

# ESD145-B1-W01005

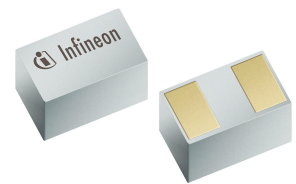
## Protection Devices

TVS (Transient Voltage Suppressor)

Bi-directional, 18 V, 0.2 pF, 01005, RoHS and Halogen Free compliant

## Features

- ESD / transient protection according to:
  - IEC61000-4-2 (ESD):  $\pm 18$  kV (air / contact discharge)
  - IEC61000-4-4 (EFT):  $\pm 2.5$  kV /  $\pm 50$  A (5/50 ns)
  - IEC61000-4-5 (Surge):  $\pm 3.5$  A (8/20  $\mu$ s)
- Bi-directional working voltage up to:  $V_{RWM} = \pm 18$  V
- Line capacitance:  $C_L = 0.2$  pF (typical) at  $f = 1$  MHz
- Clamping voltage:  $V_{CL} = 12.5$  V (typical) at  $I_{TLP} = 16$  A with  $R_{DYN} = 0.58 \Omega$  (typical)
- Very low reverse current:  $I_R < 1$  nA (typical)
- Small form factor SMD size 01005 and low profile (0.43 x 0.23 x 0.15 mm<sup>3</sup>)
- Bi-directional and symmetric I/V characteristics for optimized design / assembly



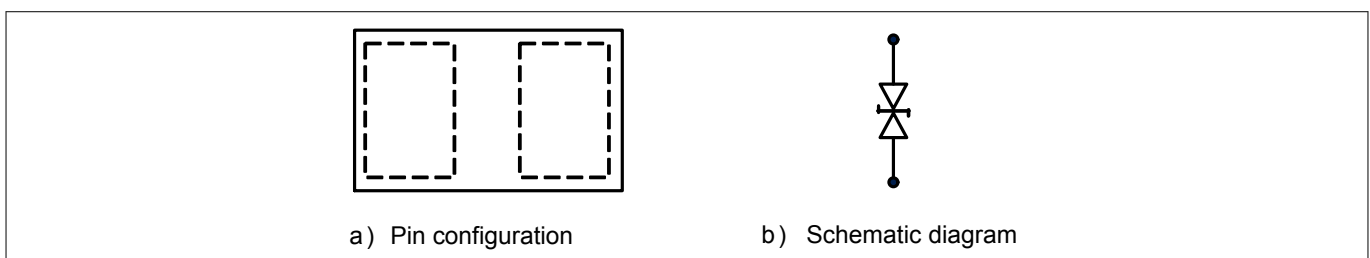
## Potential applications

- ESD protection of RF signal lines in Near Field Communication (NFC) applications , RF antenna
- For further information please refer to application notes [\[4\]](#), [\[5\]](#)

## Product validation

Qualified for industrial applications according to relevant tests of JEDEC47/20/22

## Device information



**Figure 1** Pin configuration and schematic diagram

**Table 1** Part information

Type	Package	Configuration	Marking code
ESD145-B1-W01005	WLL-2-2	1 line, bi-directional	AA <sup>1)</sup>

<sup>1)</sup> The device does not have any marking on the device top. The marking code is on pad side.

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Maximum ratings

## 1 Maximum ratings

Note:  $T_A = 25\text{ °C}$ , unless otherwise specified

**Table 2** Maximum ratings

Parameter	Symbol	Values	Unit
Reverse working voltage <sup>1)</sup>	$V_{RWM}$	±18	V
ESD discharge <sup>2)</sup>	$V_{ESD}$ (contact)	±18	kV
	$V_{ESD}$ (air)	±18	
Peak pulse power <sup>3)</sup>	$P_{PK}$	21	W
Peak pulse current <sup>3)</sup>	$I_{PP}$	±3.5	A
Operating temperature range	$T_{OP}$	-55 to 125	°C
Storage temperature	$T_{stg}$	-65 to 150	°C

**Attention:** Stresses above the maximum 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 component.

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<sup>1</sup> Device snaps back to a low holding voltage. Please refer to AN525 for latch-up prevention [5]

<sup>2</sup>  $V_{ESD}$  according to IEC61000-4-2 (R = 330 Ω, C = 150 pF discharge network)

<sup>3</sup> Stress pulse: 8/20μs current waveform according to IEC61000-4-5



**Electrical characteristics**

**Table 3 DC characteristics**

Parameter	Symbol	Values			Unit	Note or Test Condition
		Min.	Typ.	Max.		
Breakdown voltage	$V_{br}$	18.5	22	28.5	V	$I_R = 1 \text{ mA}$
Holding voltage	$V_h$	–	1.9	–	V	$I_R = I_h$
Holding reverse current	$I_h$		25		mA	$V_R = V_h$
Reverse current	$I_R$	–	–	50	nA	$V_R = 18 \text{ V}$

**Table 4 AC characteristics**

Parameter	Symbol	Values			Unit	Note or Test Condition
		Min.	Typ.	Max.		
Line capacitance	$C_L$	–	0.2	0.35	pF	$V_R = 0 \text{ V}, f = 1 \text{ MHz}$
		–	0.18	–		$V_R = 0 \text{ V}, f = 2.5 \text{ GHz}$

**Table 5 ESD and Surge characteristics**

Parameter	Symbol	Values			Unit	Note or Test Condition
		Min.	Typ.	Max.		
Clamping voltage <sup>1)</sup>	$V_{CL}$	–	8	–	V	$I_{TLP} = 8 \text{ A}, t_p = 100 \text{ ns}$
		–	12.5	–		$I_{TLP} = 16 \text{ A}, t_p = 100 \text{ ns}$
Clamping voltage <sup>2)</sup>		–	3	–		$I_{PP} = 1 \text{ A}, t_p = 8/20 \mu\text{s}$
		–	5	–		$I_{PP} = 3 \text{ A}, t_p = 8/20 \mu\text{s}$
Dynamic resistance <sup>1)</sup>	$R_{DYN}$	–	0.58		$\Omega$	$t_p = 100 \text{ ns}$

<sup>1</sup> Please refer to Application Note AN210 [1]. TLP parameters:  $Z_0 = 50 \Omega$ ,  $t_p = 100 \text{ ns}$ ,  $t_r = 0.6 \text{ ns}$ .

<sup>2</sup> Stress pulse: 8/20 $\mu\text{s}$  current waveform according to IEC61000-4-5

Typical characteristic diagrams

### 3 Typical characteristic diagrams

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

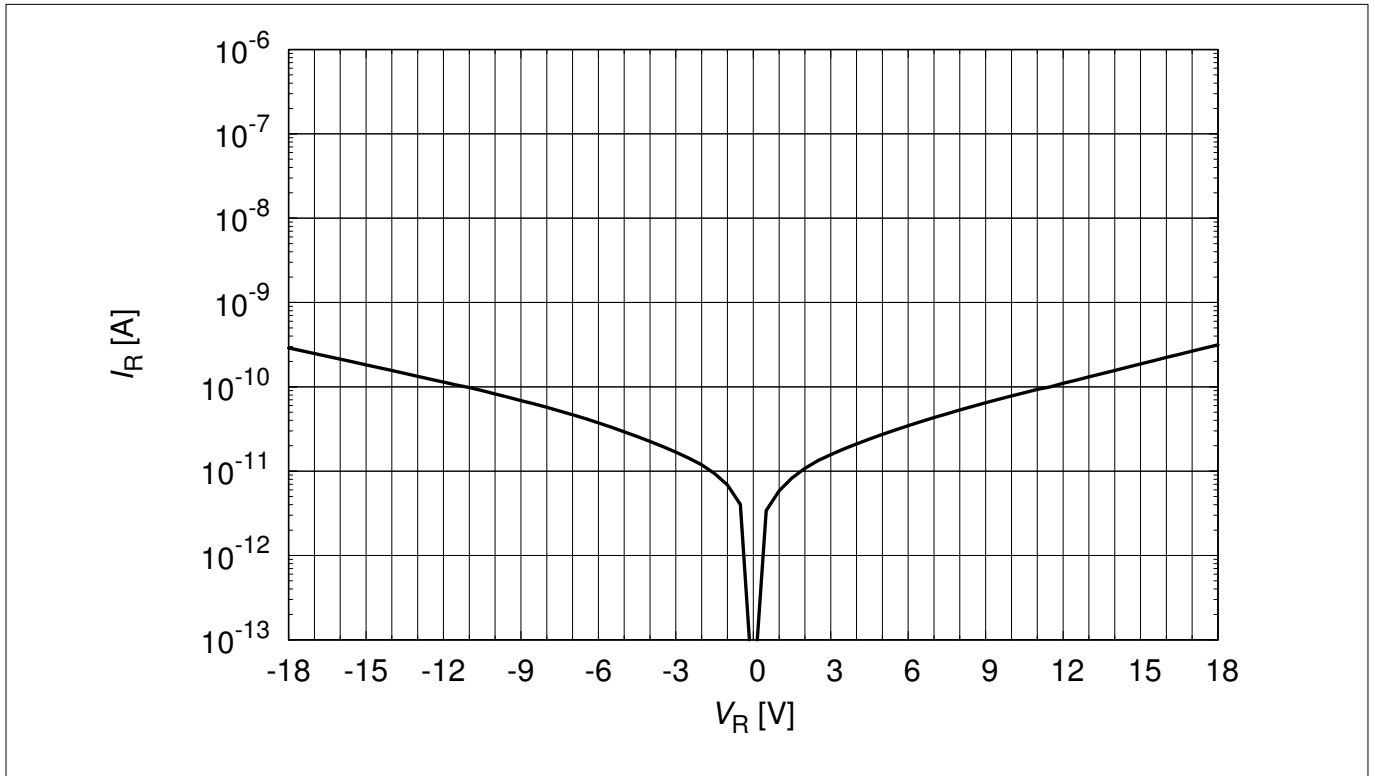


Figure 3 Reverse leakage current:  $I_R = f(V_R)$

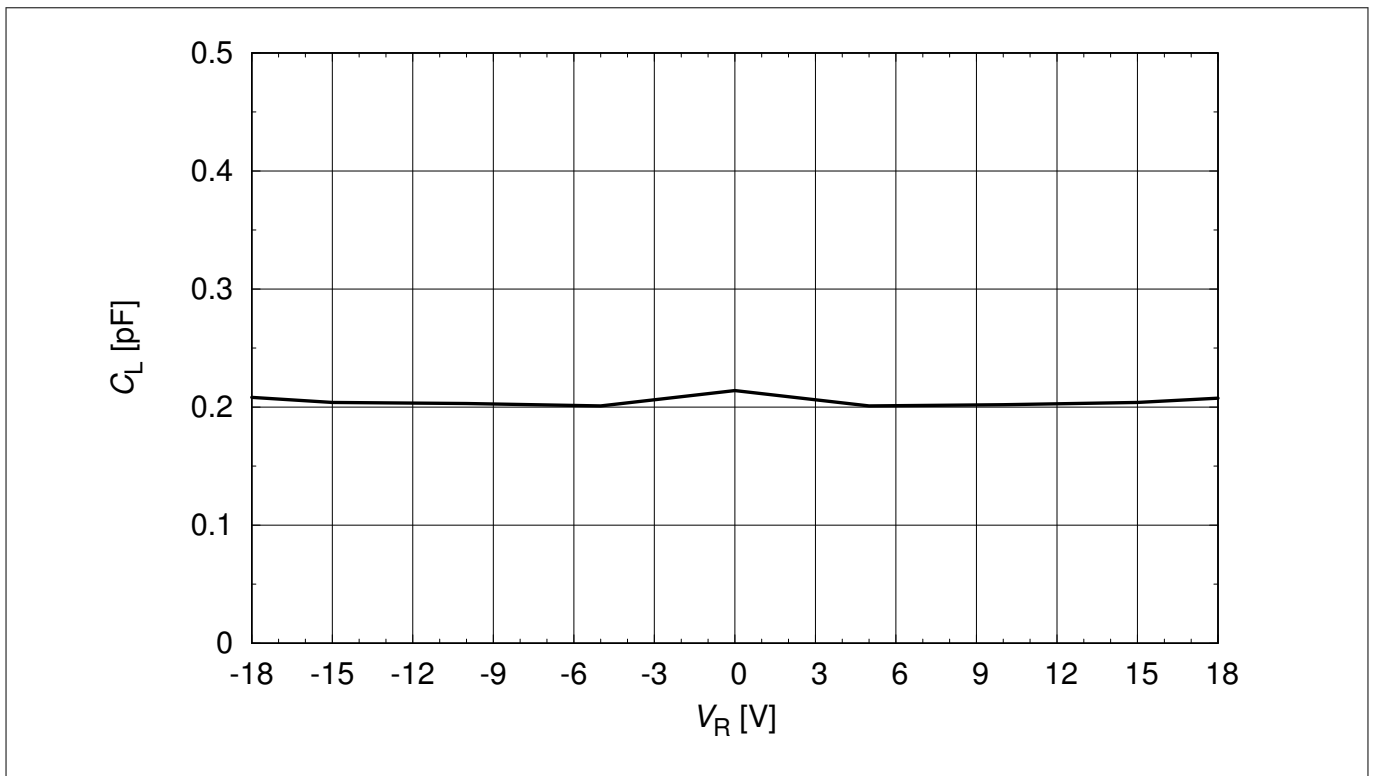


Figure 4 Line capacitance:  $C_L = f(V_R)$ ,  $f = 1\text{ MHz}$

Typical characteristic diagrams

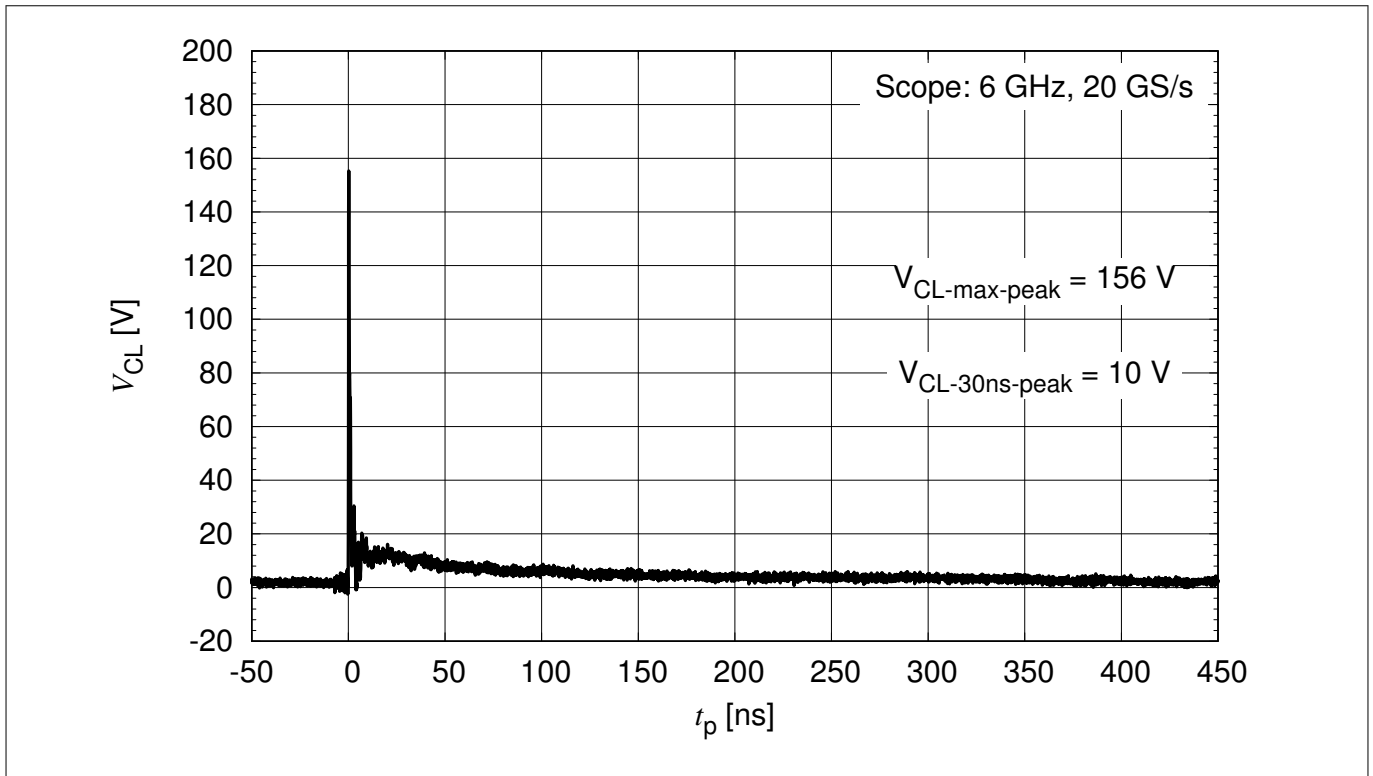


Figure 5 Clamping voltage (ESD):  $V_{CL} = f(t)$ , 8 kV positive pulse according to IEC61000-4-2

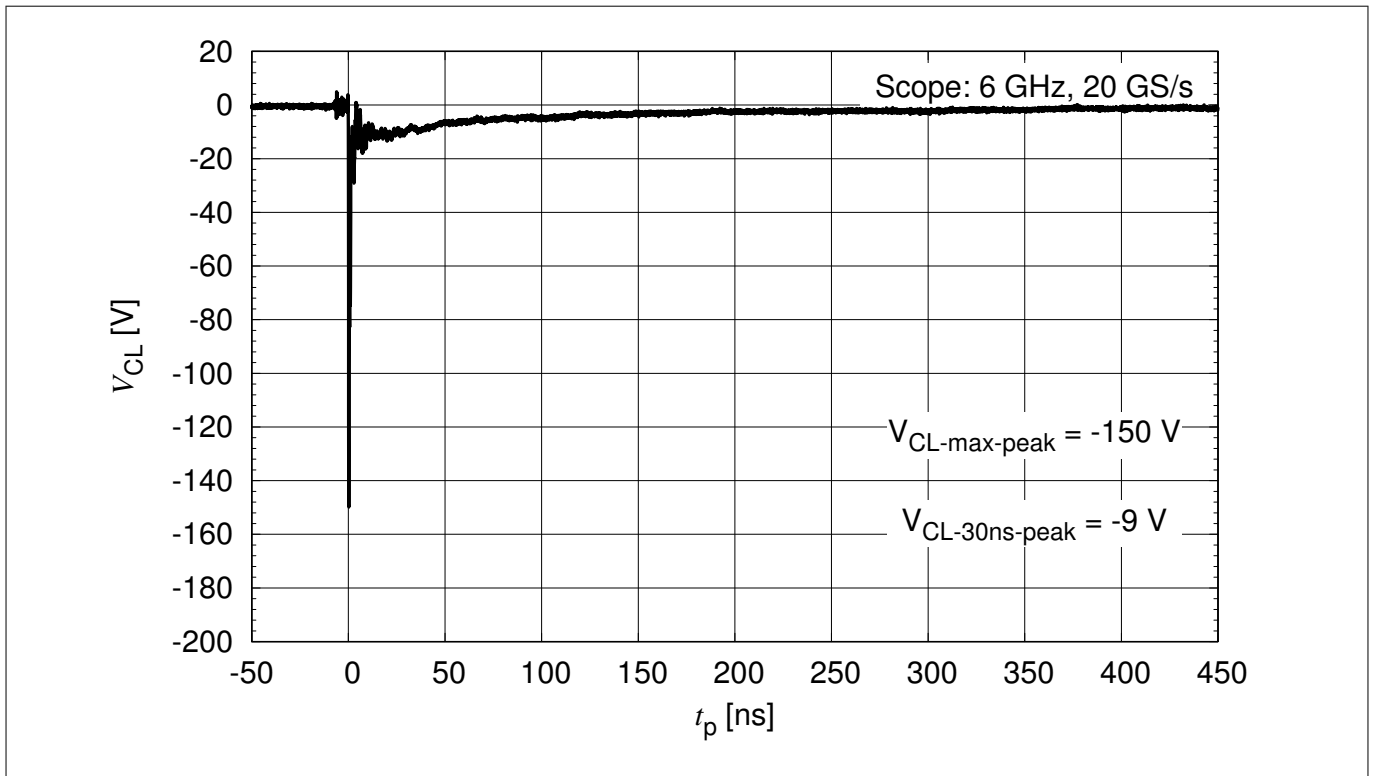


Figure 6 Clamping voltage (ESD):  $V_{CL} = f(t)$ , 8 kV negative pulse according to IEC61000-4-2

Typical characteristic diagrams

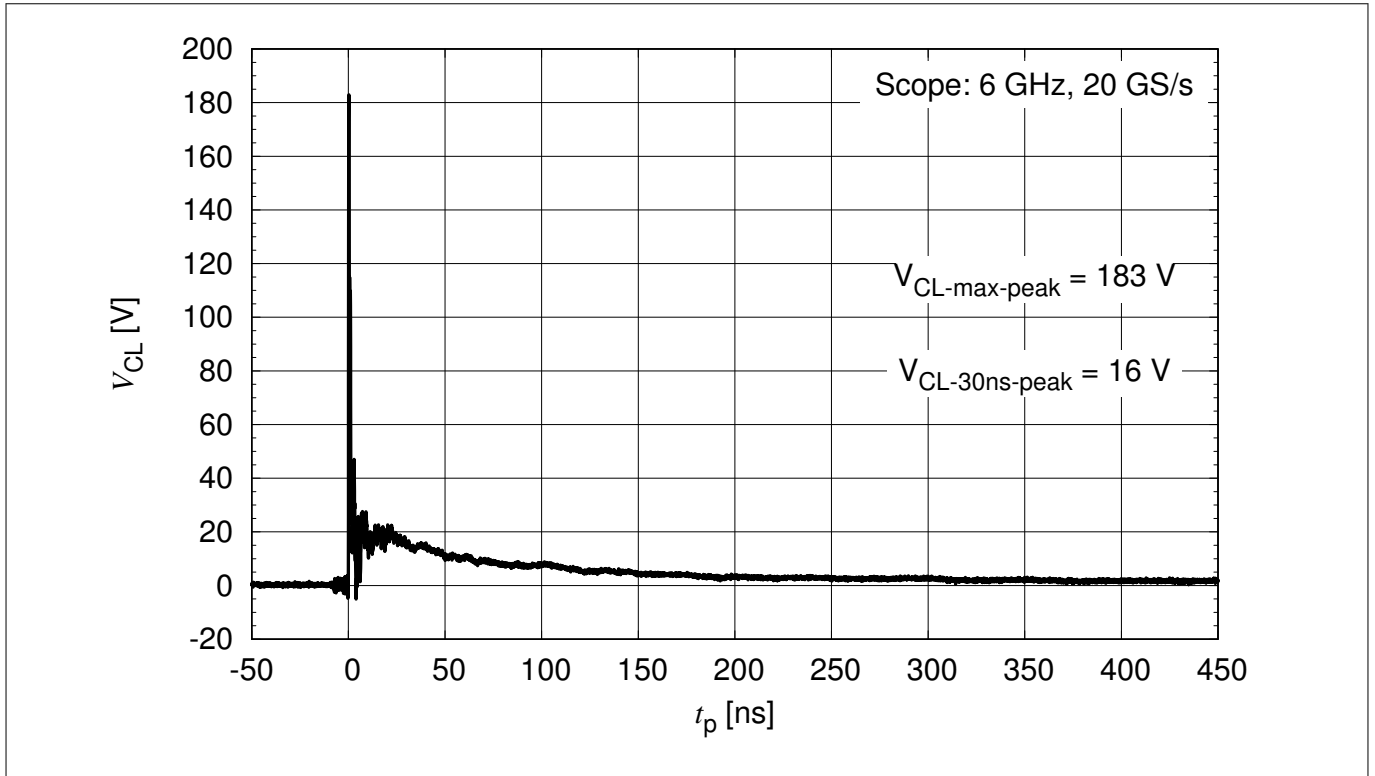


Figure 7 Clamping voltage (ESD):  $V_{CL} = f(t)$ , 15 kV positive pulse according to IEC61000-4-2

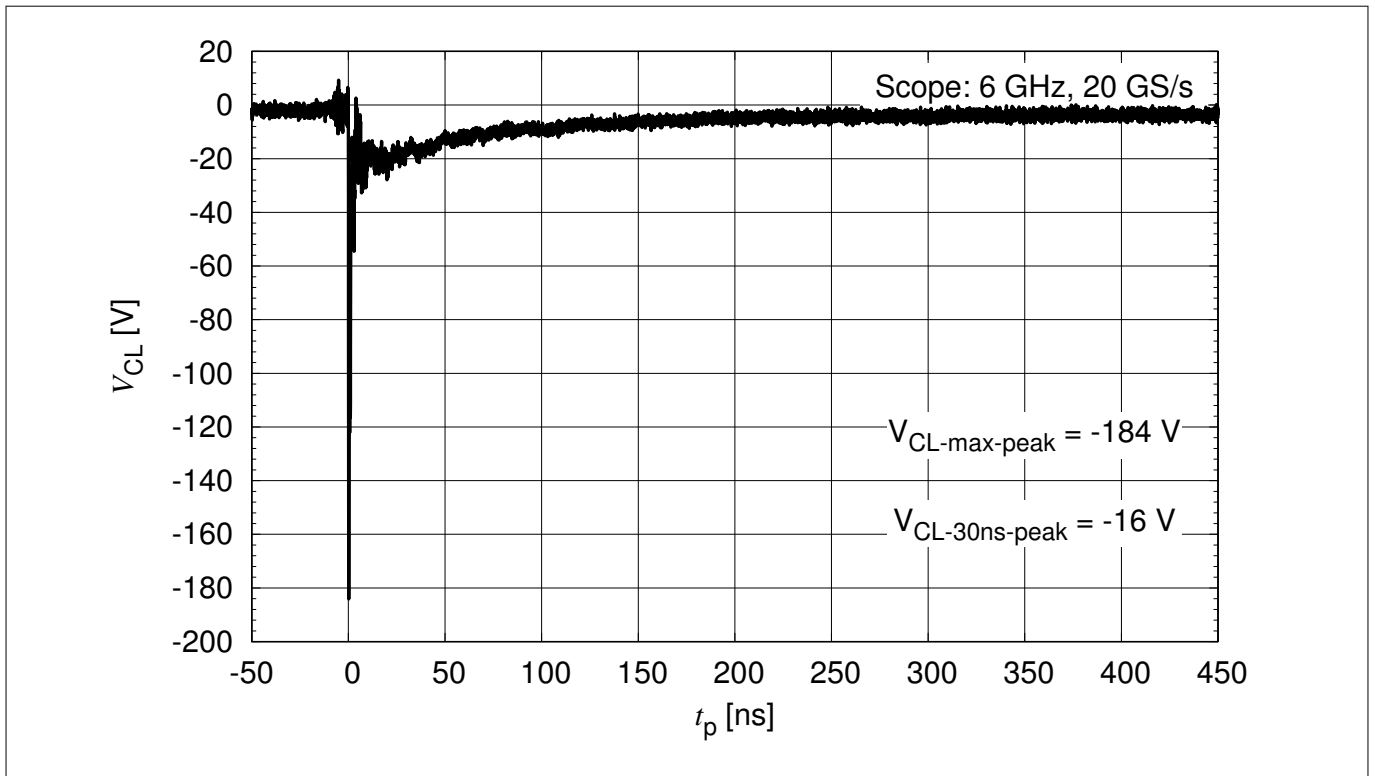
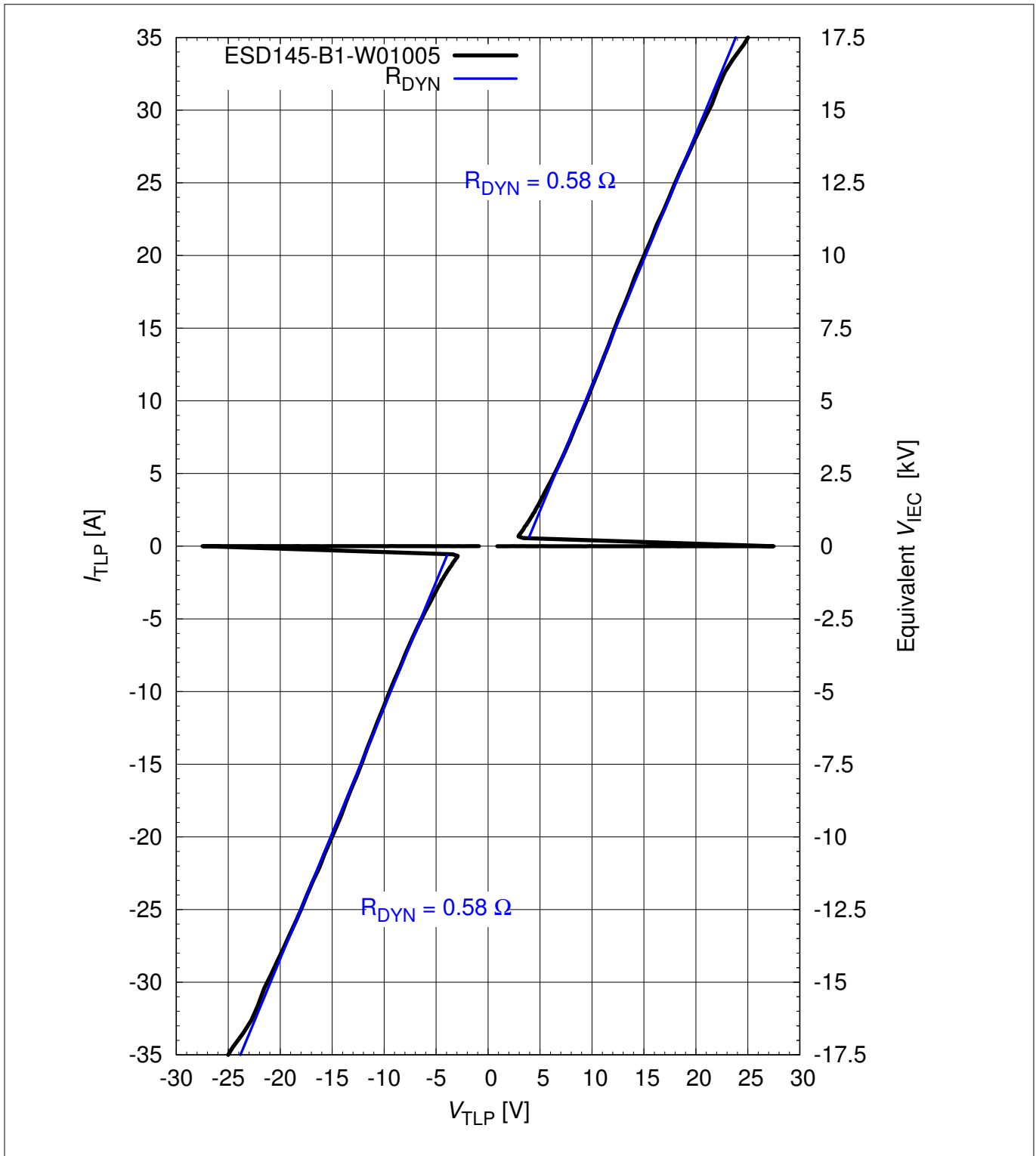


Figure 8 Clamping voltage (ESD):  $V_{CL} = f(t)$ , 15 kV negative pulse according to IEC61000-4-2



**Typical characteristic diagrams**



**Figure 9 Clamping voltage (TLP):  $I_{TLP} = f(V_{TLP})$  [1]**

Typical characteristic diagrams

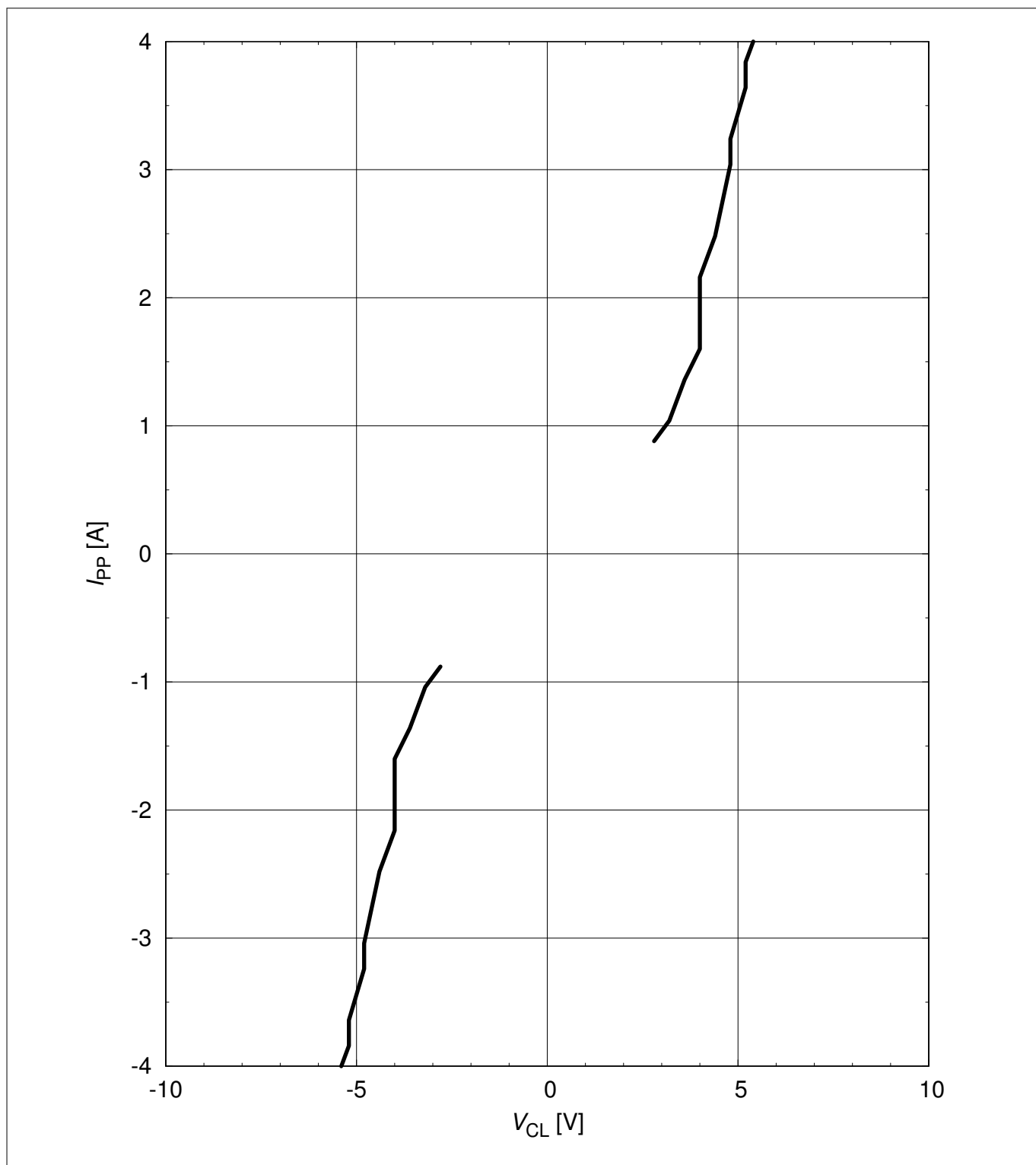
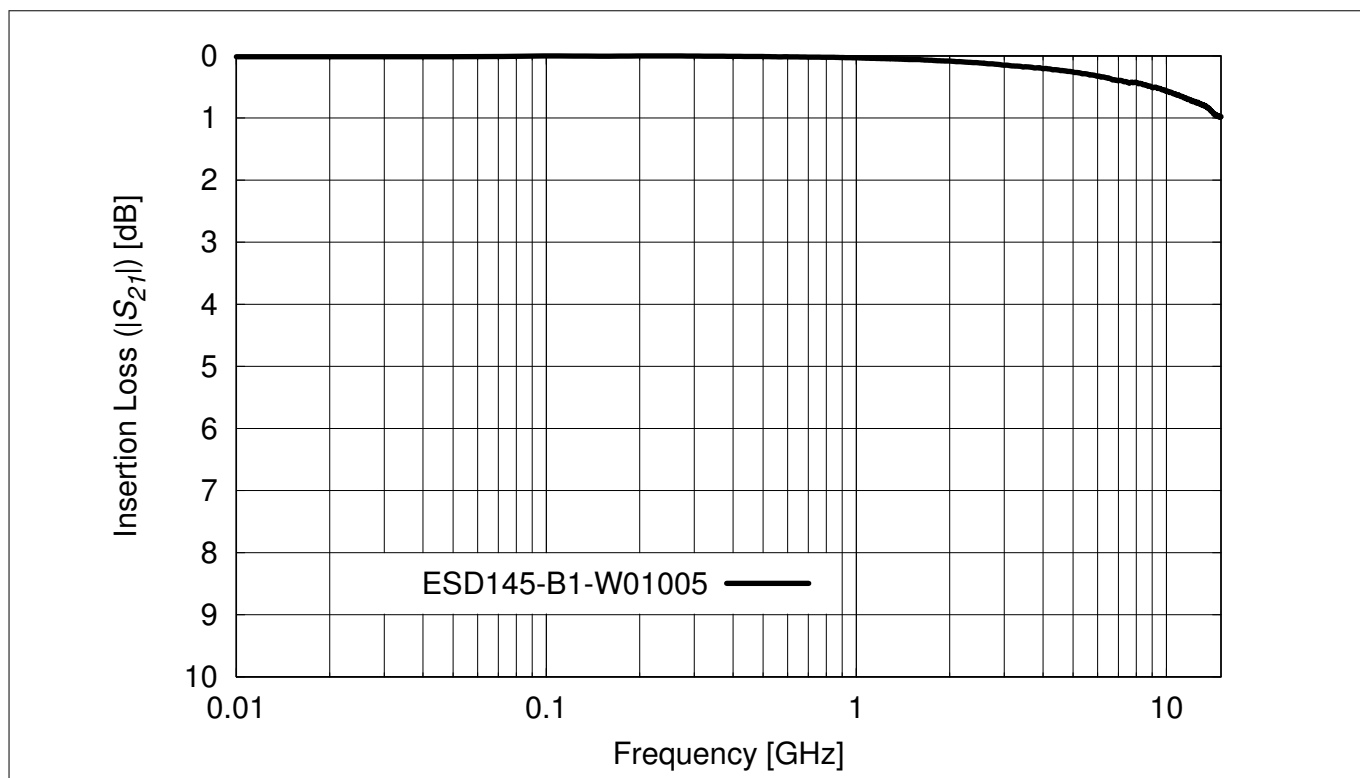


Figure 10 Clamping voltage (Surge):  $I_{PP} = f(V_{CL})$  according to IEC61000-4-5 [1]

Typical characteristic diagrams



**Figure 11** Insertion loss vs. frequency in 50 Ohm system

Package information

## 4 Package information

### 4.1 WLL-2-2 package

Note: Dimensions in mm

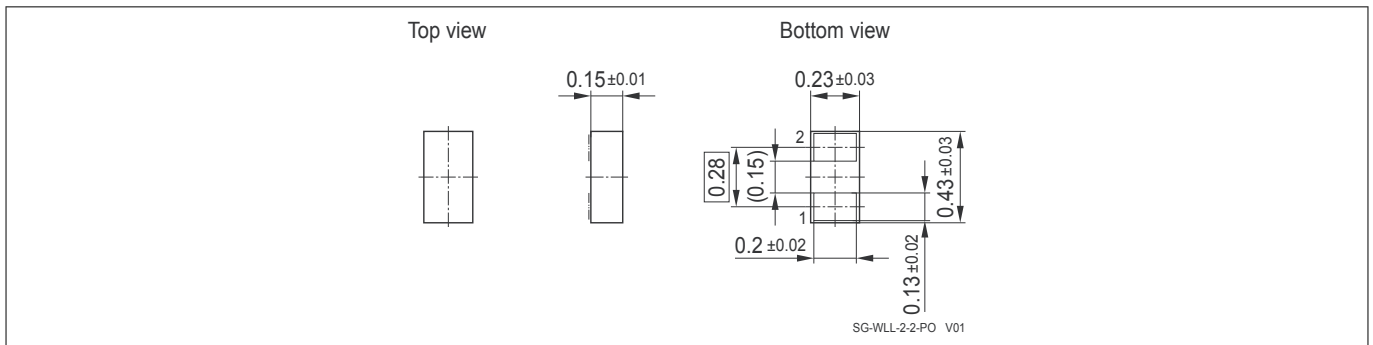


Figure 12 WLL-2-2 package outline

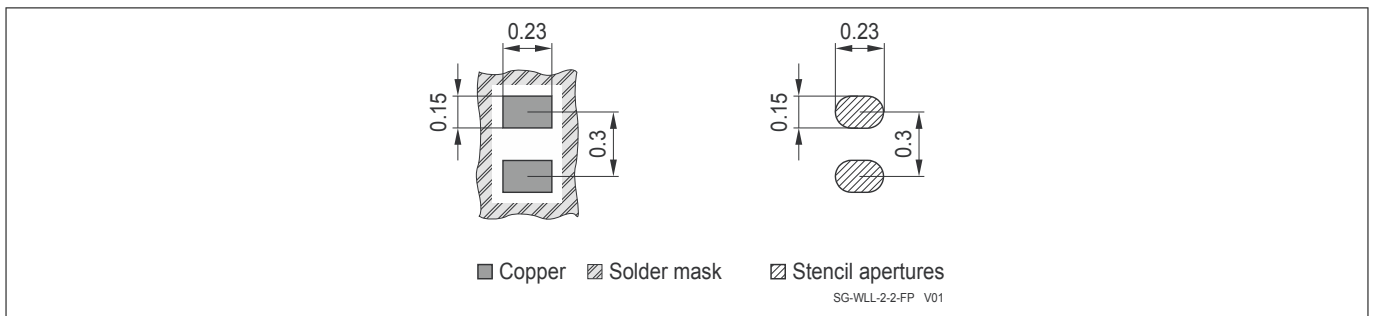


Figure 13 WLL-2-2 footprint - Recommendations for Printed Circuit Board Assembly see [2]

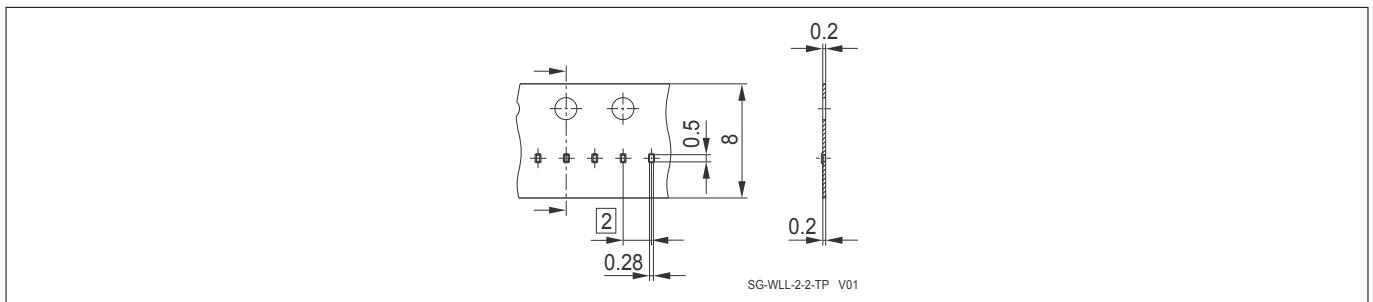


Figure 14 WLL-2-2 packing

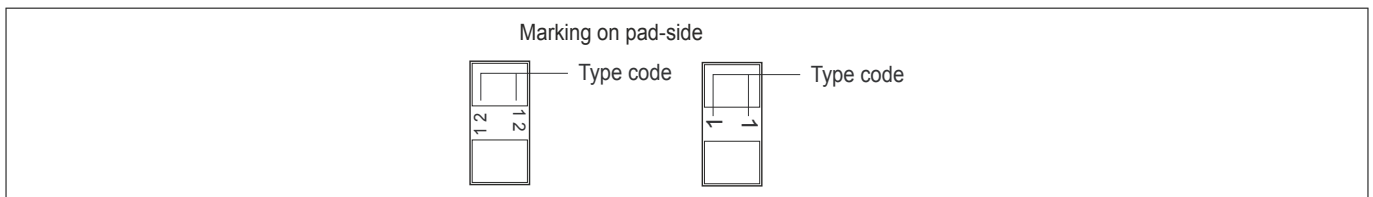


Figure 15 WLL-2-2 marking example (see Table 1)

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**References**

## **5                   References**

- [1] Infineon AG - **Application Note AN210**: Effective ESD Protection design at System Level Using VF-TLP Characterization Methodology
- [2] Infineon AG - **Recommendation for Printed Circuit Board Assembly of Infineon WLL Packages**  
[http://www.infineon.com/Packageinformation\\_WLL](http://www.infineon.com/Packageinformation_WLL)
- [3] Infineon AG - **Application Note AN392**: TVS Diodes in ChipScalePackage reduce size and save cost
- [4] Infineon AG - **Application Note AN244**: ESD Protection in Chip Size Package (CSP) tailored for the NFC Frontend
- [5] Infineon AG - **Application Note AN525**: Latch-up prediction for SCR TVS device

## **Revision history**

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**Revision history: Revision 0.1, 2016-02-24**

<b>Page or Item</b>	<b>Subjects (major changes since previous revision)</b>
Revision 1.0, 2017-08-14	
	Final datasheet

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