

NON-ISOLATED DC/DC CONVERTERS

2.5 Vdc Input

0.9 Vdc - 1.65 Vdc/10 A Output

bel
POWER PRODUCTS

xRAH-10J Series RoHS Compliant Rev.A

- Non-Isolated
- Low Profile Package (7.82 mm)
- Fixed Frequency (300 kHz)
- Under-Voltage Lockout (UVLO)
- UL60950-1 Recognized (UL/cUL)
- Remote On/Off
- Short Circuit Protection
- Over Current Protection
- Trim Function



Description

The Bel xRAH-10Jxx0 is part of the low cost non-isolated dc/dc power converter series. The modules use a SMD or SIP package for ease of layout and space savings. The output is closely regulated and the efficiency of 1.5 Vdc output is typically 88% at full load. Typical features include remote on/off, input under voltage lockout, over current protection and short circuit protection.

Part Selection

| Output Voltage | Input Voltage | Max. Output Current | Max. Output Power | Typical Efficiency | Part Number Surface Mount | Part Number Vertical Mount |
|----------------|---------------|---------------------|-------------------|--------------------|---------------------------|----------------------------|
| 1.5 V | 2.5 V | 10 A | 15 W | 88% | SRAH-10J150 | VRAH-10J150 |
| 1.2 V | 2.5 V | 10 A | 12 W | 83% | SRAH-10J120 | VRAH-10J120 |
| 1.0 V | 2.5 V | 10 A | 10 W | 80% | SRAH-10J100 | VRAH-10J100 |

- Notes:** 1. Add "0" suffix at the end of the model number to indicate "Tube Packaging", and "R" for "Reel Packaging", and "G" for "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 | - | 6 V | |
| Output Enable Terminal Voltage | -0.3 V | - | 7 V | |
| Ambient Temperature | -40 °C | - | 85 °C | |
| Storage Temperature | -40 °C | - | 125 °C | |

Input Specifications

| Parameter | Min | Typ | Max | Notes |
|---|--------|-----------------------|-----------------------|--|
| Input Voltage | 2.25 V | 2.5 V | 2.75 V | |
| Input Current (no load) | - | 75 mA | - | |
| Input Current (full load) | | | | |
| Vo=1.5 V | - | 6.8 A | - | |
| Vo=1.2 V | - | 5.6 A | - | |
| Vo=1.0 V | - | 4.9 A | - | |
| Remote Off Input Current | - | 4 mA | 8 mA | |
| Input Reflected Ripple Current (pk-pk) | - | 80 mA | 150 mA | Tested with simulated source impedance of 500 nH, 5 Hz to 20 MHz; with a 270 uF/16 V with ESR=0.018 ohm max, at 100 kHz at 25 °C |
| Input Reflected Ripple Current (rms) | - | 25 mA | 50 mA | |
| I ² t Inrush Current Transient | - | 0.04 A ² s | 0.10 A ² s | |
| Turn on Voltage Threshold | 2 V | 2.1 V | 2.15 V | |
| Turn off Voltage Threshold | 1.8 V | 2 V | 2.15 V | |

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Output Specifications

| Parameter | | Min | Typ | Max | Notes | |
|---|---------------|----------|----------------------|----------------------|---|---|
| Output Voltage Set Point | Vo=1.5 V | 1.470 V | 1.5 V | 1.530 V | Test conditions: Vin=2.5 V, Io=full load | |
| | Vo=1.2 V | 1.176 V | 1.2 V | 1.224 V | | |
| | Vo=1.0 V | 0.980 V | 1.0 V | 1.020 V | | |
| Line Regulation | Vo=1.5 V | - | 2 mV | 5 mV | | |
| | Vo=1.2 V | - | 2 mV | 5 mV | | |
| | Vo=1.0 V | - | 2 mV | 5 mV | | |
| Load Regulation | Vo=1.5 V | - | 5 mV | 10 mV | | |
| | Vo=1.2 V | - | 5 mV | 10 mV | | |
| | Vo=1.0 V | - | 5 mV | 10 mV | | |
| Regulation Over Temperature (-40 °C to +85 °C) | Vo=1.5 V | - | 13 mV | 25 mV | | |
| | Vo=1.2 V | - | 10 mV | 20 mV | | |
| | Vo=1.0 V | - | 9 mV | 20 mV | | |
| Output Current | | 0 A | - | 10 A | | |
| Current Limit Threshold | | 13 A | - | 25 A | | |
| Short Circuit Surge Transient | Vo=1.5 V | - | 0.5 A ² s | 1.5 A ² s | | |
| | Vo=1.2 V | - | 0.5 A ² s | 1.5 A ² s | | |
| | Vo=1.0 V | - | 0.5 A ² s | 1.5 A ² s | | |
| Ripple and Noise (rms) | | - | 15 mV | 25 mV | Test conditions: 0-20 MHz BW, with a 1 uF ceramic capacitor at the output. | |
| Ripple and Noise (pk-pk) | | - | 50 mV | 100 mV | | |
| Turn on Time | | - | 1 mS | 2 mS | | |
| Overshoot at Turn on | | - | 0% | 3% | | |
| Output Capacitance | | 220 uF | - | 4000 uF | | |
| Transient Response | | | | | | |
| 50% ~ 100% Max Load | Overshoot | Vo=1.5 V | - | 90 mV | 125 mV | Test conditions: di/dt = 0.5 A/uS; Vin = 2.5 V; with a 220 uF tantalum capacitor at the output. |
| | Settling Time | | - | 30 uS | 60 uS | |
| 100% ~ 50% Max Load | Overshoot | Vo=1.5 V | - | 90 mV | 125 mV | |
| | Settling Time | | - | 30 uS | 60 uS | |
| 50% ~ 100% Max Load | Overshoot | Vo=1.2 V | - | 80 mV | 120 mV | |
| | Settling Time | | - | 30 uS | 60 uS | |
| 100% ~ 50% Max Load | Overshoot | Vo=1.2 V | - | 80 mV | 120 mV | |
| | Settling Time | | - | 30 uS | 60 uS | |
| 50% ~ 100% Max Load | Overshoot | Vo=1.0 V | - | 80 mV | 120 mV | |
| | Settling Time | | - | 30 uS | 60 uS | |
| 100% ~ 50% Max Load | Overshoot | Vo=1.0 V | - | 80 mV | 120 mV | |
| | Settling Time | | - | 30 uS | 60 uS | |

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

NON-ISOLATED DC/DC CONVERTERS

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0.9 Vdc - 1.65 Vdc/10 A Output



General Specifications

| Parameter | Min | Typ | Max | Notes |
|----------------------------|----------------------|---------|---------|--|
| Efficiency | | | | Measured at Vin=2.5 V, full load and Ta=25 °C. |
| Vo=1.5 V | 85% | 88% | - | |
| Vo=1.2 V | 83% | 86% | - | |
| Vo=1.0 V | 79% | 82% | - | |
| Switching Frequency | 250 kHz | 300 kHz | 350 kHz | |
| Output Trim Range | 90%Vo | - | 110%Vo | |
| MTBF | 4,447,157 hours | | | Calculated Per Bell Core SR-332 (Io = Nominal; Ta = 25 °C) |
| Dimensions (surface mount) | | | | |
| Inches (L x W x H) | 0.78 x 0.70 x 0.32 | | | |
| Millimeters (L x W x H) | 19.81 x 17.78 x 8.13 | | | |
| Dimensions (vertical) | | | | |
| Inches (L x W x H) | 0.70 x 0.308 x 0.65 | | | |
| Millimeters (L x W x H) | 17.78 x 7.82 x 16.51 | | | |
| Weight | - | 4.7 g | - | |

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

Control Specifications

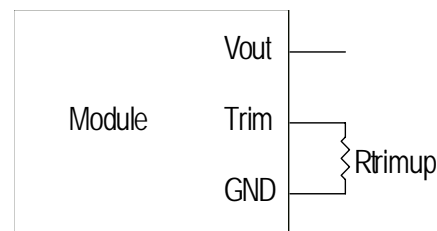
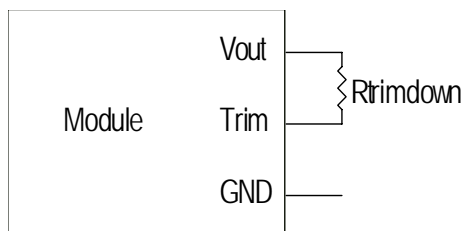
| Parameter | Min | Typ | Max | Notes |
|-----------------------|-----|-----|-------|---|
| Remote On/Off | | | | |
| Signal Low (Unit Off) | 0 V | - | 0.5 V | Remote on/off pin open, the module is on. |
| Signal High (Unit On) | 2 V | - | 5.5 V | |

Output Trim Equations

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage (Vadj) and the nominal output voltage of the converter (Vnom) 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.

$$R_{TrimDown} = \frac{A}{V_{nom} - V_{adj}} - B \qquad R_{TrimUp} = \frac{C}{V_{adj} - V_{nom}} - D$$

| Vnom | A | B | C | D |
|-------|--------|---------|--------|---------|
| 1.5 V | 49.788 | 287.900 | 43.330 | 226.000 |
| 1.2 V | 31.241 | 223.900 | 43.330 | 162.000 |
| 1.0 V | 11.029 | 92.800 | 25.550 | 56.200 |



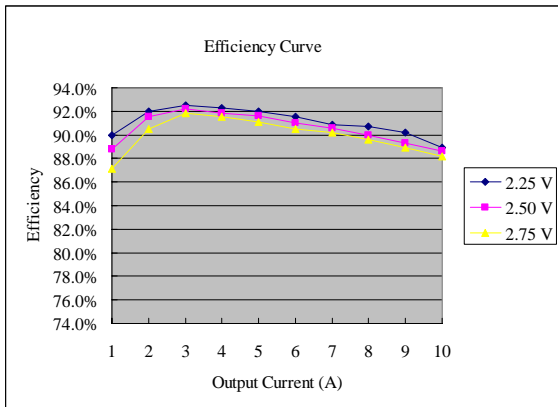
NON-ISOLATED DC/DC CONVERTERS

2.5 Vdc Input

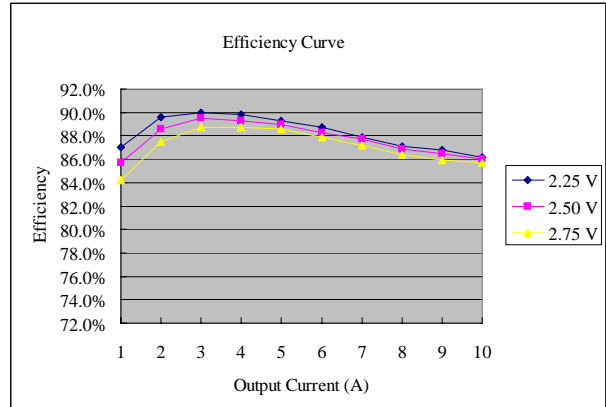
0.9 Vdc - 1.65 Vdc/10 A Output



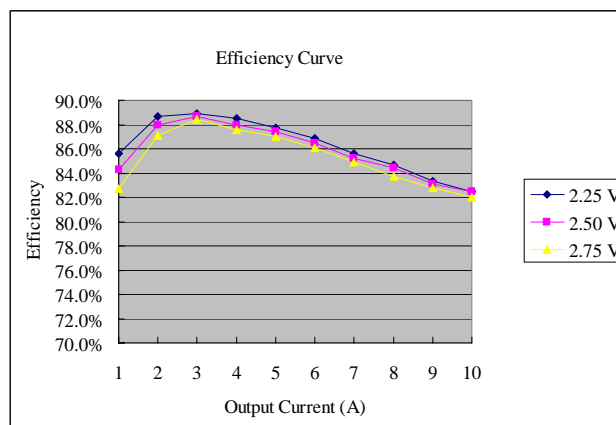
Efficiency Data



xRAH-10J150

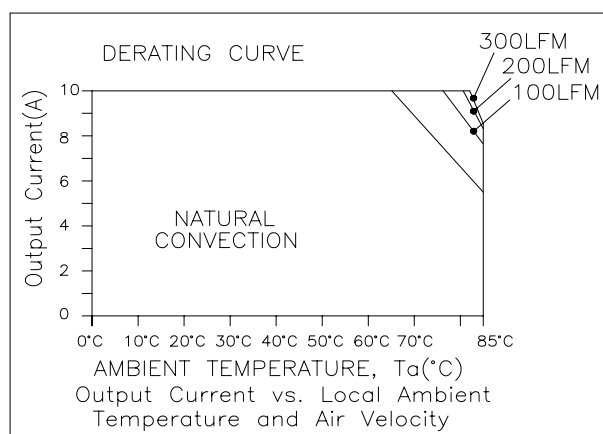


xRAH-10J120



xRAH-10J100

Thermal Derating Curve



Note: Derating curve is for 1.2 V output and tested at nominal input voltage.

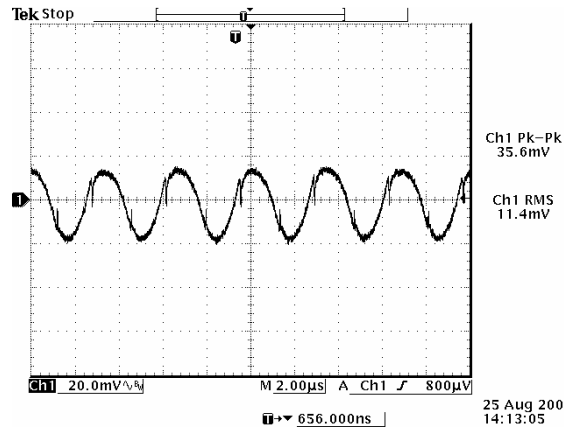
NON-ISOLATED DC/DC CONVERTERS

2.5 Vdc Input

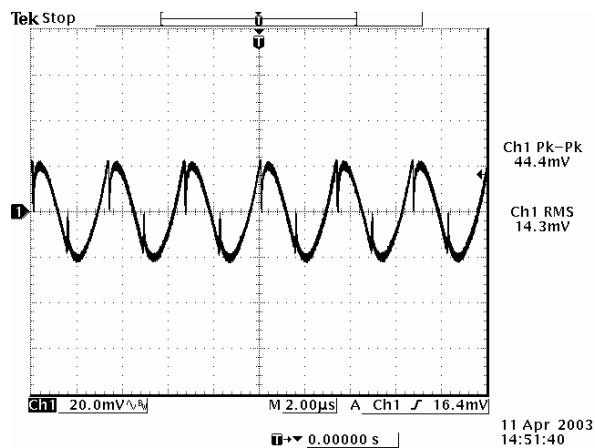
0.9 Vdc - 1.65 Vdc/10 A Output



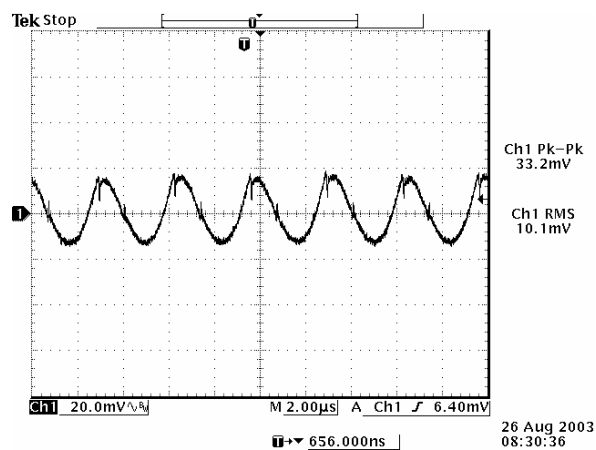
Ripple and Noise Waveforms



Ripple and Noise at max Load 1.0 Vdc Output



Ripple and Noise at max Load 1.2 Vdc Output



Ripple and Noise at max Load 1.5 Vdc Output

Note: Ripple and noise with a 1µF ceramic capacitor at the output, $T_a=25$ deg C.

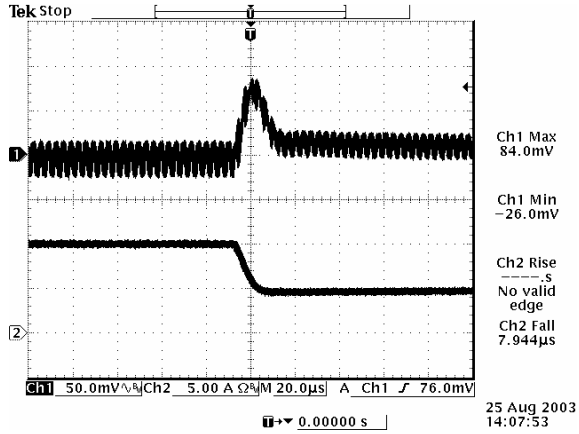
NON-ISOLATED DC/DC CONVERTERS

2.5 Vdc Input

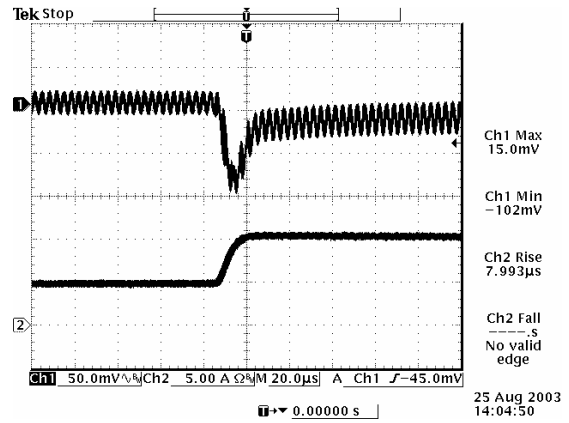
0.9 Vdc - 1.65 Vdc/10 A Output



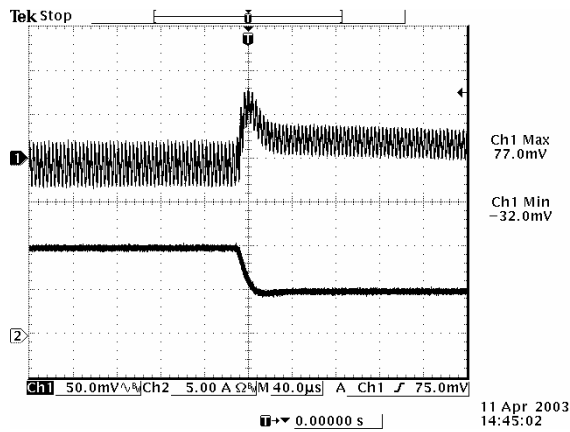
Transient Response Waveforms



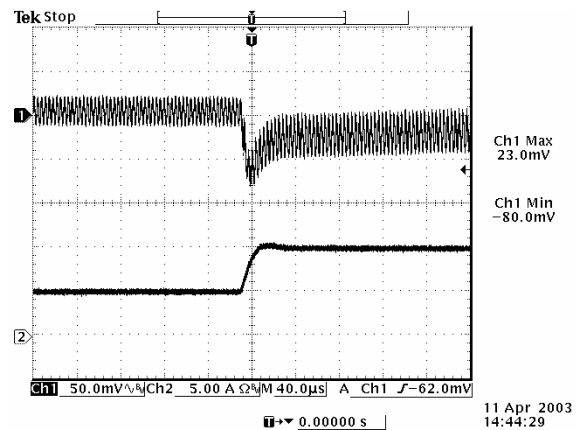
Transients 100% to 50% load 1.0 Vdc output



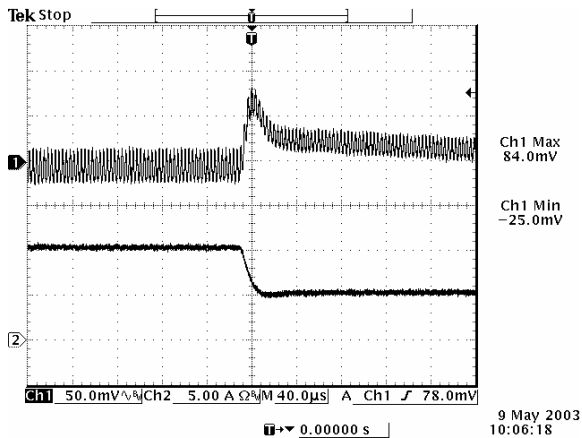
Transients 50% to 100% load 1.0 Vdc output



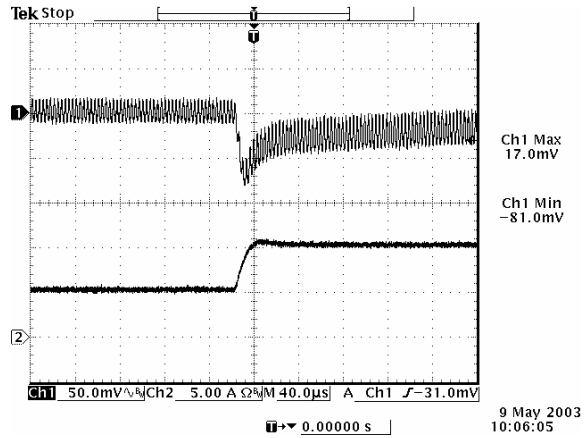
Transients 100% to 50% load 1.2 Vdc output



Transients 50% to 100% load 1.2 Vdc output



Transients 100% to 50% load 1.5 Vdc output



Transients 50% to 100% load 1.5 Vdc output

Note: Transient response at 2.5 V input, di/dt=0.5 A/µs, with 220 µF tantalum cap at the output, Ta=25 deg C.

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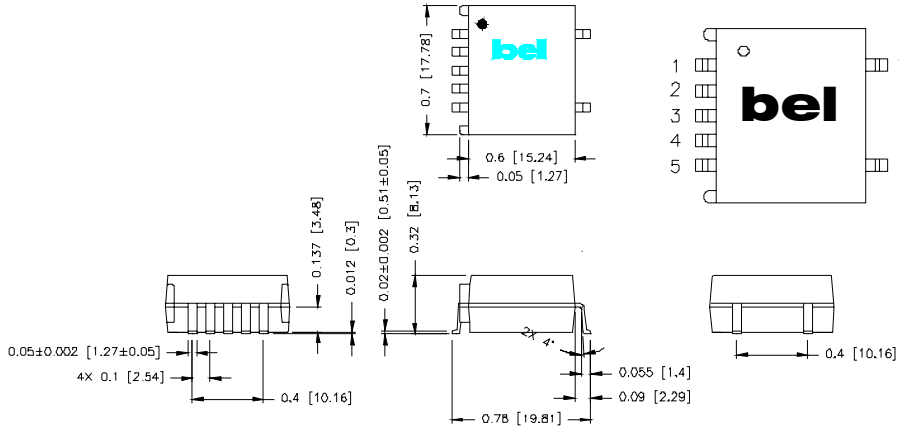
2.5 Vdc Input

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Mechanical Outline

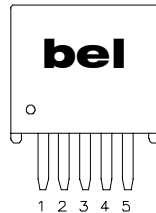
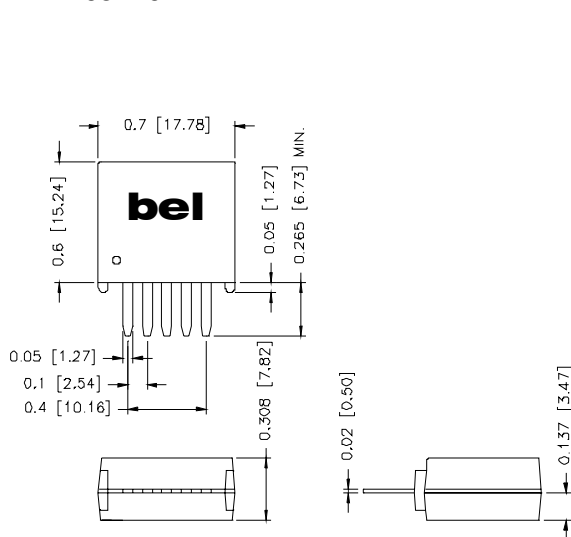
SRAH-10Jxx0



Pin Connections

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

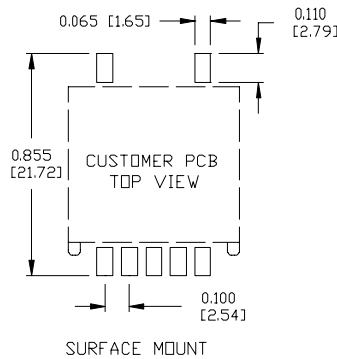
VRAH-10Jxx0



Pin Connections

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

RECOMMENDED PCB PAD LAYOUT



HOLE SIZE: 0.06" [1.57]
PAD SIZE: 0.08" [2.03]

RoHS Compliance

Complies with the European Directive 2002/95/EC, calling for the elimination of lead and other hazardous substances from electronic products. These parts are not however compatible with the higher temperatures associated with lead free solder processes and must be soldered using a reflow profile with a peak temperature of no more than 240 °C.



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- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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