

## NON-ISOLATED DC/DC CONVERTERS

10 Vdc - 14 Vdc Input

1.2 Vdc - 5.0 Vdc/10 A Outputs

**bel**  
POWER PRODUCTS

SRBC-10Axx0

RoHS Compliant

Rev.A

- Non-Isolated
- High Efficiency
- High Power Density
- Excellent Thermal Performance
- Low Cost
- Remote Sense
- Under-voltage Lockout (UVLO)
- Over Temperature Protection
- OCP/SCP
- Remote On/Off
- Industrial Temperature Range



### Description

The Bel SRBC-10Axx0 modules are a series of non-isolated dc/dc converters that deliver up to 10 A of output current with full load efficiency of 93% at 3.3 Vdc output. 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, and wide input.

### Part Selection

| Output Voltage | Input Voltage | Max. Output Current | Max. Output Power | Typical Efficiency | Model Number Active High |
|----------------|---------------|---------------------|-------------------|--------------------|--------------------------|
| 5.0 V          | 10 V - 14 V   | 10 A                | 50.0 W            | 95%                | SRBC-10A500              |
| 3.3 V          | 10 V - 14 V   | 10 A                | 33.0 W            | 93%                | SRBC-10A330              |
| 2.5 V          | 10 V - 14 V   | 10 A                | 25.0 W            | 92%                | SRBC-10A250              |
| 1.8 V          | 10 V - 14 V   | 10 A                | 18.0 W            | 90%                | SRBC-10A180              |
| 1.5 V          | 10 V - 14 V   | 10 A                | 15.0 W            | 89%                | SRBC-10A150              |
| 1.2 V          | 10 V - 14 V   | 10 A                | 12.0 W            | 87.5%              | SRBC-10A120              |

**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                             | 10 V  | -                     | 14 V                 |   |
| Input Current (full load)                 | -     | -                     | 5.7 A                | An input line fuse must always be used.   |
| Input Current (no load)                   | -     | -                     | 60 mA                |   |
| Remote Off Input Current                  | -     | 3 mA                  | 10 mA                |   |
| Input Reflected Ripple Current (pk-pk)    | -     | 100 mA                | -                    | Tested with one 1000 uF/25 V Electrolytic capacitor and four 47 uF tan capacitors and one 1 uH inductor at the input. |
| Input Reflected Ripple Current (rms)      | -     | 50 mA                 | -                    |   |
| I <sup>2</sup> t Inrush Current Transient | -     | 0.05 A <sup>2</sup> s | 0.1 A <sup>2</sup> s |   |
| Turn-on Voltage Threshold                 |       |                       |                      |   |
| 1.2 V - 3.3 V                             | -     | 7.8 V                 | -                    |   |
| 5.0 V                                     | -     | 9.4 V                 | -                    |   |
| Turn-off Voltage Threshold                |       |                       |                      |   |
| 1.2 V - 3.3 V                             | 6.7 V | -                     | 7.9 V                |   |
| 5.0 V                                     | 8.0 V | -                     | 9.0 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                                   | -                  | 10 mV                | -                  |                          |
| Line Regulation                                   | -                  | 10 mV                | -                  |                          |
| Regulation Over Temperature<br>(-40 °C to +85 °C) | -                  | 15 mV                | -                  | Tref=Ta, min to Ta, max  |
| Output Current                                    | 0 A                | -                    | 10 A               |                          |
| Current Limit Threshold                           | -                  | 200% Io              | -                  |                          |
| Short Circuit Surge Transient                     | -                  | 0.5 A <sup>2</sup> s | 1 A <sup>2</sup> s |                          |
| Ripple and Noise (pk-pk)                          | -                  | 50 mV                | 100 mV             | Tested with 0-20 MHz     |
| Ripple and Noise (rms)                            | -                  | 20 mV                | 40 mV              |                          |
| Turn on Time                                      | -                  | 7 mS                 | 10 mS              |                          |
| Overshoot at Turn on                              | -                  | -                    | 1% Vo,set          |                          |
| Output Capacitance                                | -                  | -                    | 5000 uF            |                          |
| <b>Transient Response</b>                         |                    |                      |                    |                          |
| 50% ~ 100% Max Load                               | Vo = 1.2 V - 5.0 V | -                    | 200 mV             | di/dt=2.5 A/uS, Vin=12 V |
| Settling Time                                     |                    | -                    | 25 uS              |                          |
| 100% ~ 50% Max Load                               |                    | -                    | 200 mV             |                          |
| Settling Time                                     |                    | -                    | 25 uS              |                          |

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

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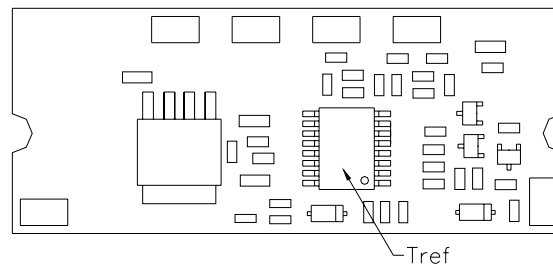


## General Specifications

| Parameter                              | Min                  | Typ     | Max     | Notes  |
|--|----------------------|---------|---------|--|
| Efficiency                             |                      |         |         | Measured at Vin=12 V, full load  |
| Vo=5.0 V                               | -                    | 95%     | -       |  |
| Vo=3.3 V                               | -                    | 93%     | -       |  |
| Vo=2.5 V                               | -                    | 92%     | -       |  |
| Vo=1.8 V                               | -                    | 90%     | -       |  |
| Vo=1.5 V                               | -                    | 89%     | -       |  |
| Vo=1.2 V                               | -                    | 87.5%   | -       |  |
| Switching Frequency                    | 265 kHz              | 300 kHz | 335 kHz |  |
| Over Temperature Shutdown <sup>1</sup> | -                    | 130 °C  | -       |  |
| Output Voltage Trim Range              |                      |         |         |  |
| 1.5 V - 5.0 V                          | 90% Vo               | -       | 110% Vo |  |
| 1.2 V                                  | -                    | -       | 110% Vo |  |
| MTBF                                   | 4,982,651 hours      |         |         | Calculated Per Bell Core SR-332 (Io = 80% Io, max; Vo=5.0 V; Vin=12 V; Ta = 25 °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                                 | -                    | 7.8 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                            |
|-----------------------|--------|-----|-------|----------------------------------|
| <b>Remote On/Off</b>  |        |     |       |                                  |
| Signal Low (Unit Off) | -0.3 V | -   | 0.3 V | Remote On/Off pin open, Unit on. |
| Signal High (Unit On) | 1 V    | -   | 14 V  |                                  |

## NON-ISOLATED DC/DC CONVERTERS

10 Vdc - 14 Vdc Input

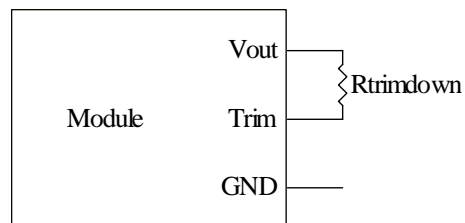
1.2 Vdc - 5.0 Vdc/10 A Outputs

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POWER PRODUCTS

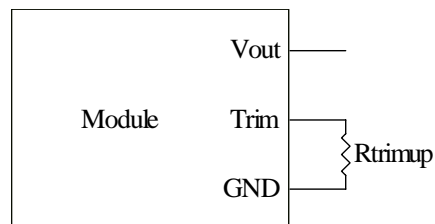
### Output Trim Equations

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage ( $V_{adj}$ ) and the nominal output voltage of the converter ( $V_{nom}$ ) are shown below. The Trim Down resistor should be connected between the Trim pin and Vout. The Trim Up resistor should be connected between the Trim pin and Ground. Only one of the resistors should be used for any given application.

$$R_{trimdown} = \frac{A}{V_{nom} - V_{adj}} - B$$



$$R_{trimup} = \frac{C}{V_{adj} - V_{nom}} - D$$



| Vnom | A       | B     | C      | D |
|------|---------|-------|--------|---|
| 5.0  | 64.6353 | 16.01 | 10.507 | 1 |
| 3.3  | 39.1049 | 16.01 | 10.507 | 1 |
| 2.5  | 27.0561 | 16.01 | 10.507 | 1 |
| 1.8  | 16.5749 | 16.01 | 10.507 | 1 |
| 1.5  | 12.0693 | 16.01 | 10.507 | 1 |
| 1.2  | -       | -     | 10.507 | 1 |

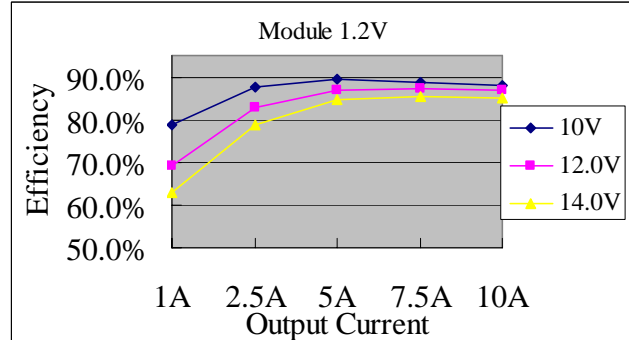
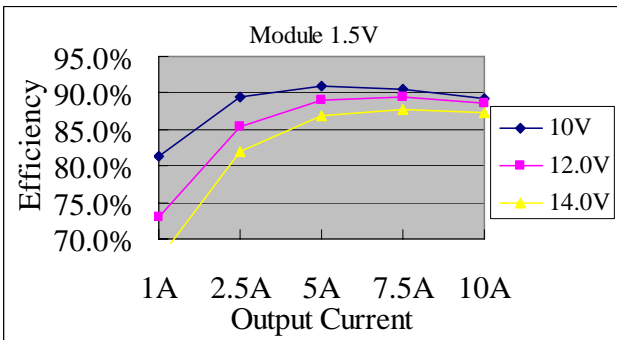
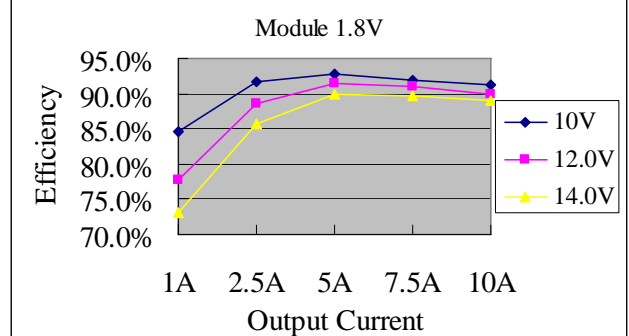
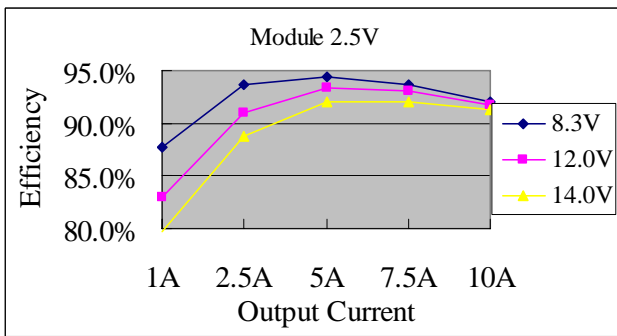
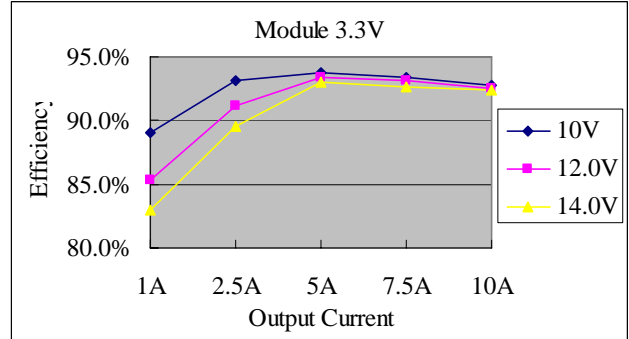
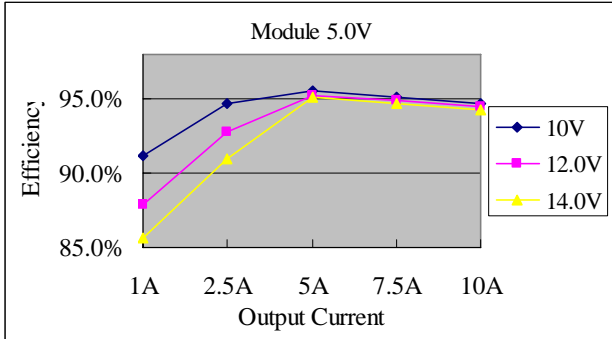
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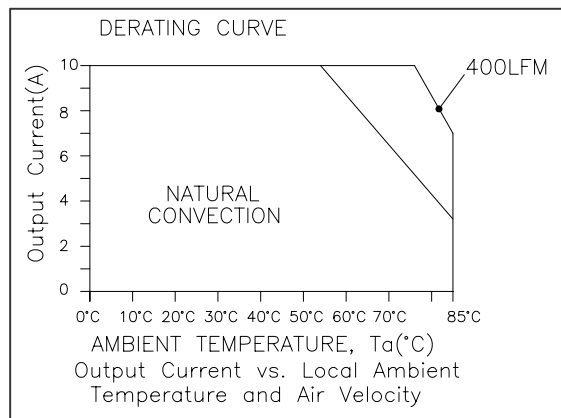
1.2 Vdc - 5.0 Vdc/10 A Outputs



## Efficiency Data



## Thermal Derating Curve



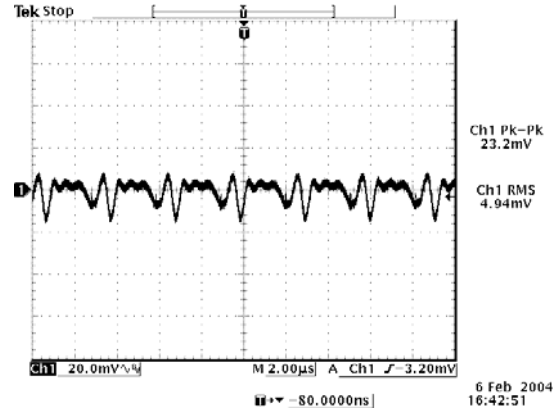
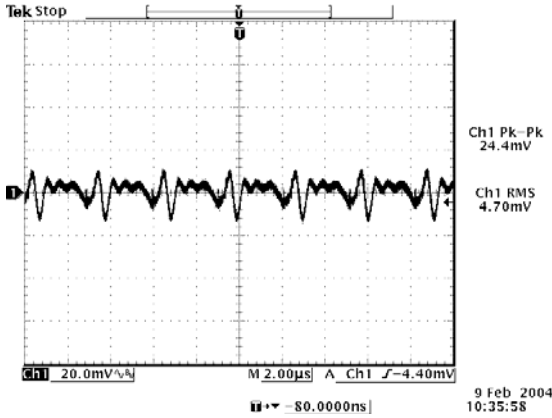
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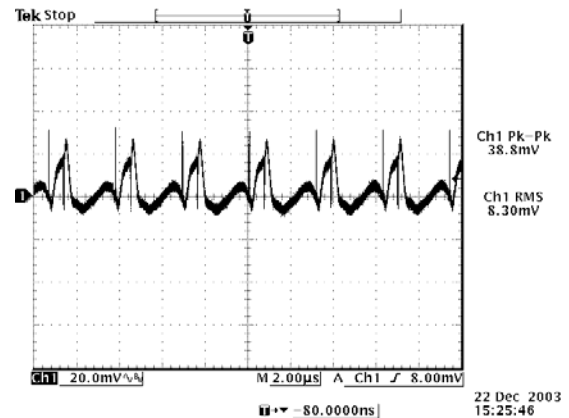
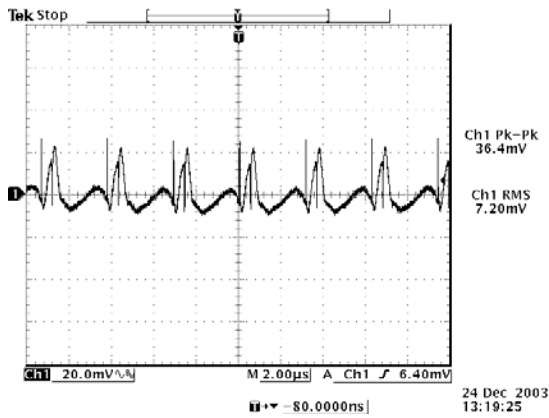


## Ripple and Noise Waveforms



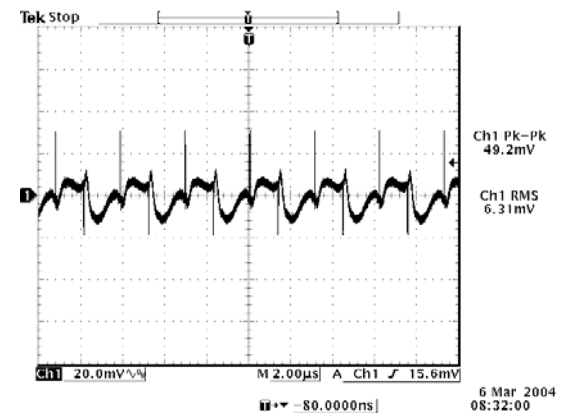
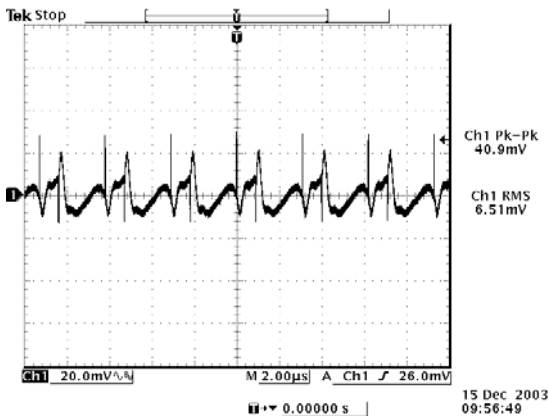
Ripple and noise at max load 1.2 Vdc output

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

Ripple and noise at max load 5.0 Vdc output

**Note:** Ripple and Noise at  $V_{in}=12$  V, external load with 10  $\mu$ F tantalum cap and 1 $\mu$ F ceramic at the output,  $T_a=25$  deg C.

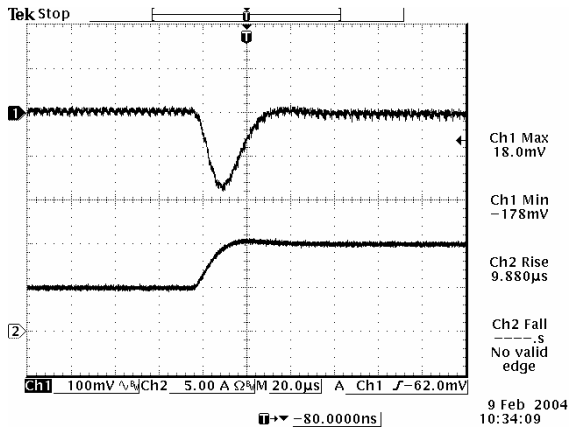
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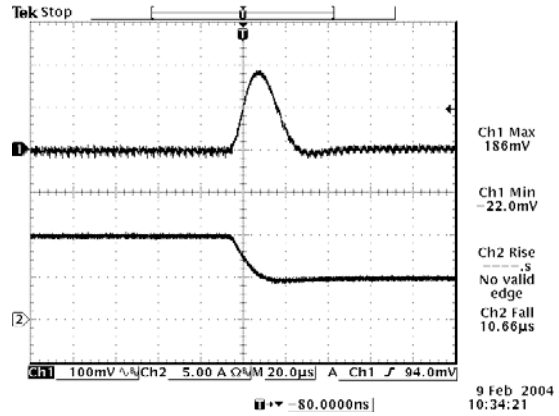
1.2 Vdc - 5.0 Vdc/10 A Outputs



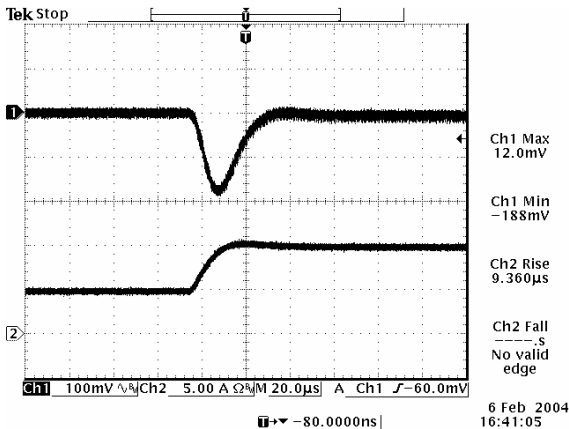
## Transient Response Waveforms



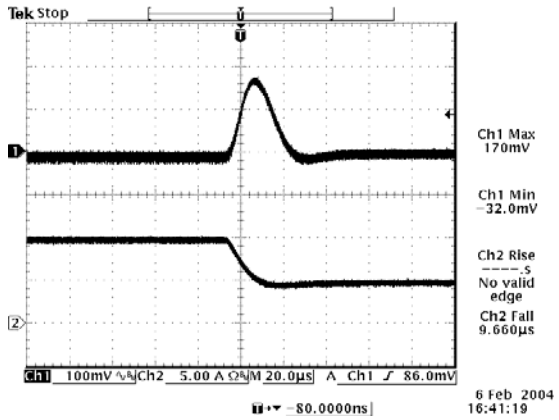
Transients 50% to 100% load 1.2 Vdc output



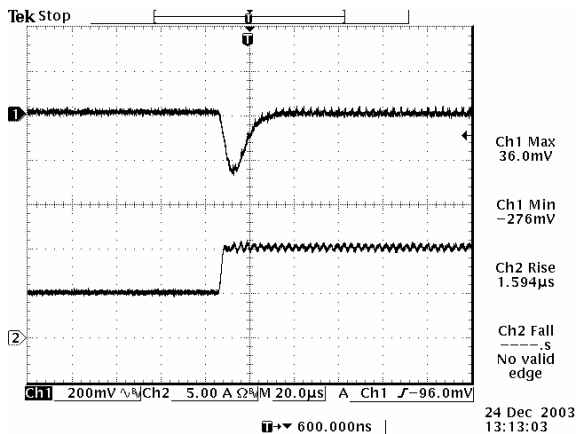
Transients 100% to 50% load 1.2 Vdc output



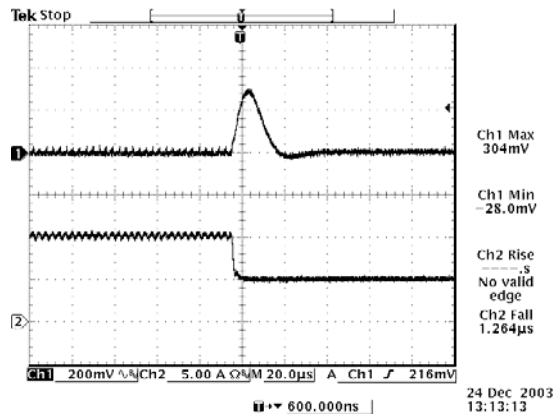
Transients 50% to 100% load 1.5 Vdc output



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

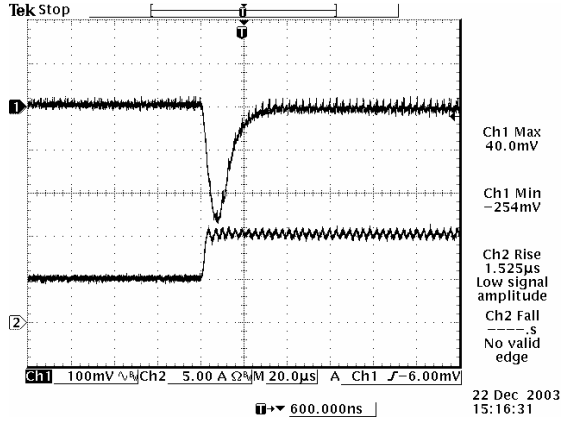
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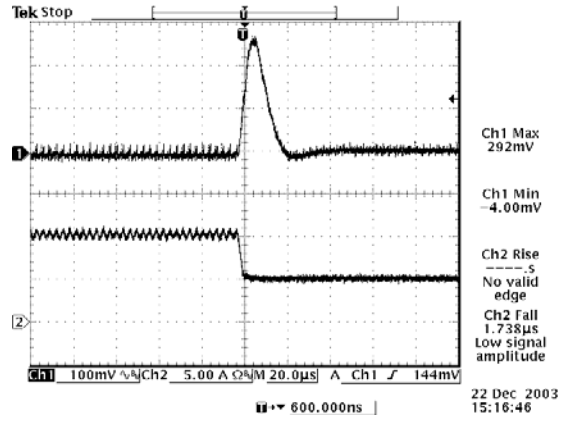
1.2 Vdc - 5.0 Vdc/10 A Outputs



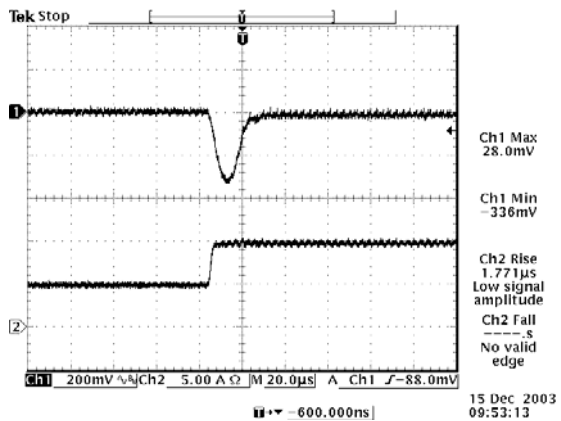
## Transient Response Waveforms (continued)



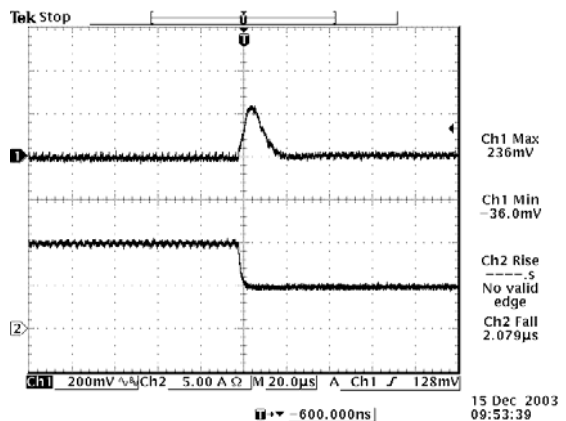
Transients 50% to 100% load 2.5 Vdc output



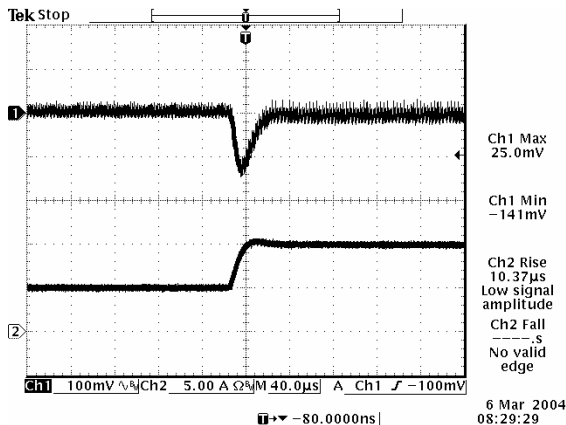
Transients 100% to 50% load 2.5 Vdc output



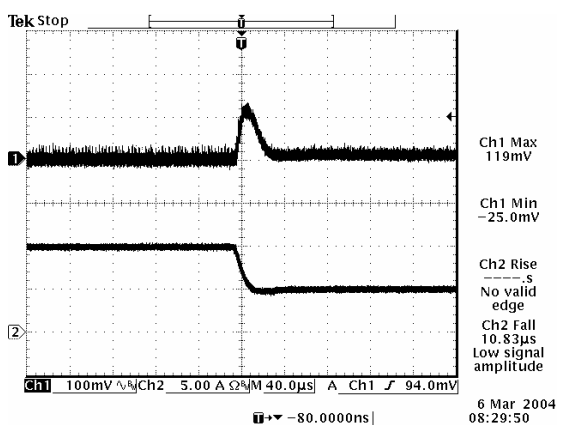
Transients 50% to 100% load 3.3 Vdc output



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  $di/dt=2.5 \text{ A}/\mu\text{S}$ , with  $1\mu\text{F}$  ceramic cap and  $10 \mu\text{F}$  tantalum cap at the output,  $T_a=25 \text{ deg C}$ .



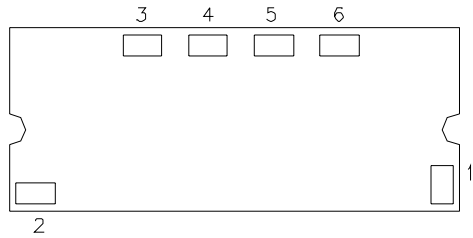
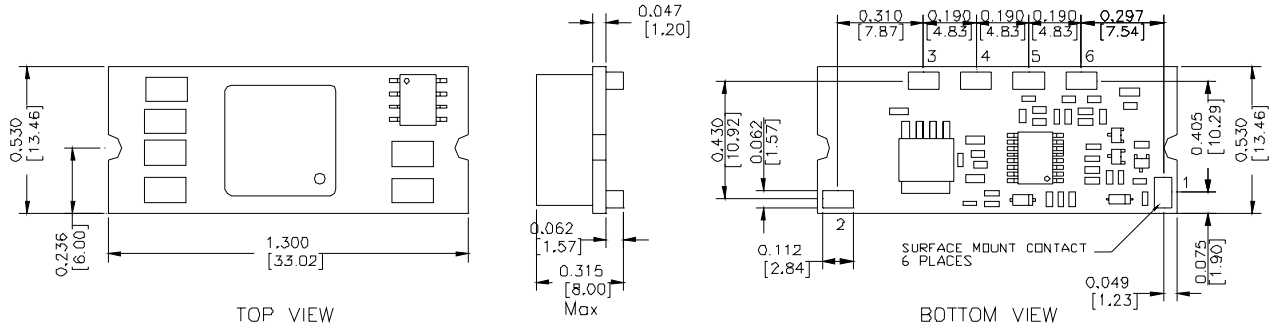
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## Mechanical Outline

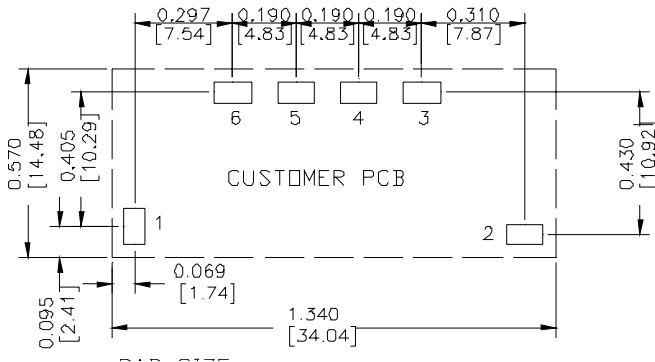


BOTTOM VIEW

RECOMMENDED PAD LAYOUT

## Pin Connections

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