



THE DATASHEET OF SMCG17A-HRA



SMCG-HRA Series



Agency Approvals

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

Maximum Ratings and Thermal Characteristics
($T_A=25^{\circ}\text{C}$ unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|---|-----------------|------------|----------------------|
| Peak Pulse Power Dissipation (IPP x VC) by 10/1000 μs waveform (Fig.2)(Note 1), (Note 2) | P_{PPM} | 1500 | W |
| Power Dissipation on infinite heat sink at $T_A=50^{\circ}\text{C}$ | $P_{M(AV)}$ | 6.5 | W |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3) | I_{FSM} | 200 | A |
| Maximum Instantaneous Forward Voltage at 100A for Unidirectional only | V_F | 3.5 | V |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -65 to 150 | $^{\circ}\text{C}$ |
| Typical Thermal Resistance Junction to Lead | $R_{\theta JL}$ | 15 | $^{\circ}\text{C/W}$ |
| Typical Thermal Resistance Junction to Ambient | $R_{\theta JA}$ | 75 | $^{\circ}\text{C/W}$ |

Notes:
 1. Non-repetitive current pulse per Fig. 4 and derated above $T_A = 25^{\circ}\text{C}$ 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.

Functional Diagram



Description

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

Features

- High-Reliability up-screened for critical applications require higher reliability performance and low infant mortality failures.
- Excellent clamping capability
- Low incremental surge resistance
- Typical I_R less than $1\mu\text{A}$ when $V_{BR\ min} > 12\text{V}$
- Surface mount component to optimize board space
- L bend lead forming gives best solderability for High reliability application
- 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)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Built-in strain relief
- Fast response time: typically less than 1.0ps from 0V to $V_{BR\ min}$
- 1500W peak pulse power capability at 10/1000 μs waveform, repetition rate (duty cycles):0.01%
- $V_{BR} @ T_J = V_{BR} @ 25^{\circ}\text{C} \times (1 + \alpha T \times (T_J - 25))$ (α T:Temperature Coefficient, typical value is 0.1%)
- Glass passivated chip junction
- High temperature soldering guaranteed: 260 $^{\circ}\text{C}$ /10 seconds at terminals
- Meet MSL level1, per J-STD-020
- Matte tin lead-free plated
- Halogen free
- RoHS compliant with exemption 7a and 7c-I
- 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.

Electrical Characteristics

| Part Number (Uni) | Part Number (Bi) | Marking | | Reverse Stand off Voltage V_R (Volts) | Breakdown Voltage V_{BR} (Volts) @ I_T | | Test Current I_T (mA) | Maximum Clamping Voltage V_C @ I_{PP} (V) | Maximum Peak Pulse Current I_{PP} (A) | Maximum Reverse Leakage I_R @ V_R (μ A) | Agency Approval  |
|-------------------|------------------|---------|------|---|--|--------|-------------------------|---|---|--|---|
| | | UNI | BI | | MIN | MAX | | | | | |
| SMCG5.0A-HRA | SMCG5.0CA-HRA | GDEH | BDEH | 5.0 | 6.40 | 7.00 | 10 | 9.2 | 163.0 | 800 | X |
| SMCG6.0A-HRA | SMCG6.0CA-HRA | GDGH | BDGH | 6.0 | 6.67 | 7.37 | 10 | 10.3 | 145.7 | 800 | X |
| SMCG6.5A-HRA | SMCG6.5CA-HRA | GDKH | BDKH | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 134.0 | 500 | X |
| SMCG7.0A-HRA | SMCG7.0CA-HRA | GDMH | BDMH | 7.0 | 7.78 | 8.60 | 10 | 12.0 | 125.0 | 200 | X |
| SMCG7.5A-HRA | SMCG7.5CA-HRA | GDPH | BDPH | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 116.3 | 100 | X |
| SMCG8.0A-HRA | SMCG8.0CA-HRA | GDRH | BDRH | 8.0 | 8.89 | 9.83 | 1 | 13.6 | 110.3 | 50 | X |
| SMCG8.5A-HRA | SMCG8.5CA-HRA | GDTH | BDTH | 8.5 | 9.44 | 10.40 | 1 | 14.4 | 104.2 | 20 | X |
| SMCG9.0A-HRA | SMCG9.0CA-HRA | GDVH | BDVH | 9.0 | 10.00 | 11.10 | 1 | 15.4 | 97.4 | 10 | X |
| SMCG10A-HRA | SMCG10CA-HRA | GDXH | BDXH | 10.0 | 11.10 | 12.30 | 1 | 17.0 | 88.3 | 5 | X |
| SMCG11A-HRA | SMCG11CA-HRA | GDZH | BDZH | 11.0 | 12.20 | 13.50 | 1 | 18.2 | 82.5 | 1 | X |
| SMCG12A-HRA | SMCG12CA-HRA | GEEH | BEEH | 12.0 | 13.30 | 14.70 | 1 | 19.9 | 75.4 | 1 | X |
| SMCG13A-HRA | SMCG13CA-HRA | GEGH | BEGH | 13.0 | 14.40 | 15.90 | 1 | 21.5 | 69.8 | 1 | X |
| SMCG14A-HRA | SMCG14CA-HRA | GEKH | BEKH | 14.0 | 15.60 | 17.20 | 1 | 23.2 | 64.7 | 1 | X |
| SMCG15A-HRA | SMCG15CA-HRA | GEMH | BEMH | 15.0 | 16.70 | 18.50 | 1 | 24.4 | 61.5 | 1 | X |
| SMCG16A-HRA | SMCG16CA-HRA | GEPH | BEPH | 16.0 | 17.80 | 19.70 | 1 | 26.0 | 57.7 | 1 | X |
| SMCG17A-HRA | SMCG17CA-HRA | GERH | BERH | 17.0 | 18.90 | 20.90 | 1 | 27.6 | 54.4 | 1 | X |
| SMCG18A-HRA | SMCG18CA-HRA | GETH | BETH | 18.0 | 20.00 | 22.10 | 1 | 29.2 | 51.4 | 1 | X |
| SMCG20A-HRA | SMCG20CA-HRA | GEVH | BEVH | 20.0 | 22.20 | 24.50 | 1 | 32.4 | 46.3 | 1 | X |
| SMCG22A-HRA | SMCG22CA-HRA | GEXH | BEXH | 22.0 | 24.40 | 26.90 | 1 | 35.5 | 42.3 | 1 | X |
| SMCG24A-HRA | SMCG24CA-HRA | GEZH | BEZH | 24.0 | 26.70 | 29.50 | 1 | 38.9 | 38.6 | 1 | X |
| SMCG26A-HRA | SMCG26CA-HRA | GFEH | BFEH | 26.0 | 28.90 | 31.90 | 1 | 42.1 | 35.7 | 1 | X |
| SMCG28A-HRA | SMCG28CA-HRA | GFGH | BFGH | 28.0 | 31.10 | 34.40 | 1 | 45.4 | 33.1 | 1 | X |
| SMCG30A-HRA | SMCG30CA-HRA | GFKH | BFKH | 30.0 | 33.30 | 36.80 | 1 | 48.4 | 31.0 | 1 | X |
| SMCG33A-HRA | SMCG33CA-HRA | GFMH | BFMH | 33.0 | 36.70 | 40.60 | 1 | 53.3 | 28.2 | 1 | X |
| SMCG36A-HRA | SMCG36CA-HRA | GFPH | BFPH | 36.0 | 40.00 | 44.20 | 1 | 58.1 | 25.9 | 1 | X |
| SMCG40A-HRA | SMCG40CA-HRA | GFRH | BFRH | 40.0 | 44.40 | 49.10 | 1 | 64.5 | 23.3 | 1 | X |
| SMCG43A-HRA | SMCG43CA-HRA | GFTH | BFTH | 43.0 | 47.80 | 52.80 | 1 | 69.4 | 21.7 | 1 | X |
| SMCG45A-HRA | SMCG45CA-HRA | GFVH | BFVH | 45.0 | 50.00 | 55.30 | 1 | 72.7 | 20.6 | 1 | X |
| SMCG48A-HRA | SMCG48CA-HRA | GFXH | BFXH | 48.0 | 53.30 | 58.90 | 1 | 77.4 | 19.4 | 1 | X |
| SMCG51A-HRA | SMCG51CA-HRA | GFZH | BFZH | 51.0 | 56.70 | 62.70 | 1 | 82.4 | 18.2 | 1 | X |
| SMCG54A-HRA | SMCG54CA-HRA | GGEH | BGEH | 54.0 | 60.00 | 66.30 | 1 | 87.1 | 17.3 | 1 | X |
| SMCG58A-HRA | SMCG58CA-HRA | GGGH | BGGH | 58.0 | 64.40 | 71.20 | 1 | 93.6 | 16.1 | 1 | X |
| SMCG60A-HRA | SMCG60CA-HRA | GGKH | BGKH | 60.0 | 66.70 | 73.70 | 1 | 96.8 | 15.5 | 1 | X |
| SMCG64A-HRA | SMCG64CA-HRA | GGMH | BGMH | 64.0 | 71.10 | 78.60 | 1 | 103.0 | 14.6 | 1 | X |
| SMCG70A-HRA | SMCG70CA-HRA | GGPH | BGPH | 70.0 | 77.80 | 86.00 | 1 | 113.0 | 13.3 | 1 | X |
| SMCG75A-HRA | SMCG75CA-HRA | GGRH | BGRH | 75.0 | 83.30 | 92.10 | 1 | 121.0 | 12.4 | 1 | X |
| SMCG78A-HRA | SMCG78CA-HRA | GGTH | BGTH | 78.0 | 86.70 | 95.80 | 1 | 126.0 | 11.9 | 1 | X |
| SMCG85A-HRA | SMCG85CA-HRA | GGVH | BGVH | 85.0 | 94.40 | 104.00 | 1 | 137.0 | 11.0 | 1 | X |
| SMCG90A-HRA | SMCG90CA-HRA | GGXH | BGXH | 90.0 | 100.00 | 111.00 | 1 | 146.0 | 10.3 | 1 | X |
| SMCG100A-HRA | SMCG100CA-HRA | GGZH | BGZH | 100.0 | 111.00 | 123.00 | 1 | 162.0 | 9.3 | 1 | X |
| SMCG110A-HRA | SMCG110CA-HRA | GHEH | BHEH | 110.0 | 122.00 | 135.00 | 1 | 177.0 | 8.5 | 1 | X |
| SMCG120A-HRA | SMCG120CA-HRA | GHHH | BHHH | 120.0 | 133.00 | 147.00 | 1 | 193.0 | 7.8 | 1 | X |
| SMCG130A-HRA | SMCG130CA-HRA | GHHH | BHHH | 130.0 | 144.00 | 159.00 | 1 | 209.0 | 7.2 | 1 | X |

Screen Process

| | |
|---|-----------------------------------|
| 100% vision inspection | MIL-STD-750 method 2074 |
| 100% High Temperature Storage Life (168hrs, 175C) | MIL-STD-750 method 1031 |
| 100% X-RAY inspection | MIL-STD-750 method 2076 |
| 100% Temperature cycle test (-55-150C, 20 cycles, dwell time 15 min) | MIL-STD-750 method 1051 |
| 100% Reflow (2x) | JEDEC J-STD-020 |
| 100% surge test (2x) | MIL-STD-750 method 4066 |
| 100% HTRB(150C, Bias=VR(80% breakdown voltage), 96hrs), for Bi-direction products, 96hrs for each direction | MIL-STD-750 method 1038 |
| Final electrical test(100% 3 sigma limit, 100% dynamic test and PAT limit) | MIL-STD-750 method 4016.4021.4011 |

Note: Up-screen program can be specified by customer's request by contacting Littelfuse customer service

I-V Curve Characteristics



- P_{PPM}** Peak Pulse Power Dissipation (IPP x VC)-- 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 through the TVS at a specified test current (I_T)
- 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°C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

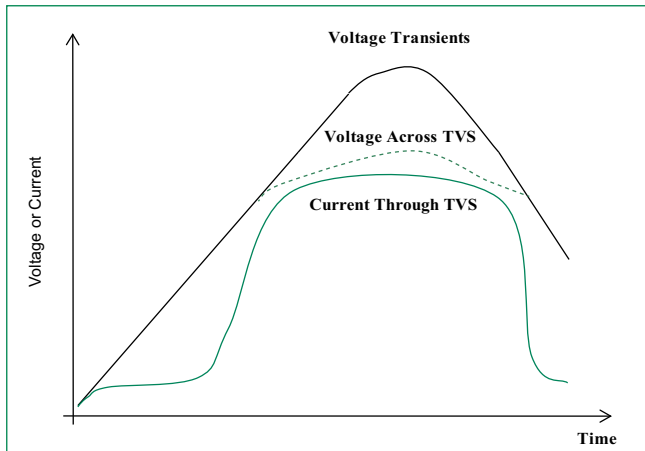


Figure 2 - Peak Pulse Power Rating



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



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_s) | 60 – 150 seconds |
| Peak Temperature (T_p) | | 260 ^{+0/-5} °C |
| Time within 5°C of actual peak Temperature (t_p) | | 30 seconds |
| 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 DO-215AB. Molded plastic body over glass passivated junction |
| Polarity | Color band denotes cathode for unidirectional components |

Environmental Specifications

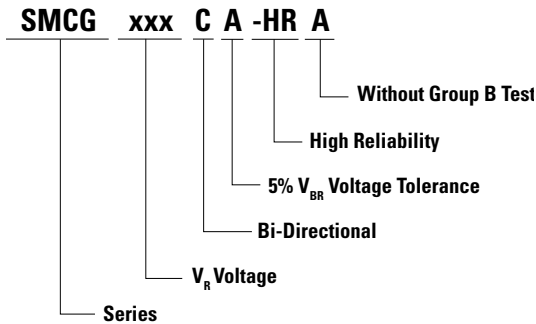
| | |
|---------------------------|--------------------------|
| High Temp. Storage | JESD22-A103 |
| HTRB | JESD22-A108 |
| Thermal Shock | JESD22-A106 |
| MSL | JEDEC-J-STD-020, Level 1 |
| H3TRB | JESD22-A101 |

Dimensions



| Dimensions | Inches | | Millimeters | |
|------------|--------|-------|-------------|--------|
| | Min | Max | Min | Max |
| A | 0.115 | 0.125 | 2.920 | 3.170 |
| B | 0.260 | 0.280 | 6.600 | 7.110 |
| C | 0.220 | 0.245 | 5.590 | 6.220 |
| D | 0.075 | 0.095 | 1.900 | 2.410 |
| E | 0.038 | 0.058 | 0.970 | 1.470 |
| F | - | 0.020 | - | 0.510 |
| G | 0.380 | 0.400 | 9.640 | 10.160 |
| H | 0.024 | 0.040 | 0.610 | 1.020 |
| I | 0.006 | 0.016 | 0.150 | 0.410 |
| J | - | 0.050 | - | 1.270 |
| K | - | 0.310 | - | 7.870 |
| L | - | 0.050 | - | 1.270 |
| M | - | 0.125 | - | 3.170 |
| N | 0.002 | 0.008 | 0.050 | 0.200 |

Part Numbering System



Part Marking System



Packaging

| Part number | Component Package | Quantity | Packaging Option | Packaging Specification |
|---------------|-------------------|----------|-----------------------------------|-------------------------|
| SMCGxxxXX-HRA | DO-215AB | 1500 | Tape & Reel – 24mm tape /13" reel | EIA STD RS-481 |

Tape and Reel Specification



Looking for pricing, stock, or lifecycle information?

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