



P-DUKE POWER

FEC15 Series

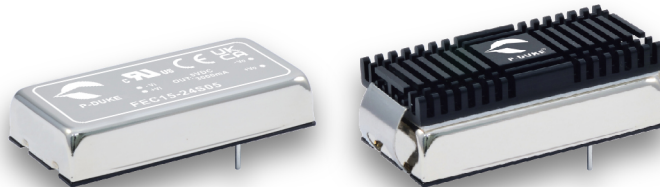
DC-DC Converter
Up to 15 Watts

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

2 : 1
Input
Range

6
sided
Shielding

REMOTE
ON
OFF

OCP

OVP

SCP

PART NUMBER STRUCTURE

FEC15 -	48	S	05	-	M3	P	HC
Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)		Operating Temp. Options	Remote On/Off Options	Assembly Options
	12:9~18 24:18~36 48:36~75	S:Single	3P3:3.3 05:5 12:12 15:15		☐ :Standard -40~+100°C With derating M3:M3 Version -55~+100°C With derating	☐ :No pin P:Positive logic N:Negative logic	☐ : None HC: Heat-sink with Clamp
		D: Dual	05:±5 12:±12 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
			Min. Load	Full Load			
	VDC	VDC	mA	mA	mA	%	μF
FEC15-12S33	9 ~ 18	3.3	0	4000	30	79	10200
FEC15-12S05	9 ~ 18	5	15	3000	25	82	7050
FEC15-12S12	9 ~ 18	12	0	1250	25	86	1035
FEC15-12S15	9 ~ 18	15	0	1000	20	86	705
FEC15-12D05	9 ~ 18	±5	0	±1500	20	83	±1020
FEC15-12D12	9 ~ 18	±12	0	±625	30	86	±495
FEC15-12D15	9 ~ 18	±15	±10	±500	35	84	±165
FEC15-24S33	18 ~ 36	3.3	0	4000	15	80	10200
FEC15-24S05	18 ~ 36	5	15	3000	10	84	7050
FEC15-24S12	18 ~ 36	12	0	1250	20	85	1035
FEC15-24S15	18 ~ 36	15	10	1000	15	85	705
FEC15-24D05	18 ~ 36	±5	0	±1500	15	84	±1020
FEC15-24D12	18 ~ 36	±12	0	±625	25	86	±495
FEC15-24D15	18 ~ 36	±15	0	±500	25	86	±165
FEC15-48S33	36 ~ 75	3.3	0	4000	10	81	10200
FEC15-48S05	36 ~ 75	5	0	3000	20	83	7050
FEC15-48S12	36 ~ 75	12	10	1250	15	87	1035
FEC15-48S15	36 ~ 75	15	0	1000	15	86	705
FEC15-48D05	36 ~ 75	±5	0	±1500	10	85	±1020
FEC15-48D12	36 ~ 75	±12	0	±625	15	88	±495
FEC15-48D15	36 ~ 75	±15	0	±500	15	87	±165

* The output requires a minimum loading on the output to maintain specified regulation. Operation under no-load condition will not damage these devices, however they may not meet all listed specification.

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 time	Constant resistive load	Power up	20			ms	
Input surge voltage	100 ms, max.	12Vin(nom)	36			VDC	
		24Vin(nom)	50				
		48Vin(nom)	100				
Input filter			Pi type				
Remote ON/OFF (Option)	Referred to –Vin pin	Positive logic	DC-DC ON	Open or 3.5 ~ 12VDC			mA
			DC-DC OFF	Short or 0 ~ 1.2VDC			
		Negative logic	DC-DC ON	Short or 0 ~ 1.2VDC			
			DC-DC OFF	Open or 3.5 ~ 12VDC			
		Input current of Ctrl pin		-0.5	+1.0		
		Remote off input current			20		

OUTPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Voltage accuracy		-1.0		+1.0	%
Line regulation	Low Line to High Line at Full Load	-0.5		+0.5	%
Load regulation	Min. Load to Full Load	-0.5		+0.5	%
	Single	-1.0		+1.0	%
	Dual				
Cross regulation	Asymmetrical load 25%/100% FL	-5.0		+5.0	%
Ripple and noise	Measured by 20MHz bandwidth		50		mVp-p
	Single		75		
	Dual				
Temperature coefficient		-0.02		+0.02	%/°C
Transient response recovery time	25% load step change		250		µs
Over voltage protection	Zener diode clamp		3.9		VDC
	3.3Vout		6.2		
	5Vout		15		
	12Vout		18		
	15Vout				
Over load protection	% of lout rated			150	%
Short circuit protection					Continuous, automatic recovery

GENERAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation voltage	1 minute	1600			VDC
	Input to Output	1600			
	Input(Output) to Case				
Isolation resistance	500VDC	1			GΩ
Isolation capacitance				300	pF
Switching frequency	Single	450	500	550	kHz
	Dual	270	300	330	
Safety approvals	IEC/ EN/ UL 62368-1				UL:E193009 CB: UL(Demko)
Case material					Nickel-coated copper
Base material					Non-conductive black plastic
Potting material					Epoxy (UL94 V-0)
Weight					27g (0.95oz)
MTBF	MIL-HDBK-217F, Full load				2.318 x 10 ⁶ hrs

ENVIRONMENTAL SPECIFICATIONS

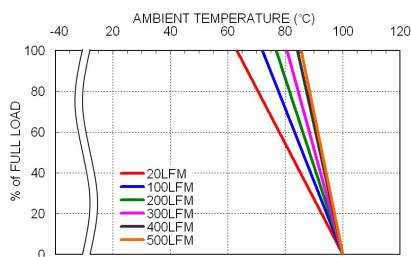
Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating ambient temperature	Standard	-40		+100	°C
	M3	-55		+100	
Maximum case temperature				100	°C
Storage temperature range		-55		+125	°C
Thermal impedance	Without heat-sink		12		°C/W
	With heat-sink		10		
Thermal shock					MIL-STD-810F
Vibration					MIL-STD-810F
Relative humidity					5% to 95% RH

EMC SPECIFICATIONS

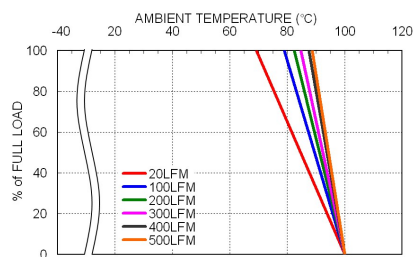
Parameter	Conditions		Level
EMI	EN55032	With external components	Class A, Class B
EMS	EN55024		
ESD	EN61000-4-2	Air $\pm 8\text{kV}$ and Contact $\pm 6\text{kV}$	Perf. Criteria B
Radiated immunity	EN61000-4-3	10 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	$\pm 2\text{kV}$	Perf. Criteria B
Surge	EN61000-4-5	With an external input filter capacitor (Nippon chemi-con KY series, 220 μF /100V)	Perf. Criteria B
		$\pm 1\text{kV}$	
Conducted immunity	EN61000-4-6	With an external input filter capacitor (Nippon chemi-con KY series, 220 μF /100V)	Perf. Criteria A
		10 Vr.m.s	
Power frequency magnetic field	EN61000-4-8	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.

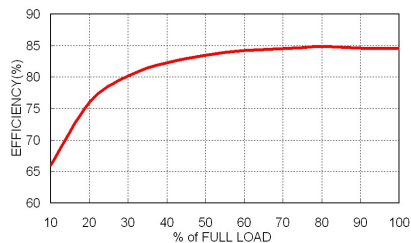
CHARACTERISTIC CURVE



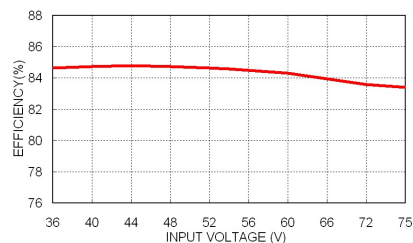
FEC15-48S05 Derating Curve



FEC15-48S05 Derating Curve With Heat-sink



FEC15-48S05 Efficiency vs. Output Load



FEC15-48S05 Efficiency vs. Input Voltage

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.

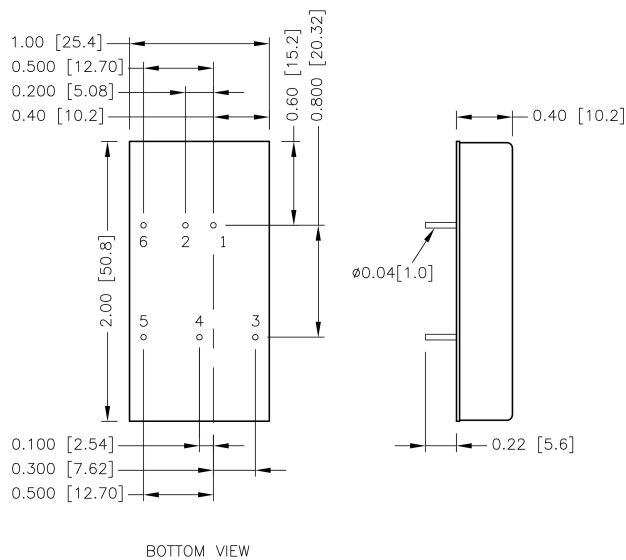
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below :

Model	Fuse Rating (A)	Fuse Type
FEC15-12S□□、FEC15-12D□□	3.15	Slow-Blow
FEC15-24S□□、FEC15-24D□□	1.6	Slow-Blow
FEC15-48S□□、FEC15-48D□□	1.0	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



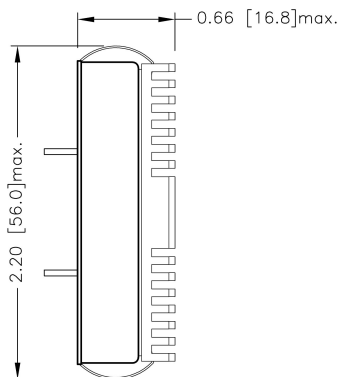
PIN CONNECTION

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 dimension tolerance ±0.004[0.10]

HEAT-SINK OPTIONS

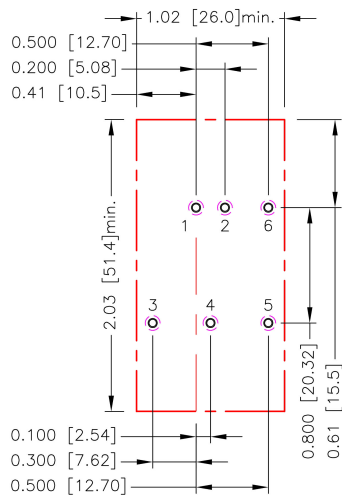
-HC (Heat-sink with clamps)



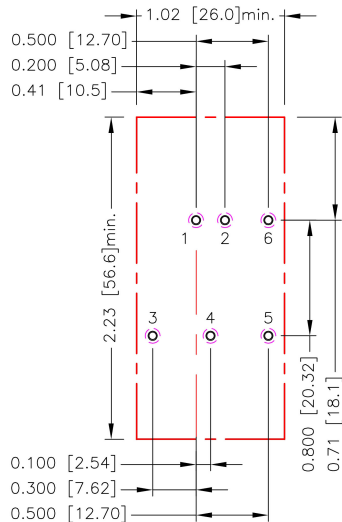
* All dimensions in inch [mm]

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.

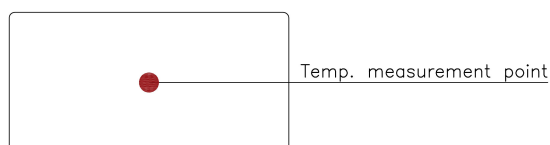
Proper cooling can be verified by measuring the point as the figure below.

The 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