



## Features

- Surface Mount SMA package
- Standoff Voltage: 5 to 220 volts
- Power Dissipation: 400 watts
- RoHS compliant\*
- AEC-Q101 compliant\*\*

## Applications

- Protection of power buses
- Protection of I/O interfaces
- Overvoltage transient protection
- Telecom, computer, industrial and consumer electronics applications

# SMAJ-Q Transient Voltage Suppressor Diode Series

## General Information

Bourns offers Transient Voltage Suppressor Diodes for surge and ESD protection applications, in compact chip package DO-214AC (SMA) size format. The Transient Voltage Suppressor series offers a choice of Working Peak Reverse Voltage from 5 V up to 220 V. Typical fast response times are less than 1.0 picosecond from 0 V to Breakdown Voltage.

Bourns® Chip Diodes conform to JEDEC standards, are easy to handle with standard pick and place equipment and the flat configuration minimizes roll away.

## Electrical Characteristics (@ T<sub>A</sub> = 25 °C Unless Otherwise Noted)

| Parameter                                                                                                  | Symbol           | Value       | Unit  |
|------------------------------------------------------------------------------------------------------------|------------------|-------------|-------|
| Minimum Peak Pulse Power Dissipation (T <sub>P</sub> = 1 ms) (Note 1,2)                                    | P <sub>PK</sub>  | 400         | Watts |
| Peak Forward Surge Current 8.3 ms Single Half Sine Wave Superimposed on Rated Load (JEDEC Method) (Note 3) | I <sub>FSM</sub> | 40          | Amps  |
| Operating Temperature Range                                                                                | T <sub>J</sub>   | -55 to +150 | °C    |
| Storage Temperature Range                                                                                  | T <sub>STG</sub> | -55 to +150 | °C    |

1. Non-repetitive current pulse, per Pulse Waveform graph and derated above T<sub>A</sub> = 25 °C per Pulse Derating Curve.
2. Mounted on 5.0 mm<sup>2</sup> (0.03 mm thick) copper pads to each terminal.
3. 8.3 ms Single Half-Sine Wave duty cycle = 4 pulses maximum per minute (unidirectional units only).

## Additional Information

Click these links for more information:



## Agency Recognition

| Description |                                      |
|-------------|--------------------------------------|
| UL          | File Number: <a href="#">E153537</a> |



## WARNING Cancer and Reproductive Harm

[www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

\*RoHS Directive 2015/863, Mar 31, 2015 and Annex.  
 \*\*\*Q" part number suffix indicates AEC-Q101 compliance.

Specifications are subject to change without notice. Users should verify actual device performance in their specific applications.

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## Electrical Characteristics (@ T<sub>A</sub> = 25 °C Unless Otherwise Noted)

| Unidirectional Device |         | Bidirectional Device |         | Breakdown Voltage V <sub>BR</sub> (Volts) |      |                       | Working Peak Reverse Voltage | Maximum Reverse Leakage @ V <sub>RWM</sub> | Maximum Clamping Voltage @ I <sub>pp</sub> (10/1000 μs) | Maximum Peak Pulse Current (10/1000 μs) | Maximum Clamping Voltage @ I <sub>pp</sub> (8/20 μs) | Maximum Peak Pulse Current (8/20 μs) |
|-----------------------|---------|----------------------|---------|-------------------------------------------|------|-----------------------|------------------------------|--------------------------------------------|---------------------------------------------------------|-----------------------------------------|------------------------------------------------------|--------------------------------------|
| Part No.              | Marking | Part No.             | Marking | Min.                                      | Max. | @ I <sub>T</sub> (mA) | V <sub>RWM</sub> (V)         | I <sub>R</sub> (μA)                        | V <sub>C</sub> (V)                                      | I <sub>pp</sub> (A)                     | V <sub>C</sub> (V)                                   | I <sub>pp</sub> (A)                  |
| SMAJ5.0A-Q            | HEQ     | SMAJ5.0CA-Q          | TEQ     | 6.40                                      | 7.00 | 10                    | 5.0                          | 800                                        | 9.2                                                     | 43.5                                    | 12.0                                                 | 217.5                                |
| SMAJ6.0A-Q            | HGQ     | SMAJ6.0CA-Q          | TGQ     | 6.67                                      | 7.37 | 10                    | 6.0                          | 800                                        | 10.3                                                    | 38.8                                    | 13.4                                                 | 194.0                                |
| SMAJ6.5A-Q            | HKQ     | SMAJ6.5CA-Q          | TKQ     | 7.22                                      | 7.98 | 10                    | 6.5                          | 500                                        | 11.2                                                    | 35.7                                    | 14.6                                                 | 178.5                                |
| SMAJ7.0A-Q            | HMQ     | SMAJ7.0CA-Q          | TMQ     | 7.78                                      | 8.60 | 10                    | 7.0                          | 200                                        | 12.0                                                    | 33.3                                    | 15.6                                                 | 166.5                                |
| SMAJ7.5A-Q            | HPQ     | SMAJ7.5CA-Q          | TPQ     | 8.33                                      | 9.21 | 1.0                   | 7.5                          | 100                                        | 12.9                                                    | 31.0                                    | 16.8                                                 | 155.0                                |
| SMAJ8.0A-Q            | HRQ     | SMAJ8.0CA-Q          | TRQ     | 8.89                                      | 9.83 | 1.0                   | 8.0                          | 50                                         | 13.6                                                    | 29.4                                    | 17.7                                                 | 147.0                                |
| SMAJ8.5A-Q            | HTQ     | SMAJ8.5CA-Q          | TTQ     | 9.44                                      | 10.4 | 1.0                   | 8.5                          | 20                                         | 14.4                                                    | 27.8                                    | 18.7                                                 | 139.0                                |
| SMAJ9.0A-Q            | HVQ     | SMAJ9.0CA-Q          | TVQ     | 10.0                                      | 11.1 | 1.0                   | 9.0                          | 10                                         | 15.4                                                    | 26.0                                    | 20.0                                                 | 130.0                                |
| SMAJ10A-Q             | HXQ     | SMAJ10CA-Q           | TXQ     | 11.1                                      | 12.3 | 1.0                   | 10                           | 5                                          | 17.0                                                    | 23.5                                    | 22.1                                                 | 117.5                                |
| SMAJ11A-Q             | HZQ     | SMAJ11CA-Q           | TZQ     | 12.2                                      | 13.5 | 1.0                   | 11                           | 1.0                                        | 18.2                                                    | 22.0                                    | 23.7                                                 | 110.0                                |
| SMAJ12A-Q             | IEQ     | SMAJ12CA-Q           | UEQ     | 13.3                                      | 14.7 | 1.0                   | 12                           | 1.0                                        | 19.9                                                    | 20.1                                    | 25.9                                                 | 100.5                                |
| SMAJ13A-Q             | IGQ     | SMAJ13CA-Q           | UGQ     | 14.4                                      | 15.9 | 1.0                   | 13                           | 1.0                                        | 21.5                                                    | 18.6                                    | 28.0                                                 | 93.0                                 |
| SMAJ14A-Q             | IKQ     | SMAJ14CA-Q           | UKQ     | 15.6                                      | 17.2 | 1.0                   | 14                           | 1.0                                        | 23.2                                                    | 17.2                                    | 30.2                                                 | 86.0                                 |
| SMAJ15A-Q             | IMQ     | SMAJ15CA-Q           | UMQ     | 16.7                                      | 18.5 | 1.0                   | 15                           | 1.0                                        | 24.4                                                    | 16.4                                    | 31.7                                                 | 82.0                                 |
| SMAJ16A-Q             | IPQ     | SMAJ16CA-Q           | UPQ     | 17.8                                      | 19.7 | 1.0                   | 16                           | 1.0                                        | 26.0                                                    | 15.4                                    | 33.8                                                 | 77.0                                 |

- Notes: 1. Suffix 'A' denotes a 5 % tolerance unidirectional device.  
 2. Suffix 'CA' denotes a 5 % tolerance bidirectional device.

~ Continued on next page ~

# SMAJ-Q Transient Voltage Suppressor Diode Series

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## Electrical Characteristics (@ T<sub>A</sub> = 25 °C Unless Otherwise Noted) - Continued

| Unidirectional Device |         | Bidirectional Device |         | Breakdown Voltage<br>V <sub>BR</sub> (Volts) |      |                          | Working<br>Peak<br>Reverse<br>Voltage | Maximum<br>Reverse<br>Leakage<br>@ V <sub>RWM</sub> | Maximum<br>Clamping<br>Voltage<br>@ I <sub>pp</sub><br>(10/1000 μs) | Maximum<br>Peak<br>Pulse<br>Current<br>(10/1000 μs) | Maximum<br>Clamping<br>Voltage<br>@ I <sub>pp</sub><br>(8/20 μs) | Maximum<br>Peak<br>Pulse<br>Current<br>(8/20 μs) |
|-----------------------|---------|----------------------|---------|----------------------------------------------|------|--------------------------|---------------------------------------|-----------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------|------------------------------------------------------------------|--------------------------------------------------|
| Part No.              | Marking | Part No.             | Marking | Min.                                         | Max. | @ I <sub>T</sub><br>(mA) | V <sub>RWM</sub><br>(V)               | I <sub>R</sub><br>(μA)                              | V <sub>C</sub><br>(V)                                               | I <sub>pp</sub><br>(A)                              | V <sub>C</sub><br>(V)                                            | I <sub>pp</sub><br>(A)                           |
| SMAJ17A-Q             | IRQ     | SMAJ17CA-Q           | URQ     | 18.9                                         | 20.9 | 1.0                      | 17                                    | 1.0                                                 | 27.6                                                                | 14.5                                                | 35.9                                                             | 72.5                                             |
| SMAJ18A-Q             | ITQ     | SMAJ18CA-Q           | UTQ     | 20.0                                         | 22.1 | 1.0                      | 18                                    | 1.0                                                 | 29.2                                                                | 13.7                                                | 38.0                                                             | 68.5                                             |
| SMAJ20A-Q             | IVQ     | SMAJ20CA-Q           | UVQ     | 22.2                                         | 24.5 | 1.0                      | 20                                    | 1.0                                                 | 32.4                                                                | 12.3                                                | 42.1                                                             | 61.5                                             |
| SMAJ22A-Q             | IXQ     | SMAJ22CA-Q           | UXQ     | 24.4                                         | 26.9 | 1.0                      | 22                                    | 1.0                                                 | 35.5                                                                | 11.3                                                | 46.2                                                             | 56.5                                             |
| SMAJ24A-Q             | IZQ     | SMAJ24CA-Q           | UZQ     | 26.7                                         | 29.5 | 1.0                      | 24                                    | 1.0                                                 | 38.9                                                                | 10.3                                                | 50.6                                                             | 51.5                                             |
| SMAJ26A-Q             | JEQ     | SMAJ26CA-Q           | VEQ     | 28.9                                         | 31.9 | 1.0                      | 26                                    | 1.0                                                 | 42.1                                                                | 9.5                                                 | 54.7                                                             | 47.5                                             |
| SMAJ28A-Q             | JGQ     | SMAJ28CA-Q           | VGQ     | 31.1                                         | 34.4 | 1.0                      | 28                                    | 1.0                                                 | 45.4                                                                | 8.8                                                 | 59.0                                                             | 44.0                                             |
| SMAJ30A-Q             | JKQ     | SMAJ30CA-Q           | VKQ     | 33.3                                         | 36.8 | 1.0                      | 30                                    | 1.0                                                 | 48.4                                                                | 8.3                                                 | 62.9                                                             | 41.5                                             |
| SMAJ33A-Q             | JMQ     | SMAJ33CA-Q           | VMQ     | 36.7                                         | 40.6 | 1.0                      | 33                                    | 1.0                                                 | 53.3                                                                | 7.5                                                 | 69.3                                                             | 37.5                                             |
| SMAJ36A-Q             | JPQ     | SMAJ36CA-Q           | VPQ     | 40                                           | 44.2 | 1.0                      | 36                                    | 1.0                                                 | 58.1                                                                | 6.9                                                 | 75.5                                                             | 34.5                                             |
| SMAJ40A-Q             | JRQ     | SMAJ40CA-Q           | VRQ     | 44.4                                         | 49.1 | 1.0                      | 40                                    | 1.0                                                 | 64.5                                                                | 6.2                                                 | 83.9                                                             | 31.0                                             |
| SMAJ43A-Q             | JTQ     | SMAJ43CA-Q           | VTQ     | 47.8                                         | 52.8 | 1.0                      | 43                                    | 1.0                                                 | 69.4                                                                | 5.8                                                 | 90.2                                                             | 29.0                                             |
| SMAJ45A-Q             | JVQ     | SMAJ45CA-Q           | VVQ     | 50                                           | 55.3 | 1.0                      | 45                                    | 1.0                                                 | 72.7                                                                | 5.5                                                 | 94.5                                                             | 27.5                                             |
| SMAJ48A-Q             | JXQ     | SMAJ48CA-Q           | VXQ     | 53.3                                         | 58.9 | 1.0                      | 48                                    | 1.0                                                 | 77.4                                                                | 5.2                                                 | 100.6                                                            | 26.0                                             |
| SMAJ51A-Q             | JZQ     | SMAJ51CA-Q           | VZQ     | 56.7                                         | 62.7 | 1.0                      | 51                                    | 1.0                                                 | 82.4                                                                | 4.9                                                 | 107.1                                                            | 24.5                                             |
| SMAJ54A-Q             | REQ     | SMAJ54CA-Q           | WEQ     | 60                                           | 66.3 | 1.0                      | 54                                    | 1.0                                                 | 87.1                                                                | 4.6                                                 | 113.2                                                            | 23.0                                             |
| SMAJ58A-Q             | RGQ     | SMAJ58CA-Q           | WGQ     | 64.4                                         | 71.2 | 1.0                      | 58                                    | 1.0                                                 | 93.6                                                                | 4.3                                                 | 121.7                                                            | 21.5                                             |
| SMAJ60A-Q             | RKQ     | SMAJ60CA-Q           | WKQ     | 66.7                                         | 73.7 | 1.0                      | 60                                    | 1.0                                                 | 96.8                                                                | 4.1                                                 | 125.8                                                            | 20.5                                             |
| SMAJ64A-Q             | RMQ     | SMAJ64CA-Q           | WMQ     | 71.1                                         | 78.6 | 1.0                      | 64                                    | 1.0                                                 | 103                                                                 | 3.9                                                 | 133.9                                                            | 19.5                                             |
| SMAJ70A-Q             | RPQ     | SMAJ70CA-Q           | WPQ     | 77.8                                         | 86.0 | 1.0                      | 70                                    | 1.0                                                 | 113                                                                 | 3.5                                                 | 146.9                                                            | 17.5                                             |
| SMAJ75A-Q             | RRQ     | SMAJ75CA-Q           | WRQ     | 83.3                                         | 92.1 | 1.0                      | 75                                    | 1.0                                                 | 121                                                                 | 3.3                                                 | 157.3                                                            | 16.5                                             |
| SMAJ78A-Q             | RTQ     | SMAJ78CA-Q           | WTQ     | 86.7                                         | 95.8 | 1.0                      | 78                                    | 1.0                                                 | 126                                                                 | 3.2                                                 | 163.8                                                            | 16.0                                             |
| SMAJ85A-Q             | RVQ     | SMAJ85CA-Q           | WVQ     | 94.4                                         | 104  | 1.0                      | 85                                    | 1.0                                                 | 137                                                                 | 2.9                                                 | 178.1                                                            | 14.5                                             |
| SMAJ90A-Q             | RXQ     | SMAJ90CA-Q           | WXQ     | 100                                          | 111  | 1.0                      | 90                                    | 1.0                                                 | 146                                                                 | 2.7                                                 | 189.8                                                            | 13.5                                             |
| SMAJ100A-Q            | RZQ     | SMAJ100CA-Q          | WZQ     | 111                                          | 123  | 1.0                      | 100                                   | 1.0                                                 | 162                                                                 | 2.5                                                 | 210.6                                                            | 12.5                                             |
| SMAJ110A-Q            | SEQ     | SMAJ110CA-Q          | XEQ     | 122                                          | 135  | 1.0                      | 110                                   | 1.0                                                 | 177                                                                 | 2.3                                                 | 230.1                                                            | 11.5                                             |
| SMAJ120A-Q            | SGQ     | SMAJ120CA-Q          | XGQ     | 133                                          | 147  | 1.0                      | 120                                   | 1.0                                                 | 193                                                                 | 2.1                                                 | 250.9                                                            | 10.5                                             |
| SMAJ130A-Q            | SKQ     | SMAJ130CA-Q          | XKQ     | 144                                          | 159  | 1.0                      | 130                                   | 1.0                                                 | 209                                                                 | 1.9                                                 | 271.7                                                            | 9.5                                              |
| SMAJ150A-Q            | SMQ     | SMAJ150CA-Q          | XMQ     | 167                                          | 185  | 1.0                      | 150                                   | 1.0                                                 | 243                                                                 | 1.6                                                 | 315.9                                                            | 8.0                                              |
| SMAJ160A-Q            | SPQ     | SMAJ160CA-Q          | XPQ     | 178                                          | 197  | 1.0                      | 160                                   | 1.0                                                 | 259                                                                 | 1.5                                                 | 336.7                                                            | 7.5                                              |
| SMAJ170A-Q            | SRQ     | SMAJ170CA-Q          | XRQ     | 189                                          | 209  | 1.0                      | 170                                   | 1.0                                                 | 275                                                                 | 1.5                                                 | 357.5                                                            | 7.5                                              |
| SMAJ180A-Q            | STQ     | SMAJ180CA-Q          | XTQ     | 201                                          | 222  | 1.0                      | 180                                   | 1.0                                                 | 292                                                                 | 1.4                                                 | 379.6                                                            | 7.0                                              |
| SMAJ200A-Q            | SVQ     | SMAJ200CA-Q          | XVQ     | 224                                          | 247  | 1.0                      | 200                                   | 1.0                                                 | 324                                                                 | 1.2                                                 | 421.2                                                            | 6.0                                              |
| SMAJ220A-Q            | SXQ     | SMAJ220CA-Q          | XXQ     | 246                                          | 272  | 1.0                      | 220                                   | 1.0                                                 | 356                                                                 | 1.1                                                 | 462.8                                                            | 5.5                                              |

Notes: 1. Suffix 'A' denotes a 5 % tolerance unidirectional device.  
2. Suffix 'CA' denotes a 5 % tolerance bidirectional device.

Specifications are subject to change without notice.

Users should verify actual device performance in their specific applications.

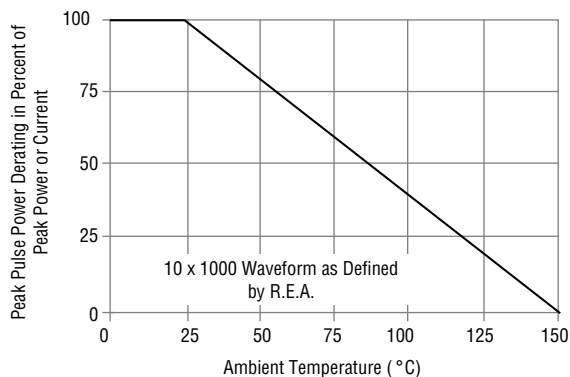
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# SMAJ-Q Transient Voltage Suppressor Diode Series

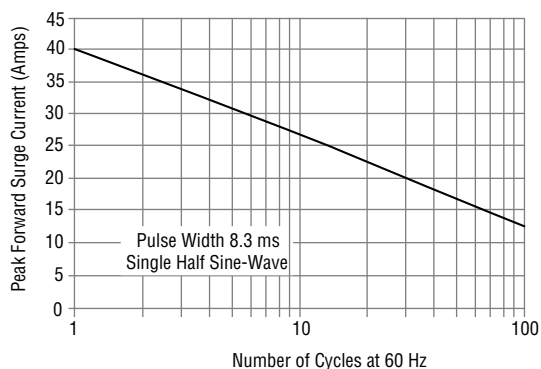
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## Performance Graphs

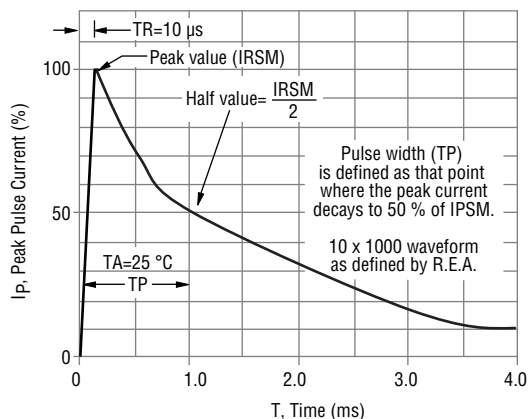
### Peak Pulse Power Derating Curve



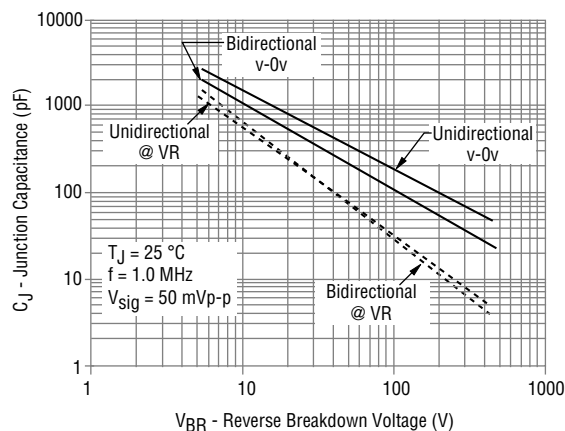
### Maximum Non-Repetitive Surge Current



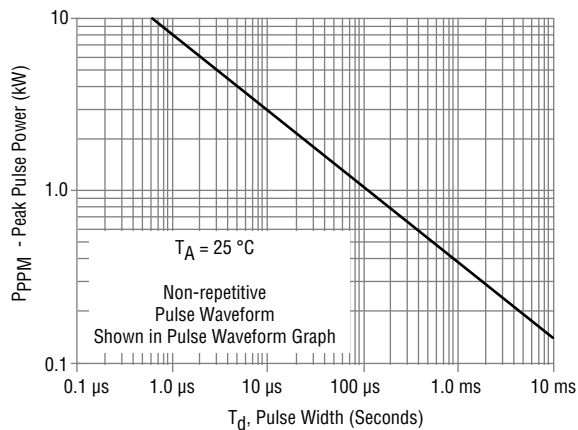
### Pulse Waveform



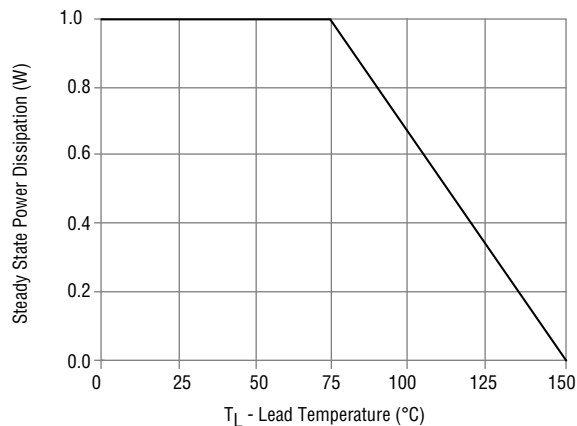
### Typical Junction Capacitance



### Pulse Rating Curve



### Steady State Power Derating Curve



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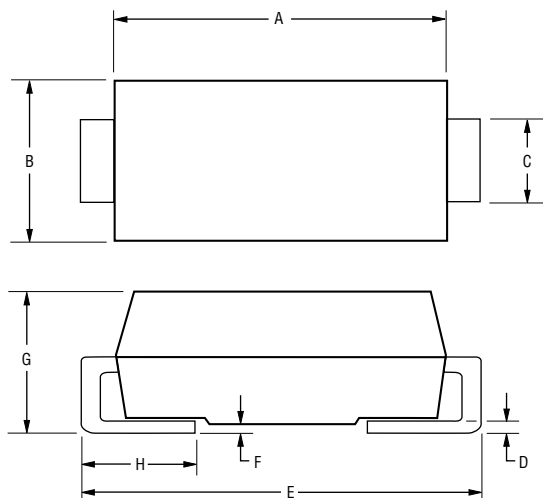
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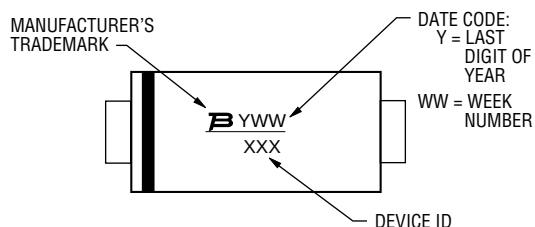
## Product Dimensions



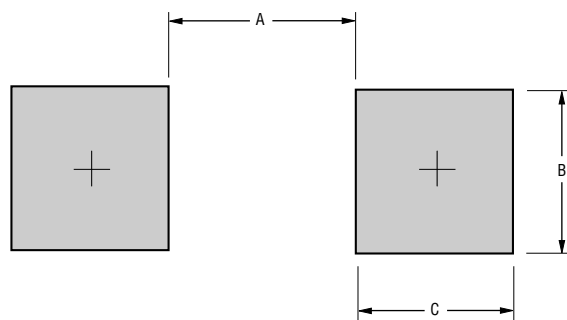
| Dimension | SMA (DO-214AC)                 |
|-----------|--------------------------------|
| A         | 3.99 - 4.50<br>(0.157 - 0.177) |
| B         | 2.54 - 2.79<br>(0.100 - 0.110) |
| C         | 1.25 - 1.65<br>(0.049 - 0.065) |
| D         | 0.15 - 0.31<br>(0.006 - 0.012) |
| E         | 4.93 - 5.28<br>(0.194 - 0.208) |
| F         | 0.203 MAX.<br>(0.008)          |
| G         | 1.98 - 2.29<br>(0.078 - 0.090) |
| H         | 0.76 - 1.52<br>(0.030 - 0.060) |

DIMENSIONS:  $\frac{\text{MM}}{(\text{INCHES})}$

## Typical Part Marking



## Recommended Footprint



| Dimension | SMA (DO-214AC)  |
|-----------|-----------------|
| A (Max.)  | 2.70<br>(0.106) |
| B (Min.)  | 2.10<br>(0.083) |
| C (Min.)  | 1.27<br>(0.050) |

DIMENSIONS:  $\frac{\text{MM}}{(\text{INCHES})}$

## Physical Specifications

Case ..... Molded plastic per UL Class 94V-0  
Polarity.....Cathode band indicates unidirectional device  
No cathode band indicates bidirectional device

## How to Order

Package ..... **SMAJ 12 CA - Q**  
SMAJ = SMA/DO-214AC  
Working Peak Reverse Voltage .....  
12 = 12 V<sub>RWM</sub> (Volts)  
Suffix .....  
A = 5 % Tolerance Unidirectional Device  
CA = 5 % Tolerance Bidirectional Device  
AEC-Q101 Suffix .....  
Q = AEC-Q101 Compliant, 13-inch Reel  
QH = AEC-Q101 Compliant, 7-inch Reel  
(available only for 12 V to 58 V models)

## Environmental Specifications

Moisture Sensitivity Level ..... 1  
ESD Classification (HBM).....3B

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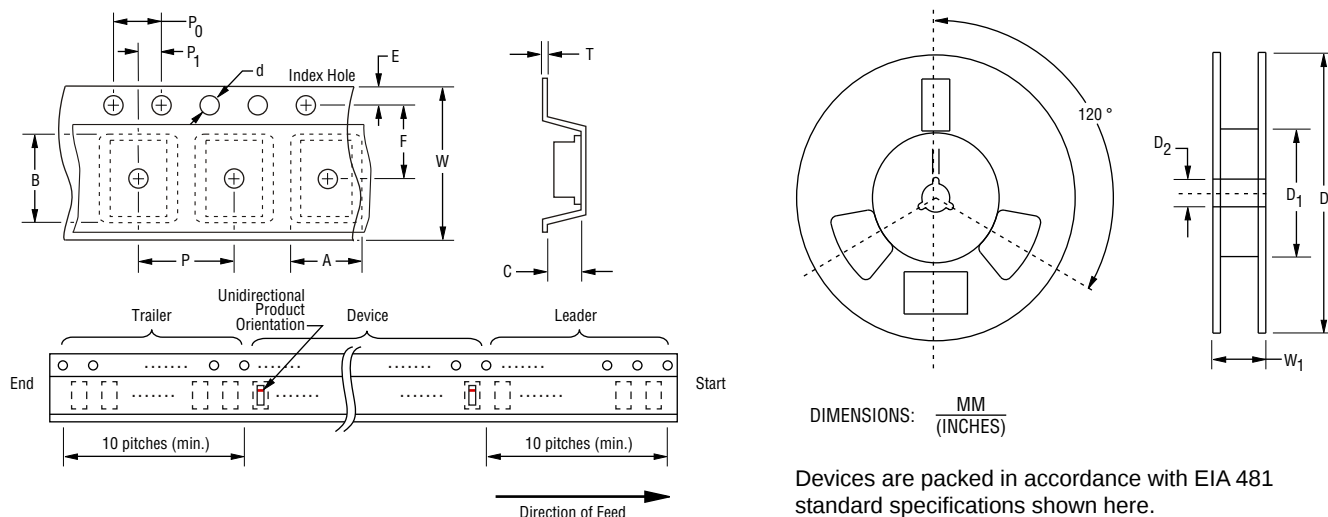
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# SMAJ-Q Transient Voltage Suppressor Diode Series

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## Packaging Information

The product will be dispensed in tape and reel format (see diagram below).



| Item                   | Symbol         | SMA (DO-214AC)                      |                        |
|------------------------|----------------|-------------------------------------|------------------------|
|                        |                | 7-Inch Reel                         | 13-Inch Reel           |
| Carrier Width          | A              | $2.90 \pm 0.20$<br>(0.114 ± 0.008)  |                        |
| Carrier Length         | B              | $5.50 \pm 0.20$<br>(0.217 ± 0.008)  |                        |
| Carrier Depth          | C              | $2.26 \pm 0.20$<br>(0.089 ± 0.008)  |                        |
| Sprocket Hole          | d              | $1.50 \pm 0.10$<br>(0.061 ± 0.004)  |                        |
| Reel Outside Diameter  | D              | $\frac{178}{(7.008)}$               | $\frac{330}{(12.992)}$ |
| Reel Inner Diameter    | D <sub>1</sub> | $\frac{50.0}{(1.969)}$ MIN.         |                        |
| Feed Hole Diameter     | D <sub>2</sub> | $13.0 \pm 0.20$<br>(0.512 ± 0.008)  |                        |
| Sprocket Hole Position | E              | $1.75 \pm 0.10$<br>(0.069 ± 0.004)  |                        |
| Punch Hole Position    | F              | $5.50 \pm 0.05$<br>(0.217 ± 0.002)  |                        |
| Punch Hole Pitch       | P              | $4.00 \pm 0.10$<br>(0.157 ± 0.004)  |                        |
| Sprocket Hole Pitch    | P <sub>0</sub> | $4.00 \pm 0.10$<br>(0.157 ± 0.004)  |                        |
| Embossment Center      | P <sub>1</sub> | $2.00 \pm 0.05$<br>(0.079 ± 0.002)  |                        |
| Overall Tape Thickness | T              | $0.30 \pm 0.10$<br>(0.012 ± 0.004)  |                        |
| Tape Width             | W              | $12.00 \pm 0.30$<br>(0.472 ± 0.012) |                        |
| Reel Width             | W <sub>1</sub> | $\frac{18.4}{(0.724)}$ MAX.         |                        |
| Quantity per Reel      | --             | 1,000                               | 5,000                  |

REV. 03/20

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