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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

Edition 2012-05-30

**Published by
Infineon Technologies AG
81726 Munich, Germany**

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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

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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 ($t_p = 8 / 20 \mu\text{s}$)
- AC working voltage up to ± 18.5 V ($V_{\text{TRIG min}} = 20$ 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

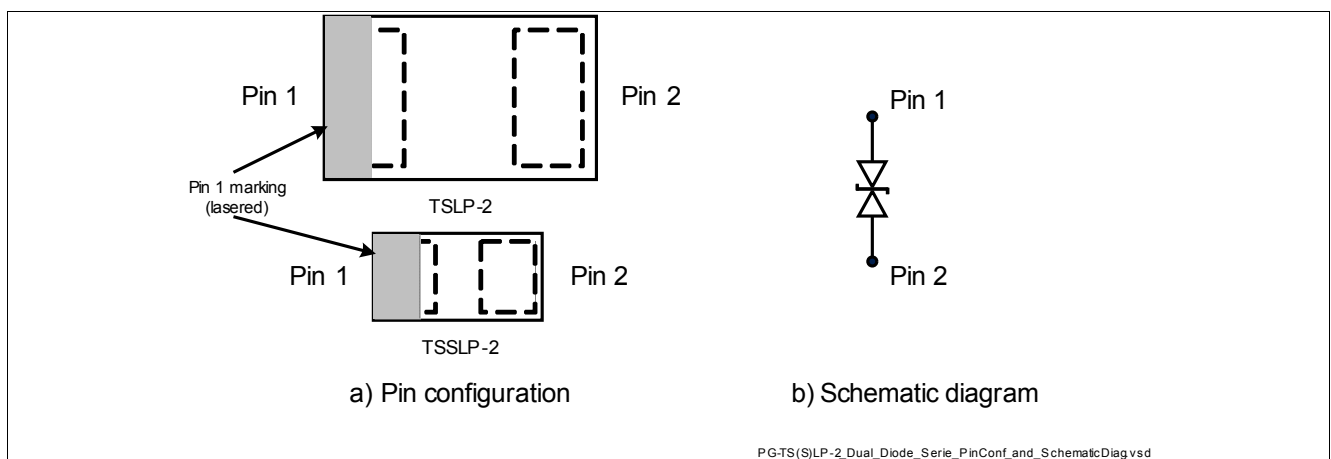


Figure 1 Pin Configuration and Schematic Diagram

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 $T_A = 25\text{ }^\circ\text{C}$, 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 ($t_p = 8 / 20\ \mu\text{s}$) ²⁾	I_{PP}	–	–	2	A
Operating temperature	T_{OP}	-40	–	85	$^\circ\text{C}$
Storage temperature	T_{stg}	-55	–	150	$^\circ\text{C}$

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

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

3.1 Electrical Characteristics at $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

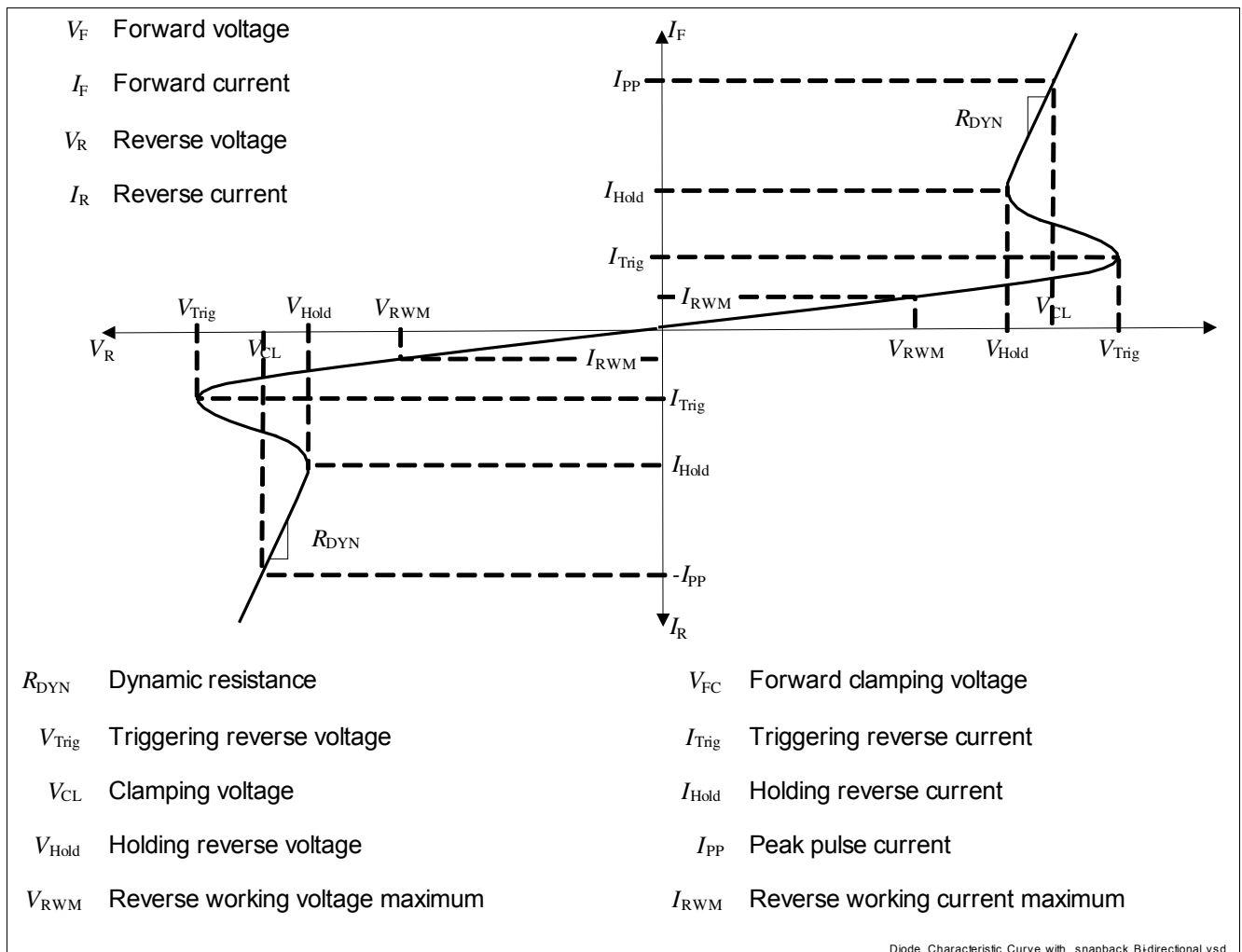


Figure 2 Definitions of electrical characteristics

Table 3 AC Characteristics at $T_A = 25\text{ }^\circ\text{C}$, 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	$V_R = 18.5\text{ V}$ Both directions
		–	–	1	mA	$V_R = 20\text{ V}$ Both directions

Table 4 RF Characteristics at $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Line capacitance ¹⁾	C_L	–	0.3	0.6	pF	$V_R = 0\text{ V}, f = 1\text{ MHz}$
		–	0.3	0.6	pF	$V_R = 0\text{ V}, f = 1\text{ GHz}$
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 $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

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

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

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

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

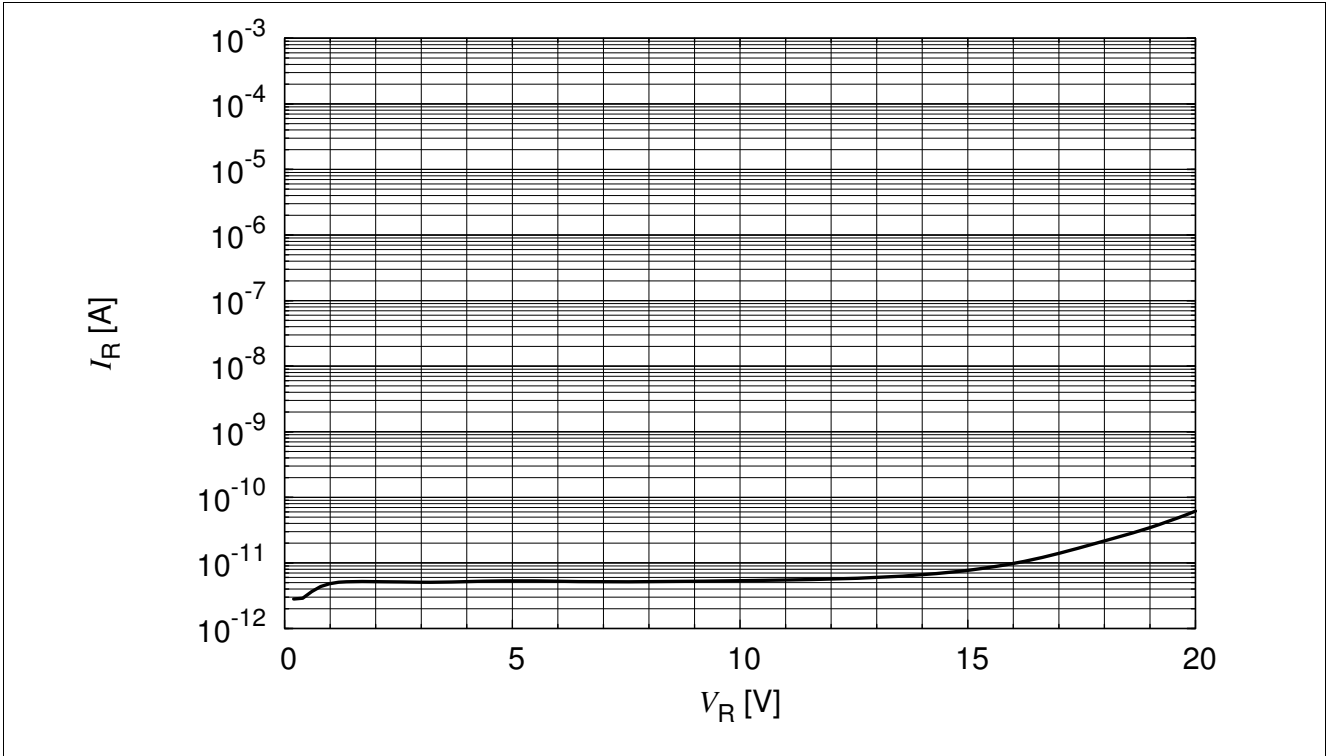


Figure 3 Reverse current: $I_R = f(V_R)$

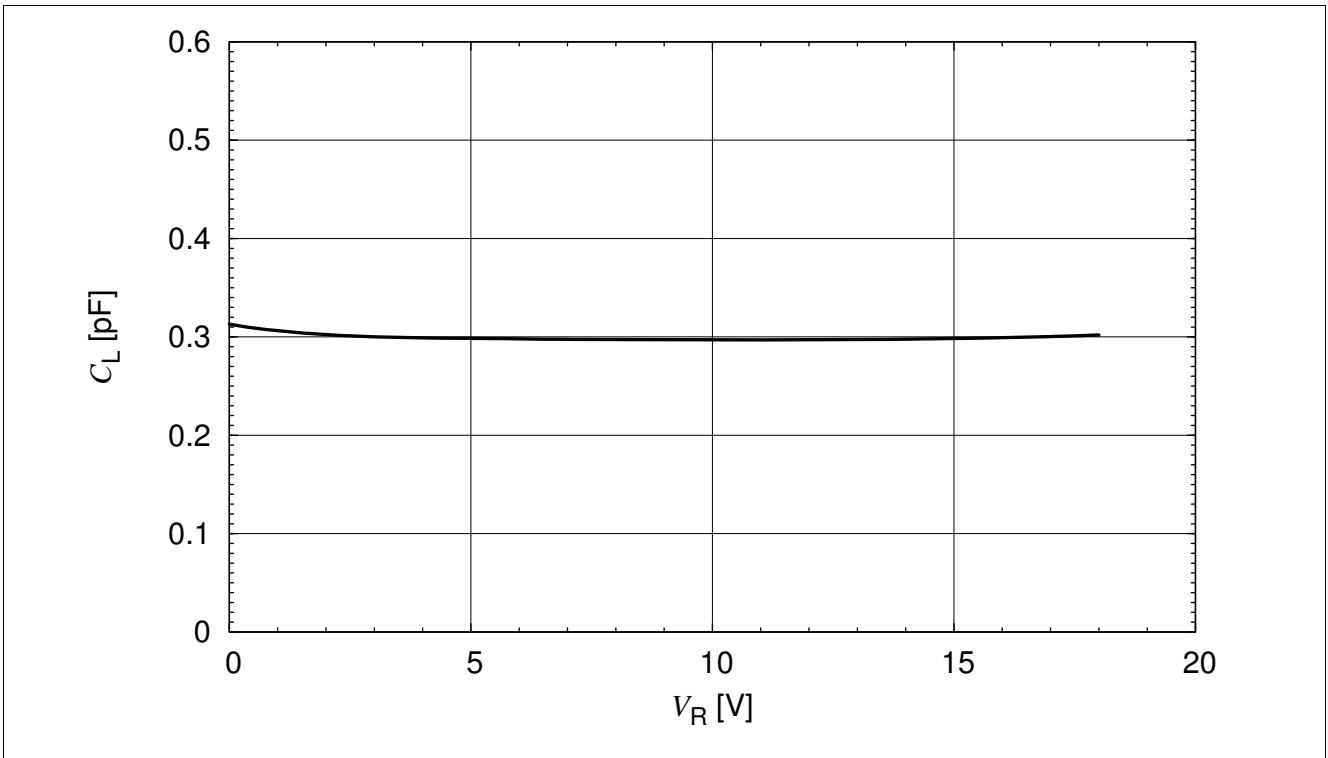


Figure 4 Line capacitance: $C_L = f(V_R), f = 1\text{ MHz}$

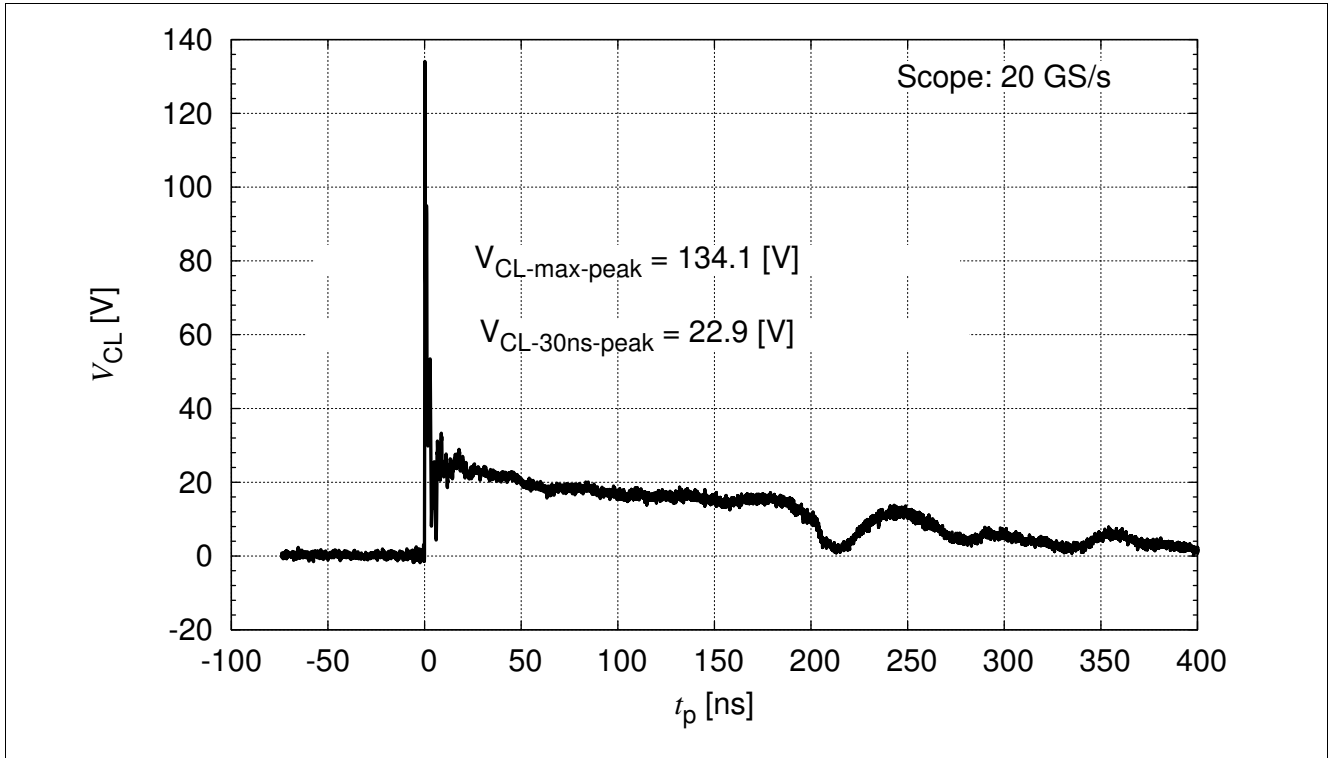


Figure 5 IEC61000-4-2 $V_{CL} = f(t)$, 8 kV positiv pulse from pin 1 to pin 2

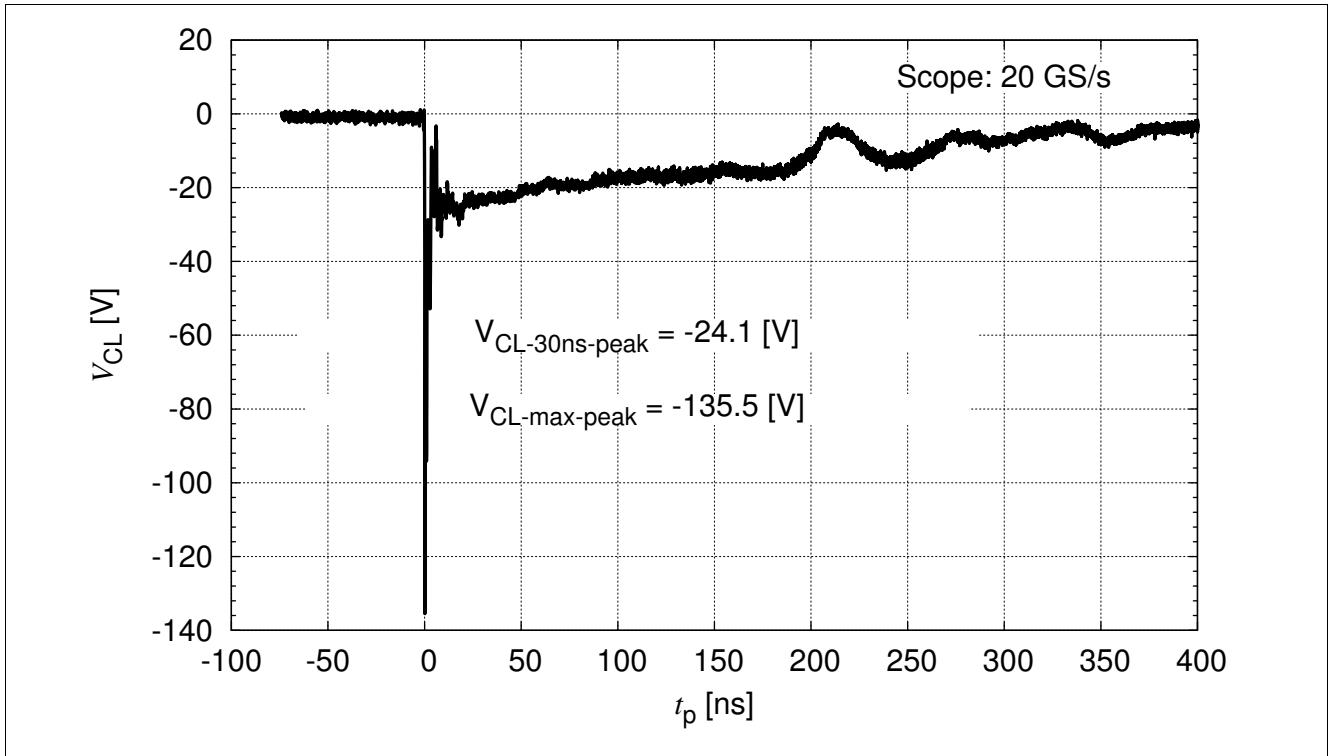


Figure 6 IEC61000-4-2 $V_{CL} = f(t)$, 8 kV negativ pulse from pin 1 to pin 2

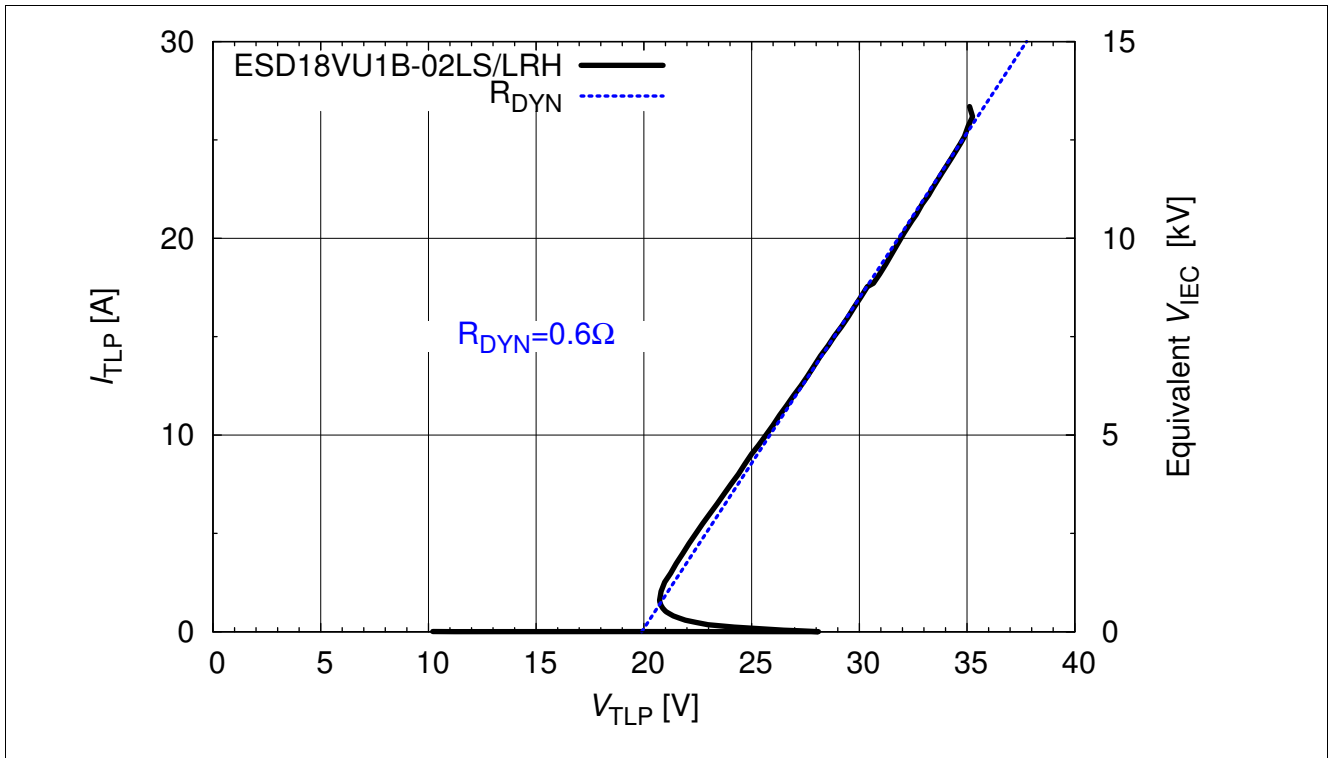


Figure 7 Clamping voltage : $I_{TLP} = f(V_{TLP})$

4 Application Information

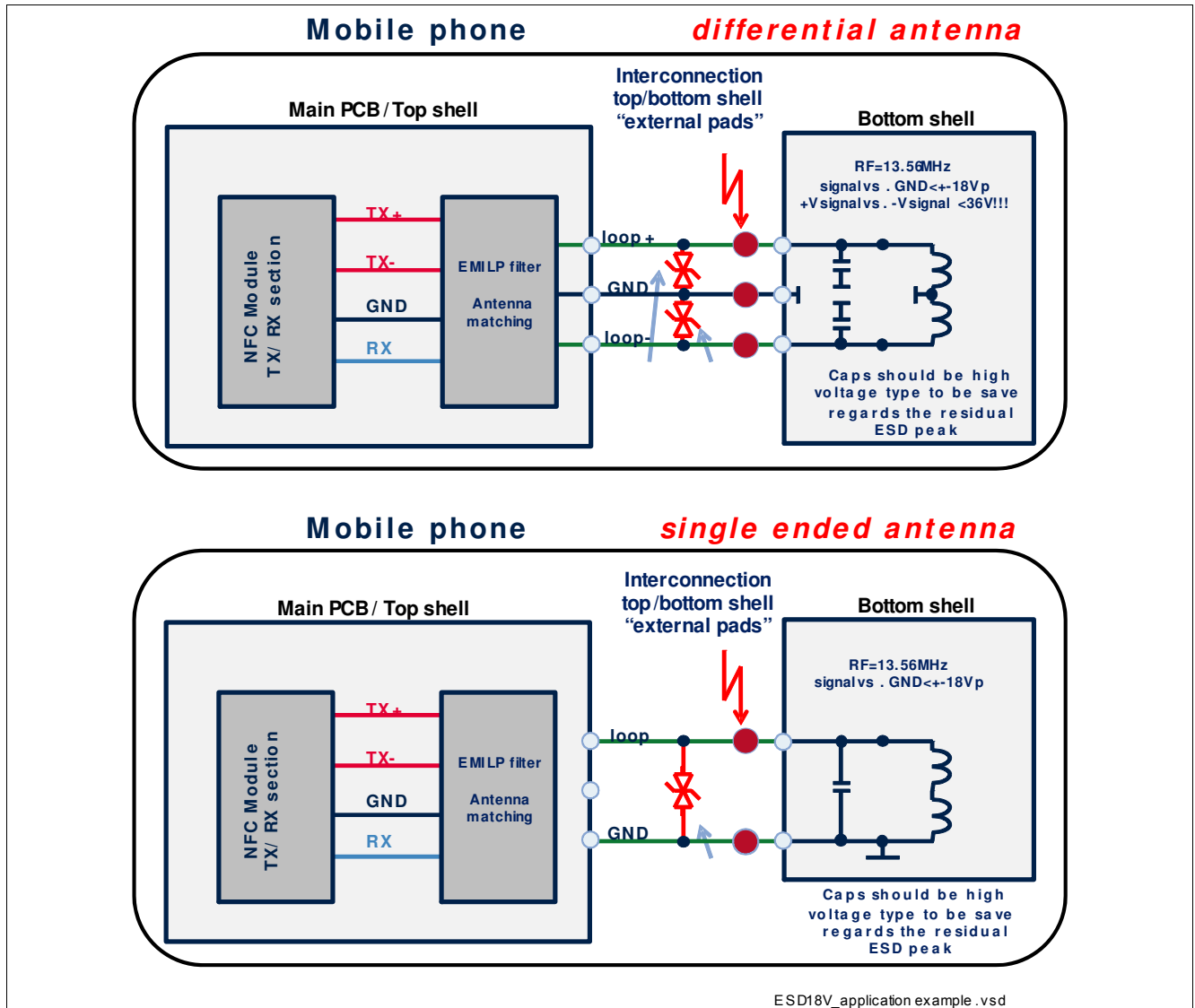


Figure 8 Bi-directional ESD / Transient protection for NFC Frontend [3]

5 Ordering Information Scheme (Examples)

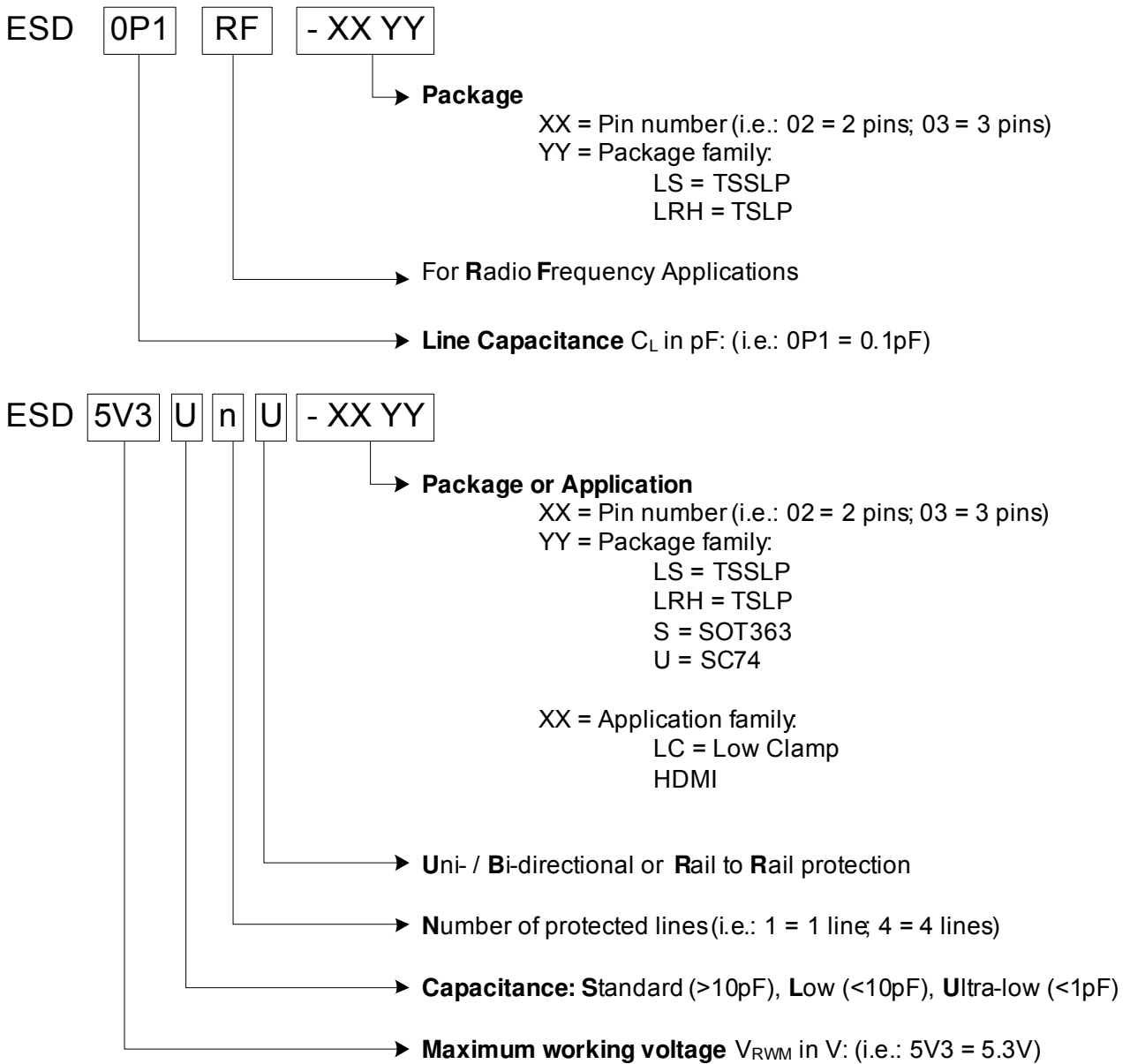


Figure 9 Ordering information scheme

6 Package Information

6.1 PG-TSSLP-2-1 [2]

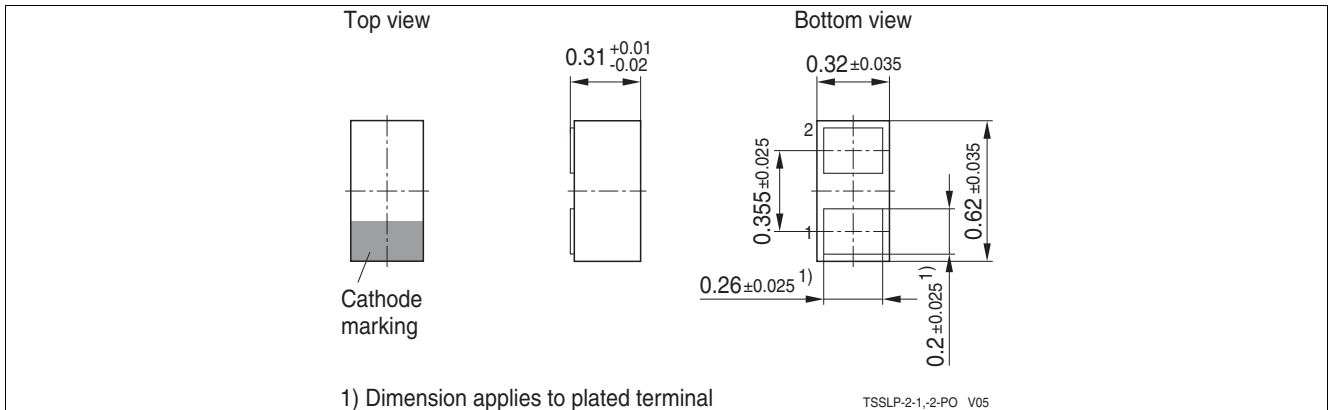


Figure 10 PG-TSSLP-2-1: Package overview

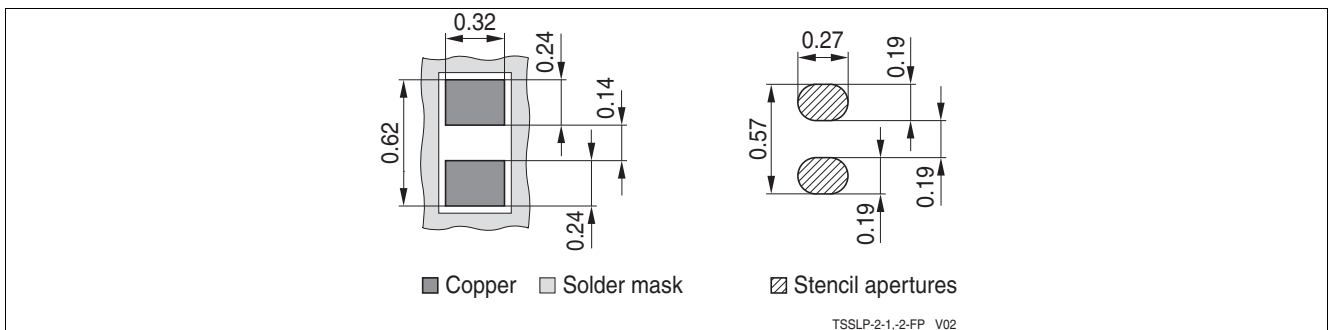


Figure 11 PG-TSSLP-2-1: Footprint

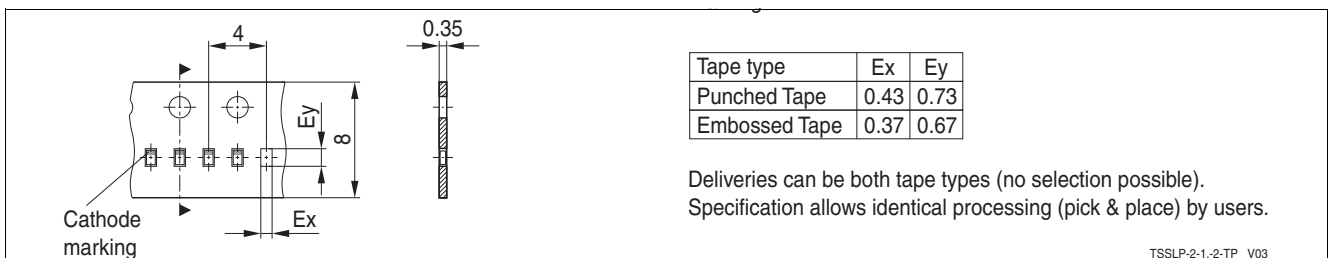


Figure 12 PG-TSSLP-2-1: Packing

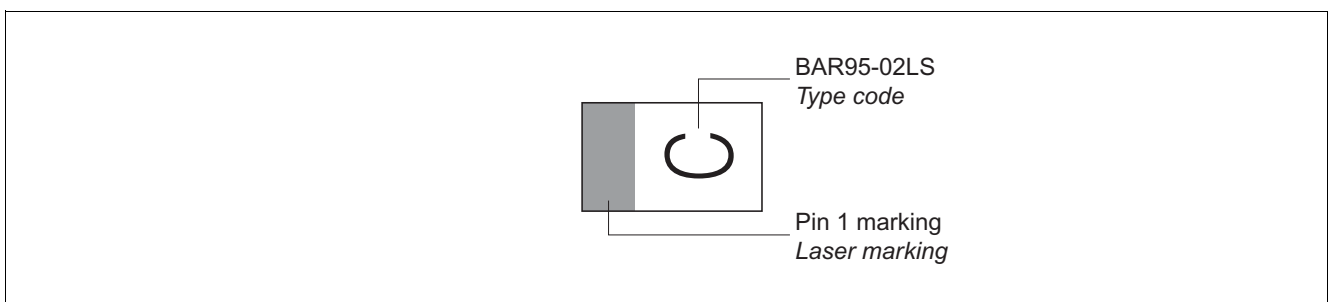


Figure 13 PG-TSSLP-2-1: Marking (example)

6.2 PG-TSLP-2-17 [2]

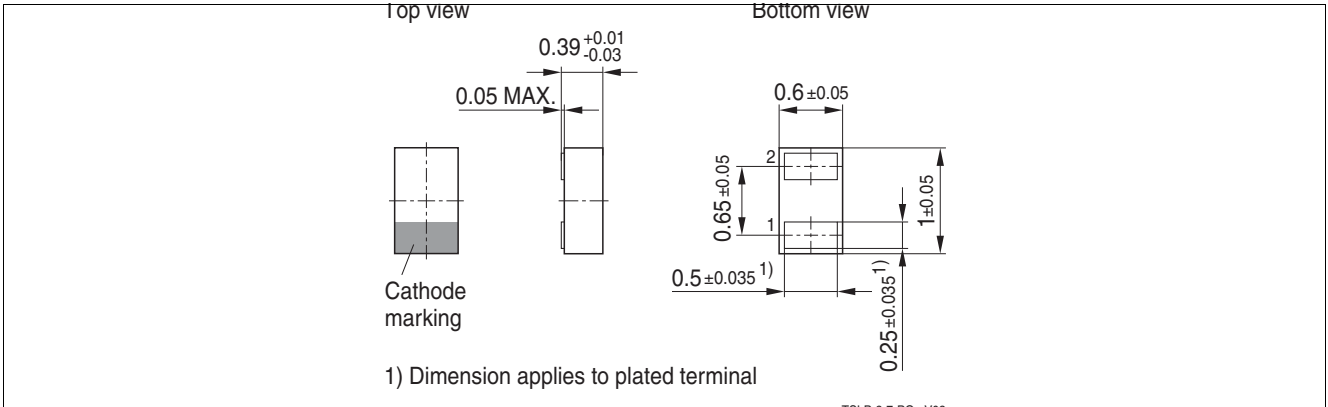


Figure 14 PG-TSLP-2-17: Package overview

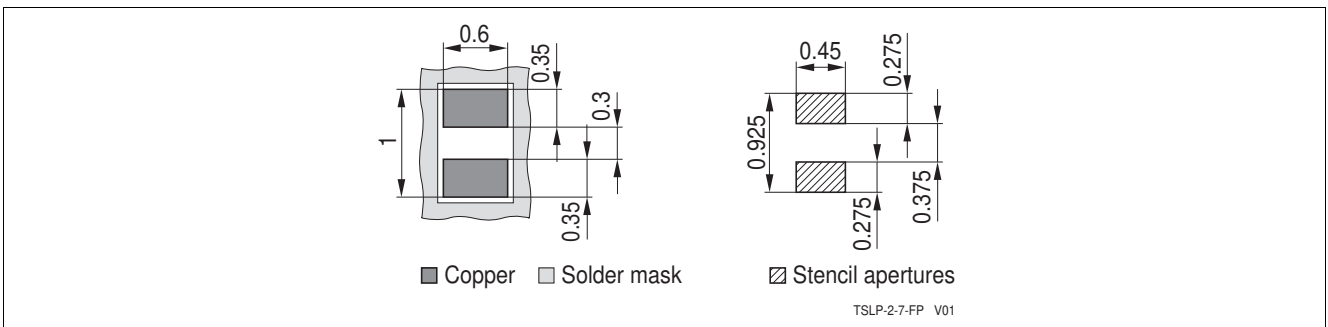


Figure 15 PG-TSLP-2-17: Footprint

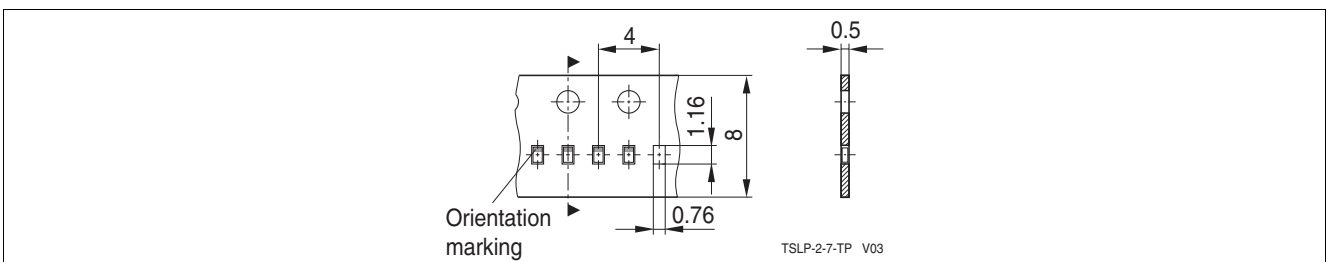


Figure 16 PG-TSLP-2-17: Packing

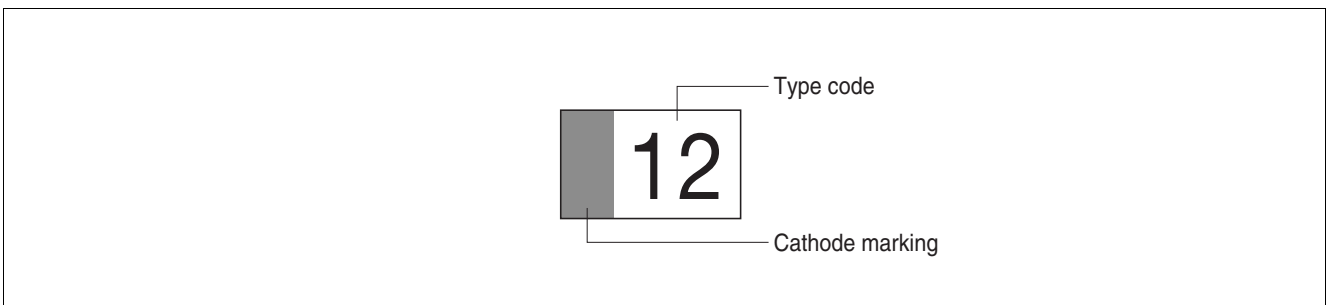


Figure 17 PG-TSLP-2-17: Marking (example)

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 ($R = 330 \Omega$, $C = 150 \text{ pF}$)
V_R	Reverse voltage
V_{RWM}	Reverse working voltage maximum
V_{TRIG}	Trigger voltage
Z_0	Impedance

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