

## ISOLATED DC/DC CONVERTERS

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

**bel**  
POWER PRODUCTS

### HBW53V08MRG RoHS Compliant PRELIMINARY Rev.A

- Fixed Frequency (270 kHz)
- Isolated
- High Efficiency
- Low Cost
- Input Under/Over-Voltage Lockout
- Output Voltage Trim
- Output Over-Voltage Shutdown
- Over Temperature Protection
- SCP/OCP
- Basic Insulation
- Remote On/Off
- Excellent Thermal Performance



### Description

The HBW53V08MRG 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

- 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 <sub>in</sub> =48 V, I <sub>o</sub> =50%load	
Load Regulation	-	0.1%V <sub>o</sub>	0.3%V <sub>o</sub>		
Line Regulation	-	0.1%V <sub>o</sub>	0.3%V <sub>o</sub>		
Regulation Over Temperature (-40deg.C-85deg.C)	-	-	0.02%V <sub>o</sub>		
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		
<b>Transient Response</b>					
△V <sub>25% - 75%</sub> of Max Load	Overshoot	-	400 mV	800 mV	di/dt=0.1 A/us, V <sub>in</sub> =48 Vdc, T <sub>a</sub> =25 °C, with a 1µF ceramic capacitor and a 200 uF Aluminum cap at output.
	Settling Time	-	400 uS	600 uS	
△V <sub>75% - 25%</sub> of Max Load	Overshoot	-	400 mV	800 mV	
	Settling Time	-	400 uS	600 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 <sub>in</sub> =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 <sub>in</sub> =48 V, full load
MTBF	TBD			Calculated Per Bell Core SR-332 (V <sub>in</sub> =48 V, V <sub>o</sub> =normal, I <sub>o</sub> =80%load, T <sub>a</sub> = 25 °C)
Dimensions Inches (L × W × H) Millimeters (L × W × H)	2.30 x 2.40 x 0.49 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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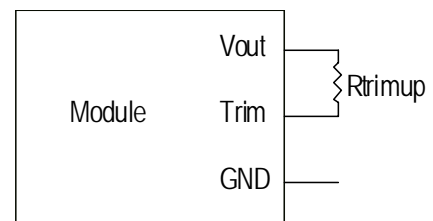
### Control Specifications

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

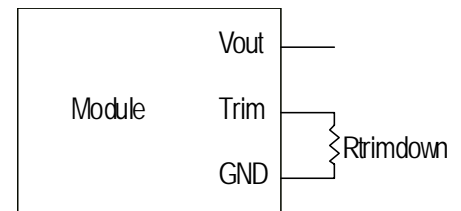
### Output Trim Equations

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]

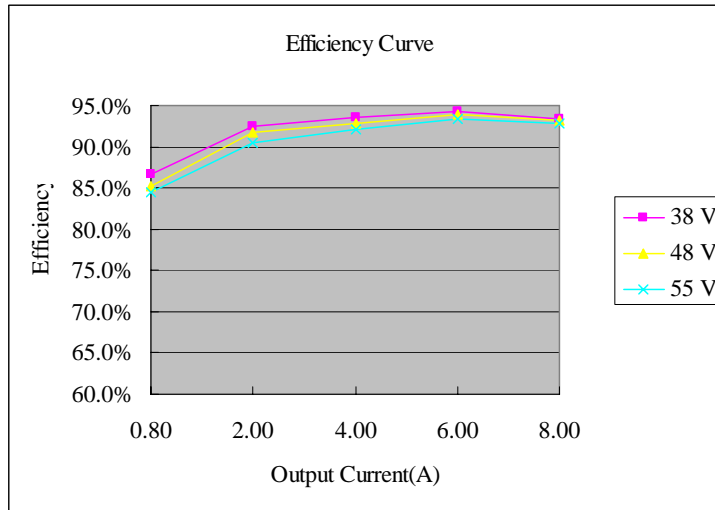
Output voltage  $V_o$ =53 V

# ISOLATED DC/DC CONVERTERS

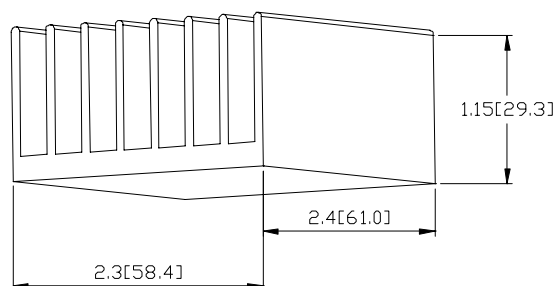
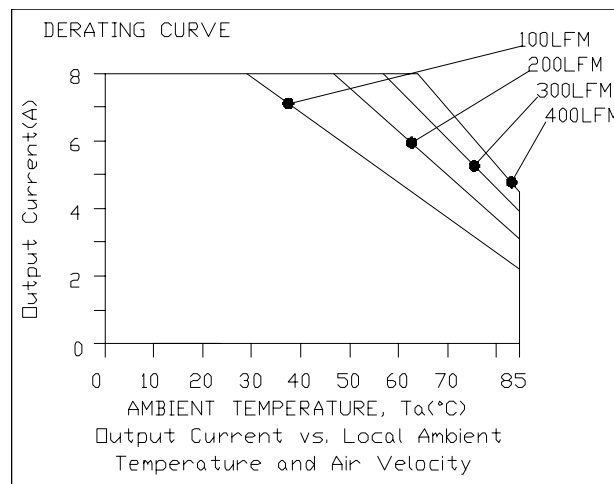
38 Vdc - 55 Vdc Input 53 Vdc/8 A Output



## Efficiency Data



## Thermal Derating Curve



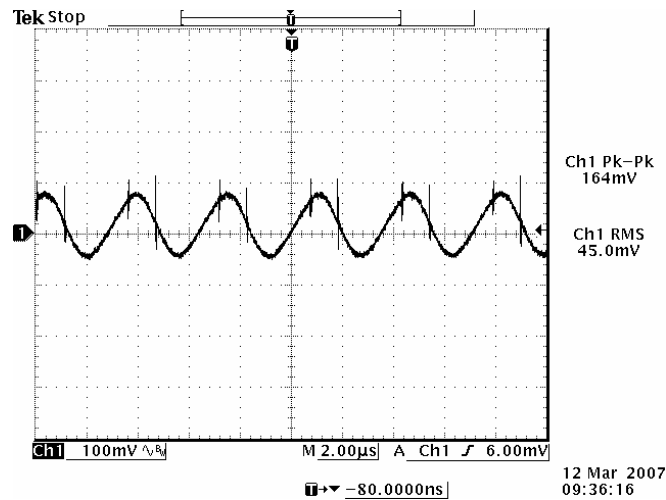
heatsink for above thermal test

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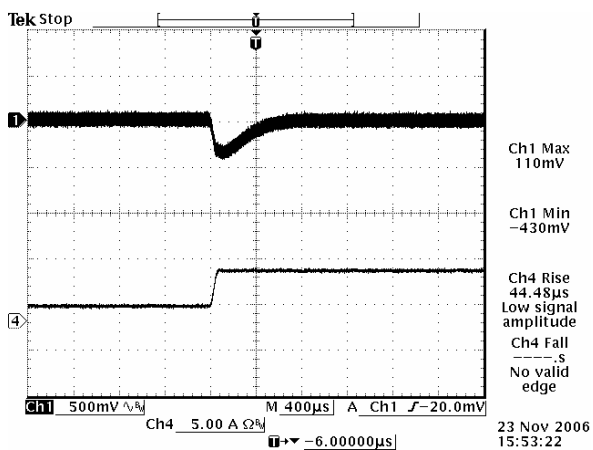
## Ripple and Noise Waveform



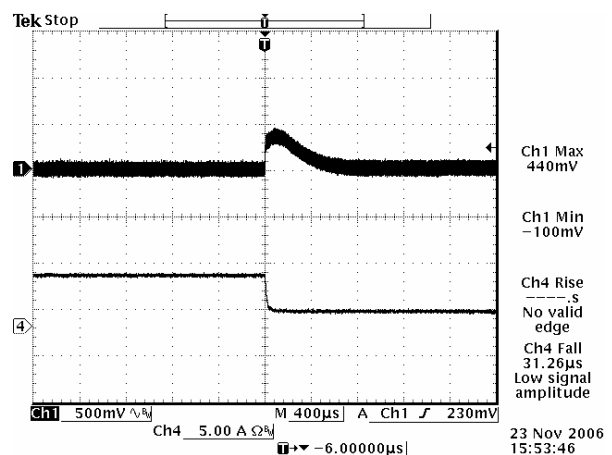
48 Vdc input, 53 Vdc/8 A output

**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



$V_{out}= 53$  V 25%-75% Load Transient



$V_{out}= 53$  V 75%-25% Load Transient

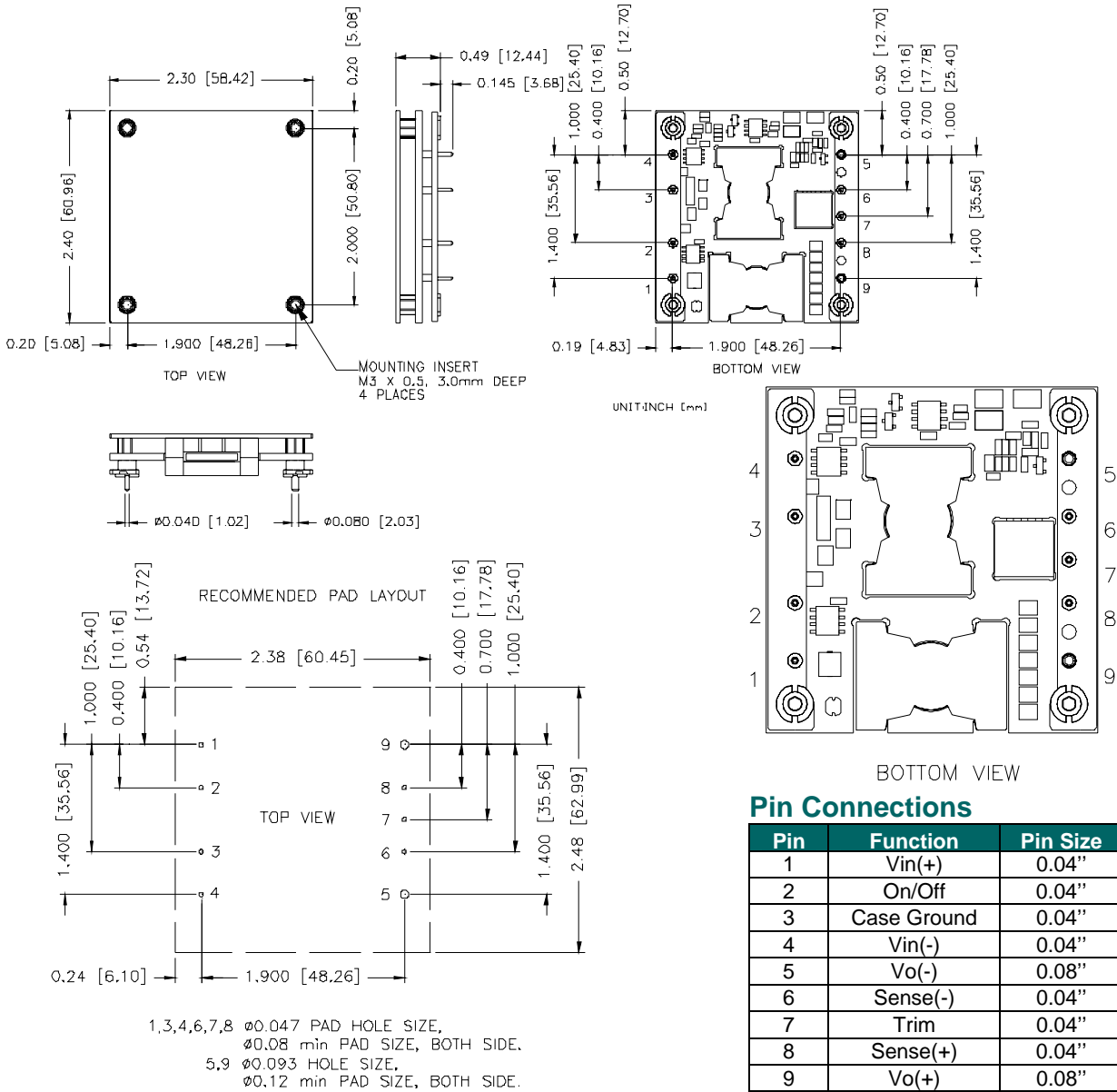
**Note:** Transients at  $di/dt=0.1$  A/µs,  $V_{in}=48$  Vdc,  $T_a=25^\circ\text{C}$  and with a 1µF ceramic cap and a 200 µF/100 V Aluminum cap at output.

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## Mechanical Outline



## 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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