NON-ISOLATED DC/DC CONVERTERS

8.3 Vdc - 14 Vdc Input 0.75 Vdc - 5.0 Vdc/16 A Output

SRBC-16A1Ax RoHS Compliant Rev.A

- Non-Isolated
- High Efficiency
- High Power Density
- Excellent Thermal Performance
- Low Cost
- Flexible Output Voltage
- Able to Sink & Source Current
- Industrial Temperature Range
- Under-voltage Lockout (UVLO)
- Over Temperature Protection
- OCP/SCP
- Wide Input
- Wide Trim
- Remote On/Off
- Active Low/High (option)
- Remote Sense

Description

The Bel SRBC-16A1Ax modules are a series of non-isolated dc/dc converters that deliver up to 16 A of output current with full load efficiency of 92% at 3.3 Vdc output. These modules provide precisely regulated voltage programmable via external resistor from 0.75 Vdc to 5.0 Vdc over a wide range of input voltage (8.4 Vdc -14 Vdc). The open-frame construction and small footprint enable designers to develop cost and space-efficient solutions. Standard features include remote On/Off, remote sense, over current protection, short current protection, and programmable output voltage.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Model Number Active Low	Model Number Active High
0.75 Vdc- 5.0 Vdc	8.3 Vdc -14 Vdc	16 A	80 W	94%	SRBC-16A1AL	SRBC-16A1A0

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

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

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Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage Vo, set ≤ 3.63 V Vo, set > 3.63 V	 8.3 V 8.3 V	 12 V 12 V	 14.0 V 13.2 V	
Input Current (full load)	-	-	11 A	This power module is not internally fused. An input line fuse must always be used.
Input Current (no load)	-	100 mA	-	
Remote Off Input Current	-	2 mA	-	
Input Reflected Ripple Current (pk-pk)	-	70 mA	200 mA	Tested with one 1000 uF/25 V AL input capacitor with ESR=0.03 ohm max and 6 × 47 uF/16 V tantalum 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^2t Inrush Current Transient	-	0.2 A^2s	0.4 A^2s	
Turn-on Voltage Threshold	-	8.0 V	-	
Turn-off Voltage Threshold	-	7.5 V	-	

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	-	Io=Io, min to Io, max
Line Regulation	-	0.1% Vo,set	-	Vin=Vin, min to Vin, max
Regulation Over Temperature (-40 °C to+85 °C)	-	0.3% Vo,set	-	Tref=Ta, min to Ta, max
Output Current	0 A	-	16 A	
Current Limit Threshold	-	180% Io,out	-	
Short Circuit Surge Transient	-	1 A^2s	3 A^2s	
Ripple and Noise (pk-pk)	-	75 mV	100 mV	Tested with 0-20 MHz, 10 uF tantalum capacitor & 1 uF TDK ceramic capacitor at the output
Ripple and Noise (rms)	-	30 mV	45 mV	
Turn on Time	-	6 mS	10 mS	
Overshoot at Turn on	-	-	1% Vo,set	
Output Capacitance ESR ≥ 10 mohm	 0 uF	 -	 5000 uF	
Transient Response				
50% ~ 100% Max Load	Vo=0.75 V - 5.0 V	-	100 mV	-	di/dt=2.5 A/uS; Vin=12 V; and with 2 × 150 uF polymer capacitors at the output
Settling Time		-	50 uS	-	
100% ~ 50% Max Load		-	100 mV	-	
Settling Time		-	50 uS	-	

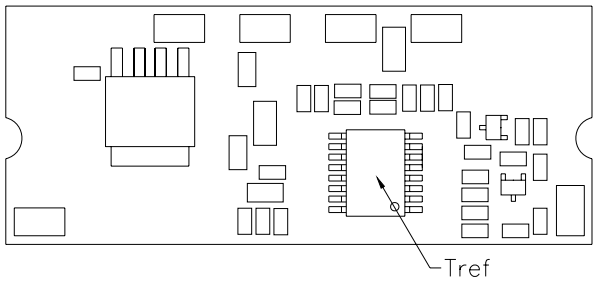
Note: All specifications are typical at nominal input, full load at 25 °C unless otherwise stated.

General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency Vo=5.0 V Vo=3.3 V Vo=2.5 V Vo=1.8 V Vo=1.5 V Vo=1.2 V Vo=0.75 V	 - - - - - - -	 94% 92% 90% 88% 87% 85% 79%	 - - - - - - -	Measured at Vin=12 V, full load
Switching Frequency	265 kHz	300 kHz	335 kHz	
Over Temperature Shutdown[1]	-	130 °C	-	
Output Trim Range (Wide Trim)	0.7525 V	-	5.0 V	
Remote Sense Compensation	-	-	0.5 V	
MTBF	2,666,488 hours			Calculated Per Bell Core SR-332 (Io = Nominal; Ta = 25 °C)
Dimensions Inches (L × W × H) Millimeters (L × W × H)	 1.30 x 0.53 x 0.315 33.02 x 13.46 x 8.00			
Weight	-	8 g	-	

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

1. The Tref temperature measurement location:

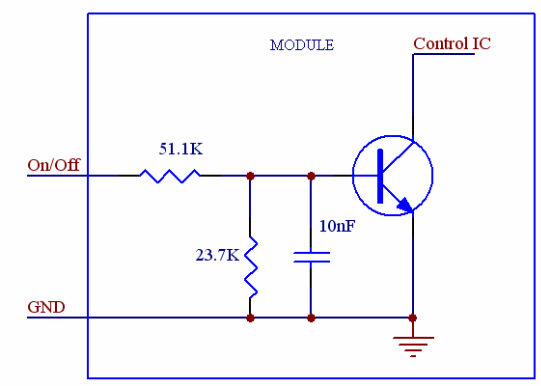


Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.2 V	-	0.3 V	SRBC-16A1A0; Remote On/Off pin open, Unit on.
Signal High (Unit On)	-	-	Vin, max	
Signal Low (Unit On)	-0.2 V	-	0.3 V	SRBC-16A1AL; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	2.5 V	-	Vin, max	

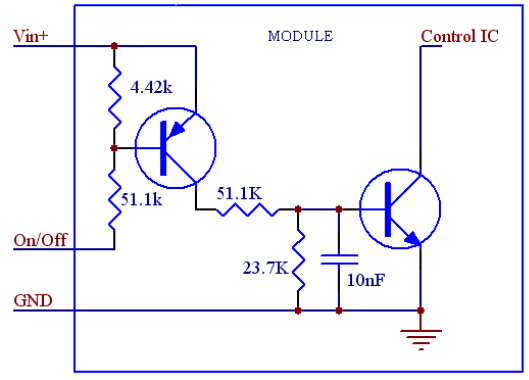
Remote Enable Specifications

The SRBC-16A1AL modules feature an enable pin with negative logic. If not using the enable pin, leave the pin open (the module will be on). During logic_high, the module is turned off, during logic_low, the module is turned on. It inner circuit impedance is showed as figure.



SRBC-16A1AL

The SRBC-16A1A0 modules feature an enable pin with Positive logic. If not using the enable pin, leave the pin open (the module will be on). During logic_high, the module is turned on, during logic_low, the module is turned off. It inner circuit impedance is showed as figure.

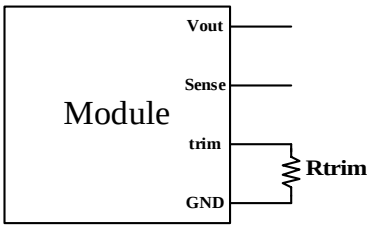


SRBC-16A1A0

Output Trim Equations

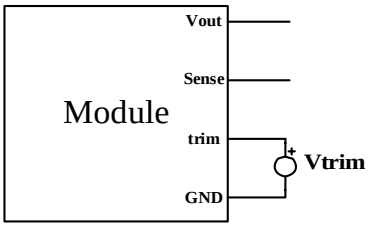
Equation for calculating the trim resistor (in Ω) given the desired adjusted voltage (Vadj) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

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

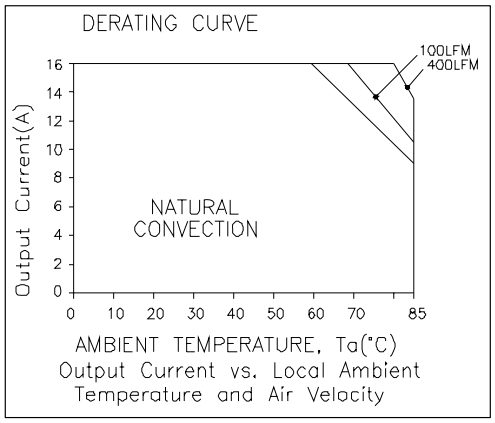


Equation for calculating the trim voltage (in V) given the desired adjusted voltage (Vadj) is shown below. The Trim Up voltage should be connected between the Trim pin and Ground.

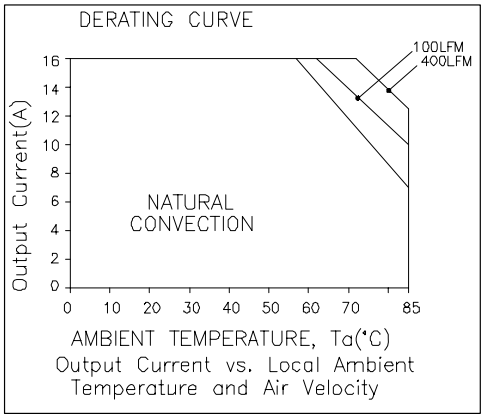
$$V_{trim} = 0.7 - 0.0667 \times (V_{adj} - 0.7525)$$



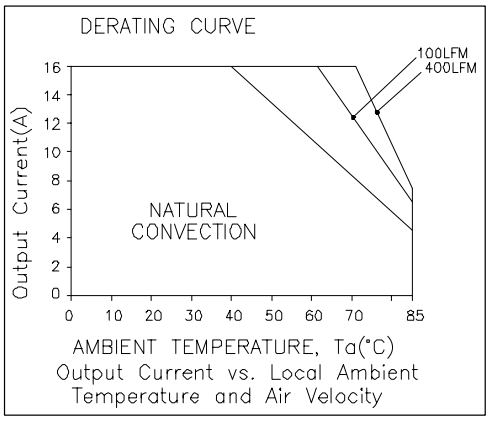
Thermal Derating Curves



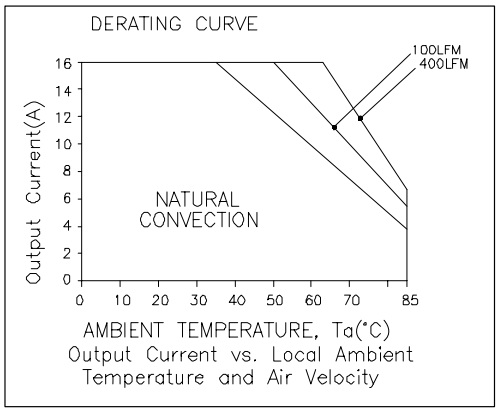
Vo=0.75 V



Vo=1.8 V

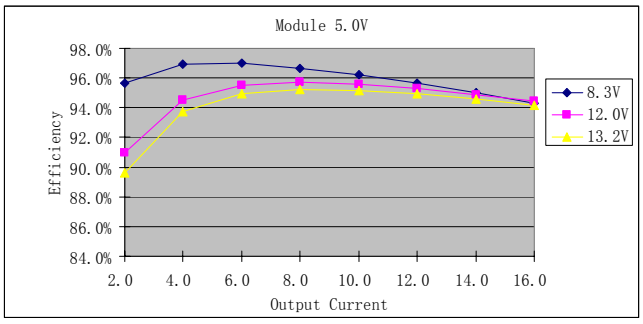


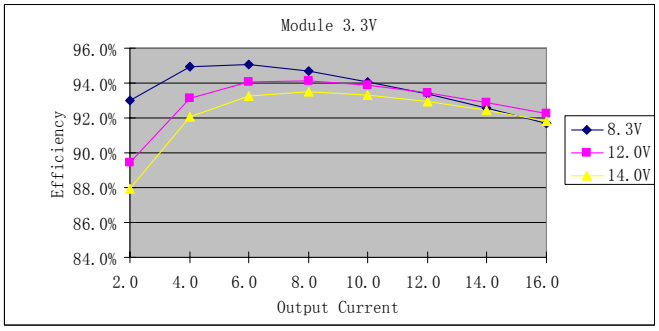
Vo=3.3 V

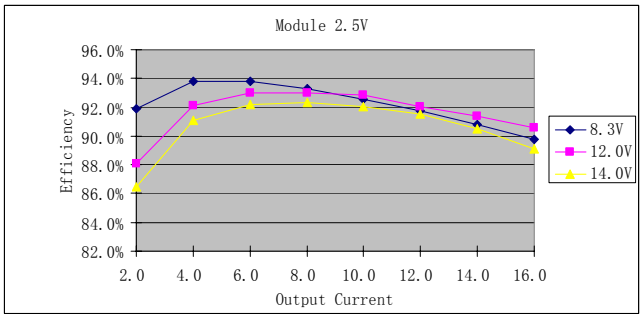


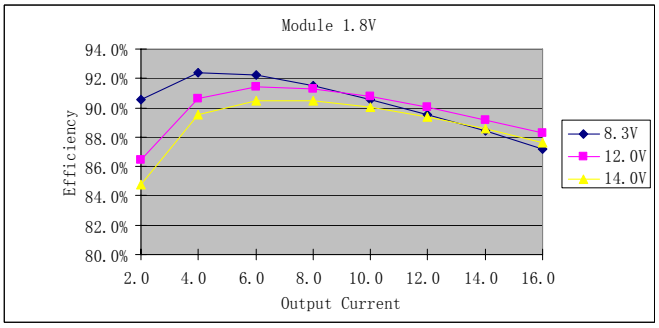
Vo=5.0 V

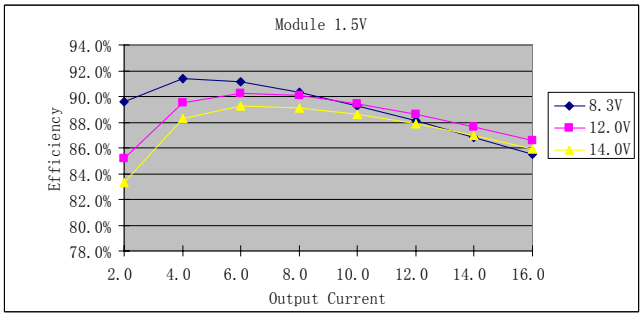
Efficiency Data

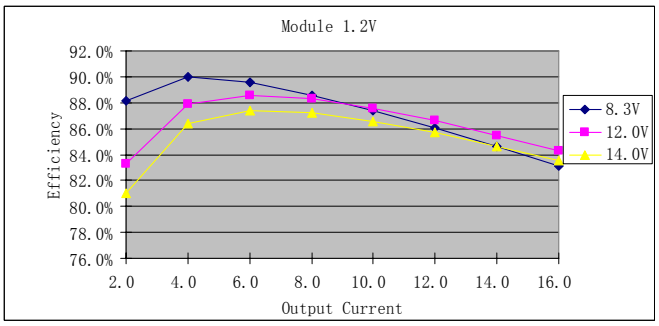


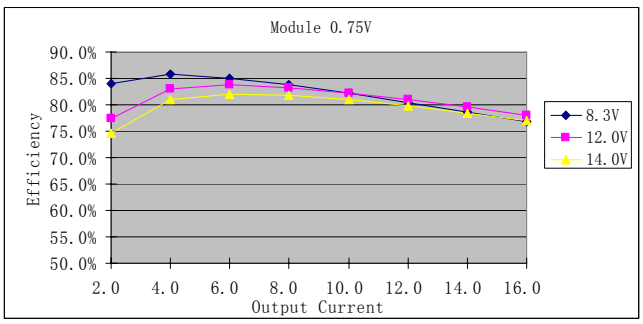




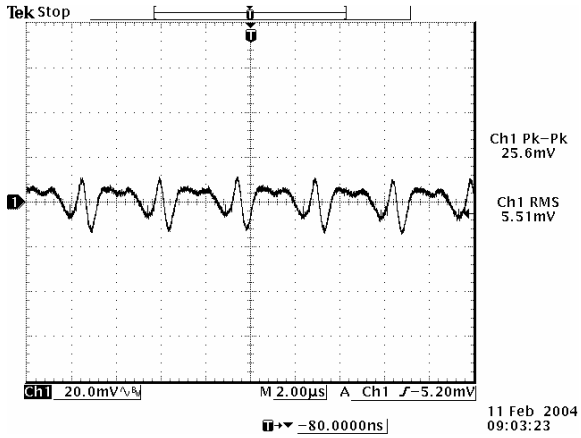




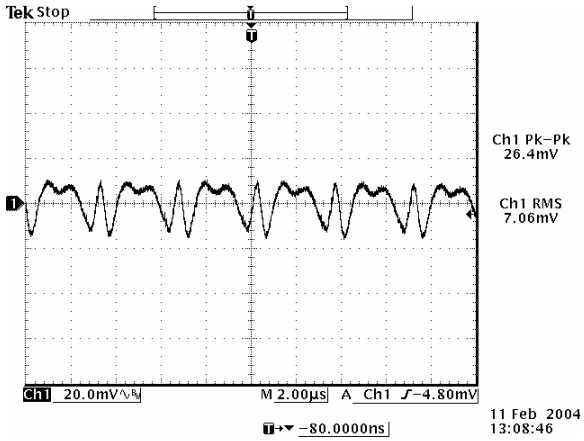




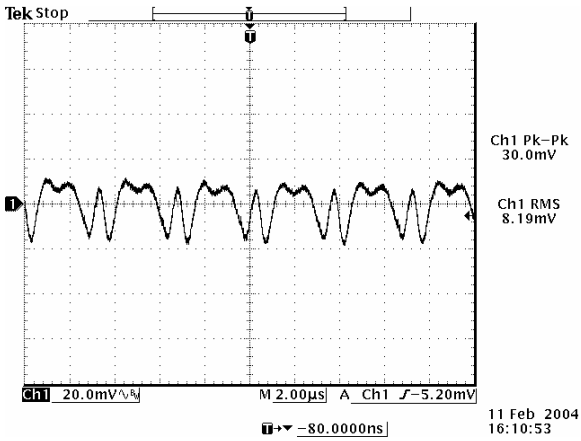
Ripple and Noise Waveforms



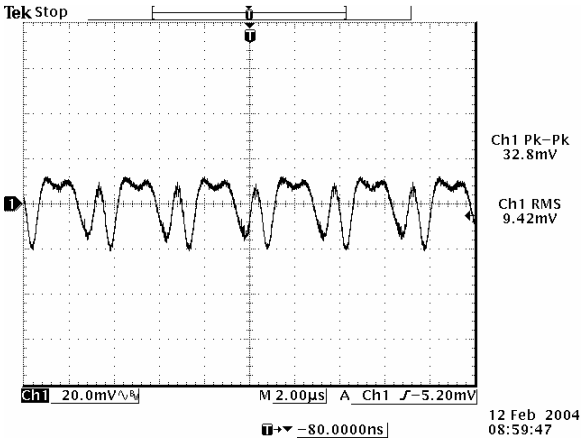
Ripple and noise at max load 0.75 Vdc output



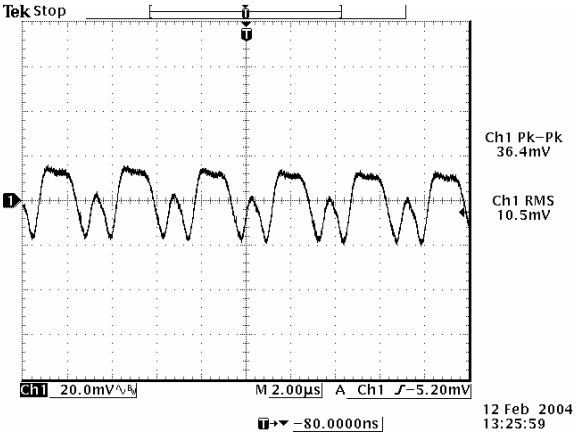
Ripple and noise at max load 1.2 Vdc output



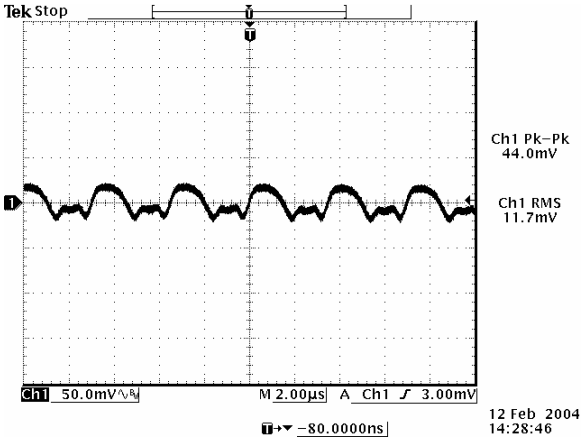
Ripple and noise at max load 1.5 Vdc output



Ripple and noise at max load 1.8 Vdc output



Ripple and noise at max load 2.5 Vdc output



Ripple and noise at max load 3.3 Vdc output

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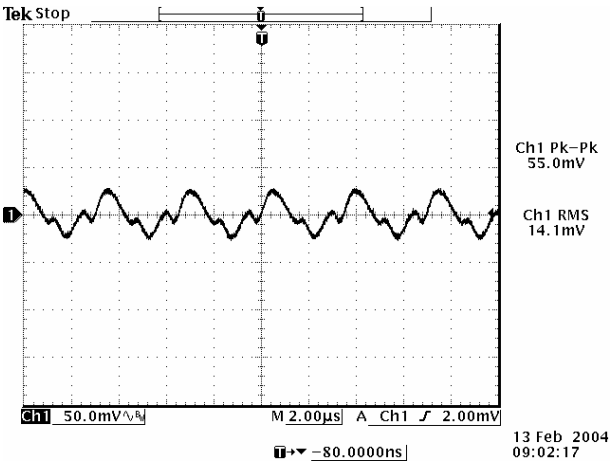
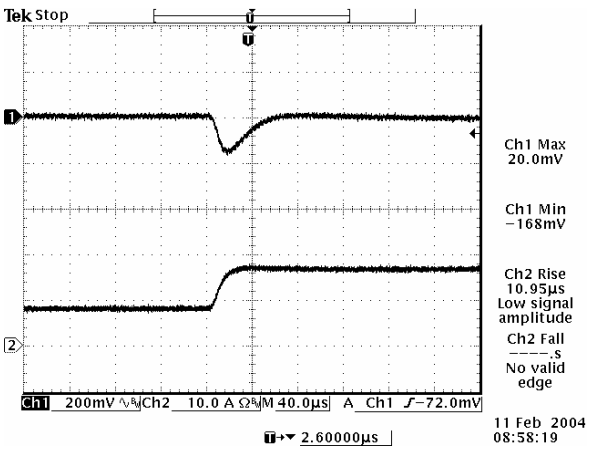
Ripple and Noise Waveforms (continued)



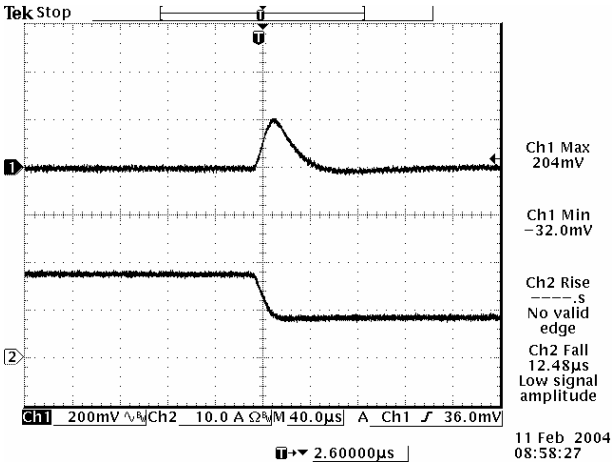
Ripple and noise at max load 5.0 Vdc output

Note: Ripple and Noise at 12 V input, with 10 uF tantalum capacitor and 1 uF ceramic capacitor at the output, and Ta=25 deg C.

Transient Response Waveforms

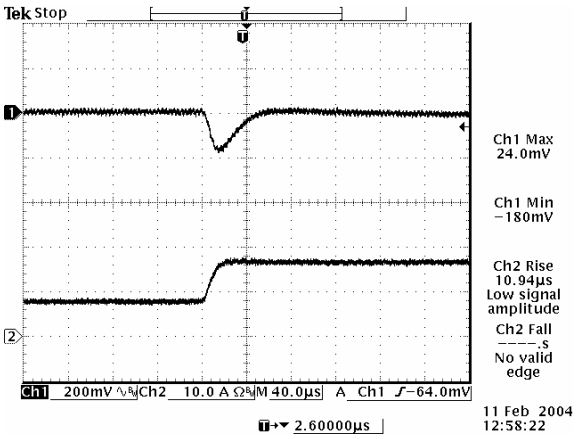


Transients 50% to 100% load 0.75 Vdc output

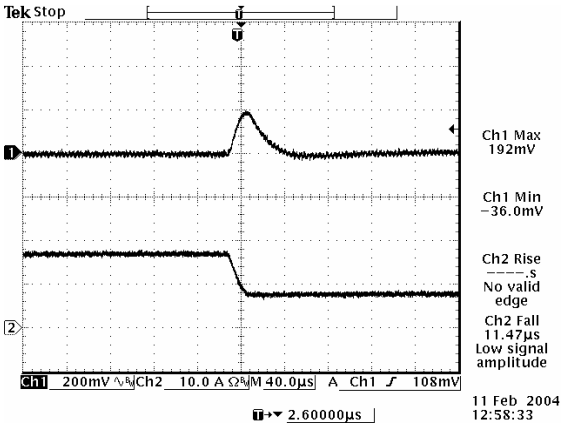


Transients 100% to 50% load 0.75 Vdc output

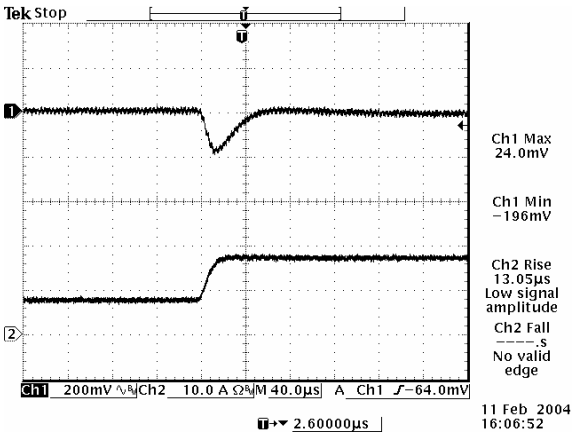
Transient Response Waveforms (continued)



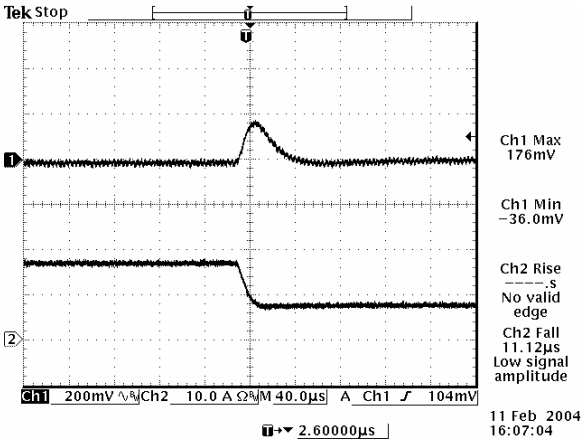
Transients 50% to 100% load 1.2 Vdc output



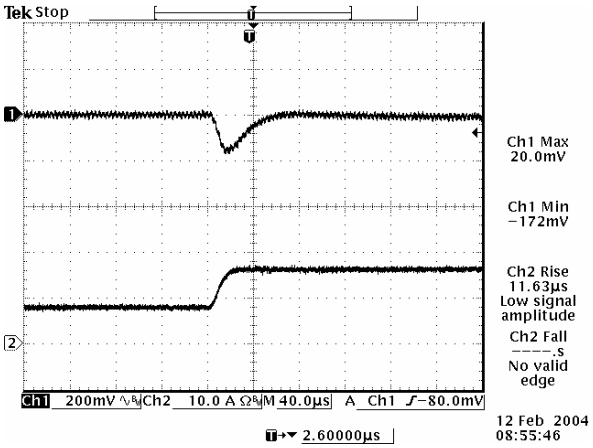
Transients 100% to 50% load 1.2 Vdc output



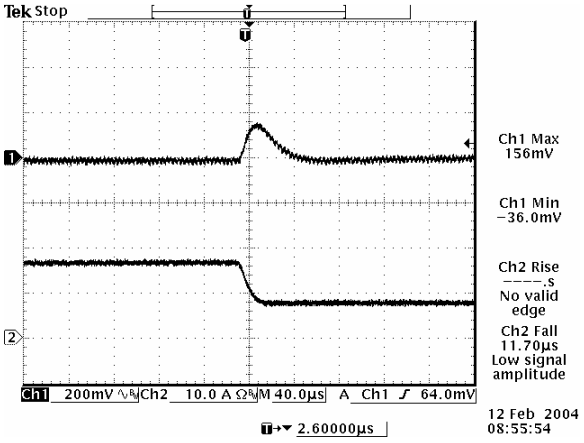
Transients 50% to 100% load 1.5 Vdc output



Transients 100% to 50% load 1.5 Vdc output

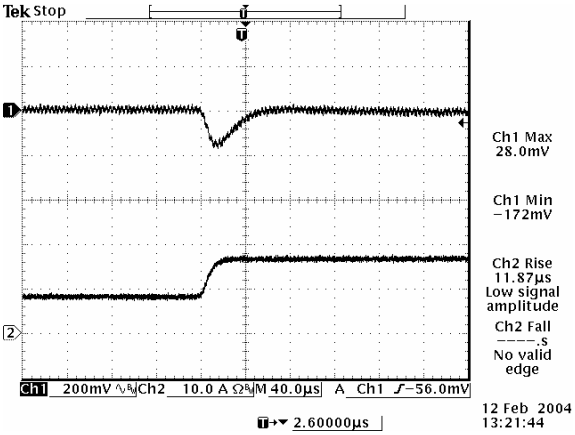


Transients 50% to 100% load 1.8 Vdc output

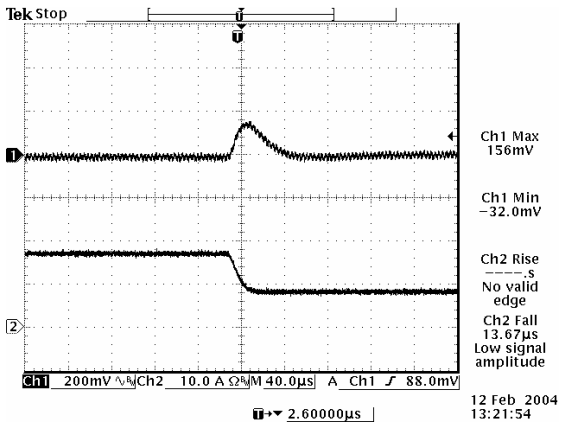


Transients 100% to 50% load 1.8 Vdc output

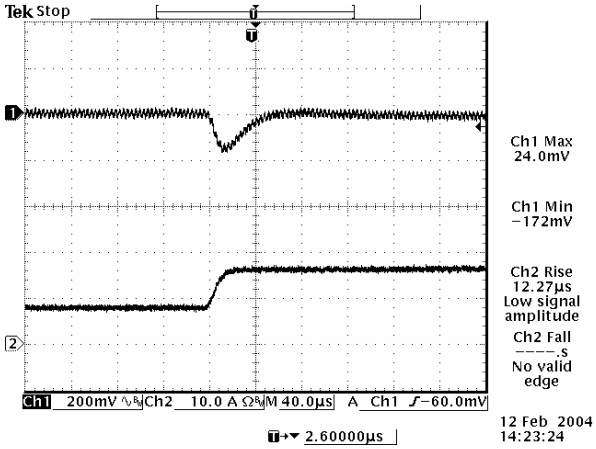
Transient Response Waveforms (continued)



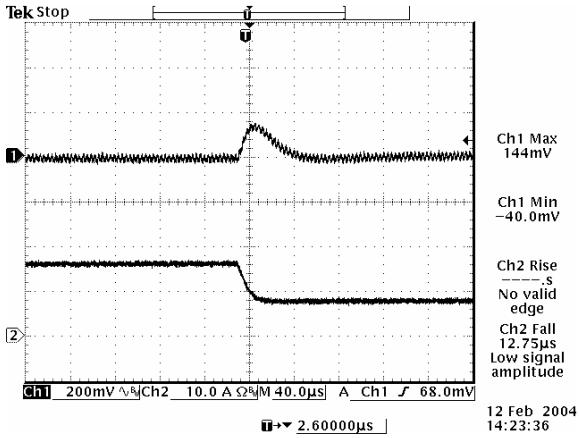
Transients 50% to 100% load 2.5 Vdc output



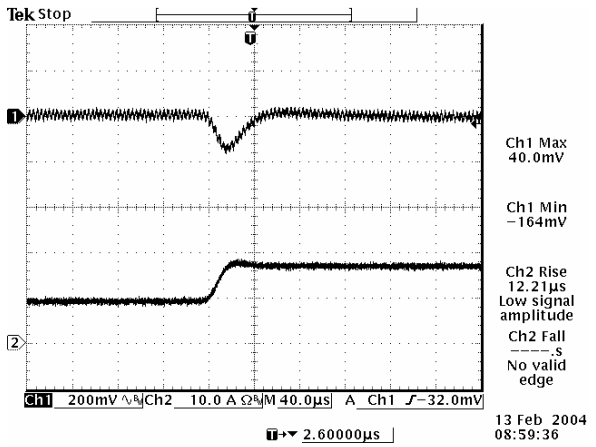
Transients 100% to 50% load 2.5 Vdc output



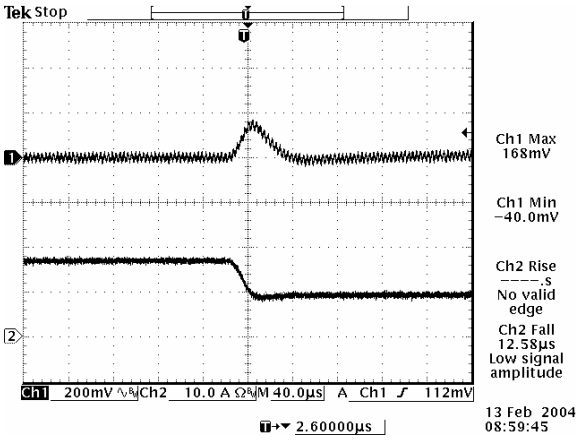
Transients 50% to 100% load 3.3 Vdc output



Transients 100% to 50% load 3.3 Vdc output



Transients 50% to 100% load 5.0 Vdc output



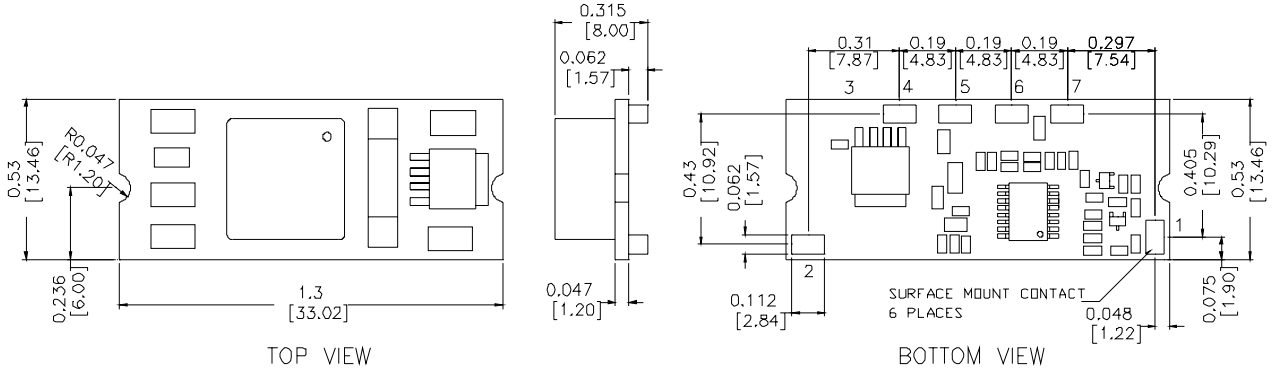
Transients 100% to 50% load 5.0 Vdc output

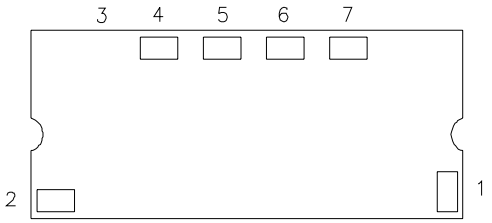
Note: Transient response at 12 V input, di/dt=2.5 A/uS, with external 2 x 150 uF polymer capacitor at the output, Ta=25 deg C.

NON-ISOLATED DC/DC CONVERTERS

8.3 Vdc - 14 Vdc Input 0.75 Vdc - 5.0 Vdc/16 A Output

Mechanical Outline



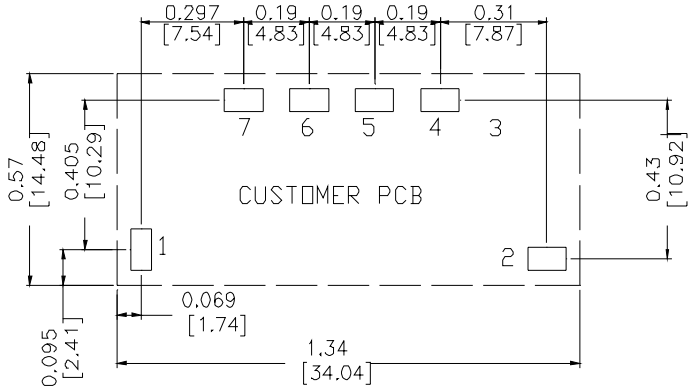


BOTTOM VIEW

Pin Connections

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

RECOMMENDED PAD LAYOUT



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.

CORPORATE

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Lancashire, PR1 8UD, U.K.
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