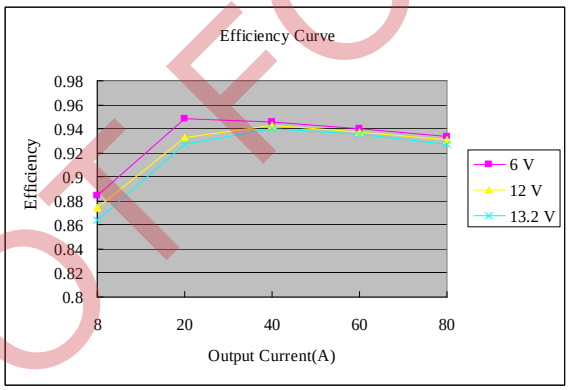
Vout =1.2 V



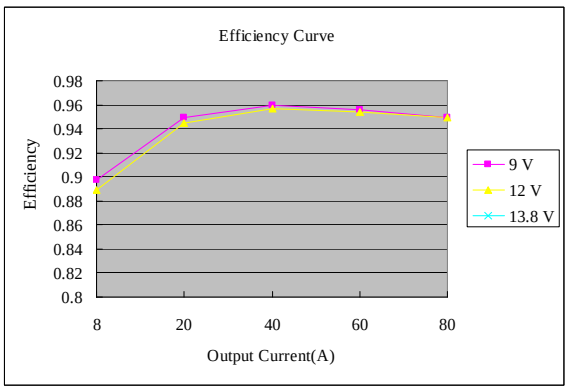
Vout =1.8 V



Vout =2.5 V

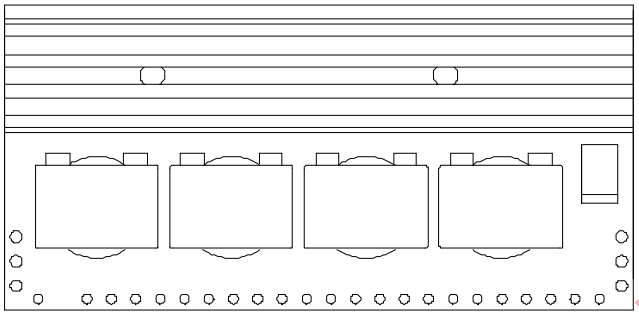


Vout =3.3 V

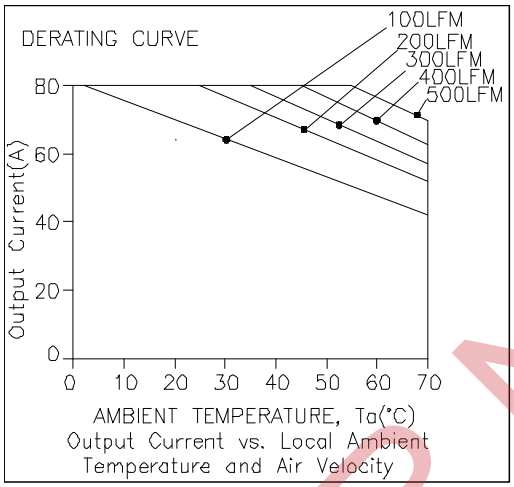


Vout =5.0 V

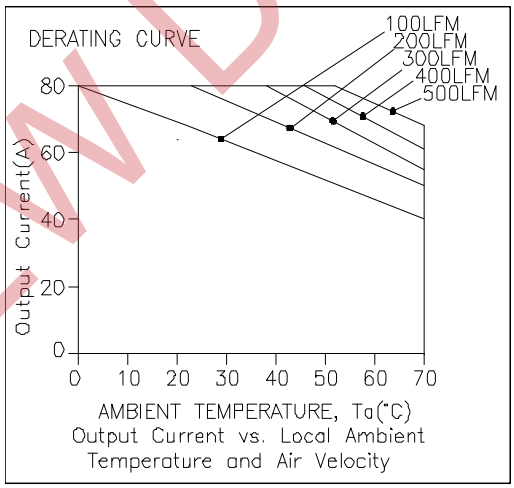
Thermal Derating Curves



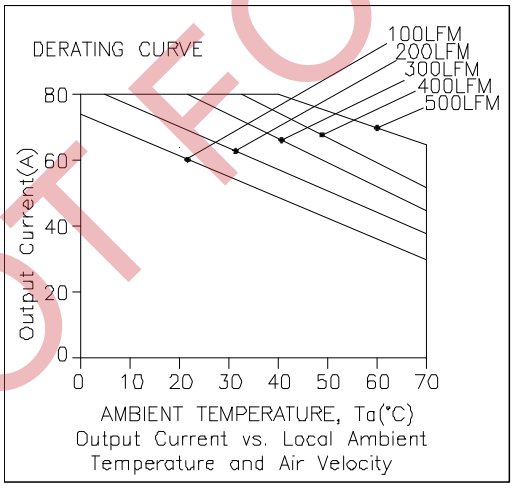
Top view



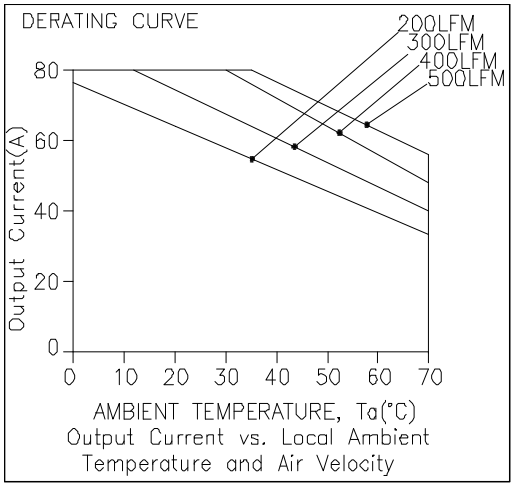
Vin=12 V, Vo=0.8375 V



Vin=12 V, Vo=1.2 V

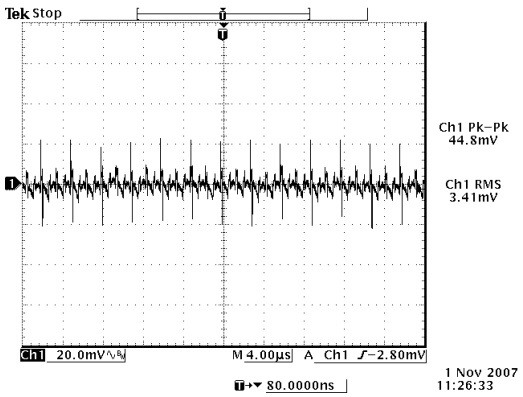


Vin=12 V, Vo=3.3 V

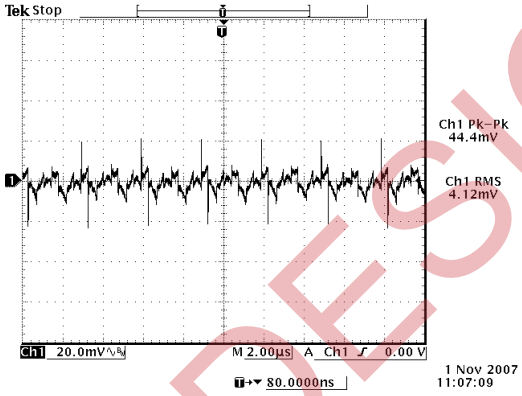


Vin=12 V, Vo=5.0 V

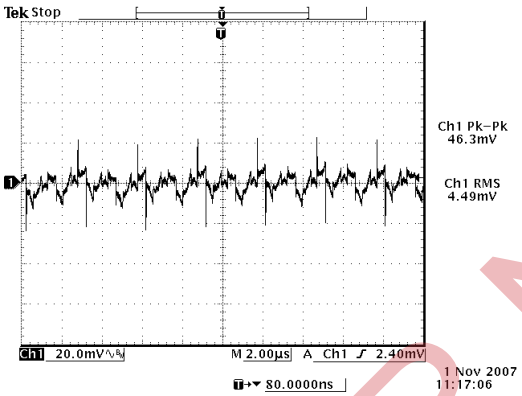
Ripple and Noise Waveforms



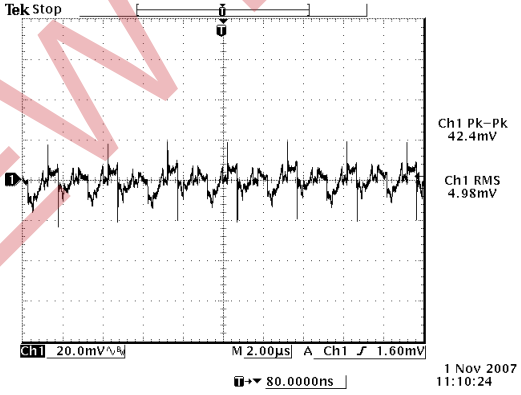
12 Vdc input, 0.8375 Vdc/80 A output



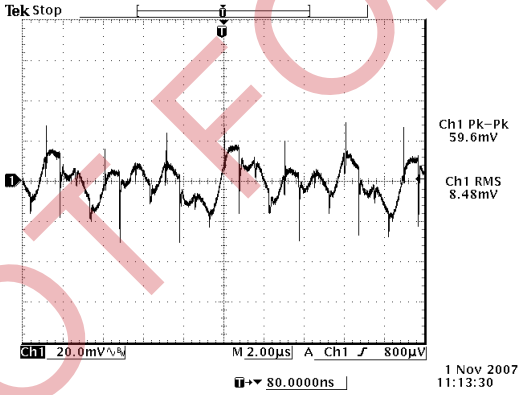
12 Vdc input, 1.0 Vdc/80 A output



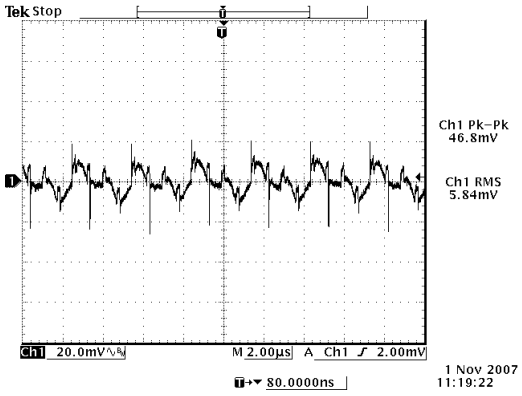
12 Vdc input, 1.5 Vdc/80 A output



12 Vdc input, 1.8 Vdc/80 A output

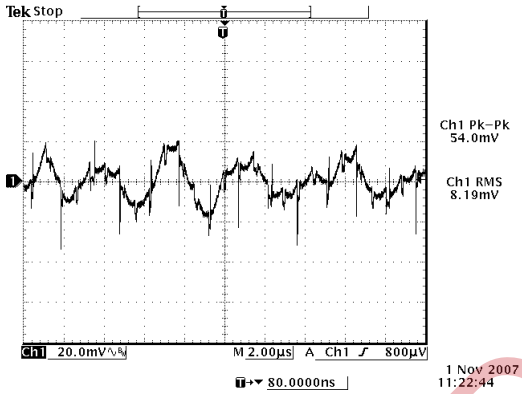


12 Vdc input, 2.5 Vdc/80 A output



12 Vdc input, 3.3 Vdc/80 A output

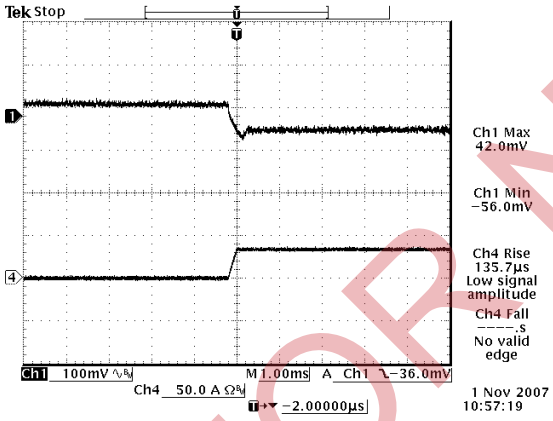
Ripple and Noise Waveforms (continued)



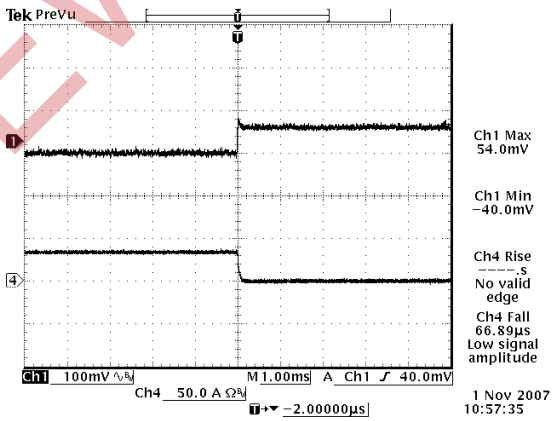
12 Vdc input, 5 Vdc/80 A output

Note: Ripple and noise at full load, 0-20 MHz BW, with a 10 uF tantalum cap and a 1uF ceramic cap at the output, and Ta=25 deg C.

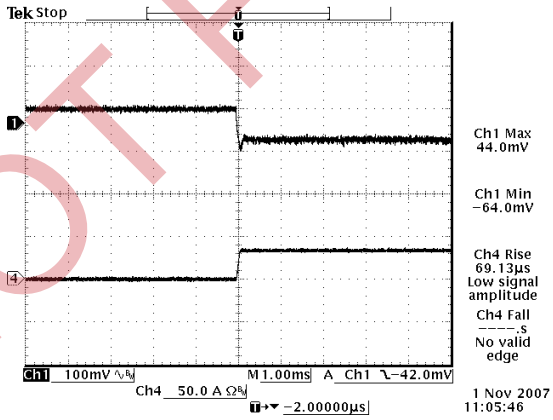
Transient Response Waveforms



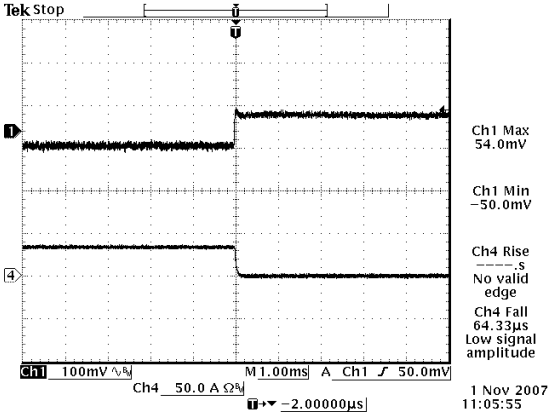
Vout= 0.8375 V 0%-50% Load Transients



Vout=0.8375 V 50%-0% Load Transients

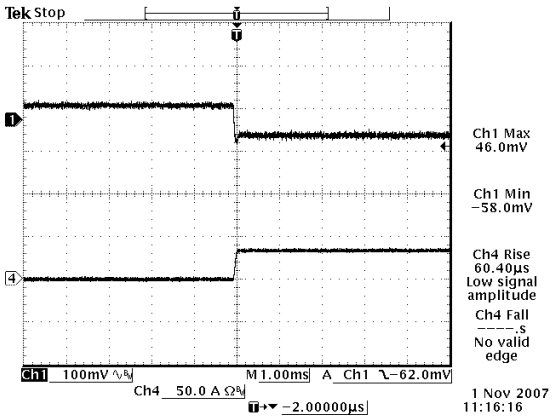


Vout=1.2 V 0%-50% Load Transients

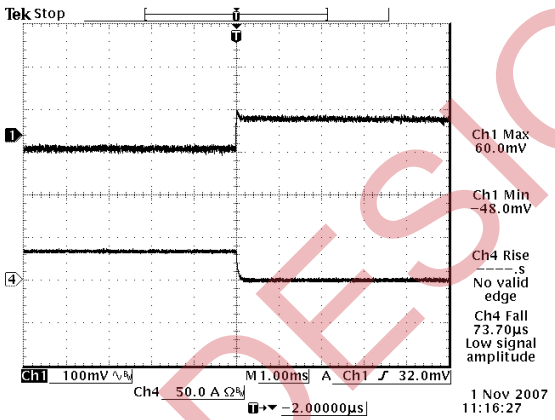


Vout=1.2 V 50%-0% Load Transients

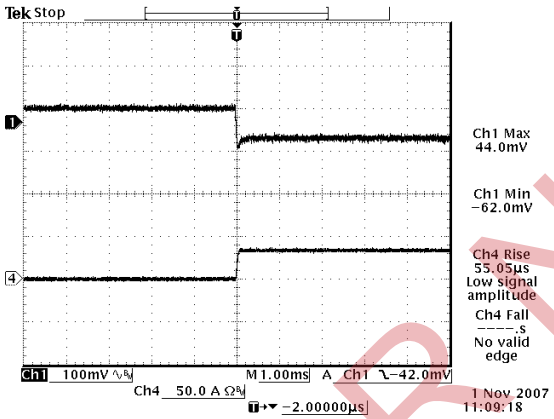
Transient Response Waveforms (continued)



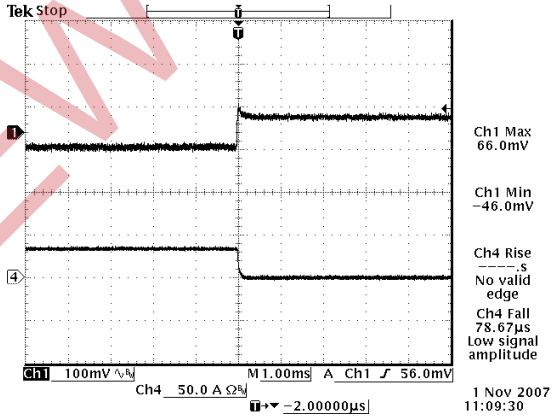
Vout=1.5 V 0%-50% Load Transients



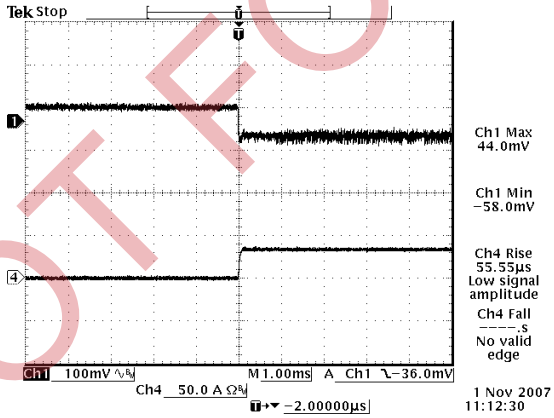
Vout=1.5 V 50%-0% Load Transients



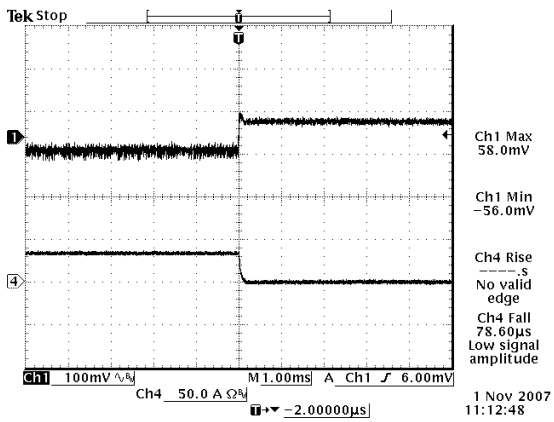
Vout= 1.8 V 0%-50% Load Transients



Vout=1.8 V 50%-0% Load Transients

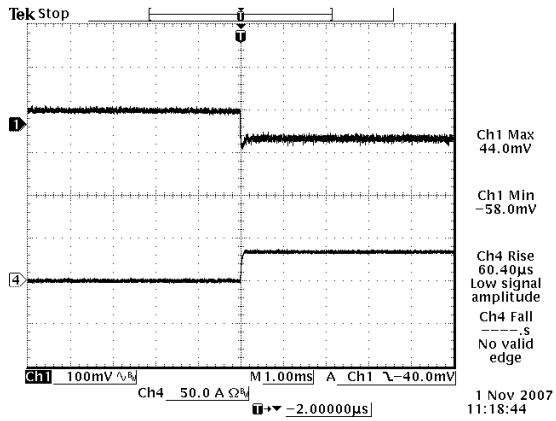


Vout=2.5 V 0%-50% Load Transients

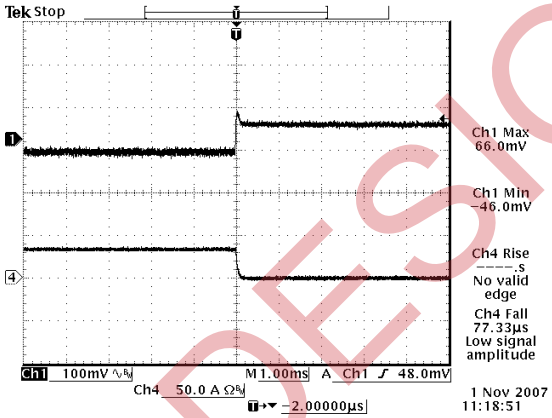


Vout=2.5 V 50%-0% Load Transients

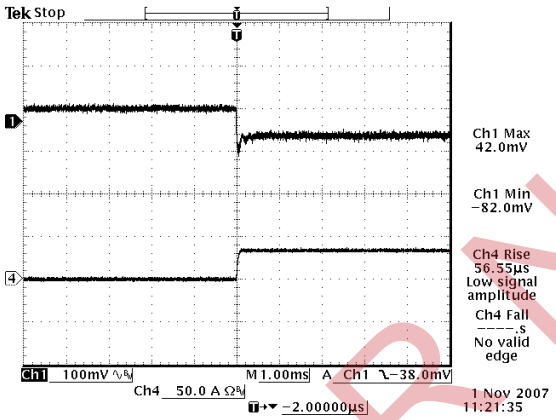
Transient Response Waveforms (continued)



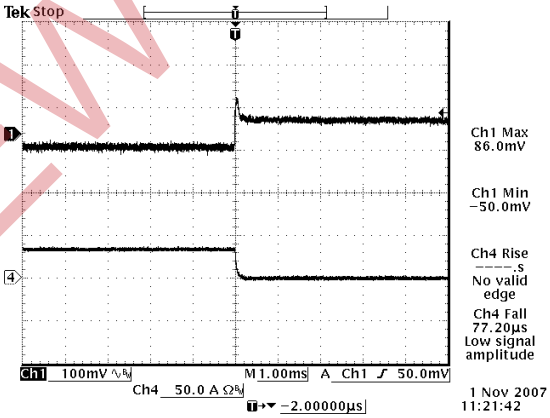
Vout=3.3 V 0%-50% Load Transients



Vout=3.3 V 50%-0% Load Transients



Vout=5 V 0%-50% Load Transients

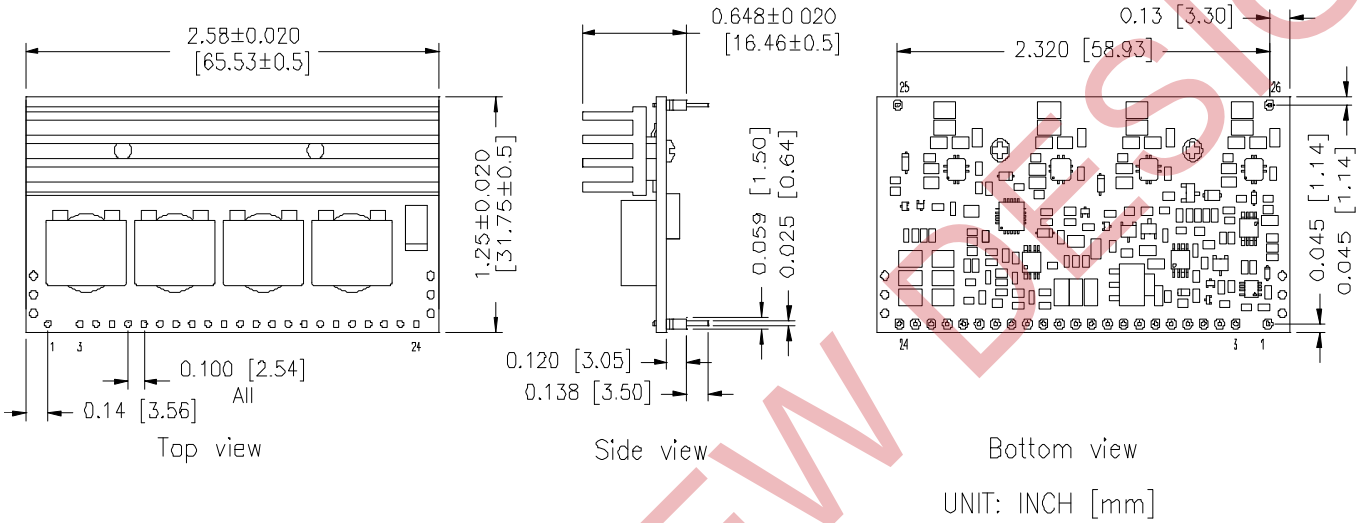


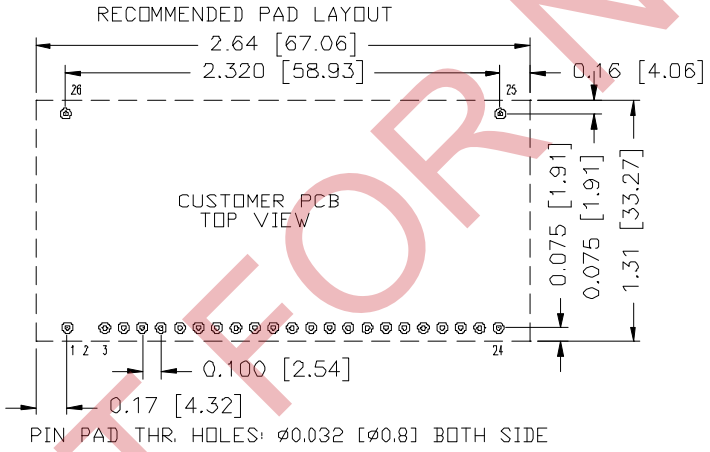
Vout=5 V 50%-0% Load Transients

Note: Transient response at di/dt = 2.5 A/uS, with extemal electrolytic cap 4700 uF, and Ta=25 deg C.

Mechanical Outline

0RP4-80E1A0



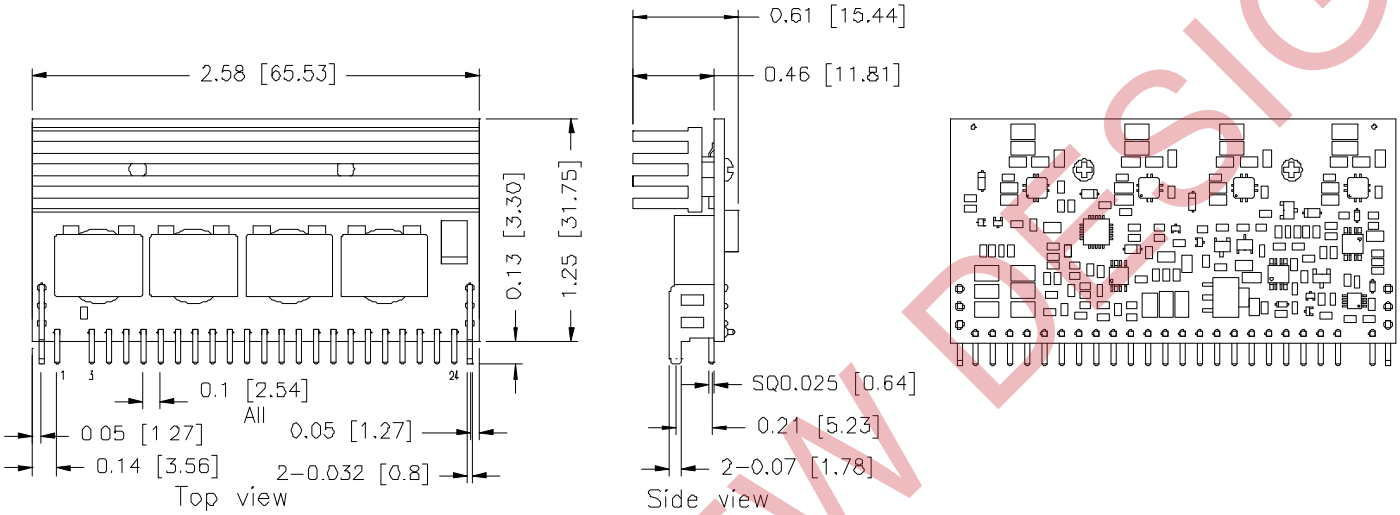


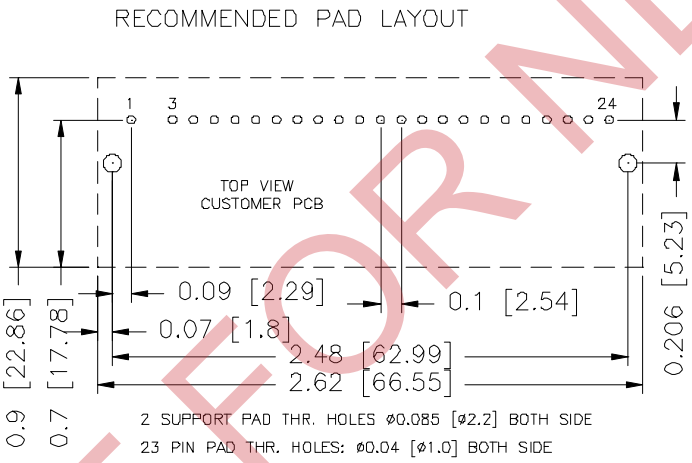
Pin Connections

Pin	Function	Pin	Function
1	Trim+	14	Vin
2	No Pin	15	Vout
3	GND	16	Vout
4	PwGOOD	17	GND
5	Trim-	18	Vout
6	Ishare	19	GND
7	GND	20	Vout
8	GND	21	GND
9	Enable	22	Vout
10	Sense-	23	GND
11	Sense+	24	Vout
12	Vin	25	Mech. Support
13	Vin	26	Mech. Support

Mechanical Outline (continued)

VRP4-80E1A0





Pin Connections

Pin	Function	Pin	Function
1	Trim+	13	Vin
2	No Pin	14	Vin
3	GND	15	Vout
4	PwGOOD	16	Vout
5	Trim-	17	GND
6	Ishare	18	Vout
7	GND	19	GND
8	GND	20	Vout
9	Enable	21	GND
10	Sense-	22	Vout
11	Sense+	23	GND
12	Vin	24	Vout

Note: This module is recommended and compatible with Pb-Free Wave Soldering and must be soldered using a peak solder temperature of no more than 260 ºC for less than 5 seconds.

Note:
1) All Pins: Material - Copper Alloy;
Finish – 3 micro inches minimum Gold over 50 micro inches minimum Nickel plate.
2) Undimensioned components are shown for visual reference only.
3) All dimensions in inches (mm); Tolerances: x.xx +/-0.02 in. (x.x +/-0.5mm) x.xxx +/-0.010 in. (x.xx +/-0.25mm).

Revision History

Date	Revision	Changes Detail	Approval
2010-07-08	A	First Release	YF Sun
2010-09-03	B	Update output capacitance in output specifications	YF Sun
2010-09-14	C	Add mechanical outline of VRP4-80E1A0	YF Sun
2011-01-06	D	Update TD	YF Sun
2011-01-28	E	Update TD	YF Sun
2011-03-01	F	Update the notes of remote on/off	YF Sun
2011-03-22	G	Update rise time, turn on time and add output power in output specifications	YF Sun
2011-05-05	H	Update TD curve drawing under the condition of Vo=5.0V.	YF Sun
2011-06-02	I	1. Add UL60950-1 2nd Edition Recognized (UL/cUL) in the first page. 2. Update weight in general specifications.	YF Sun

RoHS Compliance

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

CORPORATE

Bel Fuse Inc.
206 Van Vorst Street
Jersey City, NJ 07302
Tel 201-432-0463
Fax 201-432-9542
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

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