



PHI-CON

9 W DC-DC Converter P9E-Series

- SIL 8 Pin
- Wide input range 2:1
- 1600 V_{DC} isolation
- Continuous short circuit protection
- Output over voltage protection
- Input under voltage protection
- Remote control input



Model guide

Type	Input voltage		Input current no load [mA] typ.	Input current full load [mA] typ.	Output voltage [V _{DC}]	Output current min. [mA]	Output current max. [mA]	Efficiency @ full load [%] typ.	Capacitive load (note 2) [μF] max.
	Nominal [V _{DC}]	Range [V _{DC}]							
Single output									
P9E123R3S	12	9...18	15	680	3.3	0	2000	81	2600
P9E1205S	12	9...18	15	785	5.0	0	1600	85	1300
P9E1209S	12	9...18	15	860	9.0	0	1000	87	800
P9E1212S	12	9...18	15	850	12.0	0	750	88	560
P9E1215S	12	9...18	15	845	15.0	0	600	89	470
P9E1224S	12	9...18	15	845	24.0	0	375	89	200
P9E243R3S	24	18...36	15	345	3.3	0	2000	80	2600
P9E2405S	24	18...36	15	390	5.0	0	1600	85	1300
P9E2409S	24	18...36	15	425	9.0	0	1000	88	800
P9E2412S	24	18...36	15	420	12.0	0	750	89	560
P9E2415S	24	18...36	15	417	15.0	0	600	90	470
P9E2424S	24	18...36	15	417	24.0	0	375	90	200
P9E483R3S	48	36...75	10	170	3.3	0	2000	82	2600
P9E4805S	48	36...75	10	195	5.0	0	1600	85	1300
P9E4809S	48	36...75	10	215	9.0	0	1000	88	800
P9E4812S	48	36...75	10	210	12.0	0	750	89	560
P9E4815S	48	36...75	10	210	15.0	0	600	89	470
P9E4824S	48	36...75	10	210	24.0	0	375	89	200
Dual output									
P9E1205D	12	9...18	15	785	±5.0	0	±800	85	2 x 800
P9E1212D	12	9...18	15	850	±12.0	0	±375	88	2 x 390
P9E1215D	12	9...18	15	845	±15.0	0	±300	89	2 x 200
P9E2405D	24	18...36	15	390	±5.0	0	±800	86	2 x 800
P9E2412D	24	18...36	15	420	±12.0	0	±375	89	2 x 390
P9E2415D	24	18...36	15	430	±15.0	0	±300	87	2 x 200
P9E4805D	48	36...75	10	195	±5.0	0	±800	86	2 x 800
P9E4812D	48	36...75	10	215	±12.0	0	±375	87	2 x 390
P9E4815D	48	36...75	10	215	±15.0	0	±300	87	2 x 200

Part number structure						
Output power	Series	Input voltage		Output voltage		Outputs
P9	E	12		3R3		S
9 Watt		12	9..18 V	3R3	3.3 V	S single
		24	18..36 V	05	5 V	D dual
		48	36..75 V	09	9 V	
				12	12 V	
				15	15 V	
				24	24 V	



PHI-CON

9 W DC-DC Converter P9E-Series

Specifications

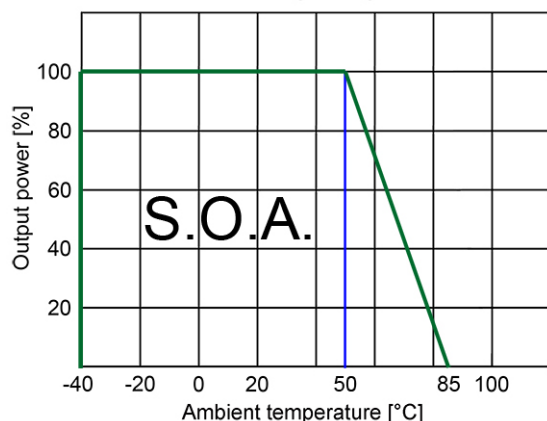
Input	
Start up voltage	P9E12xxxx: 8.9 V _{DC} P9E24xxxx: 16 V _{DC} P9E48xxxx: 33 V _{DC}
Under voltage lockout	P9E12xxxx: 7 V _{DC} P9E24xxxx: 13 V _{DC} P9E48xxxx: 30 V _{DC}
Start up time	50 ms, typ.
Input reflected ripple current	30 mA _{p-p} , max. (figure 1)
Filter	Capacitors
On / Off controll pin	On: open Off: 2...4 mA control current (via series resistor 1 kΩ, see figure 3)
Off state idle current	2.5 mA, typ.
Isolation:	
Rated isolation voltage	Input / output: 1600 V _{DC} , min. Input or output to case: 1000 V _{DC} , min.
Resistance	10 ³ Ω, min.
Capacitance	50 pF, typ.
Output	
Voltage tolerance	± 1 %
Line voltage regulation	± 0.2 %
Load regulation at 0...100 % load change	P9Exx3R3S: ± 1 % P9ExxxxD: ± 1 % All others: ± 0.5 %
Dual output cross regulation at 75 % load difference	± 5 %, max.
Ripple and noise (at 20 MHz BW)	75 mV _{p-p} , typ (see figure 2)
Over voltage protection	130 %, typ.
Over current protection	150 %, typ.
Short circuit protection	Continuous, Automatic restart
Temperature coefficient	± 0.02 % / °C
Start up time	50 ms, typ.
Transient recovery time	250 μs, typ. at 25 % load change steps
Transient response deviation	± 3 %, max. all others ± 5 %, max. at P9Exx3R3S

General	
Switching frequency	400...500 kHz
Safety standard	IEC 60950-1
Reliability calculated MTBF (MIL-HDBK-217F)	>900 000 h
EMC specifications	
Conducted emissions (figure 4)	EN 55032 class A
Radiated emissions	EN 55032 class A
ESD	IEC 61000-4-2 perf. criteria B
RS	IEC 61000-4-3 perf. criteria A
EFT (figure 4)	IEC 61000-4-4 perf. criteria A
Surge (figure 4)	IEC 61000-4-5 perf. criteria A
CS	IEC 61000-4-6 perf. criteria A
PFMF	IEC 61000-4-8 perf. criteria A
Environmental	
Operating ambient temperature	-40 ... 85 °C, see derating diagram
Storage temperature	-55 ... 125 °C
Case temperature	100 °C, max.
Derating	See SOA curve
Storage humidity	Up to 95 %, Non condensing
Cooling	30...65 LFM
Physical	
Dimensions SIP8	21.80 x 9.6 x 11.2 mm
Weight	7.3 g
Case material	Copper
Potting material	Epoxy (UL94-V0 rated)
Absolute maximum ratings	
Absolute max. voltage for 100 ms	P9E12xxxx 25 V _{DC} P9E24xxxx 50 V _{DC} P9E48xxxx 100 V _{DC}
Pin soldering temperature	260 °C for 10 s, 1.5 mm distance from body

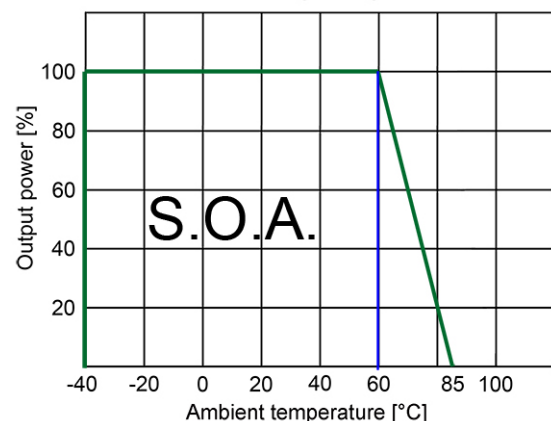
Notes:

- All specifications are typical at 25 °C, nominal input voltage and full load unless otherwise noted.
- Capacitive load is tested by minimal V_{in} and constant resistive load.

P9Exx3R3S
Derating diagram



All others
Derating diagram



9 W DC-DC Converter P9E-Series

Figure 1 Measure circuit reflected input ripple current

Input reflected current is measured through a source inductor and a source capacitor at nominal input voltage and full load.

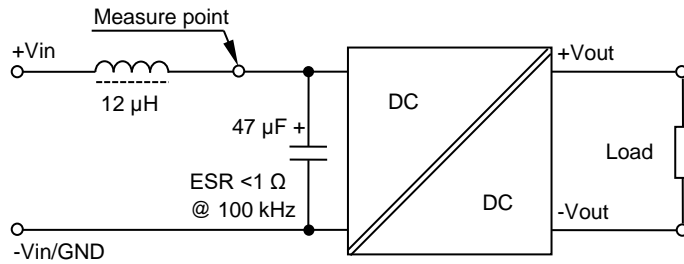


Figure 2 Measure circuit output ripple & noise voltage

Use the following measurement circuit. The oscilloscope measurement bandwidth must be > 20 MHz.

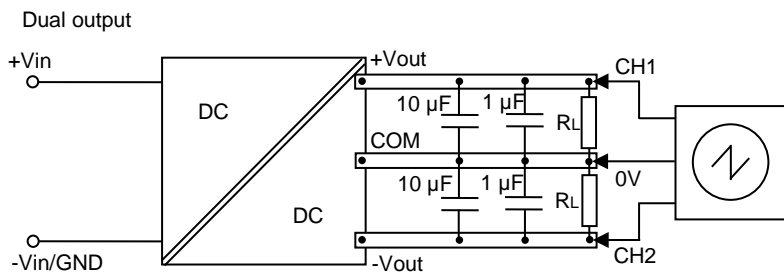
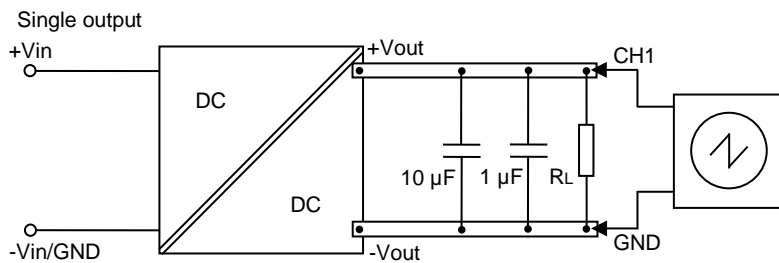
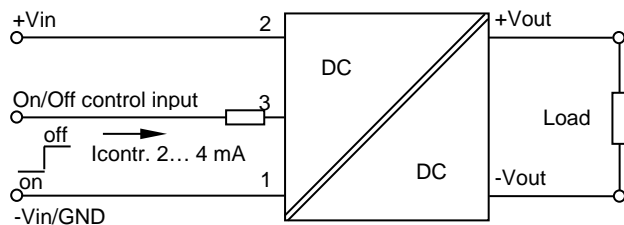


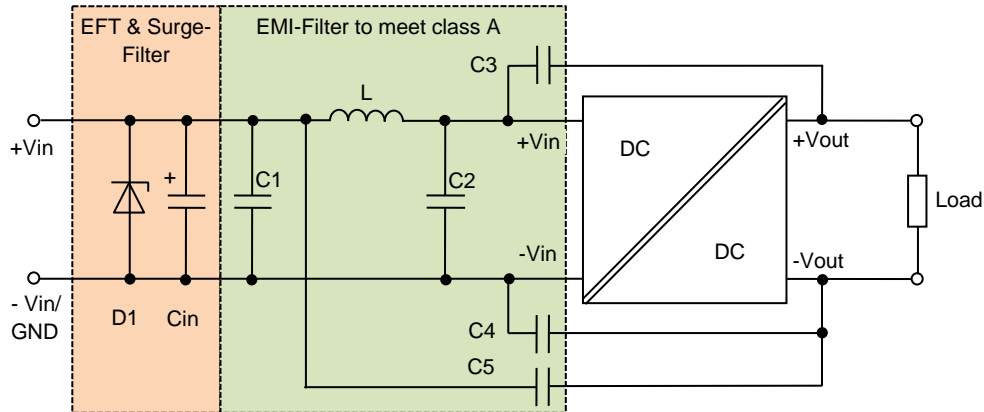
Figure 3 Application circuit remote control function



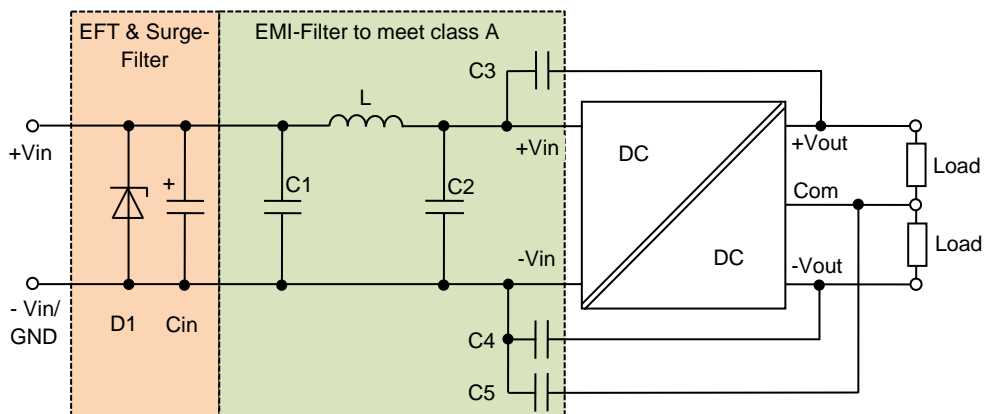
9 W DC-DC Converter P9E-Series

Figure 4 Application- and test- circuit for EFT (IEC 61000-4-4) & Surge (IEC 61000-4-5) and EMI (EN55032)

Single output



Dual output



Bill of material to figure 4							
	D1	Cin	C1, MLCC	L	C2, MLCC	C3, C4	C5
P9E12xxS	TVS, 26 V, 3 kW	330 μ F, 100 V	10 μ F, 35 V	3.3 μ H	-	1 nF, 3 kV	-
P9E12xxD	TVS, 26 V, 3 kW	330 μ F, 100 V	10 μ F, 35 V	3.3 μ H	-	1 nF, 3 kV	-
P9E24xxS	TVS, 70 V, 3 kW	330 μ F, 100 V	4.7 μ F, 100 V	10 μ H	4.7 μ F, 100 V	1 nF, 3 kV	-
P9E24xxD	TVS, 70 V, 3 kW	330 μ F, 100 V	4.7 μ F, 100 V	10 μ H	4.7 μ F, 100 V	1 nF, 3 kV	-
P9E48xxS	TVS, 120 V, 3 kW	330 μ F, 100 V	4.7 μ F, 100 V	10 μ H	4.7 μ F, 100 V	1 nF, 3 kV	220 pF, 3 kV
P9E48xxD	TVS, 120 V, 3 kW	330 μ F, 100 V	4.7 μ F, 100 V	10 μ H	4.7 μ F, 100 V	1 nF, 3 kV	220 pF, 3 kV

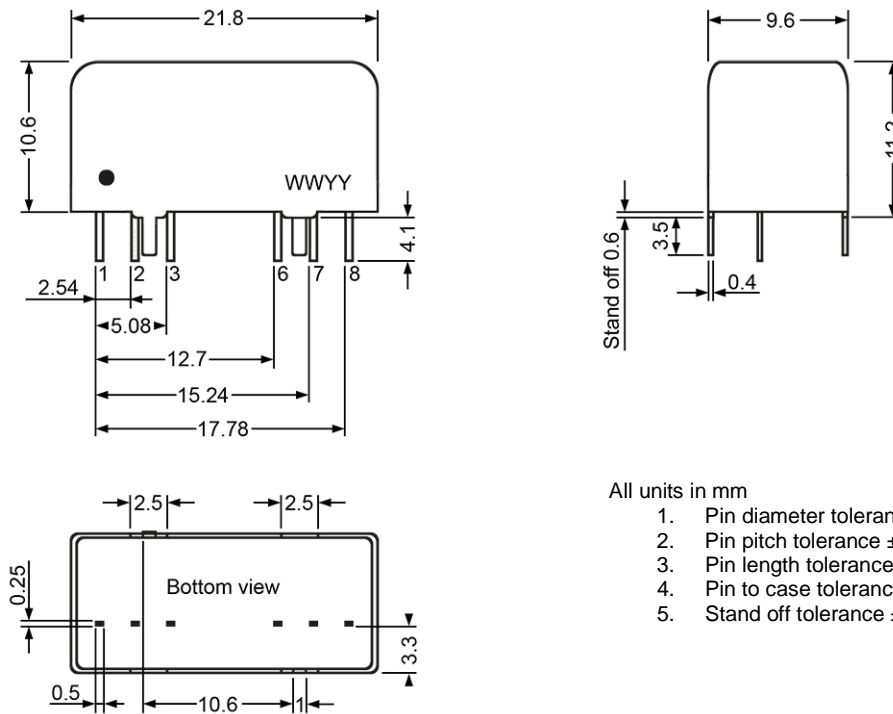
Cin recommended type: Nippon Chemicon KY-series ESR <0.1 Ω @ 100 kHz



PHI-CON

9 W DC-DC Converter P9E-Series

Dimensions



All units in mm

1. Pin diameter tolerance ± 0.05 mm
2. Pin pitch tolerance ± 0.35 mm
3. Pin length tolerance ± 0.35 mm
4. Pin to case tolerance ± 0.5 mm
5. Stand off tolerance ± 0.1 mm

Pin assignment		
Pin	Single with RC	Dual with RC
1	-V Input	-V Input
2	+V Input	+V Input
3	Remote contr. on/off	Remote contr. on/off
6	+V Output	+V Output
7	-V Output	Common
8	N.C.	-V Output

PHI-CON is a trademark of HY-LINE Holding GmbH.

Only for professional use by professionals! Not for resale or distribution to the general public in any way! Read the instructions carefully before using!

Life Support Policy: HY-LINE does not authorize the use of any of its products for use in life support devices or systems without the express written approval of an officer of the Company. Life support systems are devices which support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user. Rev: 20180126 f