

### Features

- Low capacitance: 0.3pF typical (I/O to I/O)
- Ultra low leakage: nA level
- Low operating voltage: 5V
- Low clamping voltage
- Up to 4 lines and one power line protects
- Complies with following standards:
  - IEC 61000-4-2 (ESD) immunity test  
Air discharge: ±15kV  
Contact discharge: ±8kV
  - IEC61000-4-4 (EFT) 40A (5/50ns)
  - IEC61000-4-5 (Lightning) 5A (8/20µs)
- RoHS Compliant

### Description

The ESD0541LC1 is a low capacitance TVS arrays,utilizing leading monolithic silicon technology to provide fast response time and low ESD clamping voltage, making this device an ideal solution for protecting voltage sensitive high-speed data lines.The ESD0541LC1 complies with the IEC 61000-4-2 (ESD) standard with ±15kV air and ±8kV contact discharge. It is assembled into a 10-pin DFN3020 -10 lead-free package. The leads are finished with NiPdAu. Each device will protect up to four high-speed lines. The combination of small size, low capacitance, and high surge capability makes them ideal for use in applications such as 10/100 Ethernet, USB 2.0, and video interfaces.

### Mechanical Characteristics

- Package: DFN3020-10
- Lead Finish: NiPdAu
- Case Material: "Green" Molding Compound
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 3 per J-STD-020
- Terminal Connections: See Diagram



### Applications

- USB 2.0 power and data line
- Monitors and Flat Panel Displays
- Video Graphics Cards
- Digital Video Interface (DVI)
- Notebook Computers
- 10/100 Ethernet
- Networking Equipment

### Part Number Code

|          |          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| <b>E</b> | <b>S</b> | <b>D</b> | <b>0</b> | <b>5</b> | <b>1</b> | <b>1</b> | <b>L</b> | <b>1</b> |
| <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> | <b>6</b> | <b>7</b> | <b>8</b> | <b>9</b> |

| Product Type |                                       |
|--------------|---------------------------------------|
| ESD          | TSK Electrostatic suppressor ESD Type |

| Reverse Working Voltage (V) |      |
|-----------------------------|------|
| 3V3                         | 3.3V |
| 05                          | 5V   |
| 16                          | 16V  |

| Line |        |
|------|--------|
| 1    | 1-Line |
| 2    | 2-Line |
| 3    | 3-Line |

| Capacitance Type |        |
|------------------|--------|
| L                | Low    |
| X                | Normal |

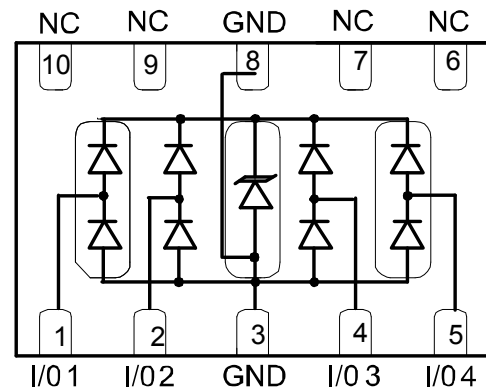
| directional |     |
|-------------|-----|
| 0           | Bi  |
| 1           | Uni |

| Size |         |
|------|---------|
| 1    | O201    |
| 2    | O402    |
| 3    | DFN0603 |
| 4    | DFN1006 |

★ Code 4 to 9 is optional

### Dimensions and Pin Configuration



Circuit and Pin Schematic

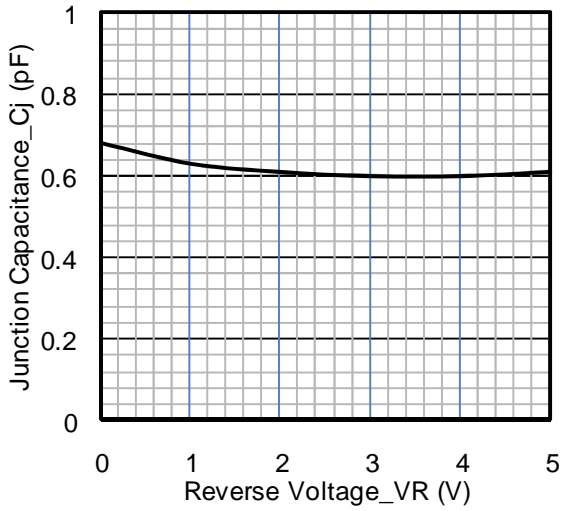
### Absolute Maximum Ratings ( $T_A=25^{\circ}\text{C}$ unless otherwise specified)

| Parameter                                | Symbol           | Value       | Unit               |
|--|------------------|-------------|--------------------|
| Peak Pulse Power (8/20 $\mu\text{s}$ )   | Ppk              | 90          | W                  |
| Peak Pulse Current (8/20 $\mu\text{s}$ ) | I <sub>PP</sub>  | 5           | A                  |
| ESD per IEC 61000-4-2 (Air)              | V <sub>ESD</sub> | $\pm 15$    | kV                 |
| ESD per IEC 61000-4-2 (Contact)          |                  | $\pm 8$     |                    |
| Operating Temperature Range              | T <sub>J</sub>   | -55 to +125 | $^{\circ}\text{C}$ |
| Storage Temperature Range                | T <sub>stg</sub> | -55 to +150 | $^{\circ}\text{C}$ |

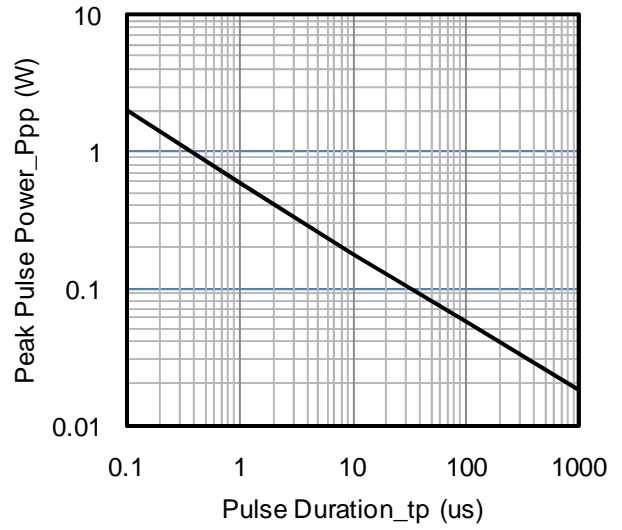
### Electrical Characteristics ( $T_A=25^{\circ}\text{C}$ unless otherwise specified)

| Parameter               | Symbol           | Min | Typ | Max | Unit          | Test Condition   |
|-------------------------|------------------|-----|-----|-----|---------------|--|
| Reverse Working Voltage | V <sub>RWM</sub> |     |     | 5   | V             |  |
| Breakdown Voltage       | V <sub>BR</sub>  | 6   |     |     | V             | I <sub>T</sub> = 1mA   |
| Reverse Leakage Current | I <sub>R</sub>   |     |     | 0.5 | $\mu\text{A}$ | V <sub>RWM</sub> = 5V  |
| Clamping Voltage        | V <sub>C</sub>   |     |     | 12  | V             | I <sub>PP</sub> = 1A (8 x 20 $\mu\text{s}$ pulse), any I/O pin to ground |
| Clamping Voltage        | V <sub>C</sub>   |     |     | 18  | V             | I <sub>PP</sub> = 5A (8 x 20 $\mu\text{s}$ pulse), any I/O pin to ground |
| Junction Capacitance    | C <sub>J</sub>   |     | 0.3 |     | pF            | V <sub>R</sub> = 0V, f = 1MHz, between I/O pins                          |
| Junction Capacitance    | C <sub>J</sub>   |     | 0.6 | 0.8 | pF            | V <sub>R</sub> = 0V, f = 1MHz, any I/O pin to ground                     |

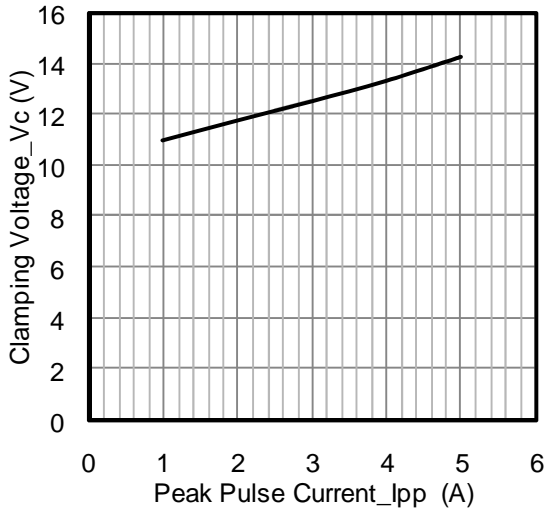
Typical Performance Characteristics (TA=25°C unless otherwise Specified)



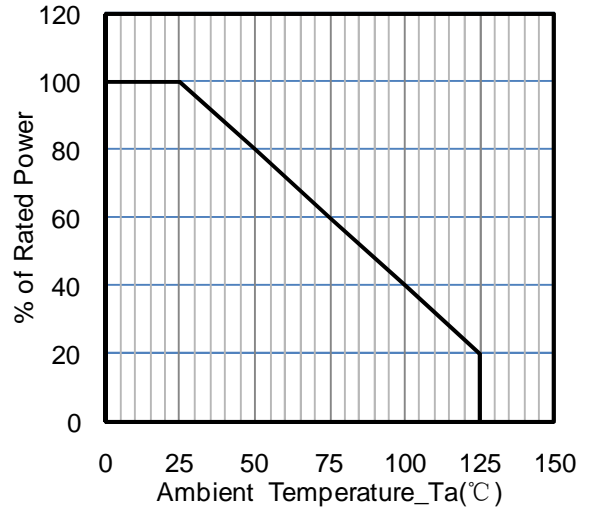
Junction Capacitance vs. Reverse Voltage



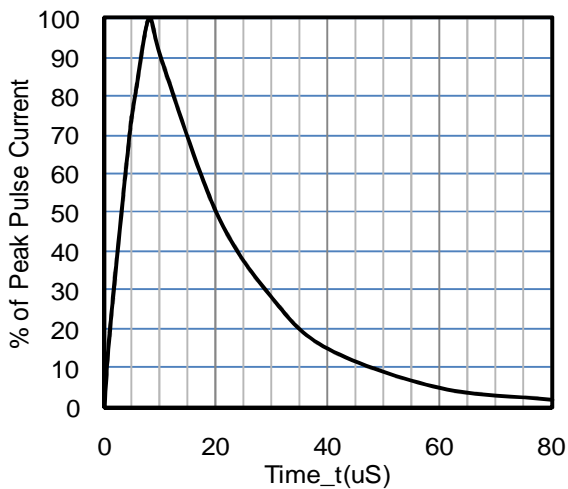
Peak Pulse Power vs. Pulse Time



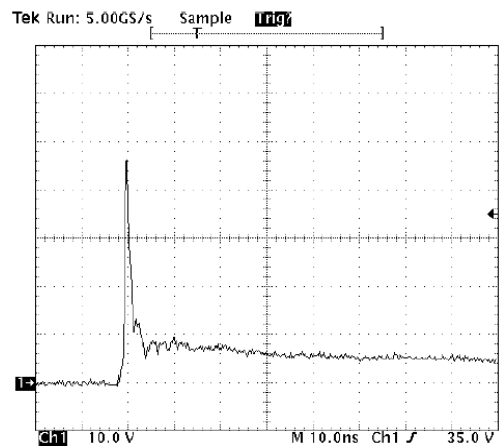
Clamping Voltage vs. Peak Pulse Current



Power Derating Curve



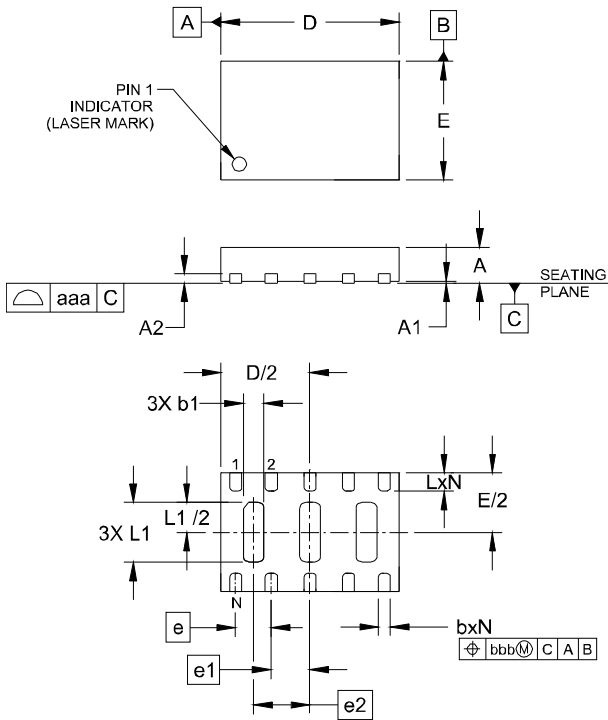
8 X 20us Pulse Waveform



ESD Clamping Voltage

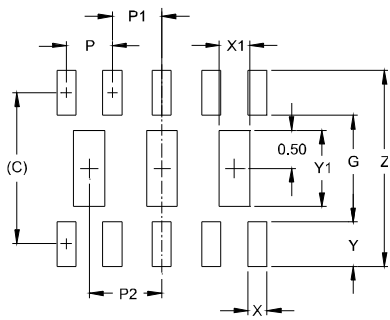
8 kV Contact per IEC61000-4-2

DFN3020-10 Package Outline Drawing



| DIMENSIONS |             |      |      |
|------------|-------------|------|------|
| DIM        | MILLIMETERS |      |      |
|            | MIN         | NOM  | MAX  |
| A          | 0.50        | 0.60 | 0.65 |
| A1         | 0.00        | 0.03 | 0.05 |
| A2         | (0.15)      |      |      |
| b          | 0.15        | 0.20 | 0.25 |
| b1         | 0.25        | 0.35 | 0.45 |
| D          | 2.90        | 3.00 | 3.10 |
| E          | 1.90        | 2.00 | 2.10 |
| e          | 0.60 BSC    |      |      |
| e1         | 0.65 BSC    |      |      |
| e2         | 0.95 BSC    |      |      |
| L          | 0.25        | 0.30 | 0.35 |
| L1         | 0.95        | 1.00 | 1.05 |
| N          | 10          |      |      |
| aaa        | 0.08        |      |      |
| bbb        | 0.10        |      |      |

Suggested Land Pattern



| DIMENSIONS |             |
|------------|-------------|
| DIM        | MILLIMETERS |
| C          | (1.98)      |
| G          | 1.40        |
| P          | 0.60        |
| P1         | 0.65        |
| P2         | 0.95        |
| X          | 0.25        |
| X1         | 0.40        |
| Y          | 0.58        |
| Y1         | 1.00        |
| Z          | 2.56        |

Ordering Information

| Part Number | Packaging        | Reel Size |
|-------------|------------------|-----------|
| ESD0541LC1  | 3000/Tape & Reel | 7 inch    |