



PHI-CON

2000 mA DC-DC Step Down Converter P78DTxxC20-Series

- Pin compatible to linear 78xx regulator (TO-220)
- Not isolated
- Efficiency up to 96 %
- Input voltage range up to 36 V
- Operating temperature range -40... 85 °C
- Continuous short circuit protection



Model guide

Type	Input voltage		Input current		Output				Efficiency	
	Nom. [V _{DC}]	Range [V _{DC}]	No load		Voltage		Current [mA] max.	Capacitive load [μF] max.	@ V _{in} min. [%]	@ V _{in} max. [%]
			typ. [mA]	max. [mA]	[V _{DC}]	Tol. max. [%]				
P78DT3R3C20	24	6...36	0.1	1	3.3	± 4	2000	1800	89	85
P78DT05C20	24	8...36	0.1	1	5.0	± 3	2000	1000	92	89
P78DT09C20	24	13...36	0.1	1	9.0	± 3	2000	680	95	92
P78DT12C20	24	16...36	0.1	1	12.0	± 3	2000	470	96	94
P78DT15C20	24	20...36	0.1	1	15.0	± 3	2000	470	96	94

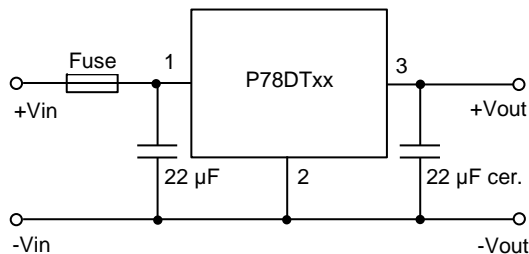
Specifications

Input	
Ingrated filter	Capacitor
Reverse polarity	Unacceptable
Output	
Input voltage regulation, full range	± 0.8 %, max.
Load regulation	± 1.5 % @ load 10..100 %
Temperature coefficient	± 0.03 % / °C
Ripple and noise @ (BW 20 MHz)	75 mVp-p, max. (See figure 1)
Short circuit protection	Continuous, automatic restart
Transient response deviation at 25 % load step change @ V _{in} nom.	±150 mV, max.
Transient recovery time at 25 % load step change, V _{in} nom.	1 ms, max.
Environmental	
Operating ambient temperature	-40 ... 85 °C
Storage temperature	-55 ... 125 °C
Storage Humidity	5 ... 95 %, non condensing
Cooling	free air convection >0.8 m/s
General	
Switching frequency	400 kHz, typ.
Reliability calc. MTBF	> 2 Mio. h
MIL-HDBK-217F @ 25 °C	

Safety standard	EN 62368-1	
EMI		
Conducted emission	EN 55032, class B	
Radiated emission (See figure 2)	EN 55032, class B	
EMC		
ESD IEC, EN 61000-4-2	Contact ± 6 kV	perf. Criteria B
RS IEC, EN 61000-4-3	10 V/m	perf. Criteria A
EFT (See figure 2) IEC, EN 61000-4-4	Line to line ± 1 kV	perf. Criteria B
Surge (See figure 2) IEC, EN 61000-4-5	± 1 kV	perf. Criteria B
CS IEC, EN 61000-4-6	3 Vrms	perf. Criteria A
Cooling	free air convection, >0.35 LFM	
Physical		
Case material	Plastic UL94-V0	
Dimensions	9 x 11.5 x 17.5 mm	
Weight	3.8 g	
Soldering temperature	≤ 260 °C, duration ≤ 10 s, ≥ 1.5 mm distance from body	

1. The max. capacitive load should be tested within the input voltage range and under full load conditions.
2. All specifications measured at Ta 25 °C, humidity < 75 %, nominal input voltage and rated output load unless otherwise specified.

Typical application circuit



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Figure 1 Measure method for output ripple and noise (BW 20 MHz)

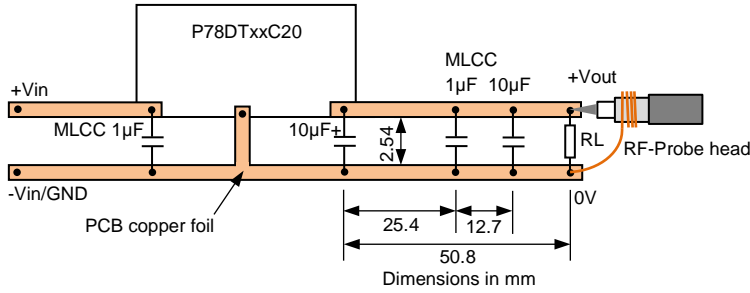
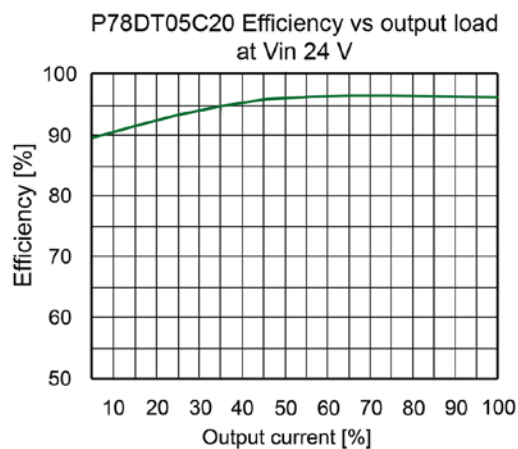
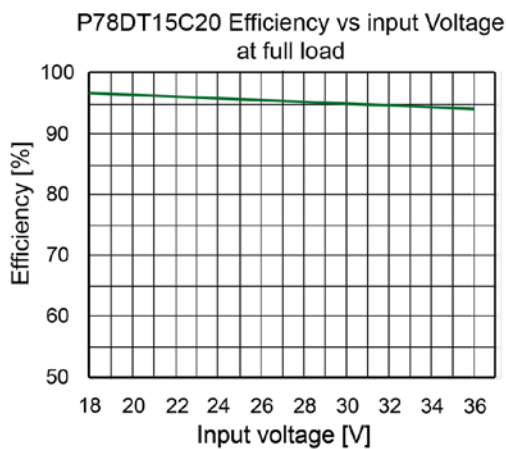
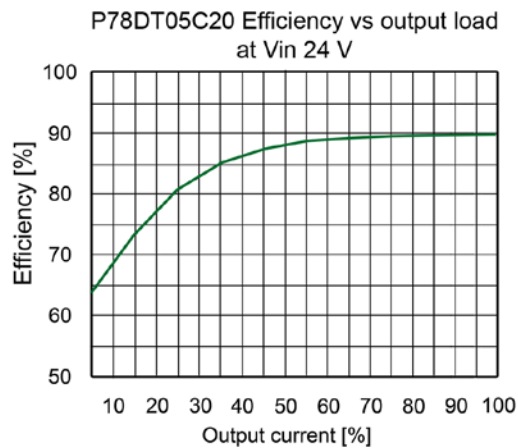
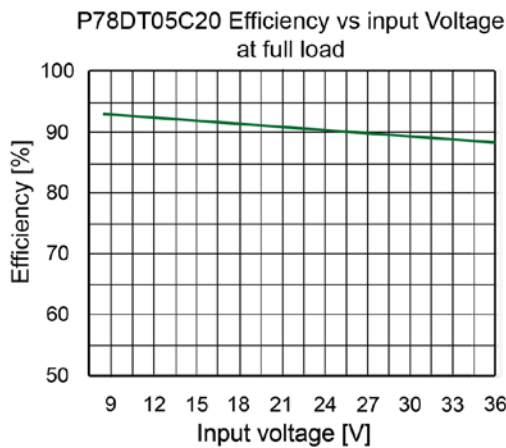
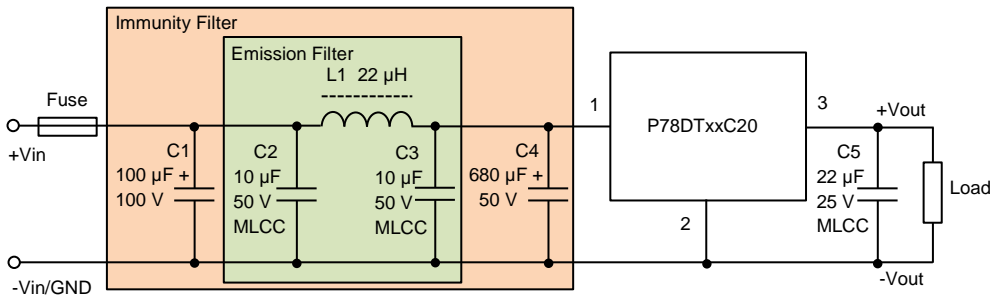


Figure 2 Test circuit for EN 55032 class B and EN 61000-4-4 and EN 61000-4-5 perf. criteria B

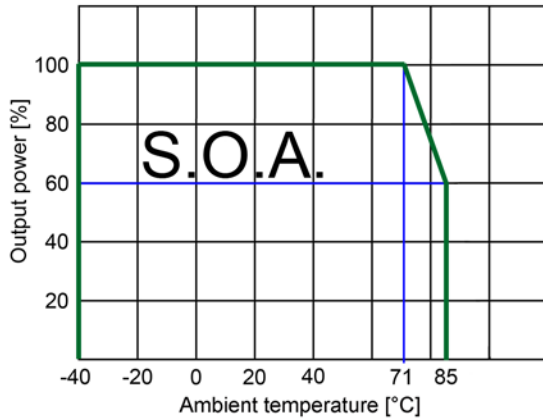




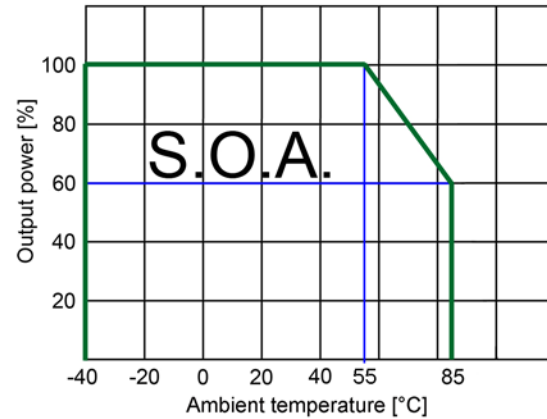
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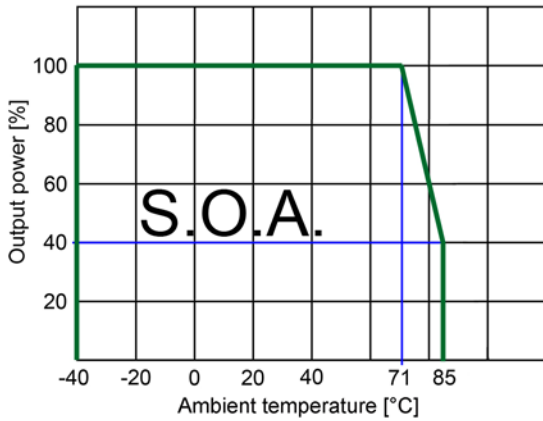
Derating diagram P78DT3R35C20, P78DT05C20
at $V_{in} < 32$ V



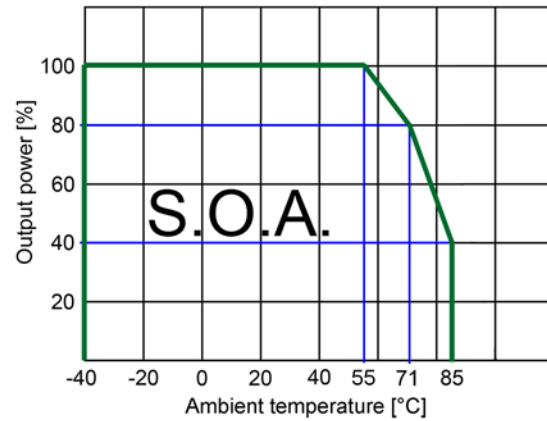
Derating diagram P78DT3R3C20, P78DT05C20
at $V_{in} 32..36$ V



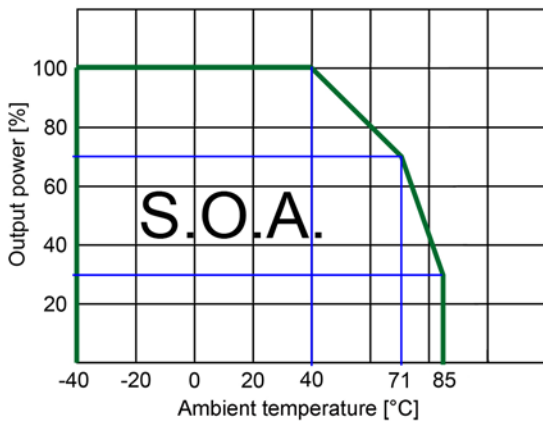
Derating diagram P78DT09C20, P78DT12C20
P78DT15C20 at $V_{in} 24$ V



Derating diagram P78DT09C20, P78DT12C20
P78DT15C20 at $V_{in} 24..32$ V



Derating diagram P78DT09C20, P78DT12C20
P78DT15C20 at $V_{in} 32..36$ V

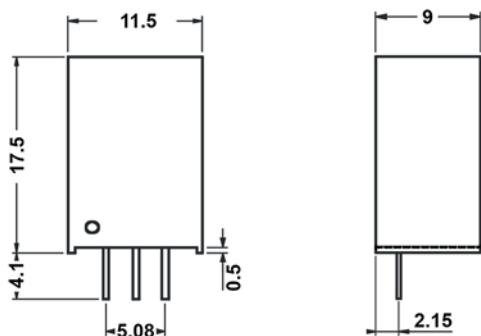




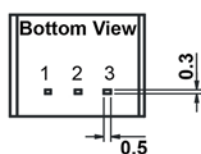
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Mechanical dimensions



Note:
All dimensions in mm
Pin square area tolerance: ± 0.1 mm
General tolerance: ± 0.5 mm



Pin assignment	
1	Vin
2	GND
3	+Vout

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