

# N05BT0603F-H

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## 50W Bi-Directional TVS For ESD Protection : 5.0V

### Features

- Bi-directional ESD protection of one line.
- JESD22-A114-B ESD rating of class 3B per human body model.
- Complies with following standards:  
IEC 61000-4-2(ESD)  $\pm 25\text{kV}$  (Air) ,  $\pm 25\text{kV}$  (Contact).
- Lead-free parts meet RoHS requirements.
- Halogen-free (IEC61249-2-21).

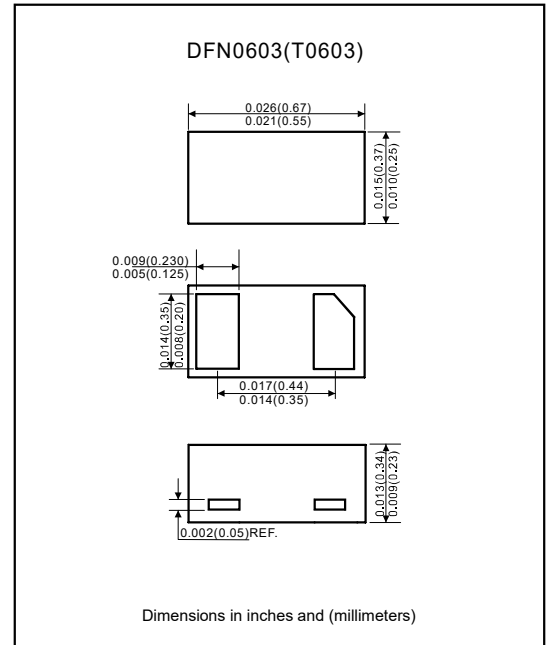
### Applications

- Computers, peripherals, and portable electronics.
- LCD TV.
- Cellular handsets, accessories, PAD, and digital camera.
- Other electronics equipment communication systems.

### Mechanical data

- Epoxy: UL94-V0 rated Flame retardant.
- Case: Molded plastic, DFN0603 (T0603).

### Package outline



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

| Parameter                                        | Symbol    | Ratings     | Units            |
|--------------------------------------------------|-----------|-------------|------------------|
| Peak pulse power (8/20 $\mu\text{s}$ ) (Note2)   | $P_{PK}$  | 50          | W                |
| Peak pulse current (8/20 $\mu\text{s}$ ) (Note2) | $I_{PP}$  | 5           | A                |
| ESD per IEC61000-4-2 (Note1) (Air)               | $V_{ESD}$ | $\pm 25$    | kV               |
| ESD per IEC61000-4-2 (Note1) (Contact)           |           | $\pm 25$    |                  |
| ESD per JESD22-A114-B (Note1) (Per human body)   |           | $\pm 16$    |                  |
| ESD per JESD22-A114-B (Note1) (Machine)          |           | $\pm 0.4$   |                  |
| Lead solder temperature (10 seconds duration)    | $T_L$     | 260         | $^\circ\text{C}$ |
| Operating temperature range                      | $T_J$     | +150        | $^\circ\text{C}$ |
| Storage temperature range                        | $T_{STG}$ | -55 to +150 | $^\circ\text{C}$ |

Note:1. Device stressed with ten non-repetitive ESD pulses.

2. Non-repetitive current pulse 8/20 $\mu\text{s}$  exponential decay waveform according to IEC61000-4-5.

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Electrical Characteristics (At T<sub>A</sub>=25°C unless otherwise noted)

| Parameter                       | Test Condition               | Symbol           | Min. | Typ. | Max. | Units |
|---------------------------------|------------------------------|------------------|------|------|------|-------|
| Reverse working voltage (Note1) |                              | V <sub>RWM</sub> |      |      | 5    | V     |
| Reverse leakage current         | V <sub>RWM</sub> =5V         | I <sub>R</sub>   |      |      | 0.1  | μA    |
| Reverse breakdown voltage       | I <sub>T</sub> =1mA          | V <sub>BR</sub>  | 5.8  |      | 8.3  | V     |
| Clamping voltage (Note2)        | I <sub>PP</sub> = 5A         | V <sub>C</sub>   |      |      | 10   | V     |
| Junction capacitance            | V <sub>R</sub> =0V, f=1.0MHz | C <sub>J</sub>   | 5    | 10   | 15   | pF    |

Note: 1.Other voltages available upon request.  
2. Non-repetitive current pulse 8/20μs exponential decay waveform according to IEC61000-4-5.

Rating and characteristic curves (ESD standards compliance)

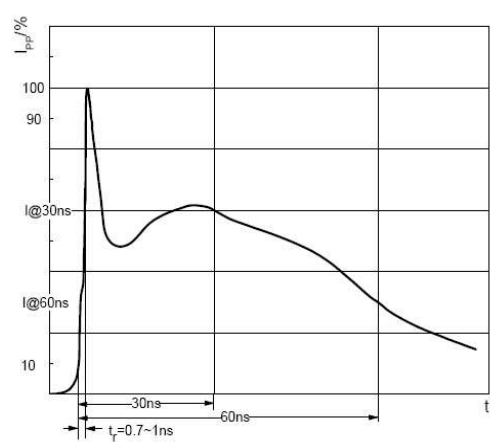
IEC61000-4-2 Standard

| Contact Discharge |                 | Air Discharge |                 |
|-------------------|-----------------|---------------|-----------------|
| Level             | Test Voltage kV | Level         | Test Voltage kV |
| 1                 | 2               | 1             | 2               |
| 2                 | 4               | 2             | 4               |
| 3                 | 6               | 3             | 8               |
| 4                 | 8               | 4             | 15              |

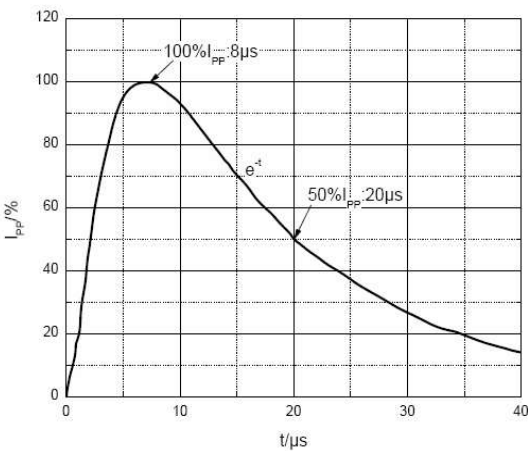
JESD22-A 114-B Standard

| ESD Class | Human Body Discharge V |
|-----------|------------------------|
| 0         | 0 ~ 249                |
| 1A        | 250 ~ 499              |
| 1B        | 500 ~ 999              |
| 1C        | 1000 ~ 1999            |
| 2         | 2000 ~ 3999            |
| 3A        | 4000 ~ 7999            |
| 3B        | 8000 ~ 15999           |

ESD pulse waveform according to IEC61000-4-2



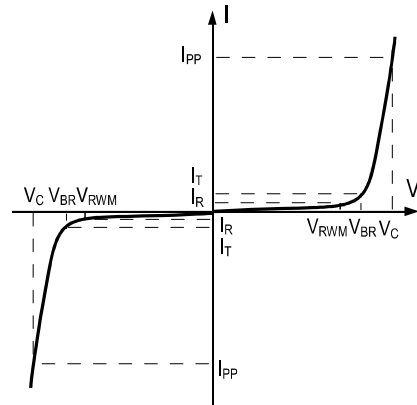
8/20μs pulse waveform according to IEC 61000-4-5



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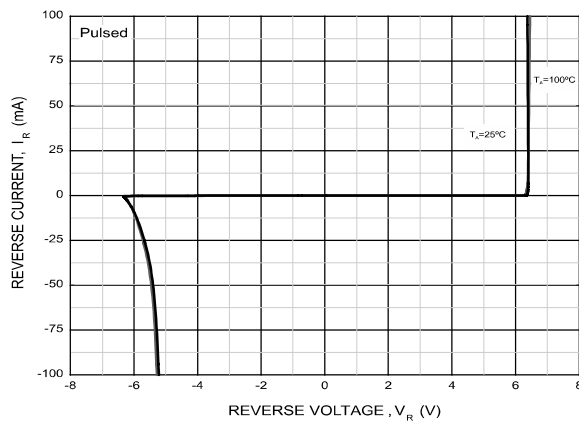
## Rating and characteristic curves

| Symbol    | Parameter                           |
|-----------|-------------------------------------|
| $V_C$     | Clamping voltage@ $I_{PP}$          |
| $I_{PP}$  | Peak pulse current                  |
| $V_{BR}$  | Breakdown voltage@ $I_T$            |
| $I_T$     | Test current                        |
| $I_R$     | Reverse leakage current @ $V_{RWM}$ |
| $V_{RWM}$ | Reverse working voltage             |

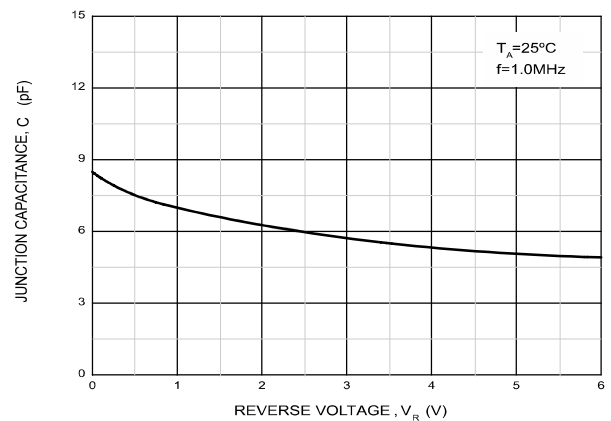


V-I characteristics for a Bi-directional TVS

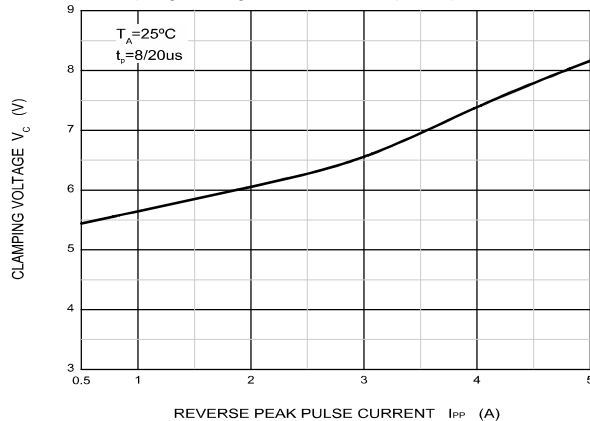
Reverse characteristics



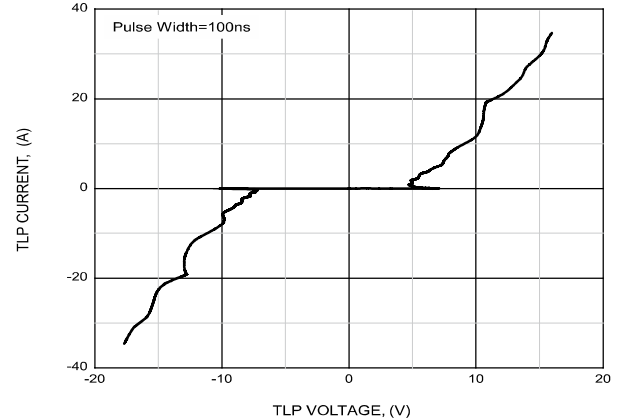
Capacitance characteristics



Clamping voltage vs. Reverse peak pulse current

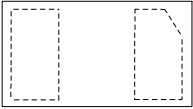


Transmission line pulsing (TLP) Measureme



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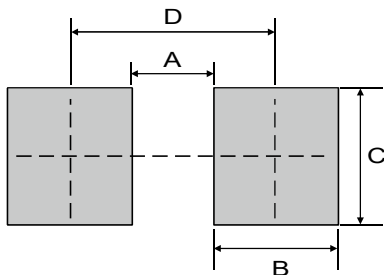
Pinning information

| Pin            | Simplified outline                                                                                                                                                                                                               | Circuit Diagram                                                                     |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Bi-Directional | <div><div><br/>Top view</div><div><br/>Bottom view</div></div> |  |

Marking

| Type number  | Marking code |
|--------------|--------------|
| N05BT0603F-H | H            |

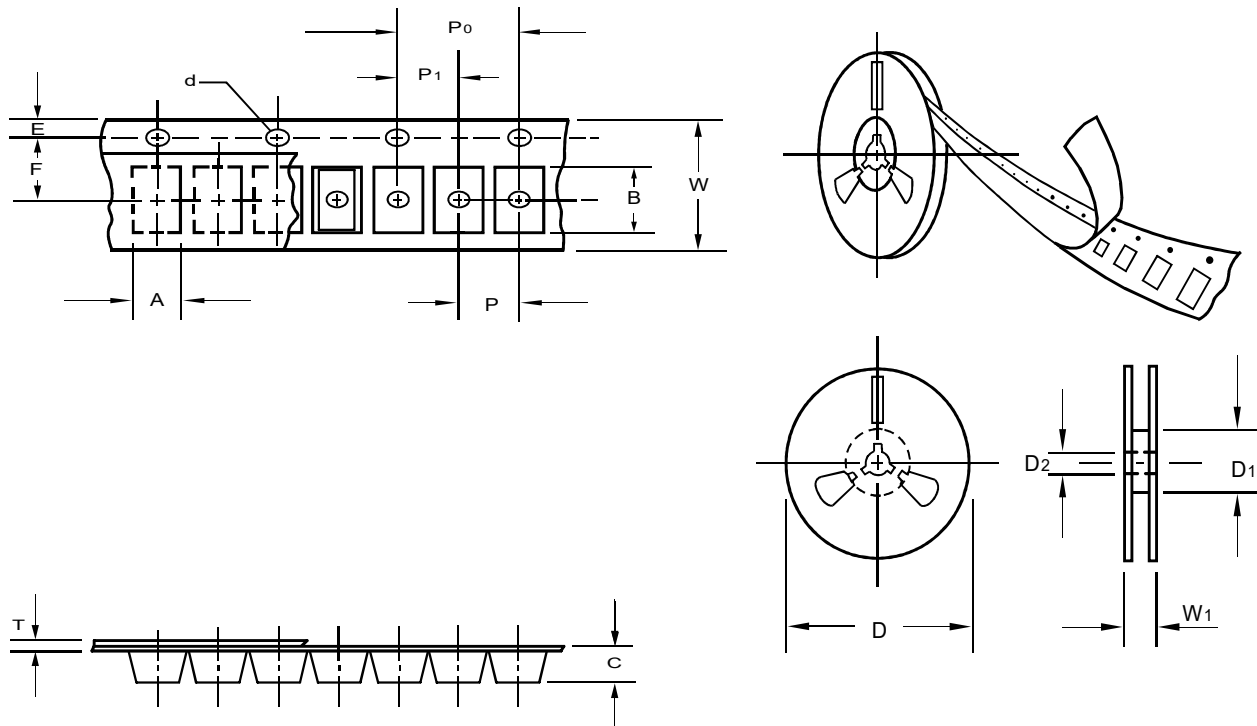
Suggested solder pad layout



| Size | T0603 |        |
|------|-------|--------|
|      | (mm)  | (inch) |
| A    | 0.20  | 0.008  |
| B    | 0.22  | 0.009  |
| C    | 0.40  | 0.012  |
| D    | 0.40  | 0.016  |

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## Packing information



unit:mm

| Item                      | Symbol | Tolerance | DFN0603<br>(T0603) |
|---------------------------|--------|-----------|--------------------|
| Carrier width             | A      | 0.3       | 0.41               |
| Carrier length            | B      | 0.3       | 0.70               |
| Carrier depth             | C      | 0.3       | 0.38               |
| Sprocket hole             | d      | 0.1       | 1.50               |
| 13" Reel outside diameter | D      | 2.0       | -                  |
| 13" Reel inner diameter   | D1     | min       | -                  |
| 7" Reel outside diameter  | D      | 2.0       | 178.0              |
| 7" Reel inner diameter    | D1     | min       | 54.4               |
| Feed hole diameter        | D2     | 0.5       | 13.0               |
| Sprocket hole position    | E      | 0.1       | 1.75               |
| Punch hole position       | F      | 0.1       | 3.50               |
| Punch hole pitch          | P      | 0.1       | 2.0                |
| Sprocket hole pitch       | P0     | 0.1       | 4.0                |
| Embossment center         | P1     | 0.1       | 2.0                |
| Overall tape thickness    | T      | 0.1       | 0.2                |
| Tape width                | W      | 0.3       | 8.0                |
| Reel width                | W1     | 1.0       | 12.3               |

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

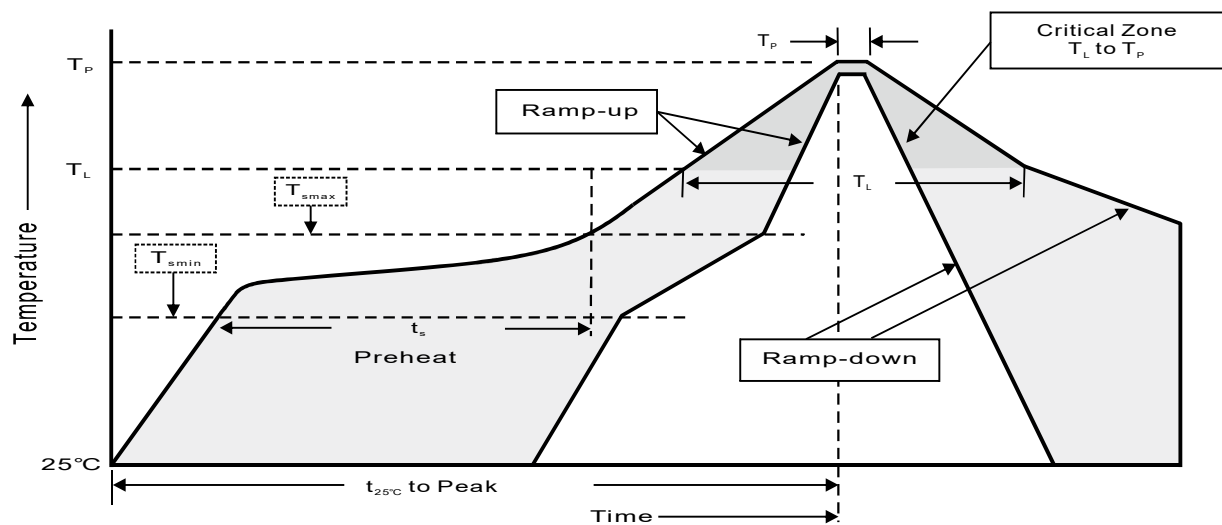
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## Reel packing

| 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) |
|-----------------|-----------|------------|-------------------------|-----------|-----------------|-----------------|-------------------|--------------|
| DFN0603 (T0603) | 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 ( $T_L$ to $T_p$ )                                                                          | < 3 °C/sec                     |
| Preheat<br>- Temperature Min ( $T_{smin}$ )<br>- Temperature Max ( $T_{smax}$ )<br>- Time (Min to Max) ( $t_s$ ) | 150°C<br>200°C<br>60 ~ 120 sec |
| $T_{smax}$ to $T_L$<br>- Ramp-up rate                                                                            | < 3 °C/sec                     |
| Time maintained above :<br>- Temperature ( $T_L$ )<br>- Time ( $T_L$ )                                           | 217°C<br>60 ~ 260 sec          |
| Peak temperature ( $T_p$ )                                                                                       | 255 °C -0/+5°C                 |
| Time with 5°C of actual peak temperature ( $T_p$ )                                                               | 10 ~30 sec                     |
| Ramp-down rate                                                                                                   | < 6 °C/sec                     |
| Time 25°C to peak temperature                                                                                    | < 6 minutes                    |