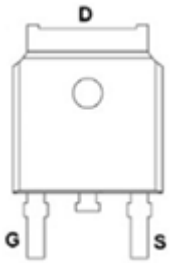
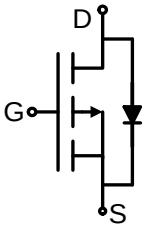
## Main Product Characteristics:

| | |
|---|---|
| $V_{DSS}$ | -40V |
| $R_{DS}$(on) | 19.96mohm(typ.) |
| $I_D$ | -30A |

TO-252




Marking and pin Assignment




Schematic diagram

## Features andBenefits:

- Advanced MOSFET process technology
- Special designed for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 100% Avalanche Rated

## Description:

It utilizes the latest trench processing techniquesto achieve the high cell density and reduces the on-resistance with high repetitiveavalanche rating. These features combine to makethis design an extremely efficient and reliable devicefor use in power switching applicationand a wide varietyof other applications

## Absolute max Rating:

| Symbol | Parameter | Max. | Units |
|---|---|---|---|
| $I_D$ @ $T_C$ = 25℃ | Continuous Drain Current, $V_{GS}$ @ 10V | -30① | A |
| $I_D$ @ $T_C$ = 100℃ | Continuous Drain Current, $V_{GS}$ @ 10V | -20① | |
| $I_{DM}$ | Pulsed Drain Current② | -120 | |
| $P_D$ @TC = 25℃ | Power Dissipation③ | 83 | W |
| | Linear Derating Factor | 1.02 | W/℃ |
| $V_{DS}$ | Drain-Source Voltage | -40 | V |
| $V_{GS}$ | Gate-to-Source Voltage | ± 20 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy @ L=0.3mH | 96.8 | mJ |
| $I_{AS}$ | Avalanche Current @ L=0.3mH | -25.4 | A |
| $T_J$<br>$T_{STG}$ | Operating Junction TemperatureRange<br>Storage TemperatureRange | -55 to + 150 | ℃ |

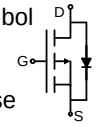
## Thermal Resistance

| Symbol | Characterizes | Typ. | Max. | Units |
|---|---|---|---|---|
| $R_{\theta JC}$ | Junction-to-case③ | — | 3 | ℃/W |
| $R_{\theta JA}$ | Junction-to-ambient (t ≤ 10s)④ | — | 62 | ℃/W |
| | Junction-to-Ambient (PCB mounted, steady-state)④ | — | 40 | ℃/W |

## Electrical Characterizes@$T_A$=25℃unless otherwise specified

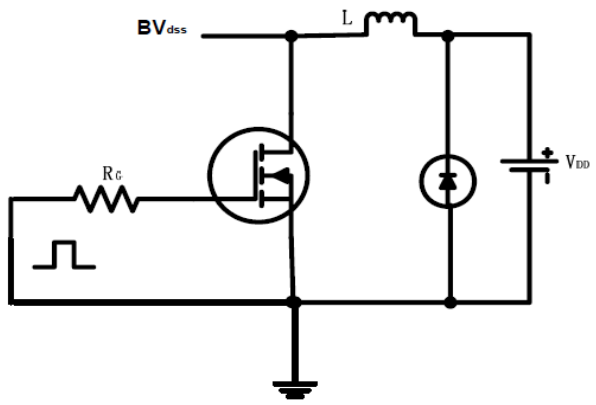
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-to-Source breakdown voltage | -40 | — | — | V | $V_{GS}$ = 0V, $I_D$ =- 250μA |
| $R_{DS(on)}$ | Static Drain-to-Source on-resistance | — | 19.96 | 31 | mΩ | $V_{GS}$=-10V,$I_D$ = -10A |
| | | — | 29.63 | — | | $T_J$ = 125℃ |
| $V_{GS(th)}$ | Gate threshold voltage | -1 | — | -3 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = -250μA |
| $I_{DSS}$ | Drain-to-Source leakage current | — | — | -1 | μA | $V_{DS}$ = -40V,$V_{GS}$ = 0V |
| | | — | — | -50 | | $T_J$ = 125℃ |
| $I_{GSS}$ | Gate-to-Source forward leakage | — | — | 100 | nA | $V_{GS}$ =20V |
| | | — | — | -100 | | $V_{GS}$ = -20V |
| $C_{iss}$ | Input capacitance | — | 1398 | — | pF | $V_{GS}$ = 0V |
| $C_{oss}$ | Output capacitance | — | 218 | — | | $V_{DS}$ =-10V |
| $C_{rss}$ | Reverse transfercapacitance | — | 184 | — | | $f$ =1MHz |

## Source-Drain Ratings and Characteristics

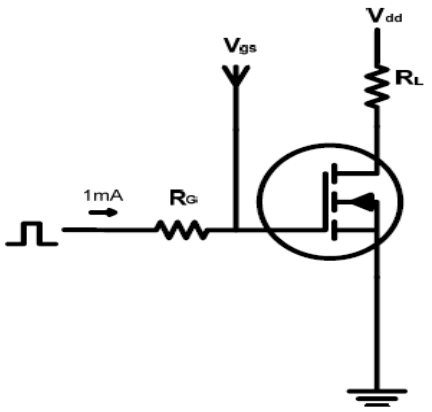
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | — | — | -30① | A | MOSFET symbol showing the integral reverse p-n junction diode.   |
| $I_{SM}$ | Pulsed Source Current (Body Diode) | — | — | -120 | A | |
| $V_{sd}$ | Diode Forward Voltage | — | -0.88 | -1.3 | V | $I_S$=-10A, $V_{GS}$=0V |

## Test circuits and Waveforms

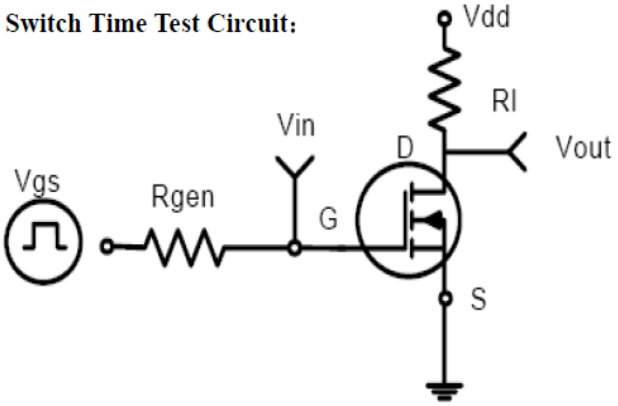
**EAS test circuits:**



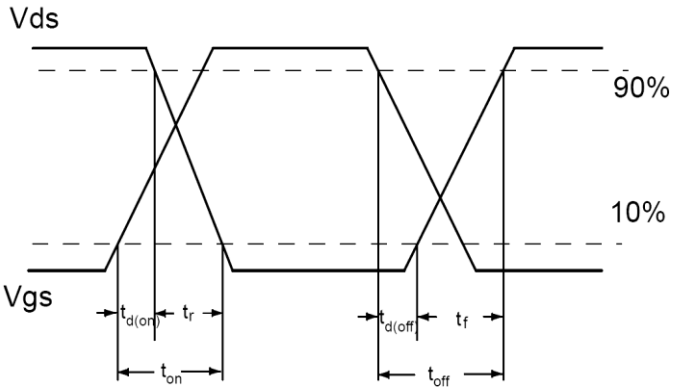

**Gate charge test circuit:**




**Switch Time Test Circuit:**




**Switch Waveforms:**




## Notes:

①Calculated continuous current based on maximum allowablejunction temperature. Package limitation current is 75A.

②Repetitive rating; pulse width limited by max. junction temperature.

③The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.

④The value of $R_{\theta JA}$ is measured with the device mounted on 1in 2 FR-4 board with 2oz. Copper, in a still air environment with TA =25℃.

⑤These curves are based on the junction-to-case thermal impedence which is measured with the device mounted to a large heatsink, assuming amaximum junction temperature of $T_{J(MAX)}$=175℃.

## Typical electrical and thermal characteristics

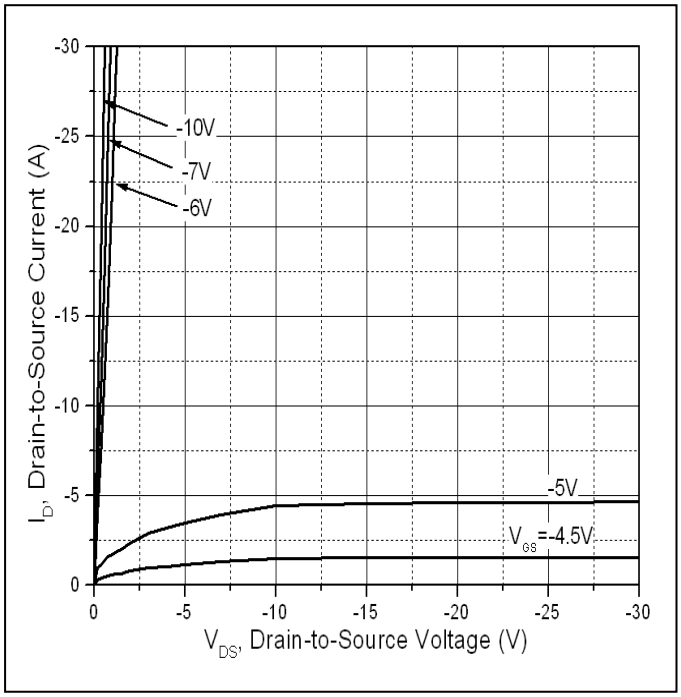



**Figure 1: Typical Output Characteristics**

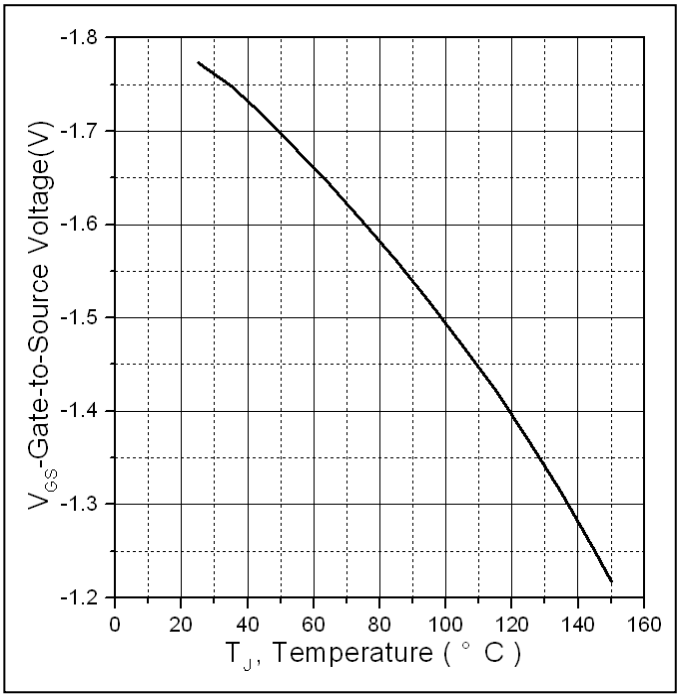



**Figure 2. Gate to source cut-off voltage**

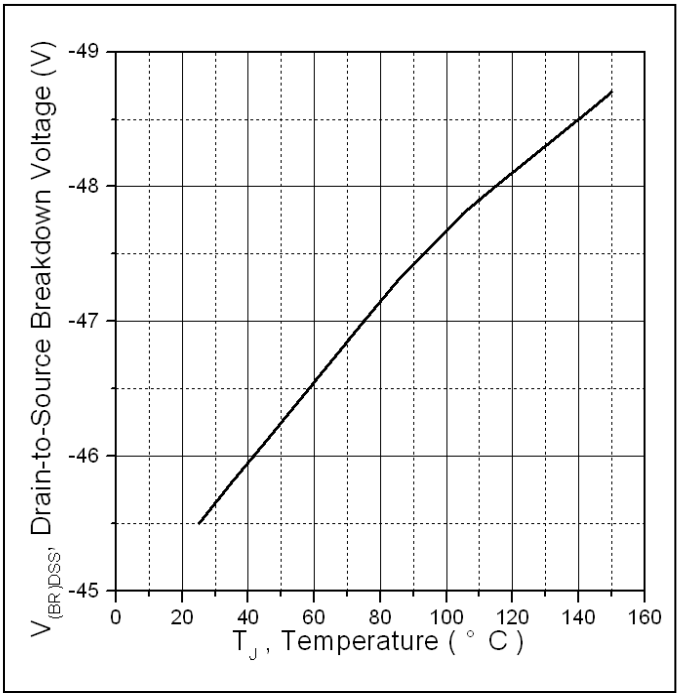



**Figure 3. Drain-to-Source Breakdown Voltage vs. Temperature**

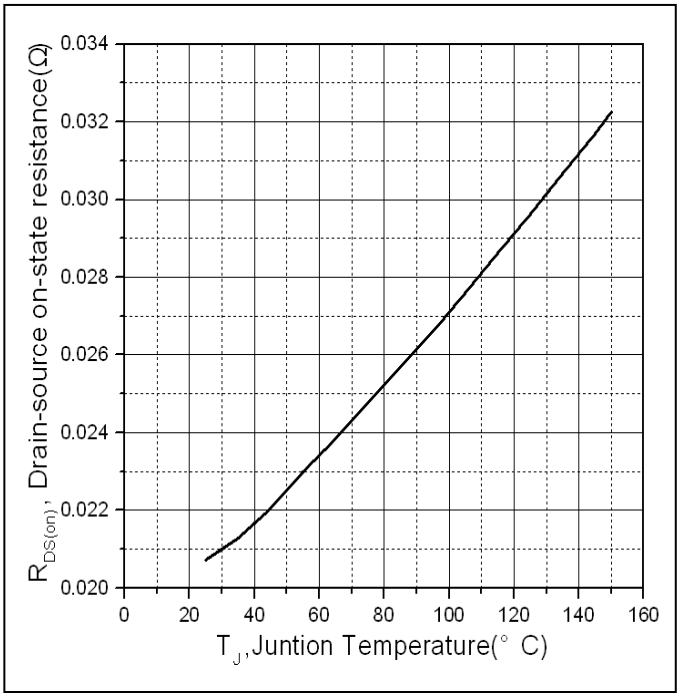



**Figure 4: Normalized On-Resistance Vs. Case Temperature**

## Typical electrical and thermal characteristics

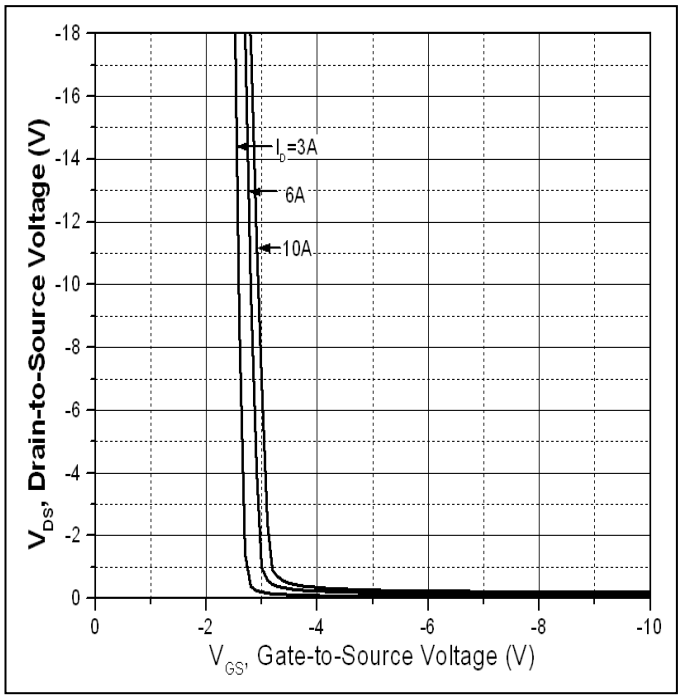



**Figure5.Gate-to-Source Voltage Vs.Drain-to-Source Voltage**

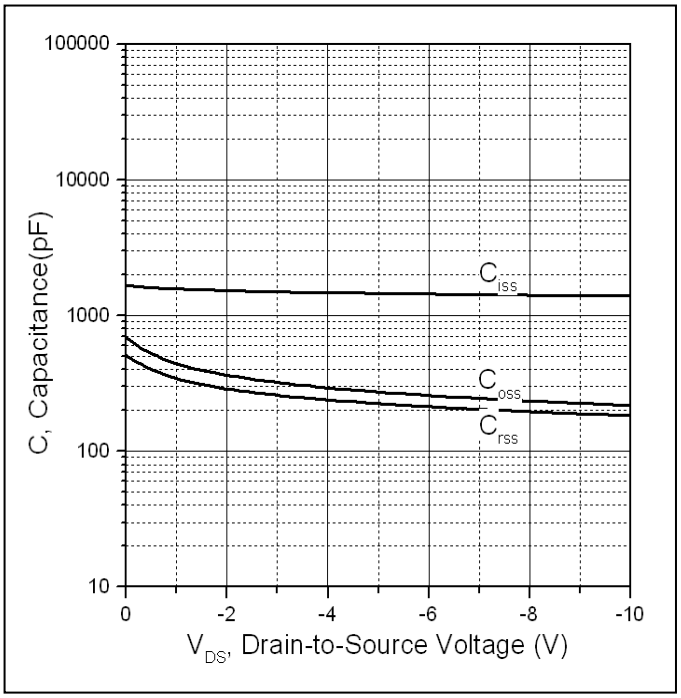



**Figure 6.Typical Capacitance Vs. Drain-to-Source Voltage**

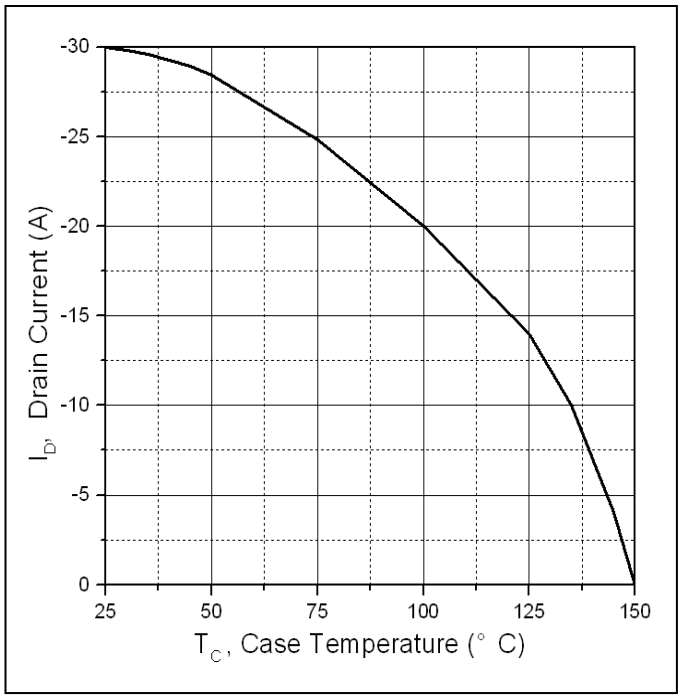
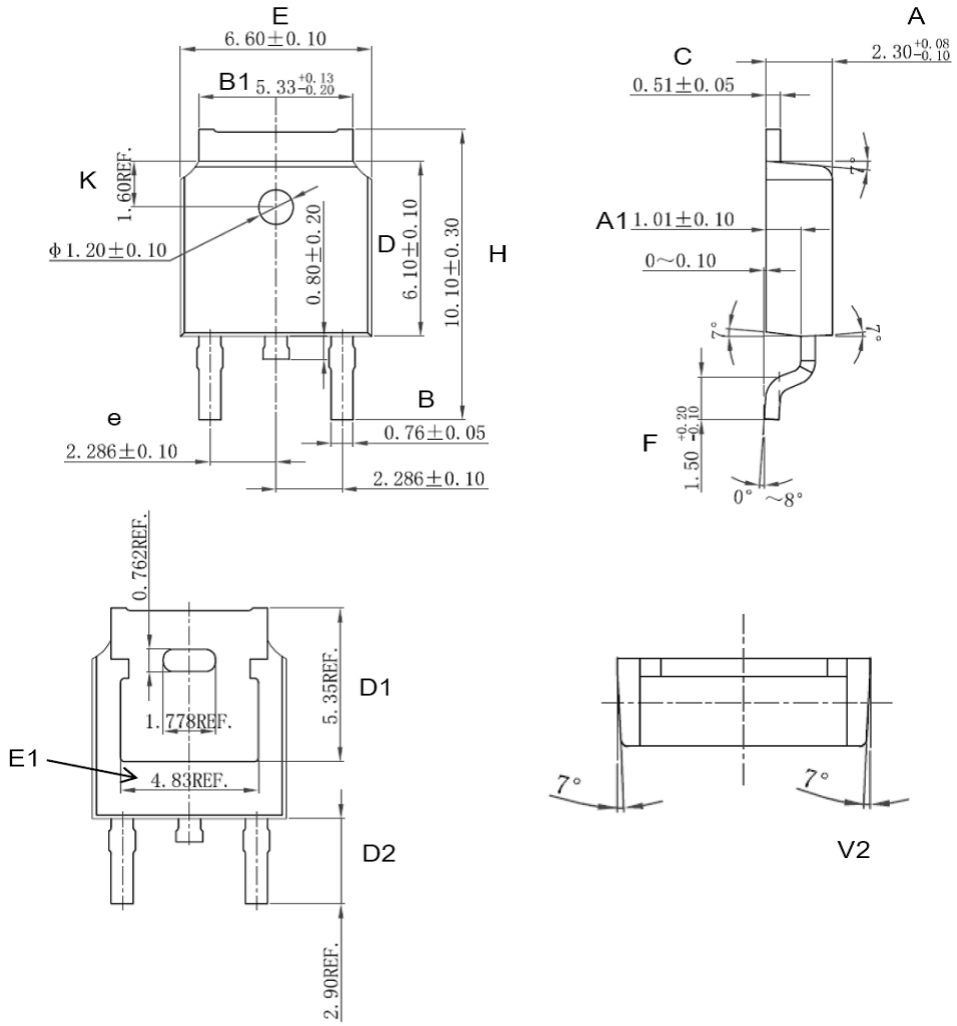



**Figure 7. Maximum Drain Current Vs. Case Temperature**

## Mechanical Data：

**DPAK PACKAGE OUTLINE DIMENSION**




| Symbol | Dimension In Millimeters | | | Dimension In Inches | | |
|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max |
| A | 2.200 | 2.300 | 2.380 | 0.087 | 0.091 | 0.094 |
| A1 | 0.910 | 1.010 | 1.110 | 0.036 | 0.040 | 0.044 |
| B | 0.710 | 0.760 | 0.810 | 0.028 | 0.030 | 0.032 |
| B1 | 5.130 | 5.330 | 5.460 | 0.202 | 0.210 | 0.215 |
| C | 0.460 | 0.510 | 0.560 | 0.018 | 0.020 | 0.022 |
| D | 6.000 | 6.100 | 6.200 | 0.236 | 0.240 | 0.244 |
| D1 | 5.350 (REF) | | | 0.211 (REF) | | |
| D2 | 2.900 (REF) | | | 0.114 (REF) | | |
| E | 6.500 | 6.600 | 6.700 | 0.256 | 0.260 | 0.264 |
| E1 | 4.83 (REF) | | | 0.190 (REF) | | |
| e | 2.186 | 2.286 | 2.386 | 0.086 | 0.090 | 0.094 |
| H | 9.800 | 10.100 | 10.400 | 0.386 | 0.398 | 0.409 |
| F | 1.400 | 1.500 | 1.700 | 0.055 | 0.059 | 0.067 |
| K | 1.600 (REF) | | | 0.063 (REF) | | |
| V2 | $8^0$ (REF) | | | $8^0$ (REF) | | |

## Ordering and Marking Information

**Device Marking: SSFD4031**

**Package (Available)**

**DPAK（TO-252）**

**Operating Temperature Range**

**C : -55 to 150℃**

## Devices per Unit

**Option1：**

| Package Type | Units/Tape | Tapes/Inner Box | Units/Inner Box | Inner Boxes/Carton Box | Units/Carton Box |
|---|---|---|---|---|---|
| TO-252 | 2500 | 2 | 5000 | 7 | 35000 |

**Option2：**

| Package Type | Units/Tape | Tapes/Inner Box | Units/Inner Box | Inner Boxes/Carton Box | Units/Carton Box |
|---|---|---|---|---|---|
| TO-252 | 2500 | 1 | 2500 | 10 | 25000 |

## Reliability Test Program

| Test Item | Conditions | Duration | Sample Size |
|---|---|---|---|
| High Temperature Reverse Bias(HTRB) | $T_j$=125℃ to 150℃ @ 80% of Max $V_{DSS}$/$V_{CES}$/VR | 168 hours<br>500 hours<br>1000 hours | 3 lots x 77 devices |
| High Temperature Gate Bias(HTGB) | $T_j$=150℃ @ 100% of Max $V_{GSS}$ | 168 hours<br>500 hours<br>1000 hours | 3 lots x 77 devices |

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