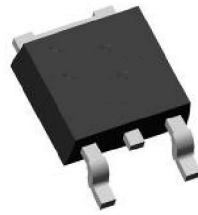
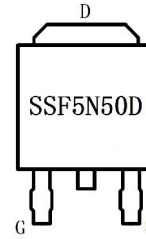


Main Product Characteristics

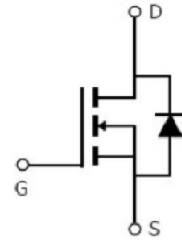
| | |
|--------------|-------------|
| V_{DSS} | 500V |
| $R_{DS(on)}$ | 1.5Ω (typ.) |
| I_D | 5A |



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°C operating temperature
- Lead free product



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 |
|--------------------------|--|-------------|-------|
| $I_D @ TC = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ ① | 5 | A |
| $I_D @ TC = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ ① | 3.1 | |
| I_{DM} | Pulsed Drain Current② | 17 | |
| $P_D @ TC = 25^\circ C$ | 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 |
| $T_J \quad T_{STG}$ | Operating Junction and Storage Temperature Range | -55 to +150 | °C |

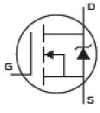
Thermal Resistance

| Symbol | Characteristics | Typ. | Max. | Units |
|-----------------|---|------|------|-------|
| $R_{\theta JC}$ | Junction-to-case ^③ | — | 1.2 | °C/W |
| $R_{\theta JA}$ | Junction-to-ambient ($t \leq 10s$) ^④ | — | 55 | °C/W |

Electrical Characteristics @ $T_A=25^\circ\text{C}$ unless otherwise specified

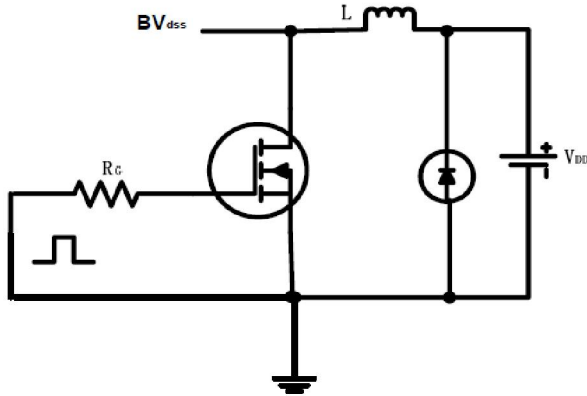
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---------------|--------------------------------------|------|------|------|----------|--|
| $V_{(BR)DSS}$ | Drain-to-Source breakdown voltage | 500 | — | — | V | $V_{GS} = 0V, I_D = 250\mu A$ |
| $R_{DS(on)}$ | Static Drain-to-Source on-resistance | — | 1.5 | 1.6 | Ω | $V_{GS}=10V, I_D = 2.75A$ $T_J = 125^\circ\text{C}$ |
| | | — | 3.6 | — | | |
| $V_{GS(th)}$ | Gate threshold voltage | 2 | — | 4 | V | $V_{DS} = V_{GS}, I_D = 250\mu A$ $T_J = 125^\circ\text{C}$ |
| | | — | 2.0 | — | | |
| I_{DSS} | Drain-to-Source leakage current | — | — | 1 | μA | $V_{DS} = 500V, V_{GS} = 0V$ $T_J = 125^\circ\text{C}$ |
| | | — | — | 50 | | |
| I_{GSS} | Gate-to-Source forward leakage | — | — | 100 | nA | $V_{GS} = 30V$ |
| | | — | — | -100 | | $V_{GS} = -30V$ |
| Q_g | Total gate charge | — | 16.9 | — | nC | $I_D = 5A,$ $V_{DS}=320V,$ $V_{GS} = 10V$ |
| Q_{gs} | Gate-to-Source charge | — | 6.9 | — | | |
| Q_{gd} | Gate-to-Drain("Miller") charge | — | 3.5 | — | | |
| $t_{d(on)}$ | Turn-on delay time | — | 11.1 | — | ns | $V_{GS}=10V, V_{DS}=200V,$ $R_{GEN}=25\Omega, I_D=5A$ |
| t_r | Rise time | — | 15.8 | — | | |
| $t_{d(off)}$ | 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 | — | | $f = 1\text{MHz}$ |

Source-Drain Ratings and Characteristics

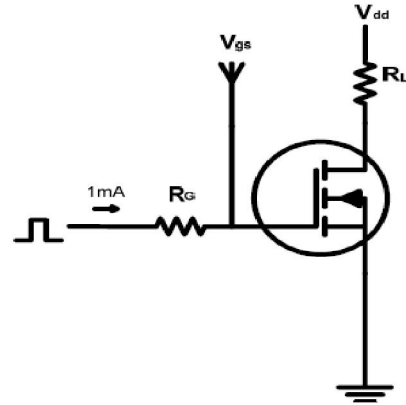
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|---|------|------|------|-------|--|
| I_S | Continuous Source Current (Body Diode) | — | — | 5 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I_{SM} | Pulsed Source Current (Body Diode) | — | — | 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 | $T_J = 25^\circ\text{C}, I_F = 5A,$ |
| Q_{rr} | Reverse Recovery Charge | — | 2333 | — | nC | $di/dt = 100A/\mu s$ |

Test Circuits and Waveforms

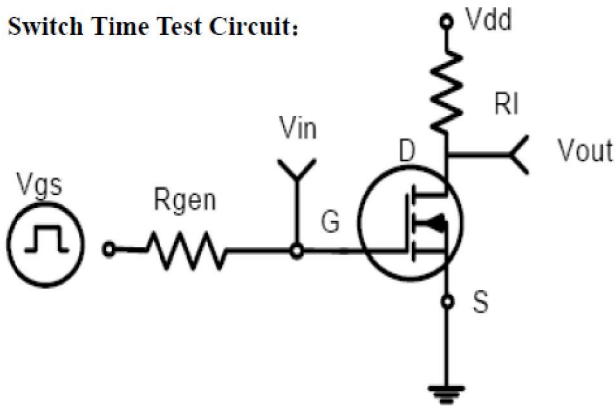
EAS test circuits:



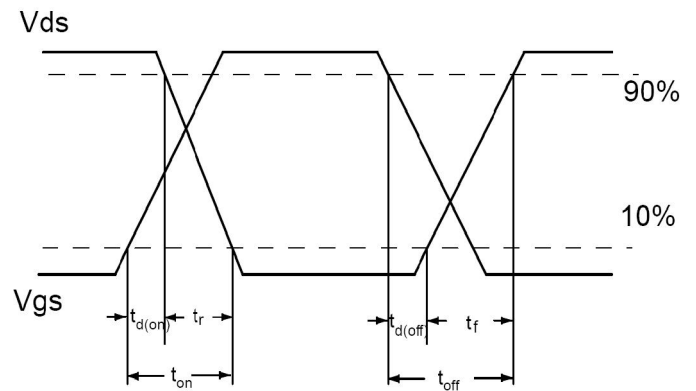
Gate charge test circuit:



Switch Time Test Circuit:



Waveforms:



Notes:

- ① The maximum current rating is limited by bond-wires.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.
- ④ The 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 $T_A = 25^\circ\text{C}$

Typical Electrical and Thermal Characteristics

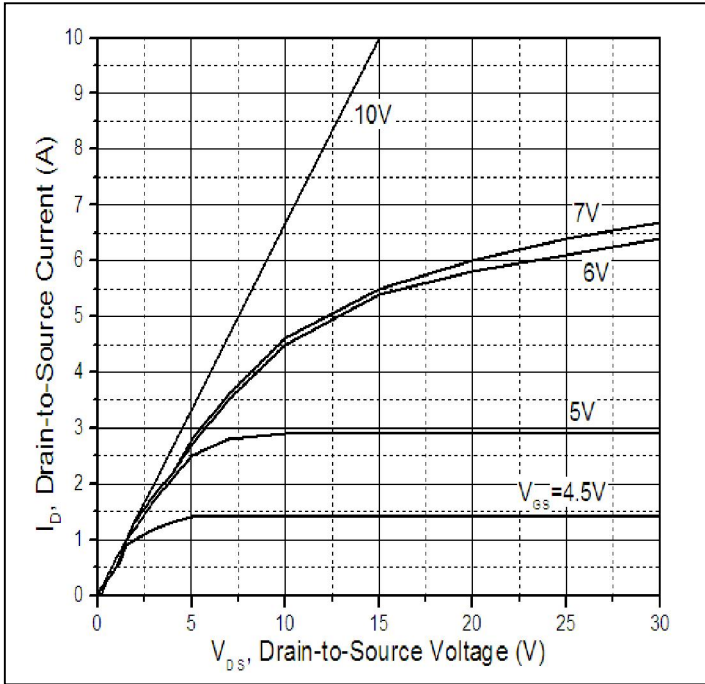


Figure 1. Typical Output Characteristics

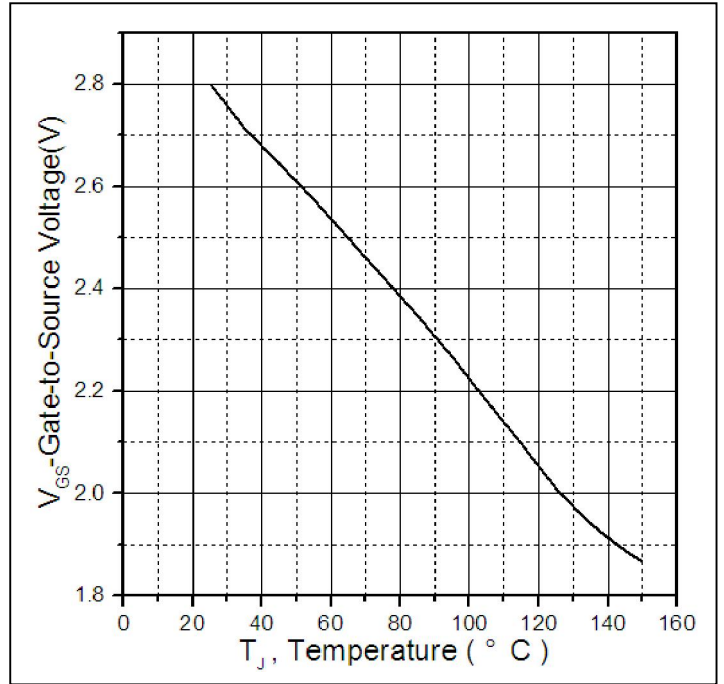


Figure 2. Gate to source cut-off voltage

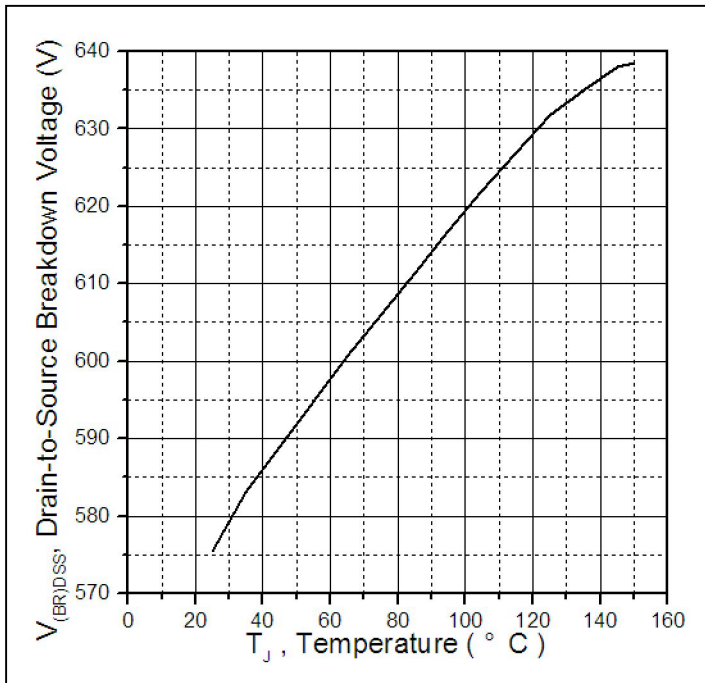


Figure 3. Drain-to-Source Breakdown Voltage vs. Case Temperature

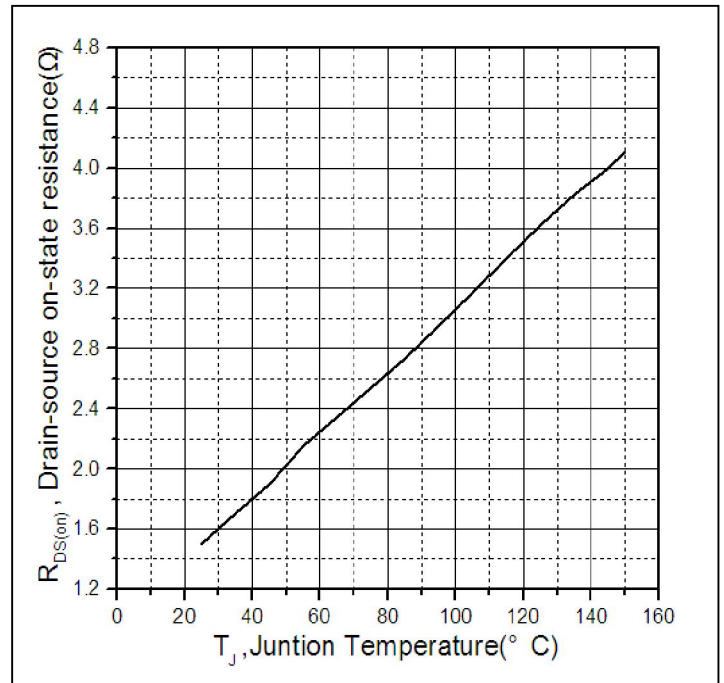


Figure 4. Normalized On-Resistance Vs. Case Temperature

Typical Electrical and Thermal Characteristics

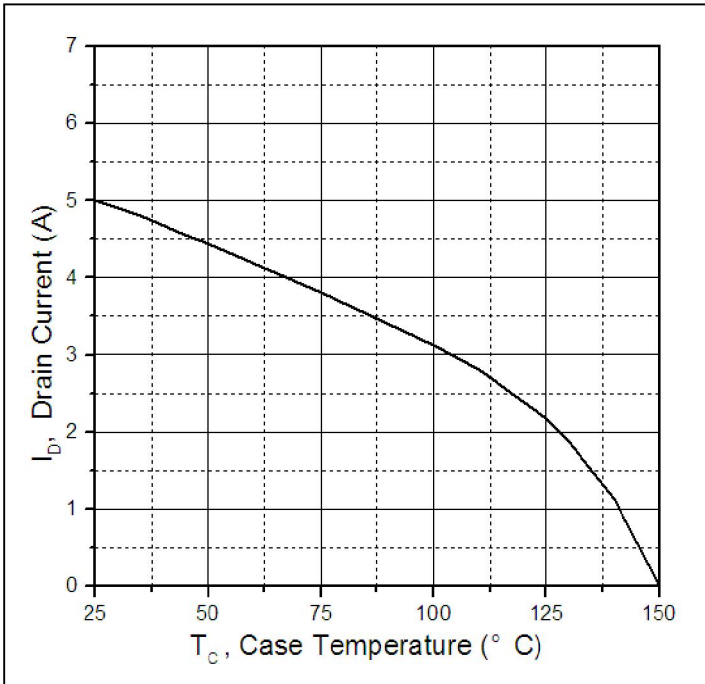


Figure 5. Maximum Drain Current Vs. Case Temperature

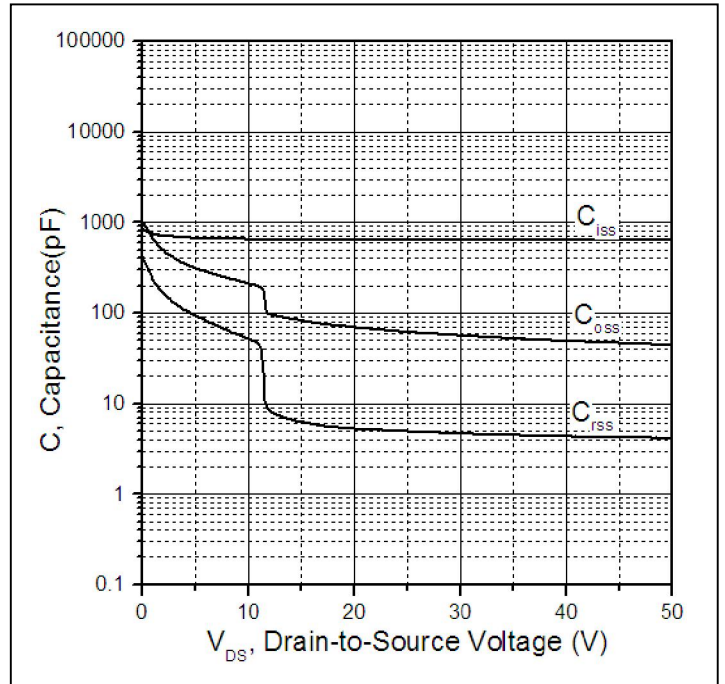


Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage

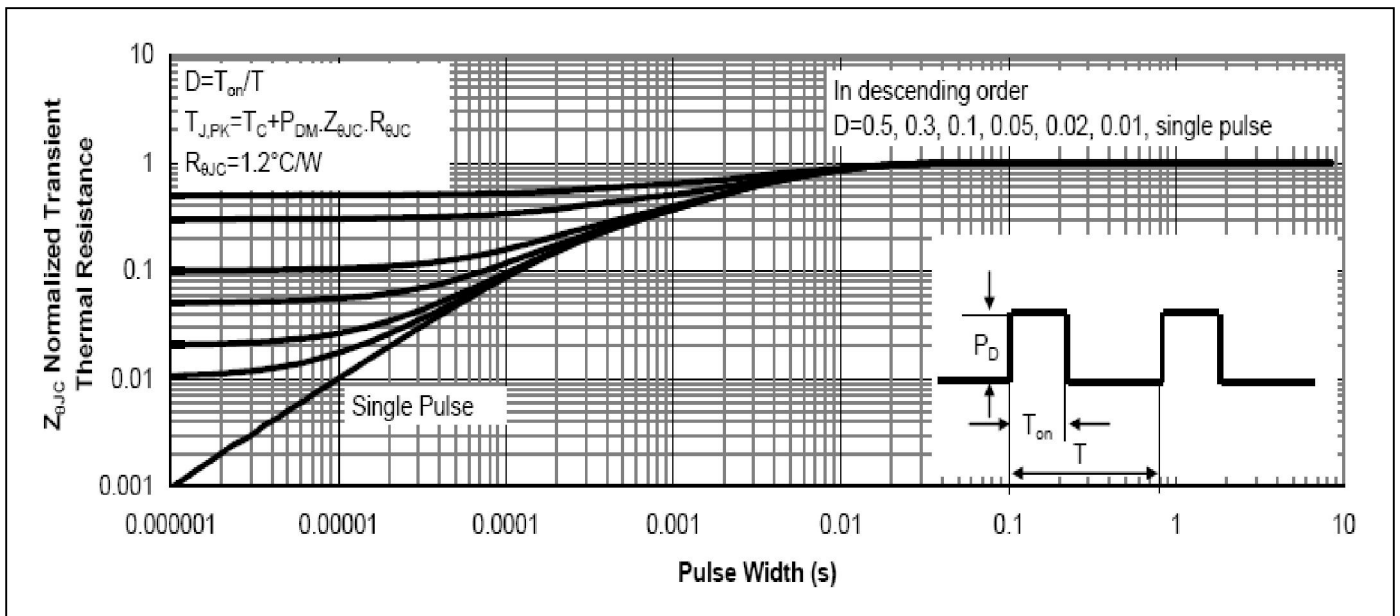
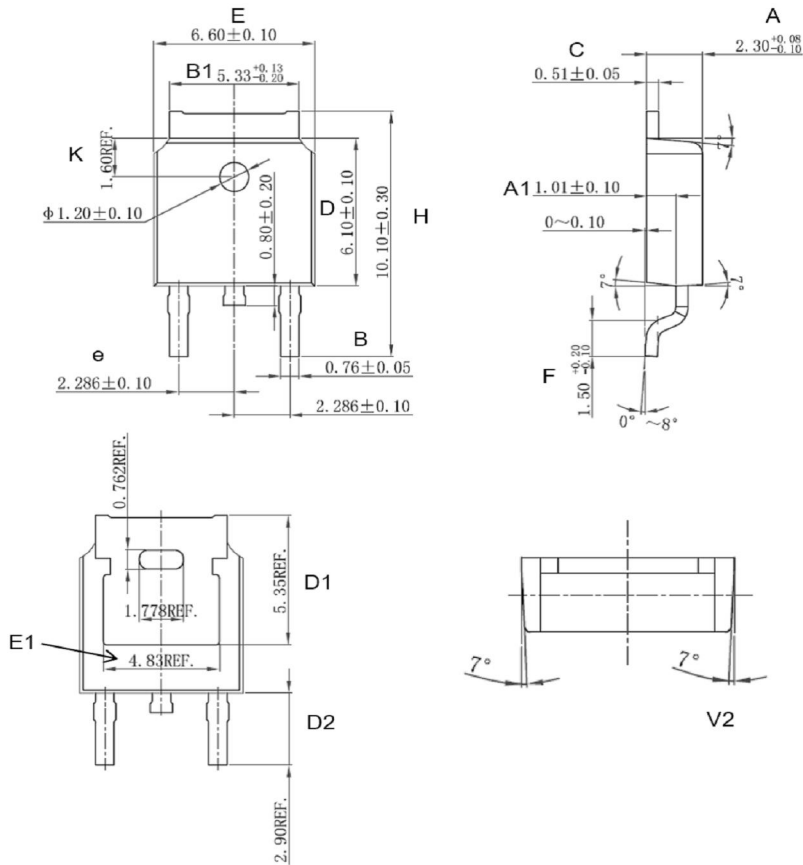


Figure7. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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° (REF) | | | 8° (REF) | | |

Ordering and Marking Information

Device Marking: SSF5N50D

Package (Available)
TO-252 (DPAK)
Operating Temperature Range
C : -55 to 150 °C

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) | $T_j=125^{\circ}\text{C}$ to 150°C @ 80% of Max $V_{DSS}/V_{CES}/V_R$ | 168 hours 500 hours 1000 hours | 3 lots x 77 devices |
| High Temperature Gate Bias(HTGB) | $T_j=150^{\circ}\text{C}$ @ 100% of Max V_{GSS} | 168 hours 500 hours 1000 hours | 3 lots x 77 devices |