

NON-ISOLATED DC/DC CONVERTERS

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

Jan. 25, 2013

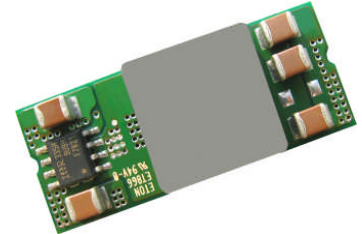
Bel Power, Inc., a subsidiary of Bel Fuse, Inc.

SRBC-10E2Ax

RoHS Compliant

Rev.C

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



Applications

- Networking
- Computers and peripherals
- Telecommunications

Description

The Bel SRBC-10E2Ax 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 ($V_{in} = 4.5 \text{ Vdc} - 14 \text{ Vdc}$). The Bel SRBC-10E2Ax has a sequencing feature that enables designers to implement various types of output voltage sequencing when powering. The efficiency is typically 93% at 3.3 Vdc output at 12 Vdc input 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	36.3 W	93%	SRBC-10E2AL	SRBC-10E2A0

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

Part Number Explanation

S R BC - 10 E 2A 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.

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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	
Sequencing Voltage ¹	-0.3 V	-	V _{in}	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

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

1. SRBC-10E2Ax series of modules include a sequencing feature that enables users to implement various types of output voltage sequencing in their applications. This is accomplished via an additional sequencing pin. When not using the sequencing feature, either, tie the SEQ pin to V_{in} or leave it unconnected.

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage V _{o,set} < 3.0 V V _{o,set} ≥ 3.0 V	4.5 V V _{o,set} + 1.5 V	- -	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	Tested with one 1000 uF/25 V AL input capacitor with ESR=0.03 ohm max and 4 × 47 uF/16 V tan capacitors with ESR=0.013 ohm max at 100 kHz, & simulated source impedance of 1000 nH, 5 Hz to 20 MHz.
Input Reflected Ripple Current (rms)	-	-	150 mA	
I ² t Inrush Current Transient	-	0.04 A ² s	0.08 A ² s	
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% V _{o,set}	-	2% V _{o,set}	V _{in} =12 V, full load
Load Regulation	-	0.1% V _{o,set}	-	
Line Regulation	-	0.1% V _{o,set}	-	
Regulation Over Temperature (-40 °C to +85 °C)	-	0.3 V _{o,set}	-	T _{ref} =T _a , min to T _a , max
Output Current	0 A	-	10 A	
Current Limit Threshold	-	200% I _{o,out}	-	
Short Circuit Surge Transient	-	1 A ² s	3 A ² s	
Ripple and Noise (pk-pk)	-	30 mV	75 mV	Tested with 0-20 MHz, with 10 uF tantalum capacitor & 1 uF ceramic capacitor at the output
Ripple and Noise (rms)	-	12 mV	35 mV	

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Output Specifications(continued)

Parameter	Min	Typ	Max	Notes
Turn on Time	-	8 mS	20 mS	
Overshoot at Turn on	-	-	1%	
Output Capacitance	0 uF	-	5600 uF	
Transient Response				
50% ~ 100% Max Load	All output	-	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				Measured at Vin=5 V, full load
Vo=3.3 V	-	92%	-	
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				Measured at Vin=12 V, full load
Vo=3.3 V	-	93%	-	
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 ¹	-	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 x W x H)	1.3 x 0.53 x 0.315			
Millimeters (L x W x H)	33.02 x 13.46 x 8.00			
Weight	-	8 g	-	

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

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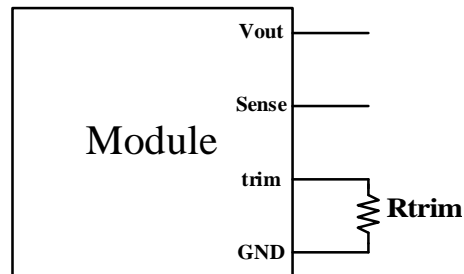
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.2 V	-	0.3 V	SRBC-10E2A0; Remote On/Off pin open, Unit on.
Signal High (Unit On)	-	-	Vin, max	
Signal Low (Unit On)	-0.2 V	-	0.3 V	SRBC-10E2AL; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	2.5 V	-	Vin, max	
Voltage Sequencing				
Sequencing Delay Time	25 mS	-	-	Delay from Vin, min to application of voltage on SEQ pin
Sequencing Slew Rate Capability	-	-	2 V/mS	Vin, min to Vin, max; Io, min to Io, max; Vseq<Vo
Tracking Accuracy				
Power-Up	-	100 mV	200 mV	
Power-Down	-	300 mV	500 mV	

Output Trim Equations

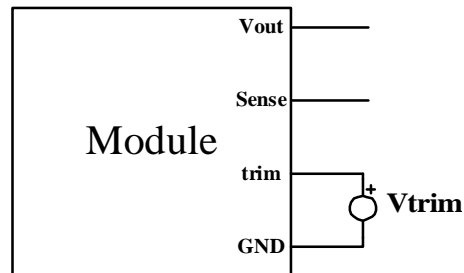
Equation for calculating the trim resistor (in Ω) given the desired output voltage (V_o) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

$$R_{trimup} = \frac{10500}{V_o - 0.7525} - 1000$$



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

$$V_{trimup} = 0.7 - 0.0667 \times (V_o - 0.7525)$$



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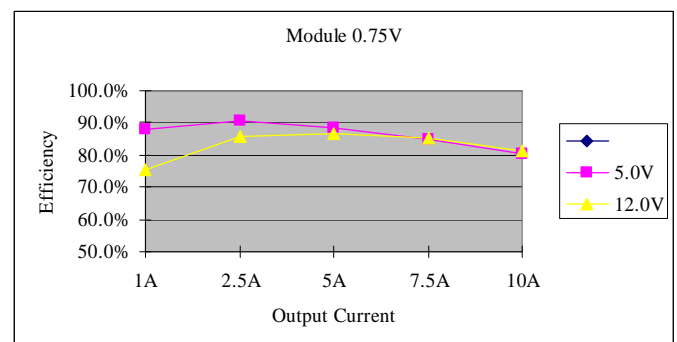
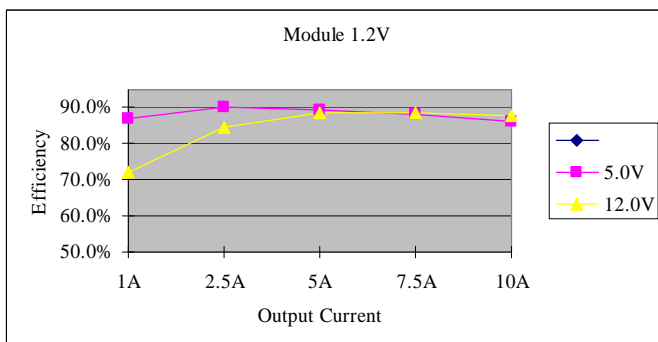
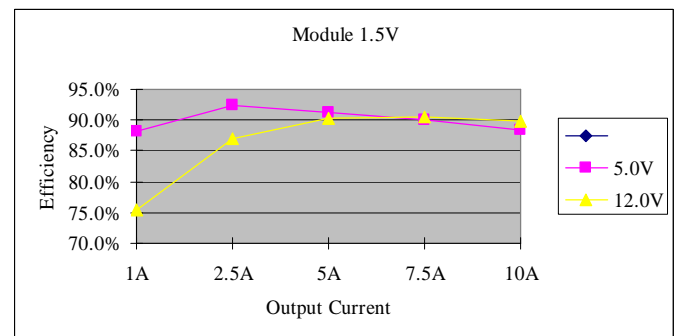
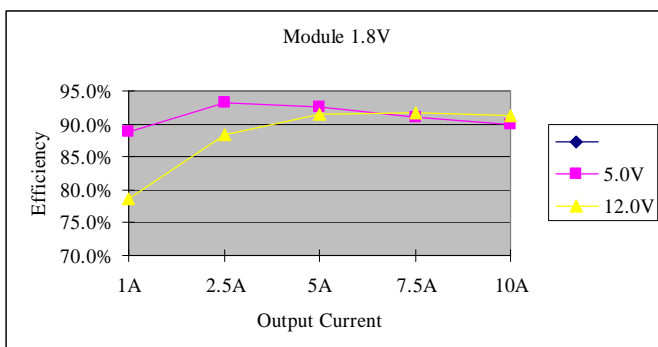
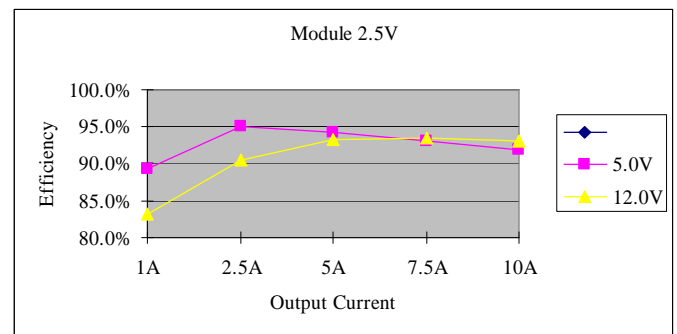
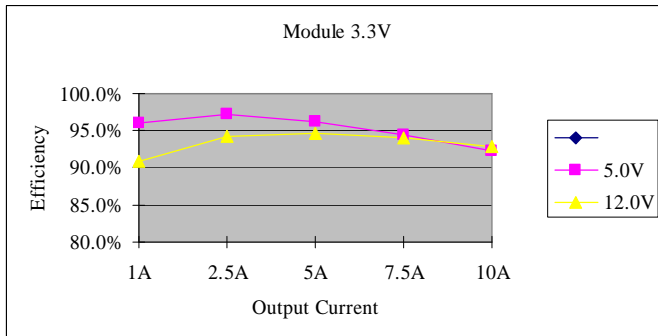
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Efficiency Data



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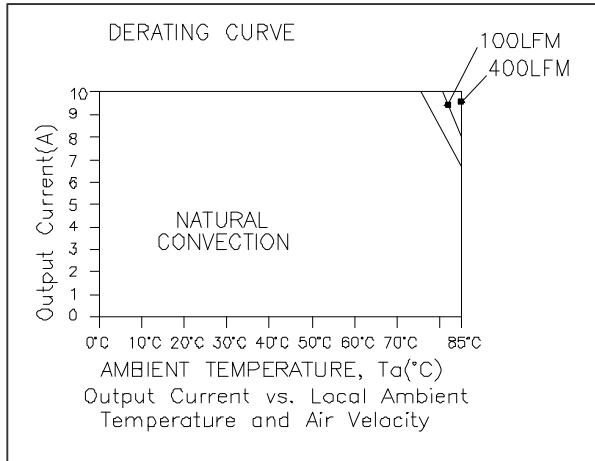
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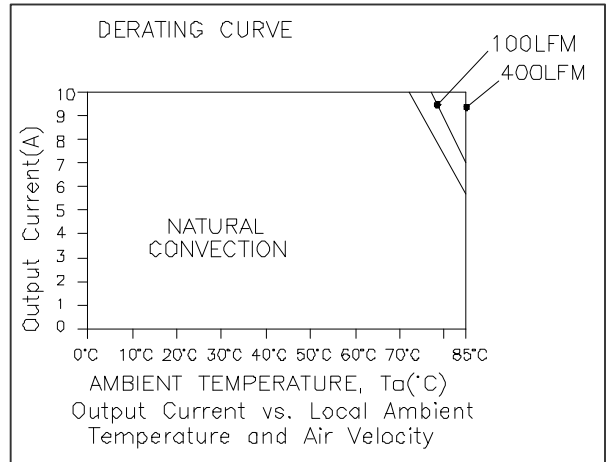
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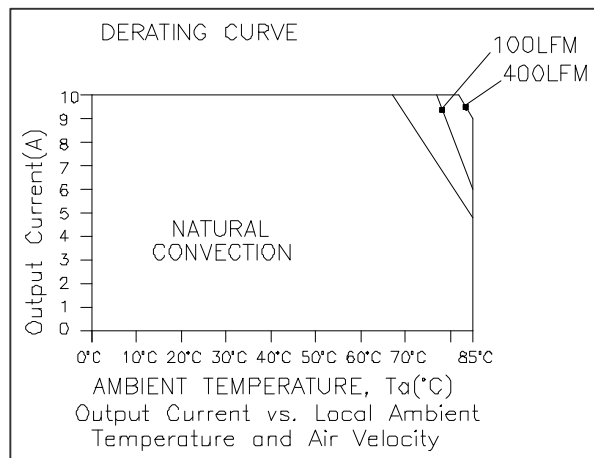
Thermal Derating Curves



Vo=0.75 V



Vo=1.8 V



Vo=3.3 V

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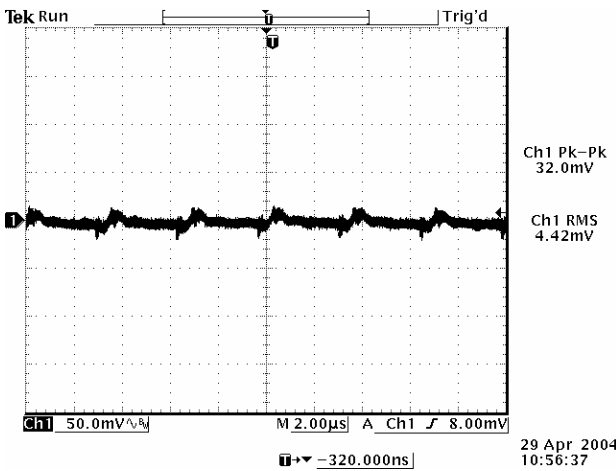
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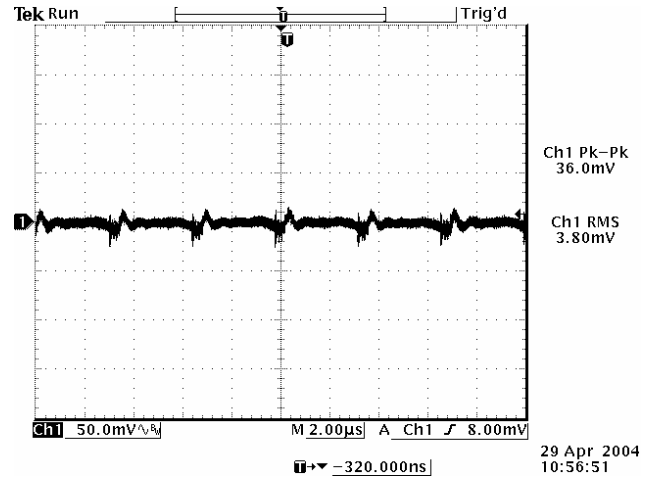
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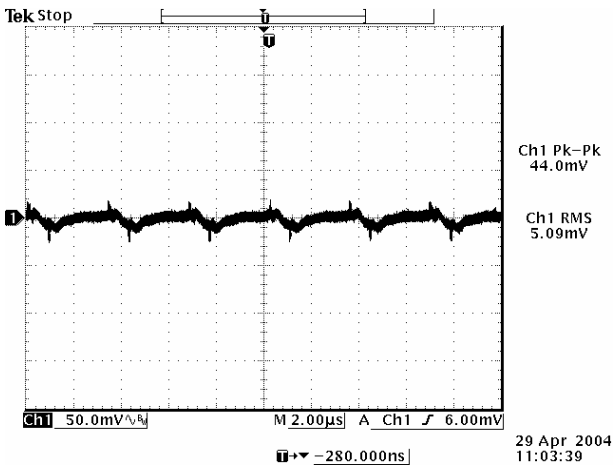
Ripple and Noise Waveforms



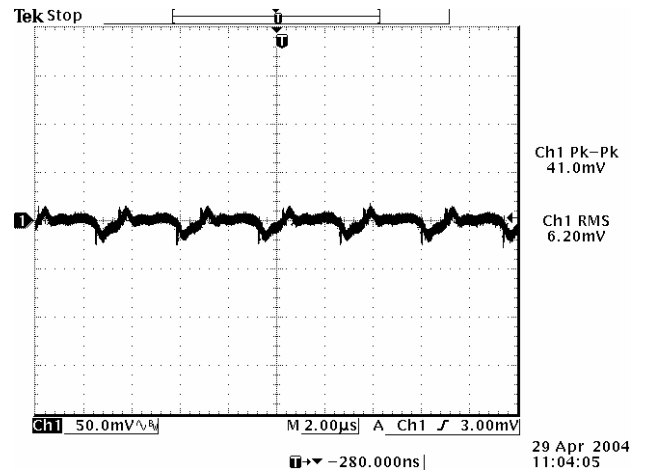
Vin=5 V, Vo=0.75 V



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 µF tantalum capacitor and 1 µF ceramic at the output, and Ta=25 deg C.

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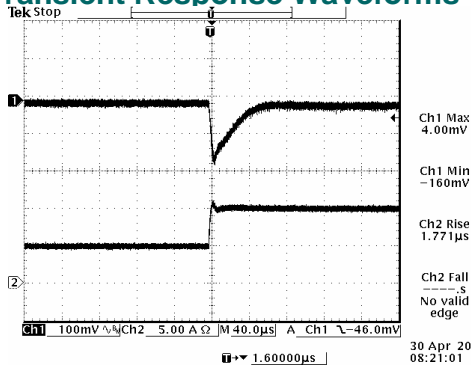
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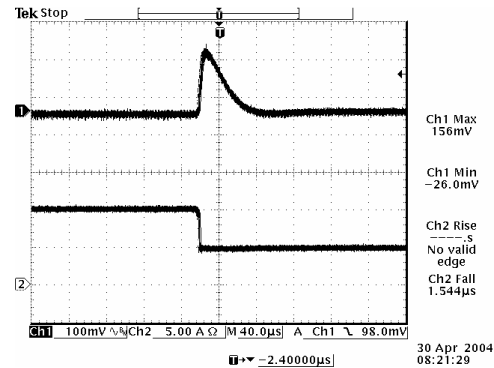
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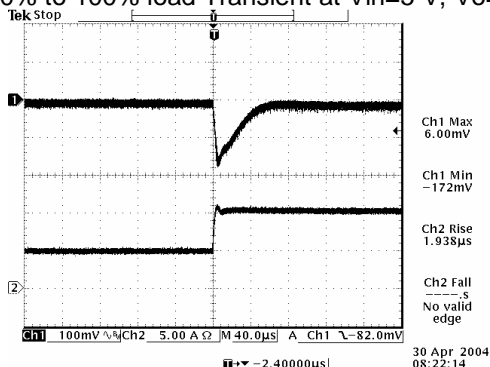
Transient Response Waveforms



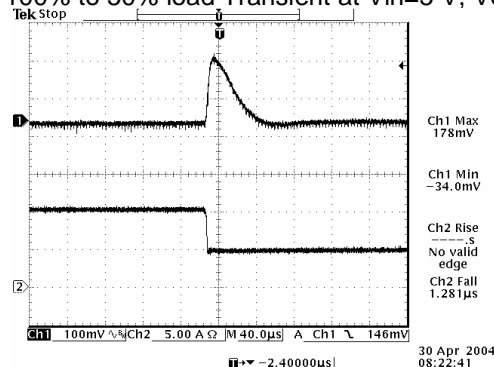
50% to 100% load Transient at Vin=5 V, Vo=0.75 V



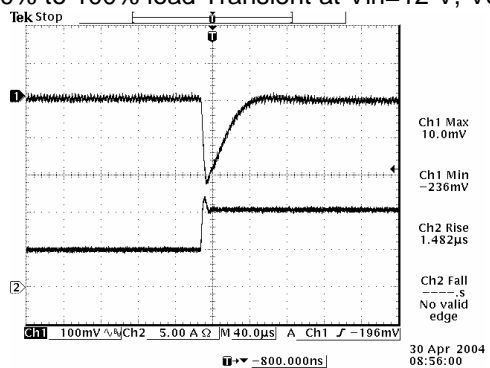
100% to 50% load Transient at Vin=5 V, Vo=0.75 V



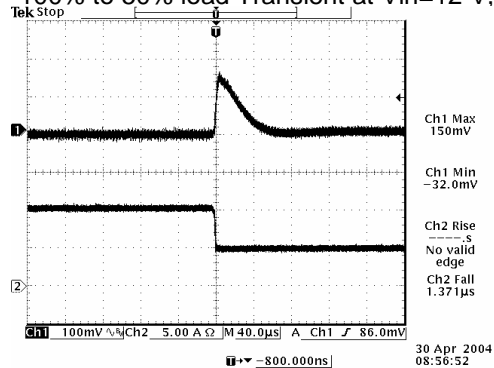
50% to 100% load Transient at Vin=12 V, Vo=0.75 V



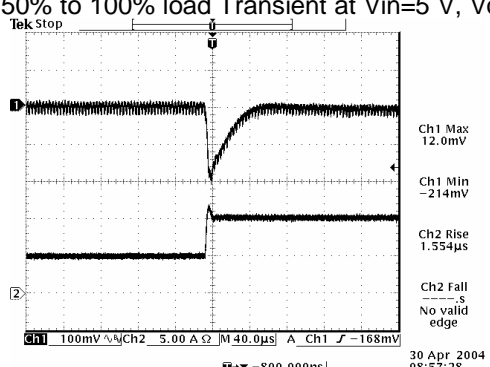
100% to 50% load Transient at Vin=12 V, Vo=0.75 V



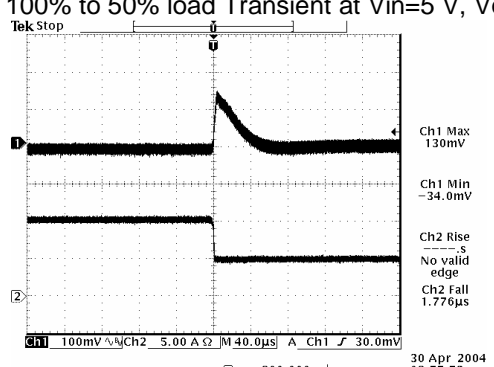
50% to 100% load Transient at Vin=5 V, Vo=3.3 V



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.

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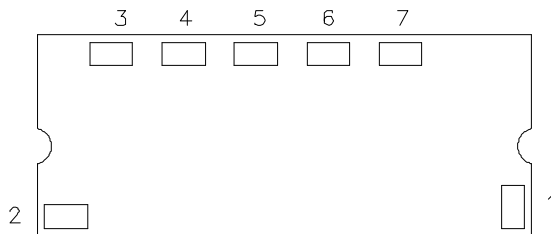
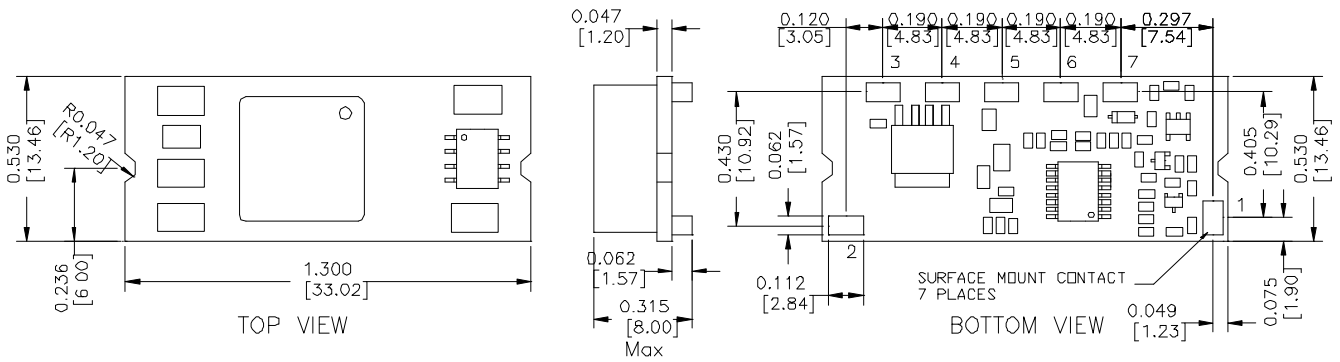
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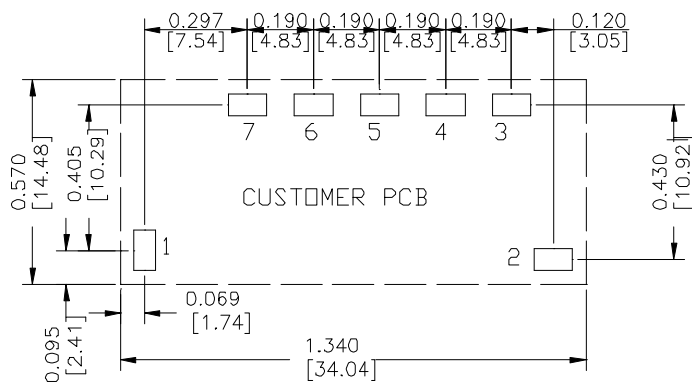
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Mechanical Outline



Pin Connections

Pin	Function
1	Remote On/Off
2	Vin+
3	SEQ
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.

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Revision History

Date	Revision	Changes Detail	Approval
2007-01-17	A	Change version to A	Lynn
2011-08-25	B	Update the reflow solder temperature.	HL
2013-01-25	C	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.



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