# THE DATASHEET OF

# SMCJ33CAQ-13-F

# 1,500W SURFACE MOUNT AUTOMOTIVE TRANSIENT VOLTAGE SUPPRESSOR

## Product Summary (@$T_A$ = +25°C)

| $P_{PK}$ | $I_{FSM}$ | $V_{RWM}$ | $PM_{(AV)}$ |
|---|---|---|---|
| 1500W | 200A | 5V to 110V | 5W |

## Features and Benefits

- 1,500W Peak Pulse Power Dissipation
- 5V to 110V Standoff Voltages
- Glass Passivated Die Construction
- Unidirectional and Bidirectional Versions Available
- Excellent Clamping Capability
- Fast Response Time
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The DIODES™ SMCJ5.0(C)AQ – SMCJ110(C)AQ are suitable for automotive applications requiring specific change control; these parts are AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities. https://www.diodes.com/quality/product-definitions/**

## Description and Applications

Suitable to protect sensitive automotive circuits against surges defined in ISO7637-2 and against electrostatic discharges according to ISO10605.

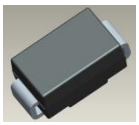
Compliance with following standards:

- ISO10605, C = 150pF, R = 330Ω:
  30kV (Air Discharge)
  30kV (Contact Discharge)
- ISO7637-2
  Pulse 1: $V_S$ = -100V
  Pulse 2a: $V_S$ = +50V
  Pulse 3a: $V_S$ = -150V
  Pulse 3b: $V_S$ = +100V

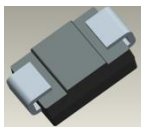
## Mechanical Data

- Package: SMC
- Package Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Lead-Free Plating (Matte Tin Finish). Solderable per MIL-STD-202, Method 208 e3
- Polarity Indicator: Cathode Band (Note: Bidirectional devices have no polarity indicator.)
- Weight: 0.21 grams (Approximate)

SMC



Top View



Bottom View

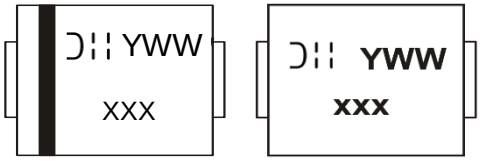
## Ordering Information (Note 4)

| Part Number | Package | Packing | |
|---|---|---|---|
| | | Qty. | Carrier |
| SMCJX.X(C)AQ-13-F* | SMC | 3000 | Tape & Reel |
| SMCJXX(C)AQ-13-F* | SMC | 3000 | Tape & Reel |
| SMCJXXX(C)AQ-13-F* | SMC | 3000 | Tape & Reel |

*X = Device Voltage, e.g., SMCJ14AQ-13-F.

Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

## Marking Information




XXX = Product Type Marking Code
(See Electrical Characteristics Table)
= Manufacturer's Marking
YWW = Date Code Marking
Y = Last Digit of Year (ex: 2 for 2022)
WW = Week Code (01 to 53)


## Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Peak Pulse Power Dissipation (Non-Repetitive Current Pulse Derated Above $T_A$ = +25°C) (Note 5) | $P_{PK}$ | 1500 | W |
| Peak Forward Surge Current, 8.3ms Single Half Sine-Wave Superimposed on Rated Load (Notes 5, 6, & 7) | $I_{FSM}$ | 200 | A |
| Steady State Power Dissipation @ $T_L$ = +75°C | $PM_{(AV)}$ | 5.0 | W |
| Instantaneous Forward Voltage @ $I_{PP}$ = 100A (Notes 5 & 7) | $V_F$ | 3.5 | V |

## Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Operating Temperature Range | $T_J$ | -55 to +150 | °C |
| Storage Temperature Range | $T_{STG}$ | -55 to +175 | °C |

Notes: 5. Valid provided that terminals are kept at ambient temperature.
6. Measured with 8.3ms single half sine-wave. Duty cycle = 4 pulses per minute maximum.
7. Unidirectional units only.

## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Part Number Add C For Bidirectional (Note 8) | Reverse Standoff Voltage | Breakdown Voltage $V_{BR}$ @ $I_T$ (Note 9) | | Test Current | Max. Reverse Leakage @ $V_{RWM}$ (Note 10) | Max. Clamping Voltage @ $I_{PP}$ (Note 11) | Max. Peak Pulse Current | Marking Code | |
|---|---|---|---|---|---|---|---|---|---|
| | $V_{RWM}$ (V) | Min (V) | Max (V) | $I_T$ (mA) | $I_R$ (µA) | $V_C$ (V) | $I_{PP}$ (A) | BI | UNI |
| SMCJ5.0(C)AQ | 5.0 | 6.40 | 7.07 | 10 | 1000 | 9.2 | 163.0 | BDE | GDE |
| SMCJ6.0(C)AQ | 6.0 | 6.67 | 7.37 | 10 | 1000 | 10.3 | 145.6 | BDG | GDG |
| SMCJ6.5(C)AQ | 6.5 | 7.22 | 7.98 | 10 | 500 | 11.2 | 133.9 | BDK | GDK |
| SMCJ7.0(C)AQ | 7.0 | 7.78 | 8.60 | 10 | 200 | 12.0 | 125.0 | BDM | GDM |
| SMCJ7.5(C)AQ | 7.5 | 8.33 | 9.21 | 1.0 | 100 | 12.9 | 116.3 | BDP | GDP |
| SMCJ8.0(C)AQ | 8.0 | 8.89 | 9.83 | 1.0 | 50 | 13.6 | 110.3 | BDR | GDR |
| SMCJ8.5(C)AQ | 8.5 | 9.44 | 10.4 | 1.0 | 20 | 14.4 | 104.2 | BDT | GDT |
| SMCJ9.0(C)AQ | 9.0 | 10.00 | 11.1 | 1.0 | 10 | 15.4 | 97.4 | BDV | GDV |
| SMCJ10(C)AQ | 10.0 | 11.10 | 12.3 | 1.0 | 5.0 | 17.0 | 88.2 | BDX | GDX |
| SMCJ11(C)AQ | 11.0 | 12.20 | 13.5 | 1.0 | 5.0 | 18.2 | 82.4 | BDZ | GDZ |
| SMCJ12(C)AQ | 12.0 | 13.30 | 14.7 | 1.0 | 5.0 | 19.9 | 75.3 | BEE | GEE |
| SMCJ13(C)AQ | 13.0 | 14.40 | 15.9 | 1.0 | 5.0 | 21.5 | 69.7 | BEG | GEG |
| SMCJ14(C)AQ | 14.0 | 15.60 | 17.2 | 1.0 | 5.0 | 23.2 | 64.7 | BEK | GEK |
| SMCJ15(C)AQ | 15.0 | 16.70 | 18.5 | 1.0 | 5.0 | 24.4 | 61.5 | BEM | GEM |
| SMCJ16(C)AQ | 16.0 | 17.80 | 19.7 | 1.0 | 5.0 | 26.0 | 57.7 | BEP | GEP |
| SMCJ17(C)AQ | 17.0 | 18.90 | 20.9 | 1.0 | 5.0 | 27.6 | 53.3 | BER | GER |
| SMCJ18(C)AQ | 18.0 | 20.00 | 22.1 | 1.0 | 5.0 | 29.2 | 51.4 | BET | GET |
| SMCJ20(C)AQ | 20.0 | 22.20 | 24.5 | 1.0 | 5.0 | 32.4 | 46.3 | BEV | GEV |
| SMCJ22(C)AQ | 22.0 | 24.40 | 27.0 | 1.0 | 5.0 | 35.5 | 42.2 | BEX | GEX |
| SMCJ24(C)AQ | 24.0 | 26.70 | 29.5 | 1.0 | 5.0 | 38.9 | 38.6 | BEZ | GEZ |
| SMCJ26(C)AQ | 26.0 | 28.90 | 31.9 | 1.0 | 5.0 | 42.1 | 35.6 | BFE | GFE |
| SMCJ28(C)AQ | 28.0 | 31.10 | 34.4 | 1.0 | 5.0 | 45.4 | 33.0 | BFG | GFG |
| SMCJ30(C)AQ | 30.0 | 33.30 | 36.8 | 1.0 | 5.0 | 48.4 | 31.0 | BFK | GFK |
| SMCJ33(C)AQ | 33.0 | 36.70 | 40.6 | 1.0 | 5.0 | 53.3 | 28.1 | BFM | GFM |
| SMCJ36(C)AQ | 36.0 | 40.00 | 44.2 | 1.0 | 5.0 | 58.1 | 25.8 | BFP | GFP |
| SMCJ40(C)AQ | 40.0 | 44.40 | 49.1 | 1.0 | 5.0 | 64.5 | 23.2 | BFR | GFR |
| SMCJ48(C)AQ | 48.0 | 53.30 | 58.9 | 1.0 | 5.0 | 77.4 | 19.4 | BFX | GFX |
| SMCJ51(C)AQ | 51.0 | 56.70 | 62.7 | 1.0 | 5.0 | 82.4 | 18.2 | BFZ | GFZ |
| SMCJ58(C)AQ | 58.0 | 64.40 | 71.2 | 1.0 | 5.0 | 93.6 | 16.0 | BGG | GGG |
| SMCJ60(C)AQ | 60.0 | 66.70 | 73.7 | 1.0 | 5.0 | 96.8 | 15.5 | BGK | GGK |
| SMCJ64(C)AQ | 64.0 | 71.10 | 78.6 | 1.0 | 5.0 | 103.0 | 14.6 | BGM | GGM |
| SMCJ70(C)AQ | 70.0 | 77.80 | 86.0 | 1.0 | 5.0 | 113.0 | 13.3 | BGP | GGP |
| SMCJ75(C)AQ | 75.0 | 83.30 | 92.1 | 1.0 | 5.0 | 121.0 | 12.4 | BGR | GGR |
| SMCJ78(C)AQ | 78.0 | 86.70 | 95.8 | 1.0 | 5.0 | 126.0 | 11.4 | BGT | GGT |
| SMCJ85(C)AQ | 85.0 | 94.40 | 104 | 1.0 | 5.0 | 137.0 | 10.4 | BGV | GGV |
| SMCJ110(C)AQ | 110.0 | 122.00 | 135 | 1.0 | 5.0 | 177.0 | 8.4 | BHE | GHE |

Notes:
8. Suffix C denotes bidirectional device.
9. $V_{BR}$ measured with $I_T$ current pulse = 10ms to 15ms.
10. For bidirectional devices having $V_{RWM}$ of 10V and under, the $I_R$ is doubled.
11. Per 10 x 1000µs waveform. See Fig 4.

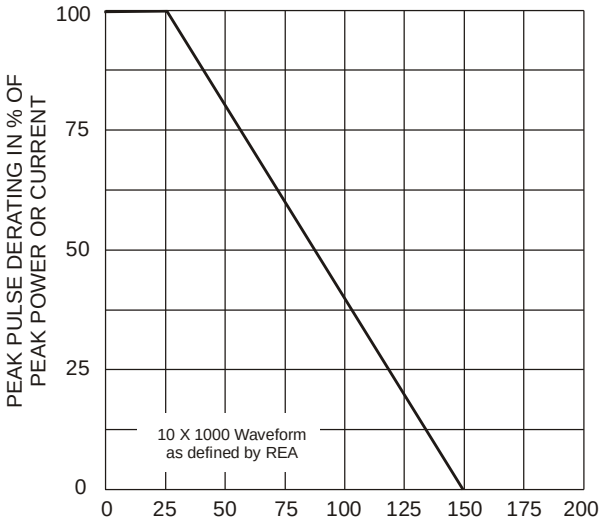



Fig. 1 Pulse Derating Curve

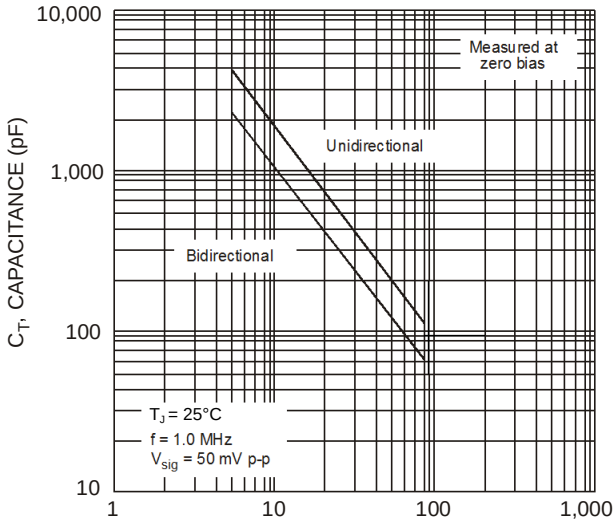



Fig. 2 Typical Total Capacitance

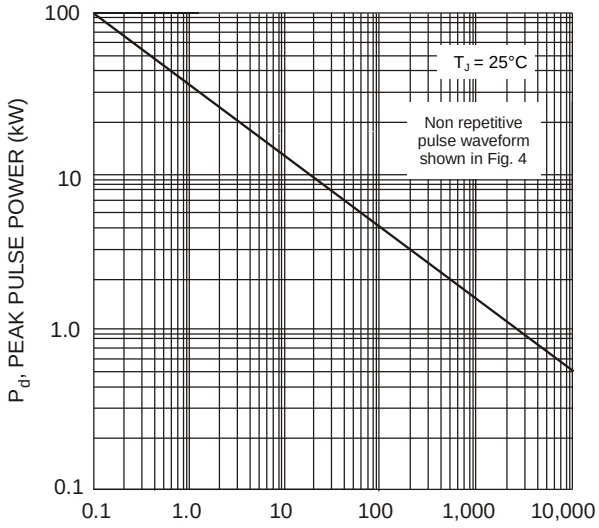



Fig. 3 Pulse Rating Curve

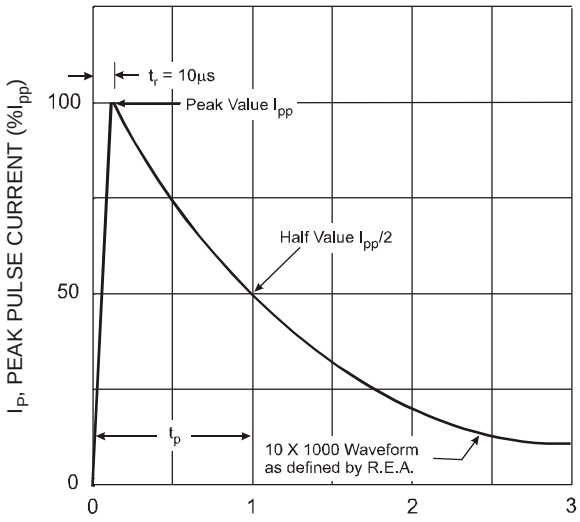



Fig. 4 Pulse Waveform

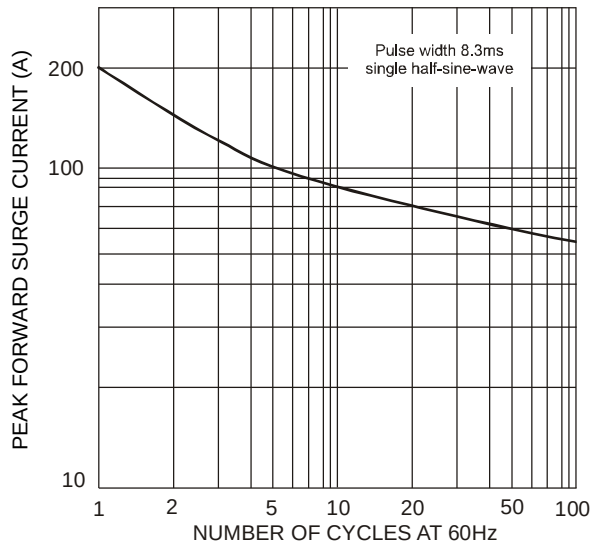



Fig. 5 Maximum Non-Repetitive Surge Current

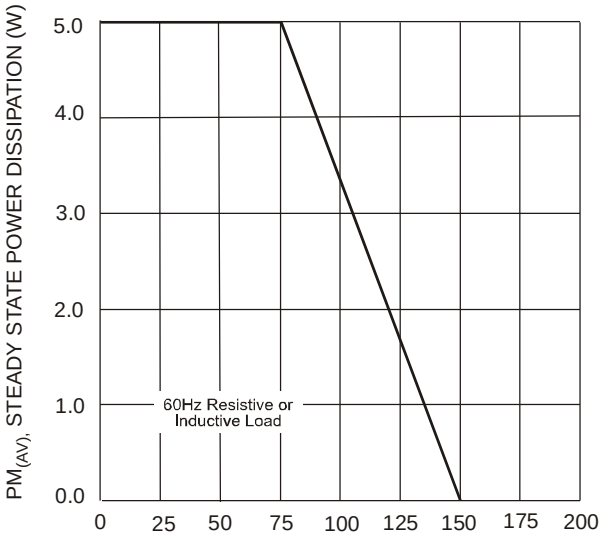
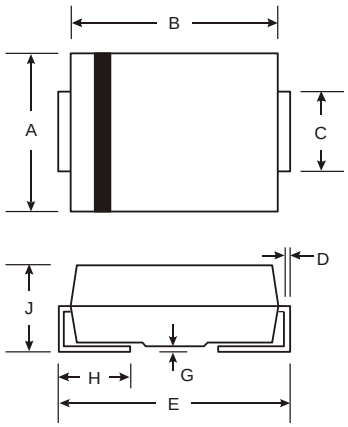



Fig. 6 Steady State Power Derating Curve

## Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

**SMC**

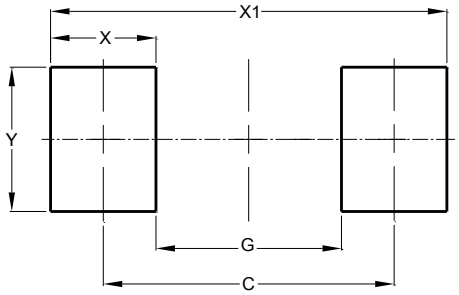



| SMC | | |
|---|---|---|
| **Dim** | **Min** | **Max** |
| **A** | 5.59 | 6.22 |
| **B** | 6.60 | 7.11 |
| **C** | 2.75 | 3.18 |
| **D** | 0.15 | 0.31 |
| **E** | 7.75 | 8.13 |
| **G** | 0.10 | 0.20 |
| **H** | 0.76 | 1.52 |
| **J** | 2.00 | 2.50 |
| **All Dimensions in mm** | | |

## Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

**SMC**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 6.90 |
| **G** | 4.40 |
| **X** | 2.50 |
| **X1** | 9.40 |
| **Y** | 3.30 |

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