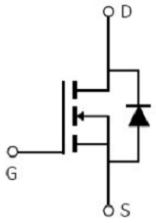
## Main Product Characteristics:

| | |
|---|---|
| $V_{DSS}$ | 60V |
| $R_{DS}$(on) | 10mohm(typ.) |
| $I_D$ | 60A |

TO220


Marking and pin Assignment




Schematic diagram

## Features and Benefits:

- Advanced trench 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 trench 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 | 60 | A |
| $I_D$ @ TC = 100°C | Continuous Drain Current, $V_{GS}$ @ 10V① | 48 | |
| $I_{DM}$ | Pulsed Drain Current② | 240 | |
| $P_D$ @TC = 25°C | Power Dissipation③ | 115 | W |
| | Linear Derating Factor | 0.74 | W/°C |
| $V_{DS}$ | Drain-Source Voltage | 60 | V |
| $V_{GS}$ | Gate-to-Source Voltage | ± 20 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy @ L=0.1mH | 235 | mJ |
| $I_{AS}$ | Avalanche Current @ L=0.1mH | 68 | A |
| $T_J$ $T_{STG}$ | Operating Junction and Storage Temperature Range | -55 to + 175 | °C |

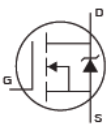
## Thermal Resistance

| Symbol | Characterizes | Typ. | Max. | Units |
|---|---|---|---|---|
| $R_{\theta JC}$ | Junction-to-case③ | — | 1.5 | ℃/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

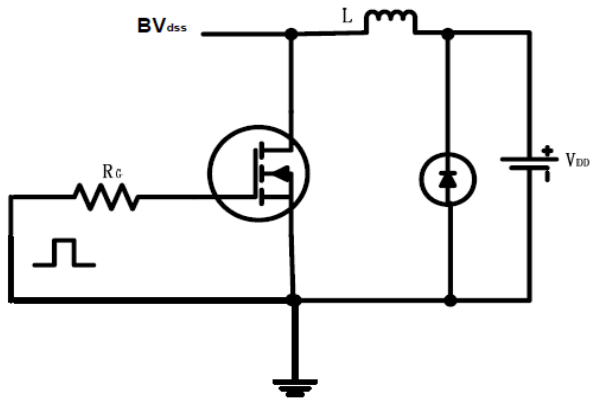
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-to-Source breakdown voltage | 60 | — | — | V | $V_{GS}$ = 0V, ID = 250μA |
| $R_{DS(on)}$ | Static Drain-to-Source on-resistance | — | 10 | 14 | mΩ | $V_{GS}$=10V,$I_D$ =30A |
| | | — | 17 | — | | $T_J$ = 125℃ |
| $V_{GS(th)}$ | Gate threshold voltage | 2 | — | 4 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA |
| | | — | 2.53 | — | | $T_J$ = 125℃ |
| $I_{DSS}$ | Drain-to-Source leakage current | — | — | 1 | μA | $V_{DS}$ = 60V,$V_{GS}$ = 0V |
| | | — | — | 50 | | $T_J$ = 125°C |
| $I_{GSS}$ | Gate-to-Source forward leakage | — | — | 100 | nA | $V_{GS}$ =20V |
| | | -100 | — | — | | $V_{GS}$ = -20V |
| $Q_g$ | Total gate charge | — | 62 | — | nC | $V_{DS}$=30V, |
| $Q_{gs}$ | Gate-to-Source charge | — | 17 | — | | $I_D$=30A, |
| $Q_{gd}$ | Gate-to-Drain("Miller") charge | — | 20 | — | | $V_{GS}$=10V |
| $t_{d(on)}$ | Turn-on delay time | — | 16 | — | ns | $V_{GS}$=10V, VDS=30V, |
| $t_r$ | Rise time | — | 13 | — | | $R_{GEN}$=2.55Ω, $I_D$=2A |
| $t_{d(off)}$ | Turn-Off delay time | — | 38.5 | — | | |
| $t_f$ | Fall time | — | 8.6 | — | | |
| $C_{iss}$ | Input capacitance | — | 3265 | — | pF | $V_{GS}$ = 0V |
| $C_{oss}$ | Output capacitance | — | 173 | — | | $V_{DS}$ = 25V |
| $C_{rss}$ | Reverse transfer capacitance | — | 163 | — | | $f$ = 1MHz |

## Source-Drain Ratings and Characteristics

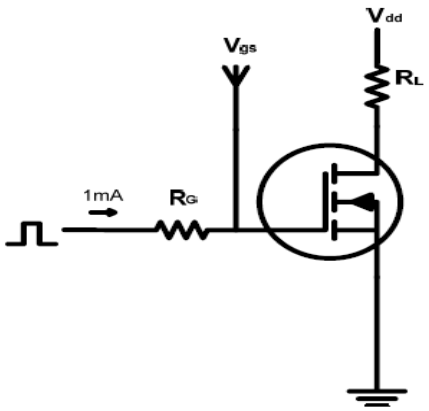
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | — | — | 60 | A | MOSFET symb showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) | — | — | 240 | A | |
| $V_{sd}$ | Diode Forward Voltage | — | 0.9 | 1.3 | V | $I_S$=40A, $V_{GS}$=0V |
| $t_{rr}$ | Reverse Recovery Time | — | 24.3 | — | ns | $T_J$ = 25°C, $I_F$ =60A, |
| $Q_{rr}$ | Reverse Recovery Charge | — | 26.5 | — | nC | di/dt = 100A/μs |

## Test circuits and Waveforms

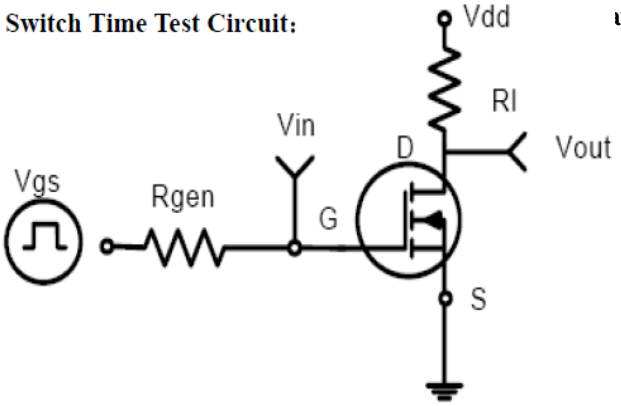
**EAS test circuits:**



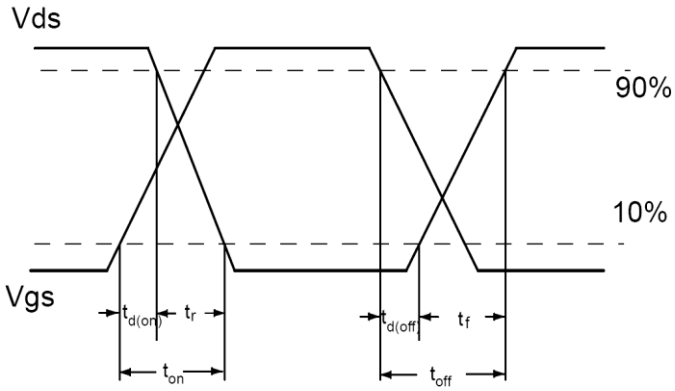

**Gate charge test circuit:**




**Switch Time Test Circuit:**




**ıveforms:**




## 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

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

## Typical electrical characteristics

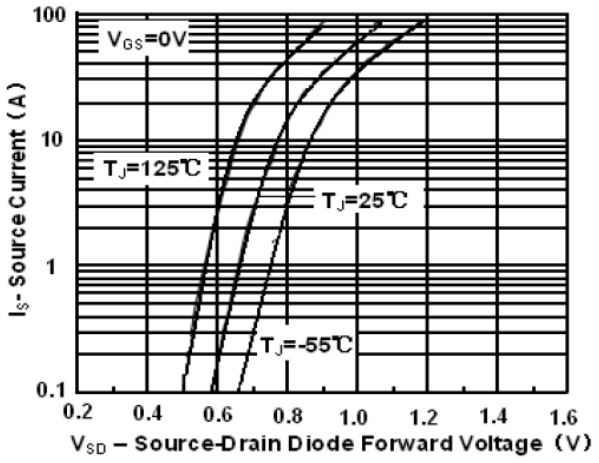



Figure 1: Body-Diode Characteristics

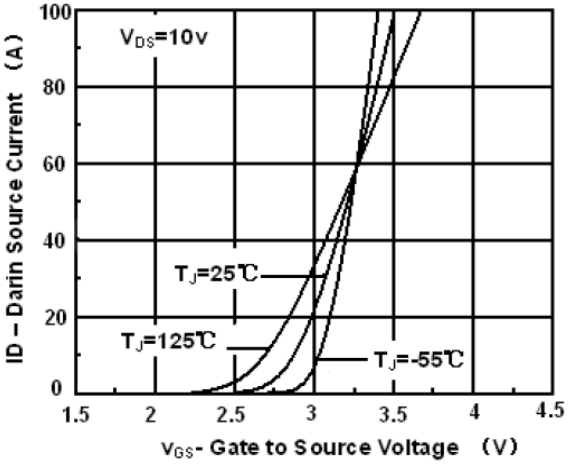



Figure 2: Typical Transfer Characteristics

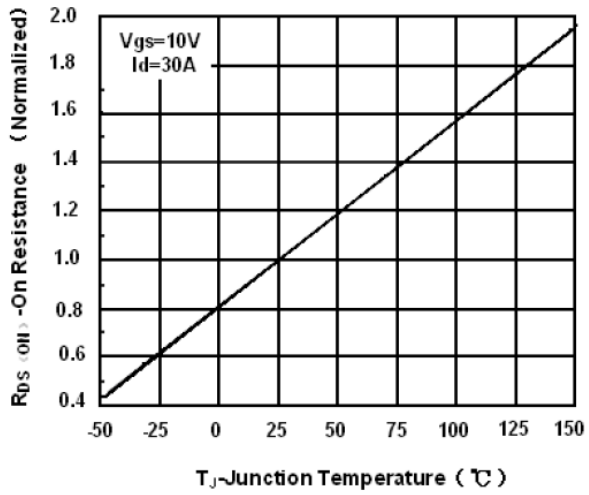



Figure 3: On-Resistance vs. Junction Temperature

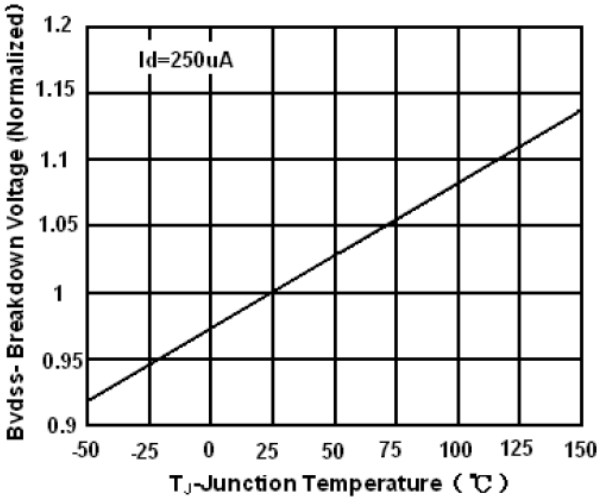



Figure 4: Breakdown Voltage vs. Junction Temperature

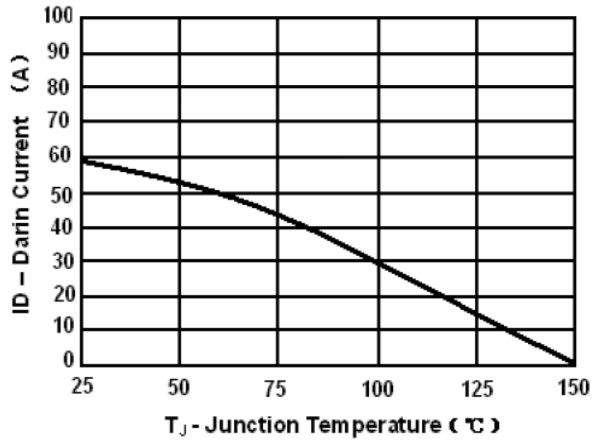



Figure 5: Maximum Drain Current vs. Junction Temperature

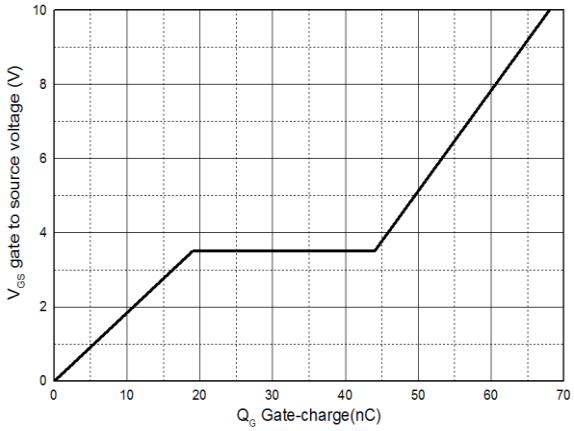



Figure 6: Gate-Charge Characteristics

## Typical thermal characteristics

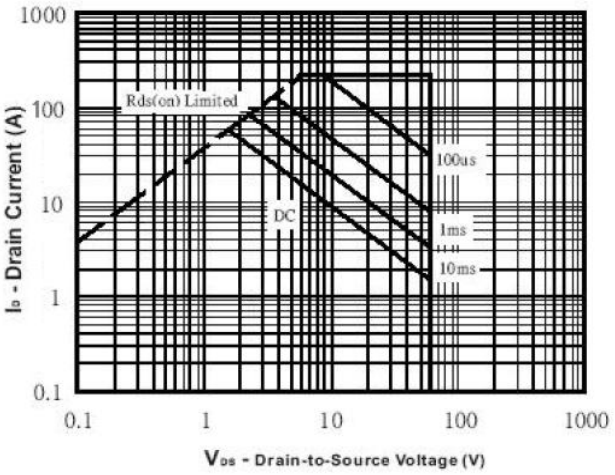



**Figure 7: Safe Operation Area**

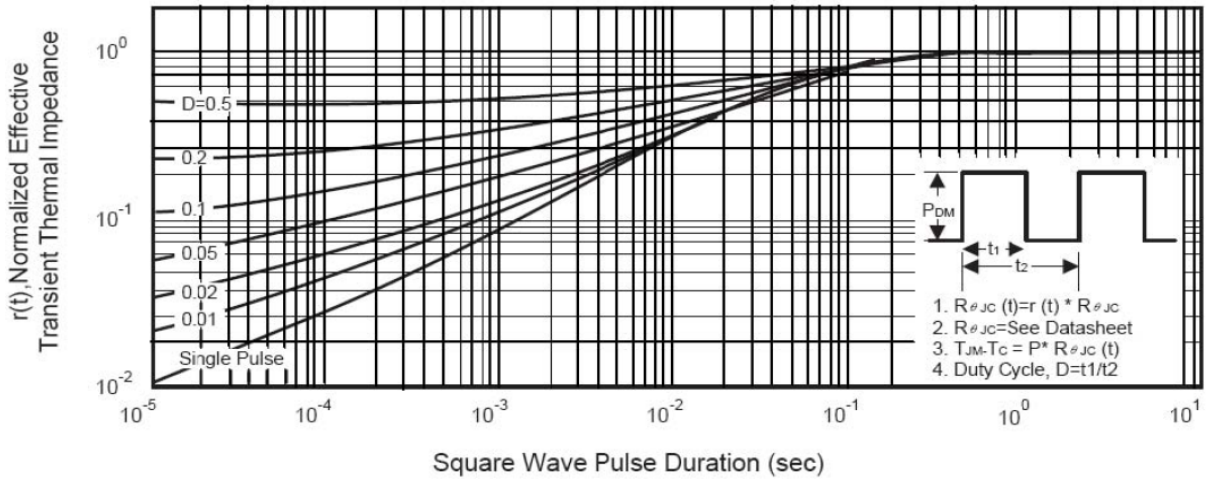
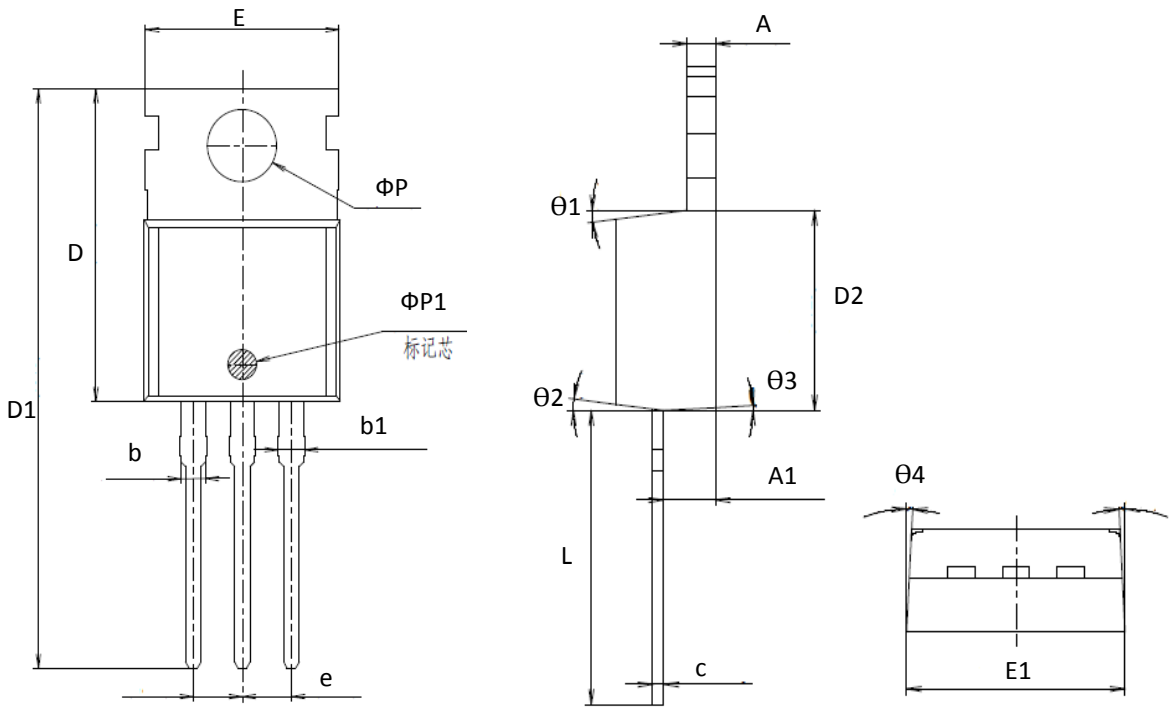



**Figure 8: Normalized Thermal transient Impedance Curve**

## Mechanical Data：

**TO220 PACKAGE OUTLINE DIMENSION_GN**




| Symbol | Dimension In Millimeters | | | Dimension In Inches | | |
|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max |
| A | - | 1.300 | - | - | 0.051 | - |
| A1 | 2.200 | 2.400 | 2.600 | 0.087 | 0.094 | 0.102 |
| b | - | 1.270 | - | - | 0.050 | - |
| b1 | 1.270 | 1.370 | 1.470 | 0.050 | 0.054 | 0.058 |
| c | - | 0.500 | - | - | 0.020 | - |
| D | - | 15.600 | - | - | 0.614 | - |
| D1 | - | 28.700 | - | - | 1.130 | - |
| D2 | - | 9.150 | - | - | 0.360 | - |
| E | 9.900 | 10.000 | 10.100 | 0.390 | 0.394 | 0.398 |
| E1 | - | 10.160 | - | - | 0.400 | - |
| ΦP | - | 3.600 | - | - | 0.142 | - |
| ΦP1 | | 1.500 | | 0.059 | | |
| e | 2.54BSC | | | 0.1BSC | | |
| L | 12.900 | 13.100 | 13.300 | 0.508 | 0.516 | 0.524 |
| θ1 | - | $7^0$ | - | - | $7^0$ | - |
| θ2 | - | $7^0$ | - | - | $7^0$ | - |
| θ3 | - | $3^0$ | - | $5^0$ | $7^0$ | $9^0$ |
| θ4 | - | $3^0$ | - | $1^0$ | $3^0$ | $5^0$ |

## Ordering and Marking Information

**Device Marking: SSF6114**

**Package (Available)**

**TO220**

**Operating Temperature Range**

**C : -55 to 175 ºC**

## Devices per Unit

| Package Type | Units/ Tube | Tubes/Inner Box | Units/Inner Box | Inner Boxes/Carton Box | Units/Carton Box |
|---|---|---|---|---|---|
| TO220 | 50 | 20 | 1000 | 6 | 6000 |

## 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) | $T_J$=125℃ to 175℃ @ 100% of Max $V_{GSS}$ | 168 hours<br>500 hours<br>1000 hours | 3 lots x 77 devices |

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