NON-ISOLATED DC/DC CONVERTERS

2.4 Vdc - 5.5 Vdc Input 0.75 Vdc - 3.63 Vdc/16 A Output

SRBC-16F1Ax RoHS Compliant Rev.A

- Non-Isolated
- High Efficiency
- High Power Density
- Fixed Frequency (300 kHz)
- Remote On/Off
- Converter Can Sink and Source Current
- Under-voltage Lockout (UVLO)
- Over Temperature Protection
- OCP/SCP
- Wide Input
- Wide Trim Range
- Remote Sense
- Active High/Low (option)

Description

The Bel SRBC-16F1Ax modules are a series of non-isolated dc/dc converters that deliver up to 16 A of output current with full load efficiency of 94% at 3.3 Vdc output. These modules provide precisely regulated voltage programmable via external resistor from 0.75 Vdc to 3.63 Vdc over a wide range of input voltage (Vin=2.4 Vdc - 5.5 Vdc). The open-frame construction and small footprint enable designers to develop cost and space-efficient solutions. Standard features include remote On/Off, over current protection, short current protection, wide input, 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	Model Number Active Low
0.75 V-3.63 V[1]	2.4 V-5.5 V	16 A	58 W	94%	SRBC-16F1AL	SRBC-16F1A0	SRBC-16F1AW[2]

Notes: 1. These modules use a buck topology, so the output voltages must be 0.8 V less than the input voltage.
2. “W” indicates special coating.
3. Add “G” to the end of the Model Number to indicate Tray Packaging.
4. 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	-	5.8 V	
Output Enable Terminal Voltage	-0.3 V	-	5.8 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				
$V_O \leqslant 1.5$ V	2.4 V	-	5.5 V	
Vo=1.8 - 2.5 V	3.0 V	-	5.5 V	
Vo=3.3 V	4.5 V	-	5.5 V	
Input Current (full load)				
Vo=3.3 V	-	11.23 A	15.10 A	
Vo=2.5 V	-	8.70 A	14.81 A	
Vo=1.8 V	-	6.40 A	13.64 A	
Vo=1.5 V	-	5.45 A	11.76 A	
Vo=1.2 V	-	4.52 A	9.64 A	
Vo=0.75 V	-	3.05 A	6.69 A	

Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
Input Current (no load)	-	80 mA	-	
Remote Off Input Current	-	10 mA	22 mA	
Input Reflected Ripple Current (pk-pk)	-	100 mA	-	With simulated source impedance of 1 uH, 5 Hz to 20 MHz and two 100 uF /10 V external input Tantalum capacitors at the input.
Input Reflected Ripple Current (rms)	-	40 mA	-	
I^2t Inrush Current Transient	-	0.15 A^2s	0.3 A^2s	
Turn-on Voltage Threshold	-	2.2 V	-	
Turn-off Voltage Threshold	-	2.0 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, Io=Io max
Output Voltage Set Point	-3% Vo,set	-	3% Vo,set	Over all operating input voltage, resistive load, and temperature conditions
Load Regulation	-	0.4% Vo,set	-	Io=Io min to Io max
Line Regulation	-	0.3% Vo,set	-	Vin=Vin min to Vin max
Regulation Over Temperature (-40 °C to +85 °C)	-	0.5% Vo,set	-	
Output Current	0 A	-	16 A	
Current Limit Threshold	19 A	-	35 A	
Short Circuit Surge Transient	-	1.6 A^2s	2 A^2s	
Ripple and Noise (pk-pk)	-	25 mV	50 mV	Tested with 0-20 MHz, with external 10 uF/16 V tantalum capacitor &1 uF /10 V TDK ceramic capacitor
Ripple and Noise (rms)	-	8 mV	15 mV	
Turn on Time	-	4 mS	8 mS	
Overshoot at Turn on	-	0%	3%	
Output Capacitance ESR ≥1 mohm ESR ≥10 mohm	 0 uF 0 uF	 - -	 1000 uF 5000 uF	
Transient Response				
50% ~ 100% Max Load	Vo=0.75-3.3 V	-	300 mV	-	di/dt=2.5 A/uS; Vin=5 V; and with external 10 uF / 16 V Tantalum capacitors and 1 uF/10 V ceramic capacitor at the output
Settling Time		-	50 uS	-	
100% ~ 50% Max Load		-	300 mV	-	
Settling Time		-	50 uS	-	
50% ~ 100% Max Load	Vo=0.75-3.3 V	-	150 mV	-	di/dt=2.5 A/uS; Vin=5 V; and with external 2 x 150 uF / 10 V Tantalum capacitors and 1 uF/10 V ceramic capacitor at the output
Settling Time		-	100 uS	-	
100% ~ 50% Max Load		-	150 mV	-	
Settling Time		-	100 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 Vo=2.5 V Vo=1.8 V Vo=1.5 V Vo=1.2 V Vo=0.7525 V	 92% 90% 88% 85% 82% 76%	 94% 92% 90% 88% 85% 79%	 - - - - - -	Measured at Vin=5 V, full load
Switching Frequency	250 kHz	300 kHz	350 kHz	
Over Temperature Shutdown	-	125 °C	-	
Output Voltage Trim Range	0.7525 V	-	3.63 V	Total adjustment of trim, setpoint and remote sense combined should not exceed 3.63 V. Vo=0.7525 V when trim pin open
Remote Sense Compensation	-	-	5%	
MTBF	5,438,000 hours			Calculated Per Bell Core SR-332 (I_O = 80% Io, max; Vo=1.8 V; Vin=5.0 V; T_a = 25 °C)
Dimensions Inches (L × W × H) Millimeters (L × W × H)	 1.3 x 0.53 x 0.315 33.02 x 13.46 x 8.00			
Weight	-	6.6 g	-	

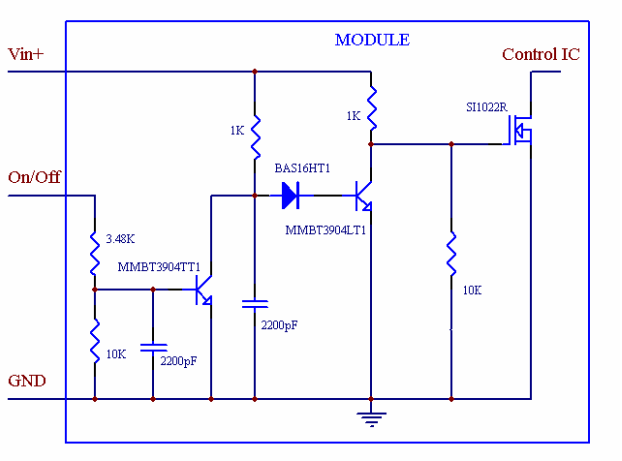
Note: All specifications are typical at 25 °C unless otherwise stated.

Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.3 V	-	0.3 V	SRBC-16F1A0; Remote On/Off pin open, Unit on.
Signal High (Unit On)	1.5 V	-	5.8 V	
Signal Low (Unit On)	-0.3 V	-	0.3 V	SRBC-16F1AL & SRBC-16F1AW; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	1.5 V	-	5.8 V	

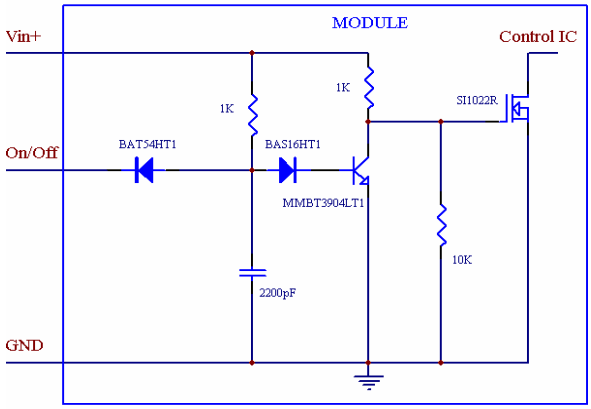
Remote Enable Specifications

The SRBC-16F1AL 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-16F1AL

The SRBC-16F1A0 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.

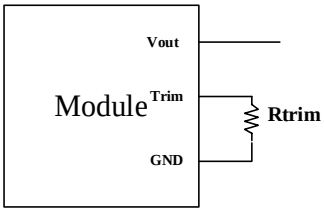


SRBC-16F1A0

Output Trim Equations

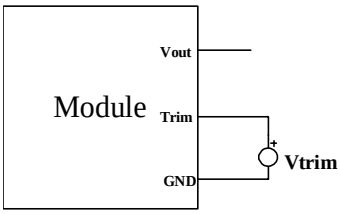
Equation for calculating the trim resistor (in KΩ) given the desired adjusted voltage (Vadj) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

$$R_{trim} = \frac{21.07}{V_{adj} - 0.7525} - 5.11$$

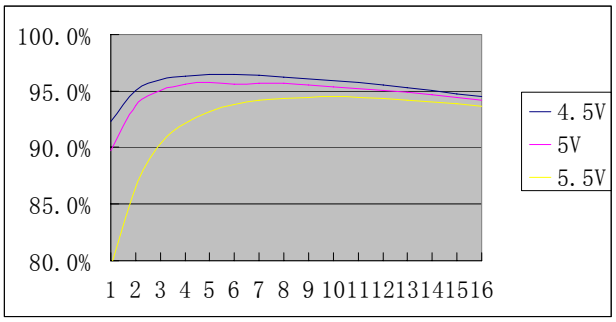


Equation for calculating the trim voltage (in V) given the desired adjusted voltage (Vadj) is shown below. The Trim Up voltage should be connected between the Trim pin and Ground.

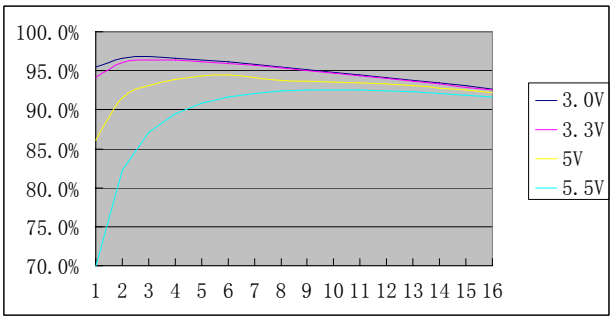
$$V_{trim} = 0.7 - 0.1698 \times (V_{adj} - 0.7525)$$



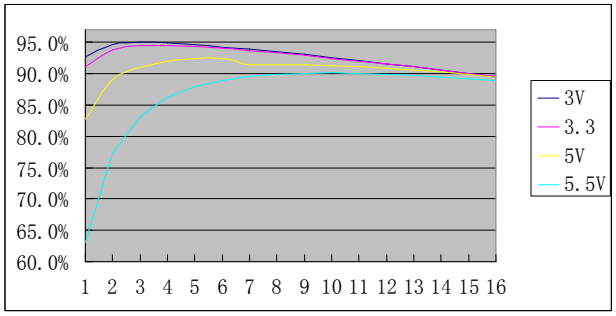
Efficiency Data



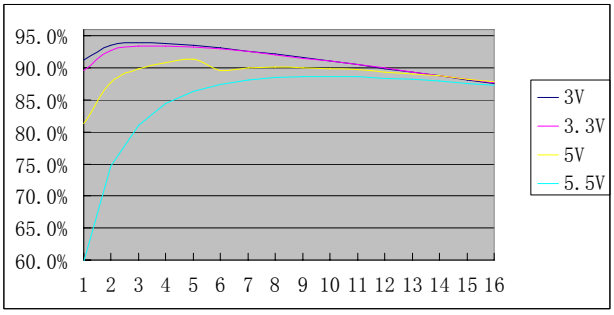
Vo=3.3 V



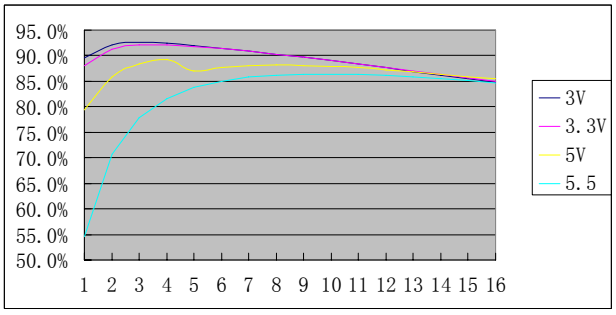
Vo=2.5 V



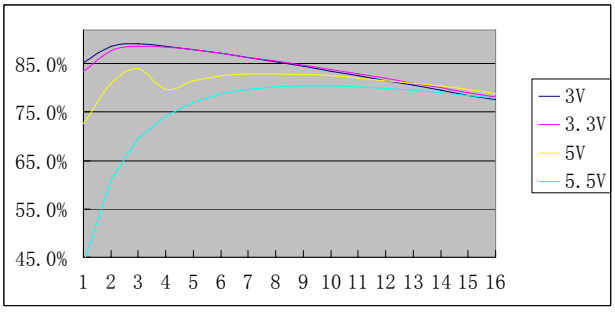
Vo=1.8 V



Vo=1.5 V

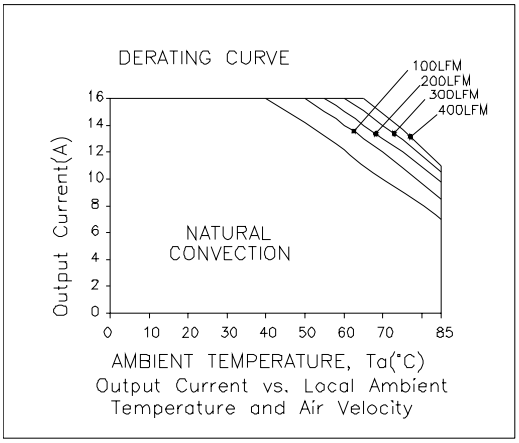


Vo=1.2 V

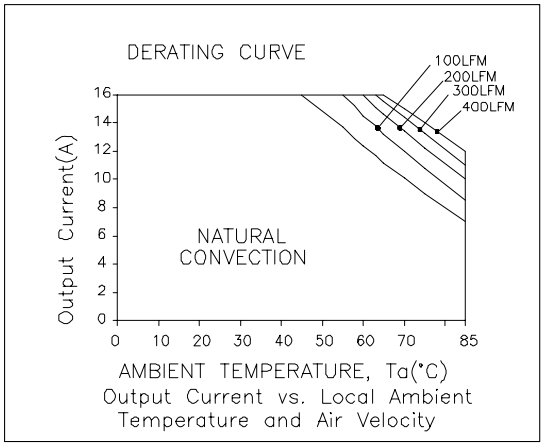


Vo=0.75 V

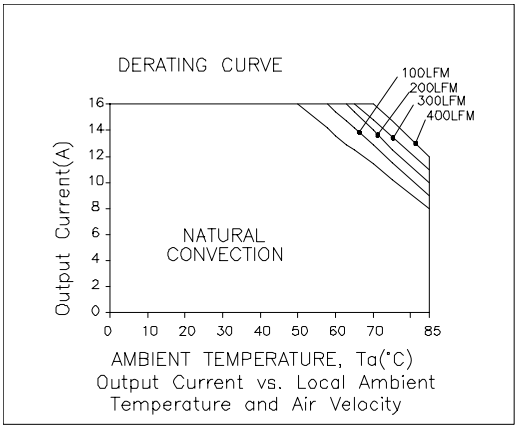
Thermal Derating Curves



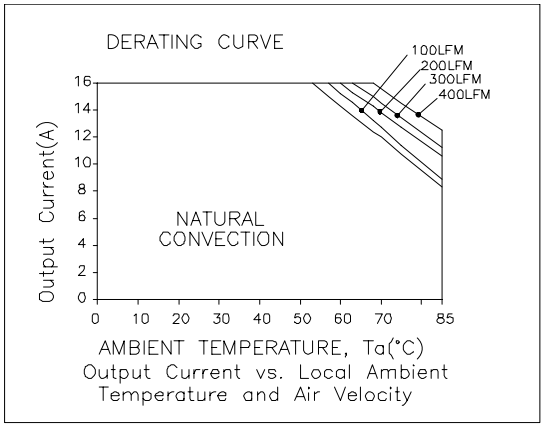
Vin=5.0 V, Vo=3.3 V or 2.5 V



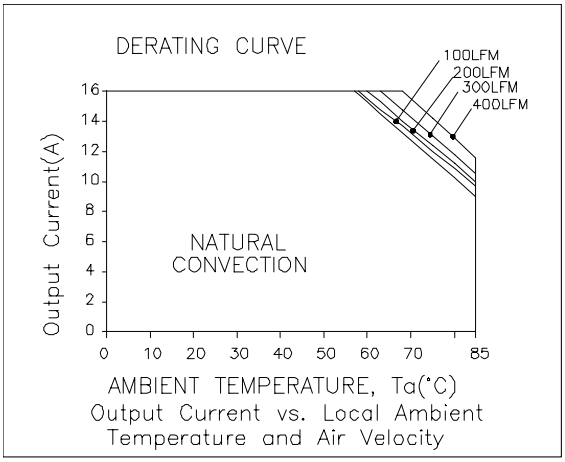
Vin=5.0 V, Vo=1.8 V or 1.5 V



Vin=5.0 V, Vo=0.7525 V or 1.2 V

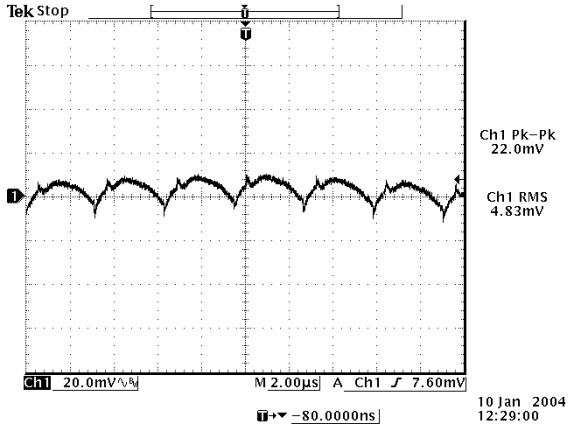


Vin=3.3 V, Vo=1.8 V or 1.5 V

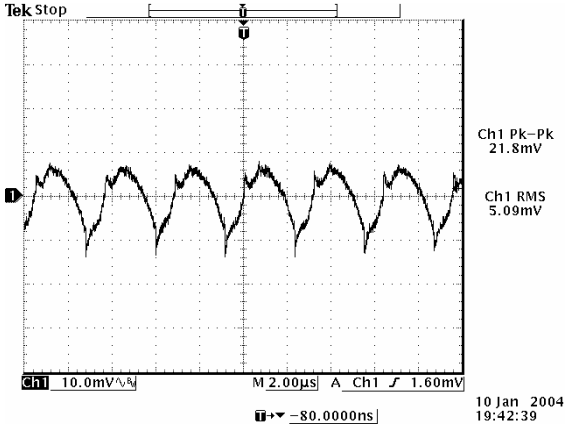


Vin=3.3 V, Vo=0.7525 V or 1.2 V

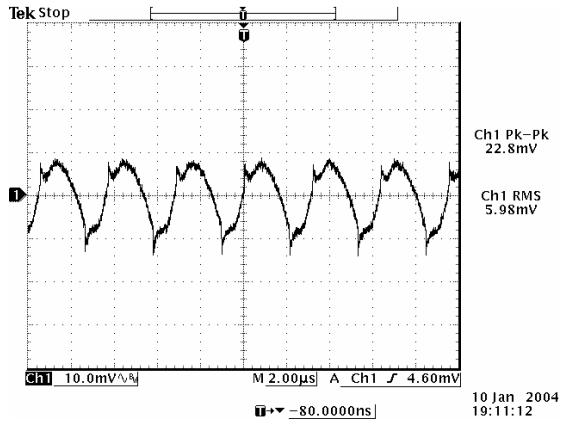
Ripple and Noise Waveforms



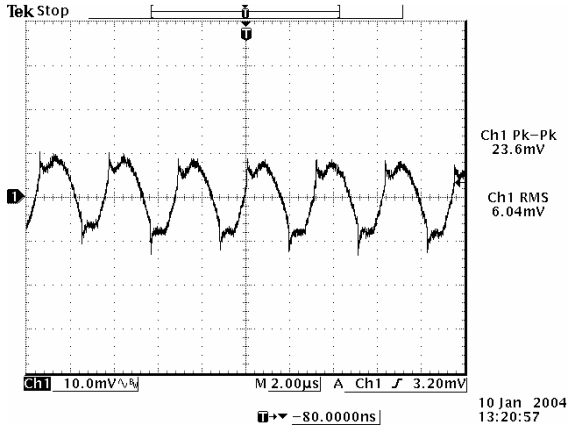
Vin=5.0 V, Vo=0.75 V



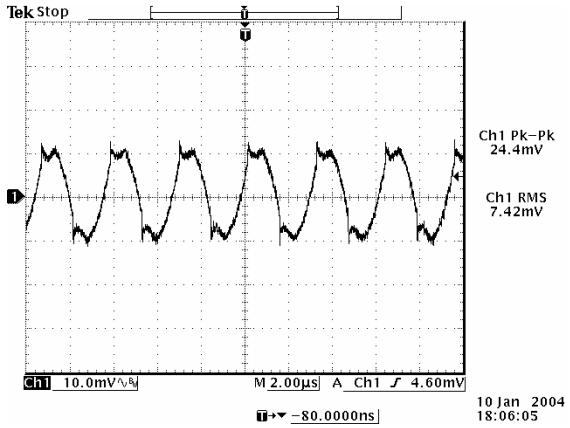
Vin=5.0 V, Vo=1.2 V



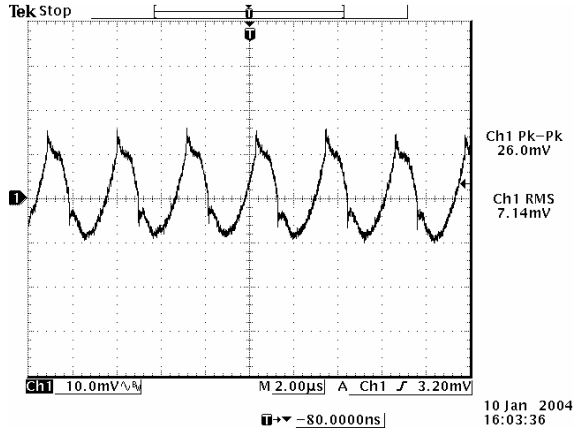
Vin=5.0 V, Vo=1.5 V



Vin=5.0 V, Vo=1.8 V



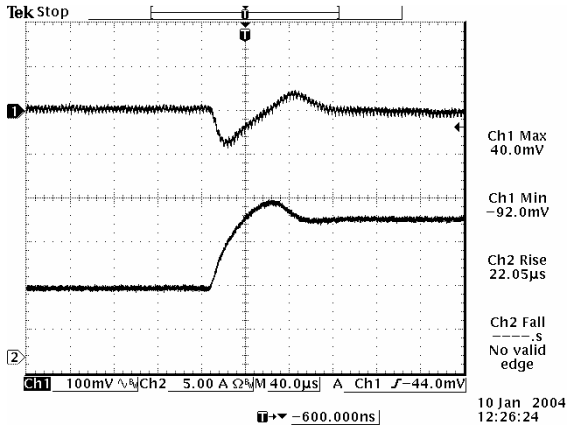
Vin=5.0 V, Vo=2.5 V



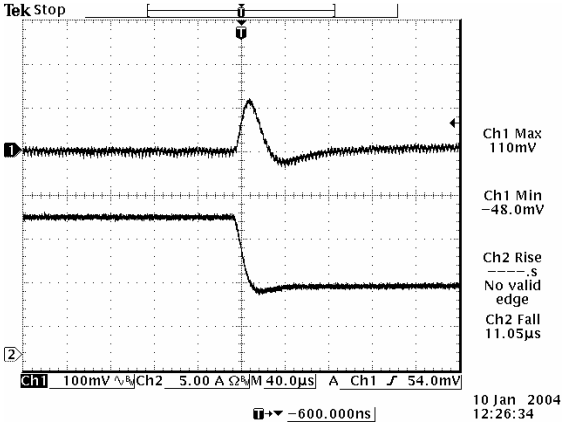
Vin=5.0 V, Vo=3.3 V

Note: Ripple and noise is tested at 0-20 MHz BW, 10 uF/16 V tantalum capacitor and 1 uF/10 V ceramic capacitor, full load, and Ta=25 deg C.

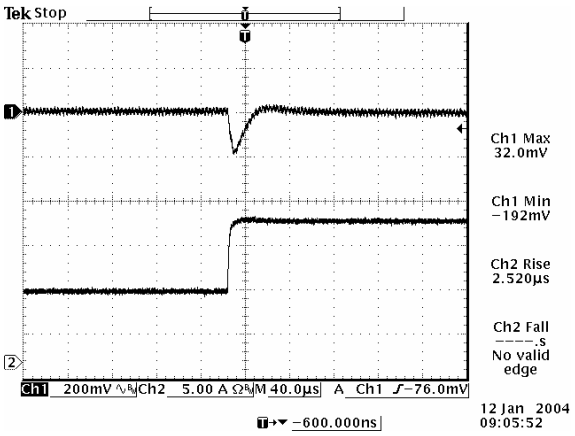
Transient Response Waveforms



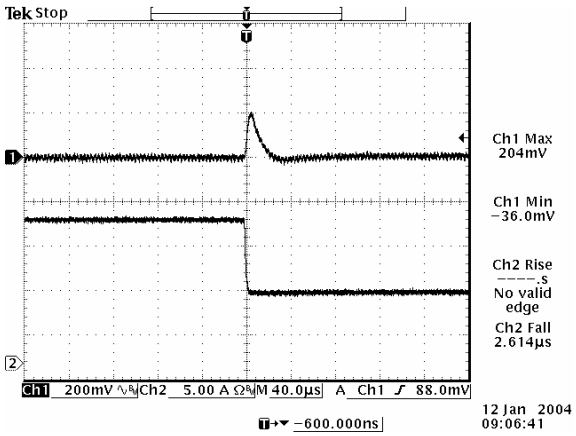
50% to 100% load step at Vin=5 V, Vo=0.75 V



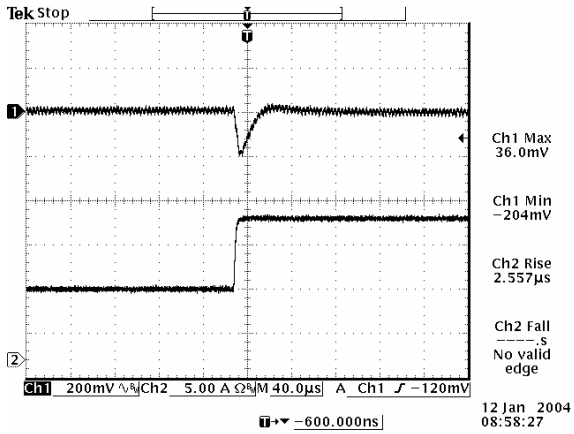
100% to 50% load step at Vin=5 V, Vo=0.75 V



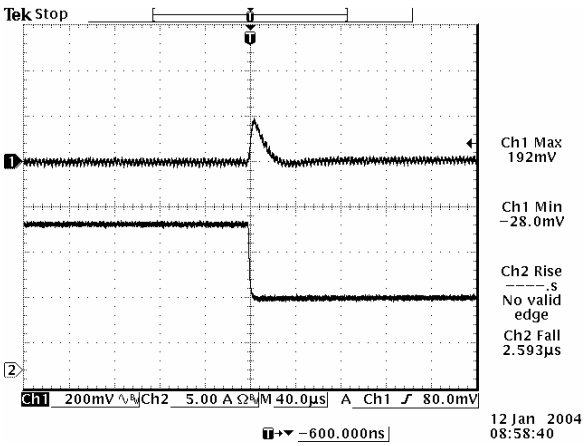
50% to 100% load step at Vin=5 V, Vo=1.2 V



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

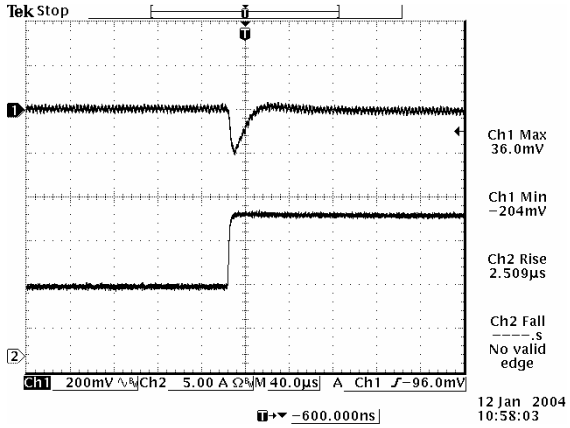


50% to 100% load step at Vin=5 V, Vo=1.5 V

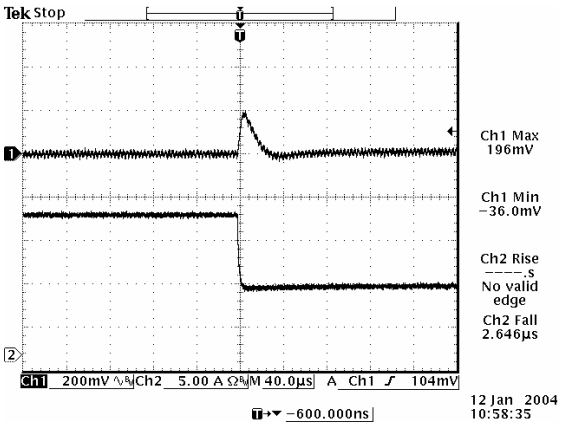


100% to 50% load step at Vin=5 V, Vo=1.5 V

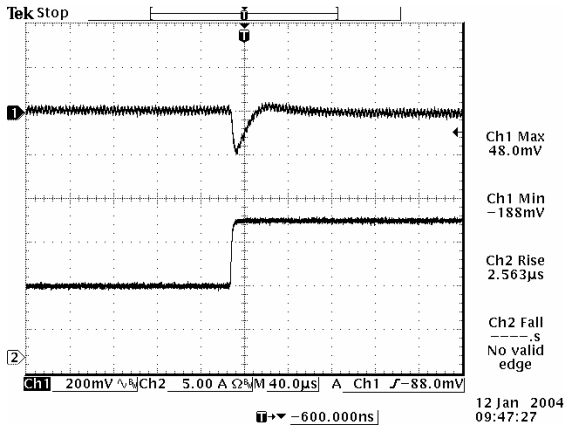
Transient Response Waveforms (continued)



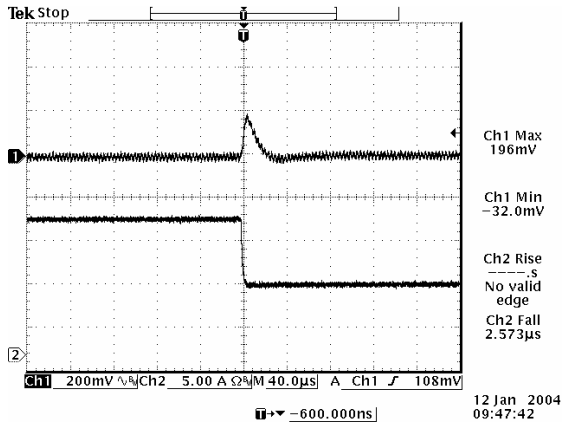
50% to 100% load step at Vin=5 V, Vo=1.8 V



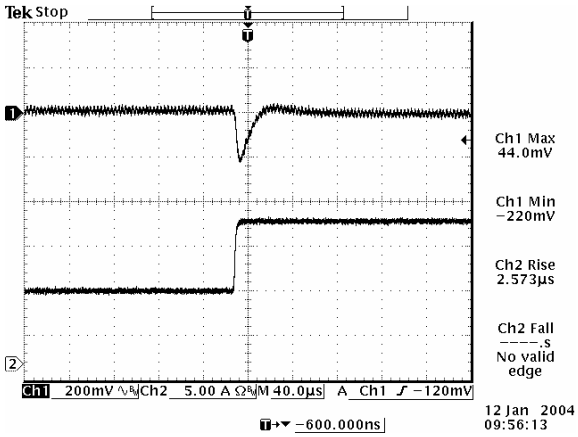
100% to 50% load step at Vin=5 V, Vo=1.8 V



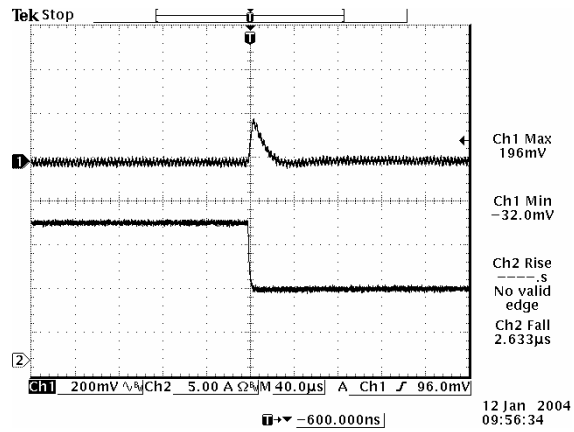
50% to 100% load step at Vin=5 V, Vo=2.5 V



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



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



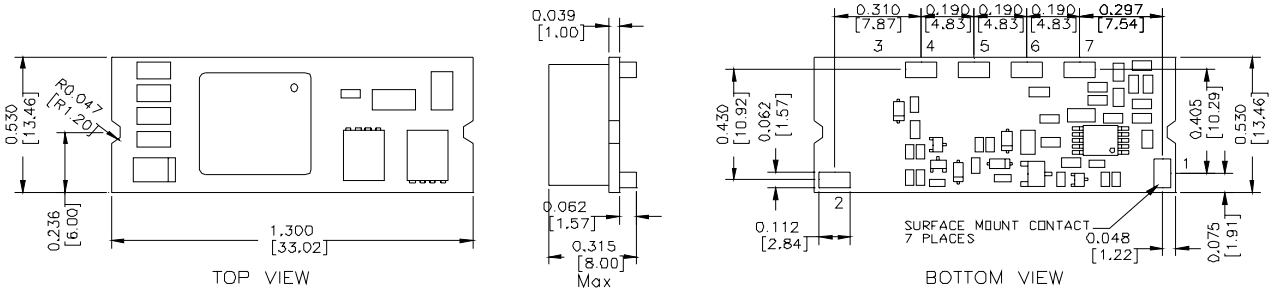
100% to 50% load step at Vin=5 V, Vo=3.3 V

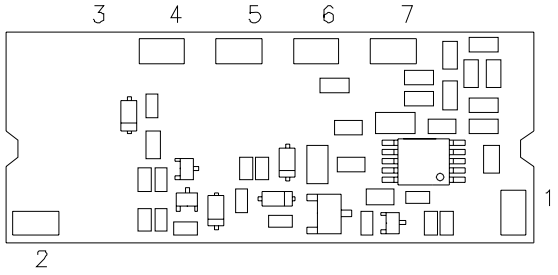
Note: Transient response is tested at di/dt=2.5 A/uS, with two 150 uF/10 V tantalum capacitors and 1uF/10 V ceramic capacitor, Ta=25 deg C.

NON-ISOLATED DC/DC CONVERTERS

2.4 Vdc - 5.5 Vdc Input 0.75 Vdc - 3.63 Vdc/16 A Output

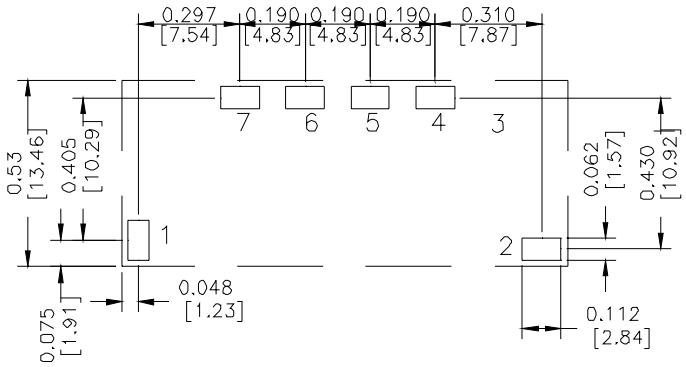
Mechanical Outline





BOTTOM VIEW

RECOMMENDED PAD LAYOUT



Pin Connections

Pin	Function
1	Remote On/Off
2	Vin
3	N/A
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.

CORPORATE

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