

FEC40 SERIES

DC-DC CONVERTER

2:1 WIDE INPUT RANGE
UP TO 40Watts



FEATURES

- 1600VDC INPUT TO OUTPUT ISOLATION
- STANDARD 2.00 X 2.00 X 0.40 INCH
- SIX-SIDED CONTINUOUS SHIELD
- UL60950-1, EN60950-1, & IEC60950-1 SAFETY APPROVALS
- CE MARKED
- COMPLIANT TO RoHS II & REACH

APPLICATIONS

- WIRELESS NETWORK
- TELECOM/DATACOM
- INDUSTRY CONTROL SYSTEM
- DISTRIBUTED POWER ARCHITECTURES
- SEMICONDUCTOR EQUIPMENT

1600VDC ISOLATION	REMOTE CONTROL	UVP	OCP	SCP	OVP	OTP
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TECHNICAL SPECIFICATION

All specifications are typical at nominal input, full load and 25°C otherwise noted

Model Number	Input Range	Output Voltage	Output Current @ Full Load		Input Current @ No Load	Efficiency	Maximum Capacitor Load (2)
	VDC	VDC	Min. Load (1) mA	Full Load mA	mA	%	µF
FEC40-12S1P5	9 ~ 18	1.5	0	8000	110	84	45000
FEC40-12S1P8	9 ~ 18	1.8	0	8000	110	82	37700
FEC40-12S2P5	9 ~ 18	2.5	0	8000	110	84	27000
FEC40-12S3P3	9 ~ 18	3.3	0	8000	175	86	21000
FEC40-12S05	9 ~ 18	5	0	8000	225	86	13600
FEC40-12S12	9 ~ 18	12	0	3333	255	86	2360
FEC40-12S15	9 ~ 18	15	0	2666	310	87	1510
FEC40-12D12	9 ~ 18	±12	±144	±1800	30	85	±1200
FEC40-12D15	9 ~ 18	±15	±112	±1400	35	85	±750
FEC40-12D3305	9 ~ 18	3.3 / 5	0	4000 / 4000(3)	325	85	11000 / 6800
FEC40-12T3312	9 ~ 18	3.3 / ±12	600 / ±40	6000 / ±400	215	84	13000 / ±330
FEC40-12T3315	9 ~ 18	3.3 / ±15	600 / ±30	6000 / ±300	230	84	13000 / ±110
FEC40-12T0512	9 ~ 18	5 / ±12	600 / ±40	6000 / ±400	280	86	6800 / ±330
FEC40-12T0515	9 ~ 18	5 / ±15	600 / ±30	6000 / ±300	255	86	6800 / ±110
FEC40-24S1P5	18 ~ 36	1.5	0	8000	40	81	45000
FEC40-24S1P8	18 ~ 36	1.8	0	8000	40	83	37700
FEC40-24S2P5	18 ~ 36	2.5	0	8000	40	86	27000
FEC40-24S3P3	18 ~ 36	3.3	0	8000	60	87	21000
FEC40-24S05	18 ~ 36	5	0	8000	80	89	13600
FEC40-24S12	18 ~ 36	12	0	3333	70	88	2360
FEC40-24S15	18 ~ 36	15	0	2666	85	89	1510
FEC40-24D12	18 ~ 36	±12	±144	±1800	20	87	±1200
FEC40-24D15	18 ~ 36	±15	±112	±1400	20	87	±750
FEC40-24D3305	18 ~ 36	3.3 / 5	0	4000 / 4000(3)	80	86	11000 / 6800
FEC40-24T3312	18 ~ 36	3.3 / ±12	600 / ±40	6000 / ±400	65	85	13000 / ±330
FEC40-24T3315	18 ~ 36	3.3 / ±15	600 / ±30	6000 / ±300	65	85	13000 / ±110
FEC40-24T0512	18 ~ 36	5 / ±12	600 / ±40	6000 / ±400	60	87	6800 / ±330
FEC40-24T0515	18 ~ 36	5 / ±15	600 / ±30	6000 / ±300	75	87	6800 / ±110
FEC40-48S1P5	36 ~ 75	1.5	0	8000	25	82	45000
FEC40-48S1P8	36 ~ 75	1.8	0	8000	25	84	37700
FEC40-48S2P5	36 ~ 75	2.5	0	8000	25	86	27000
FEC40-48S3P3	36 ~ 75	3.3	0	8000	35	88	21000
FEC40-48S05	36 ~ 75	5	0	8000	40	90	13600
FEC40-48S12	36 ~ 75	12	0	3333	50	89	2360
FEC40-48S15	36 ~ 75	15	0	2666	50	89	1510
FEC40-48D12	36 ~ 75	±12	±144	±1800	15	87	±1200
FEC40-48D15	36 ~ 75	±15	±112	±1400	15	87	±750
FEC40-48D3305	36 ~ 75	3.3 / 5	0	4000 / 4000(3)	45	88	11000 / 6800
FEC40-48T3312	36 ~ 75	3.3 / ±12	600 / ±40	6000 / ±400	35	86	13000 / ±330
FEC40-48T3315	36 ~ 75	3.3 / ±15	600 / ±30	6000 / ±300	35	86	13000 / ±110
FEC40-48T0512	36 ~ 75	5 / ±12	600 / ±40	6000 / ±400	30	88	6800 / ±330
FEC40-48T0515	36 ~ 75	5 / ±15	600 / ±30	6000 / ±300	40	88	6800 / ±110

PART NUMBER STRUCTURE
FEC40 - 48 S 05 - HS

Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Assembly Option
	12: 9-18 24: 18-36 48: 36-75	S: Single	1P5: 1.5 1P8: 1.8 2P5: 2.5 3P3: 3.3 05: 5 12: 12 15: 15	□: None HS: Heat-sink HC: Heat-sink with Clamp
		D: Dual	12: ±12 15: ±15	
		Dual Positive	3305: 3.3 / 5	
		T: Triple	3312: 3.3 / ±12 3315: 3.3 / ±15 0512: 5 / ±12 0515: 5 / ±15	

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	
Input reflected ripple current	Nominal input and Full load		40		mAp-p
Start-up voltage	12Vin(nom)			9	VDC
	24Vin(nom)			17.8	
	48Vin(nom)			36	
Shutdown voltage	12Vin(nom)		8		VDC
	24Vin(nom)		16		
	48Vin(nom)		34		
Start up time	Constant resistive load	Power up	25		ms
		Remote ON/OFF	25		
Input surge voltage	100 ms, max.	12Vin(nom)		36	VDC
		24Vin(nom)		50	
		48Vin(nom)		100	
Input filter			L-C type		
Remote ON/OFF	Referred to -Vin pin	Positive logic DC-DC ON		Open or 3.5 ~ 12VDC	
		DC-DC OFF		Short or 0 ~ 1.2VDC	
		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	Single / Dual	-1.0		+1.0	%	
	Triple: 3.3Vout, 5Vout	-1.0		+1.0		
	Triple: 12Vout, 15Vout	-5.0		+5.0		
Line regulation	Low Line to High Line at Full Load	Single / Dual	-0.5	+0.5	%	
		Triple: 3.3Vout, 5Vout	-1.0	+1.0		
		Triple: 12Vout, 15Vout	-5.0	+5.0		
Load regulation	Single / Dual: Min. Load to Full Load	Single	-0.5	+0.5	%	
		Dual	-1.0	+1.0		
		Triple: Main output: (3.3Vout, 5Vout) 10% to 100% with 10% to 100% balanced on auxiliaries. Auxiliary outputs 10% to 100% balanced on all outputs.	Triple: 3.3Vout, 5Vout	-2.0		+2.0
		Triple: 12Vout, 15Vout	-5.0	+5.0		
Cross regulation	Dual: Asymmetrical load 25%/100% FL Triple: Main output: (3.3Vout, 5Vout) 100% load, auxiliary 100%, other auxiliary 25% to 100% load or main output: (3.3Vout, 5Vout) 25%, auxiliary 25%, other auxiliary 25% to 100%.	Dual	-5.0	+5.0	%	
		Triple: 3.3Vout, 5Vout	-1.0	+1.0		
		Triple: 12Vout, 15Vout	-5.0	+5.0		
Voltage adjustability ⁽⁴⁾	Single and Dual output (not including Dual Positive and triple)	-10		+10	%	
Ripple and noise	Measured by 20MHz bandwidth With a 0.1µF/50V MLCC	Single	Others	50	mVp-p	
			12Vout, 15Vout	75		
			12Vout	120		
		Dual	15Vout	150		
			Triple	3.3Vout, 5Vout		50
			12Vout, 15Vout	75		
With a 1µF ceramic output capacitors	Dual Positive	3.3Vout, 5Vout	100			

OUTPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Temperature coefficient		-0.02		+0.02	%/°C
Transient response recovery time	25% load step change		250		µs
Over voltage protection	Zener diode clamp 1.5Vout 1.8Vout 2.5Vout 3.3Vout 5Vout 12Vout 15Vout		3.9 3.9 3.9 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
Isolation resistance	500VDC	1		1000	GΩ
Isolation capacitance					pF
Switching frequency	Others Dual Positive 5Vout 3.3Vout	270 270 450	300 300 500	330 330 550	kHz
Safety approvals					UL60950-1 EN60950-1 IEC60950-1
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				9.224 x 10 ⁵ hrs

ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating ambient temperature	With derating	-40		+85	°C
Maximum case temperature				+100	°C
Over temperature protection			+115		°C
Storage temperature range		-55		+125	°C
Thermal impedance	Vertical direction by natural convection (20LFM) Without heat-sink With heat-sink With heat-sink (500LFM)		9.2 7.6 2.8		°C/W
Thermal shock					MIL-STD-810F
Vibration					MIL-STD-810F
Relative humidity					5% to 95% RH

EMC SPECIFICATIONS

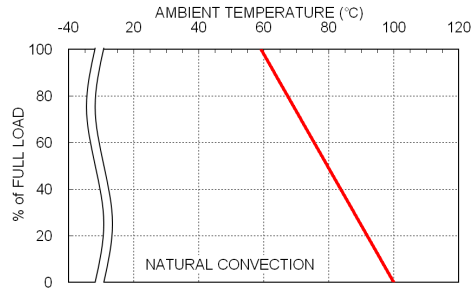
Parameter	Conditions	Level
EMI ⁽⁵⁾	EN55022	Class A, Class B
ESD	EN61000-4-2 Air ± 8kV and Contact ± 6kV	Perf. Criteria B
Radiated immunity	EN61000-4-3 10 V/m	Perf. Criteria A
Fast transient ⁽⁶⁾	EN61000-4-4 ± 2kV	Perf. Criteria B
Surge ⁽⁶⁾	EN61000-4-5 ± 1kV	Perf. Criteria B
Conducted immunity	EN61000-4-6 10 Vr.m.s	Perf. Criteria A
Power frequency magnetic field	EN61000-4-8 100A/m continuous; 1000A/m 1 second	Perf. Criteria A

Note:

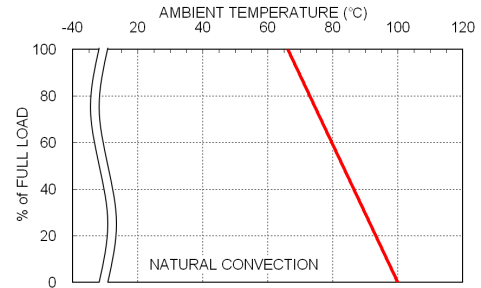
- The output requires a minimum loading on the output to maintain specified regulation. Operation under no-load condition will not damage these devices, however they may not meet all listed specification.
- Test by minimum input and constant resistive load.
- Any condition of dual output (3.3Vout, 5Vout) rated Iout current, not to exceed 8A of total output currents. The product safety approval pending.
- For the single output: Maximum output deviation is 10% inclusive of remote sense and trim. If remote sense is not being used, the +Sense should be connected to its corresponding +Vout and likewise the -Sense should be connected to its corresponding -Vout.
- The standard module meet EN55022 Class A and Class B with external components. For further information, please contact with P-DUKE.
- An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5. The filter capacitor Power Mate suggest: Nippon chemi-con KY series, 220µF/100V.

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

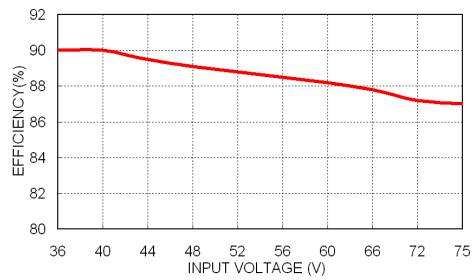
CHARACTERISTIC CURVE



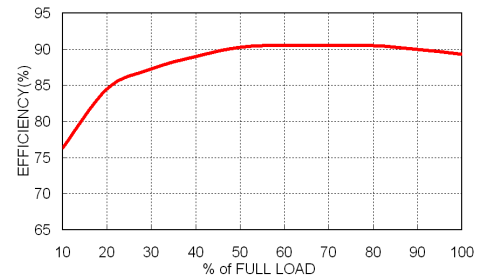
FEC40-48S05 Derating Curve



FEC40-48S05 Derating Curve With Heat-sink

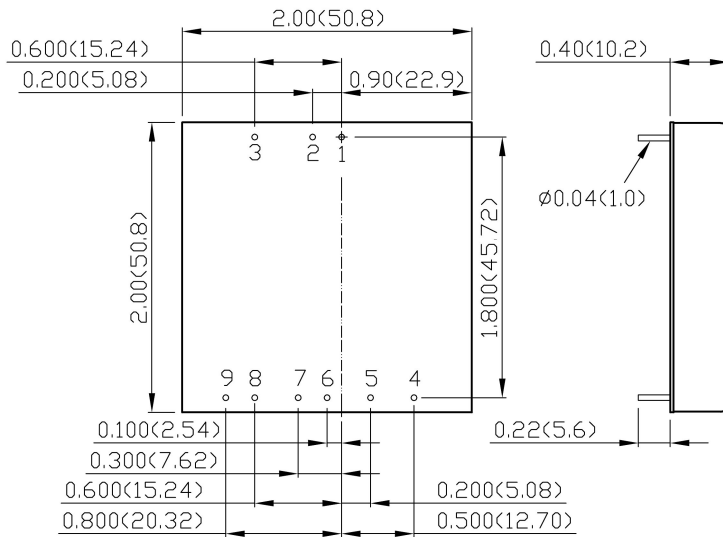


FEC40-48S05 Efficiency vs. Input Voltage



FEC40-48S05 Efficiency vs. Output Load

MECHANICAL DRAWING



BOTTOM VIEW

PIN CONNECTION

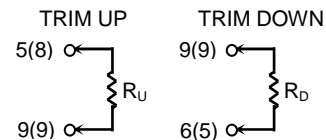
PIN	SINGLE	DUAL	DUAL POSITIVE	TRIPLE
1	+Vin	+Vin	+Vin	+Vin
2	-Vin	-Vin	-Vin	-Vin
3	Ctrl	Ctrl	Ctrl	Ctrl
4	NC	No pin	3.3Vout	+Aux
5	-Sense ⁽⁴⁾	+Vout	Common	Common
6	+Sense ⁽⁴⁾	Common	NC	-Aux
7	+Vout	Common	NC	+Vout
8	-Vout	-Vout	5Vout	Common
9	Trim	Trim	Common	NC

* NC : No Connection

EXTERNAL OUTPUT TRIMMING

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

() for dual output 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(0.1)