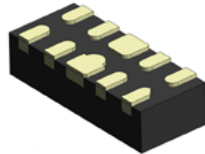


# STN254033UL33 and STN254033UL50

## TVS Diode array ESD suppressor



### Product features

- Solid-state silicon-avalanche technology
- Up to four I/O lines of protection
- Low operating and clamping voltage
- Ultra low capacitance
- Low leakage current
- Moisture sensitivity level (MSL): 3
- Molding compound flammability rating: UL 94V-0
- Termination finish: Ni/Pd/Au

### Applications

- Serial ATA
- PCI express
- Desktops, servers and notebooks
- MDDI ports
- USB 2.0, 3.0 and 3.1
- Display ports
- HDMI 1.3, 1.4 and 2.0
- Digital visual interfaces (DVI)

### Environmental compliance and general specifications

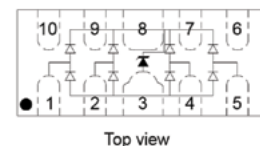
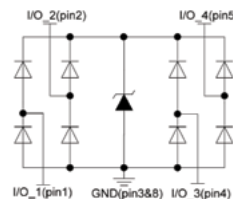
- IEC61000-4-2 (ESD)
  - Up to  $\pm 15$  kV (air)
  - Up to  $\pm 15$  kV (contact)
- IEC61000-4-5 (Lightning) Up to 7 A (8/20  $\mu$ s)



### Ordering part number

|                                | ST | N25 | 4 | 033 | U | L33 |
|--------------------------------|----|-----|---|-----|---|-----|
| Family                         | ST |     |   |     |   |     |
| Package (N25- DFN2510)         |    | N25 |   |     |   |     |
| Number of channels (4- 4)      |    |     | 4 |     |   |     |
| Operating voltage (033- 3.3 V) |    |     |   | 033 |   |     |
| Bi/Uni directional (U- Uni)    |    |     |   |     | U |     |
| Capacitance (L33- 0.33 pF)     |    |     |   |     |   | L33 |

### Pin out/functional diagram



Powering Business Worldwide

## Absolute maximum ratings

(+25 °C, RH=45%-75%, unless otherwise noted)

| Parameter                                             | Symbol           | Value             |                   | Unit |
|-------------------------------------------------------|------------------|-------------------|-------------------|------|
|                                                       |                  | STN254033UL33     | STN254033UL50     |      |
| Peak pulse power dissipation on 8/20 $\mu$ s waveform | P <sub>pp</sub>  | 30                | 70                | W    |
| ESD per IEC 61000-4-2 (Air)                           | V <sub>ESD</sub> | +/-15             | +/-15             | kV   |
| ESD per IEC 61000-4-2 (Contact)                       |                  | +/-8              | +/-15             |      |
| Lead soldering temperature                            | T <sub>L</sub>   | +260 (10 seconds) | +260 (10 seconds) | °C   |
| Operating junction temperature range                  | T <sub>J</sub>   | -55 to +125       | -55 to +125       | °C   |
| Storage temperature range                             | T <sub>STG</sub> | -55 to +150       | -55 to +150       | °C   |

## Electrical characteristics

(+25 °C)

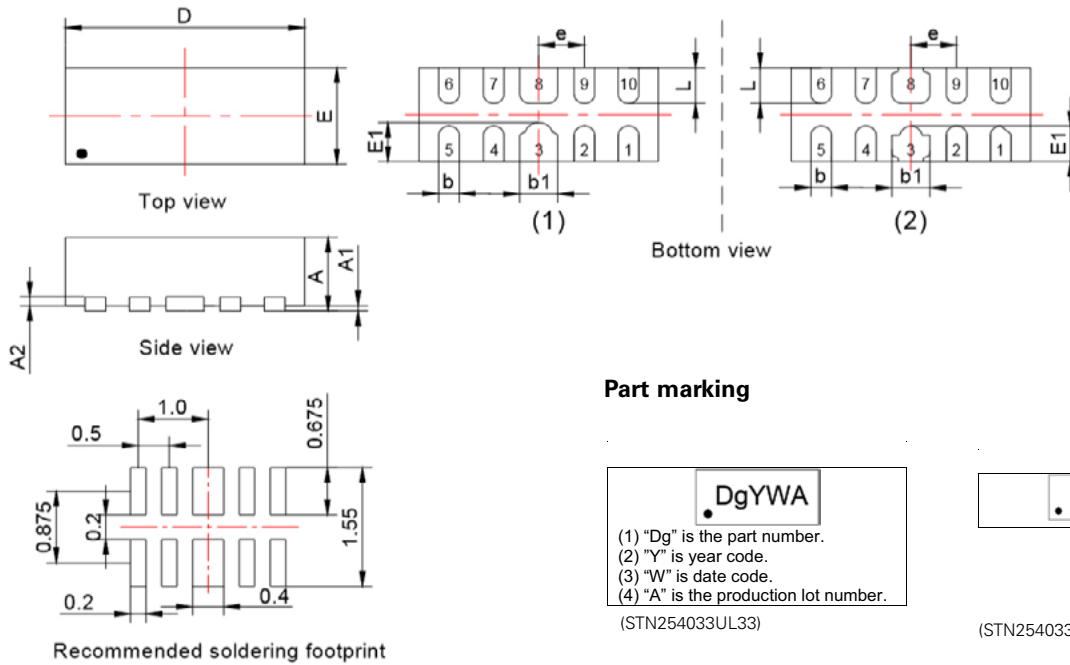
### STN254033UL33

| Parameter                  | Test condition                                          | Minimum | Typical | Maximum | Symbol (Units)            |
|----------------------------|---------------------------------------------------------|---------|---------|---------|---------------------------|
| Reverse working voltage    | I/O to GND                                              | -       | -       | 3.3     | V <sub>RWM</sub> (V)      |
| Reverse leakage current    | I/O to GND<br>V <sub>RWM</sub> = 3.3 V                  | -       | 0.1     | 1.0     | I <sub>R</sub> ( $\mu$ A) |
| Reverse triggering voltage | I/O to GND<br>I <sub>ti</sub> = 1 $\mu$ A               | 3.8     |         | -       | V <sub>ti</sub> (V)       |
| Reverse holding voltage    | I/O to GND<br>I <sub>hi</sub> = 50 mA                   | 3.5     | 5.5     | -       | V <sub>h</sub> (V)        |
| Clamping voltage           | I <sub>pp</sub> = 1 A,<br>t <sub>p</sub> = 8/20 $\mu$ s | -       | 8       | 9       | V <sub>C</sub> (V)        |
|                            | I <sub>pp</sub> = 3 A,<br>t <sub>p</sub> = 8/20 $\mu$ s | -       | 10      | 11      | V <sub>C</sub> (V)        |
|                            |                                                         |         |         |         |                           |
| Junction capacitance       | V <sub>RWM</sub> = 3.3 V, f = 1 MHz<br>I/O pin to GND   | -       | 0.33    | 0.39    | C <sub>J</sub> (pF)       |
|                            | V <sub>RWM</sub> = 3.3 V, f = 1 MHz<br>Between I/O pins | -       | 0.2     | 0.3     | C <sub>J</sub> (pF)       |
|                            |                                                         |         |         |         |                           |

### STN254033UL50

| Parameter                 | Test condition                                            | Minimum | Typical | Maximum | Symbol (Units)            |
|---------------------------|-----------------------------------------------------------|---------|---------|---------|---------------------------|
| Reverse working voltage   | I/O to GND                                                | -       | -       | 3.3     | V <sub>RWM</sub> (V)      |
| Reverse leakage current   | I/O to GND<br>V <sub>RWM</sub> = 3.3 V                    | 0.1     | -       | -       | I <sub>R</sub> ( $\mu$ A) |
| Reverse breakdown voltage | I/O to GND<br>I <sub>t</sub> = 1 mA                       | 4.0     |         | 10      | V <sub>BR</sub> (V)       |
| Clamping voltage          | I <sub>pp</sub> = 1 A,<br>t <sub>p</sub> = 8/20 $\mu$ s   | -       | 5.5     | 6.5     | V <sub>C</sub> (V)        |
|                           | I <sub>pp</sub> = 5.0 A,<br>t <sub>p</sub> = 8/20 $\mu$ s | -       | 7.5     | 8.5     | V <sub>C</sub> (V)        |
|                           | I <sub>pp</sub> = 7.0 A,<br>t <sub>p</sub> = 8/20 $\mu$ s | -       | 9       | 10.5    | V <sub>C</sub> (V)        |
|                           |                                                           |         |         |         |                           |
| Junction capacitance      | V <sub>RWM</sub> = 0 V, f = 1 MHz<br>I/O pin to GND       | -       | 0.5     | 0.6     | C <sub>J</sub> (pF)       |
|                           | V <sub>RWM</sub> = 0 V, f = 1 MHz<br>Between I/O pins     | -       | 0.25    | 0.35    | C <sub>J</sub> (pF)       |
|                           |                                                           |         |         |         |                           |

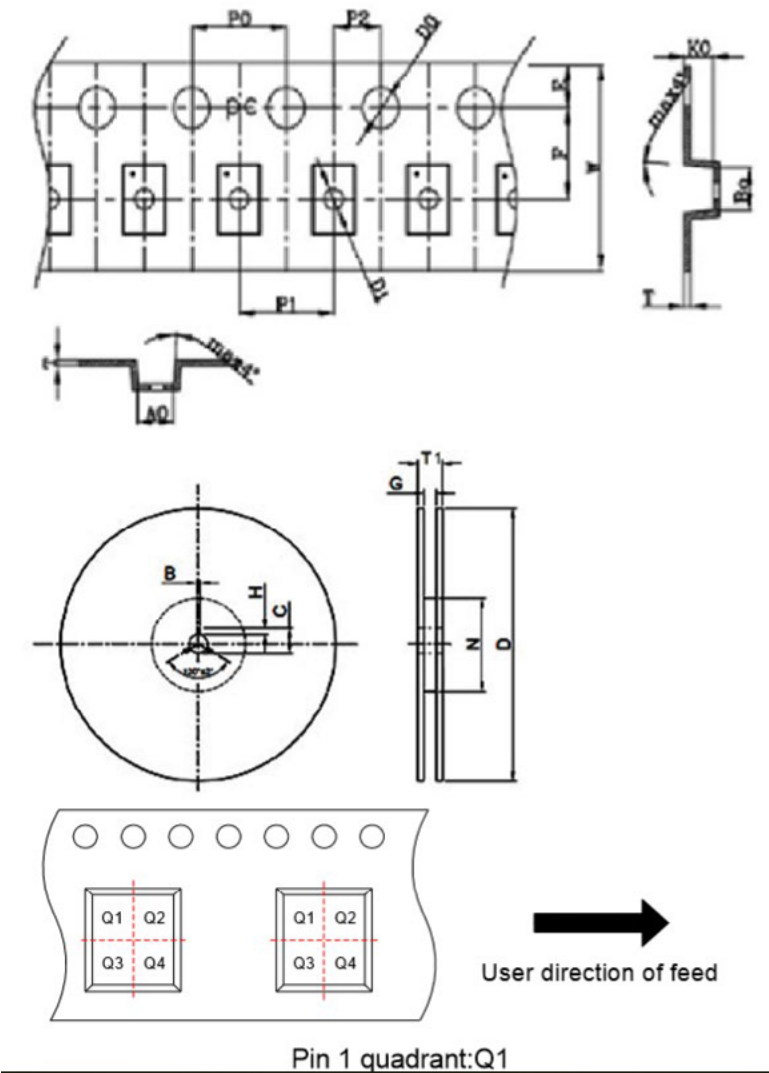
# Mechanical parameters, pad layout- mm



| Dimension | Millimeters |          |         | Inches  |           |         |
|-----------|-------------|----------|---------|---------|-----------|---------|
|           | Minimum     | Typical  | Maximum | Minimum | Typical   | Maximum |
| A         | 0.45        | -        | 0.65    | 0.018   | -         | 0.026   |
| A1        | 0.00        | -        | 0.05    | 0.000   | -         | 0.002   |
| A2        |             | 0.15 REF |         |         | 0.006 REF |         |
| b         | 0.15        | 0.20     | 0.25    | 0.006   | 0.008     | 0.010   |
| b1        | 0.35        | 0.40     | 0.45    | 0.014   | 0.016     | 0.018   |
| D         | 2.45        | 2.50     | 2.55    | 0.096   | 0.098     | 0.100   |
| E         | 0.95        | 1.00     | 1.05    | 0.037   | 0.039     | 0.041   |
| E1        | 0.30        | 0.455    | 0.61    | 0.012   | 0.018     | 0.024   |
| e         |             | 0.50 BSC |         |         | 0.020 BSC |         |
| L         | 0.33        | -        | 0.45    | 0.013   | -         | 0.018   |

Packaging information mm/inches

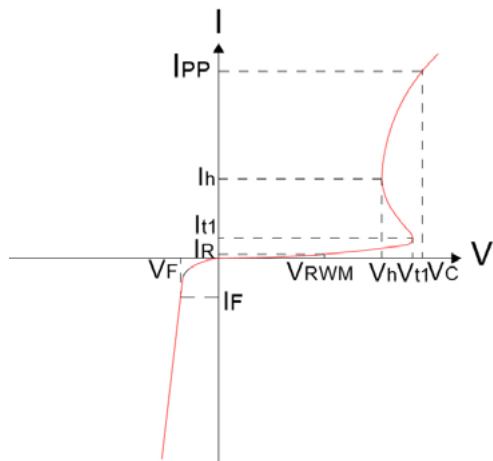
Drawing not to scale.  
Supplied in tape and reel packaging, 3,000 parts per 7" diameter reel (EIA-481 compliant)



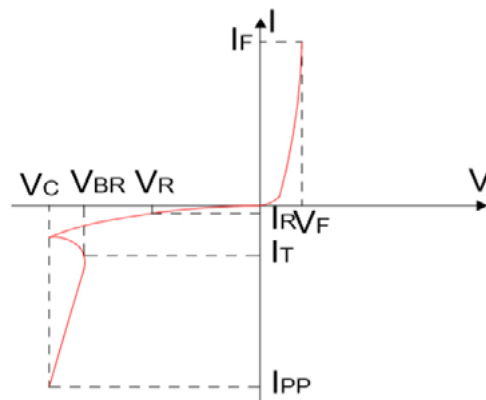
| Symbol | Dimensions  |             |
|--------|-------------|-------------|
|        | Millimeters | Inches      |
| A0     | 1.15±0.05   | 0.045±0.002 |
| B0     | 2.70±0.05   | 0.106±0.002 |
| K0     | 0.59±0.05   | 0.023±0.002 |
| P0     | 4.00±0.10   | 0.157±0.004 |
| P1     | 4.00±0.10   | 0.157±0.004 |
| P2     | 2.00±0.05   | 0.079±0.002 |
| T      | 0.20±0.02   | 0.008±0.001 |
| E      | 1.75±0.10   | 0.069±0.004 |
| F      | 3.50±0.05   | 0.138±0.002 |
| D0     | 1.55±0.05   | 0.061±0.002 |
| D1     | 0.60±0.10   | 0.024±0.004 |
| W      | 8.0±0.10    | 0.315±0.004 |
| B      | 2.0±0.5     | 0.079±0.020 |
| H      | 4.0±0.5     | 0.157±0.020 |
| C      | 13.0±0.5    | 0.512±0.020 |
| G      | 8.4±1.5     | 0.331±0.059 |
| T1     | 14.9(max)   | 0.587(max)  |
| N      | 60          | 2.362       |
| D      | 178±2.0     | 7±0.079     |

**Ratings and V-I characteristic curves** (+25 °C unless otherwise noted)

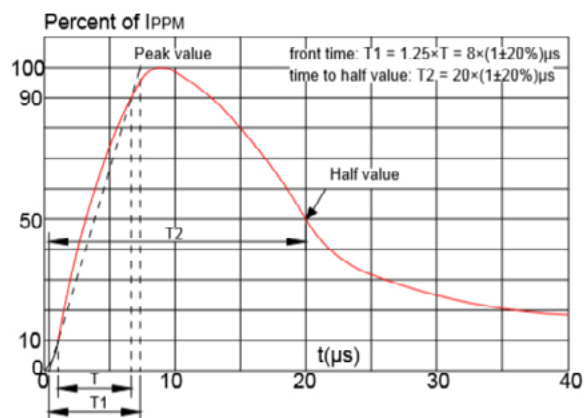
**V- I curve characteristics (Uni-directional)**  
STN254033UL33



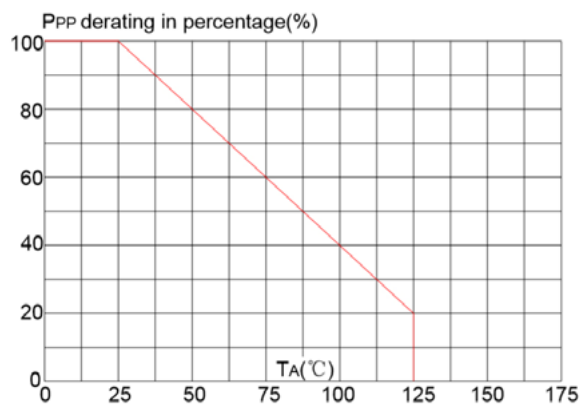
**V- I curve characteristics (Uni-directional)**  
STN254033UL50



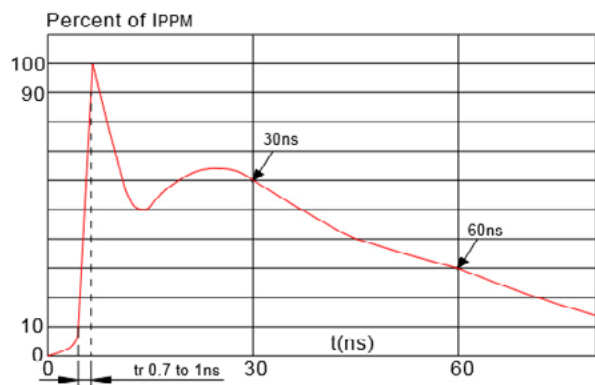
**Pulse waveform (8/20  $\mu$ s)**



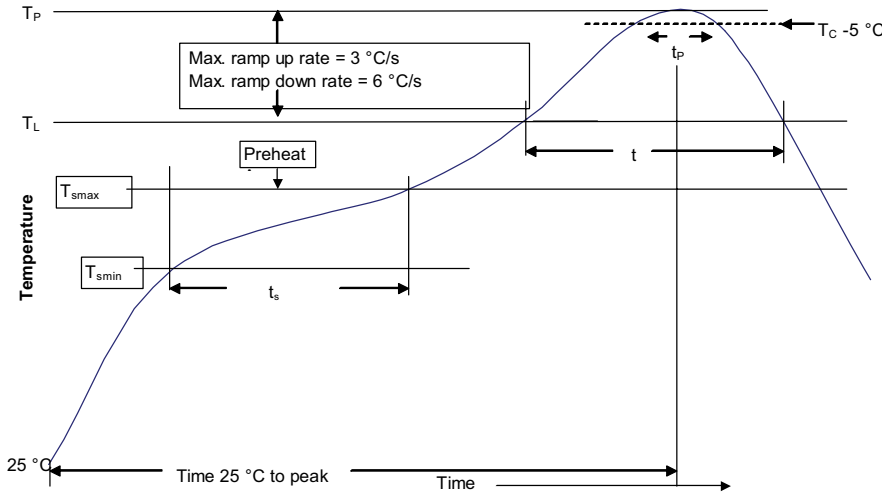
**Pulse derating curve**



**ESD waveform**



## Solder reflow profile



**Table 1 - Standard SnPb solder ( $T_c$ )**

| Package thickness | Volume mm <sup>3</sup> <350 | Volume mm <sup>3</sup> ≥350 |
|-------------------|-----------------------------|-----------------------------|
| <2.5 mm           | 235 °C                      | 220 °C                      |
| ≥2.5 mm           | 220 °C                      | 220 °C                      |

**Table 2 - Lead (Pb) free solder ( $T_c$ )**

| Package thickness | Volume mm <sup>3</sup> <350 | Volume mm <sup>3</sup> 350 - 2000 | Volume mm <sup>3</sup> >2000 |
|-------------------|-----------------------------|-----------------------------------|------------------------------|
| <1.6 mm           | 260 °C                      | 260 °C                            | 260 °C                       |
| 1.6 – 2.5 mm      | 260 °C                      | 250 °C                            | 245 °C                       |
| >2.5 mm           | 250 °C                      | 245 °C                            | 245 °C                       |

## Reference J-STD-020

| Profile feature                                                                   | Standard SnPb solder | Lead (Pb) free solder |
|-----------------------------------------------------------------------------------|----------------------|-----------------------|
| Preheat and soak                                                                  |                      |                       |
| • Temperature min. ( $T_{smin}$ )                                                 | 100 °C               | 150 °C                |
| • Temperature max. ( $T_{smax}$ )                                                 | 150 °C               | 200 °C                |
| • Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )                                     | 60-120 seconds       | 60-120 seconds        |
| Ramp up rate $T_L$ to $T_p$                                                       | 3 °C/ second max.    | 3 °C/ second max.     |
| Liquidous temperature ( $T_L$ )                                                   | 183 °C               | 217 °C                |
| Time ( $t_L$ ) maintained above $T_L$                                             | 60-150 seconds       | 60-150 seconds        |
| Peak package body temperature ( $T_p$ )*                                          | Table 1              | Table 2               |
| Time ( $t_p$ )* within 5 °C of the specified classification temperature ( $T_c$ ) | 20 seconds*          | 30 seconds*           |
| Ramp-down rate ( $T_p$ to $T_L$ )                                                 | 6 °C/ second max.    | 6 °C/ second max.     |
| Time 25 °C to peak temperature                                                    | 6 minutes max.       | 8 minutes max.        |

\* Tolerance for peak profile temperature ( $T_p$ ) is defined as a supplier minimum and a user maximum.

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