P-DUKE POWER

FED100W Series

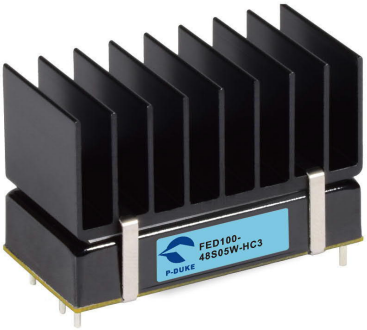
DC-DC Converter
Up to 100 Watts

3 YEARS WARRANTY

RoHS COMPLIANT

REACH COMPLIANT





Automation
Datacom
IPC
Industry
Measurement
Telecom
Automobile
Boat
Charger
Medical
PV
Railway

CE

2250 VDC Isolation Voltage
4 : 1 Wide Input Range
6 sided Shielding
LOW Standby Power
NO Min. Load Required
Operating Altitude 5000 meter
REMOTE ON OFF
OCP
OTP
OVP
SCP
UVP

PART NUMBER STRUCTURE

FED100- 48 S 05 W - N HC1

Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range	Remote On/Off Options	Assembly Options
	24: 9~36 **48:** 18~75	**S:** Single	**05:** 5 **12:** 12 **15:** 15 **24:** 24 **28:** 28 **48:** 48 **54:** 54	4:1	**□:** Positive logic **N:** Negative logic	**□:** None **HC1:** 7GA0120P02-F; H=0.3” **HC2:** 7GA0121P02-F; H=0.5” **HC3:** 7GA0122P02-F; H=0.8”

TECHNICAL SPECIFICATION All specifications are typical at nominal input, full load and 25℃ unless otherwise noted

Model Number	Input Range	Output Voltage	Output Current @Full Load	Input Current @No Load	Efficiency	Maximum Capacitor Load
	VDC	VDC	A	mA	%	μF
FED100-24S05W	9 ~ 36	5	20	10	92	30000
FED100-24S12W	9 ~ 36	12	8.4	10	94	5200
FED100-24S15W	9 ~ 36	15	6.7	10	94	3300
FED100-24S24W	9 ~ 36	24	4.2	10	93	1300
FED100-24S28W	9 ~ 36	28	3.6	10	93	970
FED100-24S48W	9 ~ 36	48	2.1	10	92	330
FED100-24S54W	9 ~ 36	54	1.86	10	92	260
FED100-48S05W	18 ~ 75	5	20	15	92	30000
FED100-48S12W	18 ~ 75	12	8.4	15	94	5200
FED100-48S15W	18 ~ 75	15	6.7	15	94	3300
FED100-48S24W	18 ~ 75	24	4.2	15	93	1300
FED100-48S28W	18 ~ 75	28	3.6	15	93	970
FED100-48S48W	18 ~ 75	48	2.1	15	92	330
FED100-48S54W	18 ~ 75	54	1.86	15	92	260

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		75 75	100 100	ms
Input surge voltage	1 second, max.	24Vin(nom) 48Vin(nom)			50 100	VDC
Input filter				Pi type		
Remote ON/OFF	Referred to –Vin pin	Positive logic (Standard) DC-DC ON DC-DC OFF Negative logic (Option) DC-DC ON 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 Remote off input current	-0.5	3	+1.0	mA 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	No Load to Full Load		-0.5		+0.5	%
Voltage adjustability			-10		+10	%
Ripple and noise	Measured by 20MHz bandwidth					
	With a 10μF/50V X7R MLCC	5Vout		75	100	mVp-p
		12Vout, 15Vout		100	125	
		24Vout, 28Vout		200	250	
	With a 4.7μF/100V X7R MLCC	48Vout, 54Vout		300	350	mVp-p
Temperature coefficient			-0.02		+0.02	%/℃
Transient response recovery time	25% load step change			250		μs
Over voltage protection	Zener diode clamp					VDC
		5Vout		6.5		
		12Vout		15		
		15Vout		20		
		24Vout		30		
		28Vout		35		
		48Vout		60		
		54Vout		66		
Over load protection	% of Iout rated; Hiccup mode			135		%
Short circuit protection			Continuous, automatics recovery			

GENERAL SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Isolation voltage	1 minute	Input to Output	2250			VDC
		Input (Output) to Case	2250			
Isolation resistance	500VDC		1			GΩ
Isolation capacitance					2200	pF
Switching frequency		48Vout, 54Vout	205	230	255	kHz
		Others	180	200	220	kHz
Safety approvals (Pending)					IEC/ EN/ UL62368-1	
Case material					Copper	
Base material					FR4 PCB	
Potting material					Silicone (UL94 V-0)	
Weight					45.35g (1.6oz)	
MTBF	MIL-HDBK-217F, Full load				7.431×10^5 hrs	

ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating ambient temperature		With derating	-40		+110	℃
Maximum case temperature					110	℃
Over temperature protection				115		℃
Storage temperature range			-55		+125	℃
Operating altitude					5000	m
Thermal impedance	Natural convection	With 5”x3” evaluation board		8		℃/W
Thermal shock					MIL-STD-810F	
Shock					MIL-STD-810F	
Vibration					MIL-STD-810F	
Relative humidity					5% to 95% RH	

EMC SPECIFICATIONS

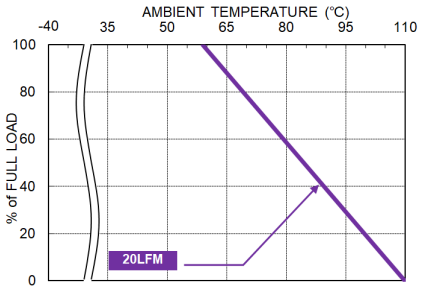
Parameter	Conditions		Level
EMI	EN55032	With external components	Class A, Class B
EMS	EN55035		
ESD	EN61000-4-2	Air ± 8kV and Contact ± 6kV	Perf. Criteria A
Radiated immunity	EN61000-4-3	20V/m	Perf. Criteria A
Fast transient	EN61000-4-4	± 2kV	Perf. Criteria A
	FED100-24S□□W	With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220μF/100V) and a TVS (SMDJ58A, 58V, 3000Watt peak pulse power) in parallel.	
	FED100-48S□□W	With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220μF/100V) and a TVS (SMDJ120A, 120V, 3000Watt peak pulse power) in parallel.	
Surge	EN61000-4-5	± 2kV	Perf. Criteria A
	FED100-24S□□W	With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220μF/100V) and a TVS (SMDJ58A, 58V, 3000Watt peak pulse power) in parallel.	
	FED100-48S□□W	With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220μF/100V) and a TVS (SMDJ120A, 120V, 3000Watt peak pulse power) in parallel.	
Conducted immunity	EN61000-4-6	10Vr.m.s	Perf. Criteria A
Power frequency magnetic field	EN61000-4-8	100A/m continuous; 1000A/m 1 second	Perf. Criteria A

Note:

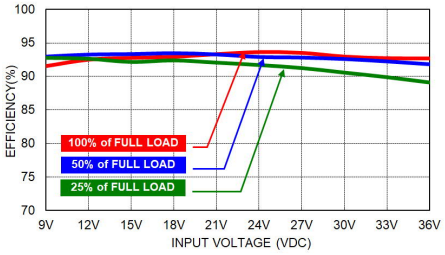
1. Input source impedance: The power module will operate as specifications without external components, assuming that the source voltage has a very low impedance and reasonable input voltage regulation. Highly inductive source impedances can affect the stability of the power module. Since real-world voltage source has finite impedance, performance can be improved by adding external filter capacitor.
   The FED100-24S□□W and FED100-48S□□W recommended Nippon Chemi-con KY series, 100μF/100V.

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

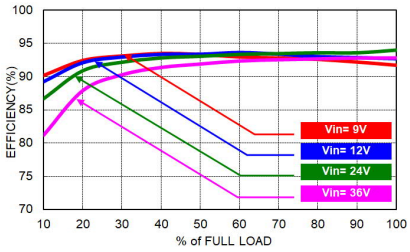
CHARACTERISTIC CURVE



FED100-24S15W Derating Curve
(Mount on 5"x3" evaluation board)



FED100-24S15W Efficiency vs. Input Voltage



FED100-24S15W Efficiency vs. Output Load

FUSE CONSIDERATION

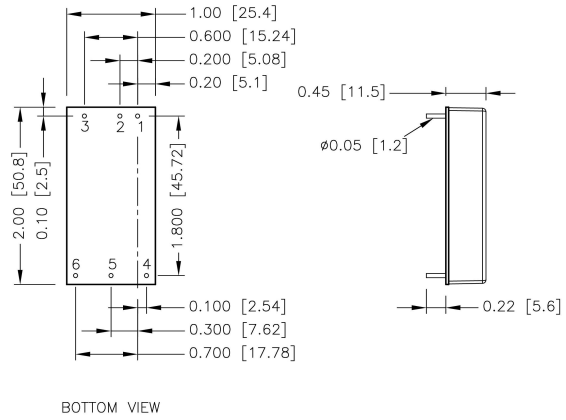
This power module is not internally fused. An input line fuse must always be used.
This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.
To maximum flexibility, internal fusing 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
FED100-24S□□W	20	Fast-Acting
FED100-48S□□W	12	Fast-Acting

The table based on the information provided in this data sheet on inrush energy and maximum DC input current at low Vin.

MECHANICAL DRAWING

Standard、-HC1、-HC2、-HC3



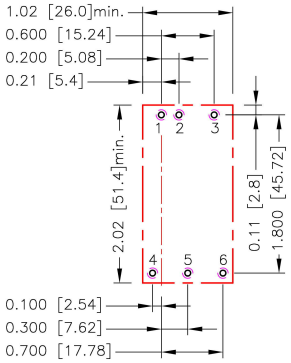
PIN CONNECTION

PIN	DEFINE
1	+ Vin
2	- Vin
3	Ctrl
4	+ Vout
5	- Vout
6	Trim

1. All dimensions in inch [mm]
   Tolerance :x.xx±0.02 [x.x±0.5]
   x.xxx±0.010 [x.xx±0.25]
2. Pin dimension tolerance ±0.004[0.10]

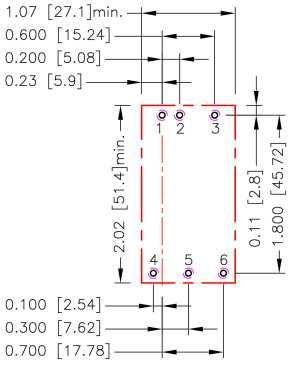
RECOMMENDED PAD LAYOUT

Standard



All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.2.3.4.5.6:ø0.059[1.50]
Top view pad 1.2.3.4.5.6: Φ0.074[1.88]
Bottom view pad 1.2.3.4.5.6: Φ0.118[3.00]

-HC1、-HC2、-HC3

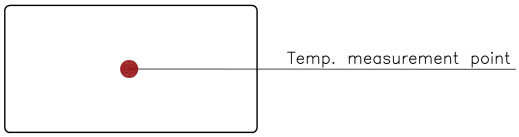


All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.2.3.4.5.6:ø0.059[1.50]
Top view pad 1.2.3.4.5.6: Φ0.074[1.88]
Bottom view pad 1.2.3.4.5.6: Φ0.118[3.00]

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.

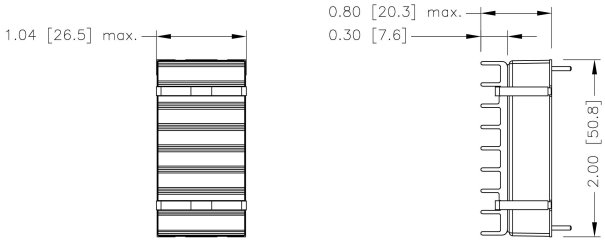
■ Thermal test condition with vertical direction by natural convection (20LFM).



TOP VIEW

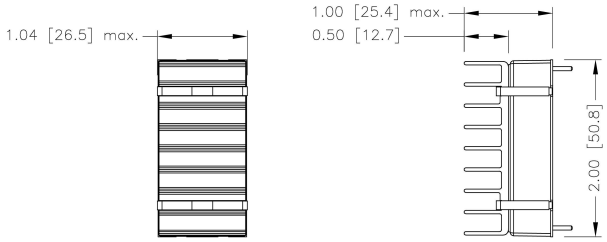
HEAT-SINK TYPE OPTIONS

FED100-□□□□□W- **HC1**
7GA0120P02-F



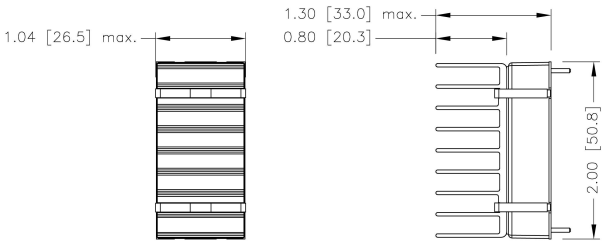
SIDE VIEW

FED100-□□□□□W- **HC2**
7GA0121P02-F



SIDE VIEW

FED100-□□□□□W- **HC3**
7GA0122P02-F



SIDE VIEW

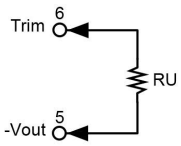
1. All dimensions in inch [mm]
2. Tolerance :x.xx±0.02 [x.x±0.5]
x.xxx±0.010 [x.xx±0.25]

OUTPUT VOLTAGE ADJUSTMENT

It allows the user to increase or decrease the output voltage of the module.
This is accomplished by connecting an external resistor between the Trim pin and either the +Vout or -Vout pins.
With an external resistor between the Trim and -Vout pin, the output voltage increases.
With an external resistor between the Trim and +Vout pin, the output voltage decreases.
The external Trim resistor needs to be at least 1/8W of rated power.

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

Trim-up



□□S05W

△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	(kΩ)	33.363	15.716	9.512	6.346	4.426	3.137	2.211	1.515	0.972	0.537

□□S12W

△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	(kΩ)	407.77	175.65	102.97	67.44	46.38	32.45	22.54	15.14	9.41	4.82

□□S15W

△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	(kΩ)	457.67	208.93	130.54	92.14	69.35	54.26	43.53	35.51	29.28	24.32

□□S24W

△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	24.240	24.480	24.720	24.960	25.200	25.440	25.680	25.920	26.160	26.400
RU	(kΩ)	1248.88	546.83	336.54	235.34	175.83	136.65	108.89	88.21	72.19	59.43

□□S28W

△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	28.280	28.560	28.840	29.120	29.400	29.680	29.960	30.240	30.520	30.800
RU	(kΩ)	1735.33	712.90	434.14	304.07	228.76	179.65	145.10	119.46	99.68	83.96

□□S48W

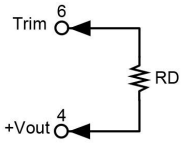
△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	48.480	48.960	49.440	49.920	50.400	50.880	51.360	51.840	52.320	52.800
RU	(kΩ)	616.74	244.11	139.44	90.13	61.45	42.69	29.47	19.64	12.05	6.01

□□S54W

△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	54.540	55.080	55.620	56.160	56.700	57.240	57.780	58.320	58.860	59.400
RU	(kΩ)	627.26	268.54	156.81	102.31	70.03	48.69	33.53	22.20	13.42	6.41

OUTPUT VOLTAGE ADJUSTMENT(CONTINUED)

Trim-down



□□S05W

△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	(kΩ)	49.803	21.556	12.684	8.344	5.769	4.065	2.853	1.948	1.246	0.685

□□S12W

△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	(kΩ)	419.22	196.87	118.52	78.50	54.21	37.90	26.19	17.38	10.50	4.99

□□S15W

△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	(kΩ)	262.56	123.07	74.17	49.24	34.13	23.99	16.71	11.24	6.97	3.55

□□S24W

△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	23.760	23.520	23.280	23.040	22.800	22.560	22.320	22.080	21.840	21.600
RD	(kΩ)	617.53	295.75	178.61	118.00	80.95	55.96	37.96	24.39	13.78	5.27

□□S28W

△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	27.720	27.440	27.160	26.880	26.600	26.320	26.040	25.760	25.480	25.200
RD	(kΩ)	988.28	513.42	330.75	234.04	174.17	133.45	103.97	81.64	64.13	50.04

□□S48W

△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	47.520	47.040	46.560	46.080	45.600	45.120	44.640	44.160	43.680	43.200
RD	(kΩ)	473.63	233.73	142.90	95.12	65.66	45.67	31.22	20.28	11.72	4.84

□□S54W

△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	53.460	52.920	52.380	51.840	51.300	50.760	50.220	49.680	49.140	48.600
RD	(kΩ)	641.18	301.78	181.68	120.23	82.91	57.83	39.82	26.26	15.68	7.20

P-DUKE

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