

ISOLATED DC/DC CONVERTERS

38 Vdc - 55 Vdc Input 53 Vdc/8 A Output

Aug. 10, 2011

Bel Power, Inc., a subsidiary of Bel Fuse, Inc.

HBW53V08xRG

RoHS Compliant

Rev.C

- Fixed Frequency (270 kHz)
- Isolated
- High Efficiency
- Low Cost
- Input Under/Over-Voltage Lockout
- Output Voltage Trim
- Class 2, Category 2, Isolated DC/DC Converter (refer to IPC-9592)
- Output Over-Voltage Shutdown
- Over Temperature Protection
- SCP/OCP
- Basic Insulation
- Remote On/Off
- Excellent Thermal Performance
- Both of IEEE802.3af and IEEE802.3at compliant



Description

The HBW53V08xRG is an isolated dc/dc converter that operates from a nominal 48 Vdc source. This unit provides up to 424 W of output power from a nominal 48 Vdc input. This unit is designed to be highly efficient and low cost. The converter is provided in an industry standard half brick package.

Part Selection

| Output Voltage | Input Voltage | Max. Output Current | Max. Output Power | Typical Efficiency | Model Number |
|----------------|-----------------|---------------------|-------------------|--------------------|--------------|
| 53 Vdc | 38 Vdc - 55 Vdc | 8 A | 424 W | 93% | HBW53V08MRG |
| 53 Vdc | 38 Vdc - 55 Vdc | 8 A | 424 W | 93% | HBW53V08SRG |

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 | -0.3 V | - | 65 V | |
| Remote On/Off | -0.3 V | - | 5 V | |
| I/O Isolation Voltage | 2250 V | - | - | |
| Ambient Temperature | -40 °C | - | 100 °C | |
| Storage Temperature | -55 °C | - | 125 °C | |

Input Specifications

| Parameter | Min | Typ | Max | Notes |
|--|------|-------|--------|---|
| Input Voltage | 38 V | 48 V | 55 V | |
| Input Current (no load) | - | 70 mA | 100 mA | |
| Input Current (full load) | - | - | 12.5 A | |
| Remote Off Input Current | - | 10 mA | 20 mA | |
| Input Reflected Ripple Current (pk-pk) | - | 20 mA | 40 mA | With simulated source impedance of 12 uH, 5 Hz to 20 MHz; use a 100uF/100 V electrolytic capacitor with ESR = 1 ohm max, at 200 kHz |
| Input Reflected Ripple Current (rms) | - | 5 mA | 10 mA | |
| Turn-on Voltage Threshold | 34 V | 36 V | 37.5 V | |
| Input Under Voltage Threshold | 33 V | 35 V | 36.5 V | |
| Input Over Voltage Threshold | 56 V | - | 60 V | |

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

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Output Specifications

| Parameter | Min | Typ | Max | Notes |
|--|---------------|--------------------|---------------------|---|
| Output Voltage Set Point | 52.5 V | 53 V | 53.5 V | V _{in} =48 V, I _o =50%load |
| Load Regulation | - | 0.1%V _o | 0.3%V _o | |
| Line Regulation | - | 0.1%V _o | 0.3%V _o | |
| Regulation Over Temperature (-40deg.C-85deg.C) | - | - | 0.02%V _o | |
| Output Current Range | 0 A | - | 8 A | |
| Output DC Current Limit | 9 A | - | 12 A | |
| Ripple and Noise (rms) | - | 50 mV | 80 mV | 0 - 20 MHz BW, with 1 uF ceramic capacitor and a 200 uF Aluminum capacitor at output |
| Ripple and Noise (pk-pk) | - | 160 mV | 250 mV | |
| Short Circuit Protection | - | - | - | Latched |
| Turn On Time | - | - | 90 mS | |
| Rise Time | - | - | 80 mS | |
| Overshoot at Turn on and off | - | 0% | 3% | |
| Output Capacitance | 200 uF | - | 1000 uF | |
| Transient Response | | | | |
| △V _{25% - 75%} of Max Load | Overshoot | - | 400 mV | di/dt=0.1 A/us, V _{in} =48 Vdc, T _a =25 °C, with a 1µF ceramic capacitor and a 200 uF Aluminum cap at output. |
| | Settling Time | - | 400 uS | |
| △V _{75% - 25%} of Max Load | Overshoot | - | 400 mV | |
| | Settling Time | - | 400 uS | |

Note: All specifications are typical at nominal input, full load at 25°C with a 1µF ceramic capacitor and a 200uF Aluminum cap at output unless otherwise stated.

General Specifications

| Parameter | Min | Typ | Max | Notes |
|-----------------------------|----------------------|---------|---------|--|
| Efficiency | 92% | 93% | - | V _{in} =48 V, full load |
| Switching Frequency | 240 kHz | 270 kHz | 300 kHz | |
| Isolation Capacitance | - | 4400 pF | - | |
| Remote Sense Compensation | - | - | 1 V | |
| Output Voltage Trim Range | 42 V | - | 56 V | |
| Over Temperature Protection | - | 100 °C | - | |
| Over Voltage Protection | 56 V | - | 59 V | V _{in} =48 V, full load |
| MTBF | TBD | | | Calculated Per Bell Core SR-332 (V _{in} =48 V, V _o =normal, I _o =80%load, T _a = 25 °C) |
| Dimensions | | | | |
| Inches (L × W × H) | 2.30 x 2.40 x 0.49 | | | |
| Millimeters (L × W × H) | 58.42 x60.96 x 12.44 | | | |
| Weight | - | 88 g | - | |

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

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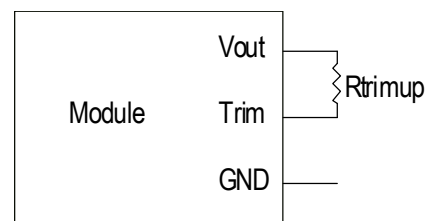
Control Specifications

| Parameter | Min | Typ | Max | Notes |
|------------------------|------------|--------|-----|---------------------------------------|
| Remote On/Off | | | | |
| Signal Low (Unit On) | Active Low | -0.3 V | - | The remote on/off pin open, Unit Off. |
| Signal High (Unit Off) | | 2.4 V | - | |

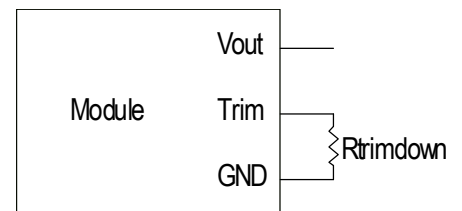
Output Trim Equations

Equations for calculating the trim resistor are shown below. The Trim Down resistor should be connected between the Trim pin and GND pin. The Trim Up resistor should be connected between the Trim pin and the Vout. Only one of the resistors should be used for any given application.

$$R_{trimup} = \frac{(100 + \delta) \cdot V_o}{1.225 \cdot \delta} - \frac{(100 + 2 \cdot \delta)}{\delta} [k\Omega]$$



$$R_{trimdown} = \frac{100}{|\delta|} - 2 [k\Omega]$$



Note: $\delta = \frac{(V_o_{req} - V_o)}{V_o} \times 100 [\%]$

V_o_{req} =Desired(trimmed) output voltage[V]

Output voltage V_o =53 V

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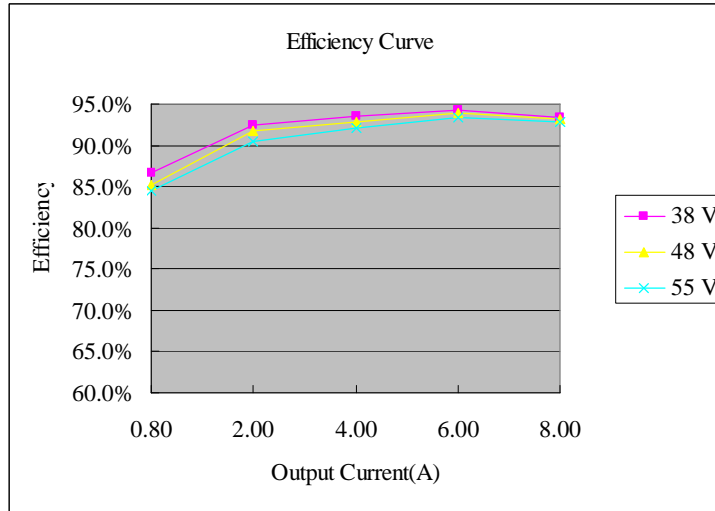
38 Vdc - 55 Vdc Input 53 Vdc/8 A Output



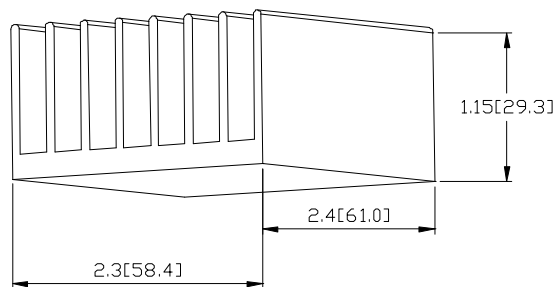
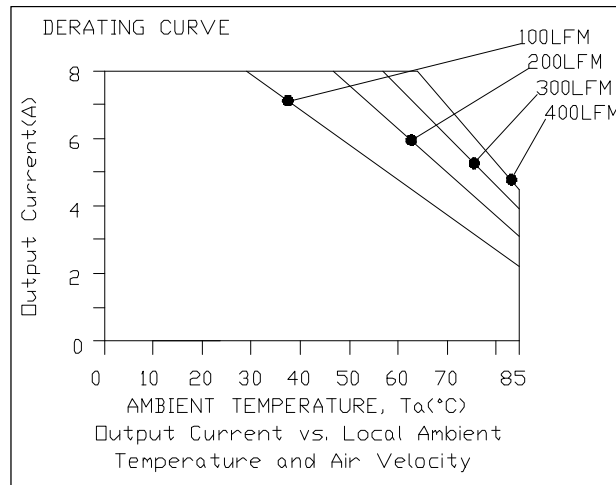
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Efficiency Data



Thermal Derating Curve



heatsink for above thermal test

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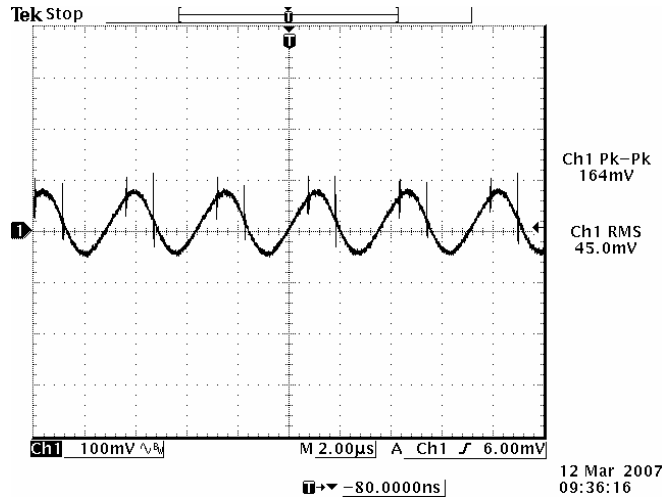
38 Vdc - 55 Vdc Input 53 Vdc/8 A Output



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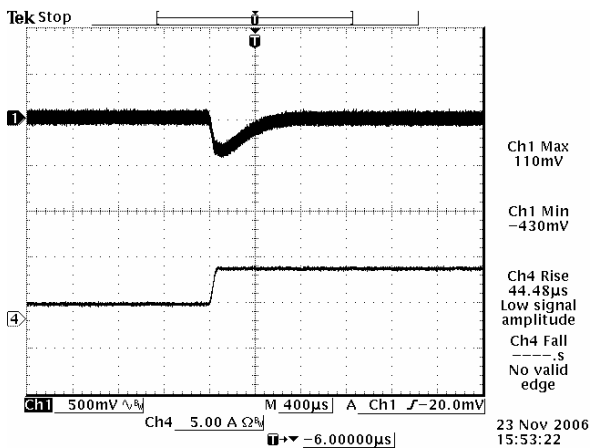
Ripple and Noise Waveform



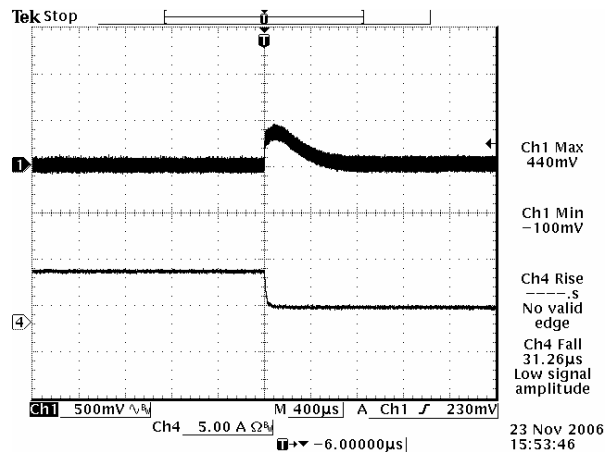
48 Vdc input, 53 Vdc/8 A output

Note: Ripple and noise at full load, with a 1µF ceramic cap and a 200 µF/100 V Aluminum cap at output, $T_a=25$ deg C.

Transient Response Waveforms



Vout= 53 V 25%-75% Load Transient



Vout= 53 V 75%-25% Load Transient

Note: Transients at $di/dt=0.1$ A/µs, $V_{in}=48$ Vdc, $T_a=25^\circ\text{C}$ and with a 1µF ceramic cap and a 200 µF/100 V Aluminum cap at output.

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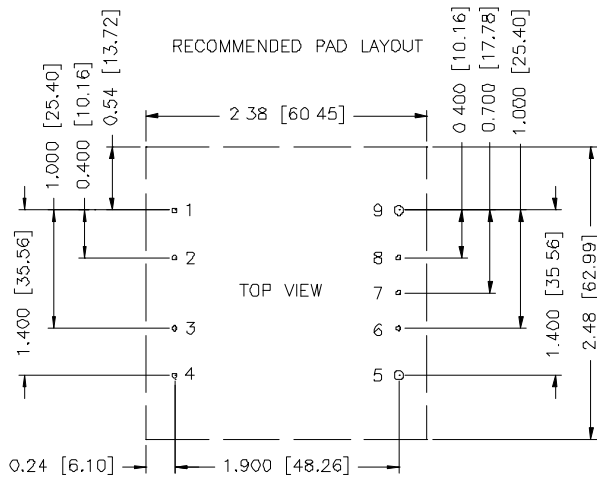
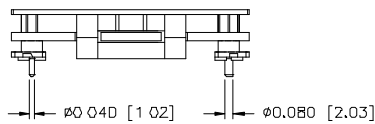
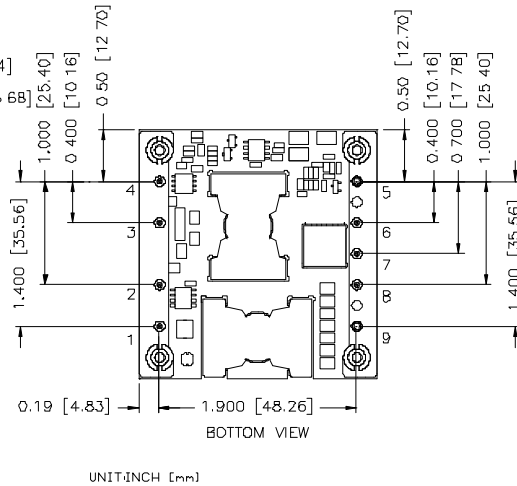
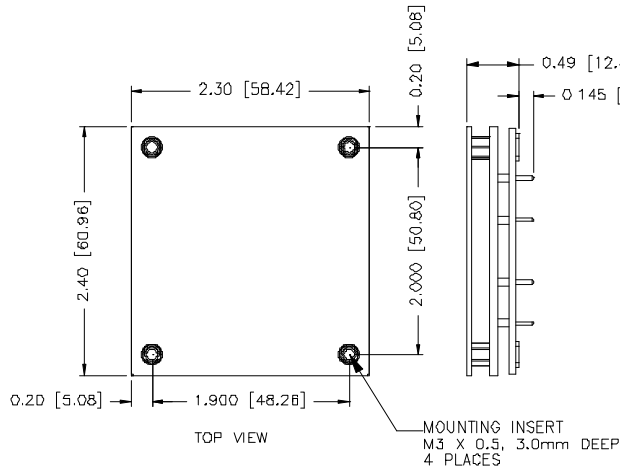
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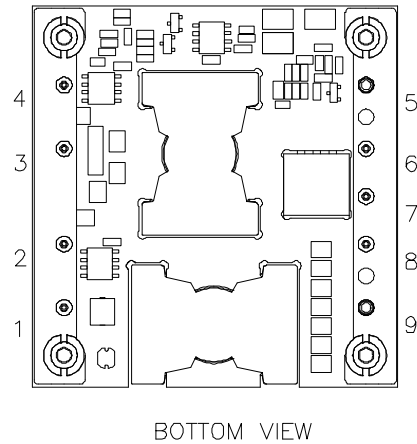
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Mechanical Outline-HBW53V08MRG



1,3,4,6,7,8 Ø0.047 PAD HOLE SIZE,
Ø0.08 min PAD SIZE, BOTH SIDE.
5,9 Ø0.093 HOLE SIZE,
Ø0.12 min PAD SIZE, BOTH SIDE.



Pin Connections

| Pin | Function | Pin Size |
|-----|-------------|----------|
| 1 | Vin(+) | 0.04" |
| 2 | On/Off | 0.04" |
| 3 | Case Ground | 0.04" |
| 4 | Vin(-) | 0.04" |
| 5 | Vo(-) | 0.08" |
| 6 | Sense(-) | 0.04" |
| 7 | Trim | 0.04" |
| 8 | Sense(+) | 0.04" |
| 9 | Vo(+) | 0.08" |

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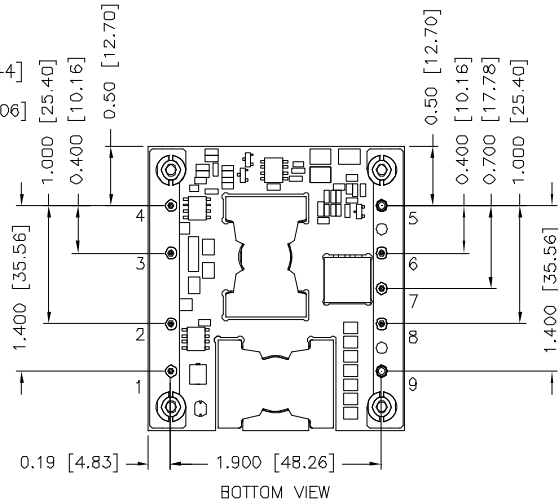
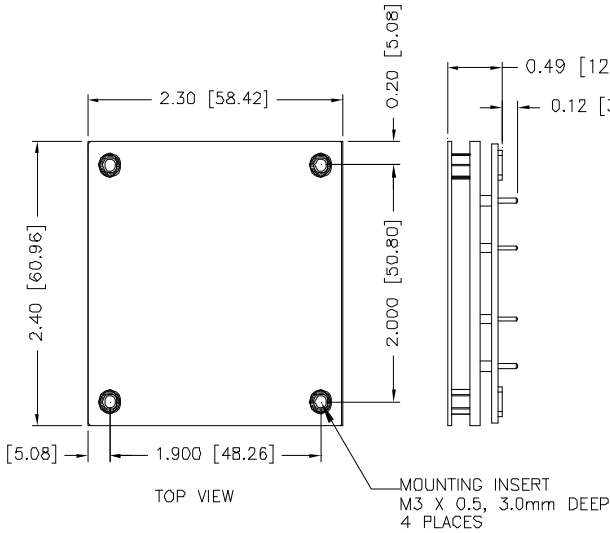
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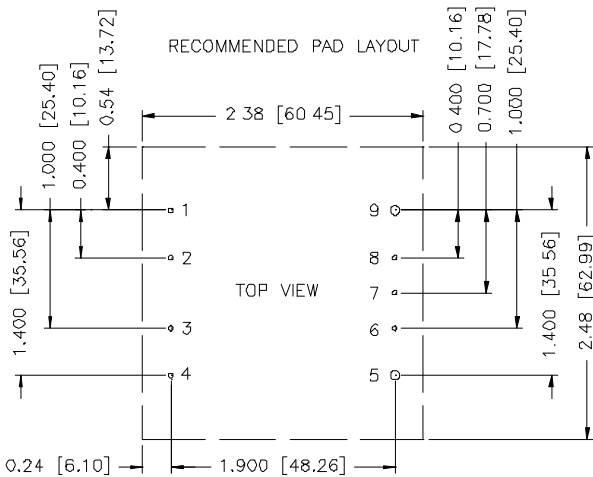
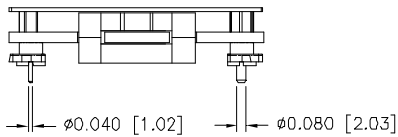
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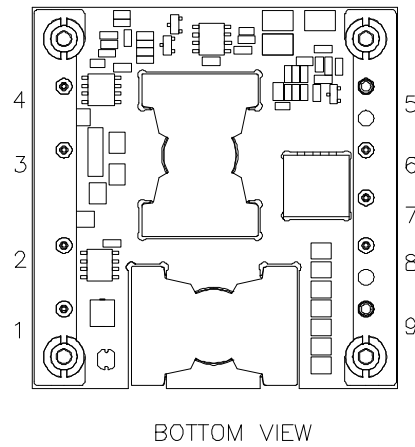
Mechanical Outline-HBW53V08SRG



UNIT:INCH [mm]



1,3,4,6,7,8 Ø0.047 PAD HOLE SIZE,
Ø0.08 min PAD SIZE, BOTH SIDE.
5,9 Ø0.093 HOLE SIZE,
Ø0.12 min PAD SIZE, BOTH SIDE.



Pin Connections

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| 6 | Sense(-) | 0.04" |
| 7 | Trim | 0.04" |
| 8 | Sense(+) | 0.04" |
| 9 | Vo(+) | 0.08" |

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Revision History

| Date | Revision | Changes Detail | Approval |
|------------|----------|--|---------------|
| 2007-5-8 | A | First Release | Masera/HF Fan |
| 2009-11-17 | B | Add Both of IEEE802.3af and IEEE802.3at compliant | HL |
| 2011-8-10 | C | Add mechanical drawing , part selection and updated part selection and add 'Class 2, Category 2, Isolated DC/DC Converter (refer to IPC-9592)' | HL |

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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