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TVS Diode

Transient Voltage Suppressor Diodes

ESD206-B1-02 Series

Ultra Low Clamping Bi-directional ESD / Transient / Surge Protection Diode

ESD206-B1-02ELS
ESD206-B1-02EL

Data Sheet

Revision 1.5, 2013-12-19
Final

Power Management & Multimarket

Revision History, Rev 1.4, 2013-11-26	
Page or Item	**Subjects (major changes since previous revision)**
Revision 1.5, 2013-12-19	
5	Update of Table 2-2)

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Last Trademarks Update 2010-10-26

1 Ultra Low Clamping Bi-directional ESD / Transient / Surge Protection Diode

1.1 Features

- ESD/Transient/Surge protection of one data / V_{bus} line exceeding standard:
  - **IEC61000-4-2 (ESD): ±30 kV (air/contact discharge)**
  - **IEC61000-4-4 (EFT): ±50 A (5/50 ns)**
  - **IEC61000-4-5 (surge): ±6 A (8/20 µs)**
- Medium capacitance: C_L **= 12 pF (typ.)**
- Bi-directional symmetrical working voltage: **-5.5 V to +5.5 V**
- Low leakage current
- Very low ESD clamping voltage: **8 V** (typ.)
- Very low dynamic resistance: **0.13 Ω** (typ.)
- Pb-free (RoHS compliant) and halogen free package

1.2 Application Examples

- Audio Line, Speaker, Headset, Microphone Protection
- Human Interface Devices (Keyboard, Touchpad, Buttons)

1.3 Product Description

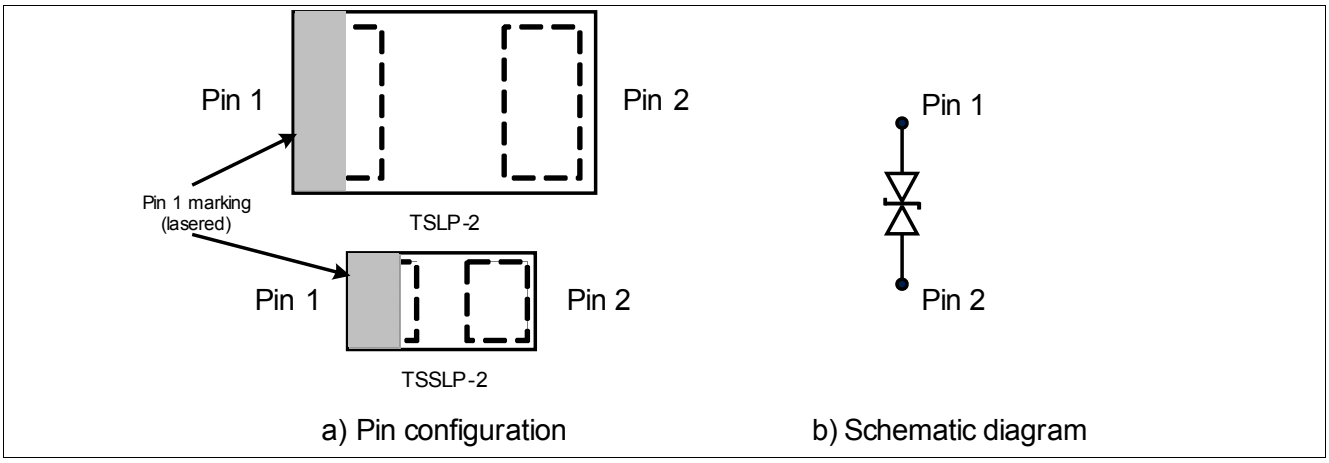

Figure 1-1 Pin Configuration and Schematic Diagram

Table 1-1 Ordering Information

Type	Package	Configuration	Marking code
ESD206-B1-02ELS	TSSLP-2-3	1 line, bi-directional	r
ESD206-B1-02EL	TSLP-2-19	1 line, bi-directional	A3

2 Characteristics

2.1 Maximum Ratings

Table 2-1 Maximum Ratings at T_A = 25 °C, unless otherwise specified[1)]

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
ESD[2)]air / contact discharge	V_{ESD}	-	-	30	kV
Peak pulse current (t_p = 8/20 µs)[3)]	I_{PP}	-	-	6	A
Operating temperature range	T_{OP}	-55	-	125	°C
Storage temperature	T_{stg}	-65	-	150	°C

1) Device is electrically symmetrical
2) V_{ESD} according to IEC61000-4-2
3) 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.

2.2 Electrical Characteristics at T_A = 25 °C, unless otherwise specified

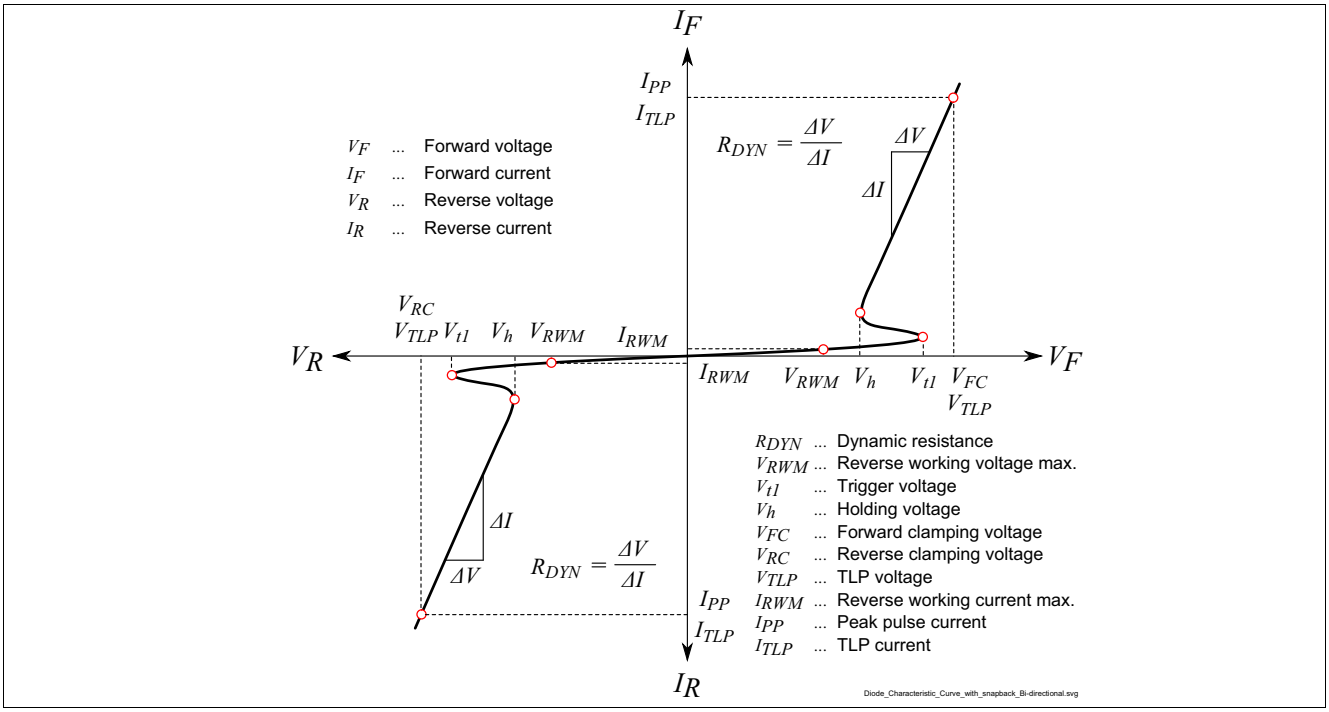

Figure 2-1 Definitions of electrical characteristics

Table 2-2 DC Characteristics at T_A = 25 °C, unless otherwise specified[1)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Reverse working voltage	V_{RWM}	-	-	5.5	V	
Reverse current	I_R	-	-	50	nA	V_R = 5.5 V
Trigger voltage	V_{t1}	6.1	-	-	V	
Holding voltage	V_h	6.1	8	9.5	V	I_R = 10 mA

1) Device is electrically symmetrical

Table 2-3 AC Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Line capacitance	C_L	-	12	20	pF	V_R = 0 V, f = 1 MHz

Table 2-4 ESD and Surge Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Clamping voltage[1)] Pin 1 to GND	V_{CL}	-	8	-	V	I_{TLP} = 16 A
		-	10.8	-		I_{TLP} = 30 A
Clamping voltage[1)] GND to Pin1			8.5			I_{TLP} = 16 A
			12.5			I_{TLP} = 30 A
Clamping voltage[2)]		-	7.5	-		I_{PP} = 1 A, t_p = 8/20 µs
		-	9.6	-		I_{PP} = 6 A, t_p = 8/20 µs
Dynamic resistance[1)]	R_{DYN}	-	0.13	-	Ω	Pin 1 to GND
			0.16			GND to Pin 1

1) ANSI/ESD STM5.5.1 - Electrostatic Discharge Sensitive Testing using Transmission Line Pulse (TLP) Model. TLP conditions: Z_0 = 50 Ω, t_p = 100 ns, t_r = 0.6 ns, I_{TLP} and V_{TLP} averaging window: t_1 = 30 ns to t_2 = 60 ns, extraction of dynamic resistance using least squares fit of TLP characteristic between I_{TLP1} = 10 A and I_{TLP2} = 40 A. Please refer to Application Note AN210[1].

2) I_{PP} according to IEC61000-4-5 (t_p = 8/20 µs)

3 Typical Characteristics at T_A = 25 °C, unless otherwise specified

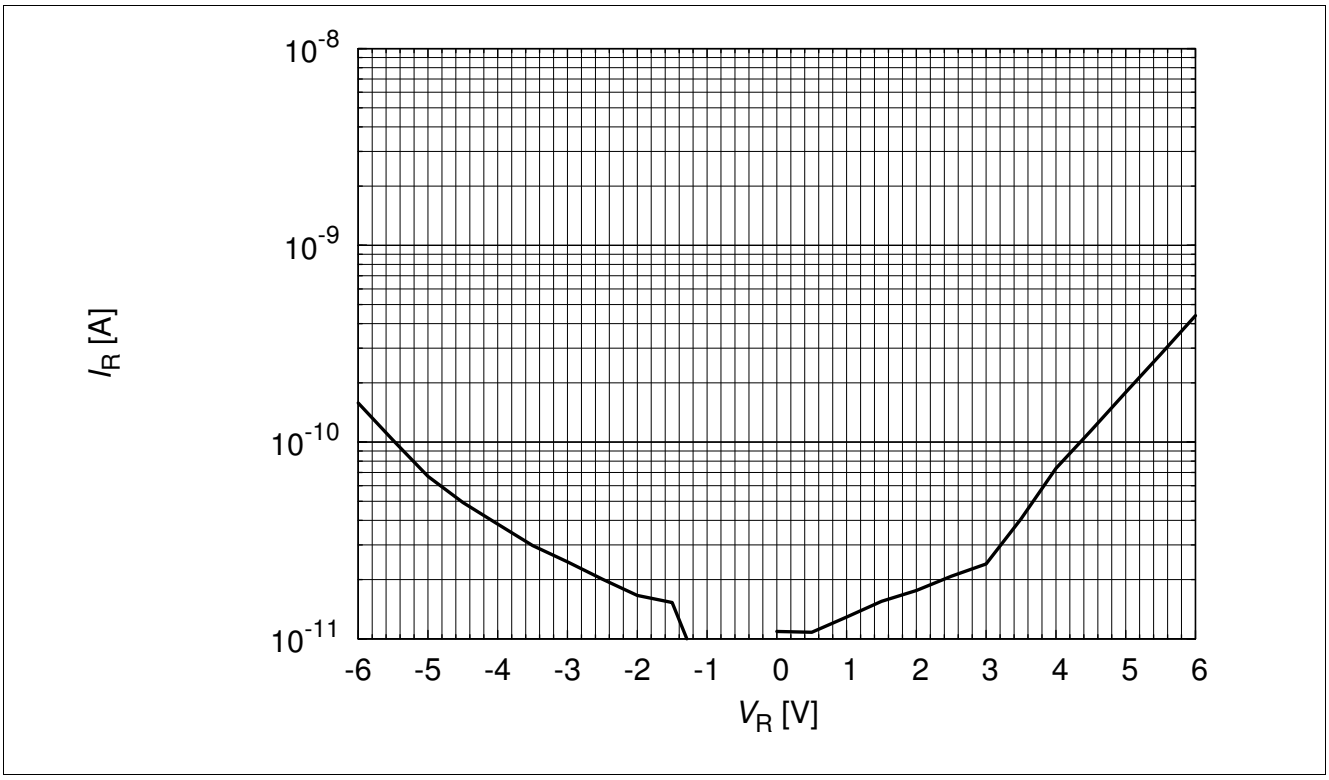

Figure 3-1 Reverse current: $I_R = f(V_R)$

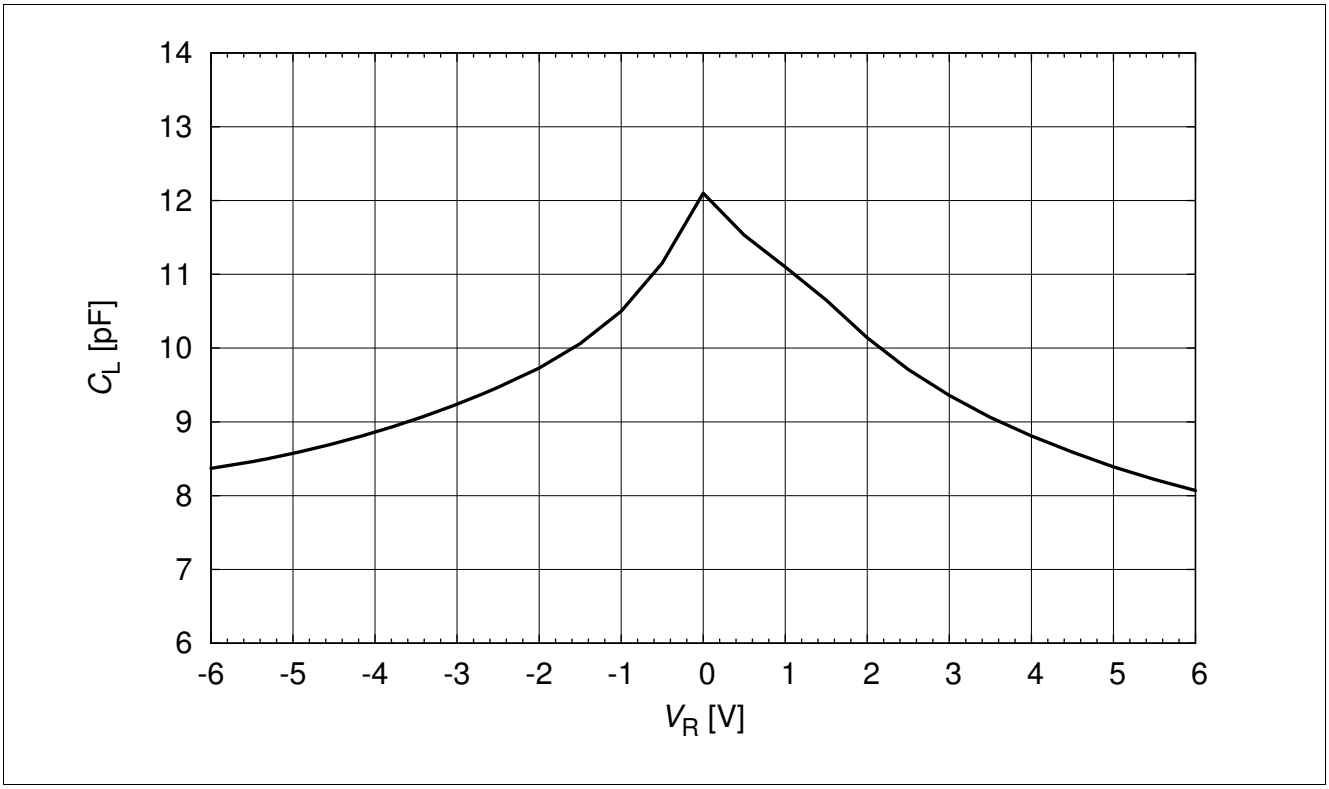

Figure 3-2 Line capacitance: $C_L = f(V_R), f$ = 1MHz

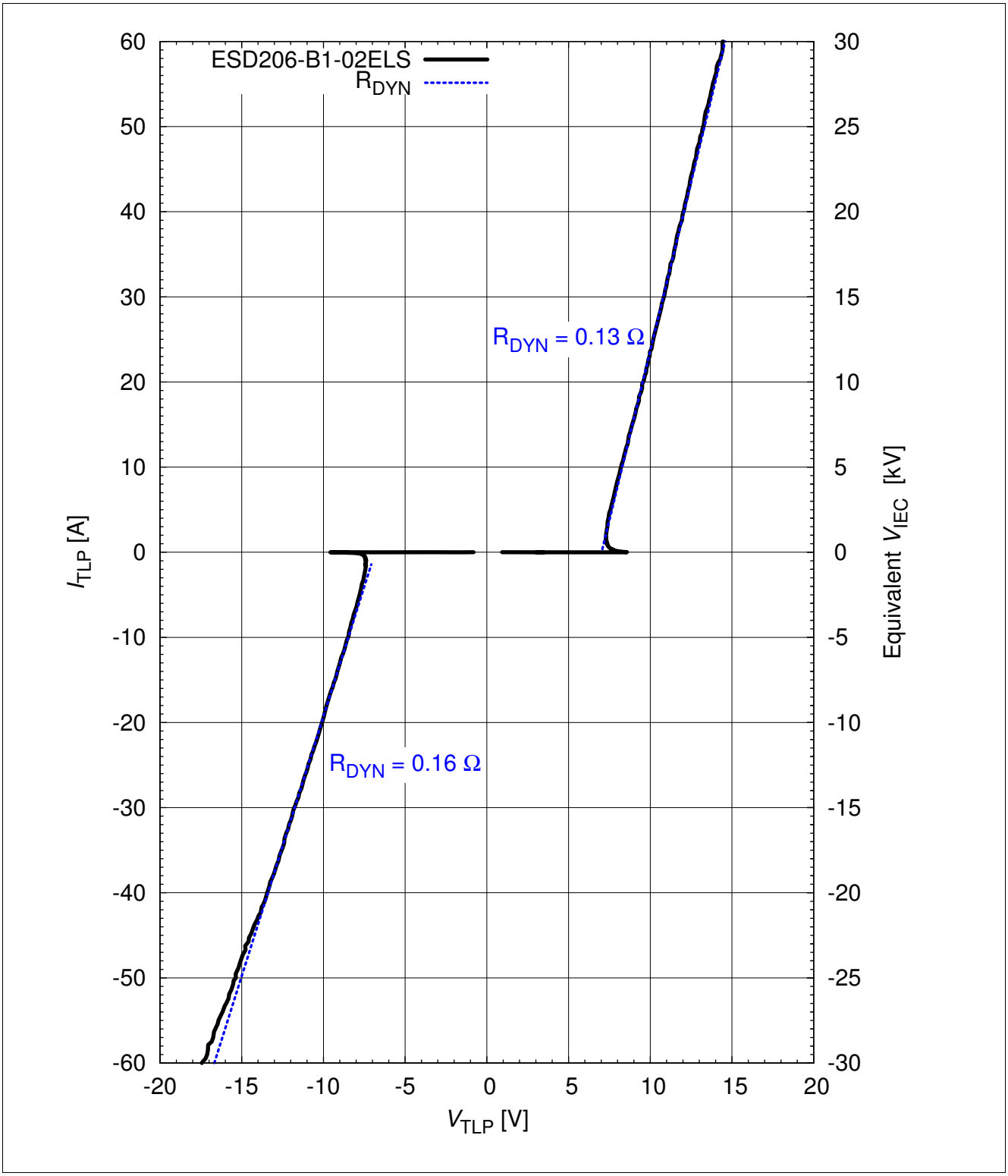

Figure 3-3 Clamping voltage (TLP): $I_{TLP} = f(V_{TLP})$ according ANSI/ESD STM5.5.1 - Electrostatic Discharge Sensitivity Testing using Transmission Line Pulse (TLP) Model. TLP conditions: Z_0 = 50 Ω, t_p = 100 ns, t_r = 0.6 ns, I_{TLP} and V_{TLP} averaging window: t_1 = ns to t_2 = 60 ns, extraction of dynamic resistance using squares fit to TLP characteristics between I_{TLP1} = 10 A and I_{TLP2} = 40 A. Please refer to Application Note AN210 [1]

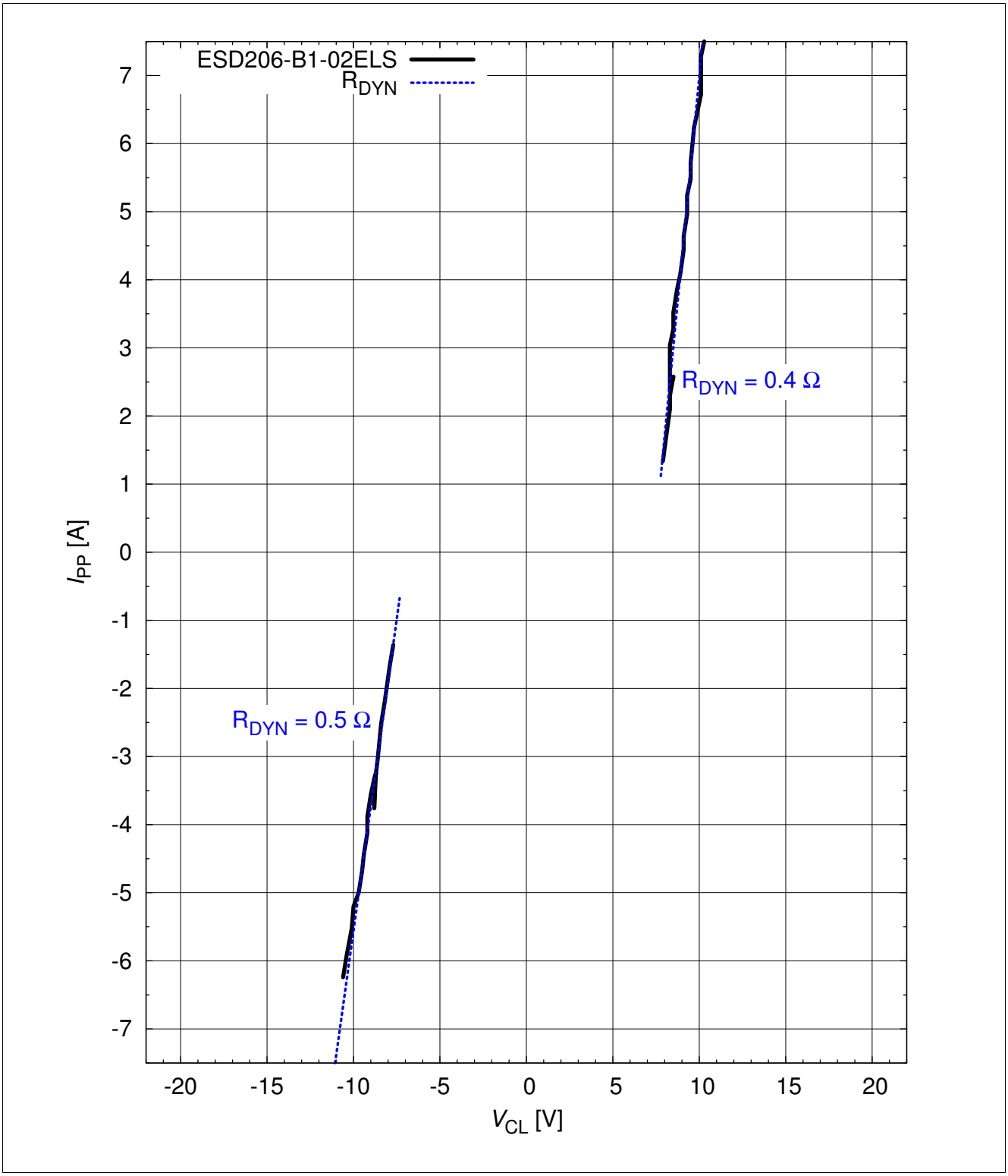

Figure 3-4 Pulse current (IEC61000-4-5) versus clamping voltage: $I_{PP} = f(V_{CL})$

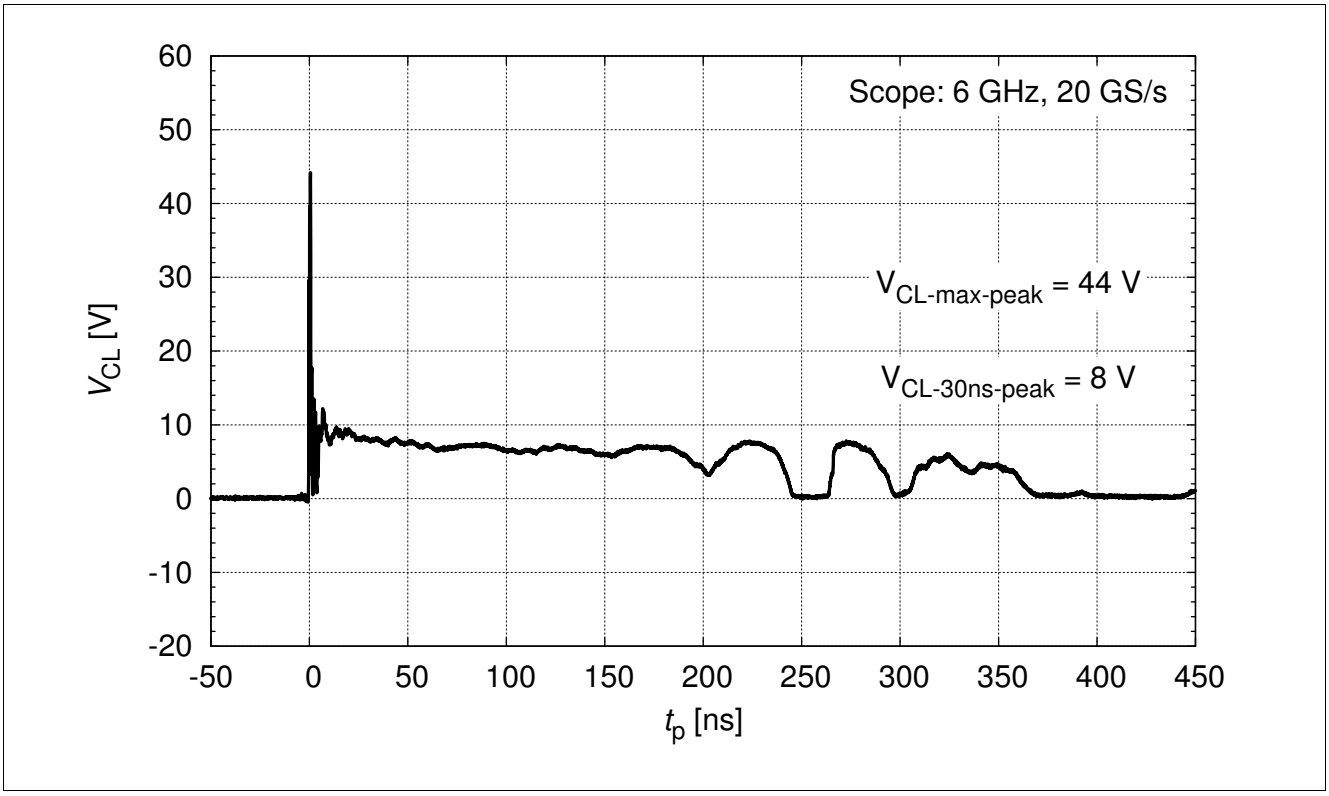

Figure 3-5 IEC61000-4-2 : $V_{CL} = f(t)$, 8 kV positive pulse from pin 1 to pin 2

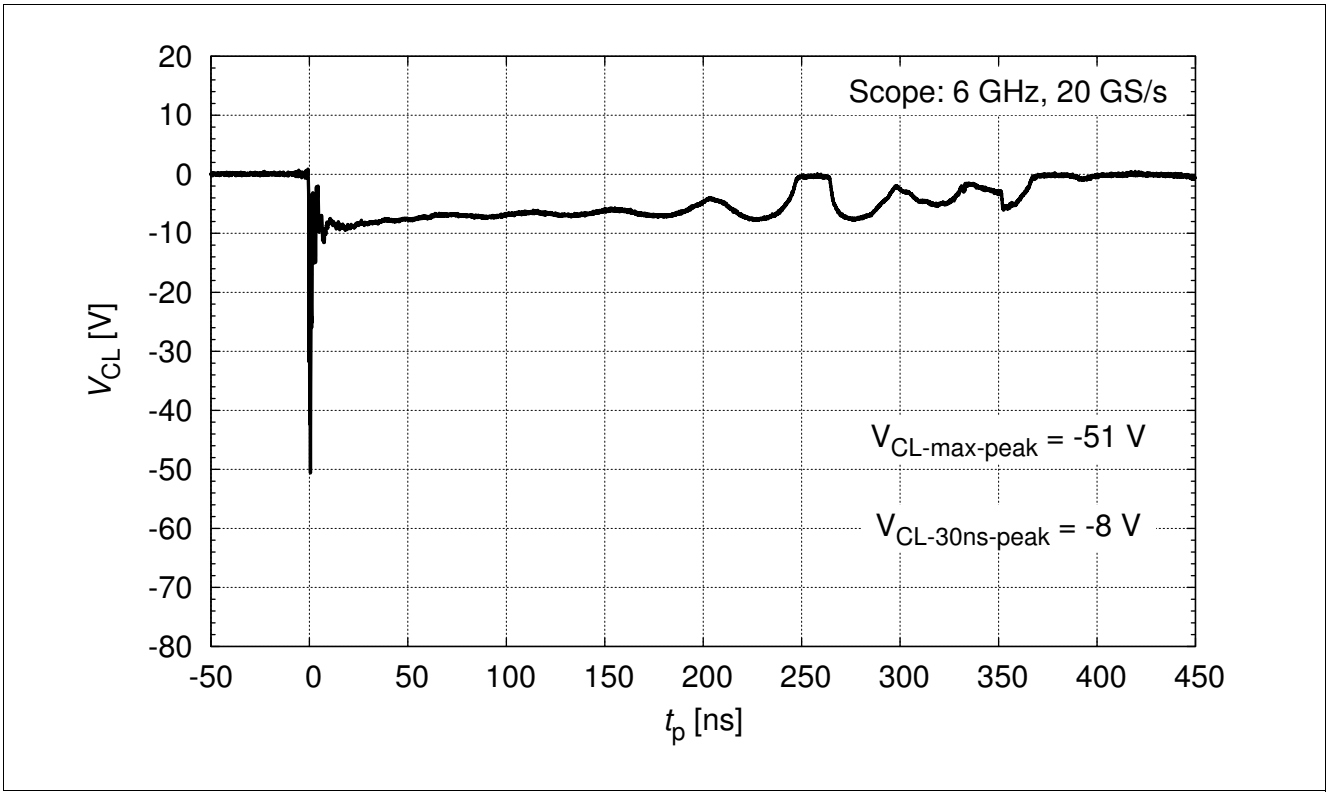

Figure 3-6 IEC61000-4-2 : $V_{CL} = f(t)$, 8 kV negative pulse from pin 1 to pin 2

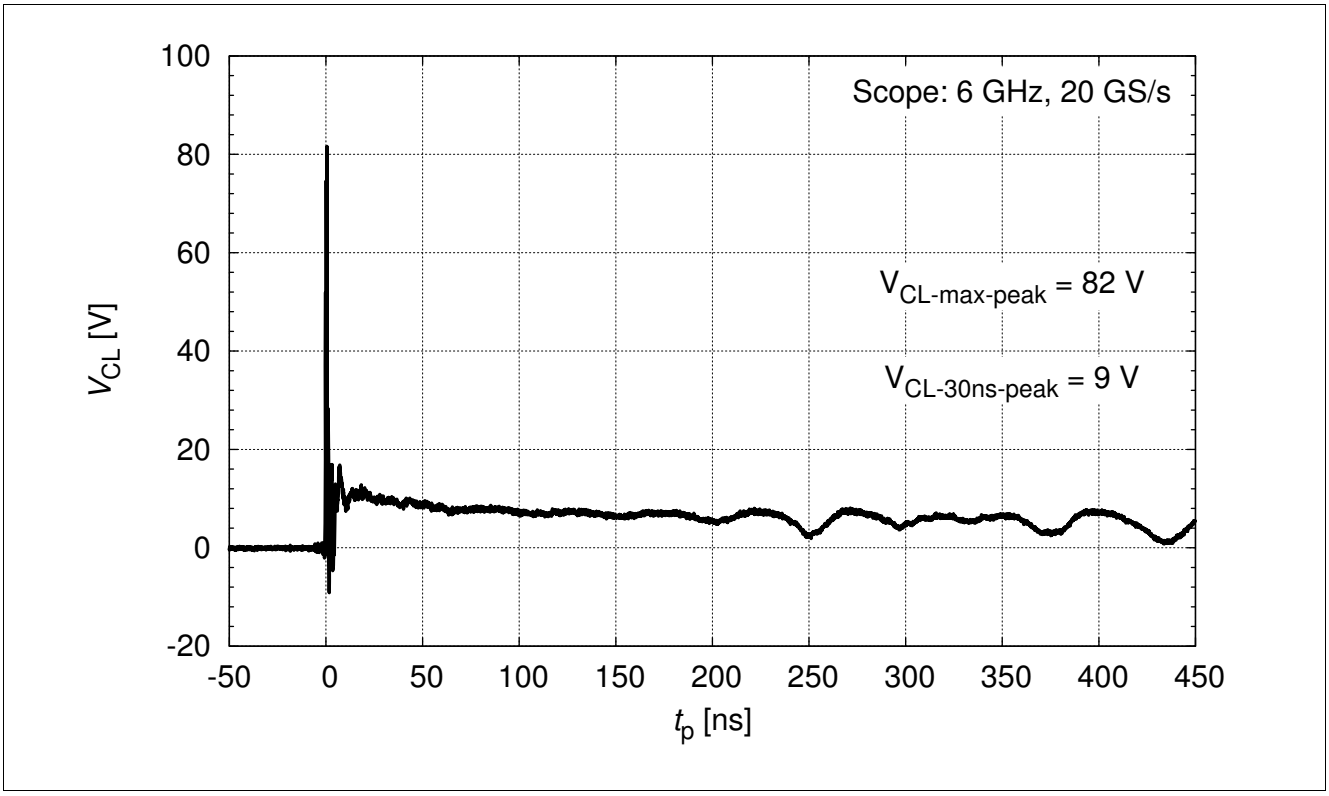

Figure 3-7 IEC61000-4-2 : $V_{CL} = f(t)$, 15 kV positive pulse from pin 1 to pin 2

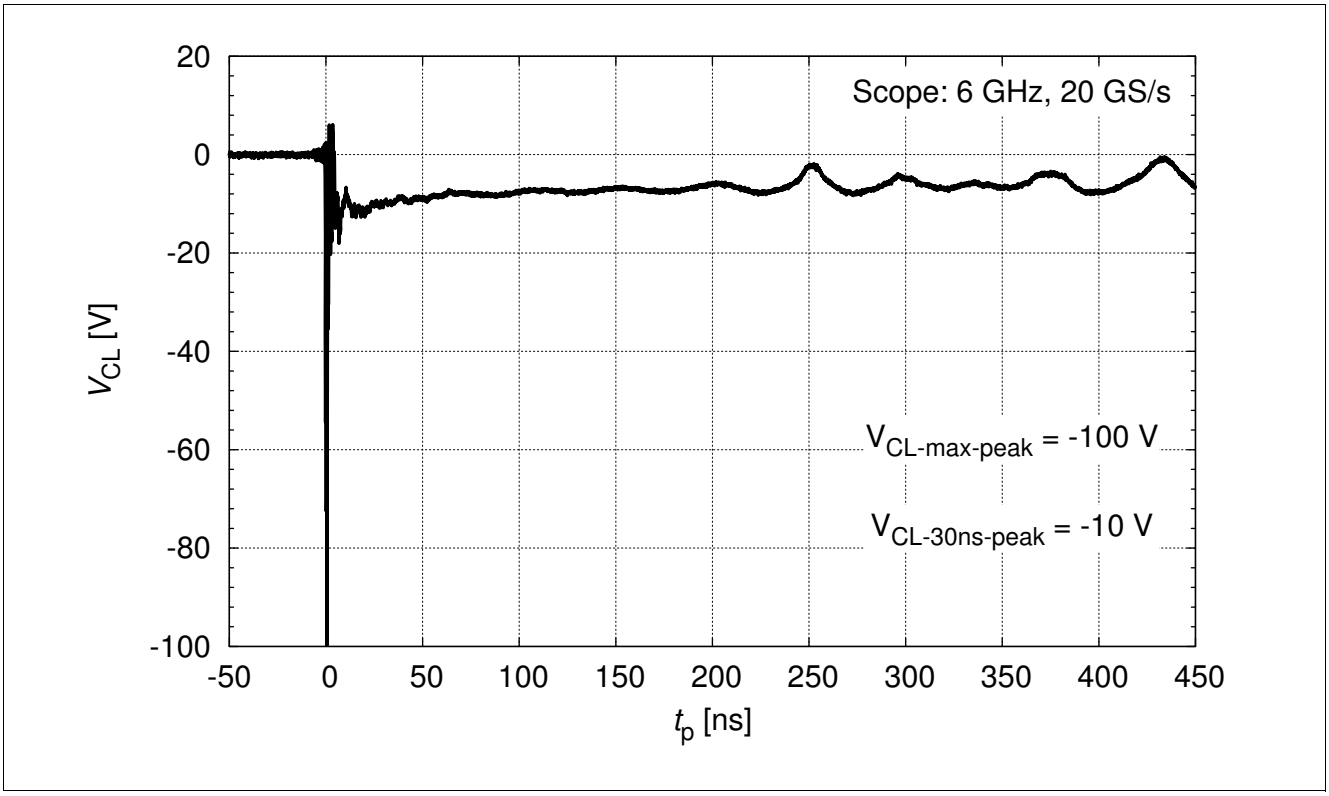

Figure 3-8 IEC61000-4-2 : $V_{CL} = f(t)$, 15 kV negative pulse from pin 1 to pin 2

4 Package Information

4.1 TSSLP-2-3

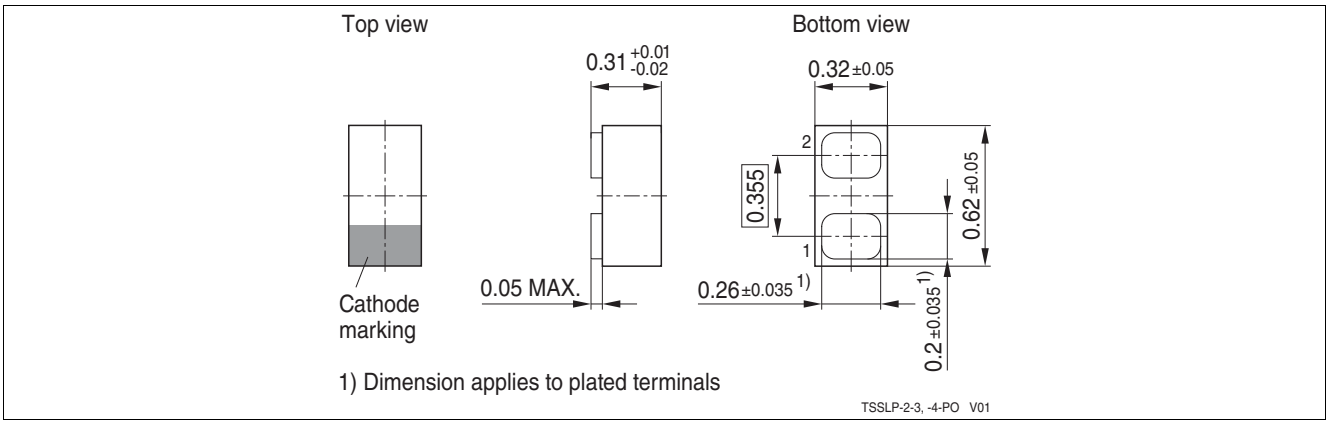

Figure 4-1 TSSLP-2-3: Package outline (dimension in mm)

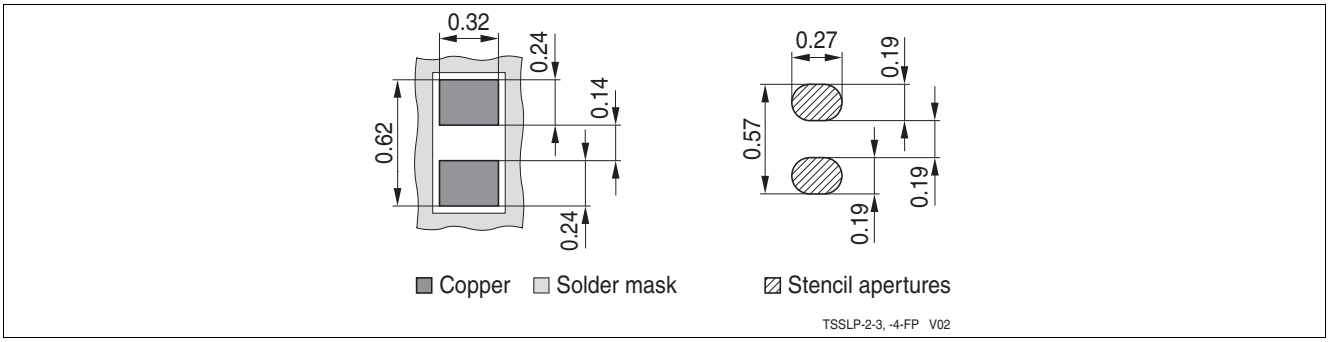

Figure 4-2 TSSLP-2-3: Footprint (dimension in mm)

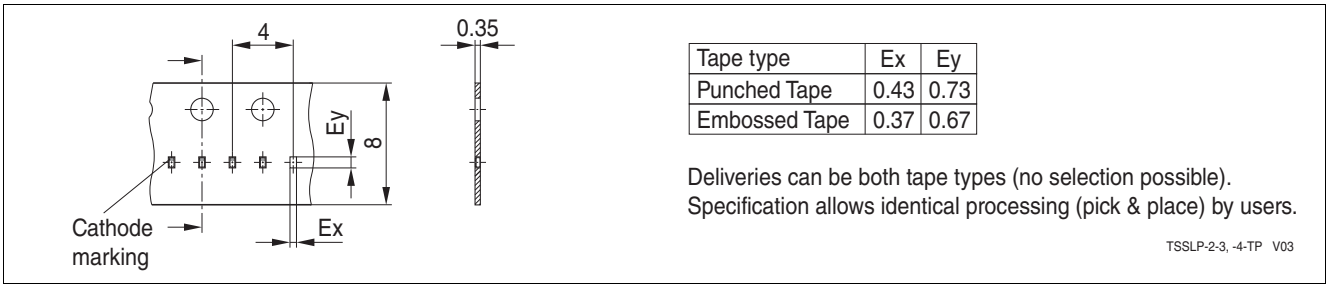

Figure 4-3 TSSLP-2-3: Tape and reel (dimension in mm)

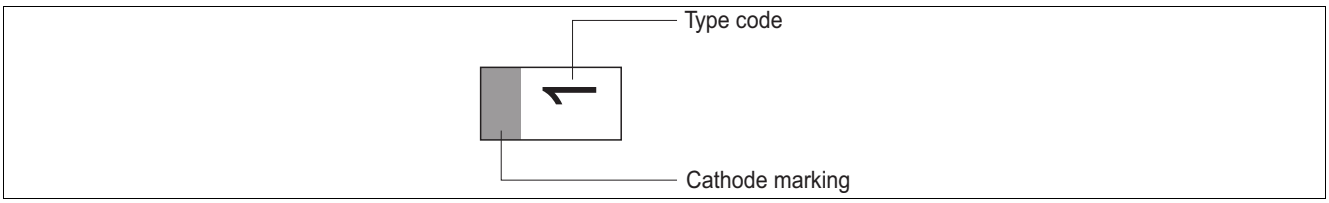

Figure 4-4 TSSLP-2-3: Marking example

4.2 TSLP-2-19

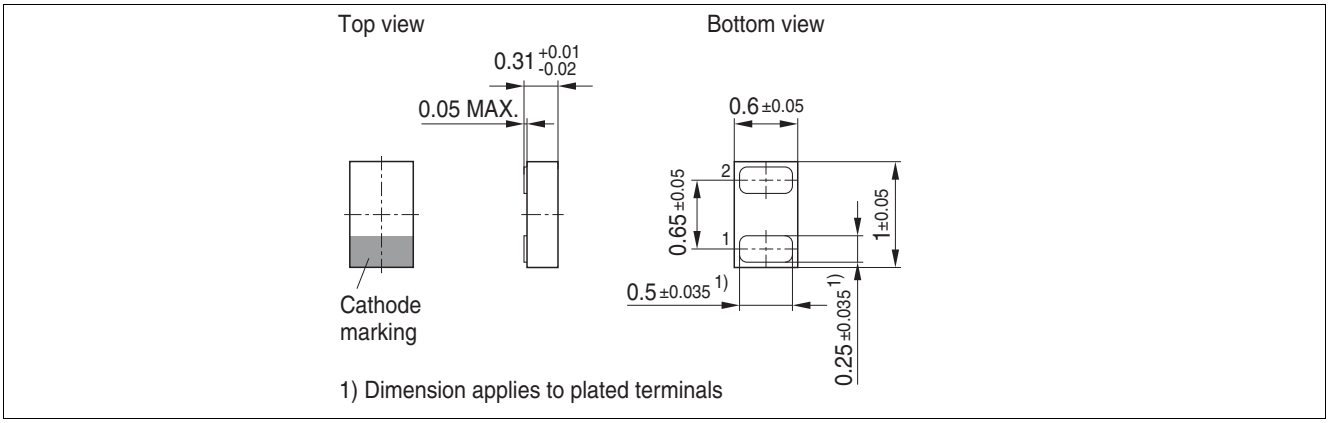

Figure 4-5 TSLP-2-19: Package outline (dimension in mm)

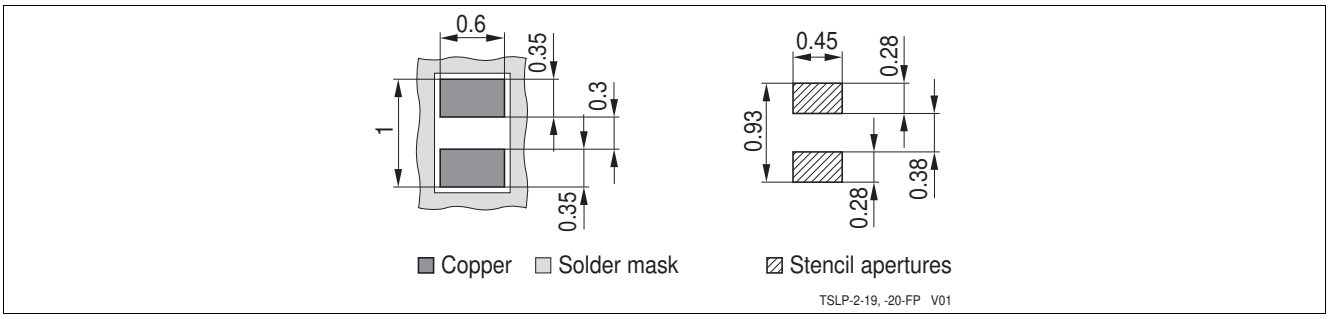

Figure 4-6 TSLP-2-19: Footprint (dimension in mm)

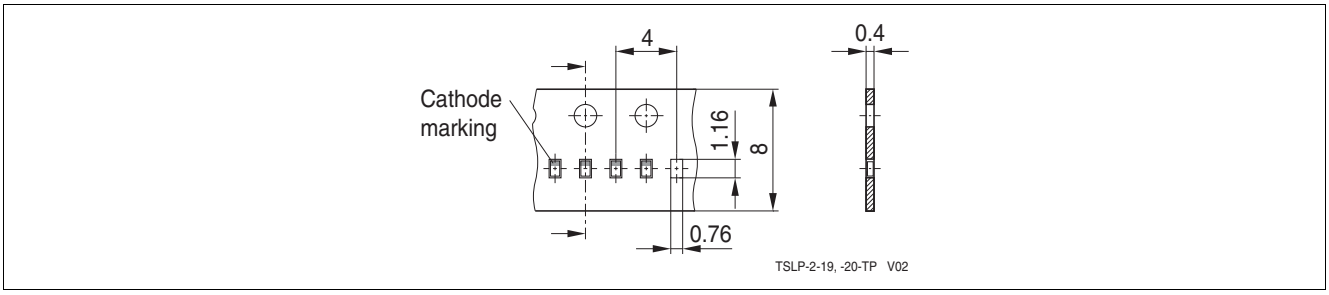

Figure 4-7 TSLP-2-19: Tape and reel (dimension in mm)

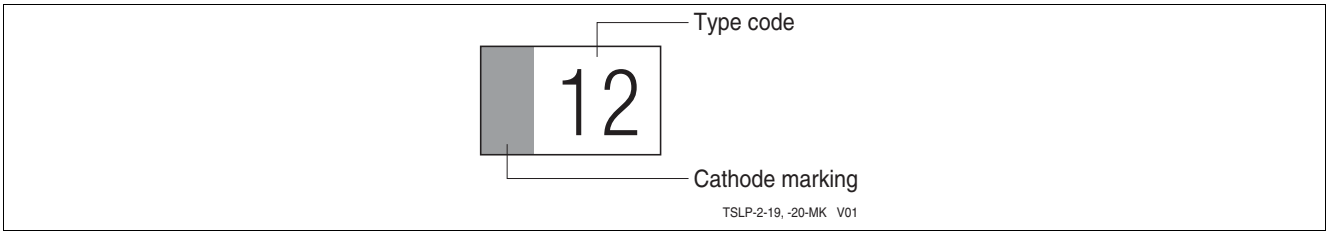

Figure 4-8 TSLP-2-19: Marking example

References

[1] Infineon AG - **Application Note AN210:** Effective ESD Protection design at System Level Using VF-TLP Characterization Methodology

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