



## SMBJ Series 600W Transient Voltage Suppressor

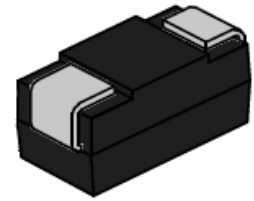
Rev.4.3

### DESCRIPTION:

TVS diodes can be used in a wide range of applications which like consumer electronic products, automotive industries, munitions, telecommunications, aerospace industries, and intelligent control systems.

### FEATURES:

- ✧ Low profile package.
- ✧ Low inductance.
- ✧ Excellent clamping capability.
- ✧ 600W peak pulse power capability at 10/1000μs waveform.
- ✧ Typical  $I_R$  less than 1μA above 10V.
- ✧ Fast response time: typically less than 1.0ps from 0V to  $V_{BR}$  min.
- ✧ High temperature to reflow soldering: 260°C/40s at terminals.
- ✧ Plastic package has underwriters laboratory flammability 94V-0.
- ✧ Meets MSL level 1, per J-STD-020, LF maximum peak of 260°C.
- ✧ Terminal: solder plated, solderable per J-STD-002.
- ✧ For surface mounted applications in order to optimize board space.
- ✧ UL 497B item recognized. (File No.:E480698).
- ✧ IEC61000-4-2 (ESD) ±30kV (air), ±30kV (contact).



SMB



Bi-directional



Uni-directional

Symbol

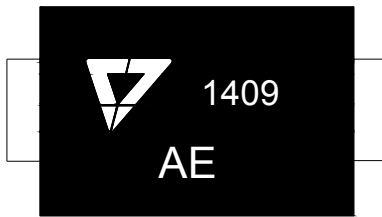
### ABSOLUTE MAXIMUM RATINGS( $T_A=25^\circ\text{C}$ , RH=45%-75%, unless otherwise noted)

| Parameter   | Symbol          | Value       | Unit |
|---|-----------------|-------------|------|
| Operating junction and storage temperature range                | $T_J/T_{STG}$   | -55 to +150 | °C   |
| Peak pulse power dissipation at 10/1000μs waveform              | $P_{PP}$        | 600         | W    |
| Steady state power dissipation at $T_L=75^\circ\text{C}$        | $P_{M(AV)}$     | 5.0         | W    |
| Maximum instantaneous forward voltage at 50A for unidirectional | $V_F$           | 5.0         | V    |
| Peak forward surge current, 8.3ms single half sine wave(Note 1) | $I_{FSM}$       | 100         | A    |
| Typical thermal resistance junction to lead                     | $R_{\theta JL}$ | 20          | °C/W |
| Typical thermal resistance junction to ambient                  | $R_{\theta JA}$ | 100         | °C/W |

### Notes:

1. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum

## MARKING



AE: Device Marking Code  
1409: In ninth week, 2014

ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

| Part Number |           | Marking |    | V <sub>R</sub> | I <sub>R</sub> @V <sub>R</sub> | V <sub>BR</sub> @I <sub>T</sub> |        | I <sub>T</sub> | V <sub>C</sub> @I <sub>PP</sub> | I <sub>PP</sub> <sup>①</sup> |
|-------------|-----------|---------|----|----------------|--------------------------------|---------------------------------|--------|----------------|---------------------------------|------------------------------|
| Uni-Polar   | Bi-Polar  | Uni     | Bi | V              | max(μA)                        | min(V)                          | max(V) | mA             | max(V)                          | A                            |
| SMBJ5.0A    | SMBJ5.0CA | KE      | AE | 5.0            | 120                            | 6.40                            | 7.00   | 10             | 9.2                             | 65.2                         |
| SMBJ6.0A    | SMBJ6.0CA | KG      | AG | 6.0            | 120                            | 6.67                            | 7.37   | 10             | 10.3                            | 58.3                         |
| SMBJ6.5A    | SMBJ6.5CA | KK      | AK | 6.5            | 120                            | 7.22                            | 7.98   | 10             | 11.2                            | 53.6                         |
| SMBJ7.0A    | SMBJ7.0CA | KM      | AM | 7.0            | 50                             | 7.78                            | 8.60   | 10             | 12.0                            | 50.0                         |
| SMBJ7.5A    | SMBJ7.5CA | KP      | AP | 7.5            | 50                             | 8.33                            | 9.21   | 1              | 12.9                            | 46.5                         |
| SMBJ8.0A    | SMBJ8.0CA | KR      | AR | 8.0            | 20                             | 8.89                            | 9.83   | 1              | 13.6                            | 44.1                         |
| SMBJ8.5A    | SMBJ8.5CA | KT      | AT | 8.5            | 10                             | 9.44                            | 10.40  | 1              | 14.4                            | 41.7                         |
| SMBJ9.0A    | SMBJ9.0CA | KV      | AV | 9.0            | 5                              | 10.00                           | 11.10  | 1              | 15.4                            | 39.0                         |
| SMBJ10A     | SMBJ10CA  | KX      | AX | 10             | 2                              | 11.10                           | 12.30  | 1              | 17.0                            | 35.3                         |
| SMBJ11A     | SMBJ11CA  | KZ      | AZ | 11             | 1                              | 12.20                           | 13.50  | 1              | 18.2                            | 33.0                         |
| SMBJ12A     | SMBJ12CA  | LE      | BE | 12             | 1                              | 13.30                           | 14.70  | 1              | 19.9                            | 30.2                         |
| SMBJ13A     | SMBJ13CA  | LG      | BG | 13             | 1                              | 14.40                           | 15.90  | 1              | 21.5                            | 27.9                         |
| SMBJ14A     | SMBJ14CA  | LK      | BK | 14             | 1                              | 15.60                           | 17.20  | 1              | 23.2                            | 25.9                         |
| SMBJ15A     | SMBJ15CA  | LM      | BM | 15             | 1                              | 16.70                           | 18.50  | 1              | 24.4                            | 24.6                         |
| SMBJ16A     | SMBJ16CA  | LP      | BP | 16             | 1                              | 17.80                           | 19.70  | 1              | 26.0                            | 23.1                         |
| SMBJ17A     | SMBJ17CA  | LR      | BR | 17             | 1                              | 18.90                           | 20.90  | 1              | 27.6                            | 21.8                         |
| SMBJ18A     | SMBJ18CA  | LT      | BT | 18             | 1                              | 20.00                           | 22.10  | 1              | 29.2                            | 20.6                         |
| SMBJ20A     | SMBJ20CA  | LV      | BV | 20             | 1                              | 22.20                           | 24.50  | 1              | 32.4                            | 18.6                         |
| SMBJ22A     | SMBJ22CA  | LX      | BX | 22             | 1                              | 24.40                           | 26.90  | 1              | 35.5                            | 16.9                         |
| SMBJ24A     | SMBJ24CA  | LZ      | BZ | 24             | 1                              | 26.70                           | 29.50  | 1              | 38.9                            | 15.4                         |
| SMBJ26A     | SMBJ26CA  | ME      | CE | 26             | 1                              | 28.90                           | 31.90  | 1              | 42.1                            | 14.3                         |
| SMBJ28A     | SMBJ28CA  | MG      | CG | 28             | 1                              | 31.10                           | 34.40  | 1              | 45.4                            | 13.2                         |
| SMBJ30A     | SMBJ30CA  | MK      | CK | 30             | 1                              | 33.30                           | 36.80  | 1              | 48.4                            | 12.4                         |

ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C, continued)

| Part Number |           | Marking |    | V <sub>R</sub> | I <sub>R</sub> @V <sub>R</sub> | V <sub>BR</sub> @I <sub>T</sub> |        | I <sub>T</sub> | V <sub>C</sub> @I <sub>PP</sub> | I <sub>PP</sub> <sup>①</sup> |
|-------------|-----------|---------|----|----------------|--------------------------------|---------------------------------|--------|----------------|---------------------------------|------------------------------|
| Uni-Polar   | Bi-Polar  | Uni     | Bi | V              | max(μA)                        | min(V)                          | max(V) | mA             | max(V)                          | A                            |
| SMBJ33A     | SMBJ33CA  | MM      | CM | 33             | 1                              | 36.70                           | 40.60  | 1              | 53.3                            | 11.3                         |
| SMBJ36A     | SMBJ36CA  | MP      | CP | 36             | 1                              | 40.00                           | 44.20  | 1              | 58.1                            | 10.4                         |
| SMBJ40A     | SMBJ40CA  | MR      | CR | 40             | 1                              | 44.40                           | 49.10  | 1              | 64.5                            | 9.3                          |
| SMBJ43A     | SMBJ43CA  | MT      | CT | 43             | 1                              | 47.80                           | 52.80  | 1              | 69.4                            | 8.7                          |
| SMBJ45A     | SMBJ45CA  | MV      | CV | 45             | 1                              | 50.00                           | 55.30  | 1              | 72.7                            | 8.3                          |
| SMBJ48A     | SMBJ48CA  | MX      | CX | 48             | 1                              | 53.30                           | 58.90  | 1              | 77.4                            | 7.8                          |
| SMBJ51A     | SMBJ51CA  | MZ      | CZ | 51             | 1                              | 56.70                           | 62.70  | 1              | 82.4                            | 7.3                          |
| SMBJ54A     | SMBJ54CA  | NE      | DE | 54             | 1                              | 60.00                           | 66.30  | 1              | 87.1                            | 6.9                          |
| SMBJ58A     | SMBJ58CA  | NG      | DG | 58             | 1                              | 64.40                           | 71.20  | 1              | 93.6                            | 6.4                          |
| SMBJ60A     | SMBJ60CA  | NK      | DK | 60             | 1                              | 66.70                           | 73.70  | 1              | 96.8                            | 6.2                          |
| SMBJ64A     | SMBJ64CA  | NM      | DM | 64             | 1                              | 71.10                           | 78.60  | 1              | 103.0                           | 5.8                          |
| SMBJ70A     | SMBJ70CA  | NP      | DP | 70             | 1                              | 77.80                           | 86.00  | 1              | 113.0                           | 5.3                          |
| SMBJ75A     | SMBJ75CA  | NR      | DR | 75             | 1                              | 83.30                           | 92.10  | 1              | 121.0                           | 5.0                          |
| SMBJ78A     | SMBJ78CA  | NT      | DT | 78             | 1                              | 86.70                           | 95.80  | 1              | 126.0                           | 4.8                          |
| SMBJ85A     | SMBJ85CA  | NV      | DV | 85             | 1                              | 94.40                           | 104.0  | 1              | 137.0                           | 4.4                          |
| SMBJ90A     | SMBJ90CA  | NX      | DX | 90             | 1                              | 100.0                           | 111.0  | 1              | 146.0                           | 4.1                          |
| SMBJ100A    | SMBJ100CA | NZ      | DZ | 100            | 1                              | 111.0                           | 123.0  | 1              | 162.0                           | 3.7                          |
| SMBJ110A    | SMBJ110CA | PE      | EE | 110            | 1                              | 122.0                           | 135.0  | 1              | 177.0                           | 3.4                          |
| SMBJ120A    | SMBJ120CA | PG      | EG | 120            | 1                              | 133.0                           | 147.0  | 1              | 193.0                           | 3.1                          |
| SMBJ130A    | SMBJ130CA | PK      | EK | 130            | 1                              | 144.0                           | 159.0  | 1              | 209.0                           | 2.9                          |
| SMBJ150A    | SMBJ150CA | PM      | EM | 150            | 1                              | 167.0                           | 185.0  | 1              | 243.0                           | 2.5                          |
| SMBJ160A    | SMBJ160CA | PP      | EP | 160            | 1                              | 178.0                           | 197.0  | 1              | 259.0                           | 2.3                          |
| SMBJ170A    | SMBJ170CA | PR      | ER | 170            | 1                              | 189.0                           | 209.0  | 1              | 275.0                           | 2.2                          |
| SMBJ180A    | SMBJ180CA | PT      | ET | 180            | 1                              | 201.0                           | 222.0  | 1              | 292.0                           | 2.1                          |
| SMBJ190A    | SMBJ190CA | PV      | EV | 190            | 1                              | 211.0                           | 234.0  | 1              | 307.0                           | 2.0                          |
| SMBJ200A    | SMBJ200CA | PX      | EX | 200            | 1                              | 224.0                           | 247.0  | 1              | 324.0                           | 1.9                          |
| SMBJ210A    | SMBJ210CA | PZ      | EZ | 210            | 1                              | 233.0                           | 258.0  | 1              | 337.0                           | 1.8                          |
| SMBJ220A    | SMBJ220CA | QE      | FE | 220            | 1                              | 246.0                           | 272.0  | 1              | 356.0                           | 1.7                          |
| SMBJ250A    | SMBJ250CA | QG      | FG | 250            | 1                              | 279.0                           | 309.0  | 1              | 405.0                           | 1.5                          |
| SMBJ300A    | SMBJ300CA | QK      | FK | 300            | 1                              | 335.0                           | 371.0  | 1              | 486.0                           | 1.3                          |

**ELECTRICAL CHARACTERISTICS** ( $T_A=25^{\circ}\text{C}$ , continued)

| Part Number |           | Marking |    | $V_R$ | $I_R@V_R$            | $V_{BR}@I_T$ |        | $I_T$ | $V_C@I_{PP}$ | $I_{PP}^{①}$ |
|-------------|-----------|---------|----|-------|----------------------|--------------|--------|-------|--------------|--------------|
| Uni-Polar   | Bi-Polar  | Uni     | Bi | V     | max( $\mu\text{A}$ ) | min(V)       | max(V) | mA    | max(V)       | A            |
| SMBJ350A    | SMBJ350CA | QM      | FM | 350   | 1                    | 391.0        | 432.0  | 1     | 567.0        | 1.1          |
| SMBJ400A    | SMBJ400CA | QP      | FP | 400   | 1                    | 447.0        | 494.0  | 1     | 648.0        | 0.9          |
| SMBJ440A    | SMBJ440CA | QR      | FR | 440   | 1                    | 492.0        | 543.0  | 1     | 713.0        | 0.8          |

① Surge waveform: 10/1000 $\mu\text{s}$

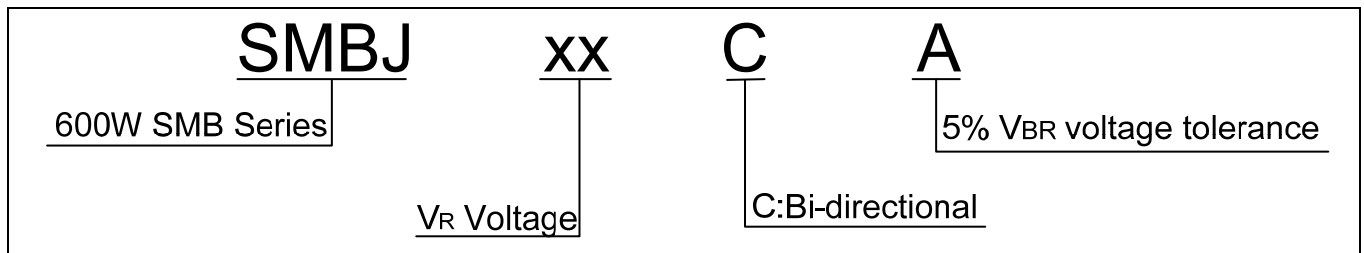
$V_R$ : Stand-off voltage -- Maximum voltage that can be applied

$V_{BR}$ : Breakdown voltage

$V_C$ : Clamping voltage -- Peak voltage measured across the suppressor at a specified  $I_{PP}$

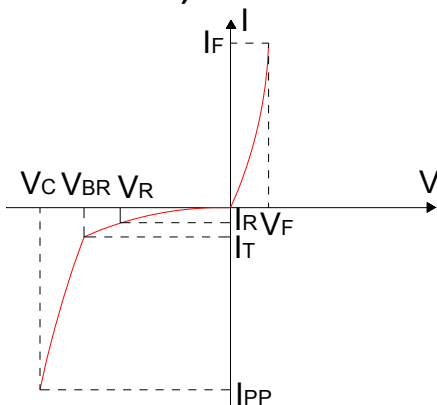
$I_R$ : Reverse leakage current

**ORDERING INFORMATION**



**RATINGS AND V-I CHARACTERISTICS CURVES** ( $T_A=25^{\circ}\text{C}$ , unless otherwise noted)

**FIG.1:V- I curve characteristics (Uni-directional)**



**FIG.2:V- I curve characteristics (Bi-directional)**

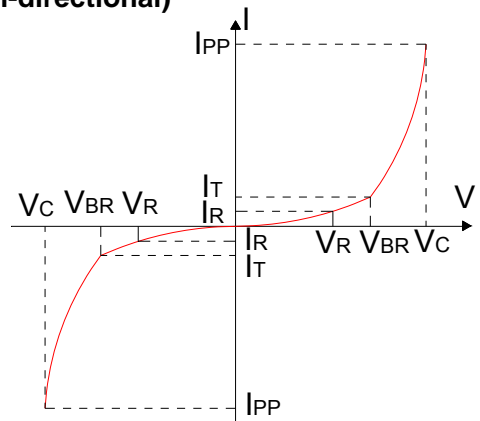


FIG.3: Pulse waveform

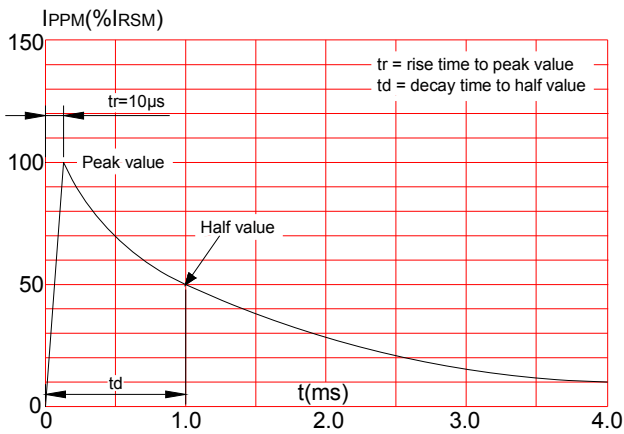


FIG.4: Pulse derating curve

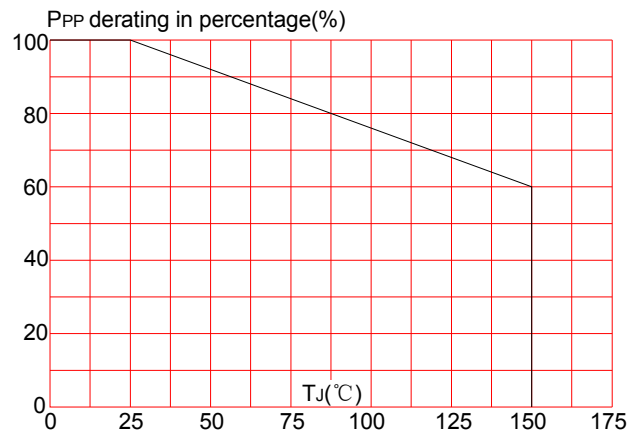
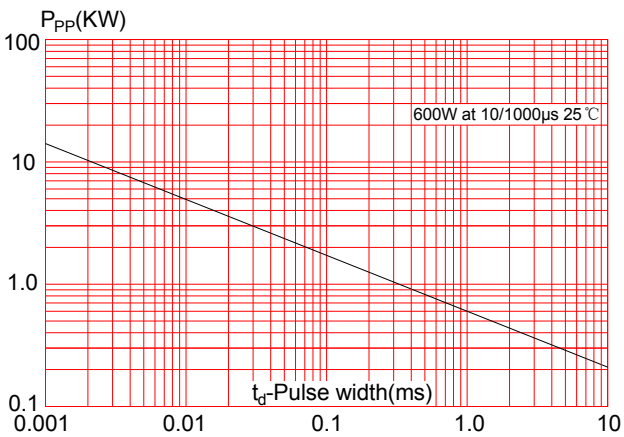
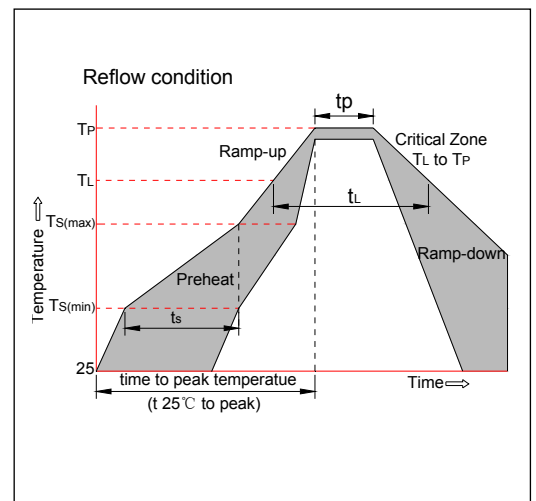


FIG.5: Peak pulse power dissipation vs. pulse width

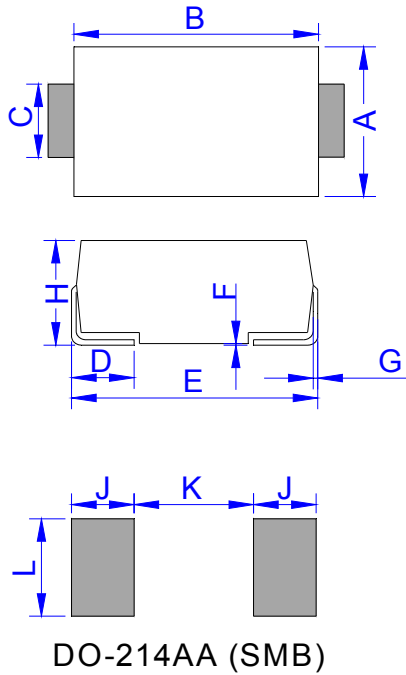


SOLDERING PARAMETERS

|   |                                   |   |
|---|-----------------------------------|---|
| Reflow Condition                                      |                                   | Pb-Free assembly<br>(see figure at right) |
| Pre Heat  | -Temperature Min ( $T_{s(min)}$ ) | +150°C                                    |
|   | -Temperature Max( $T_{s(max)}$ )  | +200°C                                    |
|   | -Time (Min to Max) (ts)           | 60-180 secs.                              |
| Average ramp up rate (Liquidus Temp ( $T_L$ )to peak) |                                   | 3°C/sec. Max                              |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                  |                                   | 3°C/sec. Max                              |
| Reflow  | -Temperature( $T_L$ )(Liquidus)   | +217°C                                    |
|   | -Temperature( $t_L$ )             | 60-150 secs.                              |
| Peak Temp ( $T_P$ )                                   |                                   | +260(+0/-5)°C                             |
| Time within 5°C of actual Peak Temp ( $t_p$ )         |                                   | 20-40secs.                                |
| Ramp-down Rate  |                                   | 6°C/sec. Max                              |
| Time 25°C to Peak Temp ( $T_P$ )                      |                                   | 8 min. Max                                |
| Do not exceed   |                                   | +260°C                                    |

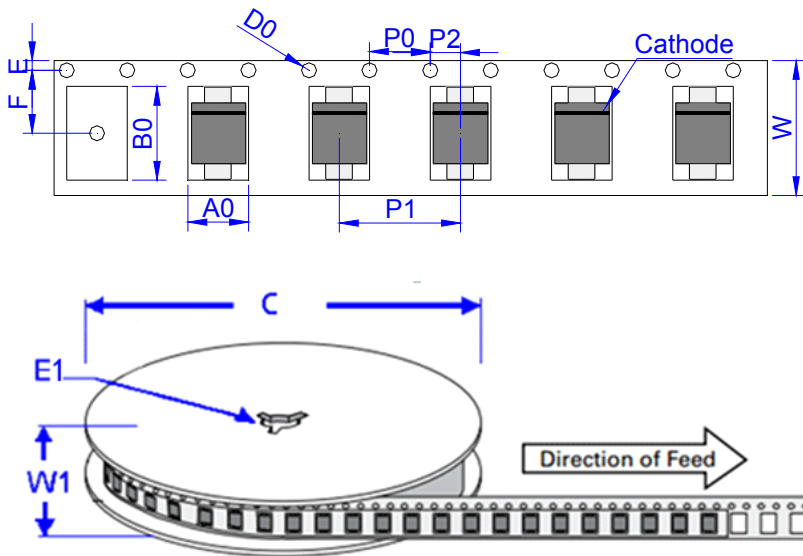


PACKAGE MECHANICAL DATA



| Ref. | Dimensions  |       |        |       |
|------|-------------|-------|--------|-------|
|      | Millimeters |       | Inches |       |
|      | Min.        | Max.  | Min.   | Max.  |
| A    | 3.30        | 3.94  | 0.130  | 0.155 |
| B    | 4.30        | 4.80  | 0.169  | 0.189 |
| C    | 1.90        | 2.20  | 0.075  | 0.087 |
| D    | 0.95        | 1.52  | 0.037  | 0.060 |
| E    | 5.20        | 5.60  | 0.205  | 0.220 |
| F    | 0.051       | 0.203 | 0.002  | 0.008 |
| G    | 0.15        | 0.31  | 0.006  | 0.012 |
| H    | 2.10        | 2.40  | 0.083  | 0.094 |
| J    | 2.20        |       | 0.087  |       |
| K    |             | 2.60  |        | 0.102 |
| L    | 2.30        |       | 0.091  |       |

TAPE AND REEL SPECIFICATION-SMB



| Ref. | Dimensions  |                |
|------|-------------|----------------|
|      | Millimeters | Inches         |
| A0   | 3.76 ± 0.3  | 0.148 ± 0.012  |
| B0   | 5.69 ± 0.3  | 0.224 ± 0.012  |
| C    | 330.0       | 13.0           |
| D0   | 1.55 ± 0.1  | 0.061 ± 0.004  |
| E    | 1.75 ± 0.2  | 0.069 ± 0.008  |
| E1   | 13.3 ± 0.3  | 0.524 ± 0.012  |
| F    | 5.5 ± 0.2   | 0.217 ± 0.008  |
| P0   | 4.00 ± 0.2  | 0.157 ± 0.008  |
| P1   | 8.00 ± 0.2  | 0.3145 ± 0.008 |
| P2   | 2.00 ± 0.2  | 0.079 ± 0.008  |
| W    | 12.0 ± 0.2  | 0.472 ± 0.008  |
| W1   | 15.7 ± 2.0  | 0.618 ± 0.079  |

| PART No.   | UNIT WEIGHT (g/PCS) typ. | REEL (PCS) | PER CARTON (PCS) | DESCRIPTION       |
|------------|--------------------------|------------|------------------|-------------------|
| SMBJxxA/CA | 0.098                    | 3,000      | 48,000           | 13 inch reel pack |

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[P6KE13CA](#) [P6KE43CA](#) [P6KE6.8CA](#) [P6KE8.2](#) [P6SMBJ20CA](#) [JANTX1N6072A](#) [SR2835ESKG](#) [SA90CA](#)