Preliminary

20 W DC-DC Converter P20E-Series

PHI-CON

- Wide input range
- 3000 V_{DC} isolation
- Aluminium heat sink case
- Continuous short circuit protection
- Over current protection
- Over continuous short circuit protection
- Output over voltage protection
- Over temperature protection
- Wide operation temperature range -40...100 °C
- Adjustable output voltage
- On / Off remote control input
- EN 50155 standard

Model guide

Type	Input voltage		Input current		Output voltage	Output current		Efficiency	Capacitor load (note2)
	Nominal [V_{DC}]	Range [V_{DC}]	no load [mA] typ.	full load [mA] typ.	[V_{DC}]	[mA] min.	[mA] max.	[%] typ.	[µF] max.
Single									
P20E243R3SK	24	13...70	10	710	3.3	0	4500	87	7000
P20E2405SK	24	13...70	10	950	5.0	0	4000	88	5000
P20E2412SK	24	13...70	10	940	12.0	0	1670	89	850
P20E2415SK	24	13...70	10	930	15.0	0	1330	90	700
P20E1103R3SK	110	42...176	10	160	3.3	0	4500	86	7000
P20E11005SK	110	42...176	10	205	5.0	0	4000	89	5000
P20E11012SK	110	42...176	10	210	12.0	0	1670	86	850
P20E11015SK	110	42...176	10	210	15.0	0	1330	86	700
Dual									
P20E243R3DK	24	13...70	10	970	±3.3	0	±2000	86	2 x 1000
P20E2405DK	24	13...70	10	925	±5.0	0	±833	90	2 x 680
P20E2415DK	24	13...70	10	925	±15.0	0	±666	90	2 x 470
P20E1103R3DK	110	42...176	10	220	±3.3	0	±2000	84	2 x 1000
P20E11005DK	110	42...176	10	210	±5.0	0	±833	87	2 x 680
P20E11015DK	110	42...176	10	210	±15.0	0	±666	87	2 x 470

Specifications

Input	
Start up voltage	P20E24xxSK: 12.3 V_{DC}
	P110E24xxSK: 40.5 V_{DC}
Under voltage lockout	P20E24xxSK: 11.6 V_{DC}
	P110E24xxSK: 38.4 V_{DC}
Filter	Pi Network
Start up time with R-load	30 ms, typ.
Reflected ripple current	20 mAp-p, (see figure 1)
ON / OFF Control threshold (see figures 6)	On: 3...12 V_{DC} or open input Off: 0...1.2 V_{DC} Standby idle current 3 mA, typ.
Isolation:	
Input / output voltage for 60 s Input or output to case for 60 s	3000 V_{DC} 1600 V_{DC}
Resistance	10^9 Ω
Capacitance	2000 pF, typ.
Output	
Voltage accuracy	± 1 %, max.
Line voltage regulation	± 0.5 %, max.
Load regulation 0...100 % load	P20ExxxxSK ± 0.5 %, max. P20ExxxxDK ±1%,max. @ balanced load
Voltage trim range (see fig. 5)	± 10 %, only single output type
Over voltage protection	140 % of nominal Vout, typ.
Over load protection	170 % of full load, typ.
Short circuit protection, hiccup	Indefinite, automatic restart
Transient recovery time @ 25 % load change steps	250 µs, typ.
Transient response deviation @ 25 % load change steps	P20Exx3R3SK ± 5 %, max. All other: ± 3 %, max.
Temperature coefficient	± 0.02 % / °C
Ripple and noise (at 20 MHz BW)	≤ 75 mVp-p, (see figure 2)
Cross deviation	5 %, typ. at 75 % load difference
General	
Switching frequency	P20E24xxx: 330 kHz, typ. P20E110xxx: 245 kHz, typ.
Safety Standard	EN 50155, EN-, IEC 60950-1
Reliability calculated MTBF MIL-HDBK-217F at 25 °C	190.000 h

EMC Characteristics	
Radiated Emissions, EN50121-3-2	40 dBµV at 20…230 MHz 47 dBµV at 230 MHz…1 GHz
Conducted Emissions EN 50121-3-2 (see figure 3)	99 dBµV at 150…500 kHz 93 dBµV at 500 kHz…30 MHz
ESD, EN 50121-3-2, perf. crit. A	Air ± 8 kV Contact ± 6 kV
RS, EN 50121-3-2 perf. crit. A	20 V/m
EFT, EN 50121-3-2, perf. crit. A (see figure 3)	2 kV
Surge, EN 50121-3-2, perf. crit. A (see figure 3)	2 kV
CS, EN 50121-3-2 perf. crit. A	10 V
PFMF, EN 61000-4-8 perf. crit. A	100 A/m
Environmental	
Operating ambient temperature (see derating diagram)	-40…61 °C, without derating -40…100 °C, with derating
Storage temperature	-55…125 °C
Case temperature	105 °C, max.
Over temperature protection	115 °C surface, typ.
Thermal impedance	11.5 K/W, typ.
Humidity	95 %, max. non condensing
Thermal shock	IEC 60068
Mechnical shock and vibration	EN 61373
Free air convection cooling	30…65 LFM (15...35 cm/s)
Physical	
Dimensions	27.6 x 27.6 x 16.9 mm
Weight	22.7 g
Case material	Copper
Potting material	Epoxy (UL94V-0 rated)
Absolute maximum ratings	
Input voltage ≤100 ms	P20E24xxSK 100 V_{DC}, max. P20E110xxSK 185 V_{DC}, max.
Pin soldering temperature	≤ 260 °C, ≤ 10 s, ≥ 1.5 mm distance from body

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Notes:
1. All parameter are typical at 25 °C, nominal input voltage and full load specified, unless otherwise noted.
2. Capacitive load tested by minimal input voltage and constant resistive load.

Figure 1 Measure circuit for reflected input ripple current

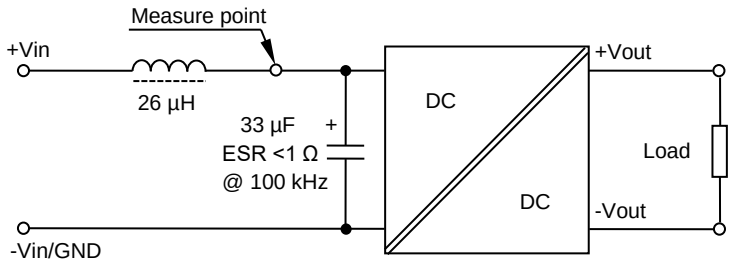
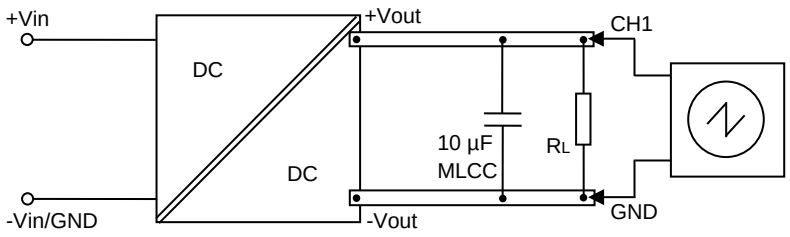


Figure 2 Measure circuit for output ripple & noise voltage, measure band wide 20 MHz



To meet the specified ripple and noise level are for the output filter circuit multilayer ceramic capacitors necessary.

Figure 3 Application circuit for ripple & noise reduction to meet conducted emission EN 50121-3-2 class A

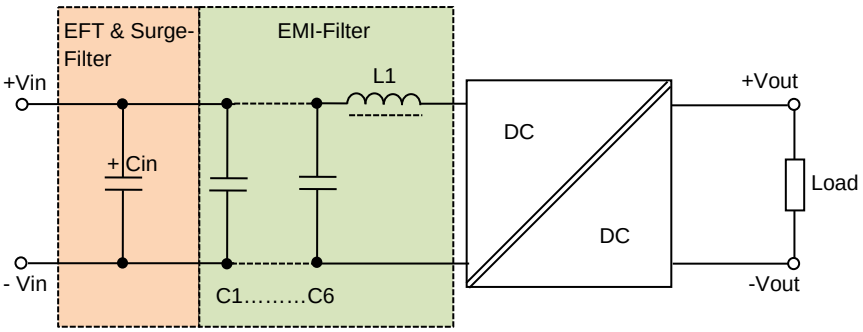


Table component for Figure 3			
Type	Cin	C1…C6	L1
P20E24xxx	330 µF, 100 V, Nippon Chemicon, EKY-101ELL331ML25S	None	None
P20E110xxx	100 µF, 250 V, Rubycon, 250BXF100M16x20-ND	1 µF, Ceramic, 250 V	12 µH

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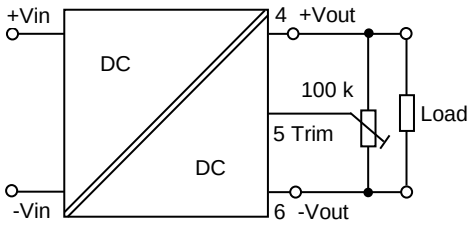
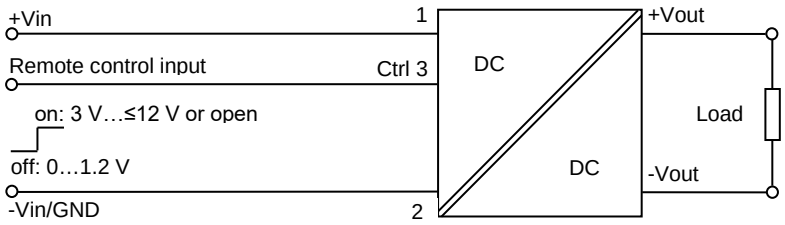
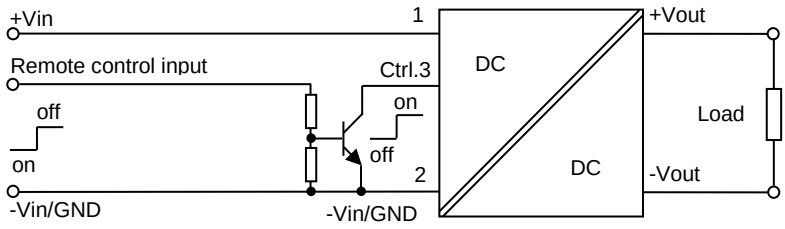
Figure 4 Output voltage trimming application (only single output converter)

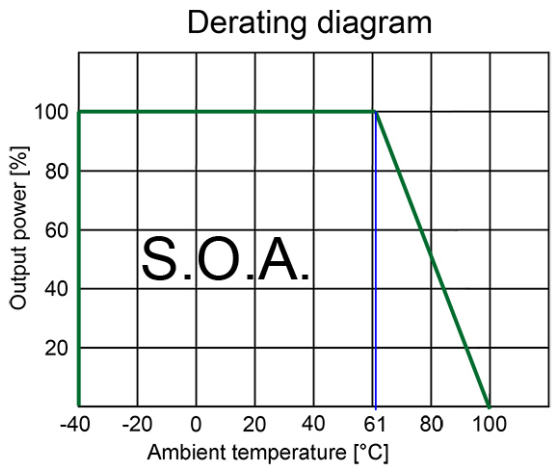


Figures 5 ON/OFF remote control application circuit



ON/OFF remote control application circuit for inverse logic and higher input level possibility





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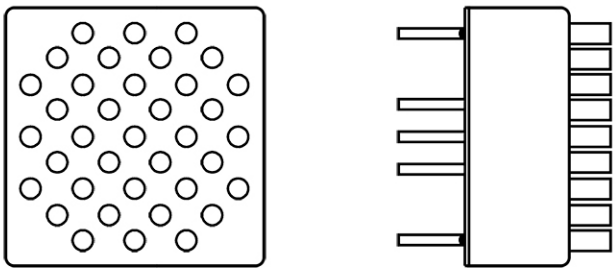
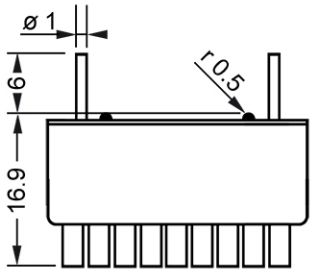
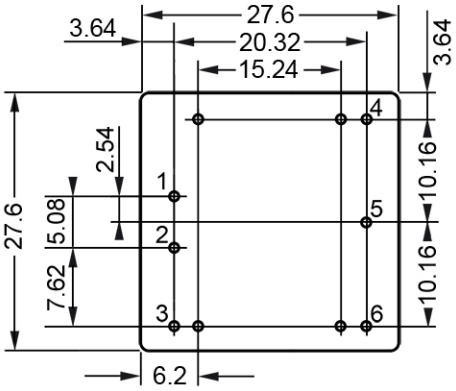
Mechanical dimensions







Note:
All dimensions in mm
1. Pin diameter tolerance ±0.05 mm
2. Pin pitch and lengh tolerance ±0.35 mm
3. Pin to case tolerance ±0.5 mm
4. Case tolerance ±0.5 mm
5. Stand off tolerance ±0.1 mm
6. Recommented Pin hole diameter 1.5 mm

Pin assignment		
Pin	Single out	Dual out
1	+Vin	+Vin
2	-Vin	-Vin
3	Rem. Ctrl.	Rem. Ctrl.
4	+Vout	+Vout
5	Trim	Com
6	-Vout	-Vout

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