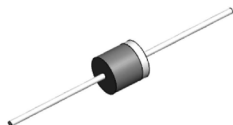


# 12KP

## Automotive grade 12000 W Transient voltage suppressor



### Product features

- Automotive grade (AEC-Q101 qualified)
  - Excellent clamping capability
  - High reliability application
  - 12000 W peak pulse power capability at 10/1000  $\mu$ s waveform
  - Typical  $I_R$  less than 5  $\mu$ A above 22 V
  - Fast response time: typically less than 1.0 ps from 0 V to  $V_{BR}$  minimum
  - Plastic package meets UL 94 V-0 flammability rating
  - Terminal: tin plated, solderable per J-STD-002
  - UL 497B recognized.
- File No. : E198449 Guide QVGQ2

### Applications

- Automotive chassis and safety systems
- Advanced driver assistance systems (ADAS)
- Communication and infotainment systems
- Network systems and body electronics
- Power Train controls
- xEV and battery systems

### Environmental compliance and general specifications

- ISO16750-2 P5A: 12 V system (87 V/0.5  $\Omega$ /400 ms)
- ISO16750-2 P5A: 24 V system (174 V/2  $\Omega$ /350 ms)
- AEC-Q101 qualified



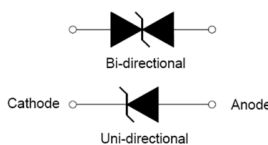
### Ordering part number

|                                       | 12KP | 20 | C | A | H |
|---------------------------------------|------|----|---|---|---|
| Family name                           |      |    |   |   |   |
| $V_R$ voltage                         |      |    |   |   |   |
| Bi-/Uni-Directional (Blank=Uni, C=Bi) |      |    |   |   |   |
| Voltage tolerance                     |      |    |   |   |   |
| High reliability application          |      |    |   |   |   |

### Alternate ordering part number

|                                       | 12KPE | 20 | C | A | H |
|---------------------------------------|-------|----|---|---|---|
| Family name                           |       |    |   |   |   |
| $V_R$ voltage                         |       |    |   |   |   |
| Bi-/Uni-Directional (Blank=Uni, C=Bi) |       |    |   |   |   |
| Voltage tolerance                     |       |    |   |   |   |
| High reliability application          |       |    |   |   |   |

### PIN configuration



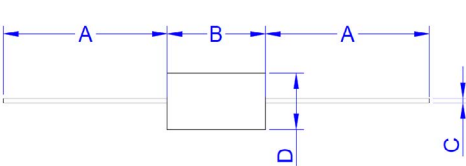
Absolute maximum ratings

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

| Parameter                                                             | Symbol          | Value       | Unit |
|-----------------------------------------------------------------------|-----------------|-------------|------|
| Storage operating junction temperature range                          | $T_{STG} / T_J$ | -55 to +175 | °C   |
| Steady state power dissipation at $T_L = +75\text{ °C}$               | $P_{M(AV)}$     | 8           | W    |
| Peak pulse power dissipation on 10/1000 $\mu$ s waveform              | $P_{PP}$        | 12000       | W    |
| Maximum instantaneous forward voltage at 100 A for unidirectional     | $V_F$           | 5           | V    |
| Peak forward surge current, 8.3 ms single half sine wave <sup>1</sup> | $I_{FSM}$       | 600         | A    |
| Typical thermal resistance junction to lead                           | $R_{\theta JL}$ | 8.0         | °C/W |
| Typical thermal resistance junction to ambient                        | $R_{\theta JA}$ | 40          | °C/W |

1. Measured on 8.3 ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle = 4 per minute maximum

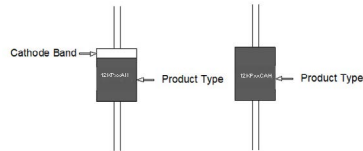
Mechanical parameters, pad layout- mm/inches



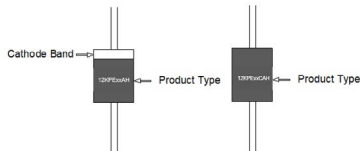
| Dimension | Millimeters |         | Inches  |         |
|-----------|-------------|---------|---------|---------|
|           | Minimum     | Maximum | Minimum | Maximum |
| A         | 25.40       | -       | 1.000   | -       |
| B         | 8.60        | 9.40    | 0.339   | 0.370   |
| C         | 1.20        | 1.40    | 0.047   | 0.055   |
| D         | 8.60        | 9.10    | 0.339   | 0.358   |

Part marking

Standard part number marking



Alternate part number marking



Packaging information

300 parts per box

**Electrical specifications** (+25 °C)

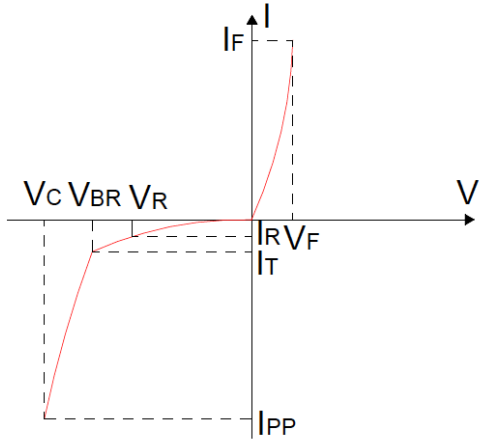
| Part number |           | Marking  |           | $V_R$ | $I_R @ V_R$ | $V_{BR} @ I_T$ |         | $I_T$ | $V_C @ I_{PP}$ | $I_{PP}$ | UL497B<br>Recognized |
|-------------|-----------|----------|-----------|-------|-------------|----------------|---------|-------|----------------|----------|----------------------|
| Uni-polar   | Bi-polar  | Uni      | Bi        | (V)   | ( $\mu A$ ) | min (V)        | max (V) | (mA)  | max (V)        | (A)      |                      |
| 12KP20AH    | 12KP20CAH | 12KP20AH | 12KP20CAH | 20    | 15          | 22.2           | 24.5    | 5     | 34.3           | 349.9    | x                    |
| 12KP22AH    | 12KP22CAH | 12KP22AH | 12KP22CAH | 22    | 10          | 24.4           | 26.9    | 5     | 37.1           | 323.5    | x                    |
| 12KP24AH    | 12KP24CAH | 12KP24AH | 12KP24CAH | 24    | 5           | 26.7           | 29.5    | 5     | 40.7           | 294.9    | x                    |
| 12KP26AH    | 12KP26CAH | 12KP26AH | 12KP26CAH | 26    | 5           | 28.9           | 31.9    | 5     | 44             | 272.8    | x                    |
| 12KP28AH    | 12KP28CAH | 12KP28AH | 12KP28CAH | 28    | 5           | 31.1           | 34.4    | 5     | 47.5           | 252.7    | x                    |
| 12KP30AH    | 12KP30CAH | 12KP30AH | 12KP30CAH | 30    | 5           | 33.3           | 36.8    | 5     | 50.7           | 236.7    | x                    |
| 12KP33AH    | 12KP33CAH | 12KP33AH | 12KP33CAH | 33    | 5           | 36.7           | 40.6    | 5     | 54.7           | 219.4    | x                    |
| 12KP36AH    | 12KP36CAH | 12KP36AH | 12KP36CAH | 36    | 5           | 40             | 44.2    | 5     | 59.8           | 200.7    | x                    |
| 12KP40AH    | 12KP40CAH | 12KP40AH | 12KP40CAH | 40    | 5           | 44.4           | 49.1    | 5     | 65.8           | 182.4    | x                    |
| 12KP43AH    | 12KP43CAH | 12KP43AH | 12KP43CAH | 43    | 5           | 47.8           | 52.8    | 5     | 69.8           | 171.9    | x                    |
| 12KP48AH    | 12KP48CAH | 12KP48AH | 12KP48CAH | 48    | 5           | 53.6           | 58.7    | 5     | 77.7           | 154.5    |                      |
| 12KP58AH    | 12KP58CAH | 12KP58AH | 12KP58CAH | 58    | 5           | 64.4           | 71.2    | 5     | 93.6           | 128.2    |                      |
| 12KP64AH    | 12KP64CAH | 12KP64AH | 12KP64CAH | 64    | 5           | 71.1           | 78.6    | 5     | 103            | 116.5    |                      |
| 12KP72AH    | 12KP72CAH | 12KP72AH | 12KP72CAH | 72    | 5           | 80             | 88.5    | 5     | 116            | 103.4    |                      |

Note: Standard part numbers listed

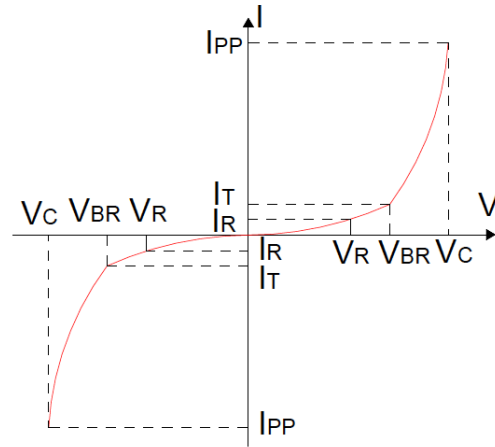
Alternate part numbers have the addition of an E and a "-" for the "." where applicable. Example standard part number 12KP20AH, Alternate part number 12KPE20AH

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

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



**V- I curve characteristics (Bi-directional)**



Surge waveform: 10/1000  $\mu$ s

$V_R$ : Stand-off voltage – Maximum voltage that can be applied

$V_{BR}$ : Breakdown voltage

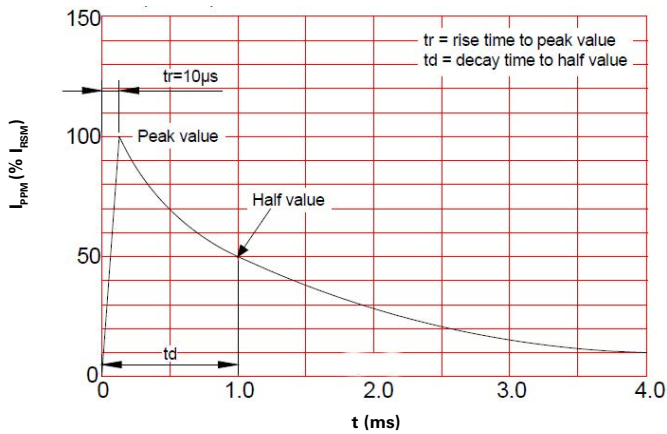
$V_C$ : Clamping voltage – Peak voltage measured across the suppressor at a specified  $I_{PP}$

$I_R$ : Reverse leakage current

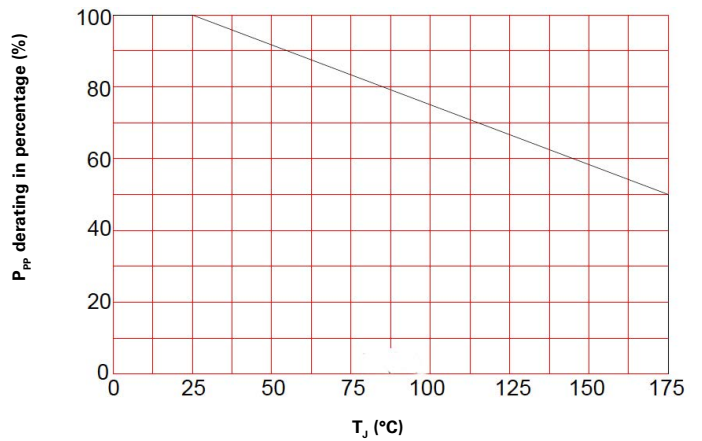
$I_T$ : Test current

$V_F$ : Forward voltage drop for Uni-directional

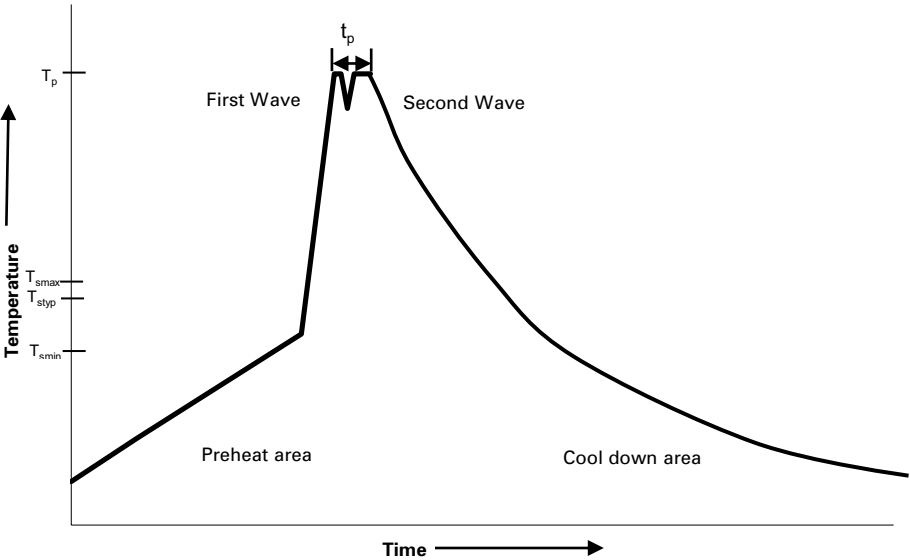
**Pulse waveform**



**Pulse derating curve**



Wave solder profile



Reference EN 61760-1:2006

| Profile feature                               | Standard SnPb solder                      | Lead (Pb) free solder                     |
|-----------------------------------------------|-------------------------------------------|-------------------------------------------|
| Preheat                                       |                                           |                                           |
| • Temperature min. ( $T_{smin}$ )             | 100 °C                                    | 100 °C                                    |
| • Temperature typ. ( $T_{styp}$ )             | 120 °C                                    | 120 °C                                    |
| • Temperature max. ( $T_{smax}$ )             | 130 °C                                    | 130 °C                                    |
| • Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ ) | 70 seconds                                | 70 seconds                                |
| $\Delta$ preheat to max Temperature           | 150 °C max.                               | 150 °C max.                               |
| Peak temperature ( $T_p$ )*                   | 235 °C – 260 °C                           | 250 °C – 260 °C                           |
| Time at peak temperature ( $t_p$ )            | 10 seconds max<br>5 seconds max each wave | 10 seconds max<br>5 seconds max each wave |
| Ramp-down rate                                | ~ 2 K/s min<br>~3.5 K/s typ<br>~5 K/s max | ~ 2 K/s min<br>~3.5 K/s typ<br>~5 K/s max |
| Time 25 °C to 25 °C                           | 4 minutes                                 | 4 minutes                                 |

Manual solder

+350 °C (4-5 seconds by soldering iron), generally manual/hand soldering is not recommended

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