

TVS Diodes

Transient Voltage Suppressor Diodes

TVS3V3L4U

Low Capacitance ESD / Transient / Surge Protection Array

TVS3V3L4U

Data Sheet

Revision 2.4, 2013-02-06
Final

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Page or Item	Subjects (major changes since previous revision)
Revision 2.4, 2013-02-06	
4	Halogen free deleted

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Last Trademarks Update 2010-06-09

1 Low Capacitance ESD / Transient / Surge Protection Array

1.1 Features

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

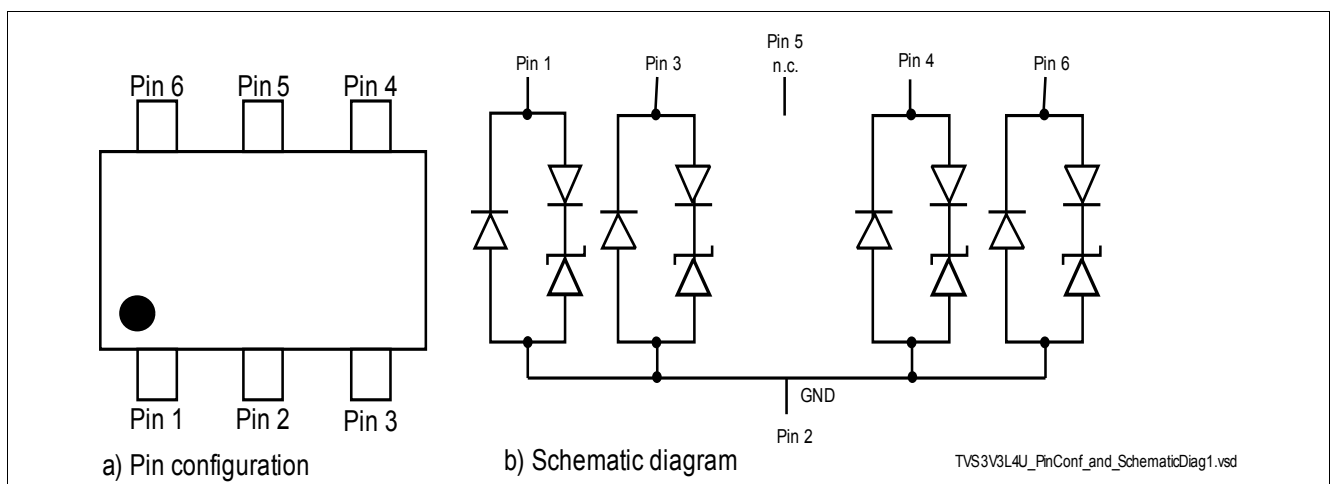


Figure 1-1 Pin configuration and Schematic diagram

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 $T_A = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
ESD discharge ¹⁾ air contact	V_{ESD}	-30 -30	– –	30 30	kV
Peak pulse current ($t_P = 8/20\ \mu\text{s}$) ²⁾	I_{PP}	-20	–	20	A
Peak pulse power $t_P = 8/20\ \mu\text{s}$ ²⁾ $t_P = 100\ \text{ns}$ ³⁾	P_{PK}	– –	– –	154 1044	W
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. P_{PK} is calculated by $I_{\text{PP}} \times V_{\text{CL}}$.

3) Please refer to AN210[1]. P_{PK} is calculated by $I_{\text{TLP}} \times V_{\text{CL}}$.

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.

2.2 DC Characteristics

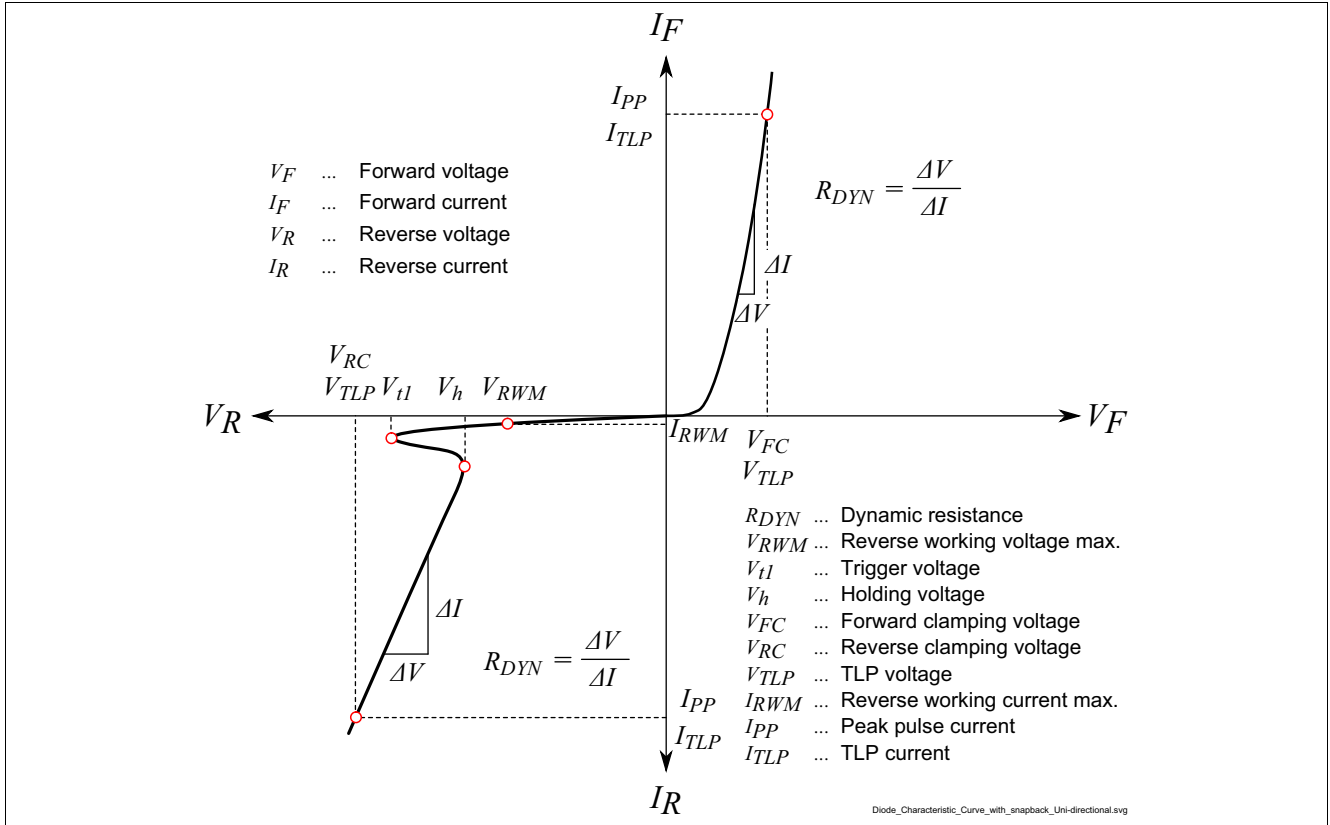


Figure 2-1 Definitions of electrical characteristics

Table 2-2 DC Characteristics at $T_A = 25\text{ °C}$, 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	$V_R = 3.3\text{ V}$

2.3 RF Characteristics

Table 2-3 RF Characteristics at $T_A = 25\text{ °C}$, unless otherwise specified

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

2.4 ESD Characteristics
Table 2-4 ESD Characteristics at $T_A = 25\text{ °C}$, unless otherwise specified

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

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

2) Please refer to Application Note AN210 [1]. TLP parameter: $Z_0 = 50\ \Omega$, $t_p = 100\ \text{ns}$, $t_r = 300\ \text{ps}$, 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 $I_{PP2} = 40\ \text{A}$.

3 Typical Characteristic

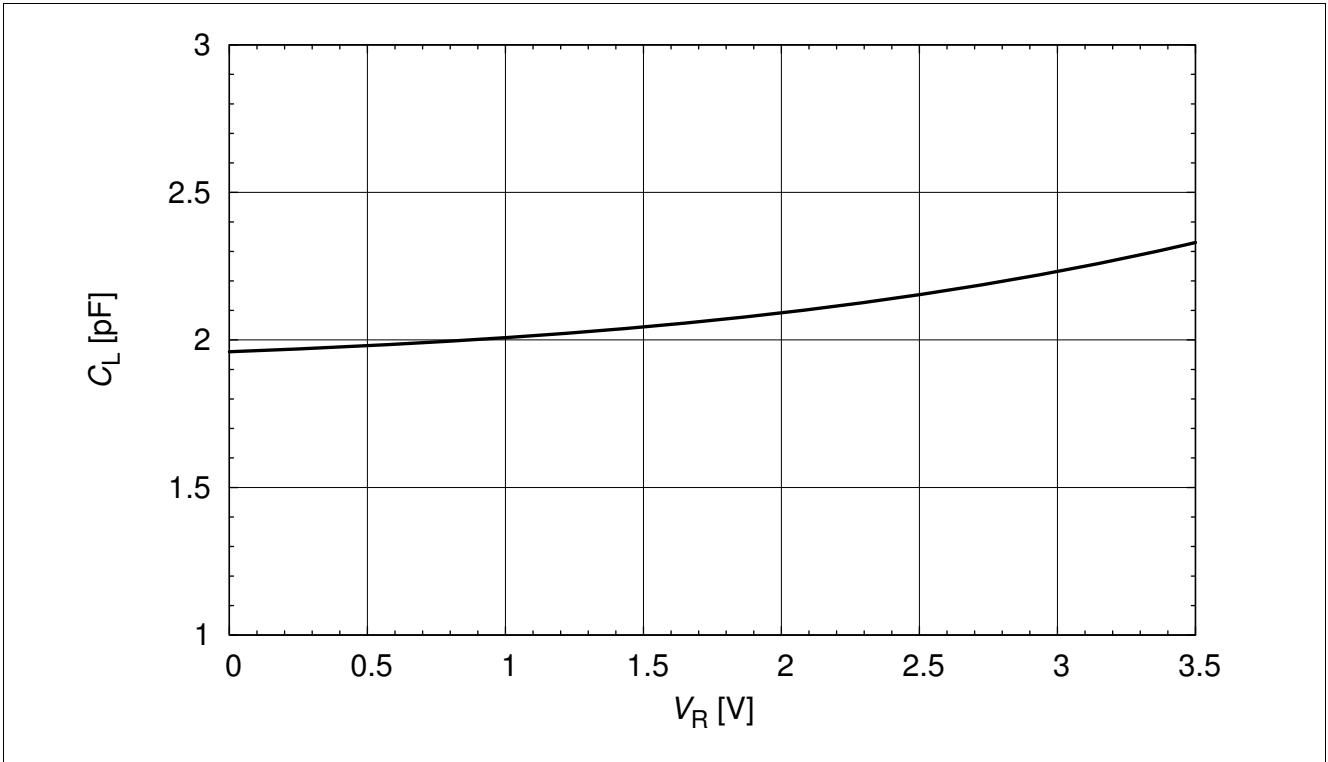


Figure 3-1 Line capacitance $C_L = f(V_R)$

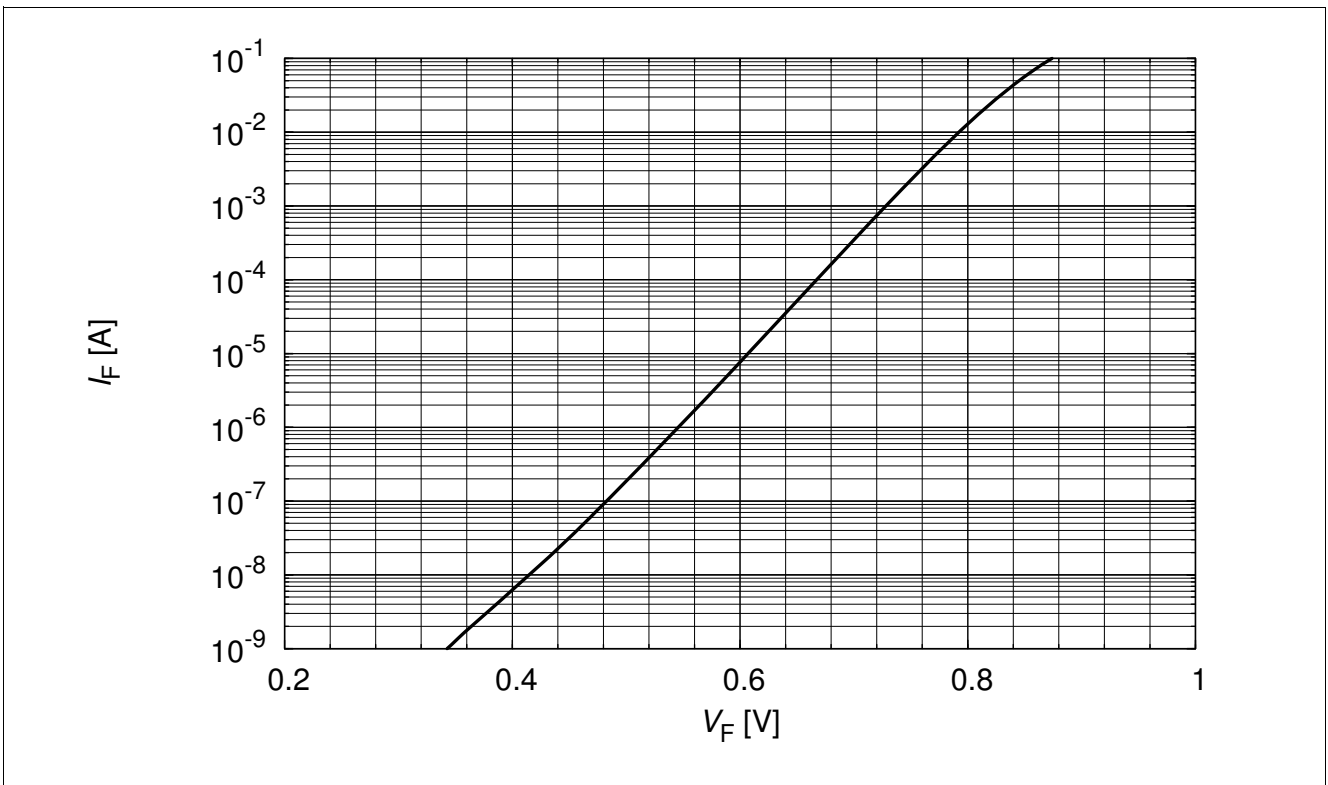


Figure 3-2 Forward characteristic, $I_F = f(V_F)$

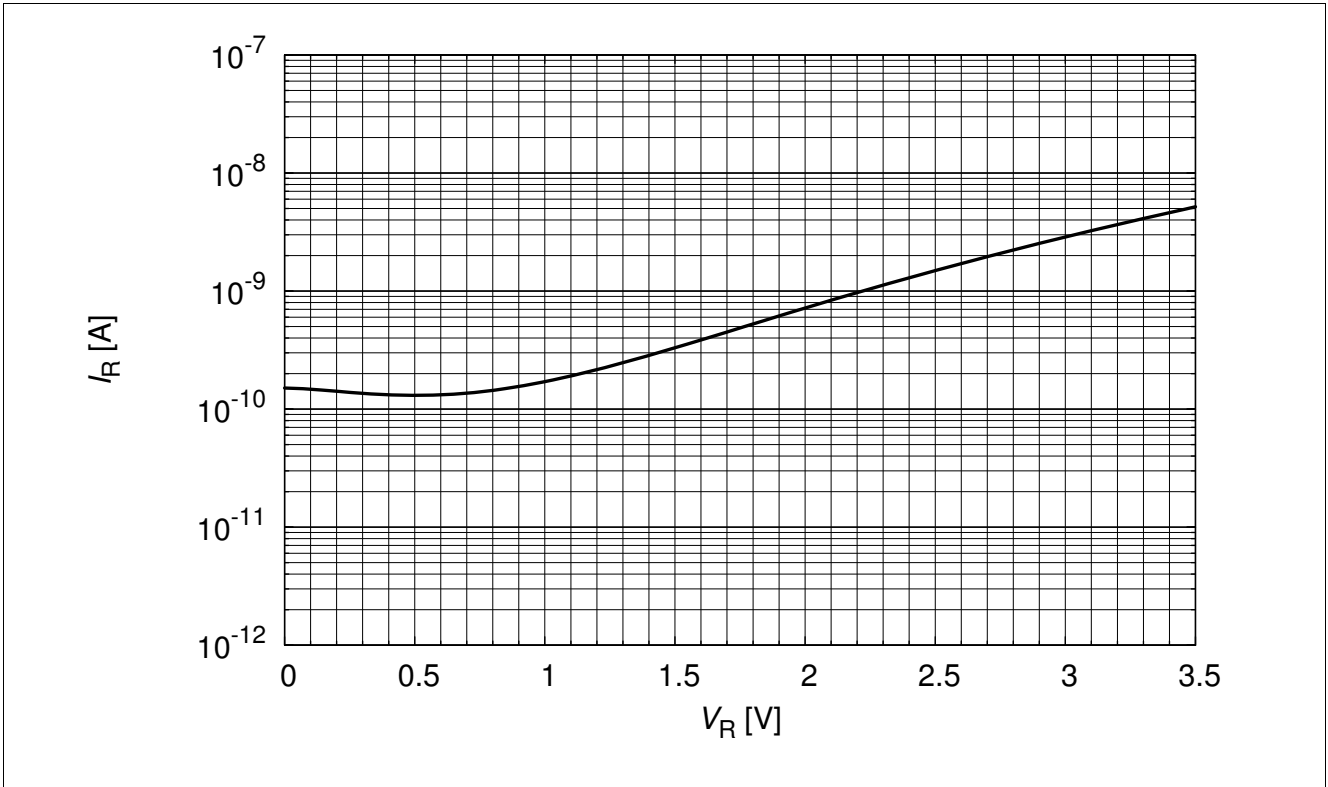


Figure 3-3 Reverse current, $I_R = f(V_R)$

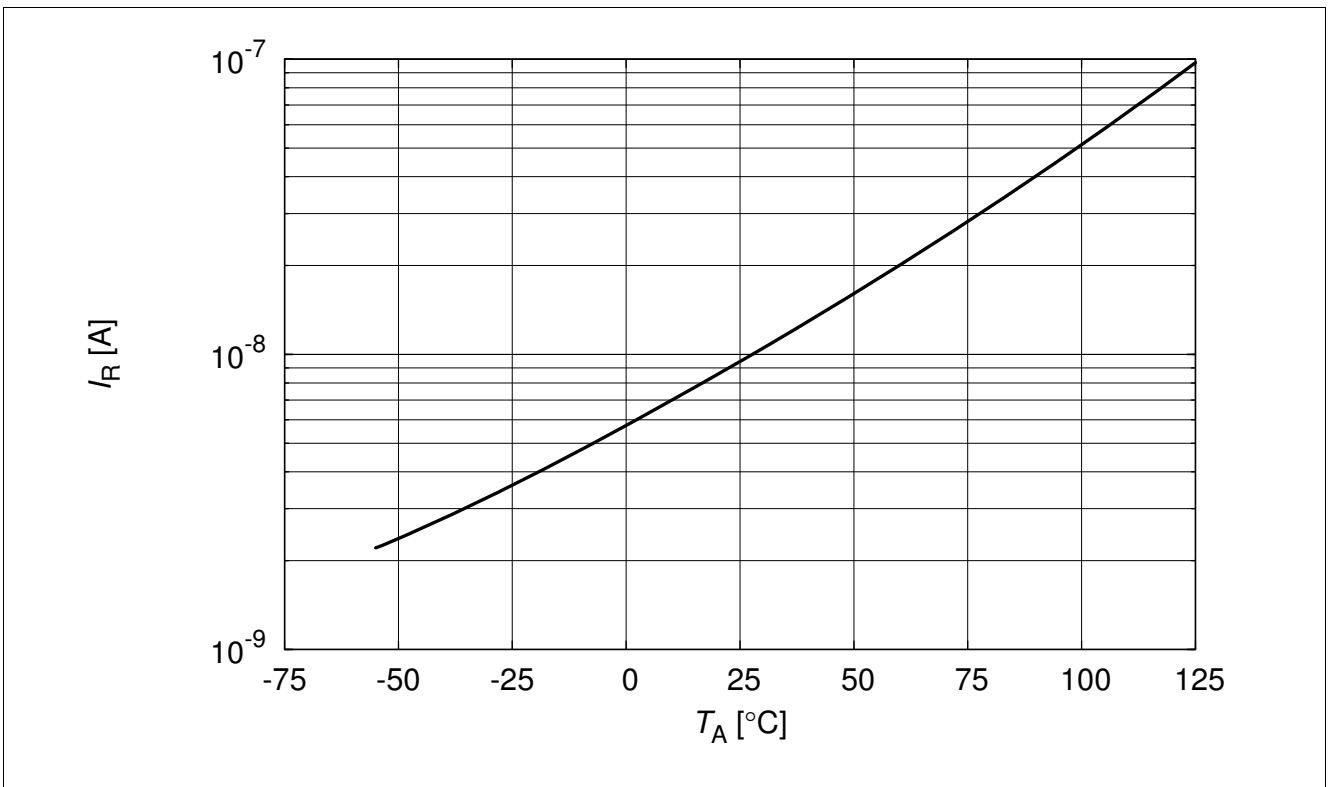


Figure 3-4 Reverse current $I_R = f(T_A)$, $V_R = 3.3$ V

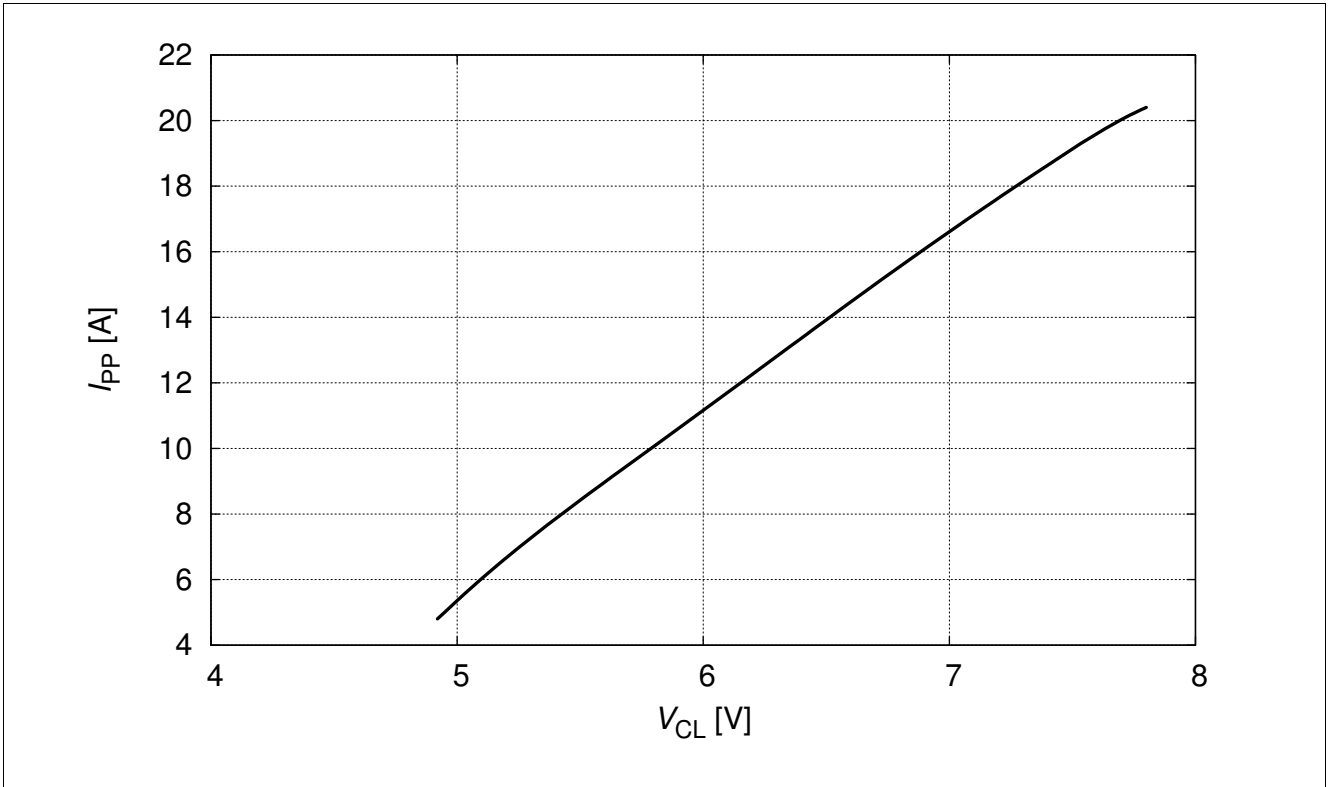


Figure 3-5 Pulse reverse current (IEC61000-4-5) versus clamping voltage, $I_{PP} = f(V_{CL})$

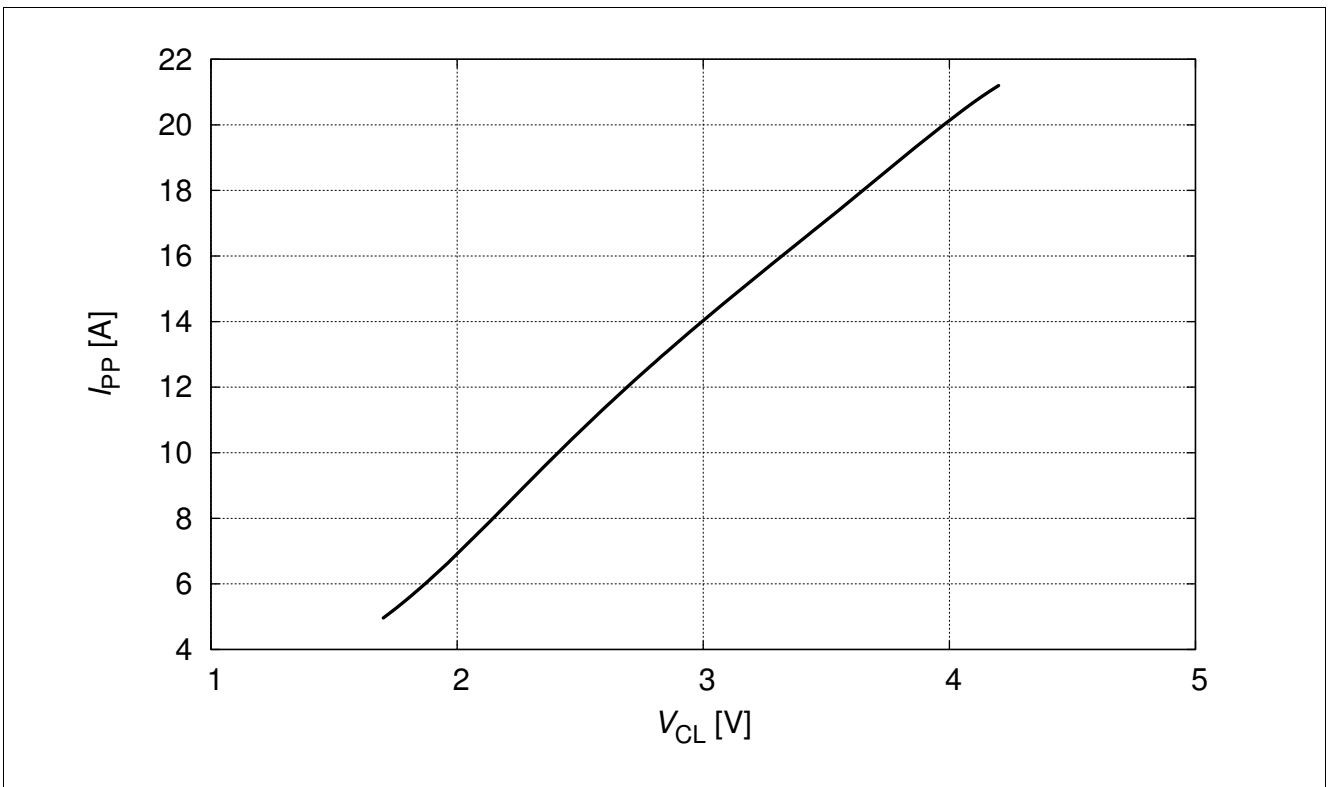


Figure 3-6 Pulse forward current (IEC61000-4-5) versus clamping voltage, $I_{PP} = f(V_{CL})$

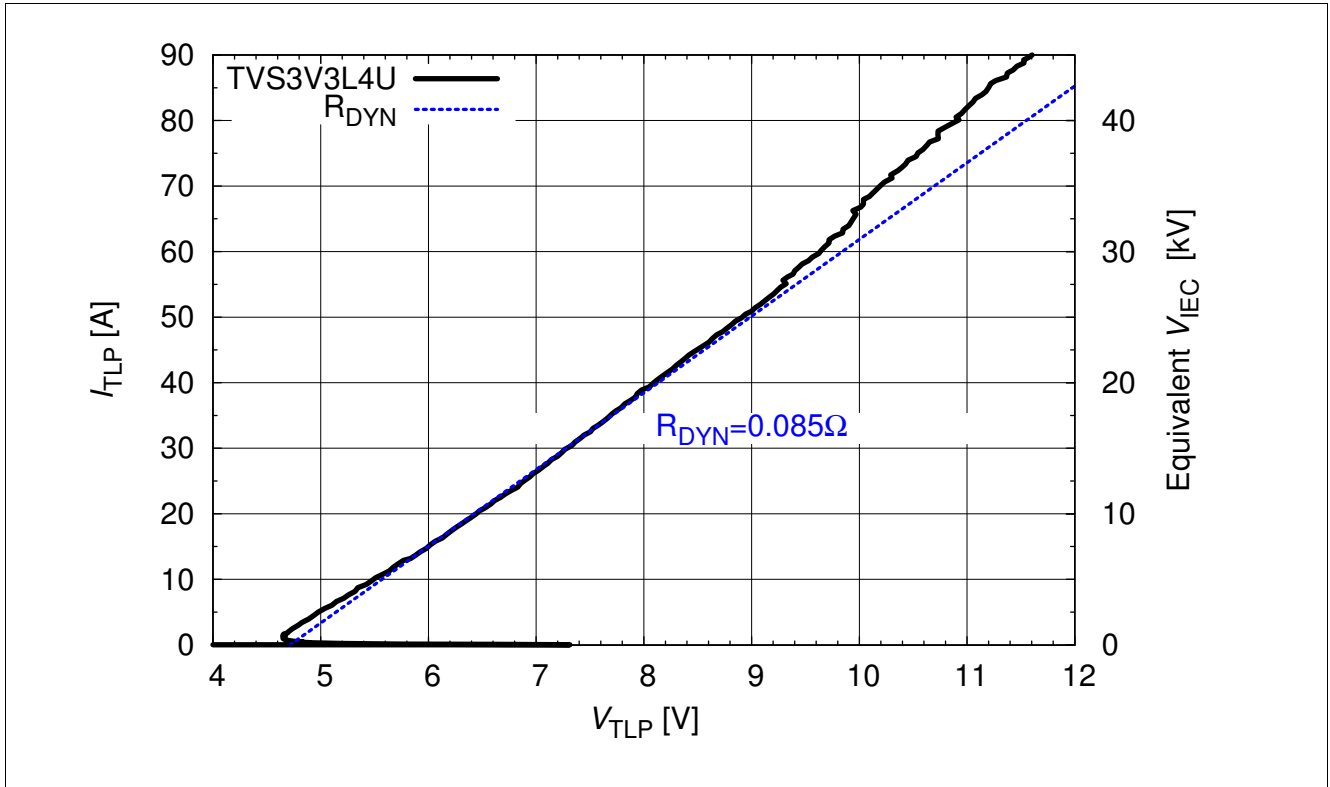


Figure 3-7 TLP characteristics, reverse pulse

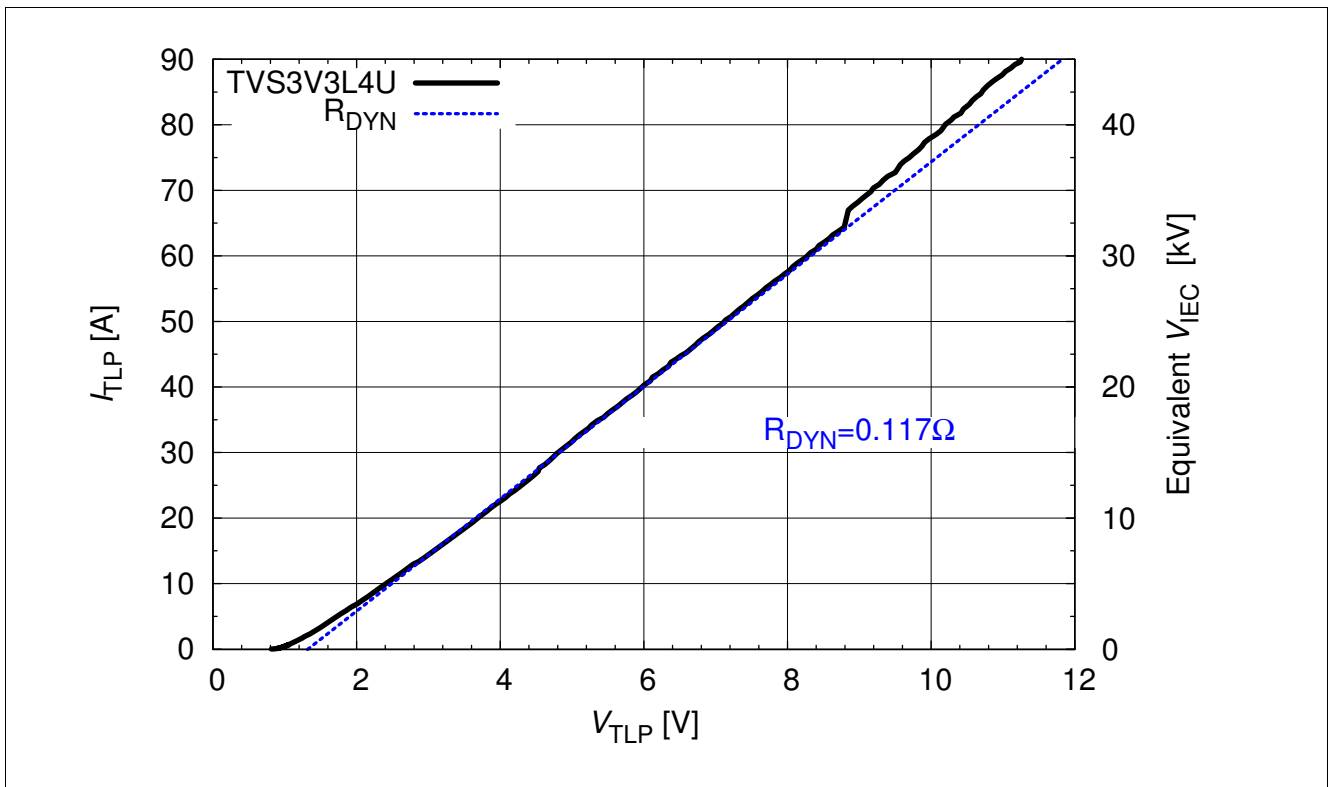


Figure 3-8 TLP characteristics, forward pulse

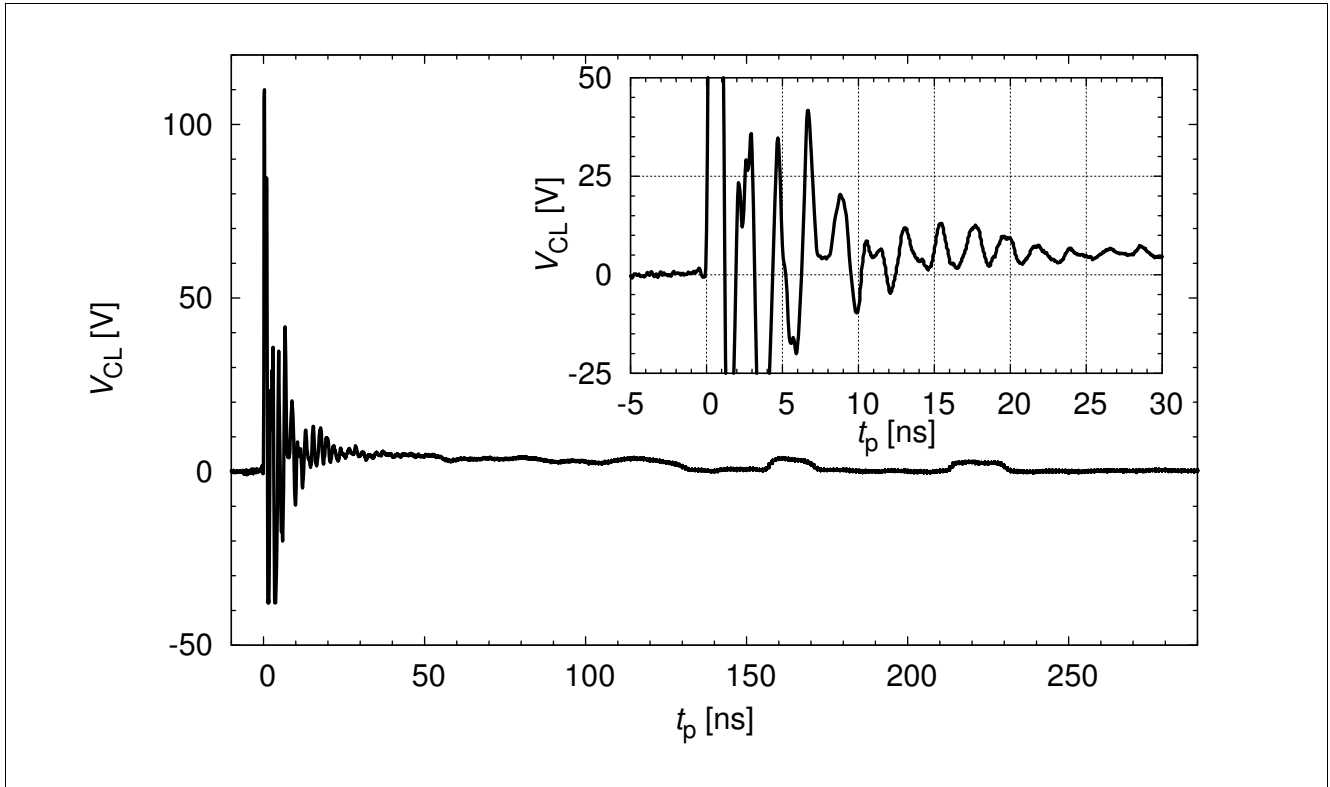


Figure 3-9 Clamping voltage at +8 kV contact discharge according IEC61000-4-2 ($R = 330 \Omega$, $C = 150 \text{ pF}$)

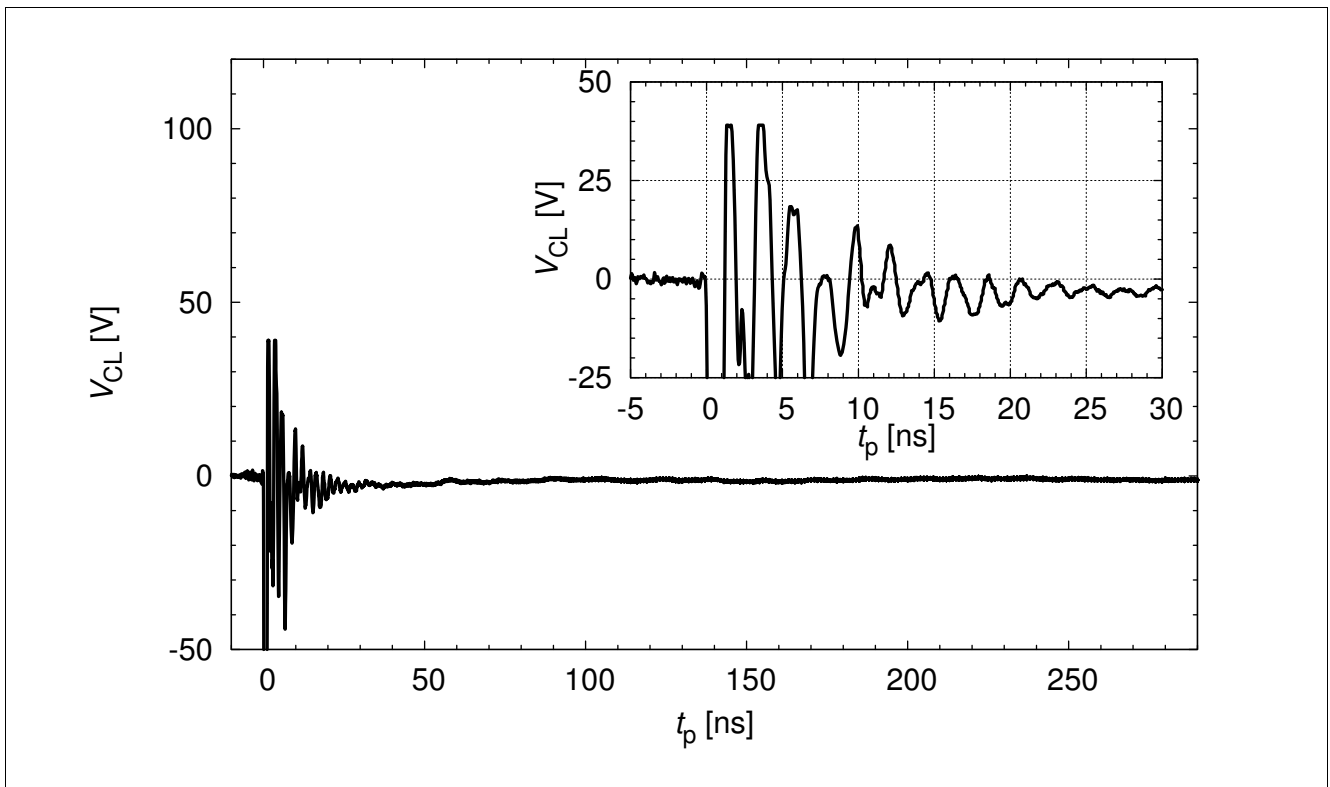


Figure 3-10 Clamping voltage at -8 kV contact discharge according IEC61000-4-2 ($R = 330 \Omega$, $C = 150 \text{ pF}$)

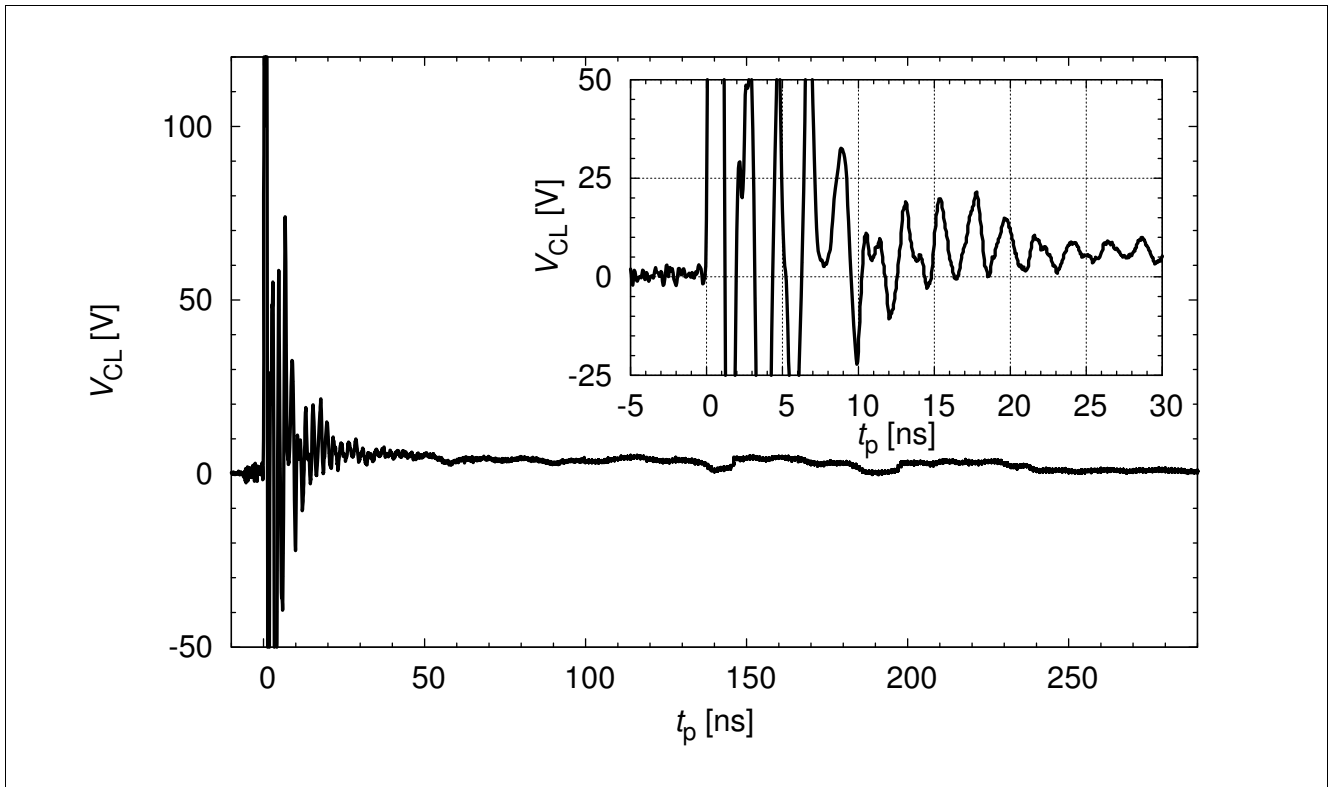


Figure 3-11 Clamping voltage at +15 kV contact discharge according IEC61000-4-2 ($R = 330 \Omega$, $C = 150 \text{ pF}$)

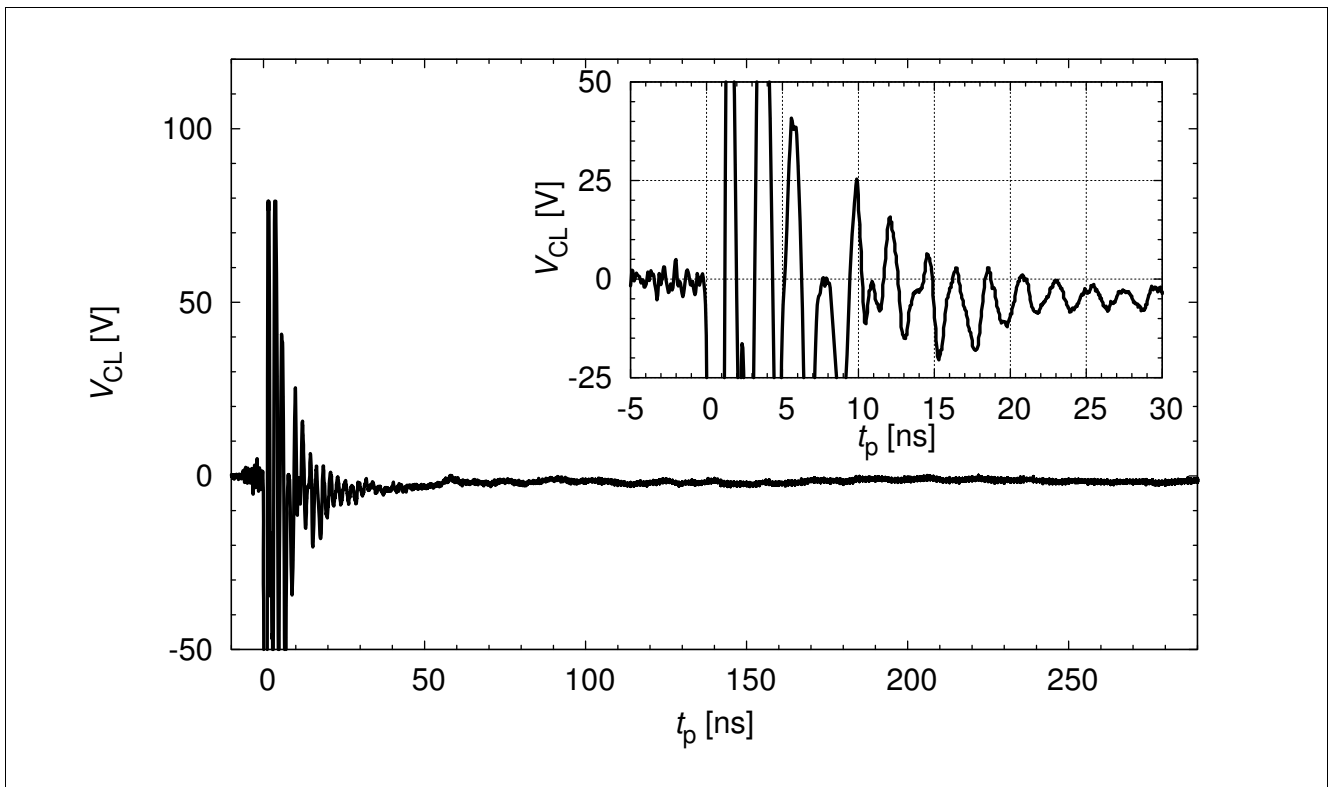


Figure 3-12 Clamping voltage at -15 kV contact discharge according IEC61000-4-2 ($R = 330 \Omega$, $C = 150 \text{ pF}$)

4 Package Information

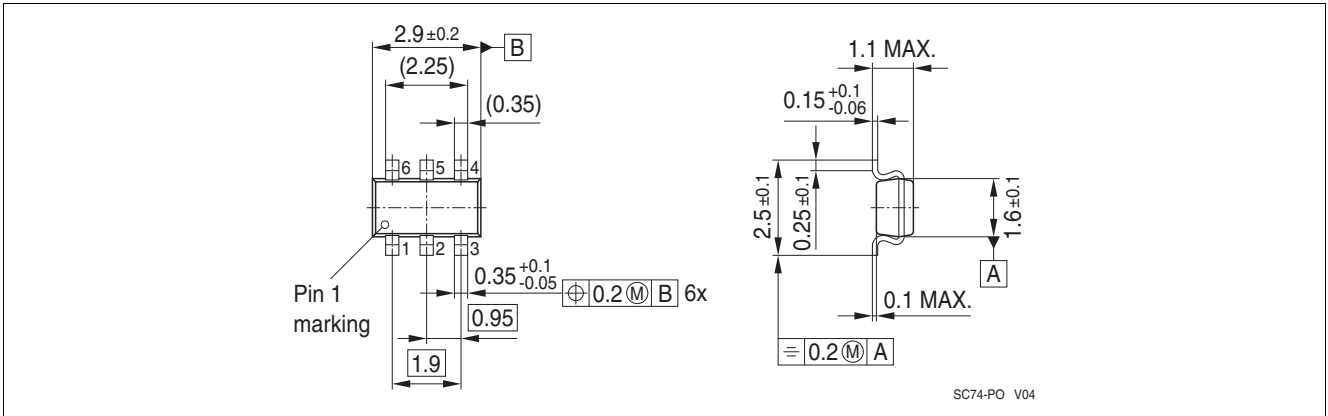


Figure 4-1 SC74 Package outline

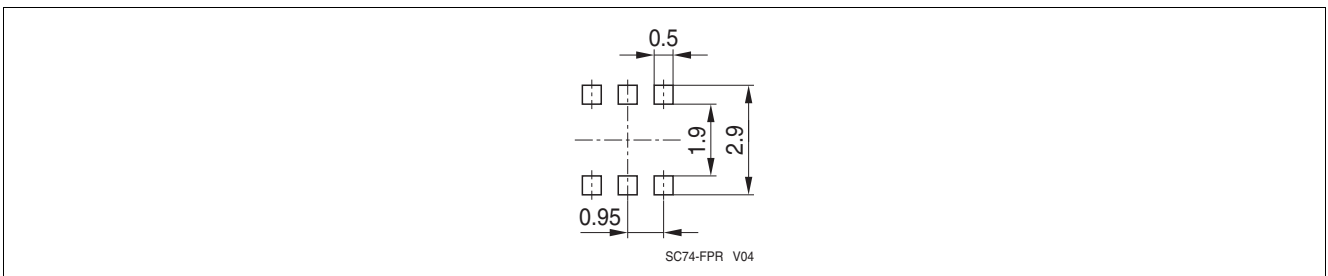


Figure 4-2 SC74 Footprint (Reflow Soldering)

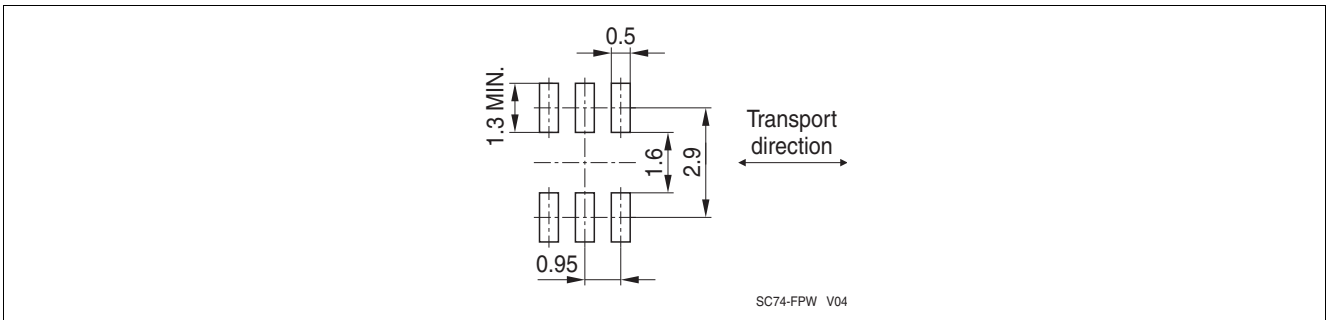


Figure 4-3 SC74 Footprint (Reflow Soldering)

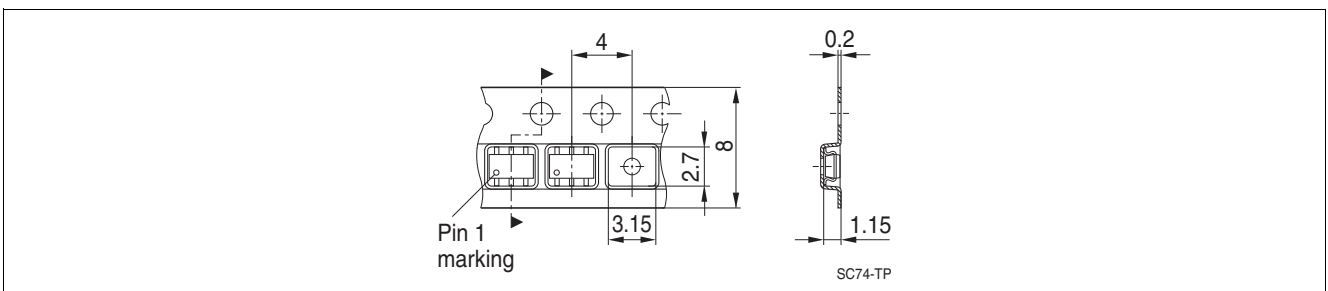


Figure 4-4 SC74 Packing

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

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