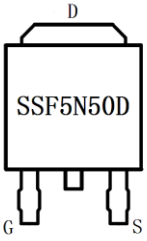
## Main Product Characteristics:

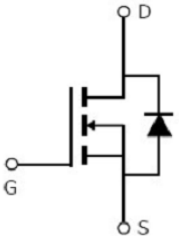
| | |
|---|---|
| $V_{DSS}$ | 500V |
| $R_{DS}$(on) | 1.5Ω (typ.) |
| $I_D$ | 5A |



TO-252




Marking and pin Assignment




Schematic diagram

## Features and Benefits:

- 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
- 150℃ operating temperature

## Description:

It utilizes the latest processing techniques to achieve the high cell density and reduces the on-resistance with high repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in power switching application and a wide variety of other applications.

## Absolute max Rating:

| Symbol | Parameter | Max. | Units |
|---|---|---|---|
| $I_D$ @ TC = 25°C | Continuous Drain Current, $V_{GS}$ @ 10V① | 5 | A |
| $I_D$ @ TC = 100°C | Continuous Drain Current, $V_{GS}$ @ 10V① | 3.1 | |
| $I_{DM}$ | Pulsed Drain Current② | 17 | |
| $P_D$ @TC = 25°C | Power Dissipation③ | 104 | W |
| | Linear Derating Factor | 0.83 | W/°C |
| $V_{DS}$ | Drain-Source Voltage | 500 | V |
| $V_{GS}$ | Gate-to-Source Voltage | ±30 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy @ L=60mH | 307 | mJ |
| $I_{AS}$ | Avalanche Current @ L=60mH | 3.2 | A |
| $T_J$ $T_{STG}$ | Operating Junction and Storage Temperature Range | -55 to +150 | °C |

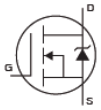
## Thermal Resistance

| Symbol | Characterizes | Typ. | Max. | Units |
|---|---|---|---|---|
| $R_{\theta JC}$ | Junction-to-case③ | — | 1.2 | ℃/W |
| $R_{\theta JA}$ | Junction-to-ambient (t ≤ 10s) ④ | — | 55 | ℃/W |

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

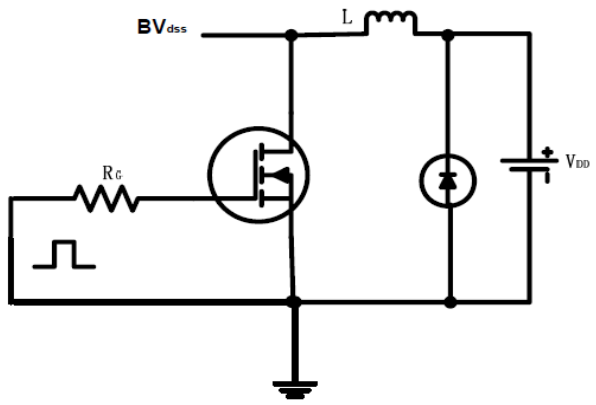
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-to-Source breakdown voltage | 500 | — | — | V | $V_{GS}$ = 0V, ID = 250μA |
| $R_{DS(on)}$ | Static Drain-to-Source on-resistance | — | 1.5 | 1.6 | Ω | $V_{GS}$=10V,$I_D$ = 2.75A |
| | | — | 3.6 | — | | $T_J$ = 125℃ |
| $V_{GS(th)}$ | Gate threshold voltage | 2 | — | 4 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA |
| | | — | 2.0 | — | | $T_J$ = 125℃ |
| $I_{DSS}$ | Drain-to-Source leakage current | — | — | 1 | μA | $V_{DS}$ = 500V,$V_{GS}$ = 0V |
| | | — | — | 50 | | $T_J$ = 125℃ |
| $I_{GSS}$ | Gate-to-Source forward leakage | — | — | 100 | nA | $V_{GS}$ =30V |
| | | — | — | -100 | | $V_{GS}$ = -30V |
| $Q_g$ | Total gate charge | — | 16.9 | — | nC | $I_D$ = 5A, |
| $Q_{gs}$ | Gate-to-Source charge | — | 6.9 | — | | $V_{DS}$=320V, |
| $Q_{gd}$ | Gate-to-Drain("Miller") charge | — | 3.5 | — | | $V_{GS}$ = 10V |
| $t_{d(on)}$ | Turn-on delay time | — | 11.1 | — | ns | $V_{GS}$=10V, VDS=200V, |
| $t_r$ | Rise time | — | 15.8 | — | | $R_{GEN}$=25Ω,ID=5A |
| $t_{d(off)}$ | Turn-Off delay time | — | 40.2 | — | | |
| $t_f$ | Fall time | — | 19.8 | — | | |
| $C_{iss}$ | Input capacitance | — | 640 | — | pF | $V_{GS}$ = 0V |
| $C_{oss}$ | Output capacitance | — | 67 | — | | $V_{DS}$ = 25V |
| $C_{rss}$ | Reverse transfer capacitance | — | 4.8 | — | | $f$ = 1MHz |

## Source-Drain Ratings and Characteristics

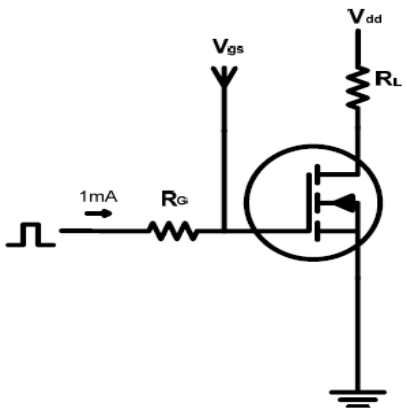
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | — | — | 5 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) | — | — | 17 | A | |
| $V_{sd}$ | Diode Forward Voltage | — | 0.89 | 1.4 | V | $I_S$=5A, $V_{GS}$=0V |
| $t_{rr}$ | Reverse Recovery Time | — | 490 | — | ns | $T_J$ = 25°C, $I_F$ =5A, |
| $Q_{rr}$ | Reverse Recovery Charge | — | 2333 | — | nC | di/dt = 100A/μs |

## Test circuits and Waveforms

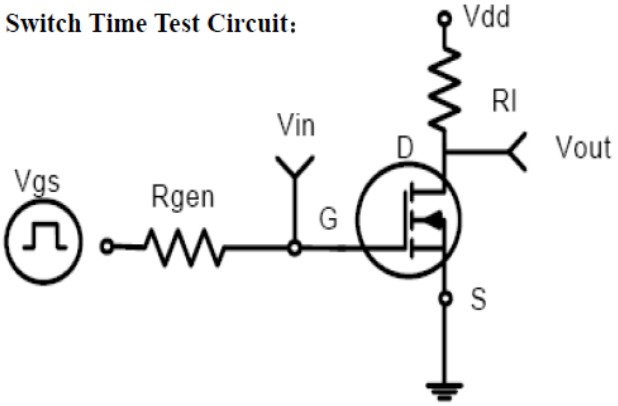
**EAS test circuits:**



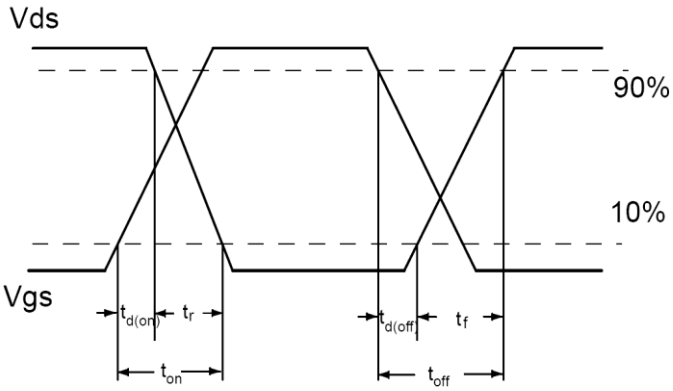

**Gate charge test circuit:**




**Switch Time Test Circuit:**




**Switch Waveforms:**




## Notes:

①The maximum current rating is limited by bond-wires.

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°C

## Typical electrical and thermal characteristics

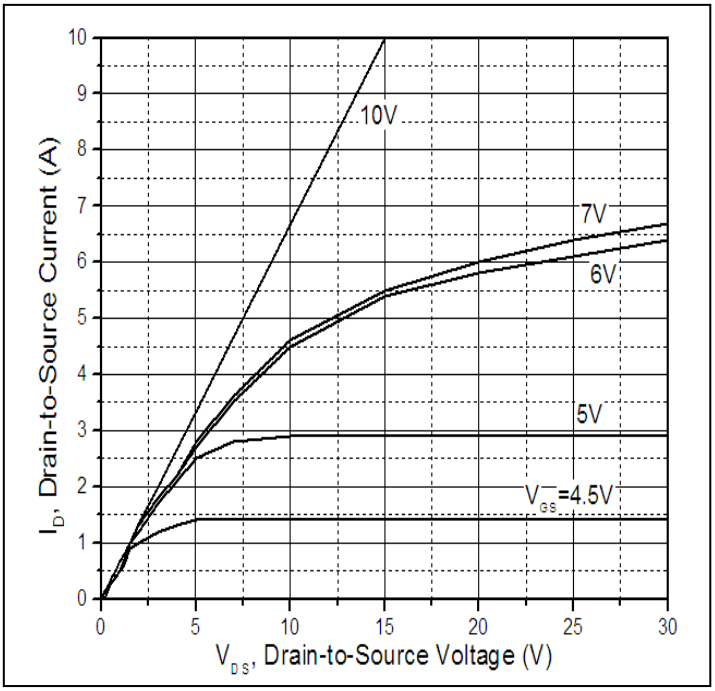



Figure 1. Typical Output Characteristics

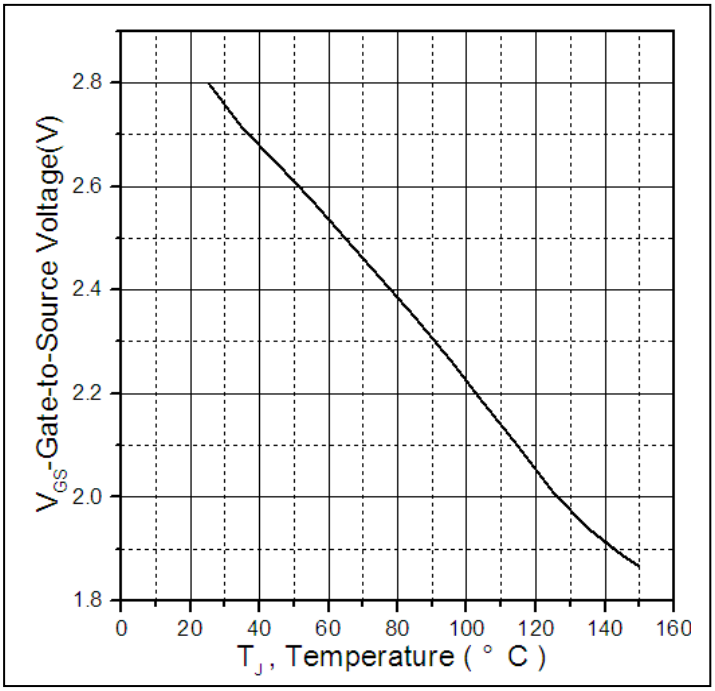



Figure 2. Gate to source cut-off voltage

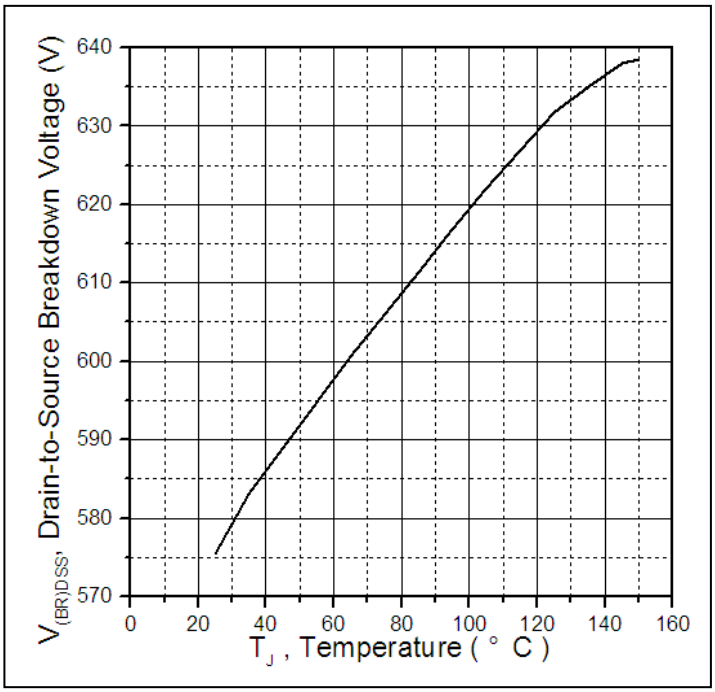



Figure 3. Drain-to-Source Breakdown Voltage vs. Case Temperature

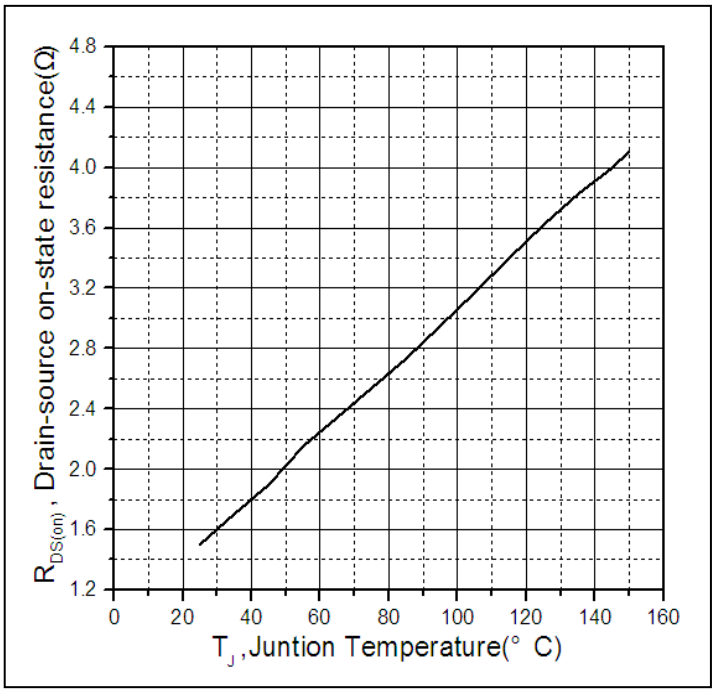



Figure 4.Normalized On-Resistance Vs. Case Temperature

## Typical electrical and thermal characteristics

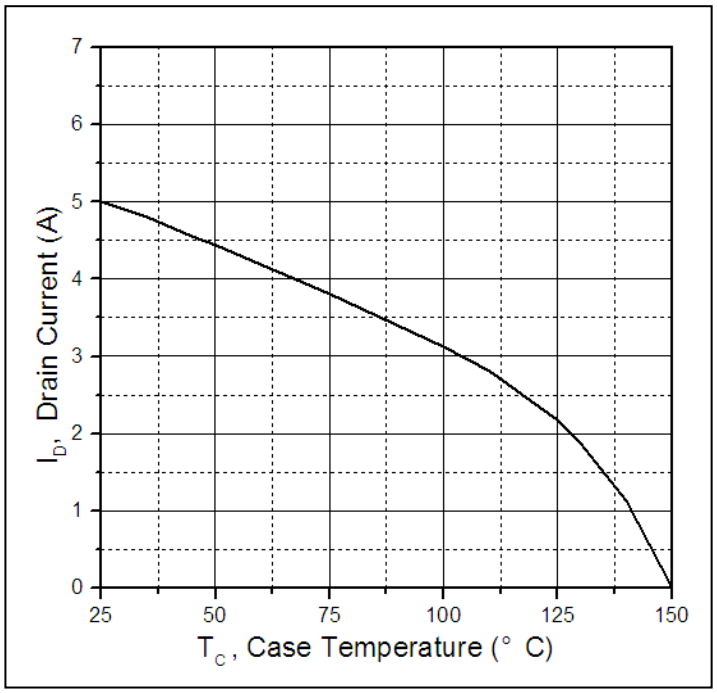



Figure 5. Maximum Drain Current Vs. Case Temperature

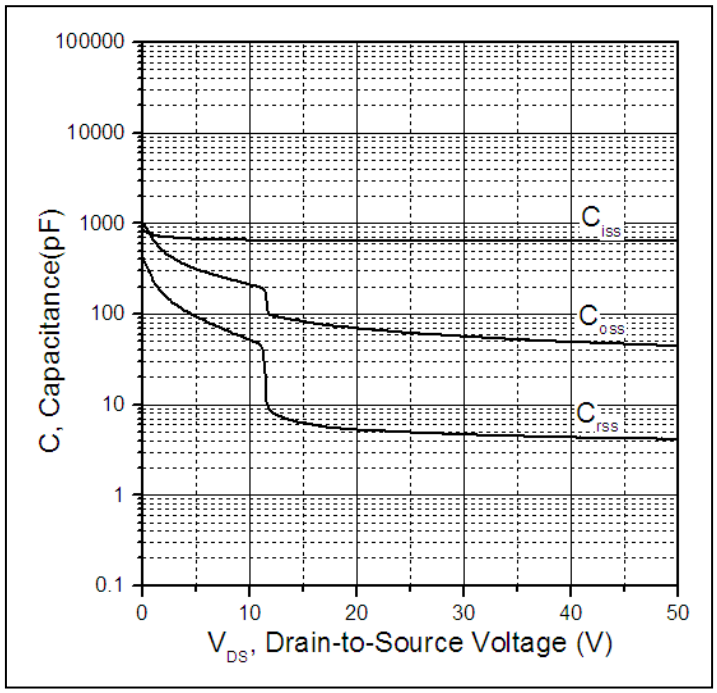



Figure 6.Typical Capacitance Vs. Drain-to-Source Voltage

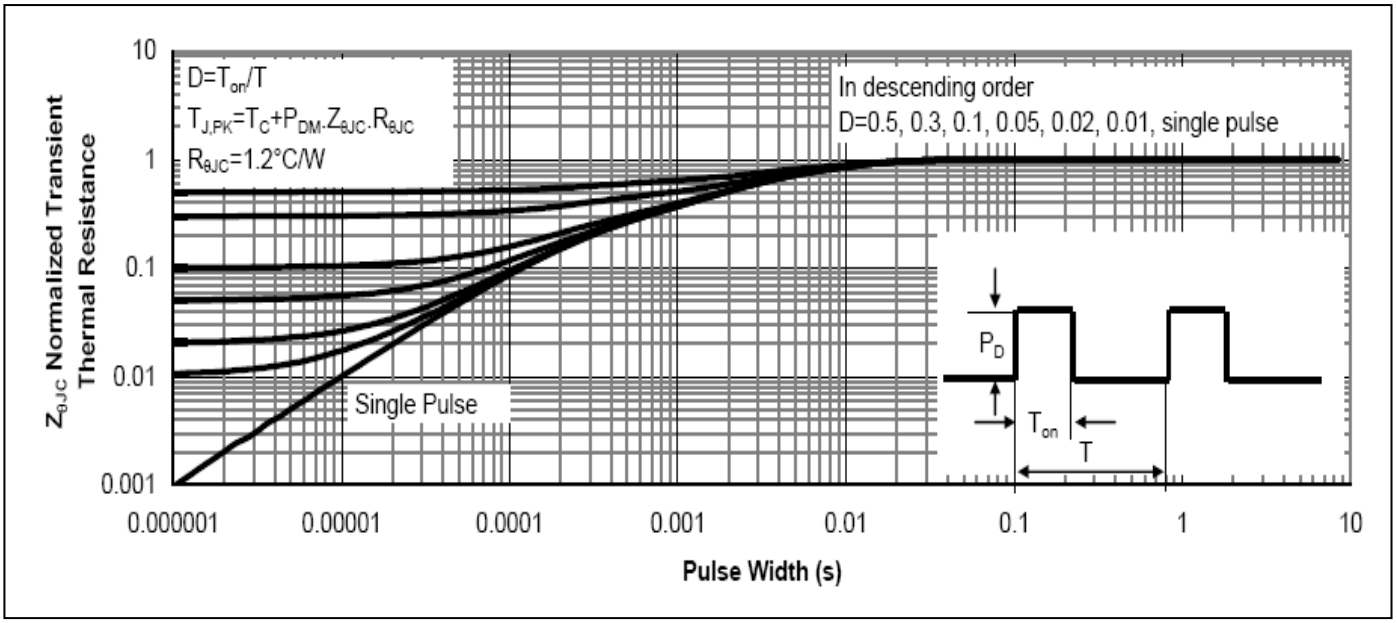
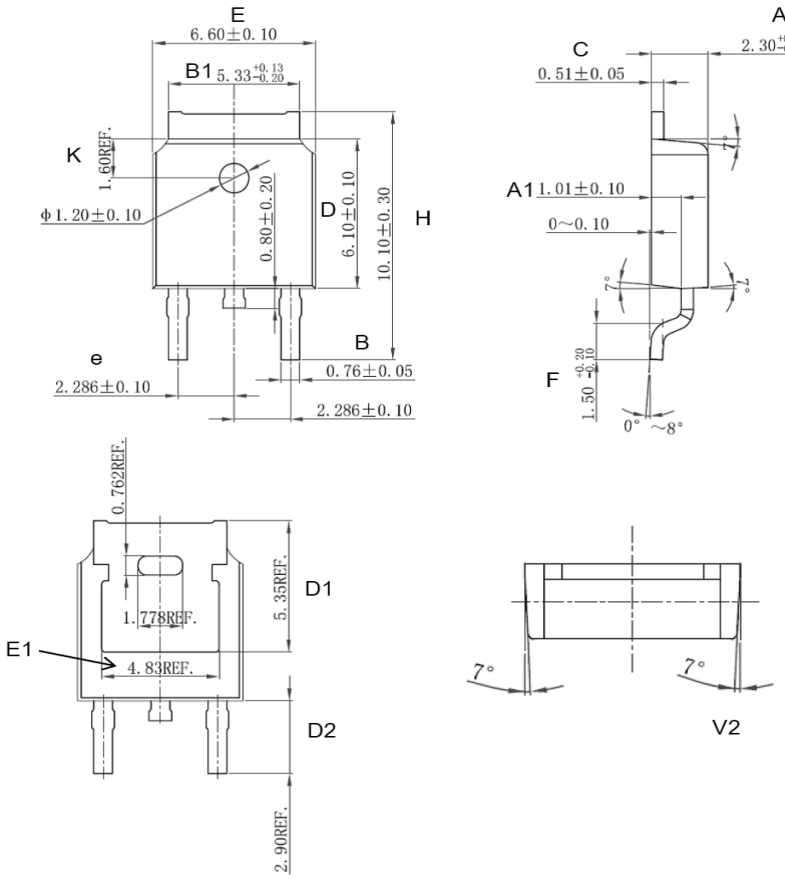



Figure7. Maximum Effective Transient Thermal Impedance, Junction-to-Case

## Mechanical Data：

TO-252 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: SSF5N50D**

**Package (Available)**

**TO-252（DPAK）**

**Operating Temperature Range**

**C : -55 to 150 ºC**

## 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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