



# QAE150W SERIES

QUARTER-BRICK DC-DC CONVERTER

4:1 ULTRA WIDE INPUT RANGE  
UP TO 132Watts



## FEATURES

- NO MINIMUM LOAD REQUIRED
- LOW STANDBY POWER CONSUMPTION
- 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

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

| 2250VDC<br>ISOLATION | REMOTE<br>CONTROL | UVP | OCP | SCP | OVP | OTP | LOW<br>STANDBY<br>POWER |
|----------------------|-------------------|-----|-----|-----|-----|-----|-------------------------|
|----------------------|-------------------|-----|-----|-----|-----|-----|-------------------------|

## TECHNICAL SPECIFICATION

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

| Model<br>Number | Input Range<br>VDC | Output Voltage<br>VDC | Output Current<br>@Full Load<br>A | Input Current<br>@ No Load<br>mA | Efficiency<br>% | Maximum<br>Capacitor Load<br>μF |
|-----------------|--------------------|-----------------------|-----------------------------------|----------------------------------|-----------------|---------------------------------|
| QAE150-24S3P3W  | 8.5 ~ 36           | 3.3                   | 30                                | 25                               | 88              | 91000                           |
| QAE150-24S05W   | 8.5 ~ 36           | 5                     | 24                                | 25                               | 89              | 48000                           |
| QAE150-24S12W   | 8.5 ~ 36           | 12                    | 10                                | 25                               | 88              | 8300                            |
| QAE150-24S15W   | 8.5 ~ 36           | 15                    | 8                                 | 25                               | 89              | 5300                            |
| QAE150-24S24W   | 8.5 ~ 36           | 24                    | 5                                 | 25                               | 88              | 2100                            |
| QAE150-24S30W   | 8.5 ~ 36           | 30                    | 4                                 | 25                               | 89              | 1300                            |
| QAE150-24S48W   | 8.5 ~ 36           | 48                    | 2.5                               | 25                               | 88              | 520                             |
| QAE150-48S3P3W  | 16.5 ~ 75          | 3.3                   | 30                                | 15                               | 88              | 91000                           |
| QAE150-48S05W   | 16.5 ~ 75          | 5                     | 24                                | 15                               | 89              | 48000                           |
| QAE150-48S12W   | 16.5 ~ 75          | 12                    | 10                                | 15                               | 89              | 8300                            |
| QAE150-48S15W   | 16.5 ~ 75          | 15                    | 8                                 | 15                               | 90              | 5300                            |
| QAE150-48S24W   | 16.5 ~ 75          | 24                    | 5                                 | 15                               | 90              | 2100                            |
| QAE150-48S30W   | 16.5 ~ 75          | 30                    | 4                                 | 15                               | 90              | 1300                            |
| QAE150-48S48W   | 16.5 ~ 75          | 48                    | 2.5                               | 15                               | 90              | 520                             |
| QAE150-110S3P3W | 40 ~ 160           | 3.3                   | 30                                | 8                                | 88              | 91000                           |
| QAE150-110S05W  | 40 ~ 160           | 5                     | 24                                | 8                                | 89              | 48000                           |
| QAE150-110S12W  | 40 ~ 160           | 12                    | 11                                | 8                                | 88              | 9170                            |
| QAE150-110S15W  | 40 ~ 160           | 15                    | 8.6                               | 8                                | 89              | 5730                            |
| QAE150-110S24W  | 40 ~ 160           | 24                    | 5.5                               | 8                                | 89              | 2290                            |
| QAE150-110S30W  | 40 ~ 160           | 30                    | 4.4                               | 8                                | 89              | 1470                            |
| QAE150-110S48W  | 40 ~ 160           | 48                    | 2.7                               | 8                                | 89              | 560                             |

## PART NUMBER STRUCTURE

| QAE150      | - | 48                                    | S                  | 05                                                           | W              | - | P                                    | HS                                                                                                                                                                                                  |
|-------------|---|---------------------------------------|--------------------|--------------------------------------------------------------|----------------|---|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Series Name |   | Input<br>Voltage<br>(VDC)             | Output<br>Quantity | Output<br>Voltage<br>(VDC)                                   | Input<br>Range |   | Ctrl and<br>Pin Options              | Heat-sink<br>and Mounting Hole Tread Options                                                                                                                                                        |
|             |   | 24:8.5~36<br>48:16.5~75<br>110:40~160 | S:Single           | 3P3:3.3<br>05:5<br>12:12<br>15:15<br>24:24<br>30:30<br>48:48 | 4:1            |   | □:Negative logic<br>P:Positive logic | □:NC<br>HS:H=0.24" Horizontal, 7G-0029A-F<br>HS1:H=0.5" Horizontal, 7G-0030A-F<br>HS2:H=0.24" Vertical, 7G-0031A-F<br>HS3:H=0.5" Vertical, 7G-0032A-F<br>TH:Through hole (No thread) <sup>(1)</sup> |

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

**INPUT SPECIFICATIONS**

| Parameter                     | Conditions                                                                                                                                                                            | Min.                | Typ.            | Max.                                                                                                     | Unit     |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------|----------------------------------------------------------------------------------------------------------|----------|
| Operating input voltage range | 24Vin(nom)<br>48Vin(nom)<br>110Vin(nom)                                                                                                                                               | 8.5<br>16.5<br>40   | 24<br>48<br>110 | 36<br>75<br>160                                                                                          | VDC      |
| Start-up voltage              | 24Vin(nom)<br>48Vin(nom)<br>110Vin(nom)                                                                                                                                               |                     |                 | 9<br>18<br>43                                                                                            | VDC      |
| Shutdown voltage              | 24Vin(nom)<br>48Vin(nom)<br>110Vin(nom)                                                                                                                                               | 7.3<br>15.5<br>33.0 |                 | 8.1<br>16.3<br>36.0                                                                                      | VDC      |
| Start up time                 | Constant resistive load<br>Power up<br>Remote ON/OFF                                                                                                                                  |                     | 75<br>75        | 100<br>100                                                                                               | ms       |
| Input surge voltage           | 1 second, max.<br>24Vin(nom)<br>48Vin(nom)<br>110Vin(nom)                                                                                                                             |                     |                 | 50<br>100<br>185                                                                                         | VDC      |
| Input filter <sup>(1)</sup>   |                                                                                                                                                                                       | Pi type             |                 |                                                                                                          |          |
| Remote ON/OFF                 | Referenced to -INPUT pin<br>Negative logic DC-DC ON<br>(Standard) DC-DC OFF<br>Positive logic DC-DC ON<br>(Option) DC-DC OFF<br>Input current of CTRL pin<br>Remote off input current |                     |                 | Short or 0 ~ 1.2VDC<br>Open or 3 ~ 12 VDC<br>Open or 3 ~ 12 VDC<br>Short or 0 ~ 1.2VDC<br>-0.5<br>1<br>3 | mA<br>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<br>3.3 & 5Vout<br>Others                                                                                                  | -0.2<br>-0.1                   |                         | +0.2<br>+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<br>With a 22μF/25V X7R MLCC<br>With a 22μF/25V X7R MLCC<br>With a 4.7μF/50V X7R MLCC<br>With a 2.2μF/100V X7R MLCC |                                | 75<br>100<br>200<br>300 |              | mVp-p |
| 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)<br>Input to Output<br>Input (Output) to Base-Plate                                         | 2250<br>2250                                   |      |                                                            | VDC  |
| Isolation resistance        | 500VDC                                                                                                                 | 1                                              |      |                                                            | GΩ   |
| Isolation capacitance       |                                                                                                                        |                                                |      | 1500                                                       | pF   |
| Switching frequency         |                                                                                                                        | 270                                            | 300  | 330                                                        | kHz  |
| Design meet safety standard |                                                                                                                        | IEC60950-1, UL60950-1, EN60950-1, EN50155      |      |                                                            |      |
| Case material               |                                                                                                                        | Aluminum base-plate with plastic case          |      |                                                            |      |
| Potting material            |                                                                                                                        | Silicon (UL94-V0)                              |      |                                                            |      |
| Dimensions                  |                                                                                                                        | 2.28 X 1.45 X 0.50 Inch<br>(57.9×36.8×12.7 mm) |      |                                                            |      |
| Weight                      |                                                                                                                        | 64g (2.26oz)                                   |      |                                                            |      |
| MTBF                        | BELLCORE TR-NWT-000332 Case 1: 50% Stress, Ta= 40°C.<br>MIL-HDBK-217F Ta=25°C, Full load (G/B, controlled environment) |                                                |      | 9.742 x 10 <sup>5</sup> hrs<br>8.573 x 10 <sup>4</sup> hrs |      |

### ENVIRONMENTAL SPECIFICATIONS

| Parameter                        | Conditions                                                                                                    | Min. | Typ.                   | Max.         | Unit |
|----------------------------------|---------------------------------------------------------------------------------------------------------------|------|------------------------|--------------|------|
| Operating base-plate temperature |                                                                                                               | -40  |                        | +100         | °C   |
| Over temperature protection      |                                                                                                               |      | +110                   |              | °C   |
| Storage temperature range        |                                                                                                               | -55  |                        | +125         | °C   |
| Thermal impedance <sup>(2)</sup> | Without Heat-sink<br>Mount on 2U iron base-plate<br>With 0.24" Height Heat-sink<br>With 0.5" Height Heat-sink |      | 9<br>2.8<br>7.1<br>5.5 |              | °C/W |
| Thermal shock                    |                                                                                                               |      | EN61373, MIL-STD-810F  |              |      |
| Vibration                        |                                                                                                               |      | EN61373, MIL-STD-810F  |              |      |
| Relative humidity                |                                                                                                               |      |                        | 5% to 95% RH |      |

### EMC SPECIFICATIONS

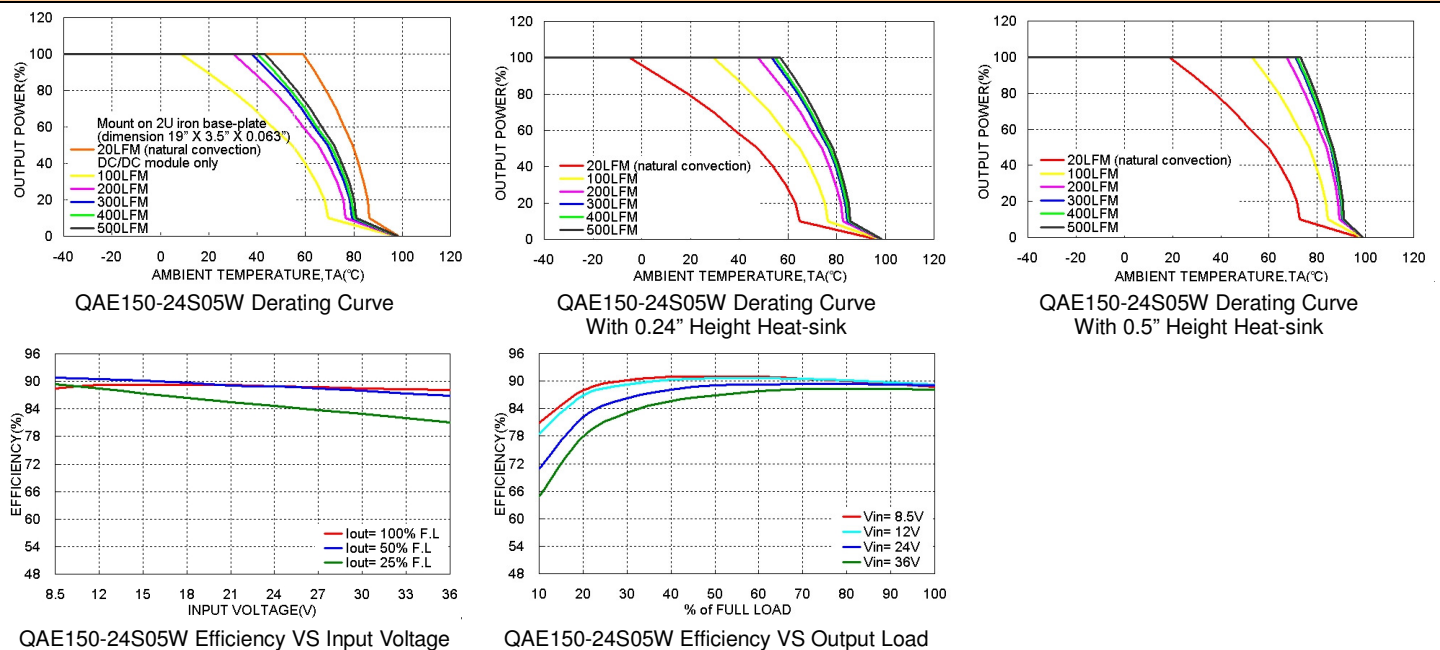
| Parameter                     | Conditions                   | Level            |
|-------------------------------|------------------------------|------------------|
| EMI <sup>(3)</sup>            | EN55011, EN55022             | Class B          |
| ESD                           | Air ± 8kV<br>Contact ± 6kV   | Perf. Criteria A |
| Radiated immunity             | 20 V/m                       | Perf. Criteria A |
| Fast transient <sup>(4)</sup> | ± 2kV                        | Perf. Criteria A |
| Surge <sup>(4)</sup>          | EN55024:±2kV<br>EN50155:±2kV | Perf. Criteria A |
| Conducted immunity            | 10 Vr.m.s                    | Perf. Criteria A |

#### Note:

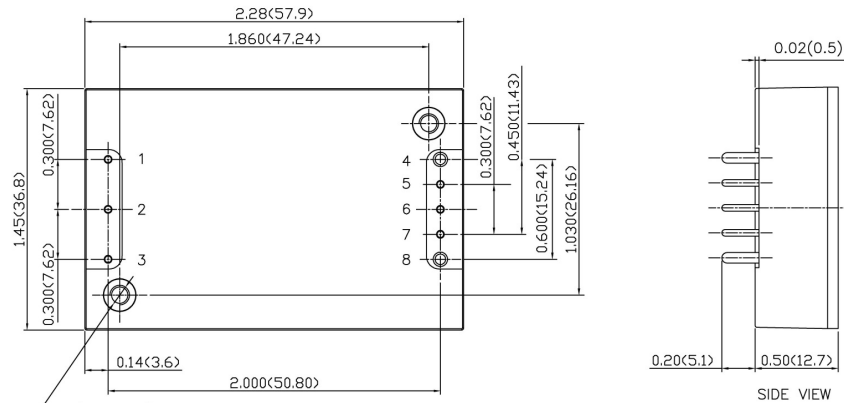
- Input source impedance: The power modules will operate as specifications without external components, assuming that the source voltage has a very low impedance and reasonable input voltage regulation. Highly inductive source impedances can affect the stability of the power module. Since real-world voltage source has finite impedance, performance can be improved by adding external filter capacitor. The QAE150-24SXXW and QAE150-48SXXW recommended Nippon Chemi-con KY series, 100μF/100V. The QAE150-110SXXW recommended Ruby-con BXF series, 39μF/200V.
- The heat-sink is optional and P/N: 7G-0029A-F, 7G-0030A-F, 7G-0031A-F, 7G-0032A-F. Please refer to heat-sink selection guide.
- The QAE150W series standard module meets EMI 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 QAE150-24SXXW and QAE150-48SXXW recommended 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220μF/100V) to connect in parallel. The QAE150-110SXXW recommended 3 pcs of aluminum electrolytic capacitor (Ruby-con BXF series, 100μF/250V) to connect in parallel.
- 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



**MECHANICAL DRAWING**



BOTTOM VIEW

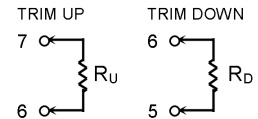
1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5)  
x.xxx±0.01 (x.xx±0.25)
3. Pin pitch tolerance ±0.01 (0.25)
4. Pin dimension tolerance ±0.004(0.1)

**PIN CONNECTION**

| PIN | DEFINE   | DIAMETER  |
|-----|----------|-----------|
| 1   | - INPUT  | 0.04 Inch |
| 2   | CTRL     | 0.04 Inch |
| 3   | + INPUT  | 0.04 Inch |
| 4   | - OUTPUT | 0.06 Inch |
| 5   | - SENSE  | 0.04 Inch |
| 6   | TRIM     | 0.04 Inch |
| 7   | + SENSE  | 0.04 Inch |
| 8   | + OUTPUT | 0.06 Inch |

**EXTERNAL OUTPUT TRIMMING**

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

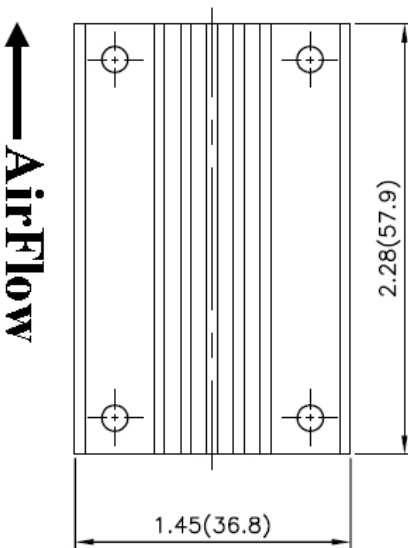
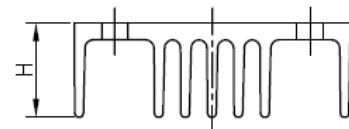


$$R_U = \left( \frac{5.11V_{OUT}(100 + \Delta\%) - (511 + 10.22\Delta\%)}{1.225\Delta\%} \right) k\Omega$$

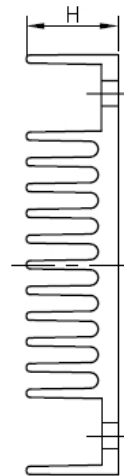
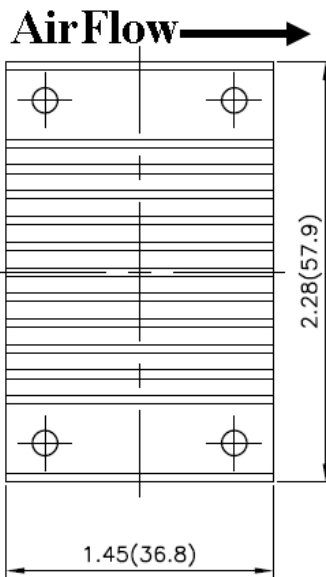
$$R_D = \left( \frac{511}{\Delta\%} - 10.22 \right) k\Omega$$

**HEAT-SINK TYPE OPTIONS**

Vertical Fin Orientation, Suffix:-HS2, -HS3



Horizontal Fin Orientation, Suffix:-HS, -HS1



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