ESD134-B1-W0201

Bi-directional ESD protection device, 2.1 V, 0.25 pF, 0201

Order now | Technical documents | Simulation | Support

Product description

This Infineon ESD (electrostatic discharge) protection device has a bi-directional and symmetric *I*/*V* characteristic and excellent clamping performance.

Feature list



- ESD / transient protection according to:
  - IEC61000-4-2 (ESD): ±28 kV (air) / ±23 kV (contact)
  - IEC61000-4-4 (EFT): ±2.5 kV / ±50 A (5/50 ns)
  - IEC61000-4-5 (Surge): ±7.5 A (8/20 µs)
- Bi-directional maximum working voltage: V_{WM} = ±2.1 V
- Line capacitance: C_L = 0.25 pF at f = 2.5 GHz
- Clamping voltage: V_{cl} = 7.7 V at I_{TLP} = 16 A with R_{dyn} = 0.28 Ω
- Very low leakage current: I_L = 0.1 nA
- Small form factor SMD size 0201, low profile (0.58 x 0.28 x 0.15 mm^3)

Potential applications

- USB 3.x Gen 1 / Gen 2, Thunderbolt
- HDMI, DisplayPort

Product validation

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

Device information

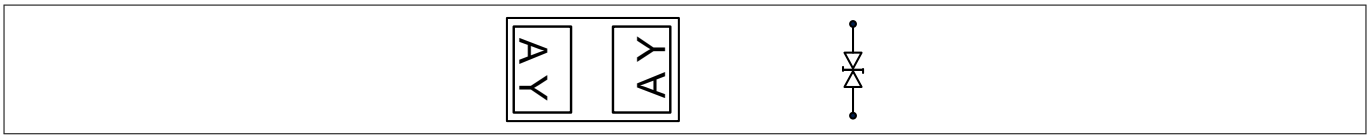


Figure 1 **Pin configuration and schematic diagram**

Table 1 **Part information**

Product name / Ordering code	Package	Pin configuration	Marking	Pieces / Reel
ESD134-B1-W0201 / ESD134B1W0201E6327XTSA1	WLL-2-3	1 line, bi-directional	AY	15 k

Table of contents

Product description 1
Feature list 1
Potential applications 1
Product validation 1
Device information 1
Table of contents 2
1 Absolute maximum ratings 3
2 Electrical characteristics 4
3 Typical characteristic diagrams 6
4 Package information WLL-2-3 13
5 References 14
6 Revision history 14
Disclaimer 15

1 Absolute maximum ratings

Table 2 Absolute maximum ratings at T_A = 25°C, unless otherwise specified

Parameter	Symbol	Values		Unit	Note or test condition
		Min.	Max.		
Working voltage [1]	V_{WM}	-2.1	+2.1	V	
ESD discharge voltage	V_{ESD} (contact)	-23	+23	kV	Discharge network: R = 330 Ω, C = 150 pF [2]
	V_{ESD} (air)	-28	+28		
Peak pulse power	P_{PK}	–	56	W	Stress pulse: 8/20 µs current waveform [3]
Peak pulse current	I_{PP}	-7.5	+7.5	A	
Operating temperature	T_{op}	-55	+125	°C	
Storage temperature	T_{stg}	-65	+150		

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 Device snaps back to a low holding voltage, refer to application note AN525 for latch-up prevention.
2 Based on IEC61000-4-2.
3 Based on IEC61000-4-5.

2 Electrical characteristics

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

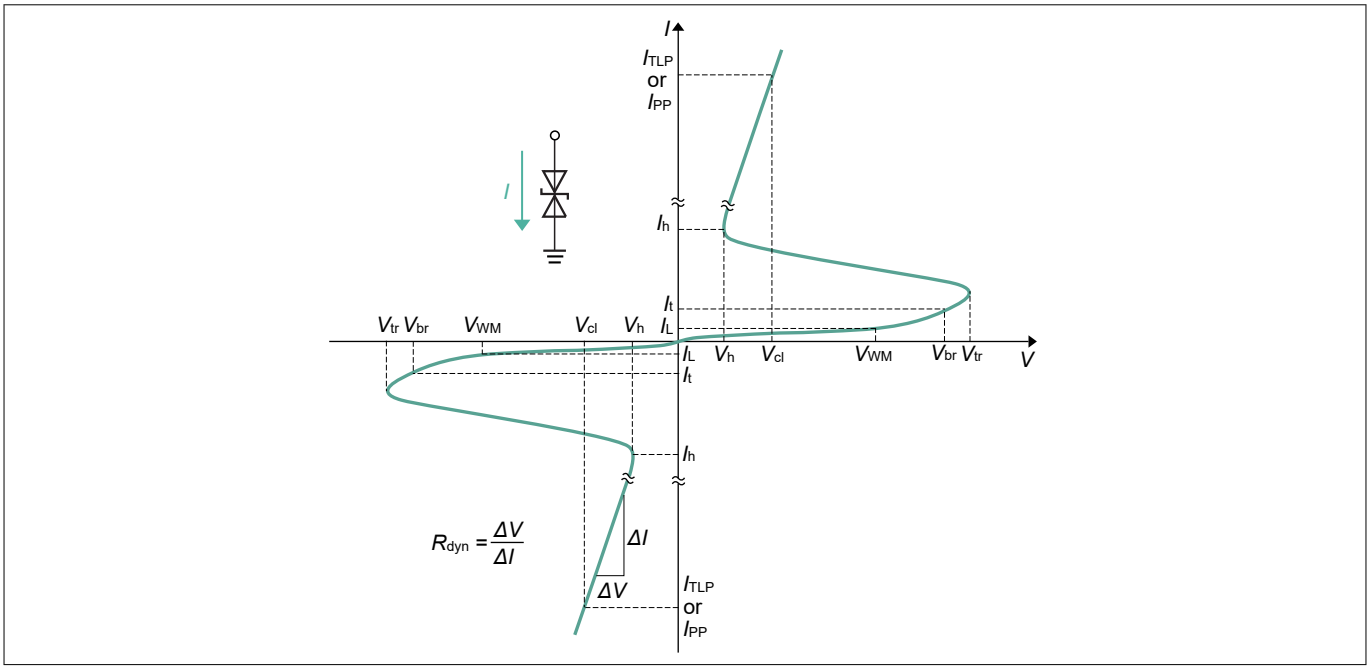


Figure 2 ***I*/*V* characteristic curve**

Table 3 ***I*/*V* characteristic parameters**

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

***Note**:* *For more detailed explanation of electrical parameters, refer to [1].*

2 Electrical characteristics

Table 4 DC characteristics

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Breakdown voltage	V_{br}	8	9.5	–	V	I_t = 1 mA
Holding voltage	V_h	–	1.8	–	V	$I = I_h$
Holding current	I_h	–	20	–		$V = V_h$
Leakage current	I_L	–	0.1	20	nA	V_{WM} = 2.1 V

Table 5 AC characteristics

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Line capacitance	C_L	–	0.3	0.35	pF	V = 0 V, f = 1 MHz
		–	0.25	–		V = 0 V, f = 2.5 GHz
Series inductance	L_S	–	<0.1	–	nH	Extracted from S-parameters

Table 6 Protection characteristics

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Clamping voltage (TLP) [4] [5]	V_{cl}	–	5.8	–	V	I_{TLP} = 8 A
		–	7.7	–		I_{TLP} = 16 A
Clamping voltage (8/20 µs) [6]		–	4.5	–		I_{PP} = 4 A
		–	7.5	–		I_{PP} = 7.5 A
Dynamic resistance [4]	R_{dyn}	–	0.28	–	Ω	

4 TLP parameters: Z_0 = 50 Ω, t_p = 100 ns, t_r = 0.6 ns, averaging window 30-60 ns.
5 Refer to application note AN210 [2]
6 t_p = 8/20 µs. Stress pulse based on IEC61000-4-5.

3 Typical characteristic diagrams

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

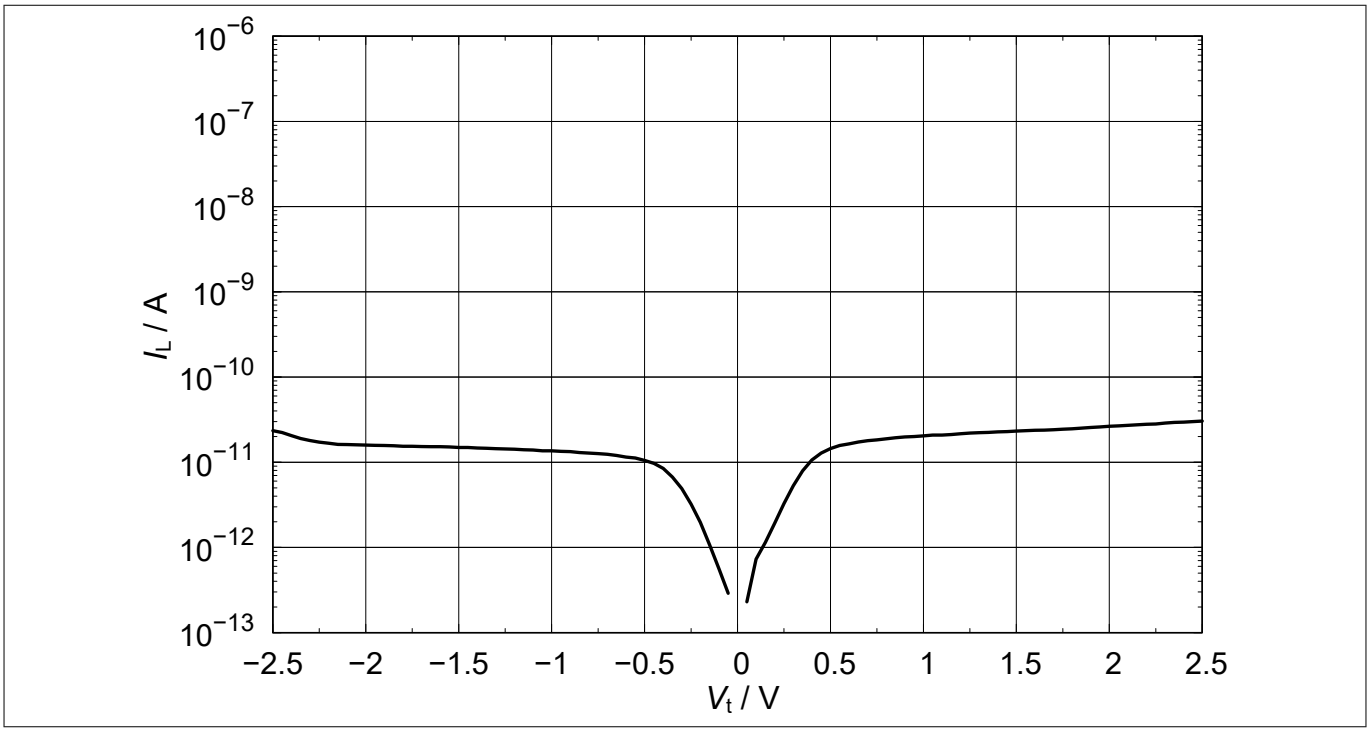


Figure 3 Leakage current: I_L = f(V_t)

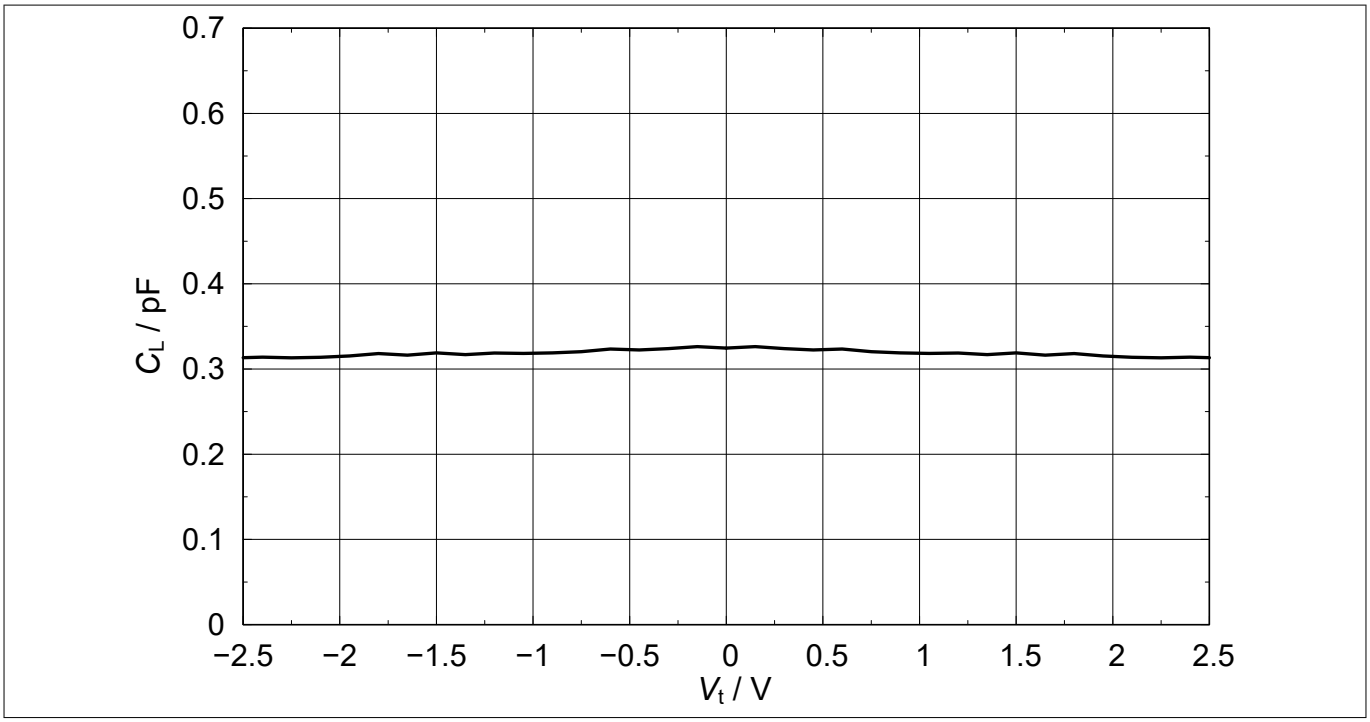


Figure 4 Line capacitance: C_L = f(V_t), f = 1 MHz

3 Typical characteristic diagrams

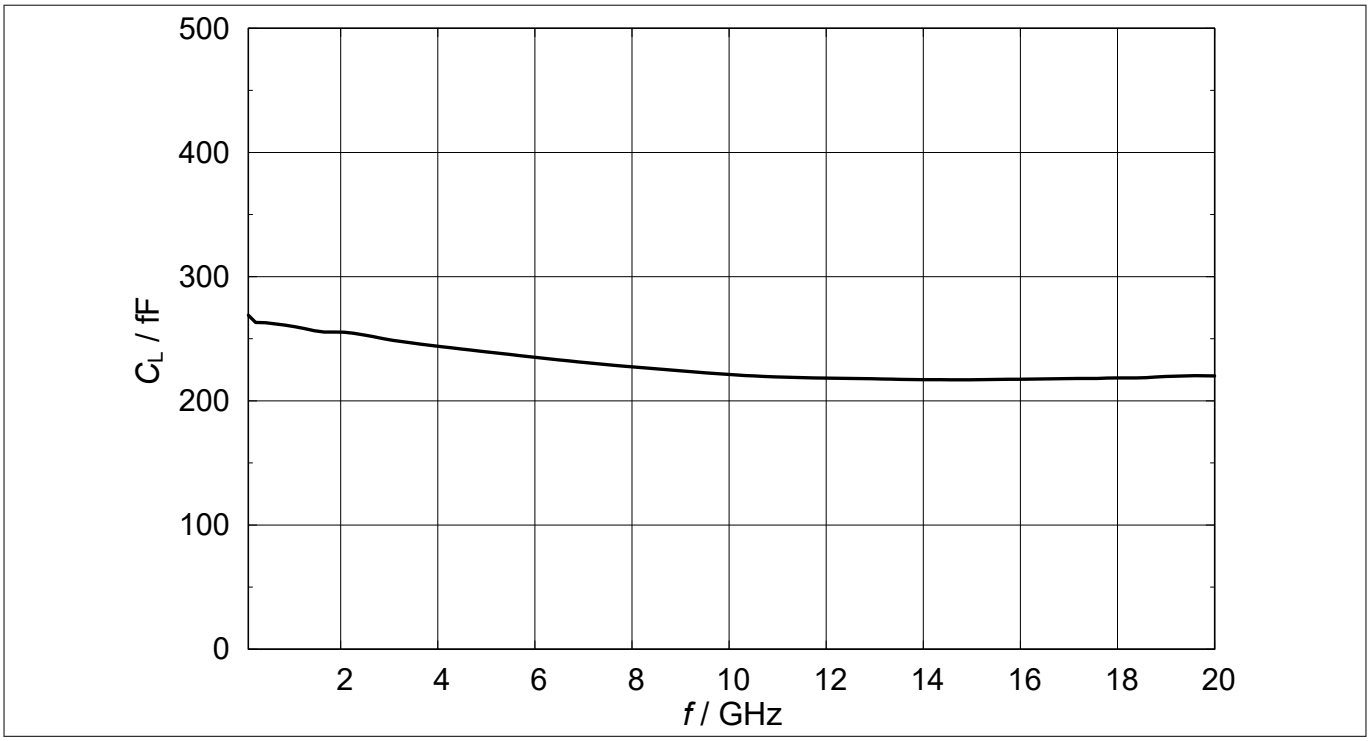


Figure 5 **Line capacitance: C_L = f(*f*) = 1 MHz**

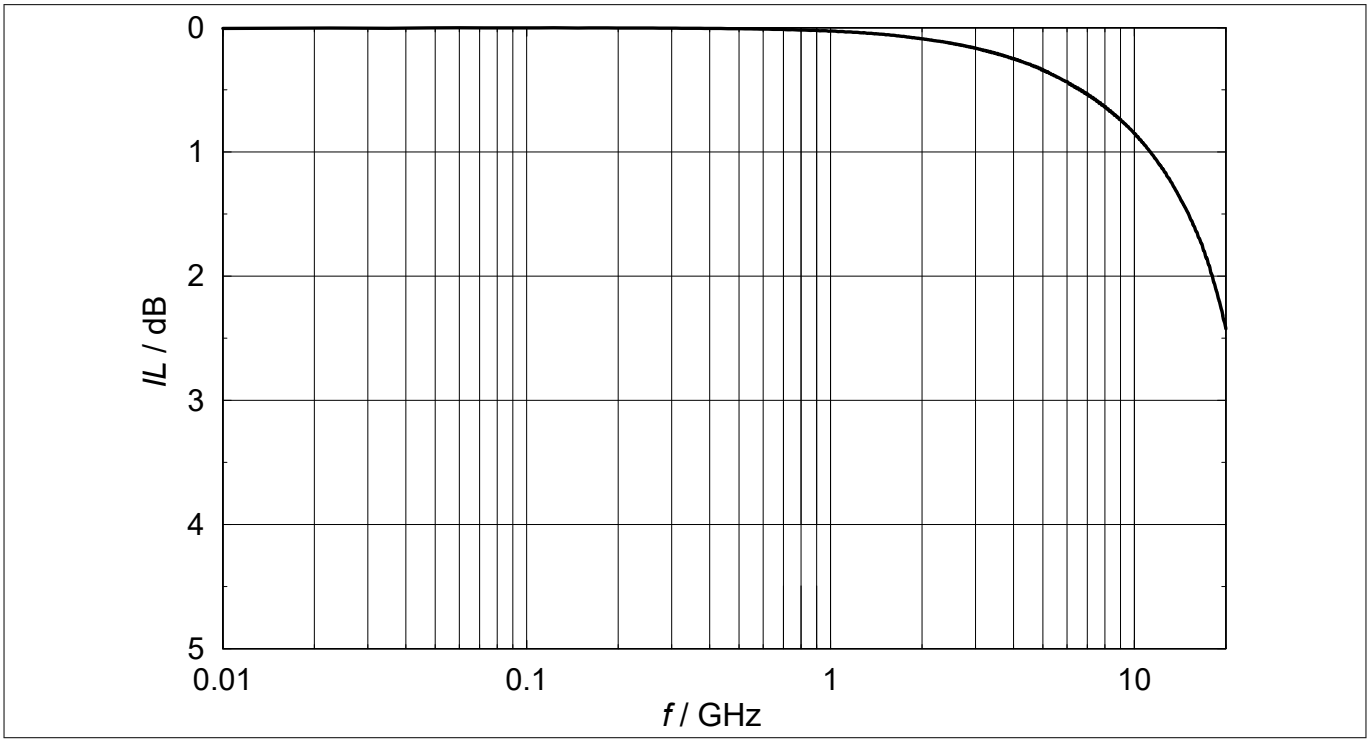


Figure 6 **Insertion loss *IL* = f(*f*), measured in a 50 Ω system**

3 Typical characteristic diagrams

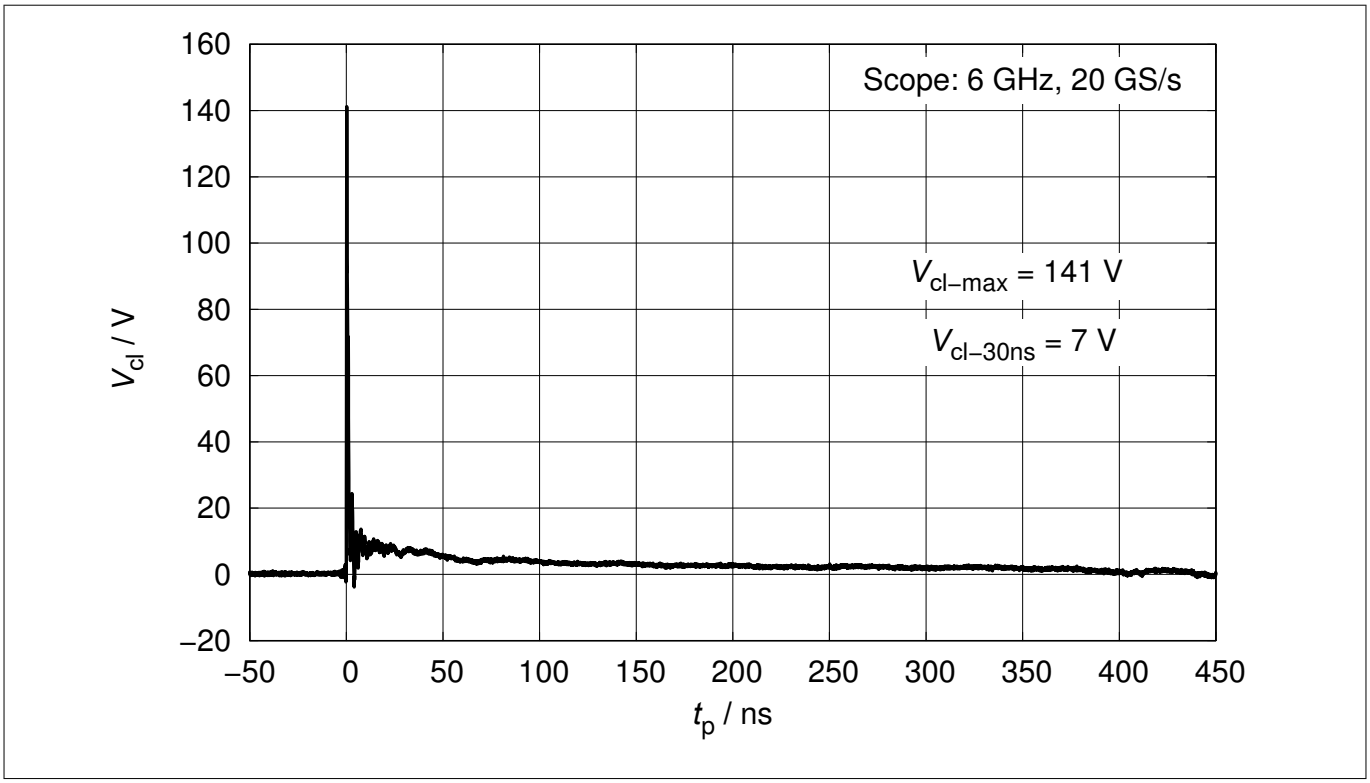


Figure 7 **Clamping voltage (ESD): $V_{cl} = f(t_p)$, 8 kV positive pulse based on IEC61000-4-2**

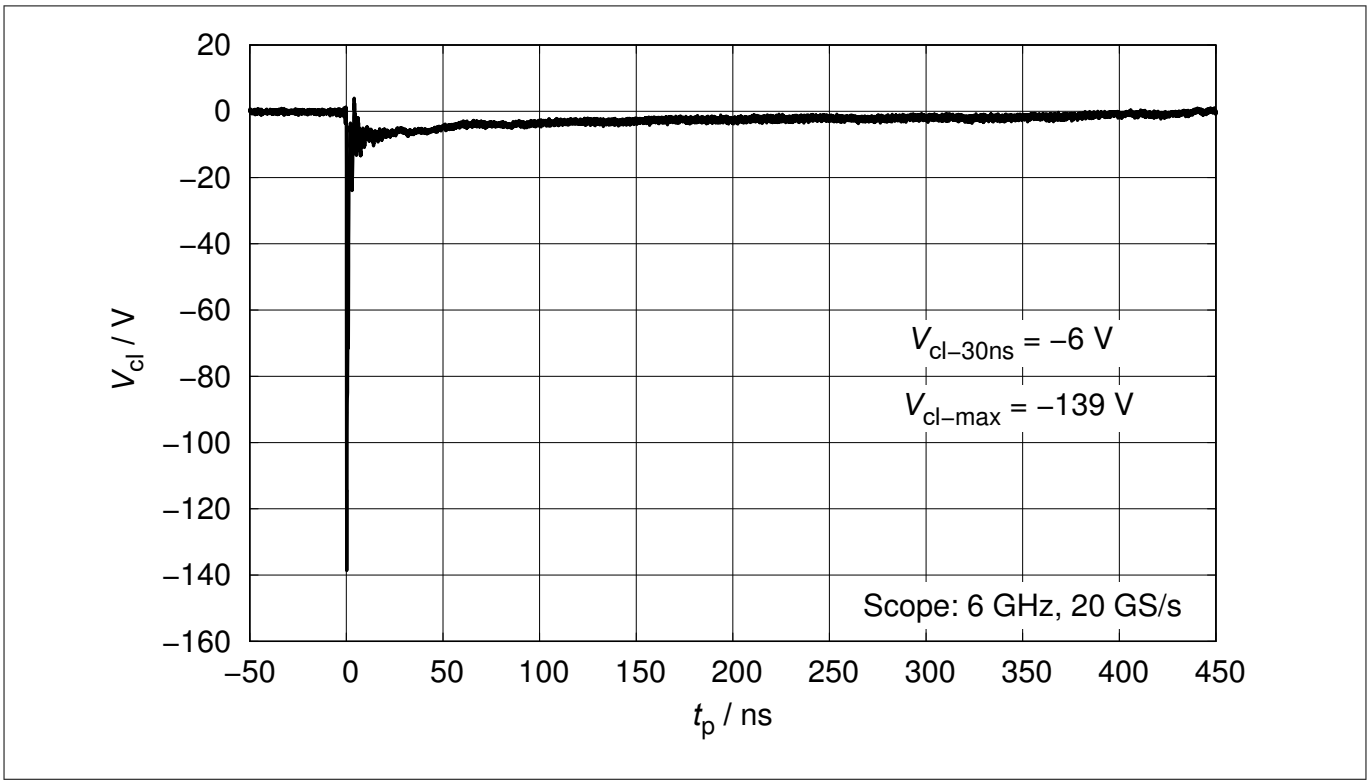


Figure 8 **Clamping voltage (ESD): $V_{cl} = f(t_p)$, 8 kV negative pulse based on IEC61000-4-2**

3 Typical characteristic diagrams

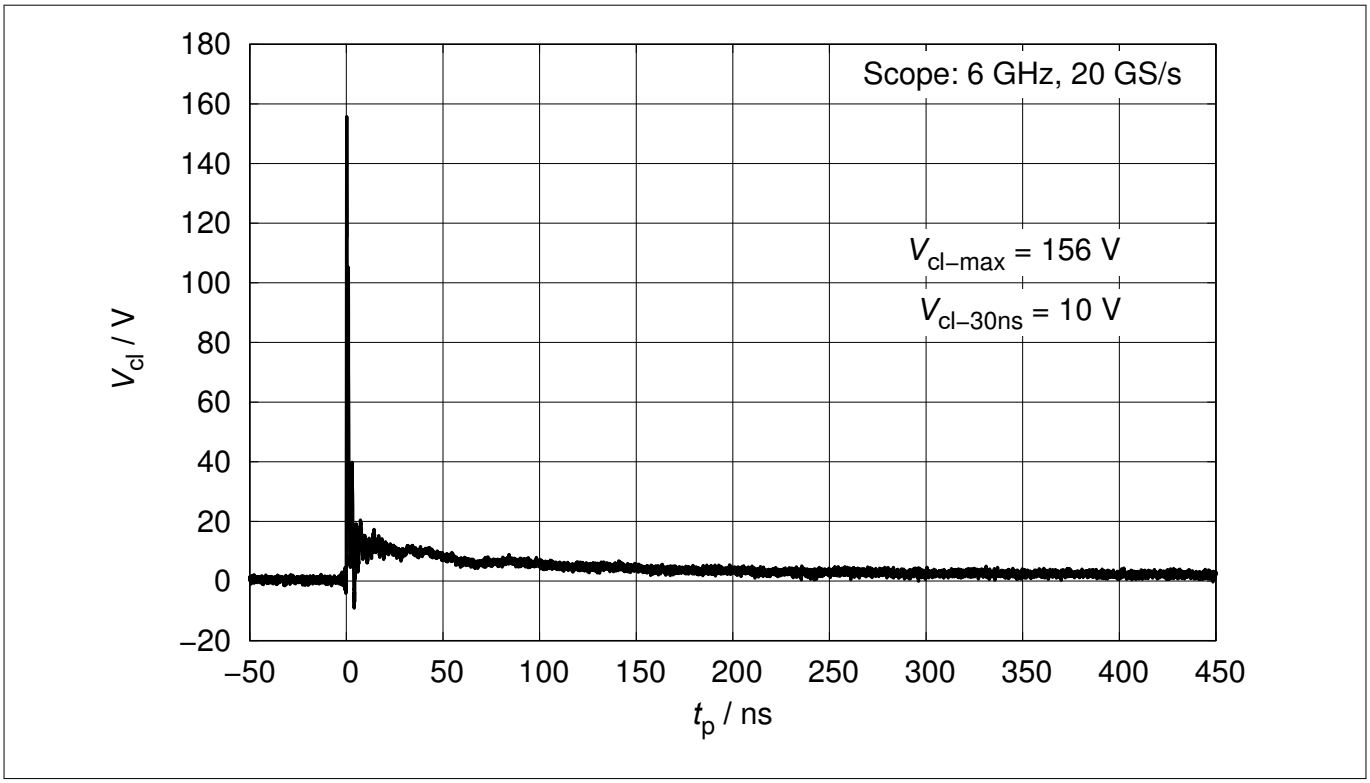


Figure 9 **Clamping voltage (ESD): $V_{cl} = f(t_p)$, 15 kV positive pulse based on IEC61000-4-2**

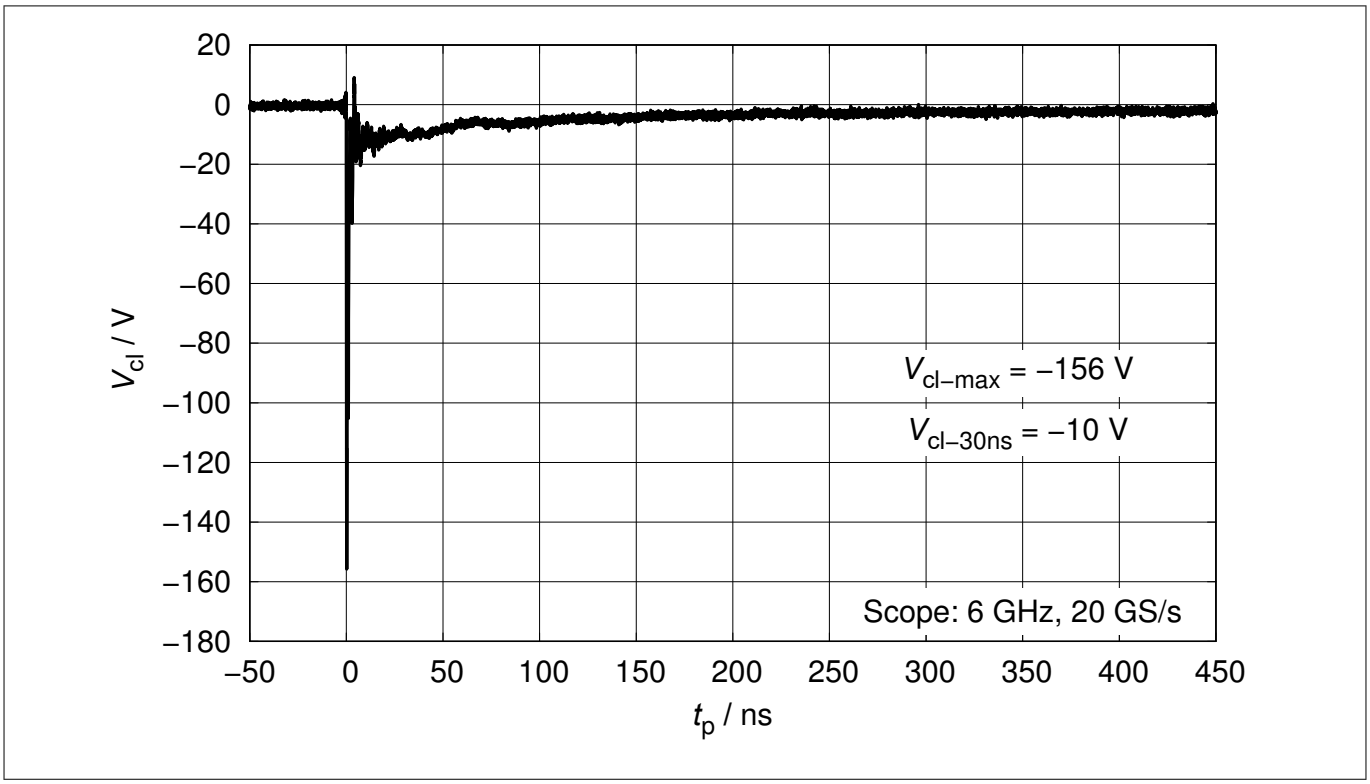


Figure 10 **Clamping voltage (ESD): $V_{cl} = f(t_p)$, 15 kV negative pulse based on IEC61000-4-2**

3 Typical characteristic diagrams

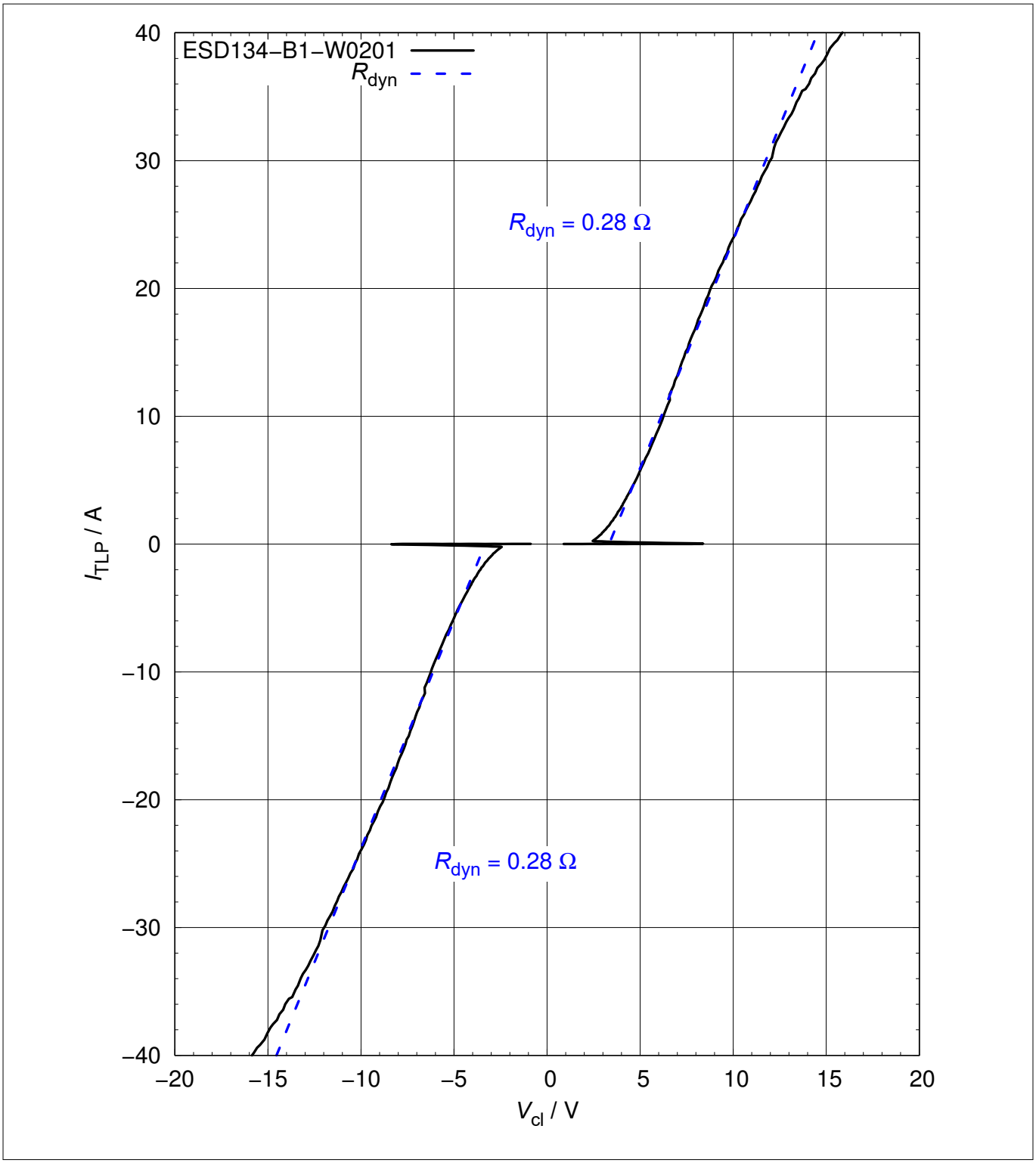


Figure 11 **Clamping voltage (TLP): I_{TLP} = f(V_{cl})**

3 Typical characteristic diagrams

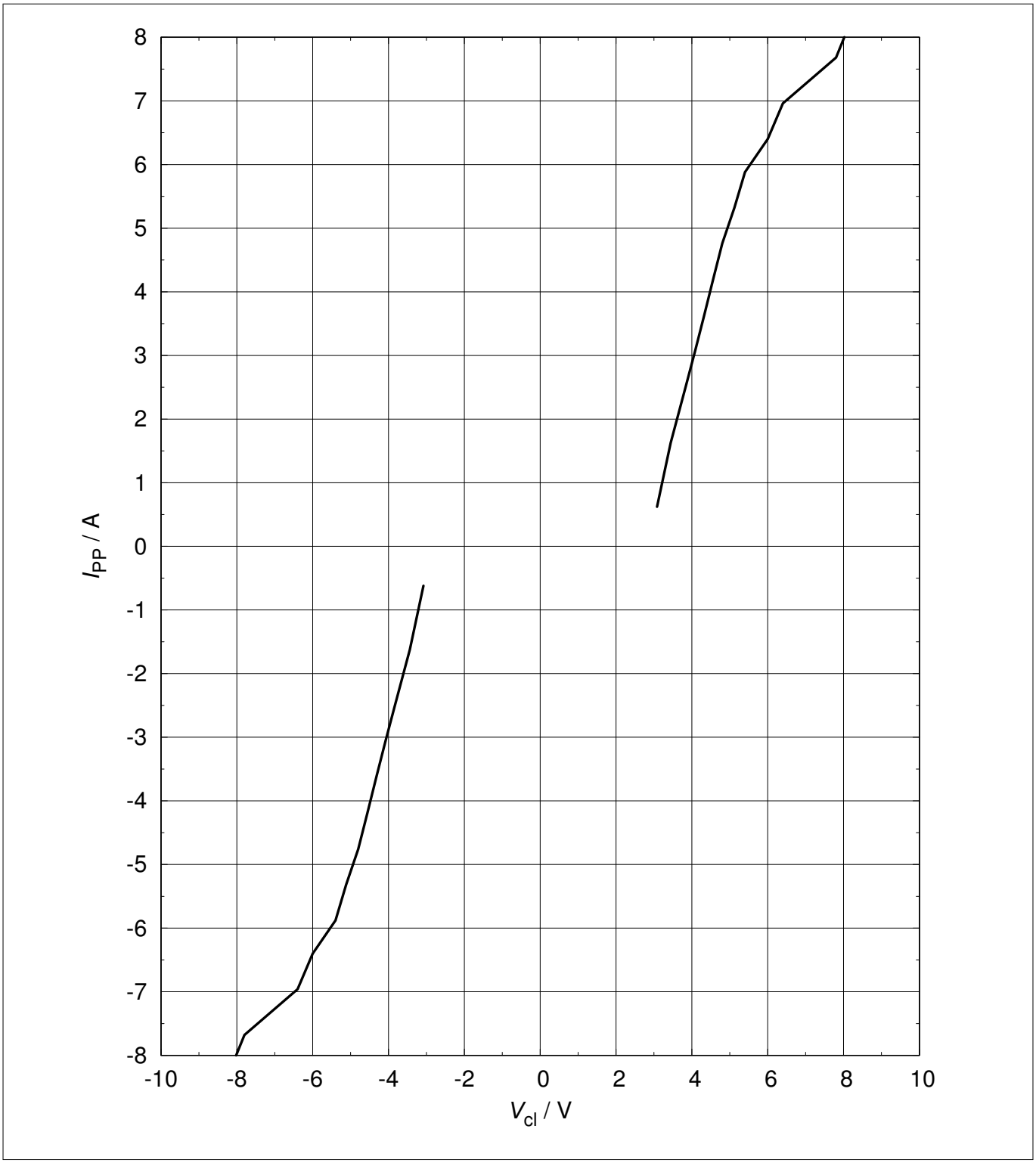


Figure 12 Clamping voltage (Surge): I_{PP} = f(V_{cl}), based on IEC61000-4-5

3 Typical characteristic diagrams

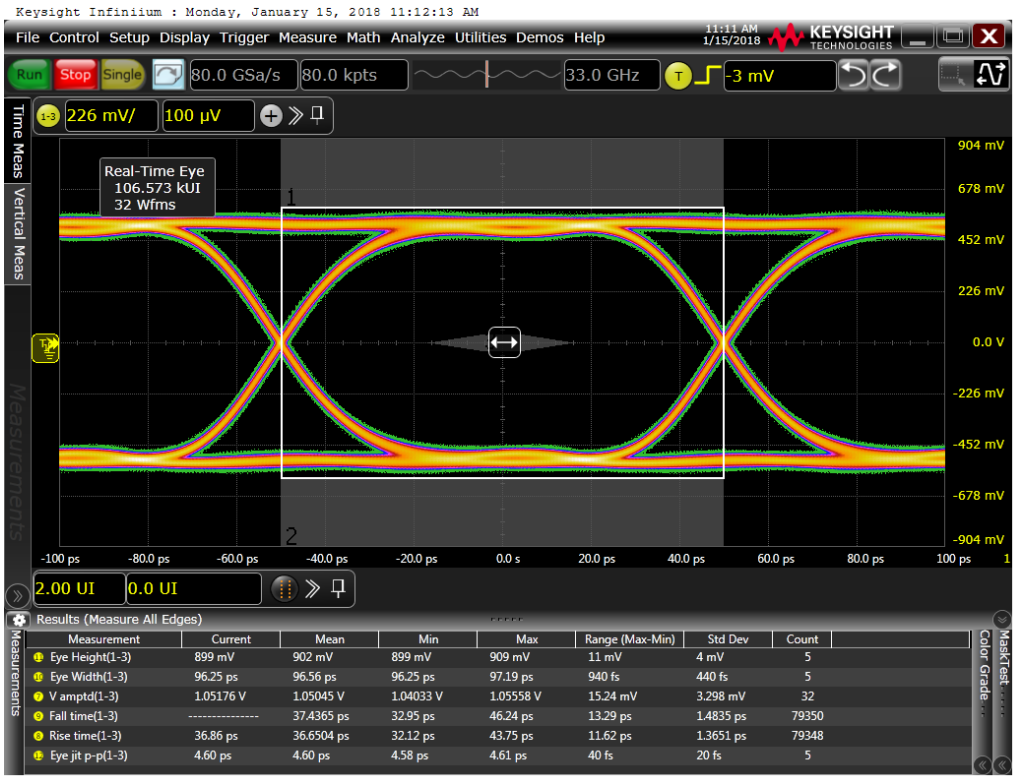


Figure 13 **10 Gbps Eye diagram with USB 3.1/3.2 Gen 2 Mask, test board only**



Figure 14 **10 Gbps Eye diagram with USB 3.1/3.2 Gen 2 Mask, test board + ESD134-B1-W0201**

4 Package information WLL-2-3

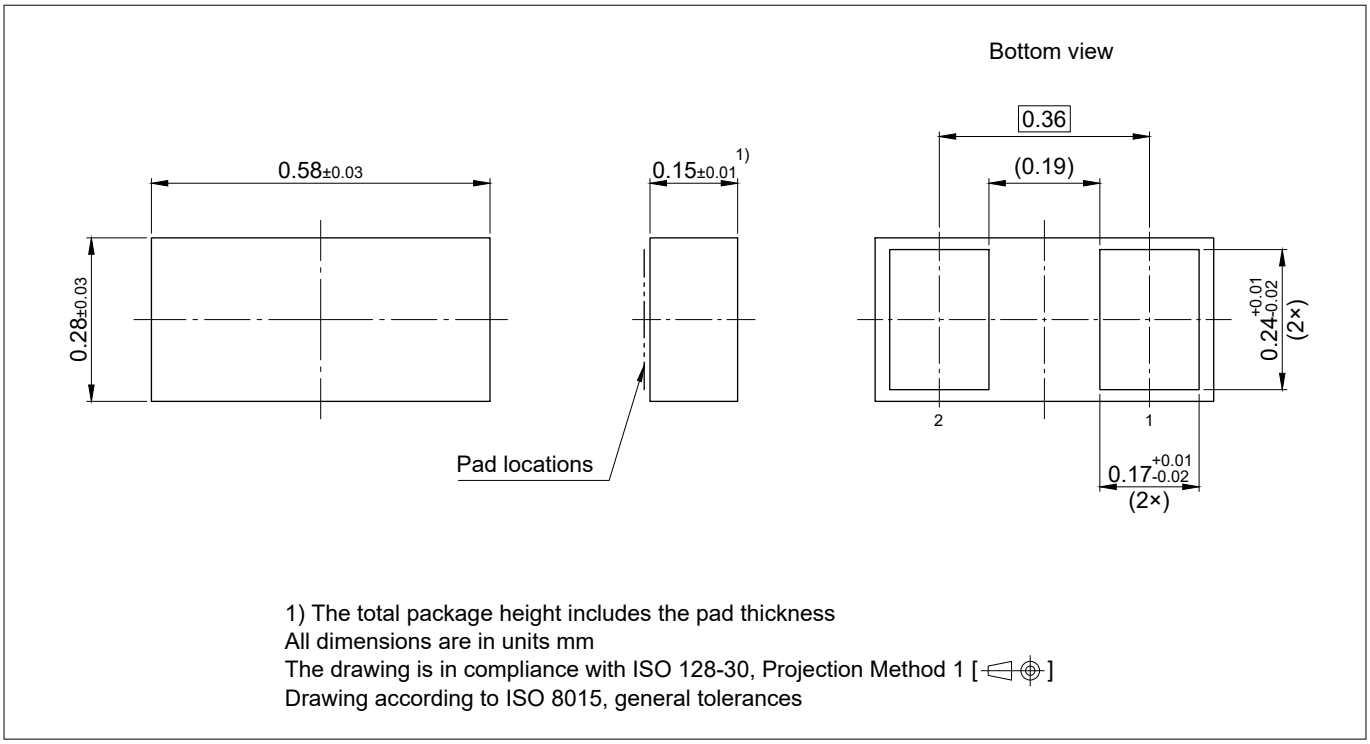


Figure 15 WLL-2-3 package

***Note**: For package information including footprint, packing and assembly recommendation refer to:*

https://www.infineon.com/cms/en/product/packages/SG-WLL/SG-WLL-2-3/

5 References

[1]	Infineon AG - Understanding ESD protection device characteristics
[2]	Infineon AG - **Application note AN210**: Effective ESD Protection Design at System Level Using VF-TLP Characterization Methodology

6 Revision history

Document version	Date of release	Description of changes
1.0	2018-11-23	• ESD values updated • Capacitance diagram C_L = f(f) added
2.0	2019-08-09	• New datasheet layout
3.0	2020-11-30	• Editorial changes
3.1	2024-01-05	• Added link to application note in Table 2
3.2	2025-07-29	• Updated new package drawing

Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

Edition 2025-07-29

Published by

Infineon Technologies AG

81726 Munich, Germany

© 2025 Infineon Technologies AG

All Rights Reserved.

Do you have a question about any aspect of this document?

Email: erratum@infineon.com

Document reference
IFX-zks1602769358028

Important notice

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie").

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

Warnings

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.