

## NON-ISOLATED DC/DC CONVERTERS

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

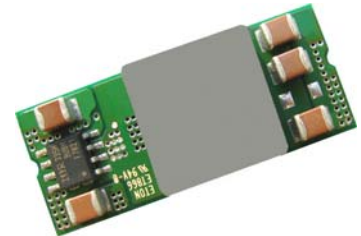
**bel**  
POWER PRODUCTS

**SRBC-10E2Ax**

**RoHS Compliant**

**Rev.A**

- Non-Isolated
- High Efficiency
- Fixed Frequency
- Low Cost
- Wide Input
- Flexible Output Voltage Sequencing
- Industrial Temperature Range
- Under-voltage Lockout (UVLO)
- Over Temperature Shutdown
- OCP/SCP
- Wide Trim
- Remote Sense
- Remote On/Off
- Active Low/High (option)



### 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.  
2. All part numbers above indicate RoHS 6. Change the second letter "R" to "7" for RoHS 5 part numbers.

### 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 <sup>1</sup>	-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.

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### Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage Vo,set <3.0 V Vo,set ≥3.0 V	4.5 V Vo,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 <sup>2</sup> t Inrush Current Transient	-	0.04 A <sup>2</sup> s	0.08 A <sup>2</sup> 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% Vo,set	-	2% Vo,set	Vin=12 V, full load
Load Regulation	-	0.1% Vo,set	-	
Line Regulation	-	0.1% Vo,set	-	
Regulation Over Temperature (-40 °C to +85 °C)	-	0.3 Vo,set	-	Tref=Ta, min to Ta, max
Output Current	0 A	-	10 A	
Current Limit Threshold	-	200% Io,out	-	
Short Circuit Surge Transient	-	1 A <sup>2</sup> s	3 A <sup>2</sup> 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	
Turn on Time	-	8 mS	20 mS	
Overshoot at Turn on	-	-	1%	
Output Capacitance	0 uF	-	5600 uF	
<b>Transient Response</b>				
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.

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



## 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 <sup>1</sup>	-	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.

## Control Specifications

Parameter	Min	Typ	Max	Notes
<b>Remote On/Off</b>				
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	
<b>Voltage Sequencing</b>				
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	

## NON-ISOLATED DC/DC CONVERTERS

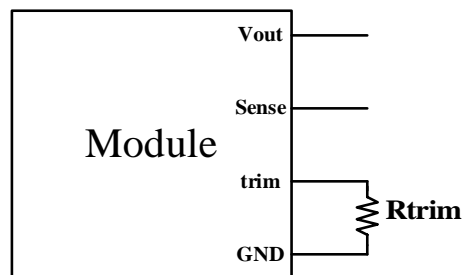
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POWER PRODUCTS

### Output Trim Equations

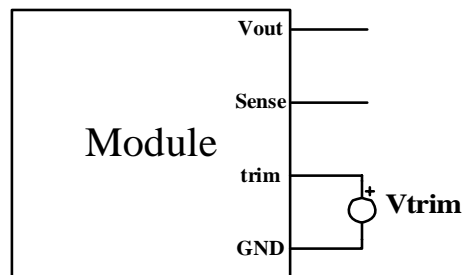
Equation for calculating the trim resistor (in  $\Omega$ ) given the desired output voltage ( $V_o$ ) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

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



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.

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

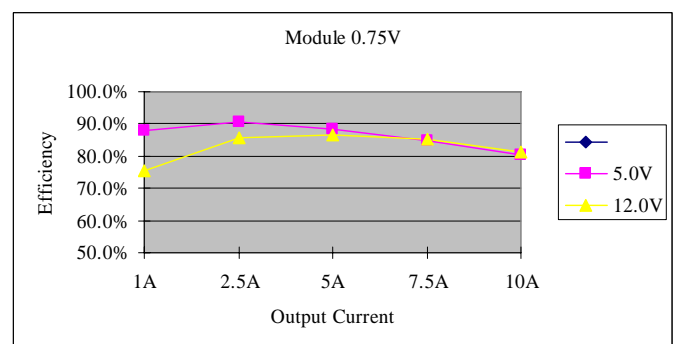
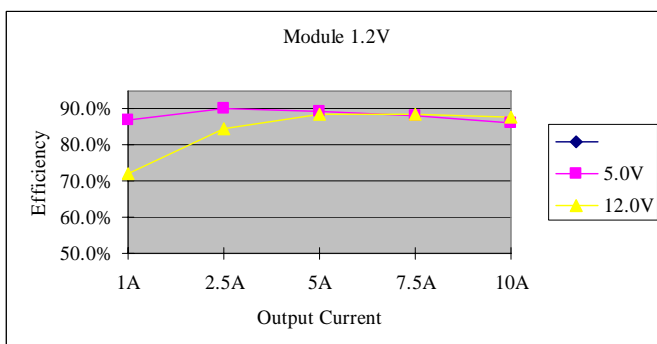
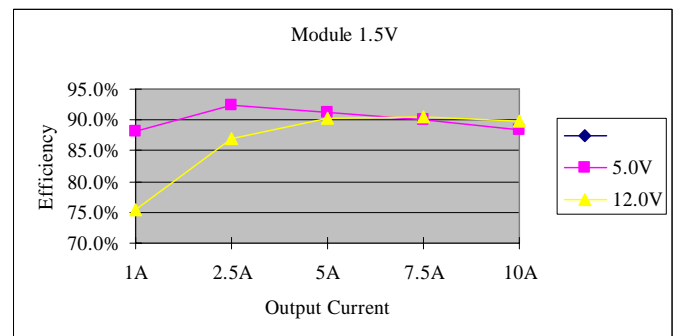
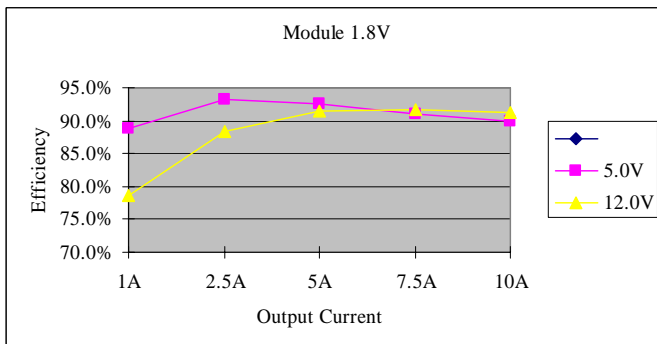
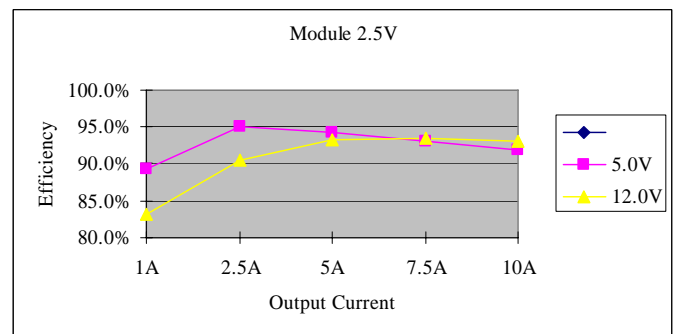
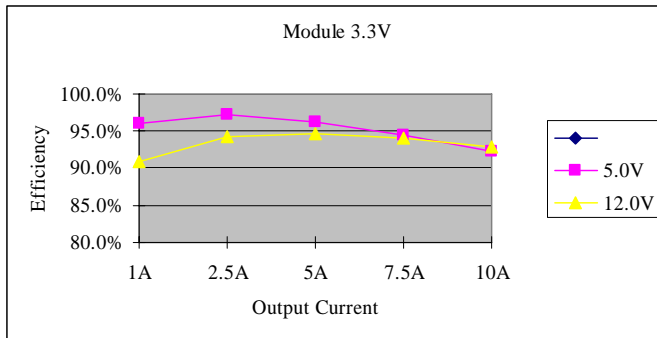


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## Efficiency Data

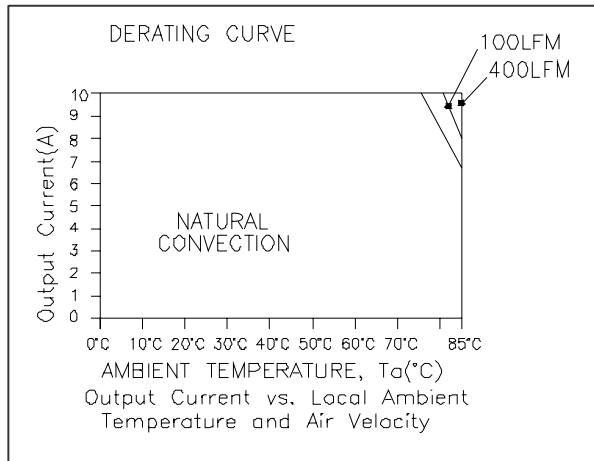


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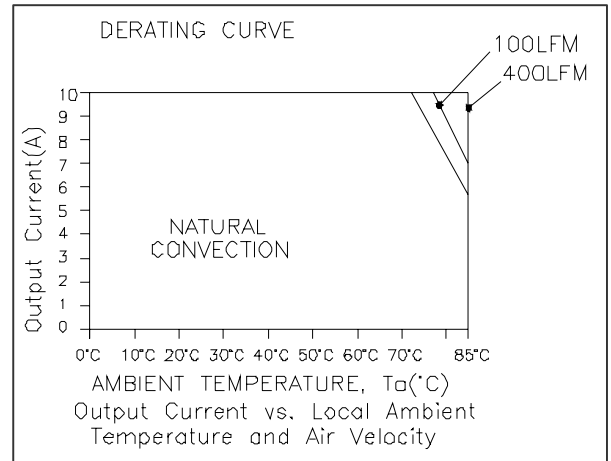
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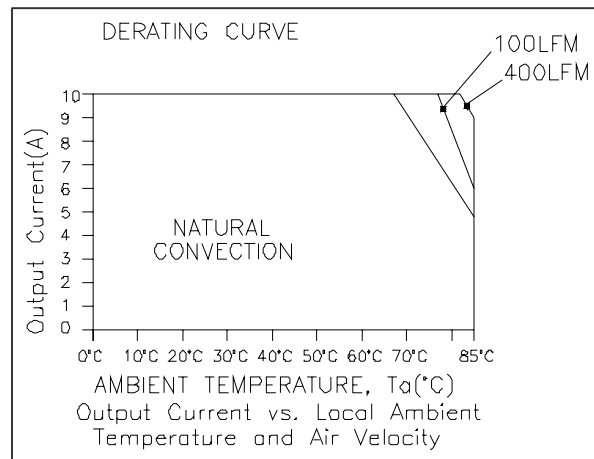
## Thermal Derating Curves



Vo=0.75 V



Vo=1.8 V



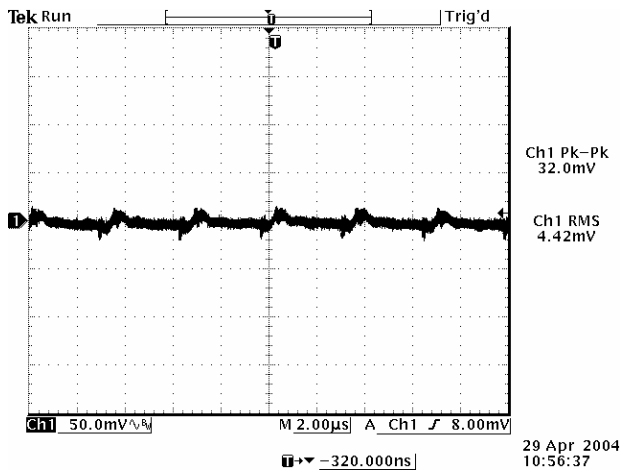
Vo=3.3 V

# NON-ISOLATED DC/DC CONVERTERS

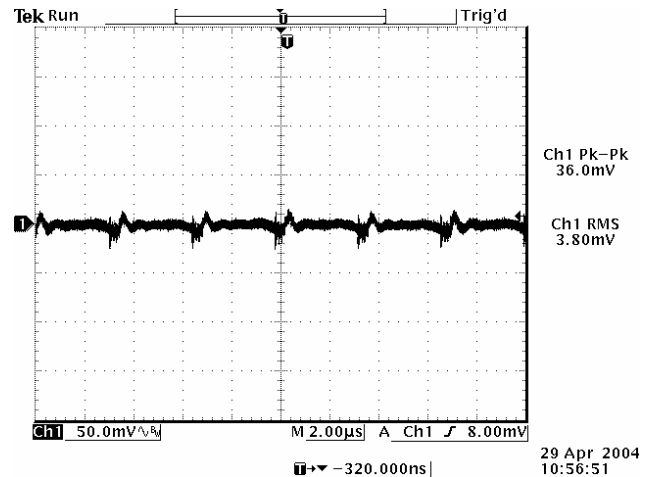
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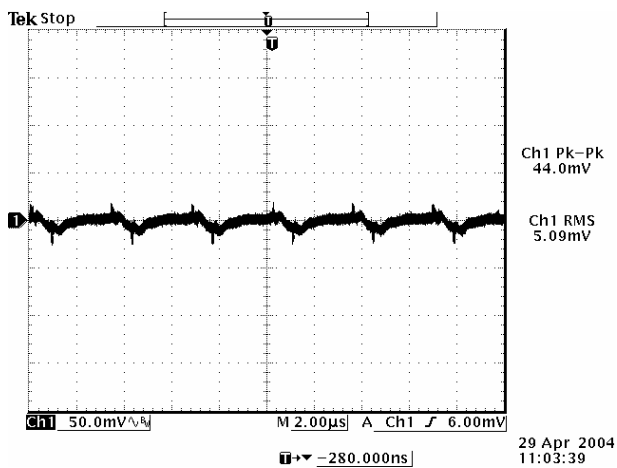
## Ripple and Noise Waveforms



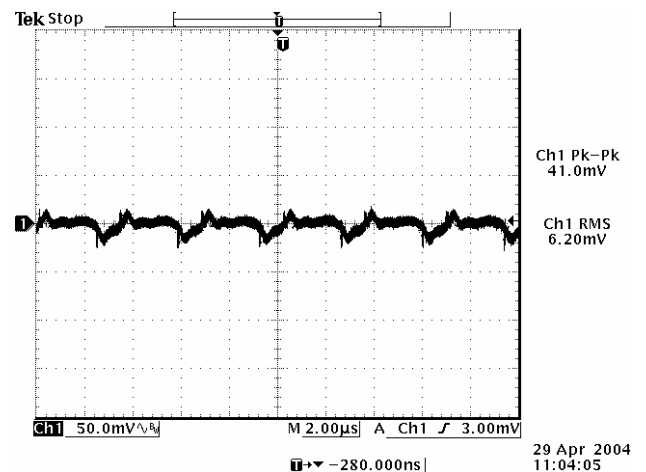
Vin=5 V, Vo=0.75 V



Vin=12 V, Vo=0.75 V



Vin=5 V, Vo=3.3 V



Vin=12 V, Vo=3.3 V

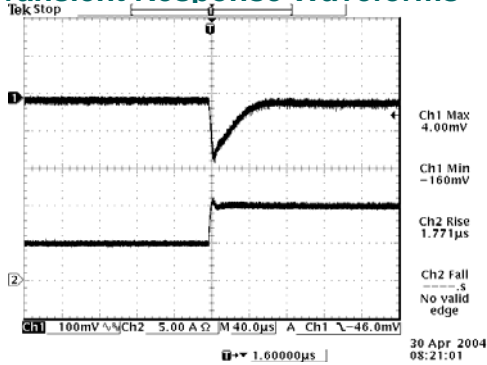
**Note:** Ripple and noise at full load, external load with 10 uF tantalum capacitor and 1 uF ceramic at the output, and Ta=25 deg C.

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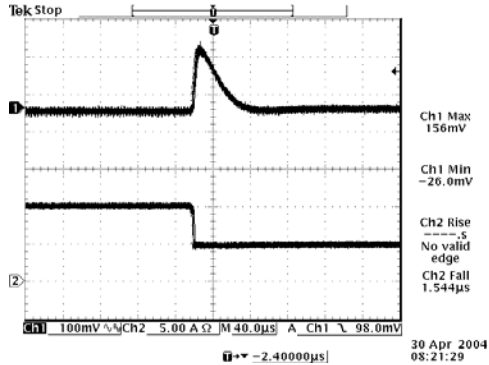
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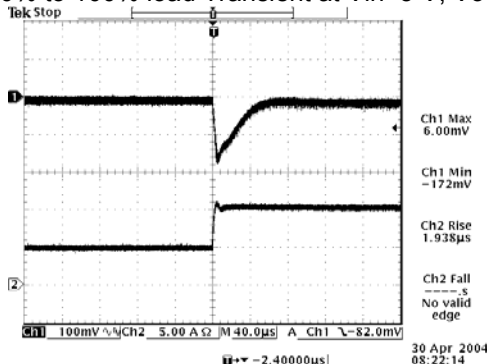
## Transient Response Waveforms



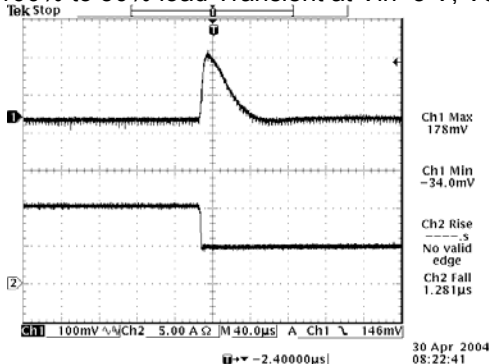
50% to 100% load Transient at Vin=5 V, Vo=0.75 V



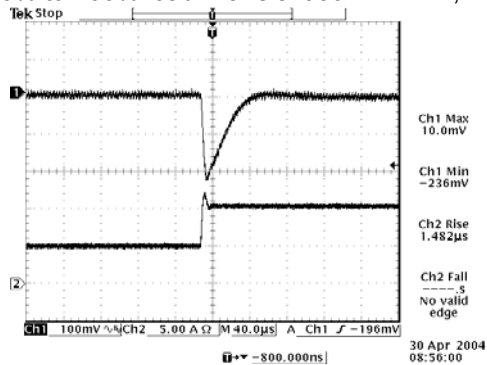
100% to 50% load Transient at Vin=5 V, Vo=0.75 V



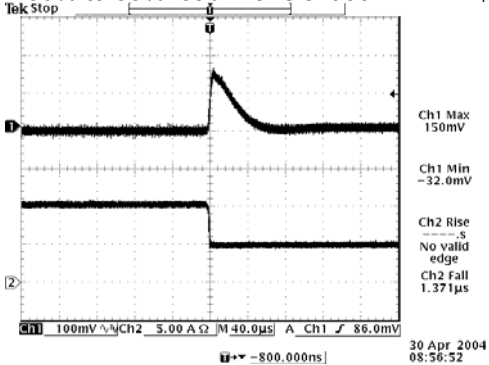
50% to 100% load Transient at Vin=12 V, Vo=0.75 V



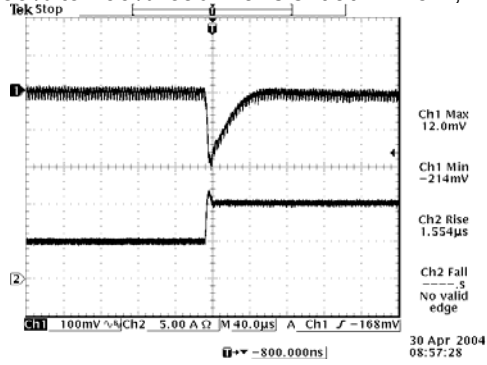
100% to 50% load Transient at Vin=12 V, Vo=0.75 V



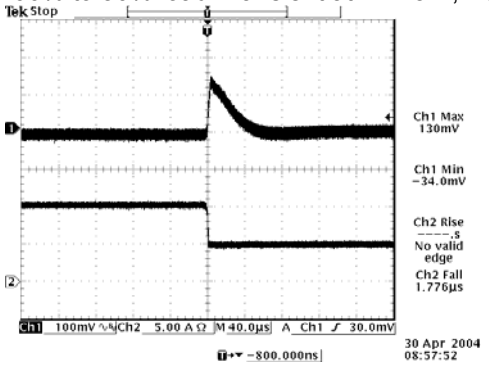
50% to 100% load Transient at Vin=5 V, Vo=3.3 V



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.

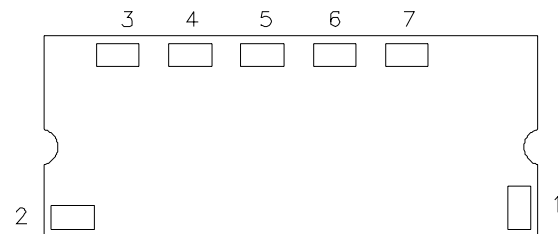
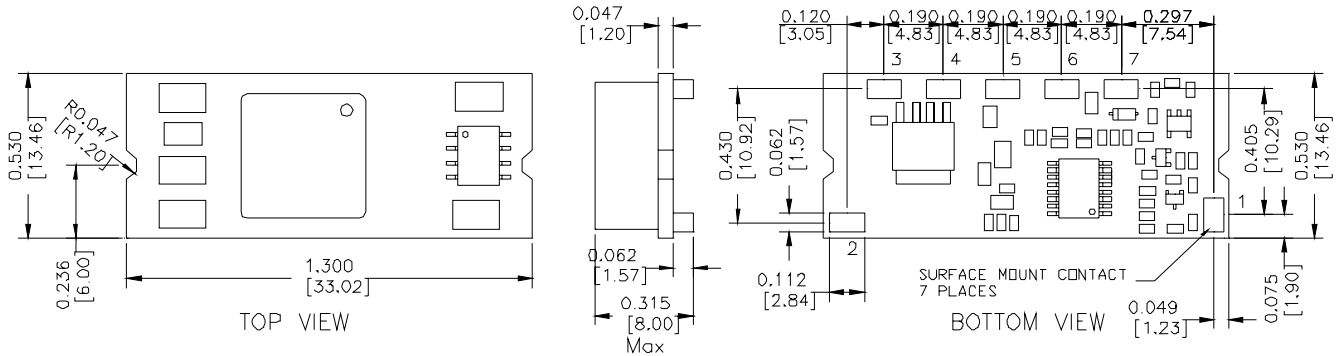


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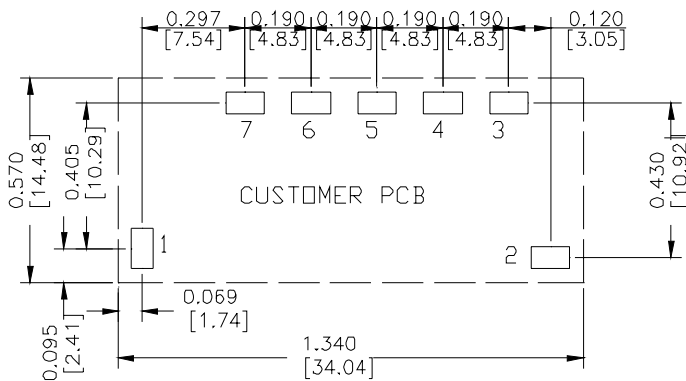


## Mechanical Outline



## 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)

## 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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