# SMAJ-H Series

## Description

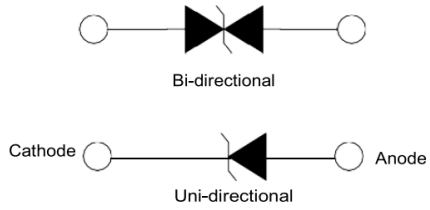
The SMAJ-H series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events. They have excellent clamping capability, high surge capability, low zener impedance and fast response time. The SMAJ-H series is supplied in YINT Semiconductor's exclusive, cost-effective, highly reliable and is ideally suited for use in communication systems, automotive, numerical controls, process controls, medical equipment, business machines, power supplies and many other industrial/consumer Applications.

Uni-directional Bi-directional

## Features

- Case: DO-214AC(SMA)
- AEC-Q101 qualified
- Excellent clamping capability
- 400 W peak pulse power capability with a 10/1000 μs waveform
- Typical failure mode is a short circuit condition for current events exceeding component rating
- Fast response time: typically less than 1.0ps from 0 Volts to VB min.
- IEC61000-4-2 (ESD) ±30kV (air), ±30kV (contact).

## Functional Diagram




## Applications

TVS devices are ideal for the transient voltage clamp protection of I/O Interfaces, DC power line bus and other circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

## Maximum Ratings ($T_A$=25℃ unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Peak Pulse Power Dissipation at TA=25ºC by 10/1000μs Waveform | $P_{PK}$ | 400 | W |
| Power Dissipation on Infinite Heat Sink at $T_L$=50°C | $P_D$ | 3.3 | W |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave[1] | $I_{FSM}$ | 60 | A |
| Maximum Instantaneous Forward Voltage at 50A for Unidirectional Only[2] | $V_F$ | 3.5 | V |
| Operating Temperature Range | $T_J$ | -55 to +150 | °C |
| Storage Temperature Range | $T_{STG}$ | -55 to +150 | °C |

NOTES:

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

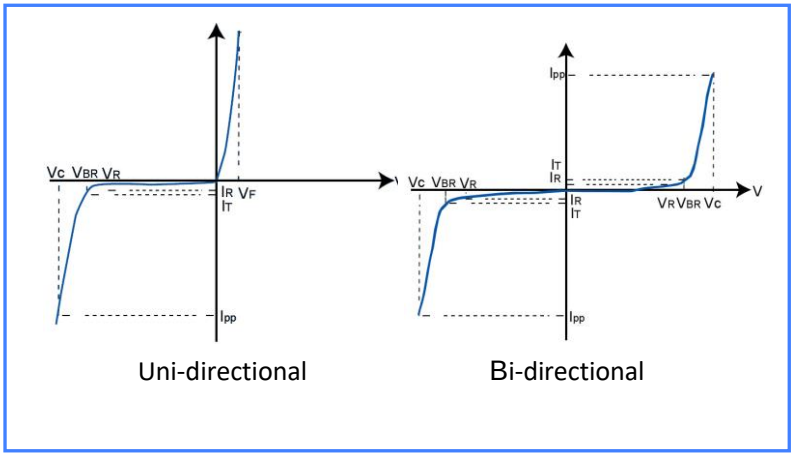
2. $V_F$ < 3.5V for single die parts and $V_F$< 5.0V for stacked-die parts.

## Electrical characteristics (TA = 25 °C unless otherwise noted)

| Part Number (Bi) | Part Number (Uni) | MARKING | | Reverse Stand off Voltage $V_R$ (Volts) | Breakdown Voltage $V_{BR}$ (Volts)@$I_T$ | | Test Current $I_T$(mA) | Maximum Reverse Leakage $I_R$ @ $V_R$(μA) | Maximum Peak Pulse Current Ipp(A) | Maximum Clamping Voltage $V_C$ @$I_{pp}$(V) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | BI | UNI | | Min .V | Max .V | | | | |
| SMAJ5.0CA-H | SMAJ5.0A-H | WEH | AEH | 5.0 | 6.40 | 7.00 | 10 | 500 | 43.5 | 9.2 |
| SMAJ6.0CA-H | SMAJ6.0A-H | WGH | AGH | 6.0 | 6.67 | 7.37 | 10 | 500 | 38.8 | 10.3 |
| SMAJ 6.5CA-H | SMAJ 6.5A-H | WKH | AKH | 6.5 | 7.22 | 7.90 | 10 | 300 | 35.7 | 11.2 |
| SMAJ7.0CA-H | SMAJ7.0 A-H | WMH | AMH | 7.0 | 7.78 | 8.60 | 10 | 200 | 33.3 | 12.0 |
| SMAJ 7.5CA-H | SMAJ 7.5A-H | WPH | APH | 7.5 | 8.33 | 9.21 | 1 | 100 | 31.0 | 12.9 |
| SMAJ 8.0CA-H | SMAJ 8.0A-H | WRH | ARH | 8.0 | 8.89 | 9.83 | 1 | 50 | 29.4 | 13.6 |
| SMAJ8.5CA-H | SMAJ8.5 A-H | WTH | ATH | 8.5 | 9.44 | 10.40 | 1 | 20 | 27.8 | 14.4 |
| SMAJ9.0CA-H | SMAJ9.0 A-H | WVH | AVH | 9.0 | 10.00 | 11.10 | 1 | 10 | 26.0 | 15.4 |
| SMAJ10CA-H | SMAJ10 A-H | WXH | AXH | 10.0 | 11.10 | 12.30 | 1 | 5 | 23.5 | 17.0 |
| SMAJ11CA-H | SMAJ11 A-H | WZH | AZH | 11.0 | 12.20 | 13.50 | 1 | 1 | 22.0 | 18.2 |
| SMAJ12CA-H | SMAJ12 A-H | XEH | BEH | 12.0 | 13.30 | 14.70 | 1 | 1 | 20.1 | 19.9 |
| SMAJ13CA-H | SMAJ13A-H | XGH | BGH | 13.0 | 14.40 | 15.90 | 1 | 1 | 18.6 | 21.5 |
| SMAJ14CA-H | SMAJ14A-H | XKH | BKH | 14.0 | 15.60 | 17.20 | 1 | 1 | 17.2 | 23.2 |
| SMAJ15CA-H | SMAJ15A-H | XMH | BMH | 15.0 | 16.70 | 18.50 | 1 | 1 | 16.4 | 24.4 |
| SMAJ16CA-H | SMAJ16A-H | XPH | BPH | 16.0 | 17.80 | 19.70 | 1 | 1 | 15.4 | 26.0 |
| SMAJ17CA-H | SMAJ17A-H | XRH | BRH | 17.0 | 18.90 | 20.90 | 1 | 1 | 14.5 | 27.6 |
| SMAJ18CA-H | SMAJ18A-H | XTH | BTH | 18.0 | 20.00 | 22.10 | 1 | 1 | 13.7 | 29.2 |
| SMAJ20CA-H | SMAJ20A-H | XVH | BVH | 20.0 | 22.20 | 24.50 | 1 | 1 | 12.3 | 32.4 |
| SMAJ22CA-H | SMAJ22A-H | XXH | BXH | 22.0 | 24.40 | 26.90 | 1 | 1 | 11.3 | 35.5 |
| SMAJ24CA-H | SMAJ24A-H | XZH | BZH | 24.0 | 26.70 | 29.50 | 1 | 1 | 10.3 | 38.9 |
| SMAJ26CA-H | SMAJ26A-H | YEH | CEH | 26.0 | 28.90 | 31.90 | 1 | 1 | 9.5 | 42.1 |
| SMAJ28CA-H | SMAJ28A-H | YGH | CGH | 28.0 | 31.10 | 34.40 | 1 | 1 | 8.8 | 45.4 |
| SMAJ30CA-H | SMAJ30A-H | YKH | CKH | 30.0 | 33.30 | 36.80 | 1 | 1 | 8.3 | 48.4 |
| SMAJ33CA-H | SMAJ33A-H | YMH | CMH | 33.0 | 36.70 | 40.60 | 1 | 1 | 7.5 | 53.3 |
| SMAJ36CA-H | SMAJ36A-H | YPH | CPH | 36.0 | 40.00 | 44.20 | 1 | 1 | 6.9 | 58.1 |
| SMAJ40CA-H | SMAJ40A-H | YRH | CRH | 40.0 | 44.40 | 49.10 | 1 | 1 | 6.2 | 64.5 |
| SMAJ43CA-H | SMAJ43A-H | YTH | CTH | 43.0 | 47.80 | 52.80 | 1 | 1 | 5.8 | 69.4 |
| SMAJ45CA-H | SMAJ45A-H | YVH | CVH | 45.0 | 50.00 | 55.30 | 1 | 1 | 5.5 | 72.7 |
| SMAJ48CA-H | SMAJ48A-H | YXH | CXH | 48.0 | 53.30 | 58.90 | 1 | 1 | 5.2 | 77.4 |
| SMAJ51CA-H | SMAJ51A-H | YZH | CZH | 51.0 | 56.70 | 62.70 | 1 | 1 | 4.9 | 82.4 |
| SMAJ54CA-H | SMAJ54A-H | ZEH | REH | 54.0 | 60.00 | 66.30 | 1 | 1 | 4.6 | 87.1 |
| SMAJ58CA-H | SMAJ58A-H | ZGH | RGH | 58.0 | 64.40 | 71.20 | 1 | 1 | 4.3 | 93.6 |
| SMAJ60CA-H | SMAJ60A-H | ZKH | RKH | 60.0 | 66.70 | 73.70 | 1 | 1 | 4.1 | 96.8 |
| SMAJ64CA-H | SMAJ64A-H | ZMH | RMH | 64.0 | 71.10 | 78.60 | 1 | 1 | 3.9 | 103.0 |

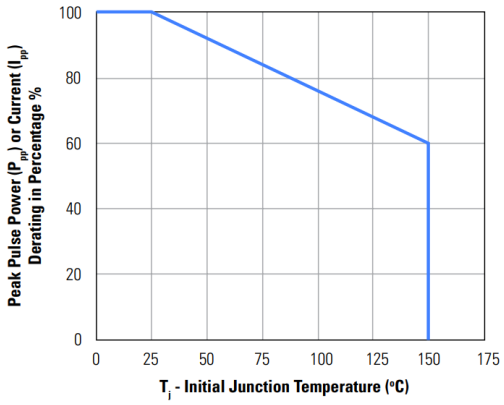
| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SMAJ70CA-H | SMAJ70A-H | ZPH | RPH | 70.0 | 77.80 | 86.00 | 1 | 1 | 3.5 | 113.0 |
| SMAJ75CA-H | SMAJ75A-H | ZRH | RRH | 75.0 | 83.30 | 92.10 | 1 | 1 | 3.3 | 121.0 |
| SMAJ78CA-H | SMAJ78A-H | ZTH | RTH | 78.0 | 86.70 | 95.80 | 1 | 1 | 3.2 | 126.0 |
| SMAJ85CA-H | SMAJ85A-H | ZVH | RVH | 85.0 | 94.4 | 104.0 | 1 | 1 | 2.9 | 137.0 |
| SMAJ90CA-H | SMAJ90A-H | ZXH | RXH | 90.0 | 100.0 | 111.0 | 1 | 1 | 2.7 | 146.0 |
| SMAJ100CA-H | SMAJ100A-H | ZZH | RZH | 100.0 | 111.0 | 123.0 | 1 | 1 | 2.5 | 162.0 |
| SMAJ110CA-H | SMAJ110A-H | VEH | SEH | 110.0 | 122.0 | 135.0 | 1 | 1 | 2.3 | 177.0 |
| SMAJ120CA-H | SMAJ120A-H | VGH | SGH | 120.0 | 133.0 | 147.0 | 1 | 1 | 2.1 | 193.0 |
| SMAJ130CA-H | SMAJ130A-H | VKH | SKH | 130.0 | 144.0 | 159.0 | 1 | 1 | 1.9 | 209.0 |
| SMAJ150CA-H | SMAJ150A-H | VMH | SMH | 150.0 | 167.0 | 185.0 | 1 | 1 | 1.6 | 243.0 |
| SMAJ160CA-H | SMAJ160A-H | VPH | SPH | 160.0 | 178.0 | 197.0 | 1 | 1 | 1.5 | 259.0 |
| SMAJ170CA-H | SMAJ170A-H | VRH | SRH | 170.0 | 189.0 | 209.0 | 1 | 1 | 1.5 | 275.0 |
| SMAJ180CA-H | SMAJ180A-H | VTH | STH | 180.0 | 201.0 | 222.0 | 1 | 1 | 1.4 | 292.0 |
| SMAJ190CA-H | SMAJ190A-H | YUH | SUH | 190.0 | 211.0 | 233.0 | 1 | 1 | 1.3 | 308.0 |
| SMAJ200CA-H | SMAJ200A-H | VVH | SVH | 200.0 | 224.0 | 247.0 | 1 | 1 | 1.2 | 324.0 |
| SMAJ210CA-H | SMAJ210A-H | YWH | SWH | 210.0 | 237.0 | 263.0 | 1 | 1 | 1.2 | 340.0 |
| SMAJ220CA-H | SMAJ220A-H | VXH | GEH | 220.0 | 246.0 | 272.0 | 1 | 1 | 1.1 | 356.0 |
| SMAJ250CA-H | SMAJ250A-H | VZH | SZH | 250.0 | 279.0 | 309.0 | 1 | 1 | 1.0 | 405.0 |
| SMAJ300CA-H | SMAJ300A-H | UEH | TEH | 300.0 | 335.0 | 371.0 | 1 | 1 | 0.8 | 486.0 |
| SMAJ350CA-H | SMAJ350A-H | UGH | TGH | 350.0 | 391.0 | 432.0 | 1 | 1 | 0.7 | 567.0 |
| SMAJ400CA-H | SMAJ400A-H | UKH | TKH | 400.0 | 447.0 | 494.0 | 1 | 1 | 0.6 | 648.0 |
| SMAJ440CA-H | SMAJ440A-H | UMH | TMH | 440.0 | 492.0 | 543.0 | 1 | 1 | 0.6 | 713.0 |

## I-V Curve characteristics

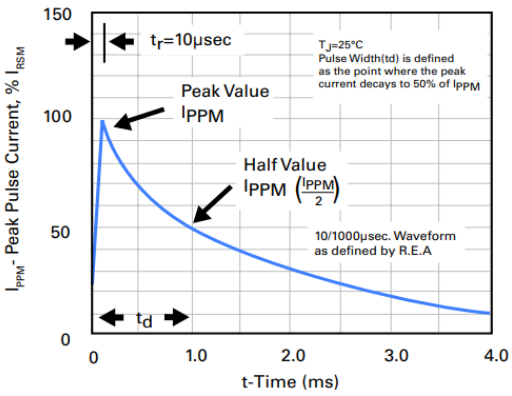



| Symbol | Parameter |
|---|---|
| $I_{PP}$ | Maximum Reverse Peak Pulse Current |
| $V_C$ | Clamping Voltage @ $I_{PP}$ |
| $V_{RWM}$ | Working Peak Reverse Voltage |
| $I_R$ | Maximum Reverse Leakage Current @$V_{RWM}$ |
| $V_{BR}$ | Breakdown Voltage @ $I_T$(Test Current) |

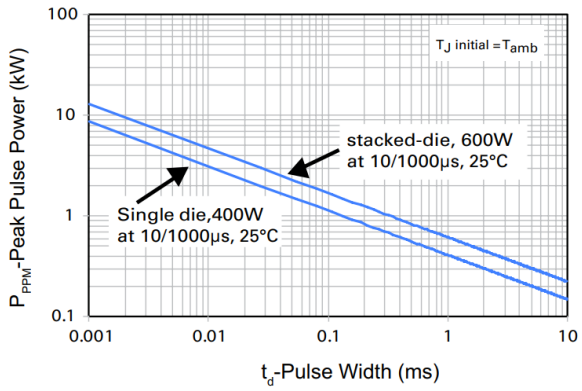
## Rating & Characteristic Curves



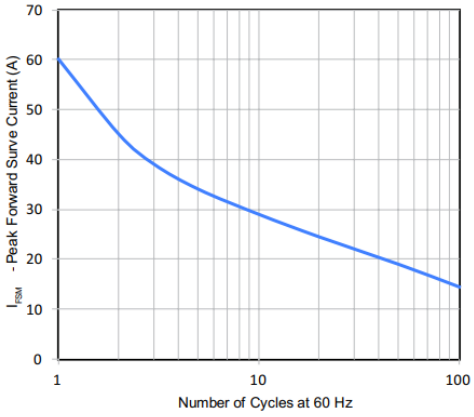

1.Peak pulse power derating curve



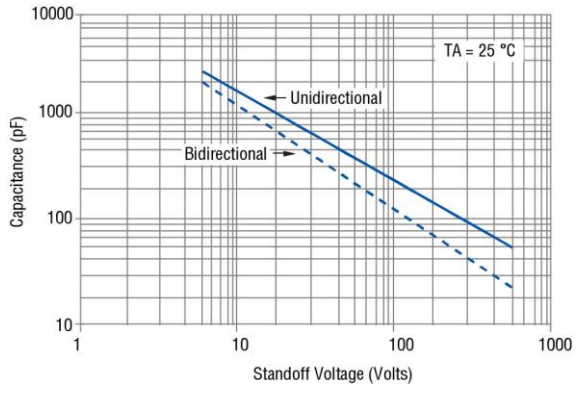

2. Pulse waveform




3. Peak pulse power rating curve

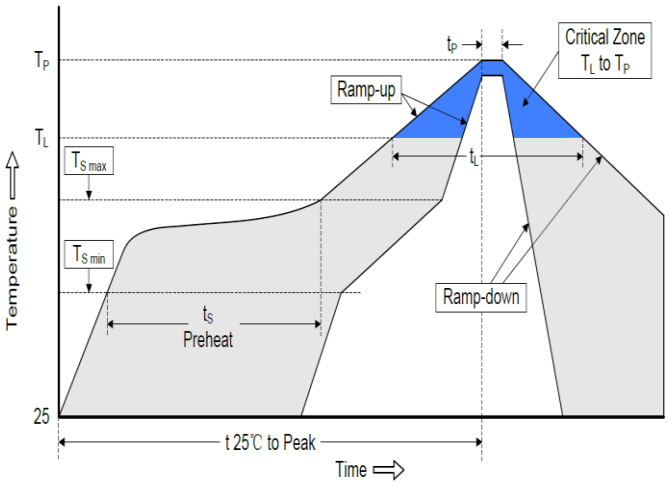



4. Maximum non-repetitive surge current



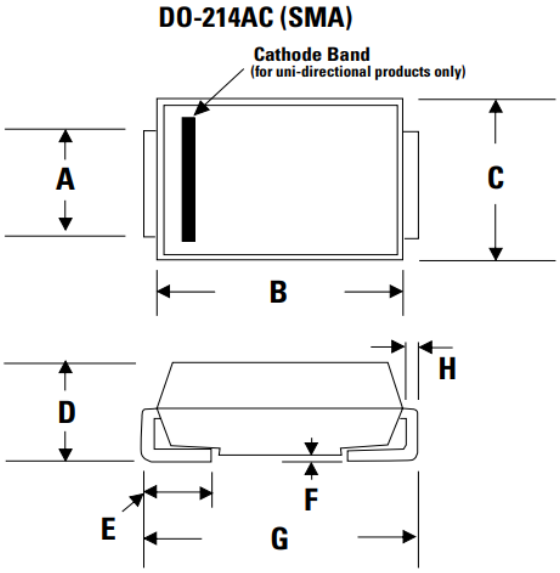

5. Typical Junction Capacitance

## Soldering parameters



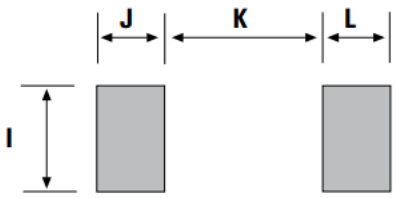

| Profile Feature | Pb-Free Assembly |
|---|---|
| Average ramp-up rate ($T_L$ to $T_P$) | 3°C/second max. |
| Preheat<br>-Temperature Min ($T_{S\,min}$)<br>-Temperature Max ($T_{S\,max}$)<br>-Time (min to max)($t_S$) | <br>150°C<br>200°C<br>60-180 seconds |
| $T_{S\,max}$ to $T_L$<br>-Ramp-up Rate | <br>3°C/second max. |
| Time maintained above:<br>- Temperature ($T_L$)<br>- Time ($t_L$) | <br>217°C<br>60-150 seconds |
| Peak Temperature ($T_P$) | 260°C |
| Time within 5°C of actual Peak Temperature ($t_P$) | 20-40 seconds |
| Ramp-down Rate | 6°C /second max. |
| Time 25°C to Peak Temperature | 8 minutes max. |

## Package outline dimensions in millimeters

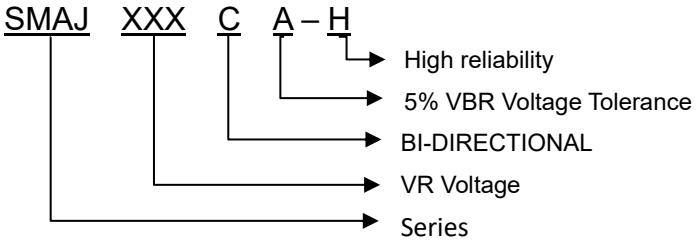


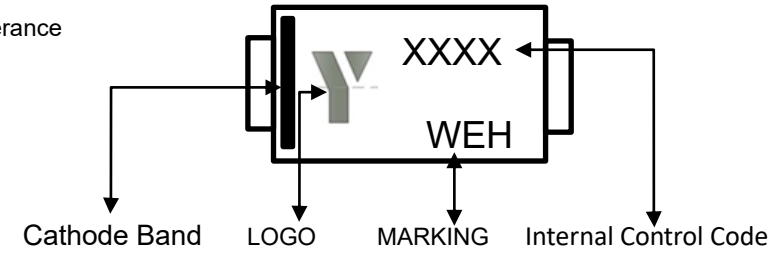

| Dimensions | Millimeter | |
|---|---|---|
| | Min | Max |
| A | 1.250 | 1.650 |
| B | 3.990 | 4.600 |
| C | 2.400 | 2.790 |
| D | 1.900 | 2.290 |
| E | 0.780 | 1.520 |
| F | - | 0.203 |
| G | 4.800 | 5.280 |
| H | 0.152 | 0.305 |
| I | 1.800 | - |
| J | 2.100 | - |
| K | - | 2.100 |
| L | 2.100 | - |

Mounting Pad Layout



## Part number code & Marking code




(for Uni-directional products only)

## Disclaimer

Specifications are subject to change without notice.

The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time.

Users should verify actual device performance in their specific applications.