



# P-DUKE POWER

## FED20W Series

DC-DC Converter  
Up to 20 Watts

**3**  
YEARS  
WARRANTY

ROHS  
COMPLIANT

REACH  
COMPLIANT



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



Railway

UL US CB CE

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

FED20	-	48	S	05	W	-	M3	N	HC
Series Name		Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range		Operating Temp. Option	Remote On/Off Option	Assembly Option
		24:9~36 48:18~75	S:Single  D: Dual	3P3:3.3 05:5 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	□: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
FED20-24S3P3W	9 ~ 36	3.3	5500	50	85	18000
FED20-24S05W	9 ~ 36	5	4000	65	88	9600
FED20-24S12W	9 ~ 36	12	1670	22	86	1650
FED20-24S15W	9 ~ 36	15	1330	22	86	1050
FED20-24D05W	9 ~ 36	±5	±2000	55	88	±4800
FED20-24D12W	9 ~ 36	±12	±833	30	87	±825
FED20-24D15W	9 ~ 36	±15	±667	30	87	±525
FED20-48S3P3W	18 ~ 75	3.3	5500	35	85	18000
FED20-48S05W	18 ~ 75	5	4000	35	88	9600
FED20-48S12W	18 ~ 75	12	1670	15	87	1650
FED20-48S15W	18 ~ 75	15	1330	15	87	1050
FED20-48D05W	18 ~ 75	±5	±2000	35	89	±4800
FED20-48D12W	18 ~ 75	±12	±833	17	88	±825
FED20-48D15W	18 ~ 75	±15	±667	17	88	±525

**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
		Remote ON/OFF		20		
Input surge voltage	100 ms, max.	24Vin(nom)			50	VDC
		48Vin(nom)			100	
Input filter			Pi type			
Remote ON/OFF	Referred to –Vin pin	Positive logic	DC-DC ON	Open or 3 ~ 12VDC		mA
		(Standard)	DC-DC OFF	Short or 0 ~ 1.2VDC		
		Negative logic	DC-DC ON	Short or 0 ~ 1.2VDC		
		(Option)	DC-DC OFF	Open or 3 ~ 12VDC		
		Input current of Ctrl pin	-0.5		+0.5	
		Remote off input current		2.5		

**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	-0.2		+0.2	%
		Dual	-0.5		+0.5	
Load regulation	No Load to Full Load	Single	-0.5		+0.5	%
		Dual	-1.0		+1.0	
Cross regulation	Asymmetrical load 25%/100% FL	Dual	-5.0		+5.0	%
Voltage adjustability	Single output		-10		+10	%
Ripple and noise	20MHz bandwidth With a 0.1μF/50V MLCC	Single		60		mVp-p
		Dual	3.3Vout Others All	75 100		
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		3.9		VDC
		5Vout		6.2		
		12Vout		15		
		15Vout		18		
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
Case grounding					Connect case to -Vin with decoupling Y Cap
Isolation resistance	500VDC	1			GΩ
Isolation capacitance				1500	pF
Switching frequency		360	400	440	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					27g (0.95oz)
MTBF	MIL-HDBK-217F, Full load				1.851 x 10 <sup>6</sup> hrs

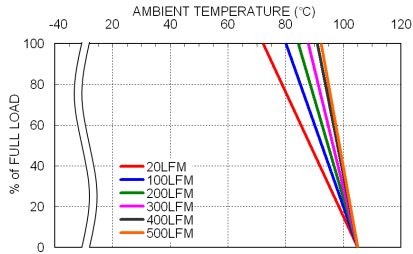
**ENVIRONMENTAL SPECIFICATIONS**

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

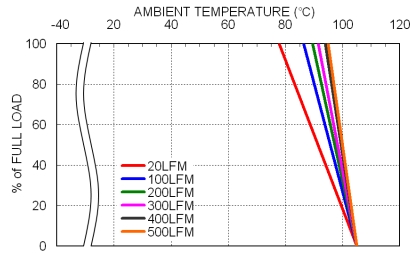
**EMC SPECIFICATIONS**

Parameter	Conditions	Level
EMI	EN55032 With external components	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	EN61000-4-4 ±2kV	Perf. Criteria B
Surge	EN61000-4-5 ±1kV With an external input filter capacitor (Nippon chemi-con KY series, 220μF/100V)	Perf. Criteria A
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

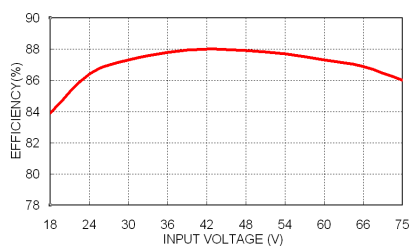
**CAUTION:** This power module is not internally fused. An input line fuse must always be used.

**CHARACTERISTIC CURVE**


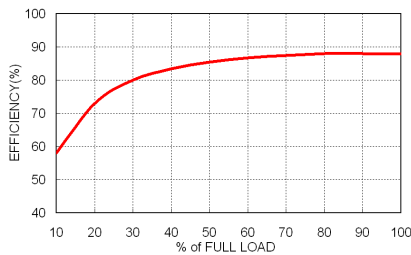
FED20-48S05W Derating Curve



FED20-48S05W Derating Curve With Heat-sink



FED20-48S05W Efficiency vs. Input Voltage



FED20-48S05W 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.

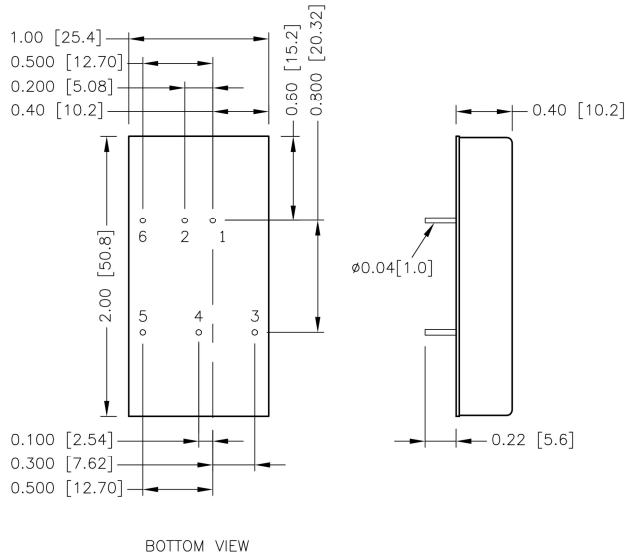
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below :

Model	Fuse Rating (A)	Fuse Type
FED20-24S□□W、FED20-24D□□W	4	Slow-Blow
FED20-48S□□W、FED20-48D□□W	2	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**



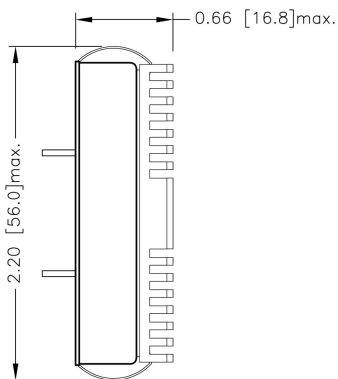
**PIN CONNECTION**

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

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**

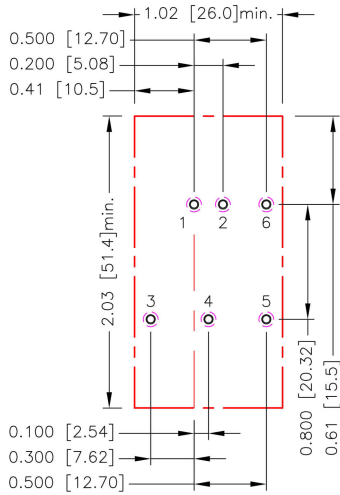
**-HC** (Heat-sink with clamps)



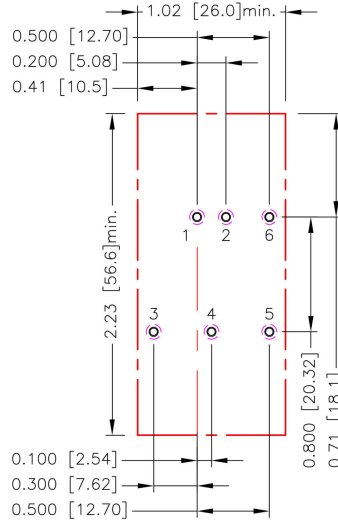
\* All dimensions in inch [mm]

**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.

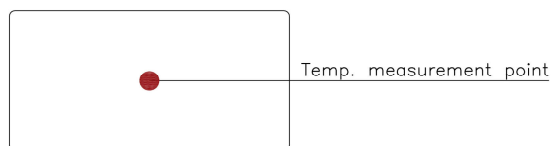
Proper cooling can be verified by measuring the point as the figure below.

The 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).



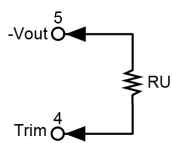
TOP VIEW

**OUTPUT VOLTAGE ADJUSTMENT**

Output voltage set point adjustment allows the user to increase or decrease the output voltage set point of the module. 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 -Vout, the output voltage set point increases. With an external resistor between the Trim and +Vout, the output voltage set point decreases. The external Trim resistor needs to be at least 1/16W of rated power.

**EXTERNAL OUTPUT TRIMMING**

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

**Trim-up**

 **S3P3W**

$\Delta V$ (%)	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 $\Omega$ )	57.930	26.165	15.577	10.283	7.106	4.988	3.476	2.341	1.459	0.753

 **S05W**

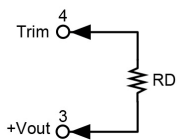
$\Delta V$ (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	5.050	5.100	5.150	5.200	5.250	5.300	5.350	5.400	5.450	5.500
RU (k $\Omega$ )	36.570	16.580	9.917	6.585	4.586	3.253	2.302	1.588	1.032	0.588

 **S12W**

$\Delta V$ (%)	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 $\Omega$ )	367.908	165.954	98.636	64.977	44.782	31.318	21.701	14.488	8.879	4.391

 **S15W**

$\Delta V$ (%)	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 $\Omega$ )	404.184	180.592	106.061	68.796	46.437	31.531	20.883	12.898	6.687	1.718

**Trim-down**

 **S3P3W**

$\Delta V$ (%)	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 $\Omega$ )	69.470	31.235	18.490	12.117	8.294	5.745	3.924	2.559	1.497	0.647

 **S05W**

$\Delta V$ (%)	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 $\Omega$ )	45.533	20.612	12.306	8.152	5.660	3.999	2.812	1.922	1.230	0.676

 **S12W**

$\Delta V$ (%)	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 $\Omega$ )	460.992	207.946	123.597	81.423	56.118	39.249	27.199	18.162	11.132	5.509

 **S15W**

$\Delta V$ (%)	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 $\Omega$ )	499.816	223.408	131.272	85.204	57.563	39.136	25.974	16.102	8.424	2.282