



THE DATASHEET OF SMDJ13



SMDJ Series



Agency Approvals

| Agency | Agency File Number |
|--------|--------------------|
| | E230531 |

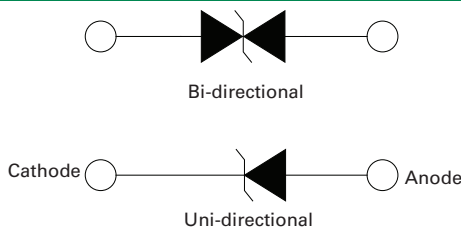
Maximum Ratings and Thermal Characteristics (T_A=25°C unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|--|------------------|------------|------|
| Peak Pulse Power Dissipation(Fig.2) by 10/1000us Test Waveform(Fig.4) (Note 1),(Note 2) -Single Die Parts | P _{PPM} | 3000 | W |
| Peak Pulse Power Dissipation(Fig.2) by 10/1000us Test Waveform(Fig.4) (Note 1), (Note 2) -Stacked Die Parts (Note 5) | P _{PPM} | 4000 | W |
| Power Dissipation on Infinite Heat Sink at T _c =50°C | P _D | 6.5 | W |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3) | I _{FSM} | 300 | A |
| Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only(Note 4) | V _F | 3.5/5.0 | V |
| Operating Temperature Range | T _J | -65 to 150 | °C |
| Storage Temperature Range | T _{STG} | -65 to 175 | °C |
| Typical Thermal Resistance Junction to Lead | R _{θJL} | 15 | °C/W |
| Typical Thermal Resistance Junction to Ambient | R _{θJA} | 75 | °C/W |

Notes:

1. Non-repetitive current pulse, per Fig. 4 and derated above T_J (initial) =25°C per Fig. 3.
2. Mounted on copper pad area of 0.31x0.31" (8.0 x 8.0mm) to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional component only, duty cycle=4 per minute maximum.
4. V_F < 3.5V for single die parts and V_F < 5.0V for stacked-die parts.
5. For stacked die component details, please refer to part numbers labeled by * in Electrical Characteristics.

Functional Diagram



Description

The SMDJ series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

Features

- 3000W P_{PPM} capability at 10/1000µs waveform, repetition rate (duty cycles):0.01%
- For surface mounted applications in order to optimize board space
- Low profile package
- Typical failure mode is short from over-specified voltage or current
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- IEC-61000-4-2 ESD 30kV(Air), 30kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2
- EFT protection of data lines in accordance with IEC 61000-4-4
- Built-in strain relief
- Glass passivated chip junction
- Fast response time: typically less than 1.0ps from 0V to BV min
- Excellent clamping capability
- Low incremental surge resistance
- Typical I_r less than 2µA when V_{BR} min>12V
- High temperature to reflow soldering guaranteed: 260°C/30sec
- V_{BR} @ T_J = V_{BR} @ 25°C x (1 + αT x (T_J - 25)) (αT: Temperature Coefficient, typical value is 0.1%)
- UL Recognized compound meeting flammability rating V-0
- Meet MSL level1, per J-STD-020, LF maximum peak of 260°C
- Matte tin lead-free plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

Applications

TVS components are ideal for the protection of I/O Interfaces, V_{CC} bus and other vulnerable circuits used in telecom, computer, Industrial and consumer electronic applications.

Additional Information



Electrical Characteristics (T_a=25°C unless otherwise noted)

| Part Number (Uni) | Part Number (Bi) | Marking | | Reverse Stand off Voltage V | Breakdown Voltage V | | Test Current I _r (mA) | Maximum Clamping Voltage VC @ I _{pp} (10/1000µs) (V) | Maximum Peak Pulse Current I _{pp} (10/1000µs) (A) | Maximum Clamping Voltage VC @ I _{pp} (8/20µs) (V) | Maximum Peak Pulse Current I _{pp} (8/20µs) (A) | Maximum Reverse Leakage IR @ VR (µA) | Maximum Temperature coefficient of VBR (%/C) | Agency Approval |
|-------------------|------------------|---------|-----|-----------------------------|---------------------|--------|----------------------------------|---|--|--|---|--------------------------------------|--|-----------------|
| | | UNI | BI | | MIN | MAX | | | | | | | | |
| SMDJ5.0A | SMDJ5.0CA | RDE | DDE | 5.0 | 6.40 | 7.00 | 10 | 9.2 | 326.1 | 11.89 | 1630.5 | 800 | 0.041 | X |
| SMDJ6.0A | SMDJ6.0CA | RDG | DDG | 6.0 | 6.67 | 7.37 | 10 | 10.3 | 291.3 | 13.31 | 1456.5 | 800 | 0.046 | X |
| SMDJ6.5A | SMDJ6.5CA | RDK | DDK | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 267.9 | 14.47 | 1339.5 | 500 | 0.052 | X |
| SMDJ7.0A | SMDJ7.0CA | PDM | DDM | 7.0 | 7.78 | 8.60 | 10 | 12.0 | 250.0 | 15.50 | 1250.0 | 200 | 0.058 | X |
| SMDJ7.5A | SMDJ7.5CA | PDP | DDP | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 232.6 | 16.67 | 1163.0 | 100 | 0.061 | X |
| SMDJ8.0A | SMDJ8.0CA | PDR | DDR | 8.0 | 8.89 | 9.83 | 1 | 13.6 | 220.6 | 17.57 | 1103.0 | 50 | 0.064 | X |
| SMDJ8.5A | SMDJ8.5CA | PDT | DDT | 8.5 | 9.44 | 10.40 | 1 | 14.4 | 208.3 | 18.60 | 1041.5 | 20 | 0.066 | X |
| SMDJ9.0A | SMDJ9.0CA | PDV | DDV | 9.0 | 10.00 | 11.10 | 1 | 15.4 | 194.8 | 19.90 | 974.0 | 10 | 0.069 | X |
| SMDJ10A | SMDJ10CA | PDX | DDX | 10.0 | 11.10 | 12.30 | 1 | 17.0 | 176.5 | 21.96 | 882.5 | 5 | 0.071 | X |
| SMDJ11A | SMDJ11CA | PDZ | DDZ | 11.0 | 12.20 | 13.50 | 1 | 18.2 | 164.8 | 23.51 | 824.0 | 2 | 0.074 | X |
| SMDJ12A | SMDJ12CA | PEE | DEE | 12.0 | 13.30 | 14.70 | 1 | 19.9 | 150.8 | 25.71 | 754.0 | 2 | 0.075 | X |
| SMDJ13A | SMDJ13CA | PEG | DEG | 13.0 | 14.40 | 15.90 | 1 | 21.5 | 139.5 | 27.78 | 697.5 | 2 | 0.076 | X |
| SMDJ14A | SMDJ14CA | PEK | DEK | 14.0 | 15.60 | 17.20 | 1 | 23.2 | 129.3 | 29.97 | 646.5 | 2 | 0.08 | X |
| SMDJ15A | SMDJ15CA | PEM | DEM | 15.0 | 16.70 | 18.50 | 1 | 24.4 | 123.0 | 31.52 | 615.0 | 2 | 0.083 | X |
| SMDJ16A | SMDJ16CA | PEP | DEP | 16.0 | 17.80 | 19.70 | 1 | 26.0 | 115.4 | 33.59 | 577.0 | 2 | 0.084 | X |
| SMDJ17A | SMDJ17CA | PER | DER | 17.0 | 18.90 | 20.90 | 1 | 27.6 | 108.7 | 35.66 | 543.5 | 2 | 0.085 | X |
| SMDJ18A | SMDJ18CA | PET | DET | 18.0 | 20.00 | 22.10 | 1 | 29.2 | 102.7 | 37.73 | 513.5 | 2 | 0.088 | X |
| SMDJ20A | SMDJ20CA | PEV | DEV | 20.0 | 22.20 | 24.50 | 1 | 32.4 | 92.6 | 41.86 | 463.0 | 2 | 0.091 | X |
| SMDJ22A | SMDJ22CA | PEX | DEX | 22.0 | 24.40 | 26.90 | 1 | 35.5 | 84.5 | 45.87 | 422.5 | 2 | 0.092 | X |
| SMDJ24A | SMDJ24CA | PEZ | DEZ | 24.0 | 26.70 | 29.50 | 1 | 38.9 | 77.1 | 50.26 | 385.5 | 2 | 0.092 | X |
| SMDJ26A | SMDJ26CA | PFE | DFE | 26.0 | 28.90 | 31.90 | 1 | 42.1 | 71.3 | 54.39 | 356.5 | 2 | 0.093 | X |
| SMDJ28A | SMDJ28CA | PFG | DFG | 28.0 | 31.10 | 34.40 | 1 | 45.4 | 66.1 | 58.66 | 330.5 | 2 | 0.094 | X |
| SMDJ30A | SMDJ30CA | PFK | DFK | 30.0 | 33.30 | 36.80 | 1 | 48.4 | 62.0 | 62.53 | 310.0 | 2 | 0.096 | X |
| SMDJ33A | SMDJ33CA | PFM | DFM | 33.0 | 36.70 | 40.60 | 1 | 53.3 | 56.3 | 68.86 | 281.5 | 2 | 0.097 | X |
| SMDJ36A | SMDJ36CA | PFP | DFP | 36.0 | 40.00 | 44.20 | 1 | 58.1 | 51.6 | 75.06 | 258.0 | 2 | 0.098 | X |
| SMDJ40A | SMDJ40CA | PFR | DFR | 40.0 | 44.40 | 49.10 | 1 | 64.5 | 46.5 | 83.33 | 232.5 | 2 | 0.099 | X |
| SMDJ43A | SMDJ43CA | PFT | DFT | 43.0 | 47.80 | 52.80 | 1 | 69.4 | 43.2 | 89.66 | 216.0 | 2 | 0.1 | X |
| SMDJ45A | SMDJ45CA | PFV | DFV | 45.0 | 50.00 | 55.30 | 1 | 72.7 | 41.3 | 93.93 | 206.5 | 2 | 0.101 | X |
| SMDJ48A | SMDJ48CA | PFX | DFX | 48.0 | 53.30 | 58.90 | 1 | 77.4 | 38.8 | 100.00 | 194.0 | 2 | 0.101 | X |
| SMDJ51A | SMDJ51CA | PFZ | DFZ | 51.0 | 56.70 | 62.70 | 1 | 82.4 | 36.4 | 106.46 | 182.0 | 2 | 0.101 | X |
| SMDJ54A | SMDJ54CA | RGE | DGE | 54.0 | 60.00 | 66.30 | 1 | 87.1 | 34.4 | 112.53 | 172.0 | 2 | 0.102 | X |
| SMDJ58A | SMDJ58CA | PGG | DGG | 58.0 | 64.40 | 71.20 | 1 | 93.6 | 32.1 | 120.93 | 160.5 | 2 | 0.103 | X |
| SMDJ60A | SMDJ60CA | PGK | DGK | 60.0 | 66.70 | 73.70 | 1 | 96.8 | 31.0 | 125.06 | 155.0 | 2 | 0.103 | X |
| SMDJ64A | SMDJ64CA | PGM | DGM | 64.0 | 71.10 | 78.60 | 1 | 103.0 | 29.1 | 133.07 | 145.5 | 2 | 0.104 | X |
| SMDJ70A | SMDJ70CA | PGP | DGP | 70.0 | 77.80 | 86.00 | 1 | 113.0 | 26.5 | 145.99 | 132.5 | 2 | 0.105 | X |
| SMDJ75A | SMDJ75CA | PGR | DGR | 75.0 | 83.30 | 92.10 | 1 | 121.0 | 24.8 | 156.33 | 124.0 | 2 | 0.106 | X |
| SMDJ78A | SMDJ78CA | PGT | DGT | 78.0 | 86.70 | 95.80 | 1 | 126.0 | 23.8 | 162.79 | 119.0 | 2 | 0.106 | X |
| SMDJ85A | SMDJ85CA | PGV | DGV | 85.0 | 94.40 | 104.00 | 1 | 137.0 | 21.9 | 177.00 | 109.5 | 2 | 0.106 | X |
| SMDJ90A | SMDJ90CA | PGX | DGX | 90.0 | 100.00 | 111.00 | 1 | 146.0 | 20.5 | 188.63 | 102.5 | 2 | 0.107 | X |
| SMDJ100A | SMDJ100CA | PGZ | DGZ | 100.0 | 111.00 | 123.00 | 1 | 162.0 | 18.5 | 209.30 | 92.5 | 2 | 0.107 | X |
| SMDJ110A | SMDJ110CA | PHE | DHE | 110.0 | 122.00 | 135.00 | 1 | 177.0 | 16.9 | 228.68 | 84.5 | 2 | 0.107 | X |
| SMDJ120A | SMDJ120CA | PHG | DHG | 120.0 | 133.00 | 147.00 | 1 | 193.0 | 15.5 | 249.35 | 77.5 | 2 | 0.108 | X |
| SMDJ130A | SMDJ130CA | PHK | DHK | 130.0 | 144.00 | 159.00 | 1 | 209.0 | 14.4 | 270.03 | 72.0 | 2 | 0.108 | X |
| SMDJ150A | - | PHM | - | 150.0 | 167.00 | 185.00 | 1 | 243.0 | 12.3 | 313.95 | 61.5 | 2 | 0.108 | X |
| - | SMDJ150CA* | - | DHM | 150.0 | 167.00 | 185.00 | 1 | 243.0 | 16.5 | 313.95 | 61.5 | 2 | 0.108 | X |
| SMDJ160A | - | PHP | - | 160.0 | 178.00 | 197.00 | 1 | 259.0 | 11.6 | 334.63 | 58.0 | 2 | 0.108 | X |
| - | SMDJ160CA* | - | DHP | 160.0 | 178.00 | 197.00 | 1 | 259.0 | 15.5 | 334.63 | 58.0 | 2 | 0.108 | X |
| SMDJ170A | - | PHR | - | 170.0 | 189.00 | 209.00 | 1 | 275.0 | 10.9 | 355.30 | 54.5 | 2 | 0.108 | X |
| - | SMDJ170CA* | - | DHR | 170.0 | 189.00 | 209.00 | 1 | 275.0 | 14.6 | 355.30 | 54.5 | 2 | 0.108 | X |
| SMDJ180A* | SMDJ180CA* | PHT | DHT | 180.0 | 200.00 | 221.00 | 1 | 292.0 | 13.7 | 377.26 | 51.5 | 2 | 0.108 | X |
| SMDJ200A* | SMDJ200CA* | PHV | DHV | 200.0 | 224.00 | 247.00 | 1 | 324.0 | 12.4 | 418.60 | 46.5 | 2 | 0.11 | X |
| SMDJ220A* | SMDJ220CA* | PKE | DKE | 220.0 | 244.00 | 270.00 | 1 | 356.0 | 11.3 | 459.95 | 42.0 | 2 | 0.11 | X |
| SMDJ250A* | SMDJ250CA* | PKG | DKG | 250.0 | 279.00 | 309.00 | 1 | 405.0 | 9.9 | 523.26 | 37.5 | 2 | 0.11 | X |
| SMDJ300A* | SMDJ300CA* | PKI | DKI | 300.0 | 335.00 | 371.00 | 1 | 486.0 | 8.3 | 627.91 | 31.0 | 2 | 0.112 | X |
| SMDJ350A* | SMDJ350CA* | PKJ | DKJ | 350.0 | 391.00 | 432.00 | 1 | 567.0 | 7.1 | 732.56 | 26.5 | 2 | 0.112 | X |
| SMDJ400A* | SMDJ400CA* | PKL | DKL | 400.0 | 447.00 | 494.00 | 1 | 648.0 | 6.2 | 837.21 | 23.5 | 2 | 0.112 | X |
| SMDJ440A* | SMDJ440CA* | PKN | DKN | 440.0 | 492.00 | 543.00 | 1 | 713.0 | 5.7 | 921.19 | 21.5 | 2 | 0.112 | X |

For bidirectional type having V_R of 10 volts and less, the I_R limit is double.

For stack-die parts, use * to label the part number.

I-V Curve Characteristics



- P_{PPM} Peak Pulse Power Dissipation** – Max power dissipation
- V_R Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation
- V_{BR} Breakdown Voltage** – Maximum voltage that flows though the TVS at a specified test current (I_r)
- V_c Clamping Voltage** – Peak voltage measured across the TVS at a specified I_{ppm} (peak impulse current)
- I_R Reverse Leakage Current** – Current measured at V_R
- V_F Forward Voltage Drop for Uni-directional**

Ratings and Characteristic Curves ($T_A=25^\circ\text{C}$ unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform



Figure 2 - Peak Pulse Power Rating



continues on next page.

Ratings and Characteristic Curves ($T_A=25^\circ\text{C}$ unless otherwise noted) (Continued)

Figure 3 - Peak Pulse Power Derating Curve



Figure 4 - Pulse Waveform



Figure 5 - Typical Junction Capacitance



Figure 6 - Typical Transient Thermal Impedance



Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only



Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)



Soldering Parameters

| | | |
|--|------------------------------------|-------------------------|
| Reflow Condition | | Lead-free assembly |
| Pre Heat | - Temperature Min ($T_{s(min)}$) | 150°C |
| | - Temperature Max ($T_{s(max)}$) | 200°C |
| | - Time (min to max) (t_s) | 60 – 120 secs |
| Average ramp up rate (Liquidus Temp (T_L) to peak) | | 3°C/second max |
| $T_{s(max)}$ to T_L - Ramp-up Rate | | 3°C/second max |
| Reflow | - Temperature (T_L) (Liquidus) | 217°C |
| | - Time (min to max) (t_r) | 60 – 150 seconds |
| Peak Temperature (T_p) | | 260 ^{+0/-5} °C |
| Time within 5°C of actual peak Temperature (t_p) | | 30 seconds max |
| Ramp-down Rate | | 6°C/second max |
| Time 25°C to peak Temperature (T_p) | | 8 minutes Max. |
| Do not exceed | | 260°C |



Physical Specifications

| | |
|-----------------|--|
| Weight | 0.007 ounce, 0.21 grams |
| Case | JEDEC DQ214AB. Molded plastic body over glass passivated junction |
| Polarity | Color band denotes positive end (cathode) except for bidirectional versions. |
| Terminal | Matte Tin-plated leads, Solderable per JESD22-B102 |

Environmental Specifications

| | |
|----------------------------|--------------------------|
| High Temp. Storage | JESD22-A103 |
| HTRB | JESD22-A108 |
| Temperature Cycling | JESD22-A104 |
| MSL | JEDEC-J-STD-020, Level 1 |
| H3TRB | JESD22-A101 |
| RSH | JESD22-A111 |

Dimensions

DO-214AB (SMC J-Bend)



| Dimensions | Inches | | Millimeters | |
|------------|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.114 | 0.126 | 2.900 | 3.200 |
| B | 0.260 | 0.280 | 6.600 | 7.110 |
| C | 0.220 | 0.245 | 5.590 | 6.220 |
| D | 0.079 | 0.103 | 2.060 | 2.620 |
| E | 0.030 | 0.060 | 0.760 | 1.520 |
| F | - | 0.008 | - | 0.203 |
| G | 0.305 | 0.320 | 7.750 | 8.130 |
| H | 0.006 | 0.012 | 0.152 | 0.305 |
| I | 0.129 | - | 3.300 | - |
| J | 0.094 | - | 2.400 | - |
| K | - | 0.165 | - | 4.200 |
| L | 0.094 | - | 2.400 | - |

Part Numbering System



Part Marking System



Packaging Options

| Part number | Component Package | Quantity | Packaging Option | Packaging Specification |
|--------------|-------------------|----------|----------------------------------|-------------------------|
| SMDJxxxXX | DO-214AB | 3000 | Tape & Reel - 16mm tape/13" reel | EIA STD RS-481 |
| SMDJxxxXX-T7 | DO-214AB | 500 | Tape & Reel - 16mm tape/7" reel | EIA STD RS-481 |


Tape and Reel Specification



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