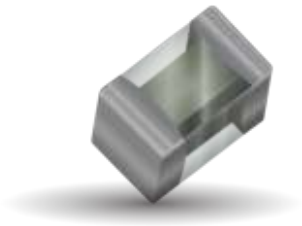
# GiGuard® - ESD Protection for High Speed Circuits

## Bi-Directional Leadless Transient Voltage Suppressor Diodes For General Purpose Use



## GENERAL DESCRIPTION

Intended for general purpose applications and utilizing the latest in TVS Technology, combined with a unique leadless package, the new GiGuard series of ESD Suppression Diodes offers Clamping Voltages below 12v and cap values as low as 0.3pfd. This combination of excellence both protects sensitive ICs during ESD events and preserves the integrity of the protected high speed signals. The KYOCERA AVX GG® series fits perfectly onto the same PCB solder pads as standard EIA 0201/0402/0603 components.

The GG® series complies with IEC 61000-4-2(ESD), Level 4+ (±20kV air, ±20kV contact discharge), IEC 61000-4-4 (electrical fast transient -EFT) (20A, 5/50 ns), very fast charged device model (CDM) ESD and cable discharge event (CDE).

## APPLICATIONS

- USB 2.0/3.0
- Tablets/Cell Phones Touch Screens
- Network Communications
- Gigabyte Ethernet
- High Def Multimedia Interface (HDMI)
- Mobile Phone Touchscreen

## FEATURES

- Low Capacitance (.3pF to 17pF typ)
- Low Vc (<12v @ 1a)
- Bi-Directional protection
- Leadless 0201/0402 case size
- -55°C ~ 125°C Operating Range

## CIRCUIT DIAGRAM



## HOW TO ORDER

**GG 0201 05 100 N 2 P**

**Series**

**Case Size**

0201
0402
0603

**Voltage Rating**

03 = 3.3V
05 = 5.0V
06 = 6V,6.5V
07 = 7.0V
12 = 12V
24 = 24V

**Nominal Cap**

0R3 = 0.3pF
2R5 = 2.5pF
5R0 = 5.0pF
5R0 = 5.0pF
100 = 10pF
170 = 17pF

**Finish**

P = 100% Tin

**Packaging**

2 = 7" Reel
0201 = 15K/Reel
0402 = 10K/Reel
0603 = 5K/Reel

**Cap Tolerance**

4 = ±2pF
C = ±.25pF
N = ±30%
M = ±20%
L = min 0.5pf - max 2.5pf
U = min 0.05pF - max 0.10pF

## CHARACTERISTIC TEST DESCRIPTION

| Characteristic Test Description | Symbol | Units |
|---|---|---|
| Nominal Reverse Working Voltage | $V_{wrm}$ | V |
| Reverse Typ. Breakdown Voltage @ 1ma | $V_{br}$ | V |
| Reverse Leakage Current @Vwrm | IL | ua |
| Peak Pulse Power (tp=8x20us) | $P_{pp}$ | W |
| Peak Pulse Current (tp=8x20us) | $I_{pp}$ | A |
| ESD Rating - Air (150pf, 330Ω network) | $V_{air}$ | KV |
| ESD Rating - Contact (150pf, 330Ω network) | $V_{con}$ | KV |

| Characteristic Test Description | Symbol | Units |
|---|---|---|
| Max Clamp Voltage @ Ipp = 16a | $V_{c16a}$ | V |
| Max ESD Clamp Voltage @ 8KV | $V_{c8k}$ | V |
| Max Clamp Voltage @ Ipp = 1a | $V_{c}$ | V |
| Max Clamp Voltage @ Ipp | $V_{clpp}$ | V |
| Nominal Capacitance (Vr=0v, f=1Mhz) | $C_{nom}$ | pF |
| Allowable Capacitance Range | $C_{ap\ (pF)}$ | min-max |

# GiGuard® - ESD Protection for High Speed Circuits

## Bi-Directional Leadless Transient Voltage Suppressor Diodes For General Purpose Use

## GENERAL ELECTRICAL CHARACTERISTICS

| KYOCERA AVX Part Number | Vrwv (V) | Cnom (pF) | Cap Min (pf) | Cap Max (pF) | Vbr Typ (V) | IL (µa) | Vc (@ Ipp=1a, tp=8x20µs) (V) | Ipp (A) | Vc (@Ipp, tp=8x20µs) (V) | Ppp (W) | Vair (KV) | Vcon (KV) | Vc (@8KV) (V) | Pack QTY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GG020103100N2P | 3.3 | 10.0 | 7 | 13 | 4.0 | <0 .1 | ≤6 | 7 | ≤10 | 70.0 | ±20 | ±20 | ≤12 | 15000 |
| GG020105100N2P | 5.0 | 10.0 | 7 | 13.0 | 5.5 | <0 .1 | ≤8 | 6 | ≤12 | 60.0 | ±20 | ±20 | ≤12 | 15000 |
| GG0201052R542P | 5.0 | 2.5 | 0.5 | 4.5 | 6.7 | <0 .1 | ≤12 | 3 | ≤15 | 46.0 | ±20 | ±15 | ≤16 | 15000 |
| GG040203100N2P | 3.3 | 10.0 | 7 | 13 | 4.0 | <0 .1 | ≤6 | 8 | ≤10 | 80.0 | ±30 | ±30 | ≤10 | 10000 |
| GG0402052R542P | 5.0 | 2.5 | 0.5 | 4.5 | 5.5 | <0 .1 | ≤12 | 3 | ≤15.5 | 46.0 | ±15 | ±15 | ≤16 | 10000 |
| GG0402055R042P | 5.0 | 5.0 | 3 | 7.0 | 5.2 | <0 .1 | ≤12 | 4 | ≤16 | 60.0 | ±15 | ±15 | ≤15 | 10000 |
| GG040205100N2P | 5.0 | 10.0 | 7 | 13.0 | 5.5 | <0 .1 | ≤8 | 8 | ≤12 | 96.0 | ±25 | ±25 | ≤12 | 10000 |
| GG040205170N2P | 5.0 | 17.0 | 11.9 | 22.0 | 5.1 | <0 .1 | ≤6.5 | 8 | ≤10 | 80.0 | ±30 | ±30 | ≤12 | 10000 |
| GG040205320M2P | 5.0 | 32.0 | 25.6 | 38.4 | 6 | <0 .1 | ≤7 | 18 | ≤11 | 200.0 | ±30 | ±30 | ≤11 | 10000 |
| GG040207100N2P | 7.0 | 10.0 | 7 | 13 | 9.0 | <0 .1 | ≤10 | 6 | ≤12 | 72.0 | ±30 | ±30 | ≤13 | 10000 |
| GG0402126R042P | 12.0 | 6.0 | 4 | 8 | 18.0 | <0 .1 | ≤18 | 6 | ≤22 | 130.0 | ±25 | ±25 | ≤22 | 10000 |
| GG060303100N2P | 3.3 | 10.0 | 7 | 13 | 3.4 | <0 .1 | ≤6 | 8 | ≤10 | 80.0 | ±30 | ±30 | ≤10 | 5000 |
| GG0603052R542P | 5.0 | 2.5 | 0.5 | 4.5 | 6.7 | <0 .1 | ≤12 | 3 | ≤15 | 45.0 | ±15 | ±15 | ≤16 | 5000 |
| GG060305100N2P | 5.0 | 10.0 | 7 | 13 | 7.5 | <0 .1 | ≤8 | 8 | ≤12 | 96.0 | ±25 | ±25 | ≤12 | 5000 |

## HIGH POWER ELECTRICAL CHARACTERISTICS

| KYOCERA AVX Part Number | Vrwv (V) | Cnom (pF) | Cap Min (pf) | Cap Max (pF) | Vbr Typ (V) | IL (µa) | Vc (@ Ipp=1a, tp=8x20µs) (V) | Ipp (A) | Vc (@Ipp, tp=8x20µs) (V) | Ppp (W) | Vair (KV) | Vcon (KV) | Vc (@8KV) (V) | Pack QTY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GG0402050R8L2P | 5.0 | 0.8 | 0.5 | 2.5 | 8.0 | <0 .1 | ≤9 | 7 | ≤15 | 100 | ±30 | ±30 | ≤13 | 10000 |
| GG0402051R5L2P | 5.0 | 1.5 | 0.5 | 2.5 | 8.0 | <0 .1 | ≤9 | 15 | ≤20 | 300 | ±30 | ±30 | ≤12 | 10000 |

## LOW CAP ELECTRICAL CHARACTERISTICS

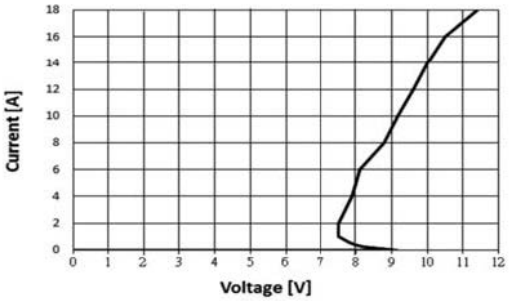
| KYOCERA AVX Part Number | Vrwv (V) | Cnom (pF) | Cap Min (pf) | Cap Max (pF) | Vbr Typ (V) | IL (µa) | Vc (@ Ipp=1a, tp=8x20µs) (V) | Ipp (A) | Vc (@Ipp, tp=8x20µs) (V) | Ppp (W) | Vair (KV) | Vcon (KV) | Vc (@8KV) (V) | Pack QTY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GG0201050R3C2P | 5.0 | 0.3 | 0.15 | 0.55 | 8.0 | <0 .1 | ≤15 | 3 | ≤20 | 60.0 | ±20 | ±20 | ≤30 | 15000 |
| GG0402050R4C2P | 5.0 | 0.35 | 0.15 | 0.65 | 8.5 | <0 .1 | ≤10 | 4 | ≤12 | 60.0 | ±20 | ±20 | ≤15 | 10000 |
| GG0402050R3C2P | 5.0 | 0.3 | 0.15 | 0.55 | 7.0 | <0 .1 | ≤12 | 3 | ≤15.5 | 54.0 | ±20 | ±20 | ≤30 | 10000 |
| GG0402060R3C2P | 6.5 | 0.3 | 0.15 | 0.55 | 7.0 | <0.1 | ≤12 | 3 | ≤15.5 | 54.0 | ±20 | ±20 | ≤30 | 10000 |



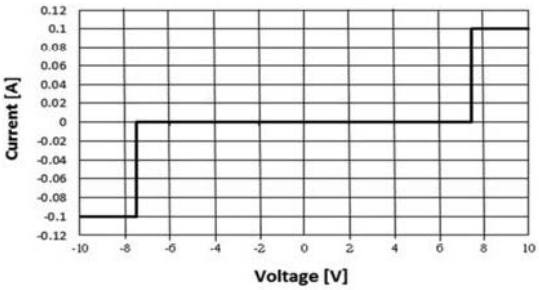
The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at www.kyocera-avx.com/disclaimer/ by reference and should be reviewed in full before placing any order.

### GG020105100N2P (10PF)

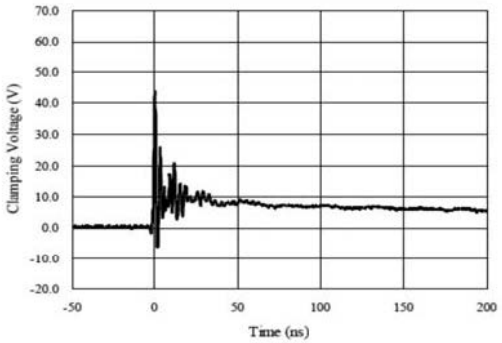
TLP Measurement



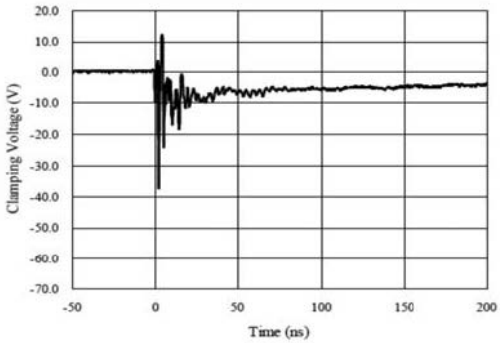

Voltage Sweeping of I/O_1 to I/O_2




ESD Clamping of I/O_1 to I/O_2 (+8kV Contact per IEC 61000-4-2)

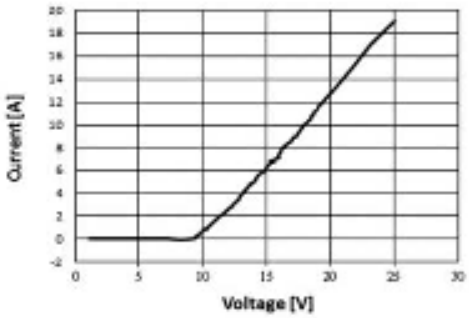



ESD Clamping of I/O_1 to I/O_2 (-8kV Contact per IEC 61000-4-2)

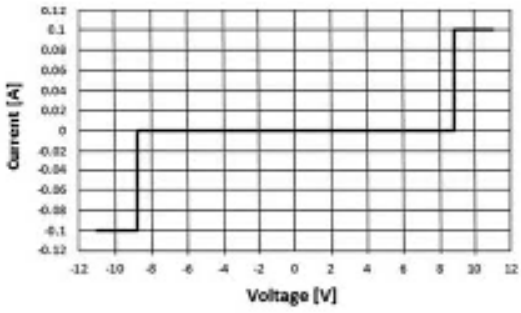



### GG0402060R3C2P (0.3PF)

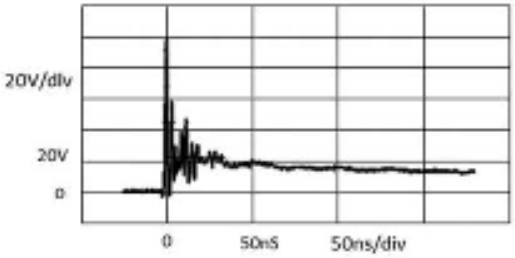
TLP Measurement



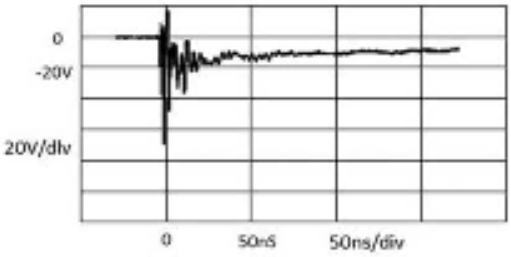

Voltage Sweeping of I/O_1 to I/O_2




ESD Clamping of I/O_1 to I/O_2 (+8kV Contact per IEC 61000-4-2)

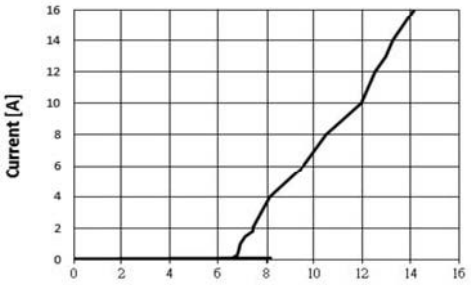



ESD Clamping of I/O_1 to I/O_2 (-8kV Contact per IEC 61000-4-2)

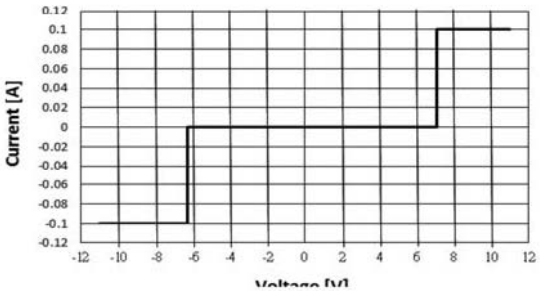


## GG0402052R542P (2.5PF)

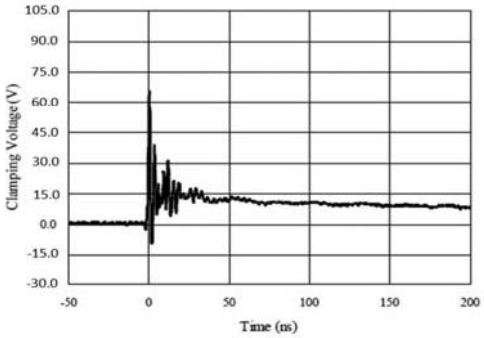
### TLP Measurement



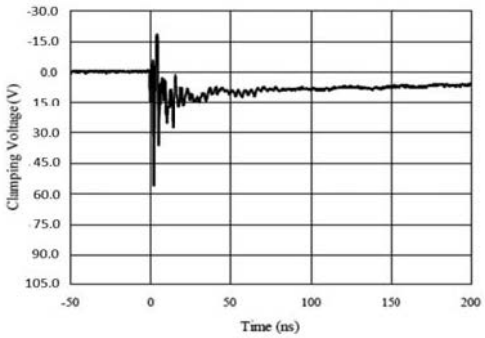

### Voltage Sweeping of I/O_1 to I/O_2




### ESD Clamping of I/O_1 to I/O_2 (+8kV Contact per IEC 61000-4-2)

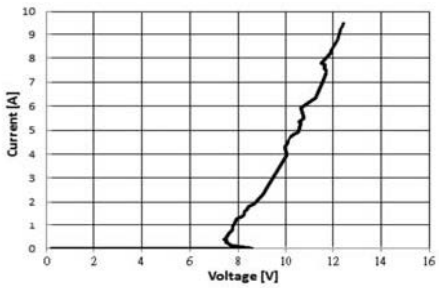



### ESD Clamping of I/O_1 to I/O_2 (-8kV Contact per IEC 61000-4-2)

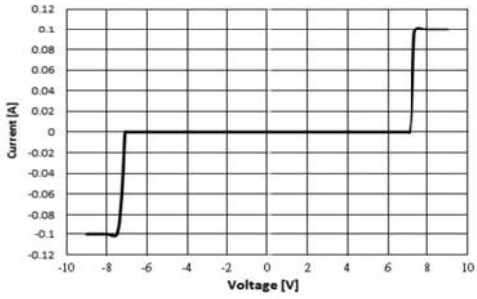



## GG0402055R042P (5.0PF)

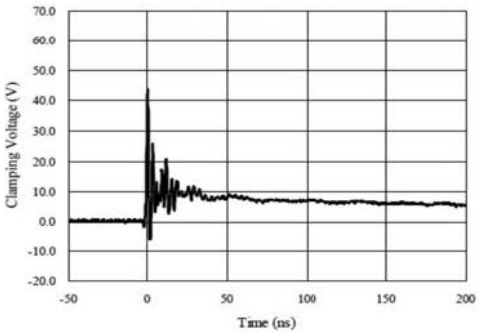
### TLP Measurement of I/O_1 to I/O_2



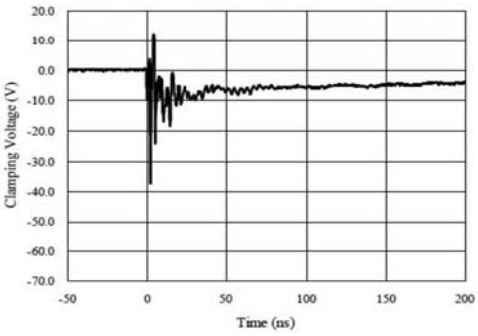

### Voltage Sweeping of I/O_1 to I/O_2




### ESD Clamping of I/O_1 to I/O_2 (+8kV Contact per IEC 61000-4-2)

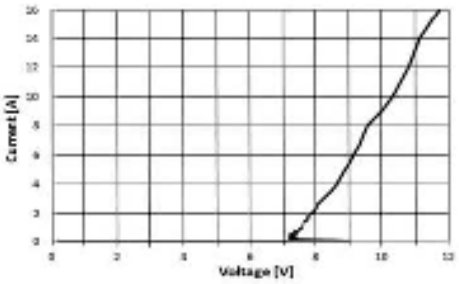



### ESD Clamping of I/O_1 to I/O_2 (-8kV Contact per IEC 61000-4-2)

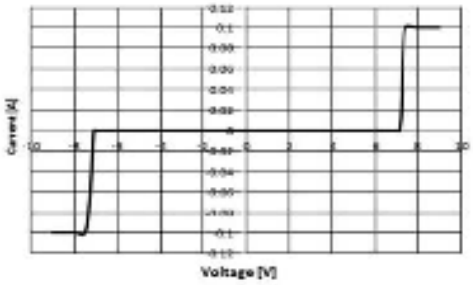


### GGS040205100N2P (10PF)

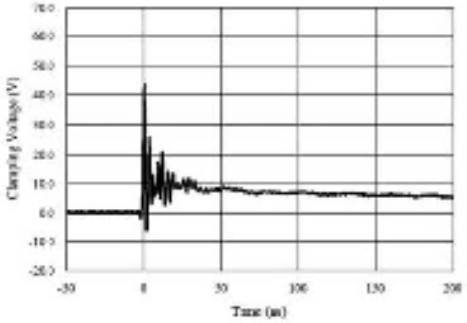
**TLP Measurement**



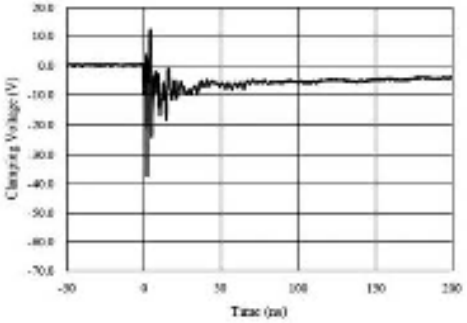

**Voltage Sweeping of I/O_1 to I/O_2**




**ESD Clamping of I/O_1 to I/O_2 (+8kV Contact per IEC 61000-4-2)**

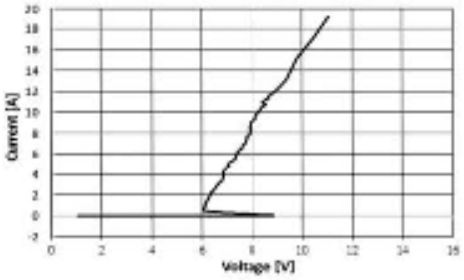



**ESD Clamping of I/O_1 to I/O_2 (-8kV Contact per IEC 61000-4-2)**

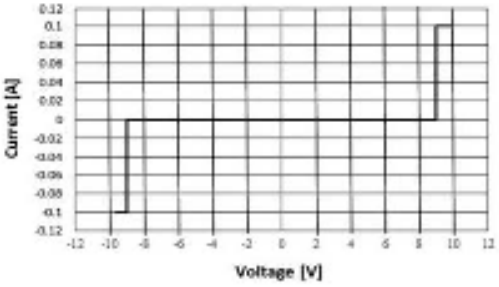



### GG040205170N2P (17PF)

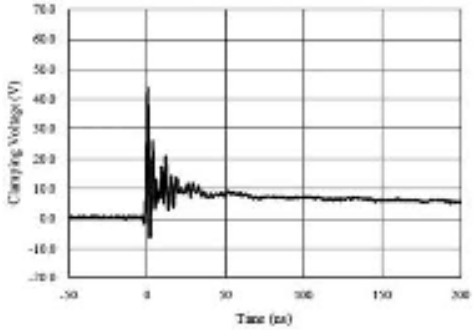
**TLP Measurement**



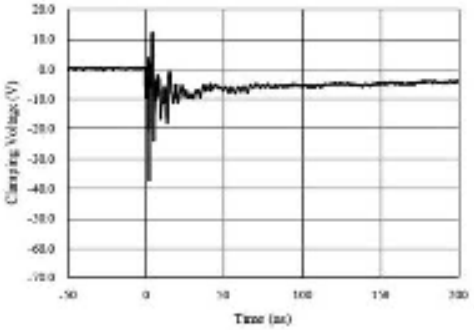

**Voltage Sweeping of I/O_1 to**



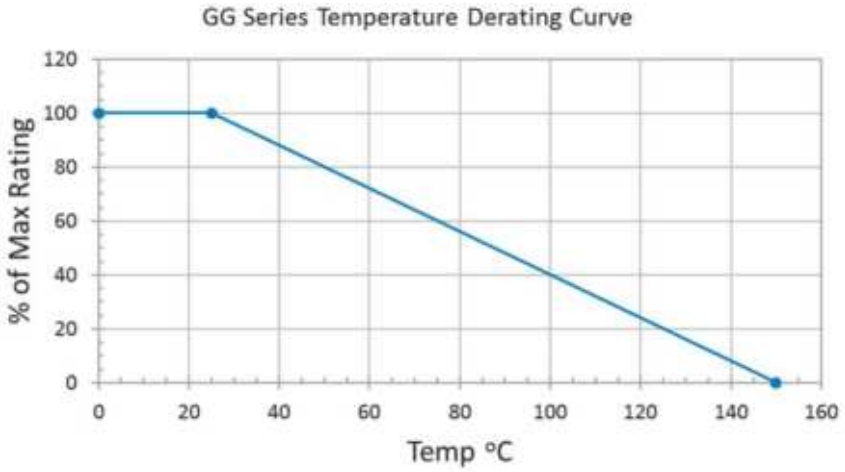

**ESD Clamping of I/O_1 to I/O_2 (+8kV Contact per IEC 61000-4-2)**



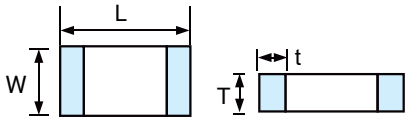

**ESD Clamping of I/O_1 to I/O_2 (-8kV Contact per IEC 61000-4-2)**



## TEMPERATURE DERATING



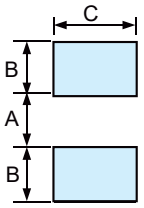

## DIMENSIONS




mm (inches)

| Size | Length (L) | Width (W) | Thickness (T) | Termination (t) |
|---|---|---|---|---|
| 0201 | 0.60 ± 0.03 (0.024 ± 0.001) | 0.30 ± 0.03 (0.012 ± 0.001) | 0.30 ± 0.03 (0.012 ± 0.001) | 0.15 ± 0.05 (0.006 ± 0.002) |
| 0402 | 1.00 ± 0.05 (0.039 ± 0.002) | 0.60 ± 0.05 (0.024 ± 0.002) | 0.50 ± 0.05 (0.020 ± 0.002) | 0.20 ± 0.05 (0.008 ± 0.002) |
| 0603 | 1.60 ± 0.10 (0.063 ± 0.004) | 0.80 ± 0.10 (0.031 ± 0.004) | 0.60 ± 0.10 (0.024 ± 0.004) | 0.30 ± 0.05 (0.012 ± 0.002) |

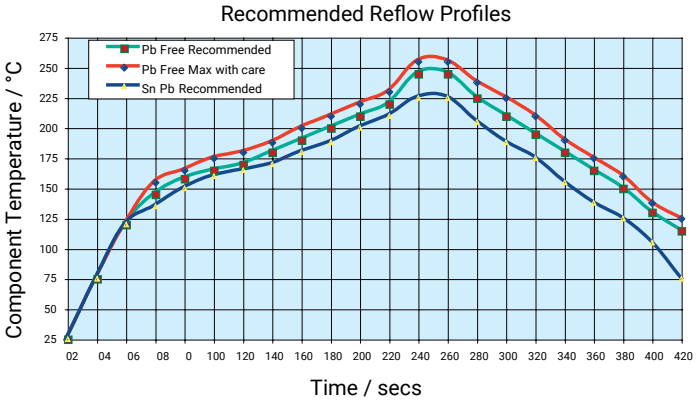
## RECOMMENDED REFLOW SOLDER PAD




mm (inches)

| Size | A | B | C |
|---|---|---|---|
| 0201 | 0.30 ± 0.05 (0.012 ± 0.002) | 0.30 ± 0.05 (0.012 ± 0.002) | 0.325 ± 0.025 (0.013 ± 0.001) |
| 0402 | 0.50 ± 0.10 (0.0215 ± 0.0025) | 0.60 ± 0.10 (0.024 ± 0.004) | 0.065 ± 0.05 (0.026 ± 0.002) |
| 0603 | 1.05 ± 0.15 (0.041 ± 0.006) | 1.05 ± 0.15 (0.041 ± 0.006) | 0.90 ± 0.10 (0.035 ± 0.004) |

## RECOMMENDED SOLDER REFLOW PROFILES




Hand Soldering Cautions

In hand soldering of the Devices. Large temperature gradient between preheated the Devices and the tip of soldering iron may cause electrical failures and mechanical damages such as cracking or breaking of the devices. The soldering shall be carefully controlled and carried out so that the temperature gradient is kept minimum with following recommended conditions for hand soldering.

## RECOMMENDED SOLDERING CONDITION 1

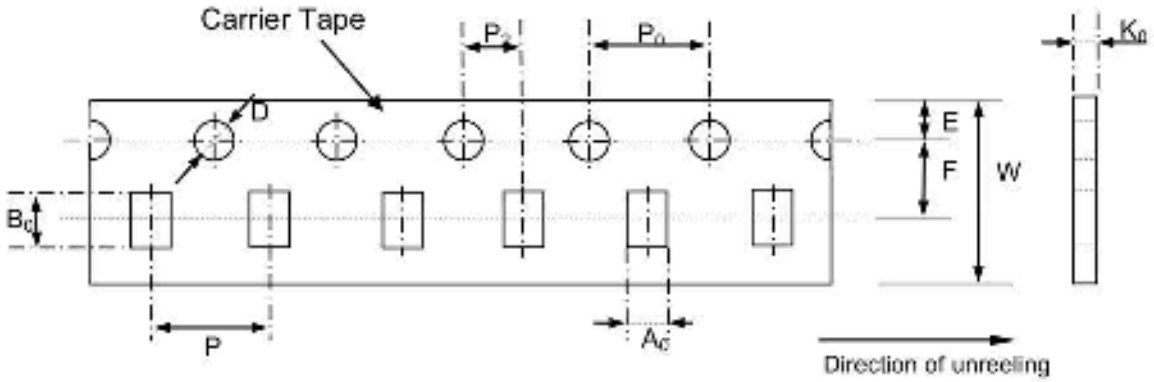
- Solder: **0.12~0.18mm** Thread solder (Sn96.5:Ag3.5) with soldering flux in the core Rosin-based and non-activated flux is recommended.
- Preheating: The Devices shall be preheated so that Temperature Gradient between the devices and the tip of soldering iron is 150° or below.
- Soldering Iron: Rated Power of 20w max with 3mm soldering tip in diameter. Temperature of soldering iron tip **300°Cmax, 3-5sec** (The required amount of solder shall be melted in advance on the soldering tip.)
- Cooling: After soldering. The Devices shall be cooled gradually at room ambient temperature.

## RECOMMENDED SOLDERING CONDITION 2 – WITHOUT PREHEATING

- Temperature of soldering iron tip 300°C max, 3-5sec.
- Solder iron tip shall not directly touch to Devices.
- Solder iron tip shall be fully preheated before soldering while soldering iron tip to the external electrode of Devices.

## PACKAGING SPECIFICATION

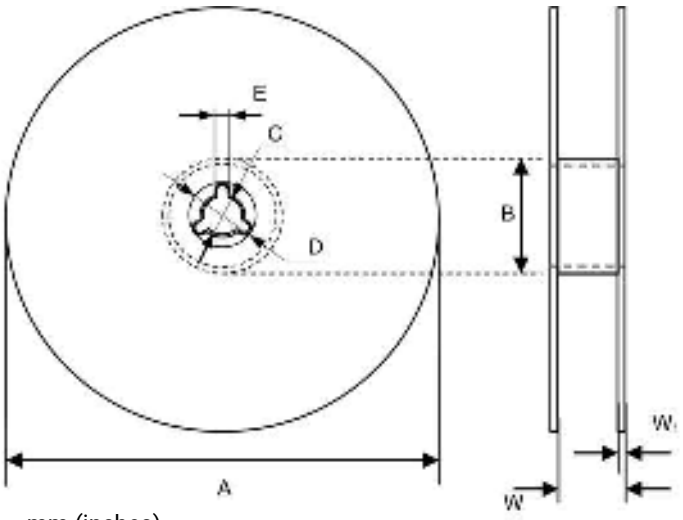
- Carrier tape and transparent cover tape should be heat-sealed to carry the products, and the reel should be used to reel the carrier tape.
- The adhesion of the heat-sealed cover tape shall be 25~60 grams with nominal of 40 grams.
- Both the head and the end portion of the taping shall be empty for reel package and SMT auto-pickup machine. And a normal paper tape shall be connected in the head of taping for the operator to handle.




mm (inches)

| Case Size | $A_0$ ±0.05 (0.002) | $B_0$ ±0.05 (0.002) | $K_0$ ±0.05 (0.002) | D +0.10 (0.004) -0.05 (0.002) | P ±0.10 (0.004) | $P_2$ ±0.10 (0.004) | $P_0$ ±0.10 (0.004) | W ±0.10 (0.004) | E ±0.10 (0.004) | F ±0.05 (0.002) | Qty |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0201 | 0.37 (0.015) | 0.67 (0.026) | 0.50 (0.020) | 1.50 (0.059) | 2.00 (0.079) | 2.00 (0.079) | 4.00 (0.157) | 8.00 (0.315) | 1.75 (0.069) | 3.50 (0.138) | 15K |
| 0402 | 0.70 (0.028) | 1.12 (0.044) | 0.60 (0.024) | 1.55 (0.061) | 2.00 (0.079) | 2.00 (0.079) | 4.00 (0.157) | 8.00 (0.315) | 1.75 (0.069) | 3.50 (0.138) | 10k |
| 0603 | 1.00 (0.039) | 1.80 (0.071) | 0.70 (0.028) | 1.50 (0.059) | 4.00 (0.157) | 2.00 (0.079) | 4.0 (0.157) | 8.00 (0.315) | 1.75 (0.069) | 3.50 (0.138) | 5K |

## REEL DIMENSIONS




mm (inches)

| Reel Size | A | B | C | D | E | W | $W_1$ |
|---|---|---|---|---|---|---|---|
| 7" | 178.0 ± 1.0 (7.008 ± 0.039) | 60.0 ± 0.5 (2.362 ± 0.020) | 13.0 ± 0.2 (0.512 ± 0.008) | 21.0 ± 0.2 (0.827 ± 0.008) | 2.0 ± 0.5 (0.079 ± 0.020) | 9.0 ± 0.50 (0.354 ± 0.020) | 1.5 ± 0.15 (0.059 ± 0.006) |