

TVS Diode Arrays

TVS Avalanche Diode Array in a Bipolar Chip Scale Package

SP0504BBC, SP0508BBC, SP0516BBC

This family of avalanche diode arrays are designed for ESD protection and offered in an ultra small chip scale package. The multi-channel devices are used to help protect sensitive digital or analog input circuits on data, signal, or control lines with Bipolar voltage levels up to 5VDC. The array is ideal for protection when AC signals are present.

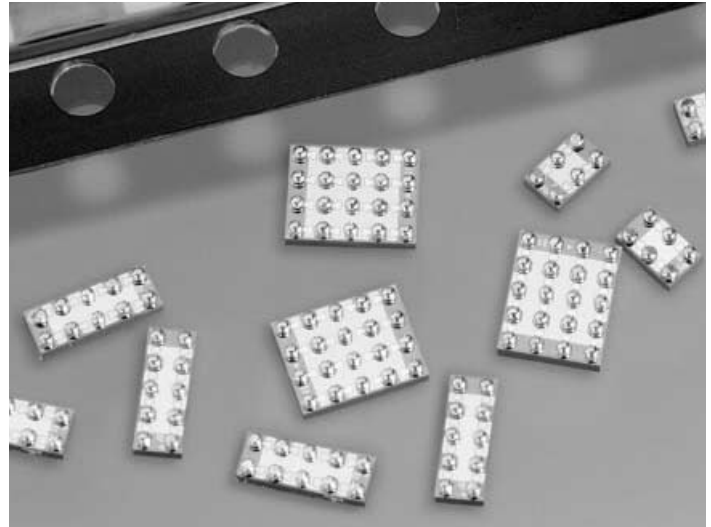
The state-of-the-art structure is designed to suppress ESD and other transient over-voltage events to meet the International Electrotechnical Compaability (EMC transient immunity standarts IEC 61000-4-2 for Electrostatic Discharge Requirements).

The monolithic silicon devices are comprised of specially designed structures for transient voltage suppression (TVS). The size and shape of these structures has been tailored for transient protection. The low capacitance and clamp voltage are ideal for high speed signal line protection.

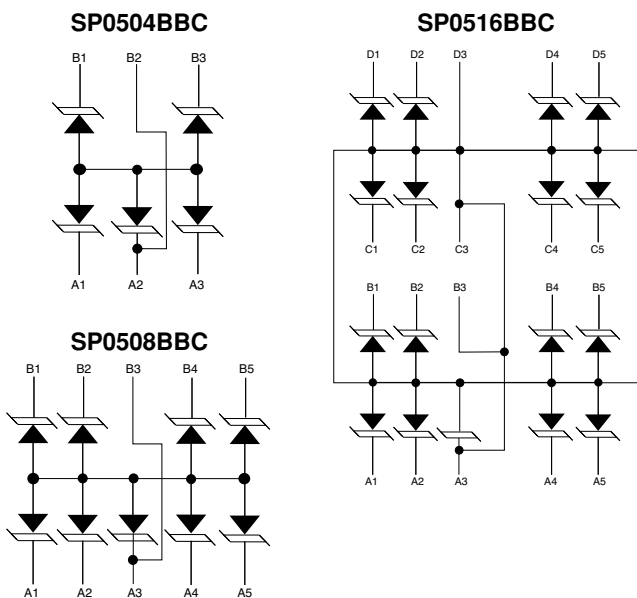
Ordering Information

NOTE: Bump pitch is 0.65mm

| Part Number | Diode Channels | Bumps | CS Package Size (mm) | Quantity Per Reel |
|-------------|----------------|-------|----------------------|-------------------|
| SP0504BBCT | 4 | 6 | 1.804 x 1.154 | 3500 |
| SP0508BBCT | 8 | 10 | 3.104 x 1.154 | 3500 |
| SP0516BBCT | 16 | 20 | 3.104 x 2.454 | 3500 |



Schematic



Features

- An Array of 4, 8 and 16 Avalanche Diodes in a ultra small Chip Scale Package (0.65mm bump pitch)
- ESD Capability per HBM Standards
 - IEC 61000-4-2, Direct Discharge18kV (Level 4)
 - IEC 61000-4-2, Air Discharge30kV (Level 4)
 - MIL STD 883D (Method 3015.7)30kV
- Bipolar signal line protection for applications up to 5V
- Fast response time< 1ns
- Low input capacitance39pF Typical
- Low clamp voltage12V Typical
- Low input leakage10uA Max
- Operating temperature range- 40°C to 85°C

Applications

- Cell phone handsets
- Personal Digital Assistants (PDA)
- Portable handheld equipment (Laptop, Palmtop computers)
- Computer port, keyboard (USB1.1)
- Set-Top Box (Audio and Video ports)
- PCMCIA cards
- MP3 players
- Digital still cameras
- Digital video cameras

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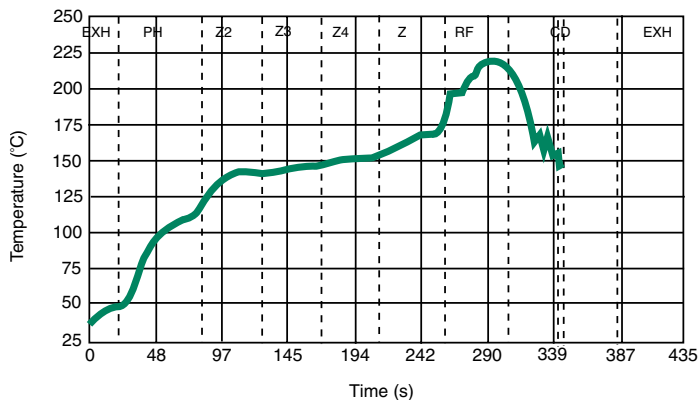
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Electrical Specifications $T_A = 25^\circ\text{C}$ Unless Otherwise Specified

| PARAMETER | TEST CONDITIONS | MIN | TYPICAL | MAX | UNITS |
|----------------------------------|---------------------|-----------|---------|-------|------------------|
| Reverse Standoff Voltage | $I = 10\mu\text{A}$ | ± 5.9 | - | - | V |
| Reverse Standoff Leakage Current | $V = \text{TBD}$ | | | 100 | nA |
| Signal Clamp Voltage | | | | | |
| Positive | $I = 10\text{mA}$ | 6.0 | 7.6 | 9.2 | V |
| Negative | $I = 10\text{mA}$ | - 9.2 | - 7.6 | - 6.0 | V |
| Clamp Voltage during ESD | | | | | |
| MIL-STD-883D Method 3015 | 8 kV Positive | | 14 | | V |
| | 8 kV Negative | | -14 | | V |
| ESD Test Level | | | | | |
| IEC-61000-4-2, Contact discharge | | 18 | | | kV |
| MIL-STD-883D Method 3015 (HBM) | | 30 | | | kV |
| Capacitance | 2.5VDC @ 1Mhz | | 39 | | pF |
| Turn on/off Time | | | <1 | | ns |
| Temperature Range | | | | | |
| Operating | | - 40 | | 85 | $^\circ\text{C}$ |
| Storage | | - 65 | | 150 | $^\circ\text{C}$ |

SILICON PROTECTION 01
CIRCUITS

Typical Solder Reflow Thermal Profile (No-Clean Flux)

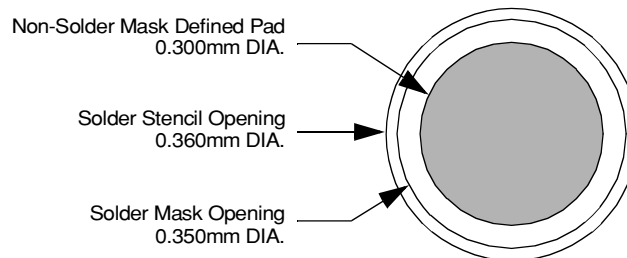
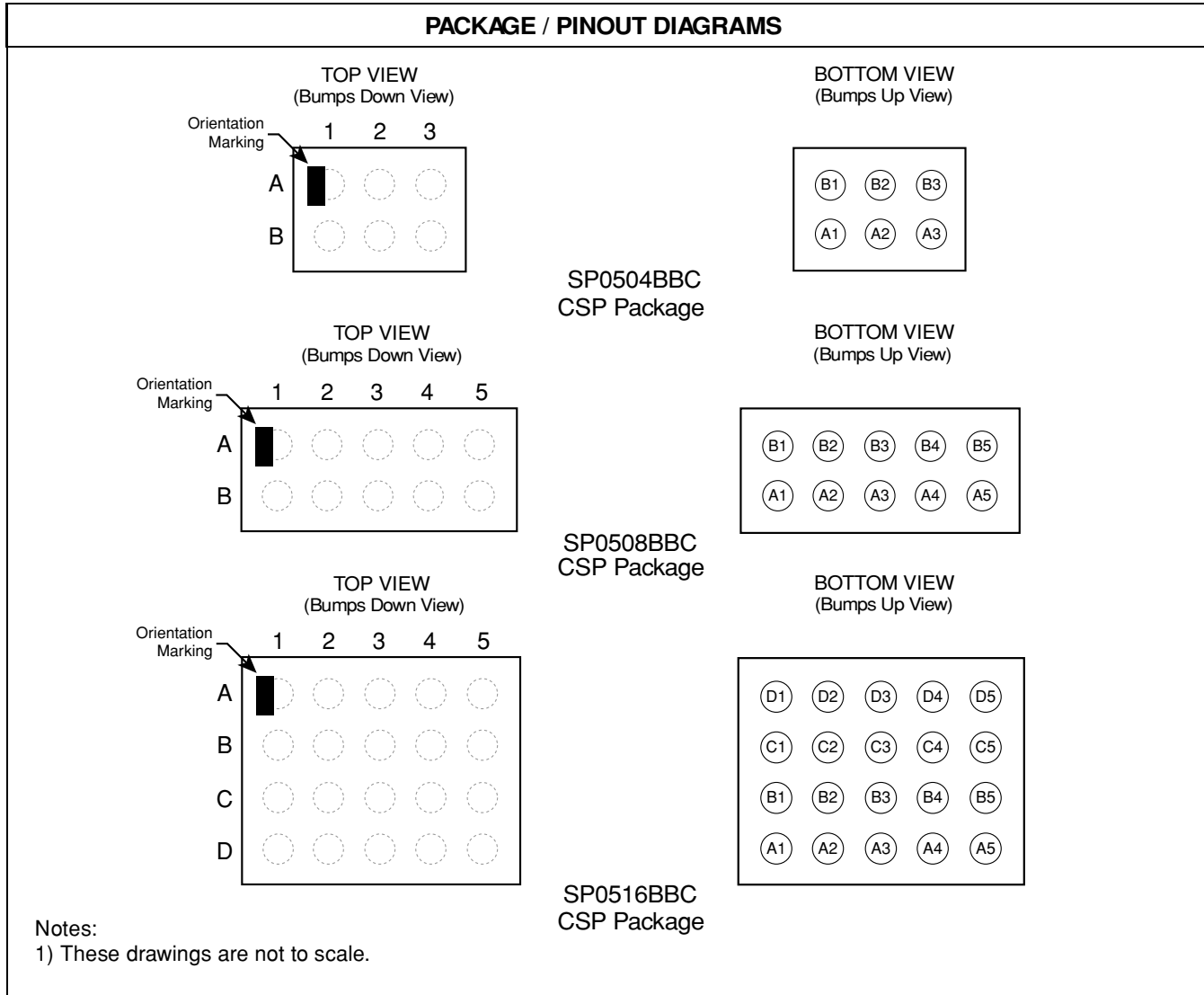


| PRINTED CIRCUIT BOARD RECOMMENDATIONS | |
|---|------------------------------|
| PARAMETER | VALUE |
| Pad Size on PCB | 0.300mm |
| Pad Shape | Round |
| Pad Definition | Non-Solder Mask defined pads |
| Solder Mask Opening | 0.350mm Round |
| Solder Stencil Thickness | 0.125 - 0.150mm |
| Solder Stencil Aperture Opening (laser cut, 5% tapered walls) | 0.360mm Round |
| Solder Flux Ratio | 50/50 by volume |
| Solder Paste Type | No Clean |
| Pad Protective Finish | OSP (Entek Cu Plus 106A) |
| Tolerance — Edge To Corner Ball | $\pm 50\mu\text{m}$ |
| Solder Ball Side Coplanarity | $\pm 20\mu\text{m}$ |
| Maximum Dwell Time Above Liquidous | 60 seconds |
| Soldering Maximum Temperature | 260 $^\circ\text{C}$ |

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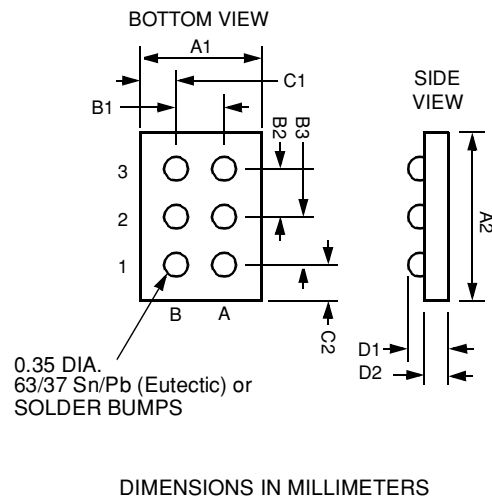
SP0504BBC 6-bump

CSP Mechanical Specifications

The SP0504BBC devices are packaged in a 6-bump custom Chip Scale Package (CSP). Dimensions are presented below.

| PACKAGE DIMENSIONS | | | | | | |
|------------------------------------|-------------|-------|-------|--------|--------|--------|
| Package | Custom CSP | | | | | |
| Bumps | 6 | | | | | |
| Dim | Millimeters | | | Inches | | |
| | Min | Nom | Max | Min | Nom | Max |
| A1 | 1.109 | 1.154 | 1.199 | 0.0437 | 0.0454 | 0.0472 |
| A2 | 1.759 | 1.804 | 1.849 | 0.0693 | 0.0710 | 0.0728 |
| B1 | 0.645 | 0.650 | 0.655 | 0.0254 | 0.0256 | 0.0258 |
| B2 | 0.645 | 0.650 | 0.655 | 0.0254 | 0.0256 | 0.0258 |
| B3 | 0.645 | 0.650 | 0.655 | 0.0254 | 0.0256 | 0.0258 |
| C1 | 0.202 | 0.252 | 0.302 | 0.0080 | 0.0099 | 0.0119 |
| C2 | 0.202 | 0.252 | 0.302 | 0.0080 | 0.0099 | 0.0119 |
| D1 | 0.600 | 0.644 | 0.687 | 0.0236 | 0.0253 | 0.0271 |
| D2 | 0.356 | 0.381 | 0.406 | 0.0140 | 0.0150 | 0.0160 |
| # per tape and reel | 3500 pieces | | | | | |
| Controlling dimension: millimeters | | | | | | |

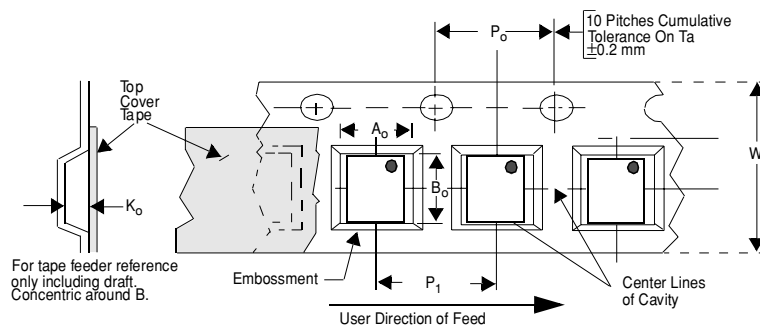
Mechanical Package Diagrams



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CSP Tape and Reel Specifications

| PART NUMBER | CHIP SIZE (mm) | POCKET SIZE (mm) B ₀ X A ₀ X K ₀ | TAPE WIDTH W | REEL DIA. | QTY PER REEL | P ₀ | P ₁ |
|-------------|-----------------------|--|-----------------|------------|--------------|----------------|----------------|
| SP0504BBC | 1.804 X 1.154 X 0.644 | 1.98 X 1.32 X 0.91 | 8mm | 178mm (7") | 3500 | 4mm | 4mm |



Tape Specifications

TVS Diode Arrays

TVS Avalanche Diode Array in a Bipolar Chip Scale Package

SP0504BBC, SP0508BBC, SP0516BBC

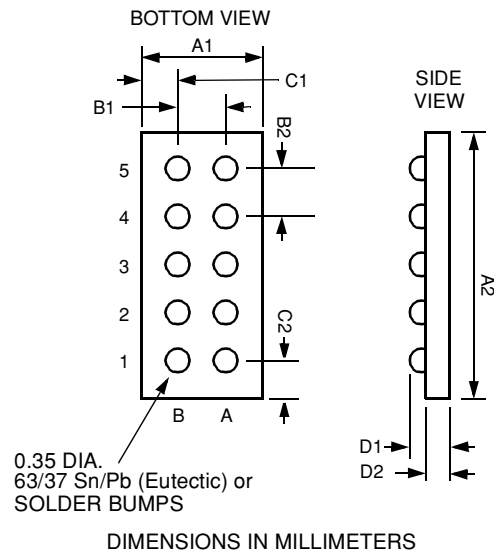
SP0508BBC10- bump

CSP Mechanical Specifications

The SP0508BBC devices are packaged in a 6-bump custom Chip Scale Package (CSP). Dimensions are presented below.

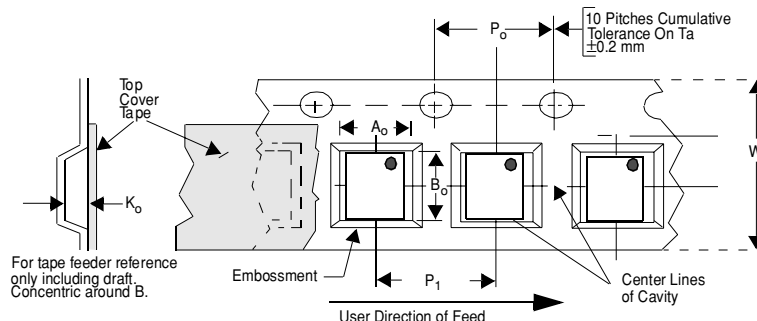
| PACKAGE DIMENSIONS | | | | | | |
|------------------------------------|-------------|-------|-------|--------|--------|--------|
| Package | Custom CSP | | | | | |
| Bumps | 10 | | | | | |
| Dim | Millimeters | | | Inches | | |
| | Min | Nom | Max | Min | Nom | Max |
| A1 | 1.109 | 1.154 | 1.199 | 0.0437 | 0.0454 | 0.0472 |
| A2 | 3.059 | 3.104 | 3.149 | 0.1204 | 0.1222 | 0.1240 |
| B1 | 0.645 | 0.650 | 0.655 | 0.0254 | 0.0256 | 0.0258 |
| B2 | 0.645 | 0.650 | 0.655 | 0.0254 | 0.0256 | 0.0258 |
| C1 | 0.202 | 0.252 | 0.302 | 0.0080 | 0.0099 | 0.0119 |
| C2 | 0.202 | 0.252 | 0.302 | 0.0080 | 0.0099 | 0.0119 |
| D1 | 0.600 | 0.644 | 0.687 | 0.0236 | 0.0253 | 0.0271 |
| D2 | 0.356 | 0.381 | 0.406 | 0.0140 | 0.0150 | 0.0160 |
| # per tape and reel | 3500 pieces | | | | | |
| Controlling dimension: millimeters | | | | | | |

Mechanical Package Diagrams



CSP Tape and Reel Specifications

| PART NUMBER | CHIP SIZE (mm) | POCKET SIZE (mm) B ₀ X A ₀ X K ₀ | TAPE WIDTH W | REEL DIAMETER | QTY PER REEL | P ₀ | P ₁ |
|-------------|-----------------------|--|-----------------|------------------|--------------------|----------------|----------------|
| SP0508BBC | 3.104 X 1.154 X 0.644 | 3.28 X 1.32 X 0.81 | 8mm | 178mm (7") | 3500 | 4mm | 4mm |



Tape Specifications

TVS Diode Arrays

TVS Avalanche Diode Array in a Bipolar Chip Scale Package

SP0504BBC, SP0508BBC, SP0516BBC

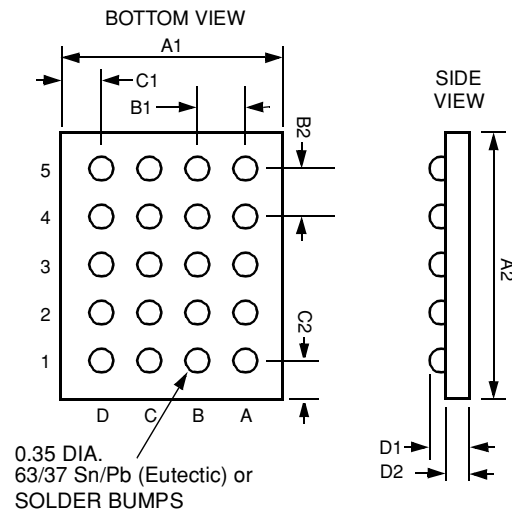
SP0516BBC 20-bump

CSP Mechanical Specifications

The SP0516BBC devices are packaged in a 20-bump custom Chip Scale Package (CSP). Dimensions are presented below.

| PACKAGE DIMENSIONS | | | | | | |
|------------------------------------|-------------|-------|-------|--------|--------|--------|
| Package | Custom CSP | | | | | |
| Bumps | 20 | | | | | |
| Dim | Millimeters | | | Inches | | |
| | Min | Nom | Max | Min | Nom | Max |
| A1 | 2.409 | 2.454 | 2.499 | 0.0948 | 0.0966 | 0.0984 |
| A2 | 3.059 | 3.104 | 3.149 | 0.1204 | 0.1222 | 0.1240 |
| B1 | 0.645 | 0.650 | 0.655 | 0.0254 | 0.0256 | 0.0258 |
| B2 | 0.645 | 0.650 | 0.655 | 0.0254 | 0.0256 | 0.0258 |
| C1 | 0.202 | 0.252 | 0.302 | 0.0080 | 0.0099 | 0.0119 |
| C2 | 0.202 | 0.252 | 0.302 | 0.0080 | 0.0099 | 0.0119 |
| D1 | 0.600 | 0.644 | 0.687 | 0.0236 | 0.0253 | 0.0271 |
| D2 | 0.356 | 0.381 | 0.406 | 0.0140 | 0.0150 | 0.0160 |
| # per tape and reel | 3500 pieces | | | | | |
| Controlling dimension: millimeters | | | | | | |

Mechanical Package Diagrams

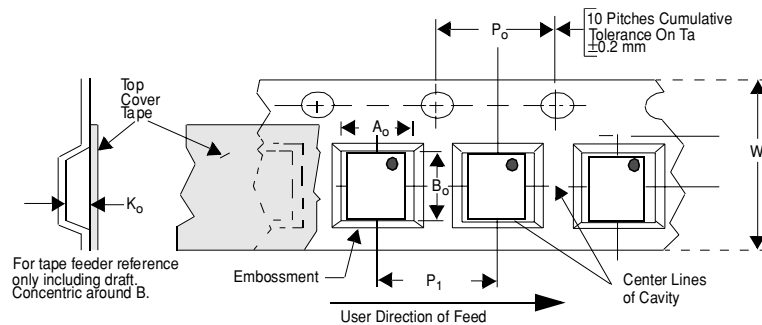


DIMENSIONS IN MILLIMETERS

SILICON PROTECTION CIRCUITS

CSP Tape and Reel Specifications

| PART NUMBER | CHIP SIZE (mm) | POCKET SIZE (mm) $B_0 \times A_0 \times K_0$ | TAPE WIDTH W | REEL DIAMETER | QTY PER REEL | P_0 | P_1 |
|-------------|-----------------------|---|-----------------|---------------|--------------|-------|-------|
| SP0516BBC | 3.104 X 2.454 X 0.644 | 3.28 X 2.64 X 0.86 | 8mm | 178mm (7") | 3500 | 4mm | 4mm |



Tape Specifications