

# LL05ABT1006-Q1

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# LL05ABT1006-Q1

## 36W Ultra Low Capacitance Bi-Directional TVS For ESD Protection Array 5.0V

### Features

- Reverse working voltage: 5V.
- 36Watts peak pulse power per line. ( $t_p=8/20\mu s$ )
- Protects one I/O or power line.
- Low clamping voltage.
- Low leakage current.
- Provide transient protection :
  - IEC 61000-4-2 (ESD)  $\pm 30kV$  (Air),  $\pm 30kV$  (Contact).
  - IEC 61000-4-4 (EFT) 40A (5/50ns).
  - IEC 61000-4-4 (Lightning) 3A (8/20 $\mu s$ ).
- Qualified to AEC-Q101 standards for high reliability.
- Lead-free parts meet RoHS requirements.
- Suffix "-H" indicates halogen-free part, ex.LL05ABT1006-Q1-H.

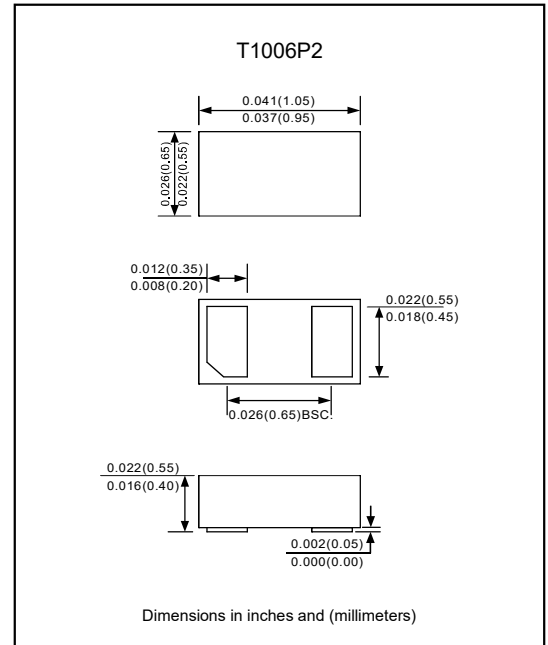
### Applications

- Laptop computers, cellular phones and digital cameras.
- Personal digital assistants. (PDAs)

### Mechanical data

- Epoxy: UL94V-0 rated flame retardant.
- Case : Molded plastic, T1006P2.

### Package outline



### Maximum ratings (At $T_A=25^\circ C$ unless otherwise noted)

| Parameter                          | Symbol    | Ratings     | Units      |
|------------------------------------|-----------|-------------|------------|
| Peak pulse power (8/20 $\mu s$ )   | $P_{PK}$  | 36          | W          |
| Peak pulse current (8/20 $\mu s$ ) | $I_{PP}$  | 3           | A          |
| Operating temperature              | $T_J$     | +125        | $^\circ C$ |
| Storage temperature range          | $T_{STG}$ | -55 to +150 | $^\circ C$ |

### Electrical characteristics (At $T_A=25^\circ C$ unless otherwise noted)

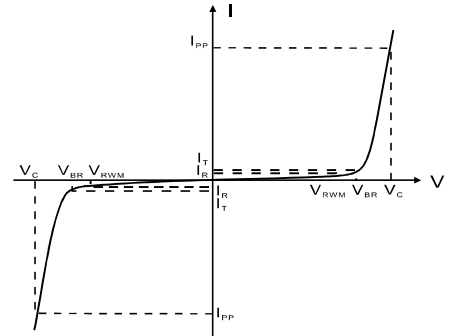
| Parameter                    | Conditions                           | Symbol    | Min. | Typ. | Max. | Unit     |
|------------------------------|--------------------------------------|-----------|------|------|------|----------|
| Reverse working voltage      |                                      | $V_{RWM}$ |      |      | 5    | V        |
| Breakdown voltage            | $I_T=1mA$                            | $V_{BR}$  | 6    |      | 9    | V        |
| Reverse leakage current      | $V_{RWM}=5V$ , $T=25^\circ C$        | $I_R$     |      |      | 500  | nA       |
| Clamping voltage             | $I_{PP}=3A$ , $t_p=8/20\mu s$        | $V_C$     |      | 10.5 | 12   | V        |
| ESD Clamping voltage (Note1) | $I_{PP}=4A$ , $t_p=0.2/100ns$ (TLP)  | $V_C$     |      | 9.8  |      | V        |
|                              | $I_{PP}=16A$ , $t_p=0.2/100ns$ (TLP) |           |      | 17.5 |      |          |
| Dynamic resistance (Note1,2) | TLP=0.2/100ns                        | $R_{DYN}$ |      | 0.6  |      | $\Omega$ |
| Junction capacitance         | $V_R=0V$ , $f=1.0MHz$                | $C_J$     |      | 0.4  | 0.6  | pF       |

Notes: 1. TLP setting:  $t_b=100ns$ ,  $t_f=0.2ns$ ,  $I_{TLP}$  and  $V_{TLP}$  sample window:  $t_1=70ns$  to  $t_2=90ns$ .  
 2. Dynamic resistance calculated from  $I_{PP}=4A$  to  $I_{PP}=16A$  using "Best fit".

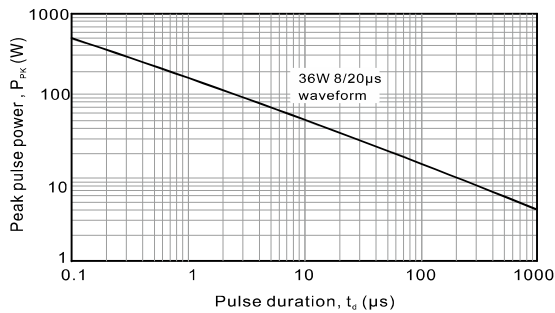
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## Rating and characteristic curves

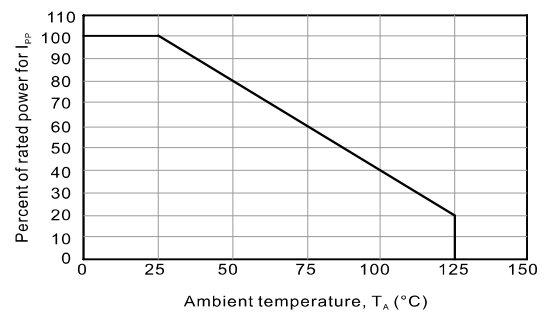
| Symbol    | Parameter                          |
|-----------|------------------------------------|
| $V_{RWM}$ | Nominal reverse working voltage    |
| $I_R$     | Reverse leakage current@ $V_{RWM}$ |
| $V_{BR}$  | Reverse breakdown voltage@ $I_T$   |
| $I_T$     | Test current for reverse breakdown |
| $V_C$     | Clamping voltage @ $I_{PP}$        |
| $I_{PP}$  | Maximum peak pulse current         |



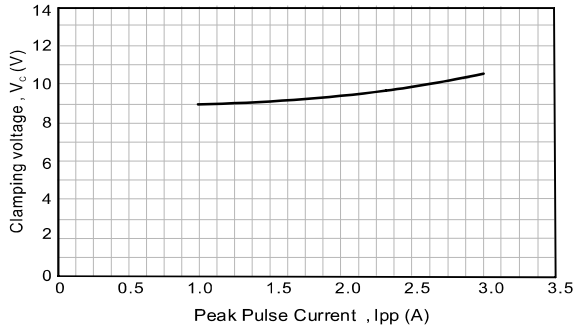
Peak pulse power vs. Pulse time



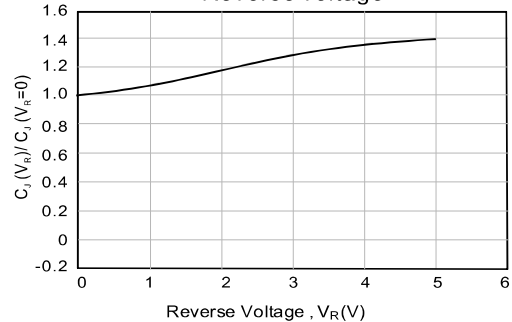
Power de-rating curve



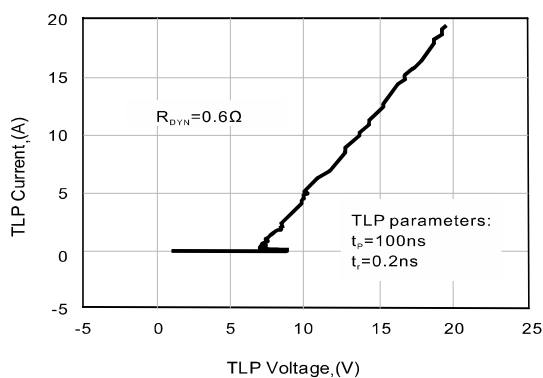
Clamping voltage vs. Peak pulse current



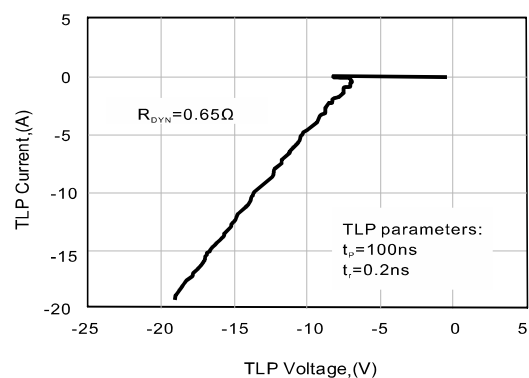
Normalized junction capacitance vs. Reverse voltage



TLP positive I-V curve

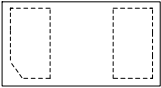
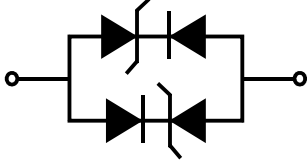


TLP negative I-V curve



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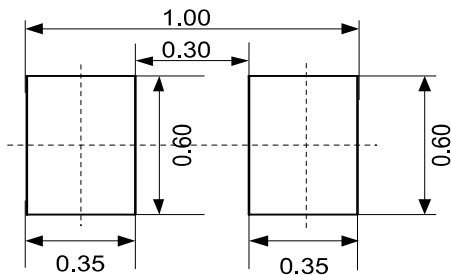
Pinning information

| Pin            | Simplified outline                                                                                                                                                                                                                           | Symbol                                                                              |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Bi-directional | <div><div></div><div>Top view</div><div></div><div>Bottom view</div></div> |  |

Marking

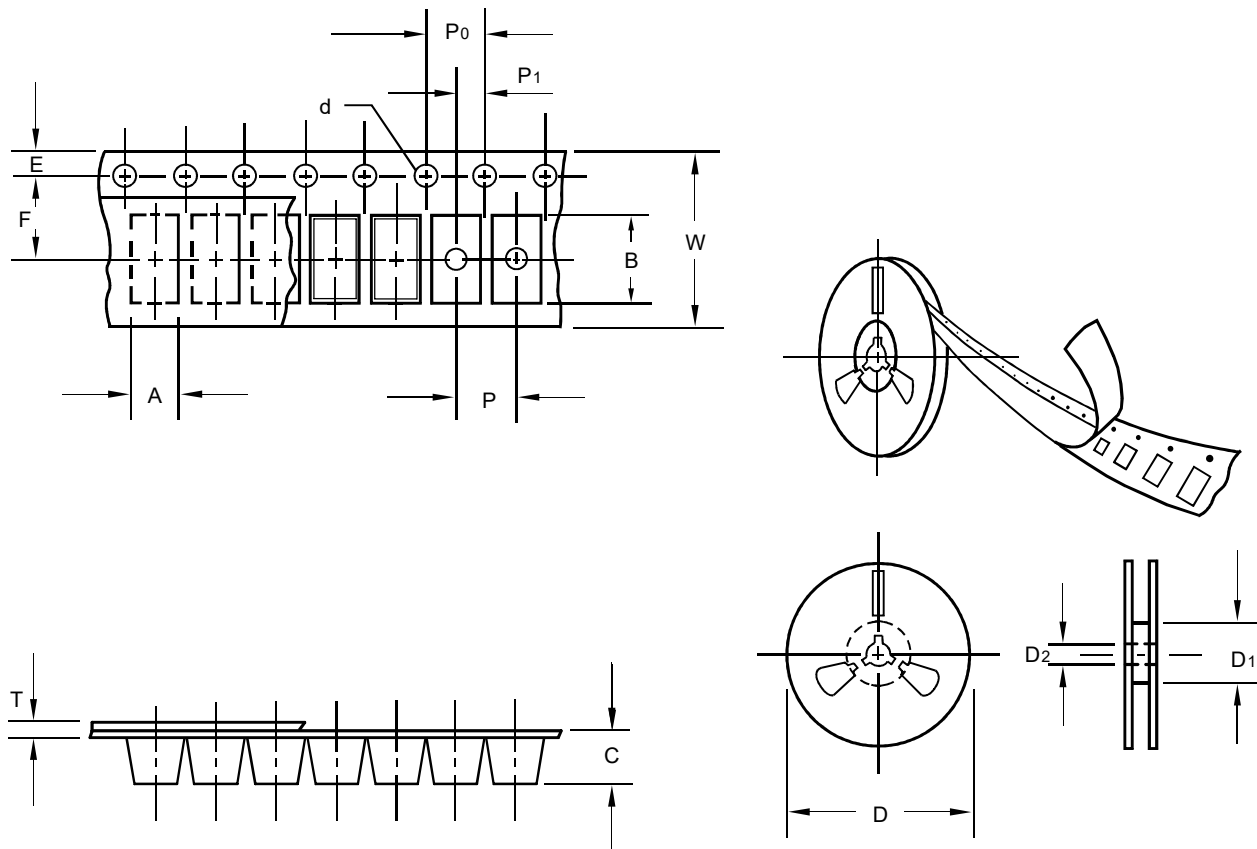
| Type number    | Marking code |
|----------------|--------------|
| LL05ABT1006-Q1 | 5T           |

Suggested solder pad layout



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## Packing information



unit:mm

| Item                      | Symbol         | Tolerance | T1006P2 |
|---------------------------|----------------|-----------|---------|
| Carrier width             | A              | 0.1       | 0.27    |
| Carrier length            | B              | 0.1       | 0.50    |
| Carrier depth             | C              | 0.1       | 0.17    |
| Sprocket hole             | d              | 0.1       | 1.50    |
| 13" Reel outside diameter | D              | 2.0       | -       |
| 13" Reel inner diameter   | D <sub>1</sub> | min       | -       |
| 7" Reel outside diameter  | D              | 2.0       | 178.00  |
| 7" Reel inner diameter    | D <sub>1</sub> | min       | 55.00   |
| Feed hole diameter        | D <sub>2</sub> | 0.5       | 13.00   |
| Sprocket hole position    | E              | 0.1       | 1.75    |
| Punch hole position       | F              | 0.1       | 3.50    |
| Punch hole pitch          | P              | 0.1       | 2.00    |
| Sprocket hole pitch       | P <sub>0</sub> | 0.1       | 4.00    |
| Embossment center         | P <sub>1</sub> | 0.1       | 2.00    |
| Overall tape thickness    | T              | 0.1       | 0.20    |
| Tape width                | W              | 0.3       | 8.00    |

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

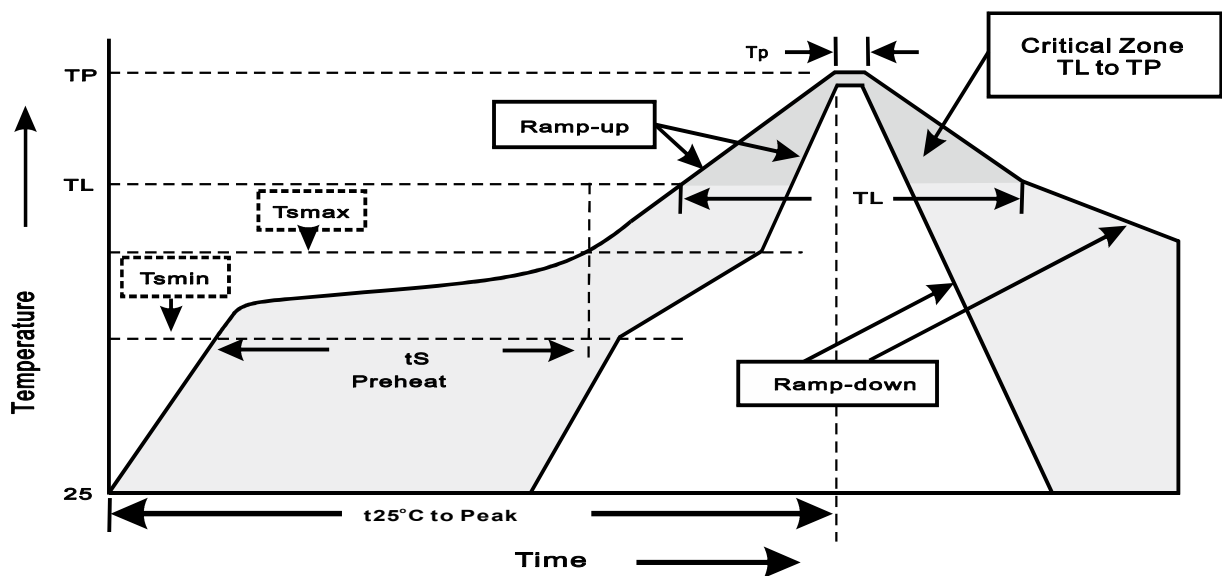
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## Reel packing

| 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) |
|---------|-----------|------------|-------------------------|-----------|-----------------|-----------------|-------------------|--------------|
| T1006P2 | 7"        | 10,000     | 4.0                     | 100,000   | 183*123*183     | 178             | 382*257*387       | 800,000      |

## 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>sm</sub> )<br>-Temperature Max(T <sub>sm</sub> )<br>-Time(min to max)(t <sub>s</sub> ) | 150°C<br>200°C<br>60~120sec |
| T <sub>sm</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                   |

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## High reliability test capabilities

| Item Test                                      | Conditions                                                                                                                                               | Reference                     |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1. MSL Preconditioning                         | 24hr bake@125°C+168hrs@85°C<br>/85%RH+3xIR@260°C+1flux<br>immersion+alcohol+DI H2O rinse                                                                 | JESD22-A113                   |
| 2. High Temperature Reverse Bias               | $V_{BR}=V_{BR\ Nom}*80\%$ ( $T_J=T_J\ max.$ ) Test Duration:1000hrs                                                                                      | JESD22-A108                   |
| 3. High Temperature Storage Life               | $T_a=150^\circ C$ Test Duration:1000hrs                                                                                                                  | JESD22 A-103                  |
| 4. Temperature Cycle                           | $-55^\circ C(15min)$ to $150^\circ C(15min)$ Test Cycles:1000cycles                                                                                      | JESD22 A-104                  |
| 5. Autoclave                                   | $P=2atm$ $T_a=121^\circ C$ $RH=100\%$ Test Duration:96hrs                                                                                                | JESD22 A-102                  |
| 6. Solderability                               | $245\pm5^\circ C$ for 5sec                                                                                                                               | J-STD-002                     |
| 7. Moisture Resistance                         | $T_a=85^\circ C/85\%$ Relative humidity Test Duration:1000hrs                                                                                            | MIL-STD-750E<br>METHOD 1021.2 |
| 8. Resistance To Solder Heat                   | $260\pm5^\circ C$ for 10sec                                                                                                                              | JESD22 B-106                  |
| 9. High Temperature High Humidity Reverse Bias | $T_a=85^\circ C$ , 85%RH, with device reverse biased at 80% of rated breakdown voltage up to a maximum of 100V or limit of chamber Test Duration:1000hrs | JESD22-A101                   |