



# P-DUKE POWER

## FKC08W Series

DC-DC Converter  
Up to 8 Watts

### 3

YEARS  
WARRANTY

ROHS  
COMPLIANT

REACH  
COMPLIANT



Railway



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV

UL US CB CE UK CA

1600  
VDC  
Isolation  
Voltage

4 : 1  
Wide  
Input  
Range

NO  
Min. Load  
Required

Operating  
Altitude  
5000  
meter

REMOTE  
ON  
OFF

OCP

SCP

UVP

### PART NUMBER STRUCTURE

| FKC08       | - | 48                                | S                  | 05                                | W              | - | M3                                                                                                                  | SMD                                                  |
|-------------|---|-----------------------------------|--------------------|-----------------------------------|----------------|---|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| Series Name |   | Input<br>Voltage<br>(VDC)         | Output<br>Quantity | Output<br>Voltage<br>(VDC)        | Input<br>Range |   | Operating Temp.<br>Options                                                                                          | Mounting Type<br>Options                             |
|             |   | 24:9~36<br>48:18~75<br>110:43~160 | S:Single           | 3P3:3.3<br>05:5<br>12:12<br>15:15 | 4 : 1          |   | <input type="checkbox"/> : Standard<br>-40~+105°C<br>With derating<br>M3: M3 Version<br>-55~+105°C<br>With derating | <input type="checkbox"/> : DIP type<br>SMD: SMD type |
|             |   |                                   | D: Dual            | 05:±5<br>12:±12<br>15:±15         |                |   |                                                                                                                     |                                                      |

## 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            | mA                        | mA                     | %          | μF                     |
| FKC08-24S3P3W  | 9 ~ 36      | 3.3            | 2400                      | 40                     | 85         | 1330                   |
| FKC08-24S05W   | 9 ~ 36      | 5              | 1600                      | 40                     | 87         | 1330                   |
| FKC08-24S12W   | 9 ~ 36      | 12             | 666                       | 25                     | 86         | 288                    |
| FKC08-24S15W   | 9 ~ 36      | 15             | 533                       | 25                     | 86         | 200                    |
| FKC08-24D05W   | 9 ~ 36      | ±5             | ±800                      | 20                     | 84         | ±900                   |
| FKC08-24D12W   | 9 ~ 36      | ±12            | ±333                      | 25                     | 86         | ±133                   |
| FKC08-24D15W   | 9 ~ 36      | ±15            | ±267                      | 25                     | 86         | ±90                    |
| FKC08-48S3P3W  | 18 ~ 75     | 3.3            | 2400                      | 20                     | 85         | 1330                   |
| FKC08-48S05W   | 18 ~ 75     | 5              | 1600                      | 20                     | 87         | 1330                   |
| FKC08-48S12W   | 18 ~ 75     | 12             | 666                       | 13                     | 87         | 288                    |
| FKC08-48S15W   | 18 ~ 75     | 15             | 533                       | 13                     | 88         | 200                    |
| FKC08-48D05W   | 18 ~ 75     | ±5             | ±800                      | 10                     | 84         | ±900                   |
| FKC08-48D12W   | 18 ~ 75     | ±12            | ±333                      | 13                     | 87         | ±133                   |
| FKC08-48D15W   | 18 ~ 75     | ±15            | ±267                      | 13                     | 87         | ±90                    |
| FKC08-110S3P3W | 43 ~ 160    | 3.3            | 2400                      | 8                      | 84         | 1330                   |
| FKC08-110S05W  | 43 ~ 160    | 5              | 1600                      | 8                      | 85         | 1330                   |
| FKC08-110S12W  | 43 ~ 160    | 12             | 666                       | 4                      | 86         | 288                    |
| FKC08-110S15W  | 43 ~ 160    | 15             | 533                       | 4                      | 86         | 200                    |
| FKC08-110D05W  | 43 ~ 160    | ±5             | ±800                      | 5                      | 82         | ±900                   |
| FKC08-110D12W  | 43 ~ 160    | ±12            | ±333                      | 5                      | 85         | ±133                   |
| FKC08-110D15W  | 43 ~ 160    | ±15            | ±267                      | 5                      | 85         | ±90                    |

## 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                   | VDC  |
|                               |                         | 48Vin(nom)                |           |         | 18                  |      |
|                               |                         | 110Vin(nom)               |           |         | 43                  |      |
| Shutdown voltage              |                         | 24Vin(nom)                | 7         | 8       | 8.8                 | VDC  |
|                               |                         | 48Vin(nom)                | 15        | 16      | 17.5                |      |
|                               |                         | 110Vin(nom)               | 37        | 40      | 42                  |      |
| Start up time                 | Constant resistive load | Power up                  |           | 450     |                     | ms   |
|                               |                         | Remote ON/OFF             |           | 5       |                     |      |
| Input surge voltage           | 100 ms, max.            | 24Vin(nom)                |           |         | 50                  | VDC  |
|                               |                         | 48Vin(nom)                |           |         | 100                 |      |
|                               |                         | 110Vin(nom)               |           |         | 170                 |      |
| Input filter                  |                         |                           |           | Pi type |                     |      |
| Remote ON/OFF                 | Referred to –Vin pin    | Positive logic            | DC-DC ON  |         | Open or 3.0 ~ 12VDC | mA   |
|                               |                         |                           | DC-DC OFF |         | Short or 0 ~ 1.2VDC |      |
|                               |                         | Input current of Ctrl pin | -0.5      |         | +0.5                |      |
|                               |                         | Remote off input current  |           | 2.5     |                     | 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 |          |             | -0.2                            |      | +0.2  | %     |
| Load regulation                  | No Load to Full Load               | DIP type | Single      | -0.5                            |      | +0.5  | %     |
|                                  |                                    |          | Dual        | -1.0                            |      | +1.0  |       |
|                                  | 10% Load to 90% Load               | SMD type | Single      | -1.0                            |      | +1.0  |       |
|                                  |                                    |          | Dual        | -1.0                            |      | +1.0  |       |
|                                  |                                    | DIP type | Single      | -0.3                            |      | +0.3  |       |
|                                  |                                    |          | Dual        | -0.8                            |      | +0.8  |       |
|                                  |                                    | SMD type | Single      | -0.8                            |      | +0.8  |       |
|                                  |                                    |          | Dual        | -0.8                            |      | +0.8  |       |
| Cross regulation                 | Asymmetrical load 25%/100% FL      |          | Dual        | -5.0                            |      | +5.0  | %     |
| Ripple and noise                 | 20MHz bandwidth                    |          | 24Vin(nom)  |                                 | 50   |       | mVp-p |
|                                  |                                    |          | 48Vin(nom)  |                                 | 50   |       |       |
|                                  |                                    |          | 110Vin(nom) |                                 | 75   |       |       |
| Temperature coefficient          |                                    |          |             | -0.02                           |      | +0.02 | %/°C  |
| Transient response recovery time | 25% load step change               |          |             |                                 | 250  |       | µs    |
| Over voltage protection          | Single Output                      |          | 3.3Vout     |                                 | 3.9  |       | VDC   |
|                                  |                                    |          | 5Vout       |                                 | 6.2  |       |       |
|                                  |                                    |          | 12Vout      |                                 | 15   |       |       |
|                                  |                                    |          | 15Vout      |                                 | 18   |       |       |
| Over load protection             | % of Iout rated                    |          |             |                                 | 150  |       | %     |
| Short circuit protection         |                                    |          |             | Continuous, automatics recovery |      |       |       |

## GENERAL SPECIFICATIONS

| Parameter             | Conditions           |          |                        | Min.                         | Typ. | Max. | Unit |
|-----------------------|----------------------|----------|------------------------|------------------------------|------|------|------|
| Isolation voltage     | 1 minute             | DIP type | Input to Output        | 1600                         |      |      | VDC  |
|                       |                      |          | Input (Output) to Case | 1600                         |      |      |      |
|                       |                      | SMD type | Input to Output        | 1600                         |      |      |      |
|                       |                      |          | Input (Output) to Case | 1000                         |      |      |      |
| Isolation resistance  | 500VDC               |          |                        | 1                            |      |      | GΩ   |
| Isolation capacitance |                      |          |                        |                              |      | 1500 | pF   |
| Switching frequency   |                      |          |                        | 270                          | 300  | 330  | kHz  |
| Safety approvals      | IEC/ EN/ UL62368-1   |          |                        | UL:E193009<br>CB:UL(Demko)   |      |      |      |
| Standard approvals    | EN50155<br>EN45545-2 |          |                        |                              |      |      |      |
| Case material         |                      |          |                        | Nickel-coated copper         |      |      |      |
| Base material         |                      |          |                        | Non-conductive black plastic |      |      |      |
| Potting material      |                      |          |                        | Epoxy (UL94 V-0)             |      |      |      |
| Weight                |                      |          |                        | 18g (0.62oz)                 |      |      |      |
| MTBF                  | MIL-HDBK-217F        |          |                        | 2.832 x 10 <sup>6</sup> hrs  |      |      |      |

## ENVIRONMENTAL SPECIFICATIONS

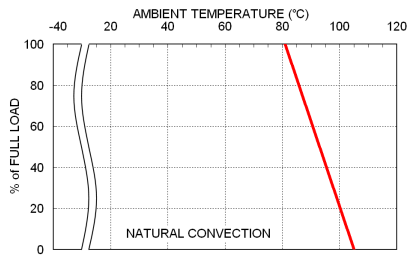
| Parameter                       | Conditions                                                                                                                                                                               | Min.       | Typ. | Max.                                                                                          | Unit |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------|-----------------------------------------------------------------------------------------------|------|
| Operating ambient temperature   | Standard<br>M3 Version<br>*Converter can meet the railway T2 and TX temperature requirement.<br>T2: -40°C~+70°C as all models;<br>TX: -40°C~+85°C as power derating to 55% output power. | -40<br>-55 |      | +105<br>+105                                                                                  | °C   |
| Maximum case temperature        |                                                                                                                                                                                          |            |      | 105                                                                                           | °C   |
| Storage temperature range       |                                                                                                                                                                                          | -55        |      | +125                                                                                          | °C   |
| Operating altitude              |                                                                                                                                                                                          |            |      | 5000                                                                                          | m    |
| Thermal impedance               | Natural convection                                                                                                                                                                       |            | 20   |                                                                                               | °C/W |
| Thermal shock                   |                                                                                                                                                                                          |            |      | MIL-STD-810F                                                                                  |      |
| Shock                           |                                                                                                                                                                                          |            |      | EN61373, MIL-STD-810F                                                                         |      |
| Vibration                       |                                                                                                                                                                                          |            |      | EN61373, MIL-STD-810F                                                                         |      |
| Relative humidity               |                                                                                                                                                                                          |            |      | 5% to 95% RH                                                                                  |      |
| Lead-free reflow solder process | Only for SMD type                                                                                                                                                                        |            |      | The time above 217°C 30~60sec.<br>Peak temperature 245°C max.<br>Time above 240°C 10sec. max. |      |

## EMC SPECIFICATIONS

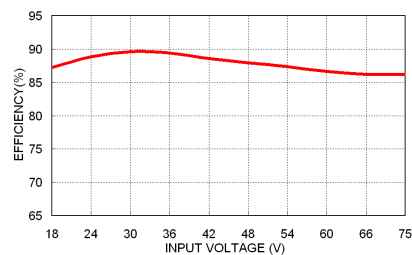
| Parameter                      | Conditions                                                                                          | Level            |
|--------------------------------|-----------------------------------------------------------------------------------------------------|------------------|
| EMI                            | EN55032, EN50121-3-2<br>With external components                                                    | Class A, Class B |
| EMS                            | EN55035, EN50121-3-2                                                                                |                  |
| ESD                            | EN61000-4-2<br>Air ± 8kV and Contact ± 6kV                                                          | Perf. Criteria A |
| Radiated immunity              | EN61000-4-3<br>20 V/m                                                                               | Perf. Criteria A |
| Fast transient                 | EN61000-4-4<br>± 2kV                                                                                | Perf. Criteria A |
|                                | 24Vin, 48Vin<br>With an external input filter capacitor<br>(Nippon chemi-con KY series, 220µF/100V) |                  |
|                                | 110 Vin<br>With an external input filter capacitor<br>(Nippon chemi-con KXJ series, 150µF/200V)     |                  |
| Surge                          | EN61000-4-5<br>±2kV                                                                                 | Perf. Criteria A |
|                                | 24Vin, 48Vin<br>With an external input filter capacitor<br>(Nippon chemi-con KY series, 220µF/100V) |                  |
|                                | 110 Vin<br>With an external input filter capacitor<br>(Nippon chemi-con KXJ series, 150µF/200V)     |                  |
| Conducted immunity             | EN61000-4-6<br>10 Vr.m.s                                                                            | Perf. Criteria A |
| Power frequency magnetic field | EN61000-4-8<br>100A/m continuous; 1000A/m 1 second                                                  | Perf. Criteria A |

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

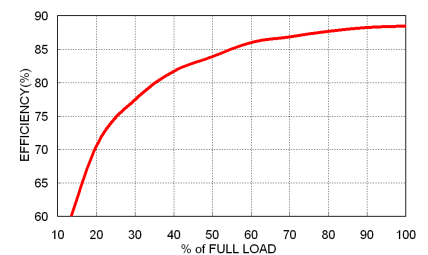
## CHARACTERISTIC CURVE



FKC08-48S05W Derating Curve



FKC08-48S05W Efficiency vs. Input Voltage



FKC08-48S05W 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.

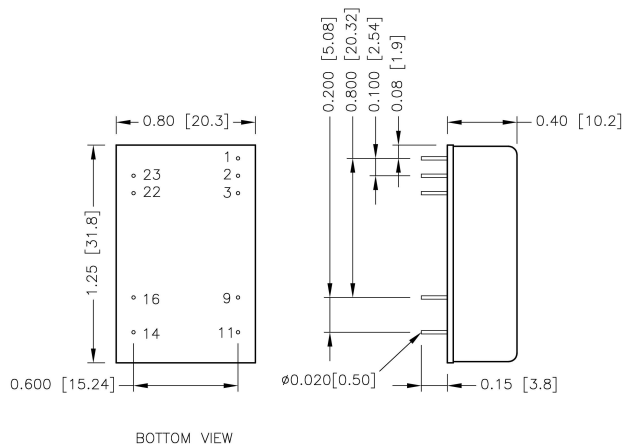
The input line fuse suggest as below :

| Model                        | Fuse Rating (A) | Fuse Type |
|------------------------------|-----------------|-----------|
| FKC08-24S□□W 、FKC08-24D□□W   | 2               | Slow-Blow |
| FKC08-48S□□W 、FKC08-48D□□W   | 1               | Slow-Blow |
| FKC08-110S□□W 、FKC08-110D□□W | 0.5             | 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

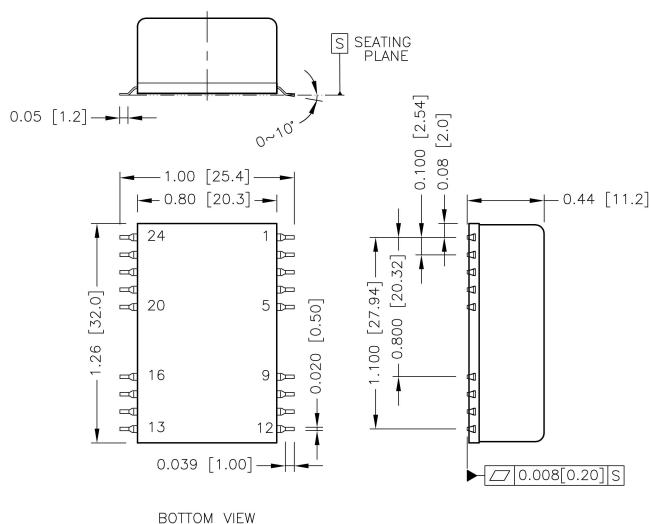
### DIP type



### PIN CONNECTION

| PIN | SINGLE | DUAL   | PIN | SINGLE | DUAL   |
|-----|--------|--------|-----|--------|--------|
| 1   | Ctrl   | Ctrl   | 23  | +Vin   | +Vin   |
| 2   | -Vin   | -Vin   | 22  | +Vin   | +Vin   |
| 3   | -Vin   | -Vin   |     |        |        |
| 9   | NC     | Common | 16  | -Vout  | Common |
| 11  | NC     | -Vout  | 14  | +Vout  | +Vout  |

### SMD type



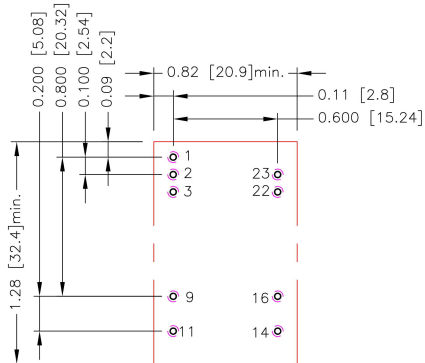
### PIN CONNECTION

| PIN    | SINGLE | DUAL   | PIN | SINGLE | DUAL   |
|--------|--------|--------|-----|--------|--------|
| 1      | Ctrl   | Ctrl   | 23  | +Vin   | +Vin   |
| 2      | -Vin   | -Vin   | 22  | +Vin   | +Vin   |
| 3      | -Vin   | -Vin   |     |        |        |
| 9      | NC     | Common | 16  | -Vout  | Common |
| 11     | NC     | -Vout  | 14  | +Vout  | +Vout  |
| Others | NC     | NC     |     |        |        |

- All dimensions in inch [mm]
- Tolerance :x.xx±0.02 [x.x±0.5]  
x.xxx±0.01 [x.xx±0.25]
- Pin dimension tolerance ±0.004[0.10]

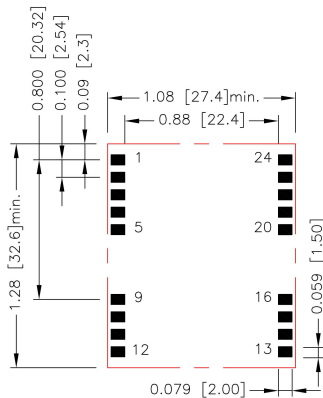
## RECOMMENDED PAD LAYOUT

### DIP type



All dimensions in inch[mm]  
 Pad size(lead free recommended)  
 Through hole 1.2.3.9.11.14.16.22.23:  $\Phi 0.031[0.80]$   
 Top view pad 1.2.3.9.11.14.16.22.23:  $\Phi 0.039[1.00]$   
 Bottom view pad 1.2.3.9.11.14.16.22.23:  $\Phi 0.063[1.60]$

### SMD type

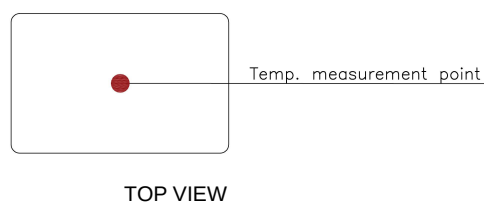


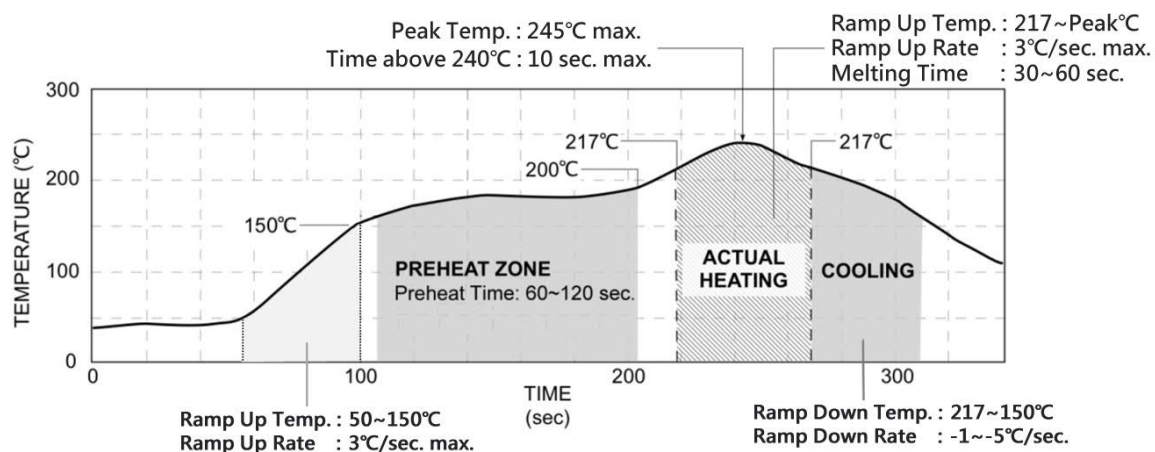
All dimensions in inch[mm]  
 Pad size(lead free recommended)  
 Top view pad: 0.079x0.059 [2.00x1.50]

## 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).



**LEAD FREE REFLOW PROFILE For SMD Type**


\*The curves define the maximum peak reflow temperature permissible measured on pin1 or Vin pin.