Power Mate Technology, Inc

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

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℃ With derating **M3:**M3 Version -55~+100℃ 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℃ unless otherwise noted

Model Number	Input Range VDC	Output Voltage VDC	Output Current @Full Load Min. Load mA	Output Current @Full Load Full Load mA	Input Current @ No Load mA	Efficiency %	Maximum Capacitor Load 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	
		24Vin(nom)	18	24	36	VDC
		48Vin(nom)	36	48	75	
Start up time	Constant resistive load	Power up		20		ms
Input surge voltage	100 ms, max.	12Vin(nom)			36	
		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 3.5 ~ 12VDC		
		Positive logic DC-DC OFF		Short or 0 ~ 1.2VDC		
		Negative logic DC-DC ON		Short or 0 ~ 1.2VDC		
		Negative logic DC-DC OFF		Open or 3.5 ~ 12VDC		
		Input current of Ctrl pin	-0.5		+1.0	mA
		Remote off input current		20		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		-0.5		+0.5	%
Load regulation	Min. 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	Measured by 20MHz bandwidth	Single Dual		50 75		mVp-p
Temperature coefficient			-0.02		+0.02	%/℃
Transient response recovery time	25% load step change			250		μs
Over voltage protection	Zener diode clamp	3.3Vout 5Vout 12Vout 15Vout		3.9 6.2 15 18		VDC
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	Input to Output Input(Output) to Case	1600 1600			VDC
Isolation resistance	500VDC		1			GΩ
Isolation capacitance					300	pF
Switching frequency		Single Dual	450 270	500 300	550 330	kHz
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

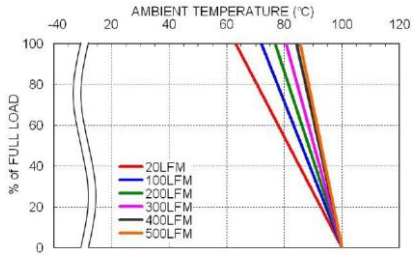
Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating ambient temperature	Standard M3	With derating With derating	-40 -55		+100 +100	℃
Maximum case temperature					100	℃
Storage temperature range			-55		+125	℃
Thermal impedance		Without heat-sink With heat-sink		12 10		℃/W
Thermal shock					MIL-STD-810F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

EMC SPECIFICATIONS

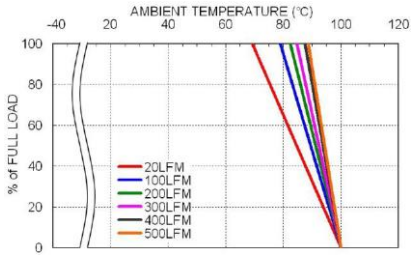
Parameter	Conditions		Level
EMI	EN55032	With external components	Class A, Class B
EMS	EN55024		
ESD	EN61000-4-2	Air ± 8kV and Contact ± 6kV	Perf. Criteria B
Radiated immunity	EN61000-4-3	10 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	± 2kV With an external input filter capacitor (Nippon chemi-con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

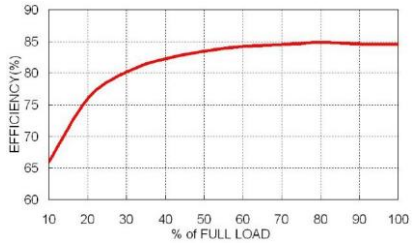
CHARACTERISTIC CURVE



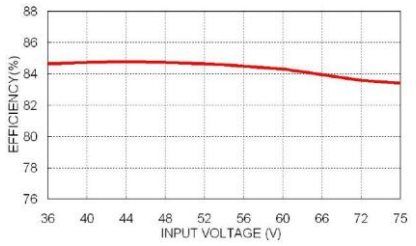
FEC15-48S05 Derating Curve



FEC15-48S05 Derating Curve With Heat-sink



FEC15-48S05 Efficiency vs. Output Load



FEC15-48S05 Efficiency vs. Input Voltage

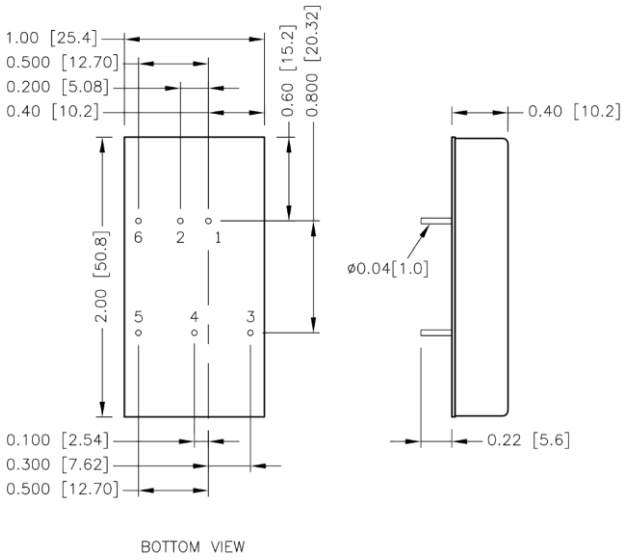
FUSE CONSIDERATION

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



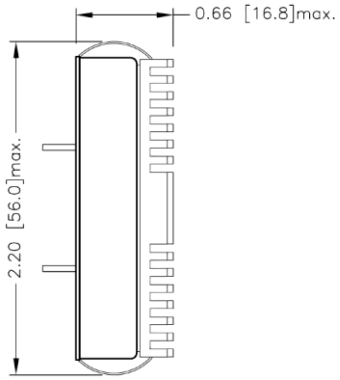
PIN CONNECTION

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

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

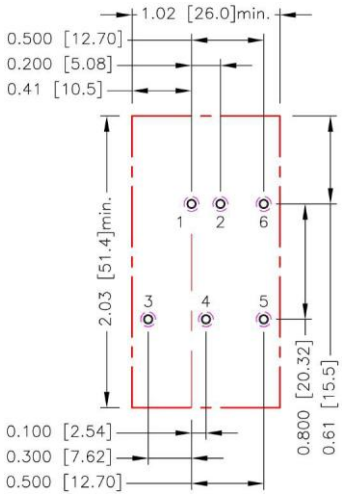
-HC (Heat-sink with clamps)



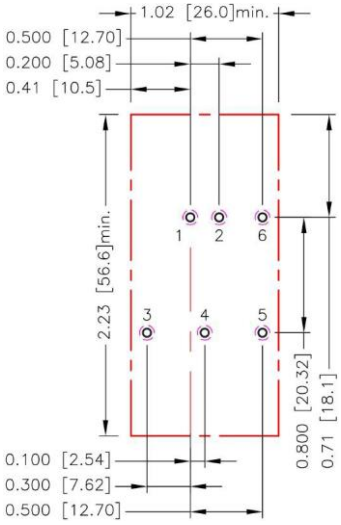
* All dimensions in inch [mm]

RECOMMENDED PAD LAYOUT

Standard



-HC

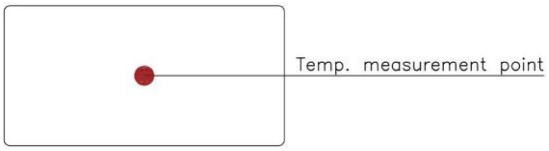


All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.2.3.4.5.6: ∅0.051[1.30]
Top view pad 1.2.3.4.5.6: ∅0.064[1.63]
Bottom view pad 1.2.3.4.5.6: ∅0.102[2.60]

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