

# PROVEN ULTRA-LOW CAPACITANCE



## Small Outline Solutions Supporting USB 3.1 Type C

Implementing USB 3.1 Type C SuperSpeed+ presents a set of challenges to design engineers. Littelfuse ESD discrete solutions available in sizes from 0402 (1.0mm x 0.6mm) down to 01005 (0.4mm x 0.2mm).

**USB 3.1 Type C Offers:**

- Direction agnostic insertions
- Fast-charging profiles for batteries
- Exceptionally fast data transfer rates

**USB 3.1 Type C Demands:**

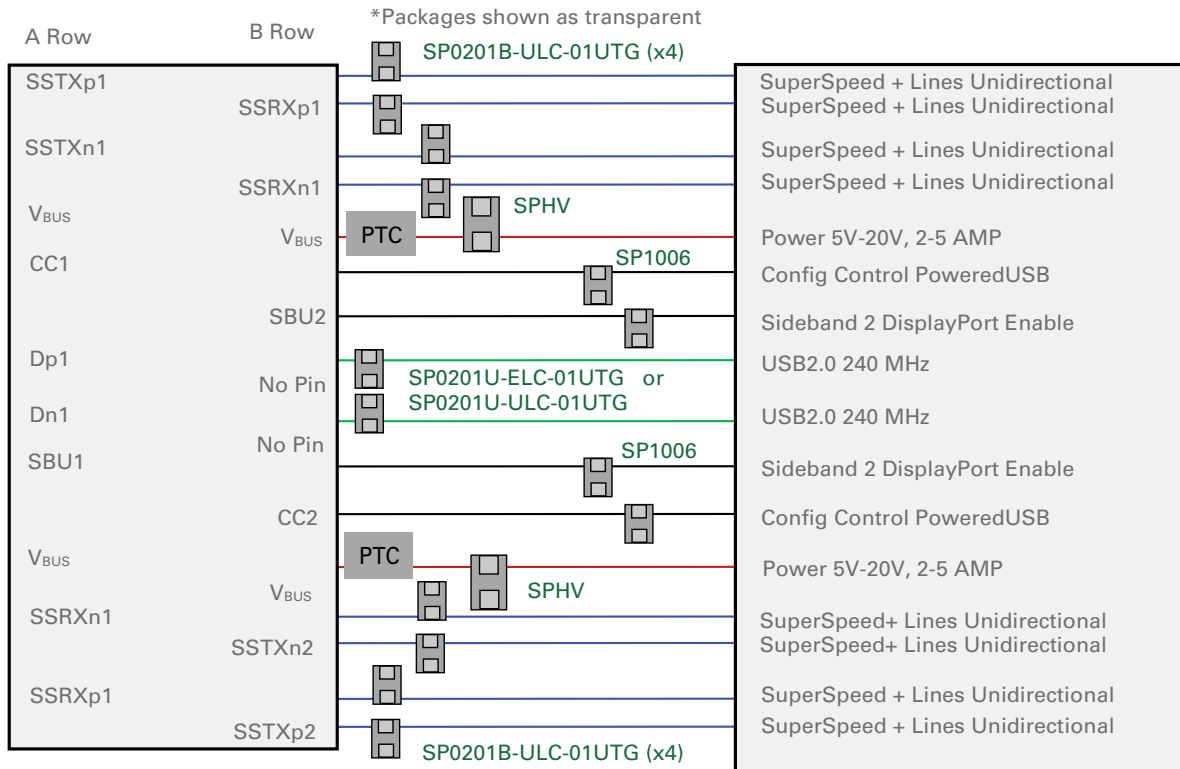
- Virtually invisible ESD and Surge Protection
- Charging Port protection up to 20V and 5A
- Logic line protection, a unipolar interface
- Extremely low parasitic capacitance, inductance and resistance

**Our Solutions Deliver:**

- Ultra-low capacitance, robust ESD and Surge tolerant solutions for Data lines, VBus and Logic Interfaces
- Fast Acting surge and ESD capable solutions from 5-24V
- Unidirectional protection withstanding >5A (8/20 $\mu$ s) surge and  $\pm$ 30kV ESD
- Fast acting, semiconductor-based ESD protection, proven in ThunderBolt and USB 3.1 interfaces

## Best Signal Integrity Solution in Smallest Packages

Focused on signal integrity, the SP0201U-ULC-01UTG (0201 DFN package) is the best solution for SuperSpeed+ lines, as it offers the lowest parasitic capacitance and inductance. Smaller packages present less parasitics.



### TVS Diode Arrays (SPA® Diodes)

| Function             | Designators     | Ordering Number                | ESD Level | I/O Cap. @ Op. Freq. (Signal Integrity) | Operating Voltage | Standard Package   |
|----------------------|-----------------|--------------------------------|-----------|---|-------------------|--------------------|
| SuperSpeed+, USB 2.0 | SSTx SSRx, D+D- | SP0201B-ULC-01UTG              | ±20kV     | 0.15 pF                                 | <5V               | 0201 DFN           |
| Logic                | SBU1/2, CC1/2   | SP1003-01ETG / SP1006-01UTG    | ±30kV     | 30pF / 25pF                             | <5V               | SOD-882 / 0201 DFN |
| Charging             | Vbus            | SPHV24-01ETG / SP24-01WTG-C-HV | ±24kV     | 17pF                                    | from 5V thru 24V  | SOD-882 / 0201 DFN |

### PTC

| Function                                    | Designators | Ordering Number | Voltage | Current | I <sub>hold</sub> 20°C(A) | I <sub>hold</sub> 60°C(A) | R <sub>1 max</sub> (Ω) | Footprint |
|---|-------------|-----------------|---------|---------|---------------------------|---------------------------|------------------------|-----------|
| Over-temperature and Overcurrent Protection | Vbus        | nanoSMD350LR-C  | 12V     | 3.5 A   | 4.8                       | 1.90                      | 0.0180                 | 1206      |
|   |             | nanoSMD400LR-C  | 12V     | 4.0A    | 5.2                       | 2.82                      | 0.0100                 | 1206      |
|   |             | microSMD450LR-C | 12V     | 4.5A    | 6.2                       | 3.30                      | 0.0085                 | 1210      |