

## SMAG Plastic-Encapsulate Diodes

### SMAG SERIES Transient Voltage Suppressor Diodes

#### Features

- P<sub>PP</sub> 400W
- V<sub>RWM</sub> 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 <sub>PPM</sub>                  | W    | with a 10/1000us waveform                        | 400            |
| Peak pulse current (1)                           | I <sub>PPM</sub>                  | A    | with a 10/1000us waveform                        | See Next Table |
| Power dissipation                                | P <sub>D</sub>                    | W    | On infinite heat sink at T <sub>L</sub> =75°C    | 1.0            |
| Peak forward surge current(2)                    | I <sub>FSM</sub>                  | A    | 8.3 ms single half sine-wave unidirectional only | 40             |
| Operating junction and storage temperature range | T <sub>J</sub> , T <sub>STG</sub> | °C   |  | -55 to +150    |

#### Electrical Characteristics (T<sub>a</sub>=25°C Unless otherwise specified)

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

#### Notes:

- (1) Non-repetitive current pulse, per Fig. 3 and derated above T<sub>A</sub> = 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<sub>F</sub><3.5V for devices of V<sub>BR</sub><200V and V<sub>F</sub><5.0V for devices of V<sub>BR</sub>>201V

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

| Part Number(Uni) | Part Number(Bi)          | $V_{BR@I_T}$<br>Breakdown Voltage $V_{BR@I_T}$ |         |                  | $I_R@V_{WM}$<br>Maximum Reverse Leakage $I_R^{(3)}$<br>( $\mu\text{A}$ ) | $V_{RWM}$<br>Working Peak Reverse Voltage $V_{RWM}$ (V) | IPP<br>Maximum Reverse Surge Current IPP <sup>(2)</sup> (A) | Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (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 <sup>(4)</sup> | 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) | $V_{BR}@I_T$<br>Breakdown Voltage $V_{BR}@I_T$ |         |                        | $I_R@V_{WM}$<br>Maximum Reverse Leakage $I_R^{(3)}$<br>( $\mu\text{A}$ ) | $V_{RWM}$<br>Working Peak Reverse Voltage<br>$V_{RWM}$ (V) | IPP<br>Maximum Reverse Surge Current IPP <sup>(2)</sup><br>(A) | Maximum Clamping Voltage $V_C$<br>@ $I_{PP}$<br>(V) |
|------------------|-----------------|--|---------|------------------------|--|--|--|---|
|                  |                 | Min(V)   | Max (V) | IT <sup>(1)</sup> (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) | $V_{BR}@I_T$<br>Breakdown Voltage $V_{BR}@I_T$ |         |                  | $I_R@V_{WM}$<br>Maximum Reverse Leakage $I_R^{(3)}$<br>( $\mu\text{A}$ ) | $V_{RWM}$<br>Working Peak Reverse Voltage $V_{RWM}$ (V) | IPP<br>Maximum Reverse Surge Current IPP <sup>(2)</sup><br>(A) | Maximum Clamping Voltage $V_c$<br>@ $I_{PP}$<br>(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

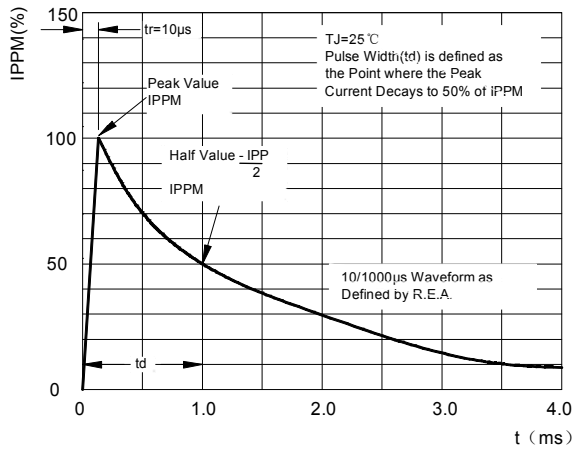


FIG4: Typical Transient Thermal Impedance



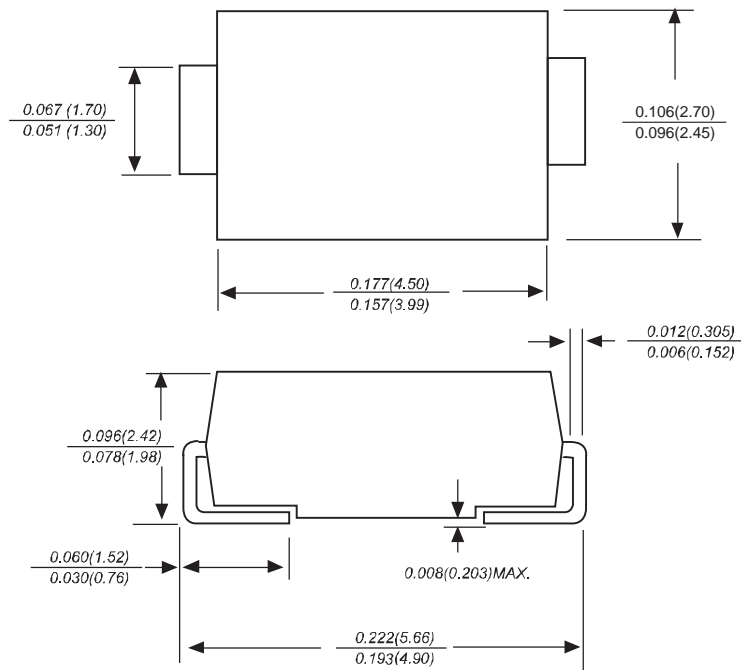
FIG5: Maximum Non-Repetitive Surge Current



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:  $\pm 0.05$  mm.
3. The pad layout is for reference purposes only.

### NOTICE

JSCJ reserves the right to make modifications, enhancements, improvements, corrections or other changes without further notice to any product herein. JSCJ does not assume any liability arising out of the application or use of any product described herein.

## 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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