

# N-Channel Logic Level Enhancement Mode Power MOSFET

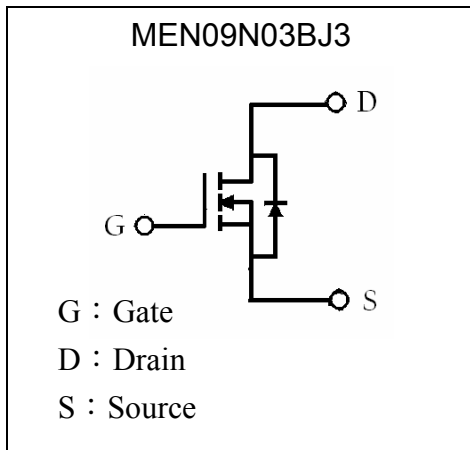
## MEN09N03BJ3

|            |             |
|------------|-------------|
| $BV_{DSS}$ | 30V         |
| $I_D$      | 50A         |
| $R_{DSON}$ | 9m $\Omega$ |

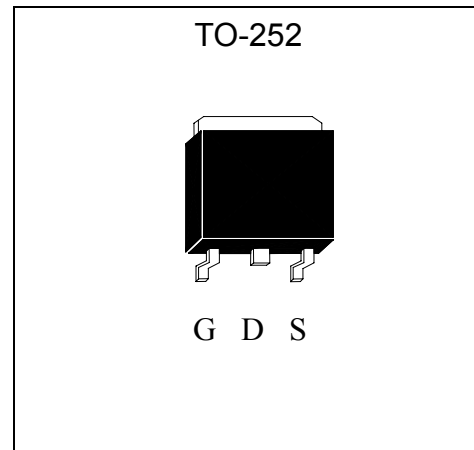
### Features

- $V_{DS}=30V$ ,  $I_D=50A$ ,  $R_{DS(ON)}=9m\Omega$
- Low Gate Charge
- Simple Drive Requirement
- RoHS compliant package
- Repetitive Avalanche Rated
- Fast Switching Characteristic

### Symbol



### Outline



### Absolute Maximum Ratings ( $T_C=25^\circ C$ )

| Parameter   | Symbol         | Limits   | Unit       |
|---|----------------|----------|------------|
| Drain-Source Voltage  | $V_{DS}$       | 30       | V          |
| Gate-Source Voltage   | $V_{GS}$       | $\pm 20$ | V          |
| Continuous Drain Current @ $T_C=25^\circ C$                 | $I_D$          | 50       | A          |
| Continuous Drain Current @ $T_C=100^\circ C$                | $I_D$          | 35       | A          |
| Pulsed Drain Current  | $I_{DM}$       | 140 *1   | A          |
| Avalanche Current   | $I_{AS}$       | 37.5     | A          |
| Avalanche Energy @ $L=0.1mH$ , $I_D=37.5A$ , $R_g=25\Omega$ | $E_{AS}$       | 70       | mJ         |
| Repetitive Avalanche Energy @ $L=0.05mH$                    | $E_{AR}$       | 15 *2    | mJ         |
| Power Dissipation ( $T_C=25^\circ C$ )                      | $P_D$          | 60       | W          |
| Power Dissipation ( $T_C=100^\circ C$ )                     |                | 32       | W          |
| Operating Junction and Storage Temperature                  | $T_j, T_{stg}$ | -55~+175 | $^\circ C$ |

100% UIS testing in condition of  $V_D=15V$ ,  $L=0.1mH$ ,  $V_G=10V$ ,  $I_L=25A$ , Rated  $V_{DS}=25V$  N-CH

Note : \*1. Pulse width limited by maximum junction temperature  
 \*2. Duty cycle  $\leq 1\%$



**Thermal Data**

| Parameter                                    | Symbol              | Value | Unit |
|--|---------------------|-------|------|
| Thermal Resistance, Junction-to-case, max    | R <sub>th,j-c</sub> | 2.5   | °C/W |
| Thermal Resistance, Junction-to-ambient, max | R <sub>th,j-a</sub> | 75    | °C/W |

**Characteristics (T<sub>c</sub>=25°C, unless otherwise specified)**

| Symbol                                 | Min. | Typ. | Max. | Unit | Test Conditions  |
|--|------|------|------|------|--|
| <b>Static</b>                          |      |      |      |      |  |
| BV <sub>DSS</sub>                      | 30   | -    | -    | V    | V <sub>GS</sub> =0, I <sub>D</sub> =250μA  |
| V <sub>GS(th)</sub>                    | 1.0  | 1.7  | 3.0  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA  |
| G <sub>FS</sub>                        | -    | 20   | -    | S    | V <sub>DS</sub> =5V, I <sub>D</sub> =20A   |
| I <sub>GSS</sub>                       | -    | -    | ±100 | nA   | V <sub>GS</sub> =±20   |
| I <sub>DSS</sub>                       | -    | -    | 1    | μA   | V <sub>DS</sub> =24V, V <sub>GS</sub> =0   |
|  | -    | -    | 25   |      | V <sub>DS</sub> =20V, V <sub>GS</sub> =0, T <sub>j</sub> =125°C  |
| I <sub>D(ON)</sub>                     | 50   | -    | -    | A    | V <sub>GS</sub> =10V, V <sub>DS</sub> =10V   |
| *R <sub>DS(ON)</sub>                   | -    | 7.5  | 9    | mΩ   | V <sub>GS</sub> =10V, I <sub>D</sub> =25A  |
|  | -    | 12   | 15   |      | V <sub>GS</sub> =5V, I <sub>D</sub> =20A   |
| <b>Dynamic</b>                         |      |      |      |      |  |
| R <sub>g</sub>                         | -    | 1.7  | -    | Ω    | V <sub>GS</sub> =15mV, V <sub>DS</sub> =0, f=1MHz  |
| *Q <sub>g</sub> (V <sub>GS</sub> =10V) | -    | 23   | -    | nC   | I <sub>D</sub> =25A, V <sub>DS</sub> =15V, V <sub>GS</sub> =10V  |
| *Q <sub>g</sub> (V <sub>GS</sub> =5V)  | -    | 13   | -    |      |  |
| *Q <sub>gs</sub>                       | -    | 4.7  | -    |      |  |
| *Q <sub>gd</sub>                       | -    | 7.4  | -    |      |  |
| *t <sub>d(ON)</sub>                    | -    | 10   | -    | ns   | V <sub>DS</sub> =15V, I <sub>D</sub> =25A, V <sub>GS</sub> =10V,<br>R <sub>G</sub> =2.7Ω, R <sub>D</sub> =0.6Ω |
| *t <sub>r</sub>                        | -    | 8    | -    |      |  |
| *t <sub>d(OFF)</sub>                   | -    | 30   | -    |      |  |
| *t <sub>f</sub>                        | -    | 5    | -    |      |  |
| C <sub>iss</sub>                       | -    | 2020 | -    | pF   | V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz  |
| C <sub>oss</sub>                       | -    | 275  | -    |      |  |
| C <sub>rss</sub>                       | -    | 160  | -    |      |  |
| <b>Source-Drain Diode</b>              |      |      |      |      |  |
| *I <sub>S</sub>                        | -    | -    | 50   | A    |  |
| *I <sub>SM</sub>                       | -    | -    | 140  |      |  |
| *V <sub>SD</sub>                       | -    | -    | 1.3  | V    | I <sub>F</sub> =I <sub>S</sub> , V <sub>GS</sub> =0  |
| *t <sub>rr</sub>                       | -    | 22   | -    | ns   | I <sub>F</sub> =I <sub>S</sub> , dI <sub>F</sub> /dt=100A/μs   |
| *I <sub>RM(REC)</sub>                  | -    | 180  | -    | A    |  |
| *Q <sub>rr</sub>                       | -    | 12   | -    | nC   |  |

\*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

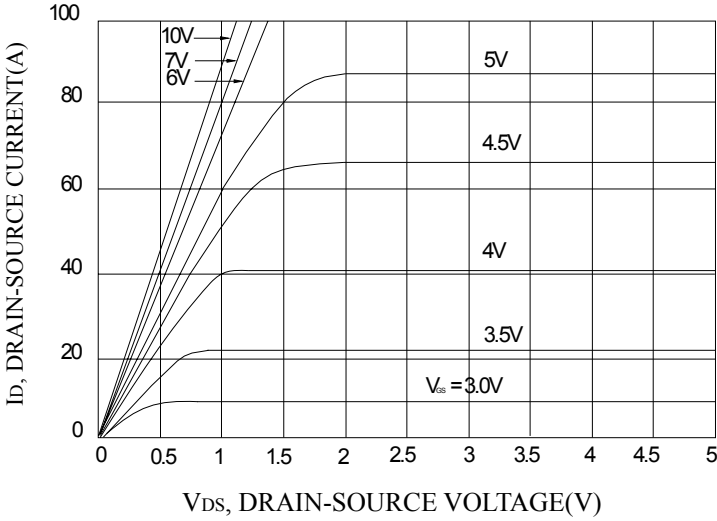
**Ordering Information**

| Device      | Package                    | Shipping               | Marking |
|-------------|----------------------------|------------------------|---------|
| MEN09N03BJ3 | TO-252<br>(RoHS compliant) | 2500 pcs / Tape & Reel | 09N03   |

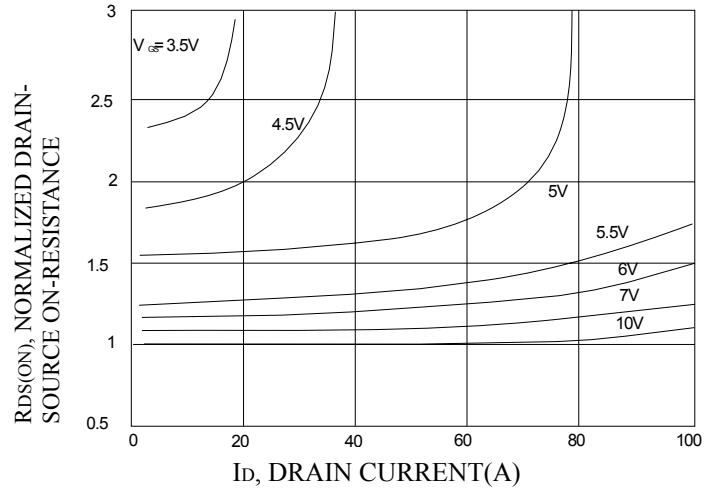


**Characteristic Curves**

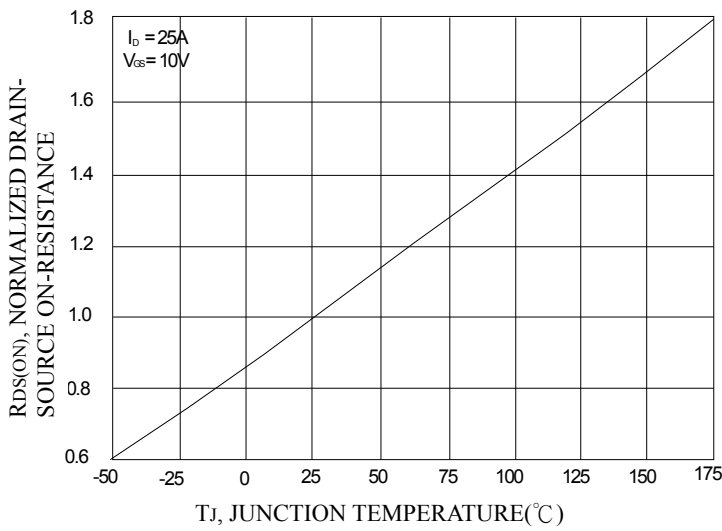
ON-REGION CHARACTERISTIC



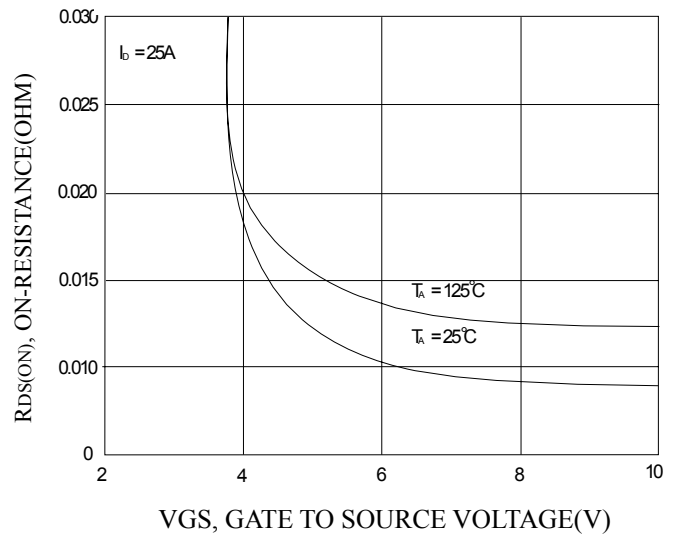
ON-RESISTANCE VARIATION WITH DRAIN CURRENT AND GATE VOLTAGE



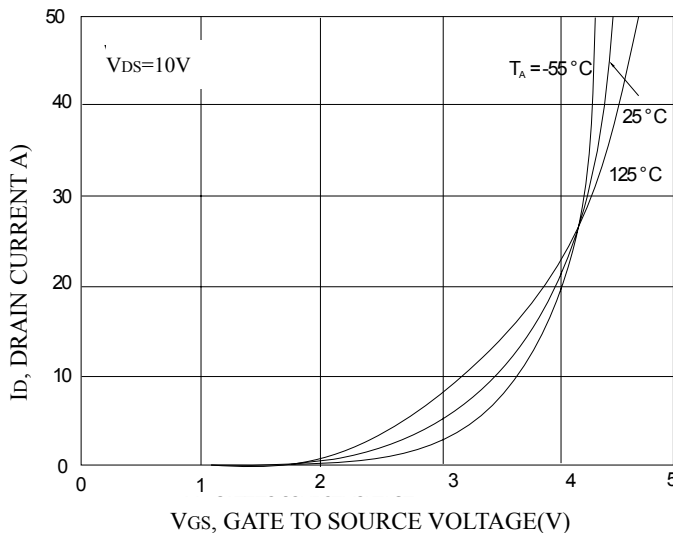
ON-RESISTANCE VARIATION WITH TEMPERATURE



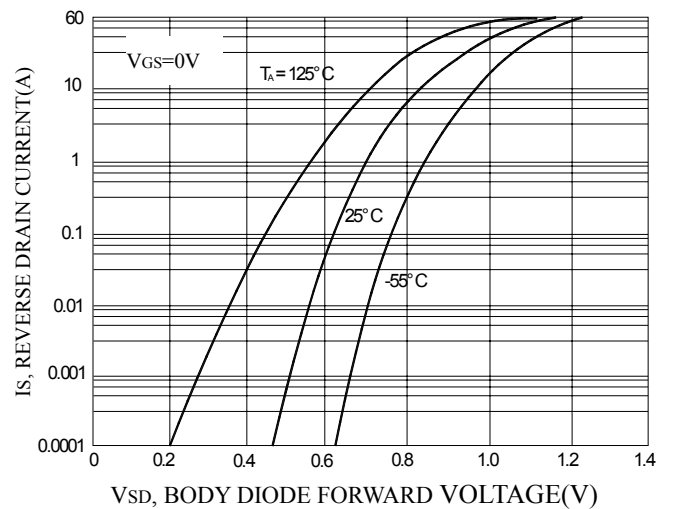
ON-RESISTANCE VARIATION WITH GATE TO SOURCE VOLTAGE



TRANSFER CHARACTERISTICS



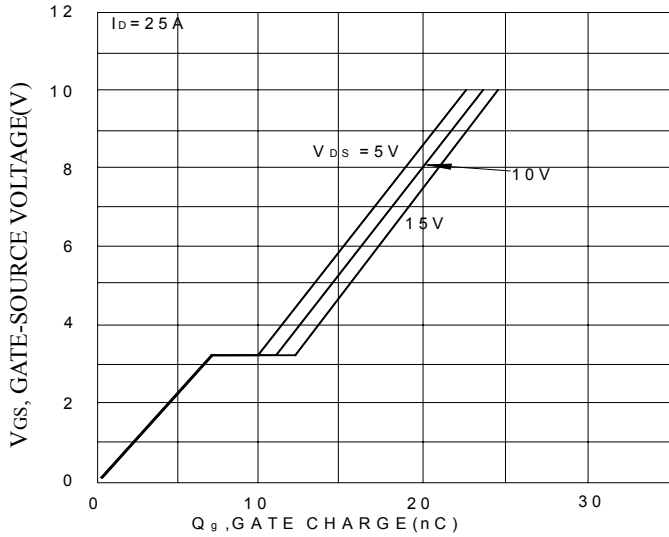
BODY DIODE FORWARD VOLTAGE VARIATION WITH SOURCE CURRENT AND TEMPERATURE



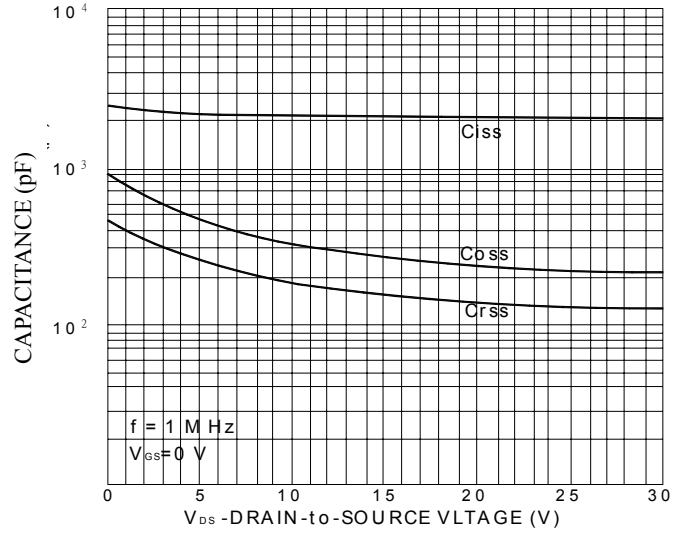


**Characteristic Curves(Cont.)**

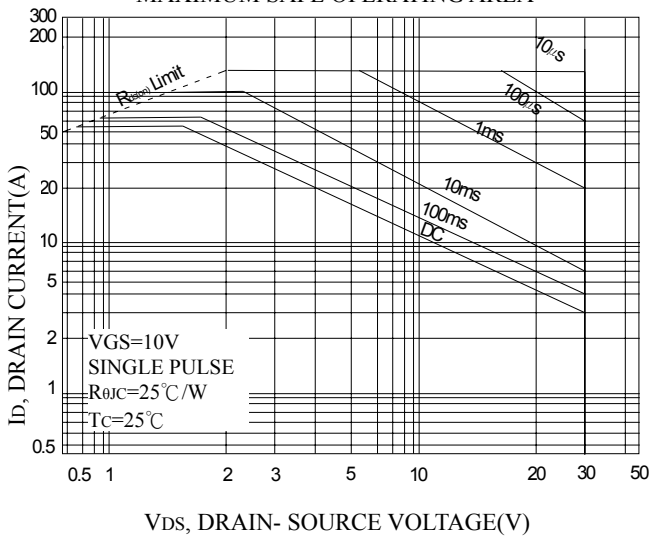
**GATE CHARGE CHARACTERISTICS**



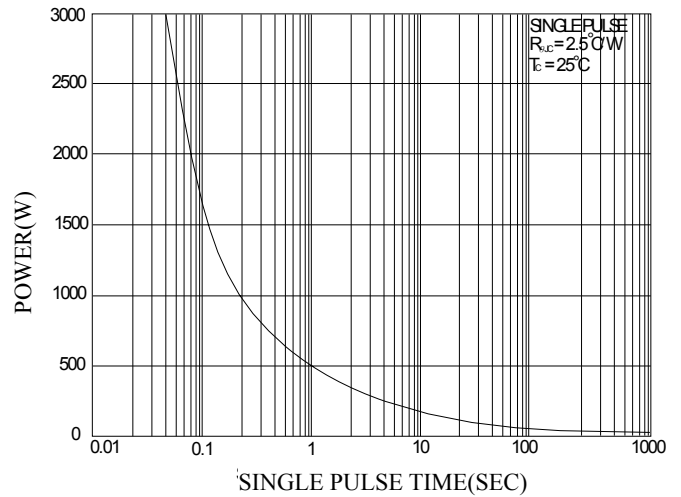
**CAPACITANCE CHARACTERISTICS**



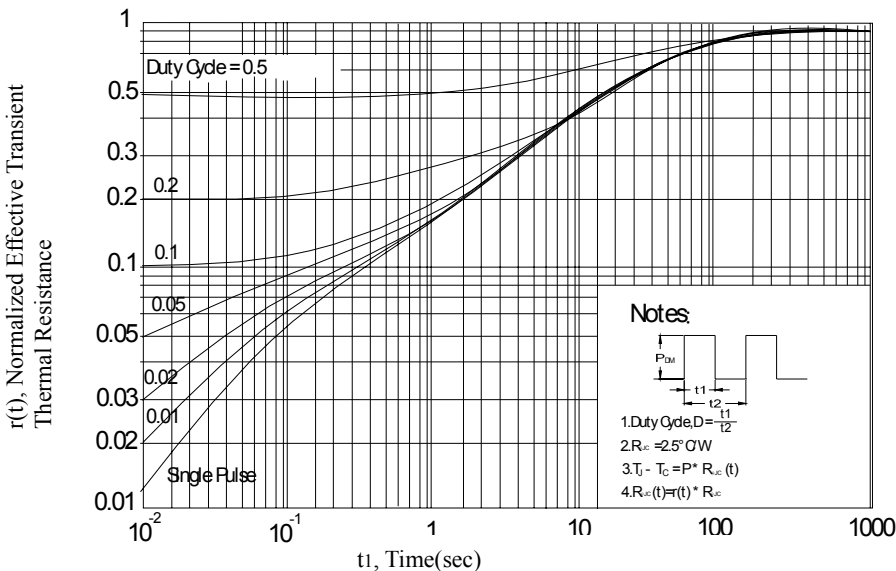
**MAXIMUM SAFE OPERATING AREA**



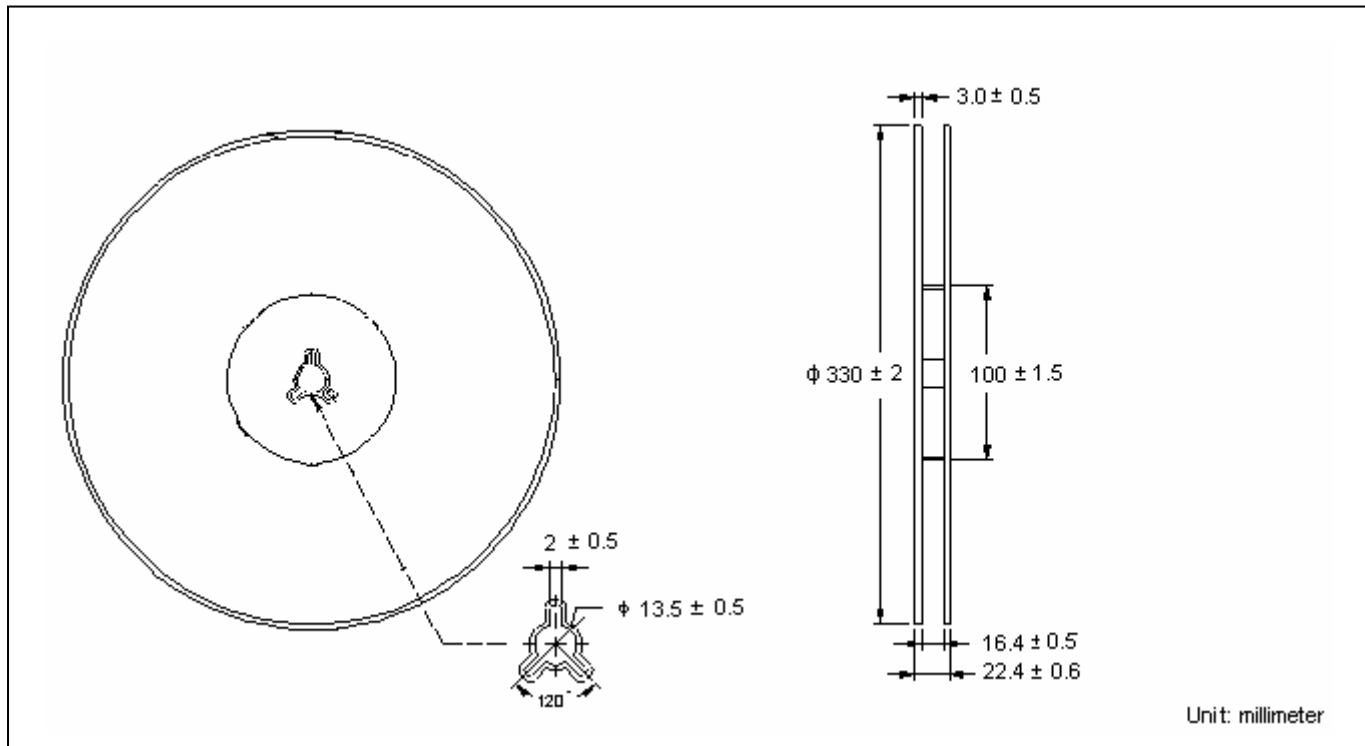
**SINGLE PULSE MAXIMUM POWER DISSIPATION**



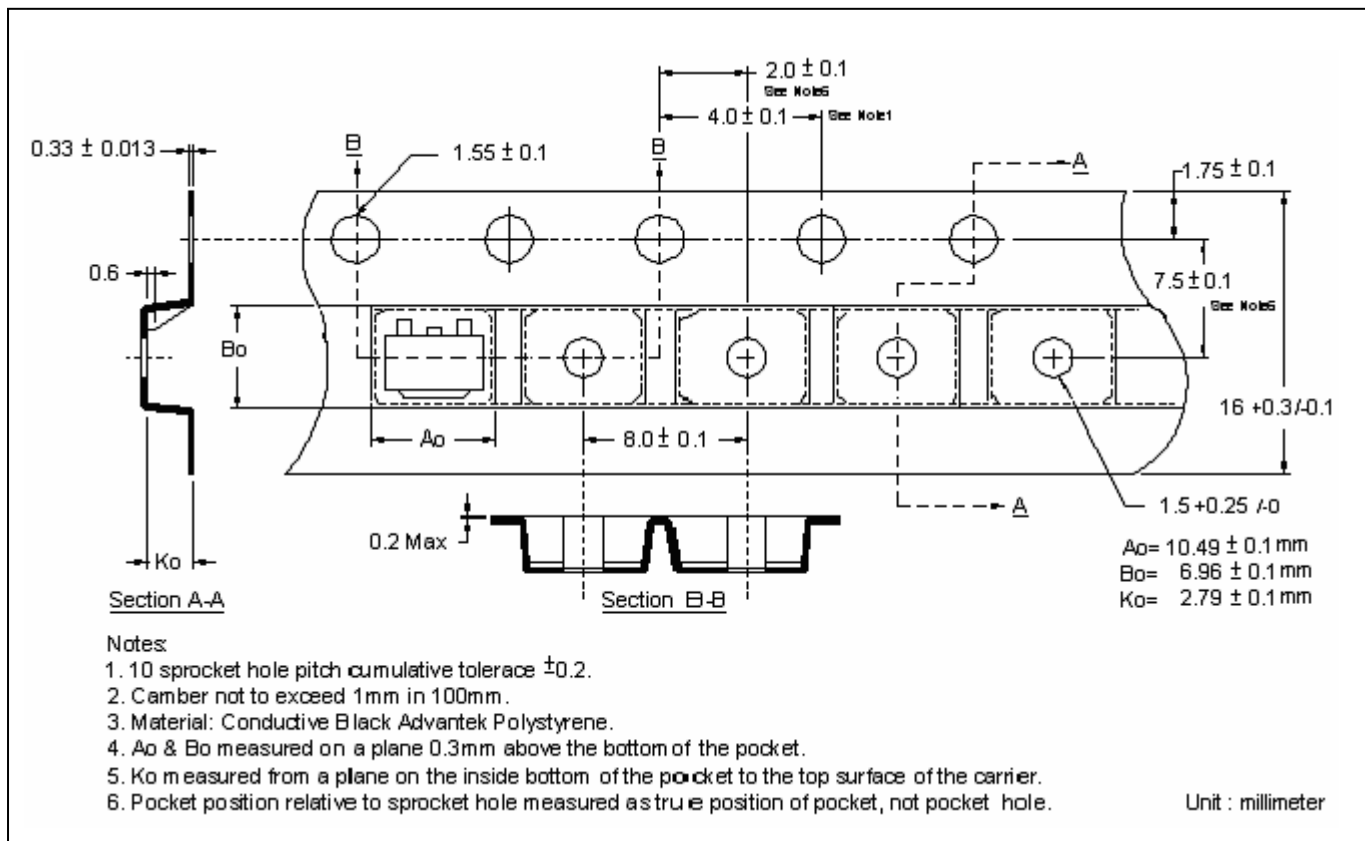
**TRANSIENT THERMAL RESISTANCE**



**Reel Dimension**



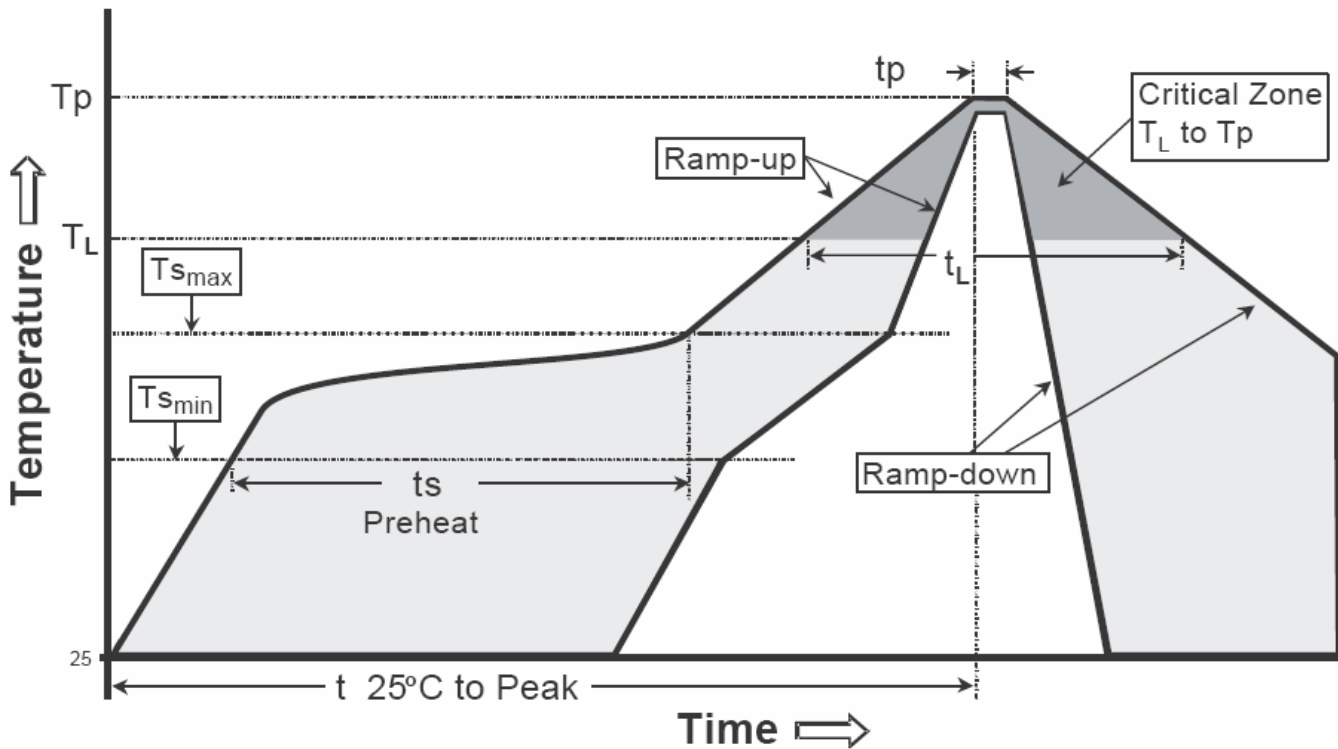
**Carrier Tape Dimension**



**Recommended wave soldering condition**

|                 |                  |                 |
|-----------------|------------------|-----------------|
| Product         | Peak Temperature | Soldering Time  |
| Pb-free devices | 260 +0/-5 °C     | 5 +1/-1 seconds |

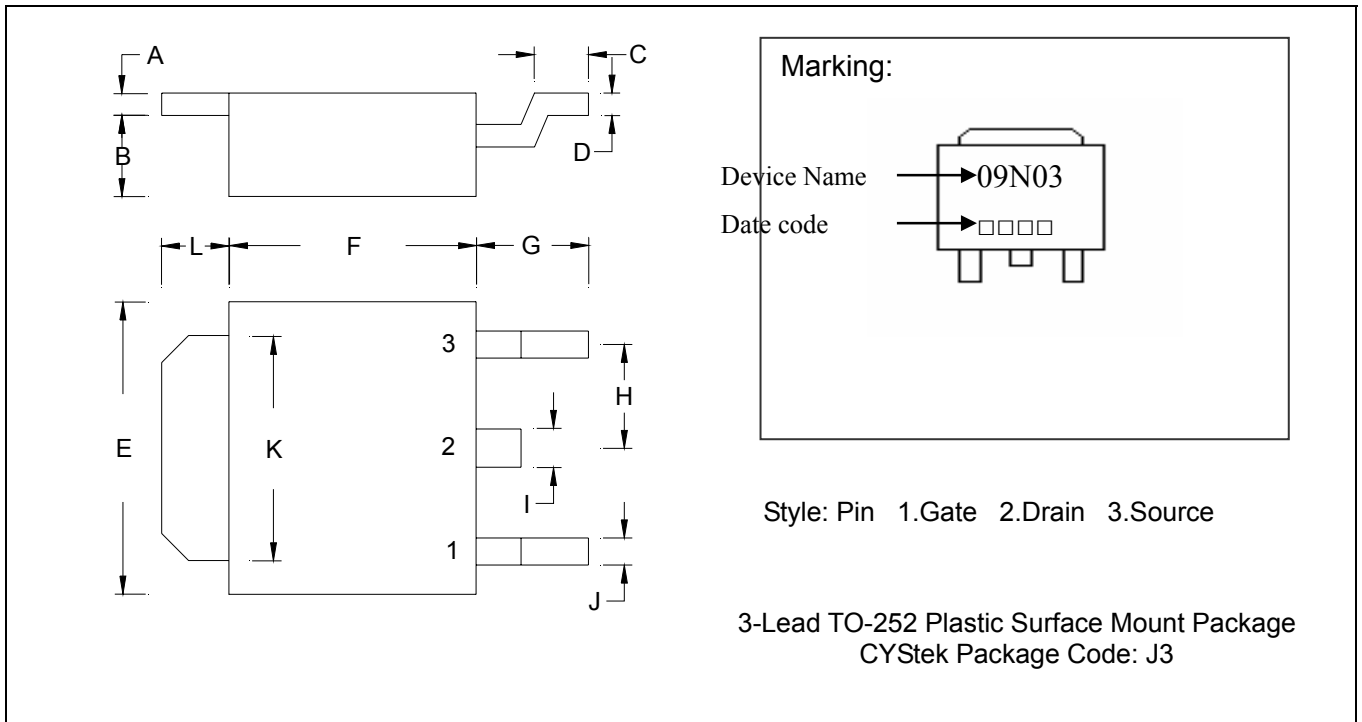
**Recommended temperature profile for IR reflow**



| Profile feature                                | Sn-Pb eutectic Assembly | Pb-free Assembly |
|--|-------------------------|------------------|
| Average ramp-up rate (Tsmax to Tp)             | 3°C/second max.         | 3°C/second max.  |
| Preheat  |                         |                  |
| -Temperature Min(Ts min)                       | 100°C                   | 150°C            |
| -Temperature Max(Ts max)                       | 150°C                   | 200°C            |
| -Time(ts min to ts max)                        | 60-120 seconds          | 60-180 seconds   |
| Time maintained above:                         |                         |                  |
| -Temperature (Tl)                              | 183°C                   | 217°C            |
| - Time (tL)                                    | 60-150 seconds          | 60-150 seconds   |
| Peak Temperature(Tp)                           | 240 +0/-5 °C            | 260 +0/-5 °C     |
| Time within 5°C of actual peak temperature(tp) | 10-30 seconds           | 20-40 seconds    |
| Ramp down rate                                 | 6°C/second max.         | 6°C/second max.  |
| Time 25 °C to peak temperature                 | 6 minutes max.          | 8 minutes max.   |

Note : All temperatures refer to topside of the package, measured on the package body surface.

**TO-252 Dimension**



\*: Typical

| DIM | Inches |        | Millimeters |      | DIM | Inches |         | Millimeters |       |
|-----|--------|--------|-------------|------|-----|--------|---------|-------------|-------|
|     | Min.   | Max.   | Min.        | Max. |     | Min.   | Max.    | Min.        | Max.  |
| A   | 0.0177 | 0.0217 | 0.45        | 0.55 | G   | 0.0866 | 0.1102  | 2.20        | 2.80  |
| B   | 0.0650 | 0.0768 | 1.65        | 1.95 | H   | -      | *0.0906 | -           | *2.30 |
| C   | 0.0354 | 0.0591 | 0.90        | 1.50 | I   | -      | 0.0449  | -           | 1.14  |
| D   | 0.0177 | 0.0236 | 0.45        | 0.60 | J   | -      | 0.0346  | -           | 0.88  |
| E   | 0.2441 | 0.2677 | 6.20        | 6.80 | K   | 0.2047 | 0.2165  | 5.20        | 5.50  |
| F   | 0.2125 | 0.2283 | 5.40        | 5.80 | L   | 0.0551 | 0.0630  | 1.40        | 1.60  |

- Notes:**
- Controlling dimension: millimeters.
  - Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
  - If there is any question with packing specification or packing method, please contact your local CYStek sales office.

**Material:**

- Lead : KFC; tin plating
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

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