

Protection Device

TVS (Transient Voltage Suppressor)

ESD113-B1 Series

Bi-directional, 3.6 V, 0.2 pF, 0201, 0402, RoHS and Halogen Free compliant

ESD113-B1-02ELS
ESD113-B1-02EL

Data Sheet

Revision 1.2, 2014-05-14
Final

Edition 2014-05-14

**Published by
Infineon Technologies AG
81726 Munich, Germany
© 2014 Infineon Technologies AG
All Rights Reserved.**

Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office (www.infineon.com)

Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

Infineon Technologies components may be used in life-support devices or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

1 Product Overview

1.1 Features

- ESD / transient protection of high speed data lines according to:
 - IEC61000-4-2 (ESD): ± 20 kV (air / contact)
 - IEC61000-4-4 (EFT): ± 2.5 kV / ± 50 A (5/50 ns)
 - IEC61000-4-5 (surge): ± 3 A (8/20 μ s)
- Bi-directional, working voltage up to: $V_{RWM} = \pm 3.6$ V
- Ultra low capacitance $C_L = 0.20$ pF (typical) at $f = 1$ GHz
- Very low clamping voltage: $V_{CL} = 14$ V (typical) at $I_{TLP} = 16$ A
- Very low reverse current: $I_R < 1$ nA (typical)
- Very low dynamic resistance: $R_{DYN} = 0.45$ Ω (typical)
- Pb-free and halogen-free package (RoHS compliant)



1.2 Application Examples

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

1.3 Product Description

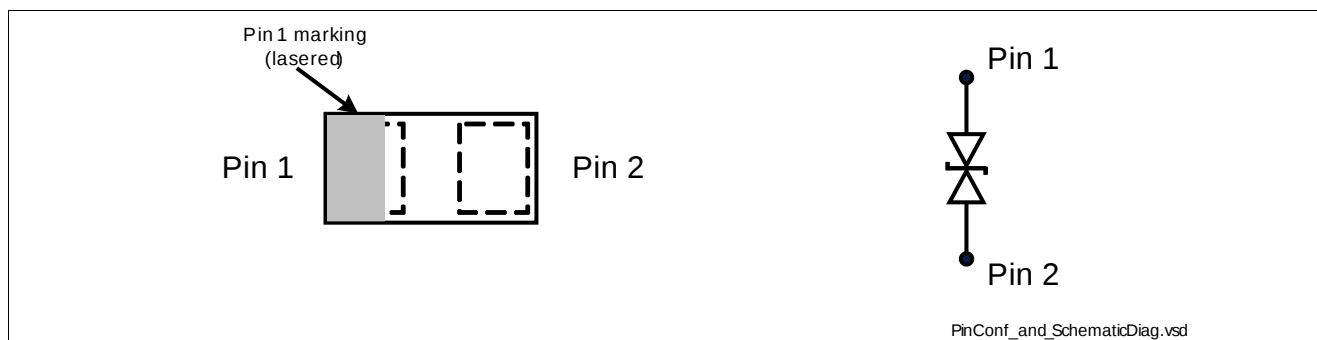


Figure 1-1 Pin Configuration and Schematic Diagram

Table 1-1 Part Information

Type	Package	Configuration	Marking code
ESD113-B1-02ELS	TSSLP-2-4	1 line, bi-directional	<u>2</u>
ESD113-B1-02EL	TSLP-2-20	1 line, bi-directional	CC

2 Maximum Ratings

Table 2-1 Maximum Rating at $T_A = 25\text{ °C}$, unless otherwise specified¹⁾

Parameter	Symbol	Values	Unit
ESD air discharge ²⁾	V_{ESD}	± 20	kV
ESD contact discharge ²⁾		± 20	
Peak pulse power	P_{PK}	36	W
Peak pulse current ³⁾	I_{PP}	± 3	A
Operating temperature	T_{OP}	-55 to 125	°C
Storage temperature	T_{stg}	-65 to 150	°C

1) Device is electrically symmetrical

2) V_{ESD} according to IEC61000-4-2

3) Non-repetitive current pulse 8/20 μ s exponential decay waveform according to IEC61000-4-5

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 component.

3 Electrical Characteristics at $T_A = 25\text{ °C}$, unless otherwise specified

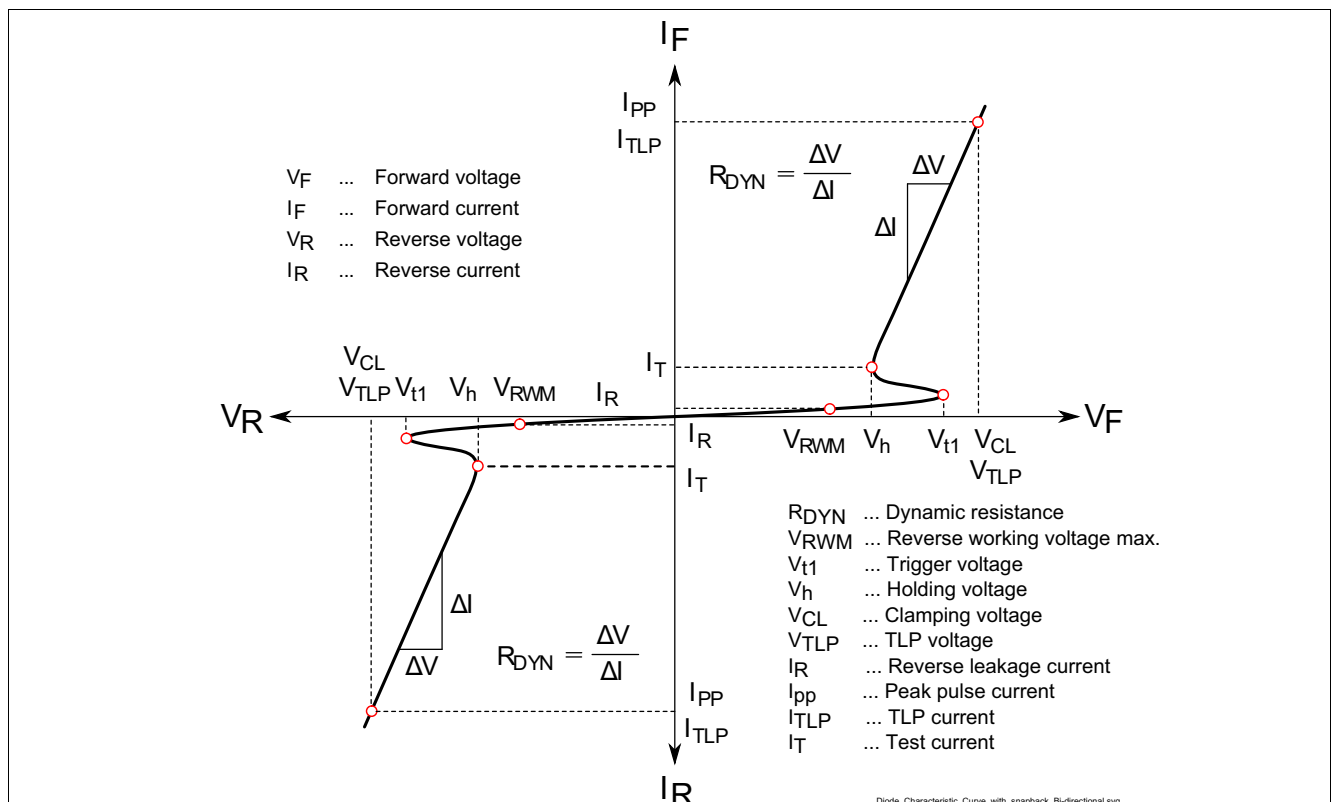


Figure 3-1 Definitions of electrical characteristics

Electrical Characteristics at $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise specified
Table 3-1 DC Characteristics at $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise specified ¹⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Reverse working voltage	V_{RWM}	-3.6	—	3.6	V	
Trigger voltage	V_{t1}	4	—	—		
Holding voltage	V_h	4	4.6	5.5		$I_T = 10\text{ mA}$
Reverse leakage current	I_R	—	<1	20	nA	$V_R = 3.3\text{ V}$

1) Device is electrically symmetrical

Table 3-2 AC 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	—	0.2	0.35	pF	$V_R = 0\text{ V}, f = 1\text{ MHz}$
		—	0.2	—		$V_R = 0\text{ V}, f = 1\text{ GHz}$
Series inductance	L_S	—	0.2	—	nH	ESD113-B1-02ELS
		—	0.4	—		ESD113-B1-02EL

Table 3-3 ESD and Surge Characteristics at $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise specified ¹⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Clamping voltage ²⁾	V _{CL}	—	14	—	V	I _{TLP} = 16 A, t _p = 100 ns
		—	20	—		I _{TLP} = 30 A, t _p = 100 ns
Clamping voltage ³⁾		—	6	—		I _{PP} = 1 A, t _p = 8/20 μs
		—	8	—		I _{PP} = 3 A, t _p = 8/20 μs
Dynamic resistance ²⁾	R _{DYN}	—	0.45	—	Ω	t _p = 100 ns

1) Device is electrically symmetrical

2) Please refer to Application Note AN210[1]. TLP parameter: $Z_0 = 50\text{ }\Omega$, $t_p = 100\text{ ns}$, $t_r = 300\text{ ps}$.

3) Non-repetitive current pulse 8/20 μs exponential decay waveform according to IEC61000-4-5

4 Typical Characteristics Diagrams

Typical characteristics diagrams at $T_A=25^\circ\text{C}$, unless otherwise specified

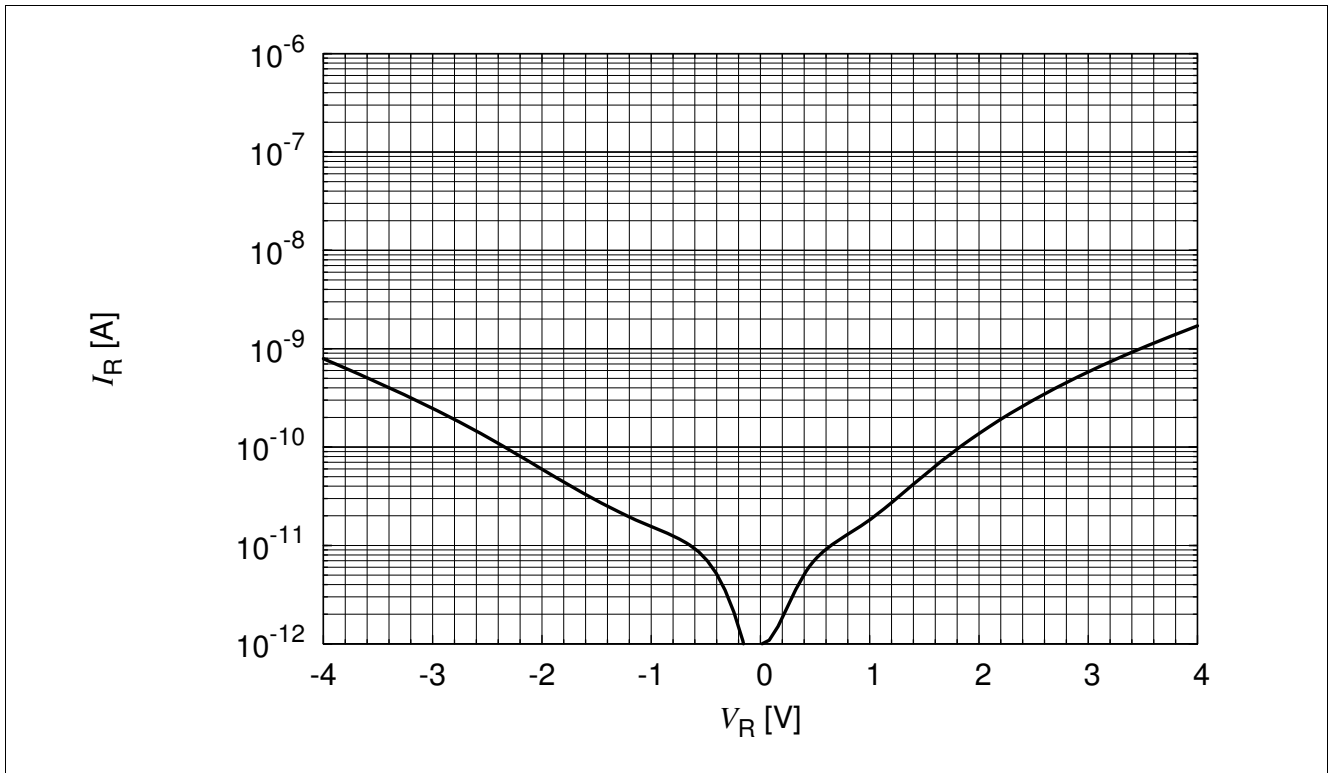


Figure 4-1 Reverse leakage current $I_R = f(V_R)$

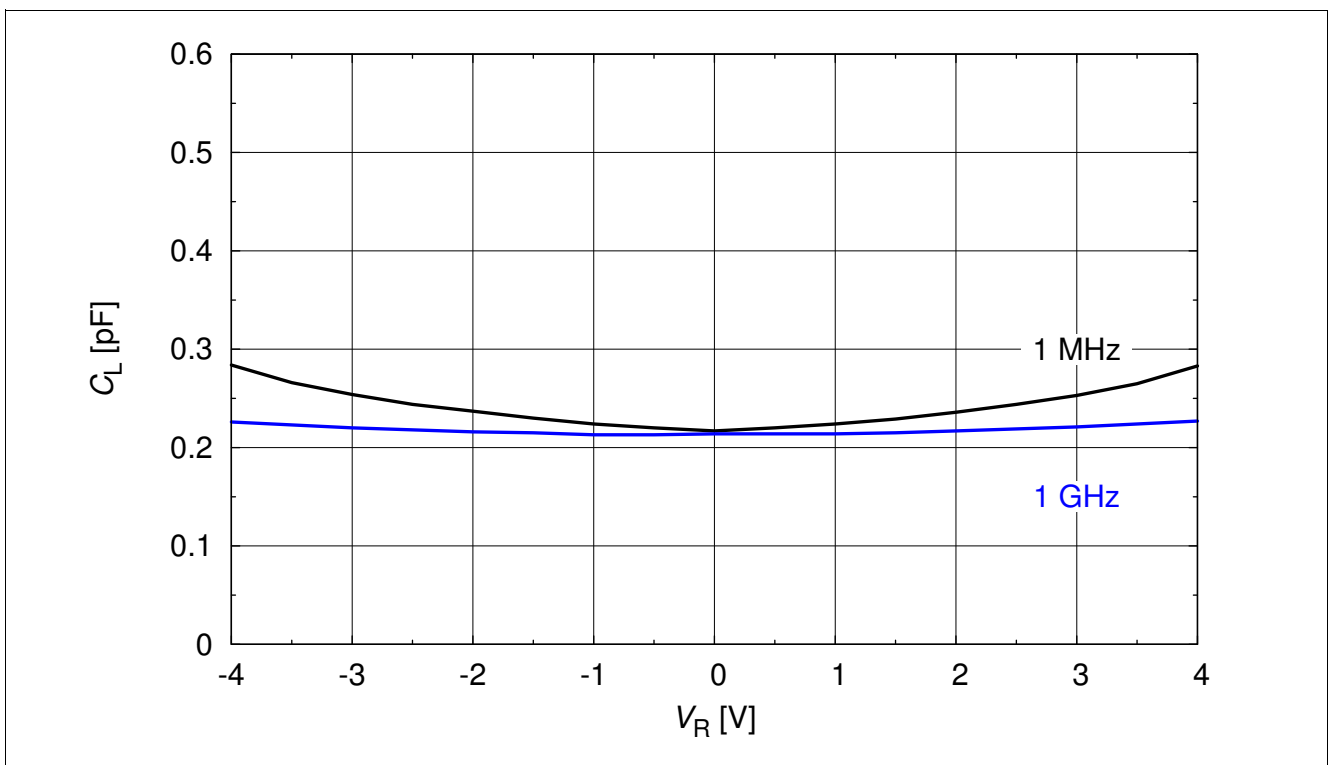


Figure 4-2 Line capacitance $C_L = f(V_R)$

Typical Characteristics Diagrams

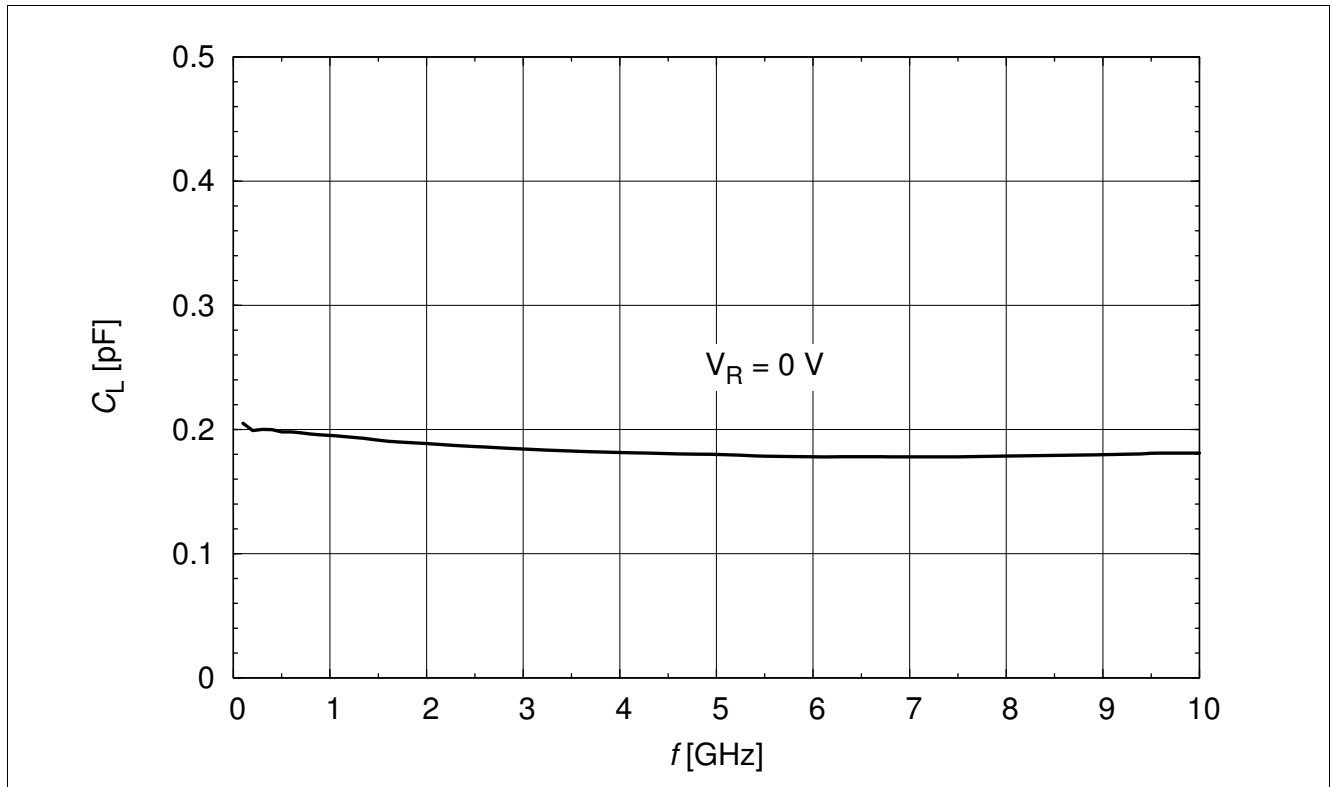


Figure 4-3 Line capacitance: $C_L = f(f)$, $V_R = 0$ V

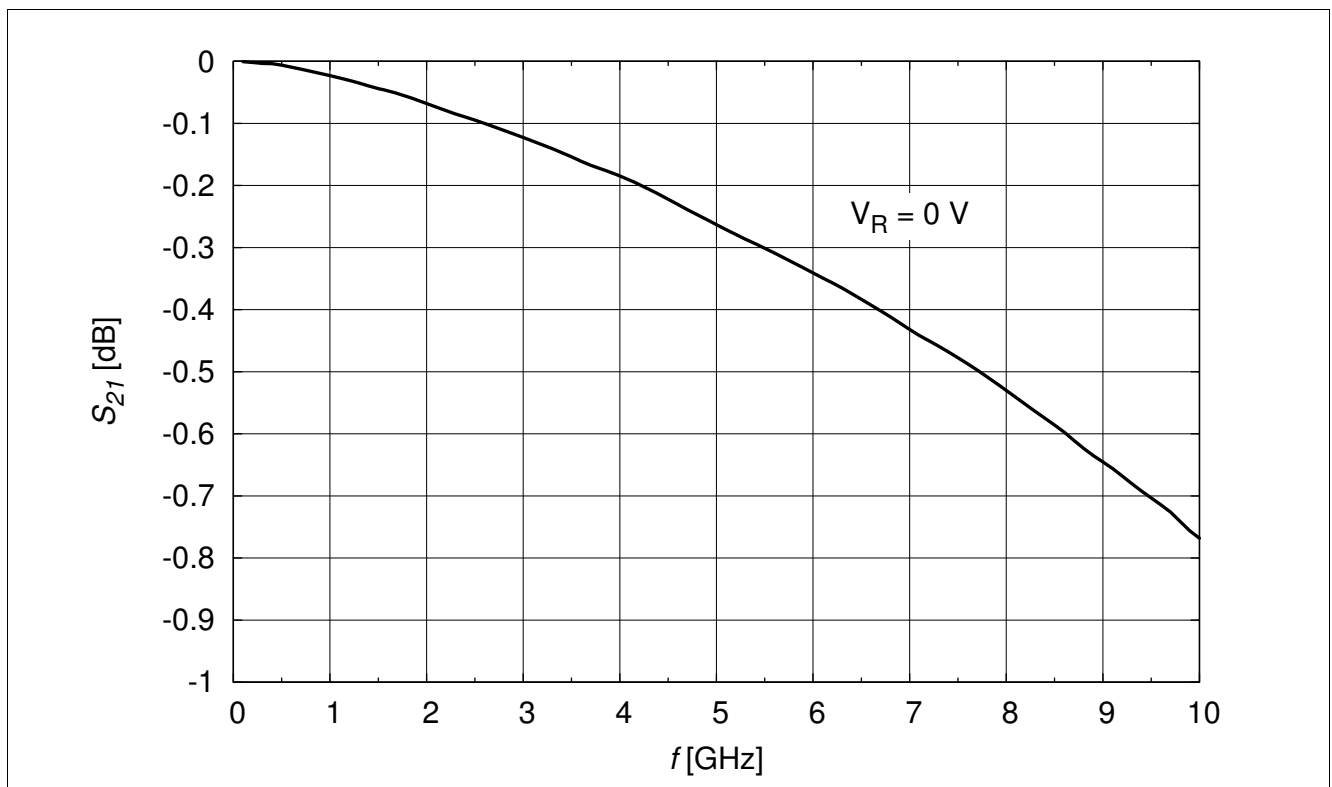


Figure 4-4 Insertion loss vs. frequency in a 50 Ω system

Typical Characteristics Diagrams

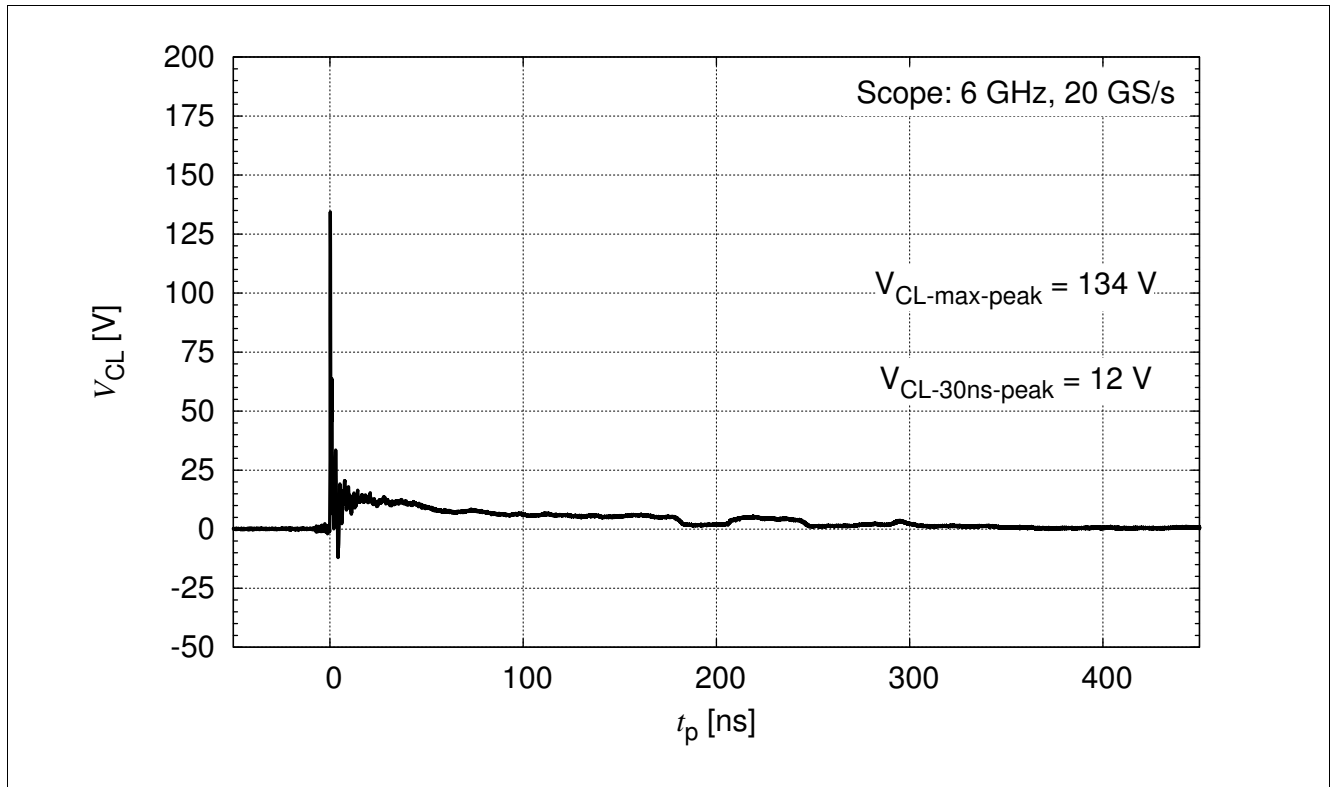


Figure 4-5 Clamping voltage (ESD): $V_{CL} = f(t)$, 8 kV positiv pulse from pin 1 to pin 2

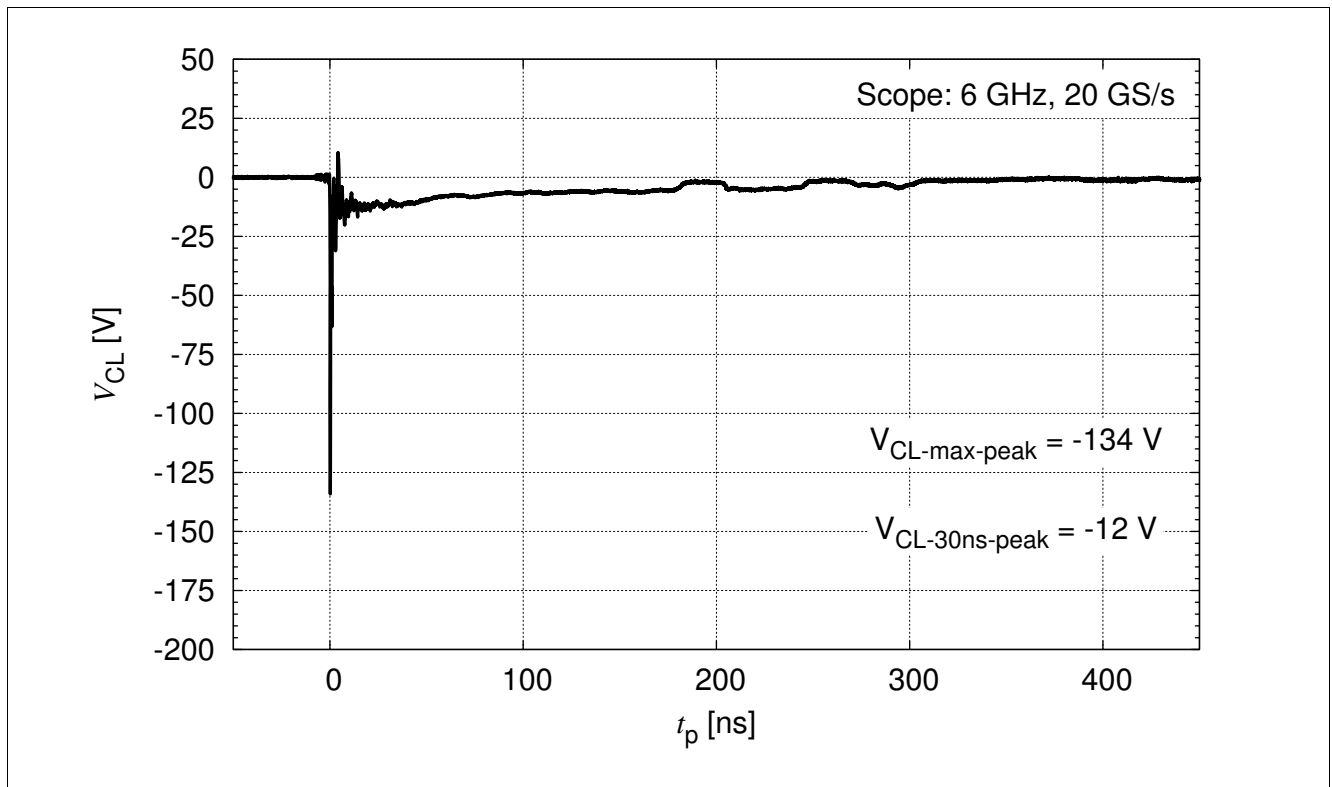


Figure 4-6 Clamping voltage (ESD): $V_{CL} = f(t)$, 8 kV negativ pulse from pin 1 to pin 2

Typical Characteristics Diagrams

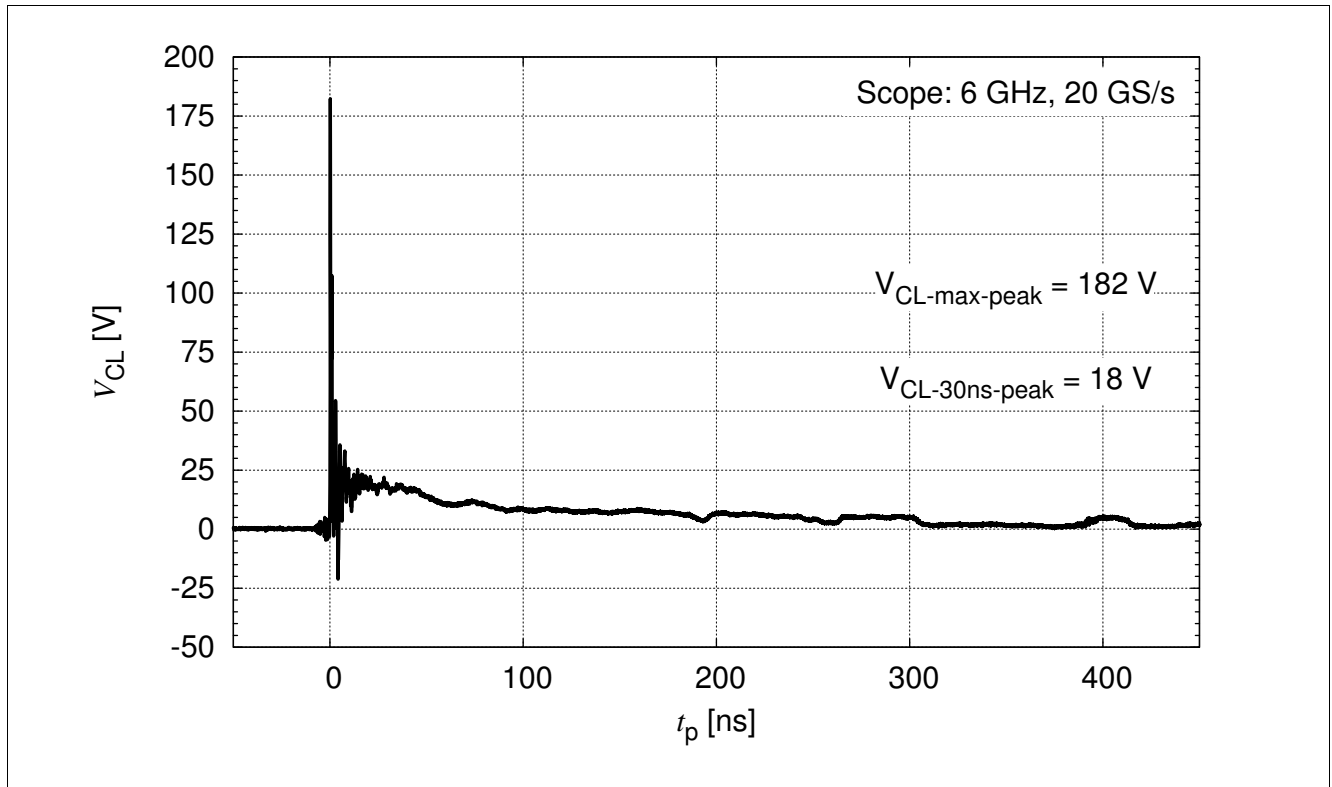


Figure 4-7 Clamping voltage (ESD): $V_{CL} = f(t)$, 15 kV positiv pulse from pin 1 to pin 2

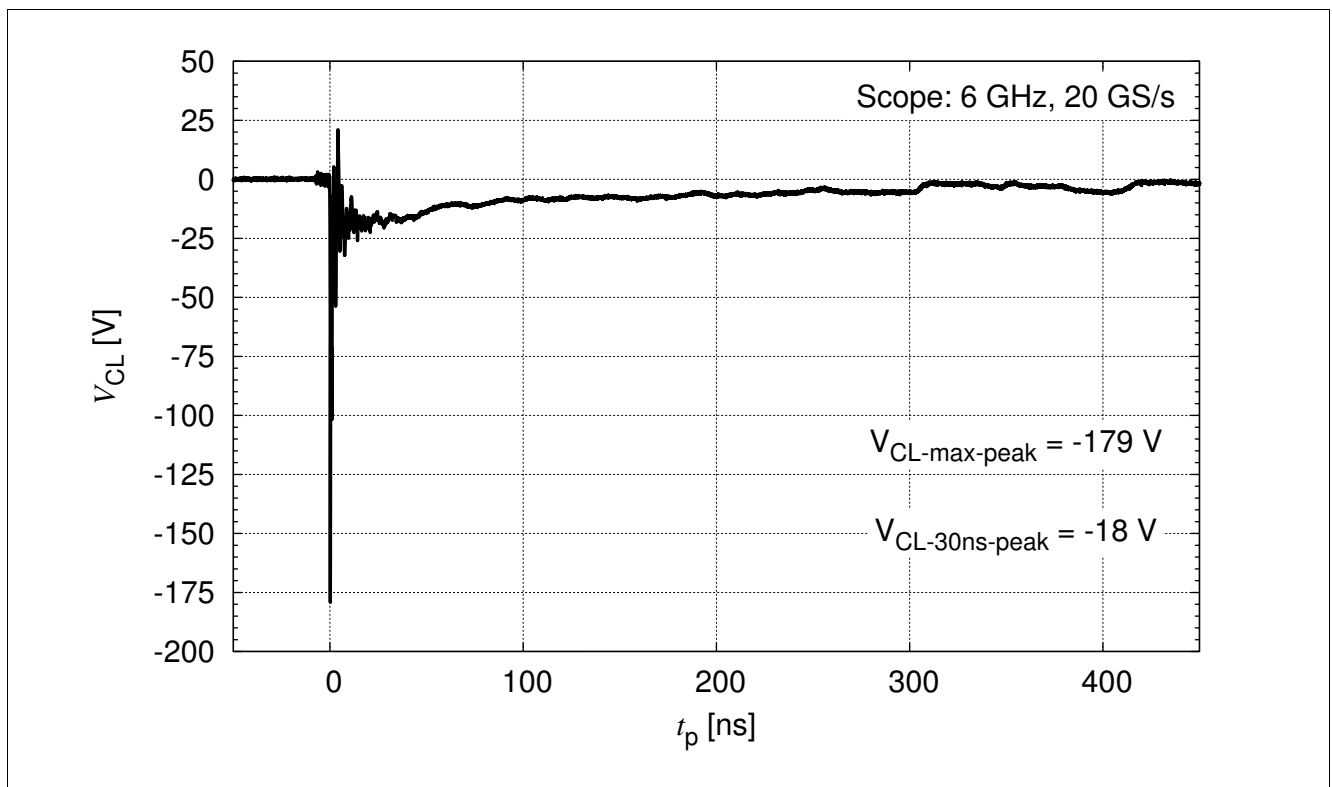


Figure 4-8 Clamping voltage (ESD): $V_{CL} = f(t)$, 15 kV negativ pulse from pin 1 to pin 2

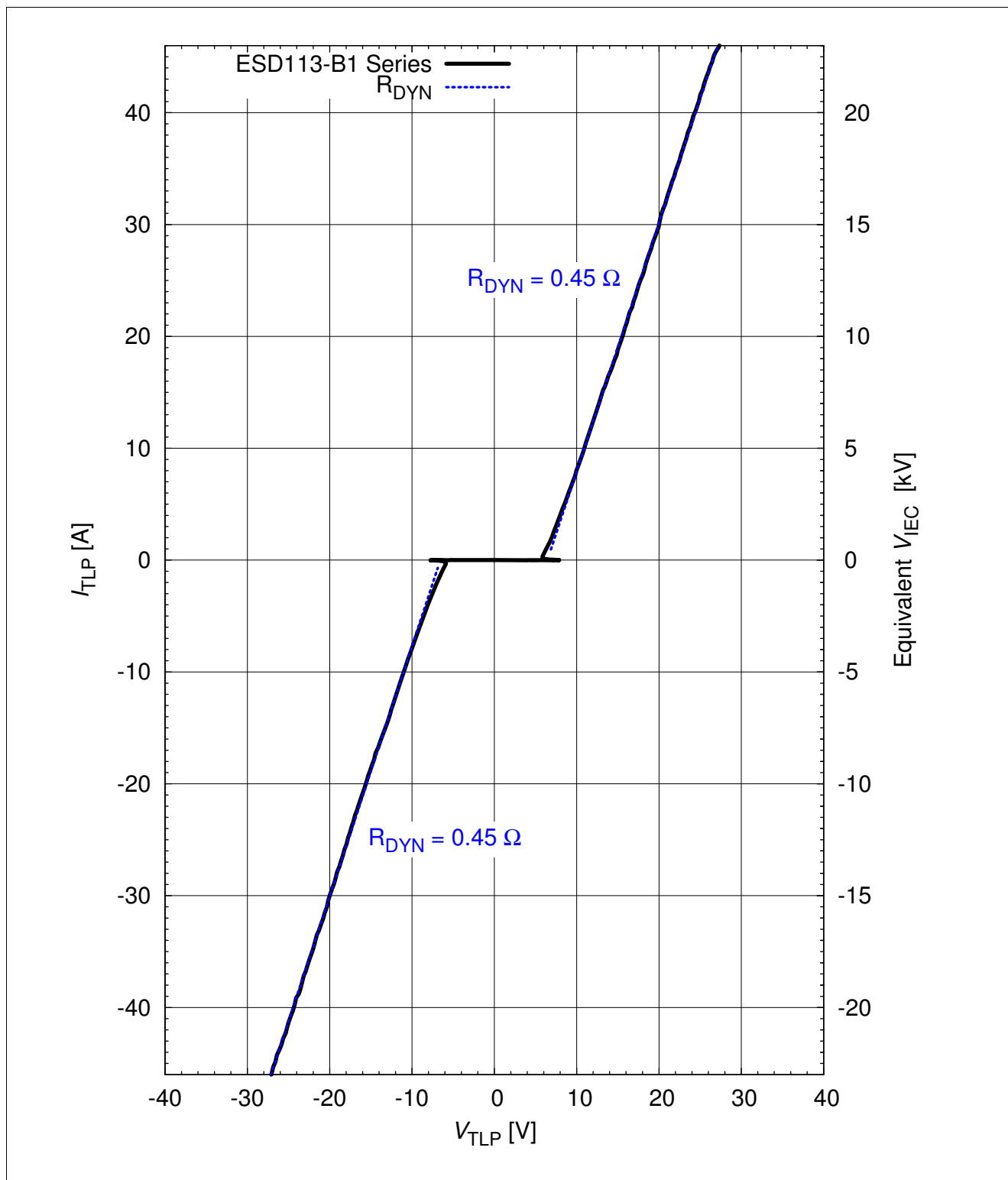


Figure 4-9 Clamping voltage (TLP): $I_{TLP} = f(V_{TLP})$ [1], pin 1 to pin 2

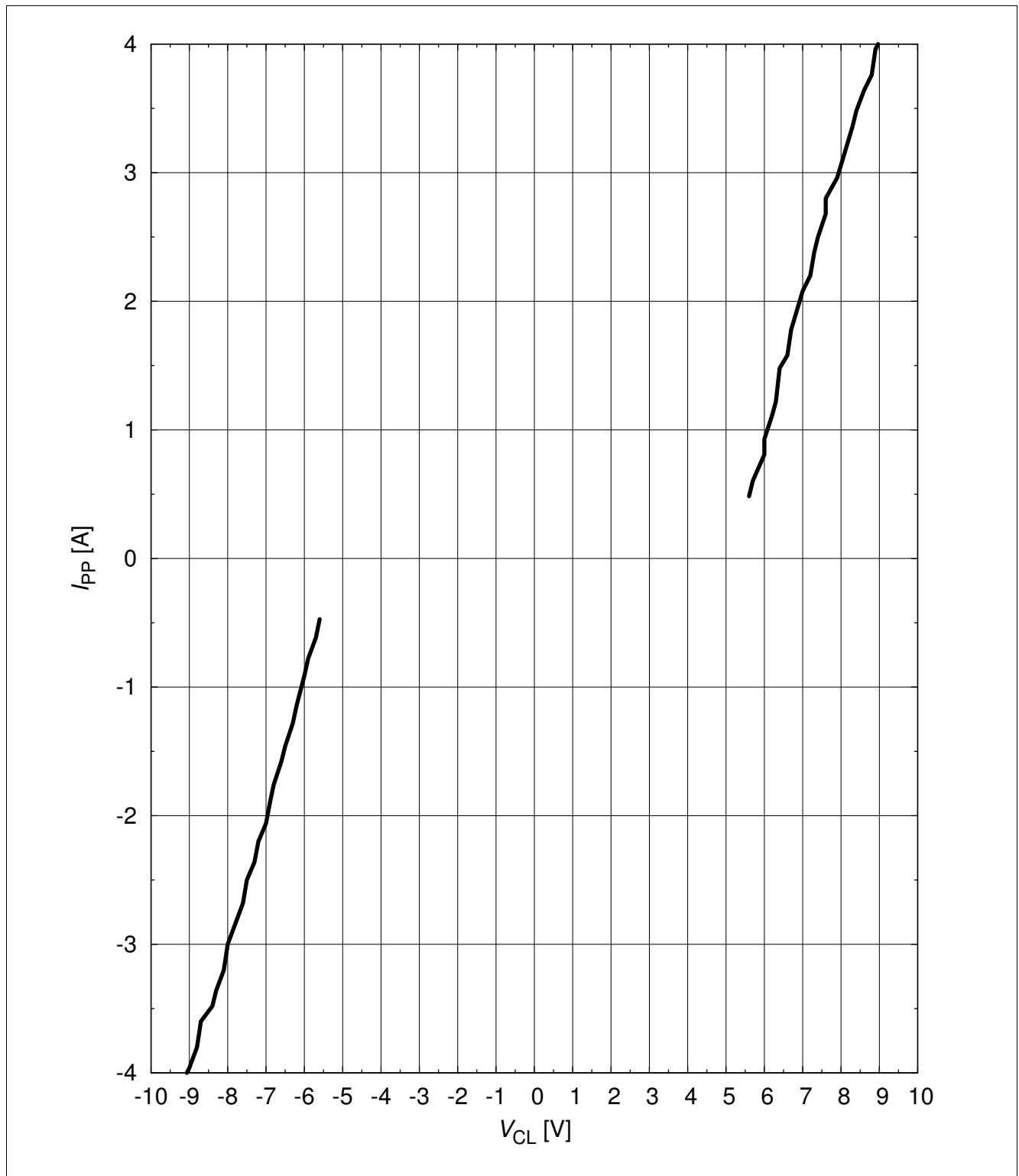


Figure 4-10 Clamping voltage (Surge): $I_{PP} = f(V_{CL})$ [1], pin 1 to pin 2

5 Package Information

5.1 TSSLP-2-4

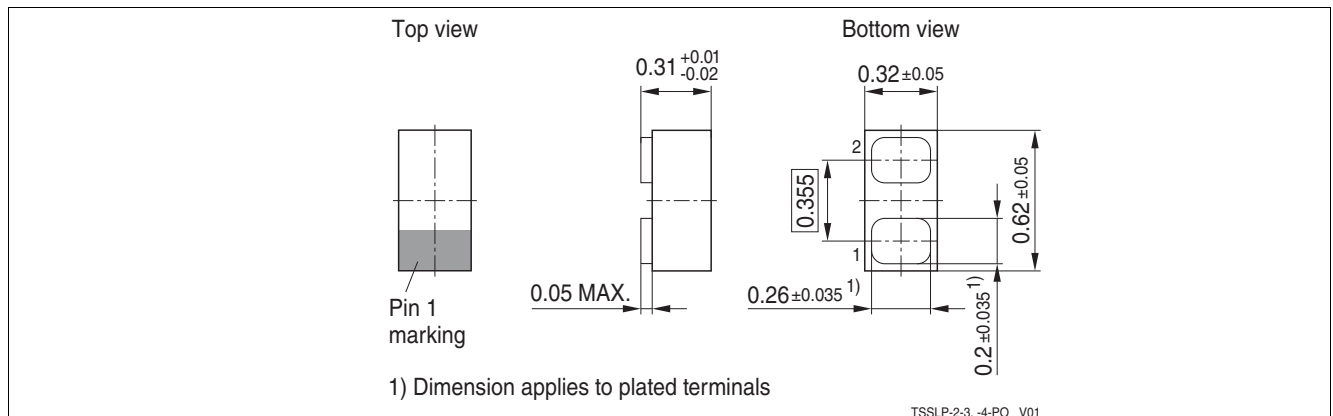


Figure 5-1 TSSLP-2-4 Package outline (dimension in mm)

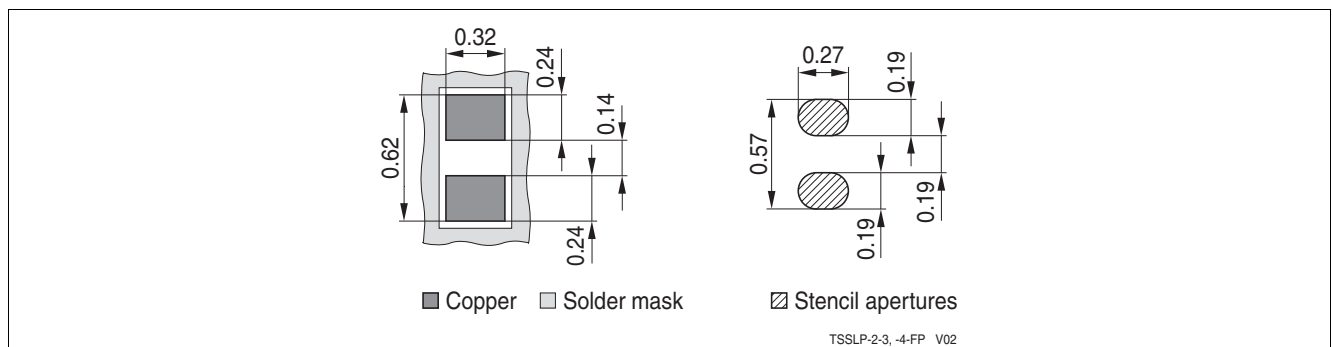


Figure 5-2 TSSLP-2-4 Footprint (dimension in mm)

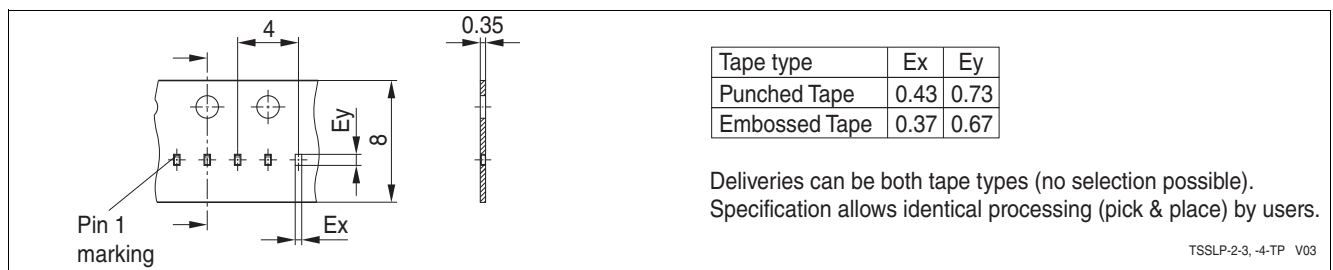


Figure 5-3 TSSLP-2-4 Packing (dimension in mm)

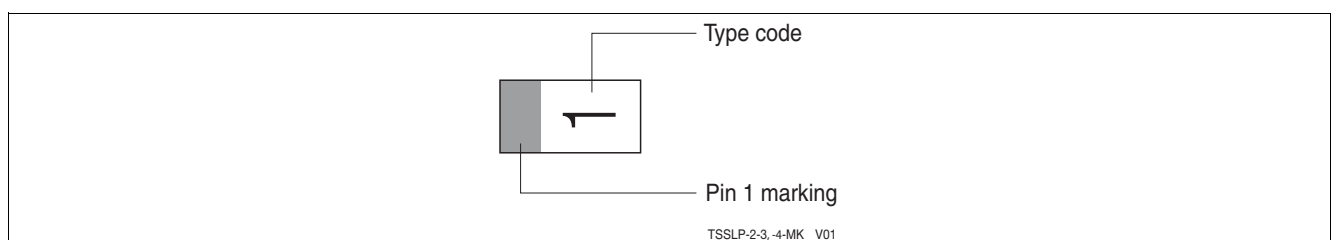


Figure 5-4 TSSLP-2-4 Marking example [Table 1-1 "Part Information" on Page 3](#)

5.2 TSLP-2-20

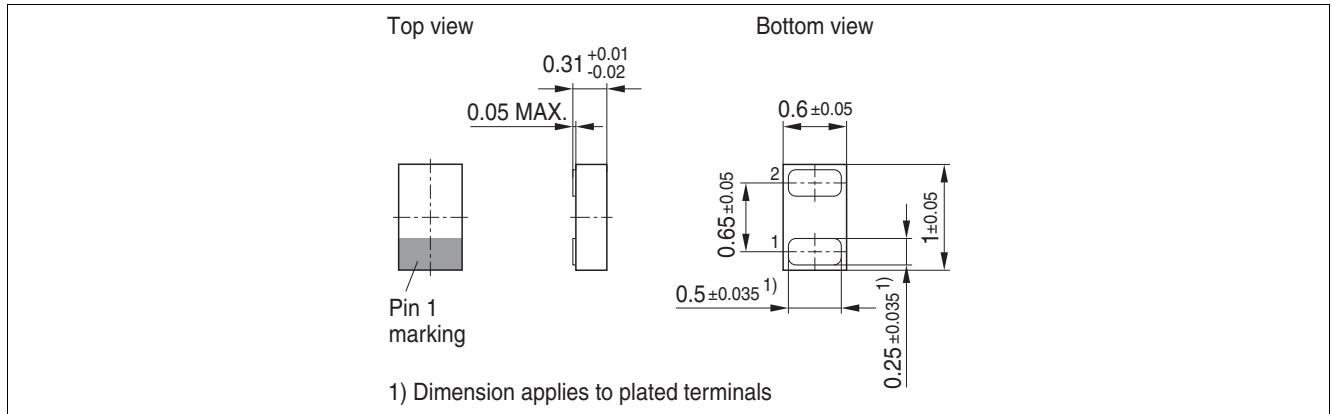


Figure 5-5 TSLP-2-20 Package outline (dimension in mm)

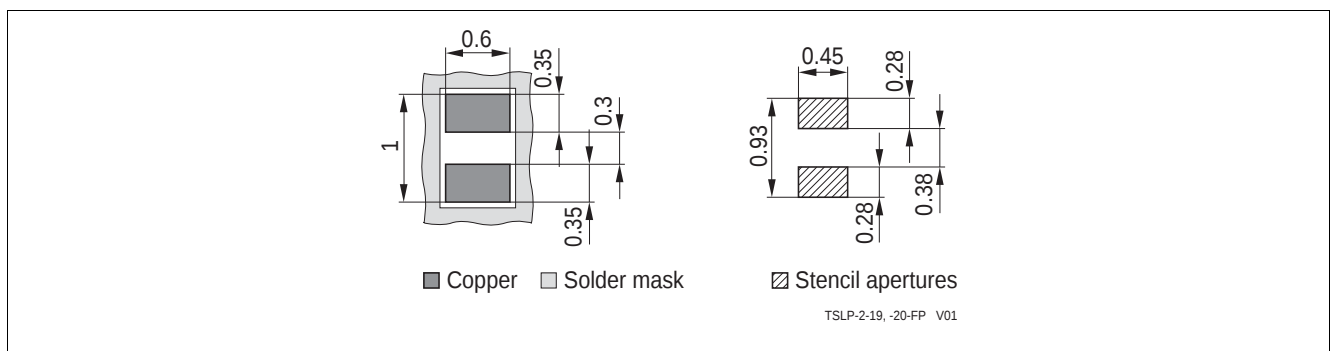


Figure 5-6 TSLP-2-20 Footprint (dimension in mm)

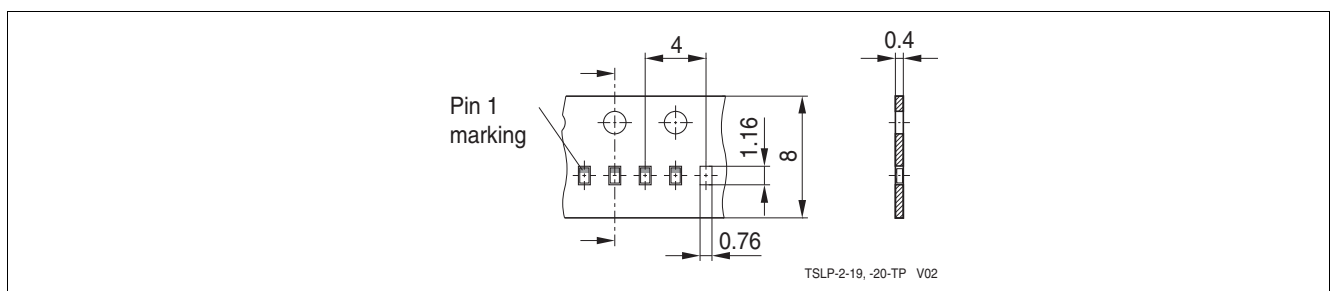


Figure 5-7 TSLP-2-20 Packing (dimension in mm)

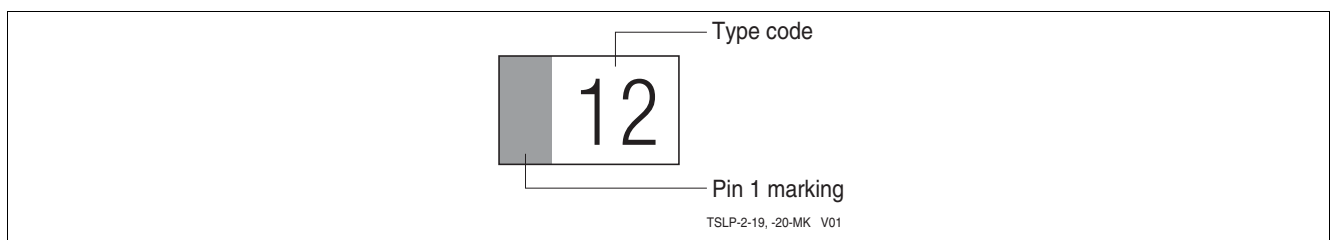


Figure 5-8 TSSLP-2-4 Marking example [Table 1-1 "Part Information" on Page 3](#)

References

- [1] Infineon AG - **Application Note AN210:** Effective ESD Protection Design at System Level Using VF-TLP Characterization Methodology
- [2] Infineon AG - Recommendations for PCB Assembly of Infineon TSLP and TSSLP Package

Revision History: Rev.1.1, 2013-02-06

Page or Item	Subjects (major changes since previous revision)
--------------	--

Revision 1.2, 2014-05-14

All	New type ESD113-B1-02EL inserted

Trademarks of Infineon Technologies AG

AURIX™, BlueMoon™, C166™, CanPAK™, CIPOS™, CIPURSE™, COMNEON™, EconoPACK™, CoolMOS™, CoolSET™, CORECONTROL™, CROSSAVE™, DAVE™, EasyPIM™, EconoBRIDGE™, EconoDUAL™, EconoPIM™, EiceDRIVER™, eupec™, FCOS™, HITFET™, HybridPACK™, I²RF™, ISOFACE™, IsoPACK™, MIPAQ™, ModSTACK™, my-d™, NovalithIC™, OmniTune™, OptiMOS™, ORIGA™, PRIMARION™, PrimePACK™, PrimeSTACK™, PRO-SIL™, PROFET™, RASIC™, ReverSave™, SatRIC™, SIEGET™, SINDRION™, SIPMOS™, SMARTi™, SmartLEWIS™, SOLID FLASH™, TEMPFET™, thinQ!™, TRENCHSTOP™, TriCore™, X-GOLD™, X-PMU™, XMM™, XPOSYS™.

Other Trademarks

Advance Design System™ (ADS) of Agilent Technologies, AMBA™, ARM™, MULTI-ICE™, KEIL™, PRIMECELL™, REALVIEW™, THUMB™, μVision™ of ARM Limited, UK. AUTOSAR™ is licensed by AUTOSAR development partnership. Bluetooth™ of Bluetooth SIG Inc. CAT-ig™ of DECT Forum. COLOSSUS™, FirstGPS™ of Trimble Navigation Ltd. EMV™ of EMVCo, LLC (Visa Holdings Inc.). EPCOS™ of Epcos AG. FLEXGO™ of Microsoft Corporation. FlexRay™ is licensed by FlexRay Consortium. HYPERTERMINAL™ of Hilgraeve Incorporated. IEC™ of Commission Electrotechnique Internationale. IrDA™ of Infrared Data Association Corporation. ISO™ of INTERNATIONAL ORGANIZATION FOR STANDARDIZATION. MATLAB™ of MathWorks, Inc. MAXIM™ of Maxim Integrated Products, Inc. MICROTEC™, NUCLEUS™ of Mentor Graphics Corporation. Mifare™ of NXP. MIPI™ of MIPI Alliance, Inc. MIPS™ of MIPS Technologies, Inc., USA. muRata™ of MURATA MANUFACTURING CO., MICROWAVE OFFICE™ (MWO) of Applied Wave Research Inc., OmniVision™ of OmniVision Technologies, Inc. Openwave™ Openwave Systems Inc. RED HAT™ Red Hat, Inc. RFMD™ RF Micro Devices, Inc. SIRIUS™ of Sirius Satellite Radio Inc. SOLARIS™ of Sun Microsystems, Inc. SPANSION™ of Spansion LLC Ltd. Symbian™ of Symbian Software Limited. TAIYO YUDEN™ of Taiyo Yuden Co. TEAKLITE™ of CEVA, Inc. TEKTRONIX™ of Tektronix Inc. TOKO™ of TOKO KABUSHIKI KAISHA TA. UNIX™ of X/Open Company Limited. VERILOG™, PALLADIUM™ of Cadence Design Systems, Inc. VLYNQ™ of Texas Instruments Incorporated. VXWORKS™, WIND RIVER™ of WIND RIVER SYSTEMS, INC. ZETEX™ of Diodes Zetex Limited.

Last Trademarks Update 2010-10-26

www.infineon.com

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

moschip.ru_6

moschip.ru_9