NON-ISOLATED DC/DC CONVERTERS

2.4 Vdc - 5.5 Vdc Input 0.75 Vdc - 3.63 Vdc/6 A Output

SRBA-06F2Ax RoHS Compliant Rev.A

- Non-Isolated
- High Efficiency
- High Power Density
- Excellent Thermal Performance
- Low Cost
- Remote On/Off
- Flexible Output Voltage Sequencing
- Under-voltage Lockout (UVLO)
- OCP/SCP
- Wide Input
- Wide Trim Range
- Active Low/High (option)
- Able to Sink & Source Current
- Fixed Frequency (300 kHz)

Description

The Bel SRBA-06F2Ax modules are a series of non-isolated dc/dc converters that deliver up to 6 A of output current with full load efficiency of 93% 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 (2.4 Vdc - 5.5 Vdc). These modules have a sequencing feature that enables designers to implement various types of output voltage sequencing when powering multiple voltages on a board. 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 circuit 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
0.75 V - 3.63 V [1]	2.4 V - 5.5 V	6 A	21.8 W	93%	SRBA-06F2AL	SRBA-06F2A0

Notes: 1. These modules use a buck topology, so the output voltages must be 0.5 V less than the input voltage.
2. Add “G” to the end of the Model Number to indicate Tray Packaging.
3. 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	-	5.5 V	
Sequencing Voltage [1]	-0.3 V	-	Vin	
Ambient Temperature	-40 °C	-	85 °C	
Storage Temperature	-55 °C	-	125 °C	

Notes: All specifications are typical at 25 °C unless otherwise stated.
1. SRBA-06F2Ax 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 the sequencing feature is not used, tie the SEQ pin to Vin or leave the SEQ pin floating.

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Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	2.4 V	-	5.5 V	Vo, set ≤ Vin-0.5 V
Input Current (full load)				
Vo=3.3 V	-	-	4.73 A	
Vo=2.5 V	-	-	5.49 A	
Vo=1.8 V	-	-	5.11 A	
Vo=1.5 V	-	-	4.31 A	
Vo=1.2 V	-	-	3.57 A	
Vo=0.75 V	-	-	2.40 A	
Input Current (no load)				
Vo=3.3 V	-	50 mA	-	
Vo=0.75 V	-	25 mA	-	
Remote Off Input Current	-	0.6 mA	-	
Input Reflected Ripple Current (pk-pk)	-	120 mA	-	Tested with simulated source impedance of 1uH, 5 Hz to 20 MHz.
Input Reflected Ripple Current (rms)	-	35 mA	-	
I^2t Inrush Current Transient	-	-	0.04 A^2s	
Turn-on Voltage Threshold	-	2.05 V	2.4 V	
Turn-off Voltage Threshold	1.8 V	2.0 V	-	

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point	-2%Vo,set	-	2%Vo,set	Vin=5 V, 50% full load
Output Voltage Set Point	-3%Vo,set	-	3%Vo,set	Over all operating input voltages, resistive loads and temperature conditions
Adjustment Range Selected by External Resistor or Voltage	0.7525 V	-	3.63 V	
Load Regulation	-	0.4%Vo,set	-	Io=0%~50% full load; Io=50%~100% full load
Line Regulation	-	0.3%Vo,set	-	Vin=Vinmin to Vinmax
Regulation Over Temperature (-40 °C to +85 °C)	-	0.4%Vo,set	-	Tref=Tamin to Tamax
Output Current	0 A	-	6 A	
Current Limit Threshold	9 A	-	18 A	Hiccup mode
Short Circuit Surge Transient	-	0.32 A^2s	-	
Ripple and Noise (pk-pk)	-	40 mV	70 mV	Tested with 0-20 MHz, with 10 uF tantalum capacitor & 1uF/10 V ceramic capacitor at output
Ripple and Noise (rms)	-	10 mV	30 mV	
Turn on Time	-	6 mS	10 mS	
Overshoot at Turn on	-	0%	3%	
Output Capacitance				
ESR ≥ 1mohm	0 uF	-	1000 uF	
ESR ≥ 10mohm	0 uF	-	3000 uF	
Transient Response				
50% ~ 100% Max Load	Vo = 0.75 V - 3.63 V	-	130 mV	-	di/dt=2.5 A/ uS; Vin=5 V; and with 10 uF tantalum capacitor & 1 uF/10 V TDK ceramic capacitor at output
Settling Time		-	25 uS	-	
100% ~ 50% Max Load		-	130 mV	-	
Settling Time		-	25 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	-	93%	-	Measured at Vin=5 V, full load
Vo=2.5 V	-	91%	-	
Vo=1.8 V	-	88%	-	
Vo=1.5 V	-	87%	-	
Vo=1.2 V	-	84%	-	
Vo=0.75 V	-	78%	-	
Switching Frequency	250 kHz	300 kHz	350 kHz	
Over Temperature Shutdown	-	135 °C	-	
Output Voltage Trim Range	0.7525 V	-	3.63 V	
MTBF	6,976,379 hours			Calculated Per Bell Core SR-332 (Vin=5 V; Vo=0.75 V, Io = 4.8 A; Ta = 25 °C)
Dimensions				
Inches (L × W × H)	0.8 x 0.45 x 0.25			
Millimeters (L × W × H)	20.32 x 11.42 x 6.36			
Weight	-	5 g	-	

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

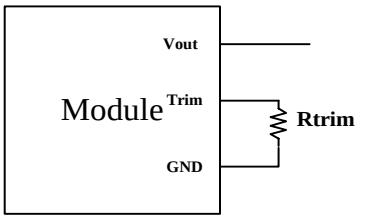
Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.2 V	-	0.3 V	Active High: SRBA-06F2A0; Remote On/Off pin open, Unit on.
Signal High (Unit On)	-	-	Vin, max	
Signal Low (Unit On)	-0.2 V	-	0.3 V	Active Low: SRBA-06F2AL; Remote On/Off pin open, Unit on.
Signal High (Unit Off)	1.5 V	-	Vin, max	
Sequencing Voltage	0 V	-	Vin	Sequencing Voltage applied on SEQ pin should be higher than output voltage.
Sequencing Slew Rate Capability	-	-	2 V/ mS	
Sequencing Delay Time	10 mS	-	-	Delay from Vinmin to application of voltage on SEQ pin
Tracking Accuracy				
Power-Up	-	100 mV	200 mV	
Power-Down	-	200 mV	400 mV	

Output Trim Equations

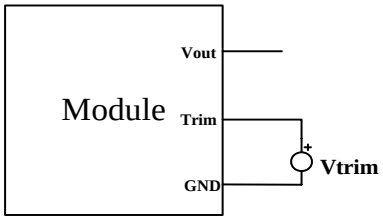
Equation for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) is shown below. The Trim Up resistor should be connected between the Trim pin and Ground.

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

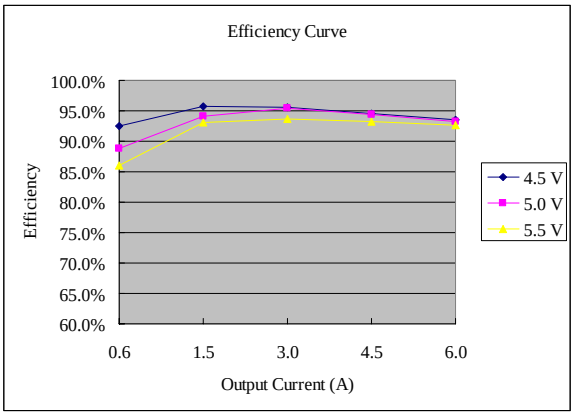


Equation for calculating the trim voltage (in V) given the desired adjusted voltage (Vadj) is shown below. The Trim Up voltage should be connected between the Trim pin and Ground.

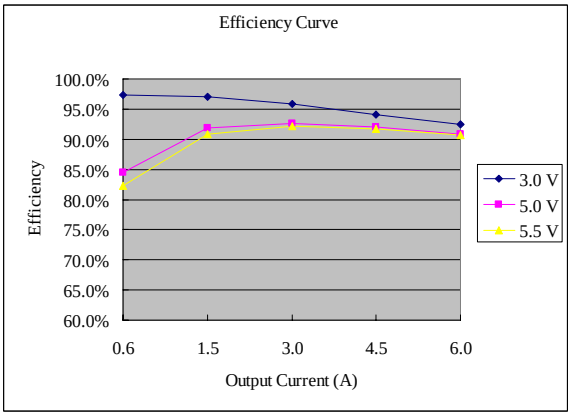
$$V_{TrimUp} = 0.7 - 0.1698 \times (V_{adj} - 0.7525)$$



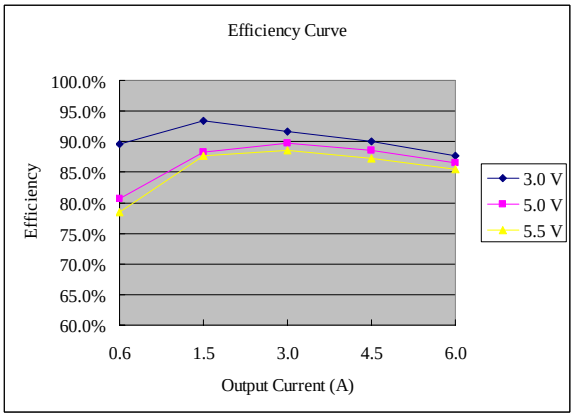
Efficiency Data



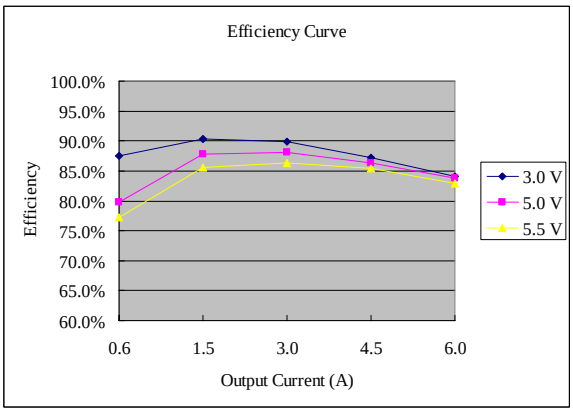
Vo=3.3 V



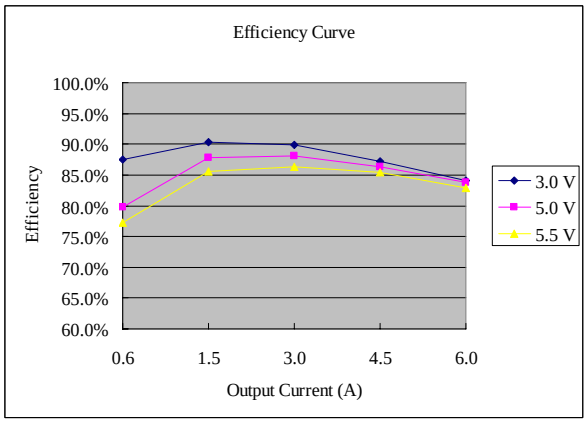
Vo=2.5 V



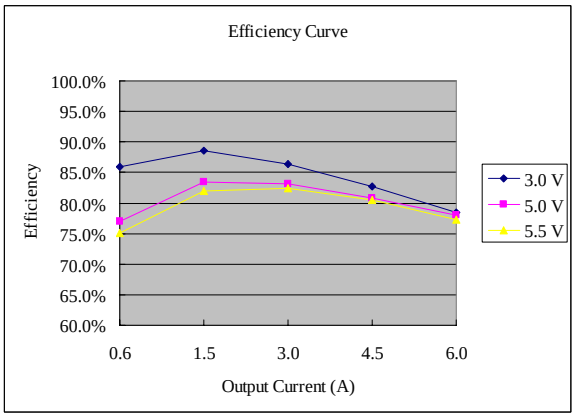
Vo=1.8 V



Vo=1.5 V

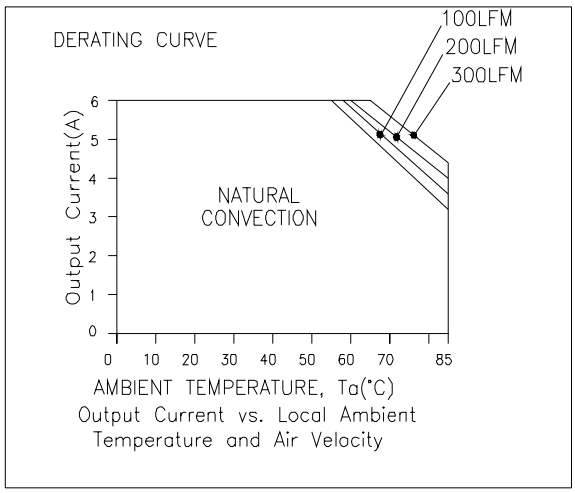


Vo=1.2 V

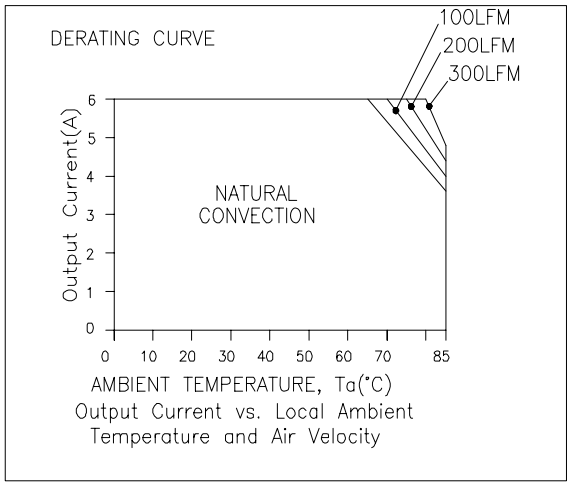


Vo=0.7525 V

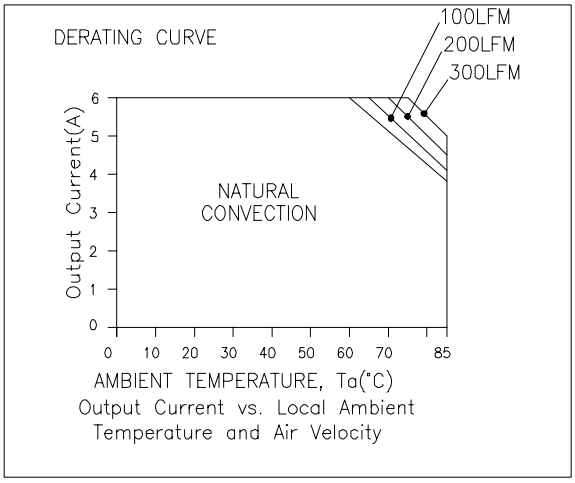
Thermal Derating Curves



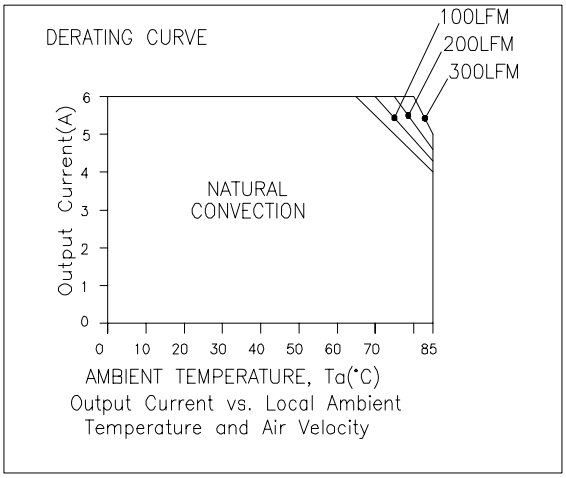
Vin=5.0 V, Vo=3.3 V



Vin=5.0 V, Vo=0.75 V

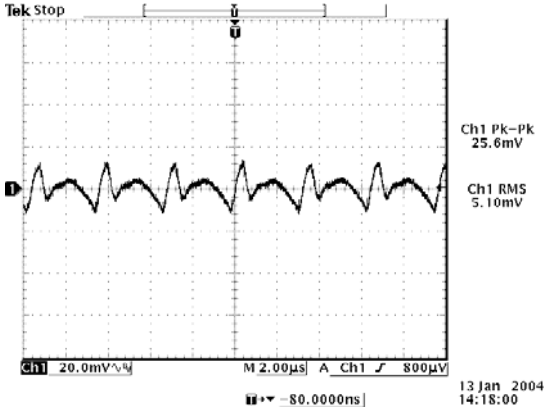


Vin=3.3 V, Vo=2.5 V

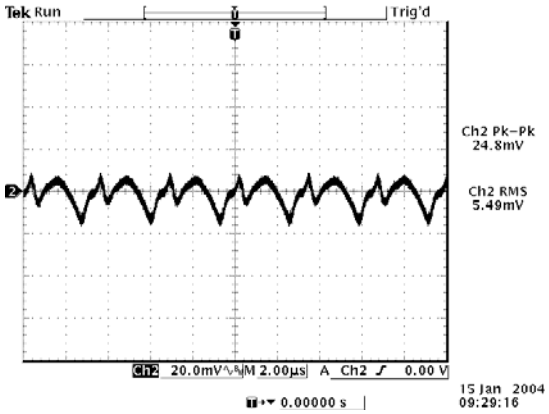


Vin=3.3 V, Vo=0.75 V

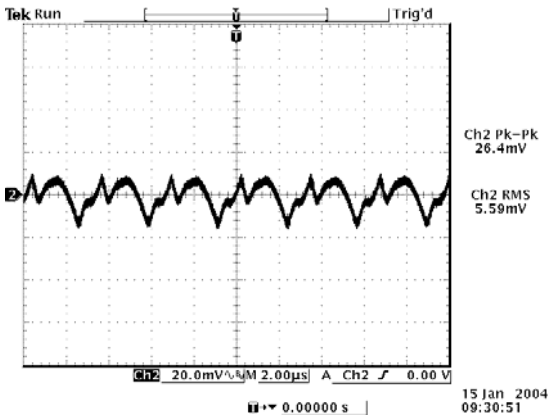
Ripple and Noise Waveforms



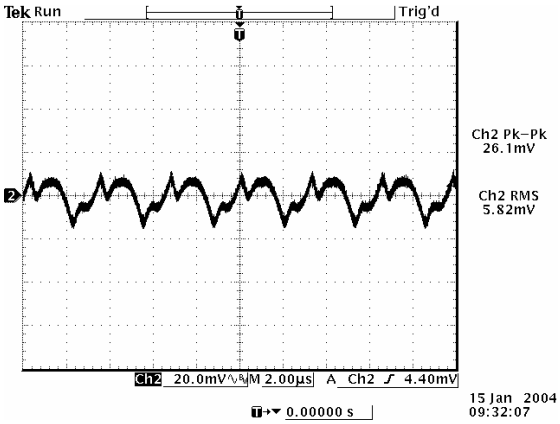
Ripple and noise at full load, Vin=5.0 V, Vo=0.7525 V



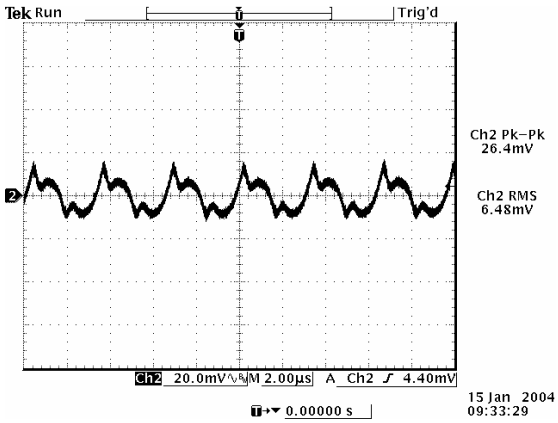
Ripple and noise at full load, Vin=5.0 V, Vo=1.2 V



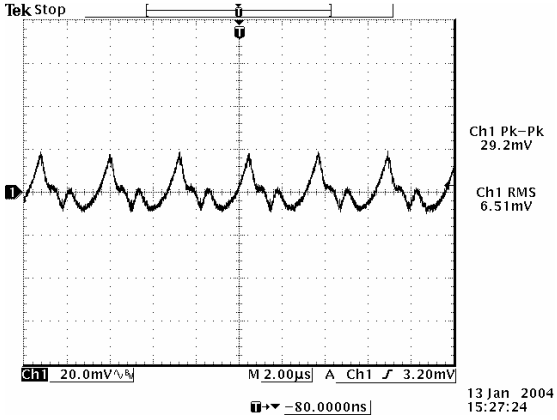
Ripple and noise at full load, Vin=5.0 V, Vo=1.5 V



Ripple and noise at full load, Vin=5.0 V, Vo=1.8 V



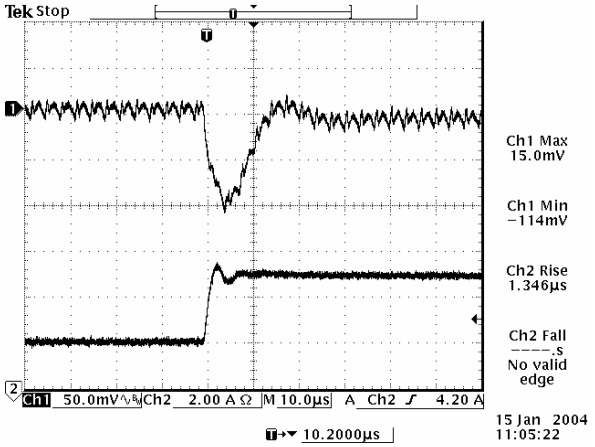
Ripple and noise at full load, Vin=5.0 V, Vo=2.5 V



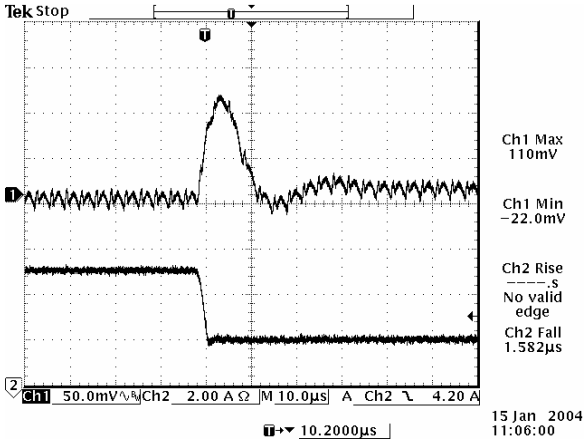
Ripple and noise at full load, Vin=5.0 V, Vo=3.3 V

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

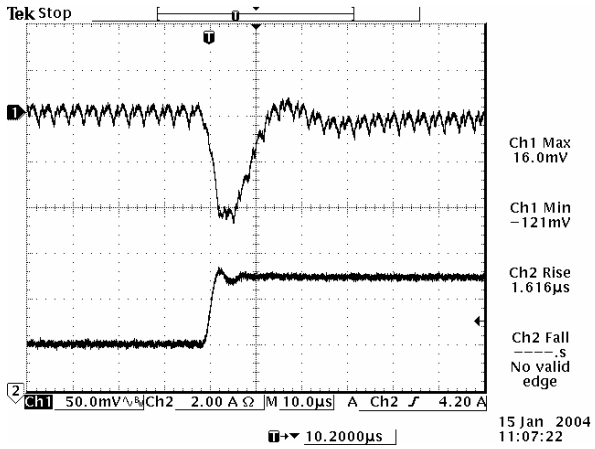
Transient Response Waveforms



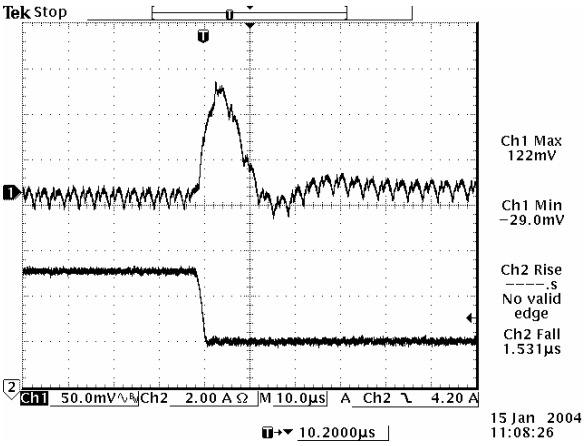
50% to 100% load step at Vin=5 V, Vo=0.75 V



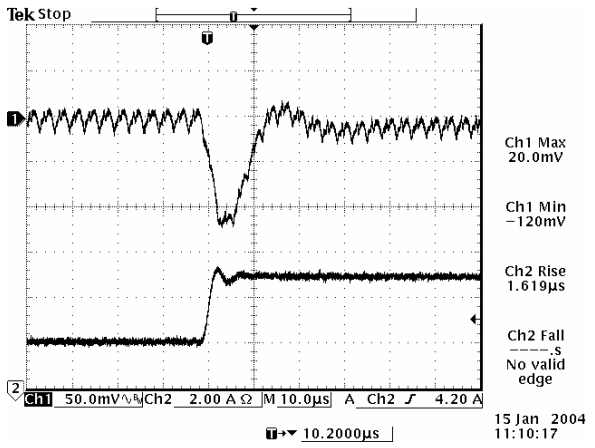
100% to 50% load step at Vin=5 V, Vo=0.75 V



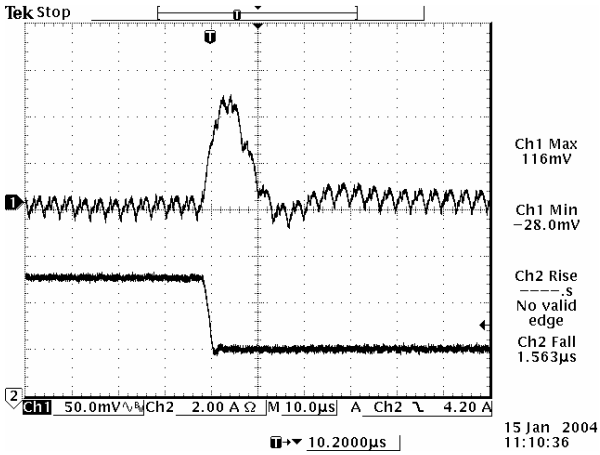
50% to 100% load step at Vin=5 V, Vo=1.2 V



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

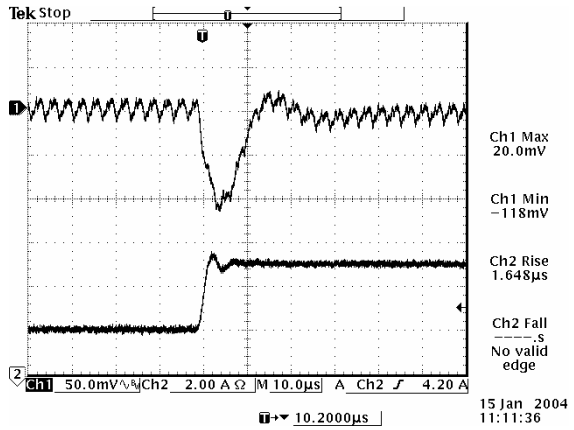


50% to 100% load step at Vin=5 V, Vo=1.5 V

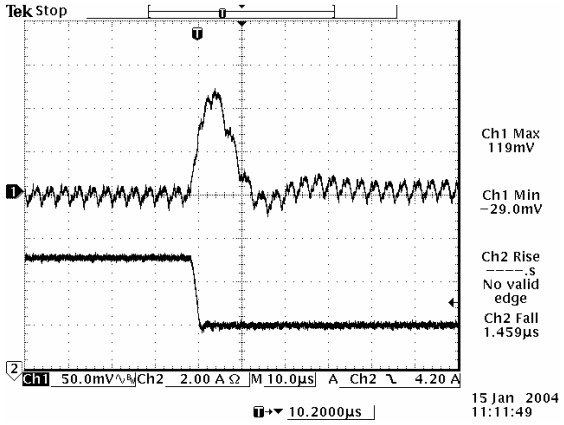


100% to 50% load step at Vin=5 V, Vo=1.5 V

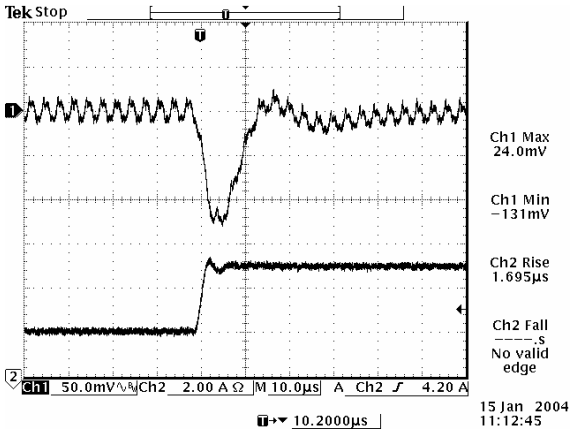
Transient Response Waveforms (continued)



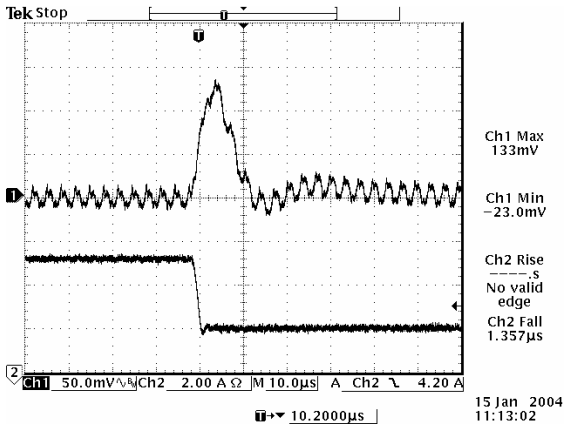
50% to 100% load step at Vin=5 V, Vo=1.8 V



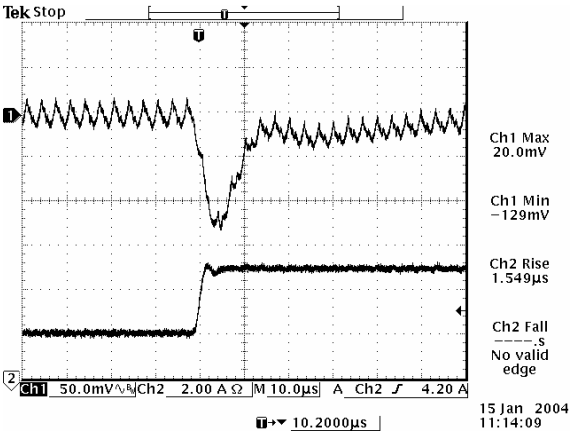
100% to 50% load step at Vin=5 V, Vo=1.8 V



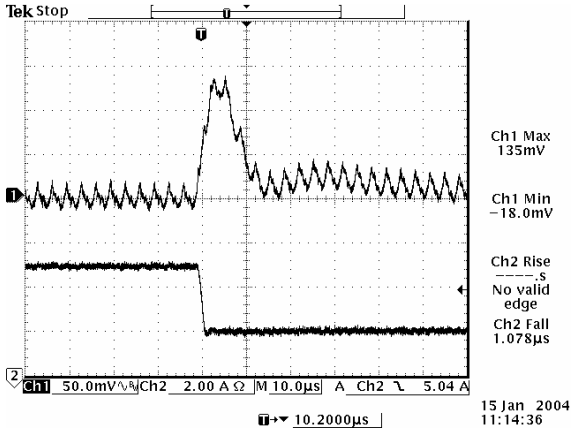
50% to 100% load step at Vin=5 V, Vo=2.5 V



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 10 uF/10 V tantalum capacitor and 1 uF/10 V ceramic capacitor, Ta=25 deg C.

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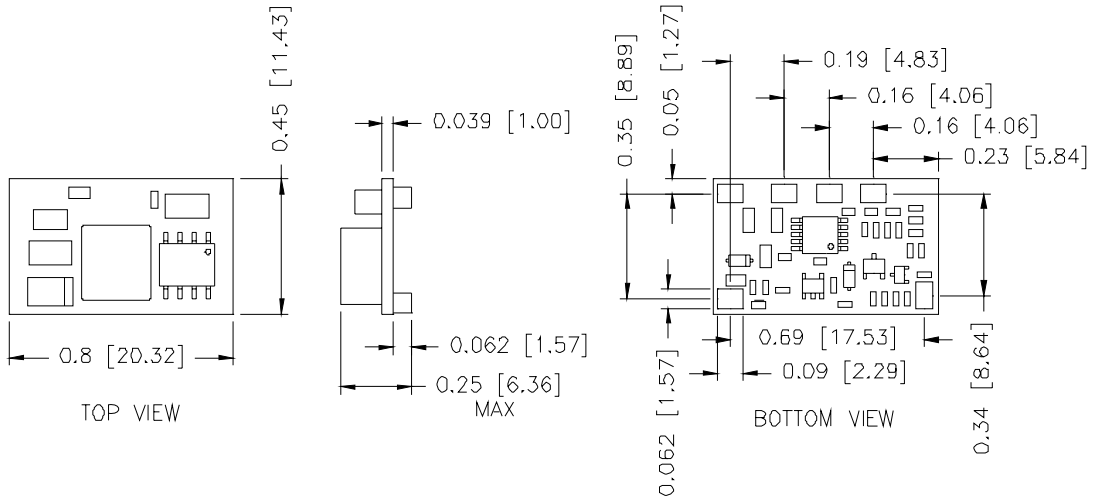
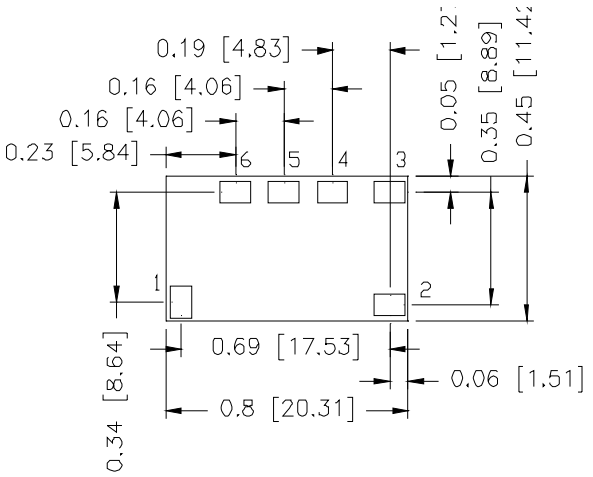
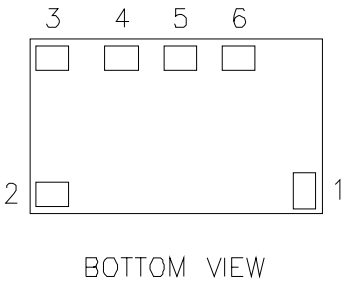
Mechanical Outline







PAD SIZE:

MIN: 0.012"* 0.0095" (3.05mm * 2.41mm)

MAX: 0.0135"* 0.011" (3.43mm * 2.79mm)

Pin Connections

Pin	Function
1	Remote On/Off
2	Vin+
3	SEQ
4	Ground
5	Trim
6	Vout+

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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