

# Chip Varistors

Countermeasure for surge voltage and static electricity

## AVR series

Type:            **AVR-M**  
                     **AVRL**

Issue date:     December 2010

- All specifications are subject to change without notice.
  - Conformity to RoHS Directive: This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.
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## Varistors(SMD)

Conformity to RoHS Directive

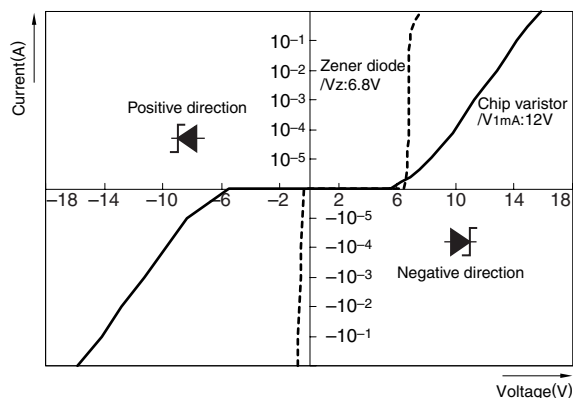
# Countermeasure for Surge Voltage and Static Electricity

## AVR Series AVR-M, AVRL Types

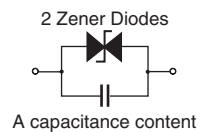
Varistors are voltage dependent nonlinear resistive elements with a resistance that decreases rapidly when the voltage is over the constant value.

Varistor is equivalent with Zener diode of two series connection. Therefore, do not have polarity.

### CURRENT vs. VOLTAGE CHARACTERISTICS

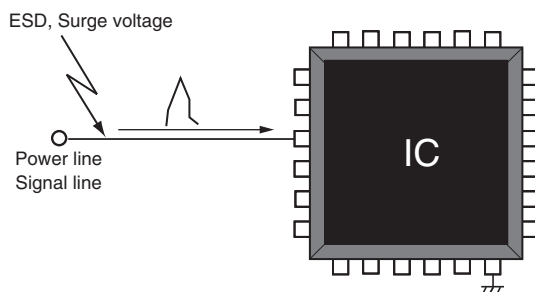


### EQUIVALENT CIRCUIT



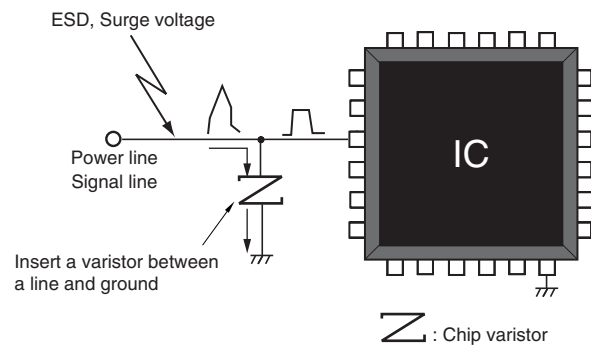
### THE EFFECT OF THE VARISTOR WITHOUT VARISTOR

A malfunction and failure of electronic equipment



### WITH VARISTOR

Suppress abnormal voltage by inserting varistor in a circuit



## FEATURES

- No polarity, due to symmetrical current-voltage characteristics. Equivalent to anode common type Zener diode.
- Excellent electrostatic absorption capability. Response is as good or better than Zener diode. Keeps symmetrical current-voltage characteristics even after electrostatic absorption.
- Adopted the inner electrodes lamination structure. Wide range of varistor voltages are available in series (6.8 to 39V). Low capacitance items are available in series (1.1pF to). World's smallest 0603-, 1005-, 1608-, 2012-chip types and 1410-array type are available in series.
- Excellent mount reliability. Good for Pb-free soldering. Adopted (Ni/Sn) electroplating. Achieved good solderability and solder heat resistance.
- Can replace a Zener diode + capacitor combination. Reduced footprint and total mounting cost.

## APPLICATIONS

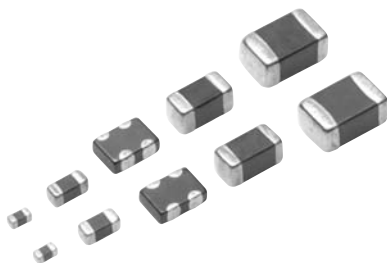
- Electrostatic absorption
- Pulse noise absorption

## TEMPERATURE RANGES

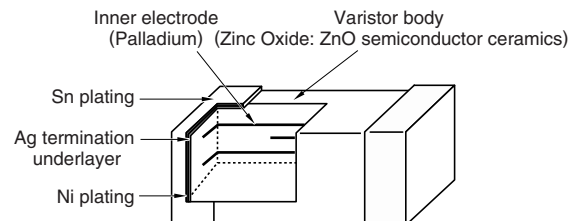
| Type      | AVR-M1005/1608/2012 | AVR-M14A2/0603/AVRL |
|-----------|---------------------|---------------------|
| Operating | -40 to +125°C       | -40 to +85°C        |
| Storage   | -40 to +125°C       | -40 to +85°C        |

## APPLICATION EXAMPLES

| Consumer product     | Application                       |
|----------------------|-----------------------------------|
| Mobile phone         | Data terminal                     |
| Digital video camera | LCD panel                         |
| Digital camera       | Touch panel                       |
| PDA                  | Button and switch unit            |
| Note PC              | Battery terminal                  |
| DVD-ROM, CD-ROM      | Audio-Video input-output terminal |
| CD/MD/MP3 player     | Microphone/receiver unit          |
| Game machine         | Controller unit                   |
|                      | CAN-BUS                           |
|                      | ECU                               |
| In-car equipment     | Connector                         |
|                      | Air conditioner panel             |
|                      | Car audio                         |
|                      | Car navigation                    |

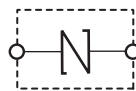


## INTERNAL STRUCTURE

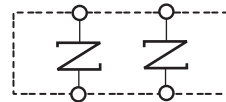


## CIRCUITS

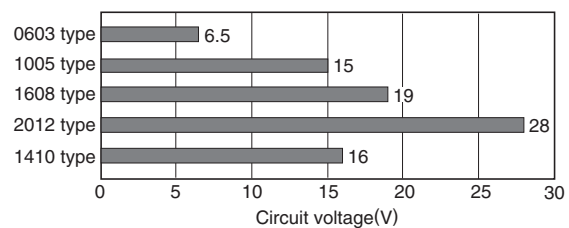
### SINGLE TYPE



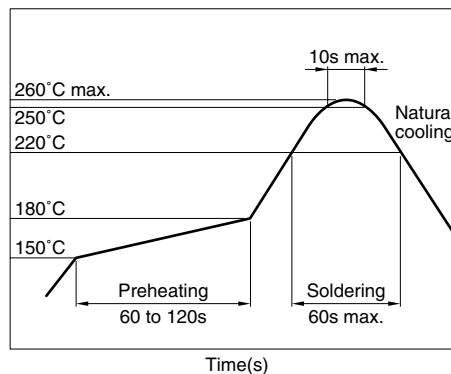
### ARRAY TYPE



## OPERATIONAL VOLTAGE RANGES



## RECOMMENDED REFLOW SOLDERING CONDITIONS



## AVR-M TYPE

### PRODUCT IDENTIFICATION

| AVR-M | 1005 | C   | 270 | M   | T   | AAB |
|-------|------|-----|-----|-----|-----|-----|
| (1)   | (2)  | (3) | (4) | (5) | (6) | (7) |

(1) Series name

(2) Dimensions L×W

|      |                       |
|------|-----------------------|
| 0603 | 0.6×0.3mm             |
| 1005 | 1.0×0.5mm             |
| 1608 | 1.6×0.8mm             |
| 2012 | 2.0×1.2mm             |
| 14A2 | 1.4×1.0mm (2-element) |

(3) Structure code

(4) Varistor voltage

|     |                      |
|-----|----------------------|
| 270 | 27×10 <sup>0</sup> V |
|-----|----------------------|

(5) Varistor voltage tolerance

|   |      |
|---|------|
| K | ±10% |
| M | ±20% |

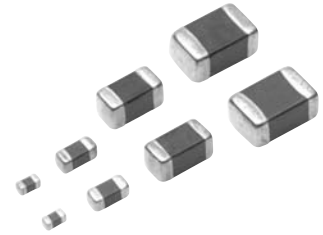
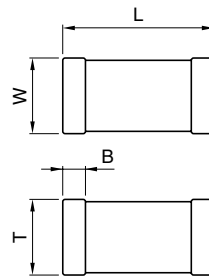
(6) Packaging style

|   |        |
|---|--------|
| T | Taping |
| B | Bulk   |

(7) Capacitance and TDK internal code

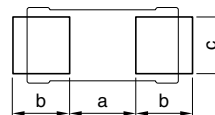
### SHAPES AND DIMENSIONS/RECOMMENDED PC BOARD PATTERN

#### 0603/1005/1608/2012 TYPES



Dimensions in mm

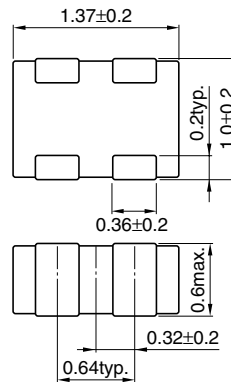
| Type | L        | W        | T        | B min. | Weight (mg)typ. |
|------|----------|----------|----------|--------|-----------------|
| 0603 | 0.6±0.03 | 0.3±0.03 | 0.3±0.03 | 0.1    | 0.2             |
| 1005 | 1.0±0.05 | 0.5±0.05 | 0.5±0.05 | 0.1    | 1.2             |
| 1608 | 1.6±0.1  | 0.8±0.1  | 0.8±0.1  | 0.2    | 5               |
| 2012 | 2.0±0.2  | 1.25±0.2 | 1.0±0.2  | 0.2    | 15              |



Dimensions in mm

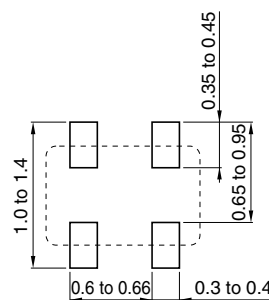
| Type | a            | b            | c            |
|------|--------------|--------------|--------------|
| 0603 | 0.25 to 0.35 | 0.2 to 0.3   | 0.25 to 0.35 |
| 1005 | 0.3 to 0.5   | 0.35 to 0.45 | 0.4 to 0.6   |
| 1608 | 0.6 to 0.8   | 0.6 to 0.8   | 0.6 to 0.8   |
| 2012 | 0.9 to 1.2   | 0.7 to 0.9   | 0.9 to 1.2   |

#### 1410 TYPE



Weight: 4mg typ.

Dimensions in mm



Dimensions in mm

## ELECTRICAL CHARACTERISTICS

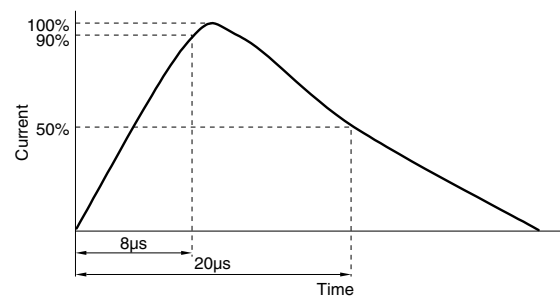
| Part No.            | Varistor voltage<br>(Breakdown voltage)<br>V <sub>1mA</sub> (V)[DC1mA] |                | Maximum<br>continuous voltage<br>(Rated voltage)<br>V <sub>dc</sub> (V) | Clamping<br>voltage<br>V <sub>cl</sub> (V)<br>[8/20μs] | Maximum<br>energy<br>E(Joule)<br>[10/1000μs] | Maximum<br>peak<br>current I <sub>p</sub> (A)<br>[8/20μs] | Capacitance<br>C(pF)<br>[1kHz, 1V <sub>rms</sub> ] | Packaging<br>quantities<br>(Taping)<br>(pieces/reel) |
|---------------------|------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------|----------------------------------------------------|------------------------------------------------------|
| 0603 type           |                                                                        |                |                                                                         |                                                        |                                              |                                                           |                                                    |                                                      |
| AVRM0603C6R8N□*101N | 6.8                                                                    | (4.76 to 8.84) | 3.5 max.                                                                | 14[1A]                                                 | 0.01 max.                                    | 10 max.                                                   | 100 typ.                                           | 15,000                                               |
| AVRM0603C080M□101N  | 8                                                                      | (6.4 to 9.6)   | 5.5 max.                                                                | 17[1A]                                                 | 0.01 max.                                    | 4 max.                                                    | 100 typ.                                           |                                                      |
| AVRM0603C120M□101N  | 12                                                                     | (9.6 to 14.4)  | 7.5 max.                                                                | 20[1A]                                                 | 0.01 max.                                    | 5 max.                                                    | 100 typ.                                           |                                                      |
| AVR-M0603C120M□AAB  | 12                                                                     | (9.6 to 14.4)  | 7.5 max.                                                                | 23[1A]                                                 | 0.01 max.                                    | 1 max.                                                    | 33 typ.                                            |                                                      |
| 1005 type           |                                                                        |                |                                                                         |                                                        |                                              |                                                           |                                                    |                                                      |
| AVRM1005C6R8N□101N  | 6.8                                                                    | (4.76 to 8.84) | 3.5 max.                                                                | 14[1A]                                                 | 0.02 max.                                    | 10 max.                                                   | 100 typ.                                           | 10,000                                               |
| AVR-M1005C080M□AAB  | 8                                                                      | (6.4 to 9.6)   | 5.5 max.                                                                | 14[1A]                                                 | 0.04 max.                                    | 25 max.                                                   | 650 typ.                                           |                                                      |
| AVR-M1005C080M□ADB  | 8                                                                      | (6.4 to 9.6)   | 5.5 max.                                                                | 14[1A]                                                 | 0.04 max.                                    | 25 max.                                                   | 480 typ.                                           |                                                      |
| AVR-M1005C080M□ABB  | 8                                                                      | (6.4 to 9.6)   | 5.5 max.                                                                | 15[1A]                                                 | 0.02 max.                                    | 3 max.                                                    | 100 typ.                                           |                                                      |
| AVR-M1005C080M□ACB  | 8                                                                      | (6.4 to 9.6)   | 5.5 max.                                                                | 19[1A]                                                 | 0.01 max.                                    | 1 max.                                                    | 33 typ.                                            |                                                      |
| AVR-M1005C120M□AAB  | 12                                                                     | (9.6 to 14.4)  | 7.5 max.                                                                | 20[1A]                                                 | 0.05 max.                                    | 10 max.                                                   | 130 typ.                                           |                                                      |
| AVRM1005C270K□101N  | 27                                                                     | (21.6 to 32.4) | 19 max.                                                                 | 55[1A]                                                 | 0.06 max.                                    | 4 max.                                                    | 100 typ.                                           |                                                      |
| AVR-M1005C270M□AAB  | 27                                                                     | (21.6 to 32.4) | 15 max.                                                                 | 50[1A]                                                 | 0.06 max.                                    | 4 max.                                                    | 40 typ.                                            |                                                      |
| AVR-M1005C270M□ABB  | 27                                                                     | (21.6 to 32.4) | 15 max.                                                                 | 50[1A]                                                 | 0.05 max.                                    | 1 max.                                                    | 15 typ.                                            |                                                      |
| 1608 type           |                                                                        |                |                                                                         |                                                        |                                              |                                                           |                                                    |                                                      |
| AVR-M1608C080M□AAB  | 8                                                                      | (6.4 to 9.6)   | 5.5 max.                                                                | 15[2A]                                                 | 0.09 max.                                    | 30 max.                                                   | 650 typ.                                           | 4,000                                                |
| AVR-M1608C120M□6AB  | 12                                                                     | (9.6 to 14.4)  | 7.5 max.                                                                | 20[2A]                                                 | 0.09 max.                                    | 50 max.                                                   | 1050 typ.                                          |                                                      |
| AVR-M1608C120M□2AB  | 12                                                                     | (9.6 to 14.4)  | 7.5 max.                                                                | 20[2A]                                                 | 0.06 max.                                    | 15 max.                                                   | 400 typ.                                           |                                                      |
| AVR-M1608C180M□6AB  | 18                                                                     | (14.4 to 21.6) | 11 max.                                                                 | 30[2A]                                                 | 0.1 max.                                     | 30 max.                                                   | 600 typ.                                           |                                                      |
| AVR-M1608C220K□6AB  | 22                                                                     | (19.8 to 24.2) | 16 max.                                                                 | 34[2A]                                                 | 0.1 max.                                     | 30 max.                                                   | 560 typ.                                           |                                                      |
| AVR-M1608C220K□2AB  | 22                                                                     | (19.8 to 24.2) | 16 max.                                                                 | 37[2A]                                                 | 0.03 max.                                    | 10 max.                                                   | 210 typ.                                           |                                                      |
| AVR-M1608C270K□6AB  | 27                                                                     | (24 to 30)     | 19 max.                                                                 | 42[2A]                                                 | 0.1 max.                                     | 48 max.                                                   | 430 typ.                                           |                                                      |
| AVR-M1608C270K□2AB  | 27                                                                     | (24 to 30)     | 19 max.                                                                 | 42[2A]                                                 | 0.1 max.                                     | 20 max.                                                   | 160 typ.                                           |                                                      |
| AVR-M1608C270K□ACB  | 27                                                                     | (24 to 30)     | 19 max.                                                                 | 54[2A]                                                 | 0.05 max.                                    | 10 max.                                                   | 60 typ.                                            |                                                      |
| AVR-M1608C270M□AAB  | 27                                                                     | (21.6 to 32.4) | 17 max.                                                                 | 52[2A]                                                 | 0.05 max.                                    | 2 max.                                                    | 30 typ.                                            |                                                      |
| AVR-M1608C270M□ABB  | 27                                                                     | (21.6 to 32.4) | 17 max.                                                                 | 52[2A]                                                 | 0.05 max.                                    | 2 max.                                                    | 15 typ.                                            |                                                      |
| AVRM1608C390K□271N  | 39                                                                     | (35 to 43)     | 28 max.                                                                 | 69[2A]                                                 | 0.1 max.                                     | 78 max.                                                   | 270 typ.                                           |                                                      |
| 2012 type           |                                                                        |                |                                                                         |                                                        |                                              |                                                           |                                                    |                                                      |
| AVR-M2012C120M□6AB  | 12                                                                     | (9.6 to 14.4)  | 7.5 max.                                                                | 20[5A]                                                 | 0.2 max.                                     | 60 max.                                                   | 1000 typ.                                          | 2,000                                                |
| AVR-M2012C220K□6AB  | 22                                                                     | (19.8 to 24.2) | 16 max.                                                                 | 38[5A]                                                 | 0.3 max.                                     | 100 max.                                                  | 800 typ.                                           |                                                      |
| AVR-M2012C390K□6AB  | 39                                                                     | (35 to 43)     | 28 max.                                                                 | 62[5A]                                                 | 0.3 max.                                     | 100 max.                                                  | 430 typ.                                           |                                                      |
| 1410 type           |                                                                        |                |                                                                         |                                                        |                                              |                                                           |                                                    |                                                      |
| AVR-M14A2C240M□600N | 24                                                                     | (20 to 27)     | 16 max.                                                                 | 50[1A]                                                 | 0.01 max.                                    | 5 max.                                                    | 60 typ.[1MHz]                                      | 4,000                                                |
| AVR-M14A2C270M□470N | 27                                                                     | (21.6 to 32.4) | 15 max.                                                                 | 54[1A]                                                 | 0.007 max.                                   | 5 max.                                                    | 47 typ.[1MHz]                                      |                                                      |
| AVRM14A2C270M□150N  | 27                                                                     | (21.6 to 32.4) | 15 max.                                                                 | 55[1A]                                                 | 0.02 max.                                    | 3 max.                                                    | 15 typ.[1MHz]                                      |                                                      |
| AVRM14A2C270M□3R3F  | 27                                                                     | (21.6 to 32.4) | 10 max.                                                                 | 45[0.2A]                                               | 0.002 max.                                   | 0.2 max.                                                  | 3.3 typ.[1MHz]                                     |                                                      |

\* □ : Packaging style (T: Taping/B: Bulk)

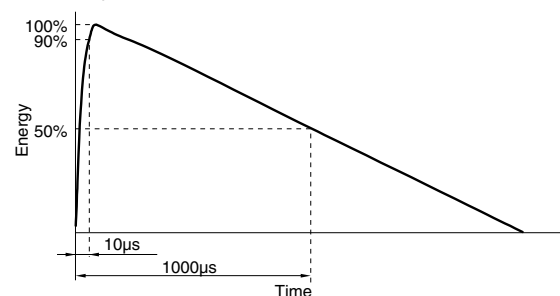
## TERMINOLOGY

| Item                                          | Unit             | Terminology                                                                                                                                                  |
|-----------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Varistor voltage<br>(Breakdown voltage)       | $V_{1mA}$<br>(V) | Voltage measured across the varistor when DC1mA is applied.                                                                                                  |
| Maximum continuous<br>voltage (Rated voltage) | $V_{dc}$<br>(V)  | Maximum DC voltage that can be applied continuously.<br>Varistor leakage current: 50 $\mu A$ max.<br>(Within the range of maximum allowable circuit voltage) |
| Clamping voltage                              | $V_{cl}$<br>(V)  | Voltage appearing across the varistor when a pulse current (8/20 $\mu s^*$ ) of specified peak value is applied.                                             |
| Maximum energy                                | $E$<br>(Joule)   | Maximum energy that can be absorbed without deteriorating varistor characteristics when an impulse (10/1000 $\mu s^*$ ) is applied once.                     |
| Maximum peak current                          | $I_p$<br>(A)     | Maximum current that can be withstood without deteriorating varistor characteristics when an impulse current (8/20 $\mu s^*$ ) is applied once.              |
| Capacitance                                   | $C$<br>(pF)      | Capacitance measured at 1kHz (or 1MHz) of oscillator frequency and 1Vrms of oscillator voltage.                                                              |

\*1 8/20 $\mu s$  test waveform



\*2 10/1000 $\mu s$  test waveform



• All specifications are subject to change without notice.

## AVRL TYPE

### PRODUCT IDENTIFICATION

| AVRL | 10  | 1A  | 3R3 | F   | T   | A   |
|------|-----|-----|-----|-----|-----|-----|
| (1)  | (2) | (3) | (4) | (5) | (6) | (7) |

(1) Series name

(2) Dimensions L×W

|    |           |
|----|-----------|
| 10 | 1.0×0.5mm |
| 16 | 1.6×0.8mm |

(3) Maximum continuous voltage

|    |       |
|----|-------|
| 1A | 10Vdc |
|----|-------|

(4) Capacitance

|     |       |
|-----|-------|
| 1R1 | 1.1pF |
| 3R3 | 3.3pF |
| 6R8 | 6.8pF |

(5) Capacitance tolerance

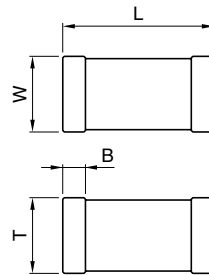
|   |        |
|---|--------|
| N | ±0.3pF |
| F | ±1pF   |
| G | ±2pF   |

(6) Packaging style

|   |        |
|---|--------|
| T | Taping |
| B | Bulk   |

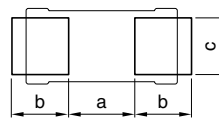
(7) Varistor voltage and TDK internal code

### SHAPES AND DIMENSIONS/RECOMMENDED PC BOARD PATTERN



Dimensions in mm

| Type | L        | W        | T        | B min. | Weight (mg)typ. |
|------|----------|----------|----------|--------|-----------------|
| 1005 | 1.0±0.05 | 0.5±0.05 | 0.5±0.05 | 0.1    | 1.2             |
| 1608 | 1.6±0.1  | 0.8±0.1  | 0.8±0.1  | 0.2    | 5               |



Dimensions in mm

| Type | a          | b            | c          |
|------|------------|--------------|------------|
| 1005 | 0.3 to 0.5 | 0.35 to 0.45 | 0.4 to 0.6 |
| 1608 | 0.6 to 0.8 | 0.6 to 0.8   | 0.6 to 0.8 |

### ELECTRICAL CHARACTERISTICS

| Part No.        | Capacitance<br>C(pF)<br>[1MHz, 1Vrms] | Maximum continuous voltage<br>(Rated voltage)<br>Vdc(V) | Insulation resistance<br>Rdc(MΩ)<br>[3Vrms] | Varistor voltage<br>V1mA(V)[DC1mA] | Packaging quantities<br>(Taping)<br>(pieces/reel) |
|-----------------|---------------------------------------|---------------------------------------------------------|---------------------------------------------|------------------------------------|---------------------------------------------------|
| 1005 type       |                                       |                                                         |                                             |                                    |                                                   |
| AVRL101A1R1N□*A | 1.1[0.8 to 1.4]                       | 10 max.                                                 | 10 min.                                     | 90 typ.                            | 10,000                                            |
| AVRL101A1R1N□B  | 1.1[0.8 to 1.4]                       | 10 max.                                                 | 10 min.                                     | 39 typ.                            |                                                   |
| AVRL101C2R2D□A  | 2.2[1.7 to 2.7]                       | 16 max.                                                 | 10 min.                                     | 90 typ.                            |                                                   |
| AVRL101A3R3F□A  | 3.3[2.3 to 4.3]                       | 10 max.                                                 | 10 min.                                     | 27 typ.                            |                                                   |
| AVRL101A6R8G□A  | 6.8[4.8 to 8.8]                       | 10 max.                                                 | 10 min.                                     | 27 typ.                            |                                                   |
| 1608 type       |                                       |                                                         |                                             |                                    |                                                   |
| AVRL161A1R1N□A  | 1.1[0.8 to 1.4]                       | 10 max.                                                 | 10 min.                                     | 90 typ.                            | 4,000                                             |
| AVRL161A1R1N□B  | 1.1[0.8 to 1.4]                       | 10 max.                                                 | 10 min.                                     | 39 typ.                            |                                                   |
| AVRL161A3R3F□A  | 3.3[2.3 to 4.3]                       | 10 max.                                                 | 10 min.                                     | 27 typ.                            |                                                   |
| AVRL161A6R8G□A  | 6.8[4.8 to 8.8]                       | 10 max.                                                 | 10 min.                                     | 27 typ.                            |                                                   |

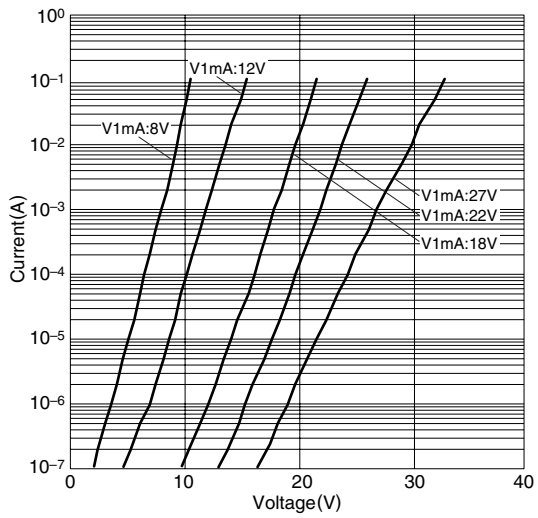
\* □ : Packaging style(T: Taping/B: Bulk)

### TERMINOLOGY

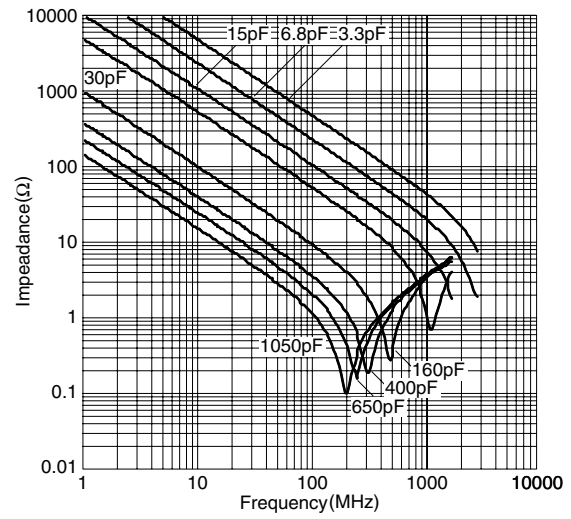
| Item                                       | Unit        | Terminology                                                                                                                                            |
|--------------------------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Capacitance                                | C<br>(pF)   | Capacitance measured at 1MHz of oscillator frequency and 1Vrms of oscillator voltage.                                                                  |
| Maximum continuous voltage (Rated voltage) | Vdc<br>(V)  | Maximum DC voltage that can be applied continuously.<br>Varistor leakage current: 50μA max.<br>(Within the range of maximum allowable circuit voltage) |
| Insulation resistance                      | Rdc<br>(MΩ) | Insulation resistance appearing across the varistor when specified voltage is applied.                                                                 |
| Varistor voltage (Breakdown voltage)       | V1mA<br>(V) | Voltage measured across the varistor when DC1mA is applied.                                                                                            |

## TYPICAL ELECTRICAL CHARACTERISTICS

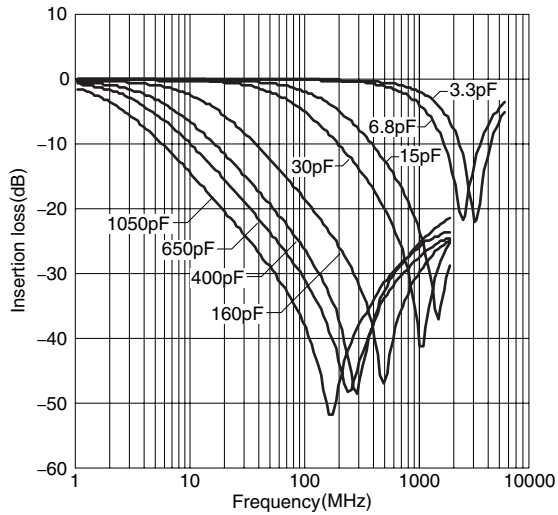
### CURRENT vs. VOLTAGE CHARACTERISTICS



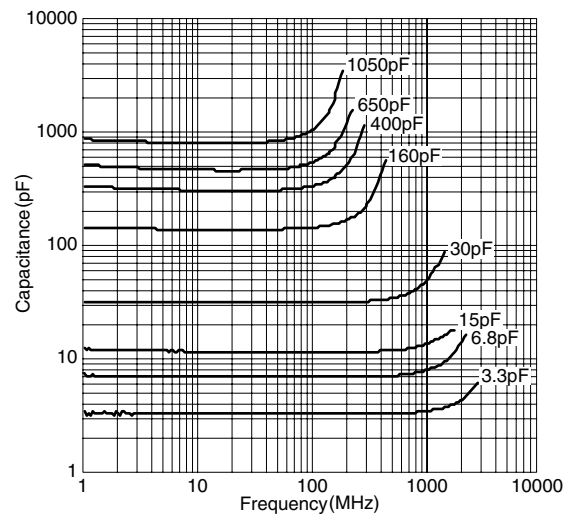
### IMPEDANCE vs. FREQUENCY CHARACTERISTICS



### TRANSMISSION CHARACTERISTICS



### CAPACITANCE vs. FREQUENCY CHARACTERISTICS



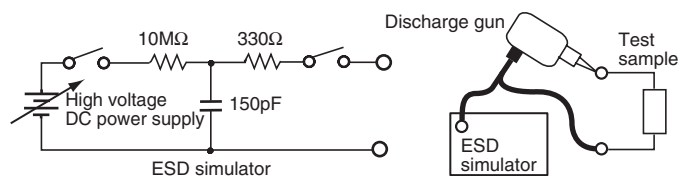
## ELECTROSTATIC DISCHARGE TESTS

### TEST CONDITIONS

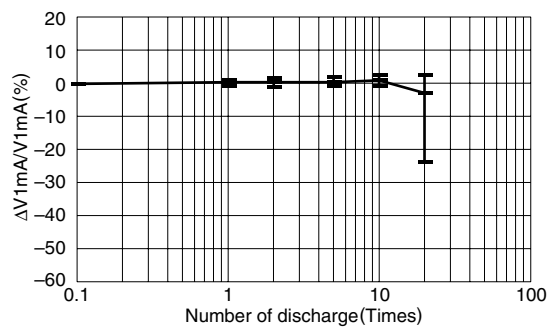
150pF, 330Ω contact discharge

Charged voltage /8kV, 0.1s interval

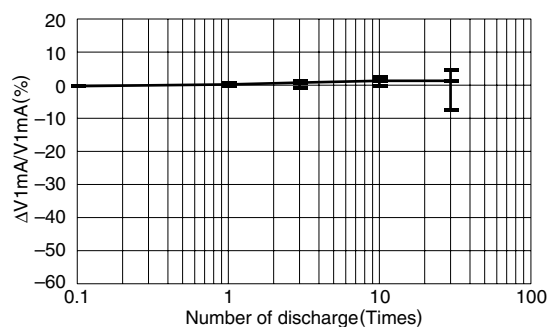
### MEASURING CIRCUIT



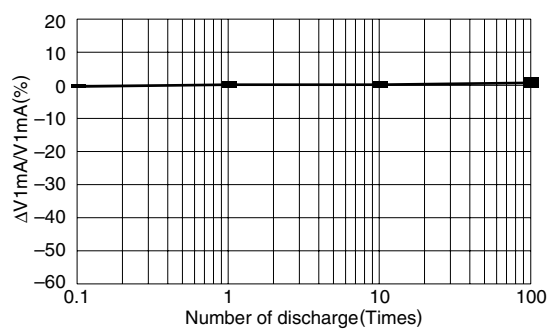
#### AVR-M0603 TYPE



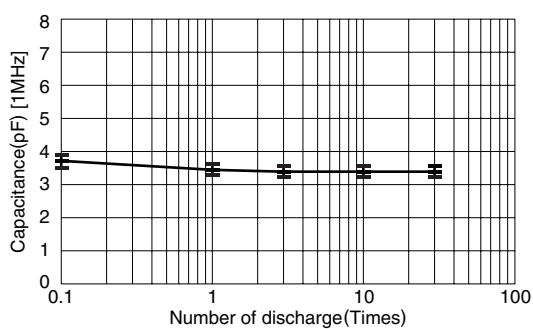
#### AVR-M1005 TYPE



#### AVR-M1608 TYPE

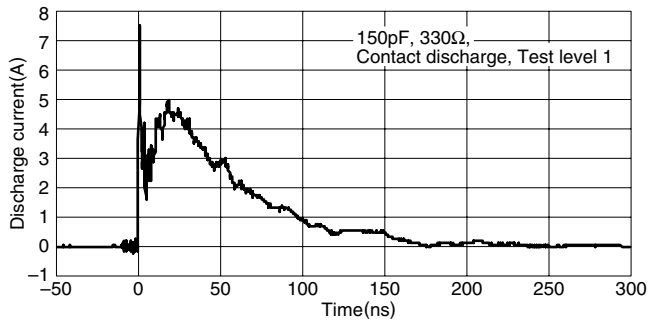


#### AVRL101A3R3F

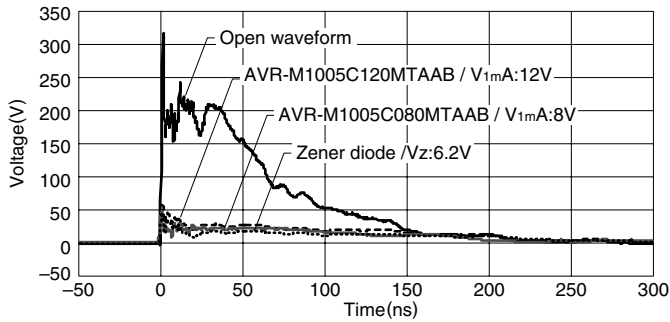


## ELECTROSTATIC ABSORPTION CHARACTERISTICS

### DISCHARGE CURRENT WAVEFORM



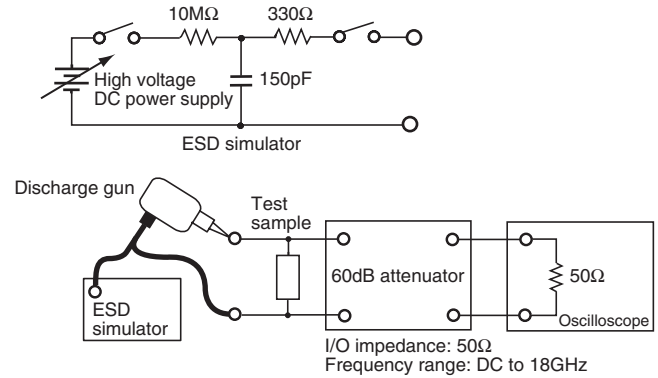
### DISCHARGE VOLTAGE WAVEFORM



### WAVEFORM PARAMETERS [IEC61000-4-2]

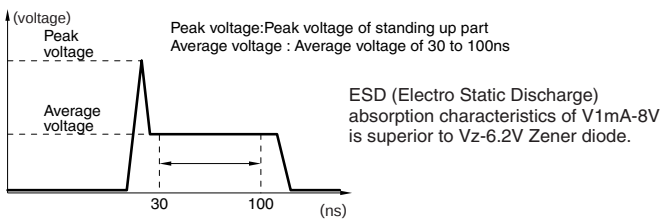
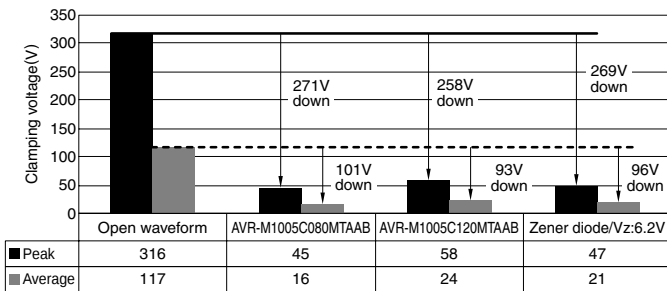
| Test level | ESD Charge voltage (kV) | First peak current of discharge (A) | Rise time (ns) |
|------------|-------------------------|-------------------------------------|----------------|
| 1          | 2                       | 7.5                                 | 0.7 to 1.0     |
| 2          | 4                       | 15                                  | 0.7 to 1.0     |
| 3          | 6                       | 22.5                                | 0.7 to 1.0     |
| 4          | 8                       | 30                                  | 0.7 to 1.0     |

### MEASURING CIRCUIT



## ESD ABSORPTION CHARACTERISTICS

### COMPARISON OF VARIOUS ELEMENTS



## MERITS OF REPLACEMENT FROM ZENER DIODE

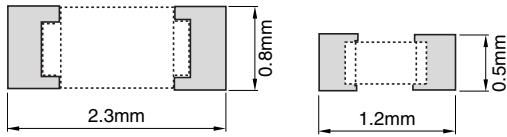
(1) Reduction in the number of parts

(2) Reduction in mounting cost

### COMPARISON OF FOOTPRINT

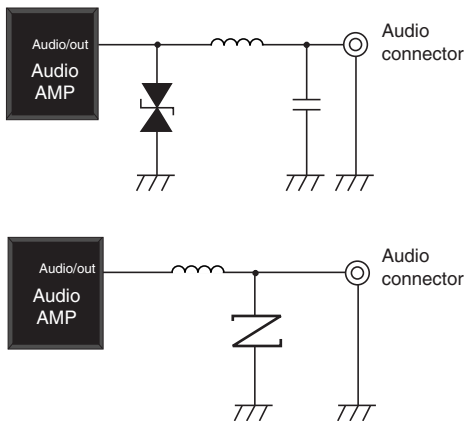
Zener diode

Chip varistor



Save a mount area 65% down

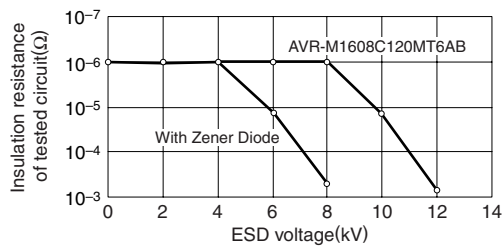
### EXAMPLE OF REPLACEMENT AT AUDIO TERMINAL



: Chip varistor

(3) Improved electrostatic absorption capability

### COMPARE DATA OF CHIP VARISTOR AND ZENER DIODE ABOUT IC PROTECTION



CMOS: D74HC04C

ESD generator : Noise Laboratory Co.,Ltd., ESS -630A

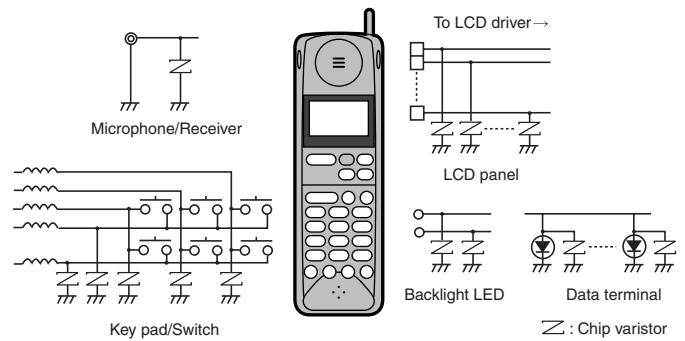
200pF-0Ω method model equipment

Contact type discharge

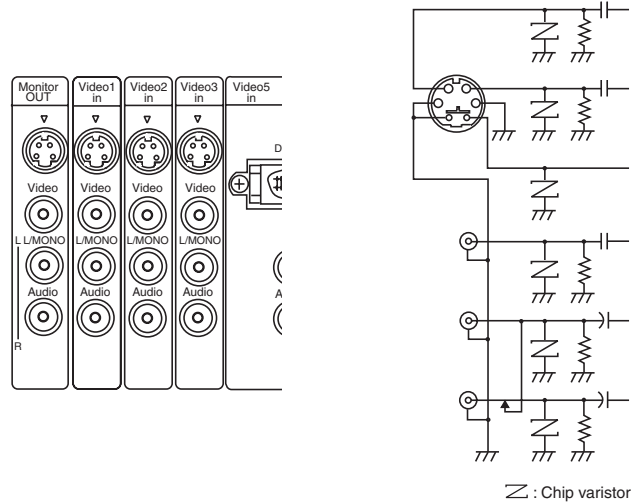
ESD applied point: Vcc-ground

## APPLICATION EXAMPLES

### CELLULAR PHONE



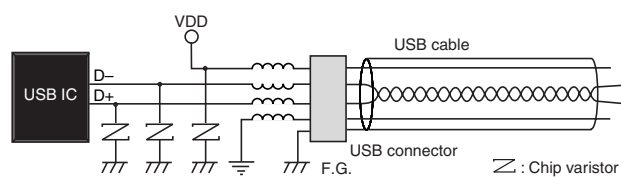
### AUDIO/VIDEO



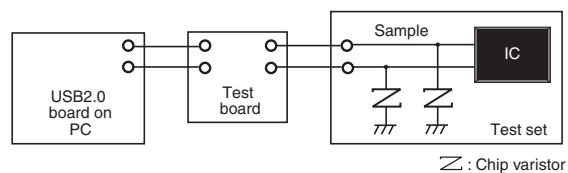
: Chip varistor

## APPLICATION EXAMPLES

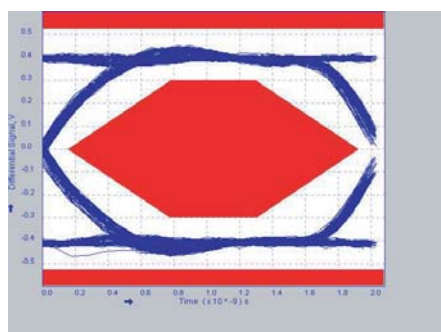
### USB 2.0



### MEASURING CIRCUIT

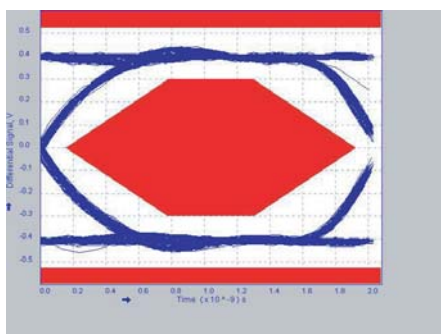


### WITHOUT VARISTOR



### WITH VARISTOR

AVRL101A3R3FT(3.3pF)



AVRL101A6R8GT(6.8pF)

