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

Power Management & Multimarket

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 µs)**
- Bi-directional, working voltage up to: V_{RWM} **= ±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

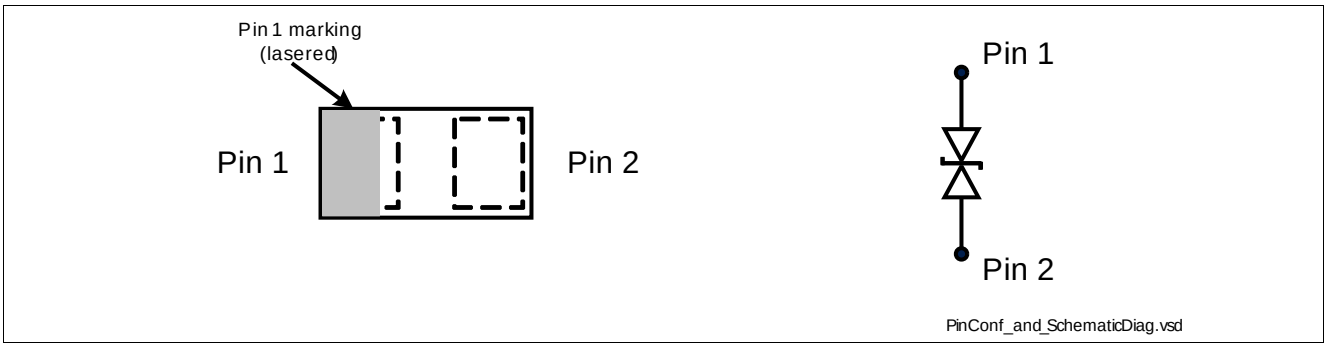


Figure 1-1 Pin Configuration and Schematic Diagram

Table 1-1 Part Information

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

2 Maximum Ratings

Table 2-1 Maximum Rating *at T_A = 25 °C, unless otherwise specified*[1)]

Parameter	Symbol	Values	Unit
ESD air discharge[2)] ESD contact discharge[2)]	V_{ESD}	±20 ±20	kV
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 µs 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 °C, unless otherwise specified

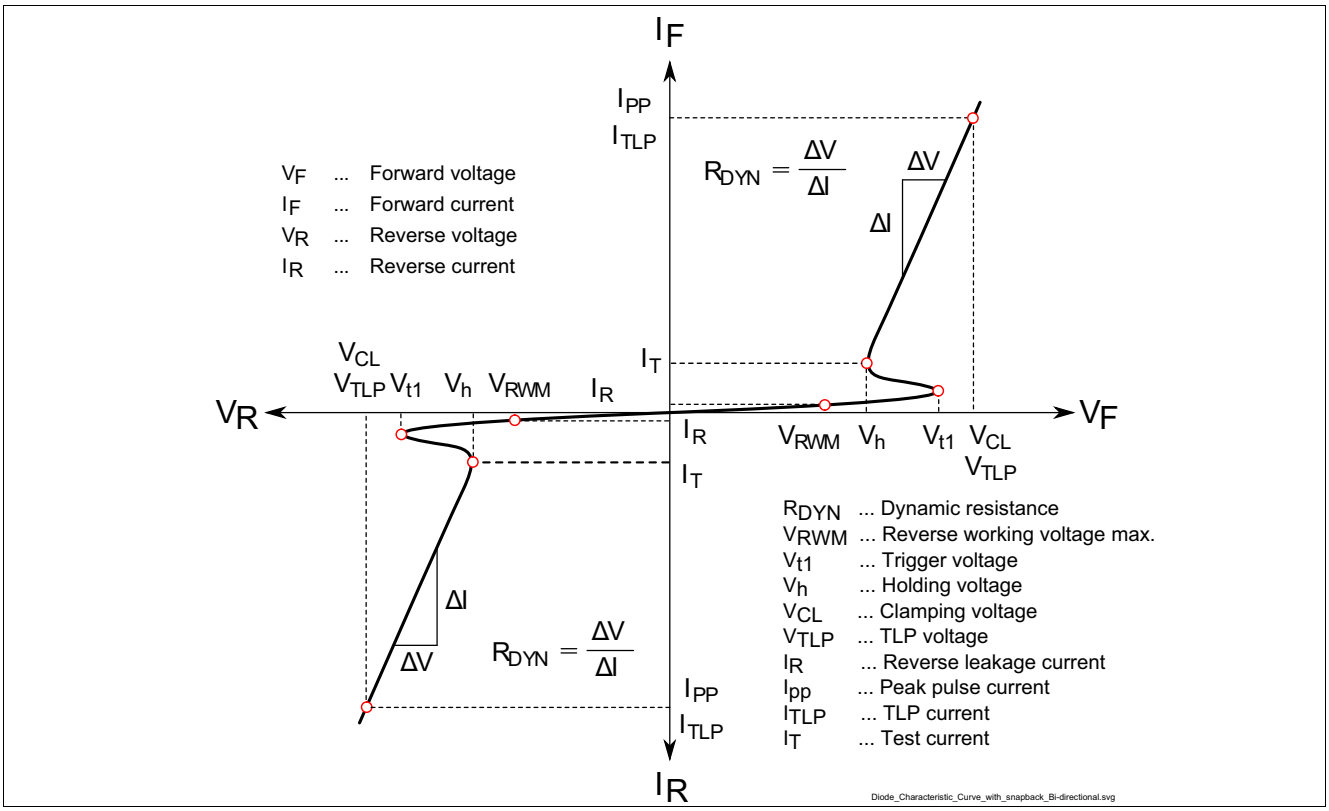


Figure 3-1 Definitions of electrical characteristics

Table 3-1 DC Characteristics at T_A = 25 °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 mA
Reverse leakage current	I_R	–	<1	20	nA	V_R = 3.3 V

1) Device is electrically symmetrical

Table 3-2 AC Characteristics at T_A = 25 °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 V, f = 1 MHz
		–	0.2	–		V_R = 0 V, f = 1 GHz
Series inductance	L_S	– –	0.2 0.4	– –	nH	ESD113-B1-02ELS ESD113-B1-02EL

Table 3-3 ESD and Surge Characteristics at T_A = 25 °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 Ω , t_p = 100ns, t_r = 300ps.

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

4 Typical Characteristics Diagrams

Typical characteristics diagrams at T_A=25°C, unless otherwise specified

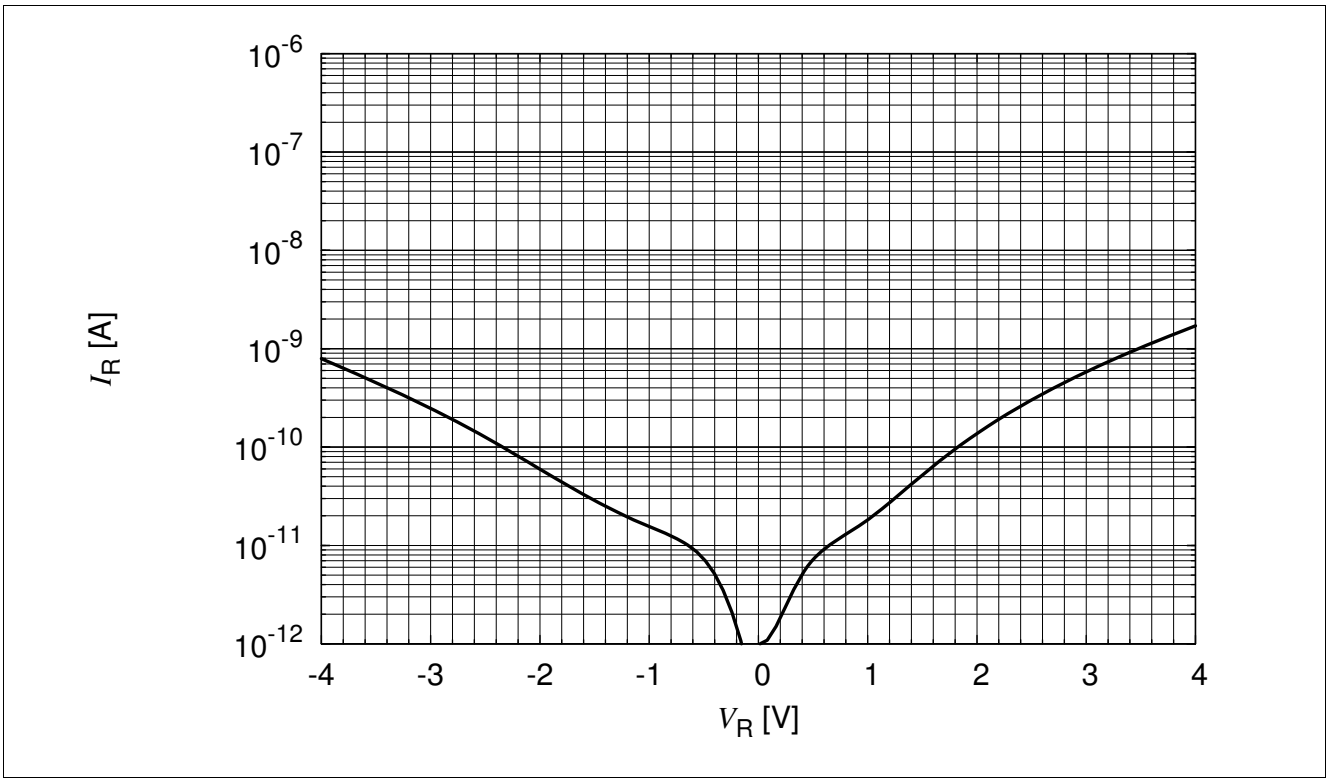


Figure 4-1 Reverse leakage current I_R = f(V_R)

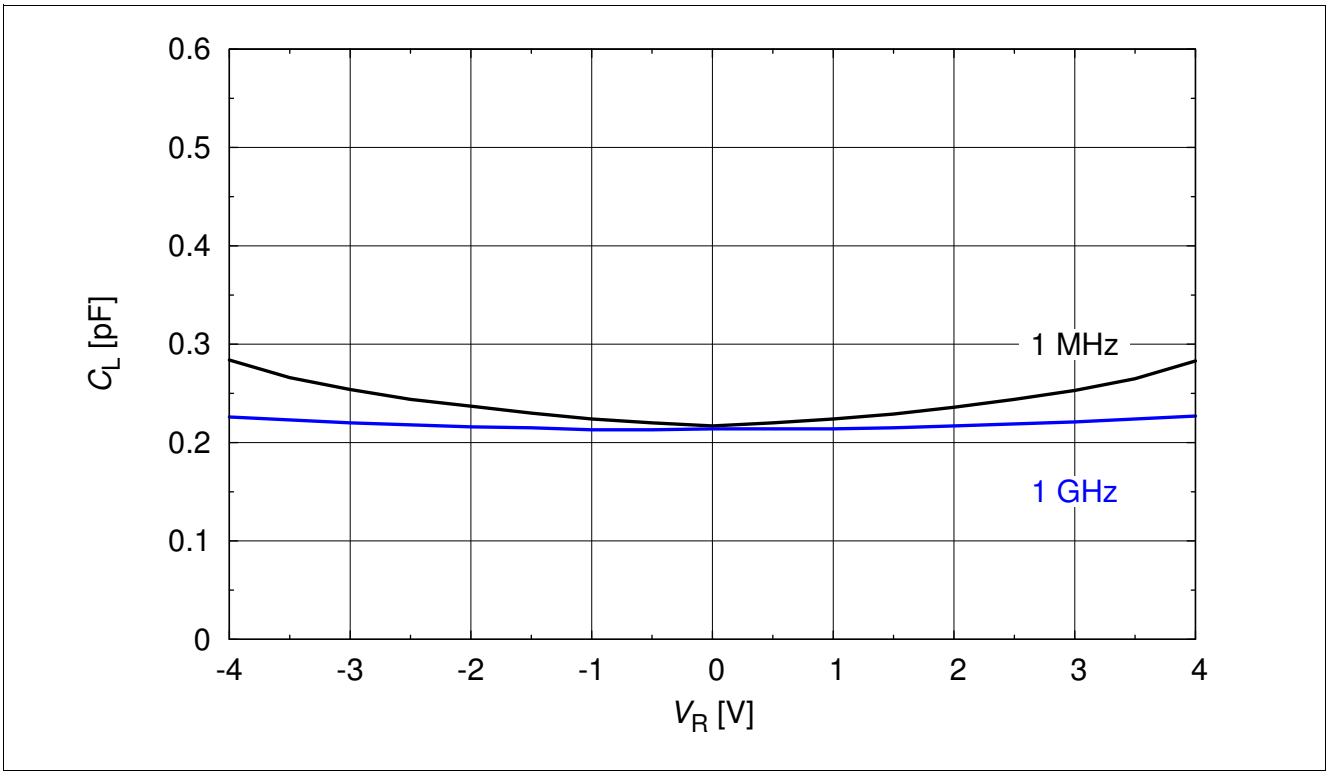


Figure 4-2 Line capacitance C_L = f(V_R)

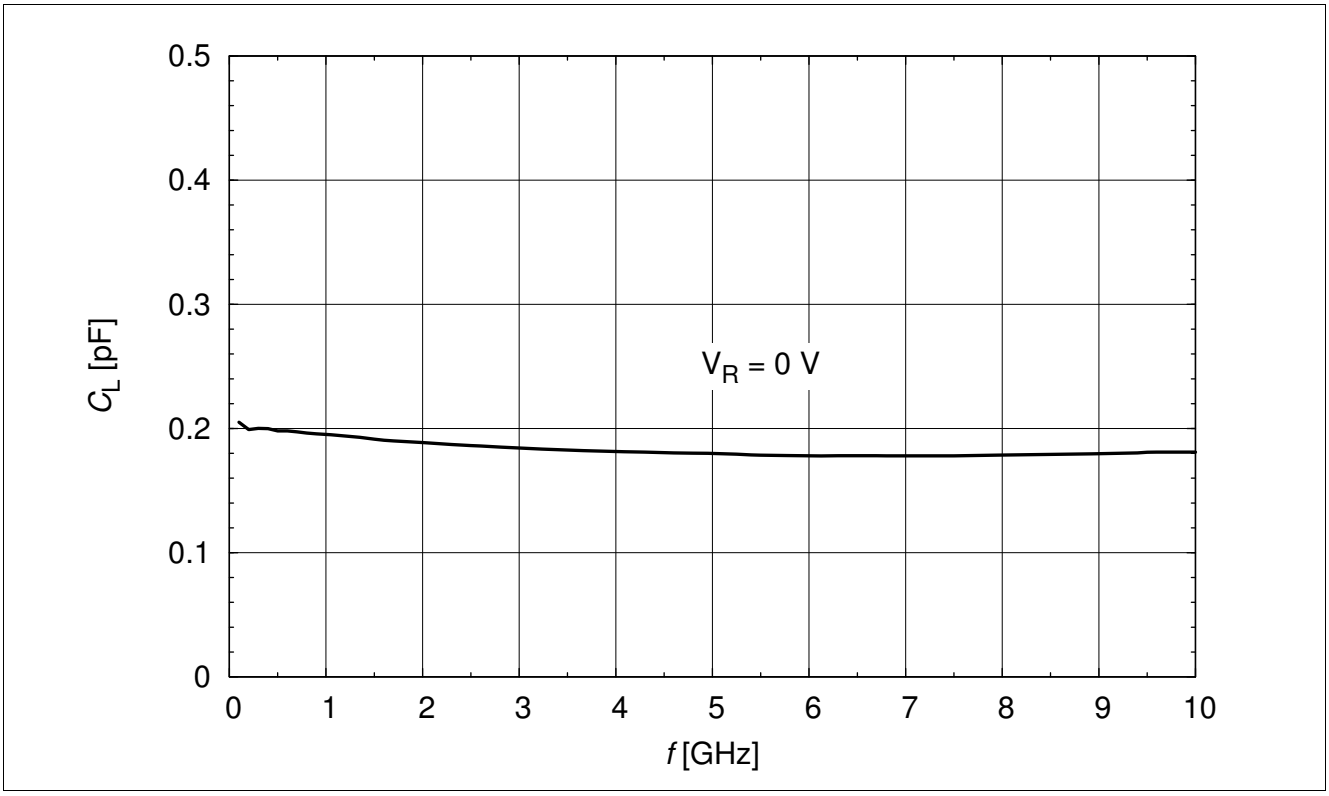


Figure 4-3 Line capacitance: $C_L = f(f)$, $V_R = 0$ V

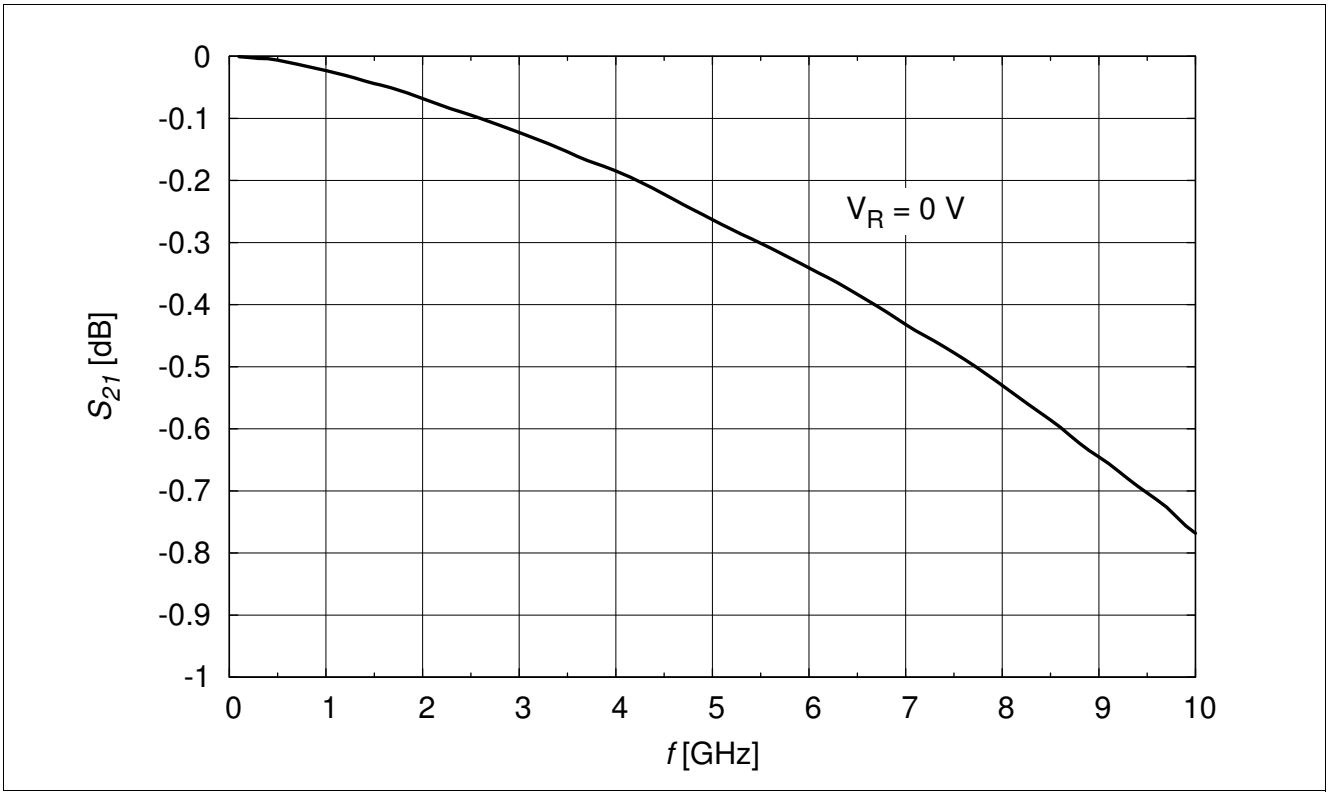


Figure 4-4 Insertion loss vs. frequency in a 50 Ω system

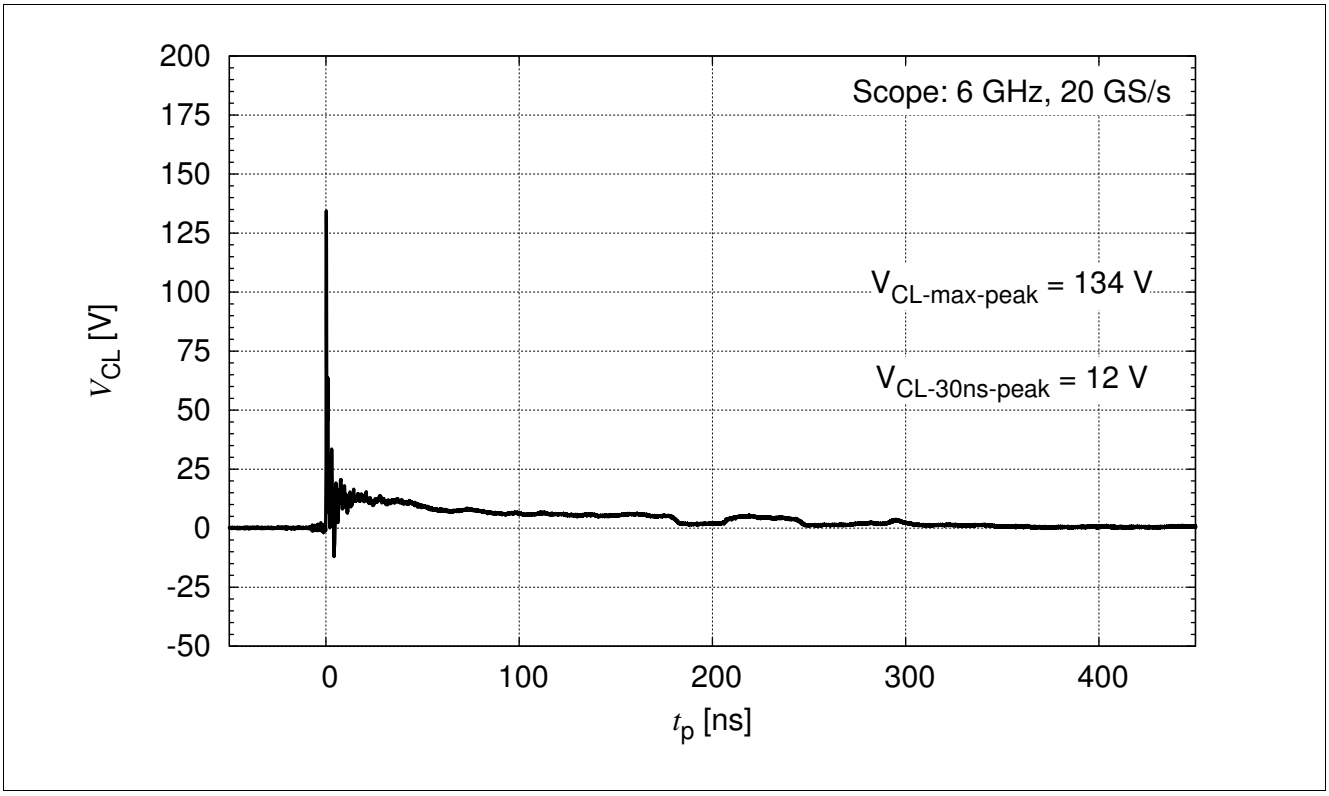


Figure 4-5 Clamping voltage (ESD): $V_{CL} = f(t)$, 8 kV positiv pulse from pin 1 to pin 2

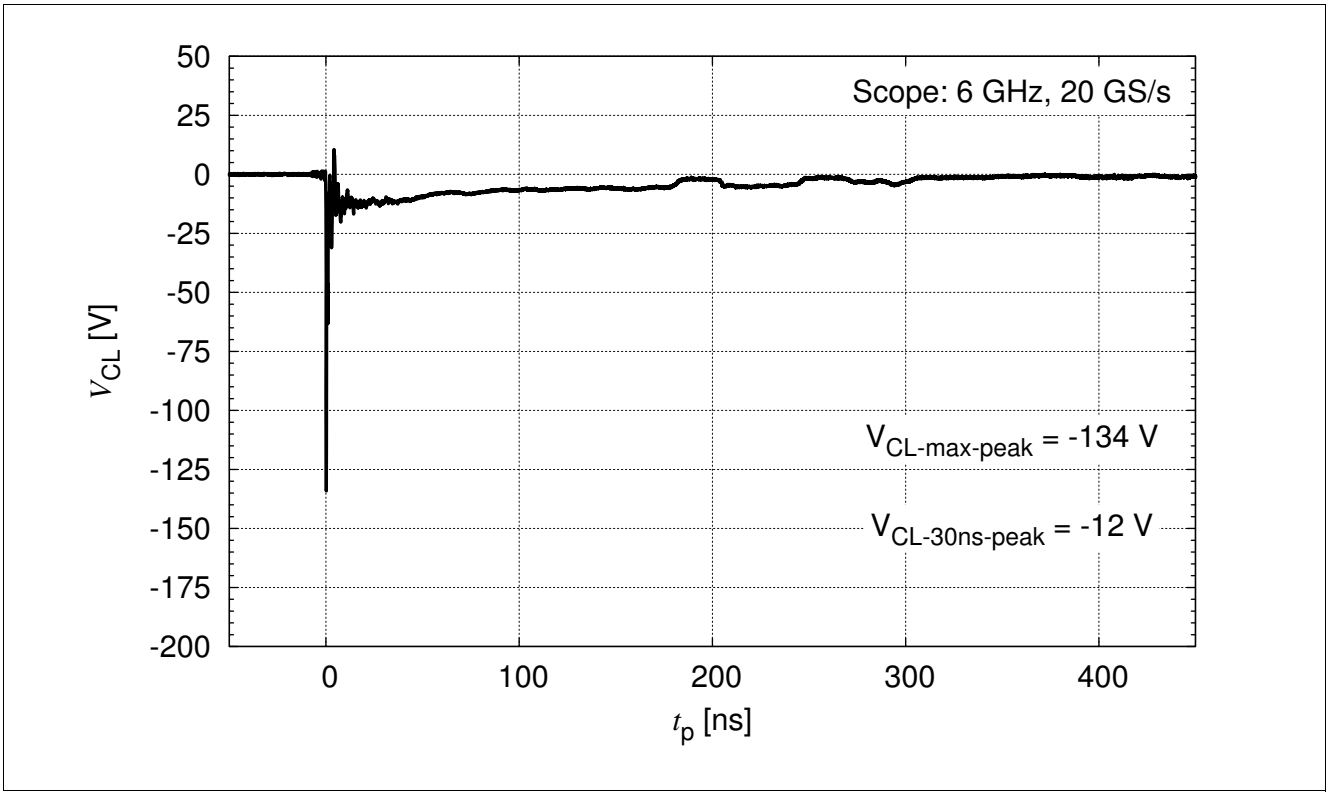


Figure 4-6 Clamping voltage (ESD): $V_{CL} = f(t)$, 8 kV negativ pulse from pin 1 to pin 2

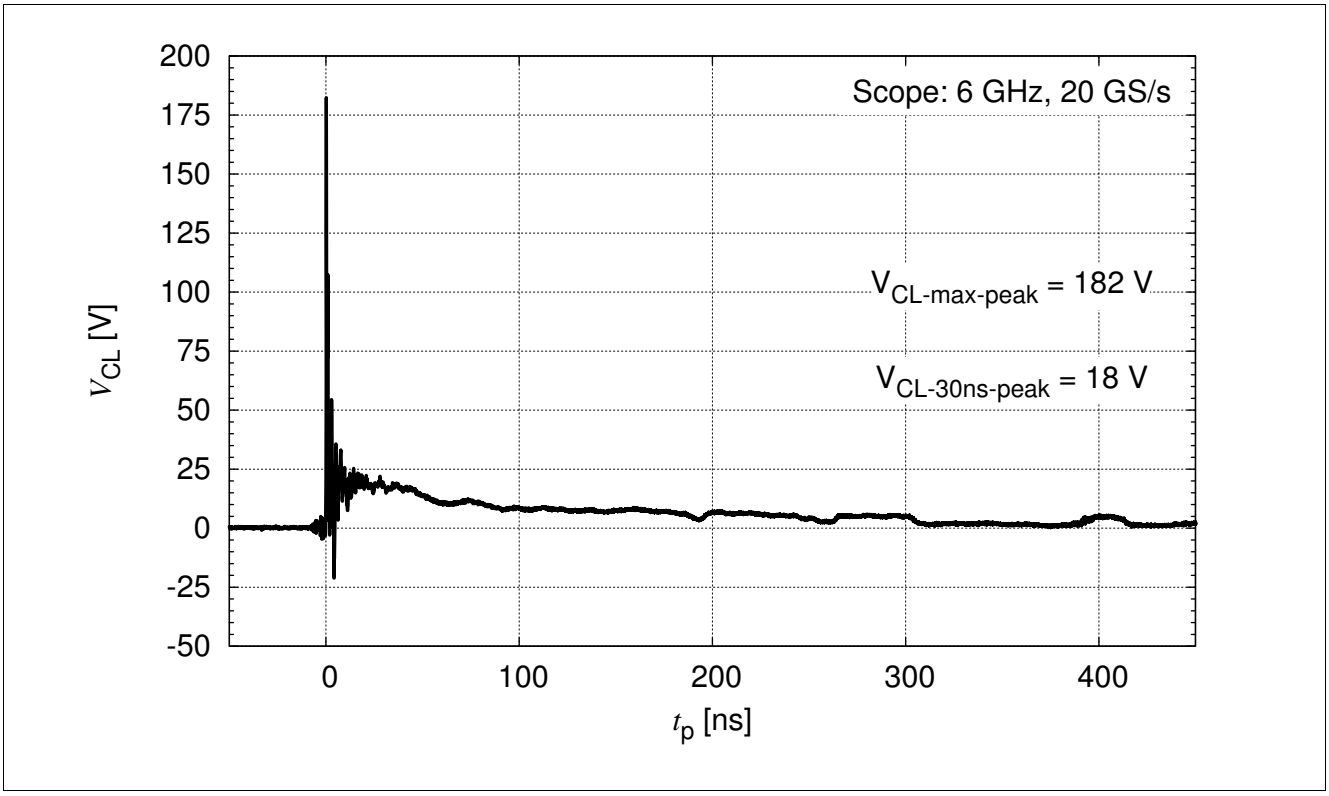


Figure 4-7 Clamping voltage (ESD): $V_{CL} = f(t)$, 15 kV positiv pulse from pin 1 to pin 2

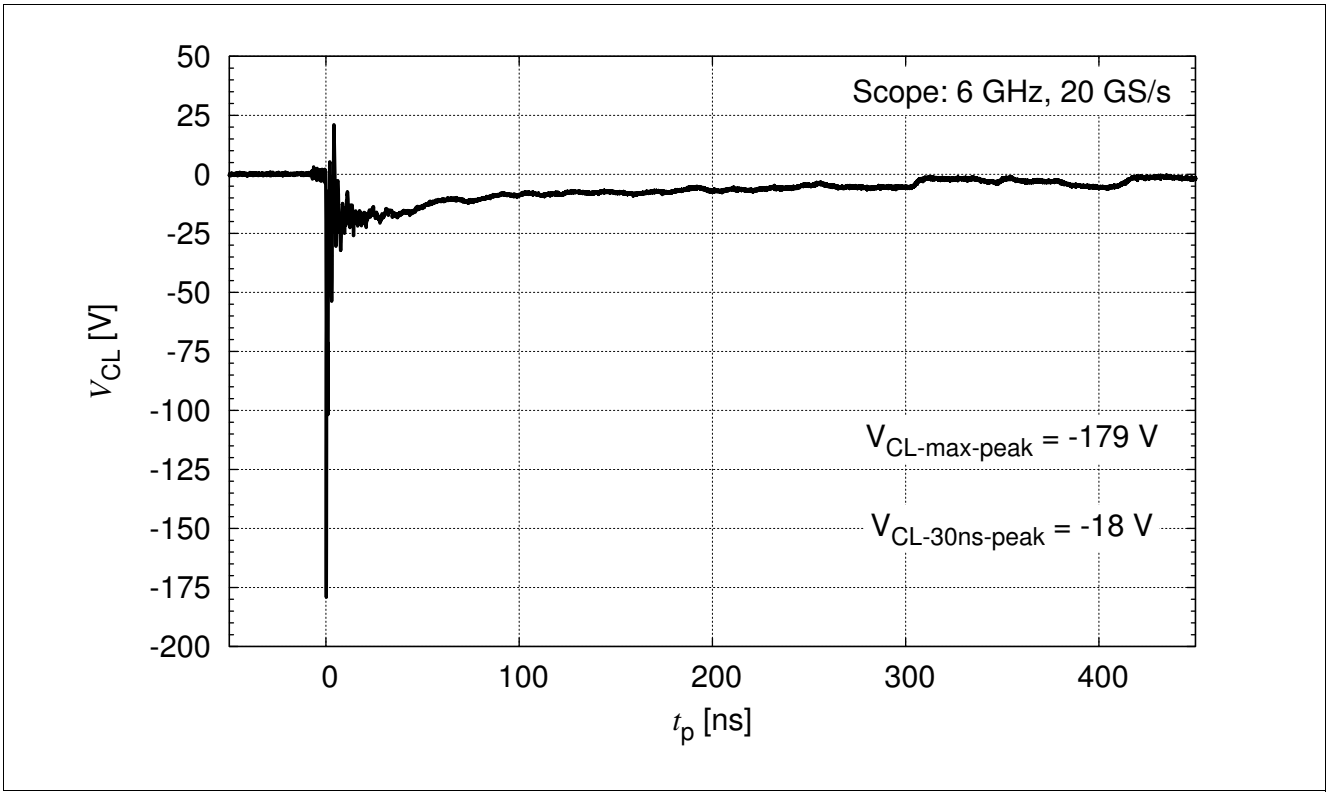


Figure 4-8 Clamping voltage (ESD): $V_{CL} = f(t)$, 15 kV negativ pulse from pin 1 to pin 2

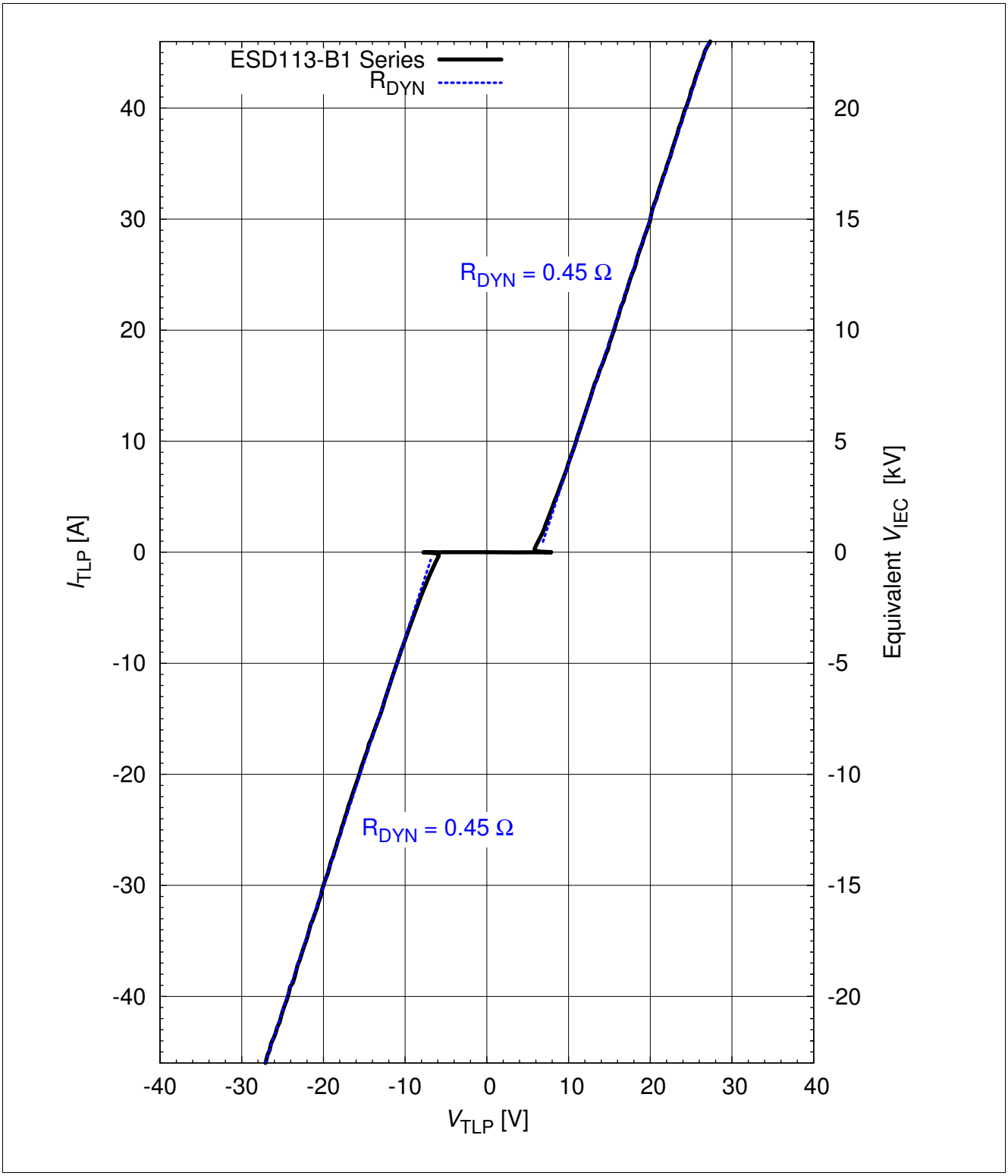


Figure 4-9 Clamping voltage (TLP): $I_{TLP} = f(V_{TLP})$ [1], pin 1 to pin 2

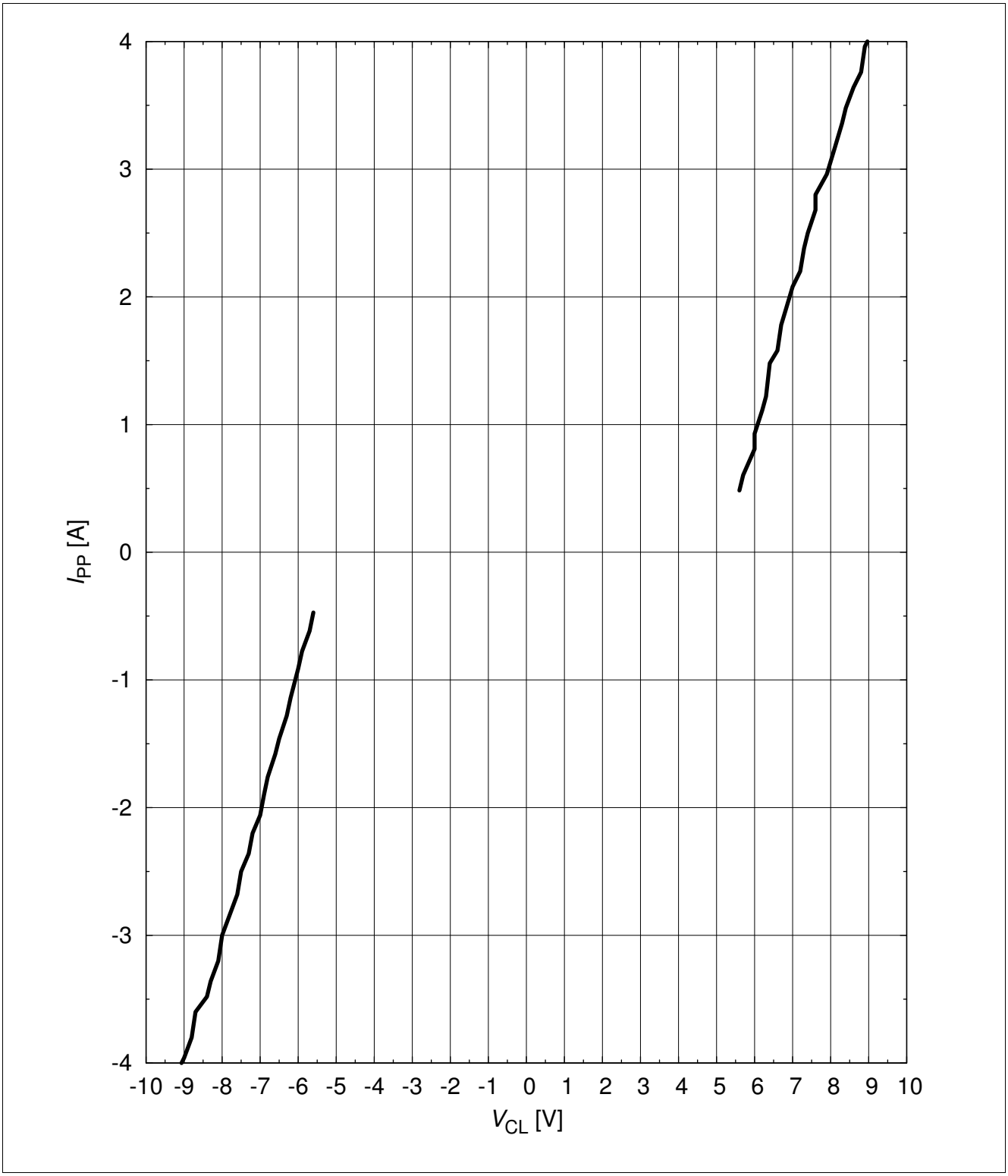


Figure 4-10 Clamping voltage (Surge): $I_{PP} = f(V_{CL})$ [1], pin 1 to pin 2

5 Package Information

5.1 TSSLP-2-4

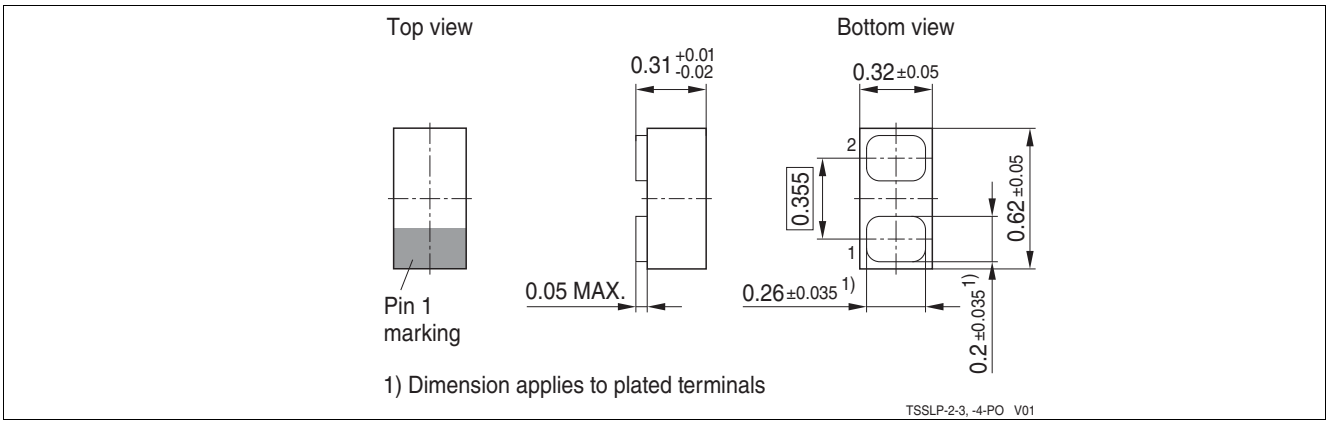


Figure 5-1 TSSLP-2-4 Package outline (dimension in mm)

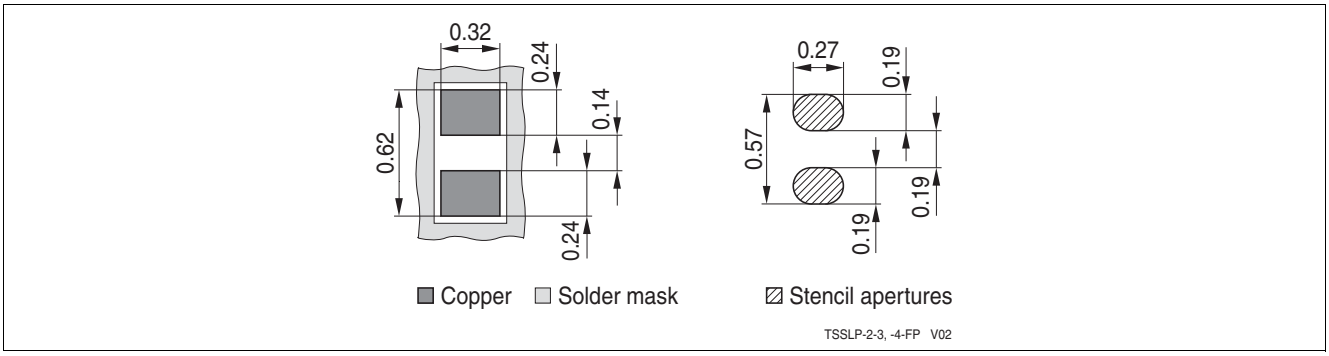


Figure 5-2 TSSLP-2-4 Footprint (dimension in mm)

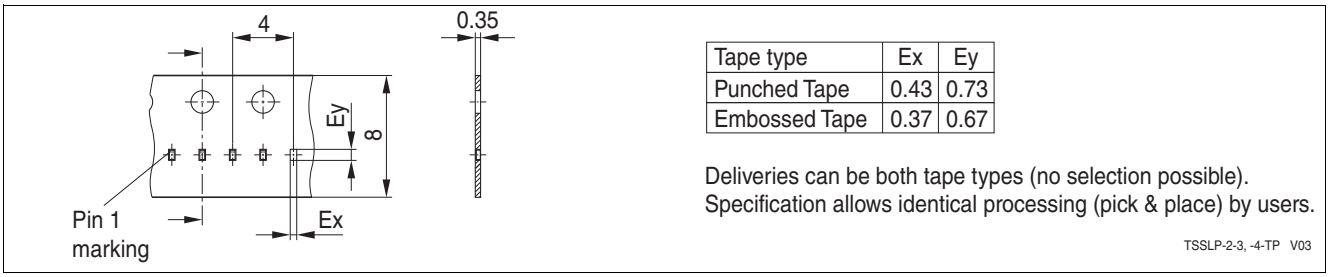


Figure 5-3 TSSLP-2-4 Packing (dimension in mm)

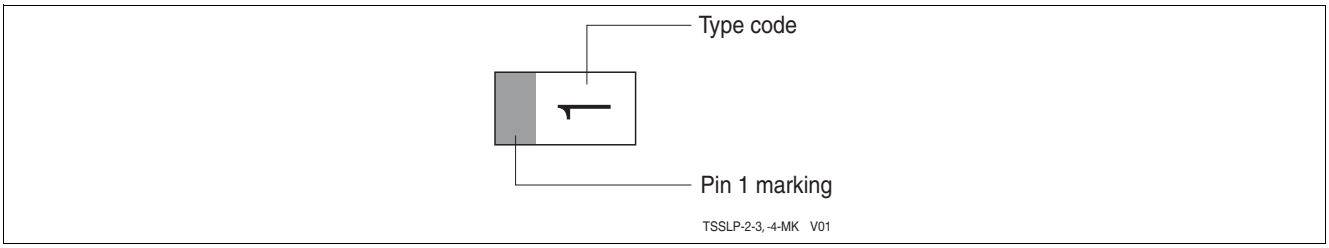


Figure 5-4 TSSLP-2-4 Marking example **Table 1-1 "Part Information" on Page 3**

5.2 TSLP-2-20

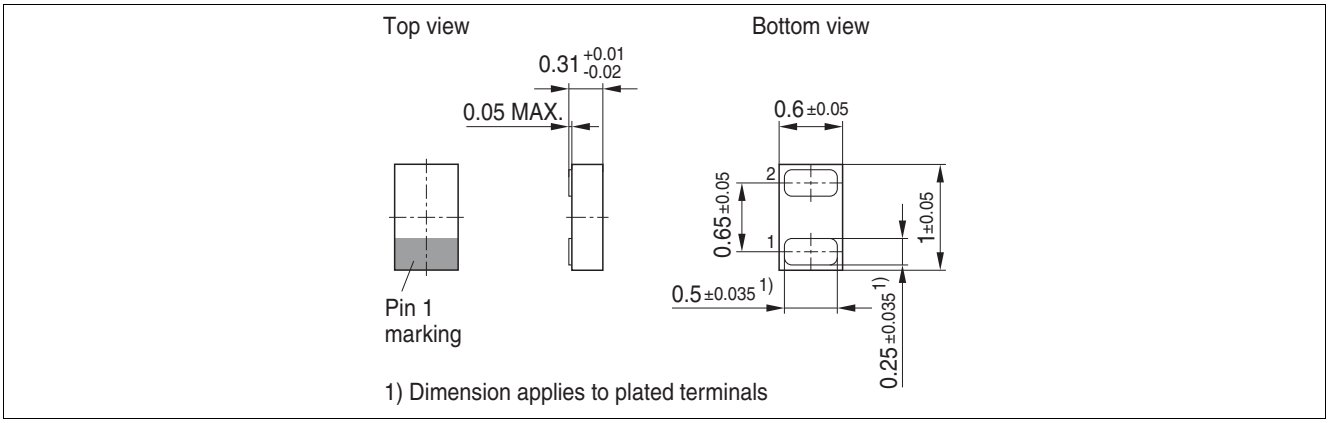


Figure 5-5 TSLP-2-20 Package outline (dimension in mm)

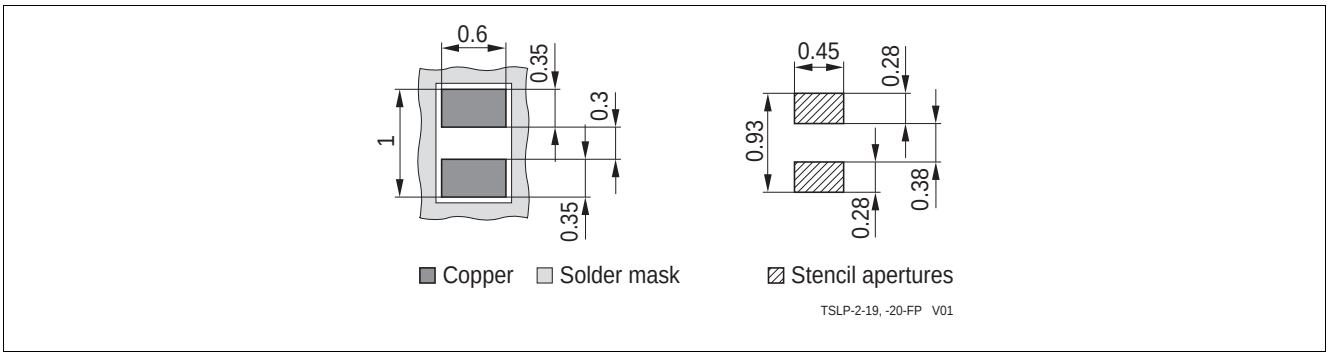


Figure 5-6 TSLP-2-20 Footprint (dimension in mm)

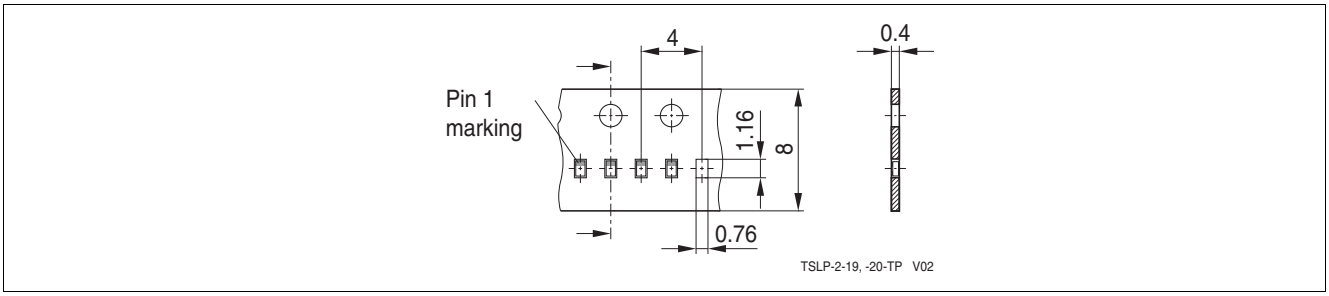


Figure 5-7 TSLP-2-20 Packing (dimension in mm)

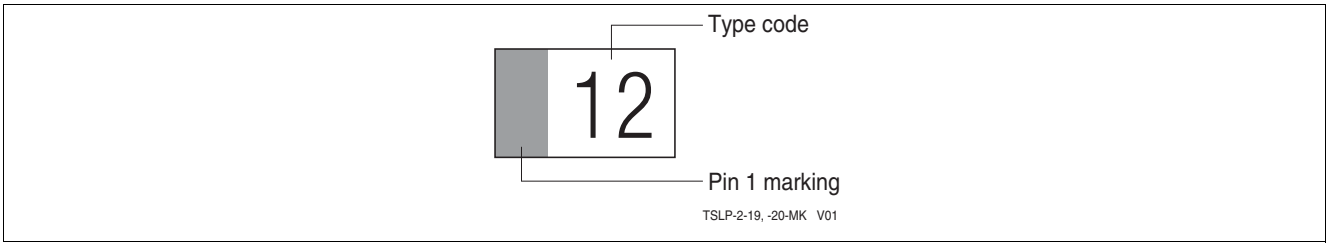


Figure 5-8 TSSLP-2-4 Marking example Table 1-1 “Part Information” on Page 3

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-iq™ 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

w w w . i n f i n e o n . c o m

Published by Infineon Technologies AG

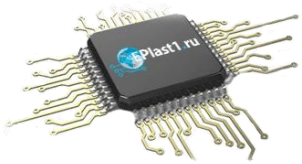
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)
Факс: 8 (812) 320-02-42
Электронная почта: org@eplast1.ru
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.