

SMAG Plastic-Encapsulate Diodes

SMAG SERIES Transient Voltage Suppressor Diodes

Features

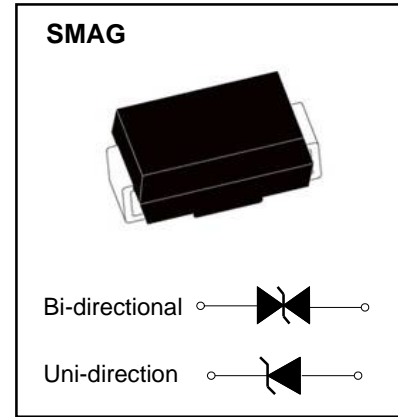
- P_{PP} 400W
- V_{RWM} 5.0V- 440V
- Glass passivated chip

Applications

- Clamping Voltage

Marking

- SMAJXX(A/C/CA)
- XX : From 5.0 To 440



Limiting Values (Absolute Maximum Rating)

| Item | Symbol | Unit | Conditions | Max |
|--|-----------------------------------|------|--|----------------|
| Peak pulse power dissipation | P _{PPM} | W | with a 10/1000us waveform | 400 |
| Peak pulse current (1) | I _{PPM} | A | with a 10/1000us waveform | See Next Table |
| Power dissipation | P _D | W | On infinite heat sink at T _L =75°C | 1.0 |
| Peak forward surge current(2) | I _{FSM} | A | 8.3 ms single half sine-wave unidirectional only | 40 |
| Operating junction and storage temperature range | T _J , T _{STG} | °C | | -55 to +150 |

Electrical Characteristics (T_a=25°C Unless otherwise specified)

| Item | Symbol | Unit | Conditions | Max |
|---|------------------|------|--|---------|
| Maximum instantaneous forward Voltage (3) | V _F | V | at 25A for unidirectional only | 3.5/5.0 |
| Thermal resistance | R _{θJL} | °C/W | junction to lead | 30 |
| | R _{θJA} | °C/W | junction to ambient, L _{Lead} = 10 mm | 120 |

Notes:

- (1) Non-repetitive current pulse, per Fig. 3 and derated above T_A = 25°C per Fig.2.
- (2) Mounted on 0.2 x 0.2" (5.0 x 5.0 mm) copper pads to each terminal
- (3) V_F<3.5V for devices of V_{BR}<200V and V_F<5.0V for devices of V_{BR}>201V

Electrical Characteristics ($T_A=25^\circ\text{C}$ unless otherwise noted)

| Part Number(Uni) | Part Number(Bi) | $V_{BR@I_T}$ Breakdown Voltage $V_{BR@I_T}$ | | | $I_R@V_{WM}$ Maximum Reverse Leakage $I_R^{(3)}$ (μA) | V_{RWM} Working Peak Reverse Voltage V_{RWM} (V) | IPP Maximum Reverse Surge Current IPP ⁽²⁾ (A) | Maximum Clamping Voltage V_C @ IPP (V) |
|------------------|--------------------------|--|---------|------------------|--|---|---|--|
| | | Min(V) | Max (V) | $I_T^{(1)}$ (mA) | | | | |
| SMAJ5.0 | SMAJ5.0C | 6.40 | 7.30 | 10 | 800 | 5.0 | 41.7 | 9.6 |
| SMAJ5.0A | SMAJ5.0CA ⁽⁴⁾ | 6.40 | 7.07 | 10 | 800 | 5.0 | 43.5 | 9.2 |
| SMAJ6.0 | SMAJ6.0C | 6.67 | 8.15 | 10 | 800 | 6.0 | 35.1 | 11.4 |
| SMAJ6.0A | SMAJ6.0CA | 6.67 | 7.37 | 10 | 800 | 6.0 | 38.8 | 10.3 |
| SMAJ6.5 | SMAJ6.5C | 7.22 | 8.82 | 10 | 500 | 6.5 | 32.5 | 12.3 |
| SMAJ6.5A | SMAJ6.5CA | 7.22 | 7.98 | 10 | 500 | 6.5 | 35.7 | 11.2 |
| SMAJ7.0 | SMAJ7.0C | 7.78 | 9.51 | 10 | 200 | 7.0 | 30.1 | 13.3 |
| SMAJ7.0A | SMAJ7.0CA | 7.78 | 8.60 | 10 | 200 | 7.0 | 33.3 | 12.0 |
| SMAJ7.5 | SMAJ7.5C | 8.33 | 10.20 | 1.0 | 100 | 7.5 | 28.0 | 14.3 |
| SMAJ7.5A | SMAJ7.5CA | 8.33 | 9.21 | 1.0 | 100 | 7.5 | 31.0 | 12.9 |
| SMAJ8.0 | SMAJ8.0C | 8.89 | 10.90 | 1.0 | 50 | 8.0 | 26.7 | 15.0 |
| SMAJ8.0A | SMAJ8.0CA | 8.89 | 9.83 | 1.0 | 50 | 8.0 | 29.4 | 13.6 |
| SMAJ8.5 | SMAJ8.5C | 9.44 | 11.50 | 1.0 | 10 | 8.5 | 25.1 | 15.9 |
| SMAJ8.5A | SMAJ8.5CA | 9.44 | 10.4 | 1.0 | 10 | 8.5 | 27.8 | 14.4 |
| SMAJ9.0 | SMAJ9.0C | 10.0 | 12.2 | 1.0 | 5.0 | 9.0 | 23.6 | 16.9 |
| SMAJ9.0A | SMAJ9.0CA | 10.0 | 11.1 | 1.0 | 5.0 | 9.0 | 26.0 | 15.4 |
| SMAJ10 | SMAJ10C | 11.1 | 13.6 | 1.0 | 5.0 | 10.0 | 21.3 | 18.8 |
| SMAJ10A | SMAJ10CA | 11.1 | 12.3 | 1.0 | 5.0 | 10.0 | 23.5 | 17.0 |
| SMAJ11 | SMAJ11C | 12.2 | 14.9 | 1.0 | 5.0 | 11.0 | 19.9 | 20.1 |
| SMAJ11A | SMAJ11CA | 12.2 | 13.5 | 1.0 | 5.0 | 11.0 | 22.0 | 18.2 |
| SMAJ12 | SMAJ12C | 13.3 | 16.3 | 1.0 | 5.0 | 12.0 | 18.2 | 22.0 |
| SMAJ12A | SMAJ12CA | 13.3 | 14.7 | 1.0 | 5.0 | 12.0 | 20.1 | 19.9 |
| SMAJ13 | SMAJ13C | 14.4 | 17.6 | 1.0 | 5.0 | 13.0 | 16.8 | 23.8 |
| SMAJ13A | SMAJ13CA | 14.4 | 15.9 | 1.0 | 5.0 | 13.0 | 18.6 | 21.5 |
| SMAJ14 | SMAJ14C | 15.6 | 19.1 | 1.0 | 5.0 | 14.0 | 15.5 | 25.8 |
| SMAJ14A | SMAJ14CA | 15.6 | 17.2 | 1.0 | 5.0 | 14.0 | 17.2 | 23.2 |
| SMAJ15 | SMAJ15C | 16.7 | 20.4 | 1.0 | 5.0 | 15.0 | 14.8 | 26.9 |
| SMAJ15A | SMAJ15CA | 16.7 | 18.5 | 1.0 | 5.0 | 15.0 | 16.4 | 24.4 |
| SMAJ16 | SMAJ16C | 17.8 | 21.8 | 1.0 | 5.0 | 16.0 | 13.9 | 28.8 |
| SMAJ16A | SMAJ16CA | 17.8 | 19.7 | 1.0 | 5.0 | 16.0 | 15.4 | 26.0 |
| SMAJ17 | SMAJ17C | 18.9 | 23.1 | 1.0 | 5.0 | 17.0 | 13.1 | 30.5 |
| SMAJ17A | SMAJ17CA | 18.9 | 20.9 | 1.0 | 5.0 | 17.0 | 14.5 | 27.6 |
| SMAJ18 | SMAJ18C | 20.0 | 24.4 | 1.0 | 5.0 | 18.0 | 12.4 | 32.2 |
| SMAJ18A | SMAJ18CA | 20.0 | 22.1 | 1.0 | 5.0 | 18.0 | 13.7 | 29.2 |
| SMAJ19 | SMAJ19C | 21.1 | 25.7 | 1.0 | 5.0 | 19.0 | 11.7 | 30.8 |
| SMAJ19A | SMAJ19CA | 21.1 | 23.3 | 1.0 | 5.0 | 19.0 | 13.0 | 30.8 |
| SMAJ20 | SMAJ20C | 22.2 | 27.1 | 1.0 | 5.0 | 20.0 | 11.1 | 35.8 |
| SMAJ20A | SMAJ20CA | 22.2 | 24.5 | 1.0 | 5.0 | 20.0 | 12.3 | 32.4 |
| SMAJ22 | SMAJ22C | 24.4 | 29.8 | 1.0 | 5.0 | 22.0 | 10.1 | 39.4 |
| SMAJ22A | SMAJ22CA | 24.4 | 26.9 | 1.0 | 5.0 | 22.0 | 11.3 | 35.5 |

Electrical Characteristics ($T_A=25^\circ\text{C}$ unless otherwise noted)

| Part Number(Uni) | Part Number(Bi) | $V_{BR}@I_T$ Breakdown Voltage $V_{BR}@I_T$ | | | $I_R@V_{WM}$ Maximum Reverse Leakage $I_R^{(3)}$ (μA) | V_{RWM} Working Peak Reverse Voltage V_{RWM} (V) | IPP Maximum Reverse Surge Current IPP ⁽²⁾ (A) | Maximum Clamping Voltage V_C @ I_{PP} (V) |
|------------------|-----------------|--|---------|------------------------|--|---|--|---|
| | | Min(V) | Max (V) | IT ⁽¹⁾ (mA) | | | | |
| SMAJ24 | SMAJ24C | 26.7 | 32.6 | 1.0 | 5.0 | 24.0 | 9.3 | 43.0 |
| SMAJ24A | SMAJ24CA | 26.7 | 29.5 | 1.0 | 5.0 | 24.0 | 10.3 | 38.9 |
| SMAJ26 | SMAJ26C | 28.9 | 35.3 | 1.0 | 5.0 | 26.0 | 8.6 | 46.6 |
| SMAJ26A | SMAJ26CA | 28.9 | 31.9 | 1.0 | 5.0 | 26.0 | 9.5 | 42.1 |
| SMAJ28 | SMAJ28C | 31.1 | 38.0 | 1.0 | 5.0 | 28.0 | 8.0 | 50.0 |
| SMAJ28A | SMAJ28CA | 31.1 | 34.4 | 1.0 | 5.0 | 28.0 | 8.8 | 45.4 |
| SMAJ30 | SMAJ30C | 33.3 | 40.7 | 1.0 | 5.0 | 30.0 | 7.5 | 53.5 |
| SMAJ30A | SMAJ30CA | 33.3 | 36.8 | 1.0 | 5.0 | 30.0 | 8.3 | 48.4 |
| SMAJ33 | SMAJ33C | 36.7 | 44.9 | 1.0 | 5.0 | 33.0 | 6.8 | 59.0 |
| SMAJ33A | SMAJ33CA | 36.7 | 40.6 | 1.0 | 5.0 | 33.0 | 7.5 | 53.3 |
| SMAJ36 | SMAJ36C | 40.0 | 48.9 | 1.0 | 5.0 | 36.0 | 6.2 | 64.3 |
| SMAJ36A | SMAJ36CA | 40.0 | 44.2 | 1.0 | 5.0 | 36.0 | 6.9 | 58.1 |
| SMAJ40 | SMAJ40C | 44.4 | 54.3 | 1.0 | 5.0 | 40.0 | 5.6 | 71.4 |
| SMAJ40A | SMAJ40CA | 44.4 | 49.1 | 1.0 | 5.0 | 40.0 | 6.2 | 64.5 |
| SMAJ43 | SMAJ43C | 47.8 | 58.4 | 1.0 | 5.0 | 43.0 | 5.2 | 76.7 |
| SMAJ43A | SMAJ43CA | 47.8 | 52.8 | 1.0 | 5.0 | 43.0 | 5.8 | 69.4 |
| SMAJ45 | SMAJ45C | 50.0 | 61.1 | 1.0 | 5.0 | 45.0 | 5.0 | 80.3 |
| SMAJ45A | SMAJ45CA | 50.0 | 55.3 | 1.0 | 5.0 | 45.0 | 5.5 | 72.7 |
| SMAJ48 | SMAJ48C | 53.3 | 65.1 | 1.0 | 5.0 | 48.0 | 4.6 | 85.5 |
| SMAJ48A | SMAJ48CA | 53.3 | 58.9 | 1.0 | 5.0 | 48.0 | 5.2 | 77.4 |
| SMAJ51 | SMAJ51C | 56.7 | 69.3 | 1.0 | 5.0 | 51.0 | 4.4 | 91.1 |
| SMAJ51A | SMAJ51CA | 56.7 | 62.7 | 1.0 | 5.0 | 51.0 | 4.9 | 82.4 |
| SMAJ54 | SMAJ54C | 60.0 | 73.3 | 1.0 | 5.0 | 54.0 | 4.1 | 96.3 |
| SMAJ54A | SMAJ54CA | 60.0 | 66.3 | 1.0 | 5.0 | 54.0 | 4.6 | 87.1 |
| SMAJ58 | SMAJ58C | 64.4 | 78.7 | 1.0 | 5.0 | 58.0 | 3.9 | 103.0 |
| SMAJ58A | SMAJ58CA | 64.4 | 71.2 | 1.0 | 5.0 | 58.0 | 4.3 | 93.6 |
| SMAJ60 | SMAJ60C | 66.7 | 81.5 | 1.0 | 5.0 | 60.0 | 3.7 | 107.0 |
| SMAJ60A | SMAJ60CA | 66.7 | 73.7 | 1.0 | 5.0 | 60.0 | 4.1 | 96.8 |
| SMAJ64 | SMAJ64C | 71.1 | 86.9 | 1.0 | 5.0 | 64.0 | 3.5 | 114.0 |
| SMAJ64A | SMAJ64CA | 71.1 | 78.6 | 1.0 | 5.0 | 64.0 | 3.9 | 103.0 |
| SMAJ70 | SMAJ70C | 77.8 | 95.1 | 1.0 | 5.0 | 70.0 | 3.2 | 125.0 |
| SMAJ70A | SMAJ70CA | 77.8 | 86.0 | 1.0 | 5.0 | 70.0 | 3.5 | 113.0 |
| SMAJ75 | SMAJ75C | 83.3 | 102.0 | 1.0 | 5.0 | 75.0 | 3.0 | 134.0 |
| SMAJ75A | SMAJ75CA | 83.3 | 92.1 | 1.0 | 5.0 | 75.0 | 3.3 | 121.0 |
| SMAJ78 | SMAJ78C | 86.7 | 106.0 | 1.0 | 5.0 | 78.0 | 2.9 | 139.0 |
| SMAJ78A | SMAJ78CA | 86.7 | 95.8 | 1.0 | 5.0 | 78.0 | 3.2 | 126.0 |
| SMAJ80 | SMAJ80C | 88.9 | 108.8 | 1.0 | 5.0 | 80.0 | 2.8 | 143.2 |
| SMAJ80A | SMAJ80CA | 88.8 | 97.6 | 1.0 | 5.0 | 80.0 | 3.1 | 129.0 |
| SMAJ85 | SMAJ85C | 94.4 | 115 | 1.0 | 5.0 | 85.0 | 2.6 | 151.0 |
| SMAJ85A | SMAJ85CA | 94.4 | 104 | 1.0 | 5.0 | 85.0 | 2.9 | 137.0 |

Electrical Characteristics ($T_A=25^\circ\text{C}$ unless otherwise noted)

| Part Number (Uni) | Part Number (Bi) | $V_{BR}@I_T$ Breakdown Voltage $V_{BR}@I_T$ | | | $I_R@V_{WM}$ Maximum Reverse Leakage $I_R^{(3)}$ (μA) | V_{RWM} Working Peak Reverse Voltage V_{RWM} (V) | IPP Maximum Reverse Surge Current IPP ⁽²⁾ (A) | Maximum Clamping Voltage V_c @ I_{PP} (V) |
|-------------------|------------------|--|---------|------------------|--|---|--|---|
| | | Min(V) | Max (V) | $I_T^{(1)}$ (mA) | | | | |
| SMAJ90 | SMAJ90C | 100 | 122 | 1.0 | 5.0 | 90.0 | 2.5 | 160.0 |
| SMAJ90A | SMAJ90CA | 100 | 111 | 1.0 | 5.0 | 90.0 | 2.7 | 146.0 |
| SMAJ100 | SMAJ100C | 111 | 136 | 1.0 | 5.0 | 100.0 | 2.2 | 179.0 |
| SMAJ100A | SMAJ100CA | 111 | 123 | 1.0 | 5.0 | 100.0 | 2.4 | 162.0 |
| SMAJ110 | SMAJ110C | 122 | 149 | 1.0 | 5.0 | 110.0 | 2.0 | 196.0 |
| SMAJ110A | SMAJ110CA | 122 | 135 | 1.0 | 5.0 | 110.0 | 2.2 | 177.0 |
| SMAJ120 | SMAJ120C | 133 | 163 | 1.0 | 5.0 | 120.0 | 1.8 | 214.0 |
| SMAJ120A | SMAJ120CA | 133 | 147 | 1.0 | 5.0 | 120.0 | 2.1 | 193.0 |
| SMAJ130 | SMAJ130C | 144 | 176 | 1.0 | 5.0 | 130.0 | 1.7 | 231.0 |
| SMAJ130A | SMAJ130CA | 144 | 159 | 1.0 | 5.0 | 130.0 | 1.9 | 209.0 |
| SMAJ140 | SMAJ140C | 155 | 190 | 1.0 | 5.0 | 140.0 | 1.6 | 250.6 |
| SMAJ140A | SMAJ140CA | 155 | 171 | 1.0 | 5.0 | 140.0 | 1.7 | 226.8 |
| SMAJ150 | SMAJ150C | 167 | 204 | 1.0 | 5.0 | 150.0 | 1.5 | 268.0 |
| SMAJ150A | SMAJ150CA | 167 | 185 | 1.0 | 5.0 | 150.0 | 1.6 | 243.0 |
| SMAJ160 | SMAJ160C | 178 | 218 | 1.0 | 5.0 | 160.0 | 1.4 | 287.0 |
| SMAJ160A | SMAJ160CA | 178 | 197 | 1.0 | 5.0 | 160.0 | 1.5 | 259.0 |
| SMAJ170 | SMAJ170C | 189 | 231 | 1.0 | 5.0 | 170.0 | 1.3 | 304.0 |
| SMAJ170A | SMAJ170CA | 189 | 209 | 1.0 | 5.0 | 170.0 | 1.4 | 275.0 |
| SMAJ180 | SMAJ180C | 200 | 244 | 1.0 | 5.0 | 180.0 | 1.2 | 322.2 |
| SMAJ180A | SMAJ180CA | 200 | 220 | 1.0 | 5.0 | 180.0 | 1.3 | 291.6 |
| SMAJ190 | SMAJ190C | 211 | 258 | 1.0 | 5.0 | 190.0 | 1.2 | 340.1 |
| SMAJ190A | SMAJ190CA | 211 | 232 | 1.0 | 5.0 | 190.0 | 1.3 | 307.8 |
| SMAJ200A | SMAJ200CA | 224 | 247 | 1.0 | 1.0 | 200.0 | 1.2 | 324.0 |
| SMAJ220A | SMAJ220CA | 246 | 272 | 1.0 | 1.0 | 220.0 | 1.1 | 356.0 |
| SMAJ250A | SMAJ250CA | 279 | 309 | 1.0 | 1.0 | 250.0 | 1.0 | 405.0 |
| SMAJ300A | SMAJ300CA | 335 | 371 | 1.0 | 1.0 | 300.0 | 0.8 | 486.0 |
| SMAJ350A | SMAJ350CA | 391 | 432 | 1.0 | 1.0 | 350.0 | 0.7 | 567.0 |
| SMAJ400A | SMAJ400CA | 447 | 494 | 1.0 | 1.0 | 400.0 | 0.6 | 648.0 |
| SMAJ440A | SMAJ440CA | 492 | 543 | 1.0 | 1.0 | 440.0 | 0.5 | 713.0 |

Notes:

- (1) $t_p \leq 50\text{ms}$ Pulse test: $t_p \leq 50\text{ms}$
- (2) Surge current waveform per Fig. 3 and derated per Fig.2.
- (3) For bi-directional types having VWM of 10 V and less, the I_R limit is doubled
- (4) For the bi-directional SMAJ5.0CA, the maximum V_{BR} is 7.25 V

Typical Characteristics

FIG1: Peak Pulse Power Rating Curve



FIG2: Pulse Power or Current vs. Initial Junction Temperature



FIG3: Pulse Waveform

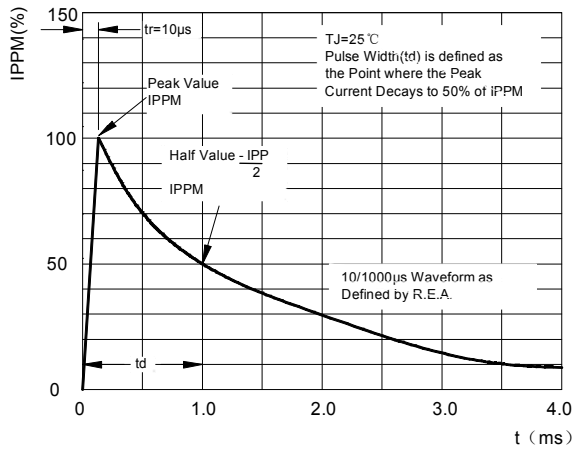


FIG4: Typical Transient Thermal Impedance



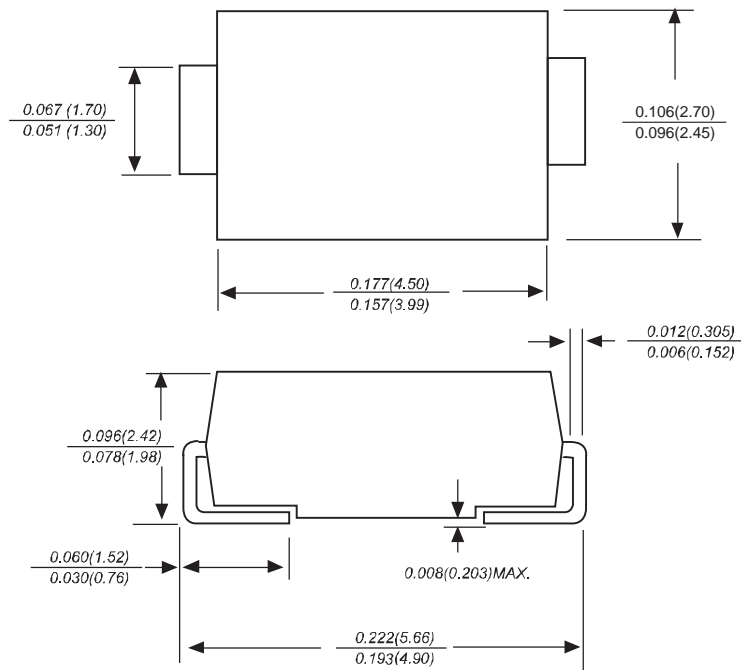
FIG5: Maximum Non-Repetitive Surge Current



FIG6: Steady State Power Dissipation



SMAG Package Outline Dimensions



Dimensions in inches and (millimeters)

SMAG Suggested Pad Layout



Note:

1. Controlling dimension: in millimeters.
2. General tolerance: ± 0.05 mm.
3. The pad layout is for reference purposes only.

NOTICE

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Reel Taping Specifications For Surface Mount Devices- SMAG



FIG: CONFIGURATION OF SURFACE MOUNTED DEVICES TAPING

| ITEM | SYMBOL | SMAG mm(inch) |
|------------------------|--------|--------------------------|
| Carrier width | A | 2.79±0.1(0.110±0.004) |
| Carrier length | B | 5.33±0.1(0.210±0.004) |
| Carrier depth | C | 2.36±0.1(0.093±0.004) |
| Sprocket hole | d | 1.55±0.05(0.061±0.002) |
| Reel outside diameter | D | 279±2.0 (11± 0.079) |
| Reel inner diameter | D1 | 75 ±1.0 (2.95 ±0.039) |
| Feed hole diameter | D2 | 13±0.5(0.512±0.020) |
| Sprocket hole position | E | 1.75±0.1(0.069±0.004) |
| Punch hole position | F | 5.5±0.05(0.217±0.002) |
| Punch hole pitch | P | 4.0±0.1(0.157±0.004) |
| Sprocket hole pitch | P0 | 4.0±0.1(0.157±0.004) |
| Embossment center | P1 | 2.0±0.1(0.079±0.004) |
| Totall tape thickness | T | 0.28±0.02(0.011 ±0.0008) |
| Tape width | W | 12.0±0.2(0.472±0.008) |
| Reel width | W1 | 16.8±2.0(0.661±0.079) |

NOTE: Devices are packed in accordance with EIA standard RS-481-A and specification given above.

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