TVS Diodes

Transient Voltage Suppressor Diodes

ESD0P2RF Series

Bi-directional Ultra-low Capacitance ESD / Transient Protection Diode

ESD0P2RF-02LS
ESD0P2RF-02LRH

Data Sheet

Rev. 1.2, 2012-10-01
Final

Power Management & Multimarket

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Revision History: Rev. 1.1,.2012-04-27	
Page or Item	**Subjects (major changes since previous revision)**
Rev. 1.2, 2012-10-01 Page Nr.8 Package name corrected (mismatch)	
10	Table 2-4 updated

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1 Bi-directional Ultra-low Capacitance ESD / Transient Protection Diode

1.1 Features

- ESD / transient protection of RF signal lines according to:
  - **IEC61000-4-2 (ESD): ±20 kV (air/contact)**
  - **IEC61000-4-4 (EFT): 40 A (5/50 ns)**
  - **IEC61000-4-5 (surge): 3 A (8/20 µs)**
- Maximum working voltage: V_{RWM} ±5.3 V
- Extremely low capacitance: C_L **= 0.2 pF (typical)**
- Low clamping voltage: V_{CL} = 29 V at I_{PP} = 16 A (typical)
- Very low reverse current I_R < 1 nA typ.
- Very small form factor down to 0.62 x 0.32 x 0.31 mm^3
- Pb-free (RoHS compliant) and halogen free package

1.2 Application Examples

- ESD protection of sensitive RF signal lines, Bluetooth Class 2, Automated Meter Reading
- RF antenna protection, frontend module, GPS, mobile TV, FM radio, UWB

1.3 Product Description

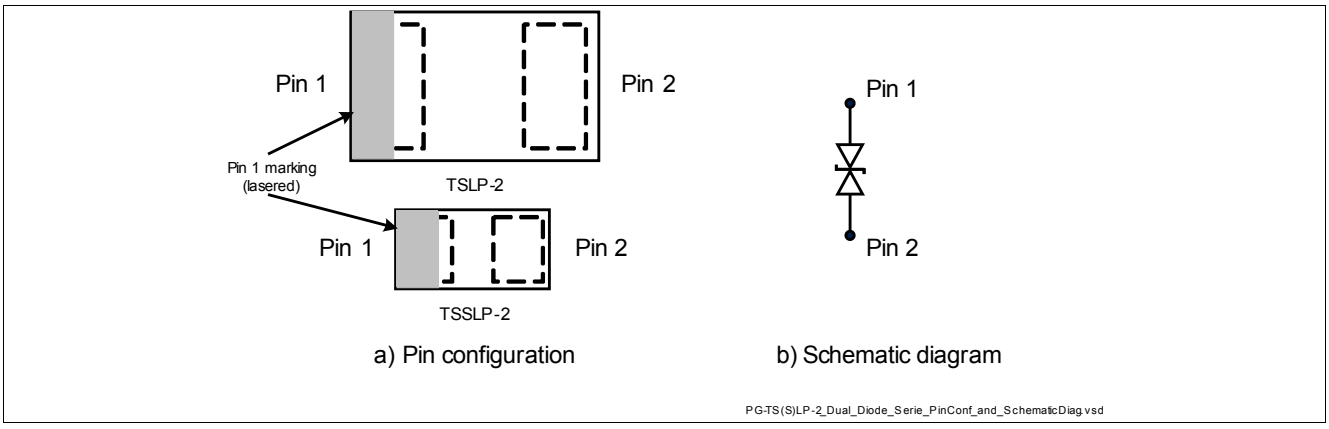


Figure 1-1 Pin Configuration and Schematic Diagram

Table 1-1 Ordering Information

Type	Package	Configuration	Marking code
ESD0P2RF-02LS	PG-TSSLP-2-1	1 line, bi-directional	T
ESD0P2RF-02LRH	PG-TSLP-2-17	1 line, bi-directional	T

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2 Characteristics

Table 2-1 Maximum Ratings at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
ESD air / contact discharge[1)]	V_{ESD}	–	–	20	kV
Peak pulse current (t_p = 8/20 µs)[2)]	I_{PP}	–	–	3	A
Operating temperature range	T_{OP}	-55	–	125	°C
Storage temperature	T_{stg}	-65	–	150	°C

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

2) I_{PP} 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 integrated circuit.

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

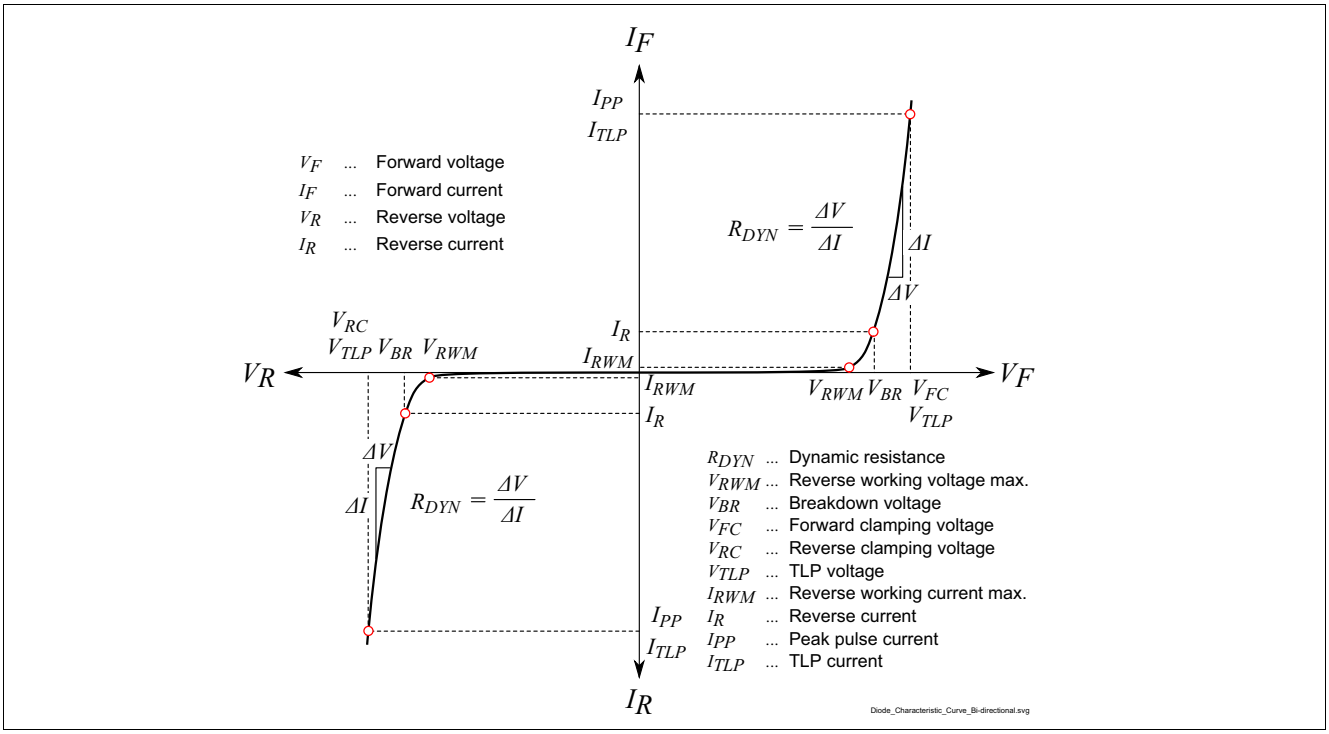


Figure 2-1 Definitions of electrical characteristics

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Table 2-2 DC Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Reverse working voltage	V_{RWM}	–5.3	–	5.3	V	
Breakdown voltage	V_{BR}	7	–	–	V	I_R = 1 mA, from pin 1 to pin 2, from pin 2 to pin 1
Reverse current	I_R	–	<1	50	nA	V_R = 5.3 V

Table 2-3 RF Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode capacitance	C_L	–	0.23	0.4	pF	V_R = 0 V, f = 1 MHz
		–	0.2	0.4	pF	V_R = 0 V, f = 1 GHz

Table 2-4 ESD Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Clamping voltage[2)]	V_{CL}	–	29	–	V	I_{TLP} = 16 A
		–	38	–		I_{TLP} = 30 A
Clamping voltage[1)]		–	11	17		I_{PP} = 1 A
		–	15	21		I_{PP} = 3 A
Dynamic resistance[2)]	R_{DYN}	–	1	–	Ω	
Series inductance	L_S	–	0.2	–	nH	ESD0P2RF-02LS
		–	0.4	–	nH	ESD0P2RF-02LRH

1) I_{PP} according to IEC61000-4-5 (t_p = 8/20 µs)

2) Please refer to Application Note AN210 [4]. 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_{TLP1} = 10 A and I_{TLP2} = 40 A.

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

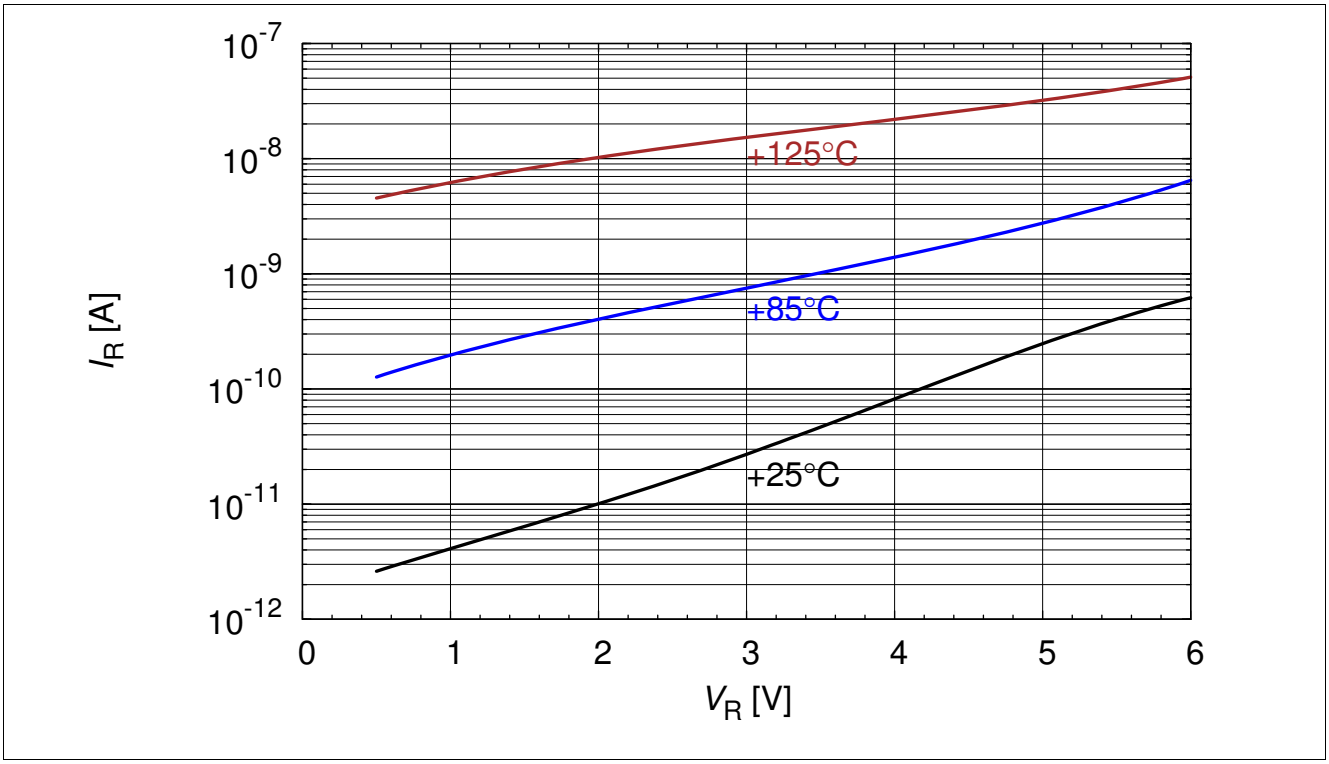


Figure 2-2 Reverse current: $I_R = f(V_R)$, T_A = parameter

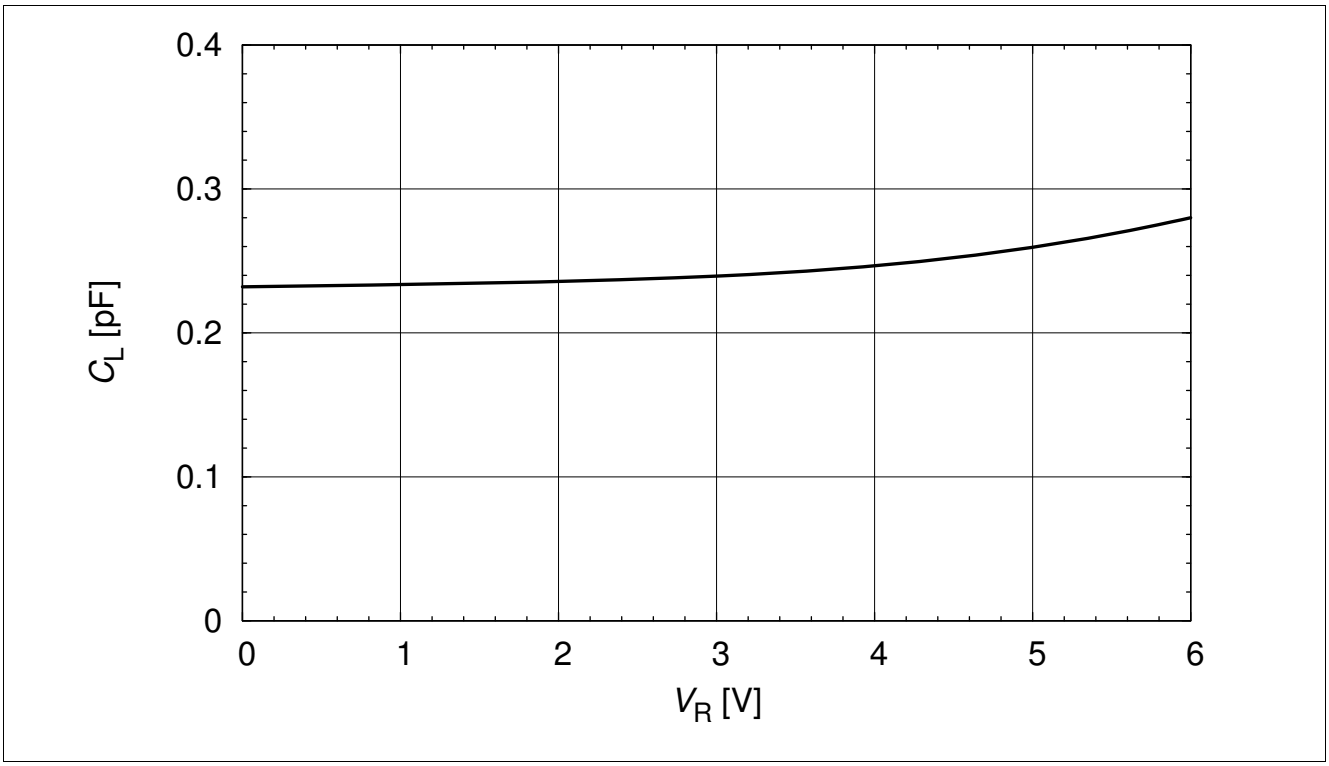


Figure 2-3 Line capacitance: $C_L = f(V_R)$, f = 1 MHz

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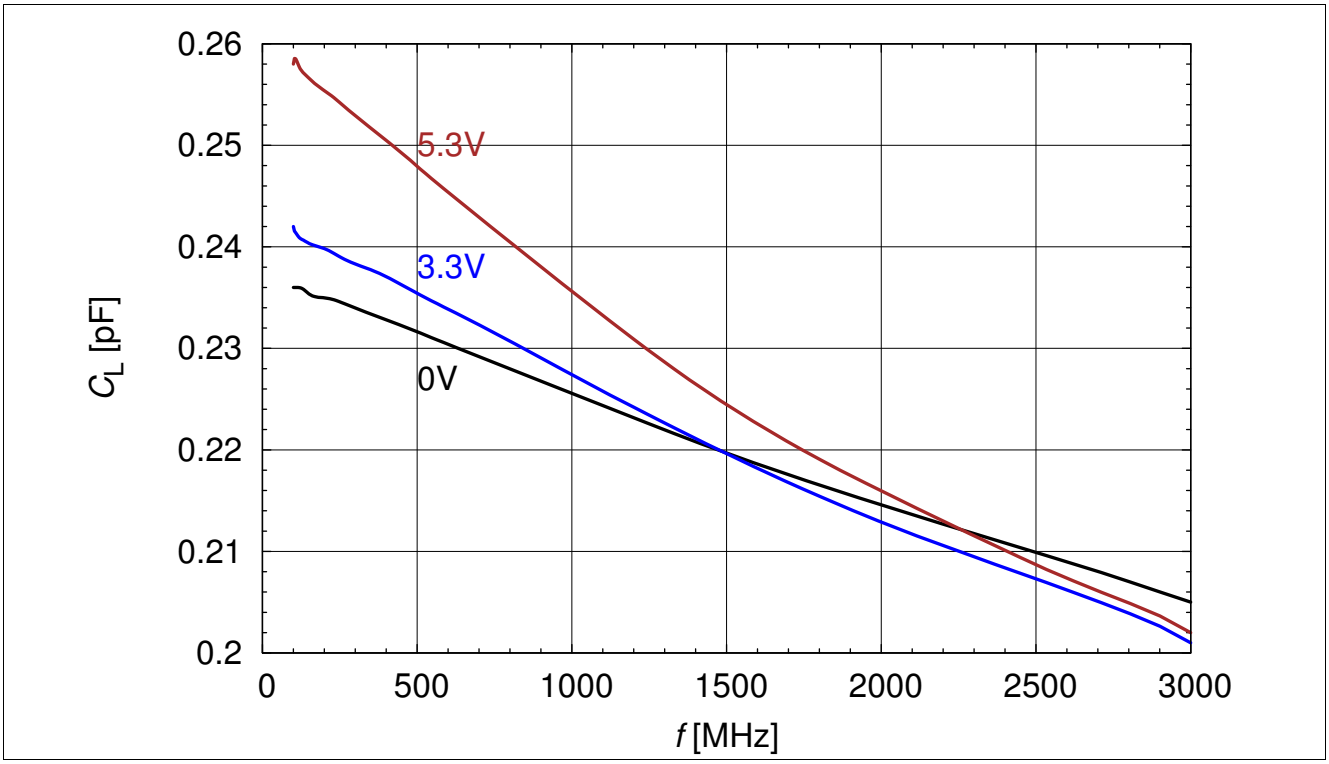


Figure 2-4 Line capacitance: $C_L = f(f)$, V_R = parameter

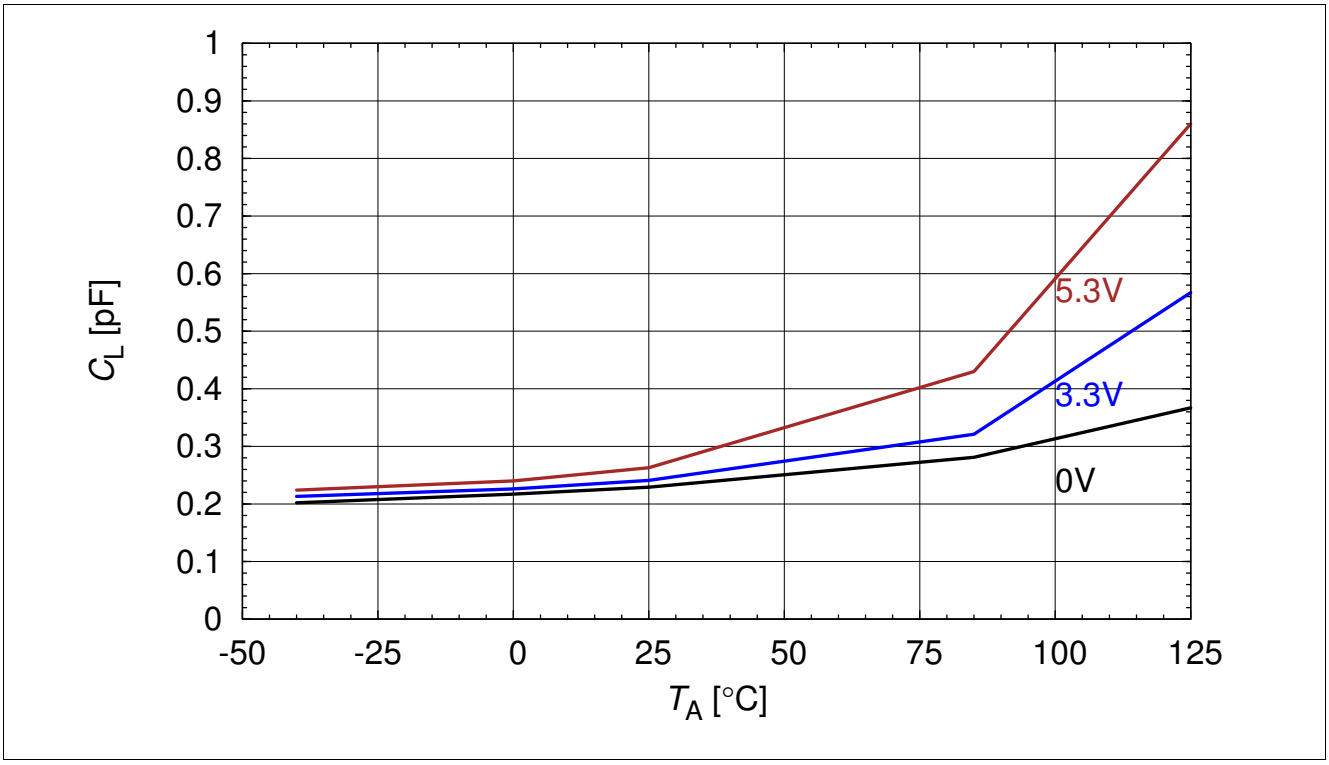


Figure 2-5 Line capacitance: $C_L = f(T_A)$, V_R = parameter

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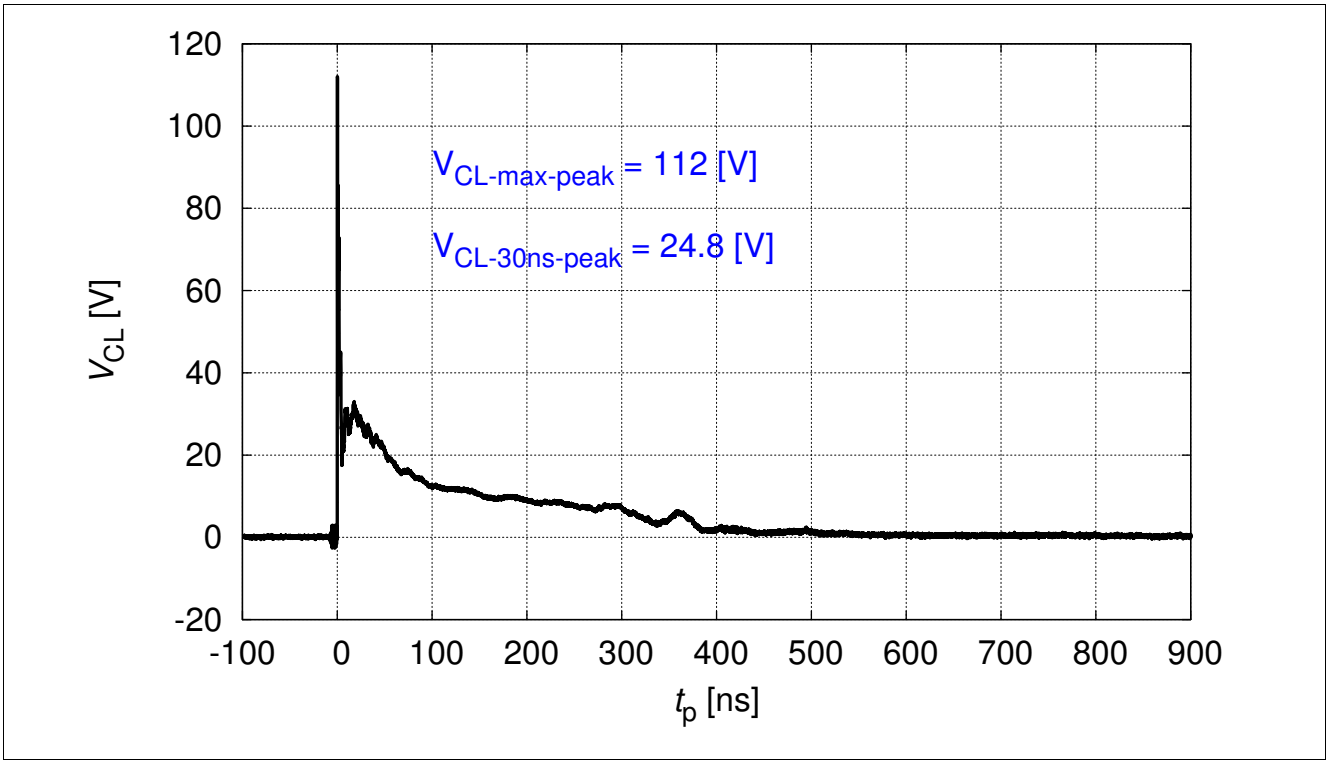


Figure 2-6 IEC61000-4-2 $V_{CL} = f(t)$, 8 kV positiv pulse from pin 1 to pin 2

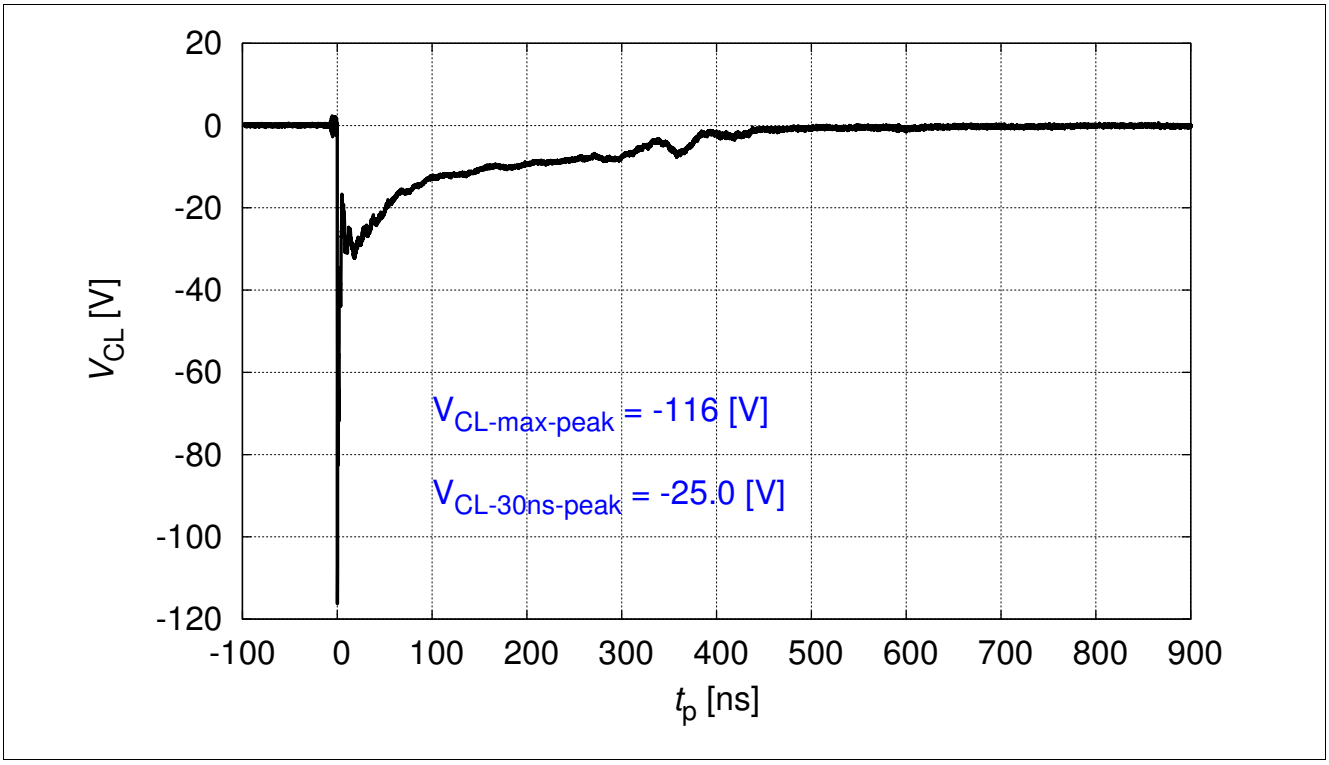


Figure 2-7 IEC61000-4-2 $V_{CL} = f(t)$, 8 kV negativ pulse from pin 1 to pin 2

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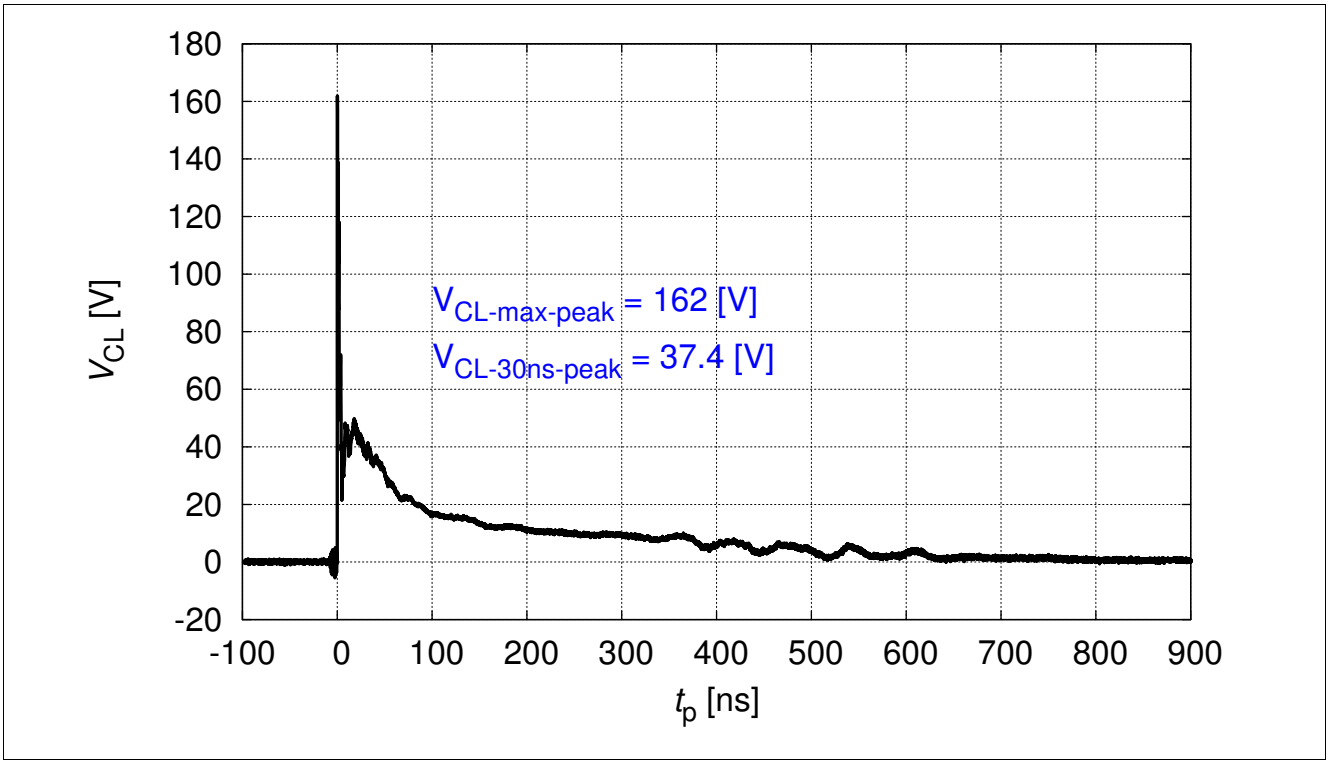


Figure 2-8 IEC61000-4-2 V_{CL} = *f*(*t*), 15 kV positiv pulse from pin 1 to pin 2

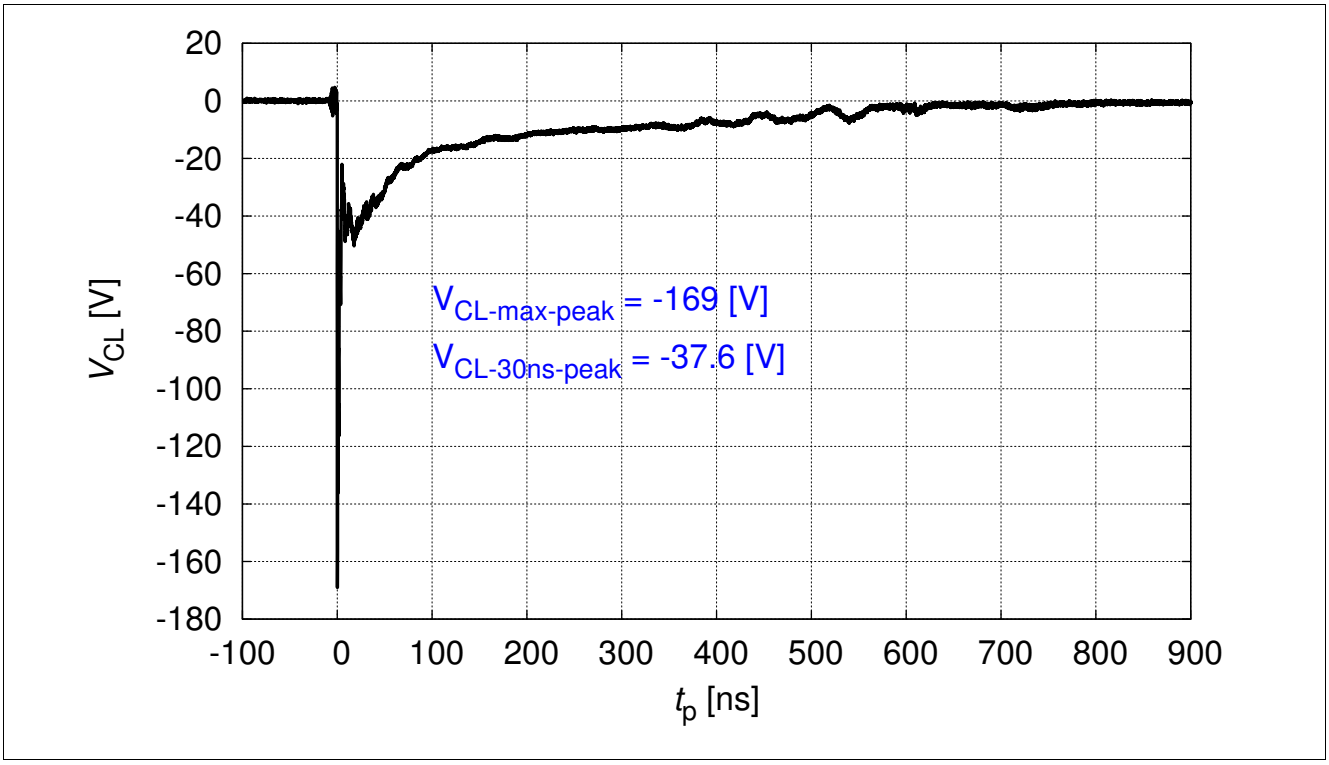


Figure 2-9 IEC61000-4-2 V_{CL} = *f*(*t*), 15 kV negativ pulse from pin 1 to pin 2

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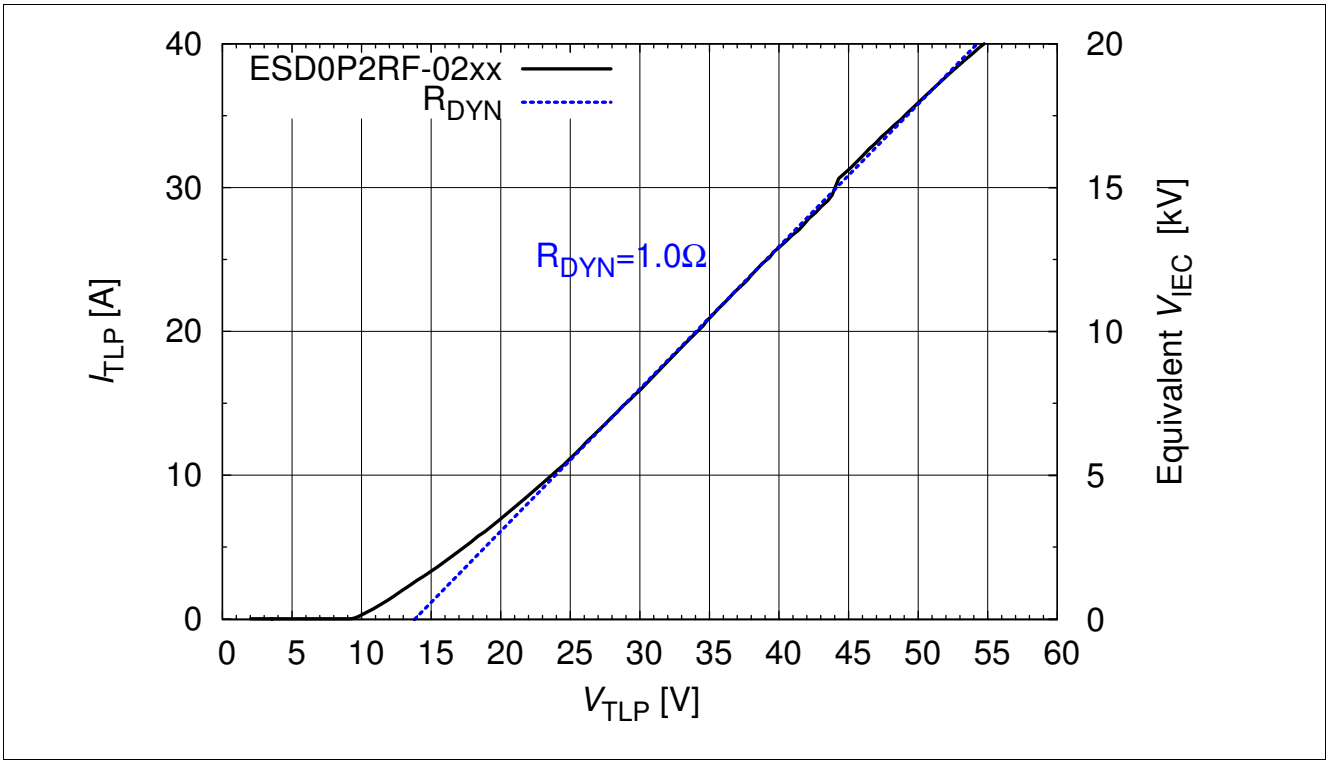


Figure 2-10 Clamping voltage : $I_{TLP} = f(V_{TLP})$ [4]

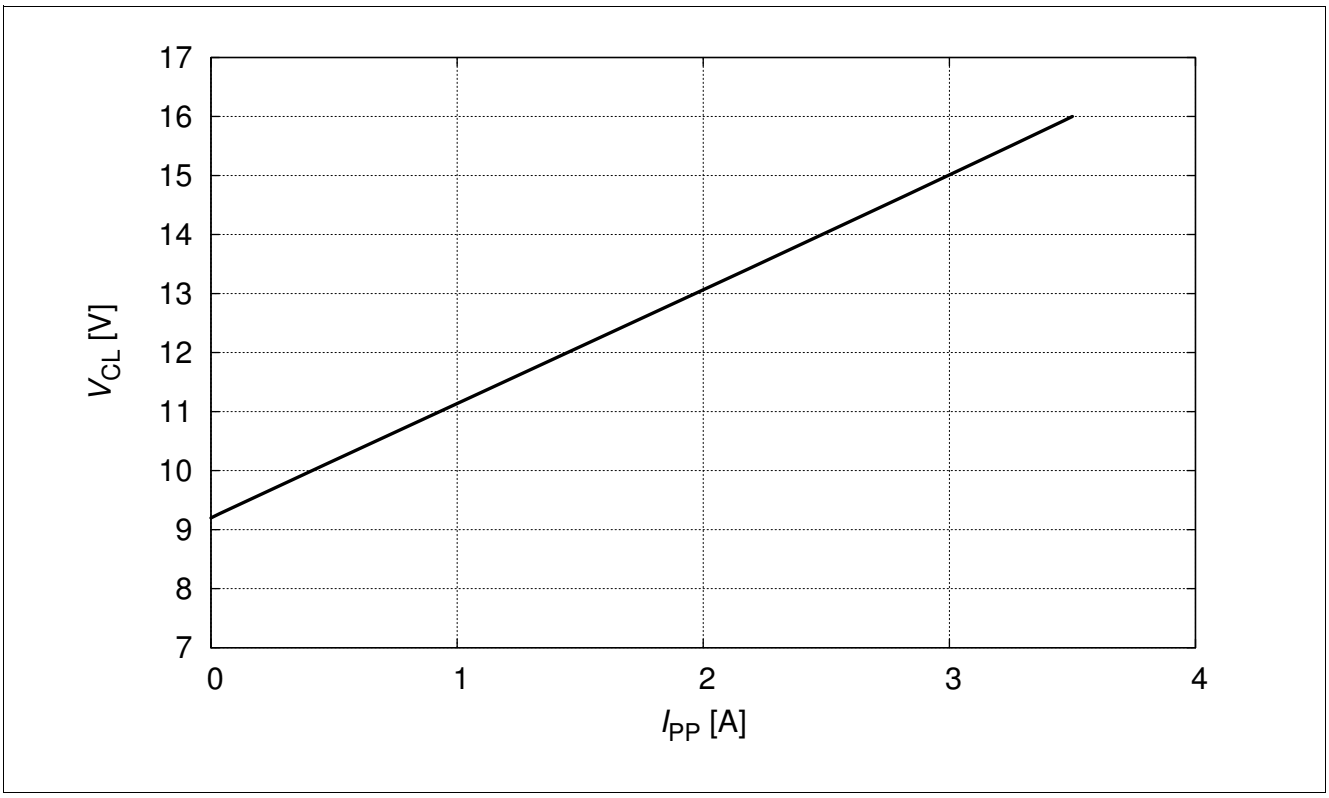


Figure 2-11 Clampine voltage: $V_{CL} = f(I_{PP})$, t_p = 8/20 µs

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3 Application Information

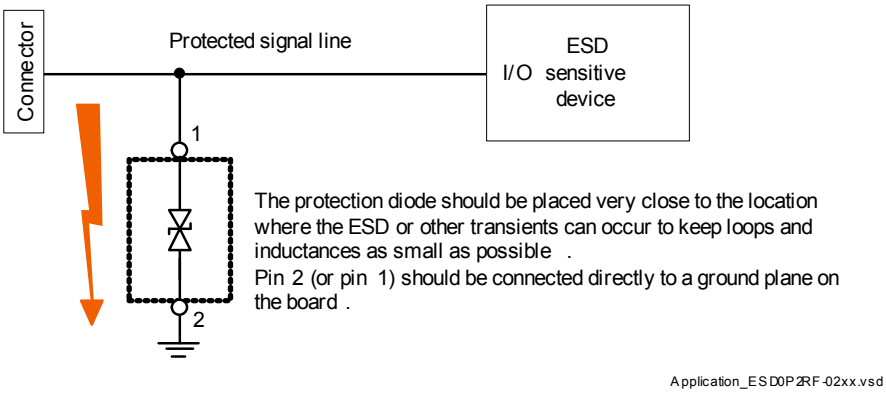


Figure 3-1 Single line, bi-directional ESD / Transient protection [1], [2]

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4 Ordering Information Scheme (Examples)

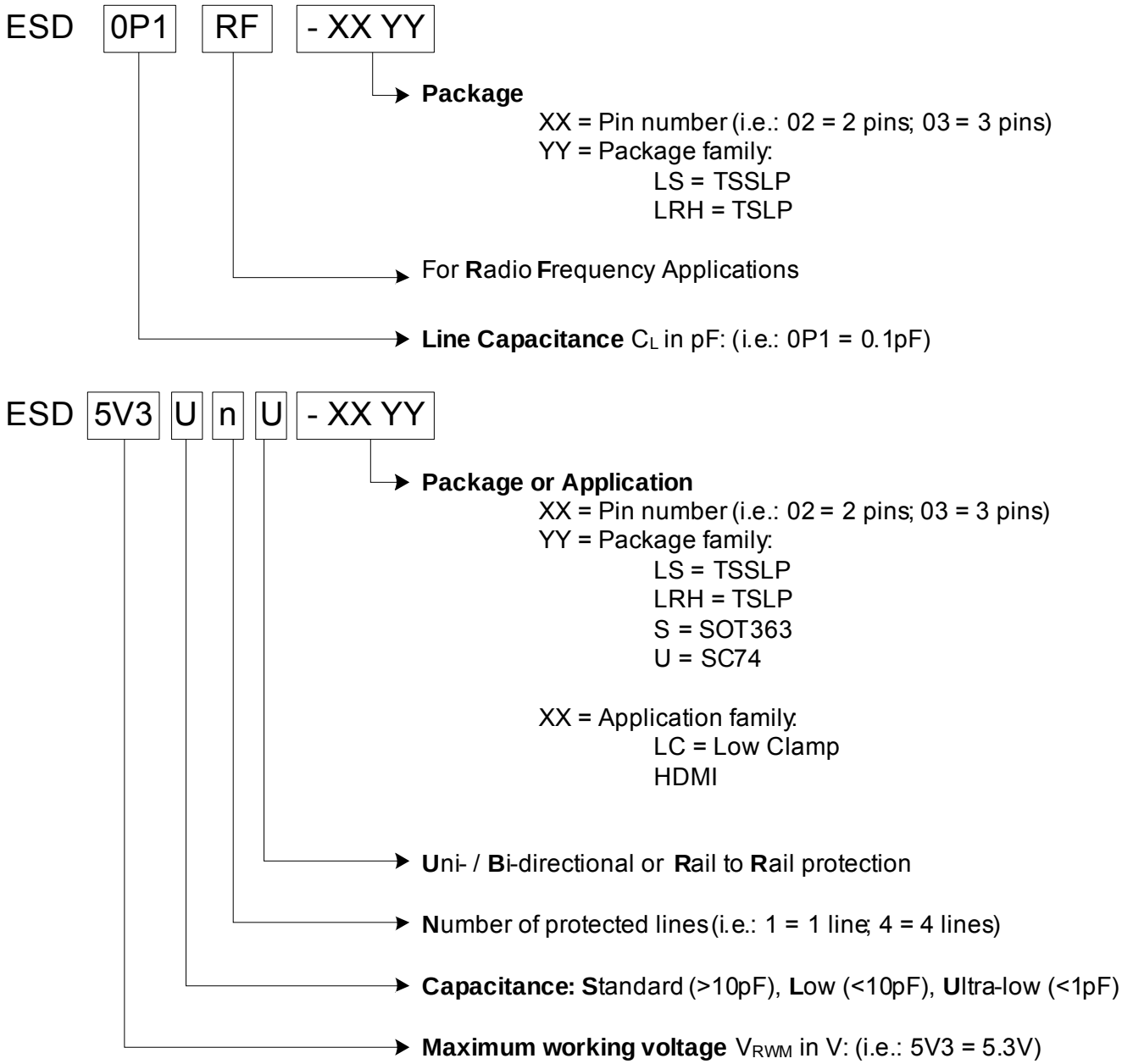


Figure 4-1 Ordering information scheme

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5 Package Information

5.1 PG-TSLP-2-17 (mm) [5]

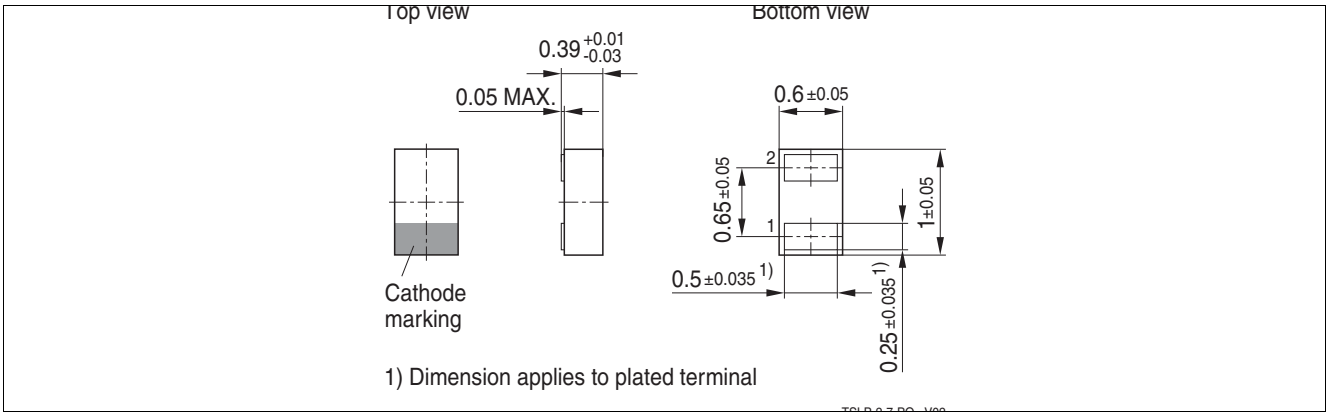


Figure 5-1 PG-TSLP-2-17: Package overview

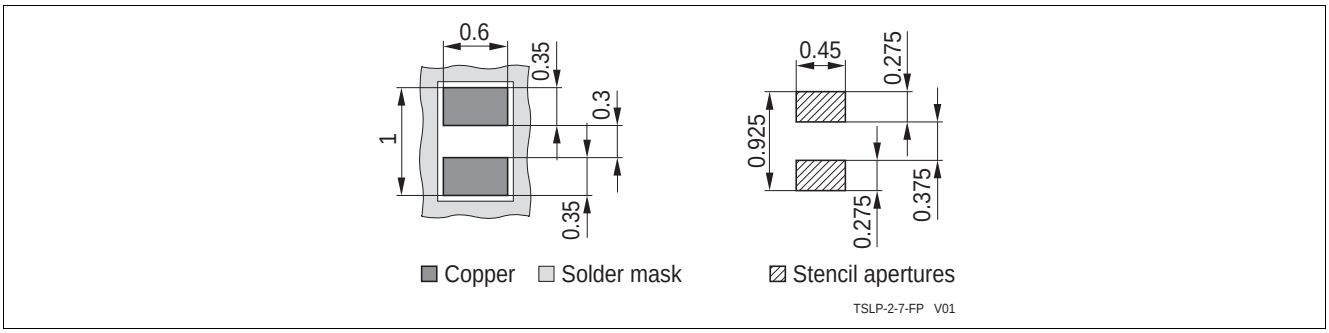


Figure 5-2 PG-TSLP-2-17: Footprint

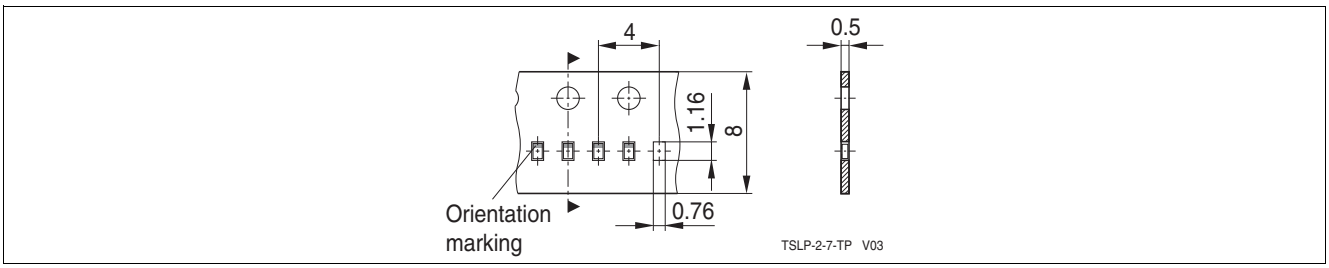


Figure 5-3 PG-TSLP-2-17: Packing

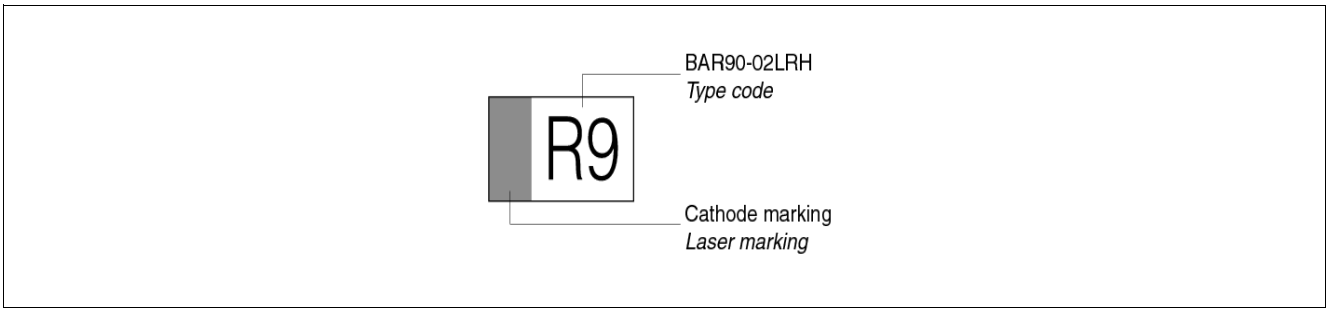


Figure 5-4 PG-TSLP-2-17: Marking (example)

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6 Package Information

6.1 PG-TSSLP-2-1 (mm) [5]

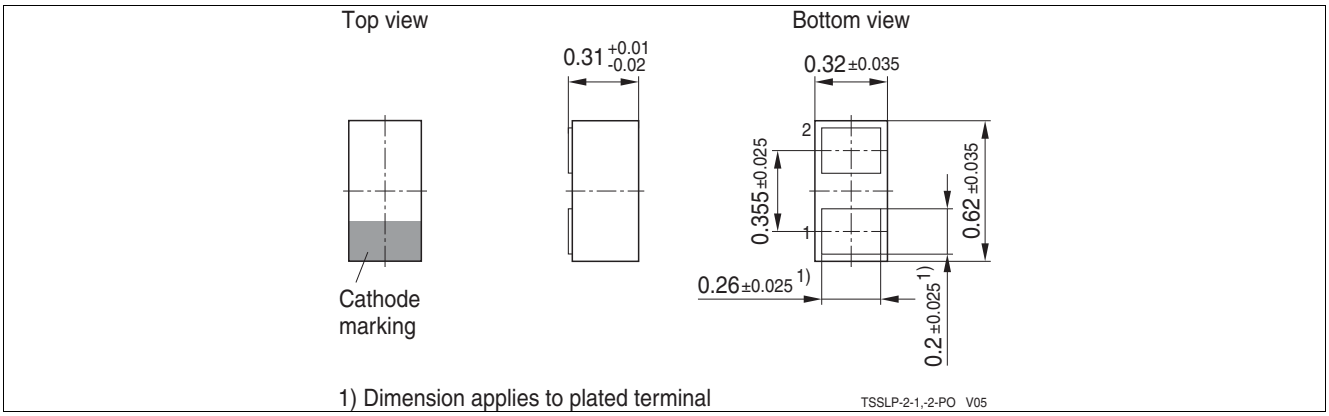


Figure 6-1 PG-TSSLP-2-1: Package overview

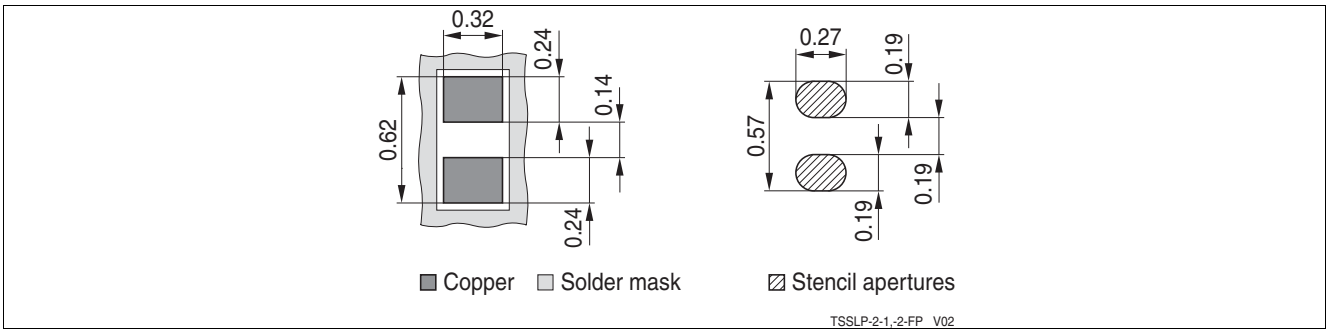


Figure 6-2 PG-TSSLP-2-1: Footprint

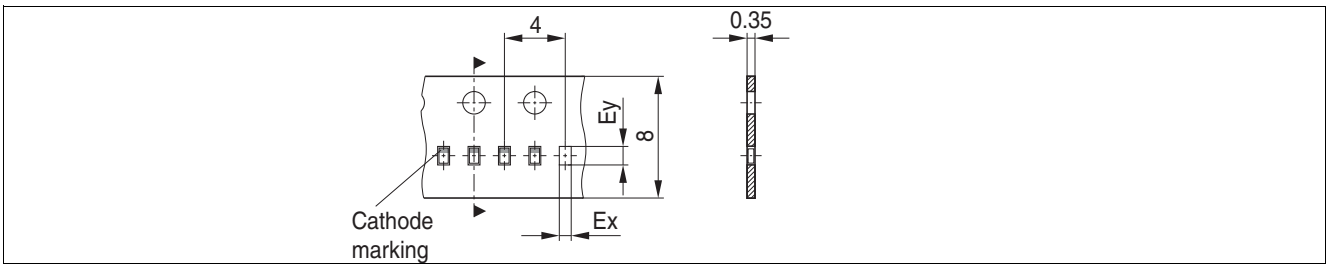


Figure 6-3 PG-TSSLP-2-1: Packing

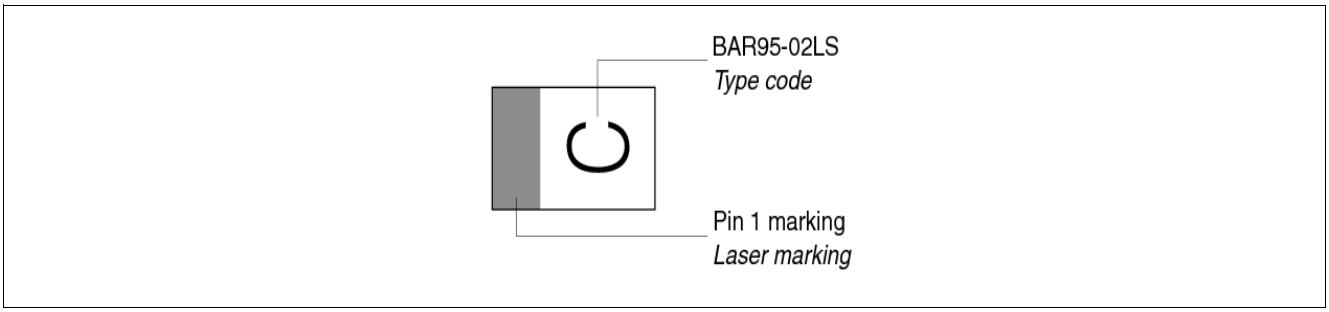


Figure 6-4 PG-TSSLP-2-1: Marking (example)

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References

[1] Infineon AG - **Application Note AN167**: ESD Protection for Broadband LNA BGA728L7 for Portable and Mobile TV Applications

[2] Infineon AG - **Application Note AN178**: ESD Protection for RF Antennas using Infineon ESD0P4RFL and ESD0P2RF-xx

[3] Infineon AG - **Application Note AN200**: Low Cost FM Radio LNA using BFR340F for Mobile Phone Applications

[4] Infineon AG - **Application Note AN210**: Effective ESD Protection Design at System Level using VF-TLP Characterization Methodology

[5] Infineon AG - Recommendations for PCB Assembly of Infineon TSLP and TSSLP Packages

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