



P-DUKE POWER

QAE100 Series

Quarter-Brick DC-DC Converter
Up to 108 Watts

3
YEARS
WARRANTY

ROHS
COMPLIANT

REACH
COMPLIANT



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



Railway



2250
VDC
Basic
Insulation

2 : 1
Input
Range

NO
Min. Load
Required

LOW
Standby
Power

REMOTE
ON
OFF

OCP

OTP

OVP

SCP

UVP

PART NUMBER STRUCTURE

QAE100 -	48	S	05	-	P	HS
Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Ctrl and Pin Options		Assembly Option
	12: 8.5~22 24: 16.5~36 48: 33~75	S:Single	3P3:3.3 05:05 12:12 15:15 24:24 30:30 48:48	□:Negative logic P:Positive logic	□: None HS:7G-0029B-F;H=0.24" HS1:7G-0030B-F;H=0.5" HS2:7G-0031B-F;H=0.24" HS3:7G-0032B-F;H=0.5" TH:Through hole (No thread)	

* The module can't equip Heat-sink with TH option.

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

Model Number	Input Range	Output Voltage	Output Current @Full Load	Input Current @ No Load	Efficiency	Maximum Capacitor Load
	VDC	VDC	A	mA	%	μF
QAE100-12S3P3	8.5 ~ 22	3.3	25	50	89	75000
QAE100-12S05	8.5 ~ 22	5	18	50	90	36000
QAE100-12S12	8.5 ~ 22	12	7.5	50	91	6250
QAE100-12S15	8.5 ~ 22	15	6	50	91	4000
QAE100-12S24	8.5 ~ 22	24	3.7	50	90	1540
QAE100-12S30	8.5 ~ 22	30	3	50	90	1000
QAE100-12S48	8.5 ~ 22	48	1.8	50	89	380
QAE100-24S3P3	16.5 ~ 36	3.3	25	25	89	75000
QAE100-24S05	16.5 ~ 36	5	18	25	90	36000
QAE100-24S12	16.5 ~ 36	12	7.5	25	91	6250
QAE100-24S15	16.5 ~ 36	15	6	25	91	4000
QAE100-24S24	16.5 ~ 36	24	3.7	25	92	1540
QAE100-24S30	16.5 ~ 36	30	3	25	91	1000
QAE100-24S48	16.5 ~ 36	48	1.8	25	89	380
QAE100-48S3P3	33 ~ 75	3.3	25	15	89	75000
QAE100-48S05	33 ~ 75	5	21	15	91	42000
QAE100-48S12	33 ~ 75	12	9	15	90	7500
QAE100-48S15	33 ~ 75	15	7	15	91	4600
QAE100-48S24	33 ~ 75	24	4.5	15	93	1870
QAE100-48S30	33 ~ 75	30	3.5	15	92	1160
QAE100-48S48	33 ~ 75	48	2.2	15	91	460

INPUT SPECIFICATIONS						
Parameter	Conditions			Min.	Typ.	Max. Unit
Operating input voltage range	12Vin(nom)			8.5	12	22
	24Vin(nom)			16.5	24	36
	48Vin(nom)			33	48	75
Start up voltage	12Vin(nom)					9
	24Vin(nom)					18
	48Vin(nom)					36
Shutdown voltage	12Vin(nom)			7.3	7.7	8.1
	24Vin(nom)			15.5	15.9	16.3
	48Vin(nom)			31.6	32	32.5
Start up time	Constant resistive load	Power up			75	100
		Remote ON/OFF			75	100
Input surge voltage	1 second, max.	12Vin(nom)				30
		24Vin(nom)				50
		48Vin(nom)				100
Input filter (1)				Pi type		
Remote ON/OFF	Referred to -Vin pin	Negative logic (Standard)	DC-DC ON	Short or 0 ~ 1.2 VDC		
			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 ~ 1.2 VDC		
		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	-0.2		+0.2	%
	3.3 & 5Vout Others	-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 connect to the output pins with the same polarity.			10	%
Ripple and noise	Measured by 20MHz bandwidth		75		mVp-p
	With a 22μF/25V X7R MLCC		100		
	With a 22μF/25V X7R MLCC		200		
	With a 4.7μF/50V X7R MLCC		300		
	With a 2.2μF/100V X7R MLCC		48Vout		
Temperature coefficient		-0.02		+0.02	%/°C
Transient response recovery time	25% load step change		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, automatic recovery			

GENERAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation voltage	1 minute (Basic insulation) Input to Output Input (Output) to Base-Plate	2250 2250			VDC
Isolation resistance	500VDC	1			GΩ
Isolation capacitance				1500	pF
Switching frequency		270	300	330	kHz
Safety approvals	IEC/ EN/ UL 62368-1			UL:E193009 CB:UL(Demko)	
Case material		Aluminum base-plate with plastic case			
Potting material		Silicone (UL94 V-0)			
Weight		64g (2.26oz)			
MTBF	MIL-HDBK-217F, Full load	3.873 x 10 ⁵ hrs			

ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating base-plate temperature		-40		+105	°C
Maximum case temperature				105	°C
Over temperature protection			110		°C
Storage temperature range		-55		+125	°C
Thermal impedance	Without Heat-sink		9		°C/W
	Mount on 2U iron base-plate		2.8		
	With 0.24" Height Heat-sink		7.1		
	With 0.5" Height Heat-sink		5.5		
Thermal shock				MIL-STD-810F	
Vibration				MIL-STD-810F	
Relative humidity				5% to 95% RH	

EMC SPECIFICATIONS

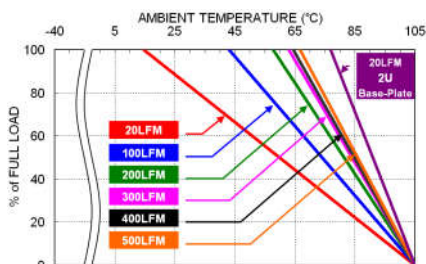
Parameter	Conditions	Level
EMI	EN55032	With external components
EMS	EN55024	
ESD	EN61000-4-2	Air $\pm 8\text{kV}$ and Contact $\pm 6\text{kV}$
Radiated immunity	EN61000-4-3	20 V/m
Fast transient	EN61000-4-4	$\pm 2\text{kV}$
Surge	EN61000-4-5	With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220 $\mu\text{F}/100\text{V}$) EN55024: $\pm 2\text{kV}$
Conducted immunity	EN61000-4-6	10 Vr.m.s
Power frequency magnetic field	EN61000-4-8	100A/m continuous; 1000A/m 1 second

Note:

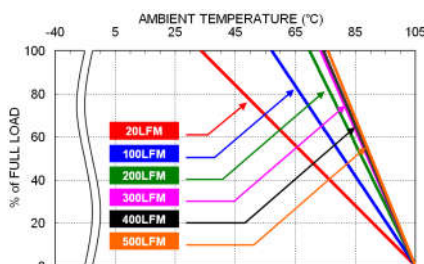
- Input source impedance: The power modules will operate as specifications without external components, assuming that the source voltage has a very low impedance and reasonable input voltage regulation. Highly inductive source impedances can affect the stability of the power module. Since real-world voltage source has finite impedance, performance can be improved by adding external filter capacitor. Recommended Nippon Chemi-con KY series, 100 $\mu\text{F}/100\text{V}$.
- BASE-PLATE GROUNDING: When connect two 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.

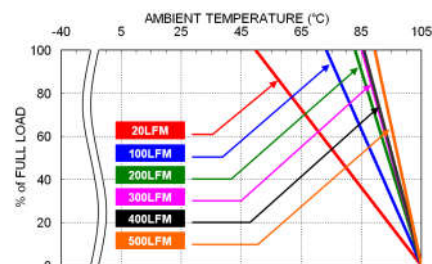
CHARACTERISTIC CURVE



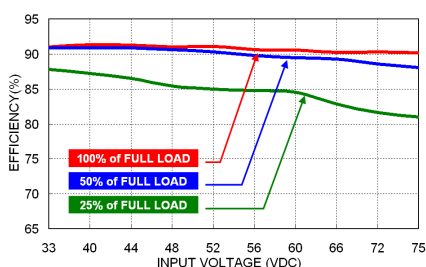
QAE100-48S05 Derating Curve



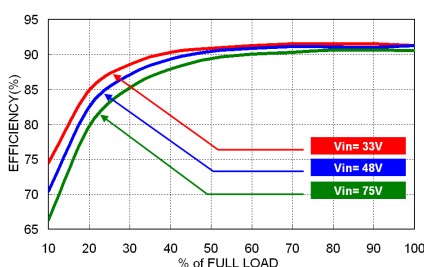
QAE100-48S05 Derating Curve
With 0.24" Height Heat-sink



QAE100-48S05 Derating Curve
With 0.5" Height Heat-sink



QAE100-48S05 Efficiency vs. Input Voltage



QAE100-48S05 Efficiency vs. Output Load

FUSE CONSIDERATION

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

This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.

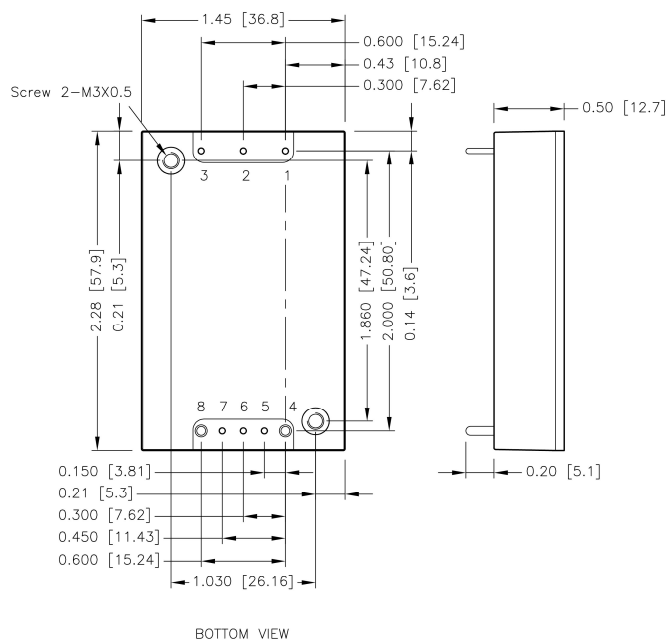
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below :

Model	Fuse Rating (A)	Fuse Type
QAE100-12S□□	20	Fast-Acting
QAE100-24S□□	10	Fast-Acting
QAE100-48S□□	6.3	Slow-Blow

The table based on the information provided in this data sheet on inrush energy and maximum DC input current at low Vin.

MECHANICAL DRAWING

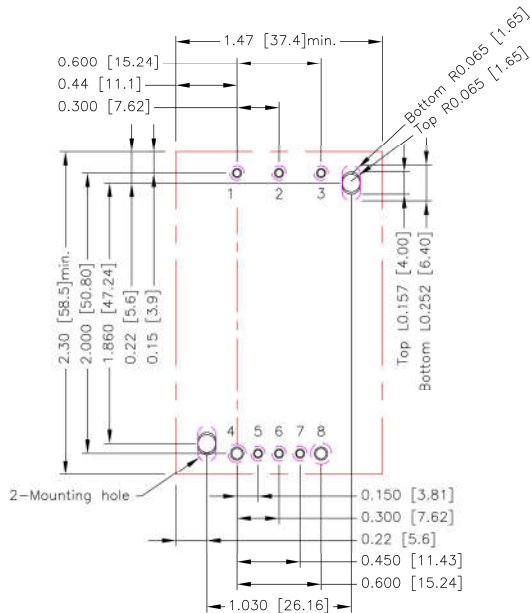


PIN CONNECTION

PIN	DEFINE	DIAMETER
1	- Vin	0.04 Inch
2	Ctrl	0.04 Inch
3	+ Vin	0.04 Inch
4	- Vout	0.06 Inch
5	- Sense	0.04 Inch
6	Trim	0.04 Inch
7	+ Sense	0.04 Inch
8	+ Vout	0.06 Inch

1. All dimensions in inch [mm]
2. Tolerance :x.xx±0.02 [x.x±0.5]
x.xxx±0.010 [x.xx±0.25]
3. Pin dimension tolerance ±0.004[0.10]
4. The screw locked torque:MAX 3.5kgf-cm [0.34N-m]

RECOMMENDED PAD LAYOUT



All dimensions in inch[mm]

Pad size(lead free recommended)

Through hole 1.2.3.5.6.7: $\varnothing 0.051[1.30]$

Through hole 4.8: $\varnothing 0.075[1.90]$

Through hole of mounting: $\varnothing 0.126[3.20]$

Top view pad 1.2.3.5.6.7: $\varnothing 0.064[1.63]$

Top view pad 4.8: $\varnothing 0.094[2.38]$

Top view pad of mounting: Groove R0.065[1.65]L0.157[4.00]

Bottom view pad 1.2.3.5.6.7: $\varnothing 0.102[2.60]$

Bottom view pad 8: $\varnothing 0.150[3.80]$

Bottom view pad 4: $\varnothing 0.130[3.30]$

Bottom view pad of mounting: Groove R0.065[1.65]L0.252[6.40]

THERMAL CONSIDERATIONS

The power module operates in a variety of thermal environments.

However, sufficient cooling should be provided to help ensure reliable operation of the unit.

Heat is removed by conduction, convection, and radiation to the surrounding Environment.

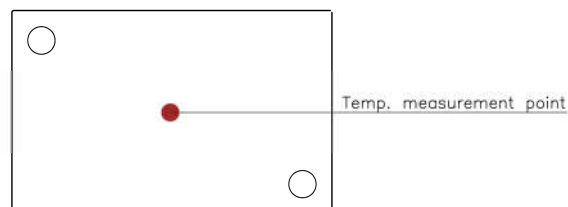
Proper cooling can be verified by measuring the point as the figure below.

The temperature at this location should not exceed "Maximum case temperature".

When Operating, adequate cooling must be provided to maintain the test point temperature at or below "Maximum case temperature".

You can limit this Temperature to a lower value for extremely high reliability.

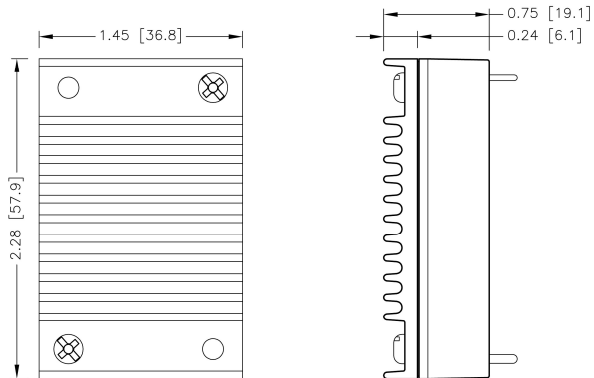
- Thermal test condition with vertical direction by natural convection (20LFM).
- The iron base-plate dimension is 19" X 3.5" X 0.063" (The height is EIA standard 2U).
- The heat-sink is optional and P/N: 7G-0029B-F, 7G-0030B-F, 7G-0031B-F, 7G-0032B-F



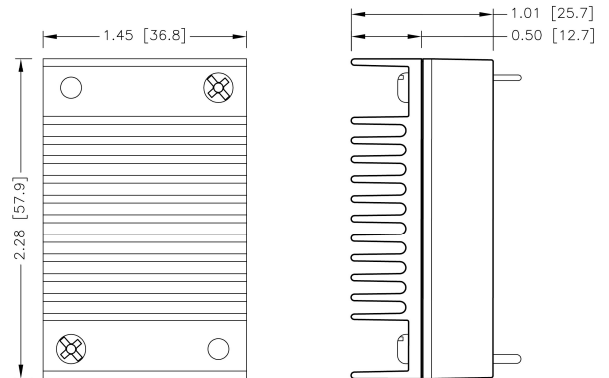
BASE PLATE

HEAT-SINK TYPE OPTIONS

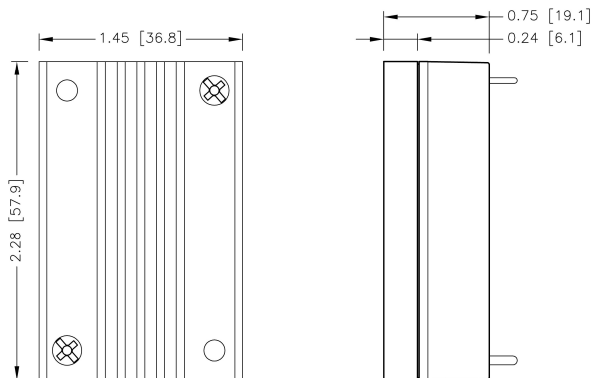
QAE100-□□S□□ -HS
7G-0029B-F



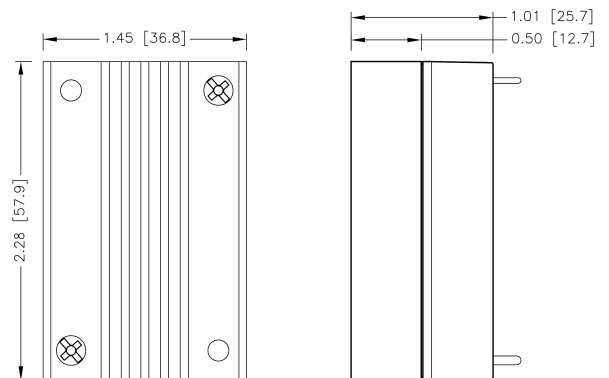
QAE100-□□S□□ -HS1
7G-0030B-F



QAE100-□□S□□ -HS2
7G-0031B-F



QAE100-□□S□□ -HS3
7G-0032B-F



1. All dimensions in inch [mm]
2. Tolerance :x.xx±0.02 [x.x±0.5]

OUTPUT VOLTAGE ADJUSTMENT

Output voltage is adjustable for 10% trim up or -20% trim down of nominal output voltage by connecting an external resistor between the Trim pin and either the +Sense or -Sense pins.

With an external resistor between the Trim and -Sense pin, the output voltage set point decreases.

With an external resistor between the Trim and +Sense pin, the output voltage set point increases.

Maximum output deviation is +10% inclusive of remote sense.

The external Trim resistor needs to be at least 1/8W of rated power.

Trim Up Equation

$$R_U = \left(\frac{5.11V_{OUT}(100 + \Delta\%)}{1.225\Delta\%} - \frac{511 + 10.22\Delta\%}{\Delta\%} \right) k\Omega$$

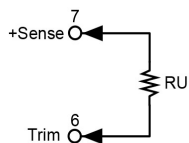
Trim Down Equation

$$R_D = \left(\frac{511}{\Delta\%} - 10.22 \right) k\Omega$$

EXTERNAL OUTPUT TRIMMING

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

Trim-up



□□S3P3

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	3.333	3.366	3.399	3.432	3.465	3.498	3.531	3.564	3.597	3.630
RU (kΩ)	869.117	436.331	292.07	219.939	176.66	147.808	127.198	111.742	99.72	90.103

□□S05

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	5.05	5.10	5.15	5.20	5.25	5.30	5.35	5.40	5.45	5.50
RU (kΩ)	1585.35	797.994	535.542	404.316	325.58	273.09	235.596	207.476	185.605	168.109

□□S12

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	12.12	12.24	12.36	12.48	12.60	12.72	12.84	12.96	13.08	13.20
RU (kΩ)	4534.55	2287.19	1538.08	1163.52	938.78	788.956	681.939	601.676	539.25	489.309

□□S15

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	15.15	15.30	15.45	15.60	15.75	15.90	16.05	16.20	16.35	16.50
RU (kΩ)	5798.49	2925.42	1967.73	1488.89	1201.58	1010.04	873.229	770.619	690.812	626.966

□□S24

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	24.24	24.48	24.72	24.96	25.20	25.44	25.68	25.92	26.16	26.40
RU (kΩ)	9590.32	4840.11	3256.7	2465	1989.98	1673.3	1447.1	1277.45	1145.5	1039.94

□□S30

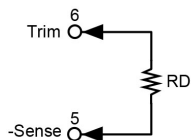
ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	30.3	30.6	30.9	31.2	31.5	31.8	32.1	32.4	32.7	33
RU (kΩ)	12118.2	6116.57	4116.02	3115.74	2515.58	2115.47	1829.68	1615.33	1448.62	1315.25

□□S48

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	48.48	48.96	49.44	49.92	50.40	50.88	51.36	51.84	52.32	52.80
RU (kΩ)	19701.9	9945.94	6693.96	5067.97	4092.38	3441.99	2977.42	2628.99	2357.99	2141.19

OUTPUT VOLTAGE ADJUSTMENT(CONTINUED)

Trim-down



□□S□□

ΔV (%)	1	2	3	4	5	6	7	8	9	10
RD (k Ω)	500.78	245.28	160.113	117.53	91.98	74.947	62.78	53.655	46.558	40.88
ΔV (%)	11	12	13	14	15	16	17	18	19	20
RD (k Ω)	36.235	32.363	29.088	26.28	23.847	21.718	19.839	18.169	16.675	15.33