



## HALF-BRICK DC-DC CONVERTER

**4:1 ULTRA WIDE INPUT RANGE  
UP TO 240Watts**



### FEATURES

- NO MINIMUM LOAD REQUIRED
- 3000VAC REINFORCED INSULATION FOR 110VIN  
2250VDC BASIC INSULATION FOR 24VIN AND 48VIN
- UL60950-1, EN60950-1, & IEC60950-1 SAFETY APPROVALS
- COMPLIANCE TO EN50155 AND EN45545-2 RAILWAY STANDARD
- CE MARKED
- COMPLIANT TO RoHS II & REACH

### APPLICATIONS

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


<b>3000VAC ISOLATION</b>	<b>2250VDC ISOLATION</b>	<b>REMOTE CONTROL</b>	<b>UVP</b>	<b>OCP</b>	<b>SCP</b>	<b>OVP</b>	<b>OTP</b>	<b>SYNC</b>
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### TECHNICAL SPECIFICATION

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

Model Number	Input Range VDC	Output Voltage VDC	Output Current @Full Load A	Input Current @ No Load mA	Efficiency %	Maximum Capacitor Load µF
PD200-24S3P3W	9 ~ 36	3.3	50	25	87	151000
PD200-24S05W	9 ~ 36	5	36	30	90	72000
PD200-24S12W	8.5 ~ 36	12	15	30	89	12500
PD200-24S15W	8.5 ~ 36	15	12	30	90	8000
PD200-24S24W	8.5 ~ 36	24	7.5	35	90	3100
PD200-24S28W	8.5 ~ 36	28	6.5	40	90	2300
PD200-24S48W	8.5 ~ 36	48	3.7	45	89	770
PD200-48S3P3W	16.5 ~ 75	3.3	50	20	88	151000
PD200-48S05W	16.5 ~ 75	5	40	20	91	80000
PD200-48S12W	16.5 ~ 75	12	18	20	90	15000
PD200-48S15W	16.5 ~ 75	15	14	20	91	9300
PD200-48S24W	16.5 ~ 75	24	9	20	90	3700
PD200-48S28W	16.5 ~ 75	28	7.5	25	91	2600
PD200-48S48W	16.5 ~ 75	48	4.5	25	90	930
PD200-110S3P3W	43 ~ 160	3.3	57	10	87	172000
PD200-110S05W	43 ~ 160	5	44	10	89	88000
PD200-110S12W	43 ~ 160	12	20	10	89	16600
PD200-110S15W	43 ~ 160	15	16	10	90	10600
PD200-110S24W	43 ~ 160	24	10	10	89	4100
PD200-110S28W	43 ~ 160	28	8.5	15	90	3000
PD200-110S48W	43 ~ 160	48	5	15	89	1000

**PART NUMBER STRUCTURE**

PD200 -	48	S	05	W -	P	Y	C	TH	HS
Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range	Ctrl and Pin Options	SYNC Option	CASE pin Option	Through hole type <sup>(1)</sup>	Assembly Option
	24:8.5~36 9~36	S:Single 3P	3:3.3 05:5	4:1	<input type="checkbox"/> :Negative logic, 0.200" pin length	<input type="checkbox"/> :No pin Y:SYNC	<input type="checkbox"/> :No pin C:CASE pin	<input type="checkbox"/> : Thread TH: No thread	<input type="checkbox"/> : None Heat-sink type:
	48:16.5~75		12:12		L:Negative logic, 0.145" pin length				HS: Height H=0.45" vertical fin, 7G-0021A-F
	110:43~160		15:15		P:Positive logic, 0.200" pin length				HS1: Height H=0.24" horizontal fin, 7G-0022A-F
			24:24		S:Positive logic, 0.145" pin length				HS2: Height H=0.24" vertical fin, 7G-0023A-F
			28:28						HS3: Height H=0.45" horizontal fin, 7G-0024A-F
			48:48						Terminal block type <sup>(2)</sup> :
									T: Wall mounted
									TF: Wall mounted with EMC filter <sup>(3)</sup>
									TF1: Wall mounted with EMC filter
									can be connected to PE  <sup>(3)</sup>

(1) The module can't equip Heat-sink with TH option.

(2) No Y and C function for terminal block type, and terminal block type only for 0.200" pin length.

(3) EMI filter meet EN55011, EN55022 Class A.

**INPUT SPECIFICATIONS**

Parameter	Conditions	Min.	Typ.	Max.	Unit	
Operating input voltage range	24Vin(nom)	9	24	36	VDC	
	3.3 & 5Vout Others	8.5	24	36		
	48Vin(nom) 110Vin(nom)	16.5 43	48 110	75 160		
Start up voltage	24Vin(nom)			9	VDC	
	48Vin(nom)			18		
	110Vin(nom)			43		
Shutdown voltage	24Vin(nom)	7.3		8.1	VDC	
	48Vin(nom)	15.5		16.3		
	110Vin(nom)	33.0		36.0		
Start up time	Constant resistive load	Power up Remote ON/OFF	75		ms	
			75			
Input surge voltage	1 second, max.	24Vin(nom)		50	VDC	
		48Vin(nom)		100		
		110Vin(nom)		185		
Input filter <sup>(1)</sup>				Pi type		
Remote ON/OFF	Referred to -Vin pin	Negative logic DC-DC ON (Standard) DC-DC OFF Positive Logic DC-DC ON (Option) DC-DC OFF Input Current of Ctrl pin Remote off input current	-0.5		1	mA
				3		mA
Sync pin signal <sup>(2)</sup>		-0.3		5.6	VDC	

## OUTPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Voltage accuracy		-1.0		+1.0	%
Line regulation	Low Line to High Line at Full Load	-0.1		+0.1	%
Load regulation	No Load to Full Load	-0.1		+0.1	%
Voltage adjustability	Maximum output deviation is inclusive of remote sense	-20		+10	%
Remote sense	% of Vout(nom) If remote sense is not being used, Sense pins should be connected to corresponding polarity OUTPUT pins.			10	%
Ripple and noise	Measured by 20MHz bandwidth With a 1 $\mu$ F/25V X7R MLCC and a 22 $\mu$ F/25V POS-CAP With a 1 $\mu$ F/25V X7R MLCC and a 22 $\mu$ F/25V POS-CAP With a 4.7 $\mu$ F/50V X7R MLCC With a 2.2 $\mu$ F/100V X7R MLCC		75 100 200 300		mVp-p
Temperature coefficient		-0.02		+0.02	%/°C
Transient response recovery time	25% load step change		200	250	$\mu$ s
Over voltage protection	% of Vout(nom); Hiccup mode	115		130	%
Over load protection	% of Iout rated; Hiccup mode	120		150	%
Short circuit protection		Continuous, automatic recovery			

## GENERAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation voltage	1 minute (Reinforced insulation)      110Vin(nom) Input to Outpt Input (Output) to Case	3000			VAC
	1 minute (Basic insulation)      Others      Input to Outpt Input (Output) to Case	1500 2250			VDC
		1600			
Isolation resistance	500VDC	1			G $\Omega$
Isolation capacitance				2500	pF
Switching frequency		225	250	275	kHz
Safety approvals					UL60950-1 EN60950-1 IEC60950-1
Case material	24Vin(nom) and 48Vin(nom) 110Vin(nom)				Metal Aluminum base-plate with plastic case
Base material	24Vin(nom) and 48Vin(nom)				FR4 PCB
Potting material					Silicone (UL94 V-0)
Weight	Module stand alone				105g (3.70oz)
	PD200-xxSxxW - T				235g (8.29oz)
	PD200-xxSxxW - TF				280g (9.88oz)
	PD200-xxSxxW - TF1				287g (10.12oz)
MTBF	MIL-HDBK-217F, Full load				2.961 $\times$ 10 <sup>5</sup> hrs

## ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating case temperature	Base-plate	-40		+115	°C
Over temperature protection			+120		°C
Storage temperature range	Terminal block type	-40		+105	°C
	Others	-55		+125	

Thermal impedance <sup>(3)</sup>	Vertical direction by natural convection (20LFM) Module without assembly option Only mount on the iron base-plate Heat-sink type with 0.24" Height Heat-sink type with 0.45" Height	6.1 2.8 5.1 4.6	°CW
Thermal shock			MIL-STD-810F
Shock			EN61373, MIL-STD-810F
Vibration			EN61373, MIL-STD-810F
Relative humidity			5% to 95% RH

## EMC SPECIFICATIONS

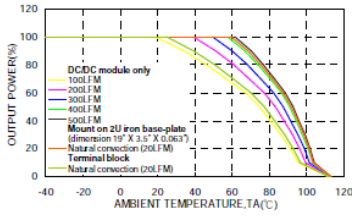
Parameter	Conditions	Level
EMI <sup>(4)</sup>	EN55011, EN55022	Class A  Class B
ESD	EN61000-4-2 Air ± 8kV and Contact ± 6kV	Perf. Criteria A
Radiated immunity	EN61000-4-3 20V/m	Perf. Criteria A
Fast transient <sup>(5)</sup>	EN61000-4-4 ± 2kV	Perf. Criteria A
Surge <sup>(5)</sup>	EN61000-4-5 EN55024 ±2kV and EN50155 ±2kV	Perf. Criteria A
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:

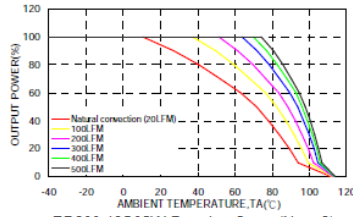
- Input source impedance: The power module will operate as specifications without external components, assuming that the source voltage has a very low impedance and reasonable input voltage regulation. Highly inductive source impedances can affect the stability of the power module. Since real-world voltage source has finite impedance, performance can be improved by adding external filter capacitor. The PD200-24SxxW and PD200-48SxxW recommended Nippon Chemi-con KY series, 100µF/100V. The PD200-110SxxW recommended Ruby-con BXF series, 68µF/200V.
- (1) Multiple PD200W series module can be synchronized together simply by connecting the Sync pins together. Care should be taken to ensure the ground potential differences between modules are minimized.  
(2) In this configuration all of the modules will be synchronized to the highest frequency module.  
(3) Up to three modules can be synchronized using this technique.  
(4) More relevant information in datasheet.
- (1) Thermal test condition with vertical direction by natural convection (20LFM).  
(2) The iron base-plate dimension is 19" X 3.5" X 0.063" (The height is EIA standard 2U).  
(3) The heat-sink is optional and P/N: 7G-0021A-F, 7G-0022A-F, 7G-0023A-F, 7G-0024A-F. Please refer to heat-sink selection guide.
- The PD200W series standard module meets EN55011, EN55022 Class A and Class B with external components.
- An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5. The PD200-24SxxW and PD200-48SxxW recommended 2 pcs of aluminum electrolytic capacitor (Nippon Chemi-con KY series, 220µF/100V) to connect in parallel. The PD200-110SxxW recommended 3 pcs of aluminum electrolytic capacitor (Ruby-con BXF series, 100µF/250V) to connect in parallel.
- CASE GROUNDING : Connecting four screw bolts to shield plane will help to reduce the EMI.
- For further information, please contact MEGA Electronics, Inc.

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

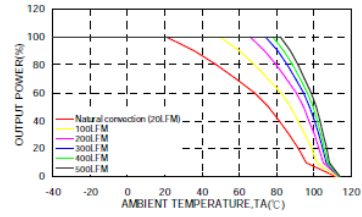
## CHARACTERISTIC CURVE



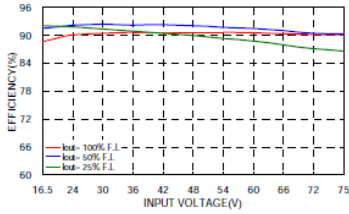
PD200-48S05W Derating Curve (Note 3)



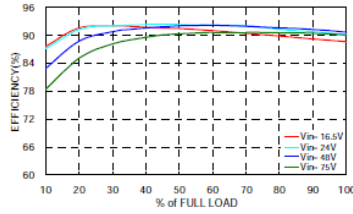
PD200-48S05W Derating Curve (Note 3)  
With 0.24" Height Heat-sink



PD200-48S05W Derating Curve (Note 3)  
With 0.45" Height Heat-sink



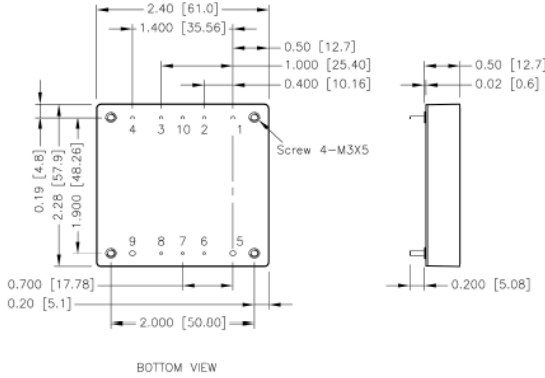
PD200-48S05W Efficiency vs. Input Voltage



PD200-48S05W Efficiency vs. Output Load

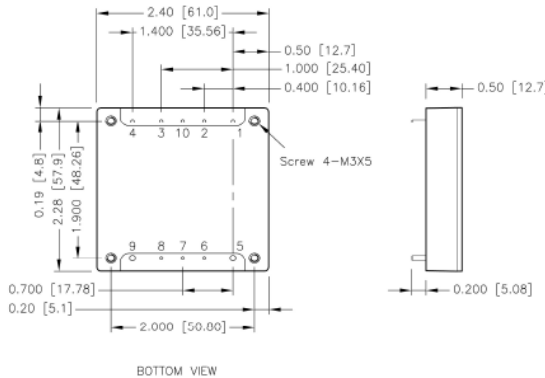
## MECHANICAL DRAWING

PD200-24SxxW  
PD200-48SxxW



\*The screw locked torque: MAX 5.0kgf-cm/0.49N-m

PD200-110SxxW



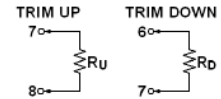
\*The screw locked torque: MAX 3.5kgf-cm/0.34N-m

### PIN CONNECTION

PIN	DEFINE	DIAMETER
1	-Vin	0.04 Inch
2	Case (option)	0.04 Inch
3	Ctrl	0.04 Inch
4	+Vin	0.04 Inch
5	-Vout	0.08 Inch
6	-Sense	0.04 Inch
7	Trim	0.04 Inch
8	+Sense	0.04 Inch
9	+Vout	0.08 Inch
10	Sync (option)	0.04 Inch

### EXTERNAL OUTPUT TRIMMING

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



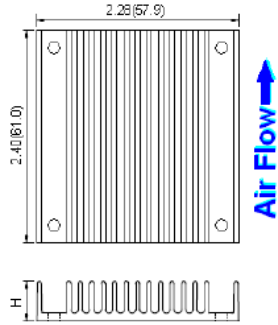
$$R_U = \left( \frac{V_{OUT} (100 + \Delta\%)}{1.225 \Delta\%} - \frac{(100 + 2\Delta\%)}{\Delta\%} \right) k\Omega$$

$$R_D = \left( \frac{100}{\Delta\%} - 2 \right) k\Omega$$

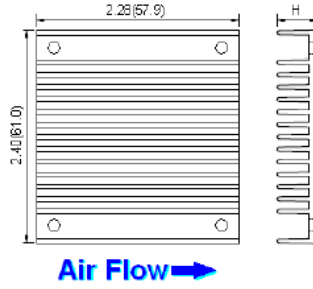
1. All dimensions in inch (mm)
2. Tolerance : x.xx±0.02 (x.x±0.5)  
x.xxx±0.01 (x.xx±0.25)
3. Pin pitch tolerance ±0.01 (0.25)
4. Pin dimension tolerance ±0.004(0.1)
5. Mounting screws should always be used.

**HEAT-SINK TYPE OPTIONS**

Vertical Fin Orientation, Suffix:-HS, -HS2



Horizontal Fin Orientation, Suffix:-HS1, -HS3

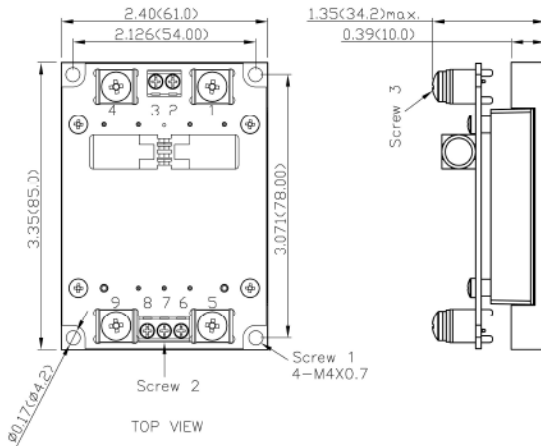


<b>HS:</b>	Height H=0.45" vertical fin, 7G-0021A-F
<b>HS1:</b>	Height H=0.24" horizontal fin, 7G-0022A-F
<b>HS2:</b>	Height H=0.24" vertical fin, 7G-0023A-F
<b>HS3:</b>	Height H=0.45" horizontal fin, 7G-0024A-F

1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5)  
x.xxx±0.01 (x.xx±0.25)

**TERMINAL BLOCK TYPE OPTION**

PD200-xxSxxW-T

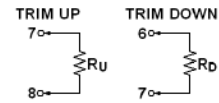


**TERMINAL CONNECTION**

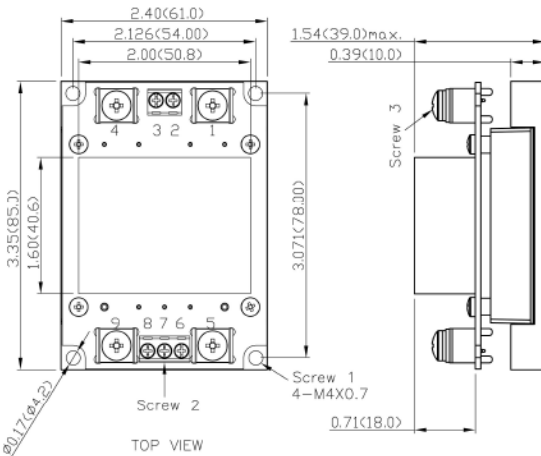
NO.	DEFINE
1	-Vin
2	NC
3	Ctrl
4	+Vin
5	-Vout
6	-Sense
7	Trim
8	+Sense
9	+Vout

**EXTERNAL OUTPUT TRIMMING**

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



PD200-xxSxxW-TF



$$R_U = \left( \frac{V_{OUT} (100 + \Delta\%) - (100 + 2\Delta\%)}{1.225 \Delta\%} - \frac{(100 + 2\Delta\%)}{\Delta\%} \right) k\Omega$$

$$R_D = \left( \frac{100}{\Delta\%} - 2 \right) k\Omega$$

1. All dimensions in inch (mm)
2. Tolerance : x.xx±0.02 (x.xx±0.5)  
x.xxx±0.01 (x.xx±0.25)
3. Screw 1 locked torque:  
MAX 11.2kgf-cm/ 1.10N-m
4. Screw 2 locked torque:  
MAX 5.2kgf-cm/ 0.51N-m
5. Screw 3 locked torque:  
MAX 16.8kgf-cm/ 1.65N-m

PD200-xxSxxW-TF1

