

HAE75W SERIES

DC/DC Converter Single Output: 75 Watts



PCB Model

Terminal Block Model

Specifications:

Input Voltage	24VDC (9 ~ 36), 48VDC (18 ~ 75) 110VDC (43~160)
Input Filter	Pi type (see note 13)
Start-up Voltage	24V input: 9V typ, 48V input: 18V typ. 110V input: 43V
Shutdown Voltage	24V input: 7.5V, 48V input: 16V 110V input: 36V
Input Surge Voltage.	24V: 50VDC. 48V: 100VDC (100ms max) 110V: 185VDC (100ms max)
Input Reverse Voltage Protection	External input fuse required
Start Up time	110vdc input: 60ms 24/48V input: 25ms (resistive load)
Remote ON/OFF note 6 Negative Logic	DC-DC ON Short or $0V < V_r < 1.2V$ DC-DC OFF Open or $3.0V < V_r < 12V$
(Positive Logic -P)	DC-DC ON Open or $3.0V < V_r < 12V$ DC-DC OFF Short or $0V < V_r < 1.2V$
	Input current of remote control pin: 0.5~1mA. Remote off state input current: 3mA
Output power	75 watts
Voltage Accuracy	±1.0%
Voltage Trim	+10% to -20% External voltage trim
Minim Load	Zero
Line Regulation	±0.1%
Load Regulation	±0.1%
Remote Sense	10% of V_{out} nominal (Note 8)
Ripple & noise	See table. 20MHZ bandwidth
Temp. Coefficient	±0.02% / °C
Transient Response	200µs (25% load step change)
Over Voltage Protection	Set at 110 ~130% of Voltage output Hiccup.
Overload Protection	Set at 120 ~ 150% of output load
Short Circuit protection	Continuous hiccup mode, auto recovery.

Features

- 4:1 wide Input range option 9~36V, 18~75V & 43~160V
- Rail EN50155 compliance pending
- Single output options, 3.3 ~ 48vdc
- Industry Standard Half-Brick package
- High efficiency up to 91%
- Regulated output & Short circuit protection
- 2250VDC isolation
- Six sided continuous copper shield (24/48V input)
- Remote ON / OFF, Negative or Positive Logic
- High operating base plate temperature : -40°to +115°C
- Zero load operation
- External Output voltage trim +10% to -20%
- Terminal block option -T (see options)
- A range of heatsink options (see options page)

Efficiency	Model dependant 86 ~ 91%
Isolation	Input – Output: 2250VDC Input / Output – Case: 1600VDC
Isolation Cap.	2500pF
Switching Freq.	300KHz
Safety	EN60950-1, UL60950-1, EN50155 (pending)
Case Material	24 & 48V input – Metal Case 110V input - Aluminium base with plastic case
Base Material	FR4 PCB (24 & 48V)
Potting	Epoxy UL94-V0
Dimensions	61 X 57.9 X 12.7mm
Weight	97g
MTBF	7.416 x 104Hrs (MIL-HDBK-217F)
Operating Base Plate Temperature	-40°C to +105°C maximum base temperature
Over Temp. Protection	Shutdown approx 115°C base temperature
Thermal Impedance	6.7°C / watt without heatsink 5.4°C / watt with 0.24" height optional heatsink 4.7°C / watt with 0.45" height optional heatsink
Thermal shock	MIL-STD-810F & EN61373
Vibration	MIL-STD-810F & EN61373
Humidity	5-95% RH
EMC	EN55011, EN55022 Class A (see note 11)
ESD	EN61000-4-2 ±8KV Air ±6KV Contact
Radiated Immunity	EN61000-4-3
Fast Transients	EN61000-4-4
Surge	EN61000-4-5
Conducted Immunity	EN61000-4-6

HAE75W SERIES

DC/DC Converter Single Output: 75 Watts

Model Number	Input Range	Output Voltage	Output Current		Output ^{(3) (4)} Ripple & Noise	No Load ⁽²⁾ Input Current	Eff ⁽³⁾ (%)	Capacitor ⁽⁵⁾ Load max.
			Min. load	Full load				
HAE75-24S3P3WP	9 ~ 36 V	3.3 VDC	0 mA	20 A	75 mVp-p	85mA	87	60600μF
HAE75-24S05WP	9 ~ 36 V	5 VDC	0 mA	15 A	75 mVp-p	120mA	88	30000μF
HAE75-24S12WP	9 ~ 36 V	12 VDC	0 mA	6.3 A	100 mVp-p	185mA	88	5250μF
HAE75-24S15WP	9 ~ 36 V	15 VDC	0 mA	5 A	100 mVp-p	185mA	88	3330μF
HAE75-24S24WP	9 ~ 36 V	24 VDC	0 mA	3.2 A	200 mVp-p	85mA	87	1330μF
HAE75-24S28WP	9 ~ 36 V	28 VDC	0 mA	2.7 A	200 mVp-p	85mA	87	960μF
HAE75-24S48WP	9 ~ 36 V	48 VDC	0 mA	1.6 A	300 mVp-p	85mA	87	330μF
HAE75-48S3P3WP	18 ~ 75 V	3.3 VDC	0 mA	20 A	75 mVp-p	60mA	88	60600μF
HAE75-48S05WP	18 ~ 75 V	5 VDC	0 mA	15 A	75 mVp-p	60mA	90	30000μF
HAE75-48S12WP	18 ~ 75 V	12 VDC	0 mA	6.3 A	100 mVp-p	90mA	90	5250μF
HAE75-48S15WP	18 ~ 75 V	15 VDC	0 mA	5 A	100 mVp-p	50mA	89	3330μF
HAE75-48S24WP	18 ~ 75 V	24 VDC	0 mA	3.2 A	200 mVp-p	50mA	88	1330μF
HAE75-48S28WP	18 ~ 75 V	28 VDC	0 mA	2.7 A	200 mVp-p	50mA	88	960μF
HAE75-48S48WP	18 ~ 75 V	48 VDC	0 mA	1.6 A	300 mVp-p	50mA	87	330μF
HAE75-110S3P3WP	43 ~ 160 V	3.3 VDC	0 mA	20 A	75 mVp-p	25mA	89	60600μF
HAE75-110S05WP	43 ~ 160 V	5 VDC	0 mA	15 A	75 mVp-p	25mA	91	30000μF
HAE75-110S12WP	43 ~ 160 V	12 VDC	0 mA	6.3 A	100 mVp-p	40mA	91	5250μF
HAE75-110S15WP	43 ~ 160 V	15 VDC	0 mA	5 A	100 mVp-p	40mA	91	3330μF
HAE75-110S24WP	43 ~ 160 V	24 VDC	0 mA	3.2 A	200 mVp-p	25mA	90	1330μF
HAE75-110S28WP	43 ~ 160 V	28 VDC	0 mA	2.7 A	200 mVp-p	25mA	90	960μF
HAE75-110S48WP	43 ~ 160 V	48 VDC	0 mA	1.6 A	300 mVp-p	25mA	90	330μF

- a) HAE75-xxxxWP = standard PCB Mounting model b) HAE75-xxxxWPT = standard chassis /panel mount with terminal block model
c) See options table for further options.

Notes:

- BELLCORE TR-NWT-000332. Case 1: 50% Stress, Temperature at 40°C.
MIL-HDBK-217F Notice2 @Ta=25°C, Full load(Ground, Benign, controlled environment).
- Typical value at nominal input and no load.
- Typical value at nominal input and full load.
- The ripple and noise of output voltage 48VDC is measured with a 2.2μF/100V X7R 1812 MLCC,
The ripple and noise of other output voltage is measured with a 4.7μF/50V X7R 1812 MLCC.
- Test by minimum input and constant resistive load.
- The CTRL pin voltage is referenced to -INPUT. The positive logic and pin length are optional.
To order positive logic ON/OFF control add the suffix -P (Ex: HAE75-48S05W-P).
- Output voltage is adjustable for 10% trim up or -20% trim down of nominal output voltage
by connecting a single resistor between TRIM and +SENSE pins for trim up or between
TRIM and -SENSE pins for trim down. To calculate the value of the resistor RU and RD
for a particular output voltage uses the following equation:

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

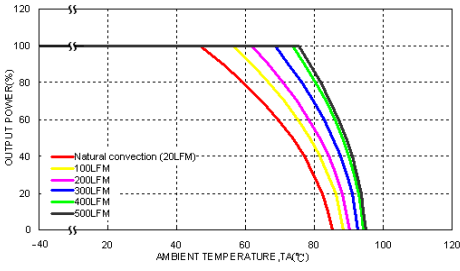
$$R_D = \left(\frac{100}{\Delta\%} - 2 \right) k\Omega$$

- Maximum output deviation is +10% inclusive of remote sense and trim. If remote sense is not being used, the +SENSE should be connected to its corresponding +OUTPUT and likewise the -SENSE should be connected to its corresponding -OUTPUT.
- CAUTION:** This power module is not internally fused. An input line fuse must always be used.
- (1) Test condition with vertical direction by natural convection (20LFM).
(2) Heat-sink is optional and P/N: 7G-0021A-F , 7G-0022A-F , 7G-0023A-F , 7G-0024A-F.
- The HAE75W series meets EN 55022 Class A or Class B only with external components. For more detail information, please contact with P-DUKE.
- An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5.
The HAE75-24SXXW and HAE75-48SXXW recommended 1 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220μF/100V, ESR 48mΩ) to connect in parallel.
The HAE75-110SXXW recommended 3 pcs of aluminum electrolytic capacitor (Ruby-con BXF series, 100μF/250V) to connect in parallel.
- CASE GROUNDING : When connect the case pin and four screw bolts to shield plane, the EMI could be reduced.
- An external input capacitor is recommended for 24VDC input model. P-DUKE suggest: 4.7μF/50V X7R MLCC or Nippon chemi-con KY series, 68μF /100V, ESR 110mΩ or better capacitor. For terminal block version, the capacitor has included in as standard, it isn't required external capacitor.

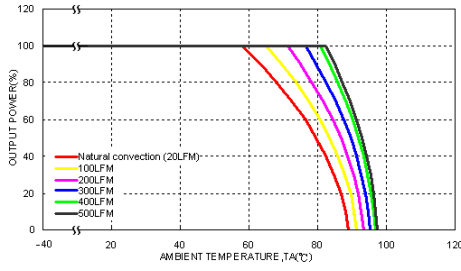
HAE75W SERIES

DC/DC Converter Single Output: 75 Watts

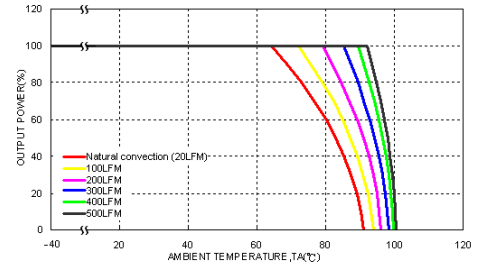
HAE75-48S05W Derating Curve



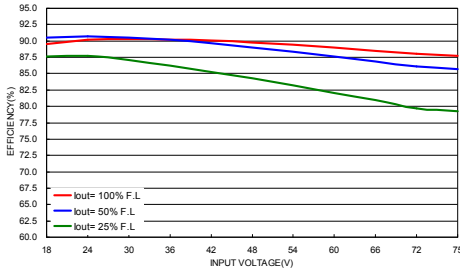
HAE75-48S05W Derating Curve With 0.24" Height Heat-sink (Note10)



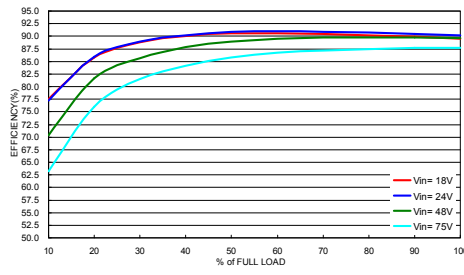
HAE75-48S05W Derating Curve With 0.45" Height Heat-sink (Note10)



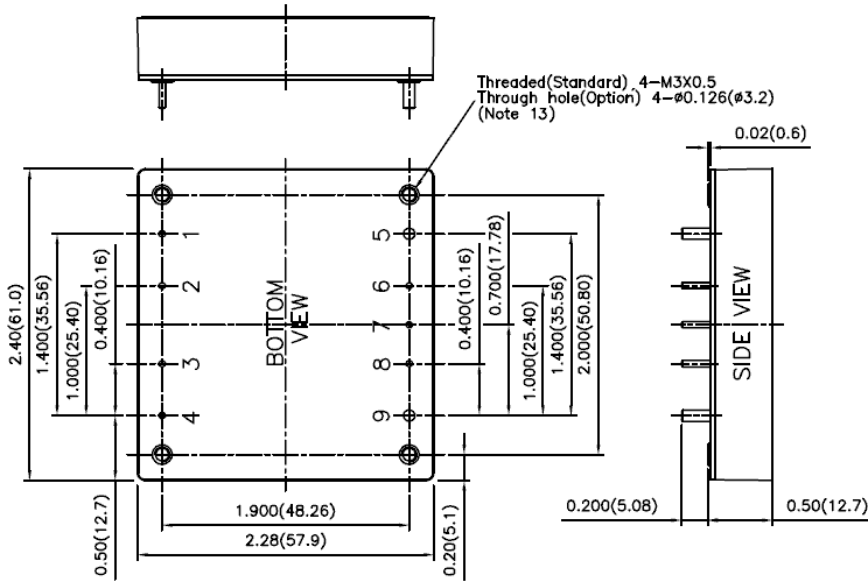
HAE75-48S05W Efficiency VS Input Voltage



HAE75-48S05W Efficiency VS Output Load



Metal case mechanical drawing: (24V & 48V input models)



1. All Dimensions : inches(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)

PIN CONNECTION		
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.

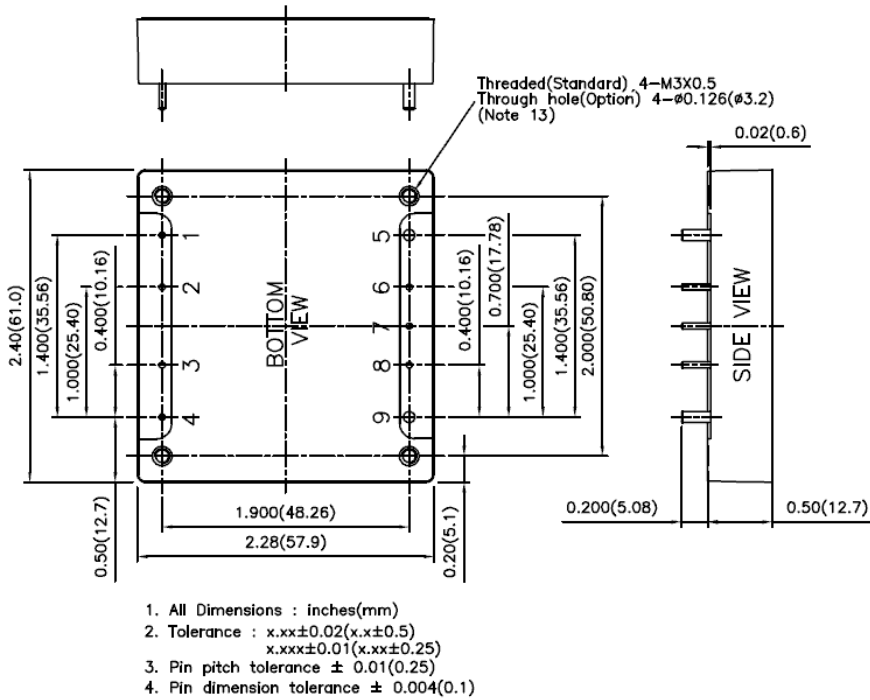
TRIM UP

TRIM DOWN

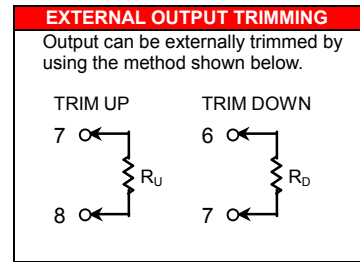
HAE75W SERIES

DC/DC Converter Single Output: 75 Watts

Plastic case mechanical drawing: (110V input models)



PIN CONNECTION		
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

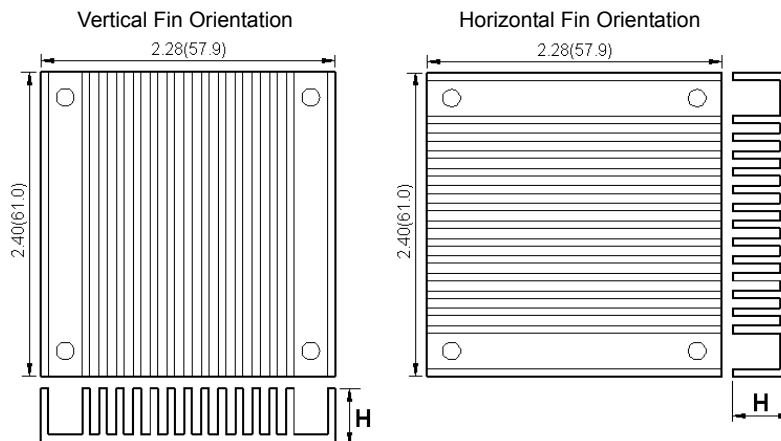


Part number structure:

<u>HAE</u>	<u>75</u>	-	<u>48</u>	<u>S</u>	<u>05</u>	<u>W</u>	-	<u>P</u>	<u>HS</u>
SERIES NAME	Output Power		Input Voltage	Output Quantity	Output Voltage	4:1 Input Range		Remote ON/OFF and pin length Options	Heat-sink Mounting Options
	75Watts		24: 9~36VDC 48:18~75VDC 110:43~160VDC	S: Single	3P3: 3.3VDC 05: 5VDC 12: 12VDC 15: 15VDC 24: 24VDC 28: 28VDC 48: 48VDC			L: Negative logic, 0.145" pin length P: Positive logic, 0.200" pin length S: Positive logic, 0.145" pin length	TH: Through hole type.(no thread) ⁽¹⁾ HS : H=0.45" Vertical, 7G-0021A-F HS1: H=0.24" Horizontal, 7G-0022A-F HS2: H=0.24" Vertical, 7G-0023A-F HS3: H=0.45" Horizontal, 7G-0024A-F T: Terminal block TDR: Terminal block with Din Rail Clip TF: Terminal block with EMC filter TFDR: Terminal block with EMC filter and Din Rail Clip

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

Heat-sink types: Suffix:-HS, -HS1, -HS2, -HS3

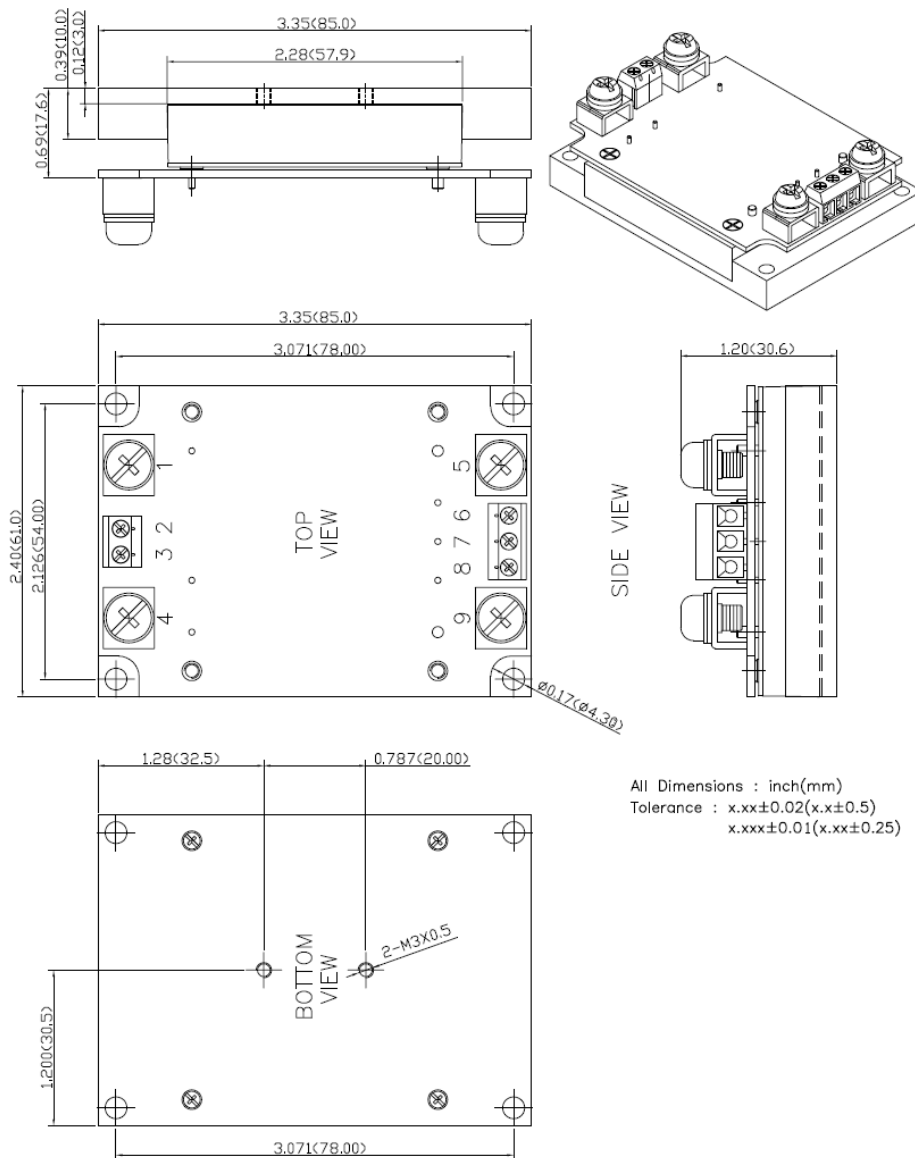


HAE75W SERIES

DC/DC Converter Single Output: 75 Watts

Terminal block type mechanical drawing:

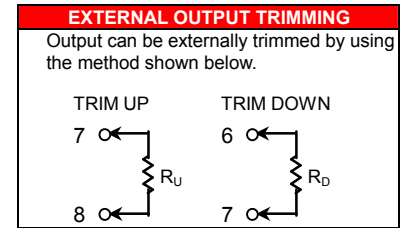
1) Terminal Block without EMC Filter, Suffix: -T (Standard model)



All Dimensions : inch(mm)
Tolerance : x.xx±0.02(x.x±0.5)
x.xxx±0.01(x.xx±0.25)

Note: These two M3×0.5 threaded holes are designed for Din Rail Clip assembly. The depth of heat-sink is allowed to be screwed into 2.8mm maximum. Customer shall take care as select the screw to avoid damaging the converter.

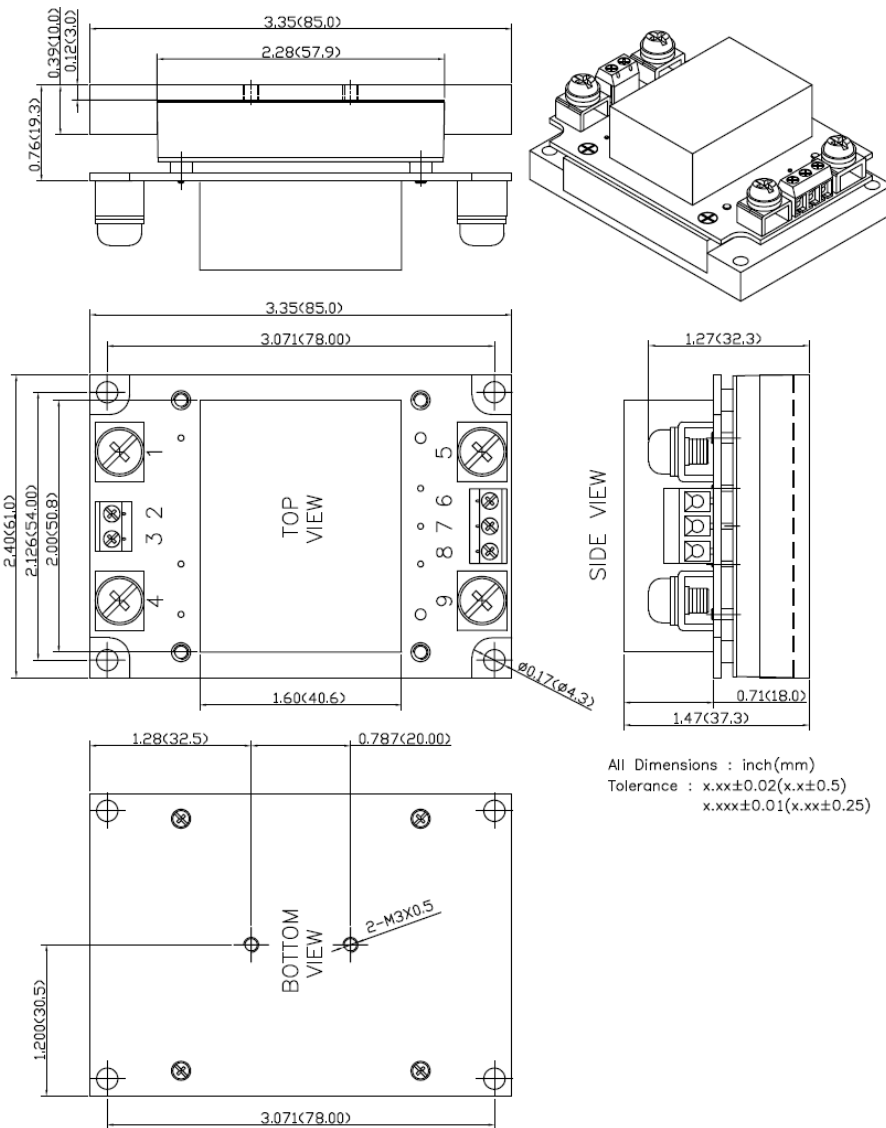
TERMINAL CONNECTION		
Terminal	Define	wire range
1	- INPUT	14 AWG to 16 AWG
2	CASE	14 AWG to 18 AWG
3	CTRL	14 AWG to 18 AWG
4	+ INPUT	14 AWG to 16 AWG
5	- OUTPUT	10 AWG to 12 AWG
6	- SENSE	14 AWG to 18 AWG
7	TRIM	14 AWG to 18 AWG
8	+ SENSE	14 AWG to 18 AWG
9	+ OUTPUT	10 AWG to 12 AWG



HAE75W SERIES

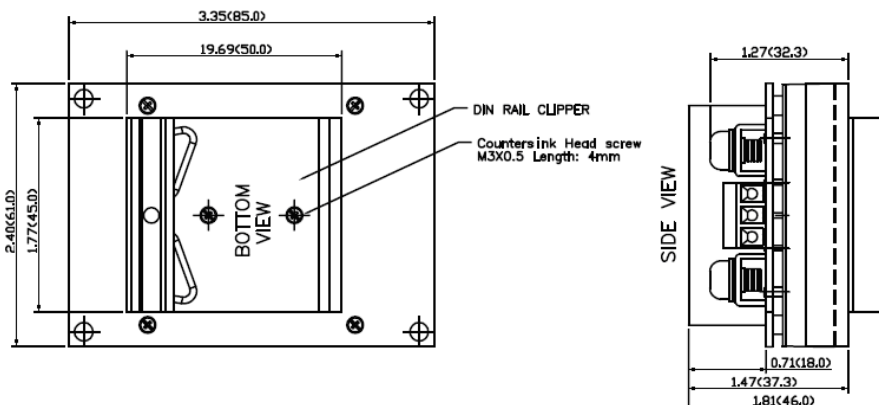
DC / DC Single Output: 75 Watts

2) Terminal Block with EMC Filter (EN55011, EN55022 Class A), Suffix: -TF



Note: These two M3×0.5 threaded holes are designed for Din Rail Clip assembly. The depth of heat-sink is allowed to be screwed into 2.8mm maximum. Customer shall take care as select the screw to avoid damaging the converter.

3) Terminal Block with Din Rail Clip (Suffix -TDR, -TFDR)



TERMINAL CONNECTION		
Terminal	Define	wire range
1	- INPUT	14 AWG to 16 AWG
2	CASE	14 AWG to 18 AWG
3	CTRL	14 AWG to 18 AWG
4	+ INPUT	14 AWG to 16 AWG
5	- OUTPUT	10 AWG to 12 AWG
6	- SENSE	14 AWG to 18 AWG
7	TRIM	14 AWG to 18 AWG
8	+ SENSE	14 AWG to 18 AWG
9	+ OUTPUT	10 AWG to 12 AWG

