



P-DUKE POWER

FEC40W Series

DC-DC Converter
Up to 40 Watts

3

YEARS
WARRANTY

ROHS
COMPLIANT

REACH
COMPLIANT



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



Railway

c US

CB CE

1600
VDC
Isolation
Voltage

4 : 1
Wide
Input
Range

6
sided
Shielding

REMOTE
ON
OFF

OCP

OTP

OVP

SCP

UVP

PART NUMBER STRUCTURE

FEC40 -	48	S	05	W -	N	HC
Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range	Remote On/Off Option	Assembly Option
	24:9~36 48:18~75	S:Single	3P3:3.3 05:5 12:12 15:15	4:1	☐ :Positive logic ☒ :Negative logic	☐ : None HC: Heat-sink with Clamp
		D: Dual	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
	VDC	VDC	Min. Load mA	Full Load A	mA	%	μF
FEC40-24S3P3W	9 ~ 36	3.3	0	10	75	87	25750
FEC40-24S05W	9 ~ 36	5	0	8	95	88	13600
FEC40-24S12W	9 ~ 36	12	50	3.33	50	87	2360
FEC40-24S15W	9 ~ 36	15	50	2.67	50	87	1510
FEC40-24D12W	9 ~ 36	±12	±65	±1.67	60	86	±1200
FEC40-24D15W	9 ~ 36	±15	±50	±1.33	70	86	±750
FEC40-48S3P3W	18 ~ 75	3.3	0	10	55	87	25750
FEC40-48S05W	18 ~ 75	5	0	8	60	89	13600
FEC40-48S12W	18 ~ 75	12	50	3.33	30	87	2360
FEC40-48S15W	18 ~ 75	15	50	2.67	25	88	1510
FEC40-48D12W	18 ~ 75	±12	±65	±1.67	30	87	±1200
FEC40-48D15W	18 ~ 75	±15	±60	±1.33	30	86	±750

* 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	24Vin(nom) 48Vin(nom)		9 18	24 48	36 75	VDC
Start up voltage	24Vin(nom) 48Vin(nom)				9 18	VDC
Shutdown voltage	24Vin(nom) 48Vin(nom)		7 15	8 16	8.8 17.5	VDC
Start up time	Constant resistive load	Power up Remote ON/OFF			20 20	ms
Input surge voltage	100 ms, max.	24Vin(nom) 48Vin(nom)			50 100	VDC
Input filter			Pi type			
Remote ON/OFF	Referred to –Vin pin	Positive logic DC-DC ON (Standard) DC-DC OFF Negative logic DC-DC ON (Option) DC-DC OFF			Open or 3 ~ 12VDC Short or 0 ~ 1.2VDC Short or 0 ~ 1.2VDC Open or 3 ~ 12VDC	
		Input current of Ctrl pin	-0.5		+0.5	mA
		Remote off		10		mA
		input current		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	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	%
Voltage adjustability			-10		+10	%
Ripple and noise	20MHz bandwidth	Single Dual		50 75 120 150		mVp-p
Temperature coefficient			-0.02		+0.02	%/°C
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, automatic 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			GΩ
Isolation capacitance					2500	pF
Switching frequency			270	300	330	kHz
Safety approvals	IEC/ UL/ EN60950-1		UL:E193009 CB: UL(Demko)			
Case material			Nickel-coated copper			
Base material			FR4 PCB			
Potting material			Epoxy (UL94 V-0)			
Weight			60g (2.11oz)			
MTBF	MIL-HDBK-217F, Full load		6.617 x 10 ⁵ hrs			

ENVIRONMENTAL SPECIFICATIONS

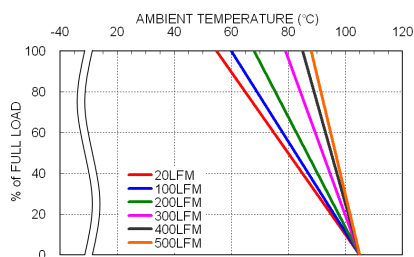
Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating ambient temperature	Without derating With derating		-40 +50		+50 +105	°C
Maximum case temperature					+105	°C
Over temperature protection				+110		°C
Storage temperature range			-55		+125	°C
Thermal impedance	Without heat-sink With heat-sink			9.2 7.6		°C/W
Thermal shock			MIL-STD-810F			
Vibration			MIL-STD-810F			
Relative humidity			5% to 95% RH			

EMC SPECIFICATIONS

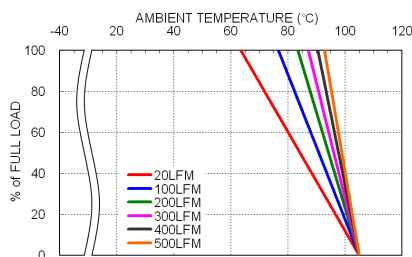
Parameter	Conditions		Level
EMI	EN55032	With external components	Class A, Class B
ESD	EN61000-4-2	Air $\pm 8\text{kV}$ and Contact $\pm 6\text{kV}$	Perf. Criteria A
Radiated immunity	EN61000-4-3	10 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	$\pm 2\text{kV}$	Perf. Criteria B
Surge	EN61000-4-5	With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

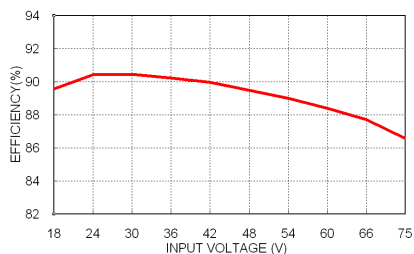
CHARACTERISTIC CURVE



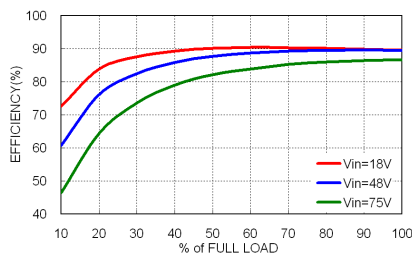
FEC40-48S05W Derating Curve



FEC40-48S05W Derating Curve With Heat-sink



FEC40-48S05W Efficiency vs. Input Voltage



FEC40-48S05W 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.

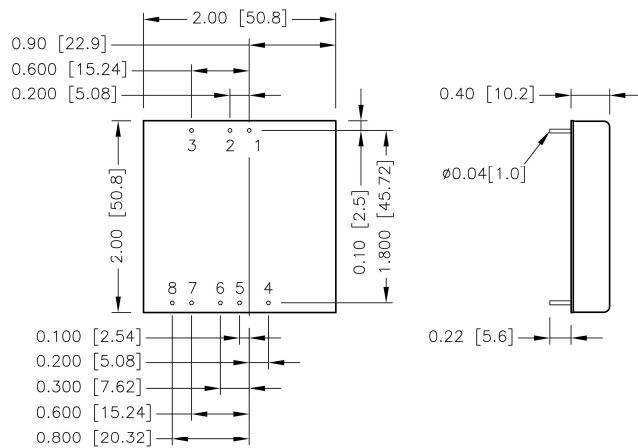
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below :

Model	Fuse Rating (A)	Fuse Type
FEC40-24S□□W、FEC40-24D□□W	8	Fast-Acting
FEC40-48S□□W、FEC40-48D□□W	4	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



BOTTOM VIEW

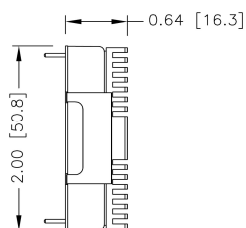
PIN CONNECTION

PIN	SINGLE	DUAL
1	+Vin	+Vin
2	-Vin	-Vin
3	Ctrl	Ctrl
4	-Sense	+Vout
5	+Sense	Common
6	+Vout	Common
7	-Vout	-Vout
8	Trim	Trim

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

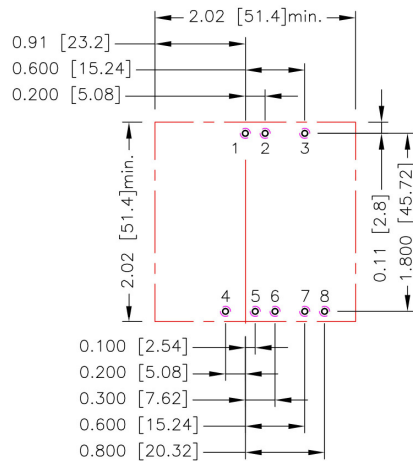
-HC (Heat-sink with clamps)



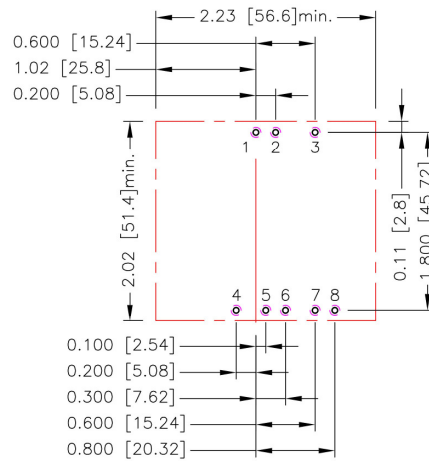
* All dimensions in inch [mm]

RECOMMENDED PAD LAYOUT

Standard



-HC



All dimensions in inch[mm]
 Pad size(lead free recommended)
 Through hole 1.2.3.4.5.6.7.8: $\varnothing 0.051[1.30]$
 Top view pad 1.2.3.4.5.6.7.8: $\varnothing 0.064[1.63]$
 Bottom view pad 1.2.3.4.5.6.7.8: $\varnothing 0.102[2.60]$

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.

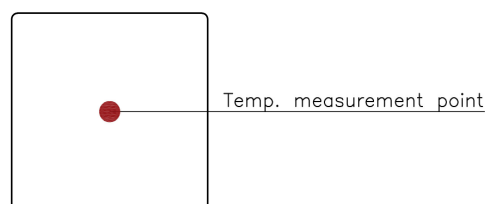
Proper cooling can be verified by measuring the point as the figure below.

The temperature at this location should not exceed 105°C.

When Operating, adequate cooling must be provided to maintain the test point temperature at or below 105°C.

Although the maximum point Temperature of the power modules is 105°C, 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

OUTPUT VOLTAGE ADJUSTMENT

Output voltage set point adjustment allows the user to increase or decrease the output voltage set point of the module.

Single Output

This is accomplished by connecting an external resistor between the Trim pin and either the +Sense or -Sense pins.

With an external resistor between the Trim and -Sense, the output voltage set point increases.

With an external resistor between the Trim and +Sense, the output voltage set point decreases.

The external Trim resistor needs to be at least 1/16W of rated power.

Dual Output

This is accomplished by connecting an external resistor between the Trim pin and either the +Output or -Output pins.

With an external resistor between the Trim and -Output pin, the output voltage set point increases.

With an external resistor between the Trim and +Output pin, the output voltage set point decreases.

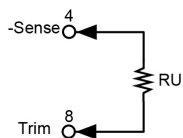
The external TRIM resistor needs to be at least 1/16W resistors.

EXTERNAL OUTPUT TRIMMING

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

Trim-up

Single Output



□□S3P3W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	3.333	3.366	3.399	3.432	3.465	3.498	3.531	3.564	3.597	3.630
RU (k Ω)	57.930	26.165	15.577	10.283	7.106	4.988	3.476	2.341	1.459	0.753

□□S05W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	5.050	5.100	5.150	5.200	5.250	5.300	5.350	5.400	5.450	5.500
RU (k Ω)	36.570	16.580	9.917	6.585	4.586	3.253	2.302	1.588	1.032	0.588

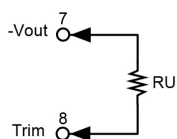
□□S12W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	12.120	12.240	12.360	12.480	12.600	12.720	12.840	12.960	13.080	13.200
RU (k Ω)	367.910	165.950	98.636	64.977	44.782	31.318	21.701	14.488	8.879	4.391

□□S15W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	15.150	15.300	15.450	15.600	15.750	15.900	16.050	16.200	16.350	16.500
RU (k Ω)	404.180	180.590	106.060	68.796	46.437	31.531	20.883	12.898	6.687	1.718

Dual Output



□□D12W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	±12.12	±12.24	±12.36	±12.48	±12.6	±12.72	±12.84	±12.96	±13.08	±13.2
RU (k Ω)	218.21	98.105	58.07	38.052	26.042	18.035	12.316	8.026	4.69	2.021

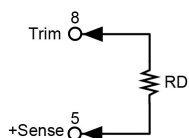
□□D15W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	±15.15	±15.3	±15.45	±15.6	±15.75	±15.9	±16.05	±16.2	±16.35	±16.5
RU (k Ω)	268.29	120.64	71.429	46.822	32.058	22.215	15.184	9.911	5.81	2.529

OUTPUT VOLTAGE ADJUSTMENT(CONTINUED)

Trim-down

Single Output



□□S3P3W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	3.267	3.234	3.201	3.168	3.135	3.102	3.069	3.036	3.003	2.970
RD (k Ω)	69.470	31.235	18.490	12.117	8.294	5.745	3.924	2.559	1.497	0.647

□□S05W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	4.950	4.900	4.850	4.800	4.750	4.700	4.650	4.600	4.550	4.500
RD (k Ω)	45.533	20.612	12.306	8.152	5.660	3.999	2.812	1.922	1.230	0.676

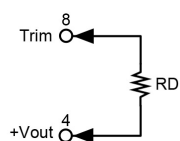
□□S12W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	11.880	11.760	11.640	11.520	11.400	11.280	11.160	11.040	10.920	10.800
RD (k Ω)	460.990	207.950	123.600	81.423	56.118	39.249	27.199	18.162	11.132	5.509

□□S15W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	14.850	14.700	14.550	14.400	14.250	14.100	13.950	13.800	13.650	13.500
RD (k Ω)	499.820	223.410	131.270	85.204	57.563	39.136	25.974	16.102	8.424	2.282

Dual Output



□□D12W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	± 11.88	± 11.76	± 11.64	± 11.52	± 11.4	± 11.28	± 11.16	± 11.04	± 10.92	± 10.8
RD (k Ω)	273.44	123.02	72.874	47.803	32.76	22.732	15.568	10.196	6.017	2.675

□□D15W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	± 14.85	± 14.7	± 14.55	± 14.4	± 14.25	± 14.1	± 13.95	± 13.8	± 13.65	± 13.5
RD (k Ω)	337.71	152.02	90.126	59.178	40.609	28.23	19.387	12.756	7.598	3.471