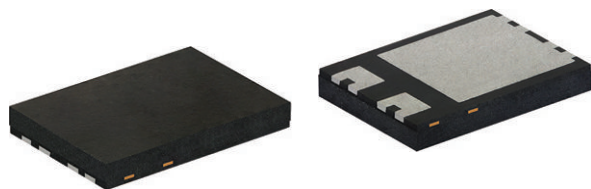


# Surface-Mount PAR<sup>®</sup> Transient Voltage Suppressors

High Temperature Stability and High Reliability Conditions



DFN6546A



## LINKS TO ADDITIONAL RESOURCES



| PRIMARY CHARACTERISTICS       |                  |
|-------------------------------|------------------|
| $V_{BR}$                      | 12 V to 100 V    |
| $V_{WM}$                      | 10.2 V to 85.5 V |
| $P_{PPM}$ (10 x 1000 $\mu$ s) | 3000 W           |
| $T_J$ max.                    | 185 °C           |
| Polarity                      | Bidirectional    |
| Package                       | DFN6546A         |
| Circuit configuration         | Single           |

## FEATURES

- Low-profile package - typical height of 0.88 mm
- Leadless DFN package with side-wettable flanks suitable for customer AOI (Automatic Optical Inspection)
- Ideal for automated placement
- Junction passivation optimized design passivated anisotropic rectifier technology
- $T_J = 185$  °C capability suitable for high reliability and automotive requirement
- Bidirectional
- Excellent clamping capability
- Peak pulse power: 3000 W (10/1000  $\mu$ s)
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified
  - Automotive ordering code: base P/NHM3
- Compatible to SMPC (TO-277A) package case outline
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

## TYPICAL APPLICATIONS

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lightning on ICs, MOSFET, signal lines of sensor units for automotive.

## MECHANICAL DATA

**Case:** DFN6546A

Molding compound meets UL 94 V-0 flammability rating  
Base P/NHM3 - halogen-free, RoHS-compliant, and AEC-Q101 qualified

**Terminals:** matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

HM3 suffix meets JESD 201 class 2 whisker test

**Polarity:** no cathode band for bidirectional types

| MAXIMUM RATINGS ( $T_A = 25$ °C, unless otherwise noted)                             |                |                     |      |
|--------------------------------------------------------------------------------------|----------------|---------------------|------|
| PARAMETER                                                                            | SYMBOL         | VALUE               | UNIT |
| Peak pulse power dissipation with a 10/1000 $\mu$ s waveform (fig. 1) <sup>(1)</sup> | $P_{PPM}$      | 3000                | W    |
| Peak pulse current with a 10/1000 $\mu$ s waveform (fig. 3) <sup>(1)</sup>           | $I_{PPM}$      | See table next page | A    |
| Operating junction and storage temperature range                                     | $T_J, T_{STG}$ | -65 to +185         | °C   |

### Note

<sup>(1)</sup> Non-repetitive current pulse, per fig. 3 and derated above  $T_A = 25$  °C per fig. 2

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)

| DEVICE TYPE | DEVICE MARKING CODE | BREAKDOWN VOLTAGE $V_{BR}^{(1)}$ AT $I_T$ (V) |      |      | TEST CURRENT $I_T$ (mA) | STAND-OFF VOLTAGE $V_{WM}$ (V) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $I_R$ ( $\mu\text{A}$ ) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $T_J = 150\text{ }^{\circ}\text{C}$ $I_R$ ( $\mu\text{A}$ ) | MAXIMUM PEAK PULSE SURGE CURRENT $I_{PPM}^{(2)}$ (A) | MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (V) | TYPICAL TEMP. COEFFICIENT OF $V_{BR}^{(3)}$ $\alpha T$ ( $\%/^{\circ}\text{C}$ ) |
|-------------|---------------------|-----------------------------------------------|------|------|-------------------------|--------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------|
|             |                     | MIN.                                          | NOM. | MAX. |                         |                                |                                                             |                                                                                                 |                                                      |                                                 |                                                                                  |
| T3KN12CA    | T3NA                | 11.4                                          | 12.0 | 12.6 | 1.0                     | 10.2                           | 5.0                                                         | 50                                                                                              | 180                                                  | 16.7                                            | 0.070                                                                            |
| T3KN13CA    | T3NB                | 12.4                                          | 13.0 | 13.7 | 1.0                     | 11.1                           | 5.0                                                         | 50                                                                                              | 165                                                  | 18.2                                            | 0.072                                                                            |
| T3KN15CA    | T3NC                | 14.3                                          | 15.0 | 15.8 | 1.0                     | 12.8                           | 2.0                                                         | 20                                                                                              | 142                                                  | 21.2                                            | 0.076                                                                            |
| T3KN16CA    | T3ND                | 15.2                                          | 16.0 | 16.8 | 1.0                     | 13.6                           | 2.0                                                         | 20                                                                                              | 133                                                  | 22.5                                            | 0.078                                                                            |
| T3KN18CA    | T3NE                | 17.1                                          | 18.0 | 18.9 | 1.0                     | 15.3                           | 1.0                                                         | 10                                                                                              | 118                                                  | 25.5                                            | 0.080                                                                            |
| T3KN20CA    | T3NF                | 19.0                                          | 20.0 | 21.0 | 1.0                     | 17.1                           | 1.0                                                         | 10                                                                                              | 108                                                  | 27.7                                            | 0.082                                                                            |
| T3KN22CA    | T3NG                | 20.9                                          | 22.0 | 23.1 | 1.0                     | 18.8                           | 1.0                                                         | 10                                                                                              | 98.0                                                 | 30.6                                            | 0.084                                                                            |
| T3KN24CA    | T3NH                | 22.8                                          | 24.0 | 25.2 | 1.0                     | 20.5                           | 1.0                                                         | 10                                                                                              | 90.4                                                 | 33.2                                            | 0.085                                                                            |
| T3KN27CA    | T3NJ                | 25.7                                          | 27.0 | 28.4 | 1.0                     | 23.1                           | 1.0                                                         | 10                                                                                              | 80.0                                                 | 37.5                                            | 0.087                                                                            |
| T3KN30CA    | T3NK                | 28.5                                          | 30.0 | 31.5 | 1.0                     | 25.6                           | 1.0                                                         | 10                                                                                              | 72.5                                                 | 41.4                                            | 0.088                                                                            |
| T3KN33CA    | T3NL                | 31.4                                          | 33.0 | 34.7 | 1.0                     | 28.2                           | 1.0                                                         | 10                                                                                              | 65.6                                                 | 45.7                                            | 0.089                                                                            |
| T3KN36CA    | T3NM                | 34.2                                          | 36.0 | 37.8 | 1.0                     | 30.8                           | 1.0                                                         | 10                                                                                              | 60.1                                                 | 49.9                                            | 0.090                                                                            |
| T3KN39CA    | T3NN                | 37.1                                          | 39.0 | 41.0 | 1.0                     | 33.3                           | 1.0                                                         | 10                                                                                              | 55.7                                                 | 53.9                                            | 0.091                                                                            |
| T3KN43CA    | T3NP                | 40.9                                          | 43.0 | 45.2 | 1.0                     | 36.8                           | 1.0                                                         | 10                                                                                              | 50.6                                                 | 59.3                                            | 0.092                                                                            |
| T3KN47CA    | T3NQ                | 44.7                                          | 47.0 | 49.4 | 1.0                     | 40.2                           | 1.0                                                         | 10                                                                                              | 46.3                                                 | 64.8                                            | 0.092                                                                            |
| T3KN51CA    | T3NR                | 48.5                                          | 51.0 | 53.6 | 1.0                     | 43.6                           | 1.0                                                         | 10                                                                                              | 42.8                                                 | 70.1                                            | 0.093                                                                            |
| T3KN56CA    | T3NS                | 53.2                                          | 56.0 | 58.8 | 1.0                     | 47.8                           | 1.0                                                         | 10                                                                                              | 39.0                                                 | 77.0                                            | 0.093                                                                            |
| T3KN62CA    | T3NT                | 58.9                                          | 62.0 | 65.1 | 1.0                     | 53.0                           | 1.0                                                         | 10                                                                                              | 35.3                                                 | 85.0                                            | 0.094                                                                            |
| T3KN68CA    | T3NU                | 64.6                                          | 68.0 | 71.4 | 1.0                     | 58.1                           | 1.0                                                         | 10                                                                                              | 32.6                                                 | 92.0                                            | 0.095                                                                            |
| T3KN75CA    | T3NV                | 71.3                                          | 75.0 | 78.8 | 1.0                     | 64.1                           | 1.0                                                         | 10                                                                                              | 28.8                                                 | 104                                             | 0.095                                                                            |
| T3KN82CA    | T3NW                | 77.9                                          | 82.0 | 86.1 | 1.0                     | 70.1                           | 1.0                                                         | 10                                                                                              | 26.5                                                 | 113                                             | 0.095                                                                            |
| T3KN91CA    | T3NX                | 86.5                                          | 91.0 | 95.5 | 1.0                     | 77.8                           | 1.0                                                         | 10                                                                                              | 24.0                                                 | 125                                             | 0.096                                                                            |
| T3KN100CA   | T3NY                | 95.0                                          | 100  | 105  | 1.0                     | 85.5                           | 1.0                                                         | 10                                                                                              | 21.9                                                 | 137                                             | 0.096                                                                            |

**Notes**

- (1) Pulse test:  $t_p \leq 50\text{ ms}$   
(2) Surge current waveform per fig. 3 and derated per fig. 2  
(3) To calculate  $V_{BR}$  vs. junction temperature, use the following formula:  $V_{BR}$  at  $T_J = V_{BR}$  at  $25\text{ }^{\circ}\text{C} \times (1 + \alpha T \times (T_J - 25))$   
(4) All terms and symbols are consistent with ANSI/IEEE C62.35

**THERMAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$  unless otherwise noted)

| PARAMETER          | SYMBOL                | TYP. | MAX. | UNIT                 |
|--------------------|-----------------------|------|------|----------------------|
| Thermal resistance | $R_{\theta JA}^{(1)}$ | 105  | 132  | $^{\circ}\text{C/W}$ |
|                    | $R_{\theta JM}^{(2)}$ | 0.95 | 1.19 | $^{\circ}\text{C/W}$ |

**Notes**

- (1) Thermal resistance junction-to-ambient to follow JEDEC® 51-2A, device mounted on FR4 PCB, 2 oz. standard footprint  
(2) Thermal resistance junction-to-mount to follow JEDEC® 51-14 using transient dual interface test method (TDIM)

**IMMUNITY TO STATIC ELECTRICAL DISCHARGE TO THE FOLLOWING STANDARDS**( $T_A = 25\text{ }^{\circ}\text{C}$  unless otherwise noted)

| STANDARD      | TEST TYPE         | TEST CONDITIONS                               | SYMBOL | VALUE |
|---------------|-------------------|-----------------------------------------------|--------|-------|
| IEC 61000-4-2 | Contact discharge | $C = 150\text{ pF}$ , $R = 330\text{ }\Omega$ | ESD    | 30 kV |
|               | Air discharge     |                                               |        | 30 kV |



## ORDERING INFORMATION TABLE

|             |                                                                                                       |    |   |     |    |   |    |
|-------------|-------------------------------------------------------------------------------------------------------|----|---|-----|----|---|----|
| Device code | T                                                                                                     | 3K | N | xxx | CA | H | M3 |
|             | 1                                                                                                     | 2  | 3 | 4   | 5  | 6 | 7  |
| 1           | - Vishay PAR <sup>®</sup> TVS product                                                                 |    |   |     |    |   |    |
| 2           | - Peak pulse power rating (3K = 3000 W)                                                               |    |   |     |    |   |    |
| 3           | - Package type (N = DFN package)                                                                      |    |   |     |    |   |    |
| 4           | - Nominal breakdown voltage                                                                           |    |   |     |    |   |    |
| 5           | - Breakdown voltage tolerance and polarity (CA $\pm$ 5 %, bidirectional)                              |    |   |     |    |   |    |
| 6           | - Quality grade (H = AEC-Q101 qualified, otherwise = industry grade)                                  |    |   |     |    |   |    |
| 7           | - Material / Environment category (M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free) |    |   |     |    |   |    |

| ORDERING INFORMATION (Example) |                 |                        |               |                                    |
|--------------------------------|-----------------|------------------------|---------------|------------------------------------|
| PREFERRED P/N                  | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                      |
| T3KN12CAHM3/H <sup>(1)</sup>   | 0.094           | H                      | 1500          | 7" diameter plastic tape and reel  |
| T3KN12CAHM3/I <sup>(1)</sup>   | 0.094           | I                      | 6000          | 13" diameter plastic tape and reel |

### Note

<sup>(1)</sup> AEC-Q101 qualified



## RATINGS AND CHARACTERISTICS CURVES ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

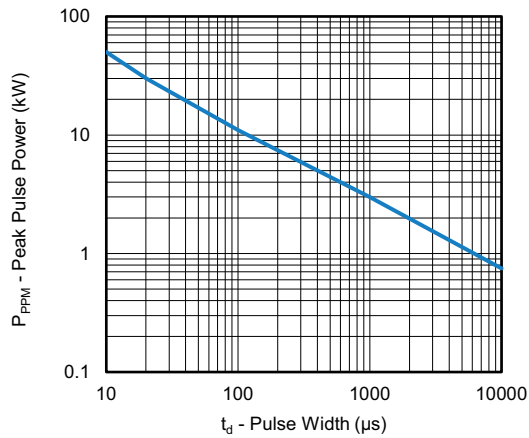


Fig. 1 - Peak Pulse Power Rating Curve

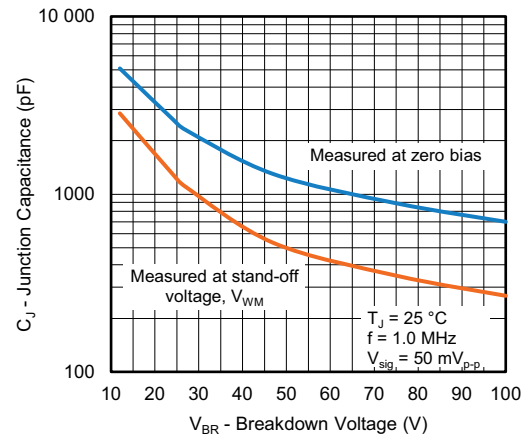


Fig. 4 - Typical Junction Capacitance

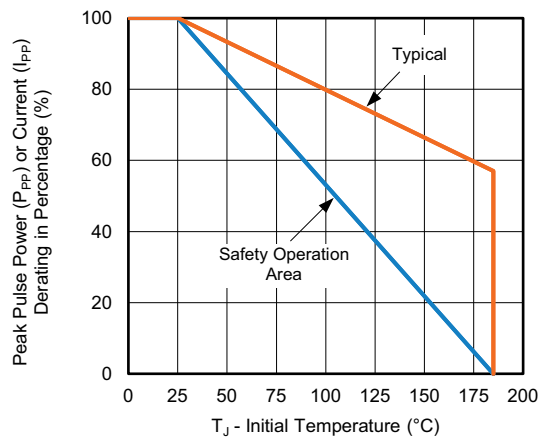


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

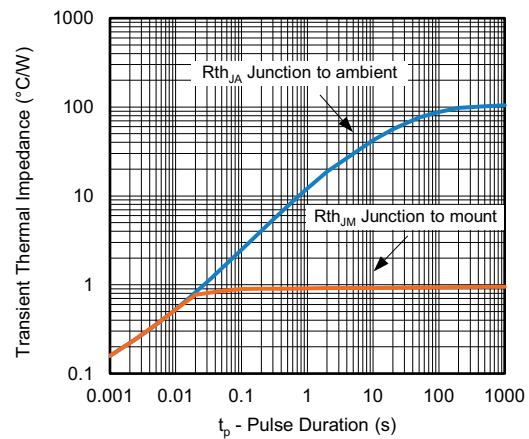


Fig. 5 - Typical Transient Thermal Impedance

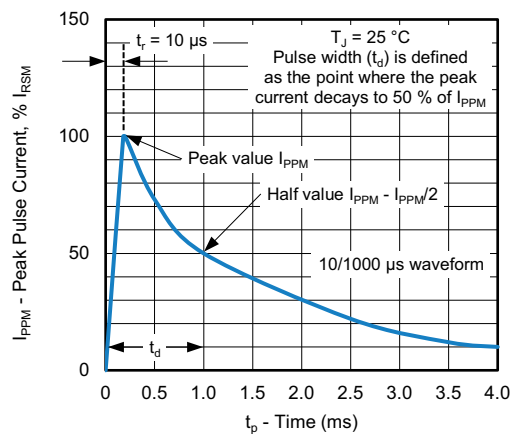


Fig. 3 - Pulse Waveform

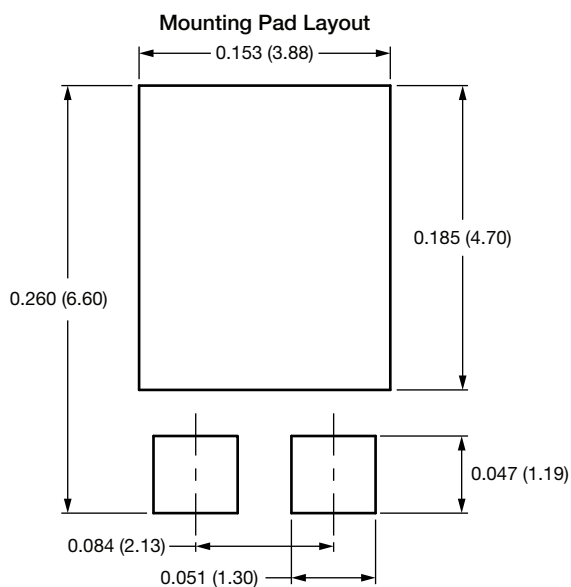
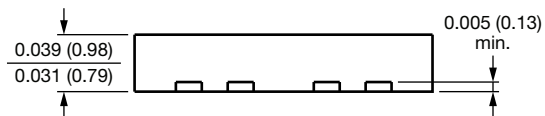
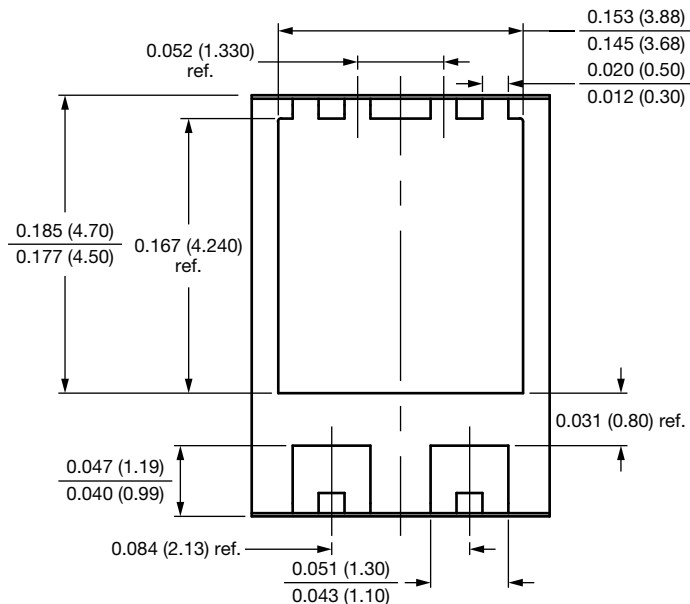
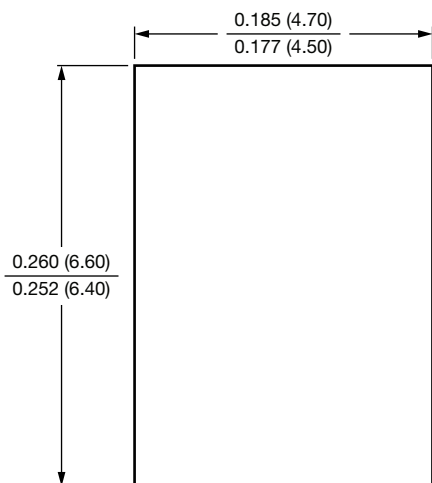
### Note

- Fig. 1, power calculations is based on  $I_{PPM}$  times defined maximum clamping voltage by pulse width



## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

### DFN6546A





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