NON-ISOLATED DC/DC CONVERTERS

5 Vdc - 13.8 Vdc Input   0.6 Vdc - 5.0 Vdc/60 A Output

Mar. 23, 2010

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

VRP3-60E1A0   RoHS Compliant   Rev.D

Features

- Non-Isolated
- High Efficiency
- Fixed Switching Frequency
- Low Cost
- Excellent Thermal Performance
- Wide Input Voltage Range
- Wide Output Trim Range
- Output Over-Voltage Shutdown
- OCP/SCP
- Low Output Ripple
- Power Good Signal
- Remote On/Off

Applications

- Networking
- Computers and peripherals
- Telecommunications

Description

The VRP3-60E1A0 is a non-isolated dc/dc converter that operates over a wide range of input voltage (Vin = 5 Vdc - 13.8 Vdc). This unit can provide a precisely regulated output voltage from 0.6 Vdc to 5.0 Vdc and can deliver up to 60 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
0.6 Vdc - 5.0 Vdc	5 Vdc - 13.8 Vdc	60 A	300 W	88%	VRP3-60E1A0

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

Part Number Explanation

<u>V</u> <u>R</u> <u>P3</u> – <u>60</u> <u>E</u> <u>1A</u> <u>0</u>
1 2 3 4 5 6 7

1---Vertical mount
2---RoHS 6, change "R" to "7" means RoHS 5
3---Series name (SIP)
4---Series code (output current 60A)
5---Input range (5-13.8V)
6---Output voltage (0.6-5.0V)
7---Suffix

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≤ 2.8 V Vo > 2.8 V	 5 V 1.8*Vo	 12 V 12 V	 13.8 V 13.8 V	
Input Current (full load)	-	-	40 A	
Input Reflected Ripple Current (pk-pk)	-	20	35	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	10	
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	 - -	 - -	 0.3% Vo 9 mV	
Regulation Over Temperature (0 °C to +70 °C)	-	-	0.02% Vo/C	
Output Current	0 A	-	60 A	
Current Limit Threshold	110% Io	130% Io	160% Io	
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=0.6 V	 - - - - - -	 - - - - - -	 60 mV 60 mV 40 mV 40 mV 30 mV 30 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)					Test conditions: 0-20 MHz BW, with a 1 µF ceramic capacitor and a 10 uF Tantalum cap at output.
	Vo=5.0 V	-	-	30 mV	
	Vo=3.3 V	-	-	30 mV	
	Vo=2.5 V	-	-	20 mV	
	Vo=1.5 V	-	-	20 mV	
	Vo=1.0 V	-	-	15 mV	
	Vo=0.6 V	-	-	15 mV	
Turn On Time		-	-	10 mS	
Rise Time		-	-	3 mS	
Overshoot at Turn on and off		-	-	0.5%	
Output Capacitance	ESR⩾1 mΩ	0 uF	-	4700 uF	
Transient Response					
0% ~ 50% Max Load	Vo=All	-	-	300 mV	Test conditions: di/dt = 10 A/uS; Vin =12 V;
Settling Time	Vo=All	-	-	100 uS	
50% ~ 0% Max Load	Vo=All	-	-	300 mV	
Settling Time	Vo=All	-	-	100 uS	

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

General Specifications

Parameter		Min	Typ	Max	Notes
Efficiency					Measured at Vin=12 V, full load.
	Vo=5.0 V	91%	94%	-	
	Vo=3.3 V	89%	91%	-	
	Vo=2.5 V	87%	90%	-	
	Vo=1.8 V	84%	88%	-	
	Vo=1.5 V	82%	87%	-	
	Vo=1.2 V	79%	84%	-	
	Vo=1.0 V	76%	81%	-	
	Vo=0.6 V	68%	74%	-	
Switching Frequency		-	333 kHz	-	
Output Voltage Trim Range		0.6 V	-	5 V	Trim pin is open, Vo = 0.6 V.
Over Voltage Protection		110% Vo,set	115%Vo,set	130%Vo,set	Vin=12 V, Io=full load.
MTBF		2,576,000 hours			Calculated Per Bell Core SR-332 (I_O = 80%Iomax; Vin=12 V; T_a = 25 °C)
Dimensions	Inches (L × W × H)	2.58 x 1.25 x 0.608			
	Millimeters (L × W × H)	65.53 x31.75 x 15.44			
Weight		-	38 g	-	

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

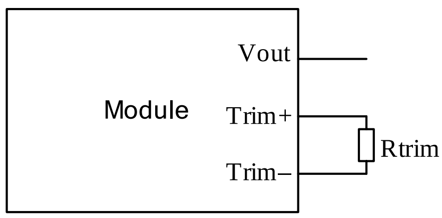
Control Specifications

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 off.
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	

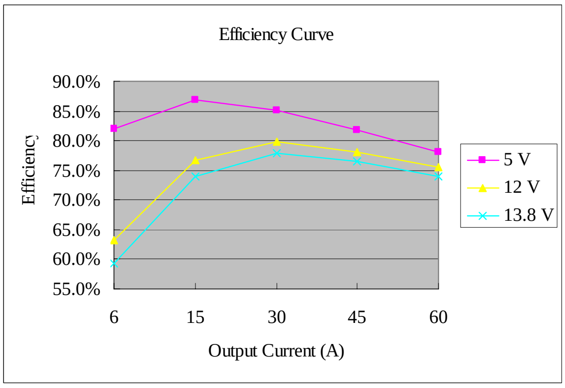
Output Trim Equation

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

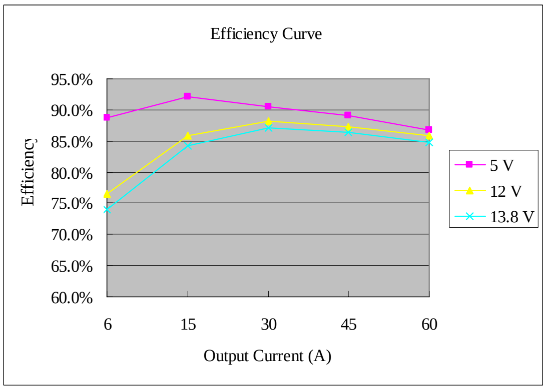
$$R_{trim} = \frac{1.2}{Vo - 0.6} (K\Omega)$$



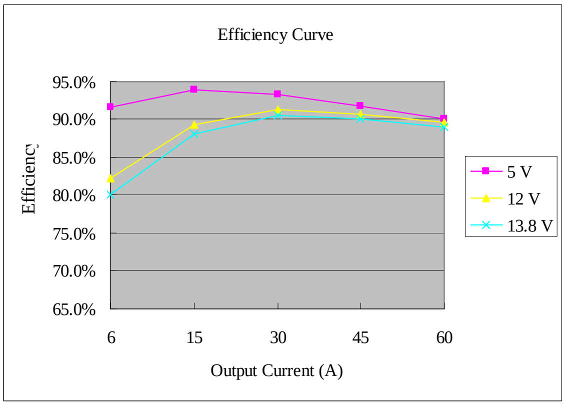
Efficiency Data



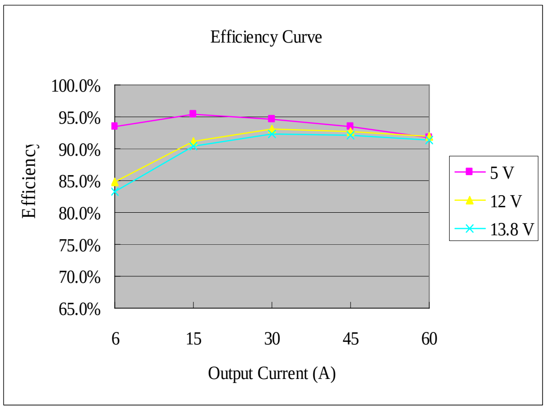
Vout =0.6 V



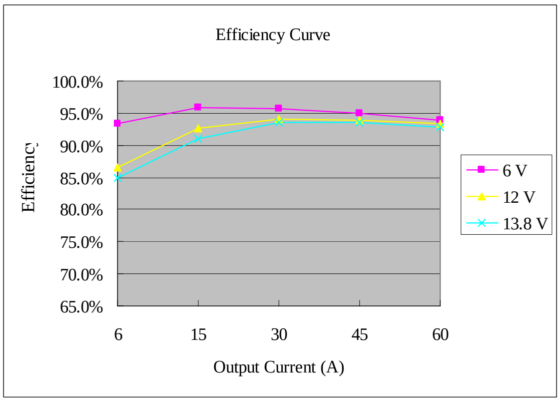
Vout =1.2 V



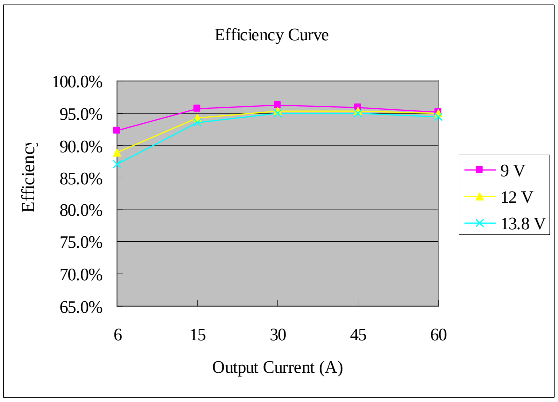
Vout =1.8 V



Vout =2.5 V

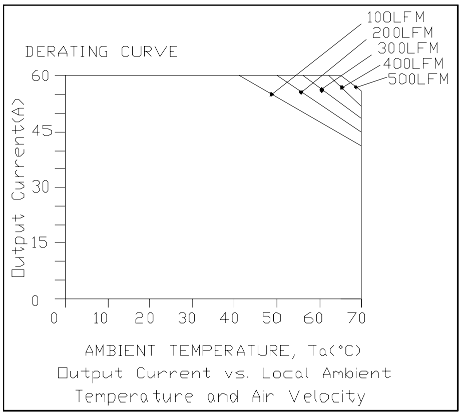


Vout =3.3 V

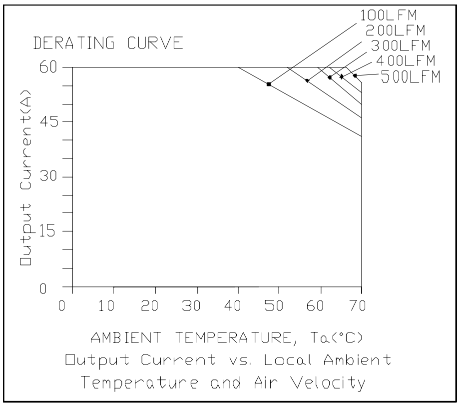


Vout =5.0 V

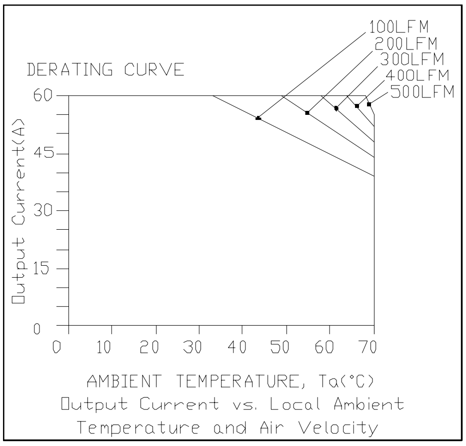
Thermal Derating Curves



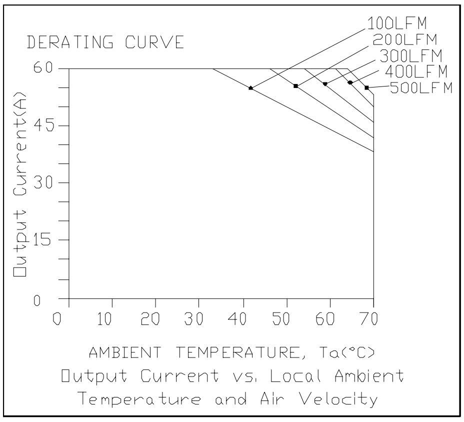
Vin=12 V, Vo=0.6 V



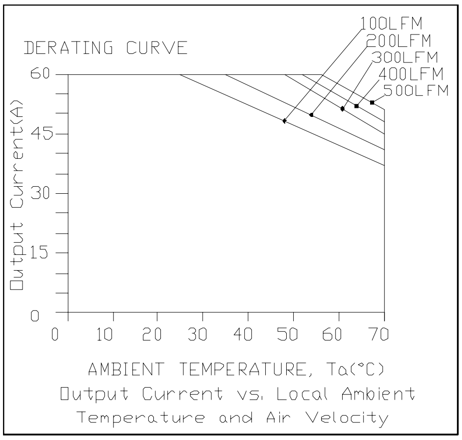
Vin=12 V, Vo=1.2 V



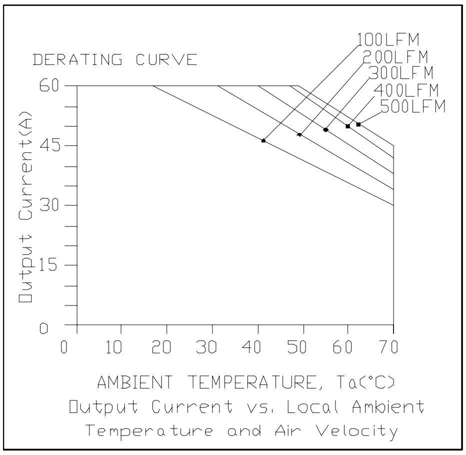
Vin=12 V, Vo=1.8 V



Vin=12 V, Vo=2.5 V

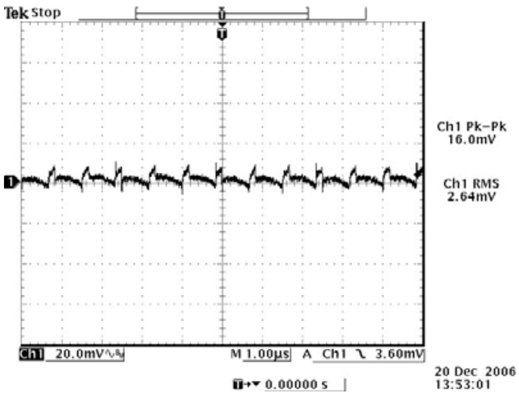


Vin=12 V, Vo=3.3 V

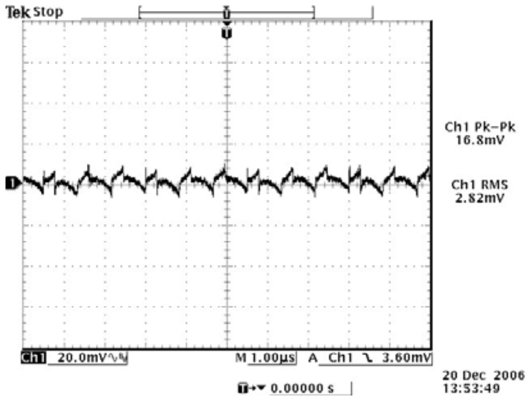


Vin=12 V, Vo=5.0 V

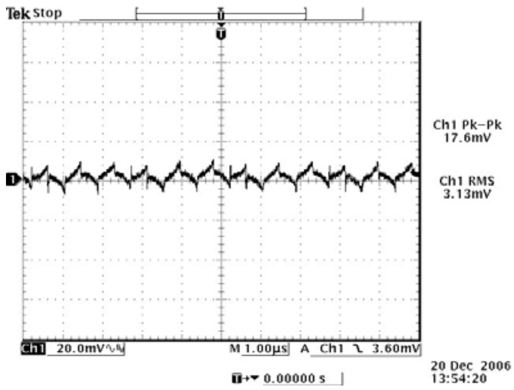
Ripple and Noise Waveforms



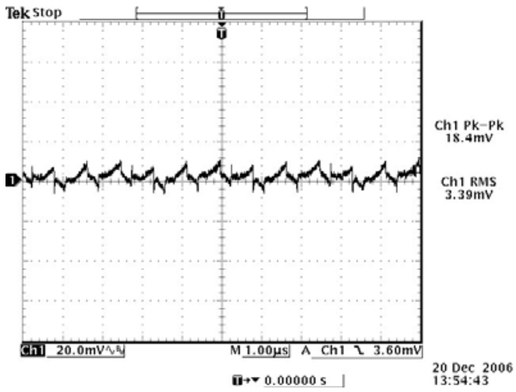
12 Vdc input, 0.6 Vdc/60 A output



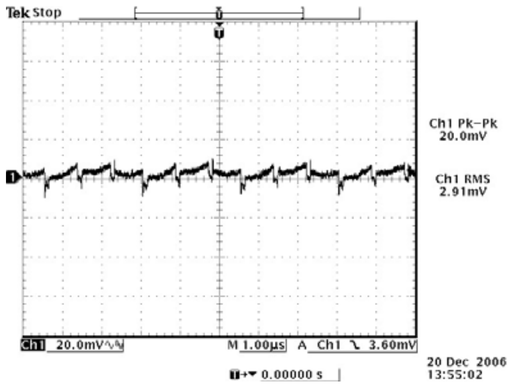
12 Vdc input, 1.2 Vdc/60 A output



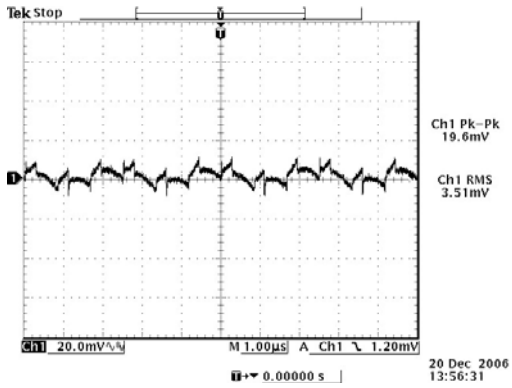
12 Vdc input, 1.8 Vdc/60 A output



12 Vdc input, 2.5 Vdc/60 A output



12 Vdc input, 3.3 Vdc/60 A output



12 Vdc input, 5.0 Vdc/60 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.

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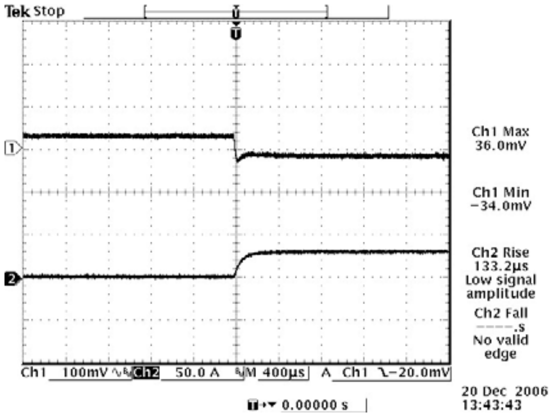
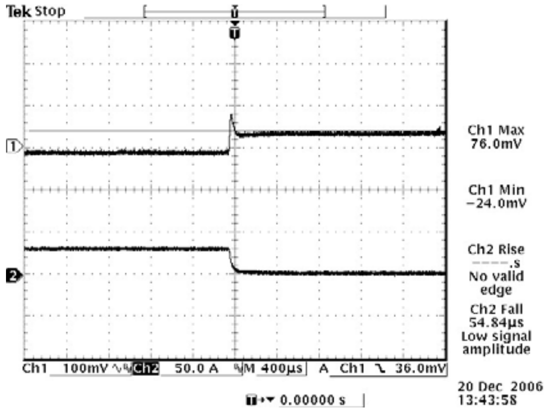
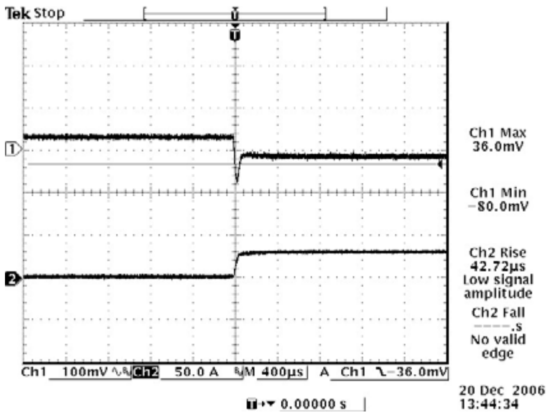
Transient Response Waveforms



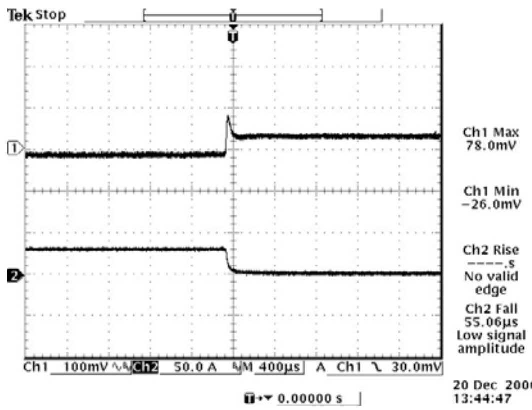
Vout= 0.6 V 0%-50% Load Transients



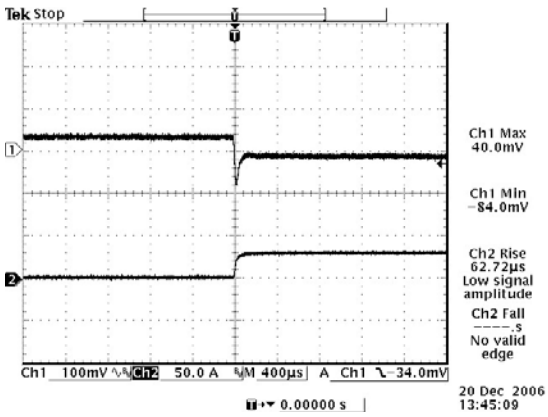
Vout=0.6 V 50%-0% Load Transients



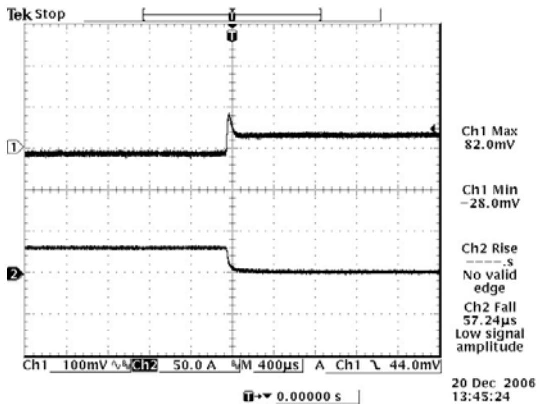
Vout=1.2 V 0%-50% Load Transients



Vout=1.2 V 50%-0% Load Transients

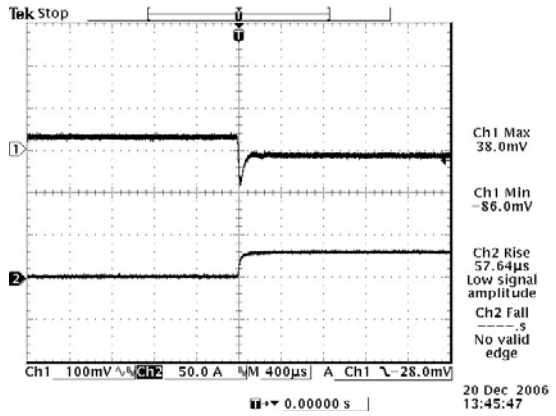


Vout=1.8 V 0%-50% Load Transients

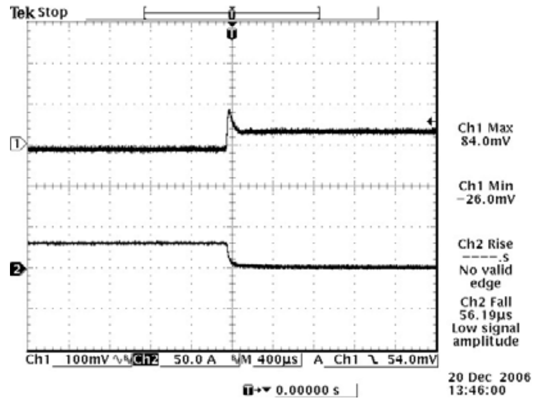


Vout=1.8 V 50%-0% Load Transients

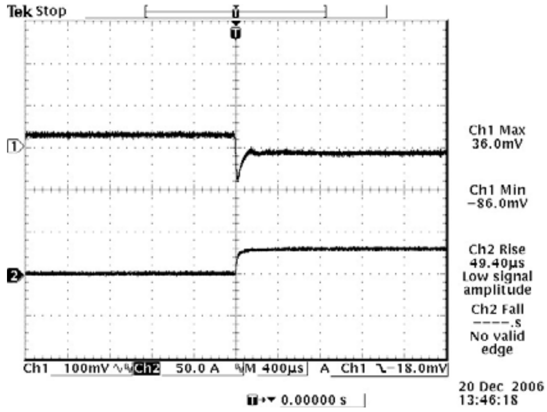
Transient Response Waveforms (continued)



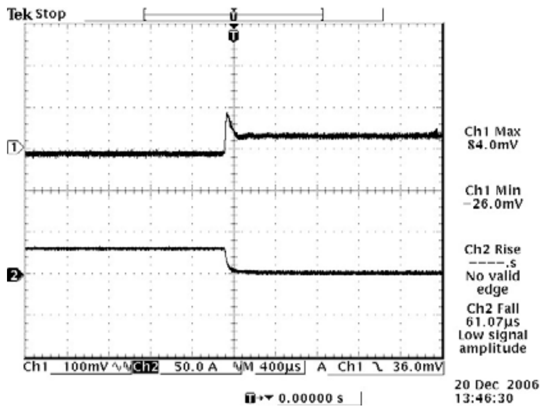
Vout= 2.5 V 0%-50% Load Transients



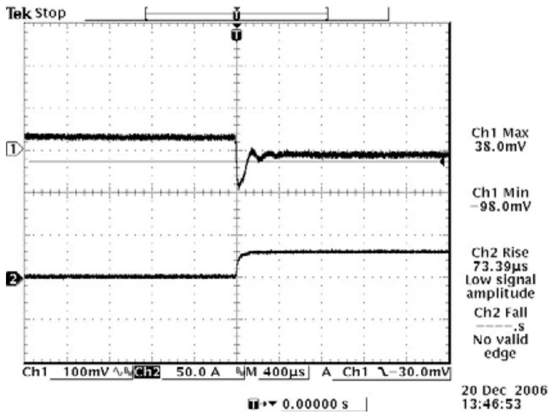
Vout=2.5 V 50%-0% Load Transients



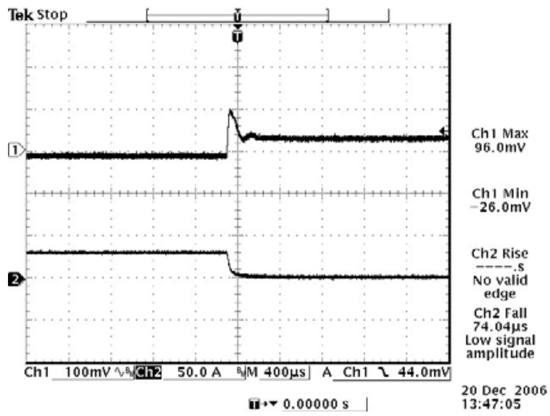
Vout=3.3 V 0%-50% Load Transients



Vout=3.3 V 50%-0% Load Transients



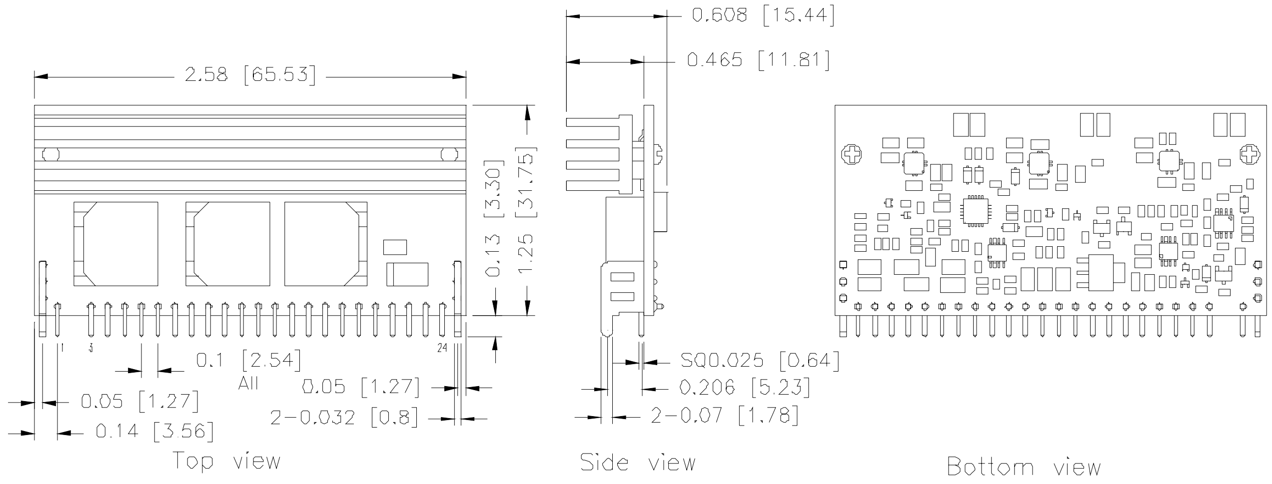
Vout=5 V 0%-50% Load Transients

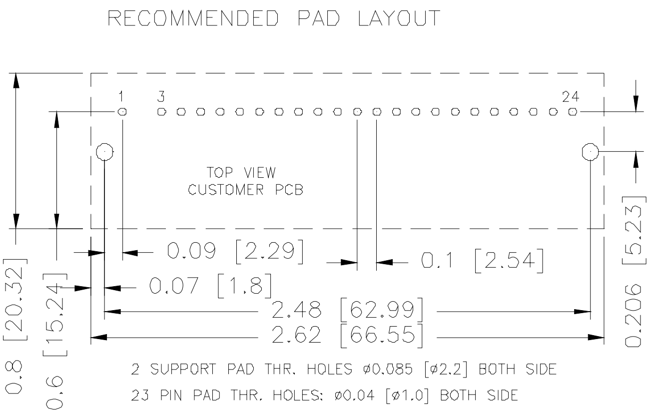


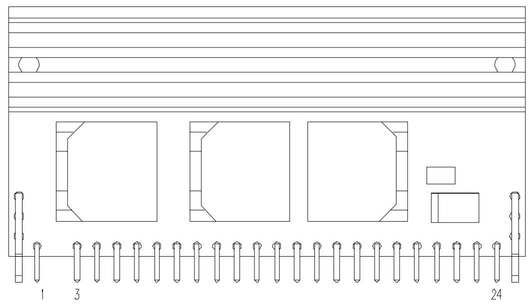
Vout=5 V 50%-0% Load Transients

Note: Transient response at di/dt = 10 A/uS, with extemal electrolytic cap 4700 uF, and Ta=25 deg C.

Mechanical Outline







Pin Connections

Pin	Function	Pin	Function	Pin	Function
1	Trim+	9	Enable	17	GND
2	N/A	10	Sense-	18	Vout
3	GND	11	Sense+	19	GND
4	PwGOOD	12	Vin	20	Vout
5	Trim-	13	Vin	21	GND
6	Ishare	14	Vin	22	Vout
7	GND	15	Vout	23	GND
8	GND	16	Vout	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
2010-3-23	D	1. Change to Bel new datasheet format	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

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
Адрес: 105318, г.Москва, ул.Щербаковская д.3, офис 1107

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

http://moschip.ru/get-element

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru
moschip.ru_4
moschip.ru_6
moschip.ru_9