| | |
|---|---|
| $V_{DSS}$ | 800 V |
| $I_D$ | 7 A |
| $R_{DS(ON)}$ | 550 mΩ |

## FEATURES

- High Speed Switching
- High Blocking Voltage with Low $R_{DS(on)}$
- Easy to Parallel
- Simple to Drive
- RoHS Compliant

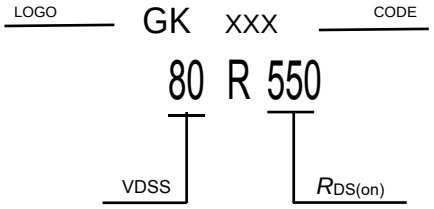
## BENEFITS

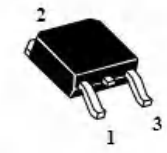
- Increased Power Density
- Faster Operating Frequency
- Reduction of Heat Sink Requirements
- Higher Efficiency
- Reduced EMI

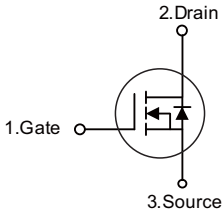
## APPLICATION

- Power Factor Correction Modules
- Switch Mode Power Supplies
- DC-AC Inverters
- High Voltage DC/DC Converters




## ABSOLUTE MAXIMUM RATINGS ($T_C$ = 25°C, unless otherwise specified)

| Symbol | Parameter | Test conditions | Value | Unit |
|---|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | | 800 | V |
| $I_D$ | Continuous Drain Current | $V_{GS}$=18V<br>$T_c$=25°C<br>$T_c$=100°C | 7<br>5 | A |
| $I_{DM}$ | Peak Drain Current | Pulse width $t_p$ limited by $T_{jmax}$ | 14 | A |
| $V_{GSmax}$ | Gate-Source Voltage, max. Transient Voltage | $t_p$≤0.5μs, $D$<0.001 | -8/+22 | V |
| $V_{GSmax}$ | Gate-Source Voltage | | -8/+22 | V |
| $V_{GSop}$ | Recommend Gate-Source Voltage | | -4/+18 | V |
| $P_{tot}$ | Power Dissipation | $T_c$=25°C<br>$T_c$=100°C | 35<br>17 | W |
| $E_{AS}$ | Non-Repetitive Avalanche Switching Energy | $V_{DD}$=50V, $L$=1mH, $I_D$=7A | 24.5 | mJ |
| $E_{AR}$ | Repetitive Avalanche Energy | $V_{DD}$=50V, $L$=500μH, $I_D$=9A | 22.5 | mJ |
| $t_{SC}$ | Short-Circuit Withstand Time | $V_{DD}$=400V, $V_{GS}$=18V,<br>$V_{DS,peak}$ < 800V | 2.5 | μs |
| $T_j$ | Operating Junction Temperature | | -40~175 | °C |
| $T_{stg}$ | Storage Temperature | | -40~150 | °C |
| $T_{sold}$ | Soldering Temperature | 1.6mm (0.063″) from case for 10s | 260 | °C |

# ELECTRICAL CHARACTERISTICS ($T_C$=25°C, unless otherwise specified)

## Static Characteristics

| Symbol | Parameter | Test conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $I_D$=100μA, $V_{GS}$=0V | 800 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=800V, $V_{GS}$=0V | | 1 | 10 | μA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{DS}$=0V, $V_{GS}$=18V | | | 250 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_D$=1mA<br>$T_j$=25°C<br>$T_j$=175°C | 2 | 3.0<br>2.2 | 4 | V |
| $R_{DS(on)}$ | Drain-Source On-State Resistance | $V_{GS}$=15V, $I_D$=3.3A<br>$T_j$=25°C<br>$T_j$=175°C | | 750<br>710 | 1030 | mΩ |
| | | $V_{GS}$=18V, $I_D$=3.3A<br>$T_j$=25°C<br>$T_j$=175°C | | 550<br>650 | 740 | mΩ |
| $g_{fs}$ | Forward Transconductance | $V_{DS}$=20V, $I_D$=3.3A | | 2.1 | | S |

## Dynamic Characteristics

| Symbol | Parameter | Test conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=600V, $f$=1MHz, $V_{GS}$=0V | | 116 | | pF |
| $C_{oss}$ | Output Capacitance | | | 18 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 2.8 | | pF |
| $E_{oss}$ | $C_{oss}$ Stored Energy | | | 2.4 | | μJ |
| $R_{G(int)}$ | Internal Gate Resistance | $f$=1MHz | | 38 | | Ω |
| $Q_g$ | Total Gate Charge | $V_{DS}$=400V, $I_D$=3.3A, $V_{GS}$=-4V/18V | | 7 | | nC |
| $Q_{gs}$ | Gate to Source Charge | | | 1.3 | | nC |
| $Q_{gd}$ | Gate to Drain Charge | | | 4.2 | | nC |

## Thermal Characteristics

| Symbol | Parameter | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| $R_{th(j-c)}$ | Thermal Resistance from Junction to Case | | 4.3 | | °C/W |

# ELECTRICAL CHARACTERISTICS ($T_C$=25°C, unless otherwise specified)

## Switching Characteristics

| Symbol | Parameter | Test conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$=400V, $I_D$=3.3A, $V_{GS}$=-4V/18V, $R_{G(ext)}$=2.5Ω, $L$=200μH, $T_j$=25°C | | 3 | | ns |
| $t_r$ | Rise Time | | | 12 | | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 9 | | ns |
| $t_f$ | Fall Time | | | 18 | | ns |
| $E_{on}$ | Turn-On Energy | | | 24 | | μJ |
| $E_{off}$ | Turn-Off Energy | | | 4 | | μJ |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$=400V, $I_D$=3.3A, $V_{GS}$=-4V/18V, $R_{G(ext)}$=2.5Ω, $L$=200μH, $T_j$=175°C | | 3 | | ns |
| $t_r$ | Rise Time | | | 11 | | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 10 | | ns |
| $t_f$ | Fall Time | | | 19 | | ns |
| $E_{on}$ | Turn-On Energy | | | 22 | | μJ |
| $E_{off}$ | Turn-Off Energy | | | 4 | | μJ |

## Reverse Diode Characteristics

| Symbol | Parameter | Test conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS}$=-4V, $I_{SD}$=1.7A<br>$T_j$=25°C<br>$T_j$=175°C | | <br>4.8<br>4.3 | | V |
| $I_S$ | Continuous Diode Forward Current | $V_{GS}$=-4V<br>$T_c$=25°C<br>$T_c$=100°C | | <br>7<br>3 | | A |

## ELECTRICAL CHARACTERISTICS ($T_C$=25°C, unless otherwise specified)

### Reverse Diode Characteristics (Continued)

| Symbol | Parameter | Test conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $t_{rr}$ | Reverse Recovery Time | $V_{GS}$=-4V, $I_{SD}$=1.7A, $V_R$=400V, di/dt=1990A/μs, $T_j$=25°C | | 45 | | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | | 54 | | nC |
| $I_{rrm}$ | Peak Reverse Recovery Current | | | 2 | | A |
| $t_{rr}$ | Reverse Recovery Time | $V_{GS}$=-4V, $I_{SD}$=1.7A, $V_R$=400V, di/dt=1990A/μs, $T_j$=175°C | | 48 | | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | | 52 | | nC |
| $I_{rrm}$ | Peak Reverse Recovery Current | | | 2.3 | | A |

## RATING AND CHARACTERISTIC CURVES

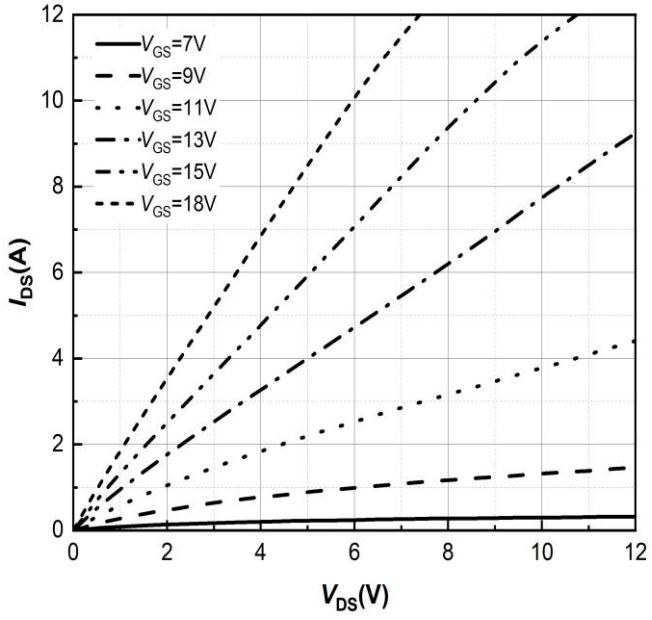



Figure 1. **Output Characteristics $T_j$=-40°C**

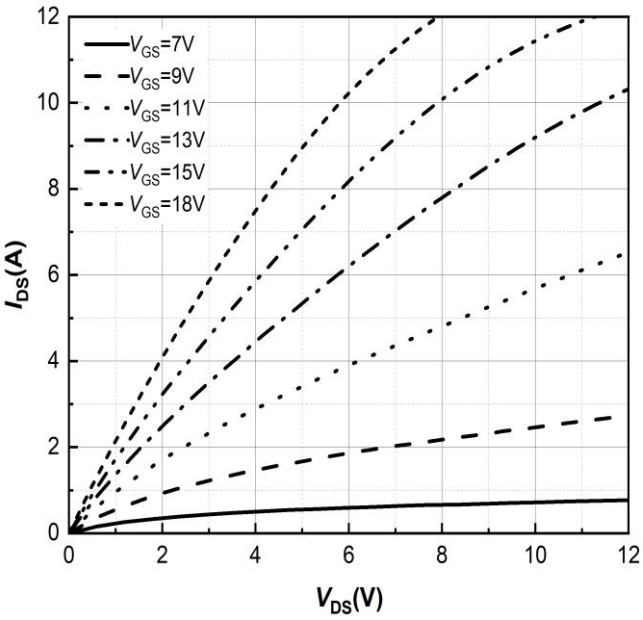



Figure 2. **Output Characteristics $T_j$=25°C**

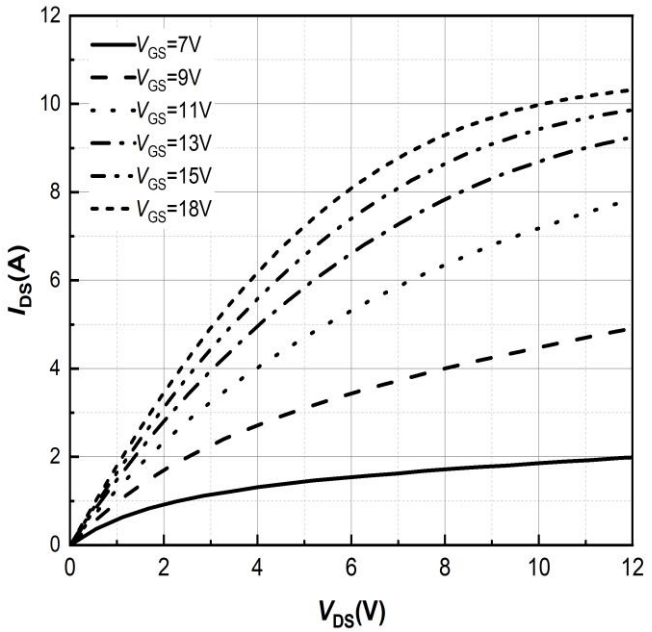



Figure 3. **Output Characteristics $T_j$=175°C**

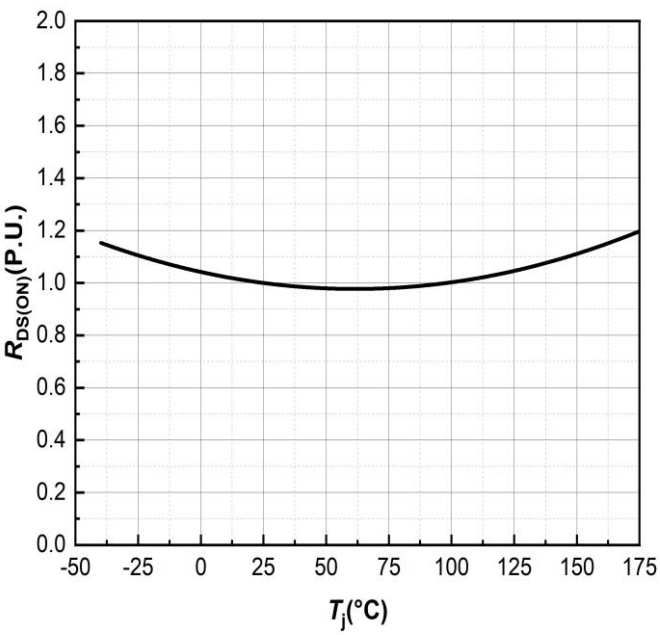



Figure 4. **Normalized On-Resistance vs. Temperature**

## RATING AND CHARACTERISTIC CURVES

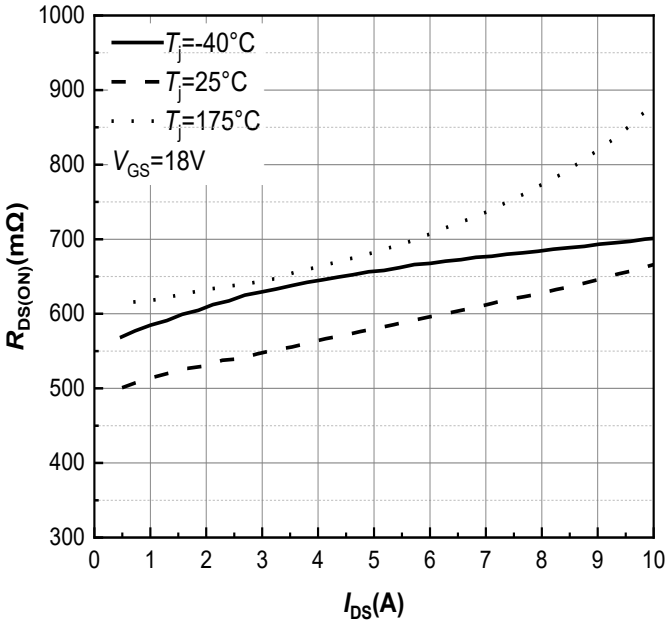



Figure 5. **On-Resistance vs. Drain Current For Various Temperatures**

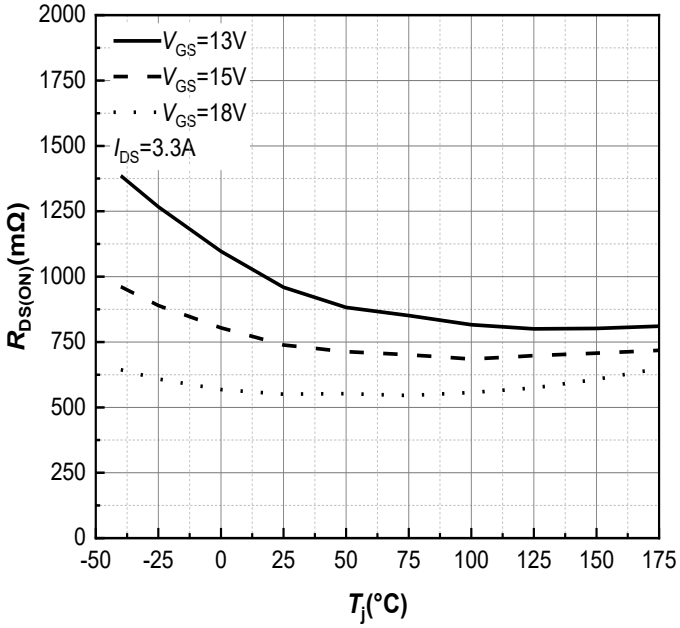



Figure 6. **On-Resistance vs. Temperature For Various Gate Voltage**

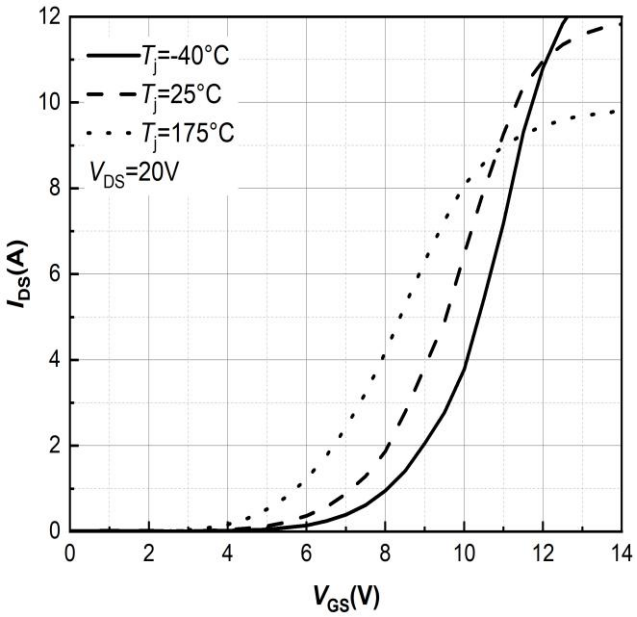



Figure 7. **Transfer Characteristic for Various Junction Temperatures**

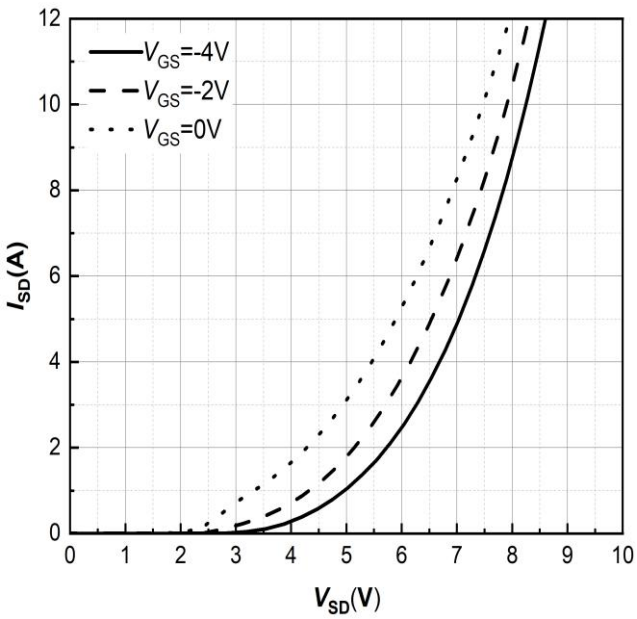



Figure 8. **Body Diode Characteristic $T_j$=-40°C**

## RATING AND CHARACTERISTIC CURVES

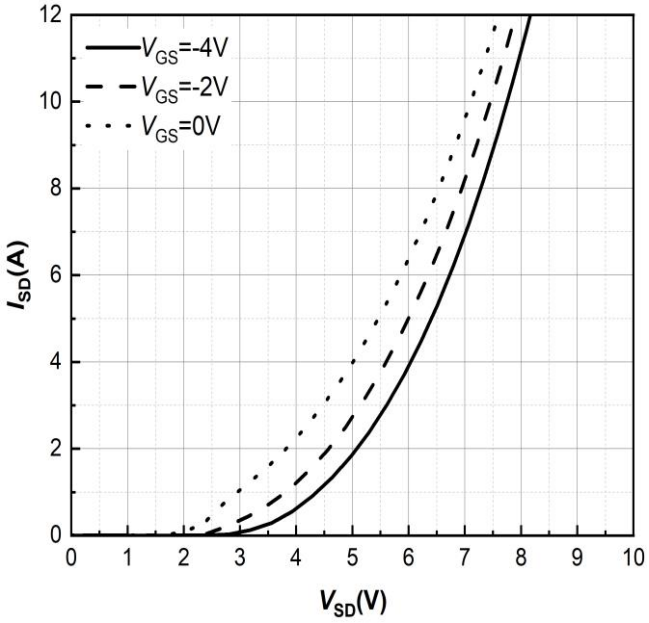



Figure 9. **Body Diode Characteristic $T_j$=25°C**

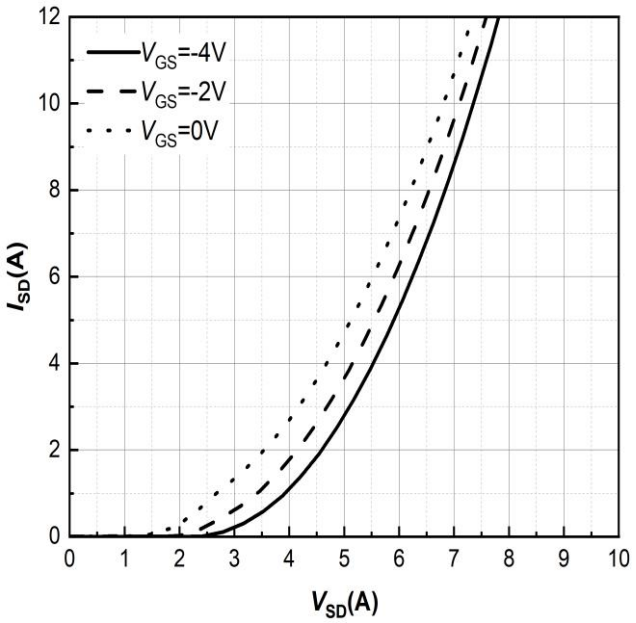



Figure 10. **Body Diode Characteristic $T_j$=175°C**

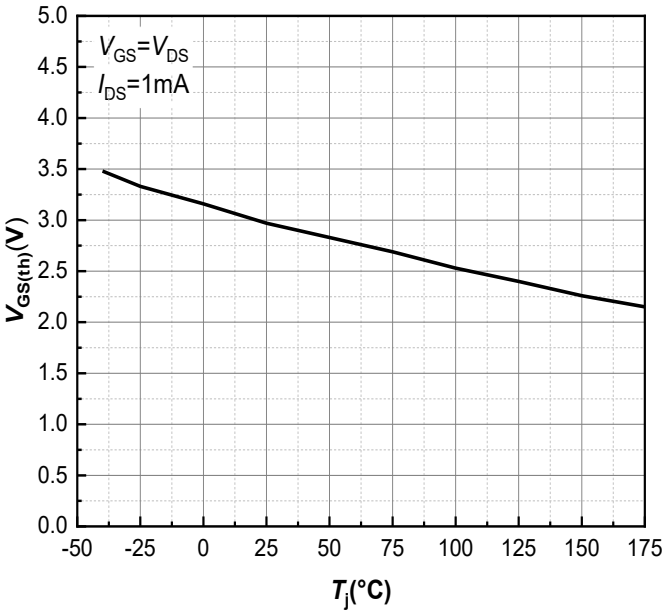



Figure 11. **Threshold Voltage vs. Temperature**

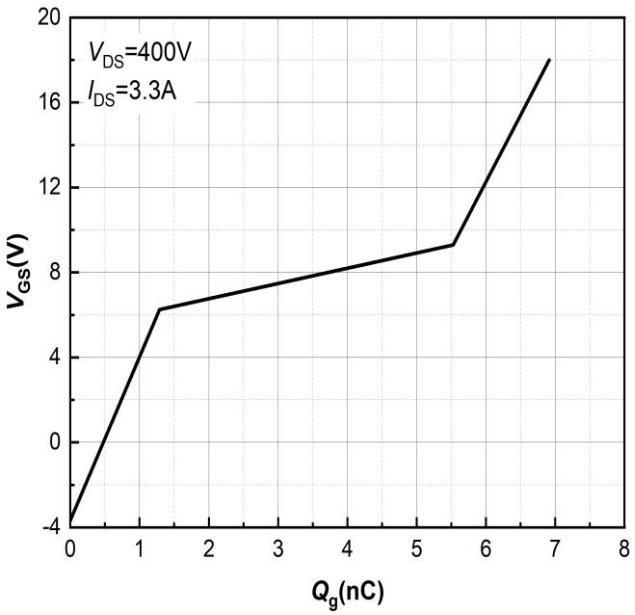



Figure 12. **Gate Charge Characteristics**

## RATING AND CHARACTERISTIC CURVES

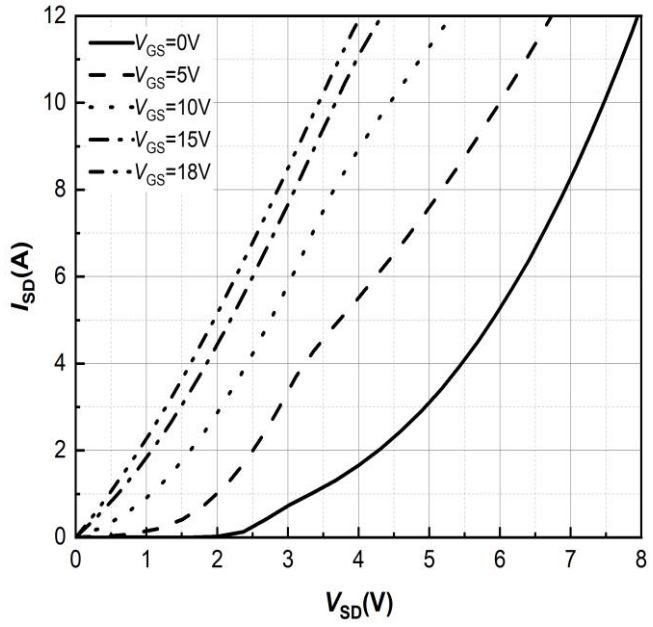



Figure 13. **3rd Quadrant Characteristic $T_j$=-40°C**

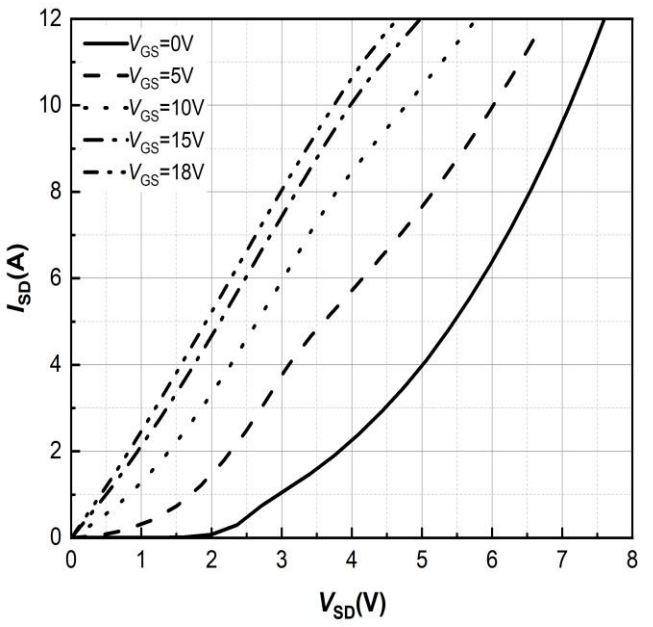



Figure 14. **3rd Quadrant Characteristic $T_j$=25°C**

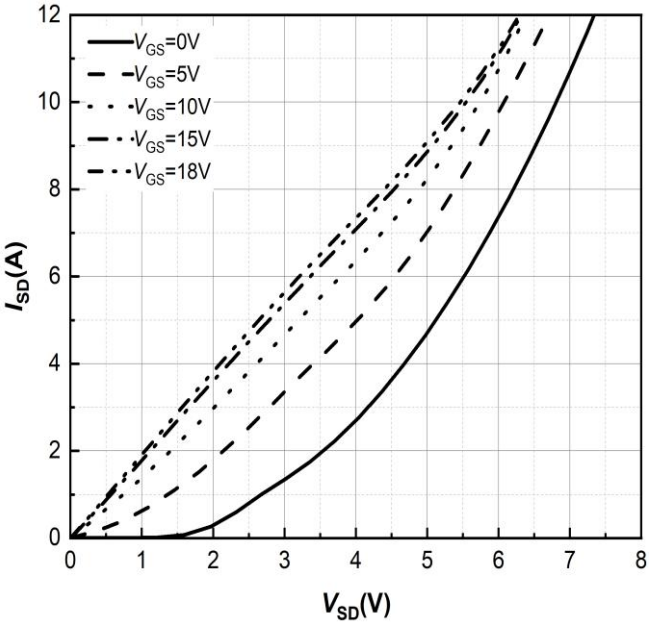



Figure 15. **3rd Quadrant Characteristic $T_j$=175°C**

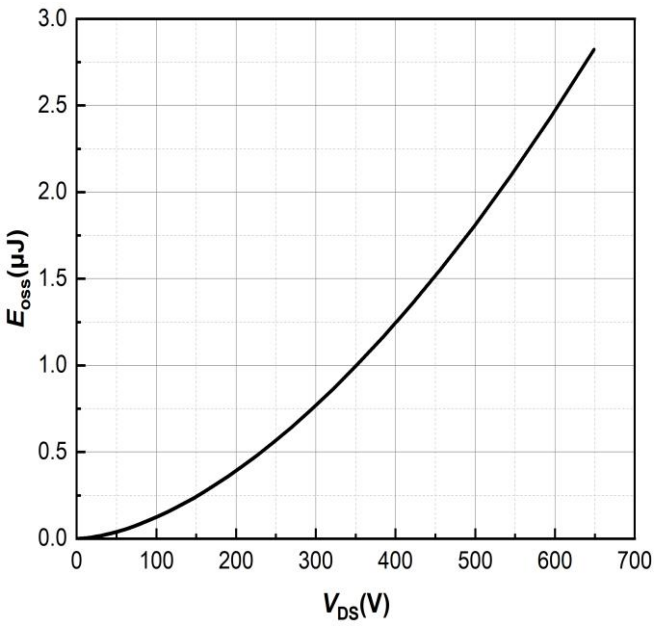



Figure 16. **Output Capacitor Stored Energy**

## RATING AND CHARACTERISTIC CURVES

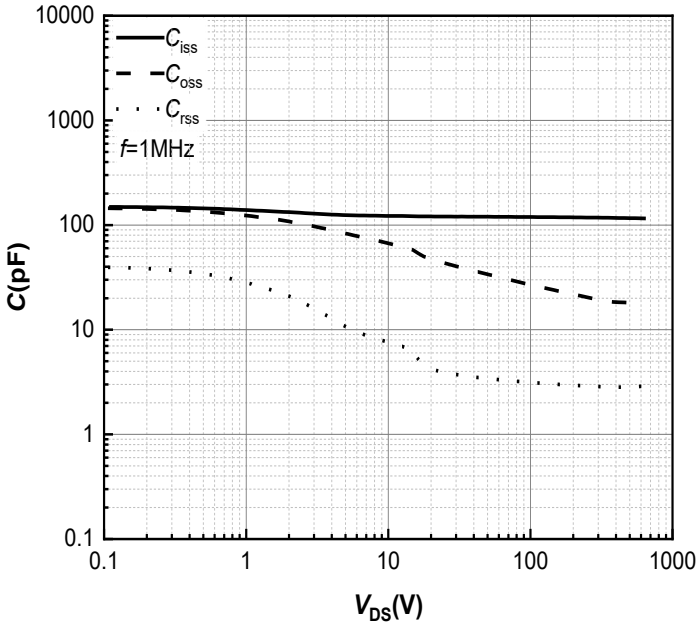



Figure 17. **Capacitances vs. Drain-Source**

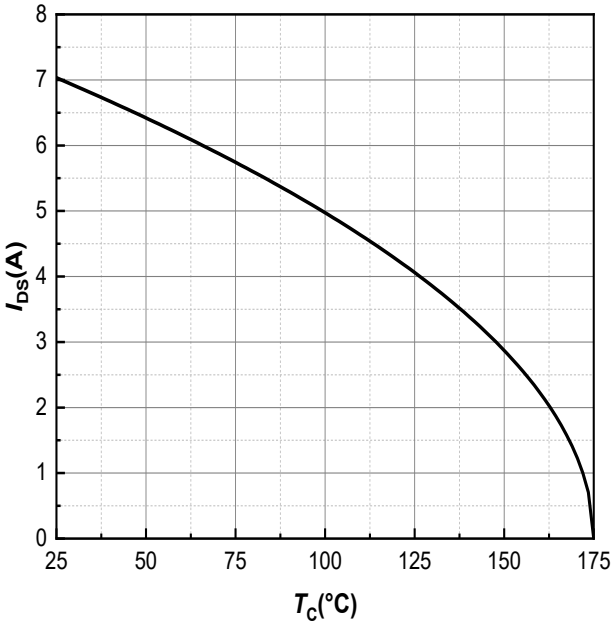



Figure 18. **Continuous Drain Current Derating vs. Case Temperature**

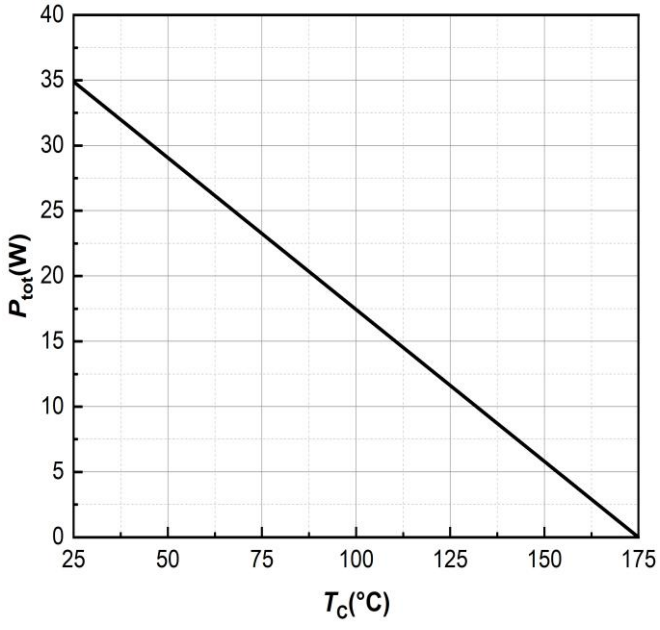



Figure 19. **Maximum Power Dissipation Derating vs. Case Temperature**

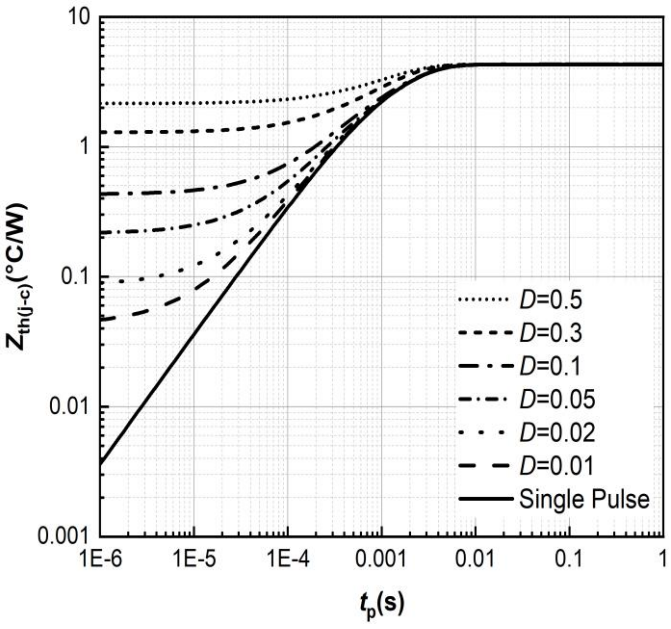



Figure 20. **Transient Thermal Impedance**

## RATING AND CHARACTERISTIC CURVES

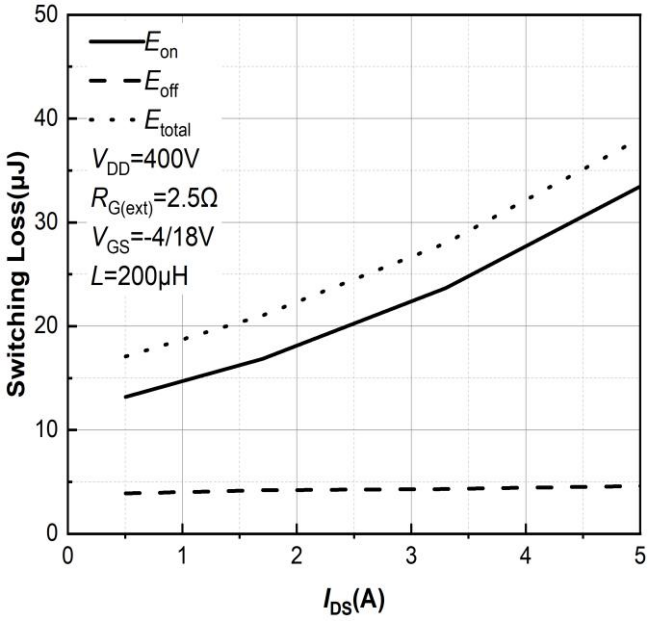



Figure 21. **Clamped Inductive Switching Energy vs. Drain Current $T_j$=25°C**

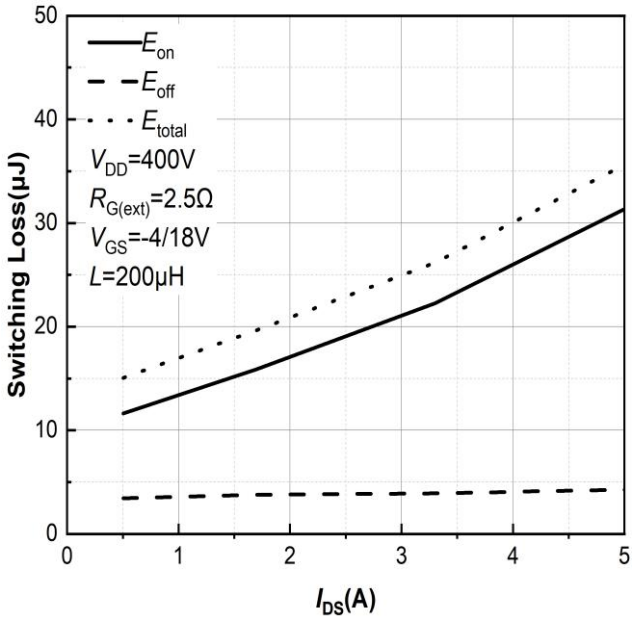



Figure 22. **Clamped Inductive Switching Energy vs. Drain Current $T_j$=175°C**

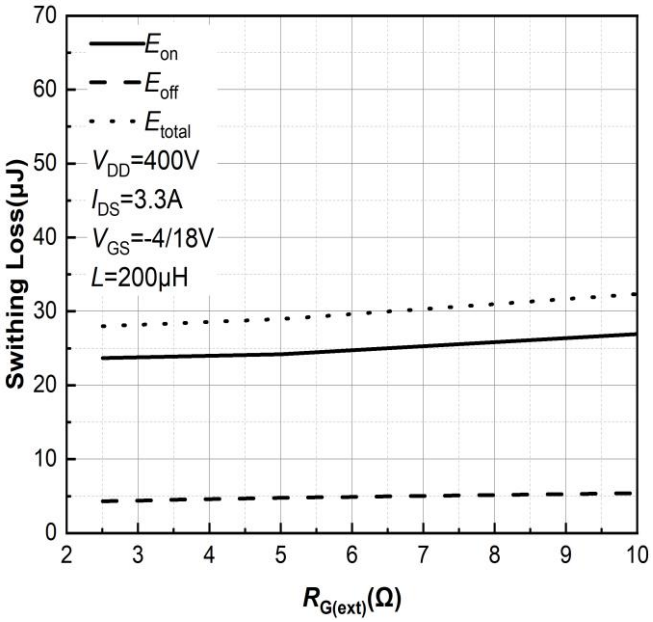



Figure 23. **Clamped Inductive Switching Energy vs. $R_{G(ext)}$ $T_j$=25°C**

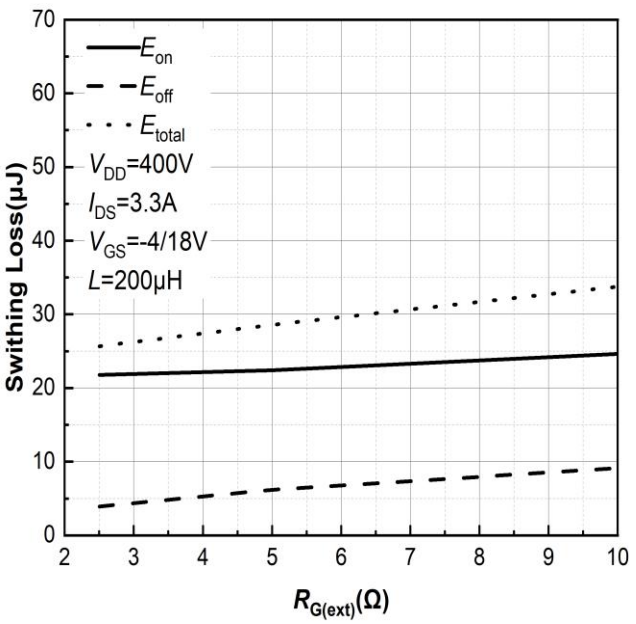



Figure 24. **Clamped Inductive Switching Energy vs. $R_{G(ext)}$ $T_j$=175°C**

## RATING AND CHARACTERISTIC CURVES

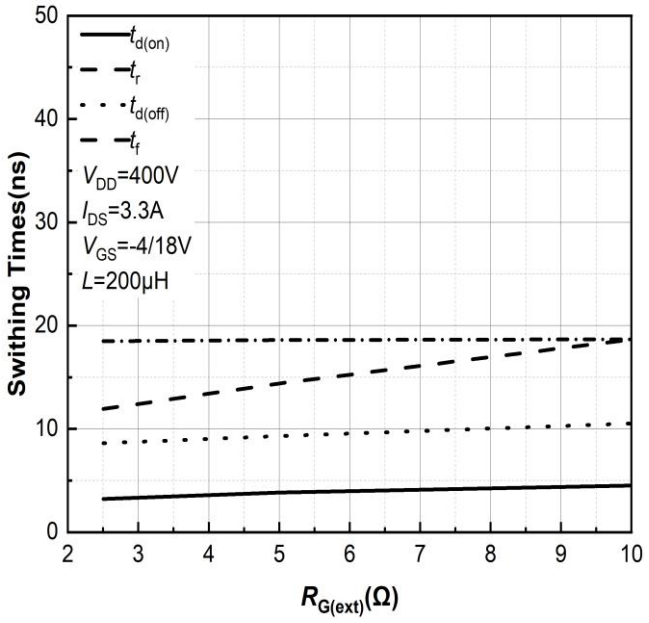



Figure 25. **Switching Times vs. $R_{G(ext)}$ $T_j$=25°C**

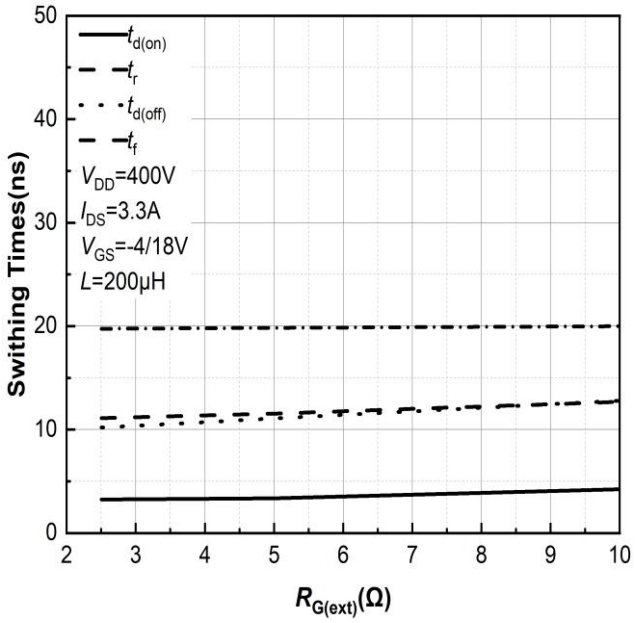



Figure 26. **Switching Times vs. $R_{G(ext)}$ $T_j$=175°C**

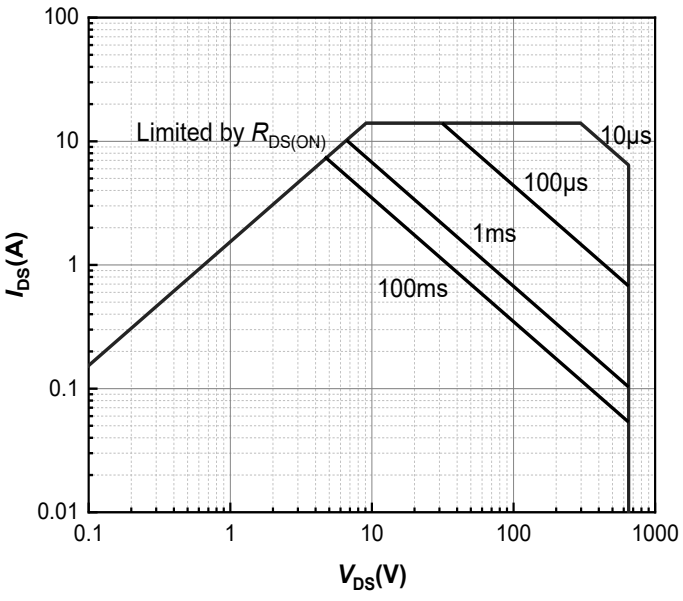
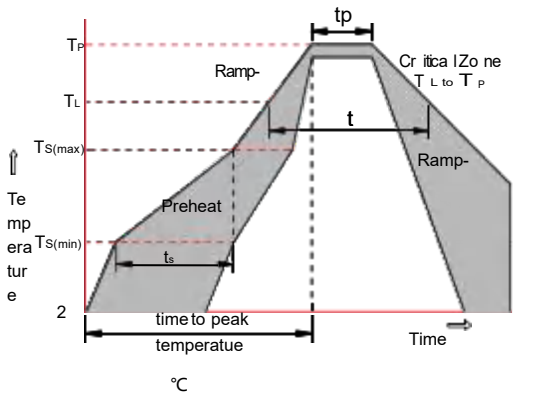



Figure 27. **Safe Operating Area**

## Soldering parameters

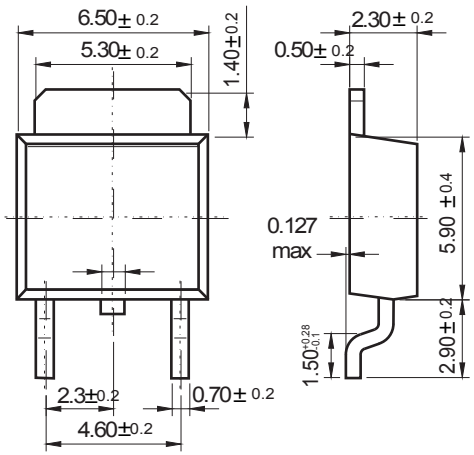
| Reflow Condition | | Pb-Free assembly (see as bellow) |
|---|---|---|
| Pre Heat | -Temperature Min ($T_{s(min)}$) | +150℃ |
| | -Temperature Max($T_{s(max)}$) | +200℃ |
| | -Time (Min to Max) (ts) | 60-180 secs. |
| Average ramp up rate (Liquid us Temp ($T_L$) to peak) | | 3℃/sec. Max |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate | | 3℃/sec. Max |
| Reflow | -Temperature($T_L$)(Liquid us) | +217℃ |
| | -Temperature($t_L$) | 60-150 secs. |
| Peak Temp ($T_p$) | | +260(+0/-5)℃ |
| Time within 5℃ of actual Peak Temp ($t_p$) | | 30 secs. Max |
| Ramp-down Rate | | 6℃/sec. Max |
| Time 25℃ to Peak Temp ($T_P$) | | 8 min. Max |
| Do not exceed | | +260℃ |

**FIG5:** Reflow condition

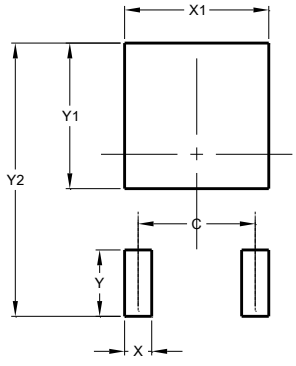



## Package Dimensions & Suggested Pad Layout

### TO-252



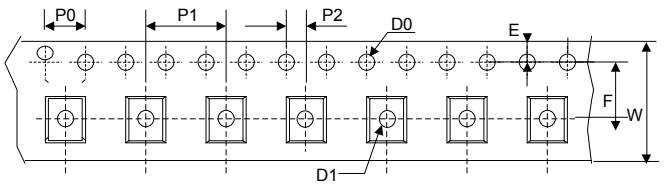

Dimensions in inches and (millimeters)

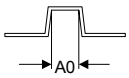



| Dimensions | Value (in mm) |
|---|---|
| C | 4.55 |
| X | 1.50 |
| X1 | 5.80 |
| Y | 2.70 |
| Y1 | 6.00 |
| Y2 | 10.90 |

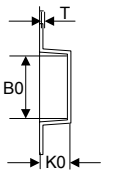
## Tape & rell specification

Tape



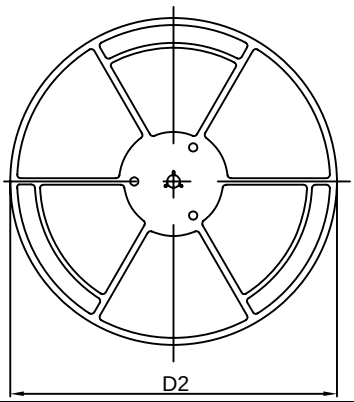



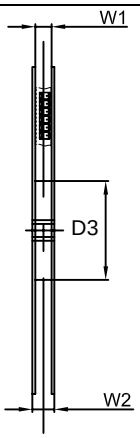

SECTION : A-A




SECTION : B-B

13” Reel






| 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 |
| W2 | 25.0±5.0 |
| I | 13.0±2.0 |

Quantity: 2500PCS