

Main Product Characteristics

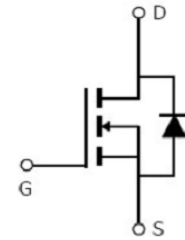
| | |
|--------------|----------------------|
| V_{DSS} | 100V |
| $R_{DS(on)}$ | 3.7m Ω (typ.) |
| I_D | 180A ^① |



TO-220



Marking and Pin Assignment



Schematic Diagram

Features and Benefits

- Advanced Process Technology
- Designed for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 175°C operating temperature



Description

The SSS1004 utilizes the latest processing techniques to achieve high cell density, low on-resistance and high repetitive avalanche rating. These features make this device extremely efficient and reliable for use in power switching applications and a wide variety of other applications.

Absolute Max Ratings

| Symbol | Parameter | Max. | Units |
|---------------------------------|--|------------------|---------------------|
| $I_D @ T_C = 25^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10\text{V}$ | 180 ^① | A |
| $I_D @ T_C = 100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10\text{V}$ | 130 ^① | |
| I_{DM} | Pulsed Drain Current ^② | 670 | |
| $P_D @ T_C = 25^\circ\text{C}$ | Power Dissipation ^③ | 375 | W |
| | Linear Derating Factor | 2.5 | W/ $^\circ\text{C}$ |
| V_{DS} | Drain-Source Voltage | 100 | V |
| V_{GS} | Gate-to-Source Voltage | ± 20 | V |
| E_{AS} | Single Pulse Avalanche Energy @ $L=0.3\text{mH}$ | 1045 | mJ |
| I_{AS} | Avalanche Current @ $L=0.3\text{mH}$ | 83.5 | A |
| T_J, T_{STG} | Operating Junction and Storage Temperature Range | -55 to +175 | $^\circ\text{C}$ |

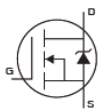
Thermal Resistance

| Symbol | Characteristics | Typ. | Max. | Units |
|-----------------|---|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case ③ | — | 0.4 | °C/W |
| $R_{\theta JA}$ | Junction-to-Ambient ($t \leq 10s$) ④ | — | 62 | °C/W |
| | Junction-to-Ambient (PCB mounted, steady-state) ④ | — | 40 | °C/W |

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

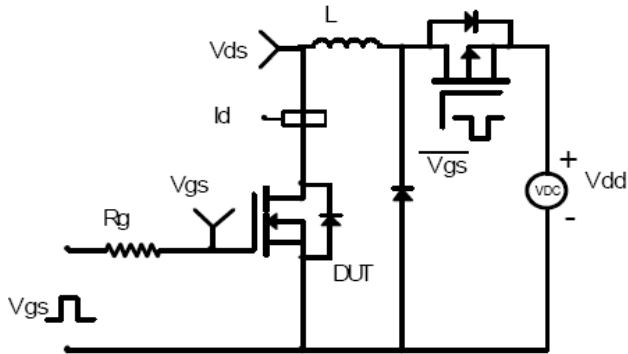
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---------------|--------------------------------------|------|------|------|-------|--|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 100 | — | — | V | $V_{GS} = 0V, I_D = 1mA$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-resistance | — | 3.7 | 4.7 | mΩ | $V_{GS}=10V, I_D=106A$ $T_J = 125^\circ\text{C}$ |
| | | — | 8.4 | — | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.0 | — | 4.0 | V | $V_{DS} = V_{GS}, I_D = 250\mu A$ $T_J = 125^\circ\text{C}$ |
| | | — | 2.2 | — | | |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | 1 | μA | $V_{DS} = 120V, V_{GS} = 0V$ $T_J = 125^\circ\text{C}$ |
| | | — | — | 50 | | |
| I_{GSS} | Gate-to-Source Forward Leakage | — | — | 100 | nA | $V_{GS} = 20V$ $V_{GS} = -20V$ |
| | | — | — | -100 | | |
| Q_g | Total Gate Charge | — | 224 | — | nC | $I_D = 50A,$ $V_{DS}=50V,$ $V_{GS} = 10V$ |
| Q_{gs} | Gate-to-Source Charge | — | 80 | — | | |
| Q_{gd} | Gate-to-Drain("Miller") Charge | — | 55 | — | | |
| $t_{d(on)}$ | Turn-on Delay Time | — | 40 | — | nS | $V_{GS}=10V, V_{DD}=65V,$ $R_L=0.87\Omega,$ $R_{GEN}=2.6\Omega$ $I_D=75A$ |
| t_r | Rise Time | — | 141 | — | | |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 95 | — | | |
| t_f | Fall Time | — | 101 | — | | |
| C_{iss} | Input Capacitance | — | 5634 | — | pF | $V_{GS} = 0V$ $V_{DS} = 50V$ $f = 1MHz$ |
| C_{oss} | Output Capacitance | — | 657 | — | | |
| C_{riss} | Reverse Transfer Capacitance | — | 12.6 | — | | |

Source-Drain Ratings and Characteristics

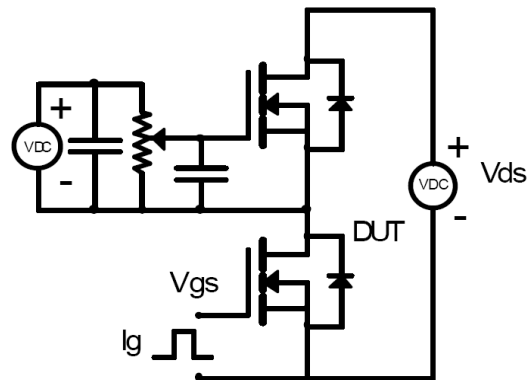
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|---|------|------|-------|-------|--|
| I_S | Continuous Source Current (Body Diode) | — | — | 180 ① | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I_{SM} | Pulsed Source Current (Body Diode) | — | — | 670 | A | |
| V_{SD} | Diode Forward Voltage | — | 0.9 | 1.3 | V | $I_S=75A, V_{GS}=0V, T_J = 25^\circ\text{C}$ |

Test Circuits and Waveforms

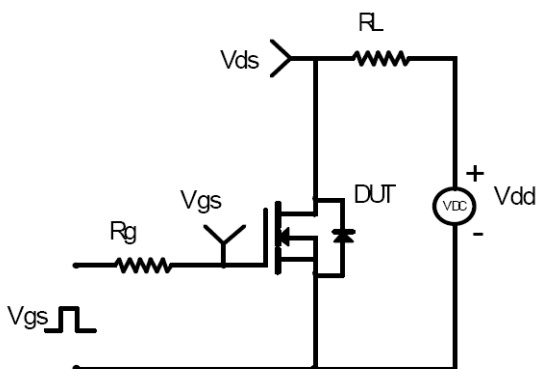
E_{AS} Test Circuit



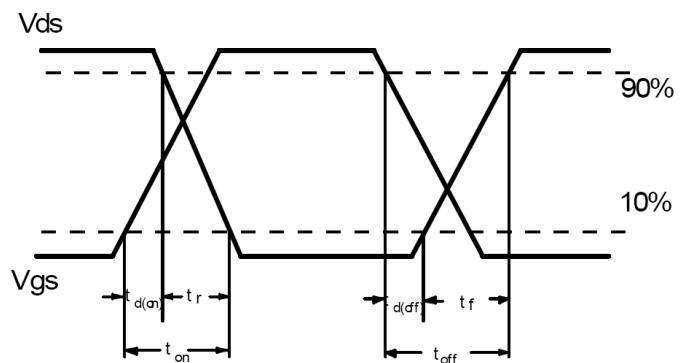
Gate Charge Test Circuit



Switching Time Test Circuit



Switching Waveforms



Notes:

- ① Calculated continuous current based on maximum allowable junction temperature.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation P_D 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 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^\circ\text{C}$

Typical Electrical and Thermal Characteristics

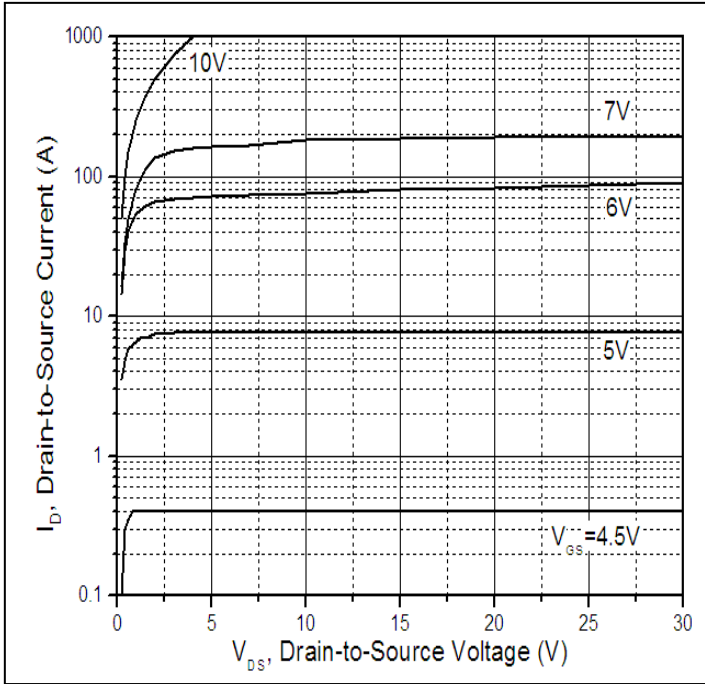


Figure 1. Typical Output Characteristics

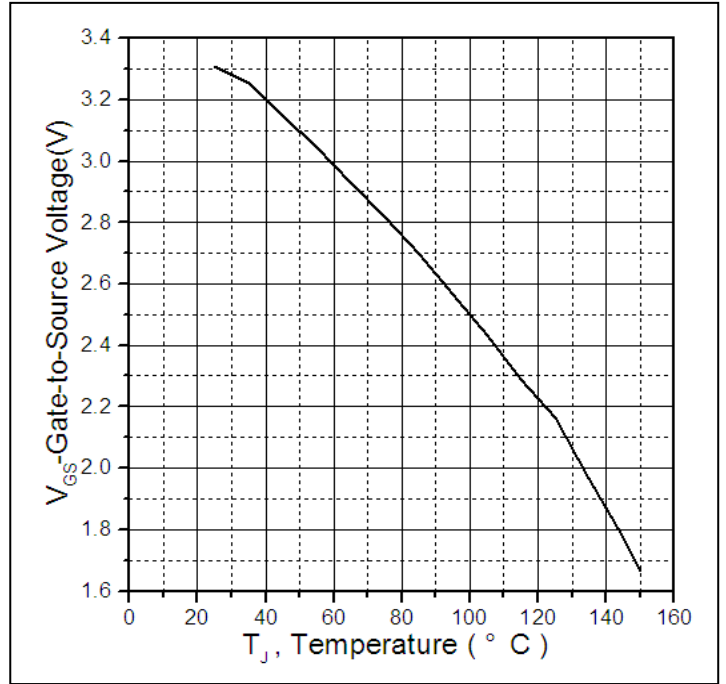


Figure 2. Gate to Source Cut-off Voltage

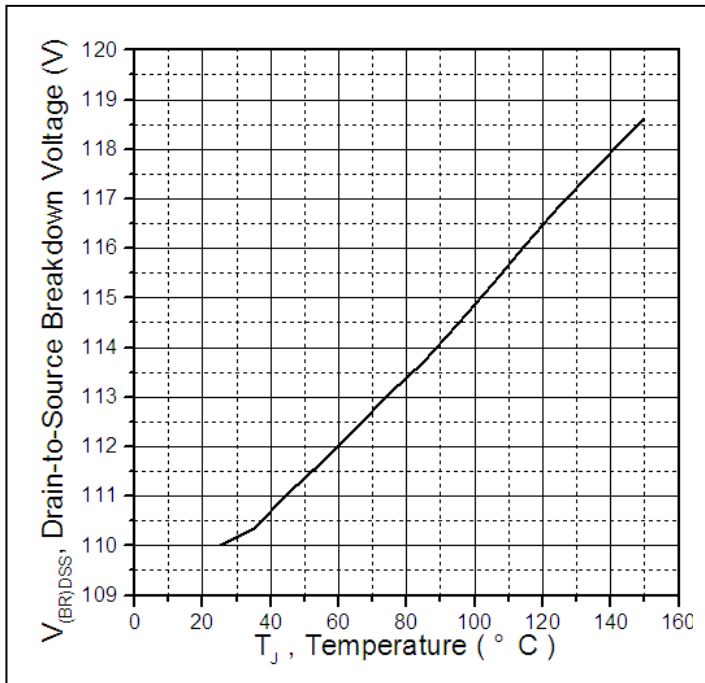


Figure 3. Drain-to-Source Breakdown Voltage Vs. Case Temperature

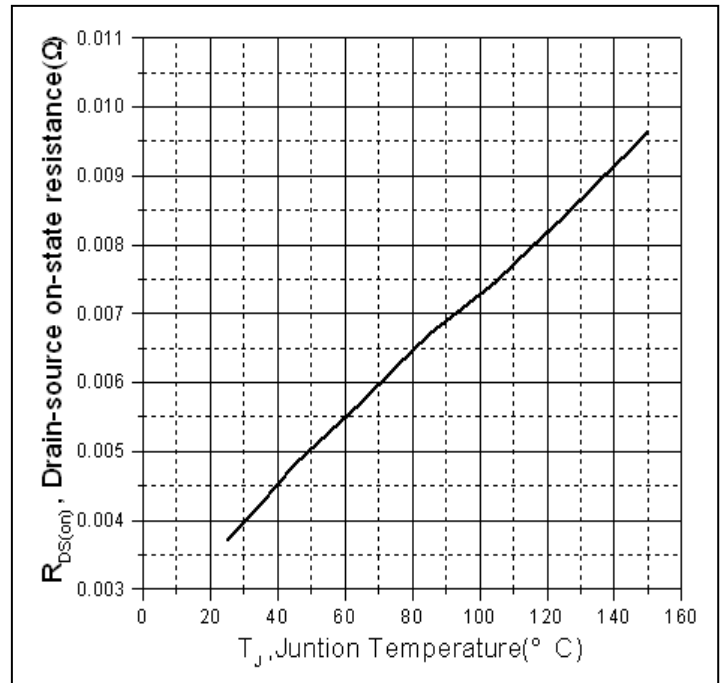


Figure 4. Normalized On-Resistance Vs. Case Temperature

Typical Electrical and Thermal Characteristics

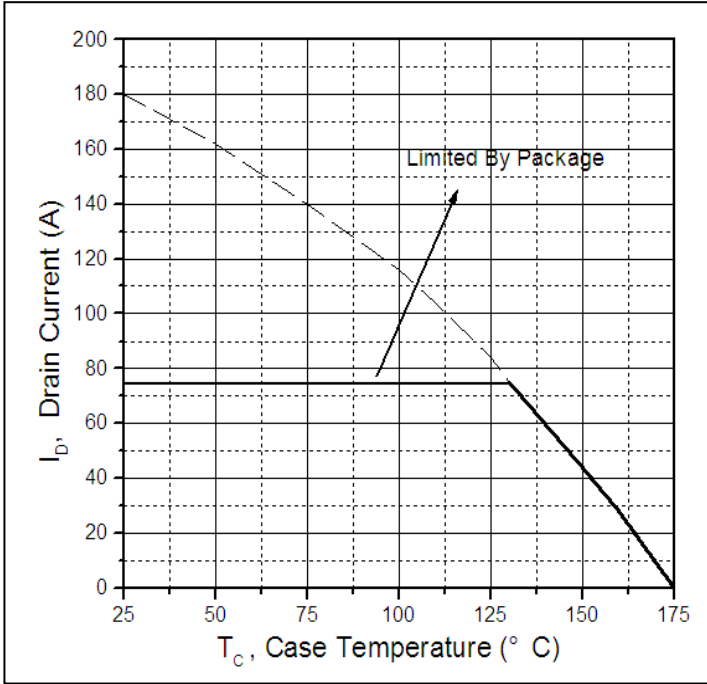


Figure 5. Maximum Drain Current Vs. Case Temperature

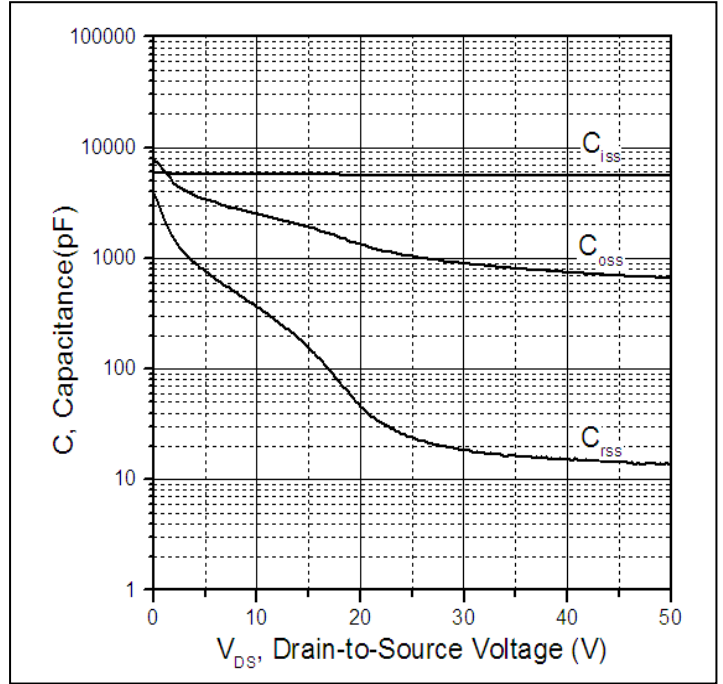


Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage

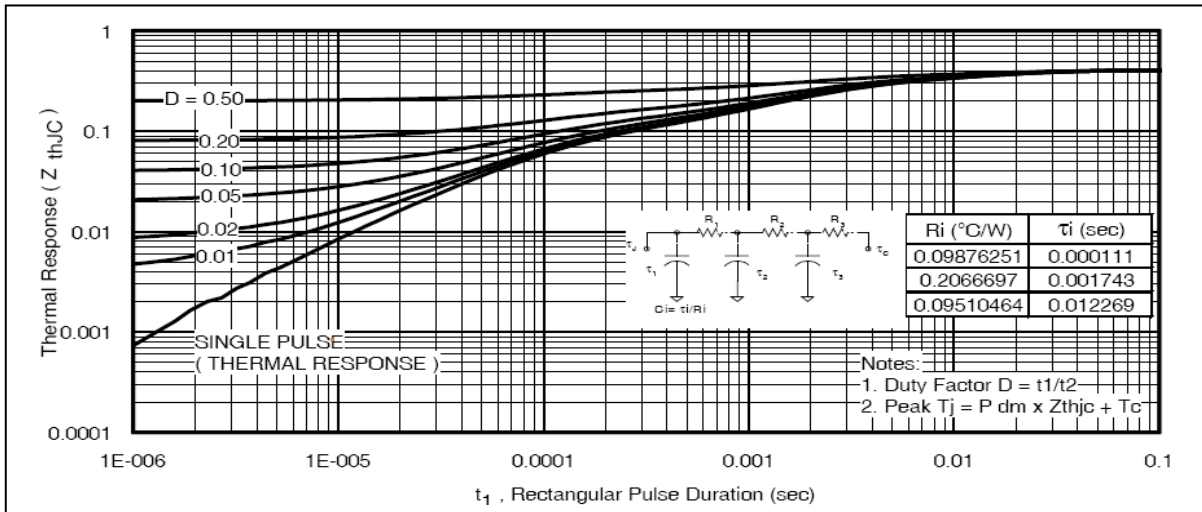
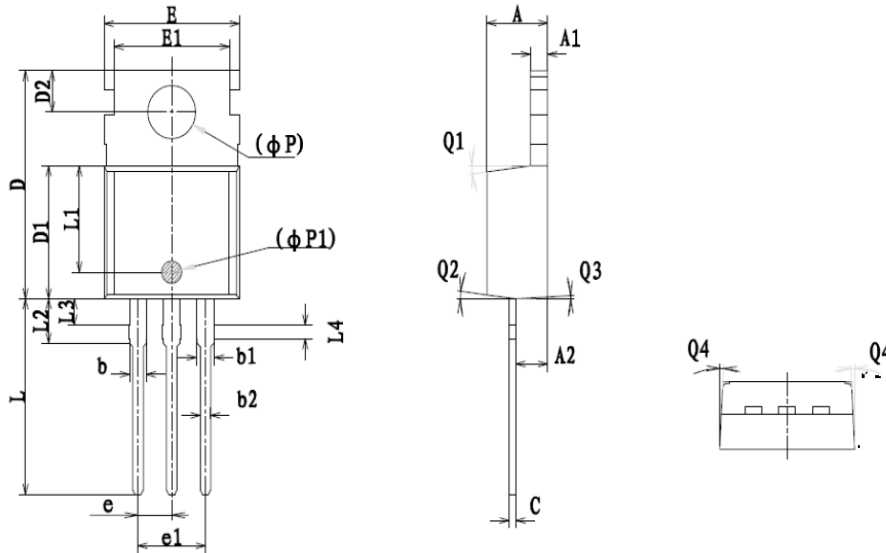


Figure 7. Maximum Effective Transient Thermal Impedance, Junction-to-Case

Mechanical Data

TO-220 PACKAGE OUTLINE DIMENSION



| Symbol | Dimension In Millimeters | | | Dimension In Inches | | |
|--------|--------------------------|----------------|----------------|---------------------|----------------|----------------|
| | Min | Nom | Max | Min | Nom | Max |
| A | 4.400 | 4.550 | 4.700 | 0.173 | 0.179 | 0.185 |
| A1 | 1.270 | 1.300 | 1.330 | 0.050 | 0.051 | 0.052 |
| A2 | 2.240 | 2.340 | 2.440 | 0.088 | 0.092 | 0.096 |
| b | - | 1.270 | - | - | 0.050 | - |
| b1 | 1.270 | 1.370 | 1.470 | 0.050 | 0.054 | 0.058 |
| b2 | 0.750 | 0.800 | 0.850 | 0.030 | 0.031 | 0.033 |
| C | 0.480 | 0.500 | 0.520 | 0.019 | 0.020 | 0.021 |
| D | 15.100 | 15.400 | 15.700 | 0.594 | 0.606 | 0.618 |
| D1 | 8.800 | 8.900 | 9.000 | 0.346 | 0.350 | 0.354 |
| D2 | 2.730 | 2.800 | 2.870 | 0.107 | 0.110 | 0.113 |
| E | 9.900 | 10.000 | 10.100 | 0.390 | 0.394 | 0.398 |
| E1 | - | 8.700 | - | - | 0.343 | - |
| φP | 3.570 | 3.600 | 3.630 | 0.141 | 0.142 | 0.143 |
| φP1 | 1.400 | 1.500 | 1.600 | 0.055 | 0.059 | 0.063 |
| e | 2.54BSC | | | 0.1BSC | | |
| e1 | 5.08BSC | | | 0.2BSC | | |
| L | 13.150 | 13.360 | 13.570 | 0.518 | 0.526 | 0.534 |
| L1 | 7.35REF | | | 0.29REF | | |
| L2 | 2.900 | 3.000 | 3.100 | 0.114 | 0.118 | 0.122 |
| L3 | 1.650 | 1.750 | 1.850 | 0.065 | 0.069 | 0.073 |
| L4 | 0.900 | 1.000 | 1.100 | 0.035 | 0.039 | 0.043 |
| Q1 | 5 ⁰ | 7 ⁰ | 9 ⁰ | 5 ⁰ | 7 ⁰ | 9 ⁰ |
| Q2 | 5 ⁰ | 7 ⁰ | 9 ⁰ | 5 ⁰ | 7 ⁰ | 9 ⁰ |
| Q3 | 5 ⁰ | 7 ⁰ | 9 ⁰ | 5 ⁰ | 7 ⁰ | 9 ⁰ |
| Q4 | 1 ⁰ | 3 ⁰ | 5 ⁰ | 1 ⁰ | 3 ⁰ | 5 ⁰ |

Ordering and Marking Information

| |
|--|
| <p>Device Marking: SSS1004</p> <p style="text-align: center;"> Package (Available) TO-220 Operating Temperature Range C : -55 to 175 °C </p> |
|--|

Devices per Unit

| Package Type | Units/Tube | Tubes/Inner Box | Units/Inner Box | Inner Boxes/Carton Box | Units/Carton Box |
|--------------|------------|-----------------|-----------------|------------------------|------------------|
| TO-220 | 50 | 20 | 1000 | 10 | 10000 |

Reliability Test Program

| Test Item | Conditions | Duration | Sample Size |
|-------------------------------------|---|--------------------------------------|---------------------|
| High Temperature Reverse Bias(HTRB) | $T_j=125^{\circ}\text{C}$ to 175°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) | $T_j=125^{\circ}\text{C}$ or 175°C @ 100% of Max V_{GSS} | 168 hours 500 hours 1000 hours | 3 lots x 77 devices |