

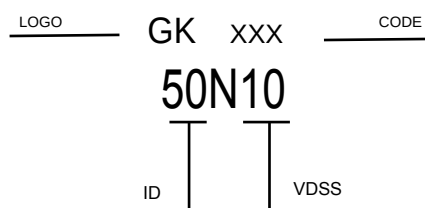
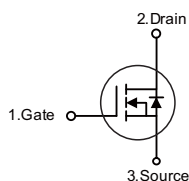
## FEATURES

- Ultra-Low  $R_{DS(ON)}$
- Low Gate Charge
- High Current Capability

$V_{DS}$  100 V  
 $I_D$  50 A  
 $R_{DS(ON)}$  14 m $\Omega$

## APPLICATION

- Power Management in Telecom., Industrial Automation
- Motor Driving in Power Tool, E-vehicle, Robotics
- Current Switching in DC/DC & AC/DC (SR) Sub-systems



## MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Maximum Ratings at  $T_c=25^{\circ}\text{C}$  unless otherwise specified

| Characteristics                              | Symbol          | Value       | Unit                 |
|----------------------------------------------|-----------------|-------------|----------------------|
| Drain-Source Voltage                         | $V_{DS}$        | 100         | V                    |
| Gate-Source Voltage                          | $V_{GS}$        | $\pm 20$    | V                    |
| Continue Drain Current                       | $I_D$           | 50          | A                    |
| Pulsed Drain Current (Note1)                 | $I_{DM}$        | 200         | A                    |
| Power Dissipation                            | $P_D$           | 82          | W                    |
| Single Pulse Avalanche Energy (Note5)        | $E_{AS}$        | 74          | mJ                   |
| Operating Temperature Range                  | $T_J$           | 150         | $^{\circ}\text{C}$   |
| Storage Temperature Range                    | $T_{STG}$       | -55 to +150 | $^{\circ}\text{C}$   |
| Thermal Resistance, Junction to Case(Note 2) | $R_{\theta JC}$ | 1.5         | $^{\circ}\text{C/W}$ |
| Thermal Resistance, Junction to Ambient      | $R_{\theta JA}$ | 39          | $^{\circ}\text{C/W}$ |

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

| Characteristics                           | Test Condition                                                                                    | Symbol       | Min | Typ  | Max       | Unit             |
|-------------------------------------------|---------------------------------------------------------------------------------------------------|--------------|-----|------|-----------|------------------|
| Drain-Source Breakdown Voltage            | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$                                               | $BV_{DSS}$   | 100 | -    | -         | V                |
| Drain-Source Leakage Current              | $V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}$                                                      | $I_{DSS}$    | -   | -    | 1         | $\mu\text{A}$    |
|                                           | $V_{DS}=100\text{ V}, T_C=125^{\circ}\text{C}$                                                    |              | -   | -    | 100       | $\mu\text{A}$    |
| Gate Leakage Current                      | $V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$                                                   | $I_{GSS}$    | -   | -    | $\pm 100$ | nA               |
| Gate-Source Threshold Voltage             | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$                                                   | $V_{GS(th)}$ | 1.2 | -    | 2.2       | V                |
| Drain-Source On-State Resistance (Note 3) | $V_{GS} = 10\text{ V}, I_D = 20\text{ A}$                                                         | $R_{DS(on)}$ | -   | 14   | 20        | $\text{m}\Omega$ |
|                                           | $V_{GS} = 4.5\text{ V}, I_D = 15\text{ A}$                                                        |              | -   | 18.6 | 25        | $\text{m}\Omega$ |
| Input Capacitance                         | $V_{GS} = 0\text{ V}, V_{DS} = 50\text{ V},$<br>$f = 1\text{ MHz}$                                | $C_{iss}$    | -   | 992  | -         | pF               |
| Output Capacitance                        |                                                                                                   | $C_{oss}$    | -   | 330  | -         | pF               |
| Reverse Transfer Capacitance              |                                                                                                   | $C_{rss}$    | -   | 19.2 | -         | pF               |
| Turn-on Delay Time                        | $V_{DS}=50\text{ V}, I_D=20\text{ A}$<br>$V_{GS}=10\text{ V}, R_G=6.2\text{ }\Omega$<br>(Note3,4) | $t_{d(ON)}$  | -   | 7    | -         | ns               |
| Rise Time                                 |                                                                                                   | $t_r$        | -   | 18   | -         | ns               |
| Turn-Off Delay Time                       |                                                                                                   | $t_{d(OFF)}$ | -   | 21   | -         | ns               |
| Fall Time                                 |                                                                                                   | $t_f$        | -   | 9    | -         | ns               |
| Total Gate Charge                         | $V_{DS}=50\text{ V}, I_D=20\text{ A},$<br>$V_{GS}=10\text{ V}$ (Note3,4)                          | $Q_G$        | -   | 19   | -         | nC               |
| Gate to Source Charge                     |                                                                                                   | $Q_{GS}$     | -   | 4    | -         | nC               |
| Gate to Drain Charge                      |                                                                                                   | $Q_{GD}$     | -   | 5    | -         | nC               |

Source-Drain Diode Characteristics at  $T_a=25^{\circ}\text{C}$  unless otherwise specified

| Characteristics                                | Test Condition                                                                                        | Symbol   | Min. | Typ. | Max. | Unit          |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------|------|------|------|---------------|
| Maximun Body-Diode Continuous Current (Note 2) |                                                                                                       | $I_S$    | -    | -    | 50   | A             |
| Maximun Body-Diode Pulsed Current              |                                                                                                       | $I_{SM}$ | -    | -    | 200  | A             |
| Drain-Source Diode Forward Voltage             | $I_{SD} = 20\text{ A}$                                                                                | $V_{SD}$ | -    | -    | 1.2  | V             |
| Reverse Recovery Time                          | $I_S = I_F, I_{SD}=20\text{ A}, V_{GS} = 0\text{ V},$<br>$dI / dt = 100\text{ A}/\mu\text{s}$ (Note3) | $t_{rr}$ | -    | 32   | -    | ns            |
| Reverse Recovery Charge                        |                                                                                                       | $Q_{rr}$ | -    | 32   | -    | $\mu\text{C}$ |

Note2:Pulse test: 300  $\mu\text{s}$  pulse width, 2 % duty cycle

RATING AND CHARACTERISTIC CURVES

Figure 1: Power De-rating

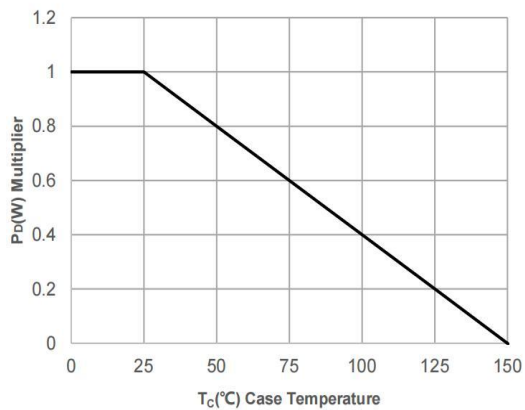


Figure 2: Current De-rating

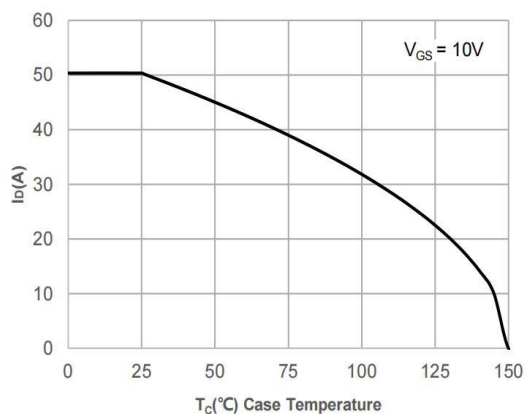


Figure 3: Normalized Maximum Transient Thermal Impedance

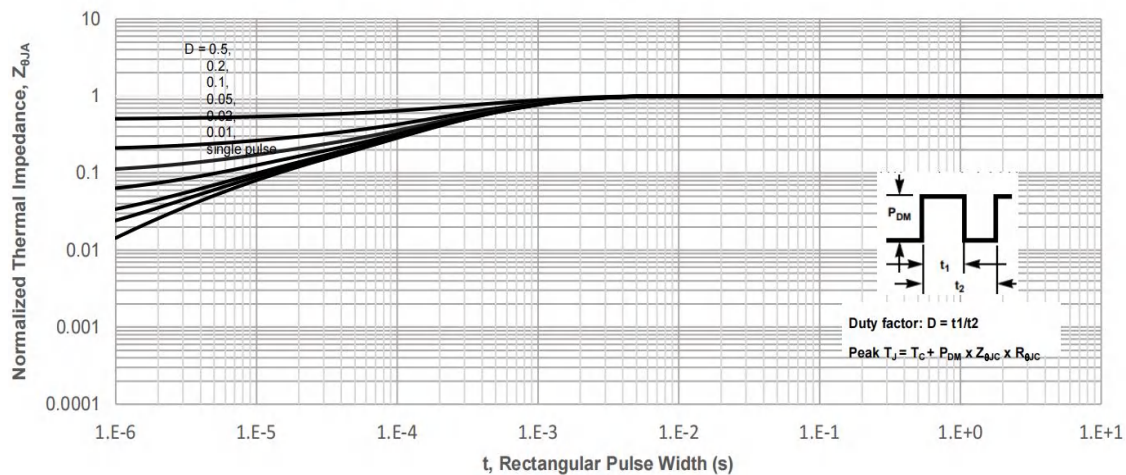
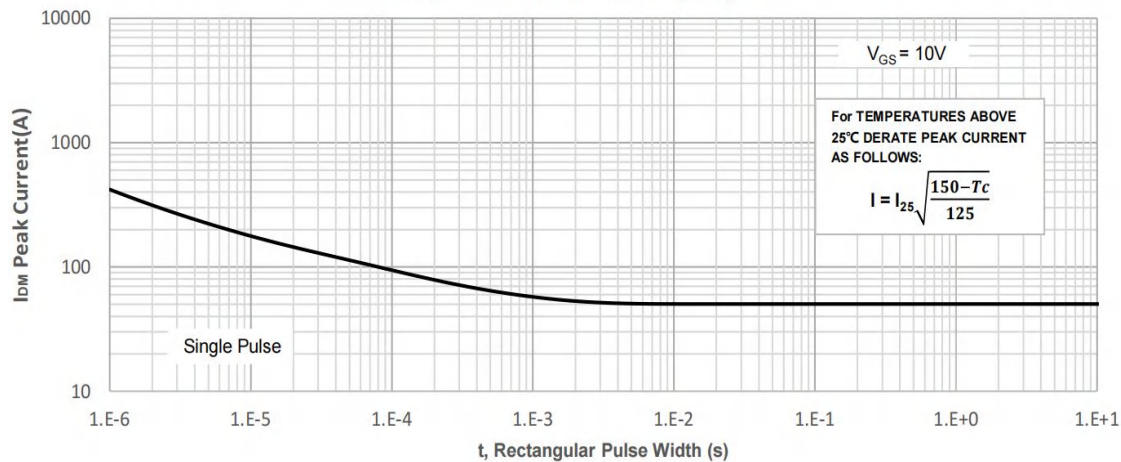


Figure 4: Peak Current Capacity



RATING AND CHARACTERISTIC CURVES

Figure 5: Output Characteristics

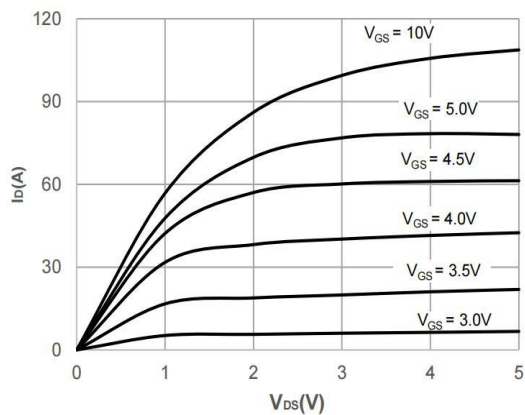


Figure 6: Typical Transfer Characteristics

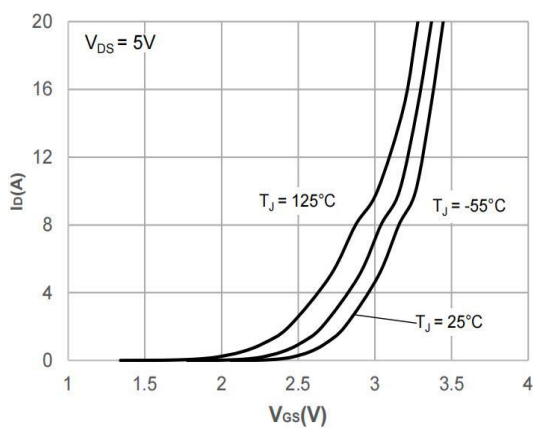


Figure 7: On-resistance vs. Drain Current

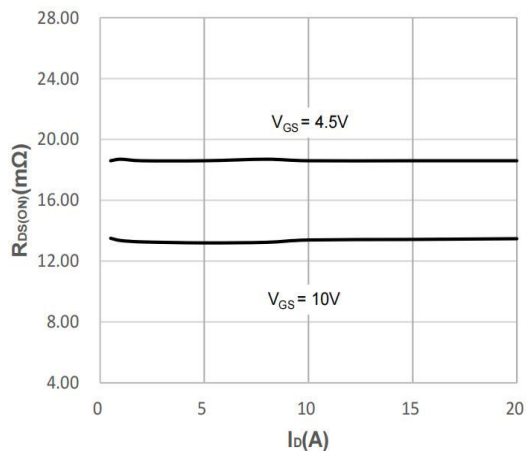


Figure 8: Body Diode Characteristics

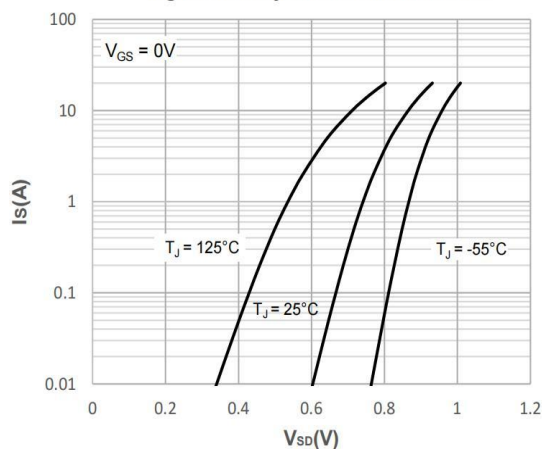


Figure 9: Gate Charge Characteristics

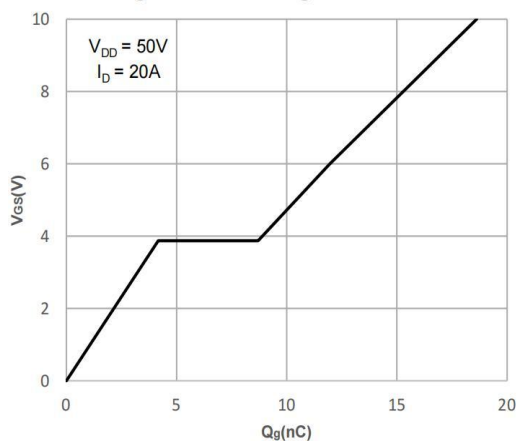
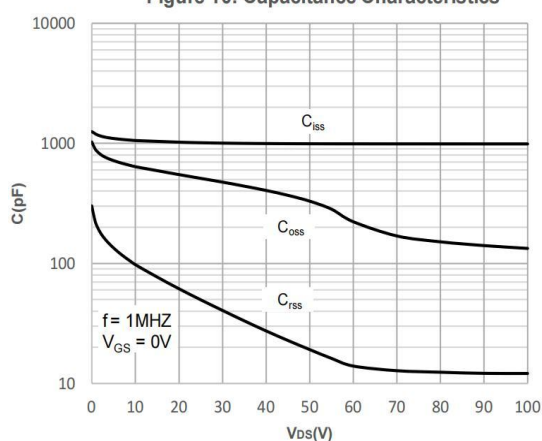


Figure 10: Capacitance Characteristics



RATING AND CHARACTERISTIC CURVES

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

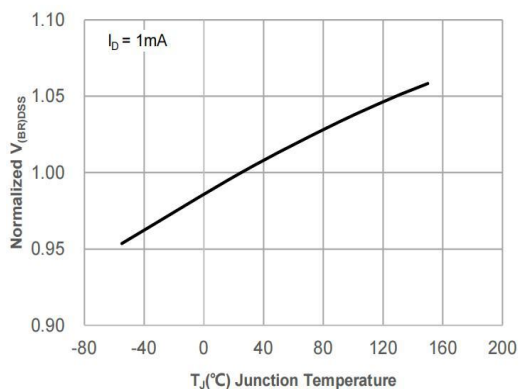


Figure 12: Normalized on Resistance vs. Junction Temperature

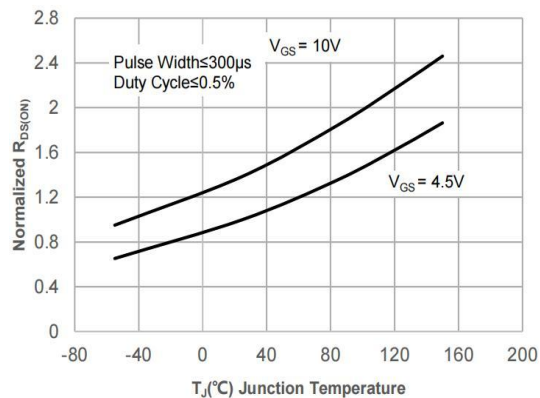


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

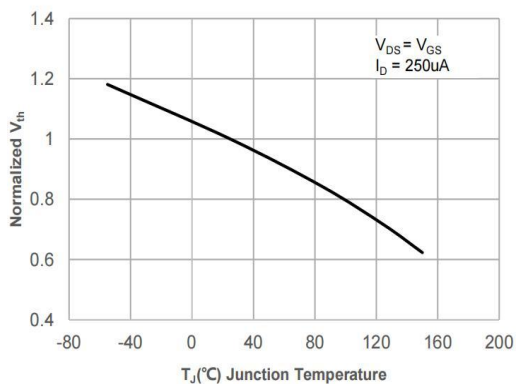


Figure 14:  $R_{DS(ON)}$  vs.  $V_{GS}$

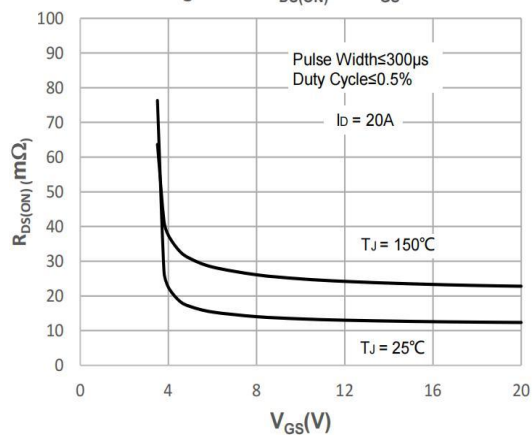
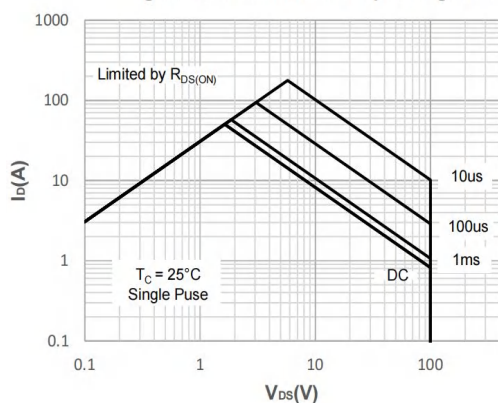
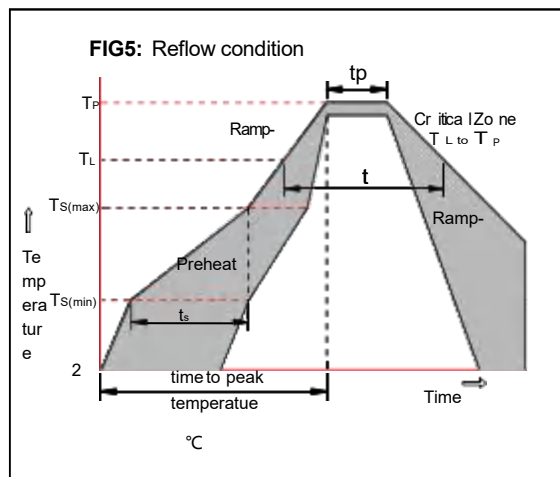


Figure 15: Maximum Safe Operating Area



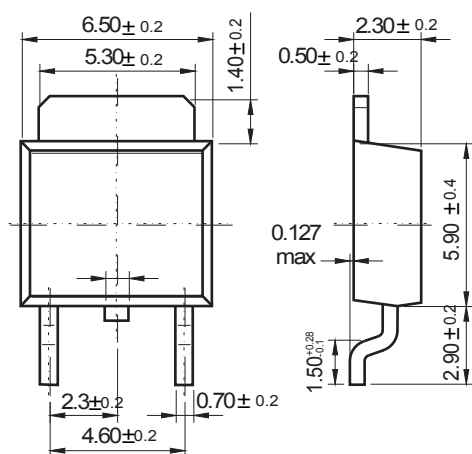
## Soldering parameters

| Reflow Condition                                        |                                   | Pb-Free assembly<br>(see as below) |
|---------------------------------------------------------|-----------------------------------|------------------------------------|
| 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 (Liquid us Temp ( $T_L$ ) to peak) |                                   | 3 °C/sec. Max                      |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                    |                                   | 3 °C/sec. Max                      |
| Reflow                                                  | -Temperature( $T_L$ )(Liquid us)  | +217 °C                            |
|                                                         | -Temperature( $t_L$ )             | 60-150 secs.                       |
| Peak Temp ( $T_P$ )                                     |                                   | +260(+0/-5) °C                     |
| Time within 5 °C of actual Peak Temp ( $t_P$ )          |                                   | 30 secs. Max                       |
| Ramp-down Rate                                          |                                   | 6 °C/sec. Max                      |
| Time 25 °C to Peak Temp ( $T_P$ )                       |                                   | 8 min. Max                         |
| Do not exceed                                           |                                   | +260 °C                            |

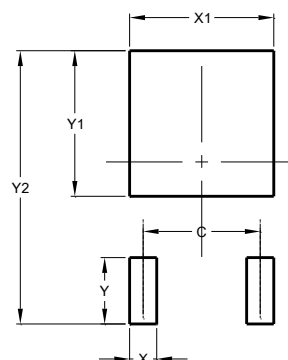


## Package Dimensions & Suggested Pad Layout

### TO-252

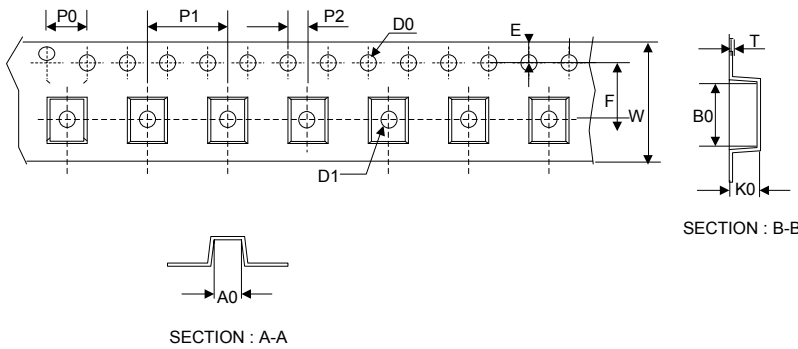
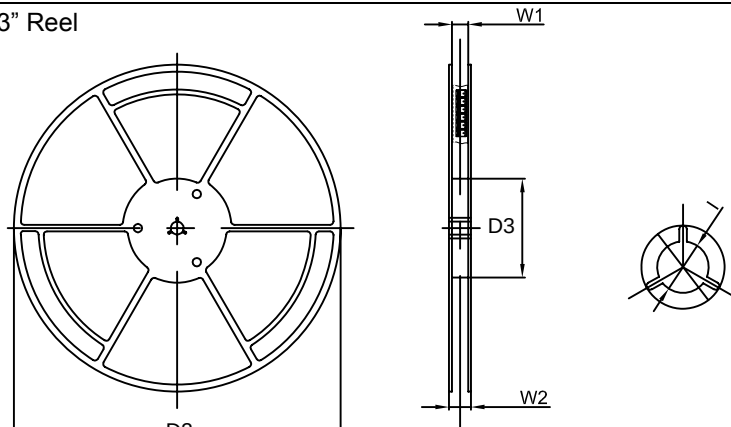


Dimensions in inches and (millimeters)



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 4.55          |
| X          | 1.50          |
| X1         | 5.80          |
| Y          | 2.70          |
| Y1         | 6.00          |
| Y2         | 10.90         |

## Tape & reel specification

| Tape                                                                               |  | Symbol            | Dimension (mm) |
|------------------------------------------------------------------------------------|--|-------------------|----------------|
|   |  | P0                | 4.00±0.20      |
|                                                                                    |  | P1                | 8.00±0.20      |
|                                                                                    |  | P2                | 2.00±0.20      |
|                                                                                    |  | D0                | 1.55±0.15      |
|                                                                                    |  | D1                | 1.55±0.20      |
|                                                                                    |  | E                 | 1.75±0.20      |
|                                                                                    |  | F                 | 7.50±0.20      |
|                                                                                    |  | W                 | 16.00±0.20     |
|                                                                                    |  | A0                | 7.10±0.20      |
|                                                                                    |  | B0                | 10.50±0.20     |
|                                                                                    |  | K0                | 2.70±0.20      |
|                                                                                    |  | T                 | 0.30±0.10      |
|                                                                                    |  | D2                | 330.0±5.0      |
|                                                                                    |  | D3                | 100.0±4.0      |
|                                                                                    |  | W1                | 20.0±5.0       |
| 13" Reel                                                                           |  | W2                | 25.0±5.0       |
|  |  | I                 | 13.0±2.0       |
|                                                                                    |  | Quantity: 2500PCS |                |