TVS Diodes

Transient Voltage Suppressor Diodes

ESD18VU1B Series

ESD / Transient Protection Diode for Near Field Communication (NFC)

ESD18VU1B-02LRH
ESD18VU1B-02LS

Data Sheet

Revision 1.1, 2012-05-30
Final

Power Management & Multimarket

Edition 2012-05-30

Published by
Infineon Technologies AG
81726 Munich, Germany

Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, 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.

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.

Revision History: Revision 1.0, 2012-02-09	
Page or Item	**Subjects (major changes since previous revision)**
Revision 1.1, 2012-05-30	
Page 15	**Figure 12** updated

Trademarks of Infineon Technologies AG

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

Other Trademarks

Advance Design System™ (ADS) of Agilent Technologies, AMBA™, ARM™, MULTI-ICE™, PRIMECELL™, REALVIEW™, THUMB™ 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 Sattelite 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 2010-06-09

Table of Contents

List of Figures

List of Tables

1 ESD / Transient Protection Diode for Near Field Communication (NFC)

1.1 Features

- ESD / transient protection according to:
  - IEC61000-4-2 (ESD contact discharge): ±10 kV
  - IEC61000-4-5 (surge): 2 A (t_p = 8 / 20 µs)
- AC working voltage up to ±18.5 V (V_{TRIG} min = 20 V)
- Ultra-low capacitance: C_L = 0.3 pF (typical)
- Small leadless plastic package, size 0201 / 0402
- Pb-free (RoHS compliant) and halogen free package

1.2 Application Examples

- ESD Protection of RF signal lines in Near Field Communication (NFC) applications

2 Product Description

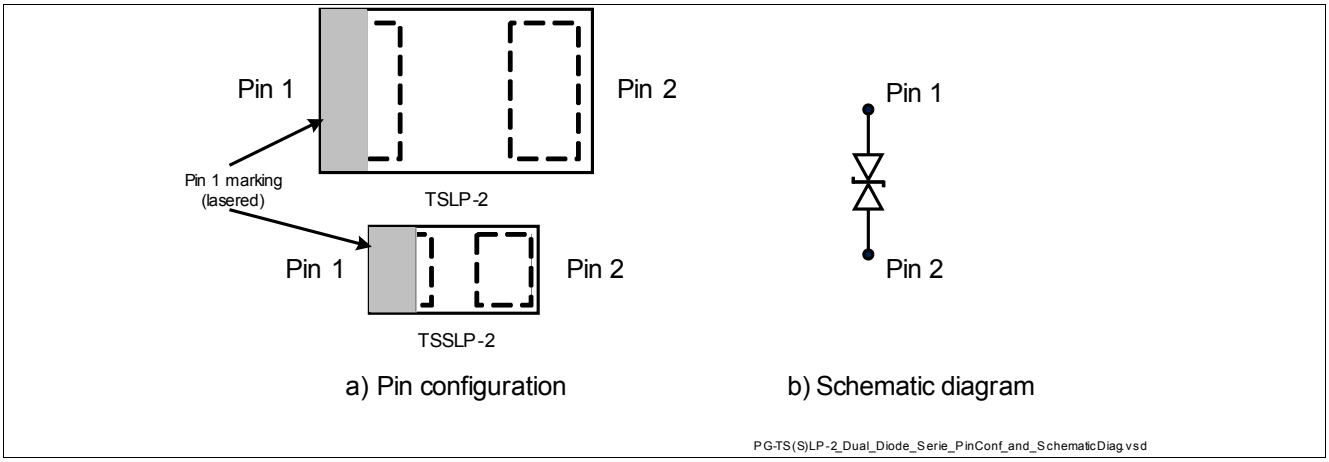

Figure 1 Pin Configuration and Schematic Diagram

Table 1 Ordering Information

Type	Package	Configuration	Marking code
ESD18VU1B-02LRH	PG-TSLP-2-17	1 line, bi-directional	X
ESD18VU1B-02LS	PG-TSSLP-2-1	1 line, bi-directional	X

3 Characteristics

Table 2 Maximum Rating *at T_A = 25 °C, unless otherwise specified*

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
ESD air discharge[1)]	V_{ESD}	–	15	–	kV
ESD contact discharge[1)]	V_{ESD}	–	–	10	kV
Peak pulse current (t_p = 8 / 20 µs)[2)]	I_{PP}	–	–	2	A
Operating temperature	T_{OP}	-40	–	85	°C
Storage temperature	T_{stg}	-55	–	150	°C

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

2) I_{PP} according to IEC61000-4-5

3.1 Electrical Characteristics at T_A = 25 °C, unless otherwise specified

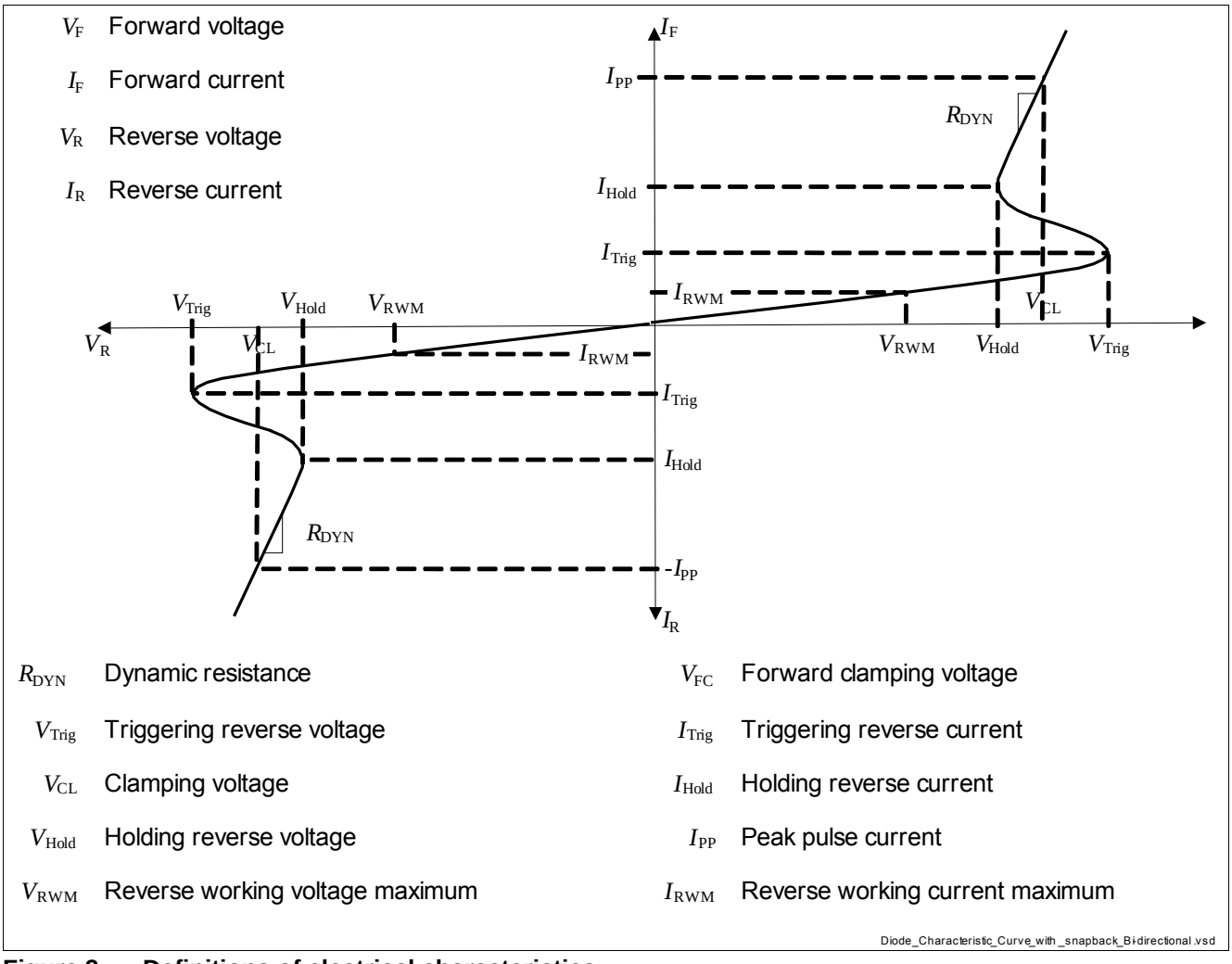

Figure 2 Definitions of electrical characteristics

Table 3 AC Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
AC working voltage	V_{RWM}	–	–	18.5	V	Both directions
AC trigger voltage	V_{TRIG}	20	–	–	V	Both directions
AC reverse current	I_R	–	–	30	nA	V_R = 18.5 V Both directions
		–	–	1	mA	V_R = 20 V Both directions

Table 4 RF Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Line capacitance[1)]	C_L	–	0.3	0.6	pF	V_R = 0 V, f = 1 MHz
		–	0.3	0.6	pF	V_R = 0 V, f = 1 GHz
Serie inductance	L_S	–	0.2	–	nH	ESD18VU1B-02LS
		–	0.4	–	nH	ESD18VU1B-02LRH

1) Total capacitance I/O to GND

Table 5 ESD Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Clamping voltage[1)]	V_{CL}	–	28	–	V	I_{PP} = 16 A, t_p = 100 ns
		–	34	–		I_{PP} = 25 A, t_p = 100 ns
Clamping voltage[2)]	V_{CL}	–	17	–	V	I_{PP} = 1 A, t_p = 8 / 20 µs
Dynamic resistance[1)]	R_{DYN}	–	0.6	–	Ω	

1)Please refer to Application Note AN210 [1]. TLP parameter: Z_0 = 50 Ω , t_p = 100ns, t_r = 300ps, averaging window: t_1 = 30 ns to t_2 = 60 ns, extraction of dynamic resistance using least squares fit of TLP charactertistics between I_{PP1} = 10 A and I_{PP2} = 40 A

2) I_{PP} according to IEC61000-4-5

3.2 Typical Characteristics at T_A = 25 °C, unless otherwise specified

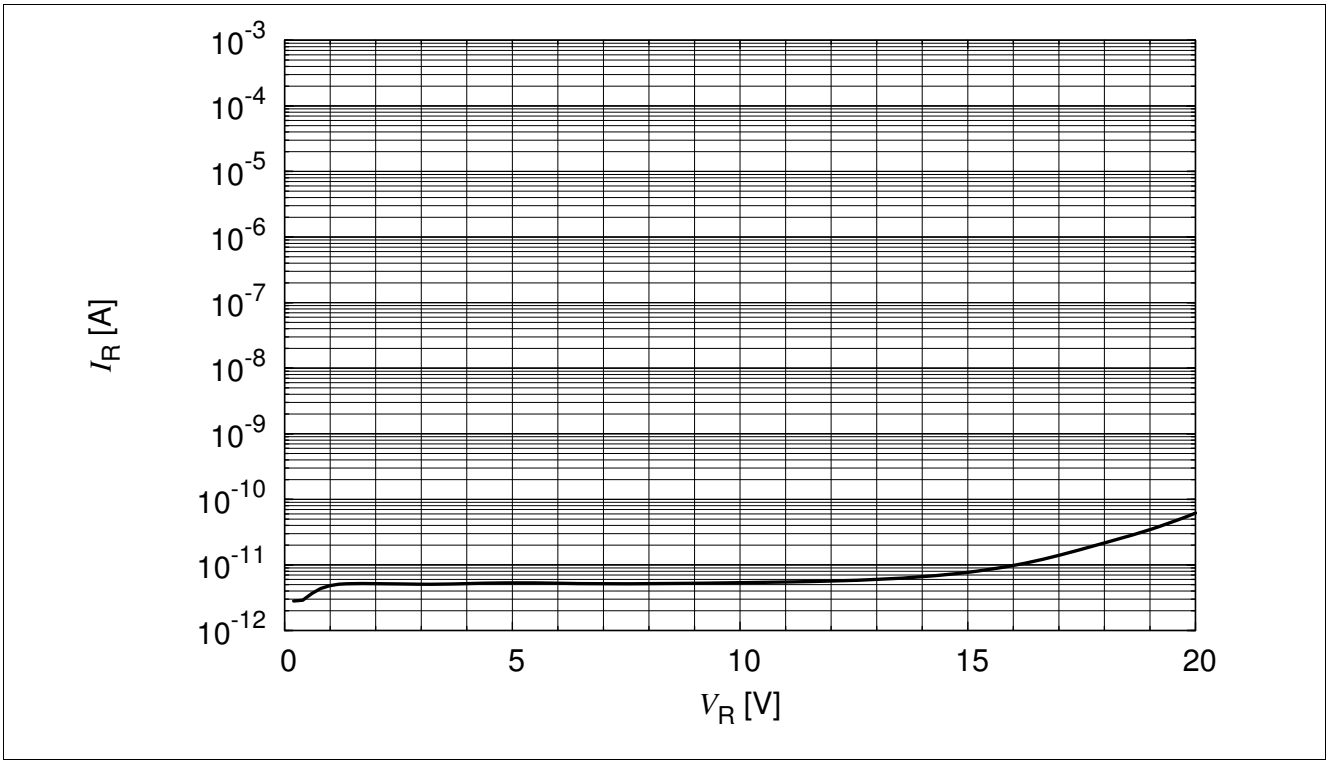

Figure 3 Reverse current: $I_R = f(V_R)$

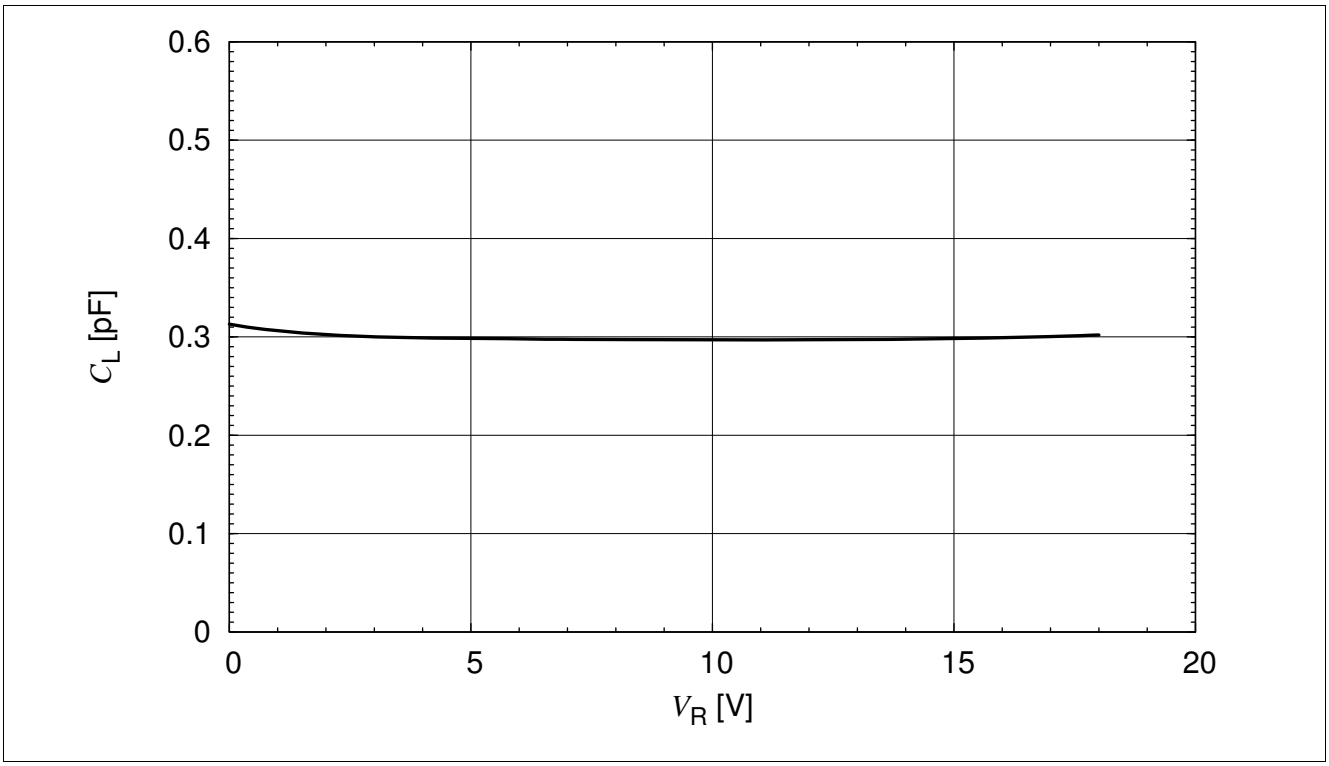

Figure 4 Line capacitance: $C_L = f(V_R)$, f = 1 MHz

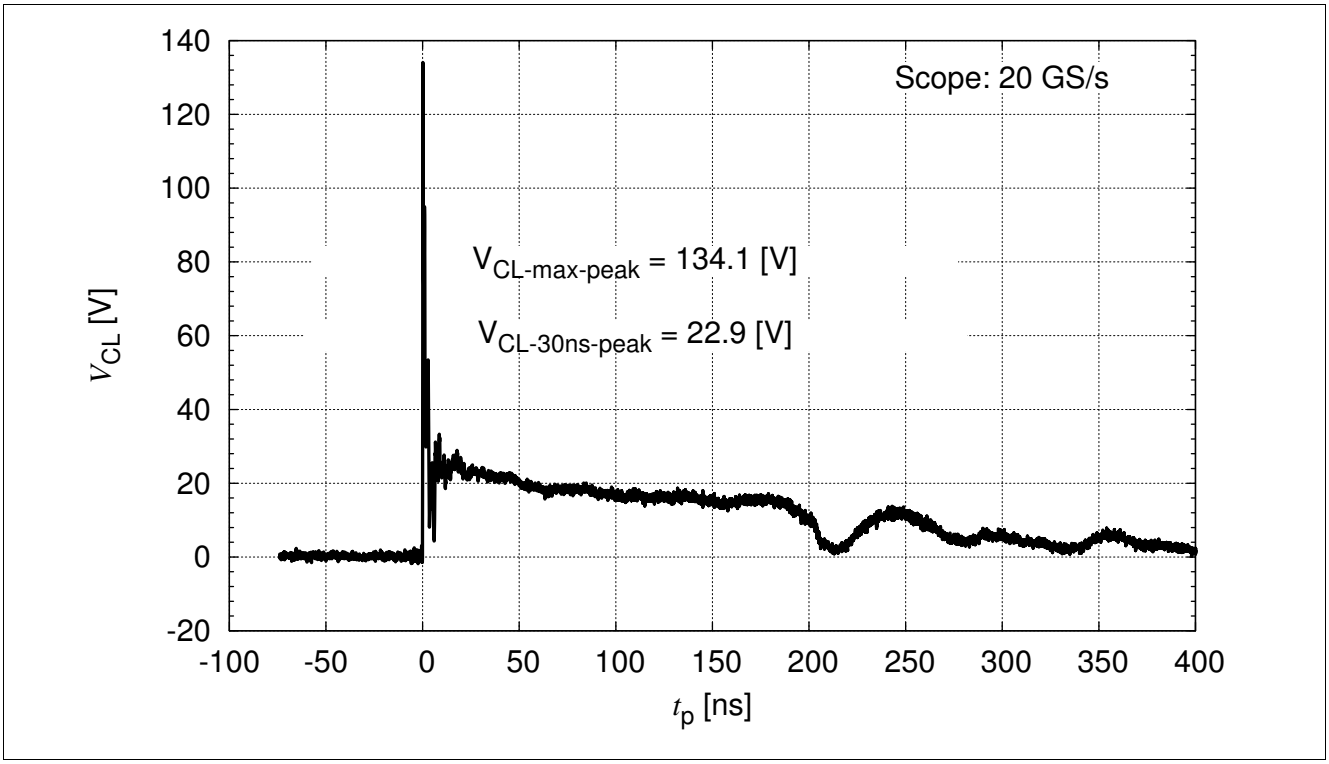

Figure 5 IEC61000-4-2 $V_{CL} = f(t)$, 8 kV positiv pulse from pin 1 to pin 2

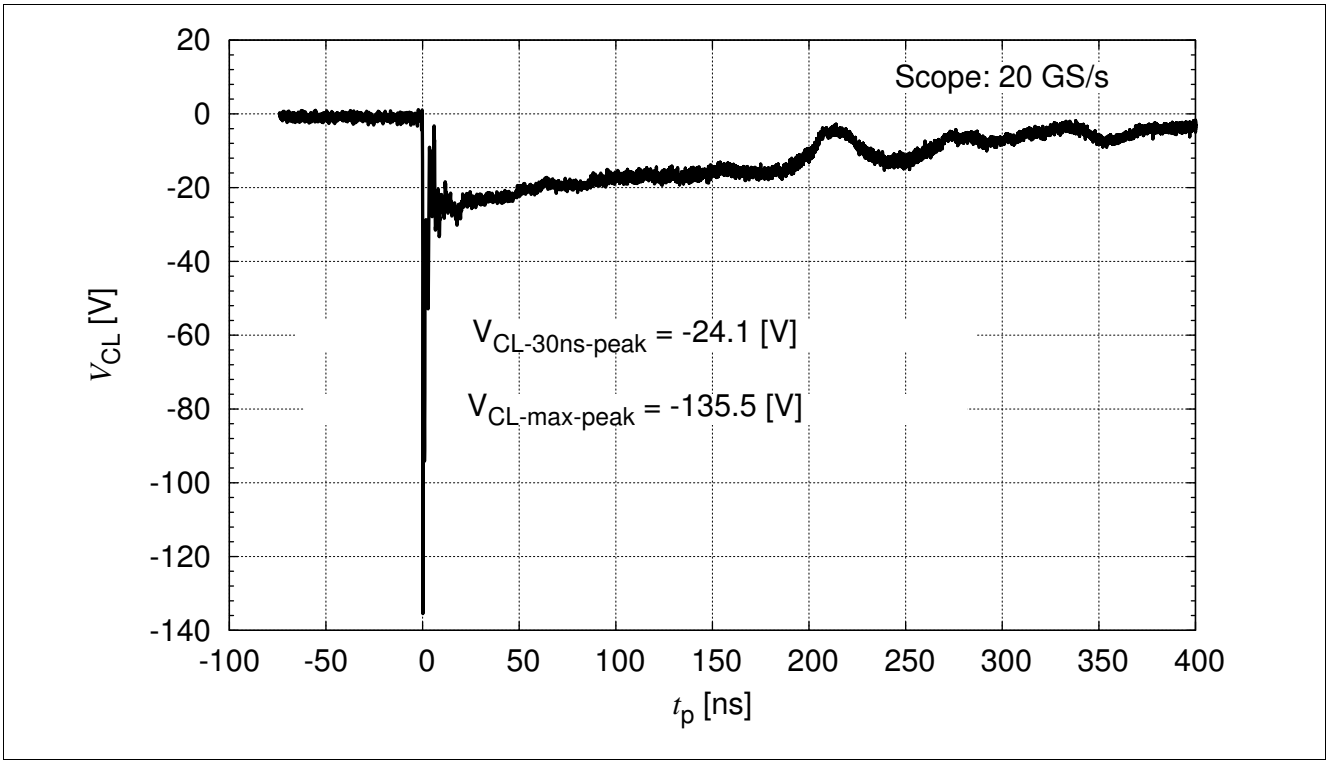

Figure 6 IEC61000-4-2 $V_{CL} = f(t)$, 8 kV negativ pulse from pin 1 to pin 2

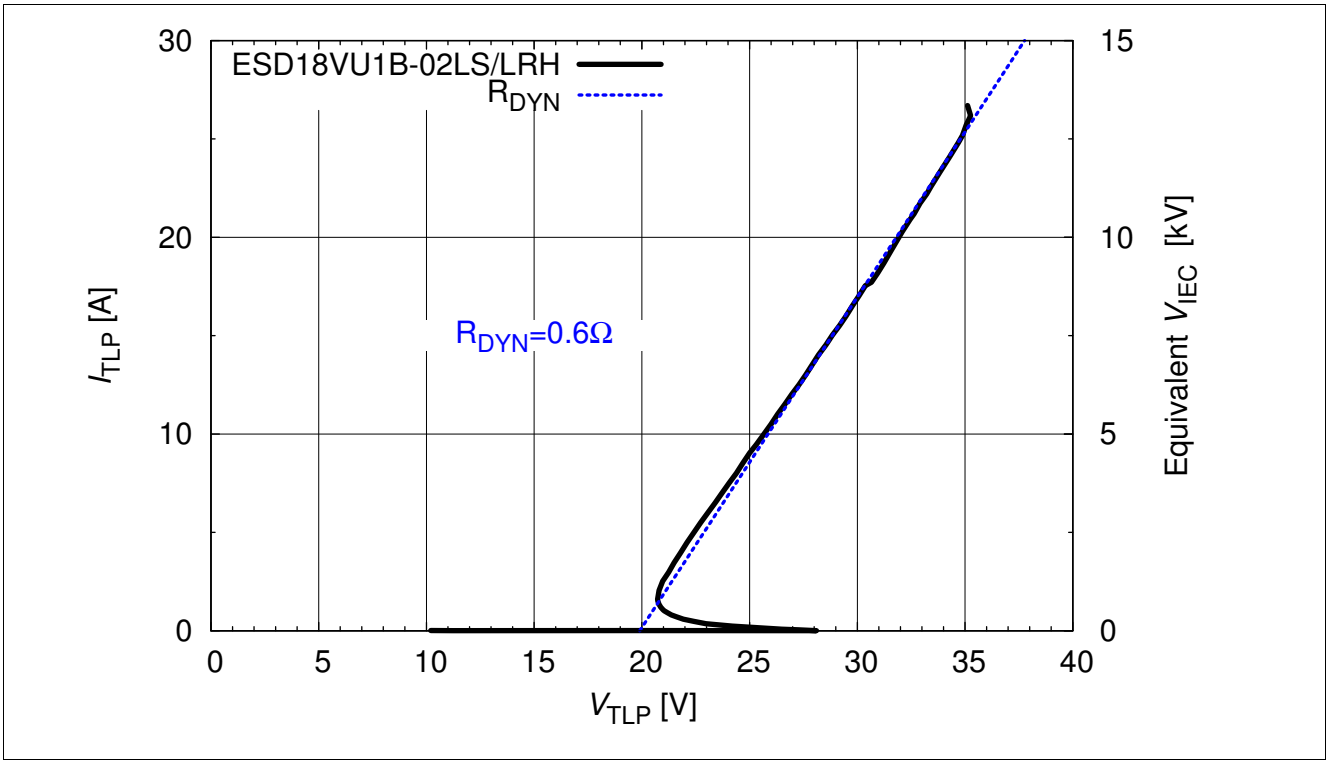

Figure 7 Clamping voltage : $I_{TLP} = f(V_{TLP})$

4 Application Information

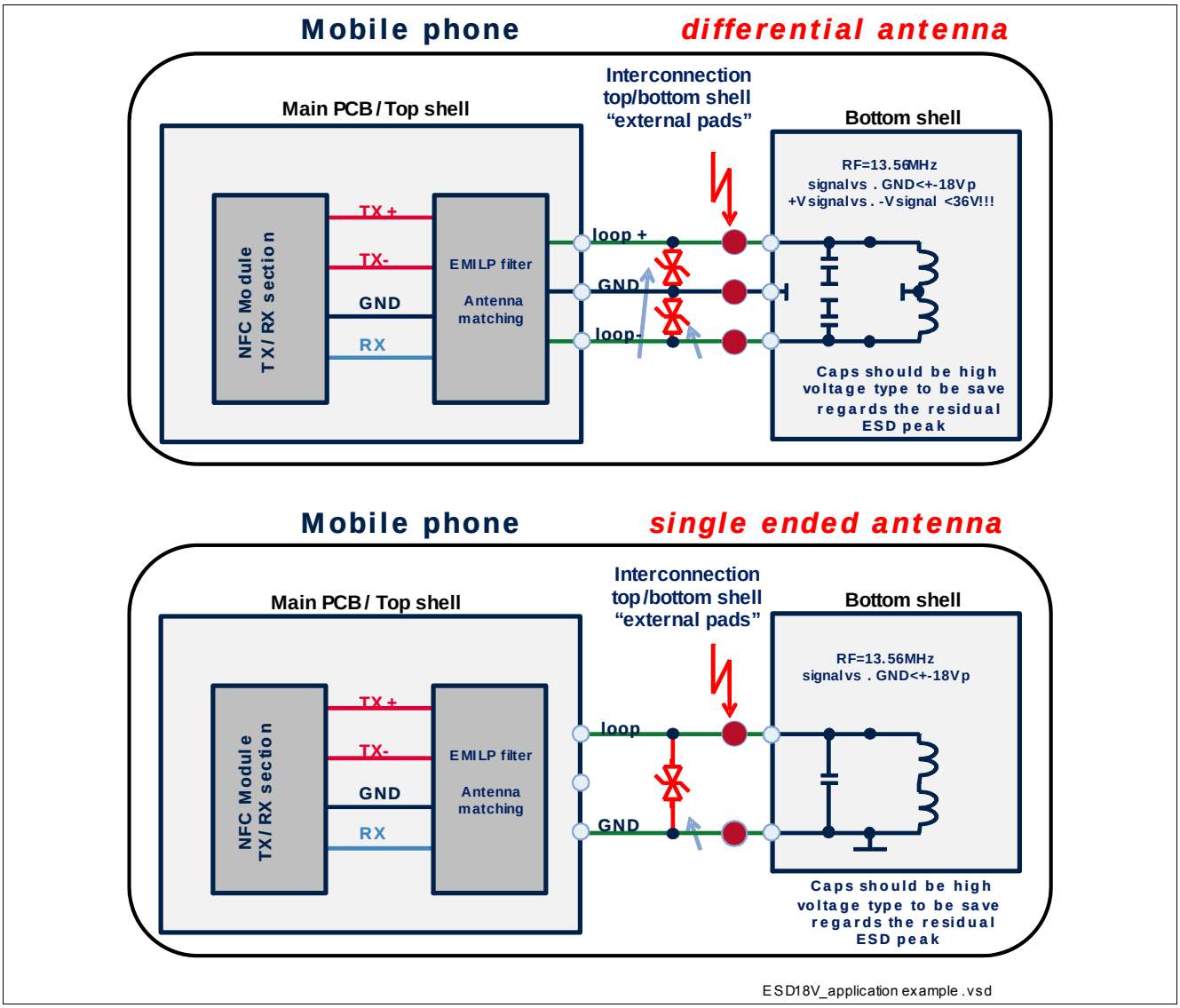

Figure 8 Bi-directional ESD / Transient protection for NFC Frontend [3]

5 Ordering Information Scheme (Examples)

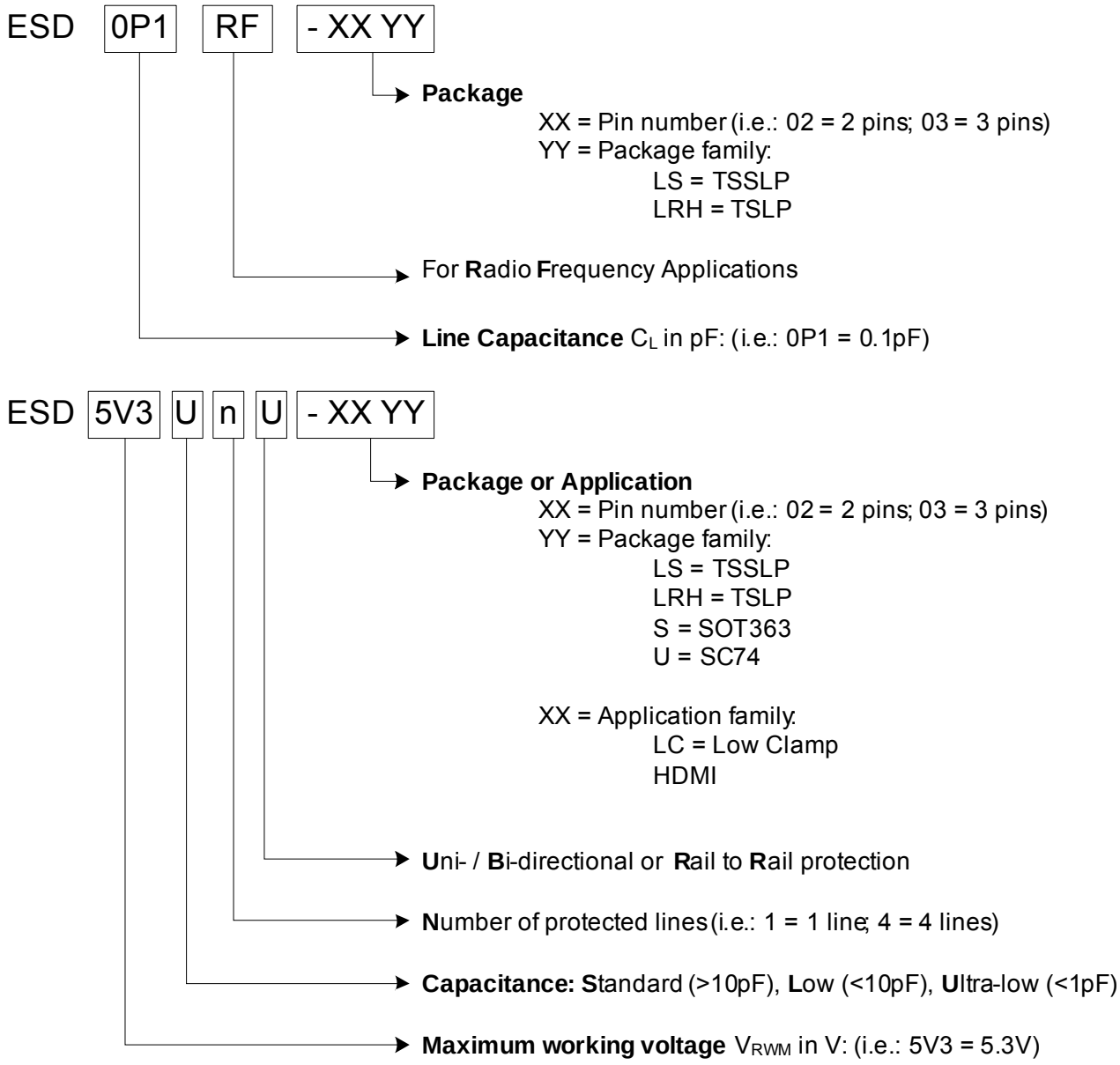

Figure 9 Ordering information scheme

6 Package Information

6.1 PG-TSSLP-2-1 [2]

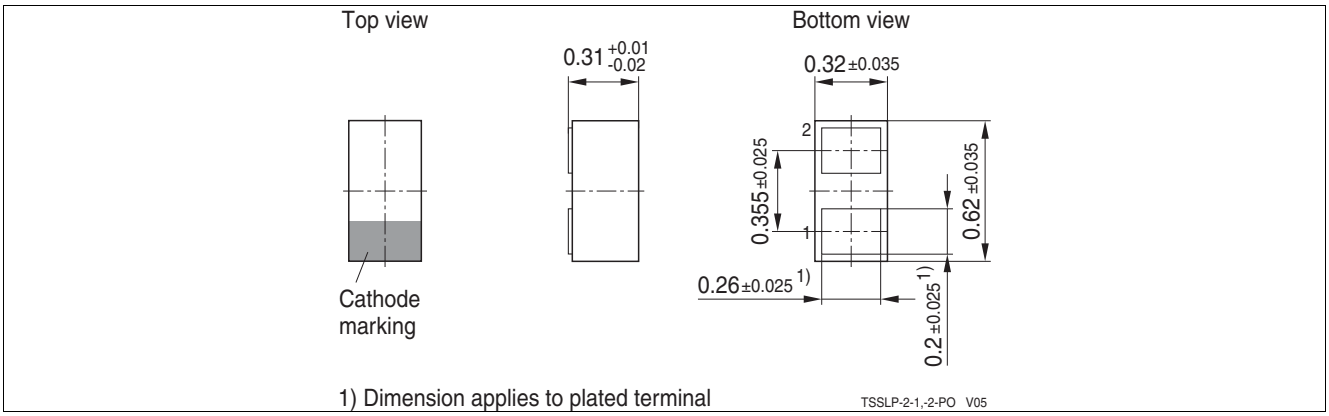

Figure 10 PG-TSSLP-2-1: Package overview

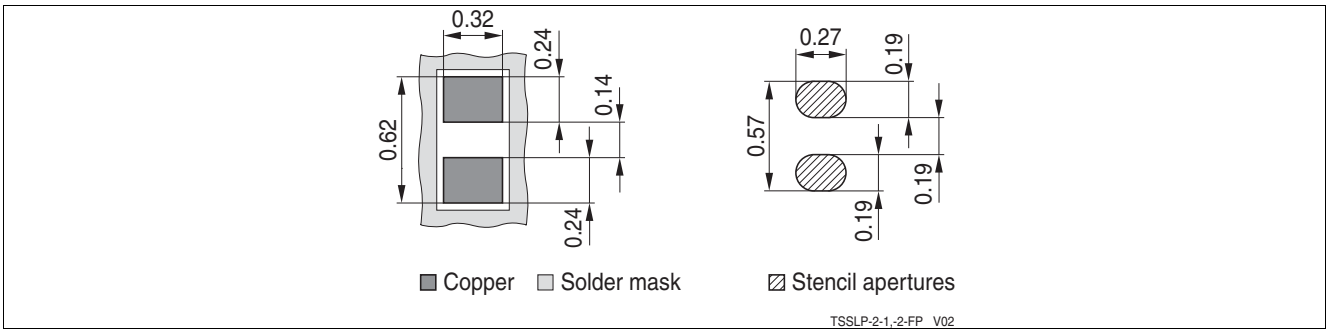

Figure 11 PG-TSSLP-2-1: Footprint

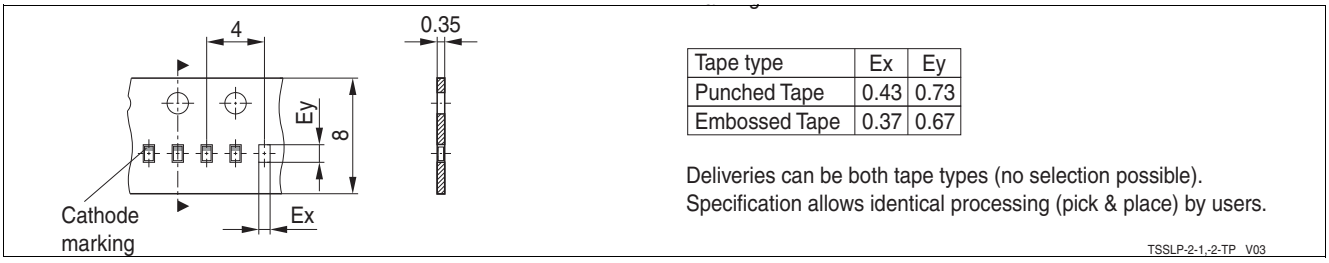

Figure 12 PG-TSSLP-2-1: Packing

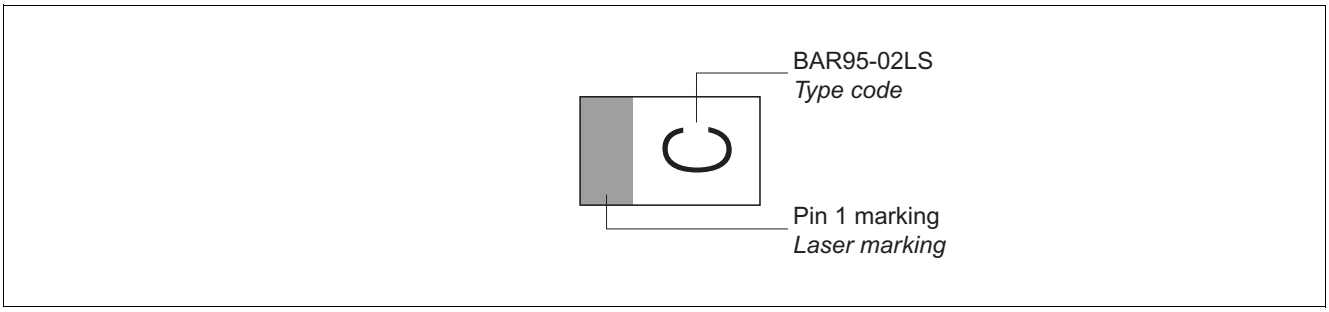

Figure 13 PG-TSSLP-2-1: Marking (example)

6.2 PG-TSLP-2-17 [2]

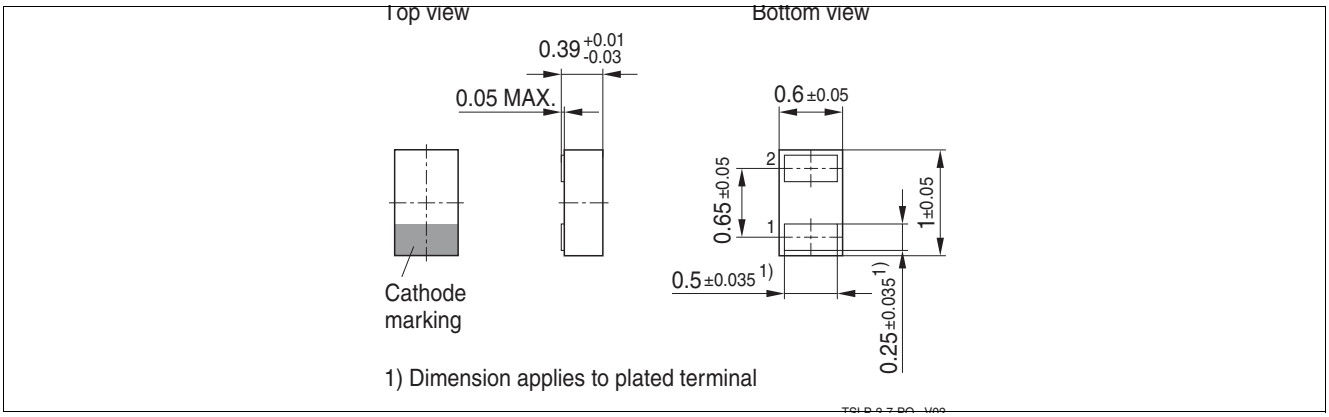

Figure 14 PG-TSLP-2-17: Package overview

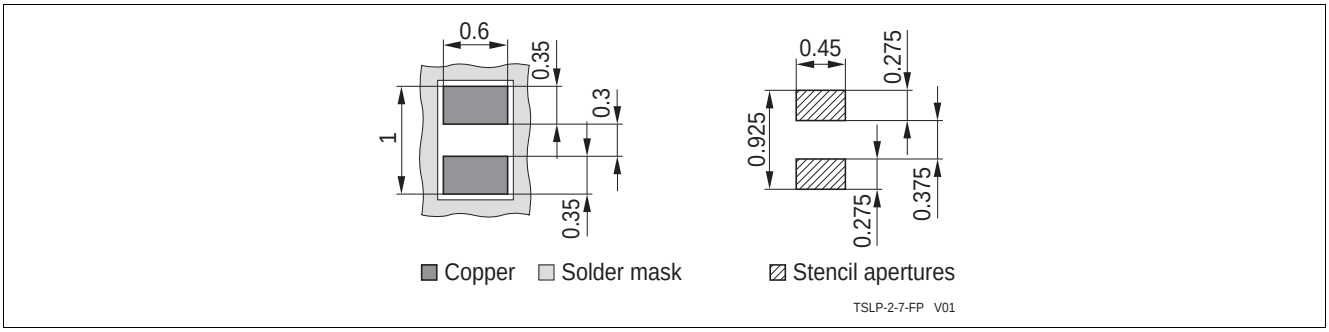

Figure 15 PG-TSLP-2-17: Footprint

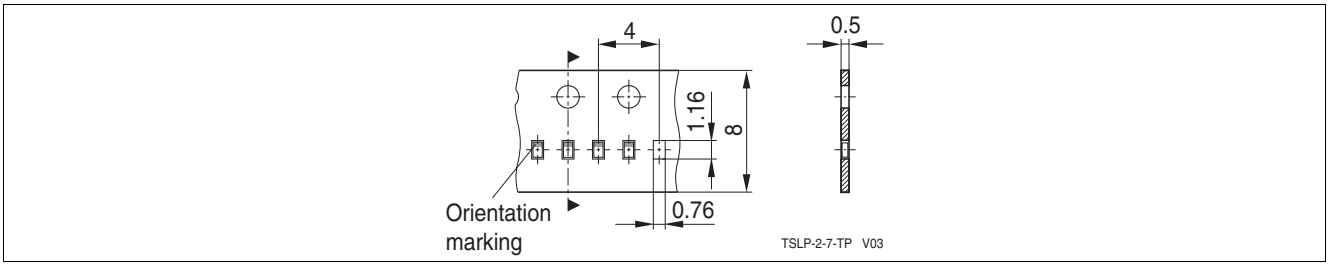

Figure 16 PG-TSLP-2-17: Packing

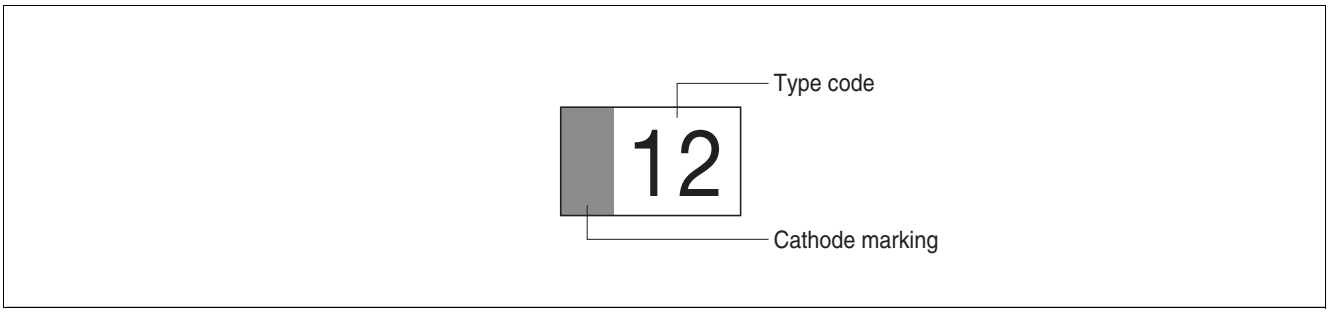

Figure 17 PG-TSLP-2-17: Marking (example)

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 Packages

[3] Infineon AG - **Application Note AN244:** Tailored ESD Protection for the NFC Frontend

Terminology

C_L	Line capacitance
ESD	Electrostatic Discharge
IEC	International Electrotechnical Commission
I_{PP}	Peak pulse current
I_R	Reverse current
I_{RWM}	Reverse working current maximum
NFC	Near Field Communication
R_{DYN}	Dynamic resistance
RoHS	Restriction of Hazardous Substances Directive
T_A	Ambient temperature
TLP	Transmission Line Pulse
T_{OP}	Operation temperature
t_p	Pulse duration
t_r	Pulse rise time
T_{stg}	Storage temperature
V_{CL}	Reverse clamping voltage
V_{ESD}	Electrostatic discharge voltage
V_{FC}	Forward Clamping Voltage
V_{IEC}	Equivalent stress level according IEC61000-4-2 (R = 330 Ω , C = 150 pF)
V_R	Reverse voltage
V_{RWM}	Reverse working voltage maximum
V_{TRIG}	Trigger voltage
Z_0	Impedance

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

Published by Infineon Technologies AG