ESD108-B1-CSP0201

Protection device

TVS (transient voltage suppressor)
Bi-directional, 5.5 V, 0.28 pF, 0201, RoHS and halogen free compliant

Features

- ESD/transient protection of high speed data lines according to:
  - IEC61000-4-2 (ESD): ±25 kV (air/contact discharge)
  - IEC61000-4-4 (EFT): ±2.5 kV/±50 A (5/50 ns)
  - IEC61000-4-5 (Surge): ±2.5 A (8/20 µs)
- Bi-directional working voltage up to: V_{RWM} = ±5.5 V
- Line capacitance: C_L = 0.28 pF (typical) at f = 1 MHz
- Clamping voltage: V_{CL} = 20 V (typical) at I_{TLP} = 16 A with R_{DYN} = 0.78 Ω (typical)
- Very low reverse current: I_R < 1 nA (typical)
- Small form factor SMD size 0201 and low profile (0.58 mm x 0.28 mm x 0.15 mm); for further package information please refer to application note AN392 *[4]*
- Bi-directional and symmetric I/V characteristics for optimized design/assembly

Potential applications

- USB 3.0, Firewire, DVI, HDMI, S-ATA, DisplayPort, Thunderbolt
- Mobile HDMI Link, MDDI, MIPI, SWP / NFC

Product validation

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

Device information

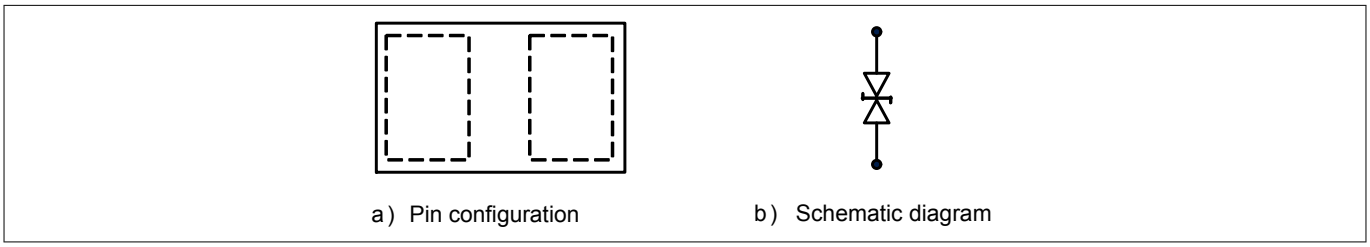

Figure 1 Pin configuration and schematic diagram

Table 1 Part information

Type	Package	Configuration	Marking code
ESD108-B1-CSP0201	WLL-2-1	1 line, bi-directional	C [1)]

1 The device has no marking or date code on the device backside. The marking code is on pad side.

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1 Maximum ratings

Note: T_A = 25 °C, unless otherwise specified.

Table 2 Maximum ratings

Parameter	Symbol	Values	Unit	Note or test condition
Reverse working voltage	V_{RWM}	±5.5	V	–
ESD (air/contact) discharge [1)]	V_{ESD}	±25	kV	–
Reverse working current	I_{RWM}	10	mA	–
Peak pulse power	P_{PK}	27.5	W	t_p = 8/20 µs [2)]
		18	kW	t_p = 100 ns [1)]
Peak pulse current [2)]	I_{PP}	±2.5	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.

Table 3 Thermal resistance

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Junction - soldering point [3)]	R_{thJS}	–	–	330	K/W	–

1 V_{ESD} according to IEC61000-4-2 (R = 330 Ω, C = 150 pF discharge network)
2 Stress pulse: 8/20 µs current waveform according to IEC61000-4-5
3 For calculation of R_{thJA} please refer to application note AN077 *[3]*: Thermal resistance calculation

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2 Electrical characteristics

Note: *T_A = 25 °C, unless otherwise specified. Device is electrically symmetrical.*

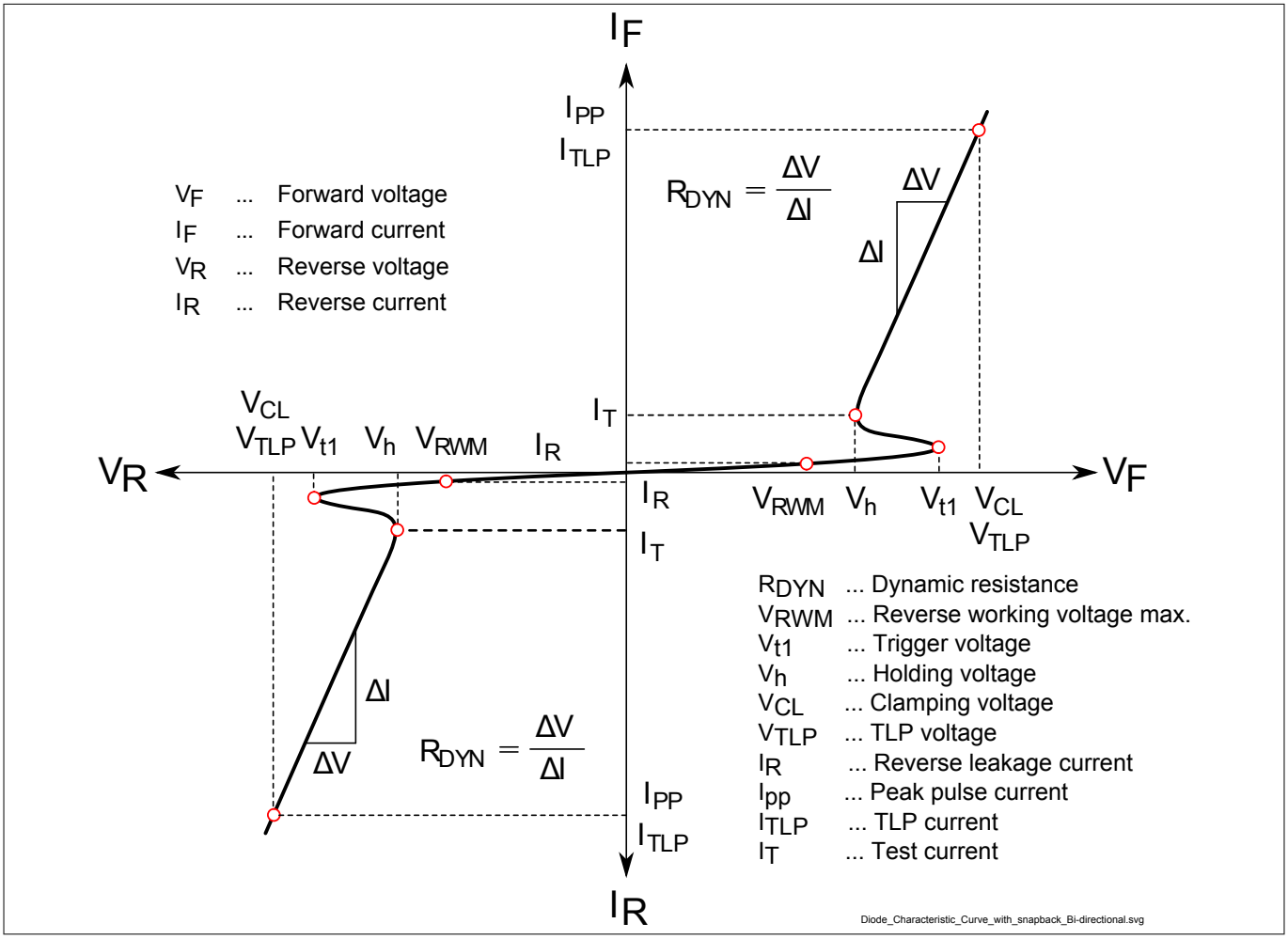

Figure 2 Definitions of electrical characteristics

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Electrical characteristics

Table 4 DC characteristics

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Reverse current	I_R	–	<1	20	nA	V_R = ±5.5 V
Trigger voltage	V_{t1}	–	9.5	12.5	V	
Holding voltage	V_h	5.5	6.5	9.5	V	I_T = 0.5 mA

Table 5 AC characteristics

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Line capacitance	C_L	–	0.28	0.38	pF	V_R = 0 V, f = 1 MHz
		–	0.22	0.38		V_R = 0 V, f = 1 GHz

Table 6 ESD and Surge characteristics

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Clamping voltage [1)]	V_{CL}	–	20	27	V	I_{TLP} = 16 A, t_p = 100 ns
		–	30.5	41		I_{TLP} = 30 A, t_p = 100 ns
Clamping voltage[2)]		–	20	–		V_{ESD} = 8 kV
		–	29	–		V_{ESD} = 15 kV
Clamping voltage [3)]		–	8.5	12		I_{PP} = 1 A, t_p = 8/20 µs
		–	11	18.5		I_{PP} = 2.5 A, t_p = 8/20 µs
Dynamic resistance [1)]	R_{DYN}	–	0.78	–	Ω	t_p = 100 ns

1 Please refer to application note AN210 *[1]*, TLP parameters: Z_0 = 50 Ω , t_p = 100 ns, t_r = 0.6 ns
2 V_{ESD} according to IEC61000-4-2 (contact discharge), V_{CL} at 30 ns (R = 330 Ω, C = 150 pF discharge network)
3 Stress pulse: 8/20 µs current waveform according to IEC61000-4-5

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3 Typical characteristic diagrams

Note: $T_A = 25\ °C$, *unless otherwise specified.*

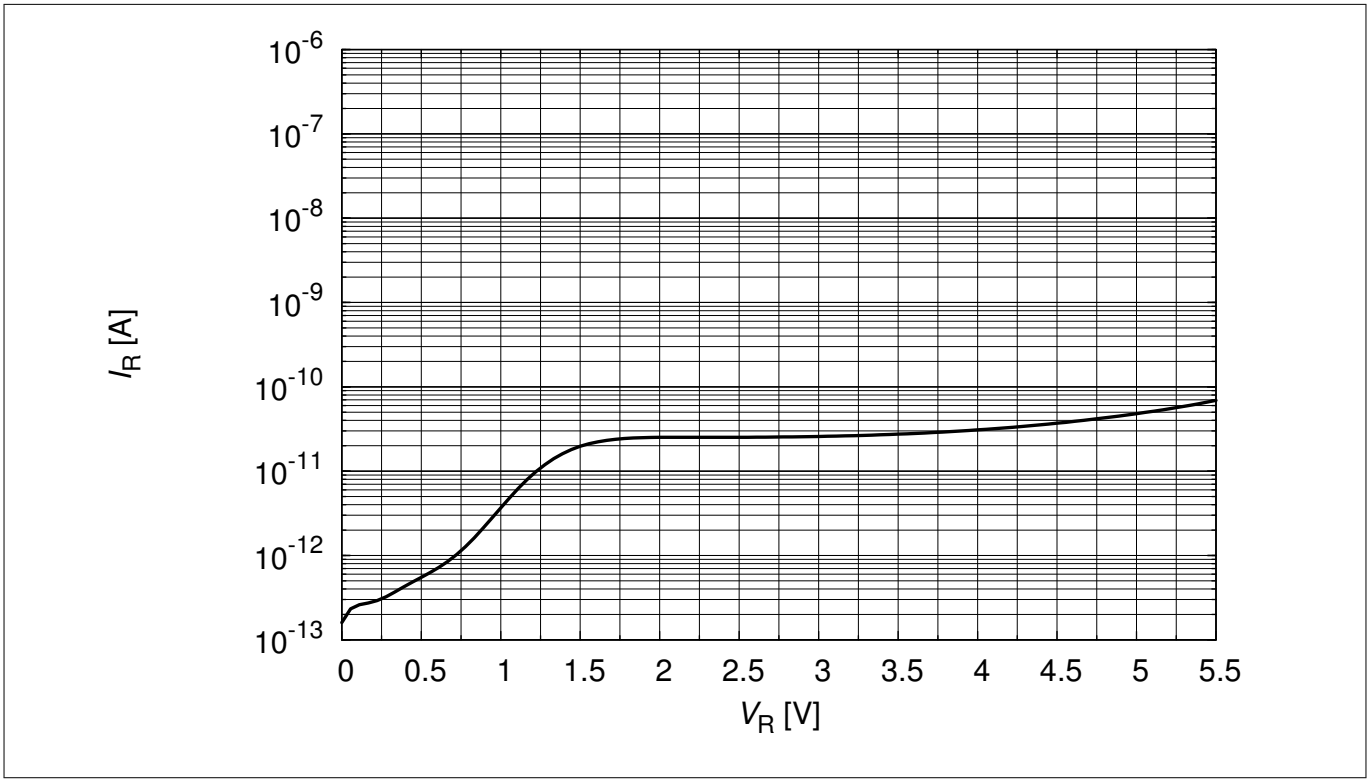

Figure 3 Reverse leakage current: $I_R = f(V_R)$

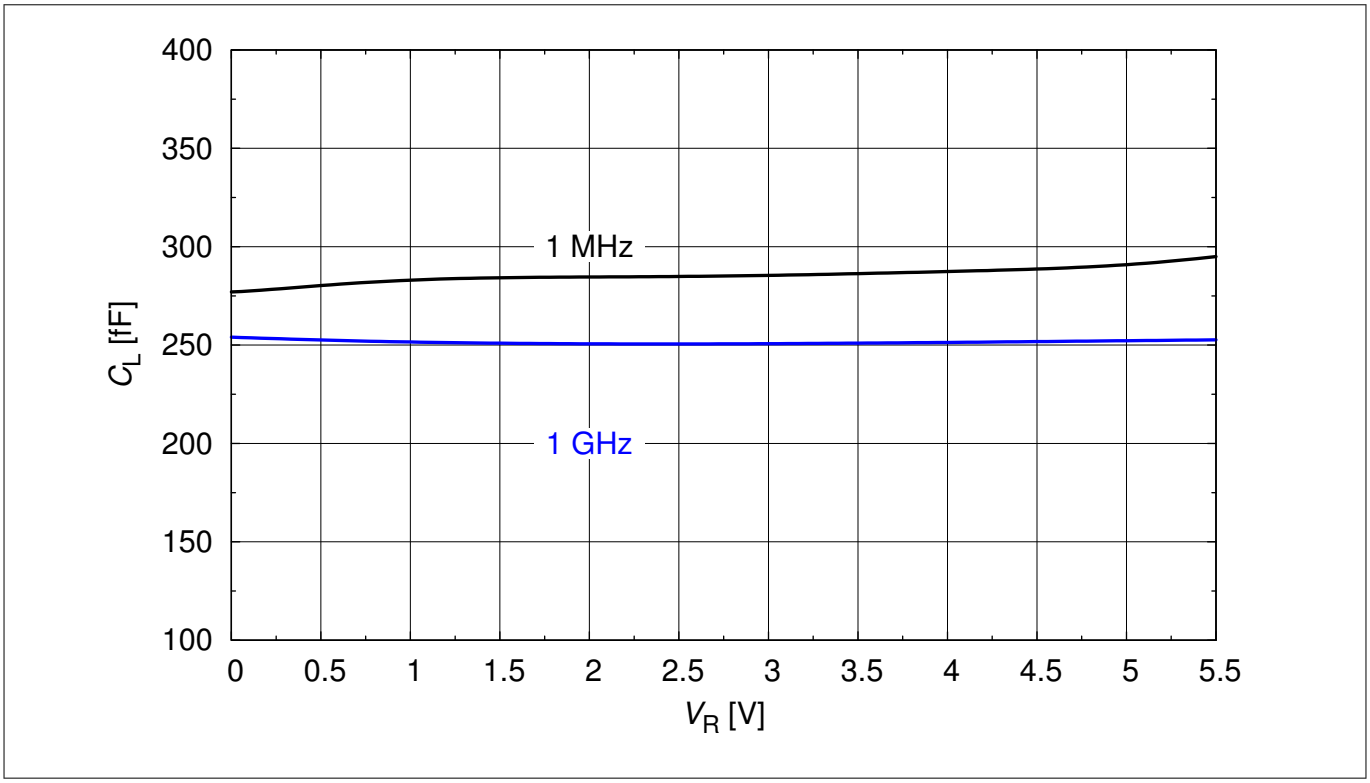

Figure 4 Line capacitance: $C_L = f(V_R)$

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Typical characteristic diagrams

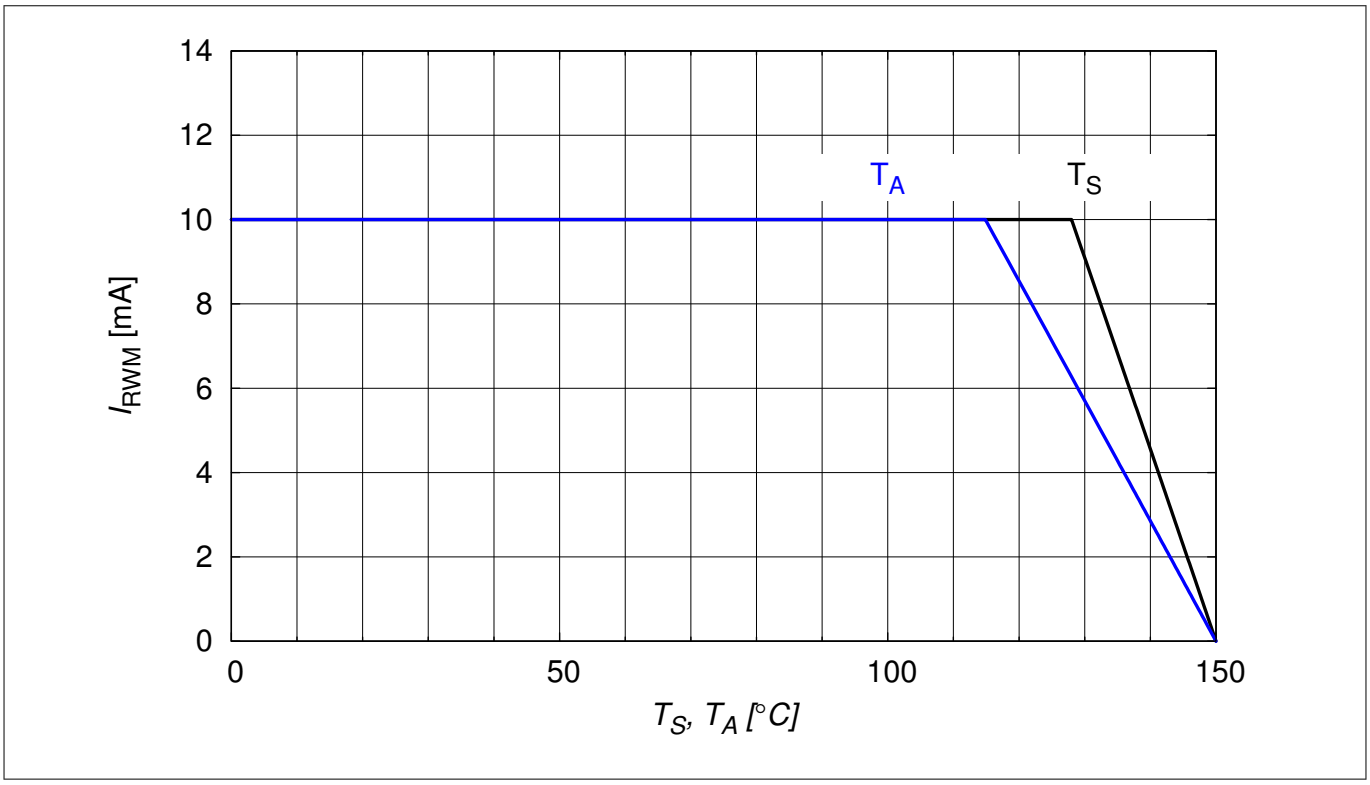

Figure 5 Reverse working current $I_{RWM} = f(T_S, T_A)$, device mounted on PCB with R_{th} = 200 K/W *[3]*

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Typical characteristic diagrams

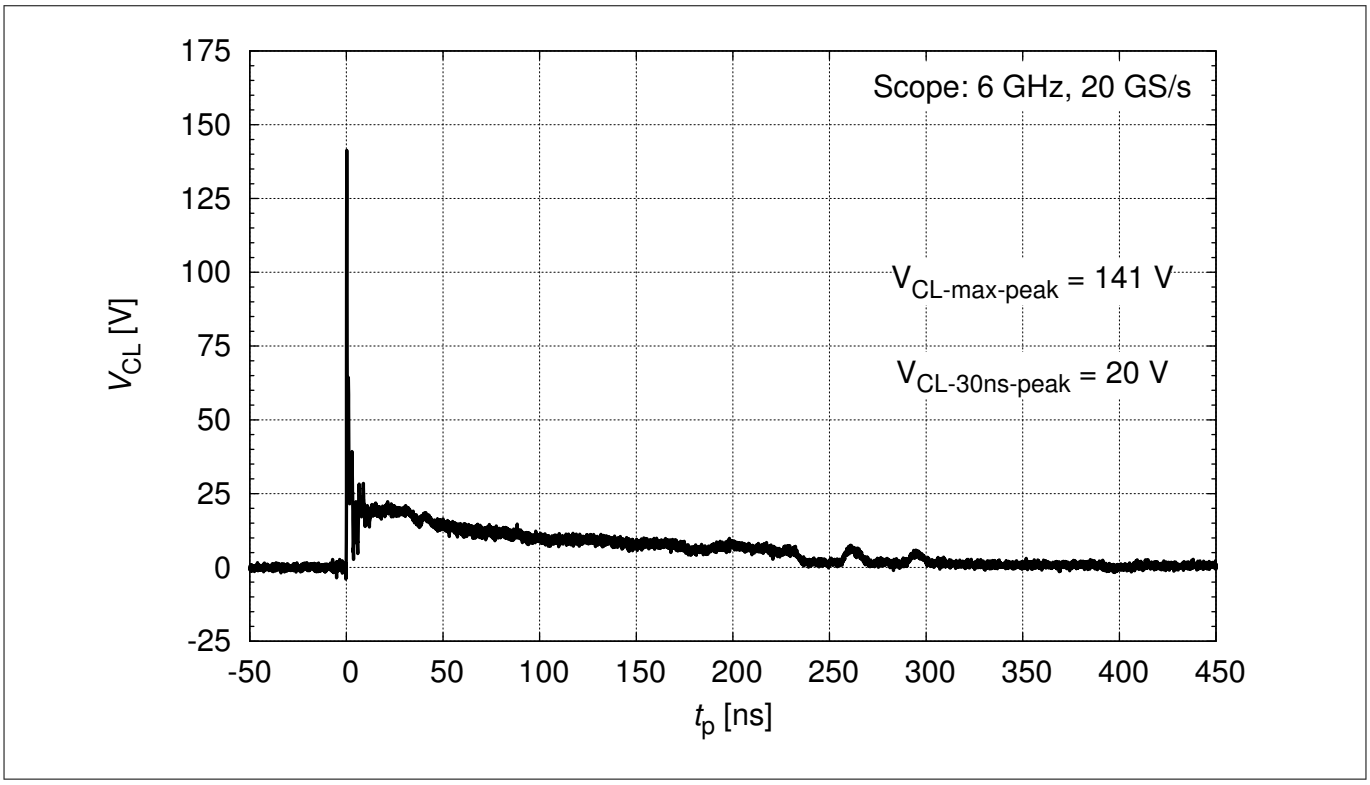

Figure 6 Clamping voltage (ESD): V_{CL} = *f(t)*, 8 kV positive pulse (according to IEC61000-4-2)

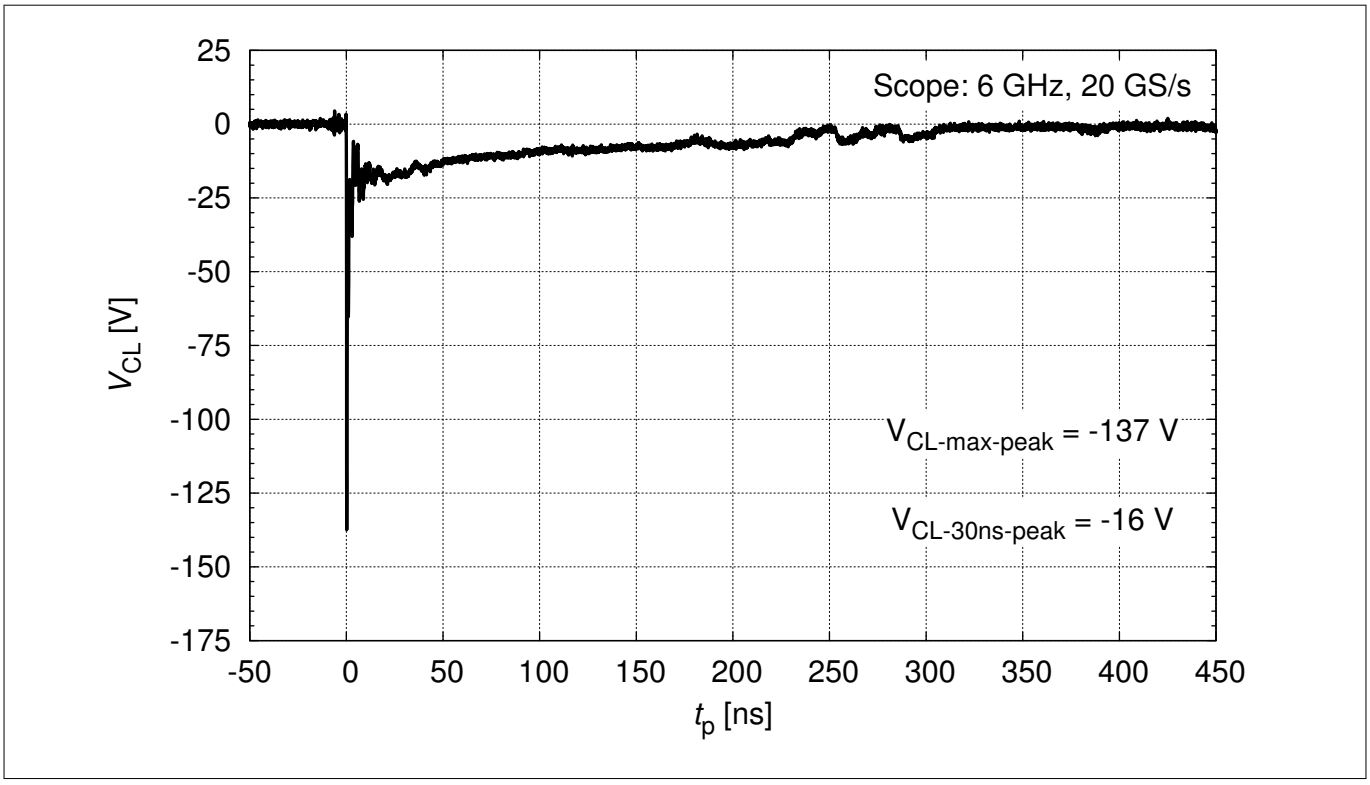

Figure 7 Clamping voltage (ESD): V_{CL} = *f(t)*, 8 kV negative pulse (according to IEC61000-4-2)

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Typical characteristic diagrams

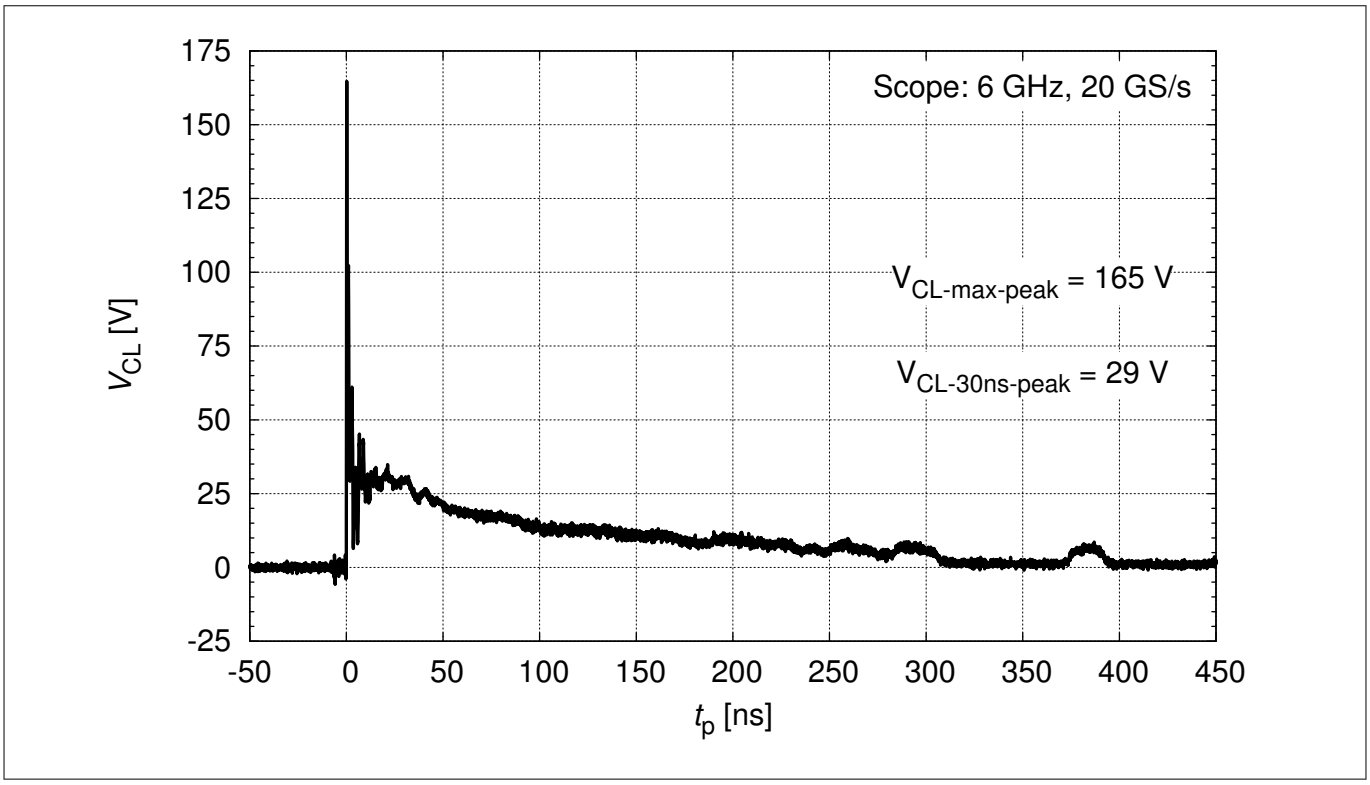

Figure 8 Clamping voltage (ESD): V_{CL} = *f(t)*, 15 kV positive pulse (according to IEC61000-4-2)

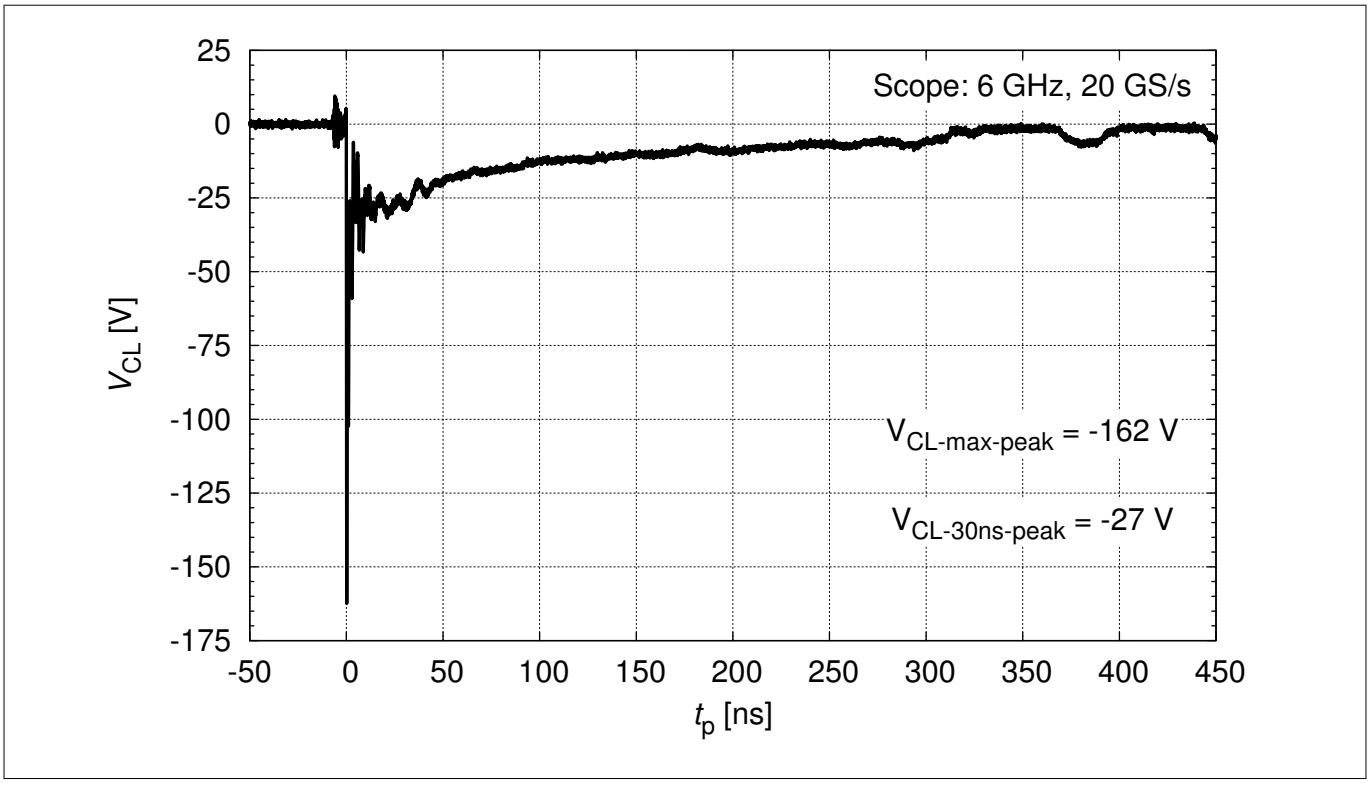

Figure 9 Clamping voltage (ESD): V_{CL} = *f(t)*, 15 kV negative pulse (according to IEC61000-4-2)

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Typical characteristic diagrams

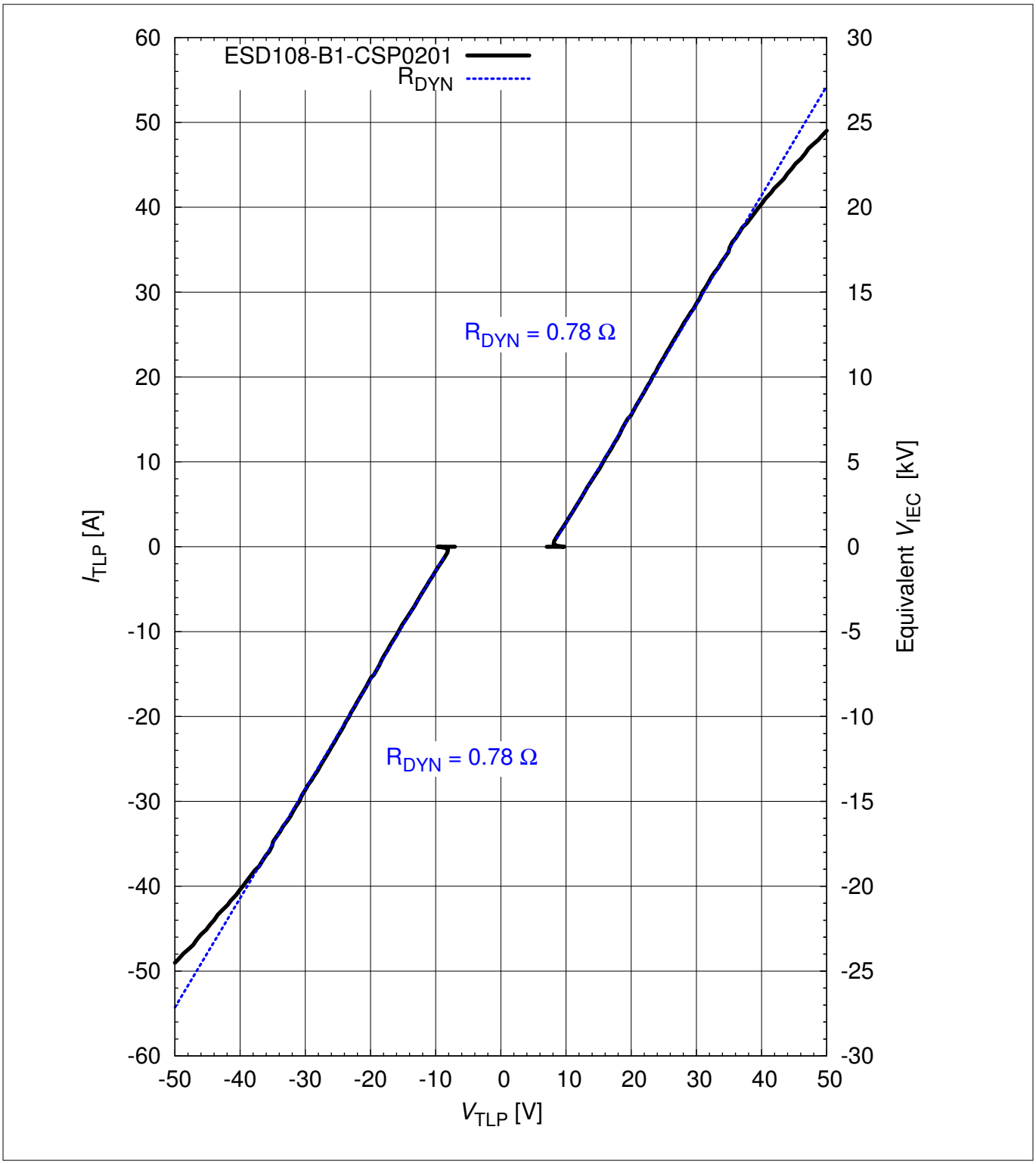

Figure 10 Clamping voltage (TLP): $I_{TLP} = f(V_{TLP})$ [1]

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Typical characteristic diagrams

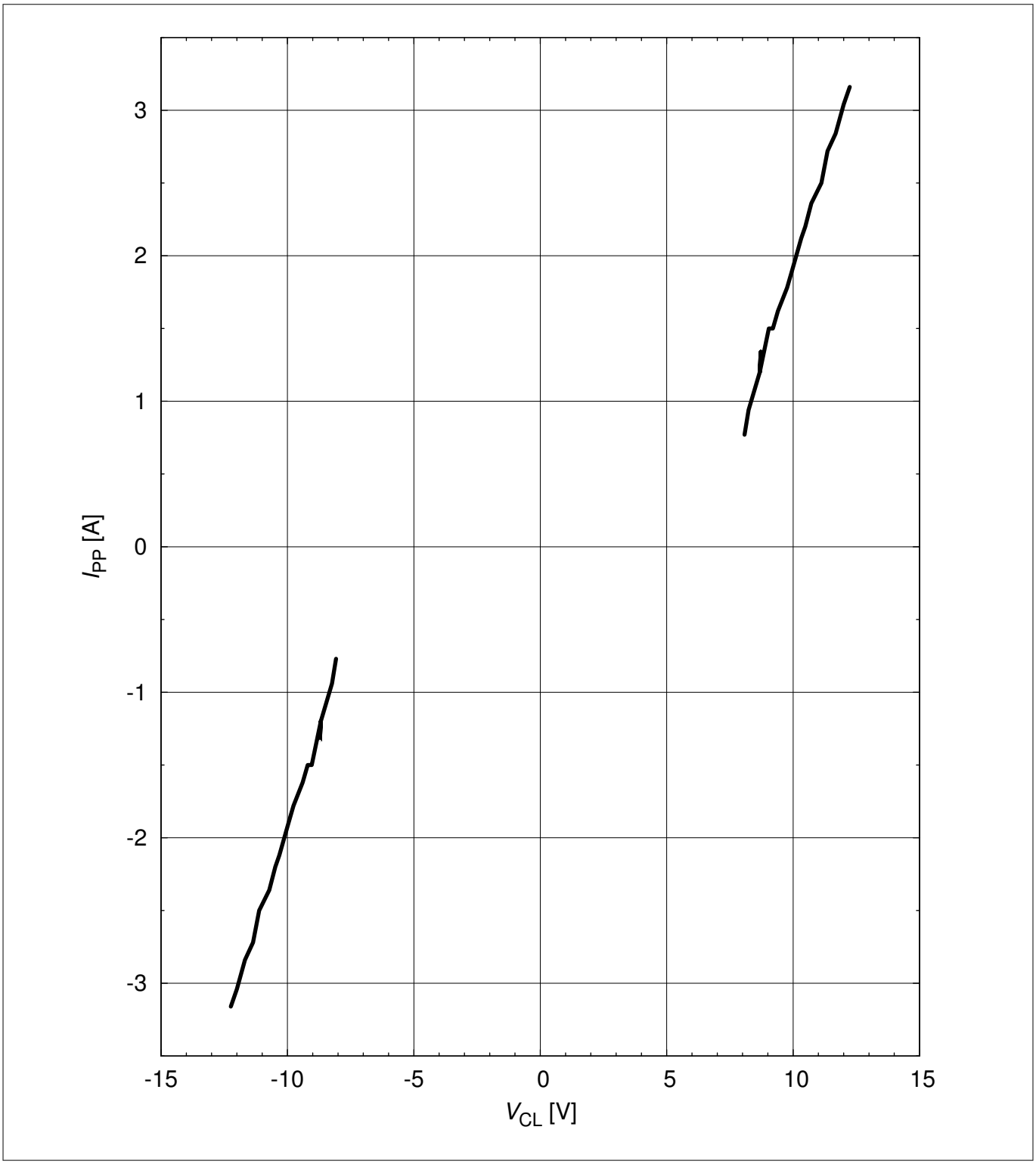

Figure 11 Clamping voltage (Surge): $I_{PP} = f(V_{CL})$ (according to IEC61000-4-5) *[1]*

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Typical characteristic diagrams

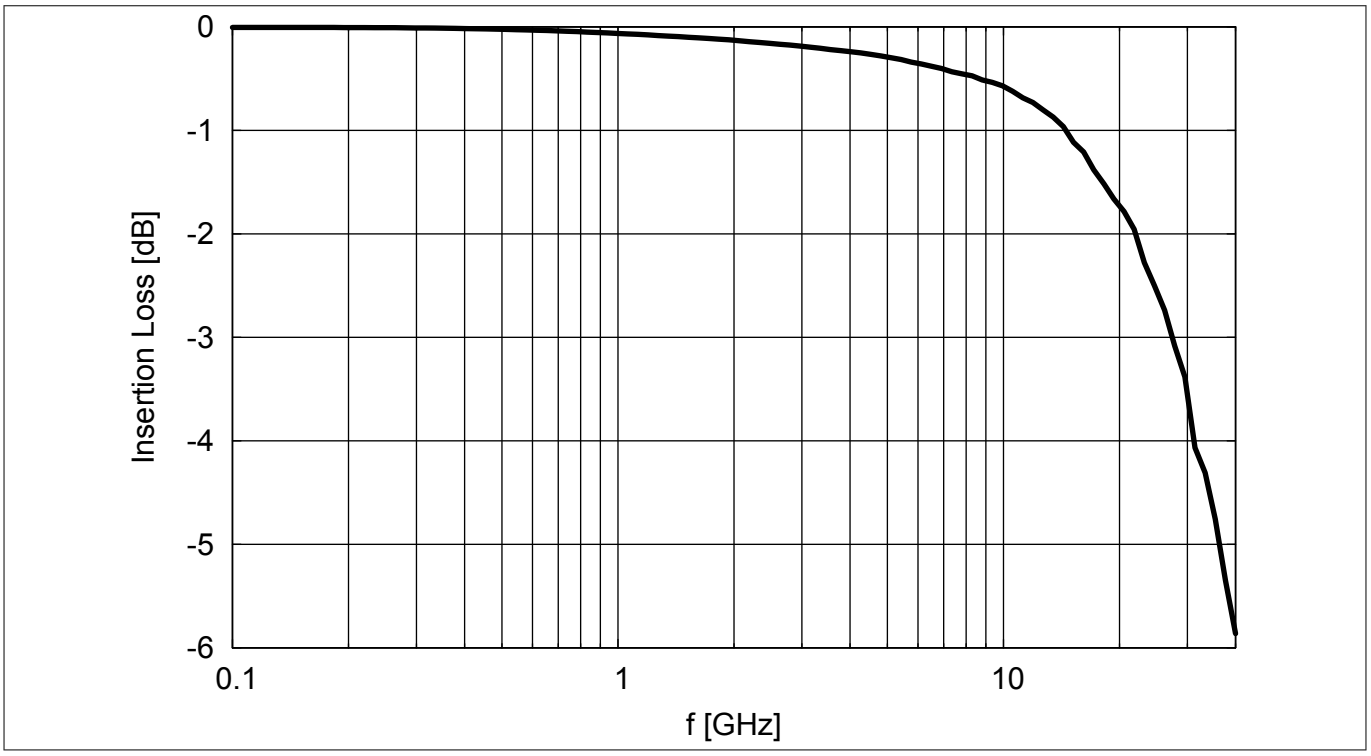

Figure 12 Insertion loss vs. frequency in a 50 Ω system

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4 Package information

4.1 WLL-2-1 package

Note: *Dimensions in mm.*

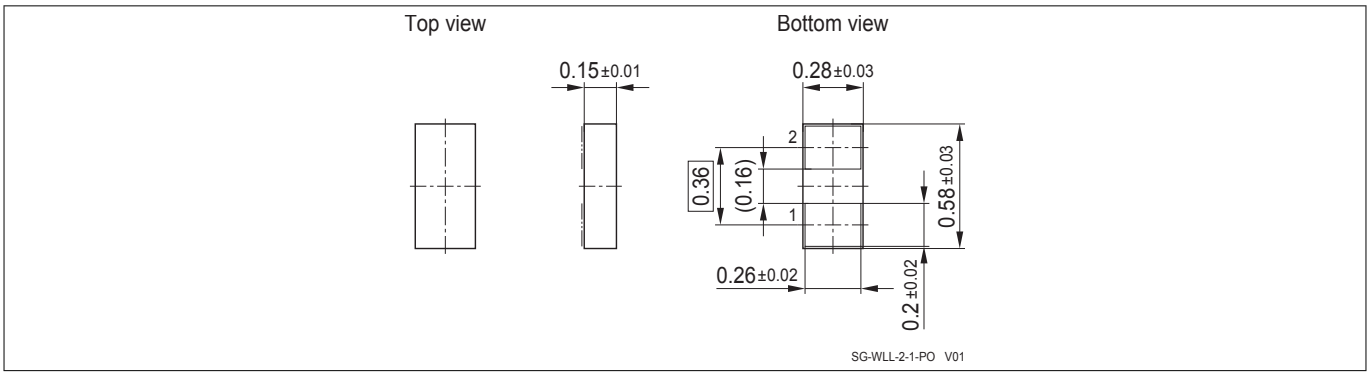

Figure 13 WLL-2-1 package outline

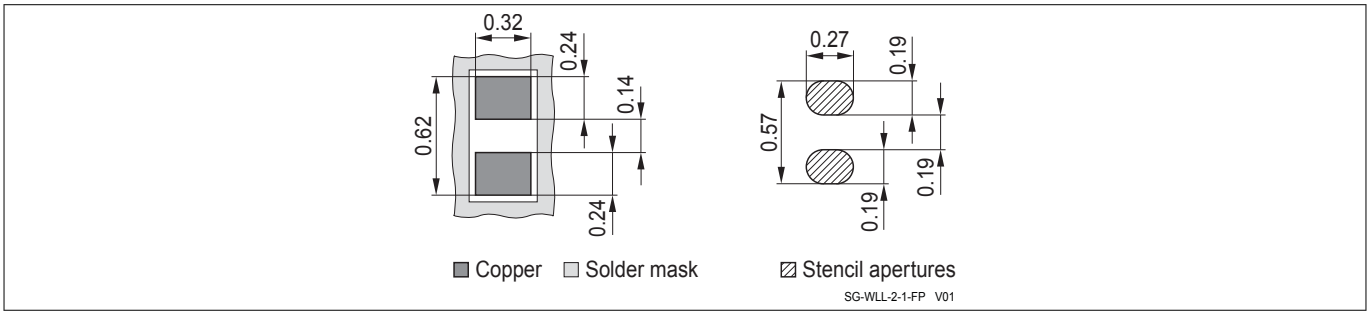

Figure 14 WLL-2-1 footprint (recommendation for printed circuit board assembly see *[2]*)

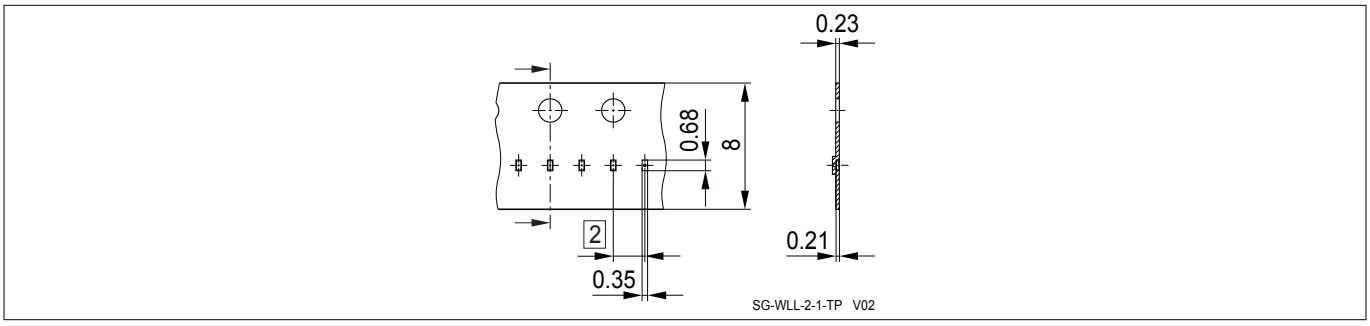

Figure 15 WLL-2-1 packing

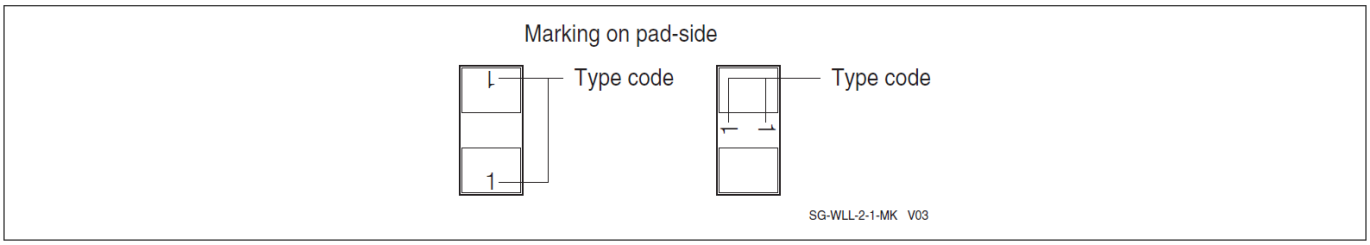

Figure 16 WLL-2-1 marking example (see *Device information*)

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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

[3] Infineon AG - **Application note AN077**: Thermal resistance calculation

[4] Infineon AG - **Application note AN392**: TVS diodes in ChipScalePackage reduce size and save cost

Revision history

Revision history: Rev. 1.4, 2016-04-21

Page or Item	Subjects (major changes since previous revision)
Revision 1.5, 2017-10-17	
All	Data sheet layout changed, references updated

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