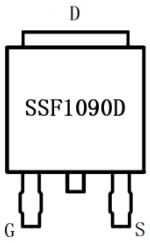
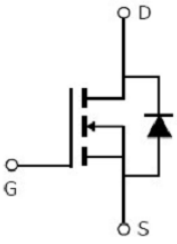
## Main Product Characteristics:

| | |
|---|---|
| $V_{DSS}$ | 100V |
| $R_{DS}$(on) | 60mΩ (typ.) |
| $I_D$ | 15A ① |

TO-252 (D-PAK)




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
- 175℃ 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, $V_{GS}$ @ 10V ① | 15 | A |
| $I_D$ @ TC = 100°C | Continuous Drain Current, $V_{GS}$ @ 10V ① | 10 | |
| $I_{DM}$ | Pulsed Drain Current ② | 60 | |
| $P_D$ @TC = 25°C | Power Dissipation ③ | 39 | W |
| | Linear Derating Factor | 0.26 | W/°C |
| $V_{DS}$ | Drain-Source Voltage | 100 | V |
| $V_{GS}$ | Gate-to-Source Voltage | ± 20 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy @ L=22mH | 142 | mJ |
| $I_{AS}$ | Avalanche Current @ L=22mH | 3.6 | A |
| $T_J$ $T_{STG}$ | Operating Junction and Storage Temperature Range | -55 to +175 | °C |

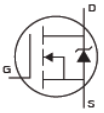
## Thermal Resistance

| Symbol | Characterizes | Typ. | Max. | Units |
|---|---|---|---|---|
| $R_{\theta JC}$ | Junction-to-case ③ | — | 3.85 | ℃/W |
| $R_{\theta JA}$ | Junction-to-Ambient (t ≤ 10s)④ | — | 60 | ℃/W |
| | Junction-to-Ambient (PCB mounted, steady-state) ④ | — | 42 | ℃/W |

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

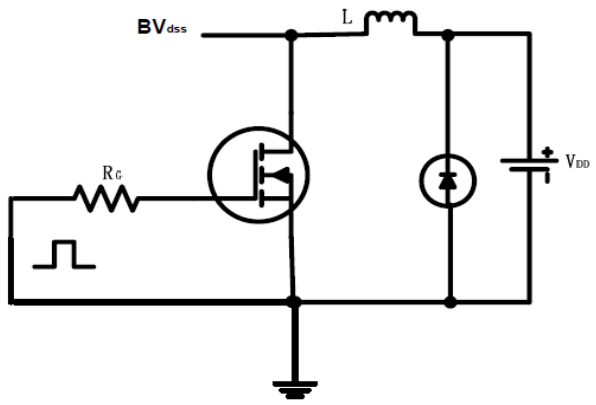
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-to-Source breakdown voltage | 100 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250μA |
| $R_{DS(on)}$ | Static Drain-to-Source on-resistance | — | 60 | 90 | mΩ | $V_{GS}$=10V,$I_D$ = 2A |
| | | — | 125 | — | | $T_J$ = 125℃ |
| $V_{GS(th)}$ | Gate threshold voltage | 2 | — | 4 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA |
| | | — | 2.46 | — | | $T_J$ = 125℃ |
| $I_{DSS}$ | Drain-to-Source leakage current | — | — | 1 | μA | $V_{DS}$ = 30V, $V_{GS}$ =0V |
| | | — | — | 50 | | $T_J$ = 125℃ |
| $I_{GSS}$ | Gate-to-Source forward leakage | — | — | 100 | A | $V_{GS}$ =20V |
| | Gate-to-Source reverse leakage | — | — | -100 | | $V_{GS}$ = -20V |
| $Q_g$ | Total gate charge | — | 20 | — | nC | $I_D$ = 9.2A |
| $Q_{gs}$ | Gate-to-Source charge | — | 4.3 | — | | $V_{DD}$=80V |
| $Q_{gd}$ | Gate-to-Drain("Miller") charge | — | 7.6 | — | | $V_{GS}$ = 10V |
| $t_{d(on)}$ | Turn-on delay time | — | 11 | — | ns | $V_{GS}$=10V, VDD=50V, |
| $t_r$ | Rise time | — | 31 | — | | $R_L$=5.4Ω,$R_{GEN}$=18Ω |
| $t_{d(off)}$ | Turn-Off delay time | — | 39 | — | | $I_D$ =9.2A |
| $t_f$ | Fall time | — | 28 | — | | |
| $C_{iss}$ | Input capacitance | — | 739 | — | pF | $V_{GS}$ = 0V |
| $C_{oss}$ | Output capacitance | — | 58 | — | | $V_{DS}$ = 25V |
| $C_{rss}$ | Reverse transfer capacitance | — | 40 | — | | $f$ = 1MHz |

## Source-Drain Ratings and Characteristics

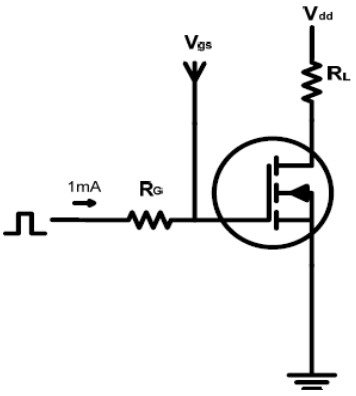
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | — | — | 15 ① | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) | — | — | 60 | A | |
| $V_{sd}$ | Diode Forward Voltage | — | 0.8 | 1.5 | V | $I_S$=3A, $V_{GS}$=0V,$T_J$= 25°C |
| $t_{rr}$ | Reverse Recovery Time | — | 35 | — | ns | $T_J$ =25°C, $I_F$ =9.2A, |
| $Q_{rr}$ | Reverse Recovery Charge | — | 67 | — | nC | di/dt = 100A/μs |

## Test circuits and Waveforms

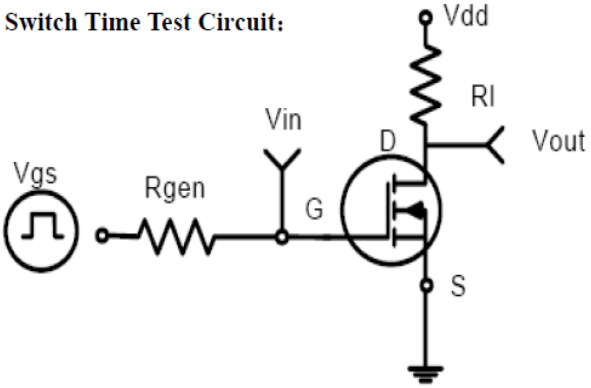
**EAS test circuits:**



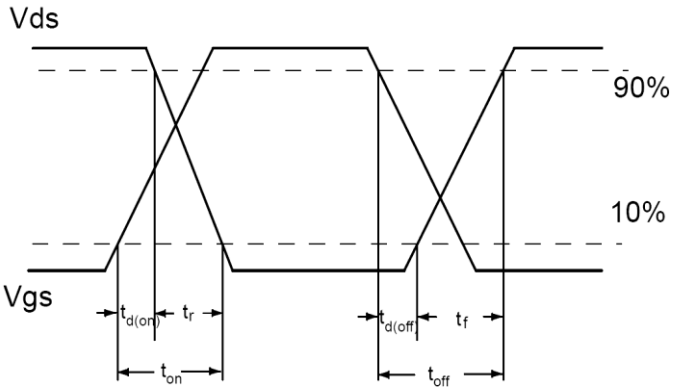

**Gate charge test circuit:**




**Switch Time Test Circuit:**




**Switch Waveforms:**




## Notes:

①Calculated continuous current based on maximum allowable junction temperature.

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 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with TA =25°C

## Typical electrical and thermal characteristics

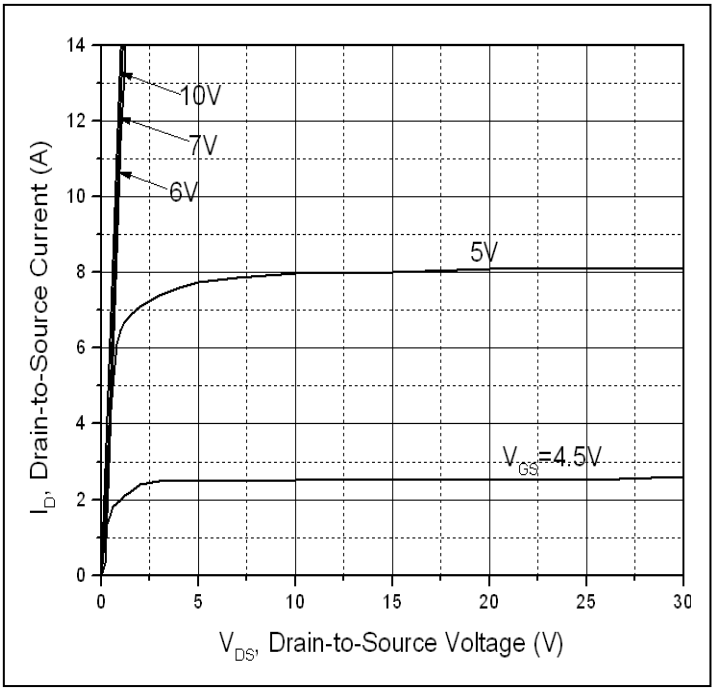



**Figure 1: Typical Output Characteristics**

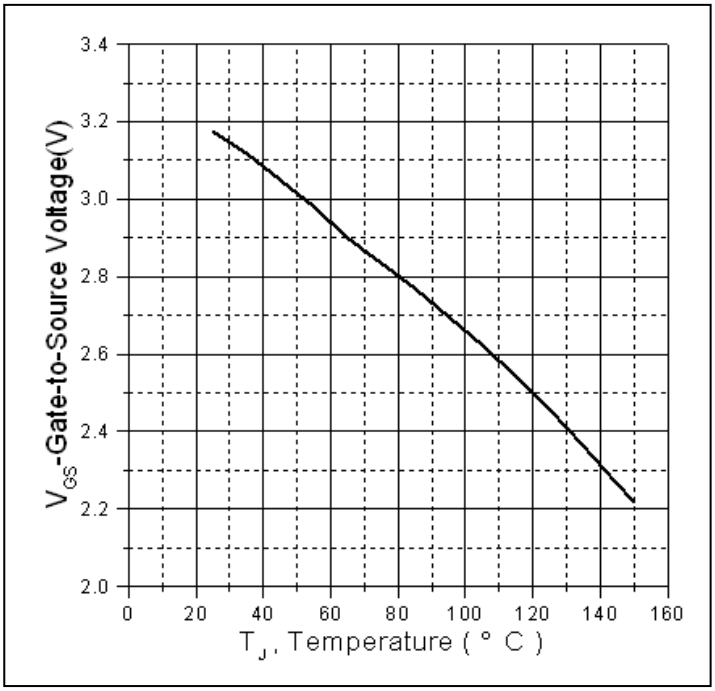



**Figure 2. Gate to source cut-off voltage**

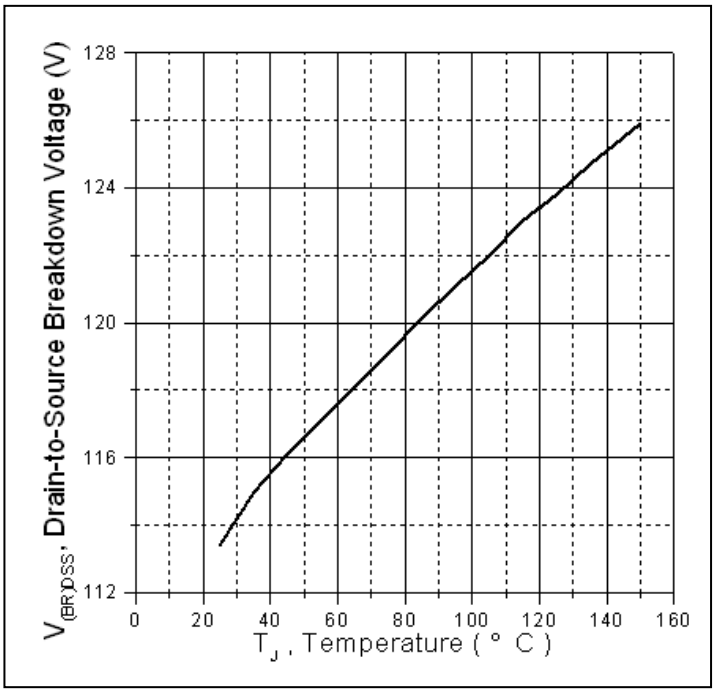



**Figure 3. Drain-to-Source Breakdown Voltage Vs. Case Temperature**

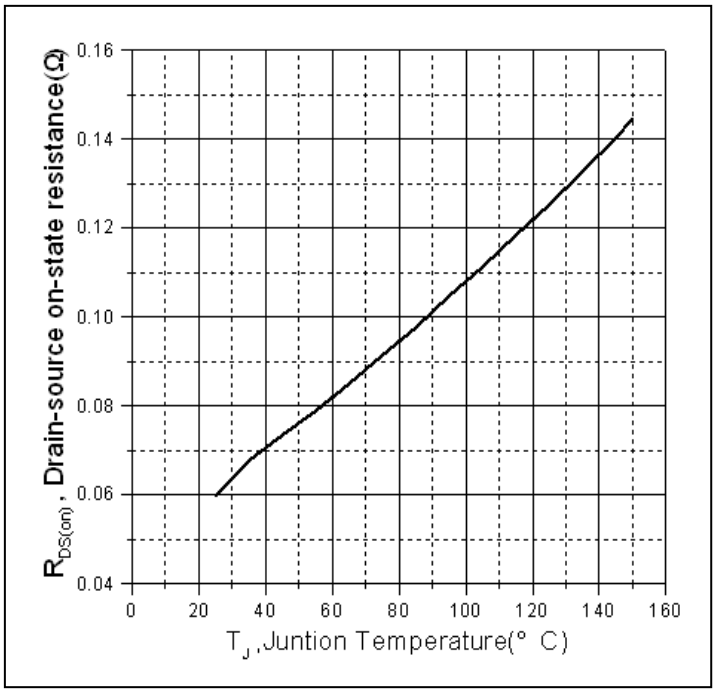



**Figure 4: Normalized On-Resistance Vs. Case Temperature**

## Typical electrical and thermal characteristics

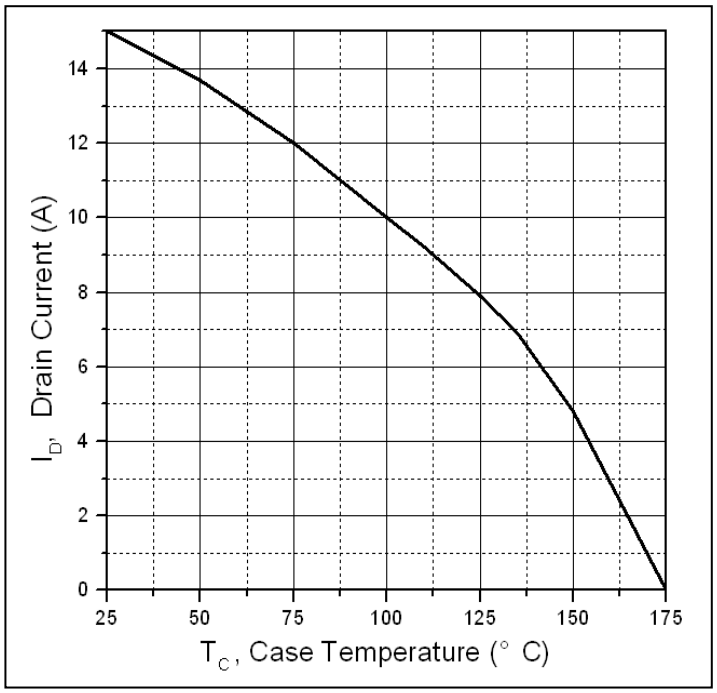



Figure 5. Maximum Drain Current Vs. Case Temperature

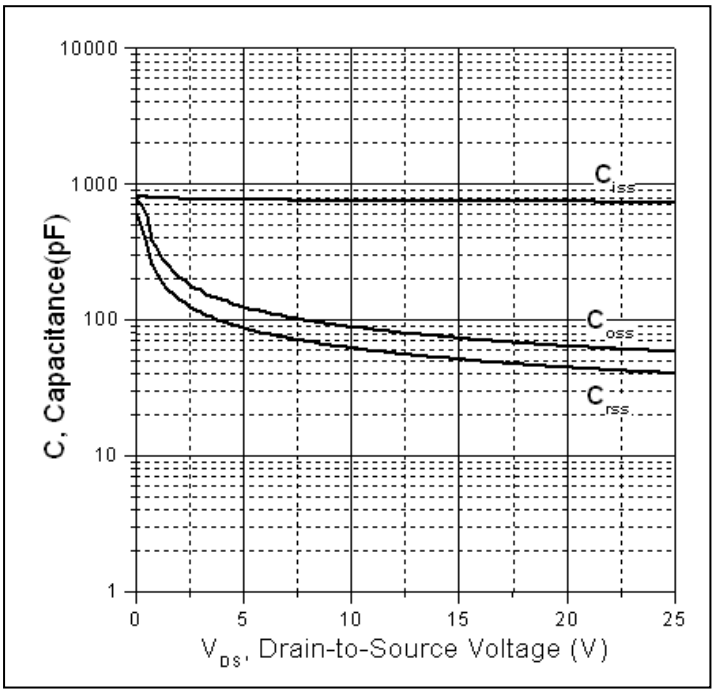



Figure 6.Typical Capacitance Vs. Drain-to-Source Voltage

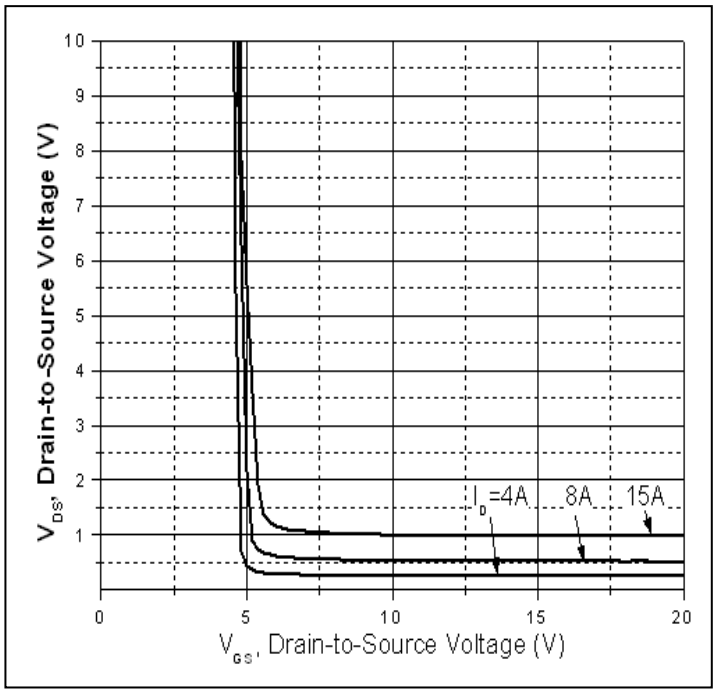



Figure 7. Drain-to-Source Voltage Vs. Gate-to-Source Voltage

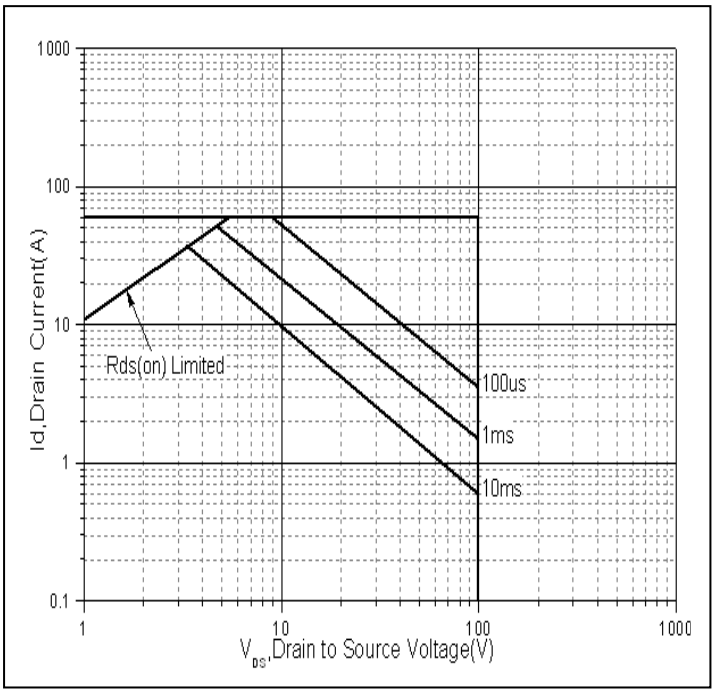
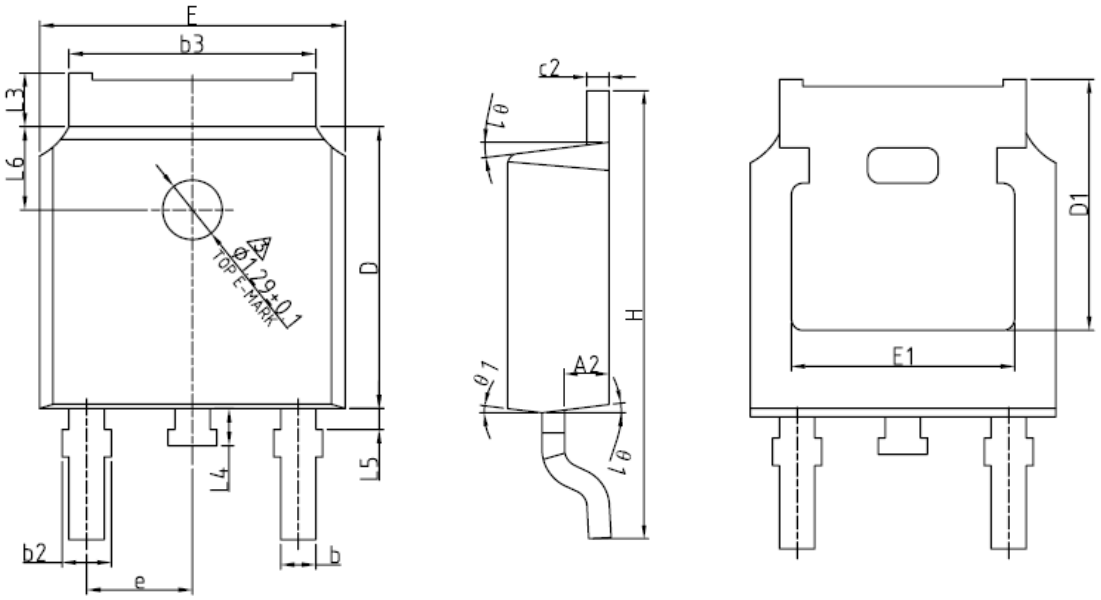
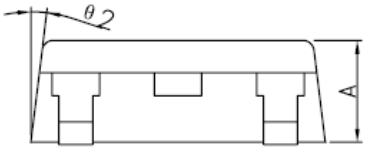


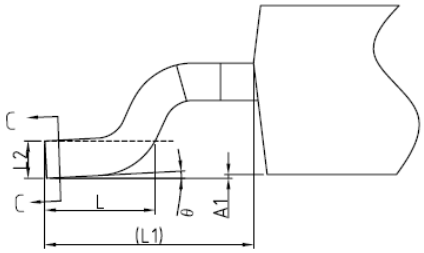

Figure 8.Maximum Safe Operating Area

## Mechanical Data：

**TO-252 PACKAGE INFORMATION** UNITS:mm




| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 2.20 | 2.30 | 2.38 |
| A1 | 0 | – | 0.10 |
| A2 | 0.90 | 1.01 | 1.10 |
| b | 0.72 | – | 0.85 |
| b1 | 0.71 | 0.76 | 0.81 |
| b2 | 0.72 | – | 0.90 |
| b3 | 5.13 | 5.33 | 5.46 |
| c | 0.47 | – | 0.60 |
| c1 | 0.46 | 0.51 | 0.56 |
| c2 | 0.47 | – | 0.60 |
| D | 6.00 | 6.10 | 6.20 |
| D1 | 5.25 | – | – |
| E | 6.50 | 6.60 | 6.70 |
| E1 | 4.70 | – | – |
| e | 2.186 | 2.286 | 2.386 |
| H | 9.80 | 10.10 | 10.40 |
| L | 1.40 | 1.50 | 1.70 |
| L1 | | 2.90REF | |
| L2 | | 0.51BSC | |
| L3 | 0.90 | – | 1.25 |
| L4 | 0.60 | 0.80 | 1.00 |
| L5 | 0.15 | – | 0.75 |
| L6 | | 1.80REF | |
| θ | 0° | – | 8° |
| θ1 | 5° | 7° | 9° |
| θ2 | 5° | 7° | 9° |

## Ordering and Marking Information

**Device Marking: SSF1090D**

**Package (Available)**

**TO-252 (D-PAK)**

**Operating Temperature Range**

**C : -55 to 175 °C**

## Devices per Unit

| Package Type | Units/ Tape | Tapes/Inner Box | Units/Inner Box | Inner Boxes/Carton Box | Units/Carton Box |
|---|---|---|---|---|---|
| TO-252 | 2500 | 1 | 2500 | 7 | 17500 |

## Reliability Test Program

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

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