



PHI-CON

1 W DC-DC Converter P1M-Series

- 8 Pin SIL package
- Wide 2:1 input range
- Isolation 1 kV_{DC}, optional 3 kV_{DC}
- ON/OFF-Remote control function optional
- Continuous short circuit protection



Model guide

Type	Input voltage		Input current no load [mA] typ.	Input current full load [mA] typ.	Output voltage [V _{DC}]	Output current		Efficiency typ. [%] typ.	Capacitive load (See note1) [μF] max.
	Nominal [V _{DC}]	Range [V _{DC}]				min. [mA]	max. [mA]		
Single output									
P1M053R3S	5	4.5...9	15	300	3.3	76	303	67	3300
P1M0505S	5	4.5...9	15	300	5.0	50	200	67	3300
P1M0509S	5	4.5...9	40	285	9.0	28	111	70	470
P1M0512S	5	4.5...9	55	285	12.0	21	83	70	470
P1M0515S	5	4.5...9	55	285	15.0	17	67	70	470
P1M0524S	5	4.5...9	70	295	24.0	10	42	68	220
P1M123R3S	12	9...18	15	120	3.3	76	303	70	3300
P1M1205S	12	9...18	15	115	5.0	50	200	72	3300
P1M1209S	12	9...18	15	110	9.0	28	111	77	470
P1M1212S	12	9...18	15	110	12.0	21	83	77	470
P1M1215S	12	9...18	15	110	15.0	17	67	77	470
P1M1224S	12	9...18	15	115	24.0	10	42	73	220
P1M243R3S	24	18...36	8	60	3.3	76	303	70	3300
P1M2405S	24	18...36	8	55	5.0	50	200	72	3300
P1M2409S	24	18...36	8	55	9.0	28	111	75	470
P1M2412S	24	18...36	8	55	12.0	21	83	75	470
P1M2415S	24	18...36	8	55	15.0	17	67	75	470
P1M2424S	24	18...36	8	55	24.0	10	42	75	220
P1M483R3S	48	36...72	6	30	3.3	76	303	66	3300
P1M4805S	48	36...72	6	30	5.0	50	200	68	3300
P1M4809S	48	36...72	6	30	9.0	28	111	70	470
P1M4812S	48	36...72	6	30	12.0	21	83	70	470
P1M4815S	48	36...72	6	30	15.0	17	67	70	470
P1M4824S	48	36...72	6	30	24.0	10	42	68	220
Dual output									
P1M053R3D	5	4.5...9	15	285	±3.3	±38	±152	70	2 x 1000
P1M0505D	5	4.5...9	15	270	±5.0	±25	±100	74	2 x 1000
P1M0509D	5	4.5...9	20	270	±9.0	±14	±56	74	2 x 220
P1M0512D	5	4.5...9	20	265	±12.0	±10	±42	75	2 x 220
P1M0515D	5	4.5...9	40	285	±15.0	±8	±33	70	2 x 220
P1M0524D	5	4.5...9	70	300	±24.0	±5	±21	67	2 x 100
P1M123R3D	12	9...18	15	120	±3.3	±38	±152	70	2 x 1000
P1M1205D	12	9...18	15	115	±5.0	±25	±100	72	2 x 1000
P1M1209D	12	9...18	15	110	±9.0	±14	±56	76	2 x 220
P1M1212D	12	9...18	15	110	±12.0	±10	±42	76	2 x 220
P1M1215D	12	9...18	15	110	±15.0	±8	±33	74	2 x 220
P1M1224D	12	9...18	40	125	±24.0	±5	±21	67	2 x 100
P1M243R3D	24	18...36	8	60	±3.3	±38	±152	70	2 x 1000
P1M2405D	24	18...36	8	60	±5.0	±25	±100	70	2 x 1000
P1M2409D	24	18...36	8	55	±9.0	±14	±56	76	2 x 220
P1M2412D	24	18...36	8	55	±12.0	±10	±42	77	2 x 220
P1M2415D	24	18...36	8	55	±15.0	±8	±33	75	2 x 220
P1M2424D	24	18...36	20	60	±24.0	±5	±21	70	2 x 100
P1M483R3D	48	36...72	6	30	±3.3	±38	±152	70	2 x 1000
P1M4805D	48	36...72	6	30	±5.0	±25	±100	70	2 x 1000
P1M4809D	48	36...72	6	30	±9.0	±14	±56	74	2 x 220
P1M4812D	48	36...72	6	25	±12.0	±10	±42	76	2 x 220
P1M4815D	48	36...72	6	30	±15.0	±8	±33	72	2 x 220
P1M4824D	48	36...72	12	30	±24.0	±5	±21	70	2 x 100

Part number structure												
Output power		Series	Input voltage		Output voltage		Outputs		Isolation		ON/OFF-Remote control	
P1	1 W	M	05	4.5..9 V	3R3	3.3 V	D		H		C	
P1	1 W		05	4.5..9 V	3R3	3.3 V	blanc	single	blanc	1 kV	blanc	No control input
			12	9..18 V	05	5 V	D	dual	H	3 kV		
			24	18..36 V	09	9 V	Z	dual, other pin assignment			C	Control input
			48	36..72 V	12	12 V						
					15	15 V						
					24	24 V						



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Specifications

Input	
Filter	Capacitor
Reflected input ripple current	35 mA _{p-p} , typ. (see Figure 1)
Remote control	
ON state threshold	Open input or ≤ 0.8 V
OFF state threshold	3.5 mA...15 mA, 4.5 V...15 V via R_s 1 k Ω (see Figure 4)
Isolation:	
Rated voltage (60 s test)	Standard: 1000 V _{DC} , Suffix H: 3000 V _{DC}
Resistance	$\geq 10^9 \Omega$
Capacitance	60 pF, typ.
Output	
Voltage tolerance	$\leq \pm 2$ %
Ripple and noise, (at 20 MHz bandwidth)	≤ 80 mV _{p-p} (see Figure 2)
Short circuit protection	Continuous, automatic restart
Line regulation	$\leq \pm 0.5$ %
Load regulation @ 25 % to 100 % loading	$\leq \pm 1$ %
Temperature coefficient	± 0.02 % / °C
Dual output cross regulation	± 5 % @ 75 % load difference
General	
Switching frequency	100...650 kHz
Safety standard to meet	EN-, IEC-, UL-, cUL 60950-1 EN-, IEC-, UL-, cUL 62368-1
Reliability calculated MTBF, MIL-HDBK-217 F @ 25 °C	≥ 1.66 Mio. h

EMC in accordance with		
RE	EN 55032	Class A
CE	EN 55032	Class A (see Figure 3)
ESD	EN-, IEC 61000-4-2	Perf. Criteria A
RS	EN-, IEC 61000-4-3	Perf. Criteria A
EFT	EN-, IEC 61000-4-4	Perf. Criteria A (see Figure 3)
Surge	EN-, IEC 61000-4-5	Perf. Criteria A (see Figure 3)
CS	EN-, IEC 61000-4-6	Perf. Criteria A
PFMF	EN-, IEC 61000-4-8	Perf. Criteria A
Environmental		
Operating ambient temperature	-40 ... 85 °C	
Storage temperature	-40 ... 125 °C	
Case temperature	≤ 100 °C	
Derating	None required	
Humidity	Up to 95 %, non condensing	
Cooling	Free air convection, ≥ 35 LFM	
Physical		
Dimensions SIP8	21.9 x 11.1 x 9.2 mm	
Weight	4.5 g	
Case material	non conductive plastic, UL94V-0 rated	
Potting material	Epoxy UL94V-0 rated	
Absolute maximum ratings		
P1M05xxx	Vin: ≤ 12 V _{DC} , ≤ 100 ms	
P1M12xxx	Vin: ≤ 24 V _{DC} , ≤ 100 ms	
P1M24xxx	Vin: ≤ 40 V _{DC} , ≤ 100 ms	
P1M48xxx	Vin: ≤ 80 V _{DC} , ≤ 100 ms	
Soldering Temperature		
≤ 260 °C, duration ≤ 10 s, ≥ 1.5 mm distance to package		

Note:

- Maximum capacitive load tested at nominal input voltage and resistive load
- All specifications typical at Ta 25 °C, nominal input voltage and full load unless otherwise specified.
- Operation at < 25 % load will not damage these devices, however they may not meet all listed parameters.
- Not usable for MOSFET- or IGBT- driver applications.
- Output parallel operation is not recommended

Figure 1 Input ripple & noise current measure circuit

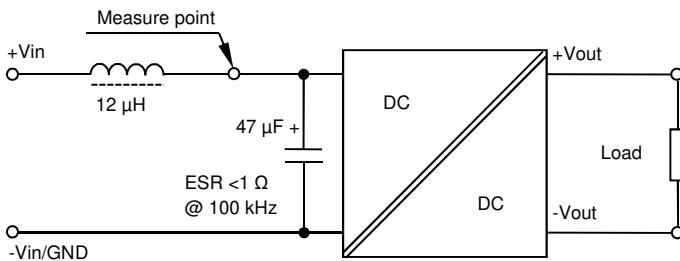
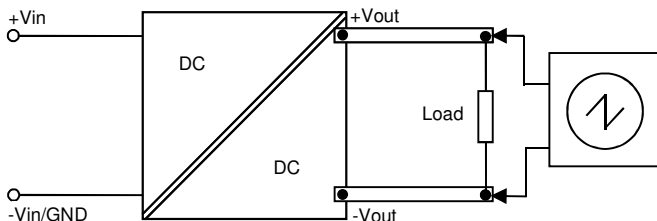


Figure 2 Output ripple & noise measure circuit (BW 20 MHz)



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Figure 3 EMI Filter circuit to meet IEC-, EN 61000-4-4 class A, IEC-, EN 61000-4-5 Class A

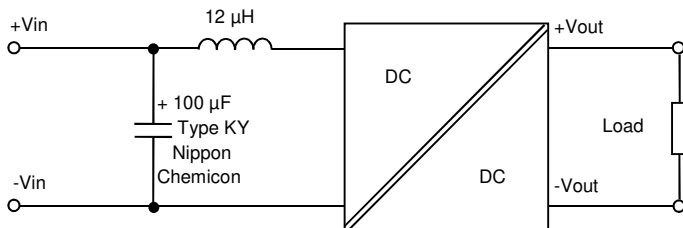
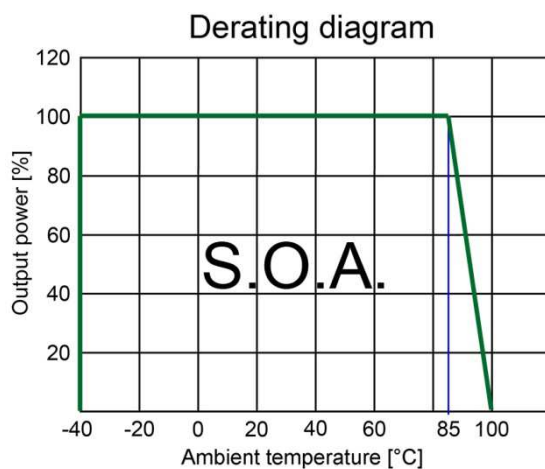
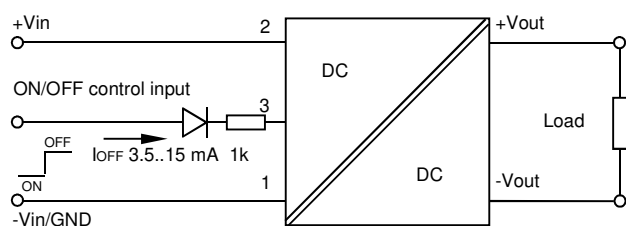


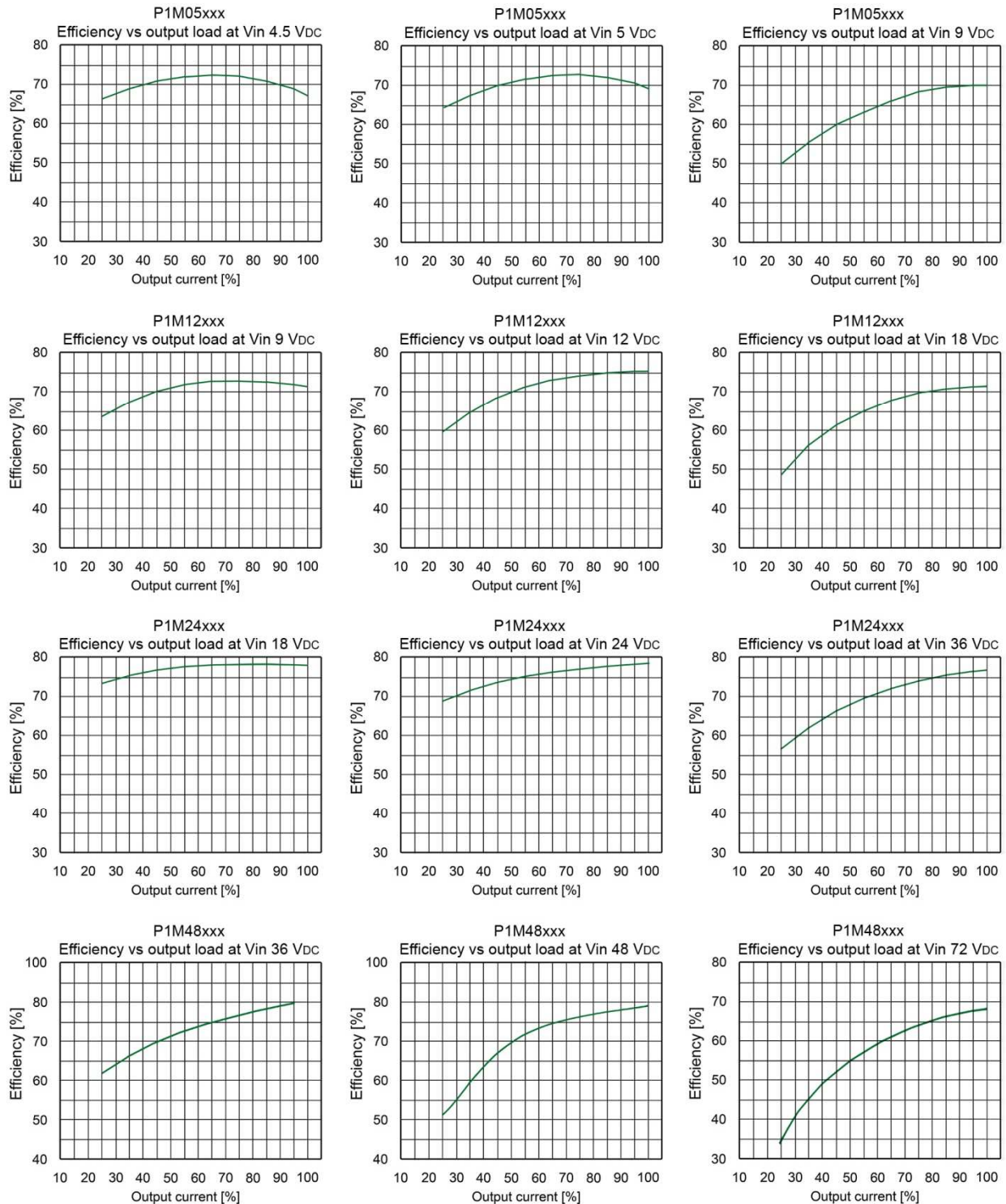
Figure 4...ON/OFF-remote control application circuit example





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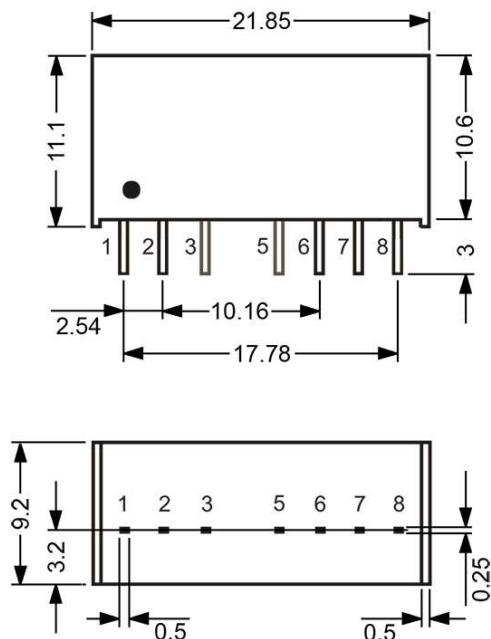




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Mechanical dimensions



Notes:
 Dimensions in mm
 Pin diameter tolerance ± 0.05 mm
 Pin pitch tolerance ± 0.35 mm
 Case tolerance ± 0.5 mm

Pin assignment						
Pin	Single	Single (Suffix C)	Dual (Suffix D)	Dual (Suffix DC)	Dual (Suffix Z)	Dual (Suffix ZC)
1	-V Input	-V Input	-V Input	-V Input	-V Input	-V Input
2	+V Input	+V Input	+V Input	+V Input	+V Input	+V Input
3	No pin	On/Off Ctrl.	N.C.	On/Off Ctrl.	N.C.	On/Off Ctrl.
5	No pin	N.C.	N.C.	N.C.	N.C.	N.C.
6	+V Output	+V Output	+V Output	+V Output	+V Output	+V Output
7	-V Output	-V Output	-V Output	-V Output	Common	Common
8	N.C.	N.C.	Common	Common	-V Output	-V Output

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