NON-ISOLATED DC/DC CONVERTERS

4.5 Vdc - 14 Vdc Input 0.75 Vdc - 3.63 Vdc/10 A Output

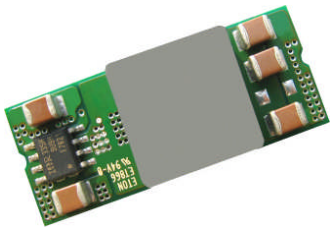
Jan. 25, 2013

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

SRBC-10E1Ax RoHS Compliant Rev.D

Features

- Non-Isolated
- High Efficiency
- Fixed Frequency
- Remote On/Off
- Low Cost
- Industrial Temperature Range (Option)
- Under-Voltage Lockout (UVLO)
- Over Temperature Shutdown
- OCP/SCP
- Wide Input
- Wide Trim
- Remote Sense
- Certificated to UL60950-1/CSA C22.2 No.60950-1, 2rd edition, am1



Applications

- Networking
- Computers and peripherals
- Telecommunications

Description

The Bel SRBC-10E1Ax is part of the non-isolated dc/dc converter series. The modules use a SMT package. These converters are available in a range of output voltages from 0.75 Vdc to 3.63 Vdc over a wide range of input voltage (Vin = 4.5 Vdc - 14 Vdc). The efficiency is typically 93% at 3.3 Vdc at output at full load.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active Low	Model Number Active High
0.75 V - 3.63 V	4.5 V - 14 V	10 A	36 W	93%	SRBC-10E1AL	SRBC-10E1A0

Notes: 1. Add “G” suffix at the end of the model number to indicate Tray Packaging.

Part Number Explanation

S	R	BC	–	10	E	1A	x
1	2	3		4	5	6	7

1---Surface mount
2---RoHS 6, change “R” to “7” means RoHS 5
3---Series name
4---Series code
5---Wide input range (4.5-14V)
6---Wide trim
7---Option, “x” of the model part number to be 0-9, A-Z, which will represent the special request of customer.

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	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

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

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage Vo,set < 3.0 Vo,set ≥ 3.0	 4.5 V Vo,set +1.5	 - -	 14 V 14 V	
Input Current (full load)	-	-	8.6 A	An input line fuse must always be used.
Input Current (no load)	-	40 mA	-	
Remote Off Input Current	-	2 mA	-	
Input Reflected Ripple Current (pk-pk)	-	-	400 mA	With simulated source impedance of 1000 nH, 5 Hz to 20 MHz, with one 1000 uF/25 V AL input capacitor with ESR=0.03 ohm max and 4 × 47 uF/16 V tantalum capacitors with ESR=0.013 ohm max at 100 kHz
Input Reflected Ripple Current (rms)	-	-	150 mA	
I^2t Inrush Current Transient	-	0.04 A^2s	0.08 A^2s	
Turn-on Voltage Threshold	-	4.3 V		
Turn-off Voltage Threshold	-	4.0 V		

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

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point	-2%Vo,set	-	2%Vo,set	Vin=5 V and 12 V, full load
Output Voltage Set Point	-3%Vo,set	-	3%Vo,set	Over all operating input voltage, resistive load, and temperature conditions.
Load Regulation	-	0.1%Vo,set	-	
Line Regulation	-	0.1%Vo,set	-	
Regulation Over Temperature (-40°C to +85°C)	-	0.3%Vo,set	-	
Output Current	0 A	-	10 A	
Current Limit Threshold	-	200% Iout	-	
Short Circuit Surge Transient	-	1 A^2s	3 A^2s	
Ripple and Noise (pk-pk)	-	30 mV	75 mV	Tested with 0-20 MHz BW, with 10 uF tantalum capacitor & 1 uF ceramic capacitor at the output
Ripple and Noise (rms)	-	12 mV	35 mV	
Turn on Time	-	8 mS	20 mS	
Overshoot at Turn on	-	-	1%	
Output Capacitance	0 uF	-	5600 uF	
Transient Response				
50% ~ 100% Max Load	Vo = 0.75 V - 3.63 V	-	160 mV	-	di/dt=2.5 A/uS; Vin=5 V & 12 V; and with 470 uF tantalum capacitor at the output
Settling Time		-	50 uS	-	
100% ~ 50% Max Load		-	160 mV	-	
Settling Time		-	50 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=3.3 V	-	92%	-	Measured at Vin=5 V, full load
Vo=2.5 V	-	91%	-	
Vo=1.8 V	-	89%	-	
Vo=1.5 V	-	88%	-	
Vo=1.2 V	-	86%	-	
Vo=0.75 V	-	80%	-	
Efficiency				
Vo=3.3 V	-	93%	-	Measured at Vin=12 V, full load
Vo=2.5 V	-	92%	-	
Vo=1.8 V	-	90%	-	
Vo=1.5 V	-	89%	-	
Vo=1.2 V	-	87.5%	-	
Vo=0.75 V	-	81%	-	
Switching Frequency	265 kHz	300 kHz	335 kHz	
Over Temperature Shutdown	-	130 °C	-	
Output Voltage Trim Range	0.7525 V	-	3.63 V	
Remote Sense Compensation	-	-	0.5 V	
MTBF	4,982,651 hours			Calculated Per Bell Core SR-332 (Io =80%Io,max; Vo=3.3 V; Vin=12 V; Ta = 30°C)
Dimensions				
Inches (L × W × H)	1.3 x 0.53 x 0.315			
Millimeters (L × W × H)	33.02 x 13.46 x 8.00			
Weight	-	8 g	-	

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

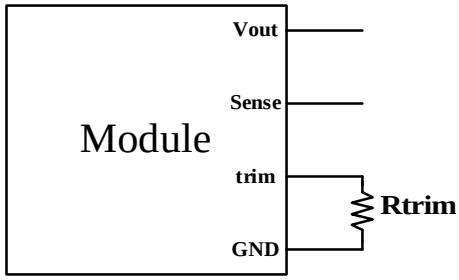
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.2 V	-	0.3 V	SRBC-10E1A0; Remote On/Off pin open, Unit on.
Signal High (Unit On)	-	-	Vin, max	
Signal Low (Unit On)	-0.2 V	-	0.3 V	SRBC-10E1AL; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	2.5 V	-	Vin, max	

Output Trim Equations

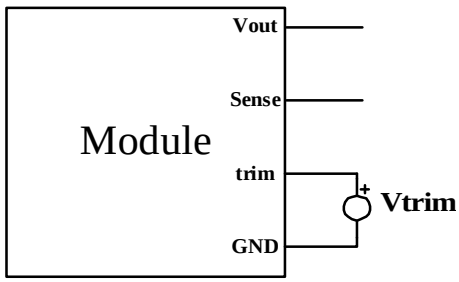
Equation for calculating the trim resistor (in Ω) given the desired output voltage (Vo) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

$$R_{trim} = \frac{10500}{Vo - 0.7525} - 1000$$

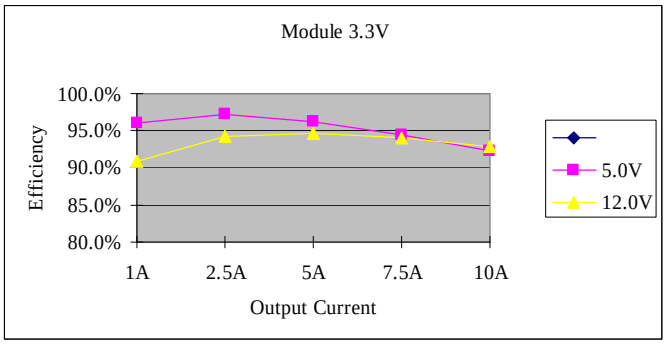


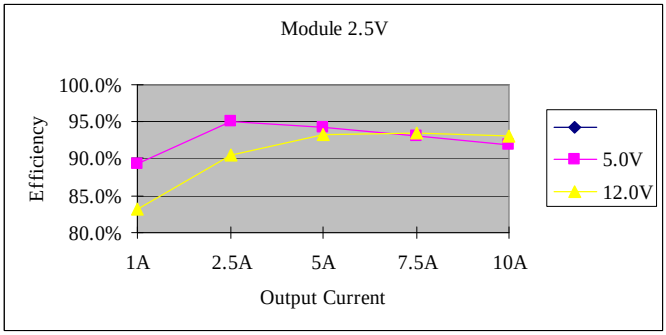
Equation for calculating the trim voltage (in V) given the desired output voltage (Vo) is shown below. The Trim Up voltage should be connected between the Trim pin and Ground.

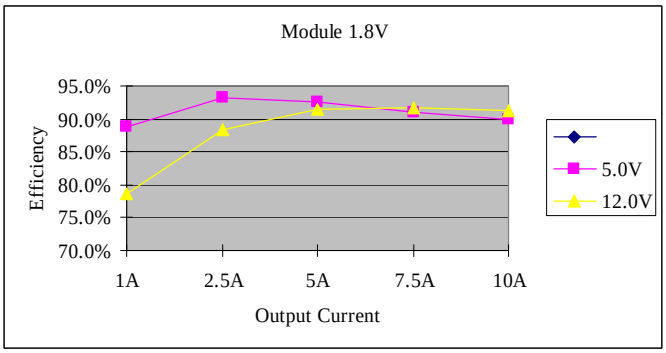
$$V_{trim} = 0.7 - 0.0667 \times (Vo - 0.7525)$$

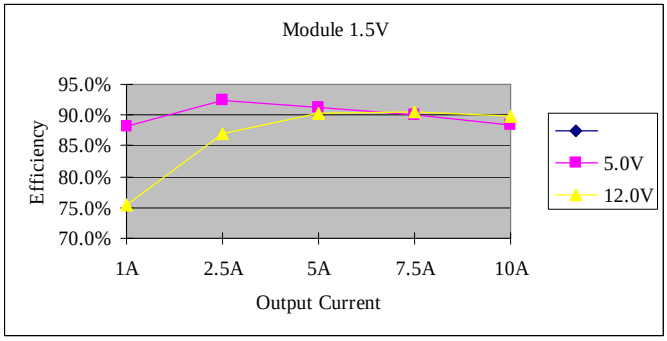


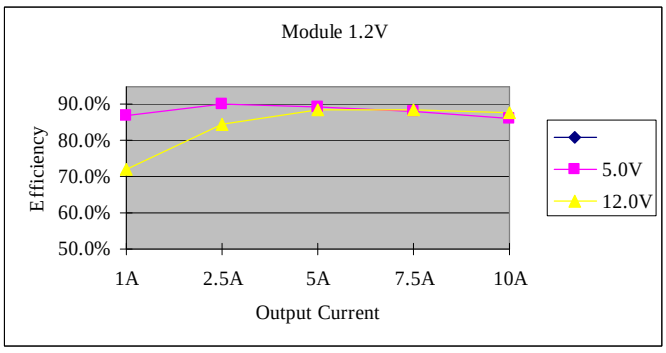
Efficiency Data

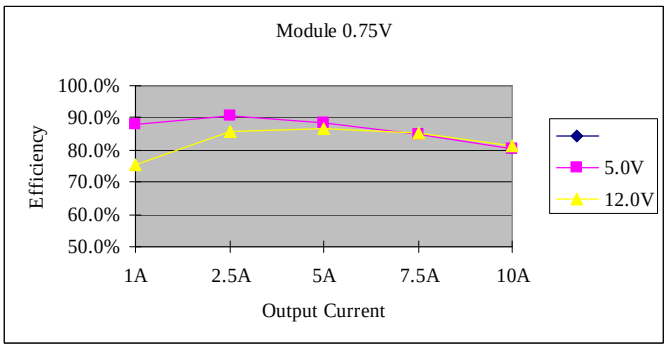




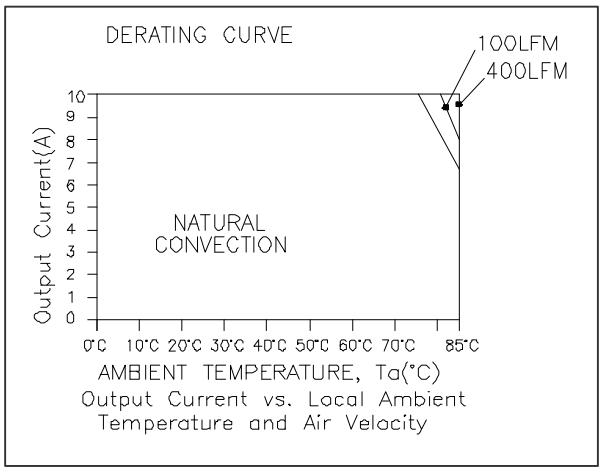




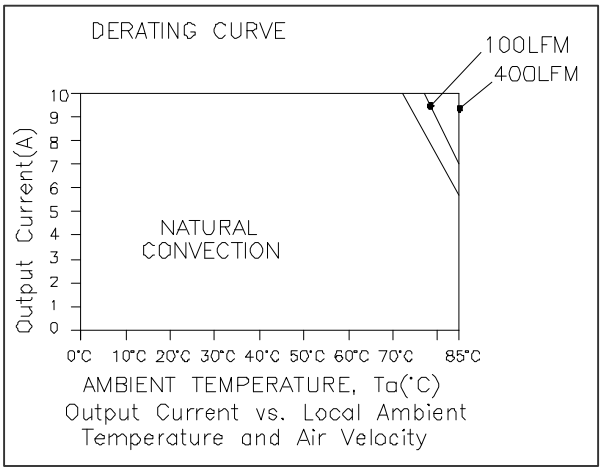




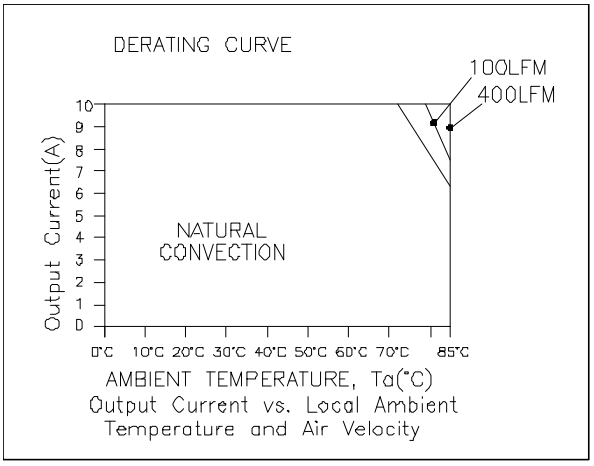
Thermal Derating Curves



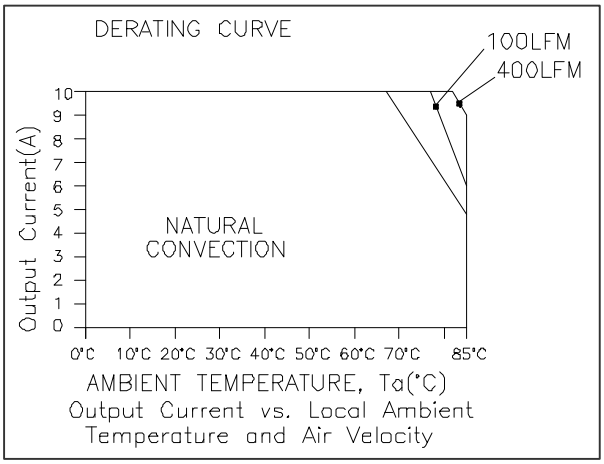
Vo=0.75 V



Vo=1.8 V

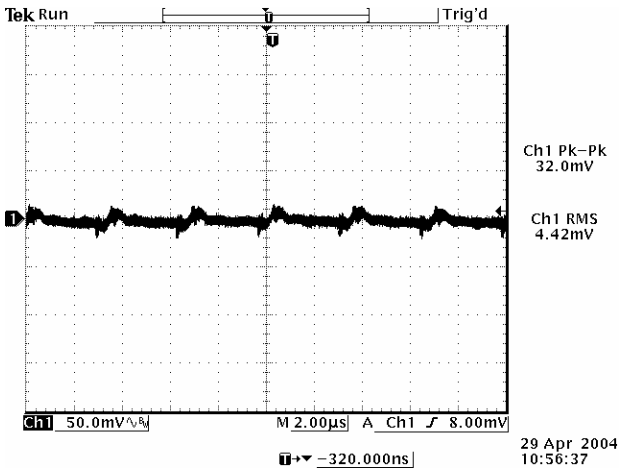


Vo=2.5 V

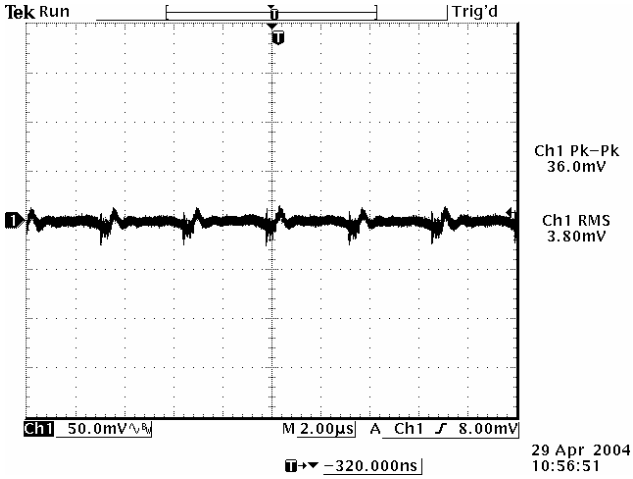


Vo=3.3 V

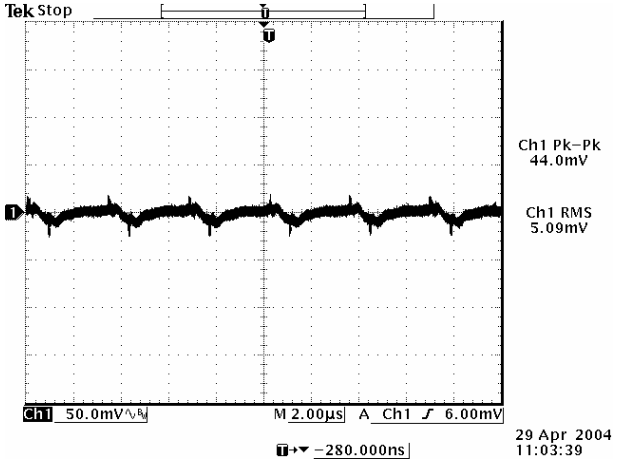
Ripple and Noise Waveforms



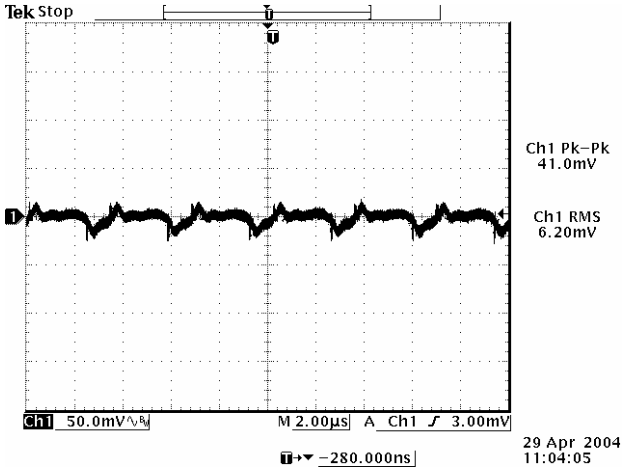
Vin=5 V, Vo=0.75 V



Vin=12 V, Vo=0.75 V



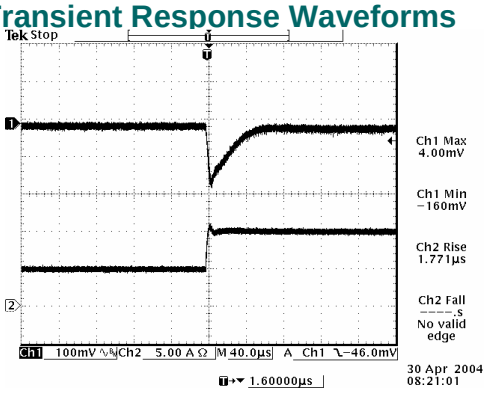
Vin=5 V, Vo=3.3 V



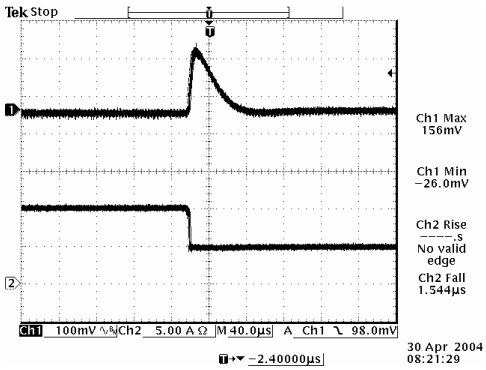
Vin=12 V, Vo=3.3 V

Note: Ripple and noise at full load, external load with 10 uF tantalum capacitor and 1 uF ceramic at the output, and Ta=25 deg C.

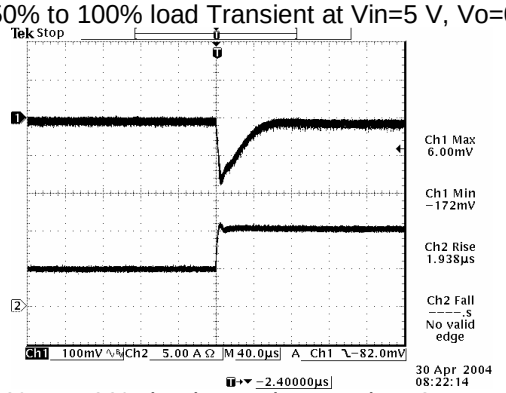
Transient Response Waveforms



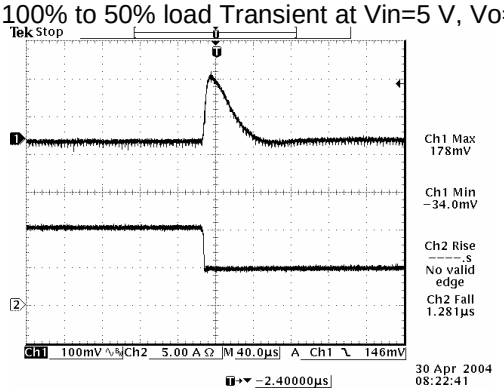
50% to 100% load Transient at Vin=5 V, Vo=0.75 V



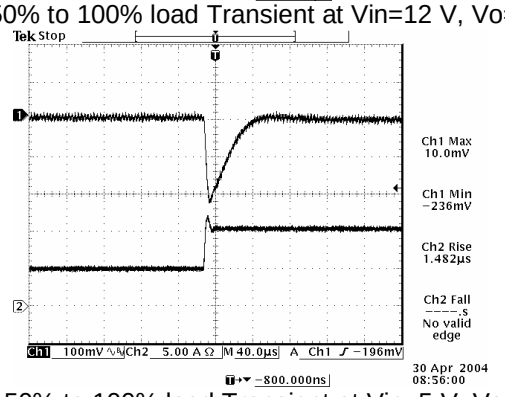
100% to 50% load Transient at Vin=5 V, Vo=0.75 V



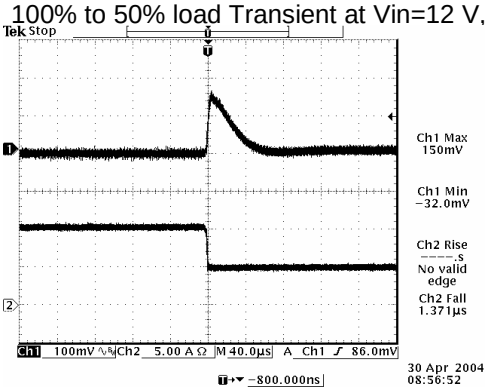
50% to 100% load Transient at Vin=12 V, Vo=0.75 V



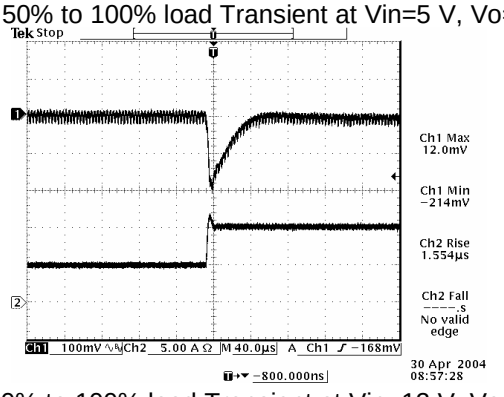
100% to 50% load Transient at Vin=12 V, Vo=0.75 V



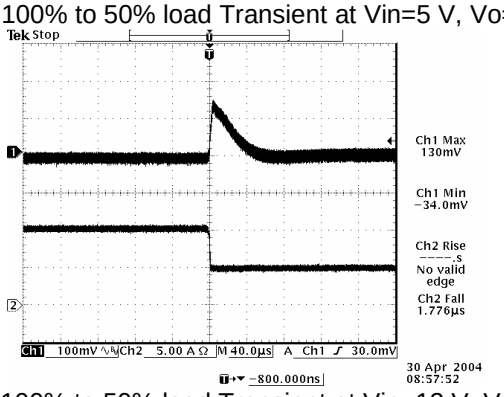
50% to 100% load Transient at Vin=5 V, Vo=3.3 V



100% to 50% load Transient at Vin=5 V, Vo=3.3 V



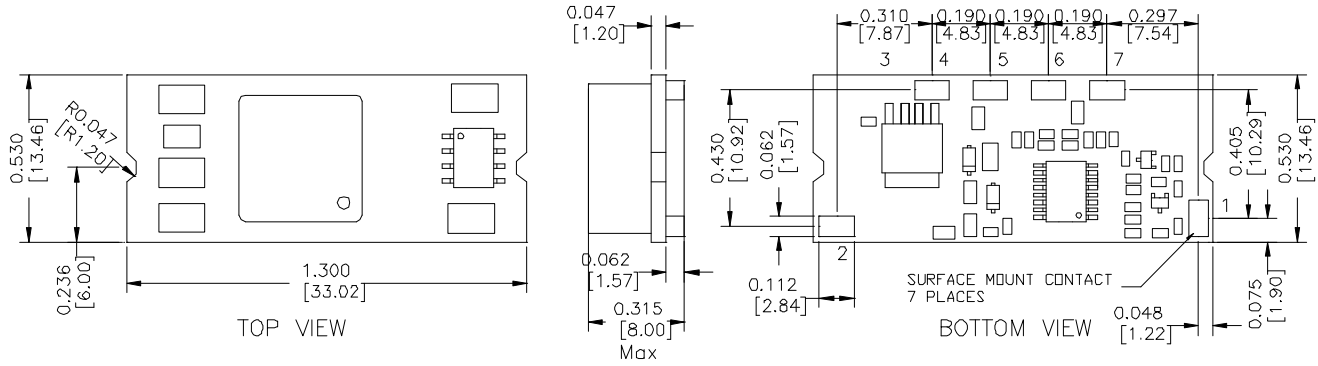
50% to 100% load Transient at Vin=12 V, Vo=3.3 V

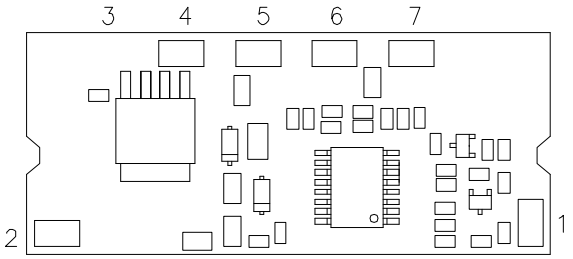


100% to 50% load Transient at Vin=12 V, Vo=3.3 V

Note: Transient response at di/dt=2.5 A/uS, external load with 470 uF tantalum capacitor at the output.

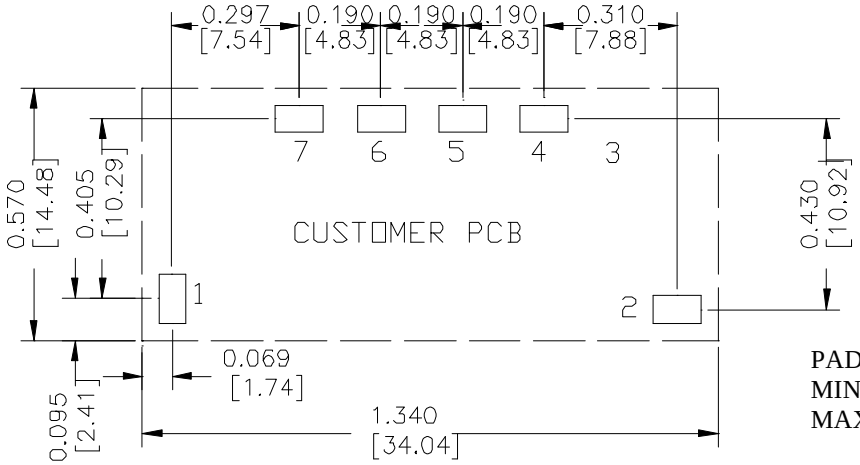
Mechanical Outline





Pin Connections

Pin	Function
1	Remote On/Off
2	Vin
3	NC
4	Ground
5	Vout
6	Trim
7	Remote Sense



PAD SIZE:
MIN: 0.14"* 0.095" (3.56mm * 2.41mm)
MAX: 0.165"* 0.11" (4.19mm * 2.79mm)

Note: 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 245 °C.

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
2007-01-17	A	Change version to A	Lynn
2008-01-29	B		HL
2011-08-25	C	Update the reflow solder temperature.	HL
2013-01-25	D	Update UL.	HL

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