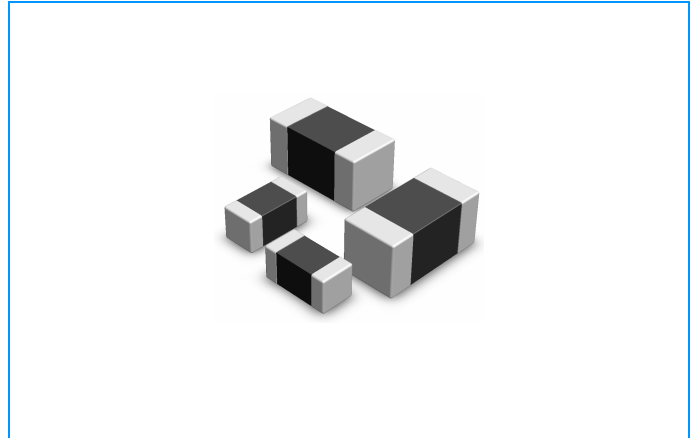


Surface Mount Multilayer Varistor

SC0402ML - SC0603ML Series

Description

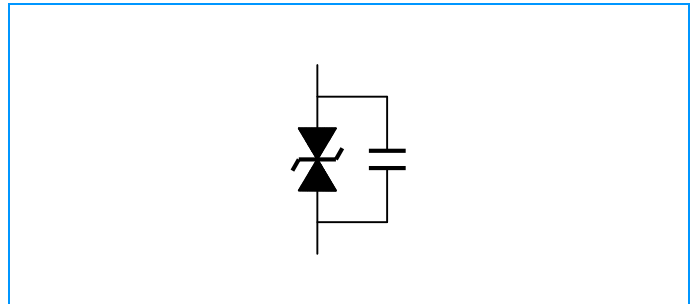
The SC Series is based on Multilayer fabrication technology. These components are designed to suppress a variety of transient events, including those specified in IEC 61000-4-2 or other standards used for Electromagnetic Compliance (EMC). The SC Series is typically applied to protect integrated circuits and other components at the circuit board level. It can operate over a wider temperature range than zener diodes.



Features

- u SMD type zinc oxide based ceramic chip
- u Lead free plating termination provided good solderability characteristic
- u Insulator overcoat keeps excellent low and stable leakage current
- u Quick response time (<1ns)
- u Low clamping voltage
- u High transient current capability
- u Meet IEC 61000-4-2 standard
- u Compact size for EIA 0402, 0603

Equivalent Circuits



Applicable

- u Application for Mother Board, Notebook, Cellular Phone, PDA, handheld device, DSC, DV, Scanner, and Set- Top Box...etc.
- u Suitable for Push-Button, Power Line and Low Frequency single line over-voltage protect.

Explanation of Part Number

| | | | | |
|-----------|-------------|-----------|------------|----------|
| SC | 0402 | ML | 080 | M |
| (1) | (2) | (3) | (4) | (5) |

- (1) Socay Logo
- (2) Chip Size (EIA): 0402 / 0603
- (3) Series Type: ML- Multilayer Varistor
- (4) Varistor Voltage: Value - 080= 08X10⁰=8V, 120=12X10⁰=12V
- (5) Varistor Voltage Tolerance: N - ±30%, M - ±20%, L - ±15%, K - ±10%

Surface Mount Multilayer Varistor

SC0402ML - SC0603ML Series

Electrical Characteristics (25±5° C)

SC0402ML Series

| Symbol | Working Voltage | | Varistor Voltage | | Clamping Voltage | Capacitance | Peak Current | Transient Energy |
|--------------|-----------------|--------------|------------------|--------------|------------------|--------------|--------------|------------------|
| | V_{RMS} | V_{DC} | V_V | ΔV_V | V_C | C_P | I_{max} | W_{max} |
| Units | Volts (Max.) | Volts (Max.) | Volts | % | Volts (Max.) | pF (Typical) | Amps (Max.) | Joules (Max.) |
| SC0402ML080M | 4 | 5.5 | 8 | ±20 | 19 | 270 | 20 | 0.05 |
| SC0402ML120M | 7 | 9 | 12.5 | ±20 | 32 | 130 | 20 | 0.05 |
| SC0402ML150L | 8 | 11 | 15 | ±15 | 33 | 120 | 20 | 0.05 |
| SC0402ML180K | 11 | 14 | 18 | ±10 | 38 | 90 | 20 | 0.05 |
| SC0402ML220K | 14 | 18 | 22 | ±10 | 45 | 85 | 20 | 0.05 |

SC0603ML Series

| Symbol | Working Voltage | | Varistor Voltage | | Clamping Voltage | Capacitance | Peak Current | Transient Energy |
|--------------|-----------------|--------------|------------------|--------------|------------------|--------------|--------------|------------------|
| | V_{RMS} | V_{DC} | V_V | ΔV_V | V_C | C_P | I_{max} | W_{max} |
| Units | Volts (Max.) | Volts (Max.) | Volts | % | Volts (Max.) | pF (Typical) | Amps (Max.) | Joules (Max.) |
| SC0603ML080M | 4 | 5.5 | 8 | ±20 | 19 | 270 | 30 | 0.1 |
| SC0603ML120M | 7 | 9 | 12.5 | ±20 | 27 | 210 | 30 | 0.1 |
| SC0603ML150L | 8 | 11 | 15 | ±15 | 33 | 200 | 30 | 0.1 |
| SC0603ML180K | 11 | 14 | 18 | ±10 | 35 | 150 | 30 | 0.1 |
| SC0603ML220K | 14 | 18 | 22 | ±10 | 40 | 130 | 30 | 0.1 |
| SC0603ML310K | 20 | 26 | 31 | ±10 | 58 | 100 | 30 | 0.1 |

V_{RMS} – Maximum AC operating voltage the varistor can maintain and not exceed 10µA leakage current

V_{DC} – Maximum DC operating voltage the varistor can maintain and not exceed 10µA leakage current

V_V – Voltage across the device measure at 1mA DC current.

Equivalent to V_B “breakdown voltage”

V_C – Maximum peak current across the varistor with 8/20µs waveform and 1A pulse current.

C_P – Device capacitance measured with zero volt bias 1Vrms at 1MHz.

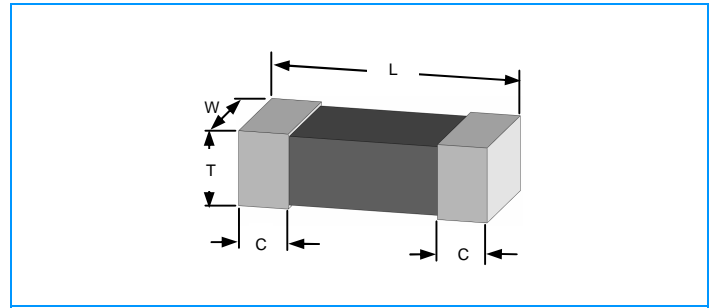
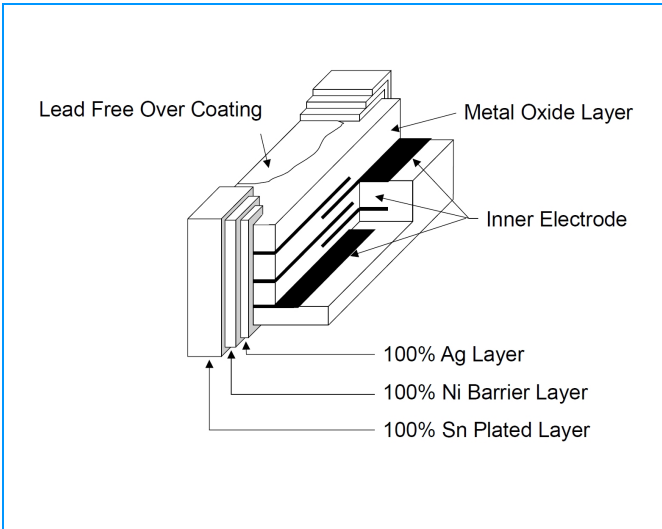
I_{max} – Maximum peak current which may be applied with 8/20µs waveform without device failure.

W_{max} – Maximum energy which may be dissipated with the 10/1000µs waveform without device failure.

Surface Mount Multilayer Varistor

SC0402ML - SC0603ML Series

Construction & Dimensions



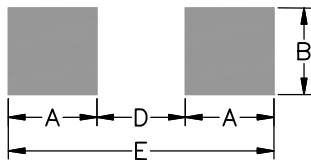
| Size EIA (EIAJ) | 0402 (1005) | | 0603 (1608) | |
|-----------------|-------------|-------------|-------------|-------------|
| | Inches | Millimeters | Inches | Millimeters |
| L | 0.038±0.005 | 0.96±0.12 | 0.063±0.006 | 1.60±0.15 |
| W | 0.019±0.003 | 0.48±0.07 | 0.031±0.004 | 0.80±0.10 |
| T | 0.020±0.004 | 0.50±0.10 | 0.031±0.008 | 0.80±0.20 |
| C | 0.010±0.006 | 0.25±0.15 | 0.012±0.008 | 0.30±0.20 |

Pad Layouts & Precaution for handling of substrate

Solder cream in reflow soldering

Refer to the recommendable land pattern as printing mask pattern for solder cream.

(1) Print solder in a thickness of 150 to 200µm



Precaution for handling of substrate

Do not exceed to bend the board after soldering this product extremely. (reference examples)

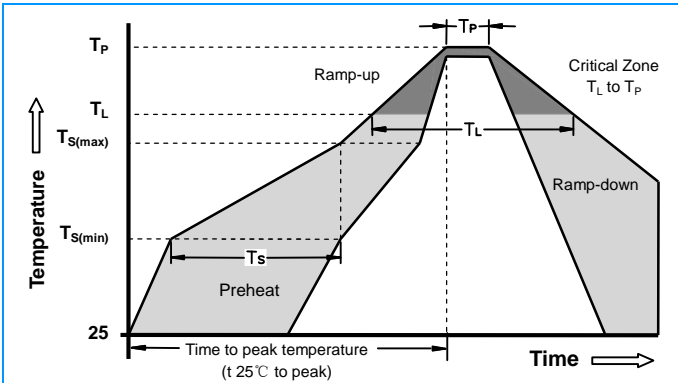
- I Mounting place must be as far as possible from the position, which is close to the break line of board or on the line of large holes of board.
- I Do not bend extremely the board, in mounting another component. If necessary, use back-up pin (support pin) to prevent from bending extremely.
- I Do not break the board by hand. We recommend to use the machine or the jig to break it.

| Size EIA (EIAJ) | 0402 (1005) | | 0603 (1608) | |
|-----------------|-------------|-------------|-------------|-------------|
| | Inches | Millimeters | Inches | Millimeters |
| A | 0.024 | 0.61 | 0.040 | 1.02 |
| B | 0.020 | 0.51 | 0.030 | 0.76 |
| D | 0.020 | 0.51 | 0.020 | 0.50 |
| E | 0.067 | 1.70 | 0.100 | 2.54 |

Surface Mount Multilayer Varistor

SC0402ML - SC0603ML Series

Soldering Parameters



Precaution for soldering

Note that this product will be easily damaged by rapid heating, rapid cooling or local heating.

Do not give heat shock over 100°C in the process of soldering. We recommend to take preheating and gradual cooling

Soldering gun procedure

Note the follows, in case of using solder gun for replacement.

- 1) The tip temperature must be less than 280 for the period within 3 seconds by using soldering gun under 30W
- 2) The soldering gun tip shall not touch this product directly.

Soldering volume

Note that excess of soldering volume will easily get crack the body of this product.

| Reflow Condition | | Pb-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 -180 Seconds |
| 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_L) | 60 -150 Seconds |
| Peak Temperature (T_P) | | 260 +0/-5°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 (T_P) | | 8 minutes Max |

General Technical Data

| | | |
|----------------------------------|---------------------|------------------|
| Operating Temperature | | -40 ~ +85°C |
| Storage Temperature | | -40 ~ +85°C |
| Response Time | | <1 ns |
| Solderability | | 245±5°C, 3±1sec |
| Solder leach resistance | | 260±5°C, 10±1sec |
| Taping Package Storage Condition | Storage Temperature | 5 ~ 40°C |
| | Relative Humidity | To 65% |
| | Storage Time | 12 Months max |

Environmental Performance

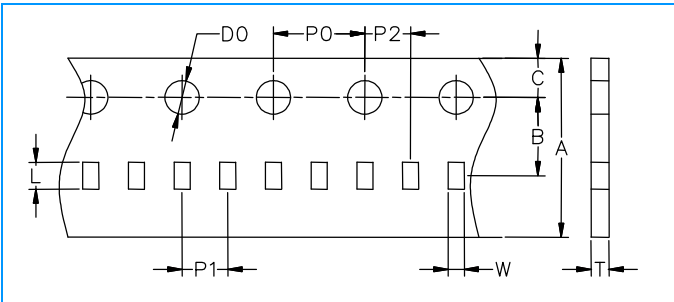
| Item | Specifications | Test Condition |
|-------------------|-----------------------------------|--|
| Bias Humidity | $\Delta V_V / V_V \leq \pm 10 \%$ | 90%RH, 40°C, Working Voltage, 1000 hrs |
| Thermal Shock | $\Delta V_V / V_V \leq \pm 10 \%$ | -40°C to 85°C, 30 min. cycle, 5 cycles |
| Full Load Voltage | $\Delta V_V / V_V \leq \pm 10 \%$ | Working Voltage, 85°C, 1000 hrs |

Surface Mount Multilayer Varistor

SC0402ML - SC0603ML Series

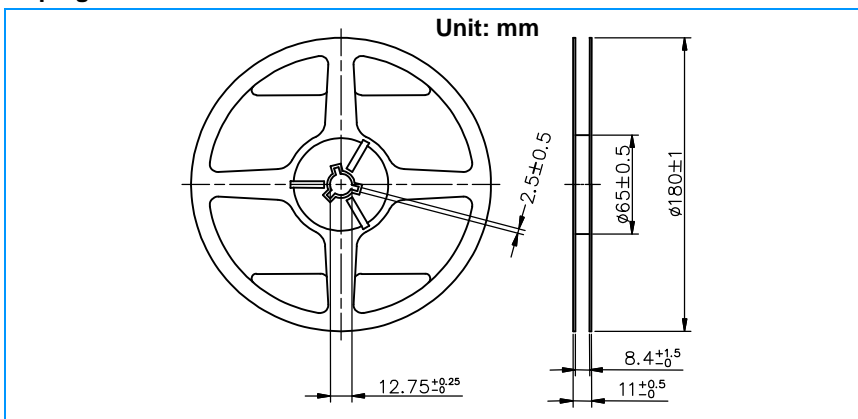
Packaging Information

Carrier Tape Dimensions



| Size EIA (EIAJ) | 0402 (1005) | | 0603 (1608) | |
|-----------------|-------------|-------------|-------------|-------------|
| | Inches | Millimeters | Inches | Millimeters |
| A | 0.315±0.012 | 8.00±0.30 | 0.315±0.012 | 8.00±0.30 |
| B | 0.138±0.002 | 3.50±0.05 | 0.138±0.002 | 3.50±0.05 |
| C | 0.069±0.002 | 1.75±0.05 | 0.069±0.002 | 1.75±0.10 |
| D0 | 0.061±0.002 | 1.55±0.05 | 0.061±0.002 | 1.55±0.05 |
| P0 | 0.157±0.004 | 4.00±0.10 | 0.157±0.004 | 4.00±0.10 |
| P1 | 0.079±0.002 | 2.00±0.05 | 0.079±0.002 | 4.00±0.10 |
| P2 | 0.079±0.002 | 2.00±0.05 | 0.079±0.002 | 2.00±0.05 |
| W | 0.023±0.001 | 0.59±0.03 | 0.041±0.006 | 1.05±0.15 |
| L | 0.044±0.001 | 1.12±0.03 | 0.075±0.006 | 1.90±0.15 |
| T | 0.024±0.001 | 0.60±0.03 | 0.037±0.002 | 0.95±0.05 |

Taping Reel Dimensions



Taping Specifications

There shall be the portion having no product in both the head and the end of taping, and there shall be the cover tape in the heat of taping.

Quantity of products in the taping package

| SIZE EIA (EIAJ) | 0402 (1005) | 0603 (1608) |
|---|-------------|-------------|
| Standard Packing Quantity (PCS / reel) | 10,000 | 4,000 |

The contents of a box :

0402 Series: 6 reels / inner box
0603 Series: 6 reels / inner box