

# HAE100 SERIES

DC/DC Converter Single Output: 100 Watts



PCB Model

Terminal Block Model

## Features

- 2:1 wide Input range option, 9~18, 18~36V,36~75V
- Industry Standard Half-Brick package
- High efficiency up to 93%
- Regulated output & Short circuit protection
- 2250VDC isolation
- Five sided continuous copper shield
- Remote ON / OFF, Negative or Positive Logic
- High operating base temperature +105°C
- Zero load operation
- External Output voltage trim
- Terminal block option -T ( see options )
- A range of heatsink options ( see options page )

## Specifications:

|   |   |                                 |   |
|---|---|---------------------------------|---|
| <b>Input Voltage</b>  | <b>12VDC</b> ( 9 ~ 18 )<br><b>24VDC</b> ( 18 ~36 )<br><b>48VDC</b> ( 36~75 )  | <b>Overload Protection</b>      | Set at 110 ~ 150% of output load  |
| <b>Input Filter</b>   | Pi type   | <b>Short Circuit protection</b> | Continuous hiccup mode  |
| <b>Start-up Voltage</b>   | 12V input: 9V<br>24V input: 18V<br>48V input: 36V   | <b>Efficiency</b>               | Model dependant 88 ~ 93%  |
| <b>Shutdown Voltage</b>   | 12V input: 7.5V<br>24V input: 16V<br>48V input: 34V   | <b>Isolation</b>                | Input – Output: 2250VDC<br>Input / Output – Case: 1600VDC   |
| <b>Input Surge Voltage.</b>                                       | 12V: 36VDC. 24V: 50VDC<br>48V: 100VDC ( 100ms )   | <b>Isolation Cap.</b>           | 2500pF  |
| <b>Input Reverse Voltage Protection</b>                           | External input fuse required  | <b>Switching Freq.</b>          | 300KHz  |
| <b>Start Up time</b>  | 25mS constant resistive load  | <b>Safety</b>                   | Designed to meet EN60950-1, UL60950-1   |
| <b>Remote ON/OFF</b><br>Negative Logic:(standard )                | DC-DC ON Short or $0V < V_r < 1.2V$<br>DC-DC OFF Open or $3.0V < V_r < 12V$   | <b>Case Material</b>            | Metal   |
| Positive Logic: -P  | DC-DC ON Open or $3.0V < V_r < 12V$<br>DC-DC OFF Short or $0V < V_r < 1.2V$   | <b>Base Material</b>            | FR4 PCB   |
| * Ref to -VE input  | Input current of remote control pin: 0.5mA<br>Remote off state input current: 3mA   | <b>Potting</b>                  | Epoxy UL94-V0   |
| <b>Output power</b>   | 100 watts   | <b>Dimensions</b>               | 61 X 57.9 X 12.7mm  |
| <b>Voltage Accuracy</b>   | ±1.0%   | <b>Weight</b>                   | 97g   |
| <b>Voltage Trim</b>   | +10% to -20% External voltage trim  | <b>MTBF</b>                     | BELLCORE TR-NWT-000332 Case 1: 50% Stress,<br>Ta= 40°C. ( $1.010 \times 10^6$ hrs )   |
| <b>Minim Load</b>   | Zero  | <b>Operating Temp</b>           | -40°C to +85°C ( without derating )<br># See derating graphs<br># Base plate conduction cooling is mandatory                          |
| <b>Line Regulation</b>  | ±0.1%   | <b>Case Temp</b>                | +105°C maximum base / case temperature  |
| <b>Load Regulation</b>  | ±0.1%   | <b>Over Temp. Protection</b>    | Shutdown approx 115°C case temperature  |
| <b>Remote Sense</b>   | 10% of Vout nominal. If not used, must be connected to corresponding +VE & -VE pins   | <b>Thermal Impedance</b>        | 6.7°C / watt without heatsink<br>5.4°C / watt with 0.24" height optional heatsink<br>4.7°C / watt with 0.45" height optional heatsink |
| <b>Ripple &amp; noise:</b><br>Measured by 20MHz bandwidth with a: | 3.3Vout, 5Vout<br>4.7µF/50V X7R MLCC 75-100mV 12Vout, 15Vout<br>4.7µF/50V X7R MLCC 100-125mV 24Vout, 28Vout<br>4.7µF/50V X7R MLCC 200-250mV 48Vout<br>2.2µF/100V X7R MLCC 300-350mV | <b>Thermal shock</b>            | EN61373, MIL-STD-810F   |
| <b>Temp. Coefficient</b>  | ±0.02% / °C   | <b>Vibration</b>                | EN61373, MIL-STD-810F   |
| <b>Transient Response</b>   | 200µS ( 25% load step change )  | <b>Humidity</b>                 | 5-95% RH  |
| <b>Over Voltage Protection</b>                                    | Set at 115 ~130% of Voltage output nominal  | <b>EMC</b>                      | EN55022 / EN5011 Class A ( see note 2 )   |
|   |   | <b>ESD</b>                      | EN61000-4-2 Air / Contact: ±8KV   |
|   |   | <b>Radiated Immunity</b>        | EN61000-4-3 10V /m  |
|   |   | <b>Fast Transients</b>          | EN61000-4-4 ±2KV  |
|   |   | <b>Surge</b>                    | EN61000-4-5 ±1KV EN55024  |
|   |   | <b>Conducted Immunity</b>       | EN61000-4-6   |

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| Model Number   | Input Range VDC | Output Voltage VDC | Output Current @Full Load A | Input Current @ No Load | Efficiency % | Maximum Capacitor Load uF |
|----------------|-----------------|--------------------|-----------------------------|-------------------------|--------------|---------------------------|
| HAE100-12S3P3P | 9 ~ 18V         | 3.3V               | 25A                         | 155mA                   | 90           | 75700                     |
| HAE100-12S05P  | 9 ~ 18V         | 5V                 | 20A                         | 150 mA                  | 91           | 40000                     |
| HAE100-12S12P  | 9 ~ 18V         | 12V                | 8.4A                        | 180 mA                  | 91           | 7000                      |
| HAE100-12S15P  | 9 ~ 18V         | 15V                | 6.7A                        | 180 mA                  | 91           | 4460                      |
| HAE100-12S24P  | 9 ~ 18V         | 24V                | 4.2A                        | 90 mA                   | 90           | 1750                      |
| HAE100-12S28P  | 9 ~ 18V         | 28V                | 3.6A                        | 100 mA                  | 90           | 1280                      |
| HAE100-12S48P  | 9 ~ 18V         | 48V                | 2.1A                        | 100 mA                  | 90           | 430                       |
| HAE100-24S3P3P | 18 ~ 36V        | 3.3V               | 25A                         | 90 mA                   | 91           | 75700                     |
| HAE100-24S05P  | 18 ~ 36V        | 5V                 | 20A                         | 150 mA                  | 93           | 40000                     |
| HAE100-24S12P  | 18 ~ 36V        | 12V                | 8.4A                        | 185 mA                  | 93           | 7000                      |
| HAE100-24S15P  | 18 ~ 36V        | 15V                | 6.7A                        | 185 mA                  | 93           | 4460                      |
| HAE100-24S24P  | 18 ~ 36V        | 24V                | 4.2A                        | 85 mA                   | 92           | 1750                      |
| HAE100-24S28P  | 18 ~ 36V        | 28V                | 3.6A                        | 85 mA                   | 92           | 1280                      |
| HAE100-24S48P  | 18 ~ 36V        | 48V                | 2.1A                        | 85 mA                   | 92           | 430                       |
| HAE100-48S3P3P | 36 ~ 75V        | 3.3V               | 25A                         | 80 mA                   | 91           | 75700                     |
| HAE100-48S05P  | 36 ~ 75V        | 5V                 | 20A                         | 90 mA                   | 93           | 40000                     |
| HAE100-48S12P  | 36 ~ 75V        | 12V                | 8.4A                        | 90 mA                   | 93           | 7000                      |
| HAE100-48S15P  | 36 ~ 75V        | 15V                | 6.7A                        | 90 mA                   | 93           | 4460                      |
| HAE100-48S24P  | 36 ~ 75V        | 24V                | 4.2A                        | 40 mA                   | 92           | 1750                      |
| HAE100-48S28P  | 36 ~ 75V        | 28V                | 3.6A                        | 40 mA                   | 92           | 1280                      |
| HAE100-48S48P  | 36 ~ 75V        | 48V                | 2.1A                        | 40 mA                   | 92           | 430                       |

a) HAE100-xxxxP = standard PCB Mounting model    b) HAE100-xxxx-PT = standard chassis /panel mount with terminal block model

c) See options table for further options.

## Notes:

- (1) Thermal test condition with vertical direction by natural convection (20LFM).  
(2) The heat-sink is optional and P/N: 7G-0021A-F , 7G-0022A-F , 7G-0023A-F , 7G-0024A-F. Please refer to heat-sink selection guide.
- The HAE100 series module w/o assembly option meets EMI Class A or Class B only with external components.  
For more detail information, please contact office.
- An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5.  
Recommended 2 pcs of aluminum electrolytic capacitor (Nippon Chemi-con KY series, 220µF/100V) to connect in parallel.
- CASE GROUNDING : When connect four screw bolts to shield plane, the EMI could be reduced.

**CAUTION:** This power module is not internally fused. An input line fuse must always be used.

## PART NUMBER STRUCTURE

**HAE100- 48 S 05 - P TH HS**

Series Name

Input Voltage (VDC)

Output Quantity

Output Voltage (VDC)

Ctrl and Pin Options

Through hole type<sup>(1)</sup>

Assembly Option

12:9~18  
24:18~36  
48:36~75

S:Single  
3P3:3.3  
05:5  
12:12  
15:15  
24:24  
28:28  
48:48

□:Negative logic,  
0.200" pin length  
L:Negative logic,  
0.145" pin length  
P:Positive logic,  
0.200" pin length  
S:Positive logic,  
0.145" pin length

□: Thread  
TH: No thread

**Heat-sink type:**  
HS: Height H=0.45" vertical fin,  
7G-0021A-F  
HS1: Height H=0.24" horizontal fin,  
7G-0022A-F  
HS2: Height H=0.24" vertical fin,  
7G-0023A-F  
HS3: Height H=0.45" horizontal fin,  
7G-0024A-F

**Terminal block type<sup>(2)</sup>:**

T: Wall mounted  
TF: Wall mounted with EMC filter<sup>(3)</sup>  
TF1: Wall mounted with EMC filter  
can be connected to PE ⊕<sup>(3)</sup>

(1) The module can't equip Heat-sink with TH option.

(2) Terminal block type only for 0.200" pin length.

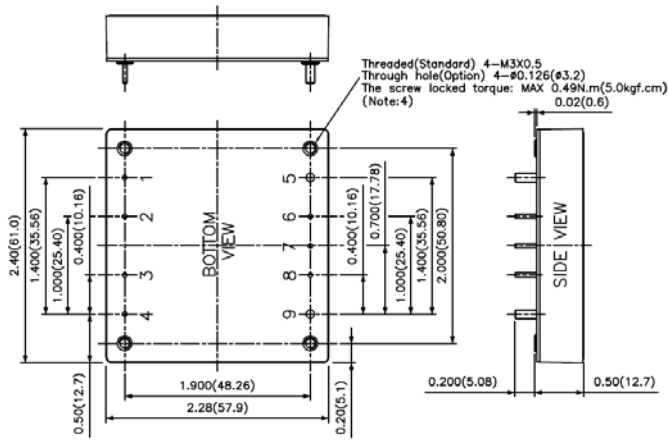
(3) EMI filter meet EN55022 Class A.

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## MECHANICAL DRAWING

Metal case mechanical drawing:

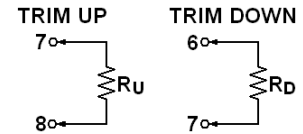


## Pin Conenction

| PIN | DEFINE   | DIAMETER  |
|-----|----------|-----------|
| 1   | - INPUT  | 0.04 Inch |
| 2   | CASE     | 0.04 Inch |
| 3   | CTRL     | 0.04 Inch |
| 4   | + INPUT  | 0.04 Inch |
| 5   | - OUTPUT | 0.08 Inch |
| 6   | - SENSE  | 0.04 Inch |
| 7   | TRIM     | 0.04 Inch |
| 8   | + SENSE  | 0.04 Inch |
| 9   | + OUTPUT | 0.08 Inch |

## EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed by using the method shown below.



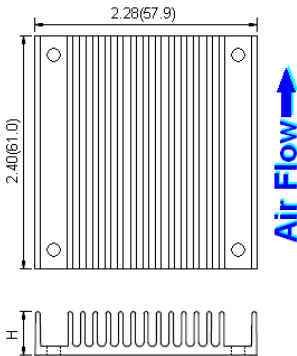
$$R_U = \left( \frac{V_{OUT} (100 + \Delta\%)}{1.225 \Delta\%} - \frac{(100 + 2\Delta\%)}{\Delta\%} \right) k\Omega$$

$$R_D = \left( \frac{100}{\Delta\%} - 2 \right) k\Omega$$

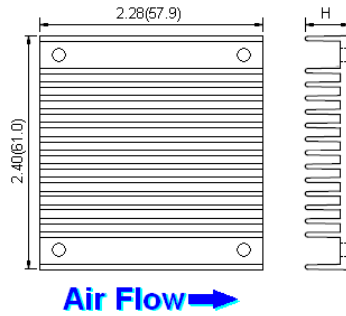
1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5)  
x.xxx±0.01 (x.xx±0.25)
3. Pin pitch tolerance ±0.01 (0.25)
4. Pin dimension tolerance ±0.004(0.1)

## HEAT-SINK TYPE OPTIONS

Vertical Fin Orientation, Suffix:-HS, -HS2



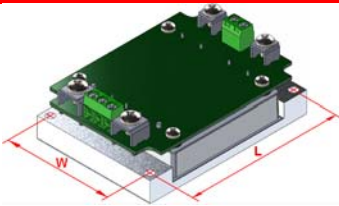
Horizontal Fin Orientation, Suffix:-HS1, -HS3



1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5)  
x.xxx±0.01 (x.xx±0.25)

## TERMINAL BLOCK TYPE OPTION

Wall mounted, Suffix: -T



Wall mounted with EMC Filter, Suffix: -TF



Wall mounted with EMC Filter, Suffix: -TF1

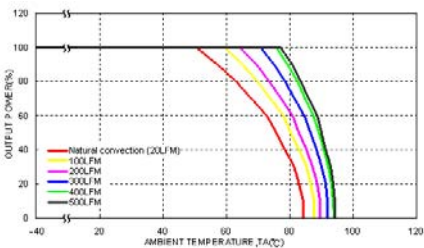


| Terminal block type | -T  | -TF   | -TF1  |
|---------------------|---|---|---|
| Weight              | 200g (7.05oz)   | 280g (9.88oz)                                   | 287g (10.12oz)                                  |
| Dimensions          | 3.35 x 2.40 x 1.10 inch (85.0 x 61.0 x 28.0mm)                | 3.35 x 2.40 x 1.47 inch (85.0 x 61.0 x 37.3 mm) | 3.35 x 2.40 x 1.53 inch (85.0 x 61.0 x 38.8 mm) |
| Through hole (W×L)  | 2.126 x 3.071 inch (54.00 x 78.00 mm), 4-φ0.17 inch (φ 4.3mm) |   |   |

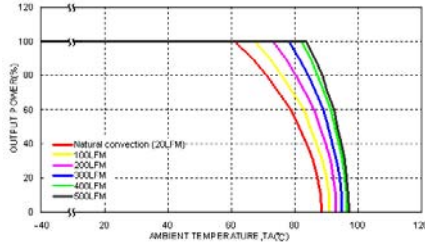
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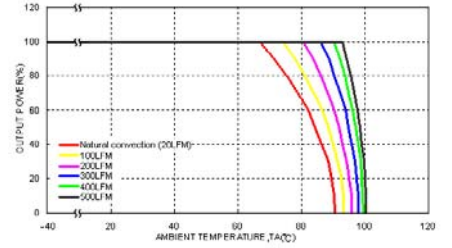
## CHARACTERISTIC CURVES:



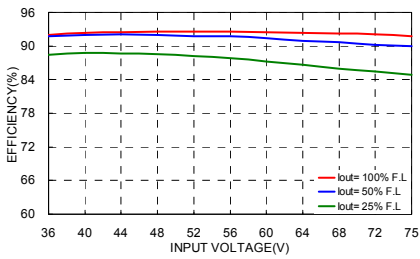
HAE100-48S05 Derating Curve (Note 1)



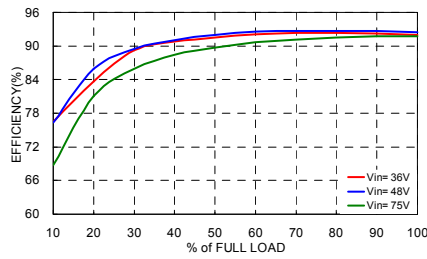
HAE100-48S05 Derating Curve (Note 1)  
With 0.24" Height Heat-sink



HAE100-48S05 Derating Curve (Note 1)  
With 0.45" Height Heat-sink



HAE100-48S05 Efficiency VS Input Voltage



HAE100-48S05 Efficiency VS Output Load