POWER MATE TECHNOLOGY CO., LTD.

HAE100 SERIES

HALF-BRICK DC-DC CONVERTER

2:1 WIDE INPUT RANGE
UP TO 100 Watts



FEATURES

- NO MINIMUM LOAD REQUIRED
- SOFT-START
- 2250VDC INPUT TO OUTPUT BASIC INSULATION
- SAFETY MEETS UL60950-1, EN60950-1, IEC60950-1 AND EN50155
- CE MARK MEETS 2006/95/EC, 2011/95/EC AND 2004/108/EC
- COMPLIANT TO RoHS EU DIRECTIVE 2011/65/EU

APPLICATIONS

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

2250VDC ISOLATION	REMOTE CONTROL	UVP	OCP	SCP	OVP	OTP

TECHNICAL SPECIFICATION All specifications are typical at nominal input, full load and 25℃ otherwise noted

Model Number	Input Range VDC	Output Voltage VDC	Output Current @Full Load A	Input Current @ No Load mA	Efficiency %	Maximum Capacitor Load µF
HAE100-12S3P3	9 ~ 18	3.3	25	155	90	75700
HAE100-12S05	9 ~ 18	5	20	150	91	40000
HAE100-12S12	9 ~ 18	12	8.4	180	91	7000
HAE100-12S15	9 ~ 18	15	6.7	180	91	4460
HAE100-12S24	9 ~ 18	24	4.2	90	90	1750
HAE100-12S28	9 ~ 18	28	3.6	100	90	1280
HAE100-12S48	9 ~ 18	48	2.1	100	90	430
HAE100-24S3P3	18 ~ 36	3.3	25	90	91	75700
HAE100-24S05	18 ~ 36	5	20	150	93	40000
HAE100-24S12	18 ~ 36	12	8.4	185	93	7000
HAE100-24S15	18 ~ 36	15	6.7	185	93	4460
HAE100-24S24	18 ~ 36	24	4.2	85	92	1750
HAE100-24S28	18 ~ 36	28	3.6	85	92	1280
HAE100-24S48	18 ~ 36	48	2.1	85	92	430
HAE100-48S3P3	36 ~ 75	3.3	25	80	91	75700
HAE100-48S05	36 ~ 75	5	20	90	93	40000
HAE100-48S12	36 ~ 75	12	8.4	90	93	7000
HAE100-48S15	36 ~ 75	15	6.7	90	93	4460
HAE100-48S24	36 ~ 75	24	4.2	40	92	1750
HAE100-48S28	36 ~ 75	28	3.6	40	92	1280
HAE100-48S48	36 ~ 75	48	2.1	40	92	430

PART NUMBER STRUCTURE

HAE100- 48 S 05 - P TH HS

Series Name

Input Voltage (VDC)
12:9~18
24:18~36
48:36~75

Output Quantity
S:Single

Output Voltage (VDC)
3P3:3.3
05:5
12:12
15:15
24:24
28:28
48:48

Ctrl and Pin Options
□: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

Through hole type(1)
□: Thread
TH: No thread

Assembly Option
□: No Heat-sink
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 EN55022 Class A.

INPUT SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating input voltage range		12Vin(nom)	9	12	18	VDC
		24Vin(nom)	18	24	36	
		48Vin(nom)	36	48	75	
Start up voltage		12Vin(nom)			9	VDC
		24Vin(nom)			18	
		48Vin(nom)			36	
Shutdown voltage		12Vin(nom)		7.5		VDC
		24Vin(nom)		16		
		48Vin(nom)		34		
Start up time	Constant resistive load	Power up		25		ms
		Remote ON/OFF		25		
Input surge voltage	100m second, max.	12Vin(nom)			36	VDC
		24Vin(nom)			50	
		48Vin(nom)			100	
Input filter				Pi type		
Remote ON/OFF	Referenced to –INPUT pin	Negative logic (Standard) DC-DC ON		Short or 0 ~ 1.2VDC		
		Negative logic (Standard) DC-DC OFF		Open or 3 ~ 12 VDC		
		Positive logic (Option) DC-DC ON		Open or 3 ~ 12 VDC		
		Positive logic (Option) DC-DC OFF		Short or 0 ~ 1.2VDC		
		Input current of CTRL pin	-0.5		1	mA
		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) If remote sense is not being used, SENSE pins should be connected to corresponding polarity OUTPUT pins.				10	%
Ripple and noise	Measured by 20MHz bandwidth					
	With a 4.7μF/50V X7R MLCC	3.3Vout, 5Vout		75		mVp-p
	With a 4.7μF/50V X7R MLCC	12Vout, 15Vout		100		
	With a 4.7μF/50V X7R MLCC	24Vout, 28Vout		200		
	With a 2.2μF/100V X7R MLCC	48Vout		300		
Temperature coefficient			-0.02		+0.02	%/℃
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		110		140	%
Short circuit protection				Continuous, automatics recovery		

GENERAL SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Isolation voltage	1 minute (Basic insulation)	Input to Output	2250			VDC
		Input (Output) to Case	1600			
Isolation resistance	500VDC		1			GΩ
Isolation capacitance					2500	pF
Switching frequency			270	300	330	kHz
Design meet safety standard				IEC60950-1, UL60950-1, EN60950-1		
Case material						Metal
Base material						FR4 PCB
Potting material						Silicon (UL94-V0)
Dimensions						2.40×2.28×0.50 Inch (61.0×57.9×12.7 mm)
Weight						97g (3.42oz)
MTBF	BELLCORE TR-NWT-000332 Case 1: 50% Stress, Ta= 40℃. MIL-HDBK-217F Ta=25℃, Full load (G/B, controlled environment)					1.010×10^6 hrs 7.416×10^4 hrs

ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating case temperature		-40		+105	℃
Over temperature protection			+115		℃
Storage temperature range	Terminal block type Others	-40 -55		+105 +125	℃
Thermal impedance (1)	Vertical direction by natural convection (20LFM) Module w/o assembly option Heat-sink type with 0.24" Height Heat-sink type with 0.45" Height		6.7 5.4 4.7		℃/W
Thermal shock				MIL-STD-810F	
Vibration				MIL-STD-810F	
Relative humidity				5% to 95% RH	

EMC SPECIFICATIONS

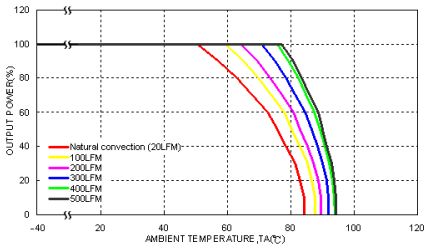
Parameter	Conditions		Level
EMI (2)	EN55022	Standard	Class A Class B
		Option TF or TF1	Class A
ESD	EN61000-4-2	Air ±8kV and Contact ±6kV	Perf. Criteria A
Radiated immunity	EN61000-4-3	10V/m	Perf. Criteria A
Fast transient (3)	EN61000-4-4	±2kV	Perf. Criteria A
Surge (3)	EN61000-4-5	EN55024 ±2kV	Perf. Criteria A
Conducted immunity	EN61000-4-6	10Vr.m.s	Perf. Criteria A

Note:

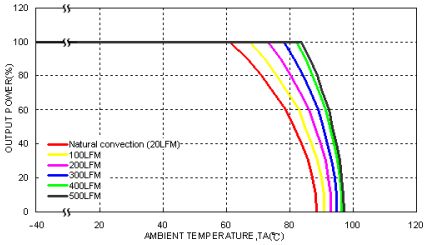
1. (1)Thermal test condition with vertical direction by natural convection (20LFM).
   (2) The heat-sink is optional and P/N: 7G-0021A-F , 7G-0022A-F , 7G-0023A-F , 7G-0024A-F. Please refer to heat-sink selection guide.
2. The HAE100 series standard module meets EN55022 Class A and Class B with external components.
   For more detail information, please contact with P-DUKE.
3. 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.
4. CASE GROUNDING：When connect four screw bolts to shield plane, the EMI could be reduced.

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

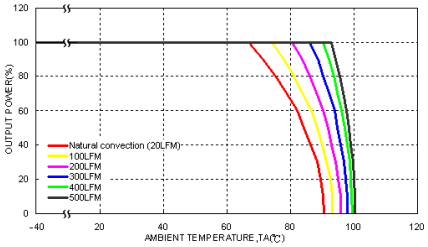
CHARACTERISTIC CURVE



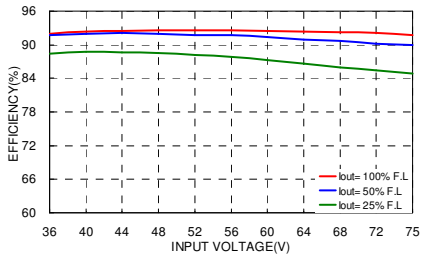
HAE100-48S05 Derating Curve (Note 1)



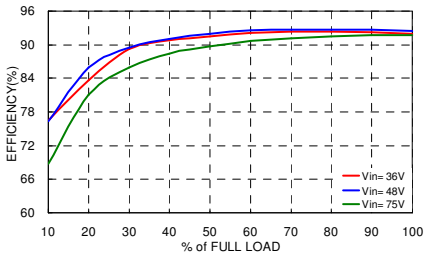
HAE100-48S05 Derating Curve (Note 1)
With 0.24” Height Heat-sink



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



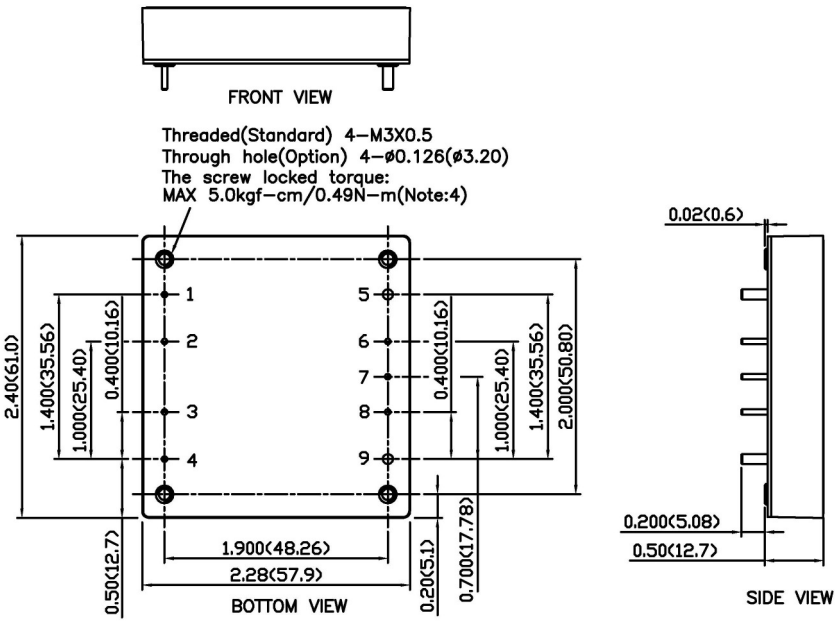
HAE100-48S05 Efficiency VS Input Voltage



HAE100-48S05 Efficiency VS Output Load

MECHANICAL DRAWING

Metal case mechanical drawing:

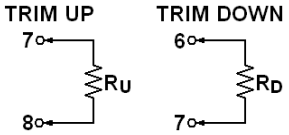


PIN CONNECTION

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.



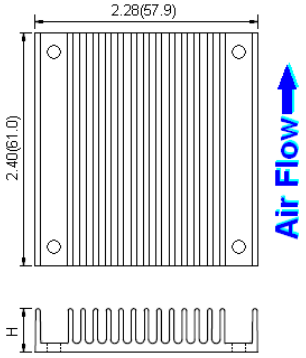
$$R_U = \left(\frac{V_{OUT}\ (100\ + \Delta\%)}{1.225\ \Delta\%} - \frac{(100\ + 2\Delta\%)}{\Delta\%} \right) k\Omega$$

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

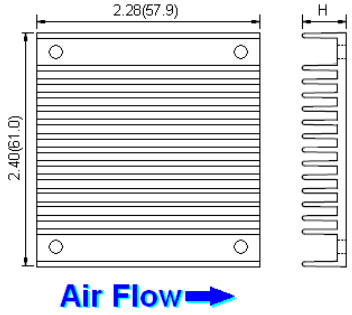
1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5)
   x.xxx±0.01 (x.xx±0.25)
3. Pin pitch tolerance ±0.01 (0.25)
4. Pin dimension tolerance ±0.004(0.1)

HEAT-SINK TYPE OPTIONS

Vertical Fin Orientation, Suffix:-HS, -HS2



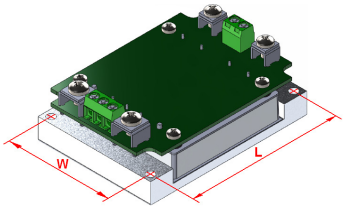
Horizontal Fin Orientation, Suffix:-HS1, -HS3



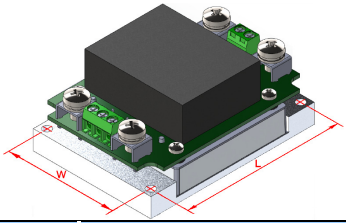
1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5)
   x.xxx±0.01 (x.xx±0.25)

TERMINAL BLOCK TYPE OPTION

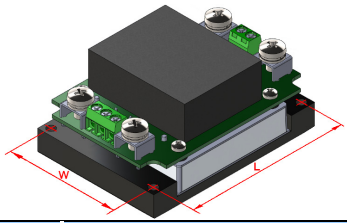
Wall mounted, Suffix: -T



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-ϕ 0.17 inch (ϕ 4.3mm)		

For more detail information, please contact with P-DUKE.