

TVS Diode

Transient Voltage Suppressor Diodes

ESD5V5S1B-02LRH

Low Clamping Bidirectional ESD Protection Diode

ESD5V5S1B-02LRH

Data Sheet

Revision 1.1, 2012-08-09
Final

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Page or Item	Subjects (major changes since previous revision)
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Revision 1.1, 2012-08-09

6	ESD Characteristics updated

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Last Trademarks Update 2010-10-26

1 Low Clamping Bidirectional ESD Protection Diode

1.1 Features

- Bidirectional ESD protection of one line
- Extremely high ESD and surge protection
 - IEC61000-4-2 (ESD): ± 30 kV (air/contact discharge)
 - IEC61000-4-5 (surge): ± 12 A (8/20 μ s)
- Low clamping voltage $V_{CL} < 7.5$ V
- Maximum peak pulse power $P_{PP} = 150$ W (8/20 μ s)
- Extremely low dynamic resistance: $R_{DYN} = 0.08$ Ω typ.
- Supports applications with signal voltage between -5.5 V and +5.5 V max.
- Line capacitance: $C_L =$ typ. 25 pF to max. 45 pF
- Package TSLP-2-17 compatible to SOD882D leadless ultra small Surface-Mounted Device (SMD)
- Size 1 mm x 0.6 mm x 0.39 mm



1.2 Application Examples

- Reliable ESD and surge protection of highly susceptible IC/ASICs in computers and peripherals, audio, headset, human digital interfaces, video equipment, cellular handsets and accessories and portable electronics
- Dedicated solution to boost ESD and surge protection performance in miniaturized modern electronics

1.3 Product Description



Figure 1-1 Pin Configuration and Schematic Diagram

Table 1-1 Ordering Information

Type	Package	Configuration	Marking code
ESD5V5S1B-02LRH	TSLP-2-17	1 line, bi-directional	YY

2 Characteristics

2.1 Maximum Ratings

Table 2-1 Maximum Ratings at $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
ESD ¹⁾ contact discharge air discharge	V_{ESD}	-	-	30 30	kV
Peak pulse current ($t_p = 8/20\text{ }\mu\text{s}$) ²⁾	I_{PP}	-	-	12	A
Peak pulse power ($t_p = 8/20\text{ }\mu\text{s}$) ²⁾	P_{PP}	-	-	150	W
Operating temperature range	T_{OP}	-55	-	125	$^\circ\text{C}$
Storage temperature	T_{stg}	-65	-	150	$^\circ\text{C}$

1) V_{ESD} according to IEC61000-4-2 ($R = 330$, $C = 150\text{ pF}$ discharge network)

2) I_{PP} according to IEC61000-4-5 ($t_p = 8/20\text{ }\mu\text{s}$)

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 $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

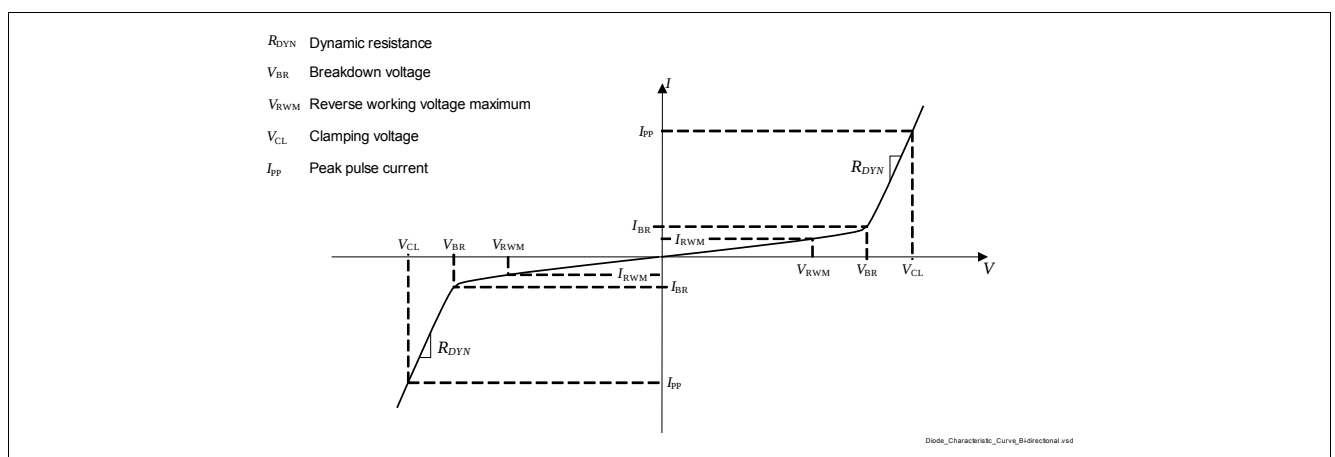


Figure 2-1 Definitions of electrical characteristics

Characteristics

Table 2-2 DC Characteristics at $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Reverse working voltage	V_{RWM}	-5.5	-	5.5	V	
Breakdown voltage ¹⁾	V_{BR}	6	-	10	V	$I_{BR} = 1\text{ mA}$
Reverse current ¹⁾	I_R	-	5	100	nA	$V_R = 5\text{ V}$

1) Voltage forced

Table 2-3 RF Characteristics at $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Line capacitance	C_L	-	24	45	pF	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$

Table 2-4 ESD Characteristics at $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Clamping voltage ¹⁾ Pin 1 to GND	V _{CL}	-	7.7	-	V	I _{TLP} = 16 A
		-	8.7	-		I _{TLP} = 30 A
Clamping voltage ¹⁾ GND to Pin 1		-	-8.2	-		I _{TLP} = 16 A
		-	-9.4	-		I _{TLP} = 30 A
Clamping voltage ²⁾		-	7.5	-		V _{ESD} = 8 kV, t _p = 30 ns contact discharge
Clamping voltage ³⁾		-	7	-		I _{PP} = 1 A
		-	9.2	-		I _{PP} = 12 A
Dynamic resistance ¹⁾	R _{DYN}	-	0.08	-	Ω	

1) ANSI/ESD STM5.5.1 - Electrostatic Discharge Sensitive Testing using Transmission Line Pulse (TLP) Model. TLP conditions: $Z_0 = 50\text{ }\Omega$, $t_p = 100\text{ ns}$, $t_r = 0.6\text{ ns}$, I_{TLP} and V_{TLP} averaging window: $t_1 = 30\text{ ns}$ to $t_2 = 60\text{ ns}$, extraction of dynamic resistance using least squares fit of TLP characteristic between $I_{PP1} = 10\text{ A}$ and $I_{PP2} = 40\text{ A}$. Please refer to Application Note AN210[1].

2) V_{ESD} according to IEC61000-4-2 ($R = 330\text{ }\Omega$, $C = 150\text{ pF}$ discharge network)

3) I_{PP} according to IEC61000-4-5 ($t_p = 8/20\text{ }\mu\text{s}$)

3 Typical Characteristics

At $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise specified

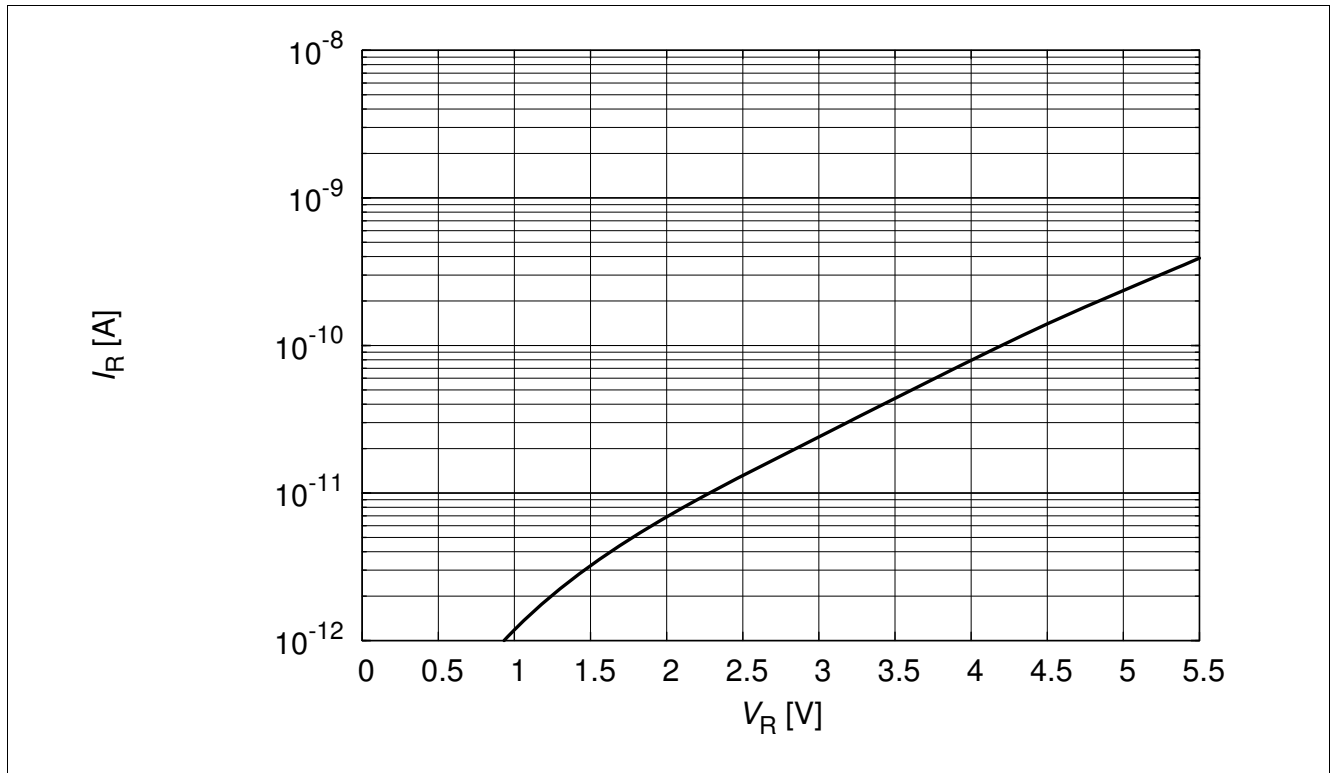


Figure 3-1 Reverse current: $I_R = f(V_R)$

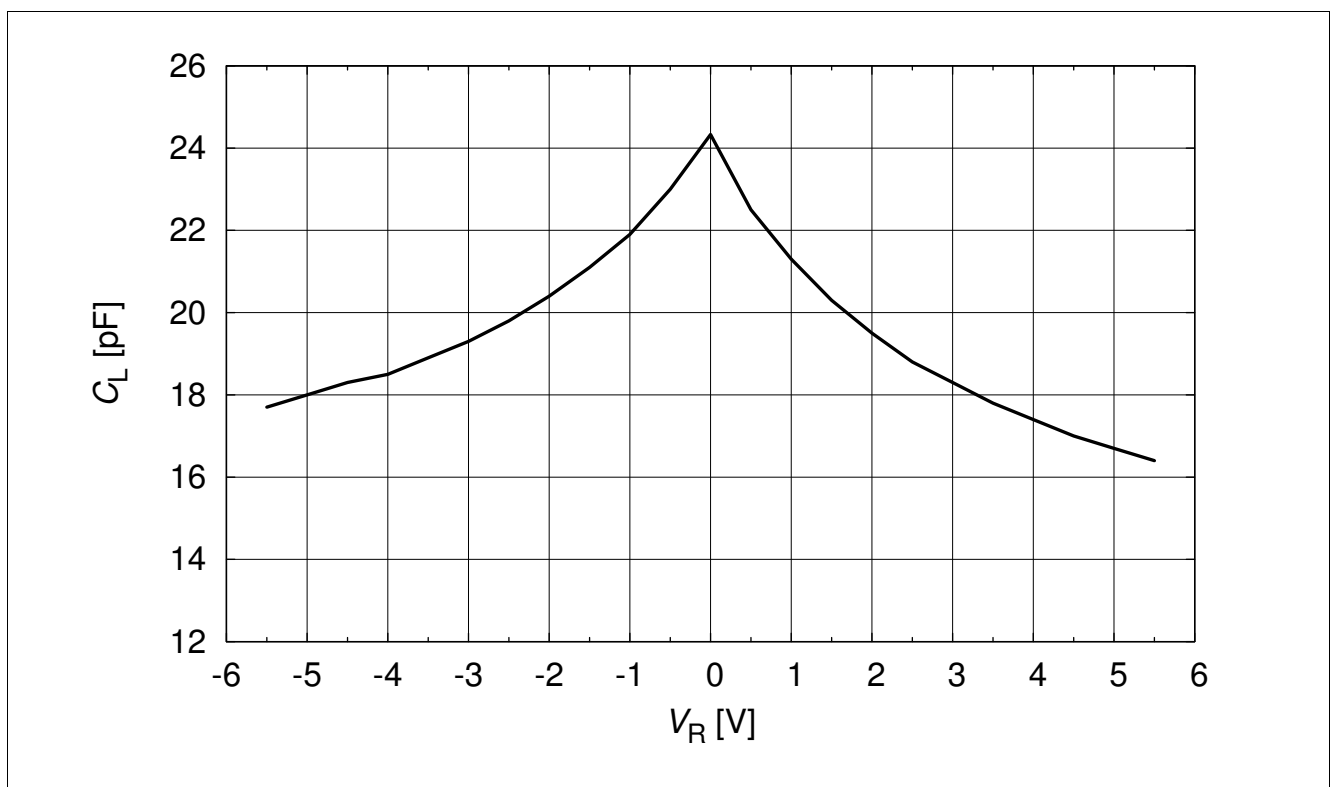


Figure 3-2 Line capacitance: $C_L = f(V_R)$, $f = 1\text{ MHz}$

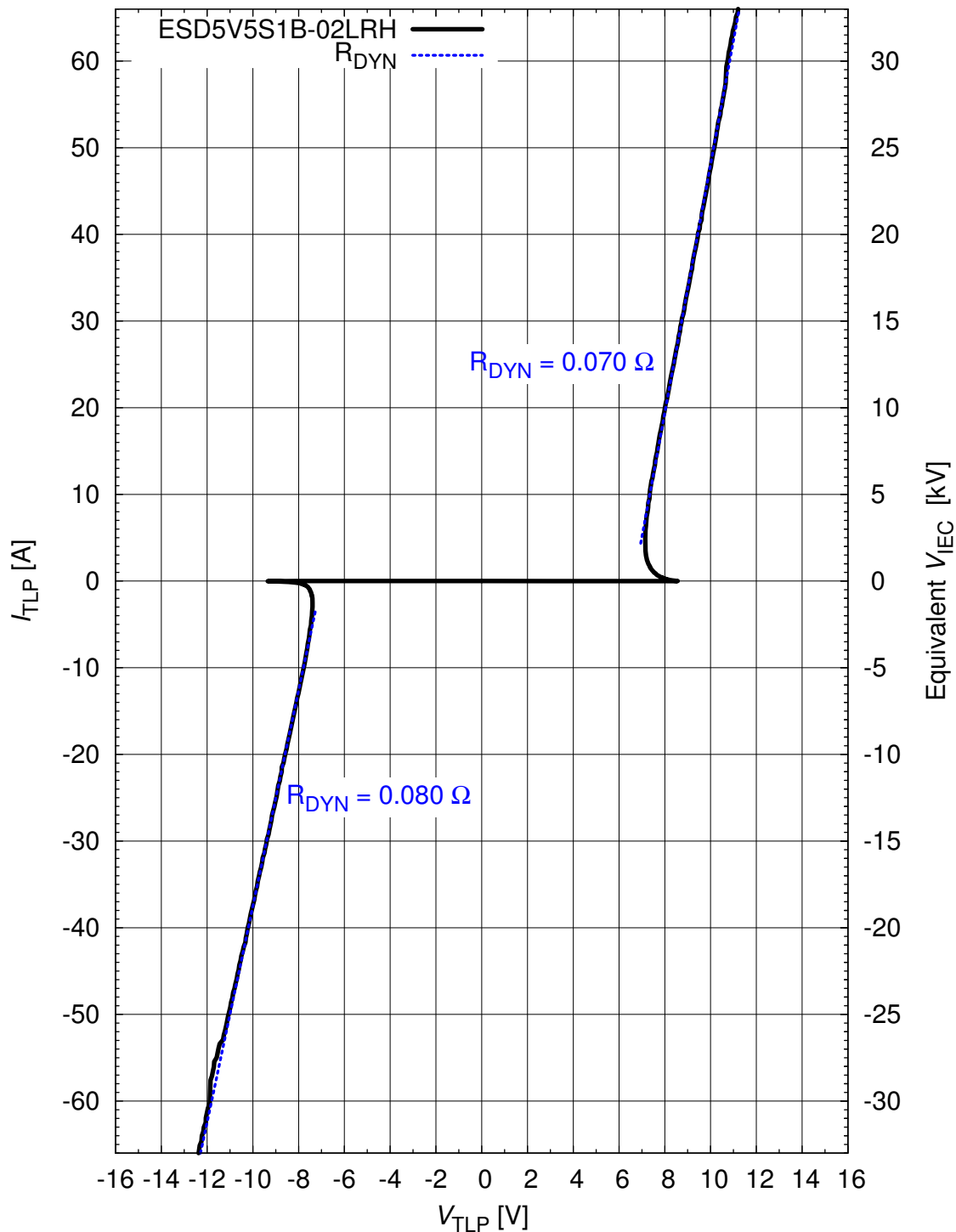


Figure 3-3 Clamping voltage (TLP): $I_{TLP} = f(V_{TLP})$ according ANSI/ESD STM5.5.1- Electrostatic Discharge Sensitivity Testing using Transmission Line Pulse (TLP) Model. TLP conditions: $Z_0 = 50 \Omega$, $t_p = 100$ ns, $t_r = 0.6$ ns, I_{TLP} and V_{TLP} averaging window: $t_1 = 30$ ns to $t_2 = 60$ ns, extraction of dynamic resistance using squares fit to TLP characteristics between $I_{TLP1} = 10$ A and $I_{TLP2} = 40$ A. Please refer to Application Note AN210[1]

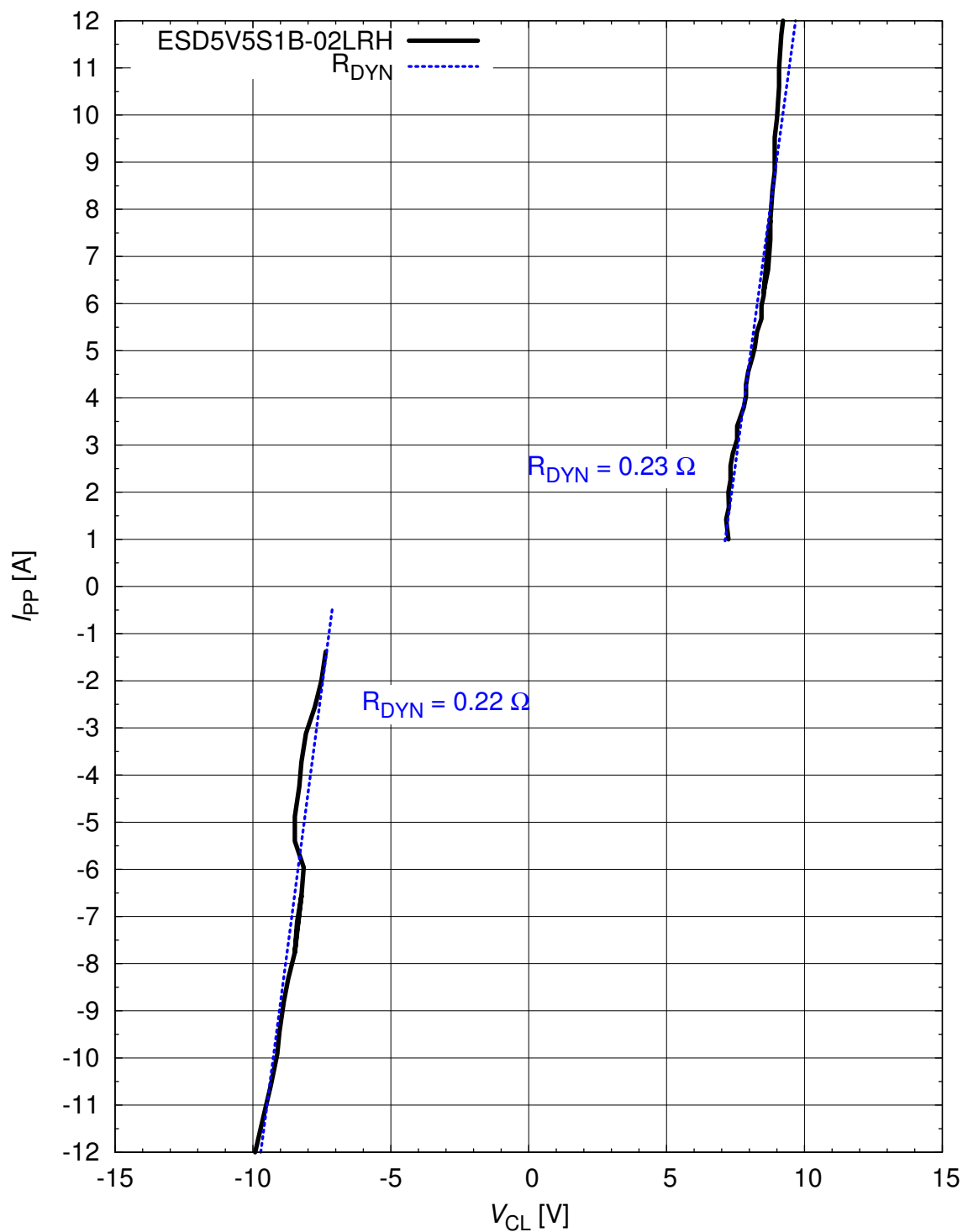


Figure 3-4 Pulse current (IEC61000-4-5) versus clamping voltage: $I_{PP} = f(V_{CL})$

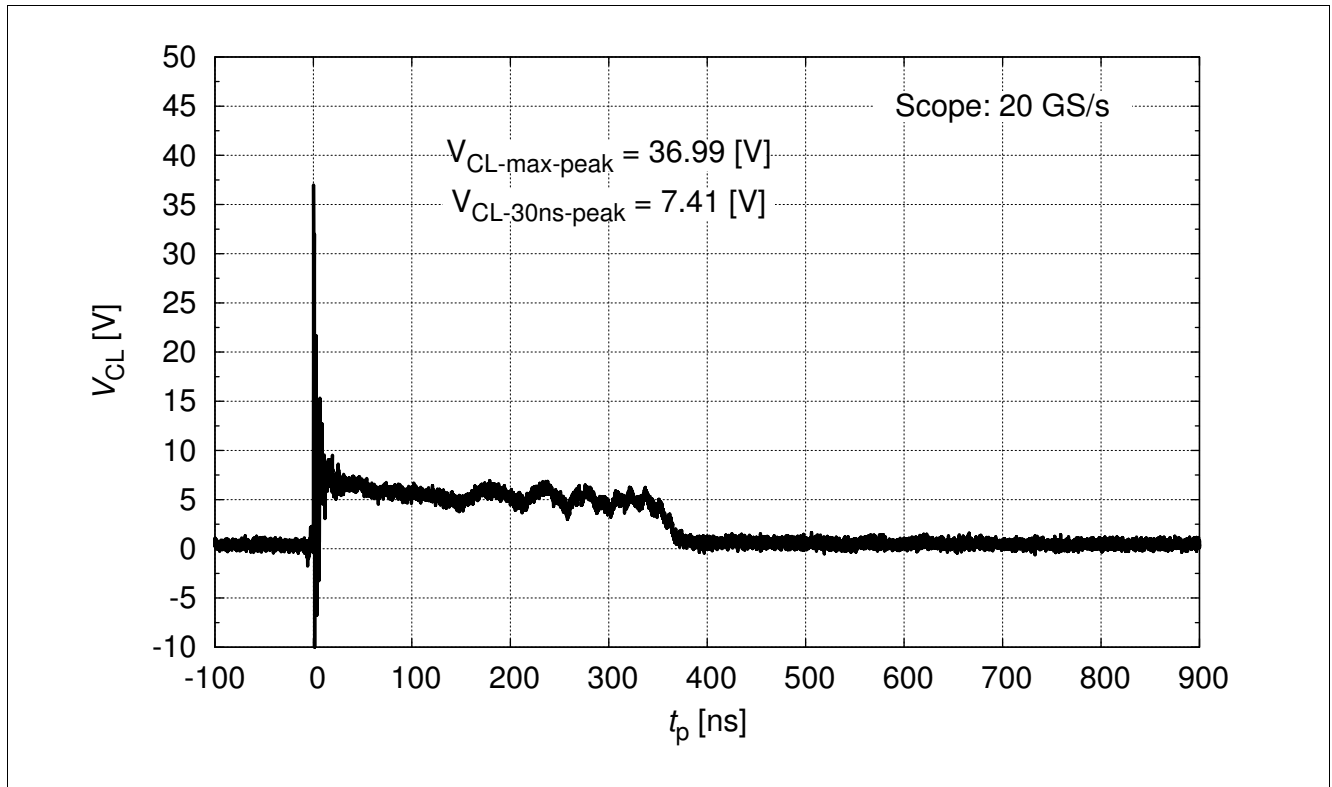


Figure 3-5 IEC61000-4-2: $V_{CL} = f(t)$, 8 kV positive pulse from pin 1 to pin 2

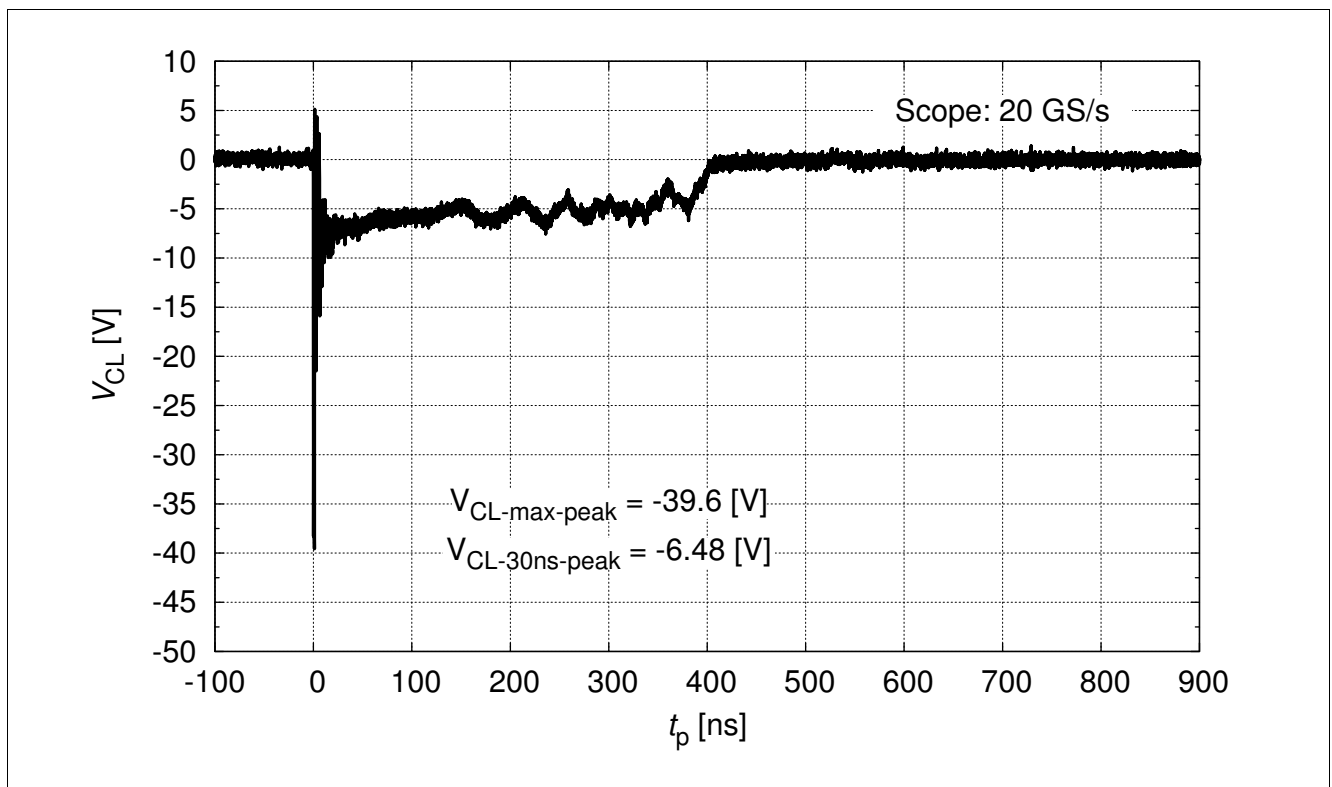


Figure 3-6 IEC61000-4-2: $V_{CL} = f(t)$, 8 kV negative pulse from pin 1 to pin 2

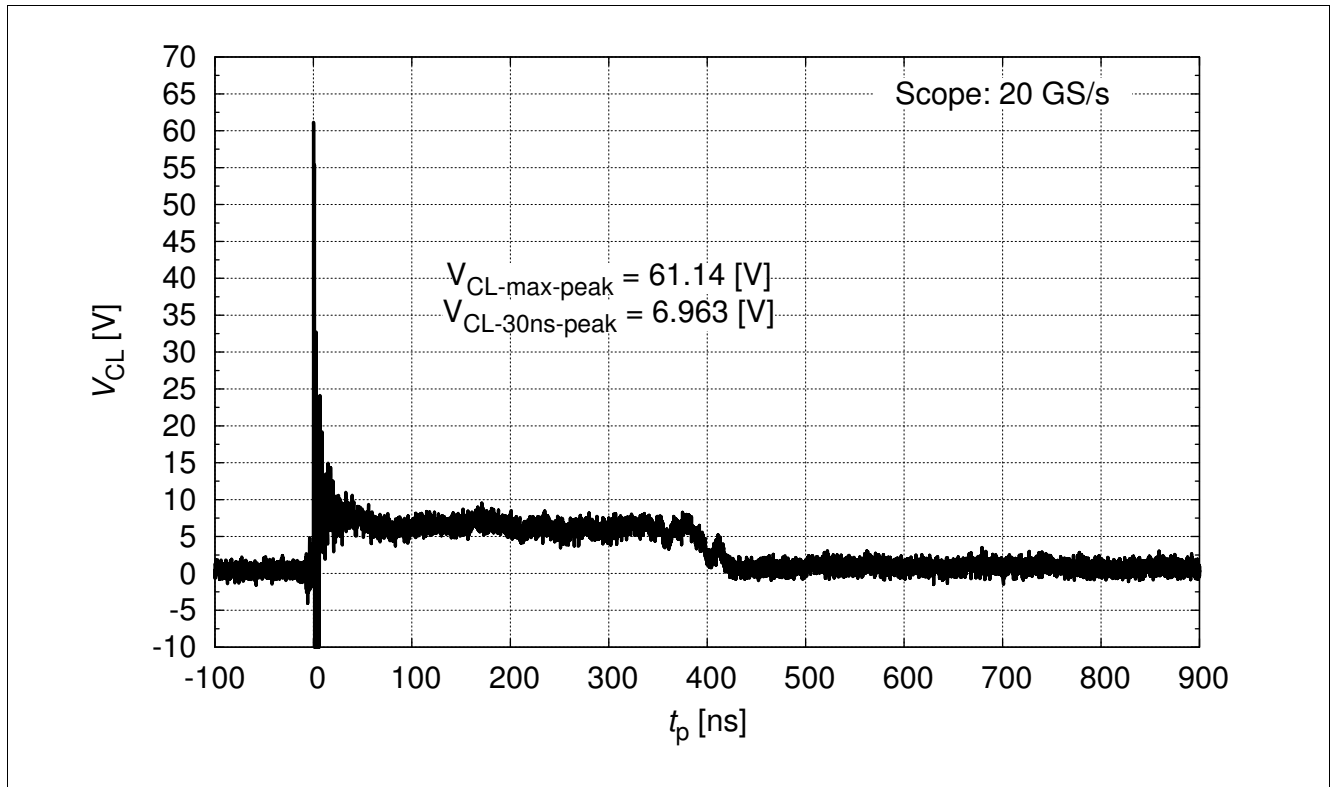


Figure 3-7 IEC61000-4-2: $V_{CL} = f(t)$, 15 kV positive pulse from pin 1 to pin 2

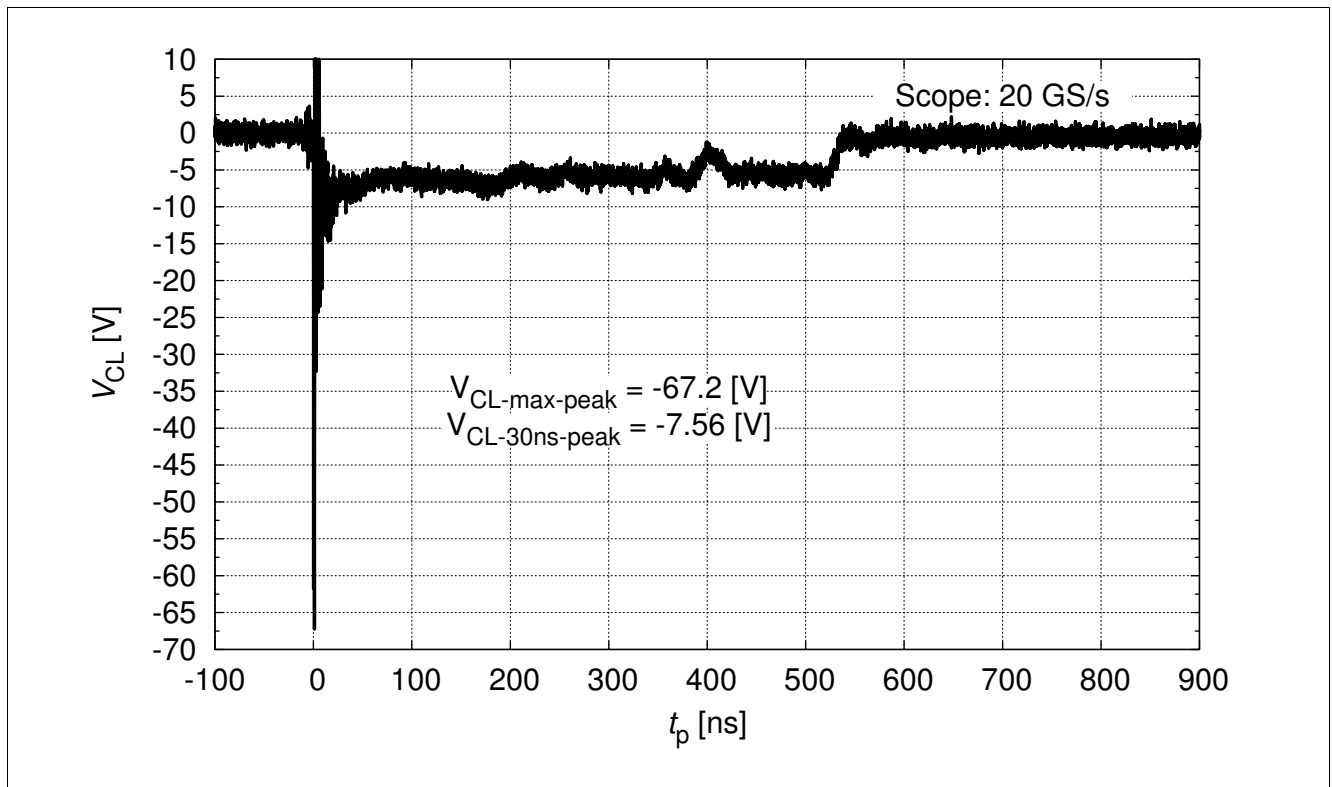


Figure 3-8 IEC61000-4-2: $V_{CL} = f(t)$, 15 kV negative pulse from pin 1 to pin 2

4 Package Information

4.1 TSLP-2-17

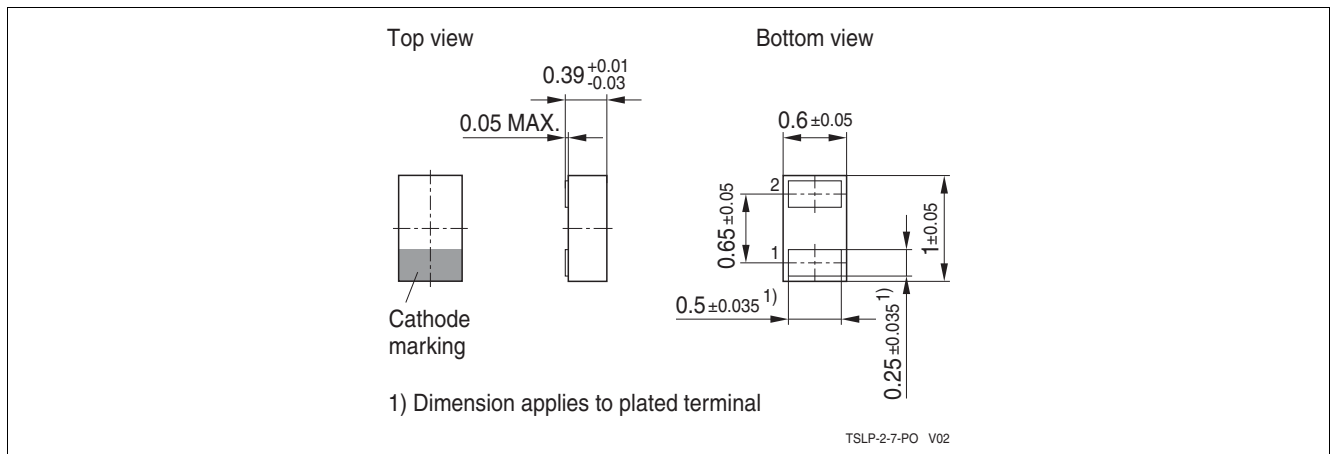


Figure 4-1 TSLP-2-17 Package outline (dimension in mm)

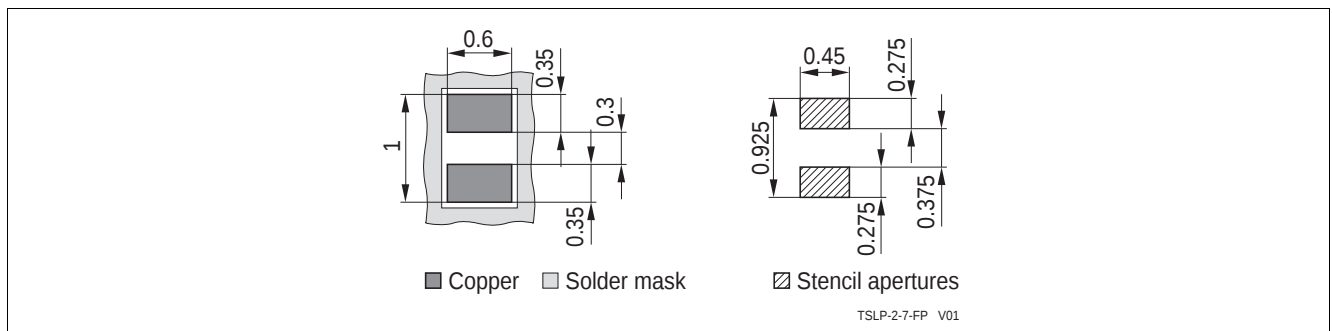


Figure 4-2 TSLP-2-17 Footprint (dimension in mm)

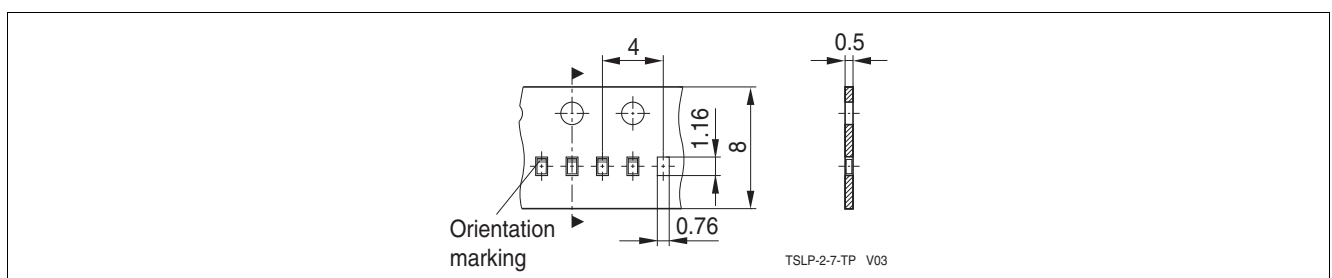


Figure 4-3 TSLP-2-17 Packing (dimension in mm)

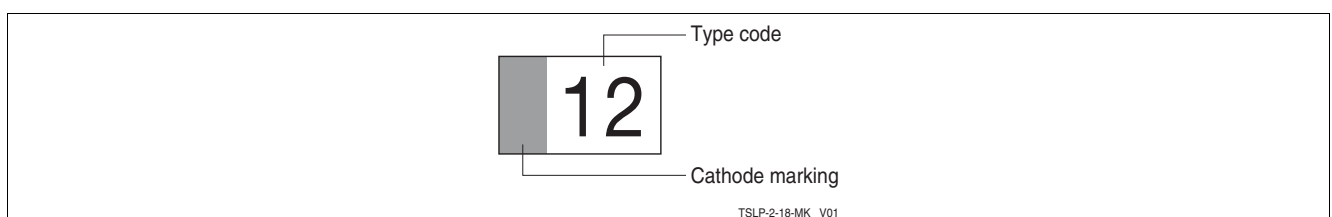


Figure 4-4 TSLP-2-17 Marking (example)

References

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

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