

HAE 75W SERIES

DC/DC Power Modules: **75 watts**



PCB Model

Terminal Block Model

Features

- ◆ NO MINIMUM LOAD REQUIRED
- ◆ 3000VAC REINFORCED INSULATION FOR 110VIN
2250VDC BASIC INSULATION FOR 24VIN AND 48VIN
- ◆ UL609 50-1, EN60950 -1, & IEC60950 -1 SAFETY APPROVALS
- ◆ COMPLIANCE TO EN5015 5 AND EN45545 -2 RAILWAY STANDARD
- ◆ CE MARKED
- ◆ COMPLIANT TO RoHS II & REACH

Applications

- ◆ RAILWAY SYSTEM
- ◆ WIRELESS NETWORK
- ◆ TELECOM/DATACOM
- ◆ INDUSTRY CONTROL SYSTEM
- ◆ DISTRIBUTED POWER ARCHITECTURES
- ◆ SEMICONDUCTOR EQUIPMENT

TECHNICAL SPECIFICATION

All specifications are typical at nominal input, full load and 25°C otherwise noted

Model Number	Input Range VDC	Output Voltage VDC	Output Current @Full Load A	Input Current @ No Load mA	Efficiency %	Maximum Cap. Load uF
HAE75 -24S3P3W P	9 ~ 36	3.3	20	85	87	60600
HAE75 -24S 05WP	9 ~ 36	5	15	120	88	30000
HAE75 -24S 12WP	9 ~ 36	12	6.3	185	88	5250
HAE75 -24S 15WP	9 ~ 36	15	5	185	88	3330
HAE75 -24S 24WP	9 ~ 36	24	3.2	85	87	1330
HAE75 -24S28W P	9 ~ 36	28	2.7	85	87	960
HAE75 -24S48W P	9 ~ 36	48	1.6	85	87	330
HAE75 -48S3P3W P	18 ~ 75	3.3	20	60	88	60600
HAE75 -48S 05WP	18 ~ 75	5	15	60	90	30000
HAE75 -48S 12WP	18 ~ 75	12	6.3	90	90	5250
HAE75 -48S 15WP	18 ~ 75	15	5	50	89	3330
HAE75 -48S 24WP	18 ~ 75	24	3.2	50	88	1330
HAE75 -48S28W P	18 ~ 75	28	2.7	50	88	960
HAE75 -48S48W P	18 ~ 75	48	1.6	50	87	330
HAE75 -110S3P3W P	43 ~ 160	3.3	20	10	89	60600
HAE75 -110S 05WP	43 ~ 160	5	15	10	91	30000
HAE75 -110S 12WP	43 ~ 160	12	6.3	10	91	5250
HAE75 -110S 15WP	43 ~ 160	15	5	10	91	3330
HAE75 -110S 24WP	43 ~ 160	24	3.2	10	90	1330
HAE75 -110S28W P	43 ~ 160	28	2.7	10	90	960
HAE75 -110S48W P	43 ~ 160	48	1.6	10	90	330

- "P" indicates Positive Logic
- For terminal block type, add -T to part number (HAE150-48S24W-PT)



PART NUMBER STRUCTURE

Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range	Ctrl and Pin Options	Through hole type ⁽¹⁾	Assembly Option
HAE 75 - 48 S 05 W - P TH HS	24: 9~36 48: 18~75 110: 43~160	S: Single	3P3: 3.3 05: 5 12: 12 15: 15 24: 24 28: 28 48: 48	4:1	□: 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	□: None 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 ⁽²⁾ : T: Wall mounted TF: Wall mounted with EMC filter ⁽³⁾ TF1: Wall mounted with EMC filter can be connected to PE ⁽³⁾

(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 EN55011, EN55022 Class A.

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INPUT SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating input voltage range	24Vin(nom)		9	24	36	VDC
	48Vin(nom)		18	48	75	
	110Vin(nom)		43	110	160	
Start up voltage	24Vin(nom)					9
	48Vin(nom)					18
	110Vin(nom)					43
Shutdown voltage	24Vin(nom)		7.5			VDC
	48Vin(nom)		16			
	110Vin(nom)		36			
Start up time	Constant resistive load	Power up	110Vin(nom)	60		ms
		Remote ON/OFF	Others	25		
Input surge voltage	1 second, max.	24Vin(nom)				50
		48Vin(nom)				100
		110Vin(nom)				185
Input filter ⁽¹⁾			Pi type			
Remote ON/OFF	Referred to -Vin pin	Negative logic (Standard)	DC-DC ON	Short or 0 ~ 1.2VDC		mA
		DC-DC OFF	Open or 3 ~ 12 VDC			
		Positive logic (Option)	DC-DC ON	Open or 3 ~ 12 VDC		
			DC-DC OFF	Short or 0 ~ 1.2VDC		
		Input current of Ctrl pin			-0.5	1
		Remote off input current			3	mA

OUTPUT SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Voltage accuracy			-1.0		+1.0	%
Line regulation	Low Line to High Line at Full Load		-0.1		+0.1	%
Load regulation	No Load to Full Load		-0.1		+0.1	%
Voltage adjustability	Maximum output deviation is inclusive of remote sense		-20		+10	%
Remote sense	% of Vout(nom)					10
	If remote sense is not being used, Sense pins should be connected to corresponding polarity OUTPUT pins.					
Ripple and noise	Measured by 20MHz bandwidth					mVp-p
	With a 4.7 μF/50V X7R MLC	3.3Vout, 5Vout	75	100		
	With a 4.7 μF/50V X7R MLC	12Vout, 15Vout	100	125		
	With a 4.7 μF/50V X7R MLC	24Vout, 28Vout	200	250		
	With a 2.2 μF/100V X7R MLC	48Vout	300	350		
Temperature coefficient			-0.02		+0.02	%/°C
Transient response recovery time	25% load step change			200	250	μs
Over voltage protection	% of Vout(nom); Hiccup mode		115		130	%
Over load protection	% of Iout rated; Hiccup mode	110Vin(nom)		150		%
		Others	110		140	
Short circuit protection			Continuous, automatic recovery			

GENERAL SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Isolation voltage	1 minute (Reinforced insulation)	110Vin(nom)	3000			VAC
	1 minute (Basic insulation)	Others	2250			VDC
Isolation resistance	500VDC		1			GΩ
Isolation capacitance			2500			pF
Switching frequency			270	300	330	kHz
Safety approvals			UL60950 -1 EN60950 -1 IEC60950 -1			
Case material	24Vin(nom) and 48Vin(nom) 110Vin(nom)		Aluminum base -plate with plastic case			Metal
Base material	24Vin(nom) and 48Vin(nom)		FR4			PCB
Potting material			Silicone (UL94 V-0)			
Weight	Module stand alone		97g (3.42oz)			
	HAE75 -□□S□□W -T		200g (7.05oz)			
	HAE75 -□□S□□W -TF		280g (9.88oz)			
	HAE75 -□□S□□W -TF1		287g (10.12oz)			
MTBF	MIL-HDBK -217F, Full load		3.362 × 10 ⁵ hrs			

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ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating case temperature	Base -plate	-40		+105	°C
Over temperature protection			+115		°C
Storage temperature range	Terminal block type Others	-40 -55		+105 +125	°C
Thermal impedance (2)	Vertical direction by natural convection (20LFM) Module without assembly option Heat-sink type with 0.24" Height Heat-sink type with 0.45" Height		6.7 5.4 4.7		°C/W
Thermal shock					MIL-STD -810F
Shock					EN61373, MIL-STD -810F
Vibration					EN61373, MIL-STD -810F
Relative humidity					5% to 95% RH

EMC SPECIFICATIONS

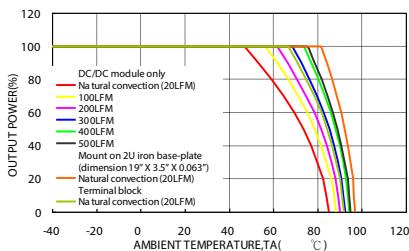
Parameter	Conditions	Level
EMI (3)	EN55011, EN55022	Class A Class B
ESD	EN61000 -4-2 Air ±8kV and Contact ±6kV	Perf. Criteria A
Radiated immunity	EN61000 -4-3 20V/m	Perf. Criteria A
Fast transient (4)	EN61000 -4-4 ±2kV	Perf. Criteria A
Surge (4)	EN61000 -4-5 EN55024 ±2kV and EN50155 ±2kV	Perf. Criteria A
Conducted immunity	EN61000 -4-6 10Vr.m.s	Perf. Criteria A
Power frequency magnetic field	EN61000 -4-8 100A/m continuous; 1000A/m 1 second	Perf. Criteria A

Notes:

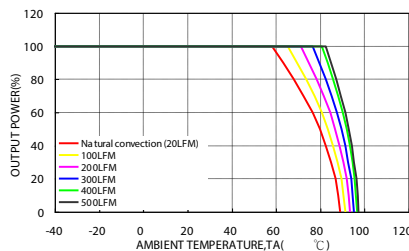
- Input source impedance: The power module will operate as specifications without external components, assuming that the source voltage has a very low impedance and reasonable input voltage regulation. Highly inductive source impedances can affect the stability of the power module. Since real-world voltage source has finite impedance, performance can be improved by adding external filter capacitor. The HAE75 -24S □□W recommended 4.7µF/50V X7R MLCC or Nippon Chemi-con KY series, 68µF/100V or better capacitor.
- (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 standard module meets EMI Class A or Class B with external components. For further 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 -24S □□W and HAE75 -48S □□W recommended 2 pcs of aluminum electrolytic capacitor (Nippon Chemi-con KY series, 220µF/100V) to connect in parallel.
The HAE75 -110S □□W recommended 2 pcs of aluminum electrolytic capacitor (Nippon Chemi-con KXJ series, 150µF/200V) to connect in parallel.
- CASE GROUNDING: Connecting four screw bolts to shield plane will help to reduce the EMI.
- For further information, please contact with P-DUKE.

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

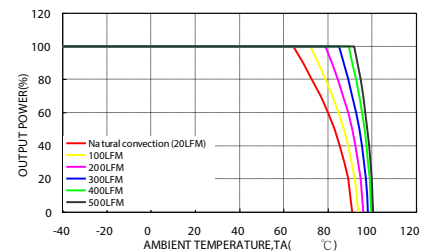
CHARACTERISTIC CURVE



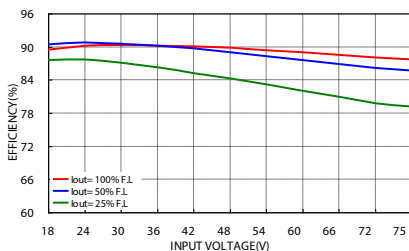
HAE75 -48S05 W Derating Curve (Note 2)



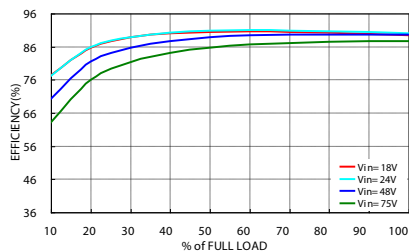
HAE75 -48S05 W Derating Curve (Note 2)
With 0.24" Height Heat -sink



HAE75 -48S05 W Derating Curve (Note 2)
With 0.45" Height Heat -sink



HAE75 -48S05 W Efficiency vs. Input Voltage



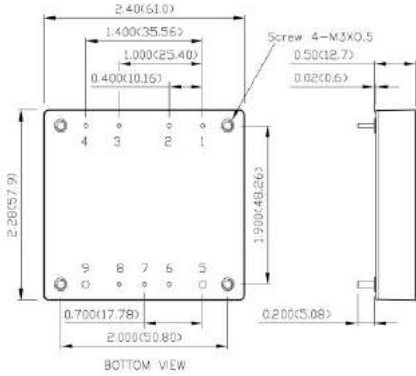
HAE75 -48S05 W Efficiency vs. Output Load

HAE+) W SERIES

DC/DC Power Modules: +) watts

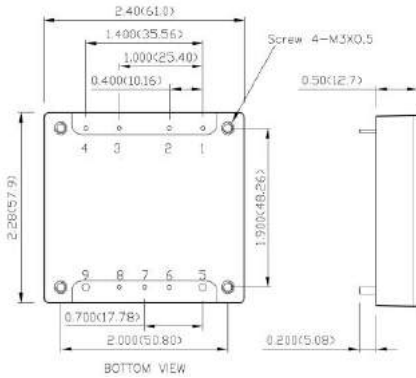
MECHANICAL DRAWINGS - PCB Mounting

HAE75-24S□□W, HAE75-48S□□W



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)
5. Mounting screws should always be used.
6. The screw locked torque:
MAX 5.0kgf-cm(0.49N-m)

HAE75-110S□□W



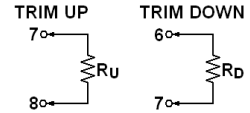
1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5)
x.xxx±0.01 (x.xx±0.25)
3. Pin pitch tolerance ±0.01 (0.25)
4. Pin dimension tolerance ±0.004(0.1)
5. Mounting screws should always be used.
6. The screw locked torque:
MAX 3.5kgf-cm(0.34N-m)

PIN CONNECTION

PIN	DEFINE	DIAMETER
1	-Vin	0.04 Inch
2	Case	0.04 Inch
3	Ctrl	0.04 Inch
4	+Vin	0.04 Inch
5	-Vout	0.08 Inch
6	-Sense	0.04 Inch
7	Trim	0.04 Inch
8	+Sense	0.04 Inch
9	+Vout	0.08 Inch

EXTERNAL OUTPUT TRIMMING

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

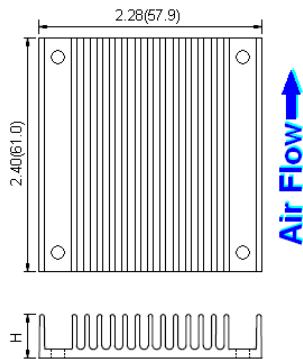


$$R_U = \left(\frac{V_{OUT}(100 + \Delta\%) - (100 + 2\Delta\%)}{1.225\Delta\%} \right) k\Omega$$

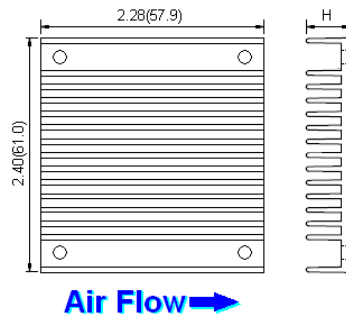
$$R_D = \left(\frac{100}{\Delta\%} - 2 \right) k\Omega$$

HEAT-SINK TYPE OPTIONS

Vertical Fin Orientation, Suffix:-HS, -HS2



Horizontal Fin Orientation, Suffix:-HS1, -HS3



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

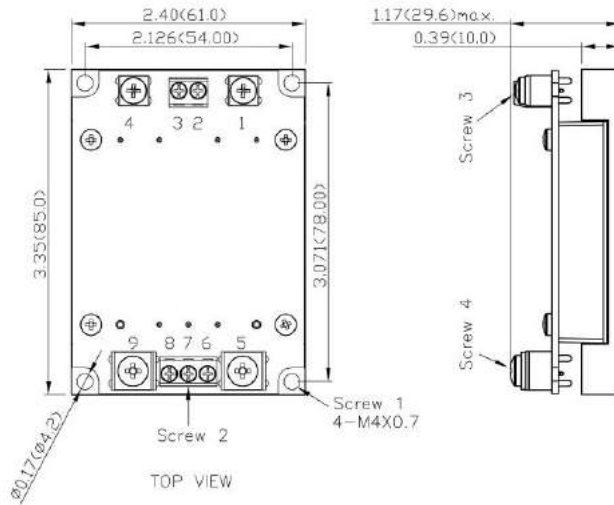
1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5)
x.xxx±0.01 (x.xx±0.25)

HAE+) W SERIES

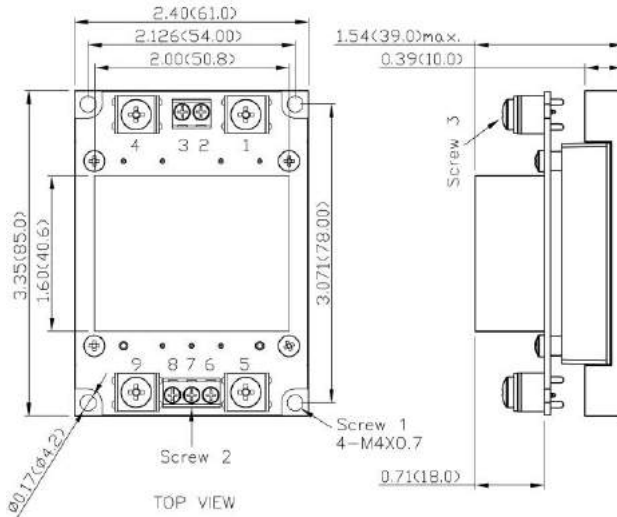
DC/DC Power Modules: +) watts

TERMINAL BLOCK TYPE OPTIONG

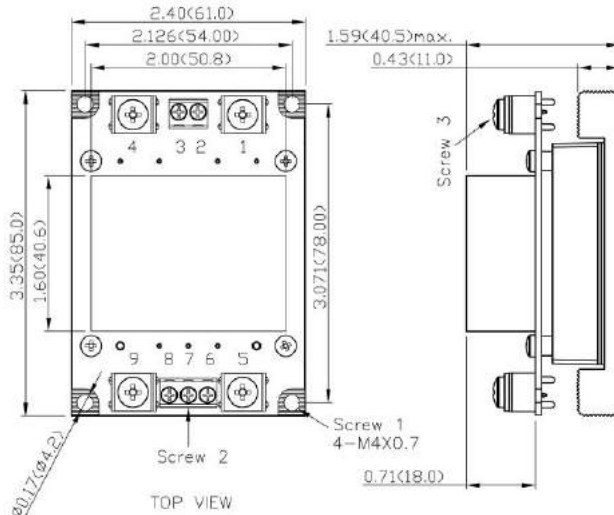
HAE75-□□S□□W-T`fiGhUxUX`HYfa`jbu`6`cW`L`



HAE75-□□S□□W-TF`fiHYfa`jbu`6`cW`k`jH`:`jHYf`L`



HAE75-□□S□□W-TF1`fiHYfa`jbu`6`cW`k`jH`:`jHYf`bc`75`G9`W`bYbW`jcb`L`

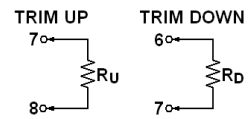


TERMINAL CONNECTION : -T,-TF

NO.	DEFINE
1	-Vin
2	Case
3	Ctrl
4	+Vin
5	-Vout
6	-Sense
7	Trim
8	+Sense
9	+Vout

EXTERNAL OUTPUT TRIMMING

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



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

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

- All dimensions in inch (mm)
- Tolerance :x.xx±0.02 (x.x±0.5)
x.xxx±0.01 (x.xx±0.25)
- Screw 1 locked torque:
MAX 11.2kgf-cm/ 1.10N-m
- Screw 2 locked torque:
MAX 5.2kgf-cm/ 0.51N-m
- Screw 3, 4 locked torque:
MAX 12.0kgf-cm/ 1.18N-m

TERMINAL CONNECTION : -TF1

NO.	DEFINE
1	-Vin
2	NC
3	Ctrl
4	+Vin
5	-Vout
6	-Sense
7	Trim
8	+Sense
9	+Vout