# TVS Diodes

Transient Voltage Suppressor Diodes

# ESD5V0L1B-02V

Bi-directional Low Capacitance TVS Diode

ESD5V0L1B-02V

## Data Sheet

Revision 1.0, 2010-12-16
Final

Industrial and Multi-Market

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| **Page or Item** | **Subjects (major changes since previous revision)** |
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# 1 Bi-directional Low Capacitance TVS Diode

## 1.1 Features

- ESD / transient protection according to:
  - IEC61000-4-2 (ESD): ±25 kV (contact)
  - IEC61000-4-4 (EFT): 40 A (5/50 ns)
  - IEC61000-4-5 (surge): 2.5 A (8/20 µs)
- Max.working voltage: $V_{RWM}$ = ±5 V
- Ultra low dynamic resistance: $R_{dyn}$ = 0.3Ω
- Low capacitance: $C_L$= 8.5 pf typ.
- Very low reverse current: $I_R$ = ≤ 1 nA typ.
- Pb-free (RoHS compliant) and halogeen free package
- Qualified according AEC Q101

## 1.2 Application Examples

- Cellular handsets, portable devices, notebooks and computers
- Digital cameras, power supplies and audio / video equipment, accessories

# 2 Product Description

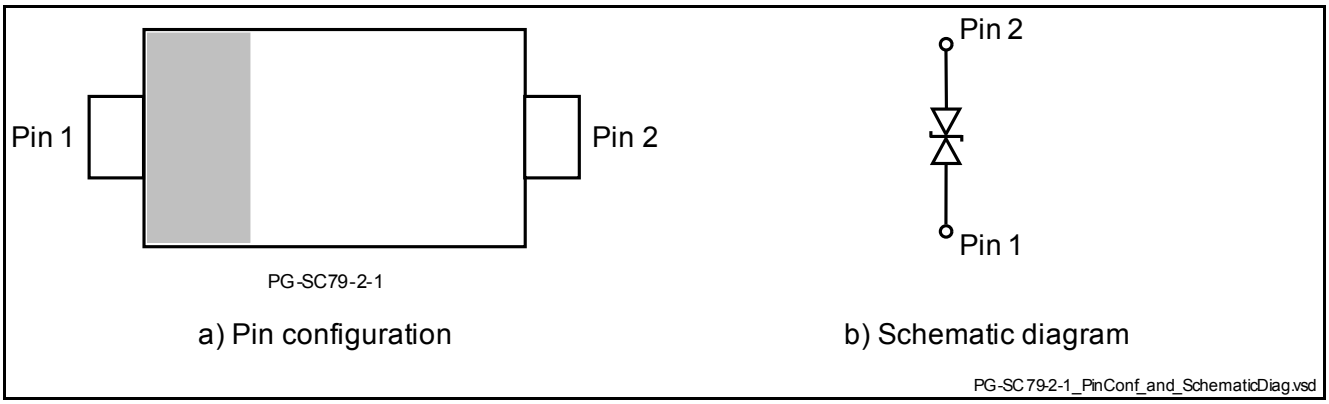


**Figure 1 Pin configuration and schematic diagram**

**Table 1 Ordering information**

| Type | Package | Configuration | Marking code |
|---|---|---|---|
| ESD5V0L1B-02V | PG-SC79-2-1 | 1 channel, bi-directional1 channel, bi-directional | I |

# 3 Characteristics

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

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| ESD contact discharge[1)] | $V_{ESD}$ | -25 | – | 25 | kV |
| Peak pulse current ($t_p$ = 8/20 µs)[2)] | $I_{PP}$ | -2.5 | – | 2.5 | 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

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

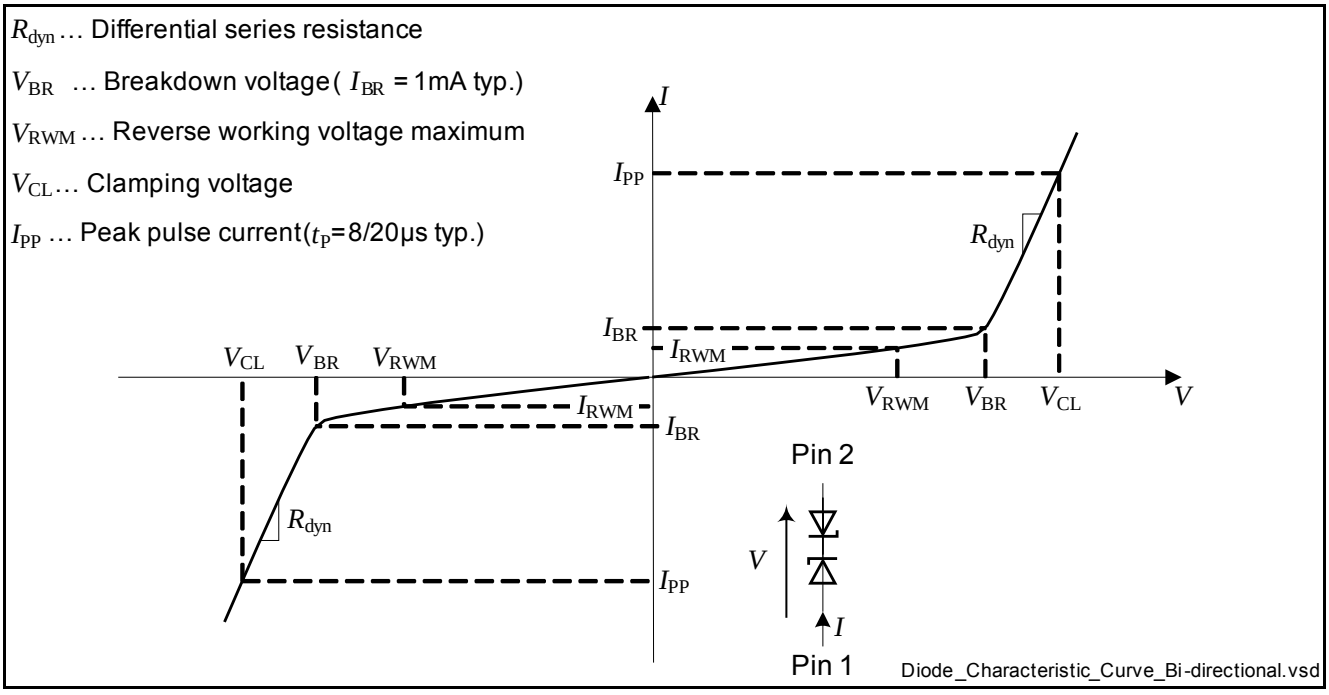


**Figure 2 Definitions of electrical characteristics**

**Table 3 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 | V | |
| Breakdown voltage | $V_{BR}$ | 7 | – | – | V | $I_R$ = 1 mA |
| Reverse current | $I_R$ | – | ≤1 | 50 | nA | $V_R$ = 3 V |

**Table 4 RF characteristics at $T_A$ = 25 °C, unless otherwise specified**

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Diode capacitance | $C_L$ | – | 8.5 | 13 | pF | $V_R$ = 0 V, $f$ = 1 MHz |

**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)] | $V_{CL}$ | – | 17 | – | V | $I_{pp}$ = 5 A, $t_p$ = 30 ns, pin 1-2 |
| Clamping voltage[1)] | $V_{CL}$ | – | 20 | – | V | $I_{pp}$ = 5 A, $t_p$ = 30 ns, pin 2-1 |
| Clamping voltage[1)] | $V_{CL}$ | – | 22 | – | V | $I_{pp}$ = 16 A, $t_p$ = 30 ns, pin 1-2 |
| Clamping voltage[1)] | $V_{CL}$ | – | 25 | – | V | $I_{pp}$ = 16 A, $t_p$ = 30 ns, pin 2-1 |
| Dynamic resistance[1)] | $R_{DYN}$ | – | 0.3 | – | Ω | $t_p$ =30 ns |

1) According TLP tests. Please refer to Application Note AN-210

## 3.2 Typical Performance characteristics at $T_A$ = 25 °C, unless otherwise specified

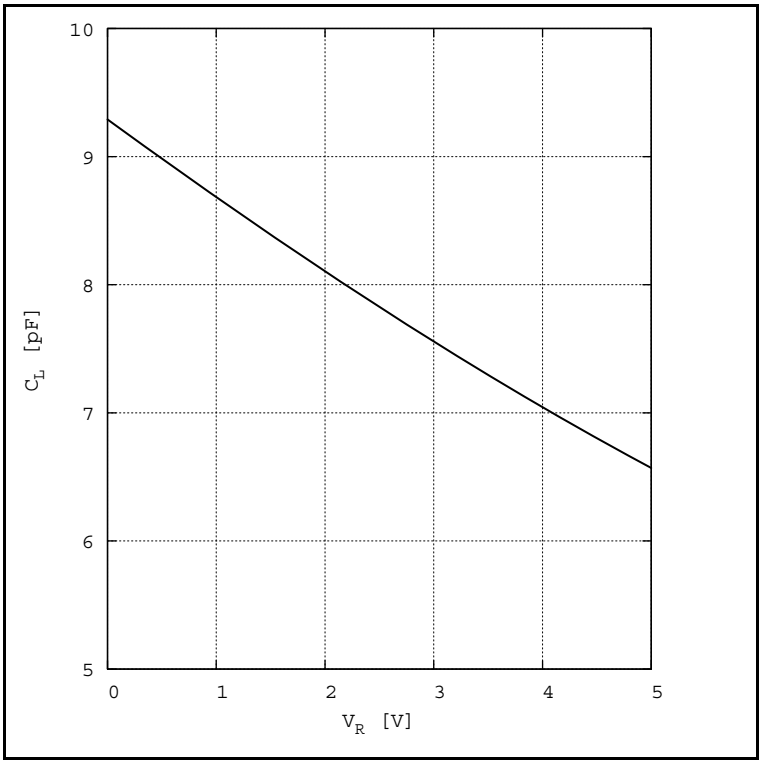


**Figure 3 Capacitance characteristics: $C_L = f(V_R)$**

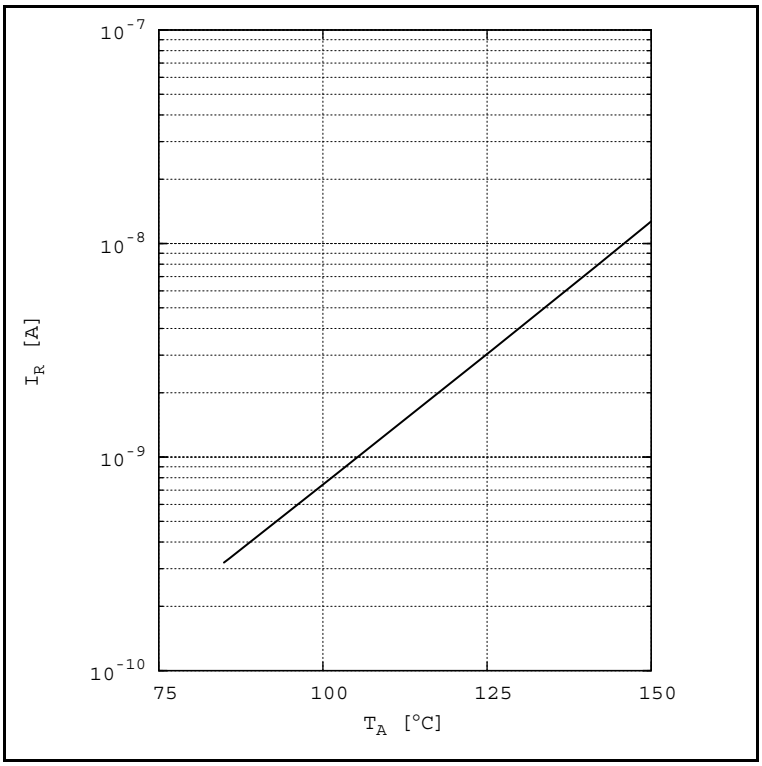


**Figure 4 Reverse characteristics: $I_R = f(V_R)$**

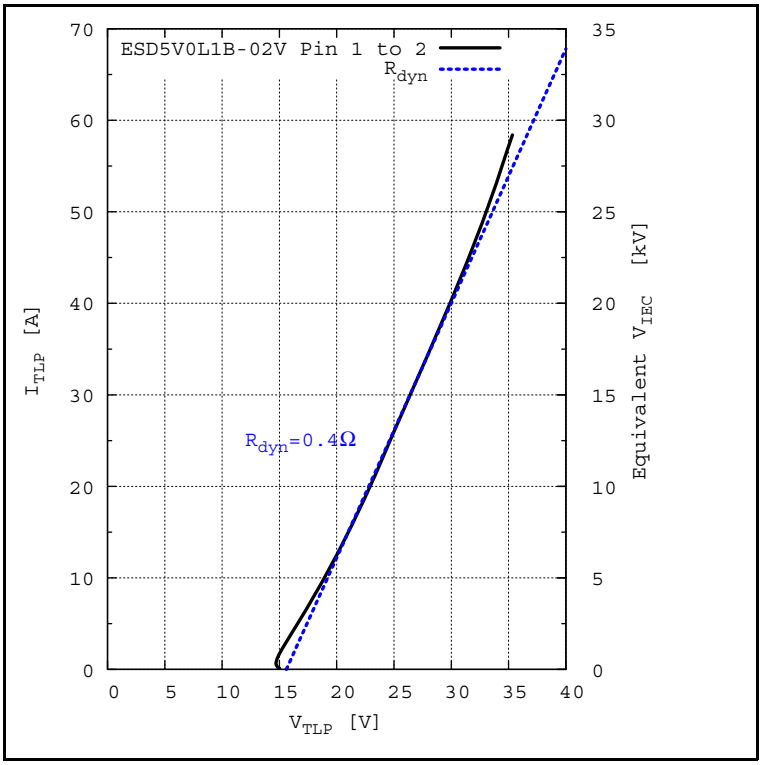


**Figure 5 Reverse TLP characteristics**

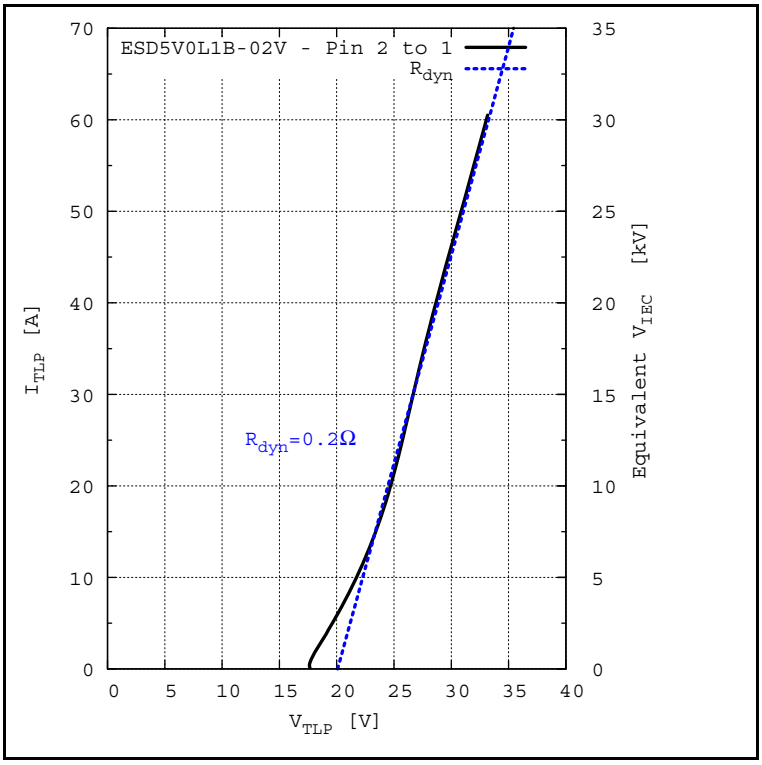


**Figure 6 Forward TLP characteristics**

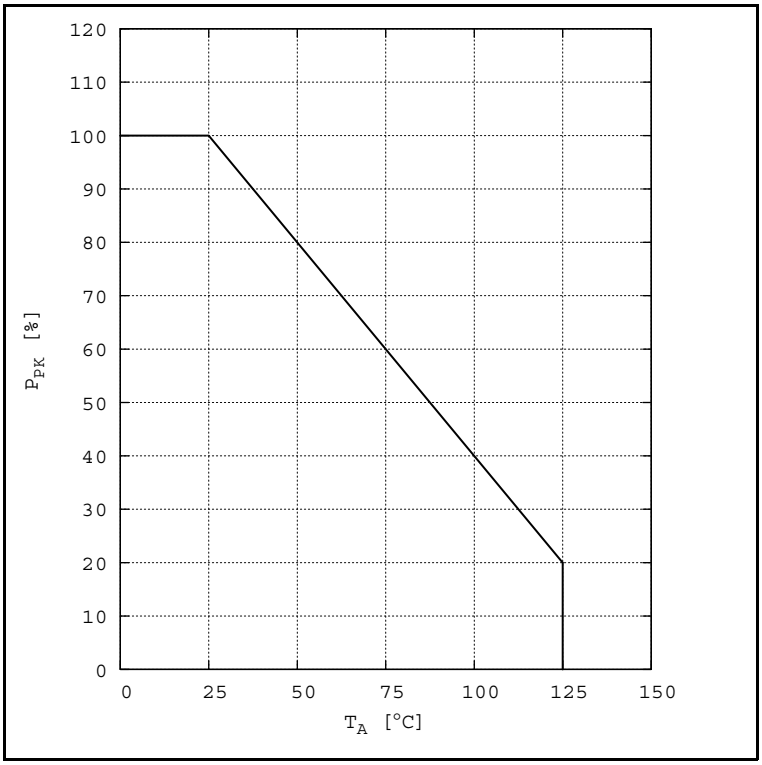


**Figure 7 Power derating curve: $P_{PK} = f(T_A)$**

# 4 Application Information

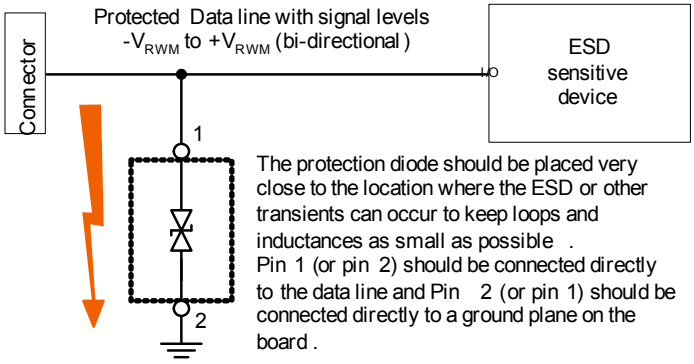


**Figure 8 Single Chanel, uni-directional TVS protection**

# 5 Ordering information scheme

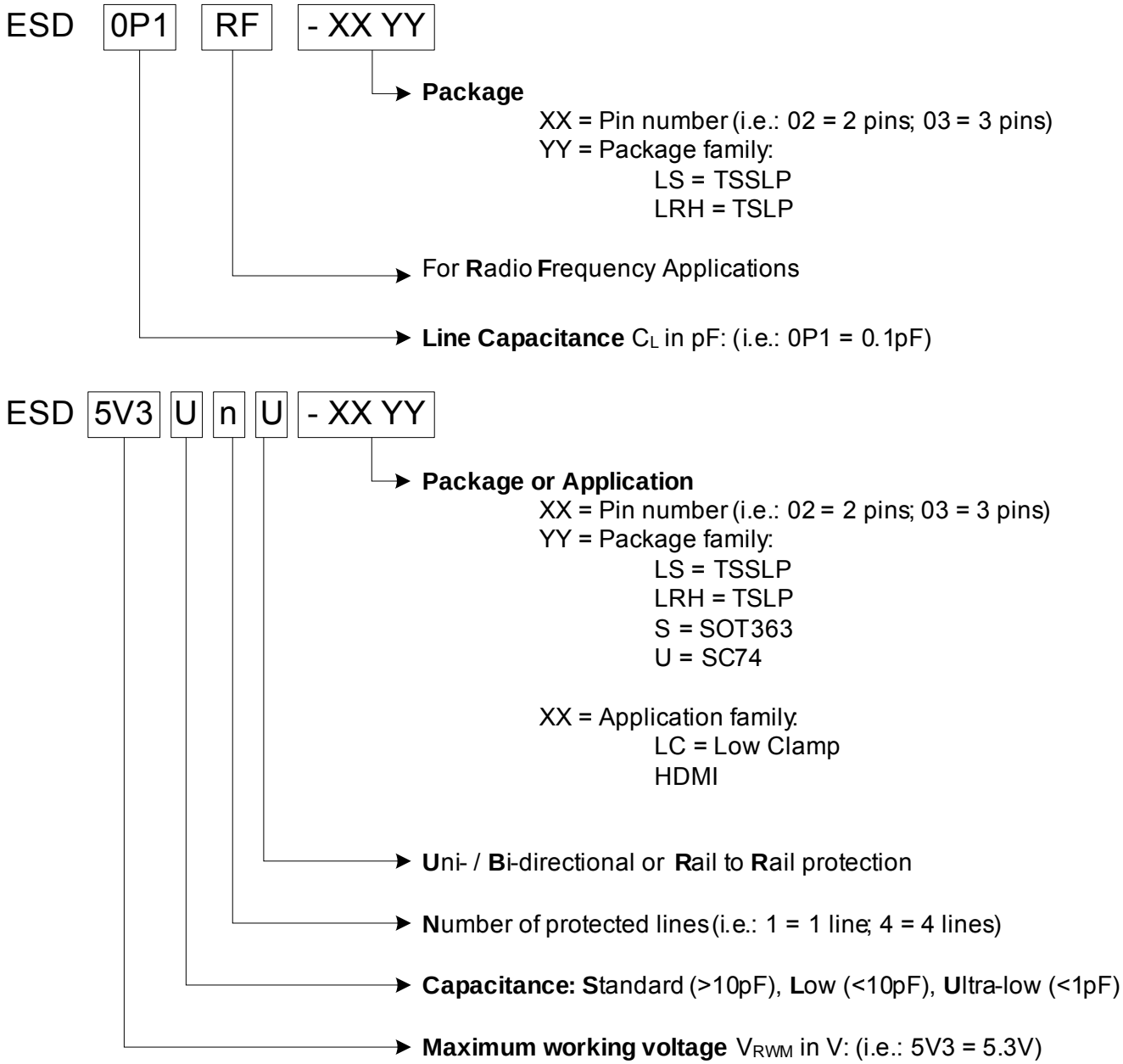


**Figure 9 Ordering Information Scheme**

# 6 Package Information

## 6.1 PG-SC79-2-1

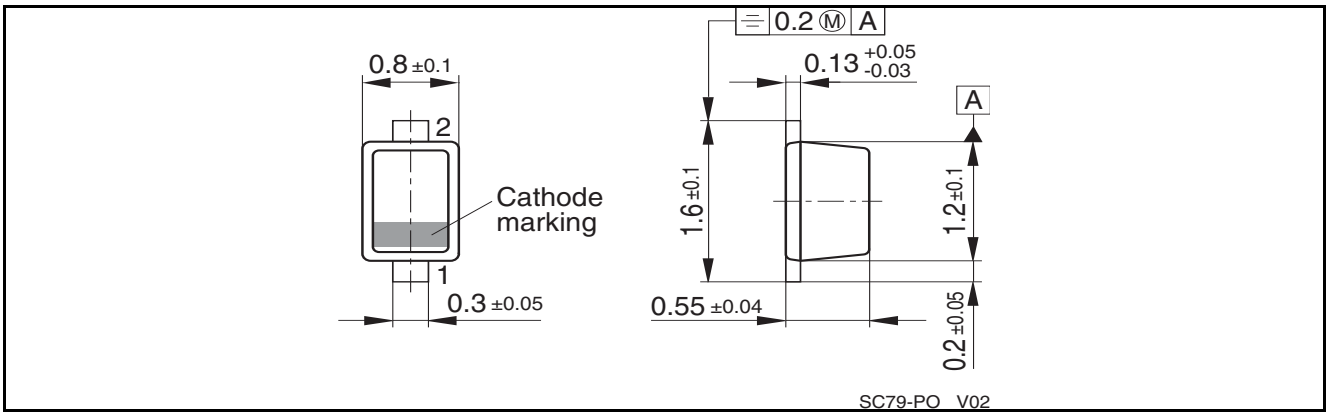


**Figure 10 PG-SC79-2-1: Package Overview**

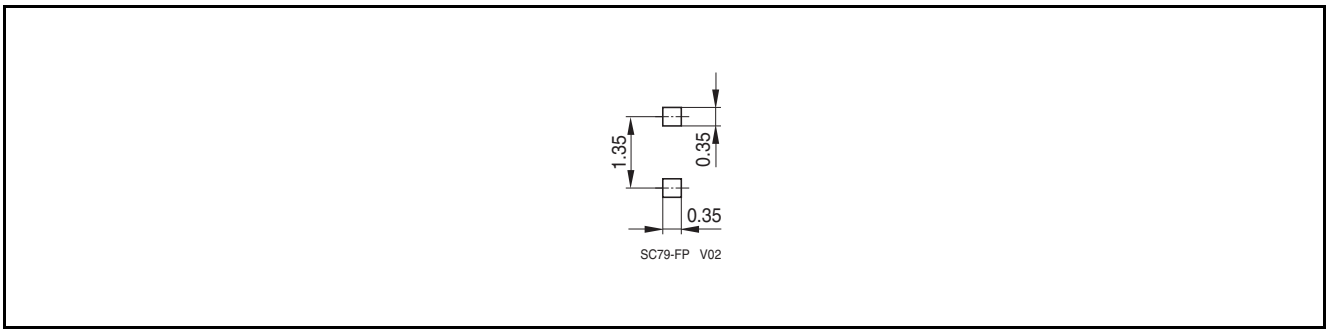


**Figure 11 PG-SC79-2-1: Footprint**

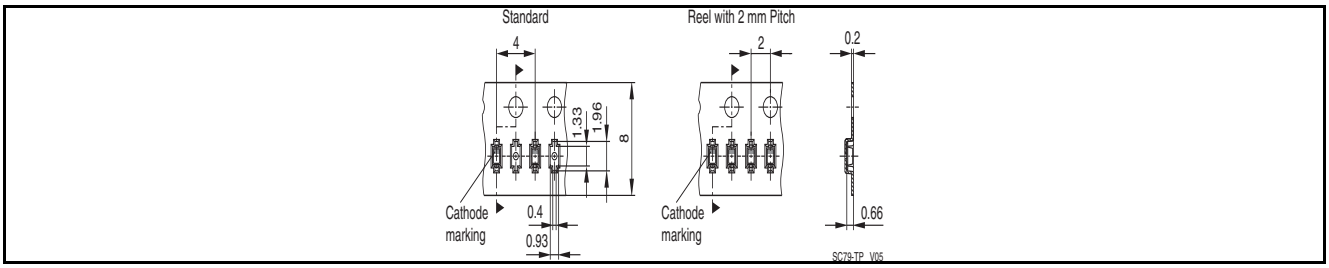


**Figure 12 PG-SC79-2-1: Packing**

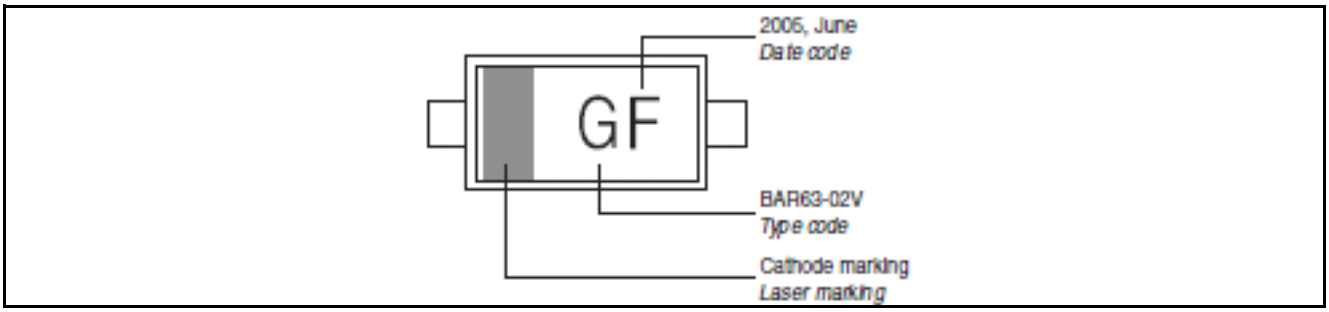


**Figure 13 PG-SC79-2-1: Marking (example)**

# 7 Date Code Marking[1)]

one digit (SCD80, SC79, SC75[1)]) CES-Code

| Month | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | a | p | A | P | a | p | A | P | a | p | A | P |
| 02 | b | q | B | Q | b | q | B | Q | b | q | B | Q |
| 03 | c | r | C | R | c | r | C | R | c | r | C | R |
| 04 | d | s | D | S | d | s | D | S | d | s | D | S |
| 05 | e | t | E | T | e | t | E | T | e | t | E | T |
| 06 | f | u | F | U | f | u | F | U | f | u | F | U |
| 07 | g | v | G | V | g | v | G | V | g | v | G | V |
| 08 | h | x | H | X | h | x | H | X | h | x | H | X |
| 09 | j | y | J | Y | j | y | J | Y | j | y | J | Y |
| 10 | k | z | K | Z | k | z | K | Z | k | z | K | Z |
| 11 | l | 2 | L | 4 | l | 2 | L | 4 | l | 2 | L | 4 |
| 12 | n | 3 | N | 5 | n | 3 | N | 5 | n | 3 | N | 5 |

**Figure 14 Date Code marking for Discrete packages with one digit (SCD8, SC79, SC75[1)]) CES-Code**

1) New Marking Layout for SC75, implemented at October 2005

# Terminology

| | |
|---|---|
| $C_L$ | Line capacitance |
| EFT | Electrical Fast Transient |
| ESD | Electrostatic Discharge |
| $\boldsymbol{I_{PP}}$ | Peak pulse current |
| $\boldsymbol{I_R}$ | Reverse current |
| RoHs | Restriction of Hazardous Substance Directive |
| $T_A$ | Ambient Temperature |
| $T_{OP}$ | Operation temperature |
| $t_p$ | Pulse duration |
| $T_{stg}$ | Storage temperature |
| $V_{CL}$ | Reverse clamping voltage |
| $V_{ESD}$ | Electrostatic discharge voltage |
| $V_R$ | Reverse voltage |
| $V_{RWM}$ | Reverse working voltage maximum |
| $V_{BR}$ | Breakdown voltage |
| $R_{DYN}$ | Dynamic resistance |

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