NON-ISOLATED DC/DC CONVERTERS

4.5 Vdc - 14 Vdc Input 0.75 Vdc - 3.63 Vdc/16 A Output

SRBC-16E1Ax RoHS Compliant Rev.A

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

Description

The Bel SRBC-16E1Ax 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 92% at 3.3 Vdc 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	16 A	58 W	92%	SRBC-16E1AL	SRBC-16E1A0

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.

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage Vo,set < 3.0 Vo,set ≥ 3.0	 4.5 V Vo,set+1.5 V	 - -	 14 V 14 V	
Input Current (full load)	-	-	15 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)	-	-	400 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	-	4.2 V	-	
Turn-off Voltage Threshold	3.7 V	-	4.2 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	-	
Line Regulation		-	0.1% Vo,set	-	
Regulation Over Temperature (-40 °C to +85 °C)		-	0.3% Vo,set	-	
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)		-	30 mV	75 mV	Tested with 0-20 MHz BW, 10 uF tantalum capacitor & 1uF ceramic capacitor at the output
Ripple and Noise (rms)		-	12 mV	30 mV	
Turn on Time		-	12 mS	20 mS	
Overshoot at Turn on		-	-	1% Vo,set	
Output Capacitance		0 uF	-	5000 uF	
Transient Response					
50% ~ 100% Max Load	All	-	150 mV	-	di/dt=2.5 A/uS; Vin=12 V and with 2 x 150 uF polymer capacitor at the output.
Settling Time		-	50 uS	-	
100% ~ 50% Max Load		-	150 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=12 V, Io=Io-max
Vo=2.5 V	-	90%	-	
Vo=1.8 V	-	88%	-	
Vo=1.5 V	-	87%	-	
Vo=1.2 V	-	85%	-	
Vo=0.75 V	-	79%	-	
Efficiency				
Vo=3.3 V	-	92%	-	Measured at Vin=5 V, Io=Io-max
Vo=2.5 V	-	90%	-	
Vo=1.8 V	-	87%	-	
Vo=1.5 V	-	86%	-	
Vo=1.2 V	-	83%	-	
Vo=0.75 V	-	78%	-	
Switching Frequency	200 kHz	230 kHz	260 kHz	
Over Temperature Shutdown	-	130 °C	-	
Output Trim Range (Wide Trim)	0.7525 V	-	3.63 V	
Remote Sense Compensation	-	-	0.5 V	
MTBF	2,666,488 hours			Calculated Per Bell Core SR-332 (Io = 80%Io,max; Vin=12 V; Vo=3.3 V; Ta=25°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.

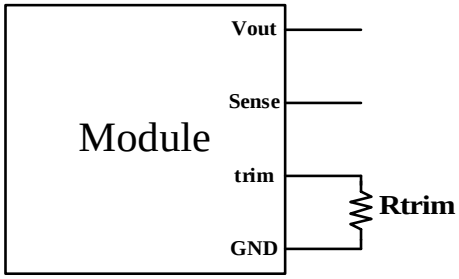
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.2 V	-	0.3 V	SRBC-16E1A0; Remote On/Off pin open, Unit on.
Signal High (Unit On)	-	-	Vin, max	
Signal Low (Unit On)	-0.2 V	-	0.3 V	SRBC-16E1AL; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	2.5 V	-	Vin, max	

Output Trim Equations

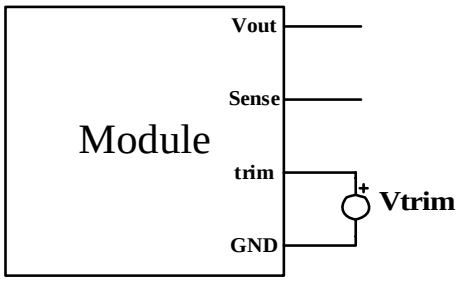
Equation for calculating the trim resistor (in Ω) given the desired output voltage (Vo) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

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

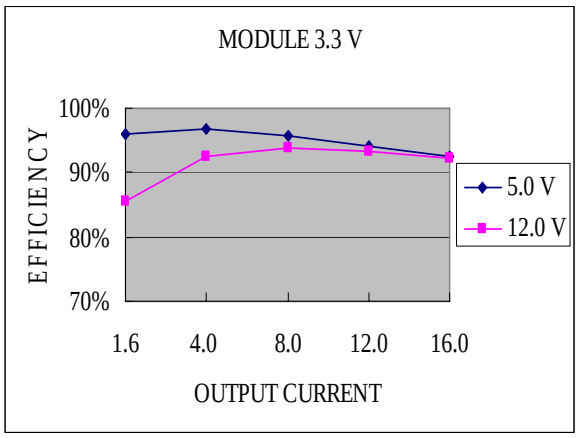


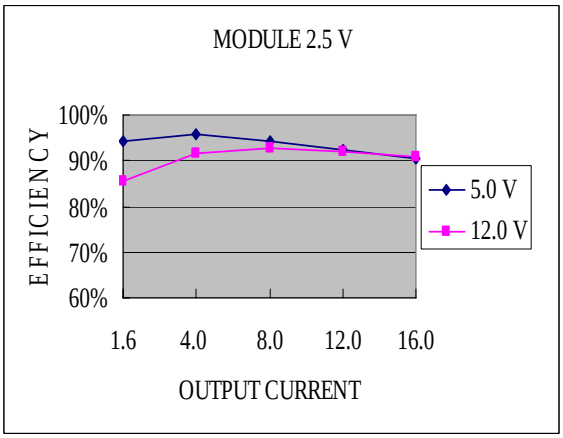
Equation for calculating the trim voltage (in V) given the desired output voltage (Vo) is shown below. The Trim Up voltage should be connected between the Trim pin and Ground.

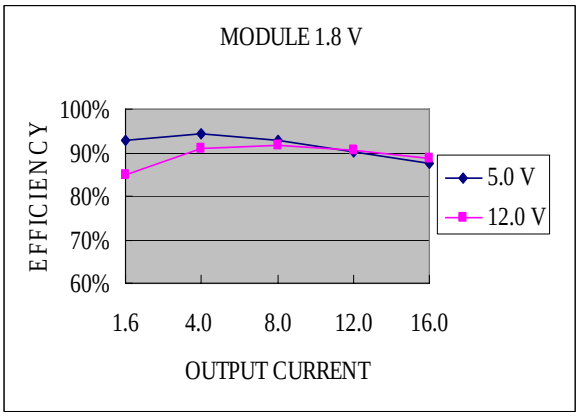
$$V_{trim} = 0.7 - 0.0667 \times (Vo - 0.7525)$$

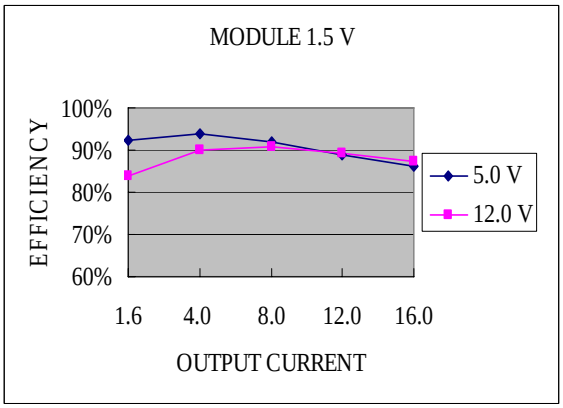


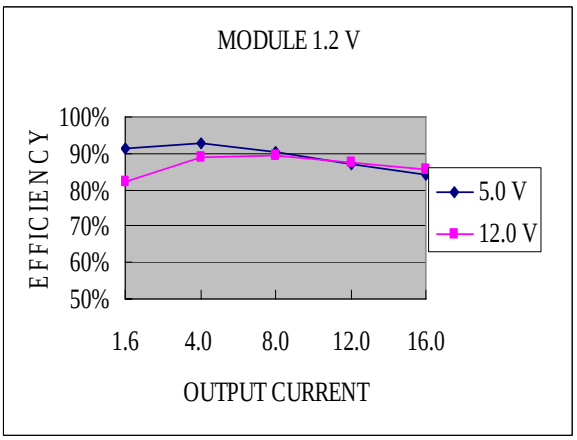
Efficiency Data

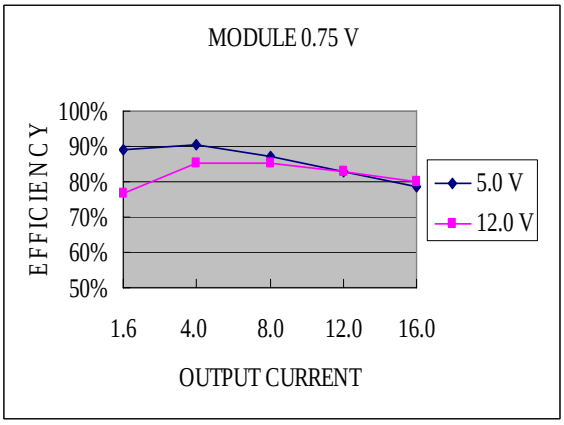




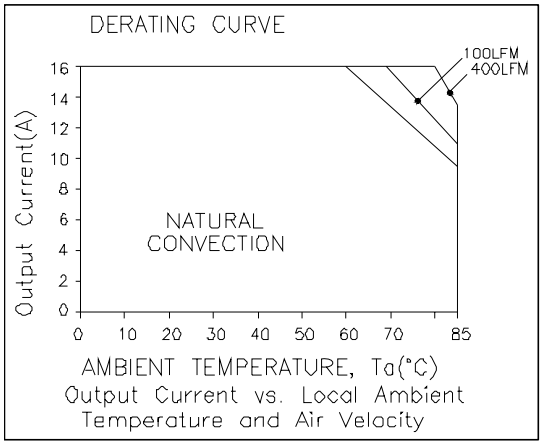




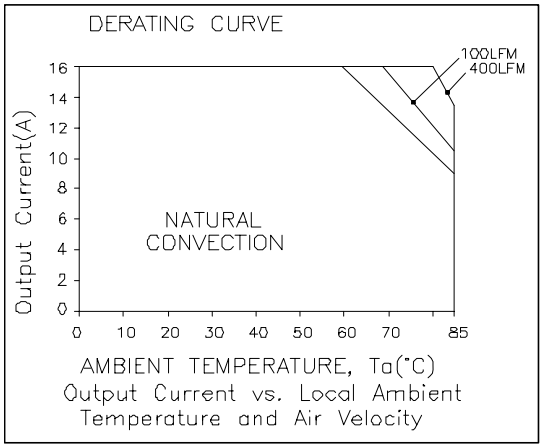




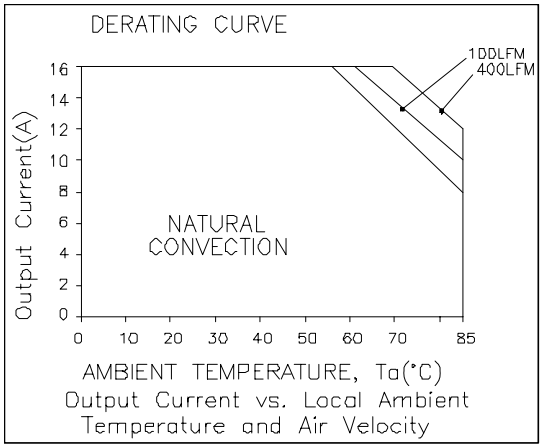
Thermal Derating Curves



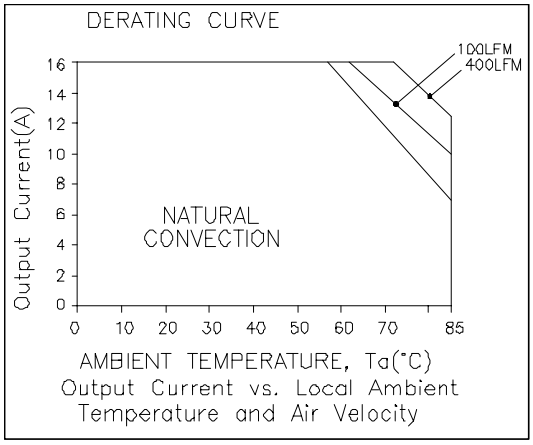
Vo=0.75 V; Vin=5.0 V



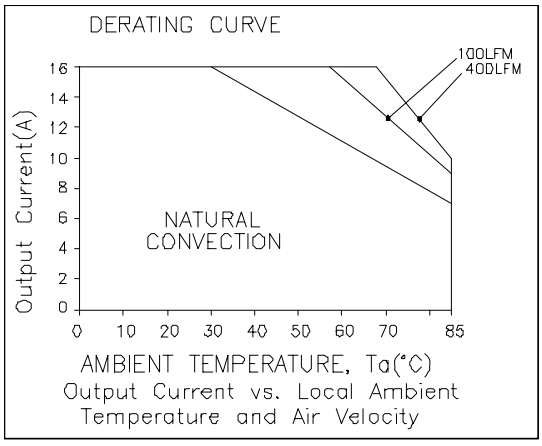
Vo=0.75 V; Vin=12.0 V



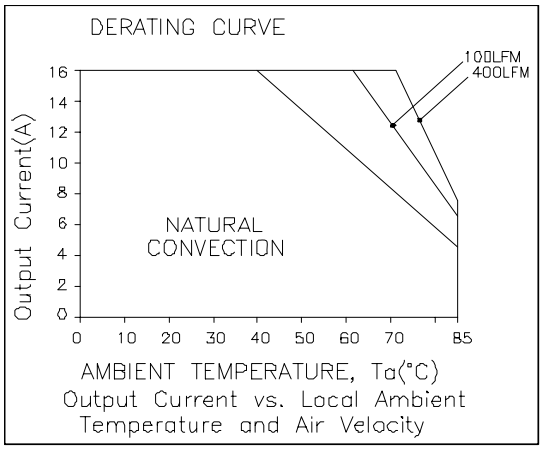
Vo=1.8 V; Vin=5.0 V



Vo=1.8 V; Vin=12 V

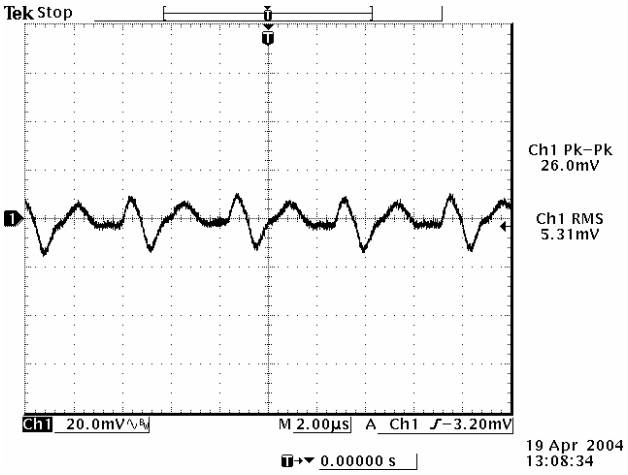


Vo=3.3 V; Vin=5.0 V

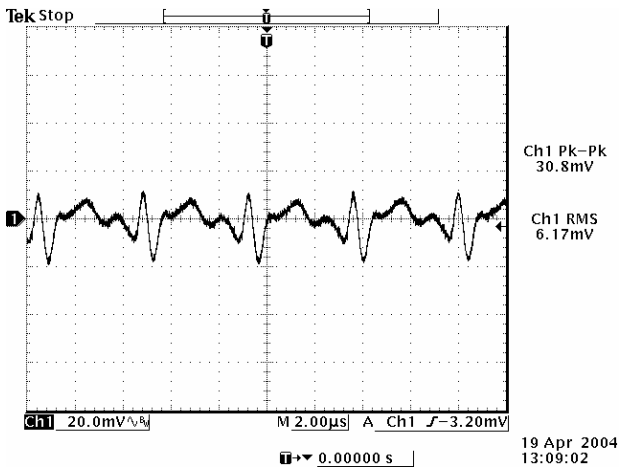


Vo=3.3 V; Vin=12 V

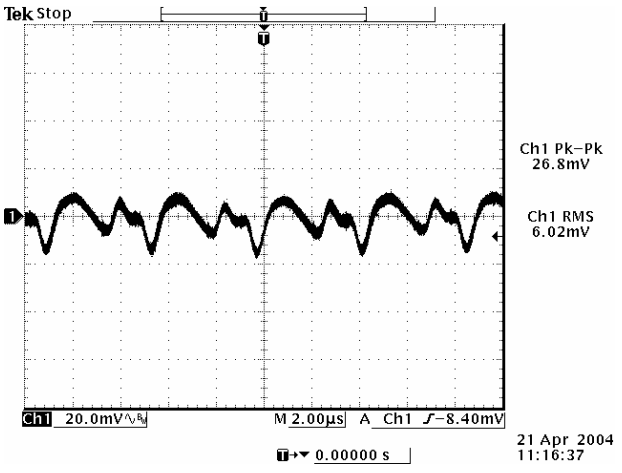
Ripple and Noise Waveforms



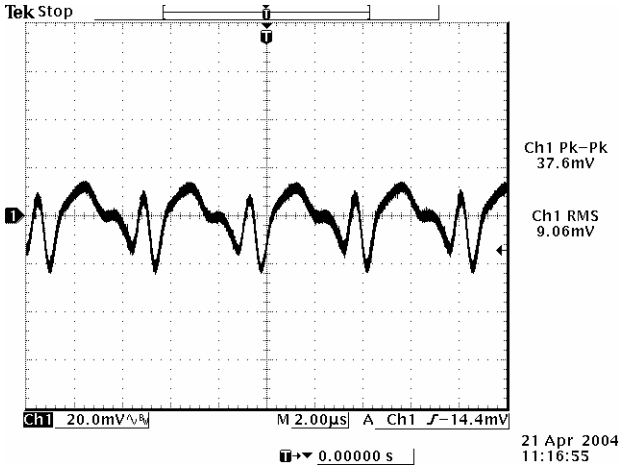
Vin=5 V, Vo=0.7525 V



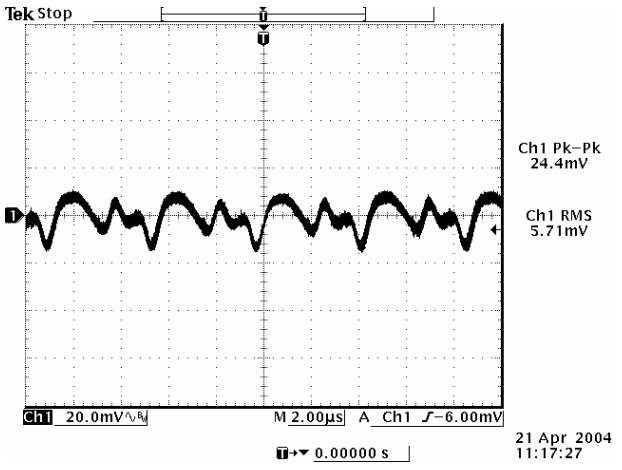
Vin=12 V, Vo=0.7525 V



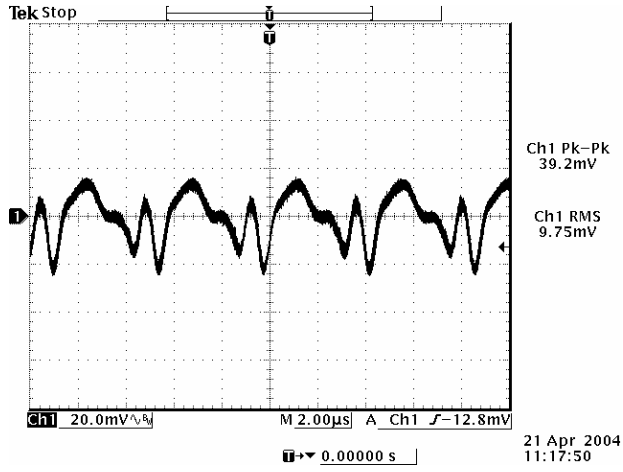
Vin=5 V, Vo=1.2 V



Vin=12 V, Vo=1.2 V

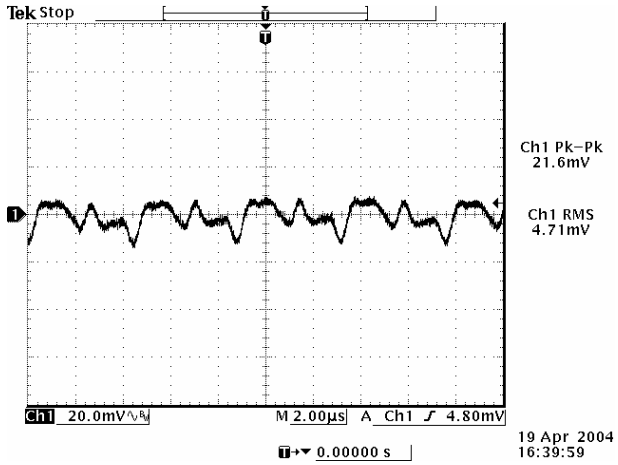


Vin=5 V, Vo=1.5 V

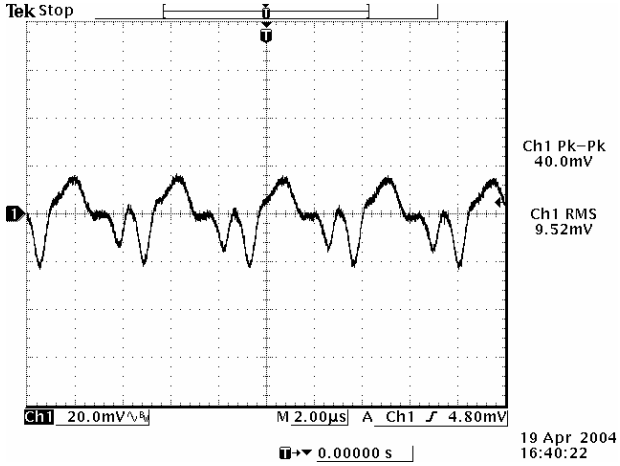


Vin=12 V, Vo=1.5 V

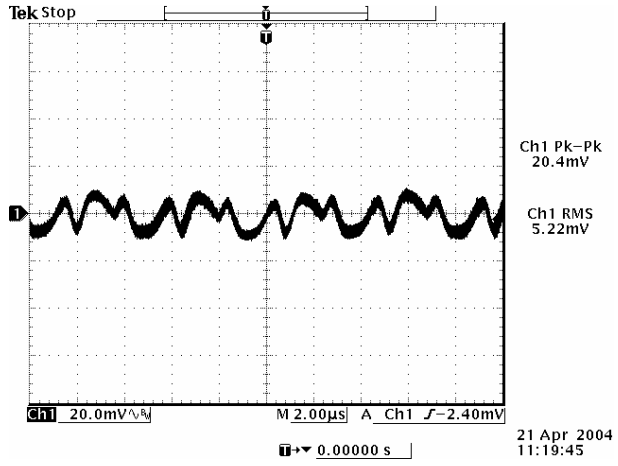
Ripple and Noise Waveforms (continued)



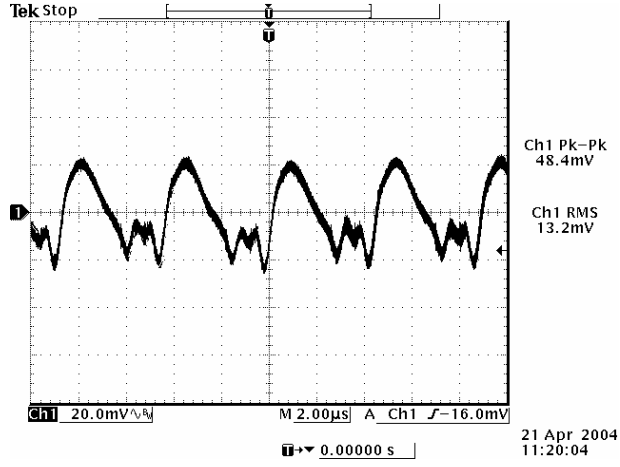
Vin=5 V, Vo=1.8 V



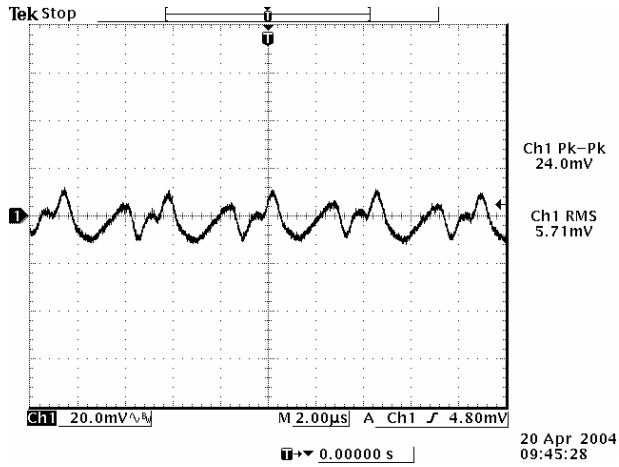
Vin=12 V, Vo=1.8 V



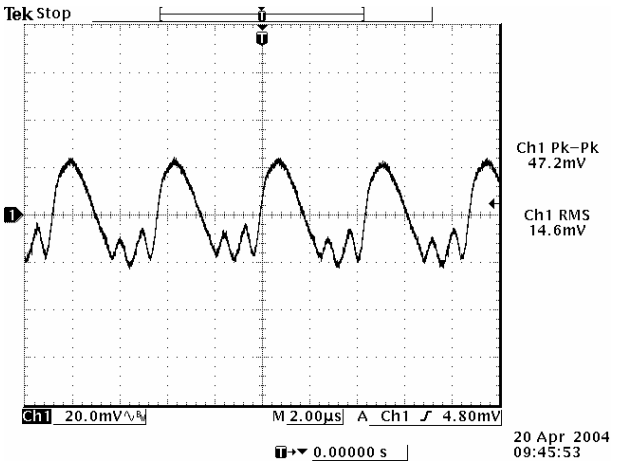
Vin=5 V, Vo=2.5 V



Vin=12 V, Vo=2.5 V



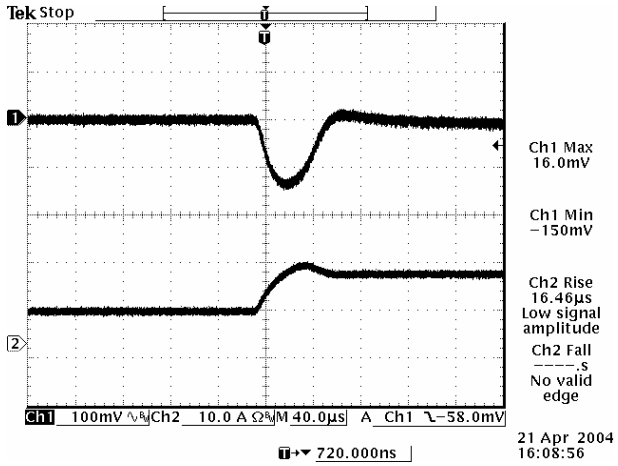
Vin=5 V, Vo=3.3 V



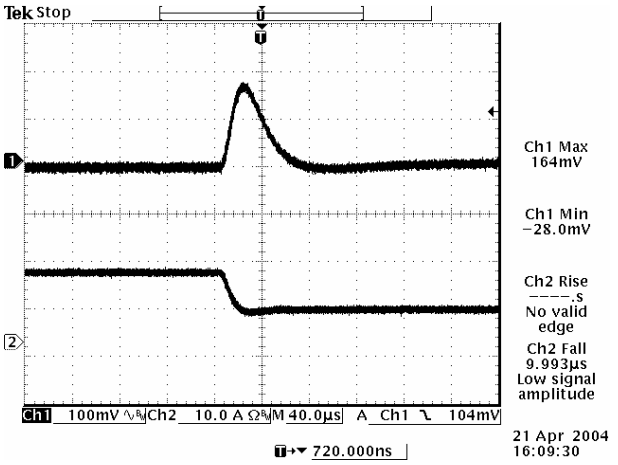
Vin=12 V, Vo=3.3 V

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

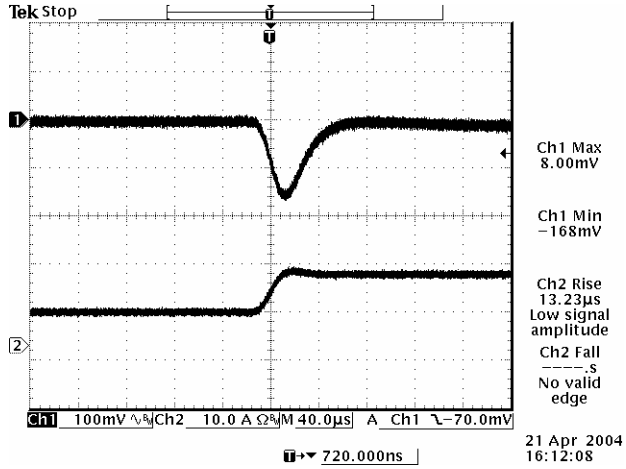
Transient Response Waveforms



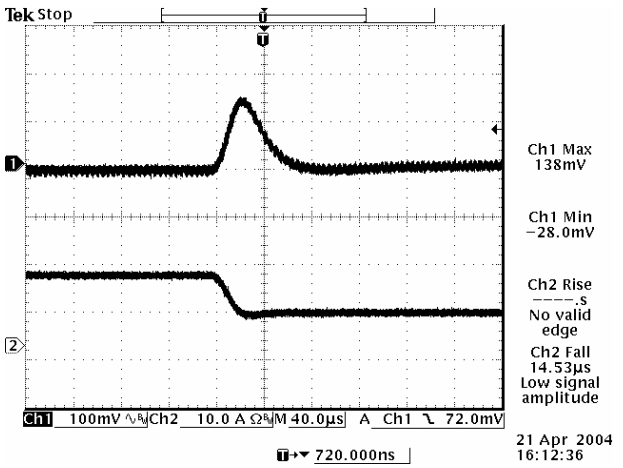
50% to 100% load Transient at Vin=5 V, Vo=0.75 V



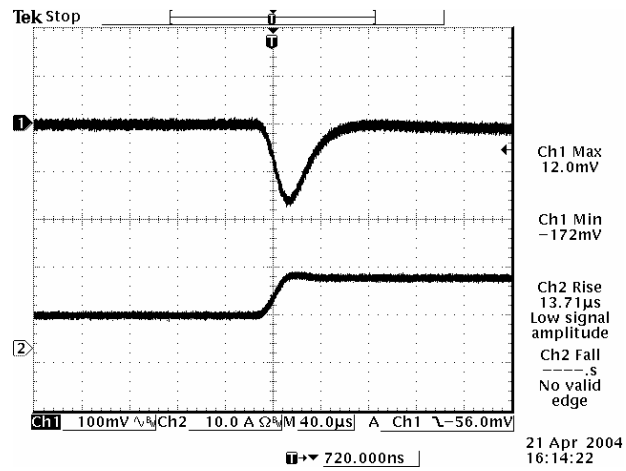
100% to 50% load Transient at Vin=5 V, Vo=0.75 V



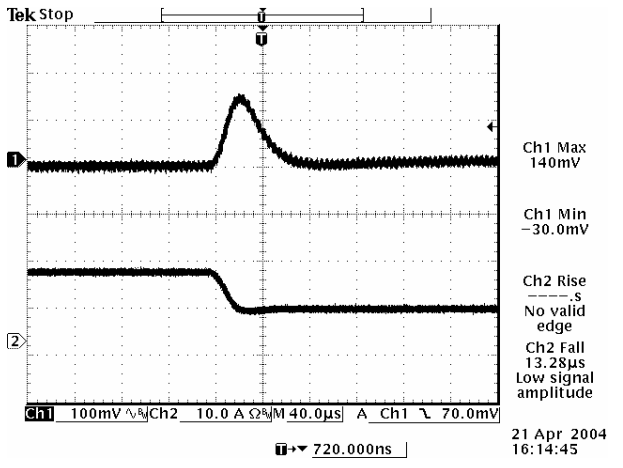
50% to 100% load Transient at Vin=5 V, Vo=1.2 V



100% to 50% load Transient at Vin=5 V, Vo=1.2 V

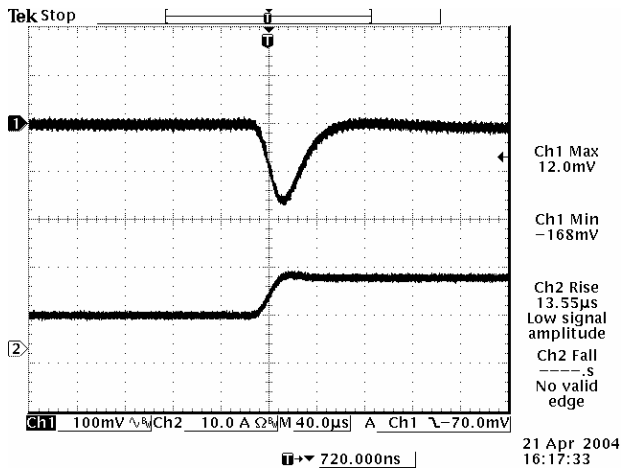


50% to 100% load Transient at Vin=5 V, Vo=1.5 V

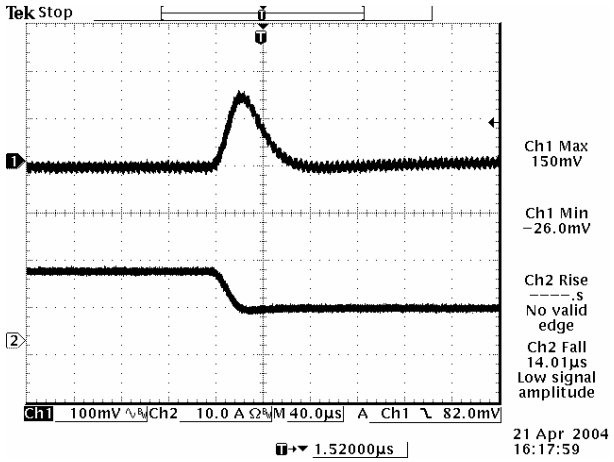


100% to 50% load Transient at Vin=5 V, Vo=1.5 V

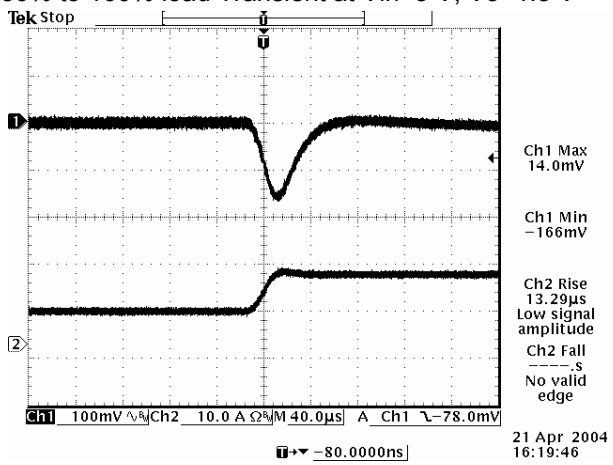
Transient Response Waveforms (continued)



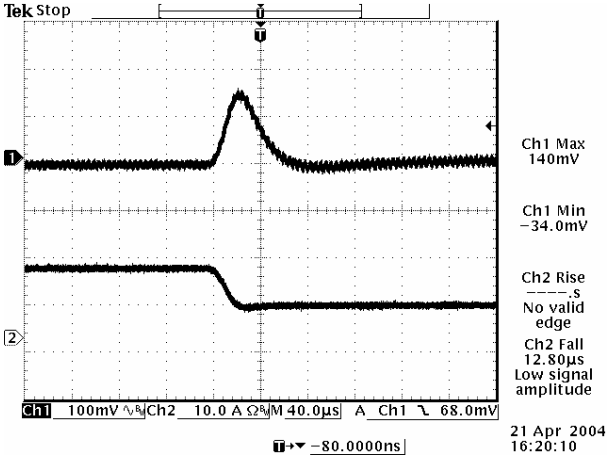
50% to 100% load Transient at Vin=5 V, Vo=1.8 V



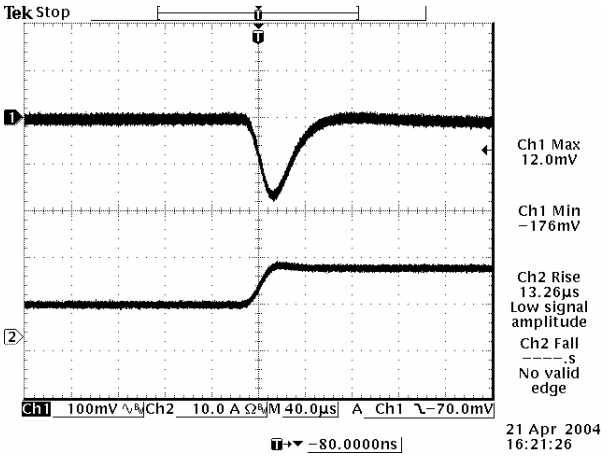
100% to 50% load Transient at Vin=5 V, Vo=1.8 V



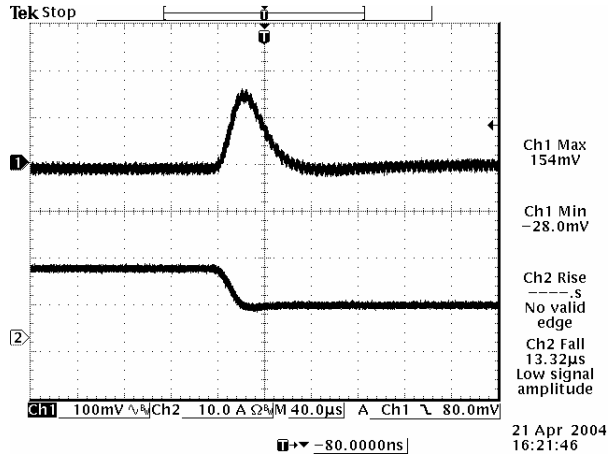
50% to 100% load Transient at Vin=5 V, Vo=2.5 V



100% to 50% load Transient at Vin=5 V, Vo=2.5 V

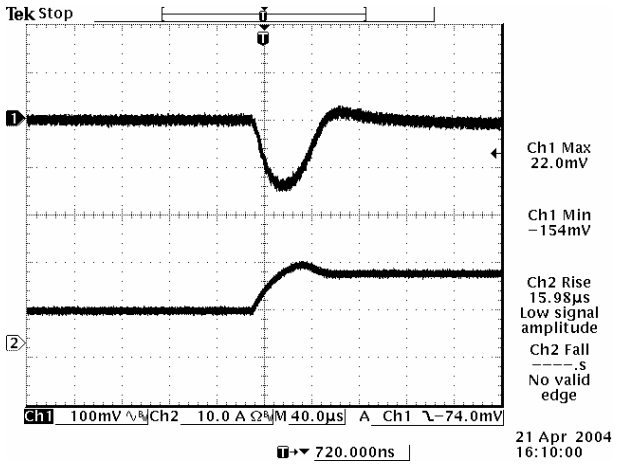


50% to 100% load Transient at Vin=5 V, Vo=3.3 V

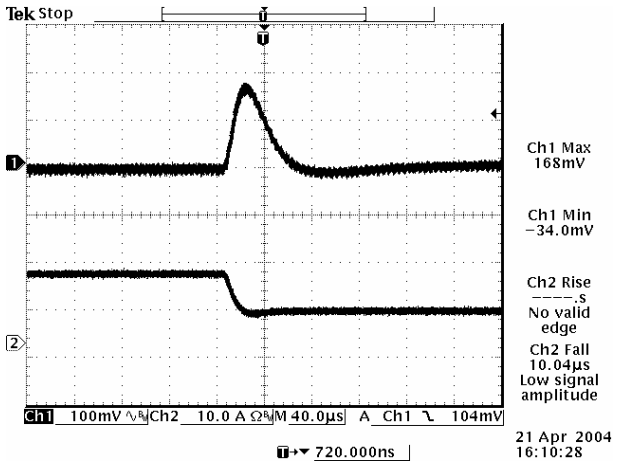


100% to 50% load Transient at Vin=5 V, Vo=3.3 V

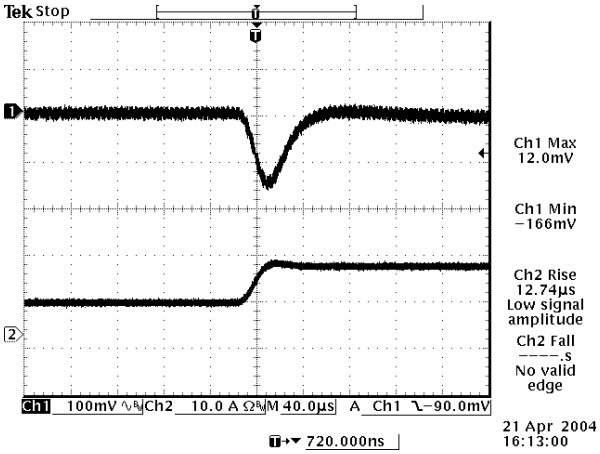
Transient Response Waveforms (continued)



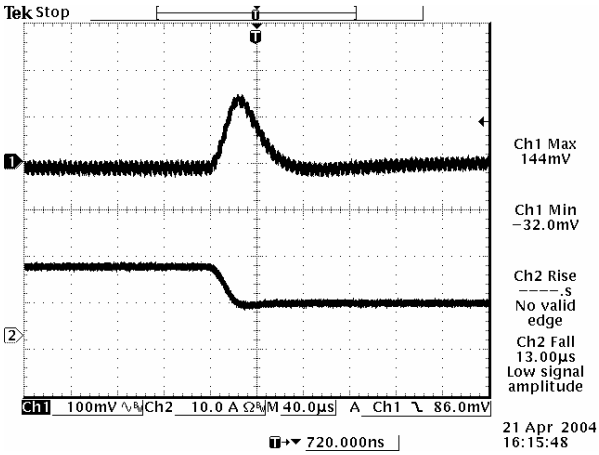
50% to 100% load Transient at Vin=12 V, Vo=0.75 V



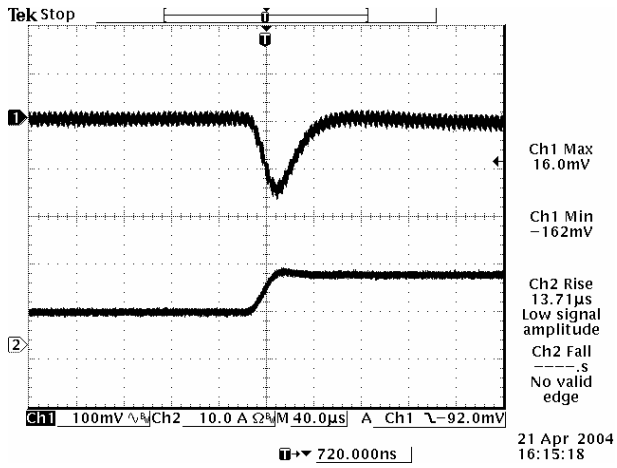
100% to 50% load Transient at Vin=12 V, Vo=0.75 V



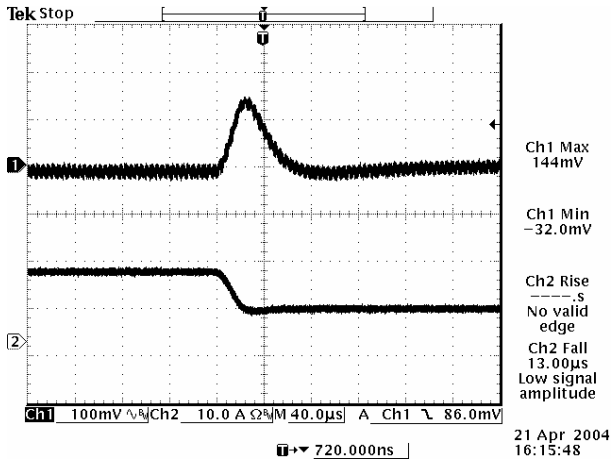
50% to 100% load Transient at Vin=12 V, Vo=1.2 V



100% to 50% load Transient at Vin=12 V, Vo=1.2 V

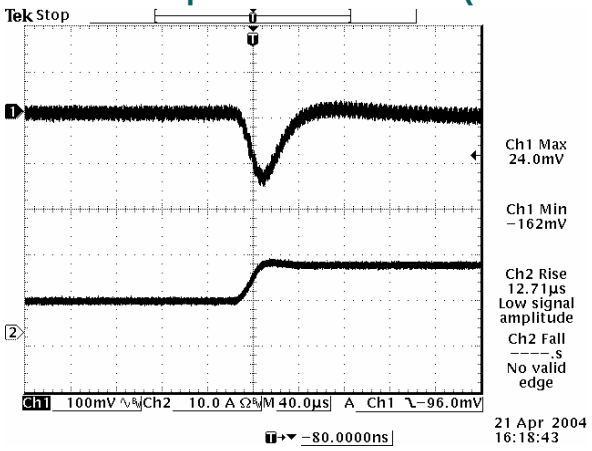


50% to 100% load Transient at Vin=12 V, Vo=1.5 V

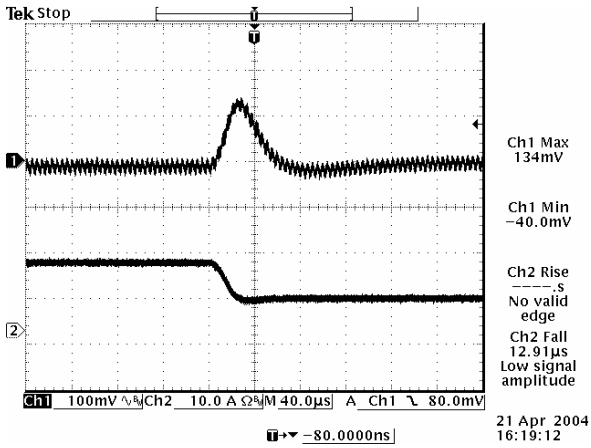


100% to 50% load Transient at Vin=12 V, Vo=1.5 V

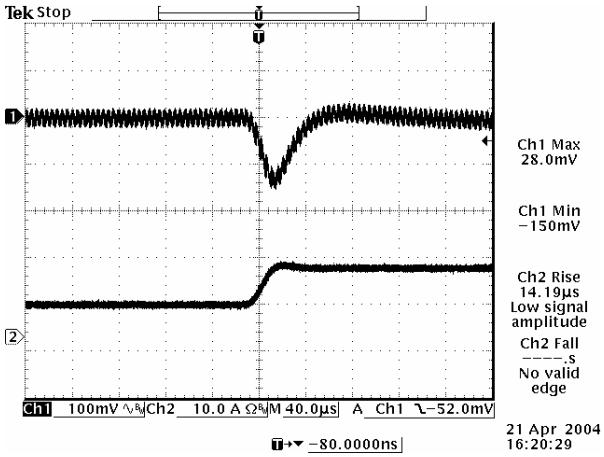
Transient Response Waveforms (continued)



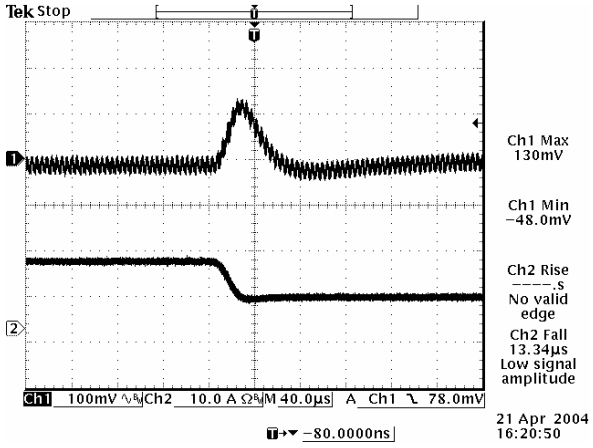
50% to 100% load Transient at Vin=12 V, Vo=1.8 V



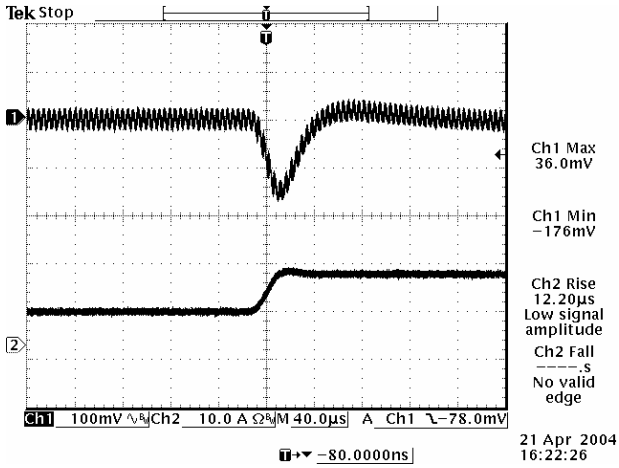
100% to 50% load Transient at Vin=12 V, Vo=1.8 V



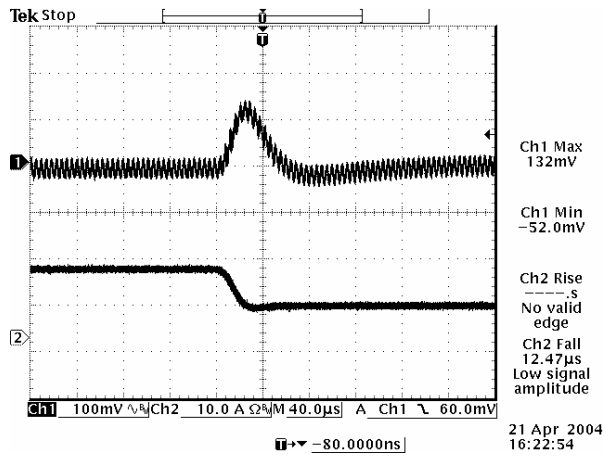
50% to 100% load Transient at Vin=12 V, Vo=2.5 V



100% to 50% load Transient at Vin=12 V, Vo=2.5 V



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



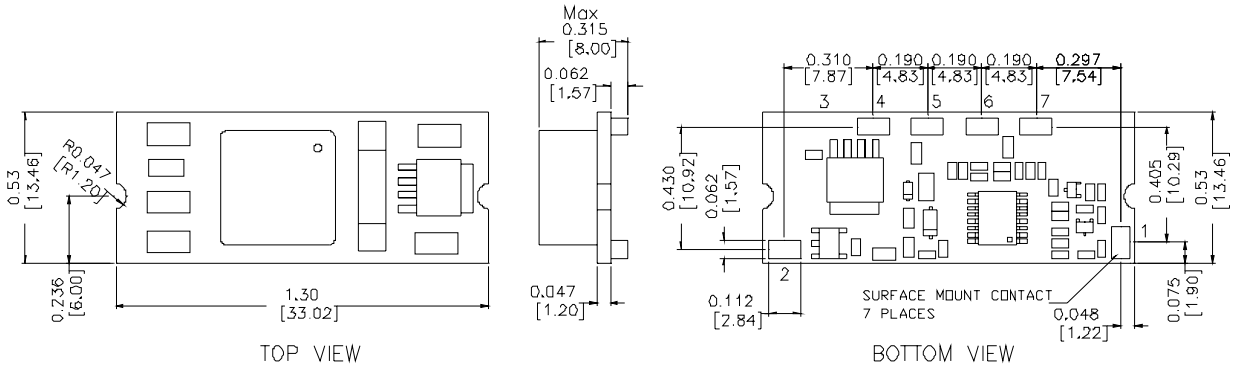
100% to 50% load Transient at Vin=12 V, Vo=3.3 V

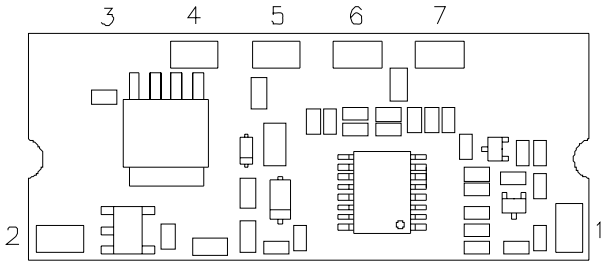
Note: Transient response with external load capacitance Cext=2x150uF (Polymer capacitors), and Ta=25℃.

NON-ISOLATED DC/DC CONVERTERS

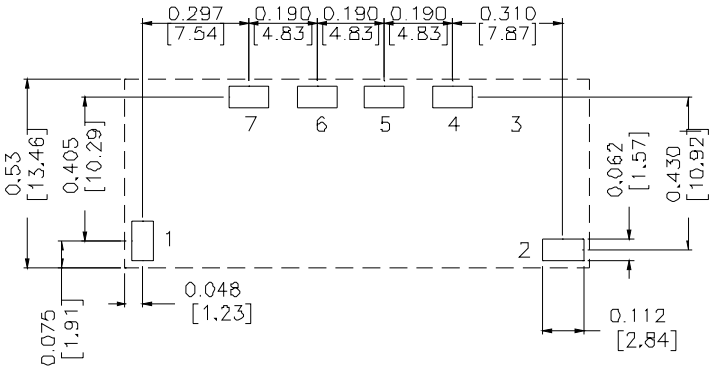
4.5 Vdc - 14 Vdc Input 0.75 Vdc - 3.63 Vdc/16 A Output

Mechanical Outline





RECOMMENDED PCB PAD LAYOUT



Pin Connections

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