

# LL18BT1006L1

## List

|                                                         |   |
|---------------------------------------------------------|---|
| List.....                                               | 1 |
| Package outline.....                                    | 2 |
| Features.....                                           | 2 |
| Mechanical data.....                                    | 2 |
| Maximum ratings .....                                   | 2 |
| Electrical characteristics.....                         | 2 |
| Rating and characteristic curves.....                   | 3 |
| Pinning information.....                                | 4 |
| Marking.....                                            | 4 |
| Suggested solder pad layout.....                        | 4 |
| Packing information.....                                | 5 |
| Reel packing.....                                       | 6 |
| Suggested thermal profiles for soldering processes..... | 6 |
| High reliability test capabilities.....                 | 7 |

# LL18BT1006L1

## Ultra Low Capacitance TVS Diode For ESD Protection 18V

### Features

- Bi-directional TVS
- Ultra low capacitance: 0.5pF typical
- Small body outline dimensions: 1.00mm x 0.60 mm (typ.)
- Low body height
- Low leakage
- Response time is typically < 1 ns
- Provide transient protection:  
IEC 61000-4-2 (ESD) Contact  $\pm 12\text{KV}$ /Air  $\pm 15\text{KV}$   
IEC 61000-4-4 (EFT) 40A (5/50ns)  
IEC 61000-4-5 (Surge) 2.5A (8/20us)
- We declare that the material of product compliance with RoHS requirements.
- Suffix "-H" indicates Halogen-free parts, ex.LL18BT1006L1-H

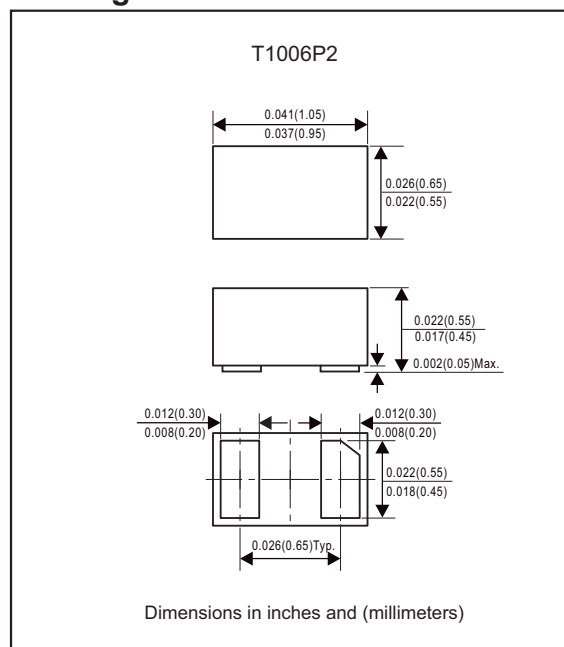
### Applications

- Cellular phones audio
- MP3 players
- Digital cameras
- Portable applications
- mobile telephone

### Mechanical data

- Case : Molded plastic, T1006P2
- Mounting Position : Any
- Weight : Approximated 0.73 mg

### Package outline



### Maximum ratings (at $T_A=25^\circ\text{C}$ unless otherwise noted)

| Parameter                                                      | Symbol           | Value                | Unit |
|----------------------------------------------------------------|------------------|----------------------|------|
| Peak Pulse Power (According to IEC 61000-4-5)                  | P <sub>PP</sub>  | 87.5                 | W    |
| Peak Pulse Current (According to IEC 61000-4-5)                | I <sub>PP</sub>  | 2.5                  | A    |
| ESD per IEC 61000-4-2 (Air)<br>ESD per IEC 61000-4-2 (Contact) | ESD              | $\pm 15$<br>$\pm 12$ | KV   |
| Operating junction temperature range                           | T <sub>J</sub>   | -55 to +150          | °C   |
| Storage temperature range                                      | T <sub>STG</sub> | -55 to +150          | °C   |

### Electrical characteristics (at $T_A=25^\circ\text{C}$ unless otherwise noted)

| Parameter                     | Condition                                                                                               | Symbol           | Min. | Typ.     | Max. | Unit |
|-------------------------------|---------------------------------------------------------------------------------------------------------|------------------|------|----------|------|------|
| Reverse Stand-Off Voltage     |                                                                                                         | V <sub>RWM</sub> |      |          | 18   | V    |
| Reverse Breakdown Voltage     | I <sub>T</sub> =1mA                                                                                     | V <sub>BR</sub>  | 19.5 |          | 7    | V    |
| Reverse Leakage Current       | V <sub>RWM</sub> =18V                                                                                   | I <sub>R</sub>   |      |          | 500  | nA   |
| Clamping Voltage (Note 1)     | I <sub>PP</sub> =2.5A, T <sub>P</sub> =8/20us                                                           | V <sub>C</sub>   |      | 30       | 35   | V    |
| Clamping Voltage              | I <sub>PP</sub> =4.0A, T <sub>LP</sub> =0.2/100ns<br>I <sub>PP</sub> =16.0A, T <sub>LP</sub> =0.2/100ns | V <sub>C</sub>   |      | 29<br>41 |      | V    |
| Junction Capacitance          | Between I/O Pin and GND, V <sub>R</sub> =0V, f=1MHz                                                     | C <sub>J</sub>   |      | 0.5      | 0.8  | pF   |
| Dynamic Resistance (Note 2'3) | Dynamic Resistance                                                                                      | R <sub>D</sub>   |      | 1        |      | Ω    |

Note:

1. Non-repetitive current pulse 8/20 us exponential decay waveform according to IEC 61000-4-5.
2. TLP Settings: t<sub>p</sub> = 100ns, t<sub>r</sub> = 0.2ns, I<sub>TLP</sub> and V<sub>TLP</sub> averaging window: t<sub>1</sub> = 70ns to t<sub>2</sub> = 90ns.
3. Dynamic resistance calculated from I<sub>TLP</sub> = 4A to I<sub>TLP</sub> = 16A using "Best Fit"

## Rating and characteristic curves(LL18BT1006L1)

Figure1. Peak Pulse Power vs. Pulse Time

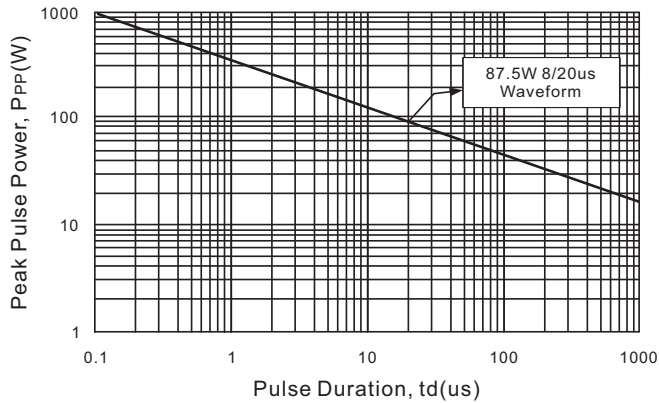


Figure2. Power Derating Curve

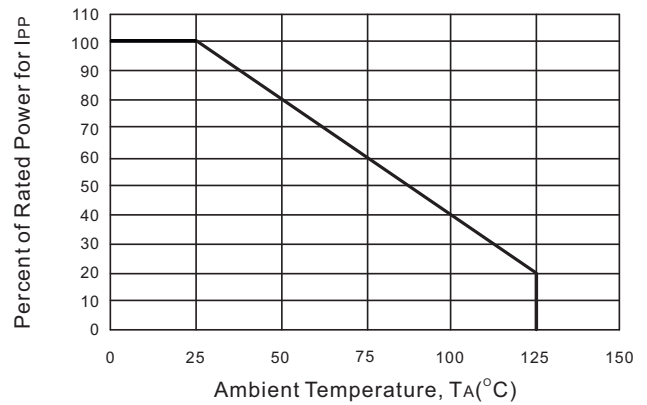


Figure3. Clamping Voltage vs. Peak Pulse Current

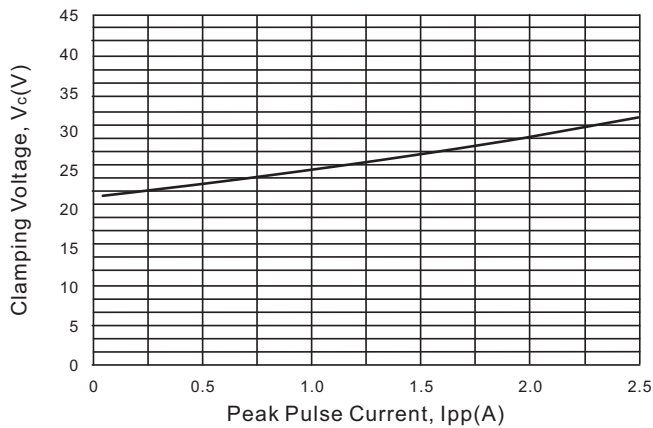


Figure4. Normalized Junction Capacitance vs. Reverse Voltage

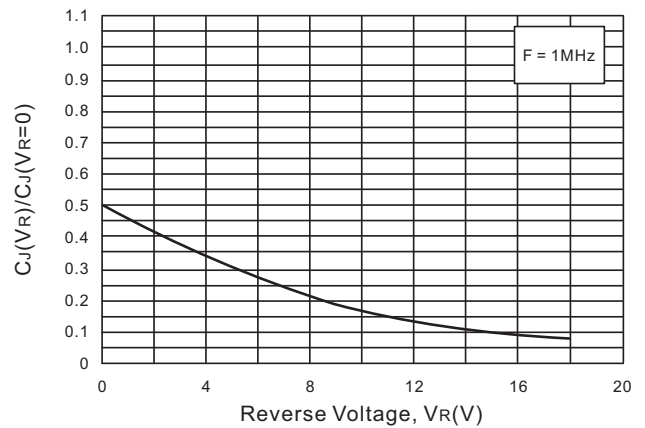


Figure5. TLP Positive I-V Curve

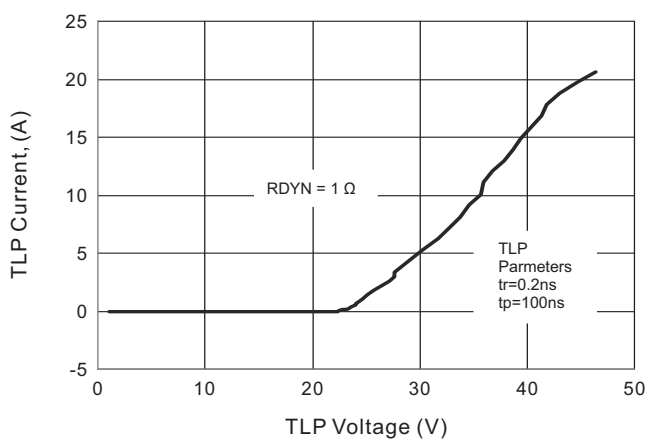
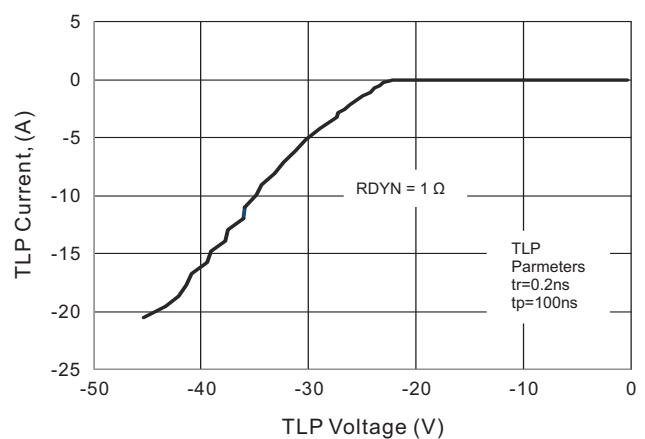


Figure6. TLP Negative I-V Curve



# LL18BT1006L1

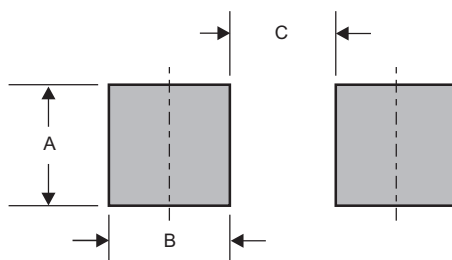
## Pinning information

| Pin            | Simplified outline                                                                | Symbol                                                                              |
|----------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Bi-Directional |  |  |

## Marking

| Type number  | Marking code |
|--------------|--------------|
| LL18BT1006L1 | SS           |

## Suggested solder pad layout

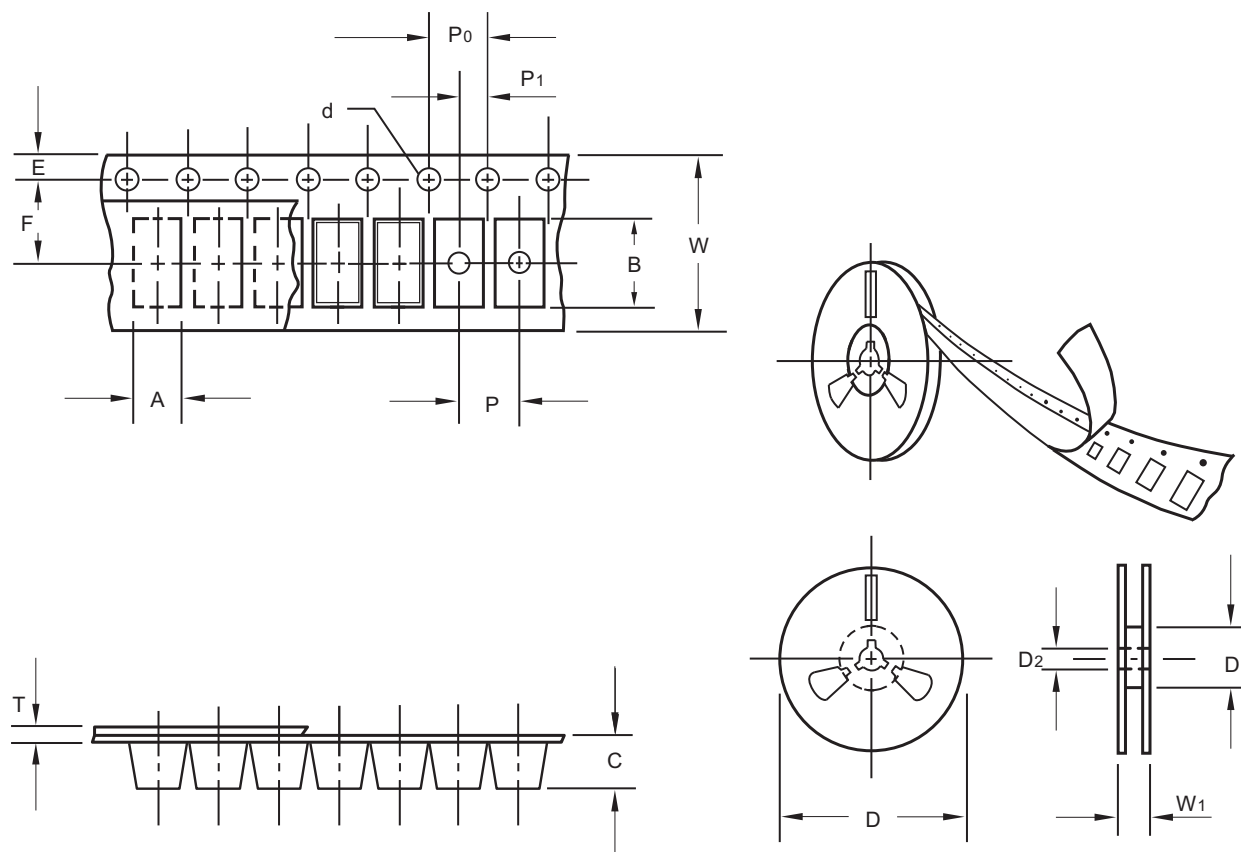


Dimensions in inches and (millimeters)

| PACKAGE | A            | B            | C            |
|---------|--------------|--------------|--------------|
| T1006P2 | 0.024 (0.60) | 0.014 (0.35) | 0.012 (0.30) |

## LL18BT1006L1

## Packing information



unit:mm

| Item                     | Symbol | Tolerance | T1006P2 |
|--------------------------|--------|-----------|---------|
| Carrier width            | A      | 0.1       | 0.70    |
| Carrier length           | B      | 0.1       | 1.12    |
| Carrier depth            | C      | 0.1       | 0.48    |
| Sprocket hole            | d      | 0.1       | 1.50    |
| 7" Reel outside diameter | D      | 2.0       | 178.00  |
| 7" Reel inner diameter   | D1     | min       | 50.00   |
| Feed hole diameter       | D2     | 0.2       | 13.00   |
| Sprocket hole position   | E      | 0.1       | 1.75    |
| Punch hole position      | F      | 0.1       | 3.50    |
| Punch hole pitch         | P      | 0.1       | 4.00    |
| Sprocket hole pitch      | P0     | 0.1       | 4.00    |
| Embossment center        | P1     | 0.1       | 2.00    |
| Overall tape thickness   | T      | 0.1       | 0.23    |
| Tape width               | W      | 0.3       | 8.00    |
| Reel width               | W1     | 1.0       | 9.50    |

Note: Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

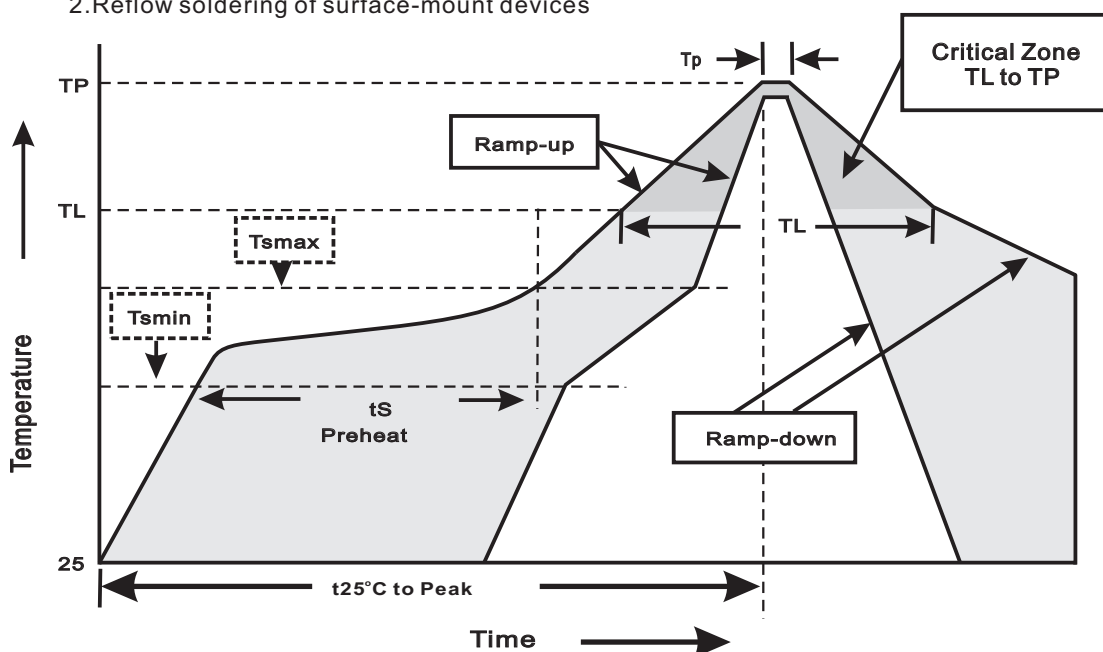
# LL18BT1006L1

## Reel packing

| PACKAGE | REEL SIZE | REEL (pcs) | COMPONENT SPACING (m/m) | BOX (pcs) | INNER BOX (m/m) | REEL DIA, (m/m) | CARTON SIZE (m/m) | CARTON (pcs) | APPROX. GROSS WEIGHT (kg) |
|---------|-----------|------------|-------------------------|-----------|-----------------|-----------------|-------------------|--------------|---------------------------|
| T1006P2 | 7"        | 10,000     | 4.0                     | 100,000   | 183*123*183     | 178             | 382*257*387       | 800,000      | 15.0                      |

## Suggested thermal profiles for soldering processes

- 1.Storage environment: Temperature=5°C~40°C Humidity=55%±25%
- 2.Reflow soldering of surface-mount devices



### 3.Reflow soldering

| Profile Feature                                                                                                                 | Soldering Condition         |
|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Average ramp-up rate(T <sub>L</sub> to T <sub>P</sub> )                                                                         | <3°C/sec                    |
| Preheat<br>-Temperature Min(T <sub>smmin</sub> )<br>-Temperature Max(T <sub>smmax</sub> )<br>-Time(min to max)(t <sub>s</sub> ) | 150°C<br>200°C<br>60~120sec |
| T <sub>smmax</sub> to T <sub>L</sub><br>-Ramp-upRate                                                                            | <3°C/sec                    |
| Time maintained above:<br>-Temperature(T <sub>L</sub> )<br>-Time(t <sub>L</sub> )                                               | 217°C<br>60~260sec          |
| Peak Temperature(T <sub>P</sub> )                                                                                               | 255°C-0/+5°C                |
| Time within 5°C of actual Peak Temperature(t <sub>P</sub> )                                                                     | 10~30sec                    |
| Ramp-down Rate                                                                                                                  | <6°C/sec                    |
| Time 25°C to Peak Temperature                                                                                                   | <6minutes                   |

# LL18BT1006L1

## High reliability test capabilities

| Item Test                        | Conditions                                                                                                        | Reference                   |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------|-----------------------------|
| 1. Solder Resistance             | at $260 \pm 5^{\circ}\text{C}$ for $10 \pm 2\text{sec.}$                                                          | MIL-STD-750D<br>METHOD-2031 |
| 2. Solderability                 | at $245 \pm 5^{\circ}\text{C}$ for 5 sec.                                                                         | MIL-STD-202F<br>METHOD-208  |
| 3. High Temperature Reverse Bias | $V_{\text{BR}} = V_{\text{BR Min}} * 80\%$ at $T_{\text{J}} = 150^{\circ}\text{C}$ for 168 hrs.                   | MIL-STD-750D<br>METHOD-1038 |
| 4. Pressure Cooker               | $15P_{\text{SIG}}$ at $T_{\text{A}} = 121^{\circ}\text{C}$ for 4 hrs.                                             | JESD22-A102                 |
| 5. Temperature Cycling           | $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ dwelled for 30 min.<br>and transferred for 5min. total 10 cycles. | MIL-STD-750D<br>METHOD-1051 |
| 6. Humidity                      | at $T_{\text{A}} = 85^{\circ}\text{C}$ , RH=85% for 1000hrs.                                                      | MIL-STD-750D<br>METHOD-1021 |
| 7. High Temperature Storage Life | at $150^{\circ}\text{C}$ for 1000 hrs.                                                                            | MIL-STD-750D<br>METHOD-1031 |