

## Power over Ethernet power supply protection

Datasheet - production data



SO-8 package PEP01-5841

### **Features**

Peak pulse power: up to 2.7 kW (8/20 μs)

Stand-off voltage: 58 V

4 unidirectional Transils<sup>™</sup> and 4 decoupling capacitances

Low clamping voltage: 100 V

Low leakage current:

- 0.2 μA at 25 °C

1 μA at 85 °C

Operating T<sub>i</sub> max: 150 °C

JEDEC registered package outline

### Complies with the following standards

IEC61000-4-2 level 4

- 15 kV (air discharge)

- 8 kV (contact discharge)

• IEC61000-4-5 level 2

±1 kV 42 Ω

• IEEE 802.3af-2003

IEEE 802.3at-2008

### **Description**

The PEP01-5841 has been designed to protect power over Ethernet PSE equipment against line overvoltages. It embeds 4 decoupling capacitors to stabilize power supplies.

It is compatible with IEEE 802.3af-2003 and IEEE 802.3at-2008 requirements and it allows PoE based systems to be protected against both electrical overstress (EOS) and electrostatic discharges (ESD) according to IEC61000-4-5 and IEC61000-4-2.

The low clamping voltage (100 V) makes it compatible with PMOS and PSE controller technologies. Developed in Planar technology, it provides high reliability level.

Packaged in SO-8, this minimizes PCB consumption (footprint in accordance with the IPC 7531 standard).

Gnd PS1 PS2 PS3 PS4
2-3-6-7 1 4 5 8

All Gnd pins must be connected to Gnd

Figure 1. Functional diagram

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Characteristics PEP01-5841

### 1 Characteristics

Table 1. Absolute ratings ( $T_{amb} = 25 \text{ °C}$ )

Symbol	Parameter	Value	Unit	
$V_{PP}$	Peak pulse voltage (IEC61000-4-2 contact d	30	kV	
P <sub>PP</sub>	Peak pulse power dissipation	$T_j$ initial = $T_{amb}$	2700	W
T <sub>stg</sub>	Storage temperature range	-65 to + 150	°C	
T <sub>j</sub>	Operating junction temperature range	-55 to + 150	°C	
T <sub>L</sub>	Maximum lead temperature for soldering dur	260	°C	

Figure 2. Electrical characteristics - definitions (T<sub>amb</sub> = 25 °C)

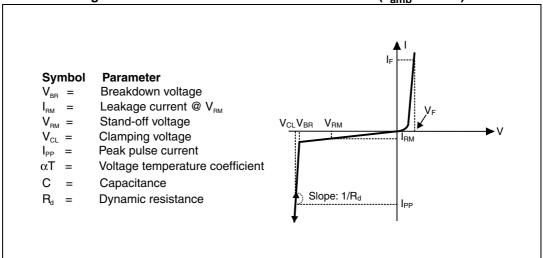


Table 2. Electrical characteristics - values ( $T_{amb} = 25$  °C)

	I <sub>RM</sub> max @ V <sub>RM</sub>			V <sub>BR</sub> @I <sub>R</sub> <sup>(1)</sup>			8/20 µs					
Туре							V <sub>CL</sub>	@I <sub>PP</sub>	R <sub>D</sub> <sup>(2)</sup>	С	αT <sup>(3)</sup>	
туре	25 °C	85 °C		min.	typ.	max.		max.			typ.	max.
	μA	μΑ	٧	٧			mA	٧	Α	Ω	pF	10 <sup>-4</sup> °C
PEP01-5841	0.2	1	58	64.4	67.8	71.2	1	100	24	1.2	55	10.4

- 1. Pulse test:  $t_p < 50 \text{ ms}$
- 2. To calculate maximum clamping voltage at other surge level, use the following formula:  $V_{CLmax} = R_D \ x \ I_{PP} + V_{BRmax}$
- 3. To calculate V<sub>BR</sub> versus junction temperature, use the following formula: V<sub>BR @ TJ</sub> = V<sub>BR</sub> @  $_{25}$  °C x (1 +  $_{\alpha}$ T x (T<sub>J</sub> 25))

PEP01-5841 Characteristics

Figure 3. Pulse waveform

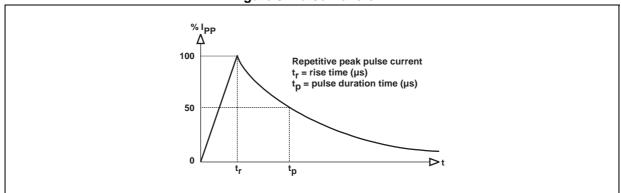


Figure 4. Peak power dissipation versus initial Figure 5. Peak pulse power versus exponential junction temperature pulse duration ( $T_i$  initial = 25 °C)

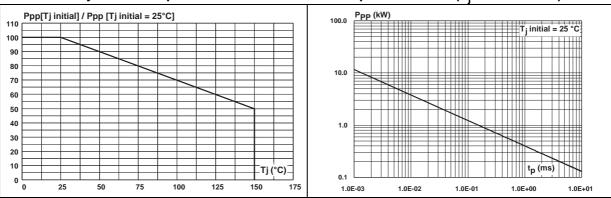
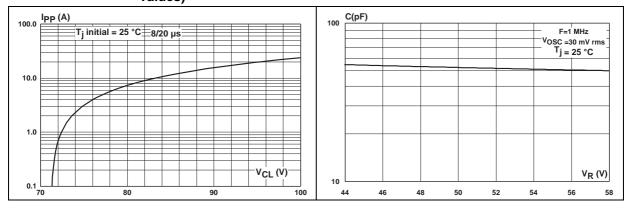


Figure 6. Clamping voltage versus peak pulse current (exponential waveform, maximum values)

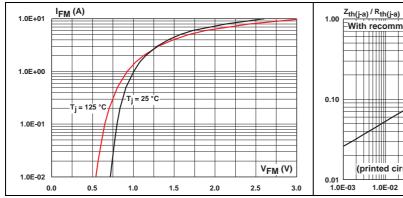
Figure 7. Capacitance versus voltage (typical values)



Characteristics PEP01-5841

Figure 8. Peak forward voltage drop versus peak forward current (typical values)

Figure 9. Relative variation of thermal impedance junction to ambient versus pulse duration



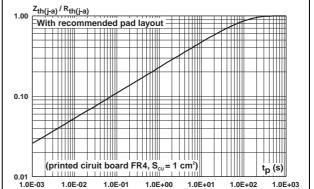
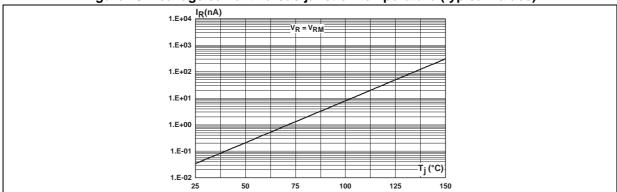


Figure 10. Leakage current versus junction temperature (typical values)



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PEP01-5841 Application

# 2 Application

ШШ 48V I<sup>2</sup>C 111111111 PoE Controller 11111111 .....

Figure 11. Typical application circuit with PMOS integrated in PSE controller

Application PEP01-5841

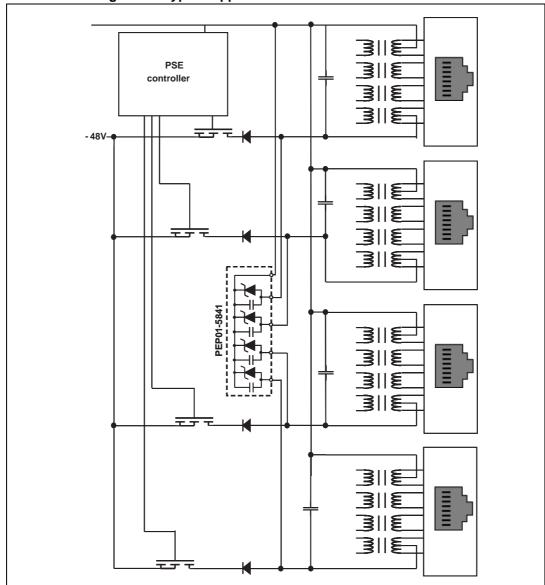


Figure 12. Typical application circuit with external PMOS

Figure 11 and Figure 12 show typical application schematics of PoE network. Power sourcing equipment (PSE) allows communication and power sourcing for several power devices (PD). The number of ways is generally a multiple of 4, this optimizes the PEP01-5841 for track layout and crosstalk, as well as PCB surface occupation. This protection device has been studied to comply with the latest IEEE 802.3af-2003 requirements and to withstand the surge defined in the IEC 61000-4-5 level 2 requirements.

## 3 Package information

- Case: JEDEC SO-8 molded plastic over planar junction
- Terminals: solder plated, solderable according to MIL-STD-750, Method 2026
- Flammability: epoxy is rated UL94V-0
- RoHS package

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: <a href="https://www.st.com">www.st.com</a>. ECOPACK<sup>®</sup> is an ST trademark.

Seating Plane C h x 45°

Deppic L1

Deppic L1

Figure 13. SO-8 dimension definitions

Table 3. SO-8 dimension values

		Dimensions						
Ref.		Millimeters		Inches				
	Min.	Тур.	Max.	Min.	Тур.	Max.		
Α	-	-	1.75	-	-	0.069		
A1	0.1	-	0.25	0.004	-	0.010		
A2	1.25	-	-	0.049	-	-		
b	0.28	-	0.48	0.011	-	0.019		
С	0.17	-	0.23	0.007	-	0.009		
D	4.80	4.90	5.00	0.189	0.193	0.197		
Е	5.80	6.00	6.20	0.228	0.236	0.244		
E1	3.80	3.90	4.00	0.150	0.154	0.157		
е	-	1.27	-	-	0.050	-		
h	0.25	-	0.50	0.010	-	0.020		
L	0.40	-	1.27	0.016	-	0.050		
L1	-	1.04	-	-	0.041	-		
k	0°	-	8°	0°	-	8°		
ppp	-	-	0.10	-	-	0.004		

Package information PEP01-5841

Figure 14. Footprint recommendation dimensions in mm (inches)

Figure 15. Footprint recommendation for improved clearance dimensions in mm (inches)

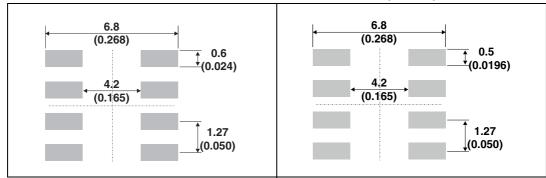
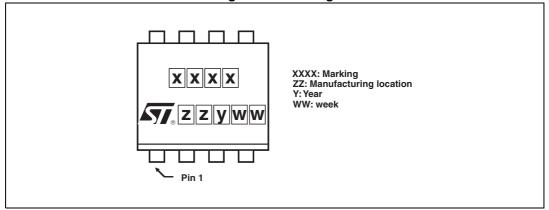


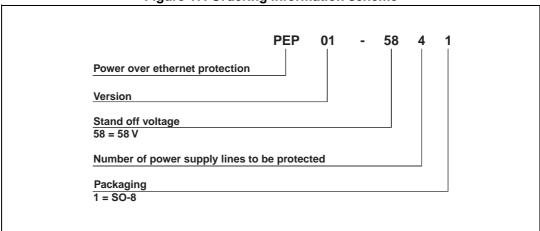
Figure 16. Marking



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# 4 Ordering information

Figure 17. Ordering information scheme



**Table 4. Ordering information** 

Order code	Marking	Package	Weight	Base qty	Delivery mode
PEP01-5841	58E1	SO-8	78 mg	2000	Tape and reel

## 5 Revision history

**Table 5. Document revision history** 

Date	Revision	Changes
06-May-2009	1	Initial release.
14-May-2009	2	Standards compliance updated.
17-Jan-2013	3	Added note on GND pins in Figure 1 and added Figure 15.
13-Nov-2013	4	Updated level 4 to level 2 under Figure 12.

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#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: <u>org@eplast1.ru</u>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина,

дом 2, корпус 4, литера А.