

# TVS Diodes

Transient Voltage Suppressor Diodes

## ESD204-B1-02 Series

Bi-directional Low Capacitance TVS Diode

ESD204-B1-02ELS  
ESD204-B1-02EL

## Data Sheet

Revision 1.2, 2013-05-17  
Final

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**Revision History: Rev. 1.1, 2013-02-06**

Page or Item	Subjects (major changes since previous revision)
<b>Revision 1.2, 2013-05-17</b>	
	New type ESD204-B1-02EL inserted

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Last Trademarks Update 2010-06-09

# 1 Bi-directional Low Capacitance TVS Diode

## 1.1 Features

- ESD / Transient protection of data lines in 3.3 / 5 / 12 V applications according to :
  - IEC61000-4-2 (ESD) :  $\pm 20$  kV (air) and  $\pm 18$  kV (contact)
  - IEC61000-4-4 (EFT) :  $\pm 40$  A (5/50ns)
- Maximum working voltage:  $V_{RWM} = -8 / +14$  V
- Very low reverse current:  $I_R < 1$  nA (typical)
- Low capacitance  $C_L = 4$  pF I/O to GND (typical)



## 1.2 Application Examples

- Keypad, touchpad, buttons, convenience keys
- LCD displays, Camera, audio lines, mobile communication, Consumer products (E-Book, MP3, DVD, DSC, ...)
- Notebooks tablets and desktop computers and their peripherals

## 1.3 Product Description

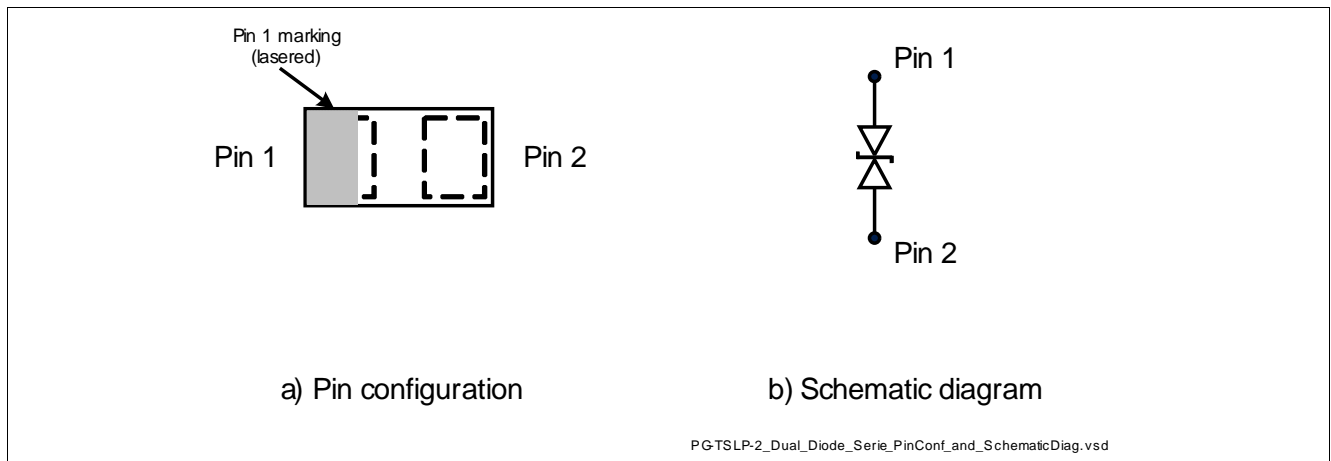


Figure 1 a) Pin Configuration and b) Schematic Diagram

Table 1 Ordering information

Type	Package	Configuration	Marking code
ESD204-B1-02ELS	TSSLP-2-3	1 line, bi-directional	<u>D</u>
ESD204-B1-02EL <sup>1)</sup>	TSLP-2-19	1 line, bi-directional	RR

1) Product not available yet, target data

## 2 Characteristics

**Table 2** Maximum Rating at  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified

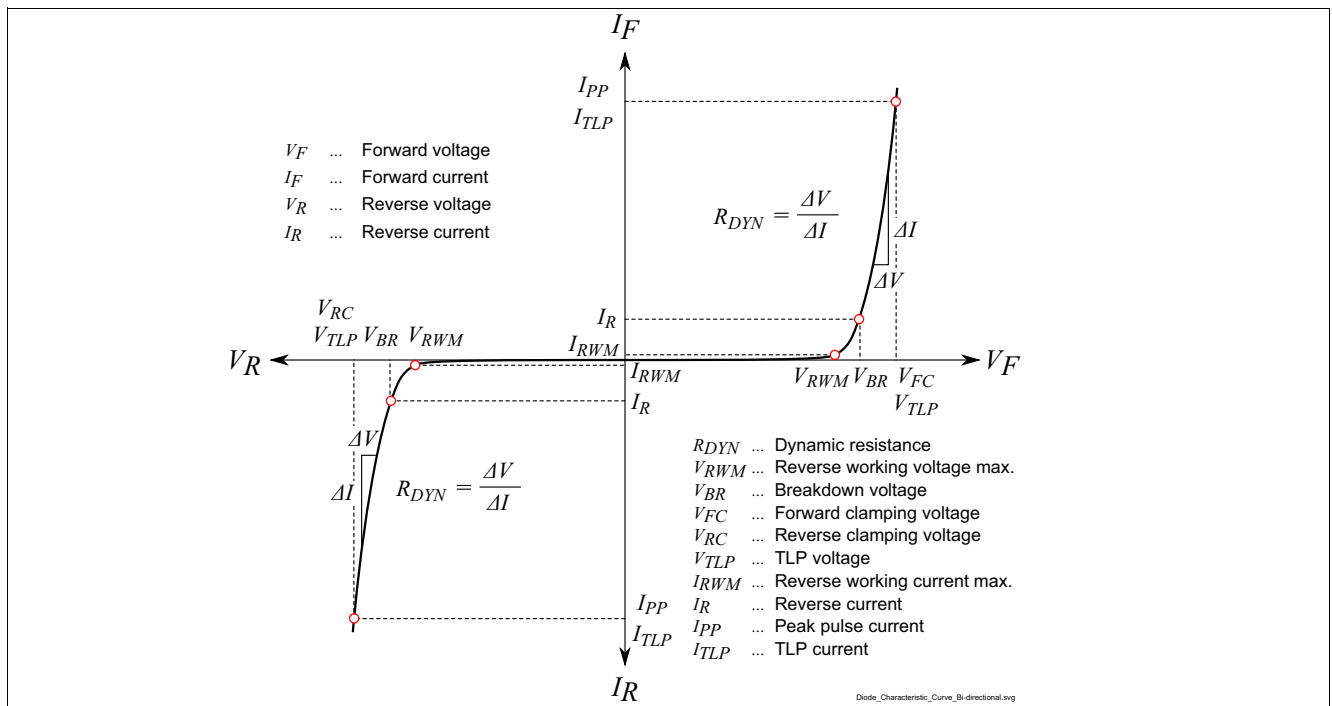
Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
ESD air discharge <sup>1)</sup>	$V_{ESD}$	-20	–	20	kV
ESD contact discharge <sup>1)</sup>	$V_{ESD}$	-18	–	18	kV
Peak pulse current ( $t_p = 8/20\text{ }\mu\text{s}$ ) <sup>2)</sup>	$I_{PP}$	-1	–	1	A
Operating temperature	$T_{OP}$	-55	–	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-65	–	150	$^\circ\text{C}$

1)  $V_{ESD}$  according to IEC61000-4-2

2)  $I_{PP}$  according to IEC61000-4-5

**Attention:** Stresses above the max. values listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.

### 2.1 Electrical Characteristics at $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified



**Figure 2** Definitions of electrical characteristics

**Table 3 DC characteristics at  $T_A = 25\text{ °C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Reverse working voltage	$V_{RWM}$	-8	–	14	V	from Pin2 to Pin1
Breakdown voltage	$V_{BR}$	8.5	11	14	V	$I_R = 1\text{ mA}$ , from Pin1 to Pin2
Breakdown voltage	$V_{BR}$	14.5	17	20	V	$I_R = 1\text{ mA}$ , from Pin2 to Pin1
Reverse current	$I_R$	–	<1	50	nA	$V_R = 3.3\text{ V}$

**Table 4 RF characteristics at  $T_A = 25\text{ °C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Line capacitance	$C_L$	–	4	7	pF	$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ , I/O to GND
Serie inductance	$L_S$	–	0.2	–	nH	ESD204-B1-02ELS ESD204-B1-02EL
		–	0.4	–		

**Table 5 ESD characteristics at  $T_A = 25\text{ °C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Clamping voltage <sup>1)</sup>	$V_{CL}$	–	17	22	V	$I_{PP} = 1\text{ A}$ from Pin1 to Pin2
	$V_{CL}$	–	23	28	V	$I_{PP} = 1\text{ A}$ from Pin2 to Pin1

1) According to IEC61000-4-5 ( $t_p : 8 / 20\text{ }\mu\text{s}$ )

2.2 Typical Performance characteristics at  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified

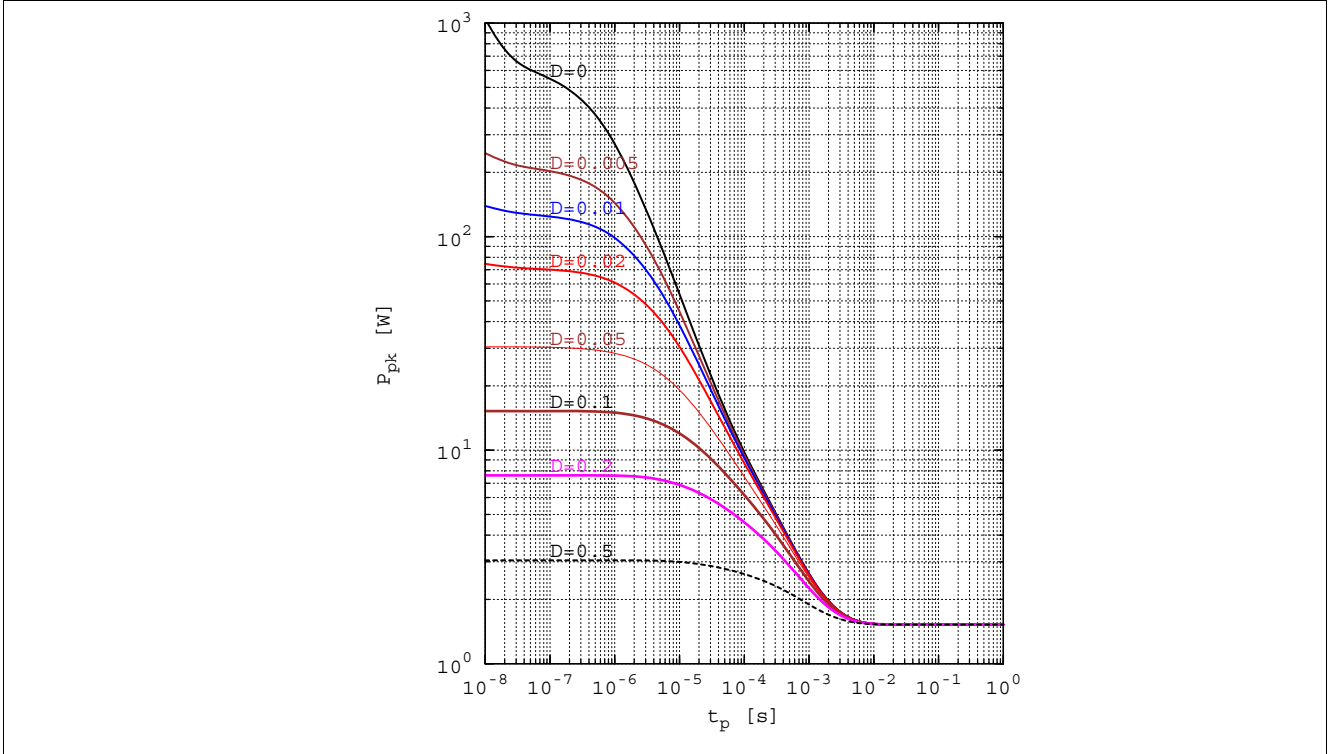


Figure 3 Non-repetitive peak pulse power:  $P_{pk} = f(t_p)$

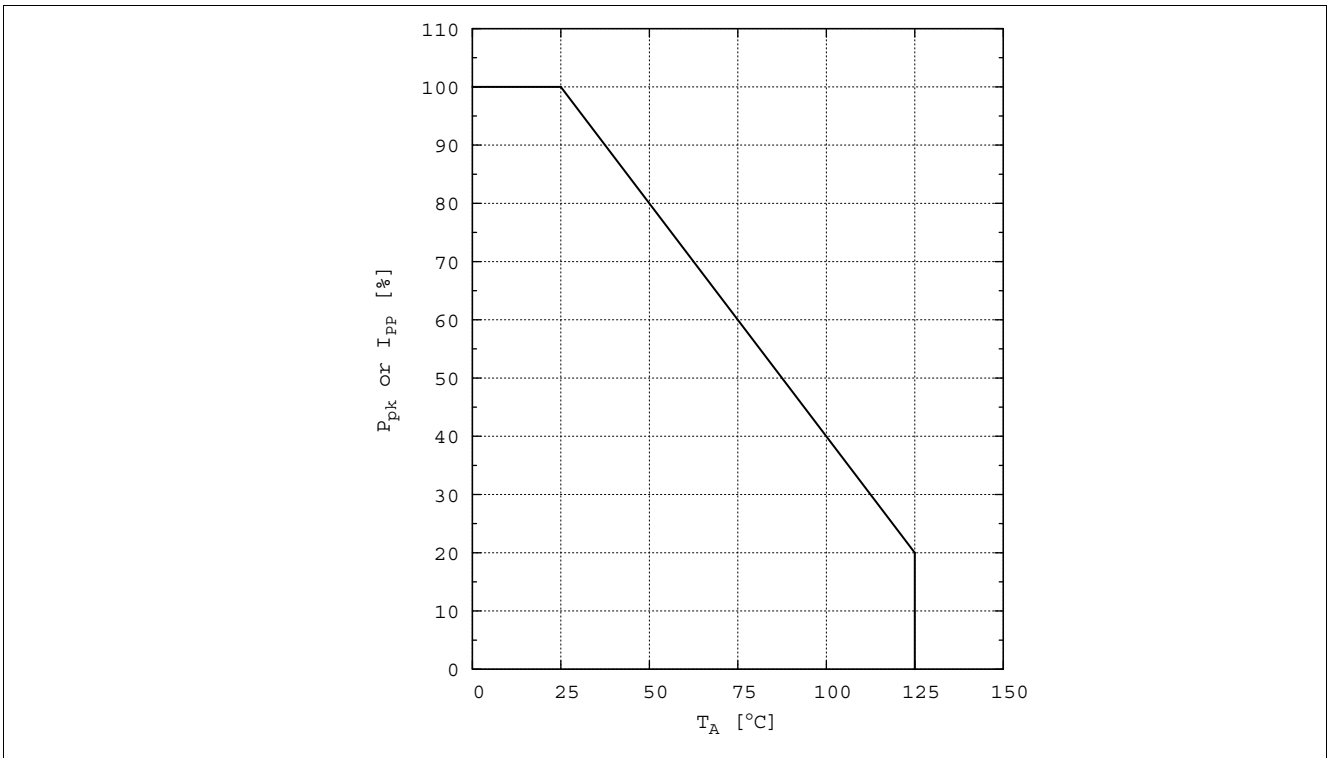


Figure 4 Power derating curve:  $P_{pk} = f(T_A)$

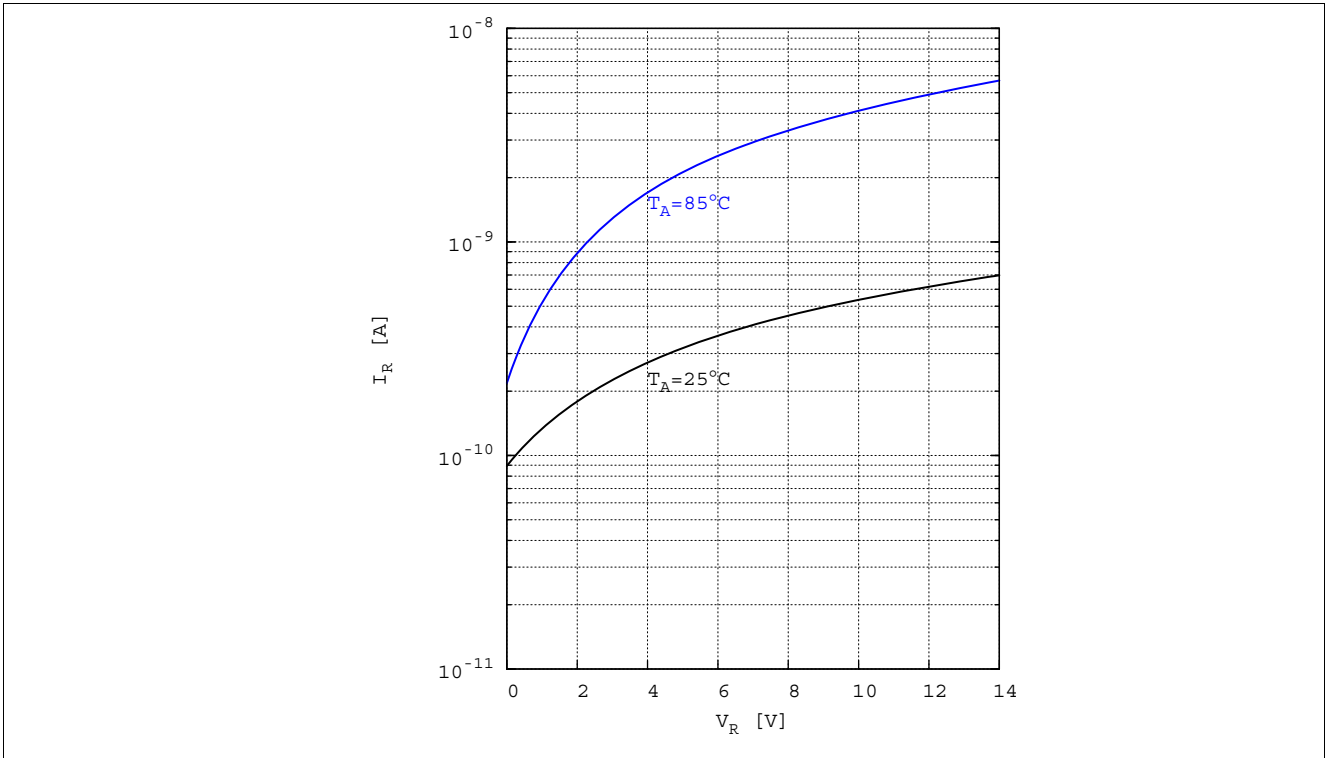


Figure 5 Reverse characteristic,  $I_R = (V_R)$ ,  $T_A =$  parameter

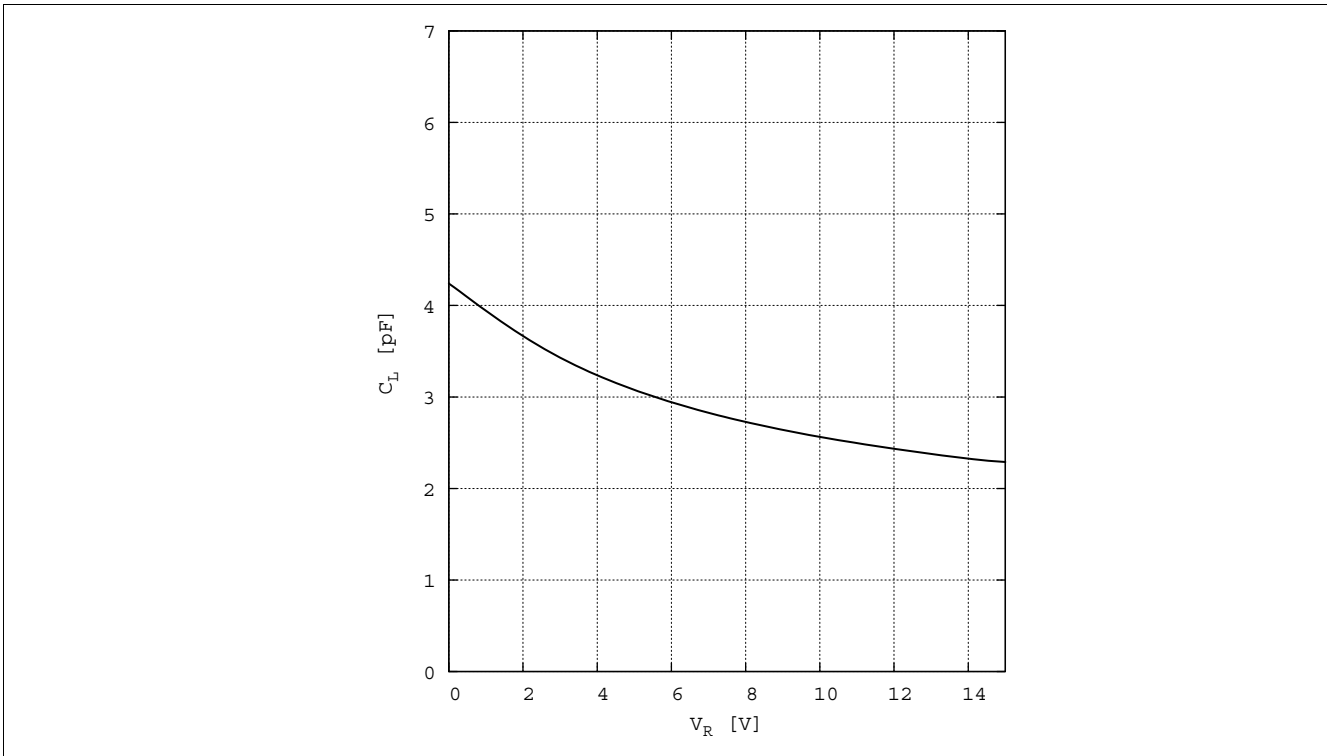


Figure 6 Line capacitance  $C_L = f(V_R)$



### 3 Application Information

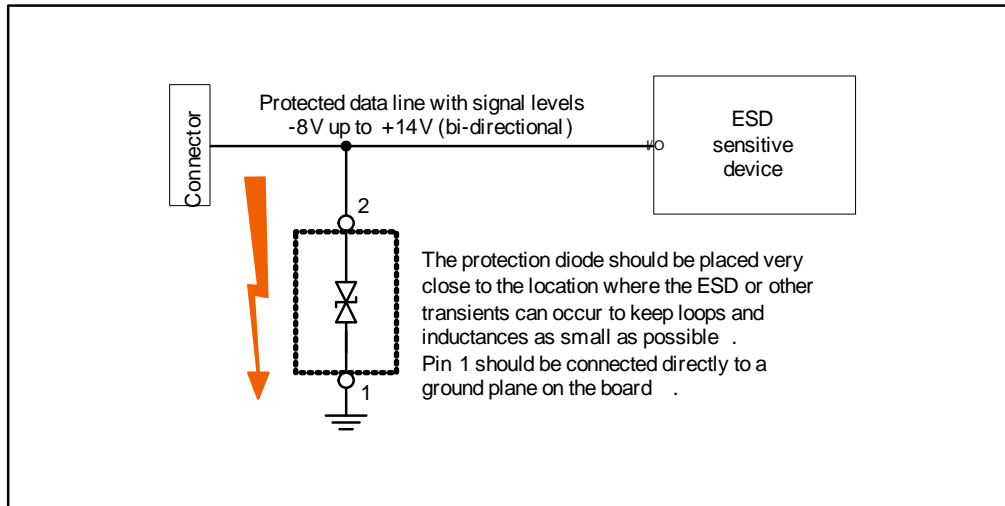


Figure 7 1 Line, bi-directional protection with ESD diode

## 4 Package Information

### 4.1 TSSLP-2-3

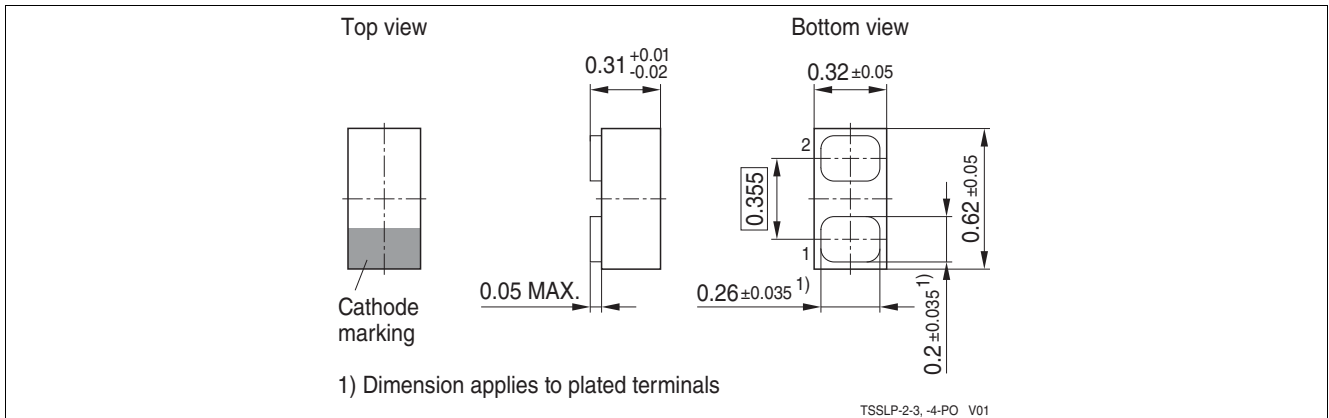


Figure 8 TSSLP-2-3: Package Overview

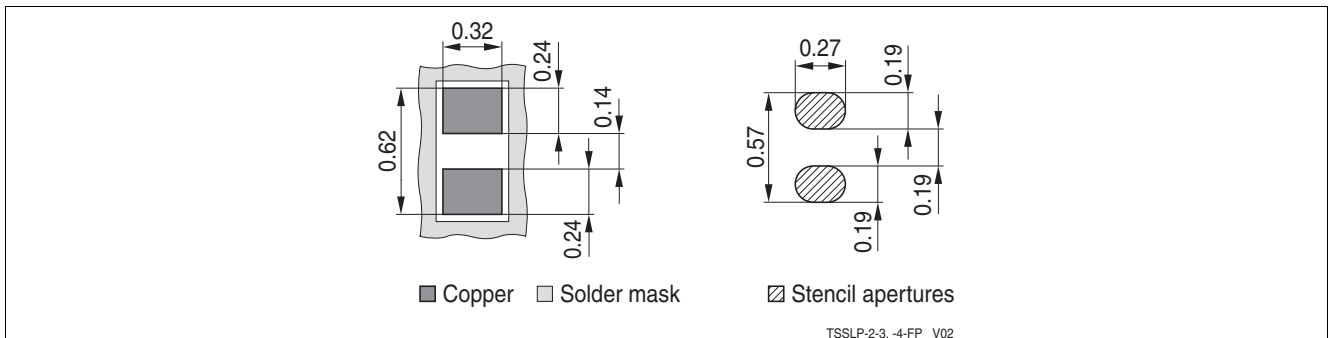


Figure 9 TSSLP-2-3 Footprint

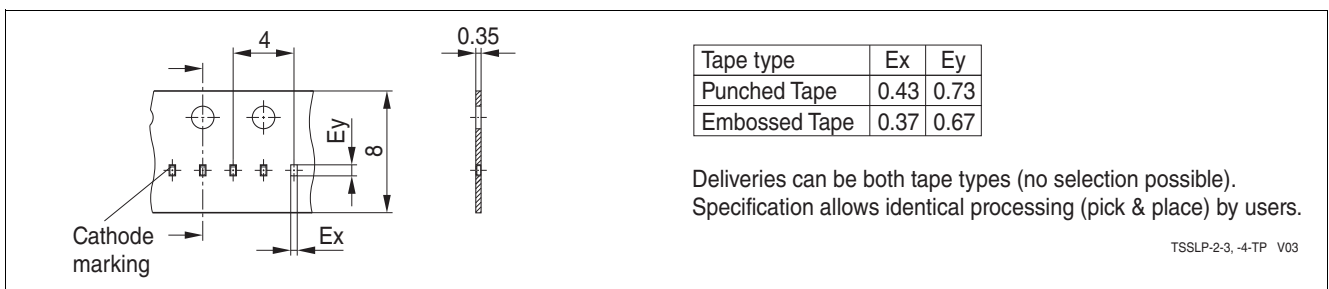


Figure 10 TSSLP-2-3: Packing

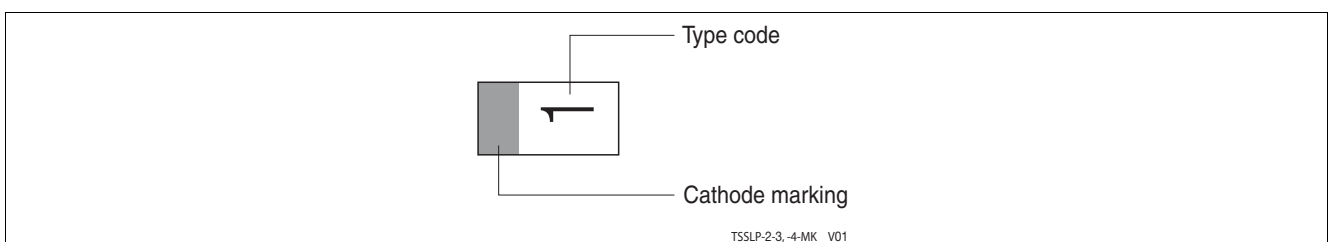


Figure 11 TSSLP-2-3: Marking (example)

4.2 TSLP-2-19

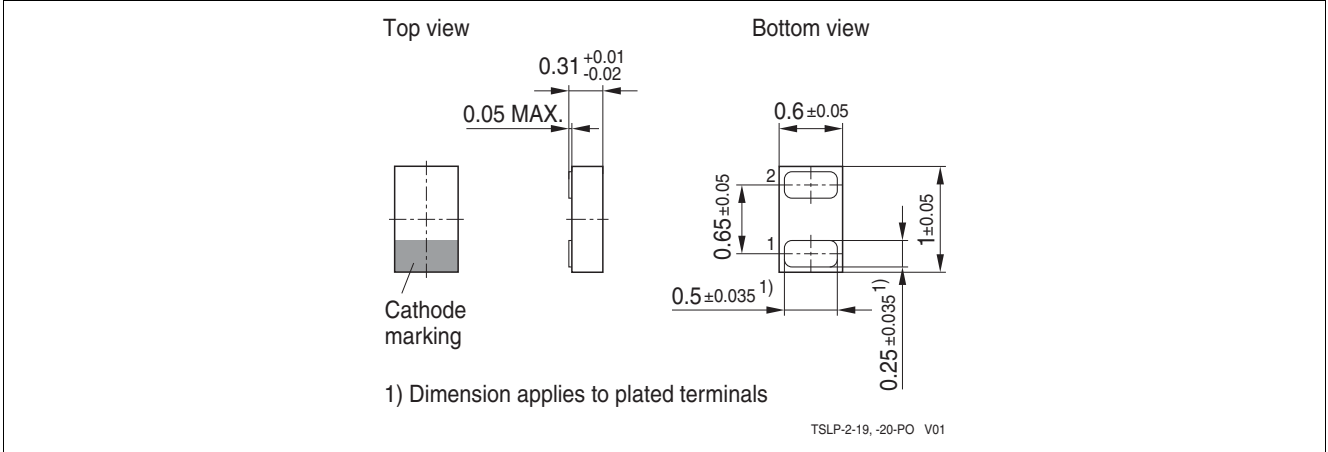


Figure 12 TSLP-2-19: Package Overview

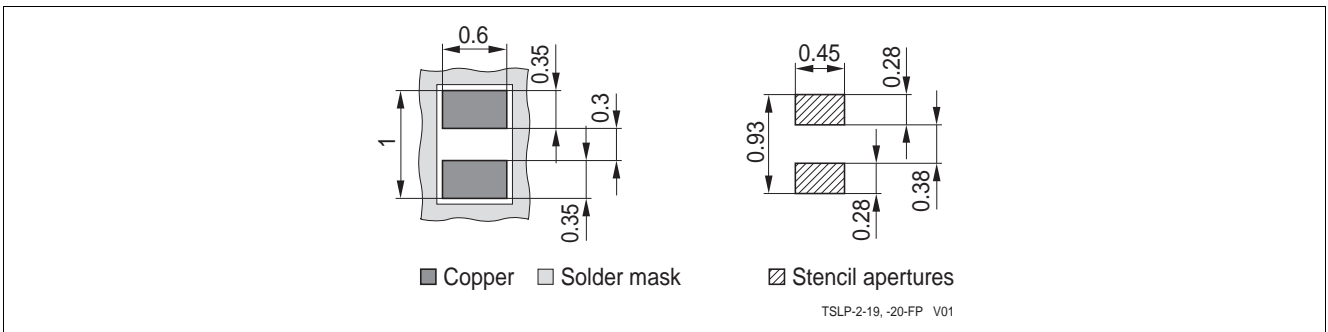


Figure 13 TSLP-2-19: Footprint

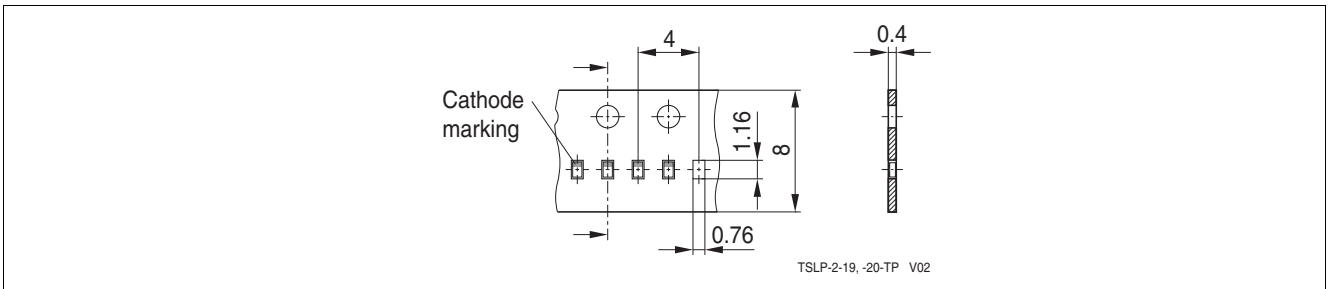


Figure 14 TSLP-2-19: Packing

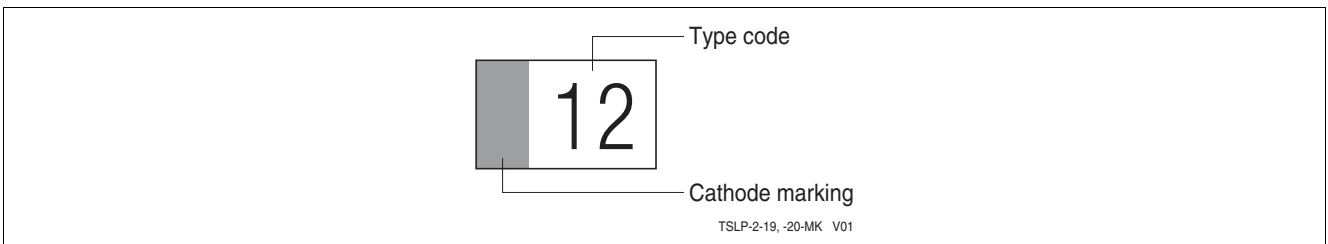


Figure 15 TSLP-2-19: Marking (example)

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