| | | |
|---|---|---|
| $V_{DSS}$ | 700 | V |
| $I_D$ | 15 | A |
| $R_{DS(ON)}$ | 0.24 | Ω |

## Features

Ultra low $R_{DS(on)}$
Ultra low gate charge (typ. $Q_g$=31nC)
100% UIS tested
RoHS compliant

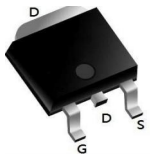
GK XXX
C70R240

## Applications

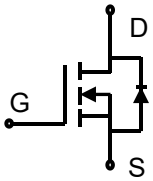
Power factor correction (PFC).
Switched mode power supplies (SMPS).
Uninterruptible power supply (UPS).

LOGO GK XXX CODE
C70 R 240
VDSS $R_{DS(on)}$

**TO-252**




**Equivalent Circuit**




## MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

**Absolute Maximum Ratings** (@ T = 25°C unless otherwise specified)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DSS}$ | 700 | V |
| Continuous drain current [1] ( $T_C$ = 25°C ) | $I_D$ | 15 | A |
| ( $T_C$ = 100°C ) | | 9.5 | A |
| Pulsed drain current [2] | $I_{DM}$ | 45 | A |
| Gate-Source voltage | $V_{GSS}$ | ±30 | V |
| Avalanche energy, single pulse [3] | $E_{AS}$ | 211.6 | mJ |
| Power Dissipation | $P_D$ | 158 | W |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to +150 | °C |
| Continuous diode forward current | $I_S$ | 15 | A |
| Diode pulse current | $I_{S,pulse}$ | 45 | A |

## Electrical Characteristics ($T_J$=25℃unless otherwise noted)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | |
| Drain-source breakdown voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250uA | 700 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250uA | 2.5 | 3.5 | 4.5 | V |
| Drain cut-off current | $I_{DSS}$ | $V_{DS}$=700V, $V_{GS}$=0 V,$T_j$ =25°C | - | - | 1 | μA |
| Gate leakage current, Forward | $I_{GSSF}$ | $V_{GS}$=30V, $V_{DS}$=0 V | - | - | 100 | nA |
| Gate leakage current, Reverse | $I_{GSSR}$ | $V_{GS}$=-30V, $V_{DS}$=0 V | - | - | -100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}$=10V, $I_D$=7.5A<br>$T_j$ = 25°C<br>$T_j$ = 150°C | -<br>-<br>- | <br>0.24<br>0.62 | <br>0.28<br>- | Ω |
| Gate resistance | $R_G$ | f=1 MHz, open drain | - | 5.34 | - | Ω |
| **Dynamic characteristics** | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{DS}$ =100V, $V_{GS}$=0V, f=250kHz | - | 1347 | - | pF |
| Output capacitance | $C_{oss}$ | | - | 51 | - | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 0.91 | - | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$ =400V, $I_D$=7.5A<br>$R_G$ = 10Ω, $V_{GS}$=10V | - | 63 | - | ns |
| Rise time | $t_r$ | | - | 13 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 58 | - | |
| Fall time | $t_f$ | | - | 7.1 | - | |
| **Gate charge characteristics** | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=560V, $I_D$=7.5A, $V_{GS}$=0 to 10 V | - | 6.9 | - | nC |
| Gate to drain charge | $Q_{gd}$ | | - | 13 | - | |
| Gate charge total | $Q_g$ | | - | 31 | - | |
| Gate plateau voltage | $V_{plateau}$ | | - | 5.4 | - | V |
| **Reverse diode characteristics** | | | | | | |
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0 V, $I_F$=7.5A | - | - | 1.1 | V |
| Reverse recovery time | $t_{rr}$ | $V_R$=400V, $I_F$=7.5A, $dI_F/dt$=100 A/μs | - | 274 | - | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 2871 | - | nC |
| Peak reverse recovery current | $I_{rrm}$ | | - | 22.5 | - | A |

Notes:

1. Limited by maximum junction temperature and duty cycle.
2. Limited by maximum junction temperature, maximum duty cycle is 0.75.
3. $I_{AS}$=2.3A, L=80mH, $V_{DD}$=60V, Starting Tj= 25°C.
4. The value of $R_{thJA}$ is measured by placing the device in a still air box which is one cubic foot.

## Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 0.79 | °C/W |
| Thermal Resistance, Junction-to-Ambient, minimal Footprint [4)] | $R_{\theta JA}$ | 62 | °C/W |
| Soldering temperature, wave soldering only allowed at leads. (1.6mm from case for 10s) | $T_{sold}$ | 260 | °C |

## RATING AND CHARACTERISTIC CURVES

Fig 1: Output Characteristics

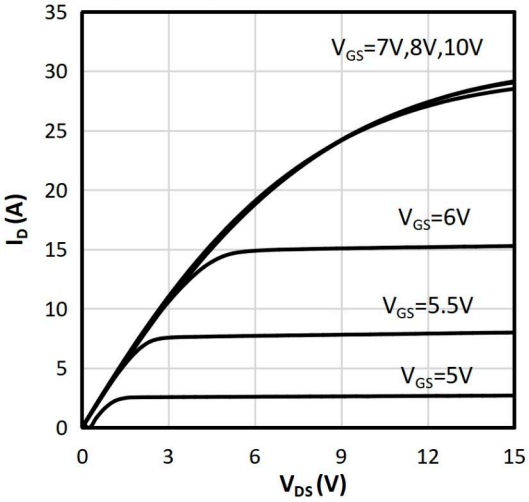



Fig 2: Transfer Characteristics

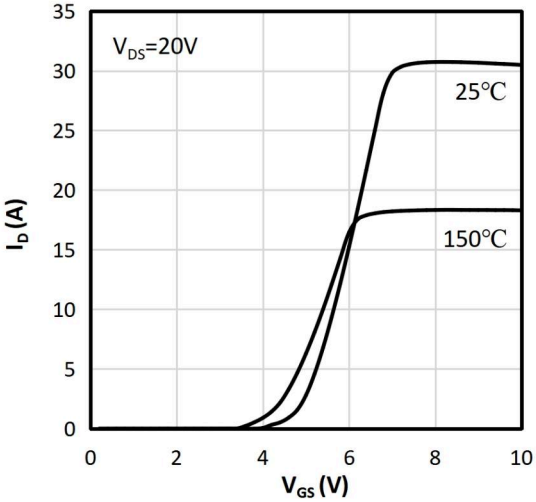



Fig 3: Rds(on) vs Drain Current

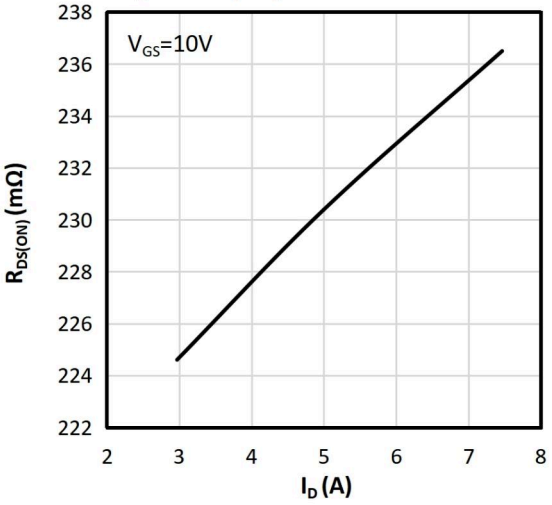



Fig 4: Rds(on) vs. Temperature

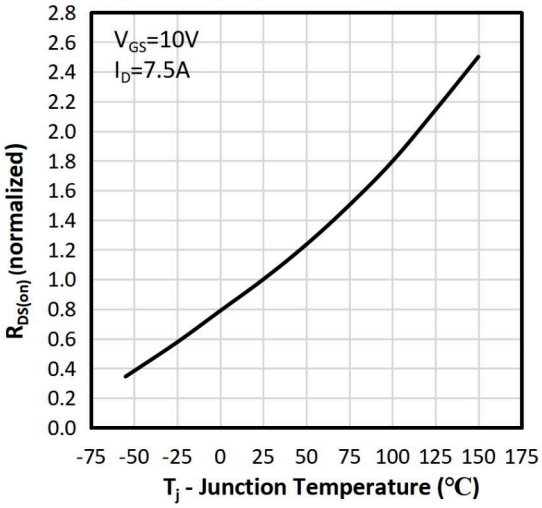



Fig 5: Breakdown Voltage vs. Temperature

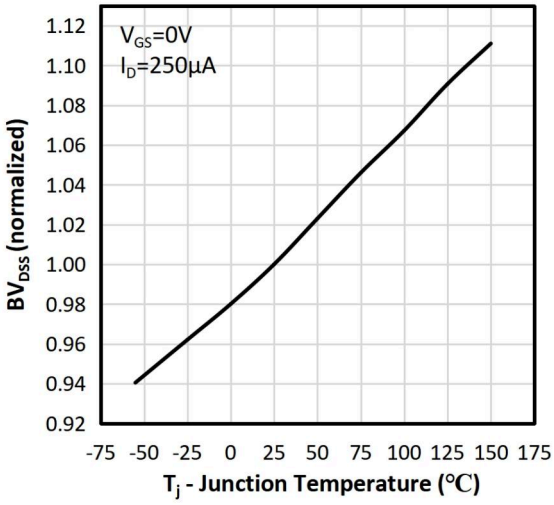
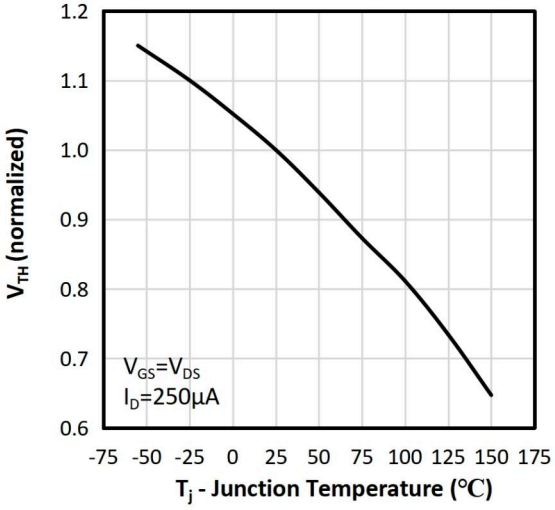



Fig 6: Threshold voltage vs. Temperature



## RATING AND CHARACTERISTIC CURVES

Fig 7: Body-Diode Characteristics

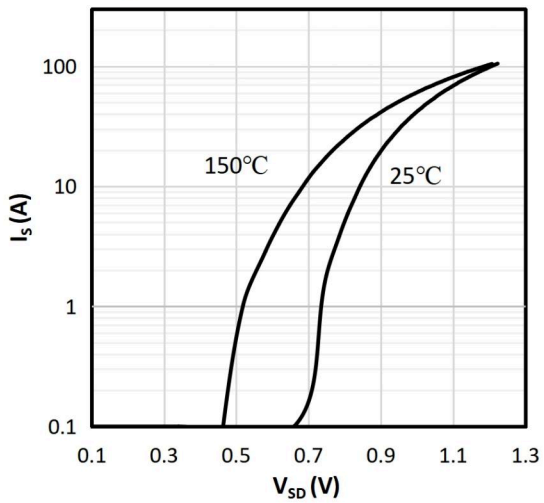



Fig 8: Capatitance Characteristics

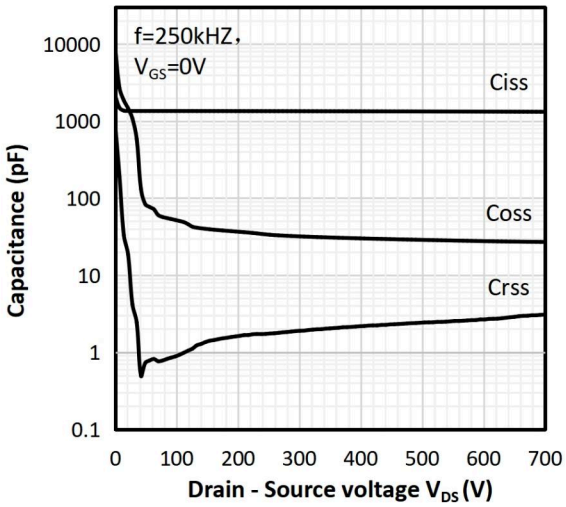



Fig 9: Gate charger Characteristics

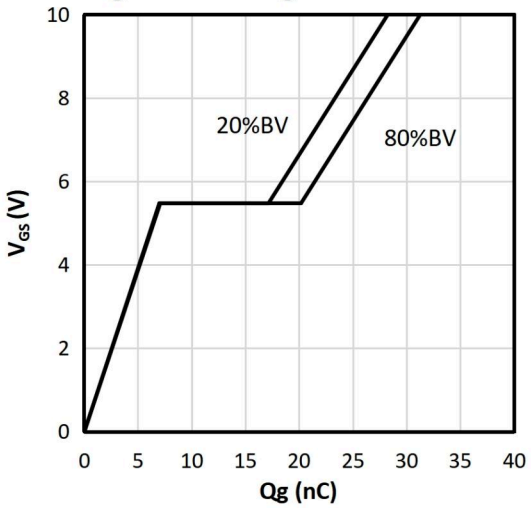



Fig 10: Drain Current Derating

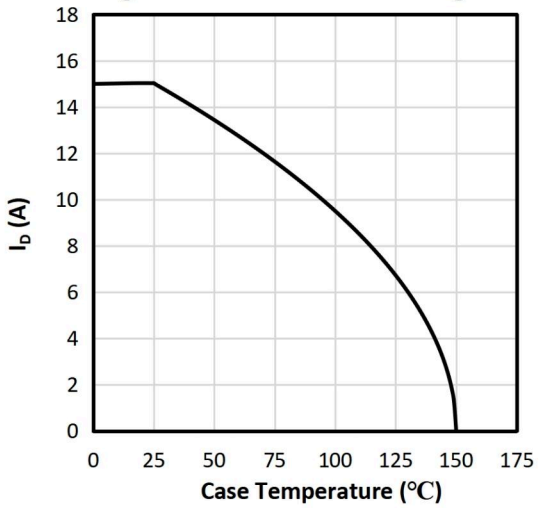



Fig 11: Power Dissipation vs.Temperature

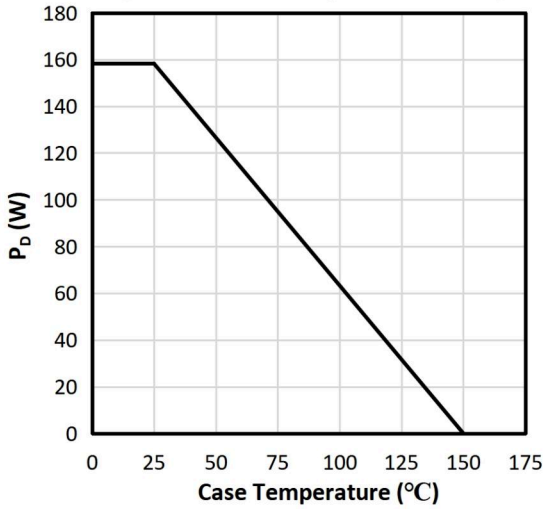
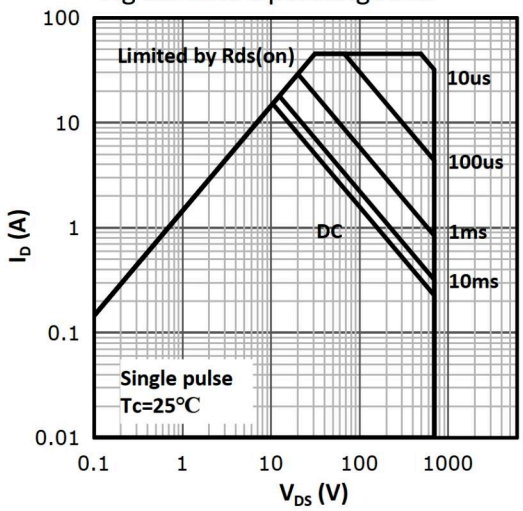
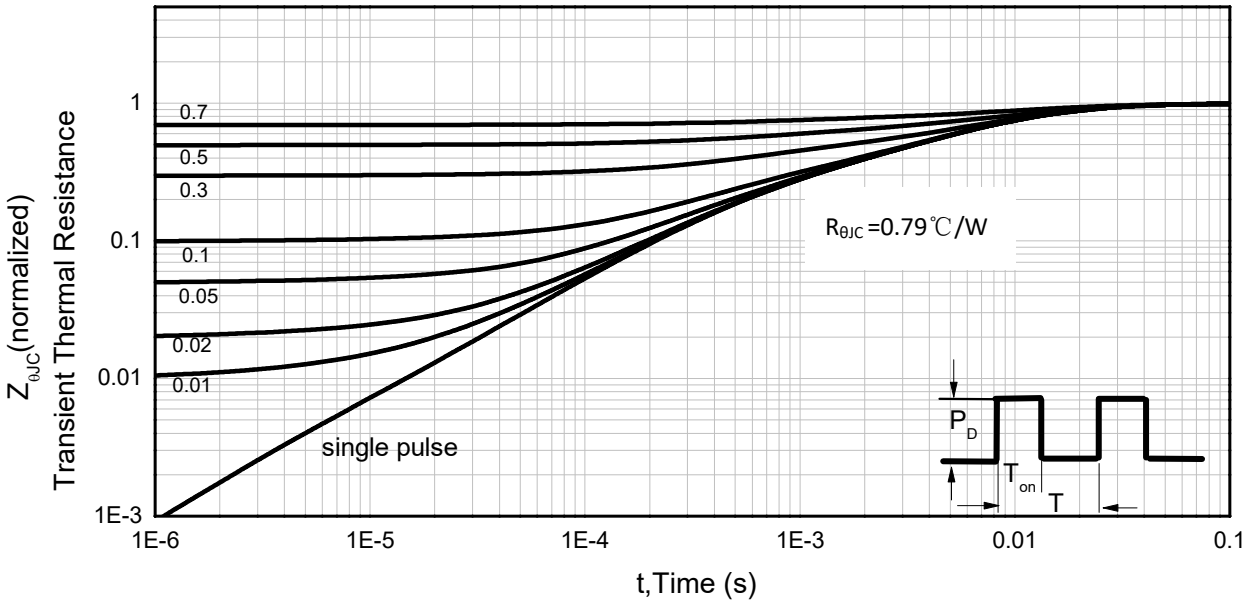



Fig 12: Safe Operating Area



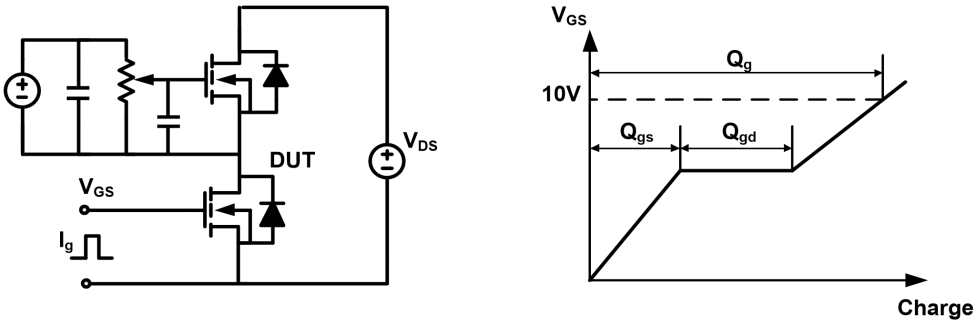
## RATING AND CHARACTERISTIC CURVES

Fig 13: Normalized Maximum Transient Thermal Impedance ($R_{thJC}$)

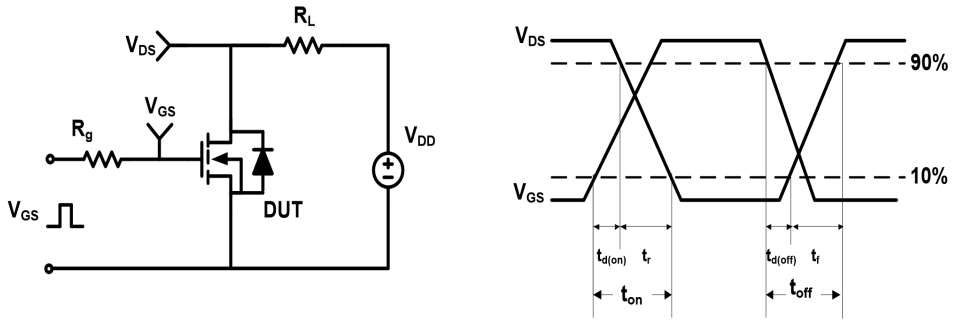


## Test Circuit

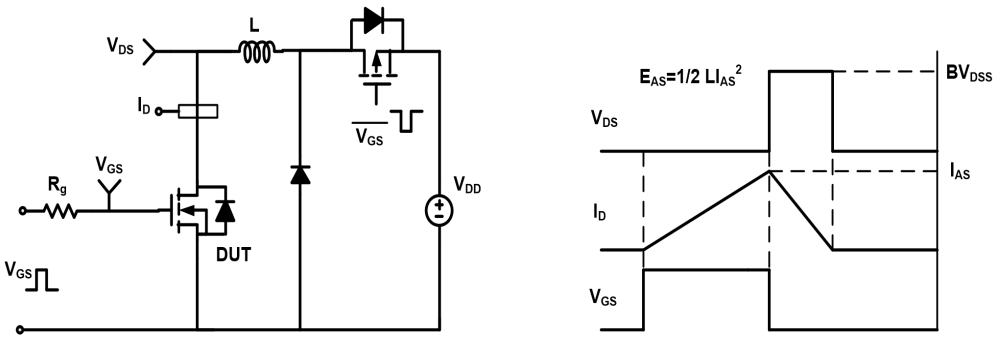
### Gate Charge Test Circuit & Waveform



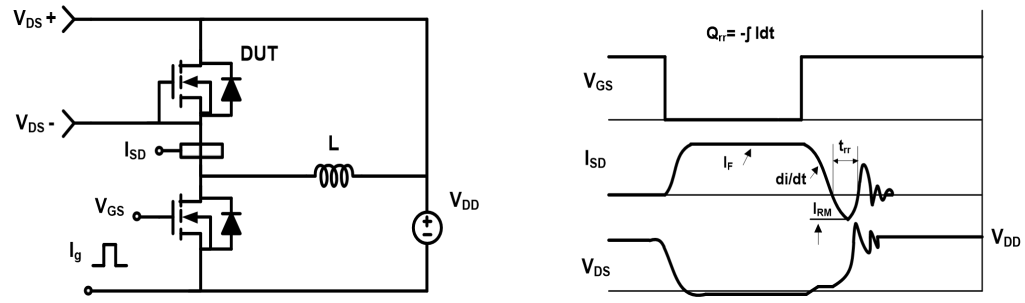

### Resistive Switching Test Circuit & Waveform




### Unclamped Inductive Switching (UIS) Test Circuit & Waveform



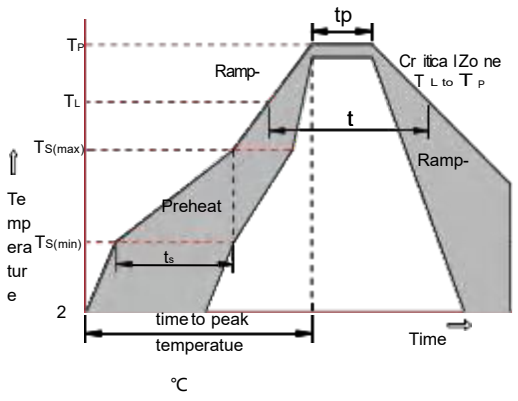

### Diode Recovery Test Circuit & Waveform



## Soldering parameters

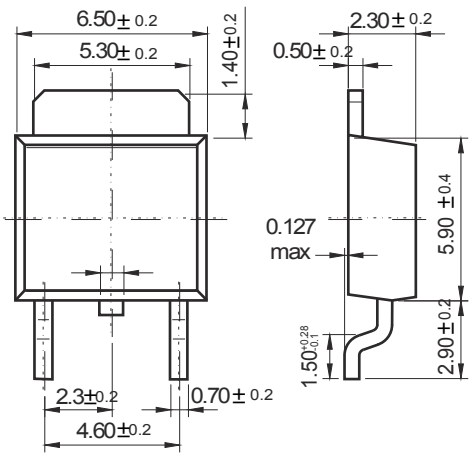
| Reflow Condition | | Pb-Free assembly (see as bellow) |
|---|---|---|
| Pre Heat | -Temperature Min ($T_{s(min)}$) | +150℃ |
| | -Temperature Max($T_{s(max)}$) | +200℃ |
| | -Time (Min to Max) (ts) | 60-180 secs. |
| Average ramp up rate (Liquid us Temp ($T_L$) to peak) | | 3℃/sec. Max |
| $T_{s(max)}$ 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

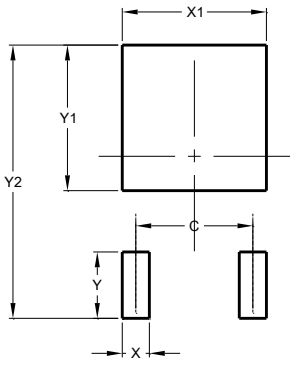



## Package Dimensions & Suggested Pad Layout

TO-252



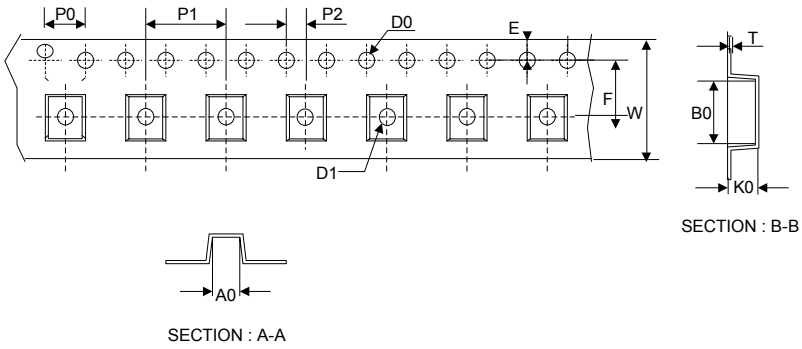

Dimensions in inches and (millimeters)




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

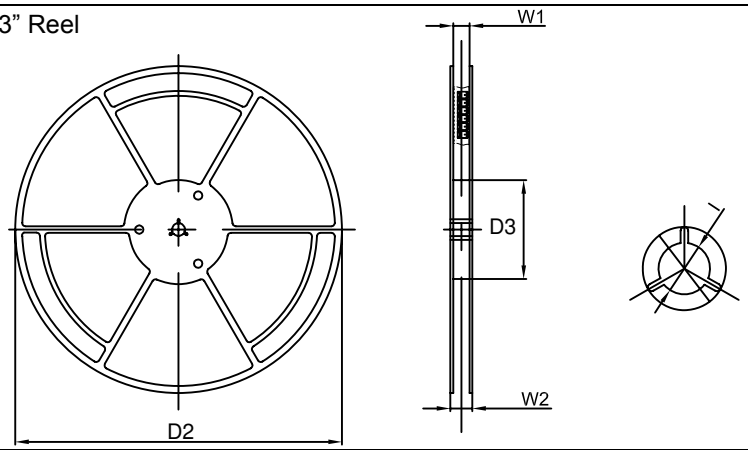
## Tape & rell specification

Tape




| 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 |

13” Reel




| | |
|---|---|
| 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