

PHI-CON

1000 mA DC-DC Step Down Converter P78BS-Series

- Non isolated
- 10 Pin SMD package
- Function compatible with 78xx linear regulator
- Efficiency up to 93 %
- Operating temperature range -40...+85 °C
- Continuous short circuit protected
- Thermal shut down
- Adjustable output voltage



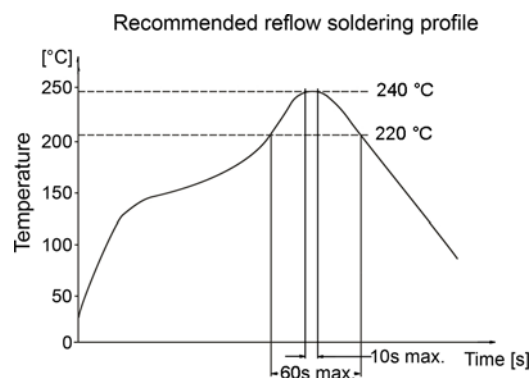
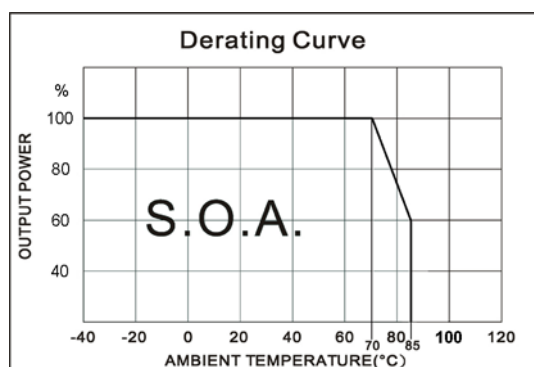
Model guide

Type	Input voltage		Output				Efficiency	
	Range [V _{DC}]	Nominal [V _{DC}]	Voltage [V _{DC}]	Adjust trim range [V _{DC}]	Current [mA]	Capacitive load max. [μF]	@ V _{in} min. [%]	@ V _{in} max. [%]
P78BS1R5	4.75..15	12	1.5	fixed	1000	1000	76	74
P78BS1R8	4.75..15	12	1.8	1.5...3.6	1000	1000	79	77
P78BS2R5	5..18	12	2.5	1.5...3.9	1000	1000	83	81
P78BS3R3	5..18	12	3.3	1.8...5.5	1000	1000	84	84
P78BS05	7..18	12	5.0	2.5...8	1000	1000	90	88
P78BS6R5	8.5..18	12	6.5	fixed	1000	1000	93	91

Specifications

Output	
Voltage accuracy	± 3 %, max.
Input voltage regulation	± 0.5 %, max.
Load regulation	± 1 % @ load change 10..100 %
Dynamic load stability	± 75 mV @ load 10..100 %
Temperature coefficient	± 0.02 % / °C
Ripple (at 20 MHz BW)	35 mVp-p, max.
Noise (at 20 MHz BW)	15 mVp-p, max.
Short circuit protection (hiccup mode)	Continuous, automatic recovery
Thermal shutdown	150 °C, typ. internal temp.
Output current limit	1.8 A, typ.
Transient peak deviation	± 100 mV, max. @ load change 10..100 %
Transient recovery time	100 μs, max. @ load change 10..100 %
Input	
Filter	Capacitive, 1 μF
Short circuit input power	1.8 W, max.
Quiescent current	15 mA, typ.
No load input power consumption	54 mW, max.
ON control threshold	1.2 V min., 6 V max. or open pin 10
OFF control threshold	< 0.6 V
ON / OFF control current	< 200 μA
Shut down quiescent current	200 μA, max.

General	
Thermal shutdown	160 °C, internal junction
Switching frequency	1.4 MHz, typ.
Reliability calc. MTBF @ 25 °C MIL-HDBK-217F	> 1 Mio. h
Environmental	
Operating ambient temperature	-40 °C ... +85 °C
Operating case temperature	100 °C, max.
Storage temperature	-55 °C ... +125 °C
Derating	see diagram
Storage humidity	Up to 95%, non condensing
Cooling	Free air convection
Physical	
Dimensions	SMD10, 15.24 x 8.5 x 7.25 mm
Weight	2.3 g
Case material	Plastic UL94-V0
Soldering temperature	See soldering profile

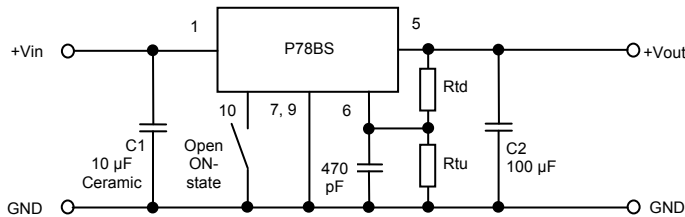


This curve applies only to hot air reflow soldering.

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Standard application circuit



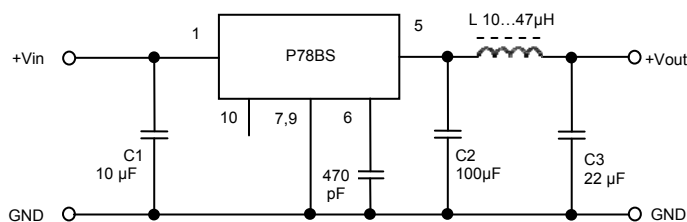
1. C1,C2 are require and should be placed close to the pins of the converter, with shortest possible traces.
2. Do not connect the converter parallel or a hot swap
3. Do not connect the converter parallel or a hot swap

Adjustment resistor values								
Type	P78BS1R8		P78BS2R5		P78BS3R3		P78BS5	
Adj. range	1.5...3.6 V		1.5...3.9 V		1.8...5.5 V		2.5...6.5 V	
Adj. Vout [V]	Rtd [kΩ]	Rtu [kΩ]	Rtd [kΩ]	Rtu [kΩ]	Rtd [kΩ]	Rtu [kΩ]	Rtd [kΩ]	Rtu [kΩ]
1.5	188	-	15.4	-	-	-	-	-
1.8	-	-	68.6	-	15.4	-	-	-
2.5	-	81.4	-	-	87	-	9.7	-
3.0	-	32.2	-	88.7	339	-	30.5	-
3.3	-	18.6	-	41.3	-	-	48.8	-
3.6	-	9.5	-	20.1	-	121	75	-
3.9	-	-	-	8.0	-	51	115	-
4.5	-	-	-	-	-	16.6	338	-
4.9	-	-	-	-	-	8	1835	-
5.0	-	-	-	-	-	6.5	-	-
5.1	-	-	-	-	-	5.2	-	426
5.5	-	-	-	-	-	1.1	-	58.7
6.0	-	-	-	-	-	-	-	16.9
6.5	-	-	-	-	-	-	-	3.2

Note: The above dates only are as reference, you could make corresponding adjustment with actual output when they are at practical application.

Application circuit to reduce output ripple.

It is recommended to add a LC filter to output.



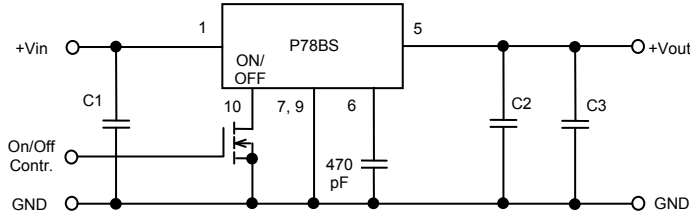
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ON / OFF control function

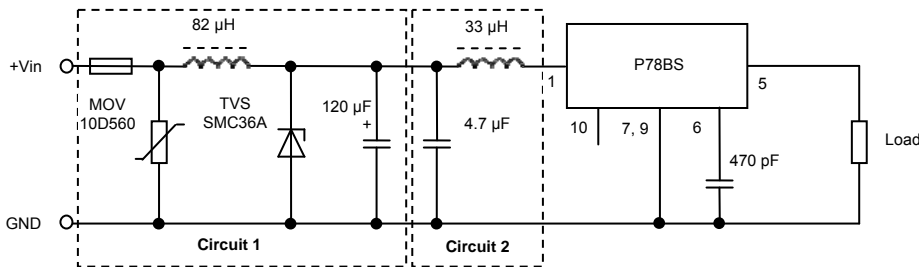
The ON/OFF pin 10 provides several features for adjusting and sequencing the power supply. An user has the flexibility of using the ON/OFF pin 10 as:

1) A digital on/off control by pulling down the ON/OFF pin with an open-drain transistor.

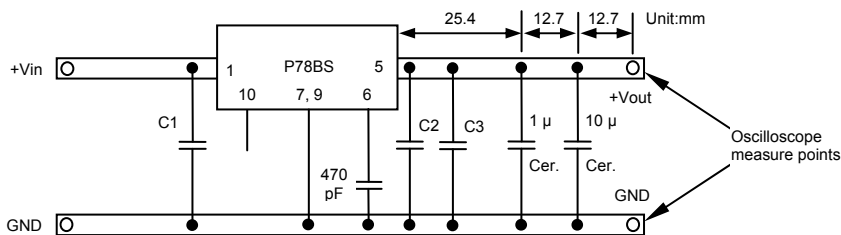


EMC Specification				
EMI	CE	CISPR22 / EN55022		Class A, without external circuit
		CISPR22 / EN55022		Class B, with external filter circuit 2
	RE	CISPR22 / EN55022		Class A, with external filter circuit 2
EMS	ESD	IEC / EN61000-4-2	Contact ± 6 kV	perf. Criteria B
		IEC / EN61000-4-2	Air ± 8 kV	perf. Criteria B
	RS	IEC / EN61000-4-3	10 V/m	perf. Criteria A
	EFT	IEC / EN61000-4-4	± 2 kV	perf. Criteria B, with ext. filter circuit 1
	Surge	IEC / EN61000-4-5	± 2 kV	perf. Criteria B, with ext. filter circuit 1
	CS	IEC / EN61000-4-6	3 V rms	perf. Criteria A
	Voltage dips, short and interruptions immunity	IEC / EN61000-4-29	0...70 %	perf. Criteria B

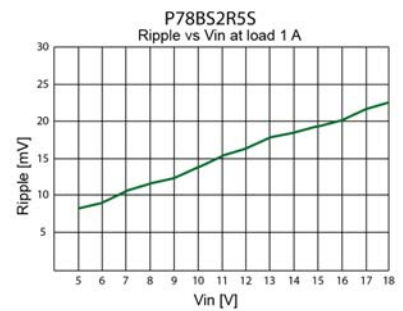
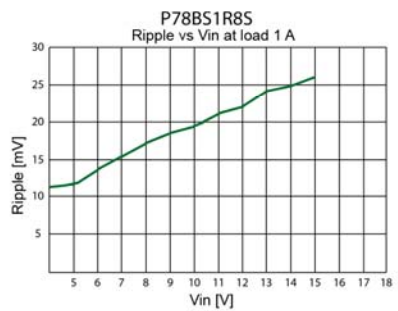
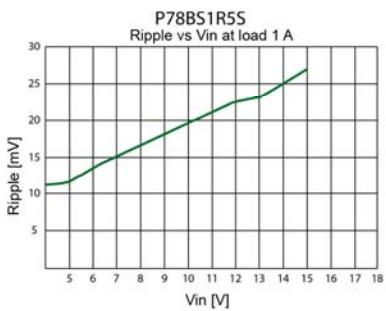
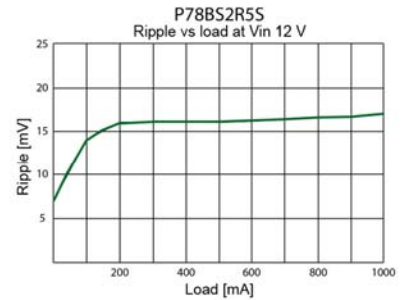
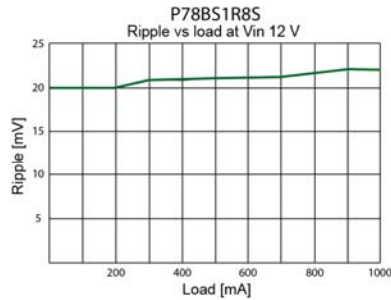
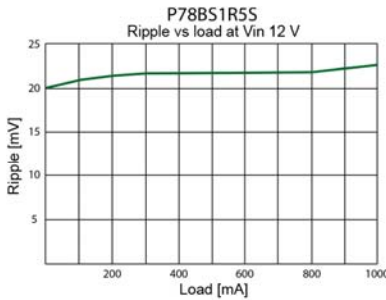
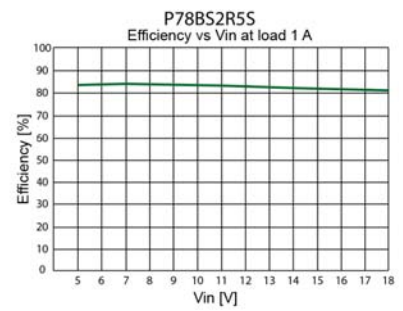
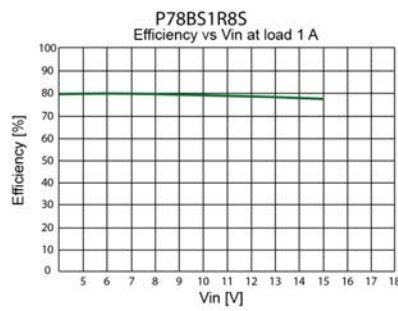
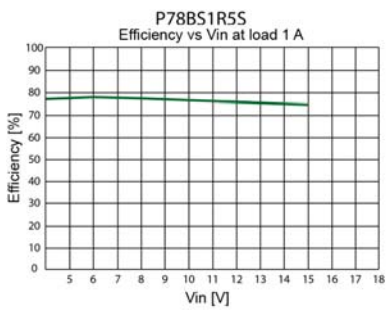
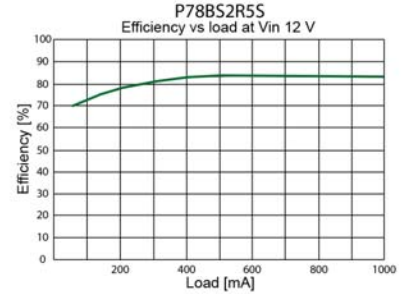
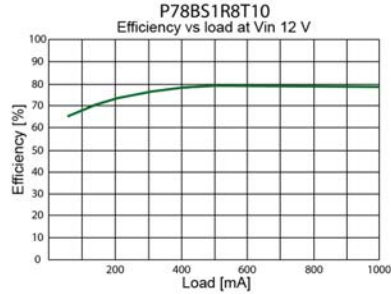
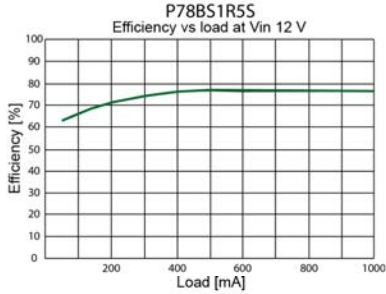
EMC Application circuit



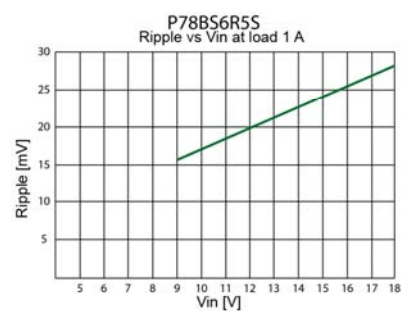
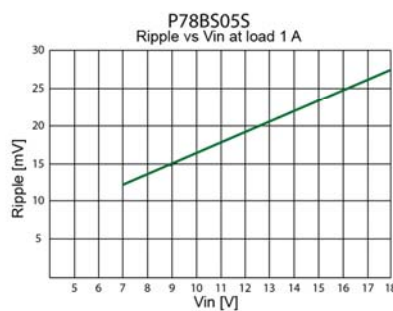
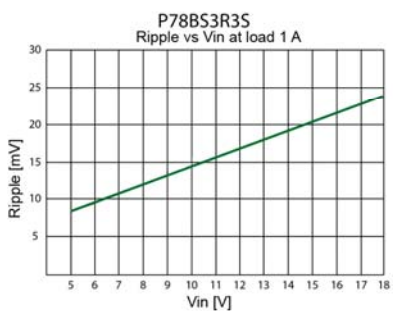
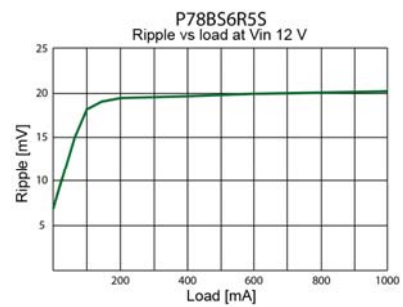
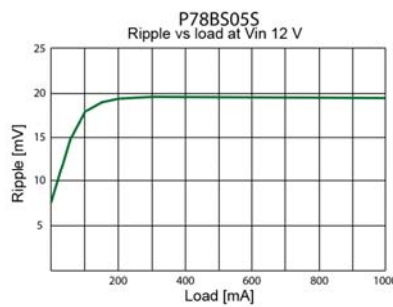
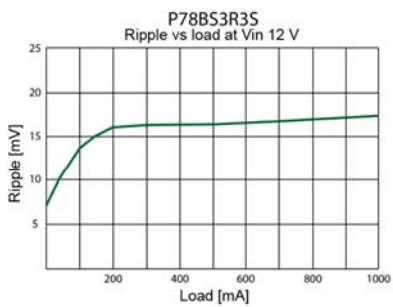
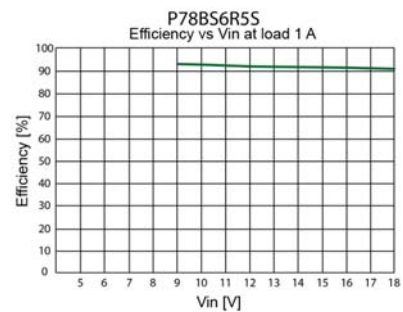
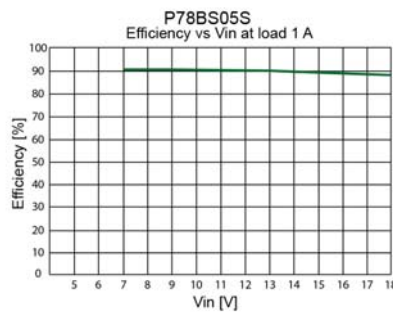
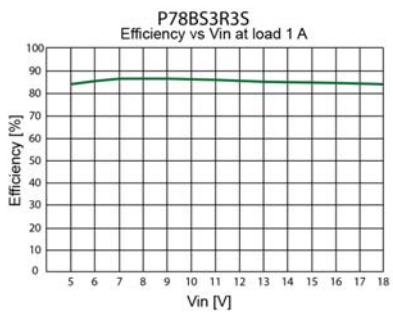
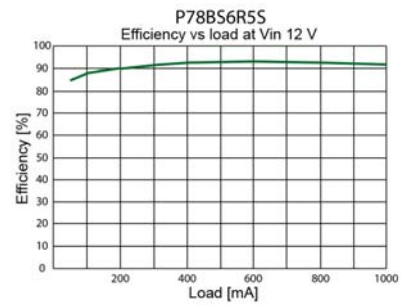
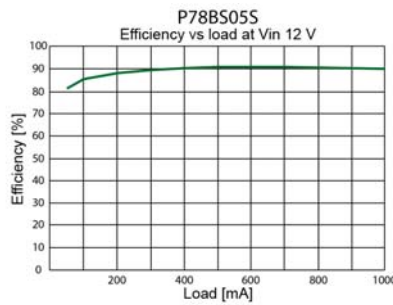
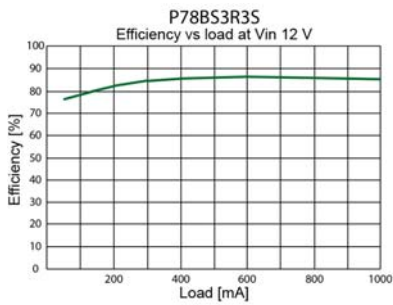
Test circuit for output ripple & noise, start up time and load transient response



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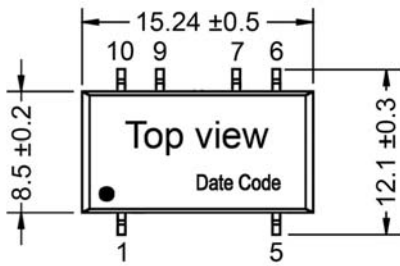
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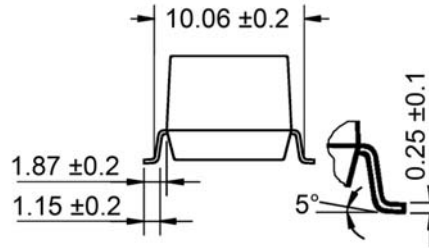
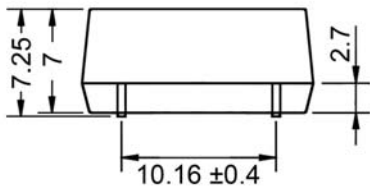
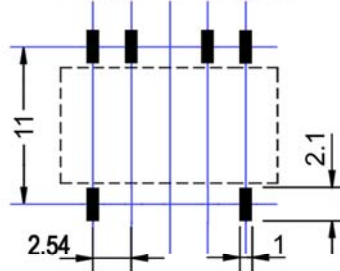
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Dimensions



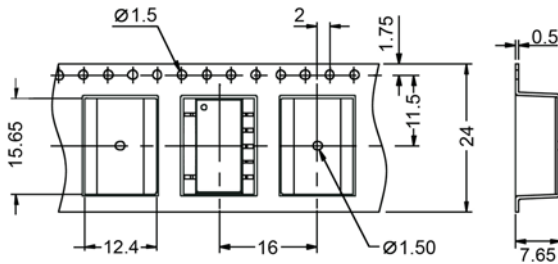
Example PCB Layout



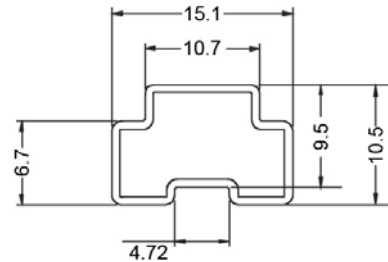
Notes:

All dimensions are in mm.
General tolerances ± 0.25 mm
Pin tolerances ± 0.1 mm

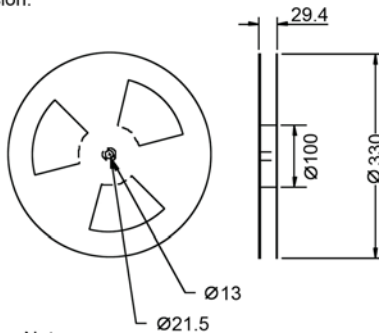
Tape dimension:



Tube dimensions:



Reel dimension:



Note:
Unit: mm
General tolerances: ± 0.5 mm
Quantity per reel: 500 pieces

Note:
Unit: mm
General tolerances: ± 0.5 mm

Short tube 220 mm, quantity 13 pieces,
Inner packing box dimensions L 255 mm, W 170 mm, H 80 mm.
Outer packing box contain six inner boxes,
dimensions: L 375 mm, W 280 mm, H 270 mm.

Long tube 530 mm, quantity 33 pieces,
Inner packing box dimensions L 580 mm, W 200 mm, H 100 mm.
Outer packing box with two inner packing boxes,
dimensions: L 600 mm, W 215 mm, H 220 mm.
Outer packing box with three inner packing boxes,
dimensions: L 600 mm, W 215 mm, H 325 mm.

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