



# P-DUKE POWER

## FEC15W Series

DC-DC Converter  
Up to 15 Watts

**3**  
YEARS  
WARRANTY

ROHS  
COMPLIANT

REACH  
COMPLIANT



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



Railway

UL US CB CE UK CA

1600  
VDC  
Isolation  
Voltage

4 : 1  
Wide  
Input  
Range

6  
sided  
Shielding

NO  
Min. Load  
Required

REMOTE  
ON  
OFF

OCP

OVP

SCP

UVP

### PART NUMBER STRUCTURE

FEC15	-	48	S	05	W	-	M3	P	HC
Series Name		Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range		Operating Temp. Options	Remote On/Off Options	Assembly Options
		24:9~36 48:18~75	S:Single  D: Dual	3P3:3.3 05:5 5P1:5.1 12:12 15:15  05:±5 12:±12 15:±15	4:1		□:Standard -40~+105°C With derating M3:M3 Version -55~+105°C With derating	□:No pin P:Positive logic N:Negative logic	□: None HC: Heat-sink with Clamp

**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
FEC15-24S3P3W	9 ~ 36	3.3	4500	50	86	14700
FEC15-24S05W	9 ~ 36	5	3000	65	87	7200
FEC15-24S5P1W	9 ~ 36	5.1	3000	65	87	7200
FEC15-24S12W	9 ~ 36	12	1250	22	87	1250
FEC15-24S15W	9 ~ 36	15	1000	22	87	800
FEC15-24D05W	9 ~ 36	±5	±1500	55	87	±3600
FEC15-24D12W	9 ~ 36	±12	±625	30	88	±625
FEC15-24D15W	9 ~ 36	±15	±500	30	88	±400
FEC15-48S3P3W	18 ~ 75	3.3	4500	35	86	14700
FEC15-48S05W	18 ~ 75	5	3000	35	88	7200
FEC15-48S5P1W	18 ~ 75	5.1	3000	35	88	7200
FEC15-48S12W	18 ~ 75	12	1250	15	87	1250
FEC15-48S15W	18 ~ 75	15	1000	15	87	800
FEC15-48D05W	18 ~ 75	±5	±1500	35	88	±3600
FEC15-48D12W	18 ~ 75	±12	±625	17	88	±625
FEC15-48D15W	18 ~ 75	±15	±500	17	88	±400

INPUT SPECIFICATIONS							
Parameter	Conditions		Min.	Typ.	Max.	Unit	
Operating input voltage range	24Vin(nom)		9	24	36	VDC	
	48Vin(nom)		18	48	75		
Start up voltage	24Vin(nom)				9	VDC	
	48Vin(nom)				18		
Shutdown voltage	24Vin(nom)		7	8	8.8	VDC	
	48Vin(nom)		14.5	16	17.5		
Start up time	Constant resistive load	Power up		20		ms	
Input surge voltage	100 ms, max.	24Vin(nom)			50	VDC	
		48Vin(nom)			100		
Input filter				Pi type			
Remote ON/OFF (Option)	Referred to -Vin pin	Positive logic	DC-DC ON	Open or 3 ~ 12VDC			
			DC-DC OFF	Short or 0 ~ 1.2VDC			
		Negative logic	DC-DC ON	Short or 0 ~ 1.2VDC			
			DC-DC OFF	Open or 3 ~ 12VDC			
		Input current of Ctrl pin	-0.5		+0.5	mA	
		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	Single Dual	-0.2 -0.5		+0.2 +0.5	%
Load regulation	No Load to Full Load	Single Dual	-0.5 -1.0		+0.5 +1.0	%
Cross regulation	Asymmetrical load 25%/100% FL	Dual	-5.0		+5.0	%
Ripple and noise	20MHz bandwidth With a 0.1 $\mu$ F/50V MLCC	Single Dual		50 75 75		mVp-p
Temperature coefficient			-0.02		+0.02	%/°C
Transient response recovery time	25% load step change			250		$\mu$ s
Over voltage protection	Zener diode clamp	3.3Vout 5Vout, 5.1Vout 12Vout 15Vout		3.9 6.2 15 18		VDC
Over load protection	% of lout rated			150		%
Short circuit protection			Continuous, automatics recovery			

GENERAL SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Isolation voltage	1 minute	Input to Output Input (Output) to Case	1600 1600			VDC
Case grounding			Connect case to -Vin with decoupling Y Cap			
Isolation resistance	500VDC		1			$\Omega$
Isolation capacitance					1500	pF
Switching frequency			360	400	440	kHz
Safety approvals	IEC /EN/ UL 62368-1		UL:E193009 CB: UL(Demko)			
Case material			Nickel-coated copper			
Base material			FR4 PCB			
Potting material			Epoxy (UL94 V-0)			
Weight			27g (0.95oz)			
MTBF	MIL-HDBK-217F, Full load		2.430 x 10 <sup>6</sup> hrs			

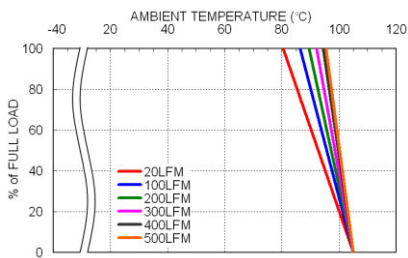
ENVIRONMENTAL SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating ambient temperature	Standard M3	With derating With derating	-40 -55		+105 +105	°C
Maximum case temperature					105	°C
Storage temperature range			-55		+125	°C
Thermal impedance	Without heat-sink With heat-sink			12 10		°C/W
Thermal shock			MIL-STD-810F			
Vibration			MIL-STD-810F			
Relative humidity			5% to 95% RH			

## EMC SPECIFICATIONS

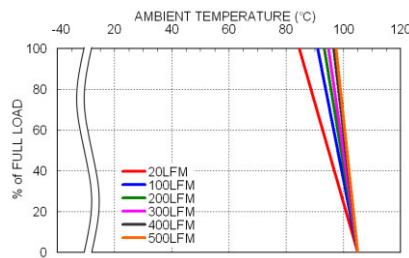
Parameter	Conditions	Level
EMI	EN55032	With external components
EMS	EN55035	
ESD	EN61000-4-2	Air ± 8kV and Contact ± 6kV
Radiated immunity	EN61000-4-3	10 V/m
Fast transient	EN61000-4-4	±2kV
Surge	EN61000-4-5	With an external input filter capacitor (Nippon chemi-con KY series, 220µF/100V)
		±1kV
Conducted immunity	EN61000-4-6	10 Vr.m.s
Power frequency magnetic field	EN61000-4-8	100A/m continuous; 1000A/m 1 second

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

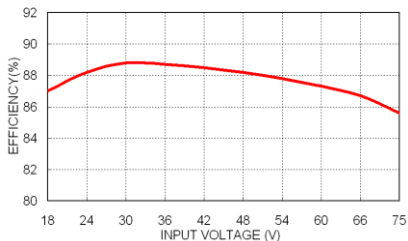
## CHARACTERISTIC CURVE



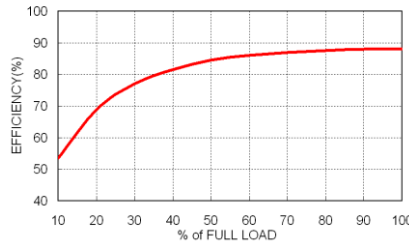
FEC15-48S05W Derating Curve



FEC15-48S05W Derating Curve With Heat-sink



FEC15-48S05W Efficiency vs. Input Voltage



FEC15-48S05W 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.

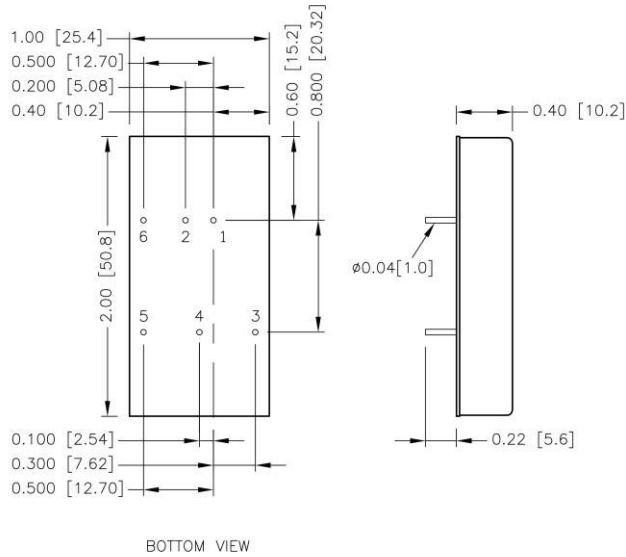
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below :

Model	Fuse Rating (A)	Fuse Type
FEC15-24S□□W · FEC15-24D□□W	3.15	Slow-Blow
FEC15-48S□□W · FEC15-48D□□W	1.6	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



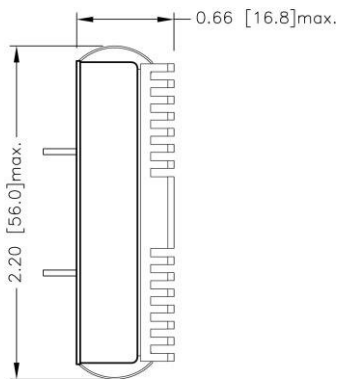
### PIN CONNECTION

PIN	SINGLE	DUAL
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	No pin	Common
5	-Vout	-Vout
6	Ctrl(Optional)	Ctrl(Optional)

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[0.10]

## HEAT-SINK OPTIONS

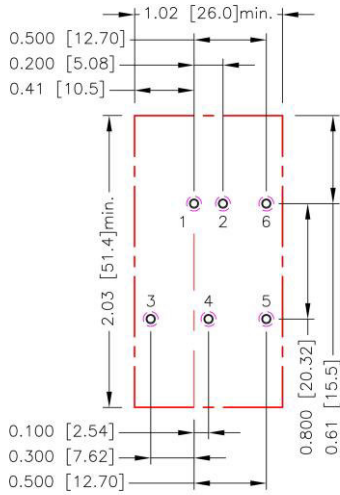
-HC (Heat-sink with clamps)



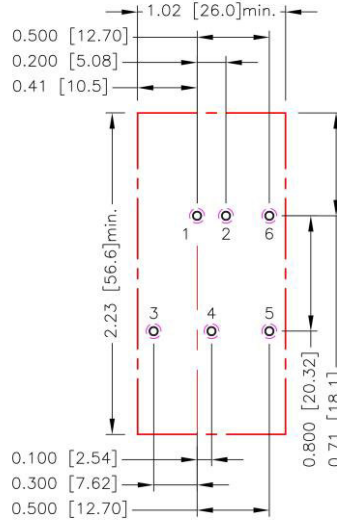
\* All dimensions in inch [mm]

## RECOMMENDED PAD LAYOUT

### Standard



### -HC



All dimensions in inch[mm]  
 Pad size(lead free recommended)  
 Through hole 1.2.3.4.5.6:  $\varnothing 0.051[1.30]$   
 Top view pad 1.2.3.4.5.6:  $\varnothing 0.064[1.63]$   
 Bottom view pad 1.2.3.4.5.6:  $\varnothing 0.102[2.60]$

## 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.

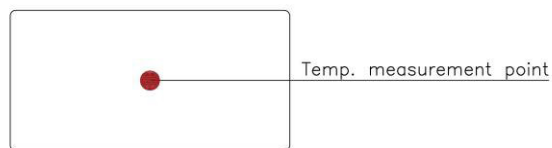
The case temperature ( $T_c$ ) should be measured at the position as the figure below.

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).



TOP VIEW