

PHI-CON

500 mA DC-DC Step Down Converter P78E-Series

- Low cost
- Non Isolated
- 3 Pin SIL compatible with 78Mxx linear regulator
- Efficiency up to 94 %
- Operating temperature range -40...+85 °C
- Wide Input Range
- Continuous short circuit protected



Model selection guide

Typ	Input voltage range [V _{DC}]	Input current			Output			Efficiency	
		No-load [mA]	Full load		Voltage [V _{DC}]	Current [mA]	Capacitive load max. [µF]	@ V _{in} min. [%]	@ V _{in} max. [%]
			@ V _{in} min. [mA]	@ V _{in} max. [mA]					
P78E3R3	4.5...28	1	412	79	3.3	500	100	89	75
P78E05	7...28	1	388	112	5.0	500	100	92	82
P78E12	14...28	1.5	456	238	12.0	500	100	94	90
P78E15	17...28	2	470	290	15.0	500	47	94	92

Specifications

Input	
Start up time @ V _{in} nominal and resistive load	10 ms typ.
Filter	Capacitors
Reflected ripple current (*4)	35 mA p-p
Output	
Voltage accuracy	± 3%, max.
Input voltage regulation	± 0.5%
Load regulation	± 0.8% @ load 10..100%
Minimum output current	5 mA (*7)
Short circuit protection	Not limited, automatic recovery
Ripple and noise (*1)	60 mVp-p, max.
Temperature coefficient	± 0.02% / °C
Transient recovery time (*3)	250 µs, typ.
Transient response deviation (*3)	±3 %, max.
General	
Switching frequency	570 kHz, typ.
Reliability calculated MTBF @ 25 °C (MIL-HDBK-217F)	>4 Mio. h
Safety standard in accordance with	IEC 60950-1 EN 60950-1

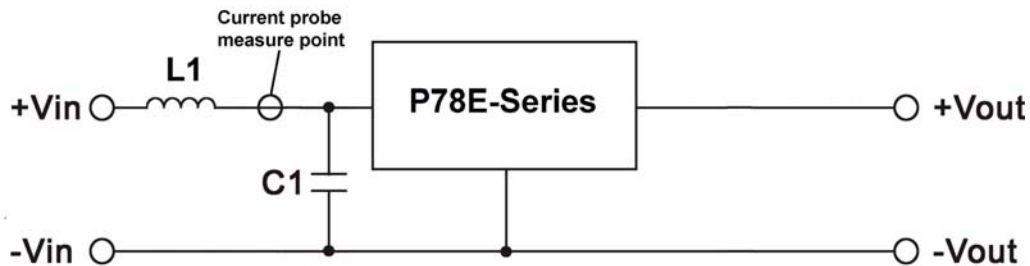
Environmental	
Operating ambient temperature	-40 °C ... +85 °C Derating see diagram
Case temperature	100 °C, max.
Storage temperature	-55 °C ... +125 °C
Derating	see diagram
Humidity	Up to 95 %, non-condensing
Cooling	nature convection
Physical	
Dimensions of SIP3-case	11.68 x 7.5 x 10.15 mm
Weight	2 g
Case material	non-conductive black plastic, UL94V-0
Potting material	Epoxy UL94V-0
EMC characteristics (*6)	
Radiated emissions	EN 55022 class B
Conducted emissions	EN 55022 class B
ESD	IEC61000-4-2 Perf. Criteria A
RS	IEC61000-4-3 Perf. Criteria A
EFT	IEC61000-4-4 Perf. Criteria A
Surge	IEC61000-4-5 Perf. Criteria A
CS	IEC61000-4-6 Perf. Criteria A
PFMF	IEC61000-4-8 Perf. Criteria A
Absolute maximum ratings (*5)	
Input voltage range	0...30 V _{DC} for max. 0.1 s
Soldering temperature, 1.5 mm distance from case	260 °C for 10 s

Notes:

1. Ripple & noise measured with 20 MHz bandwidth.
2. Tested by minimal V_{in} and constant resistive from 2 % to 100 % load.
3. Tested by normal V_{in} and 25 % load step change (75 %-50 %-25 % of full output load).
4. Input reflected ripple current is measured through a source inductor L1: 12 µH and a source capacitor C1: 47 µF
5. Do not operate the converter exceeding the absolute maximum rating, over rating causes damage to the units.
6. Input filter components (C1, C2, L1) are used to help meet EMI & EMS requirement for the module. See EMC filter circuit. These components should be mounted as close as possible to the module and all leads should be minimized to decrease radiated noise.
7. Operation under no-load conditions will not damage these devices, however they may not meet all listed specifications.

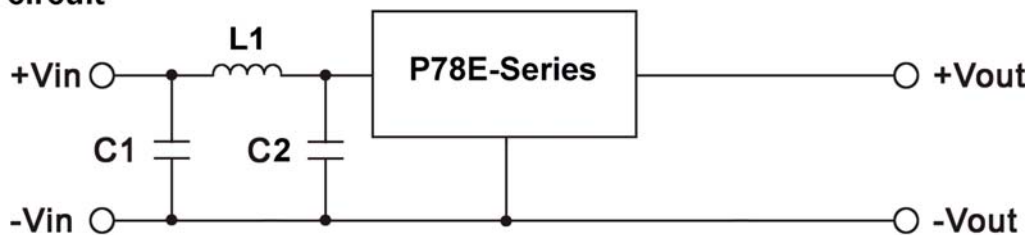
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Ripple current measure circuit



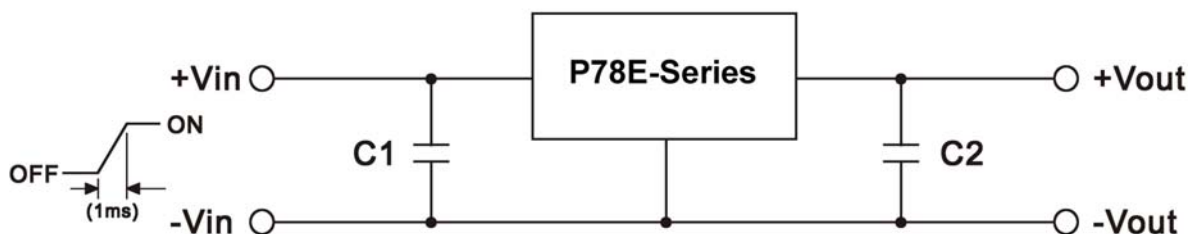
The input reflected ripple current is measured through an inductor L1: 12 μ H and a capacitor C1: 47 μ F at nominal input voltage and full load.

EMC Filter circuit



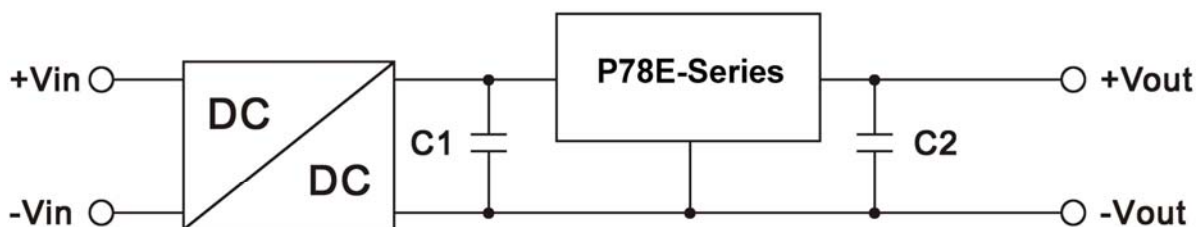
Input filter components C1, C2: 10 μ F, L1: 6.8 μ H are used to help meet EMI & EMS requirement for the module. These components should be mounted as close as possible to the module and all leads should be minimized to decrease radiated noise.

Typical application circuit



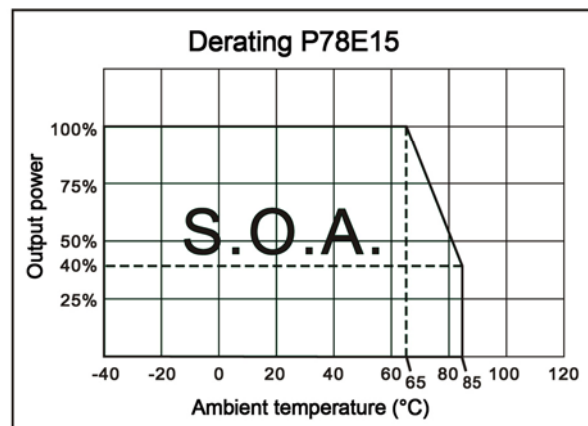
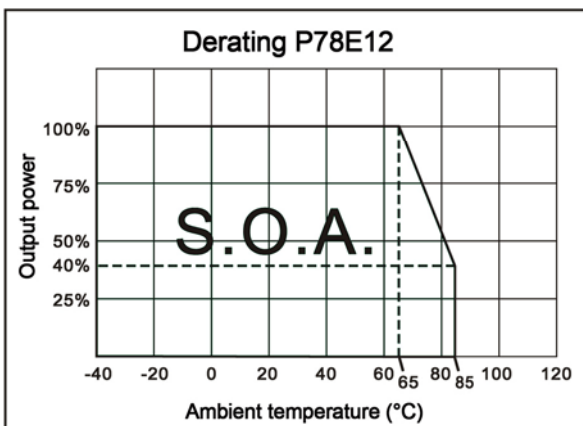
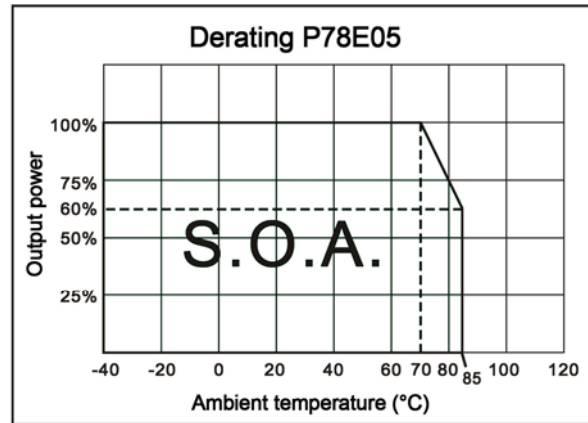
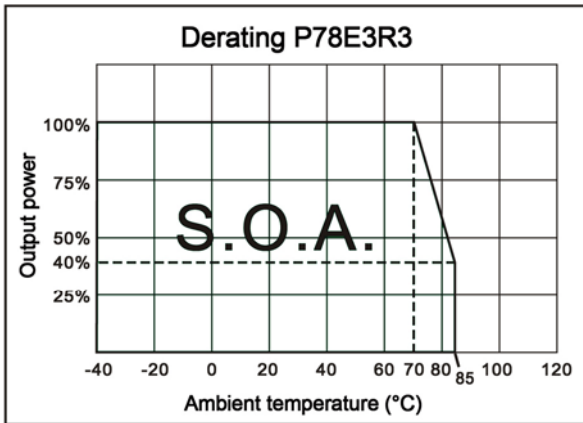
- For converter protection during the power up, use soft start Vin and C1 with 22 μ F
- C2: 47 μ F optional

Isolated wide input range regulated output

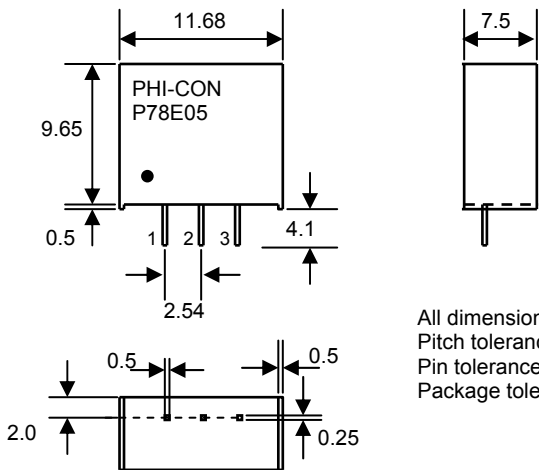


- Isolation voltage up to 6kV
- Wide input voltage range
- Improved loading / line regulation
- Point-of-load Architecture
- C1: Required if further decoupling filtering may be necessary between the two converters
- C2: Optional

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Dimensions



All dimensions in mm
 Pitch tolerance ± 0.35 mm
 Pin tolerance ± 0.05 mm
 Package tolerance ± 0.5 mm

Pin connections

Pin	Connections
1	+V Input
2	GND
3	+V Output

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