

ESD251-B1-W0201

Bi-directional TVS device, 3.3 V, 30 pF, 0201

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Product description

This Infineon transient voltage suppressor (TVS) device has a bi-directional and symmetric I/V characteristic for optimized design and assembly.

Feature list

- ESD/ transient protection according to:
 - IEC61000-4-2 (ESD): ± 30 kV (air/ contact discharge)
 - IEC61000-4-4 (EFT): ± 3 kV/ ± 60 A (5/50 ns)
 - IEC61000-4-5 (Surge): ± 11 A (8/20 μ s)
- Bi-directional working voltage: $V_{WM} = \pm 3.3$ V
- Line capacitance: $C_L = 30$ pF at $f = 1$ MHz
- Clamping voltage: $V_{cl} = 5.8$ V at $I_{TLP} = 16$ A with $R_{dyn} = 0.07 \Omega$
- Very low leakage current: $I_L = 1$ nA (typical)
- Small form factor SMD size 0201, low profile (0.58 x 0.28 x 0.15 mm³) [2]



Potential applications

- IC/ ASICs in audio, headset
- Human digital interfaces, buttons, GPIO

Product validation

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

Device information

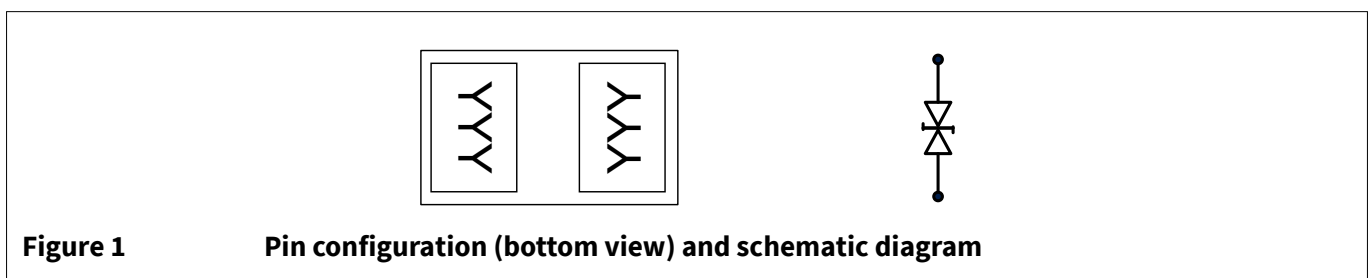


Table 1 Part information

Product name / Ordering code	Package	Pin configuration	Marking	Pieces / Reel
ESD251-B1-W0201 / ESD251B1W0201E6327XTSA1	WLL-2-3	1 line, bi-directional	YYY	15 k

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Absolute maximum ratings

1 Absolute maximum ratings

Table 2 Absolute maximum ratings at $T_A = 25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Values		Unit	Note or test condition
		Min.	Max		
Working voltage	V_{WM}	-3.3	3.3	V	
ESD discharge	V_{ESD} (contact)	-30	30	kV	Discharge network: $R = 330 \Omega$, $C = 150 \text{ pF}$ ¹⁾
	V_{ESD} (air)	-30	30		
Peak pulse power	P_{PK}	-	72	W	Stress pulse: 8/20 μs current waveform ²⁾
Peak pulse current	I_{PP}	-11	11	A	Stress pulse: 8/20 μs current waveform ²⁾
Operating temperature range	T_{op}	-55	125	$^\circ\text{C}$	
Storage temperature	T_{stg}	-65	150	$^\circ\text{C}$	

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.*

¹ Based on IEC61000-4-2

² Based on IEC61000-4-5

Electrical characteristics

2 Electrical characteristics

Note: $T_A = 25^\circ\text{C}$, unless otherwise specified. Device is electrically symmetrical.

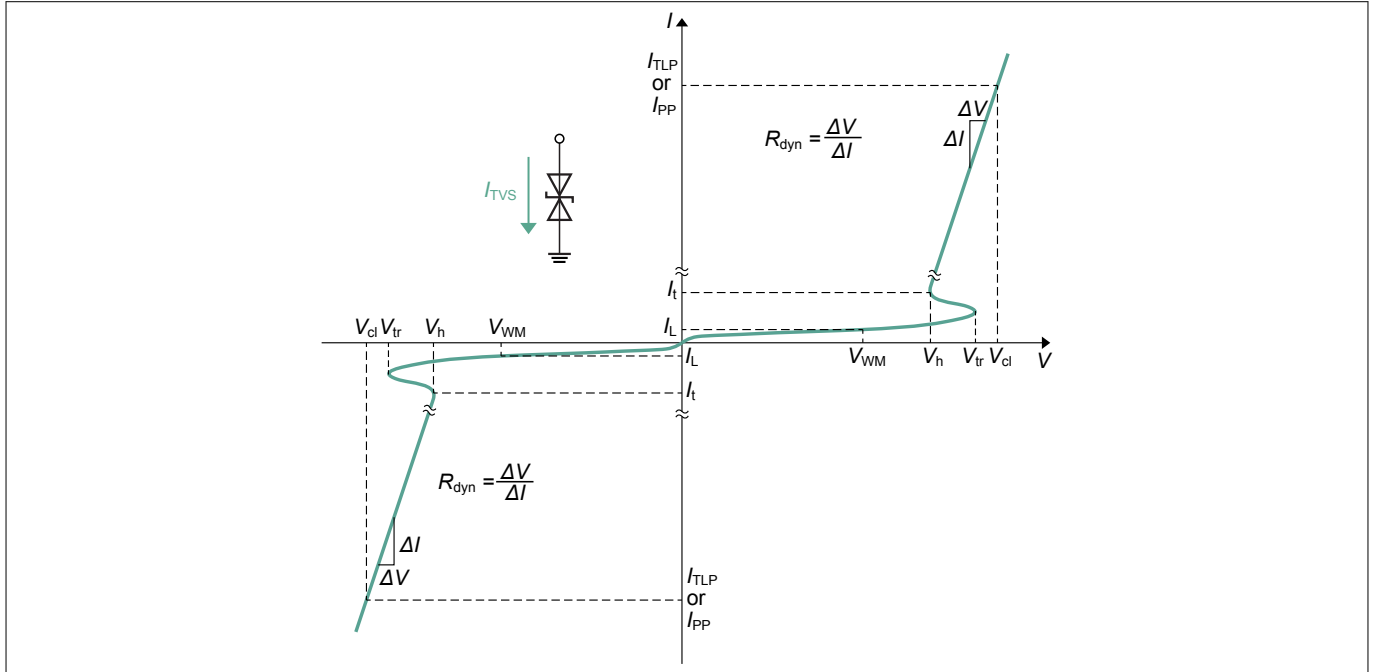


Figure 2

Table 3 Electrical parameters

Symbol	Parameter
R_{dyn}	Dynamic resistance
V_{WM}	Maximum working voltage
V_{cl}	Clamping voltage
V_{TLP}	TLP voltage
I_{TLP}	TLP current
V_t	Test voltage
I_t	Test current
V_h	Holding voltage
I_h	Holding current
V_{br}	Breakdown voltage
V_{tr}	Trigger voltage
I_L	Leakage current
V_{ESD}	Maximum electrostatic discharge voltage, based on IEC61000-4-2
I_{PP}	Peak pulse current, based on IEC61000-4-5

Electrical characteristics

Table 4 DC characteristics

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Trigger voltage ³⁾	V_{tr}	5	6	7.5	V	
Holding voltage	V_h	4	5.8	7.2	V	$I_t = 1 \text{ mA}$
Leakage current	I_L	–	1	100	nA	$V_{WM} = 3.3 \text{ V}$

Table 5 AC characteristics

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Line capacitance ³⁾	C_L	–	30	33	pF	$V_t = 0 \text{ V}, f = 1 \text{ MHz}$
		–	30	–		$V_t = 0 \text{ V}, f = 1 \text{ GHz}$
Series inductance	L_S	–	<0.1	–	nH	Extracted from S-parameters

Table 6 ESD and Surge characteristics

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Clamping voltage (TLP) ⁴⁾	V_{cl}	–	5.1	–	V	$I_{TLP} = 4 \text{ A}$
		–	5.3	–		$I_{TLP} = 8 \text{ A}$
		–	5.8	–		$I_{TLP} = 16 \text{ A}$
		–	6.9	–		$I_{TLP} = 30 \text{ A}$
Clamping voltage (8/20 μs) ⁵⁾		–	5	–		$I_{PP} = 1 \text{ A}$
		–	5.5	–		$I_{PP} = 4 \text{ A}$
		–	6.3	–		$I_{PP} = 10 \text{ A}$
Dynamic resistance ⁴⁾	R_{DYN}	–	0.07	–	Ω	

³⁾ Verified by design

⁴⁾ TLP parameters: $Z_0 = 50 \Omega$, $t_p = 100 \text{ ns}$, $t_r = 0.6 \text{ ns}$. Refer to application note AN 210 [1]

⁵⁾ $t_p = 8/20 \mu\text{s}$. Stress pulse based on IEC61000-4-5.

Typical characteristic diagrams

3 Typical characteristic diagrams

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

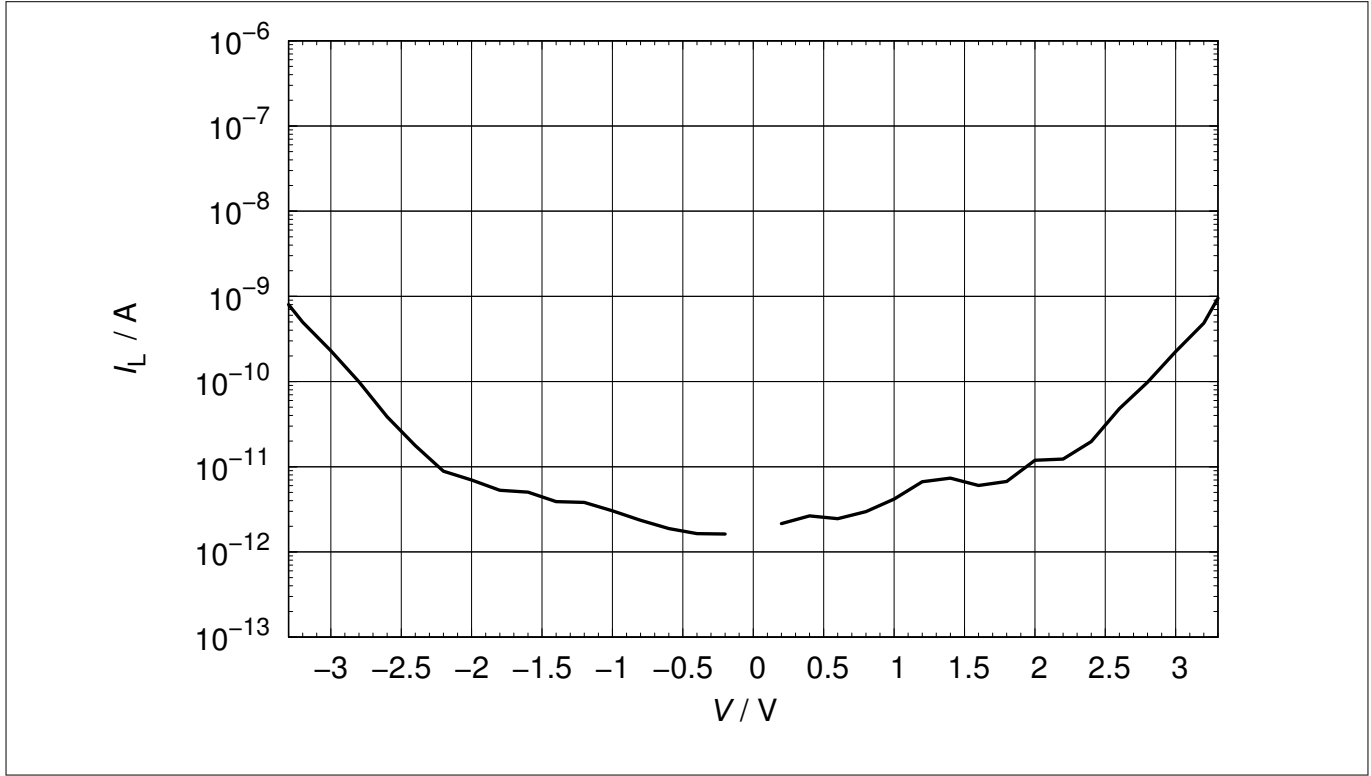


Figure 3 Leakage current: $I_L = f(V_t)$

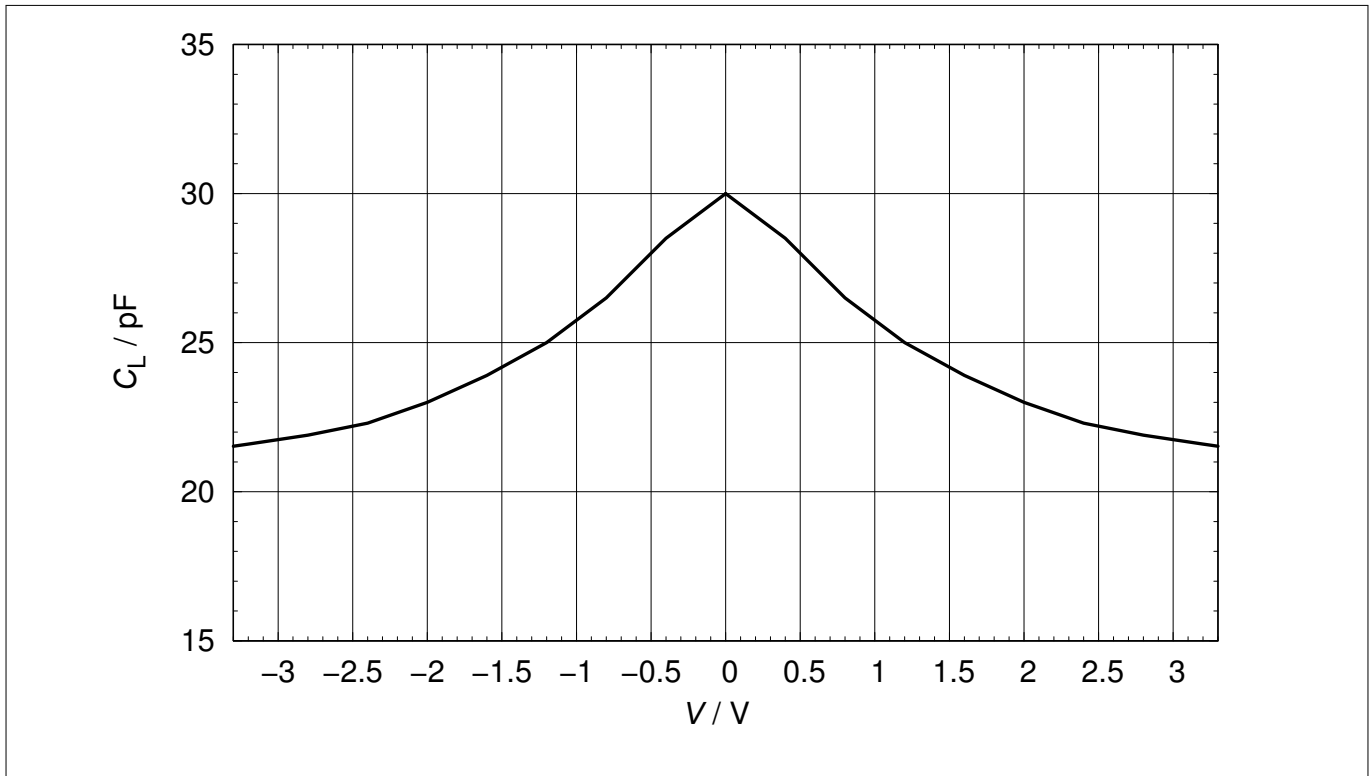


Figure 4 Line capacitance: $C_L = f(V_t)$, $f = 1\text{ MHz}$

Typical characteristic diagrams

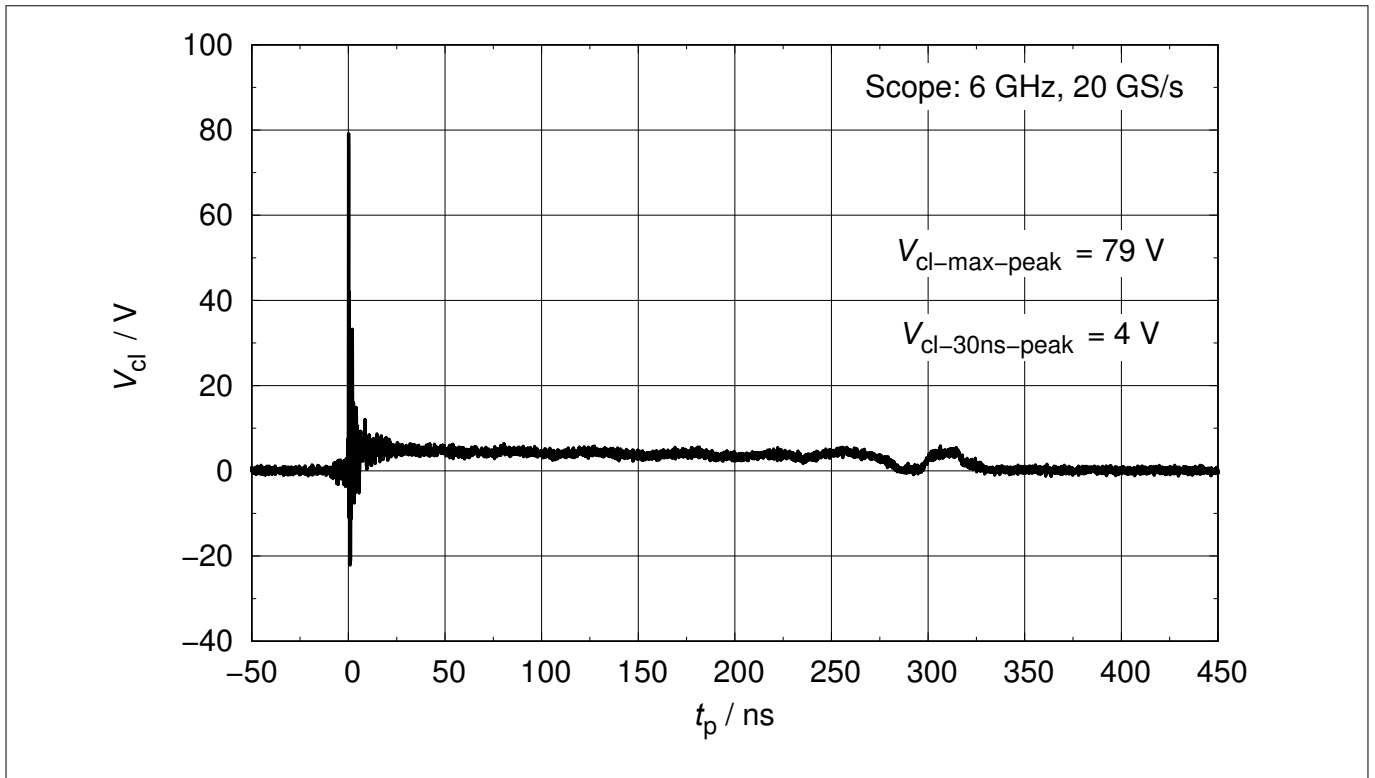


Figure 5 Clamping voltage (ESD): $V_{cl} = f(t_p)$, 8 kV positive pulse based on IEC61000-4-2

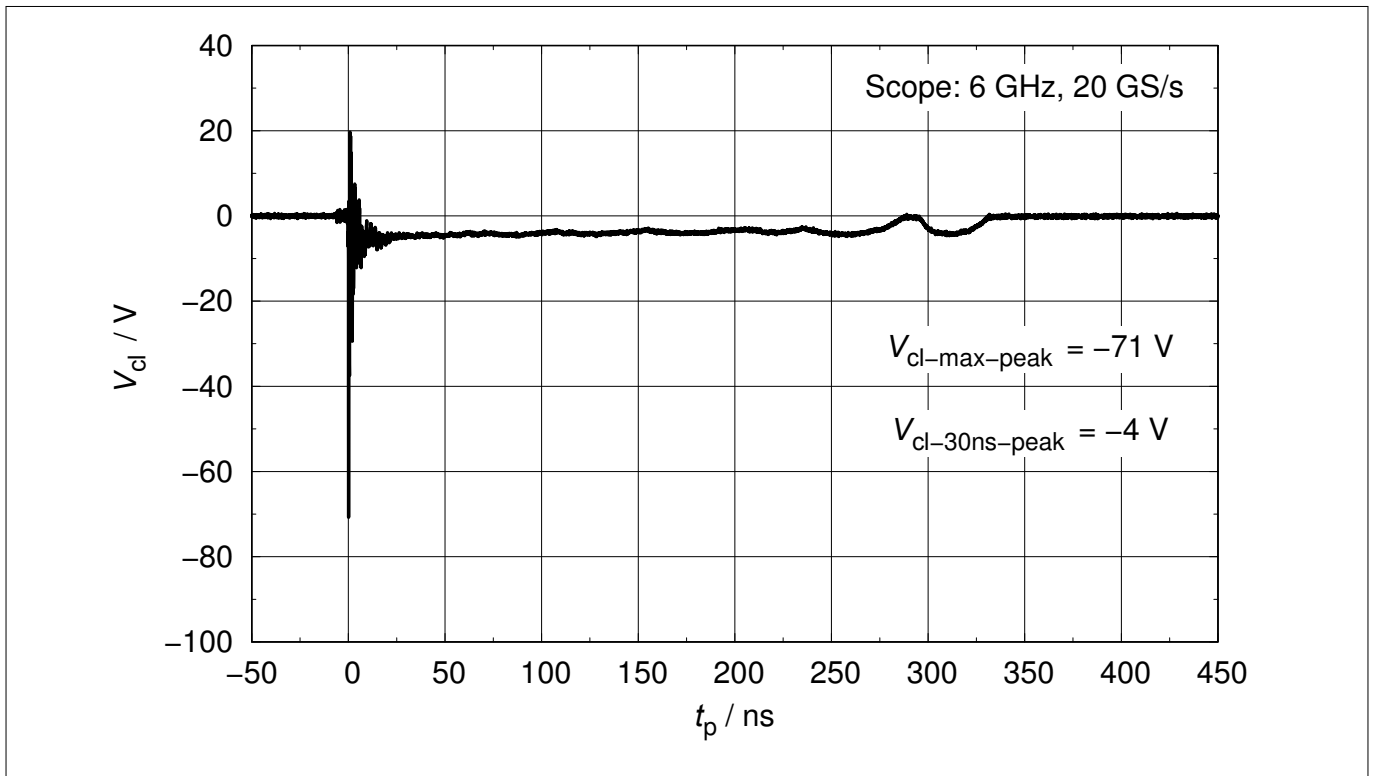


Figure 6 Clamping voltage (ESD): $V_{cl} = f(t_p)$, 8 kV negative pulse based on IEC61000-4-2

Typical characteristic diagrams

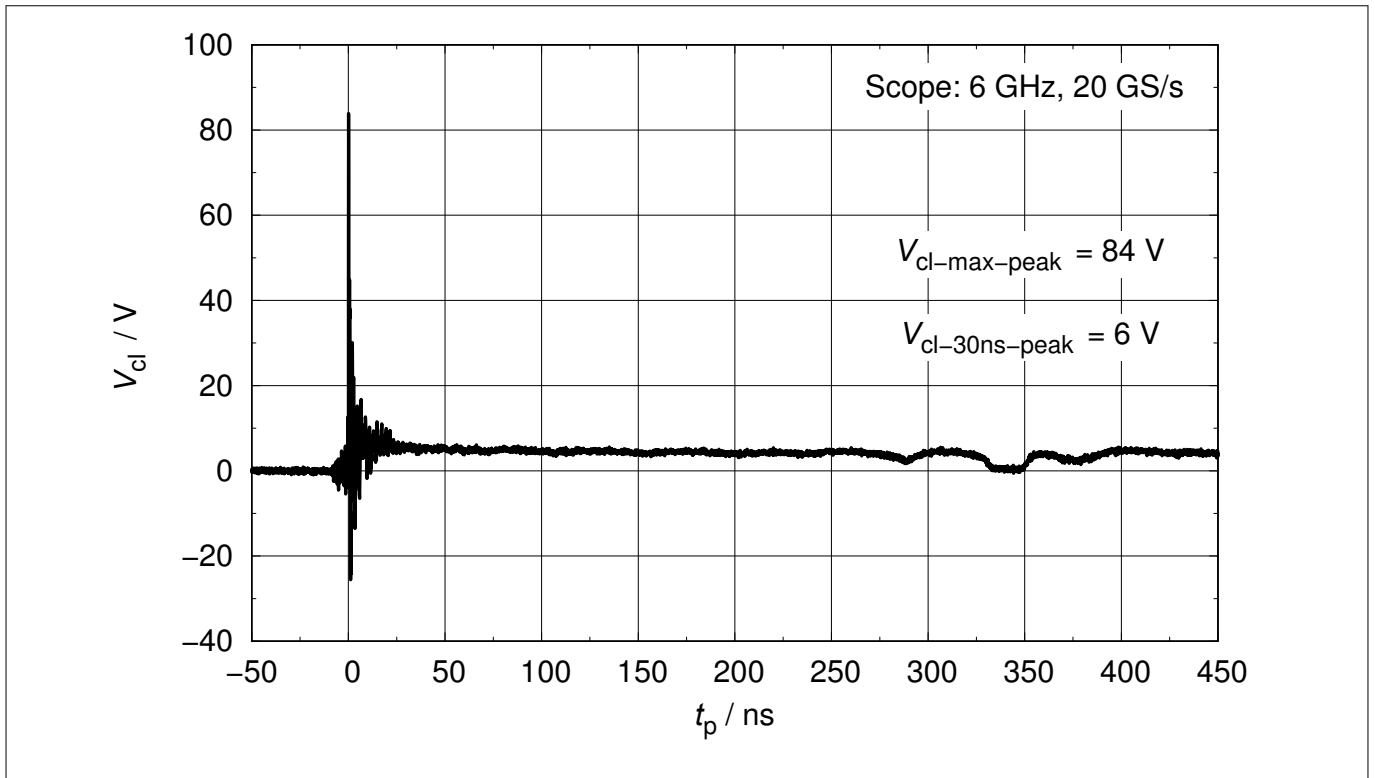


Figure 7 Clamping voltage (ESD): $V_{cl} = f(t_p)$, 15 kV positive pulse based on IEC61000-4-2

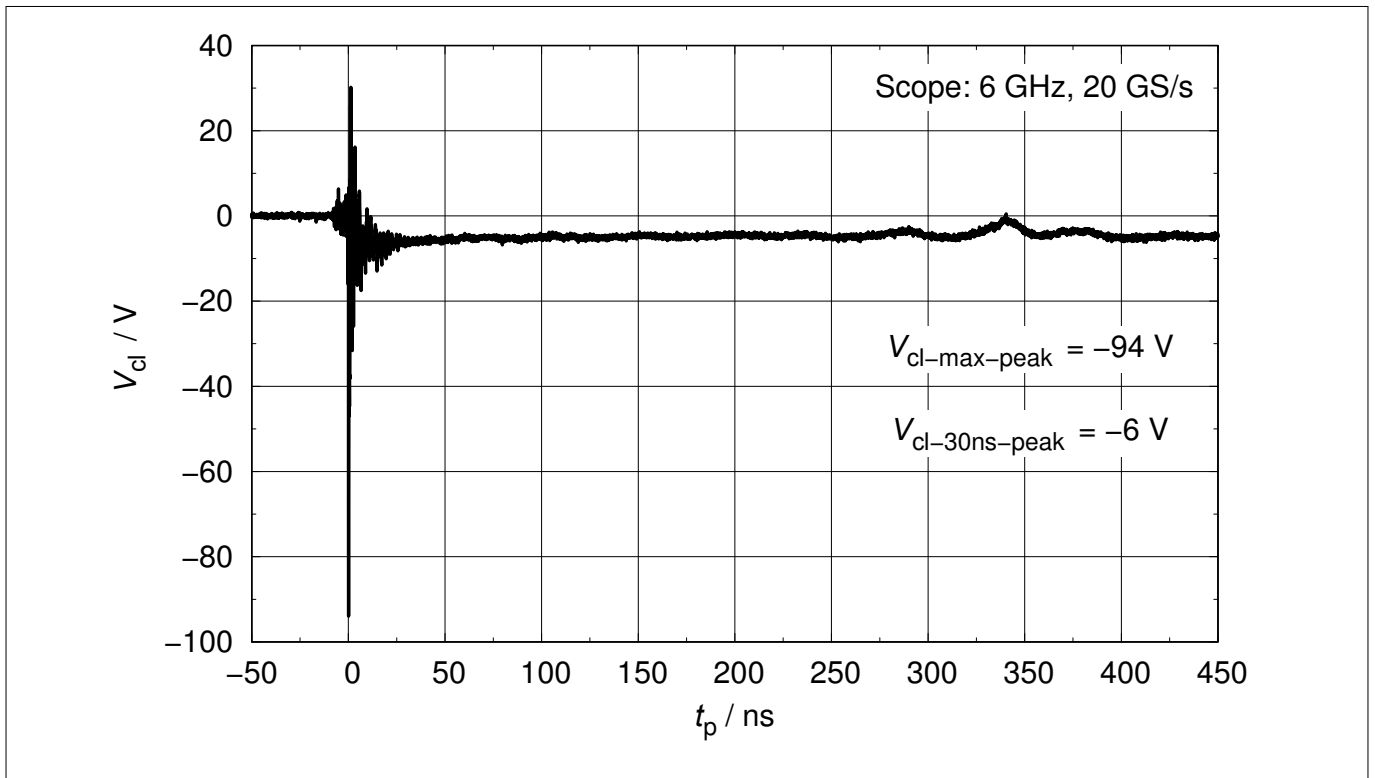


Figure 8 Clamping voltage (ESD): $V_{cl} = f(t_p)$, 15 kV negative pulse based on IEC61000-4-2

Typical characteristic diagrams

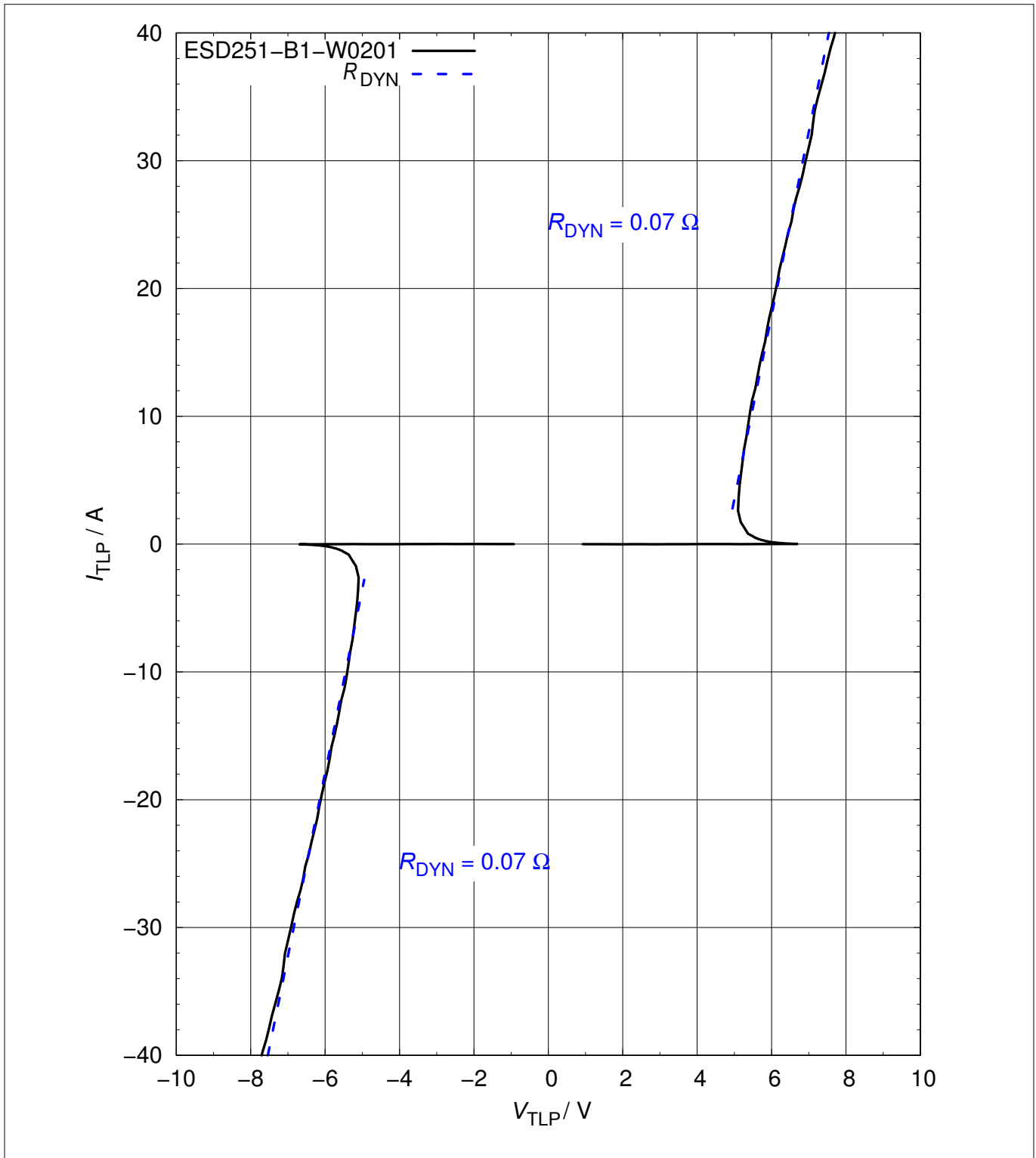


Figure 9 Clamping voltage (TLP): $I_{TLP} = f(V_{TLP})$

Typical characteristic diagrams

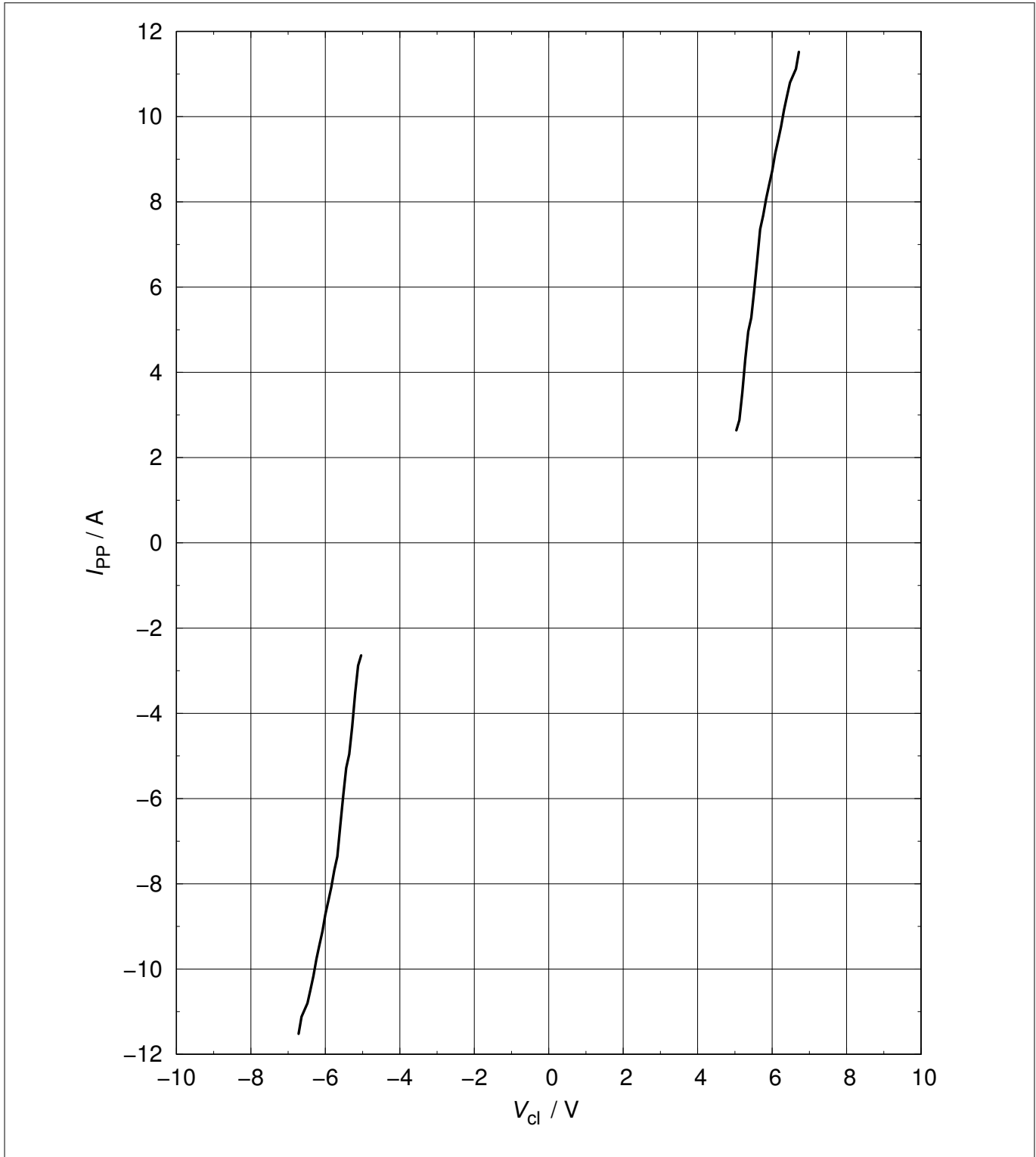


Figure 10 Clamping voltage (Surge): $I_{PP} = f(V_{cl})$ based on IEC61000-4-5

Typical characteristic diagrams

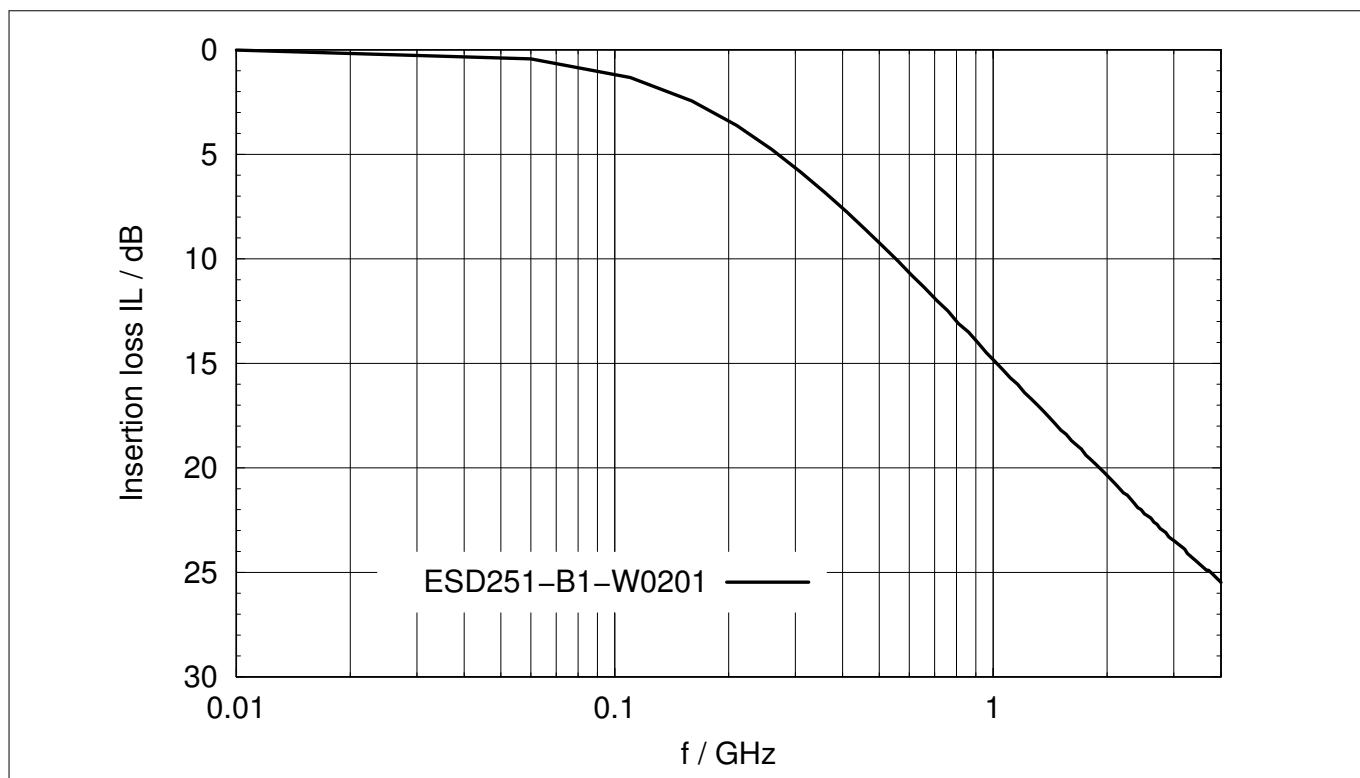


Figure 11 Insertion loss $IL = f(f)$, measured in a 50 Ω system

Package information

4 Package information

4.1 WLL-2-3 package

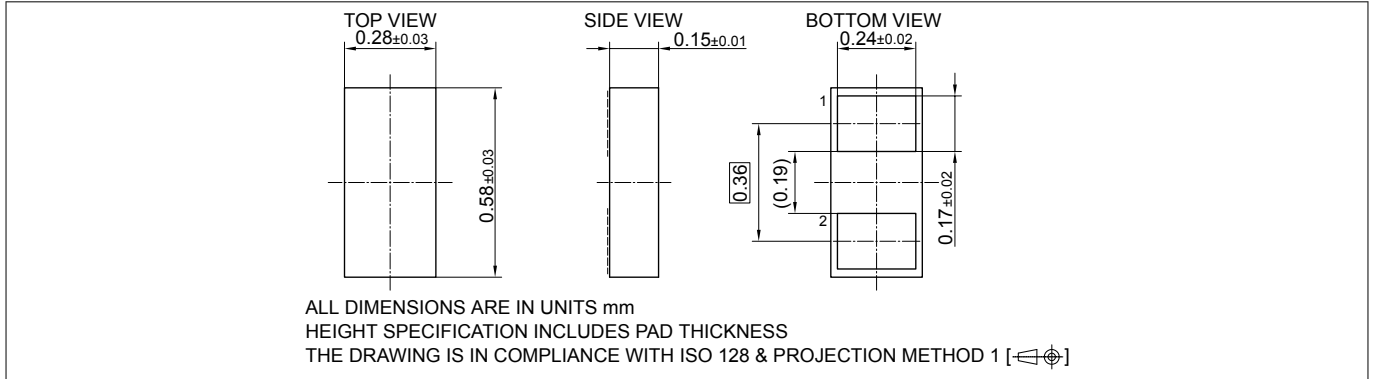


Figure 12 Package outline

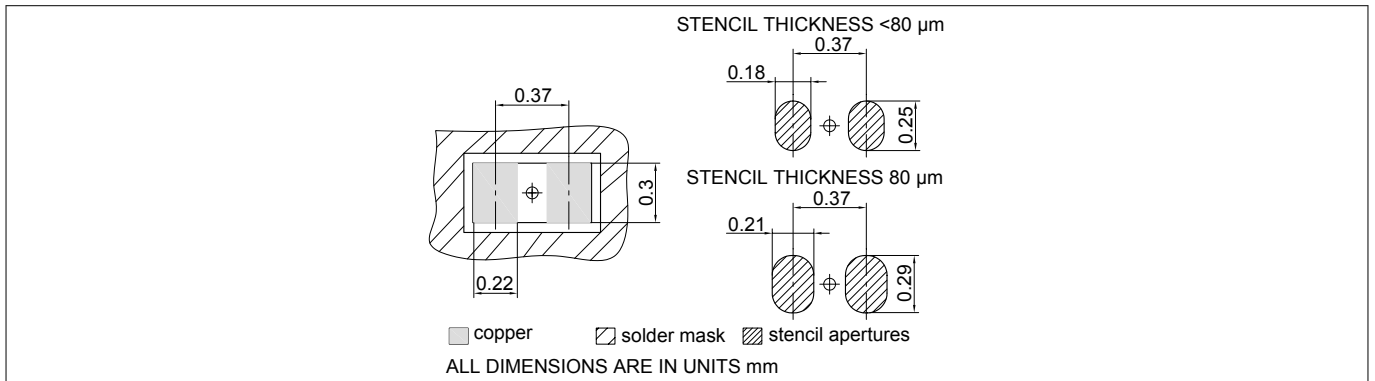


Figure 13 Footprint

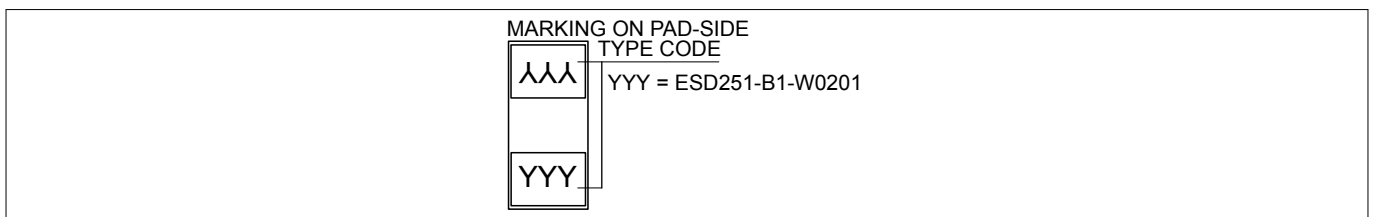


Figure 14 Marking

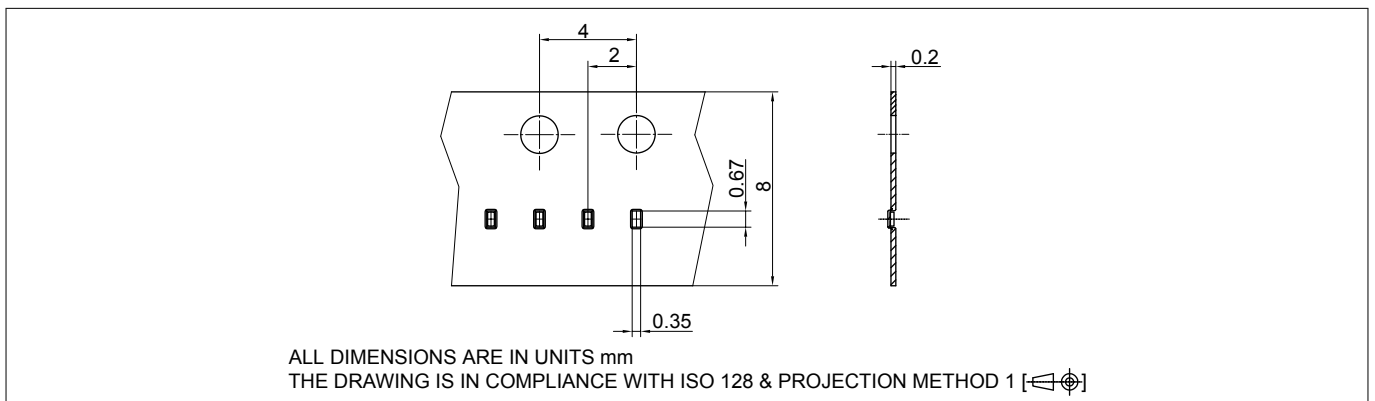


Figure 15 Packing

References

5 References

[1]	Infineon AG - Application note AN210: Effective ESD Protection Design at System Level Using VF-TLP Characterization Methodology
[2]	Infineon AG - Recommendations for Printed Circuit Board Assembly of Infineon WLL Packages http://www.infineon.com/Packageinformation_WLL

Revision history

Document version	Date of release	Description of changes
v1.0	2018-03-01	<ul style="list-style-type: none">Final data sheet
v2.0	2019-04-09	<ul style="list-style-type: none">Insertion loss characteristic and maximum ratings updatedMinor editorial changes
v2.1	2019-08-09	<ul style="list-style-type: none">New data sheet layout

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