

## 250W FLIP CHIP TVS ARRAY



### DESCRIPTION

The P0402FCxxC Series Flip Chips employ advanced silicon P/N junction technology for unmatched board-level transient voltage protection against Electrostatic Discharge (ESD) and Electrical Fast Transients (EFT). Developed specifically for high-density circuit protection, this series meets the IEC 61000-4-2 and 61000-4-4 requirements. These devices are ideally suited for handheld devices, PCMCIA and SMART cards.

This series provides ESD protection greater than 25 kilovolts with a peak pulse power dissipation of 250 Watts per line for an 8/20 $\mu$ s waveform. In addition, the P0402FCxxC series features superior clamping performance, low leakage current characteristics and a response time of less than a nanosecond. Their low inductance virtually eliminates overshoot voltage due to package inductance.

### FEATURES

- Compatible with IEC 61000-4-2 (ESD): Air 15kV, Contact 8kV
- Compatible with IEC 61000-4-4 (EFT): 40A, 5/50ns
- ESD Protection > 25 kilovolts
- Available in Voltages Ranging from 3.3V to 36V
- 250 Watts Peak Pulse Power per Line (tp = 8/20 $\mu$ s)
- Protection for 1 Line
- RoHS Compliant
- REACH Compliant

### APPLICATIONS

- Cellular Phones
- MCM Boards
- Wireless Communication Circuits
- IR LEDs
- SMART & PCMCIA Cards

### MECHANICAL CHARACTERISTICS

- Standard EIA Chip Size: 0402
- Approximate Weight: 0.73 milligrams
- Lead-Free Plating
- Solder Reflow Temperature:
  - Lead-Free - Sn/Ag/Cu, 96/3.5/0.5: 260-270°C
- Flammability Rating UL 94V-0
- 8mm Tape per EIA Standard 481
- Top Contacts: Solder Bump 0.004" in Height (Nominal)

### CIRCUIT DIAGRAM



**1 Line of Protection**

## TYPICAL DEVICE CHARACTERISTICS

## MAXIMUM RATINGS @ 25°C Unless Otherwise Specified

| PARAMETER                                     | SYMBOL           | VALUE      | UNITS |
|-----------------------------------------------|------------------|------------|-------|
| Peak Pulse Power (tp = 8/20μs) - See Figure 1 | P <sub>PP</sub>  | 250        | Watts |
| Operating Temperature                         | T <sub>A</sub>   | -55 to 150 | °C    |
| Storage Temperature                           | T <sub>STG</sub> | -55 to 150 | °C    |

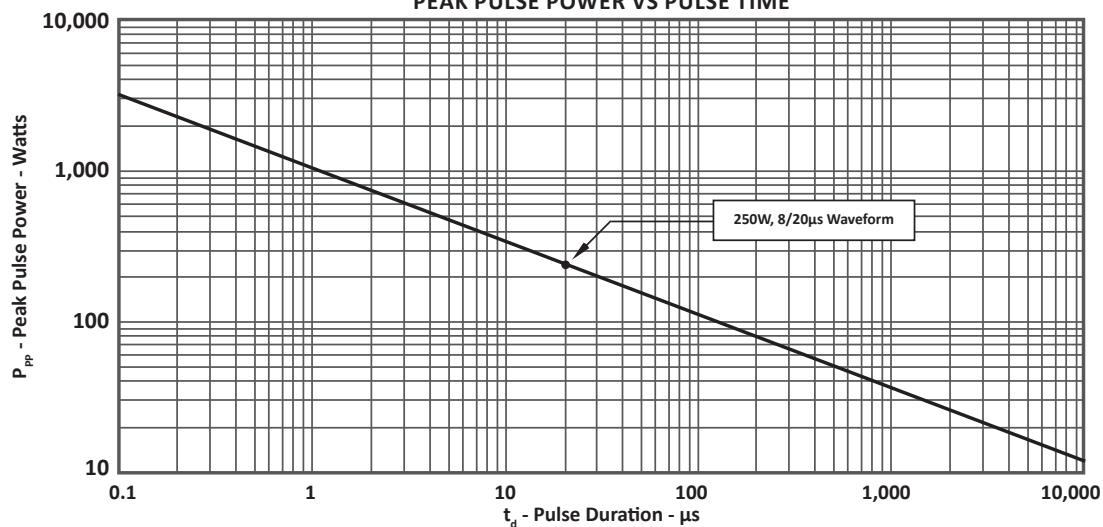
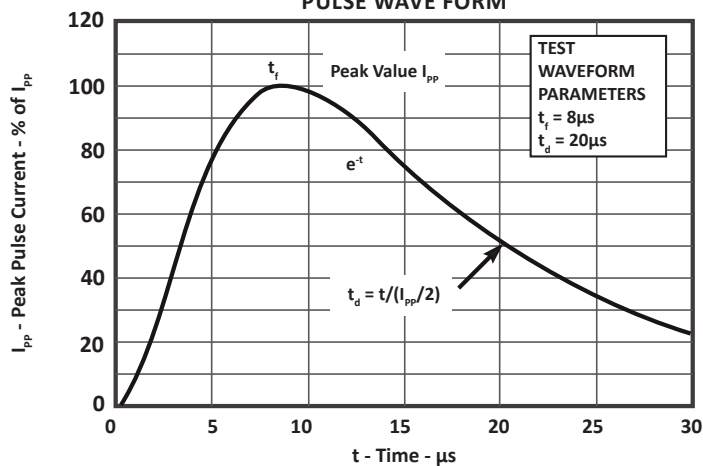
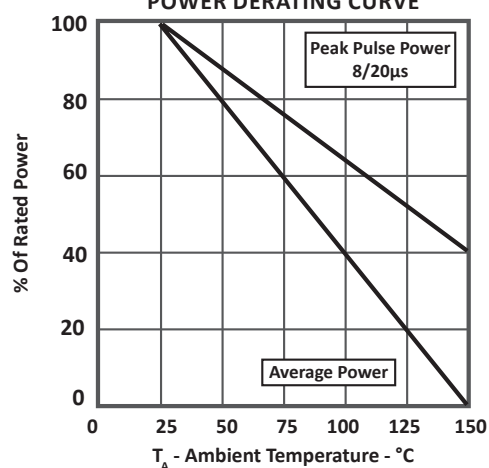
## ELECTRICAL CHARACTERISTICS PER LINE @ 25°C Unless Otherwise Specified

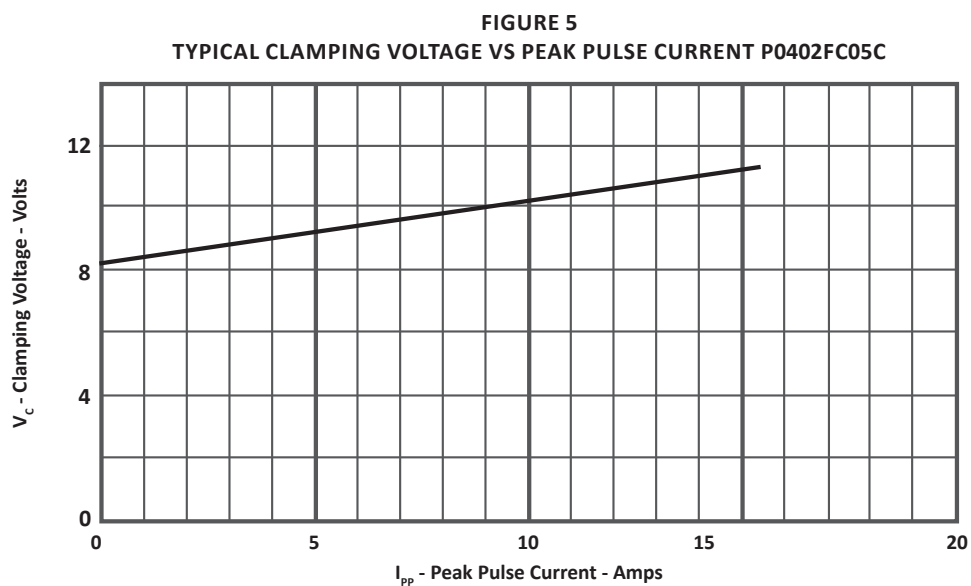
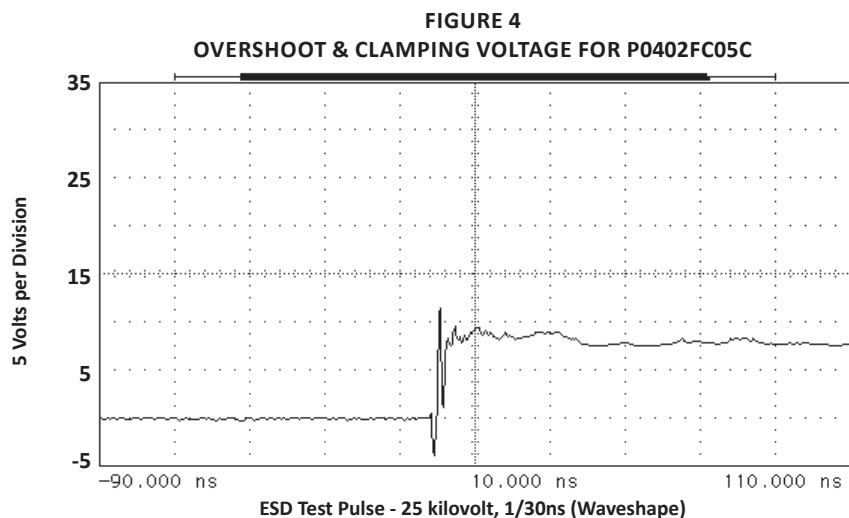
| PART<br>NUMBER<br>(Note 1) | RATED<br>STAND-OFF<br>VOLTAGE<br><br>V <sub>WM</sub><br>VOLTS | MINIMUM<br>BREAKDOWN<br>VOLTAGE<br><br>@ 1mA<br>V <sub>(BR)</sub><br>VOLTS | MAXIMUM<br>CLAMPING<br>VOLTAGE<br>(Fig. 2)<br>@ I <sub>p</sub> = 1A<br>V <sub>c</sub><br>VOLTS | MAXIMUM<br>CLAMPING<br>VOLTAGE<br>(Fig. 2)<br><br>@ 8/20μs<br>V <sub>c</sub> @ I <sub>PP</sub> | MAXIMUM<br>LEAKAGE<br>CURRENT<br>(Note 2)<br>@ V <sub>WM</sub><br>I <sub>D</sub><br>μA | TYPICAL<br>CAPACITANCE<br><br>@ 0V, 1MHz<br>C<br>pF |
|----------------------------|---------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------|
| P0402FC3.3C                | 3.3                                                           | 4.0                                                                        | 7.0                                                                                            | 12.5V @ 20A                                                                                    | 75*                                                                                    | 150                                                 |
| P0402FC05C                 | 5.0                                                           | 6.0                                                                        | 11.0                                                                                           | 14.7V @ 17A                                                                                    | 10**                                                                                   | 100                                                 |
| P0402FC08C                 | 8.0                                                           | 8.5                                                                        | 13.2                                                                                           | 19.2V @ 13A                                                                                    | 10***                                                                                  | 75                                                  |
| P0402FC12C                 | 12.0                                                          | 13.3                                                                       | 19.8                                                                                           | 29.7V @ 9A                                                                                     | 1                                                                                      | 50                                                  |
| P0402FC15C                 | 15.0                                                          | 16.7                                                                       | 25.4                                                                                           | 35.7V @ 7A                                                                                     | 1                                                                                      | 40                                                  |
| P0402FC24C                 | 24.0                                                          | 26.7                                                                       | 37.2                                                                                           | 55.0V @ 5A                                                                                     | 1                                                                                      | 30                                                  |
| P0402FC36C                 | 36.0                                                          | 40.0                                                                       | 70.0                                                                                           | 84.0V @ 3A                                                                                     | 1                                                                                      | 25                                                  |

## NOTES

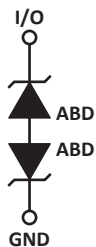
1. All devices are bidirectional. Electrical characteristics apply in both directions.
2. \*Maximum leakage current < 5μA @ 2.8V. \*\*Maximum leakage current < 500nA @ 3.3V. \*\*\*Maximum leakage current < 200nA @ 5V.

## TYPICAL DEVICE CHARACTERISTICS

 FIGURE 1  
 PEAK PULSE POWER VS PULSE TIME

 FIGURE 2  
 PULSE WAVE FORM

 FIGURE 3  
 POWER DERATING CURVE


**TYPICAL DEVICE CHARACTERISTICS**

## SPICE MODEL

**FIGURE 1**  
**SPICE MODEL FOR**


ABD - Avalanche Breakdown Diode (TVS)

| TABLE 1 - SPICE PARAMETERS |               |             |
|----------------------------|---------------|-------------|
| PARAMETER                  | UNIT          | ABD(TVS)    |
| BV                         | V             | See Table 2 |
| IBV                        | $\mu\text{A}$ | 1           |
| $C_{jo}$                   | pF            | See Table 2 |
| $I_s$                      | A             | See Table 2 |
| $V_j$                      | V             | 0.6         |
| M                          | -             | 0.33        |
| N                          | -             | 1           |
| $R_s$                      | -             | See Table 2 |
| TT                         | s             | 1E-8        |
| EG                         | eV            | 1.11        |

| TABLE 2 - ABD SPECIFIC SPICE PARAMETERS |               |               |              |              |
|-----------------------------------------|---------------|---------------|--------------|--------------|
| PART NUMBER                             | $B_v$ (VOLTS) | $C_{jo}$ (pF) | $I_s$ (AMPS) | $R_s$ (OHMS) |
| P0402FC3.3C                             | 4.0           | 150           | 1E-11        | 0.20         |
| P0402FC05C                              | 6.0           | 100           | 1E-11        | 0.16         |
| P0402FC08C                              | 8.5           | 75            | 1E-13        | 0.33         |
| P0402FC12C                              | 13.3          | 50            | 1E-13        | 0.51         |
| P0402FC15C                              | 16.7          | 40            | 1E-13        | 0.53         |
| P0402FC24C                              | 26.7          | 20            | 1E-13        | 0.63         |
| P0402FC36C                              | 40.2          | 15            | 1E-13        | 0.73         |

## SOLDER REFLOW INFORMATION

| PRINTED CIRCUIT BOARD RECOMMENDATIONS                         |                              |
|---------------------------------------------------------------|------------------------------|
| PARAMETER                                                     | VALUE                        |
| Pad Size on PCB                                               | 0.275mm                      |
| Pad Shape                                                     | Round                        |
| Pad Definition                                                | Non-Solder Mask Defined Pads |
| Solder Mask Opening                                           | 0.325mm Round                |
| Solder Stencil Thickness                                      | 0.150mm                      |
| Solder Stencil Aperture Opening (Laser cut, 5% tapered walls) | 0.330mm Round                |
| Solder Paste Type                                             | No Clean                     |
| Pad Protective Finish                                         | OSP (Entek Cu Plus 106A)     |
| Tolerance - Edge To Corner Ball                               | ±50µm                        |
| Solder Ball Side Coplanarity                                  | ±20µm                        |
| Maximum Dwell Time Above Liquidous (183°C)                    | 60 seconds                   |
| Soldering Maximum Temperature                                 | 270°C                        |

### REQUIREMENTS

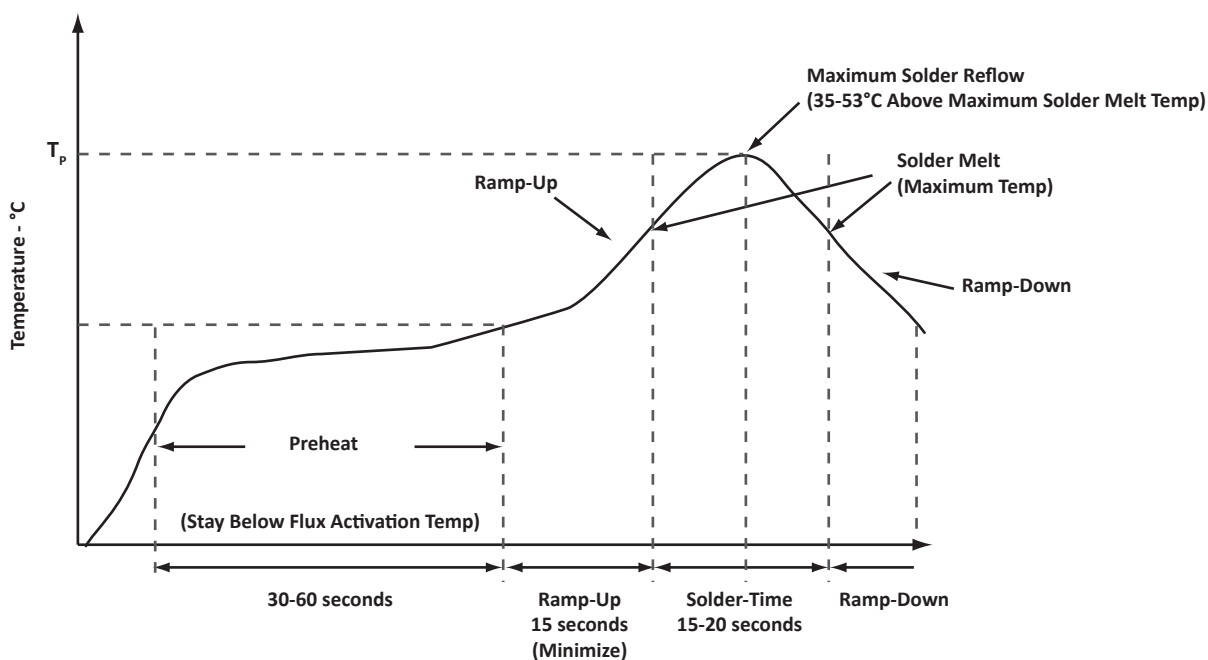
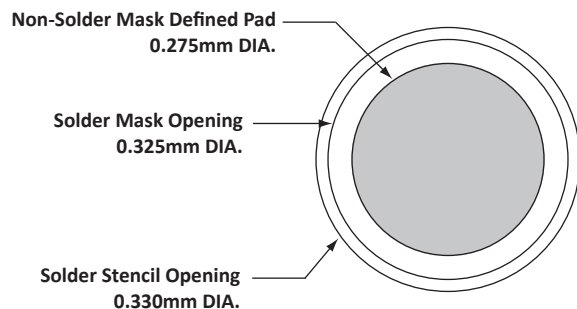
Temperature:

$T_p$  for Lead-Free (Sn/Ag/Cu): 260-270°C

$T_p$  for Tin-Lead: 240-245°C

Preheat time and temperature depends on solder paste and flux activation temperature, component size, weight, surface area and plating.

### RECOMMENDED NON-SOLDER MASK DEFINED PAD ILLUSTRATION



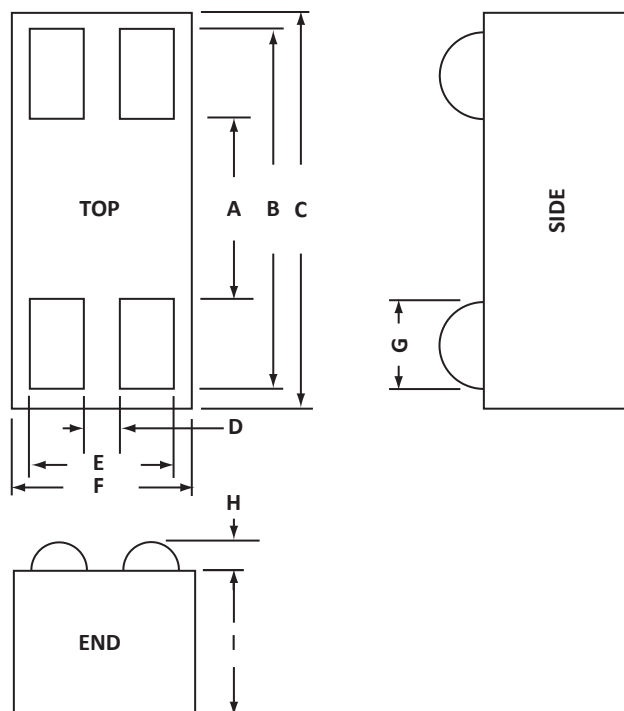
## 0402 PACKAGE INFORMATION

### OUTLINE DIMENSIONS

| DIM | MILLIMETERS |       | INCHES |       |
|-----|-------------|-------|--------|-------|
|     | MIN         | MAX   | MIN    | MAX   |
| A   | 0.46        |       | 0.018  |       |
| B   | 0.86        |       | 0.034  |       |
| C   | 0.98        | 1.02  | 0.038  | 0.040 |
| D   | 0.10        |       | 0.004  |       |
| E   | 0.35        |       | 0.014  |       |
| F   | 0.458       | 0.508 | 0.018  | 0.020 |
| G   | 0.20        |       | 0.008  |       |
| H   | 0.051       | 0.076 | 0.002  | 0.003 |
| I   | 0.406       |       | 0.016  |       |

#### NOTES

1. Controlling dimensions in inches.
2. Decimal tolerance: .xxx ± 0.05mm (0.002").
3. Maximum chip size: 1.02mm (0.040") by 0.51mm (0.020").

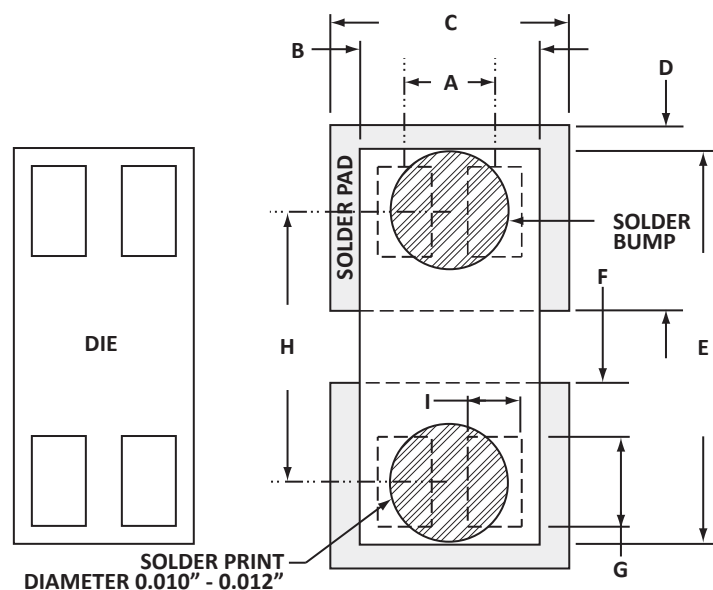


### LAYOUT DIMENSIONS

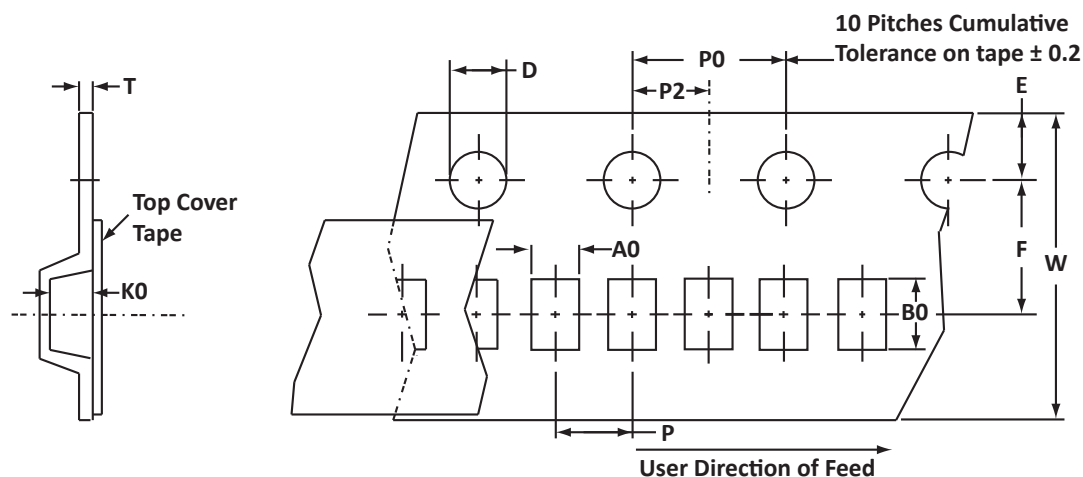
| DIM | MILLIMETERS |  | INCHES  |  |
|-----|-------------|--|---------|--|
|     | NOMINAL     |  | NOMINAL |  |
| A   | 0.23        |  | 0.009   |  |
| B   | 0.48        |  | 0.019   |  |
| C   | 0.69        |  | 0.027   |  |
| D   | 0.46        |  | 0.018   |  |
| E   | 0.99        |  | 0.039   |  |
| F   | 0.20        |  | 0.008   |  |
| G   | 0.20        |  | 0.008   |  |
| H   | 0.66        |  | 0.026   |  |
| I   | 0.13        |  | 0.005   |  |

#### NOTES

1. Controlling dimensions in inches.
2. Decimal tolerance: .xxx ± 0.05mm (0.002").



## TAPE AND REEL INFORMATION



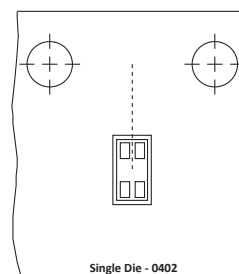
### SPECIFICATIONS

| REEL DIA. | TAPE WIDTH | A0          | B0          | K0          | D           | E           | F           | W           | P0          | P2          | P           | Tmax |
|-----------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------|
| 178(7")   | 8          | 0.70 ± 0.05 | 1.15 ± 0.10 | 0.56 ± 0.05 | 1.55 ± 0.05 | 1.75 ± 0.10 | 3.50 ± 0.05 | 8.00 ± 0.20 | 4.00 ± 0.05 | 2.00 ± 0.05 | 2.00 ± 0.05 | 0.25 |

#### NOTES

1. Dimensions in millimeters.
2. Top view of tape. Metal contacts are face down in tape package.
3. Orientation: preferred stencil - 0.1mm (0.004").
4. Surface mount product is taped and reeled in accordance with EIA 481.
5. 8mm plastic tape: 7" Reels - 5,000 (pocket under hole skipped) pieces per reel.
6. Marking on Reel - part number, date code and lot number.

#### TAPE & REEL ORIENTATION



Package outline, pad layout and tape specifications per document number 06001.R7 8/12.

### ORDERING INFORMATION

| BASE PART NUMBER<br>(xx = Voltage) | LEADFREE SUFFIX | TAPE SUFFIX | QTY/REEL | REEL SIZE | TUBE QTY |
|------------------------------------|-----------------|-------------|----------|-----------|----------|
| P0402FCxxC                         | -LF             | -T75-1      | 5,000    | 7"        | n/a      |

This device is only available in a Lead-Free configuration.

## COMPANY INFORMATION

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### COMPANY PROFILE

In business more than 20 years, ProTek Devices™ is a privately-held company located in Tempe, Arizona, that offers a product line of transient voltage suppressors (TVS); avalanche breakdown diodes; steering diode TVS arrays and other surge suppressor component products. These TVS devices protect electronic systems from the effects of lightning, electrostatic discharge (ESD), nuclear electromagnetic pulses (NEMP), inductive switching and EMI / RFI. ProTek Devices also offers high performance interface and linear products that include analog switches; multiplexers; LED drivers; audio control ICs; RF and related high frequency products. The analog devices work in a host of consumer; industrial; automotive and other applications.

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PATENT INFORMATION: This device is patented under U.S. Patent No. Des. "D456,367S".

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«FORSTAR» (основан в 1998 г.)

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