TVS Diodes

Transient Voltage Suppressor Diodes

TVS3V3L4U

Low Capacitance ESD / Transient / Surge Protection Array

Data Sheet

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Page or Item	**Subjects (major changes since previous revision)**
Revision 2.2, 2012-05-09	
7	**Figure 1-1** updated

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Last Trademarks Update 2010-06-09

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1 Low Capacitance ESD / Transient / Surge Protection Array

1.1 Features

- ESD/Transient/Surge protection according to:
  IEC61000-4-2 (ESD): ±30 kV contact discharge
  IEC61000-4-4 (EFT): ±80 A (5/50 ns)
  IEC61000-4-2 (Surge): ±20 A (8/20 µs)
- Reverse working voltage maximum: V_{RWM} = 3.3 V
- Low leakage current: I_R < 50 nA
- **Low capacitance: C_L = 2 pF typ. (I/O to GND), 1 pF typ. (I/O to I/O)**
- Low clamping voltage: V_{CL} = 7.7 V @ 20 A (8/20 µs) typ.
- Pb-free (RoHS compliant) and halogen free package

1.2 Application Examples

- 10/100/1000 Ethernet
- 4 lines uni-directional (Pin 2 to GND)
- 2 lines bi-directional (Pin 2 n.c.)

1.3 Product Description

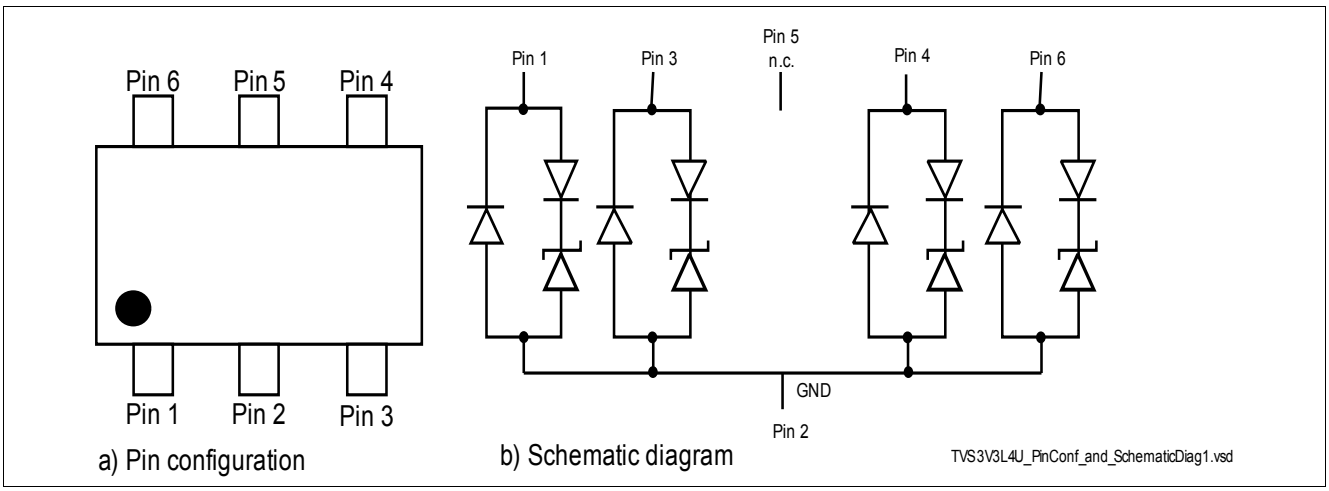

Figure 1-1 Pin configuration and Schematic diagram

Table 1-1 Ordering Information

Type	Package	Configuration	Marking code
TVS3V3L4U	SC74	4 lines, uni-directional or 2 lines, bidirectional	E1s

2 Electrical Characteristics

2.1 Maximum Ratings

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

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
ESD contact discharge[1)]	V_{ESD}	–	–	30	kV
Peak pulse current (t_P = 8/20 µs)[2)]	I_{PP}	–	–	20	A
Operating temperature	T_{OP}	-55	–	125	°C
Storage temperature	T_{stg}	-55	–	150	°C

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

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

2.2 DC Characteristics

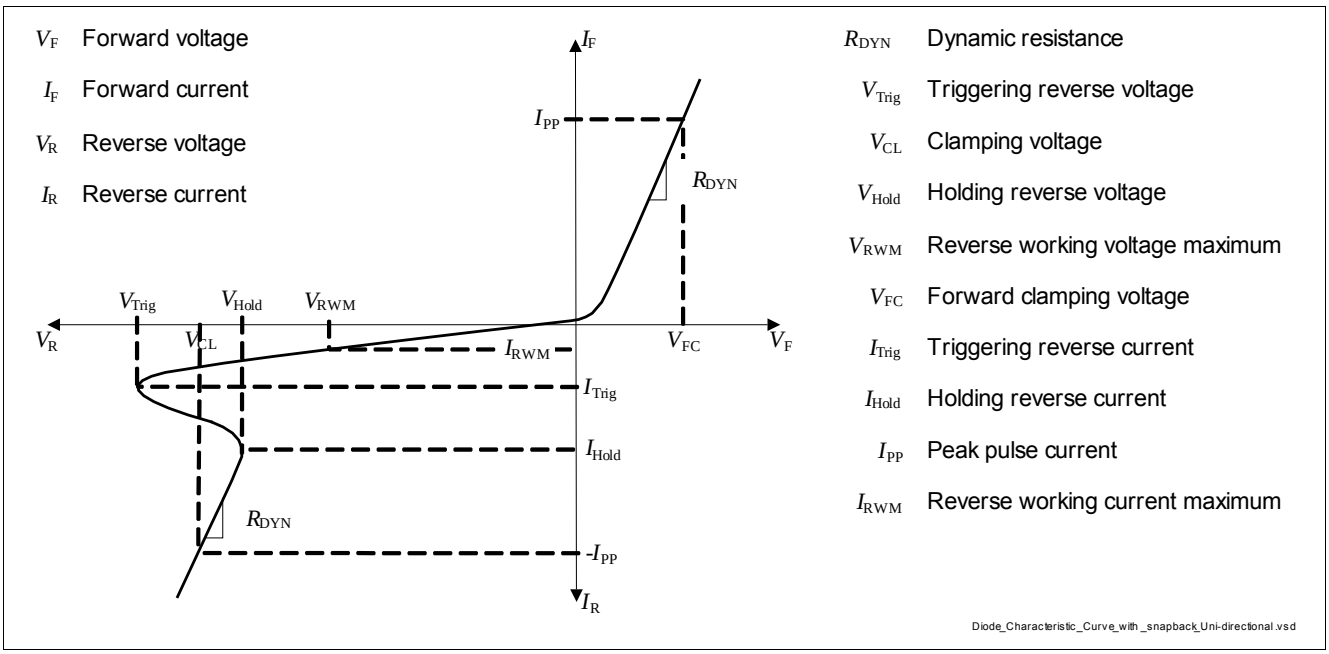

Figure 2-1 Definitions of electrical characteristics

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}	–	–	3.3	V	
Reverse current	I_R	–	–	50	nA	V_R = 3.3 V

2.3 RF Characteristics

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

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Line capacitance I/O to GND I/O to I/O	C_L	 – –	 2 1	 3 –	pF	V_R = 0 V, f = 1 MHz

2.4 ESD Characteristics

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

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Reverse clamping voltage[1] I/O to GND I/O to GND I/O to GND I/O to GND I/O to GND	V_{CL}	 – – – – –	 4.2 4.9 5.8 6.7 7.7	 – – – – –	V	t_p = 8/20 µs I_{PP} = 1 A I_{PP} = 5 A I_{PP} = 10 A I_{PP} = 15 A I_{PP} = 20 A
Reverse clamping voltage[2] I/O to GND		 –	 5.8	 –		t_p = 100 ns I_{PP} = 16 A_{PP}
Forward clamping voltage[1] GND to I/O GND to I/O	V_{FC}	 – –	 1.1 4	 – –	V	t_p = 8/20 µs I_{PP} = 1 A I_{PP} = 20 A
Forward clamping voltage[2] GND to I/O		 –	 3.1	 –		t_p = 100 ns I_{PP} = 16 A
Dynamic resistance[1] I/O to GND	R_{DYN}	 –	 0.15	 –	Ω	 t_p = 8/20 µs
Dynamic restiance[2] I/O to GND		 –	 0.09	 –		 t_p = 100 ns

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

2) 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 characteristics between I_{PP1} = 10 A and I_{PP2} = 40 A.

3 Typical Characteristic

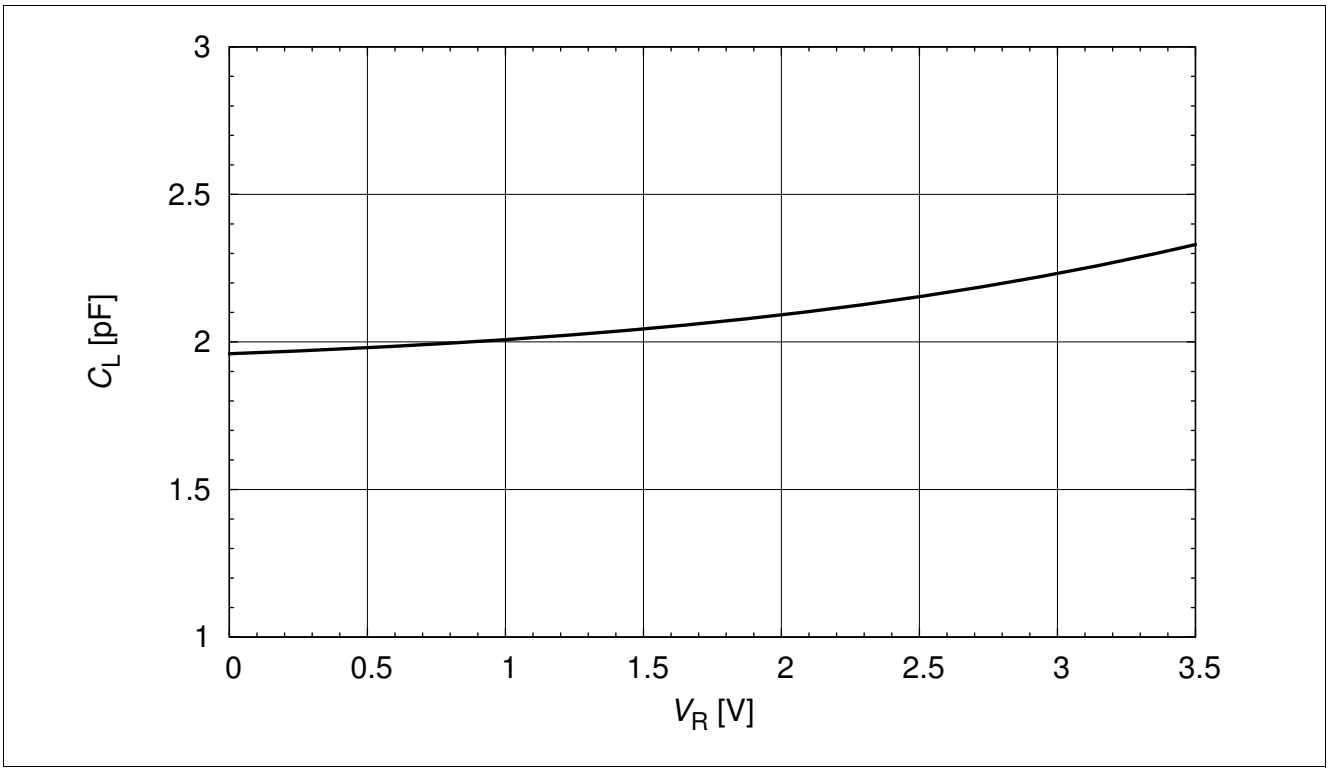

Figure 3-1 Line capacitance $C_L = f(V_R)$

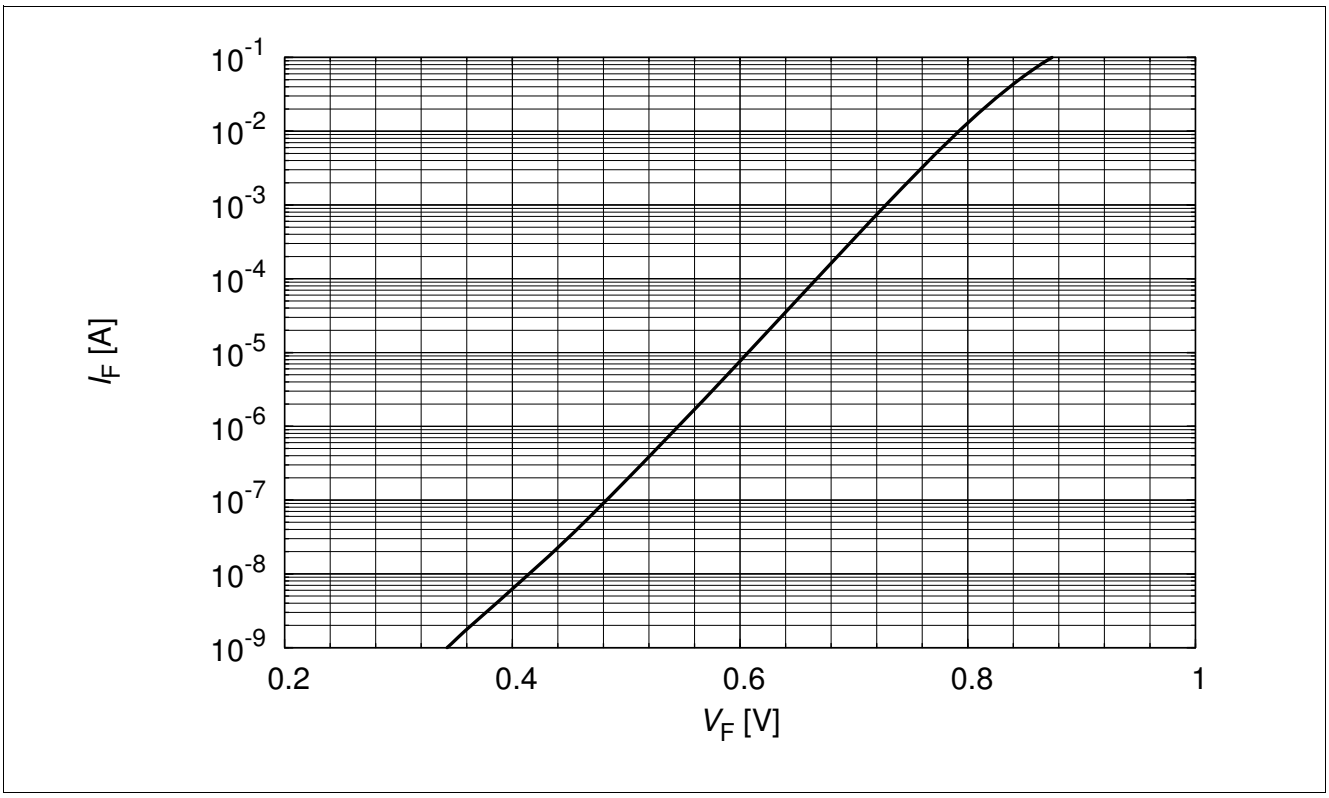

Figure 3-2 Forward characteristic, $I_F = f(V_F)$

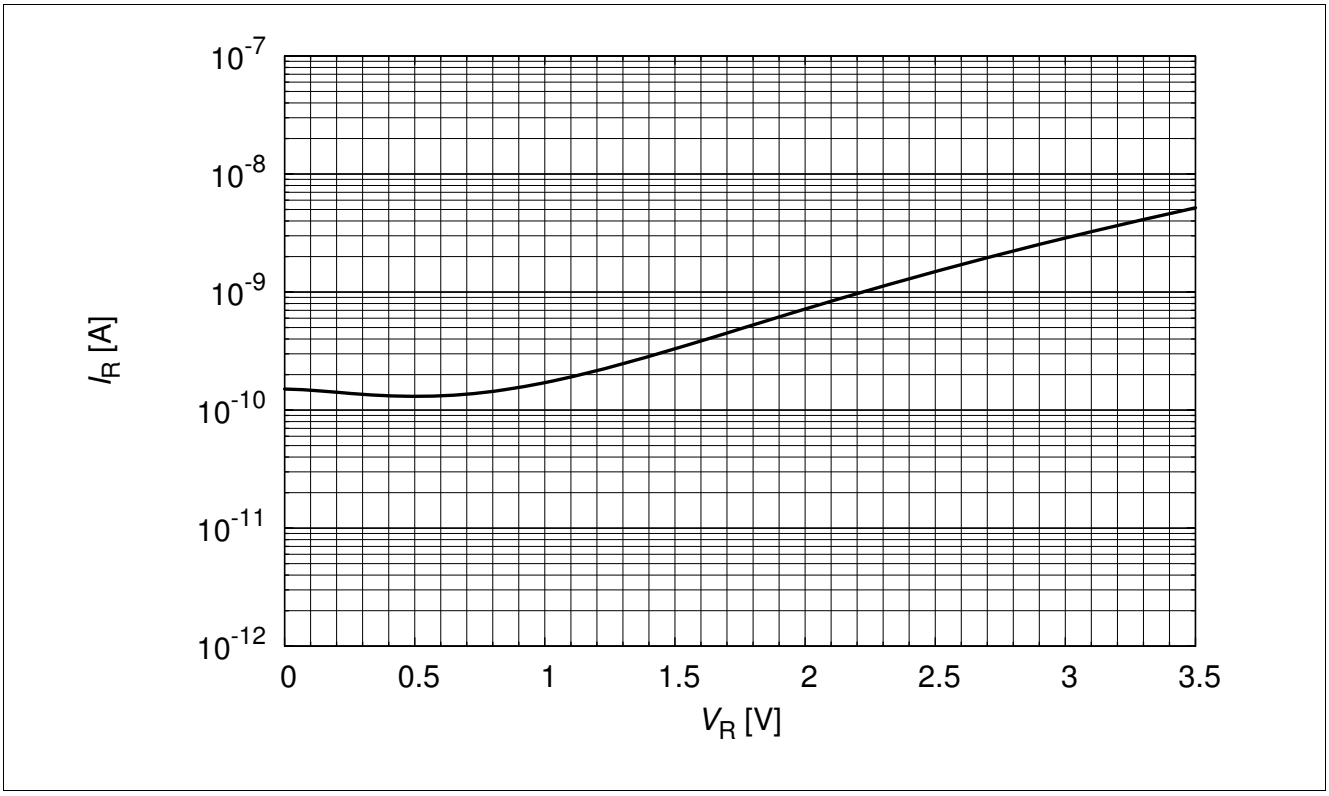

Figure 3-3 Reverse current, $I_R = f(V_R)$

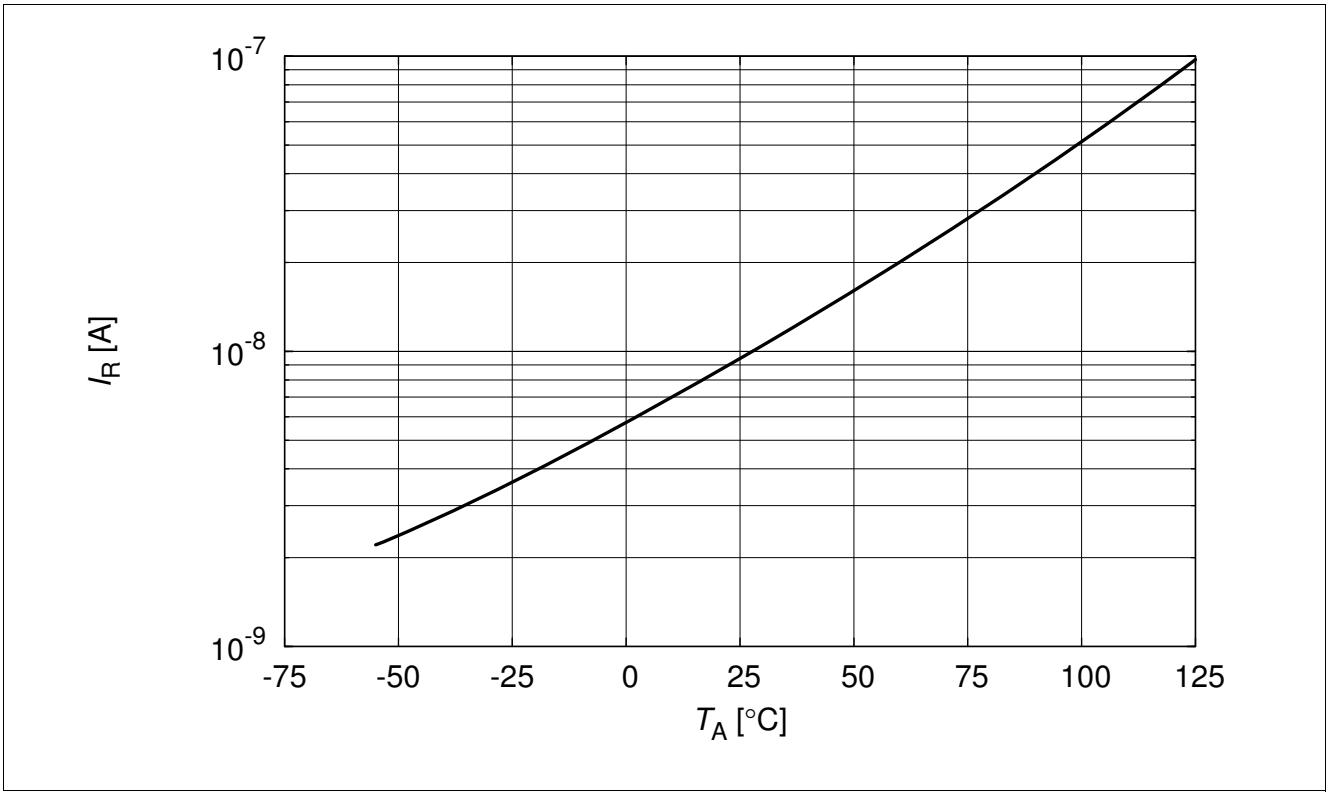

Figure 3-4 Reverse current $I_R = f(T_A)$, V_R = 3.3 V

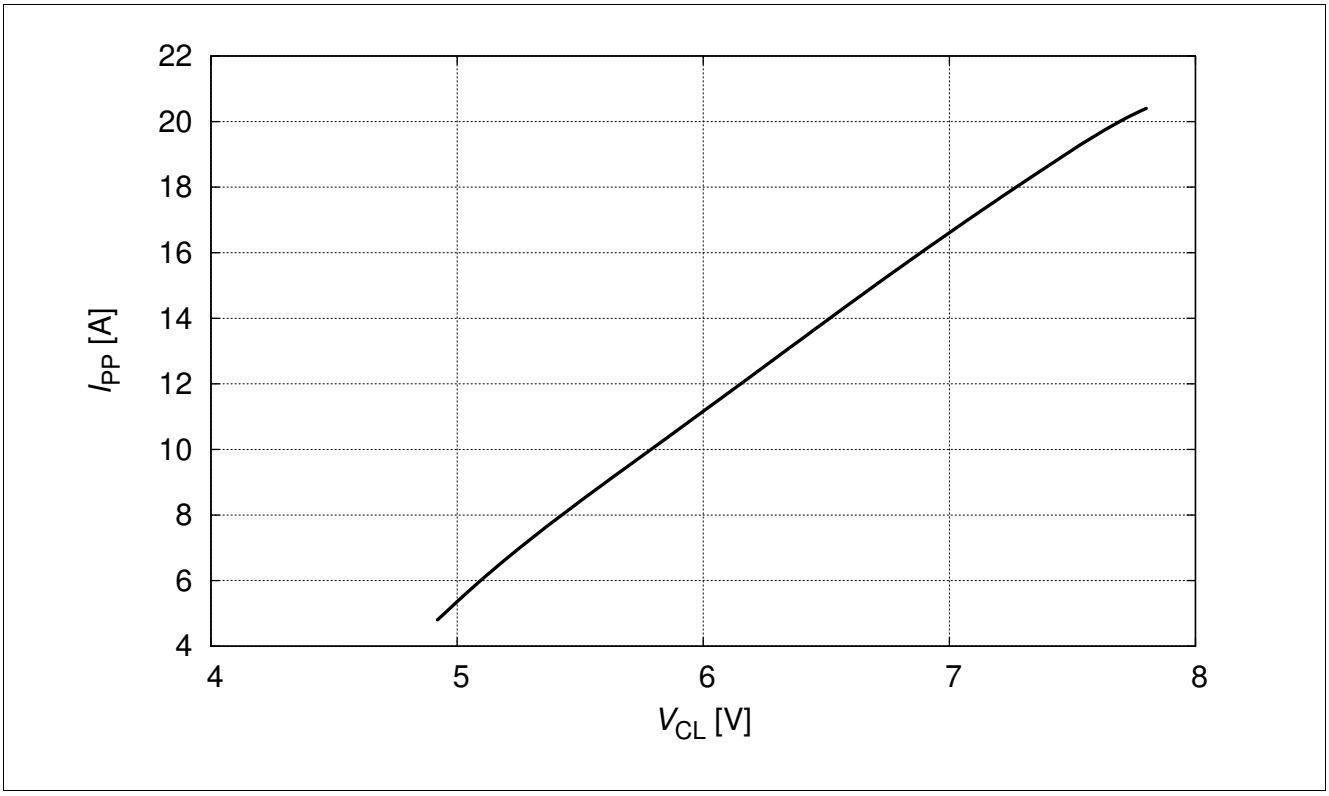

Figure 3-5 Pulse reverse current (IEC61000-4-5) versus clamping voltage, $I_{PP} = f(V_{CL})$

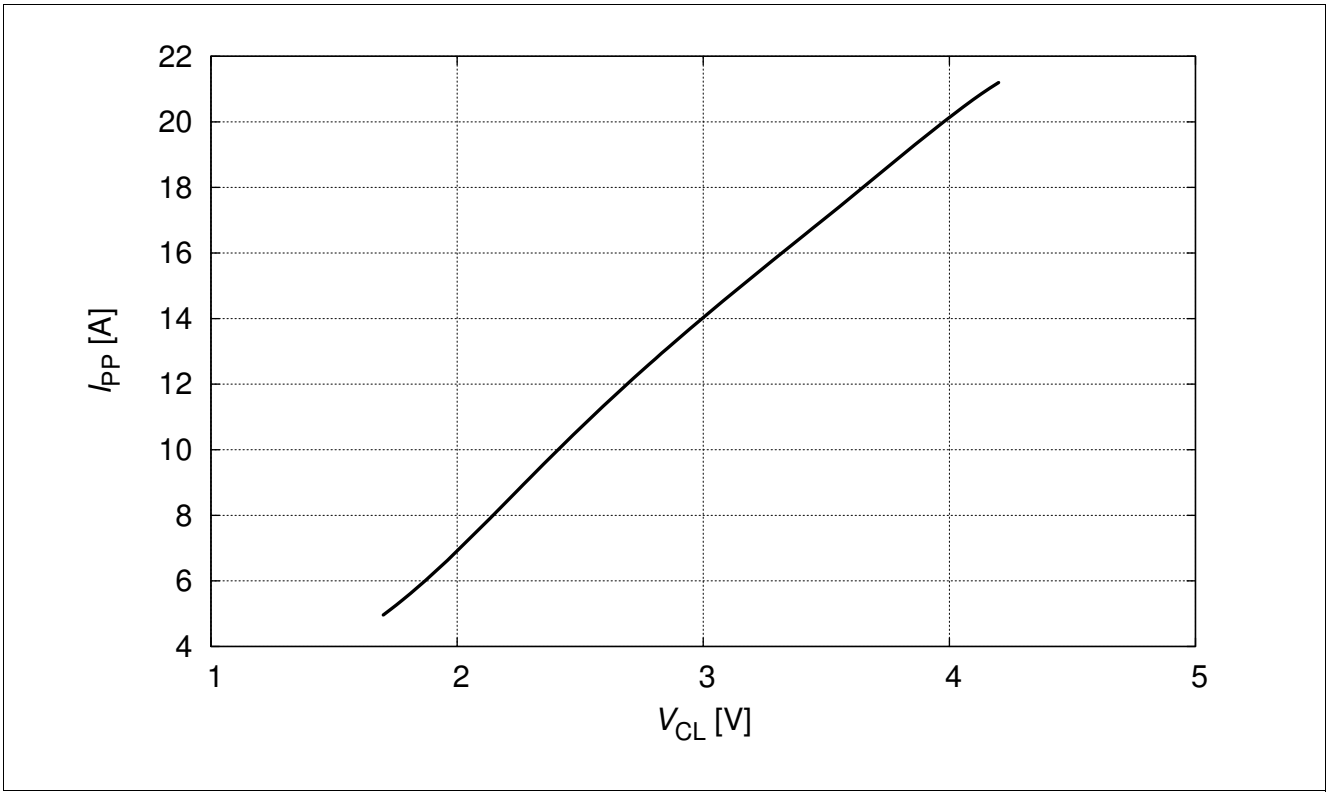

Figure 3-6 Pulse forward current (IEC61000-4-5) versus clamping voltage, $I_{PP} = f(V_{CL})$

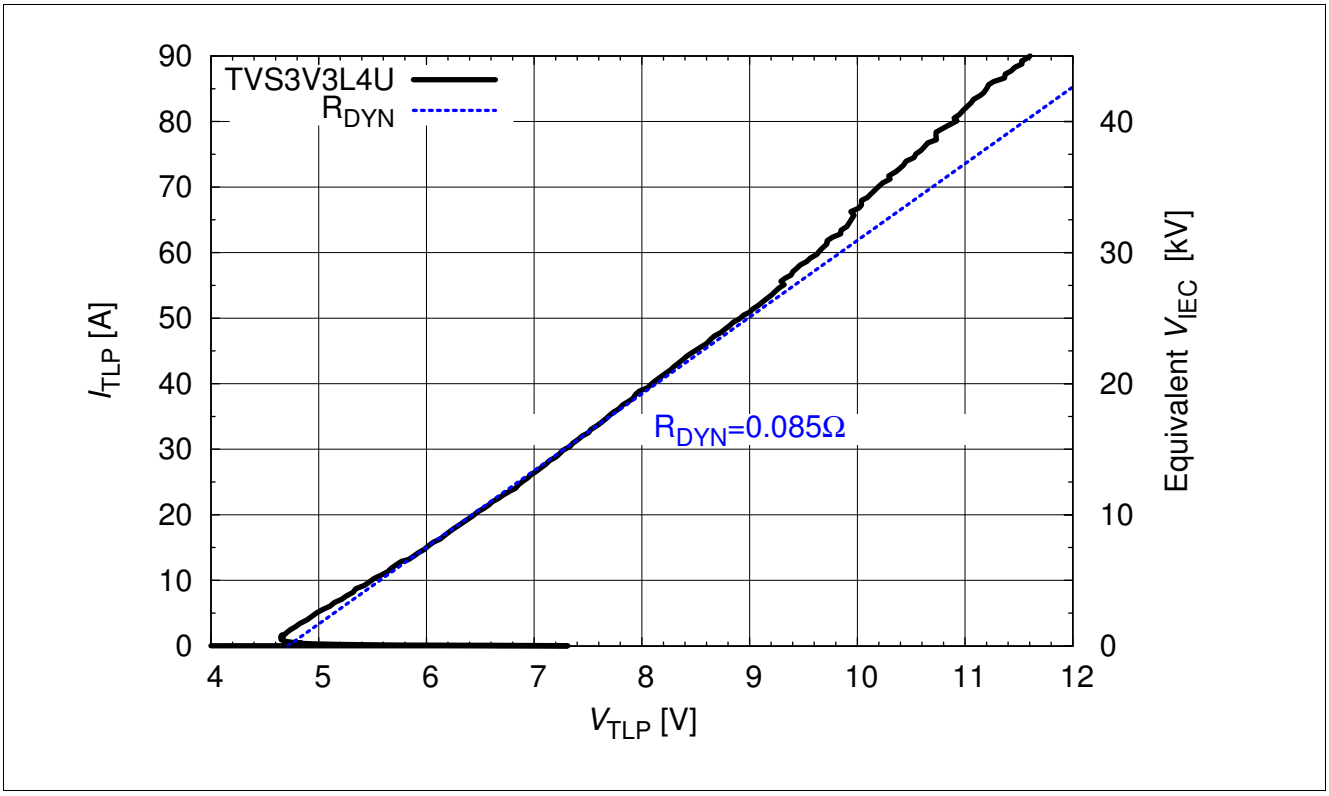

Figure 3-7 TLP characteristics, reverse pulse

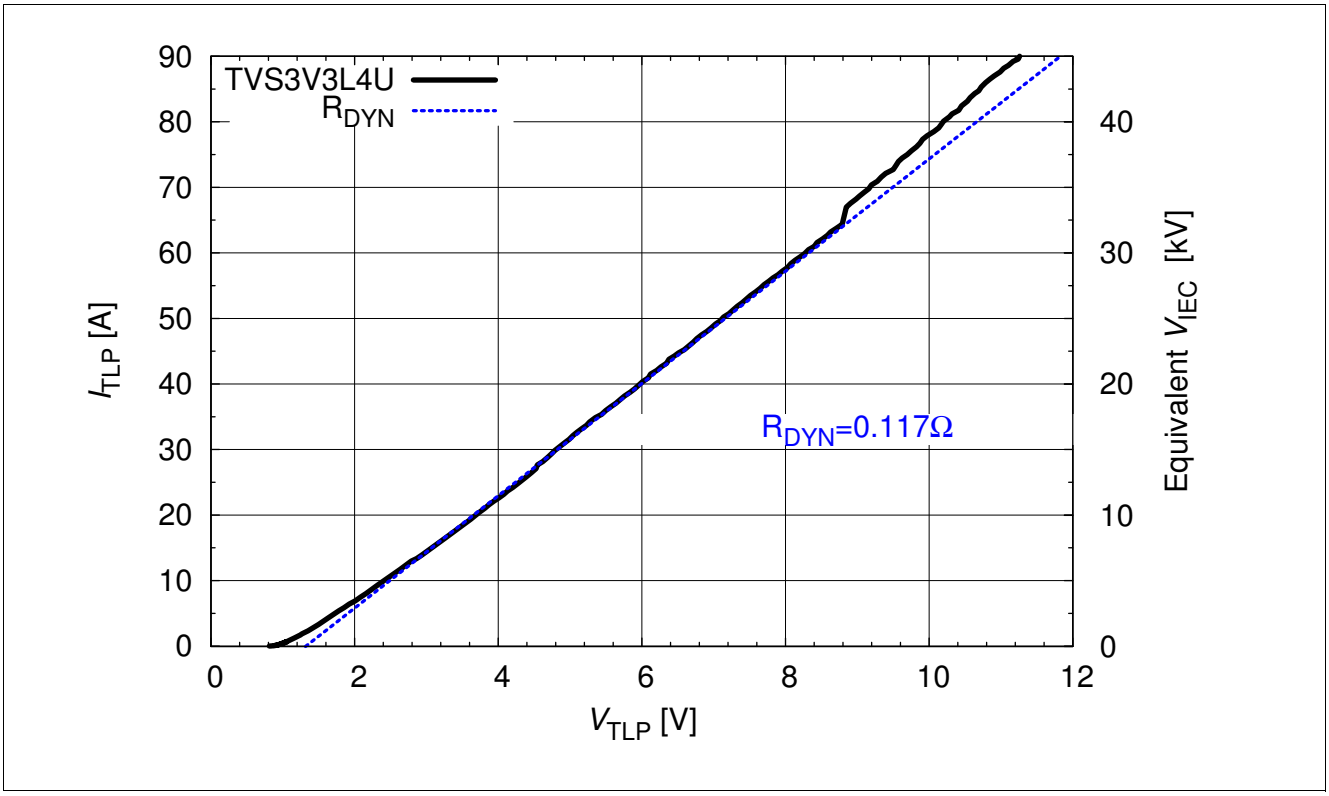

Figure 3-8 TLP characteristics, forward pulse

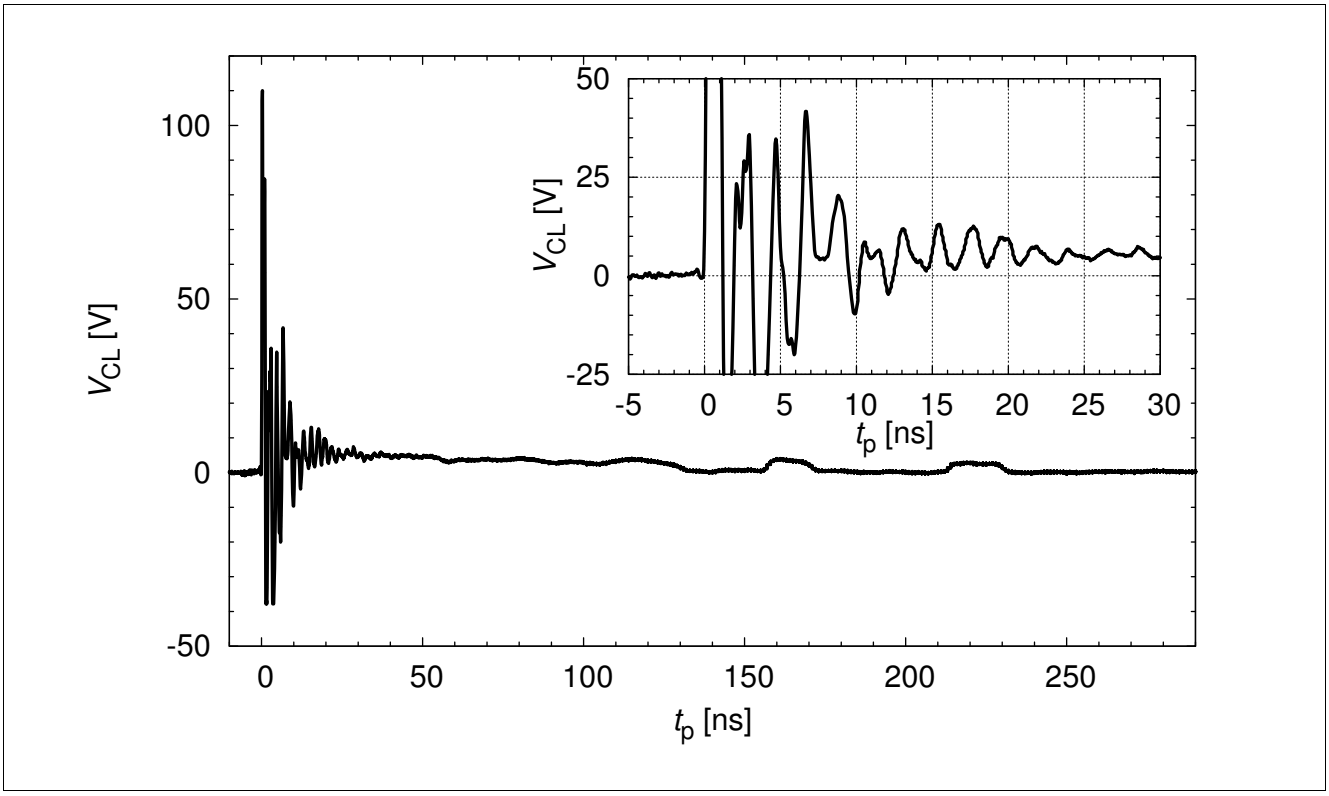

Figure 3-9 Clamping voltage at +8 kV contact discharge according IEC61000-4-2 (R = 330 Ω, C = 150 pF)

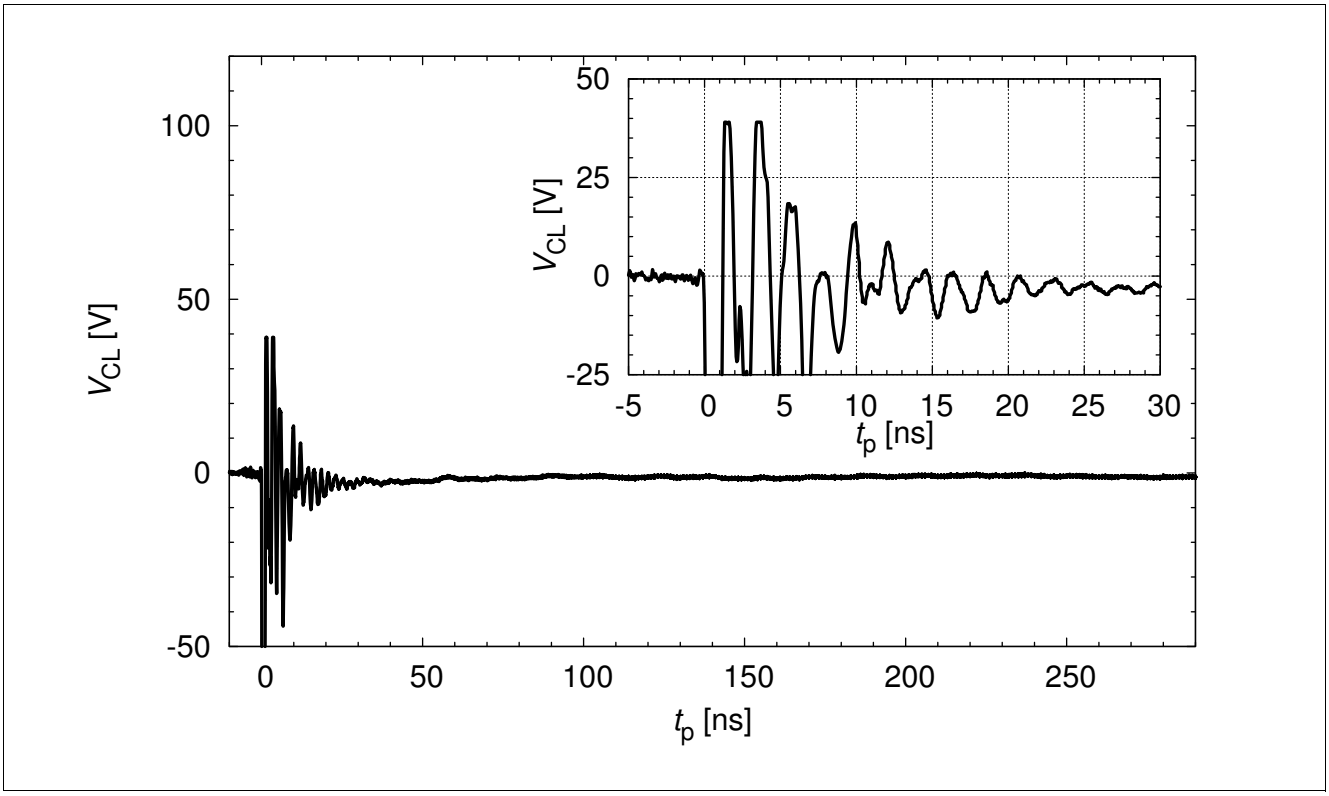

Figure 3-10 Clamping voltage at -8 kV contact discharge according IEC61000-4-2 (R = 330 Ω, C = 150 pF)

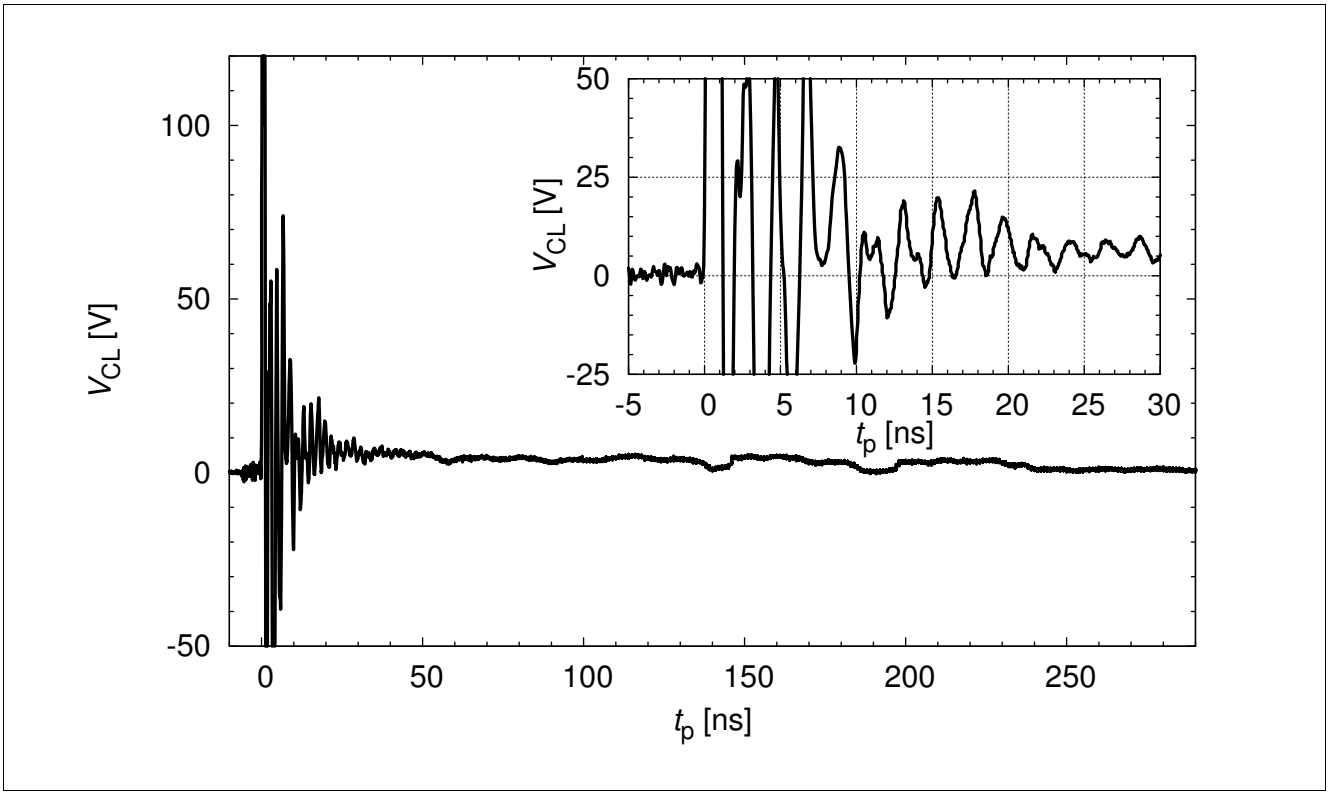

Figure 3-11 Clamping voltage at +15 kV contact discharge according IEC61000-4-2 (R = 330 Ω, C = 150 pF)

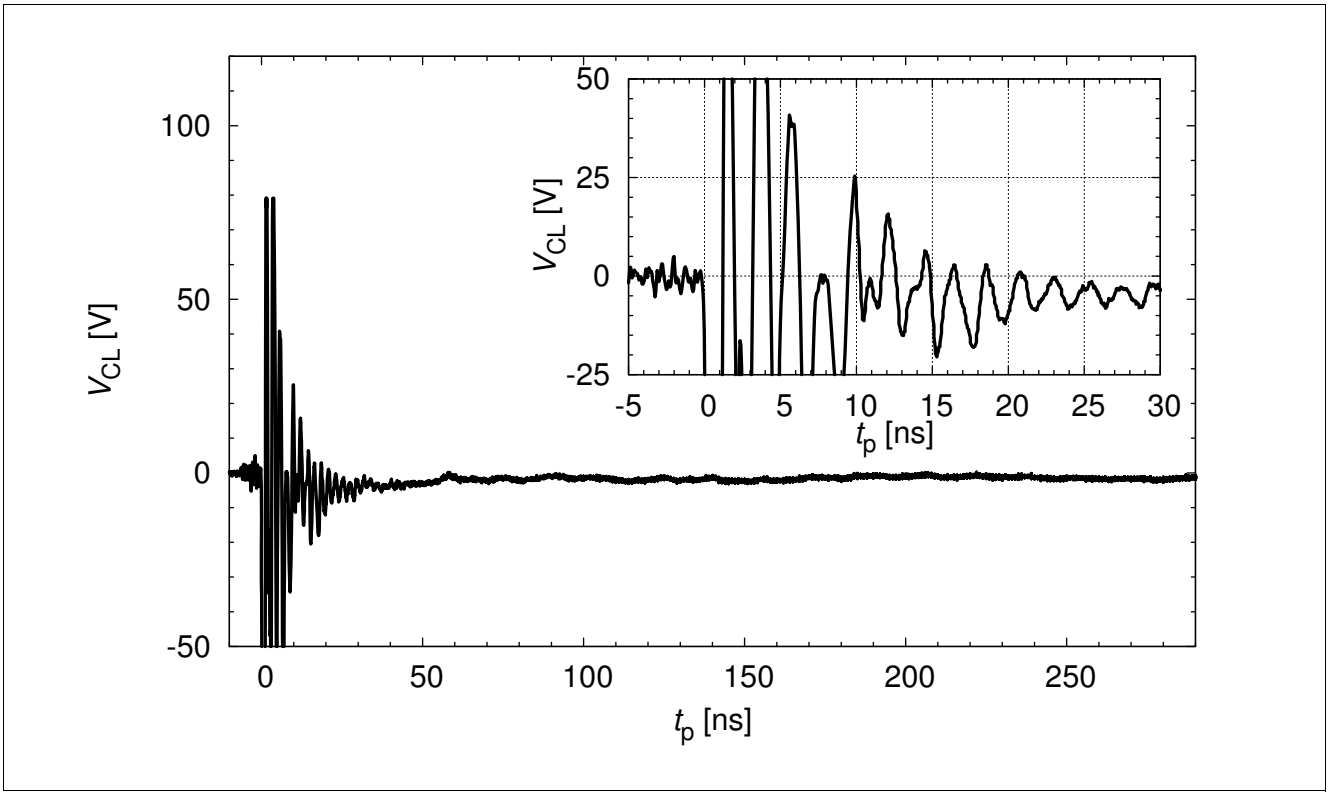

Figure 3-12 Clamping voltage at -15 kV contact discharge according IEC61000-4-2 (R = 330 Ω, C = 150 pF)

4 Package Information

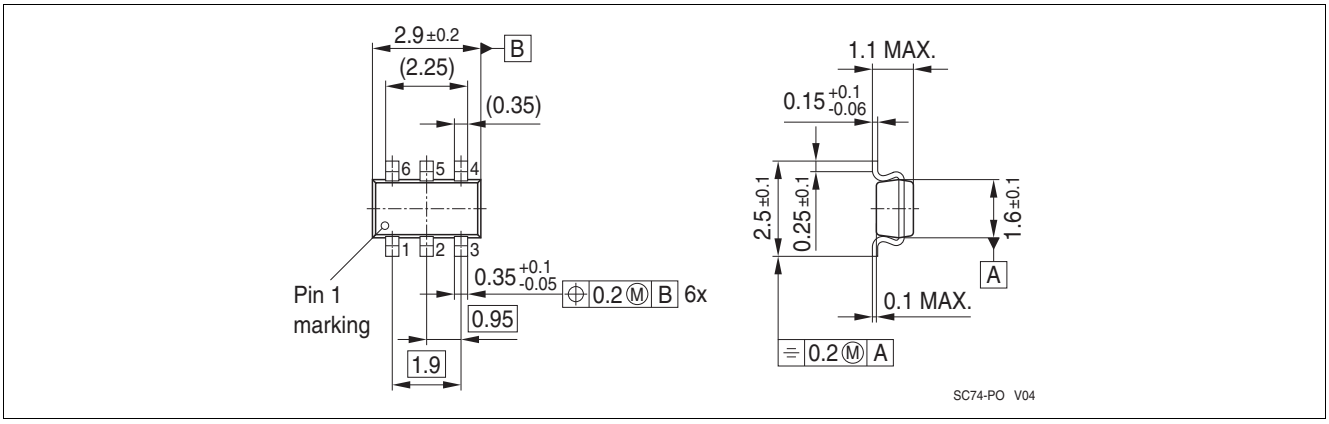

Figure 4-1 SC74 Package outline

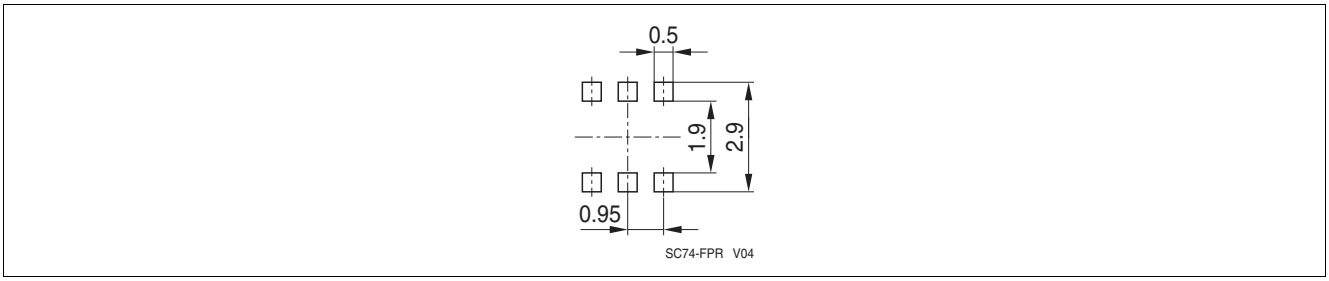

Figure 4-2 SC74 Footprint (Reflow Soldering)

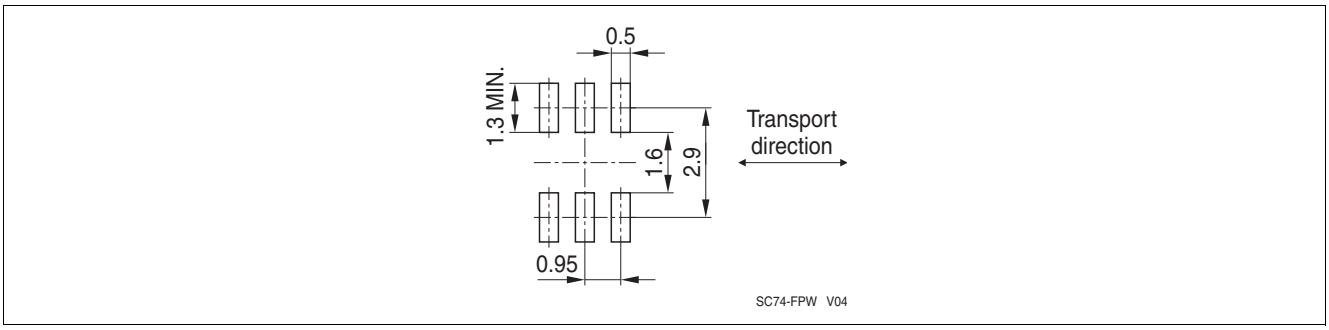

Figure 4-3 SC74 Footprint (Reflow Soldering)

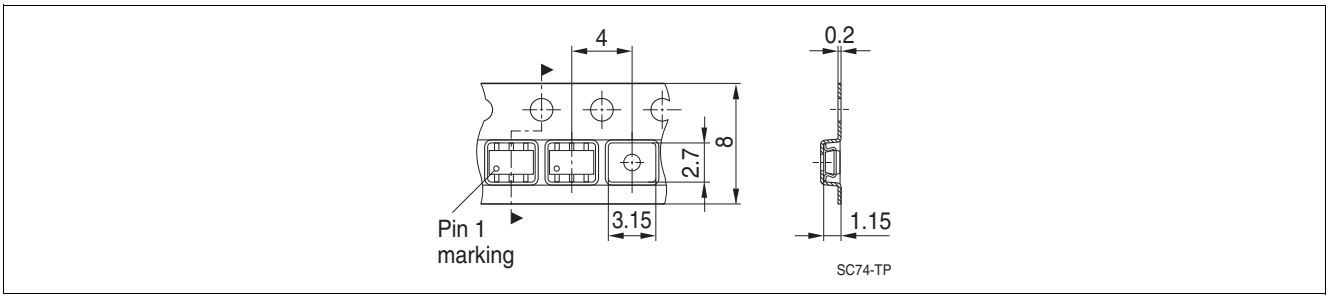

Figure 4-4 SC74 Packing

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

Terminology

C_L	Line capacitance
DSC	Digital Still Camera
DVD	Digital Versatile Disc
DVI	Digital Visual Interface
EFT	Electrical Fast Transient
ESD	Electrostatic Discharge
HDMI	High Definition Multimedia Interface
IEC	International Electrotechnical Commission
I_{PP}	Peak pulse current
I_R	Reverse current
I_{RWM}	Reverse working current maximum
LCD	Liquid Crystal Display
MP3	Moving Picture Experts Group III
PCB	Printed Circuit Board
R_{DYN}	Dynamic resistance
RoHS	Restriction of Hazardous Substances Directive
S-ATA	Serial Advanced Technology Attachment
STB	Set-Top-Box
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
USB	Universal Serial Bus
V_{CL}	Reverse clamping voltage
V_{ESD}	Electrostatic discharge voltage
V_{FC}	Forward Clamping Voltage
V_{Hold}	Holding 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}	Triggering Voltage
Z_0	Impedance

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