

Main Product Characteristics

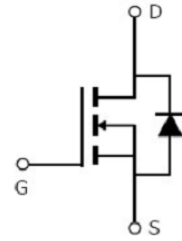
| | |
|--------------|------------------|
| V_{DSS} | 610V |
| $R_{DS(on)}$ | 0.27Ω(typ.) |
| I_D | 15A ^① |



TO-220



Marking and Pin Assignment



Schematic Diagram

Features and Benefits

- High dv/dt and avalanche capabilities
- 100% avalanche tested
- Low input capacitance and gate charge
- Low gate input resistance



Description

The SSF18NS60 combines an innovative super junction technology and advance process. This technology achieves low R_{dson} , energy savings, high reliability and uniformity, superior power density and space saving.

Absolute Max Ratings

| Symbol | Parameter | Max. | Units |
|---------------------------------|--------------------------------------------------|------------------|-------|
| $I_D @ T_C = 25^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10\text{V}$ | 15 ^① | A |
| $I_D @ T_C = 100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10\text{V}$ | 9.4 ^① | |
| I_{DM} | Pulsed Drain Current ^② | 60 | |
| $P_D @ T_C = 25^\circ\text{C}$ | Power Dissipation ^③ | 156 | W |
| | Linear Derating Factor | 1.25 | W/°C |
| V_{DS} | Drain-Source Voltage | 610 | V |
| V_{GS} | Gate-to-Source Voltage | ±30 | V |
| E_{AS} | Single Pulse Avalanche Energy @ L=22.5mH | 180 | mJ |
| I_{AS} | Avalanche Current @ L=22.5mH | 4 | A |
| T_J, T_{STG} | Operating Junction and Storage Temperature Range | -55 to + 150 | °C |

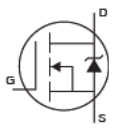
Thermal Resistance

| Symbol | Characteristics | Typ. | Max. | Units |
|-----------------|----------------------------------------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case ③ | — | 0.8 | °C/W |
| $R_{\theta JA}$ | Junction-to-Ambient ($t \leq 10s$) ④ | — | 62 | °C/W |

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

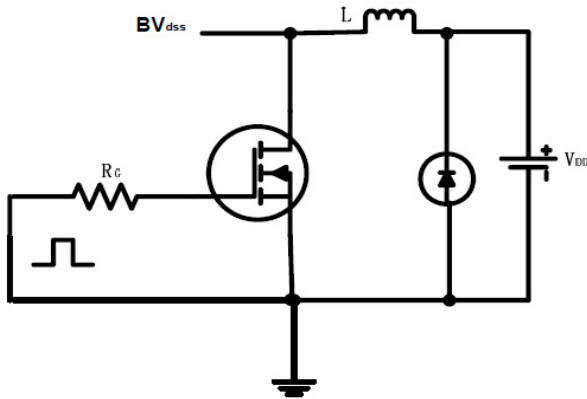
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---------------|--------------------------------------|------|------|------|----------|-----------------------------------|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 610 | — | — | V | $V_{GS} = 0V, I_D = 250\mu A$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-resistance | — | 0.27 | 0.35 | Ω | $V_{GS}=10V, I_D = 9.4A$ |
| | | — | 0.73 | — | | $T_J = 125^\circ C$ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2 | — | 4 | V | $V_{DS} = V_{GS}, I_D = 250\mu A$ |
| | | — | 2.66 | — | | $T_J = 125^\circ C$ |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | 1 | μA | $V_{DS} = 600V, V_{GS} = 0V$ |
| | | — | — | 50 | | $T_J = 125^\circ C$ |
| I_{GSS} | Gate-to-Source Forward Leakage | — | — | 100 | nA | $V_{GS} = 30V$ |
| | | — | — | -100 | | $V_{GS} = -30V$ |
| Q_g | Total Gate Charge | — | 27.0 | — | nC | $I_D = 10A,$ |
| Q_{gs} | Gate-to-Source Charge | — | 6.3 | — | | $V_{DS}=480V,$ |
| Q_{gd} | Gate-to-Drain("Miller") Charge | — | 13.7 | — | | $V_{GS} = 10V$ |
| $t_{d(on)}$ | Turn-on Delay Time | — | 12.3 | — | nS | $V_{GS}=10V, V_{DS} = 480V,$ |
| t_r | Rise Time | — | 24.3 | — | | $R_L=40\Omega,$ |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 27.1 | — | | $R_{GEN}=4.1\Omega$ |
| t_f | Fall Time | — | 19.7 | — | | $I_D = 12A$ |
| C_{iss} | Input Capacitance | — | 949 | — | pF | $V_{GS} = 0V$ |
| C_{oss} | Output Capacitance | — | 783 | — | | $V_{DS} = 25V$ |
| C_{rss} | Reverse Transfer Capacitance | — | 11 | — | | $f = 400KHz$ |

Source-Drain Ratings and Characteristics

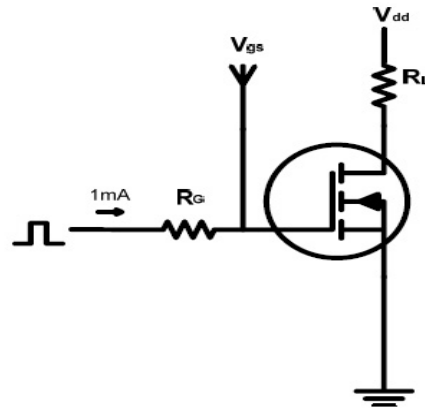
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|-------------------------------------------|------|------|------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 | — | 0.89 | 1.3 | V | $I_S=15A, V_{GS}=0V$ |
| t_{rr} | Reverse Recovery Time | — | 313 | — | nS | $T_J = 25^\circ C, I_F = 15A, di/dt =$ |
| Q_{rr} | Reverse Recovery Charge | — | 3 | — | μC | 100A/ μs |

Test Circuits and Waveforms

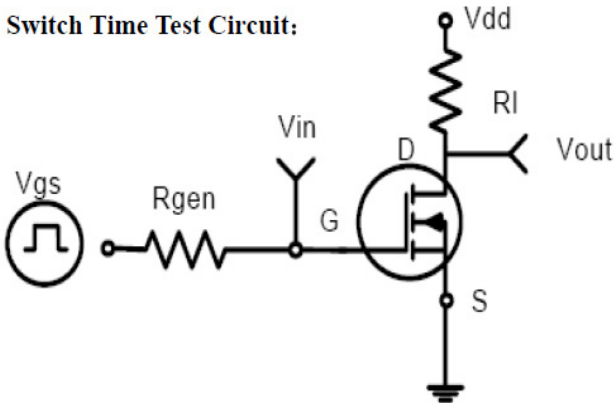
EAS test circuits:



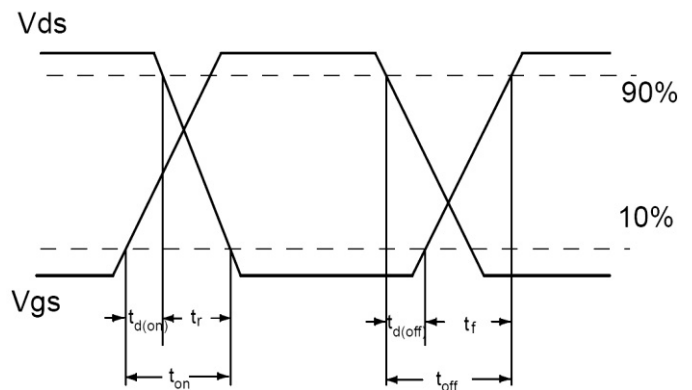
Gate charge test circuit:



Switch Time Test Circuit:



Switching Waveforms:



Notes:

- ① Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A.
- 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

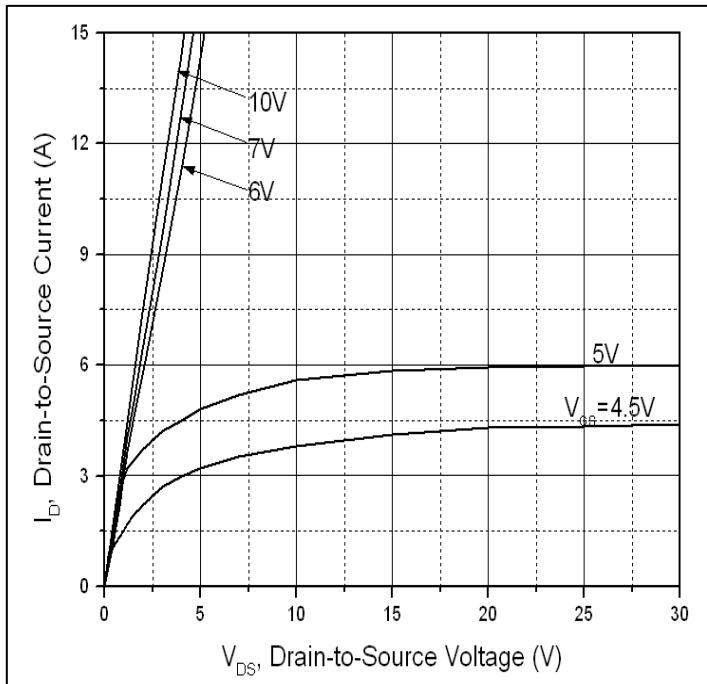


Figure 1. Typical Output Characteristics

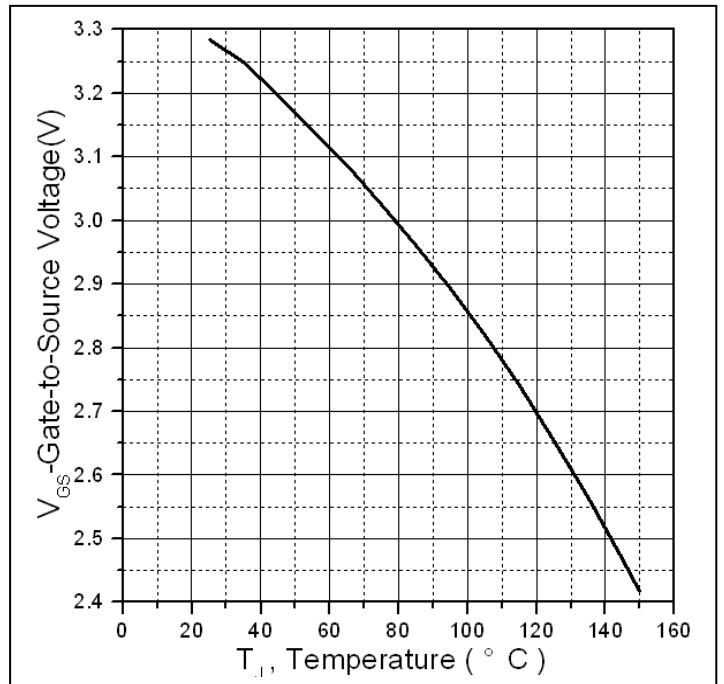


Figure 2. Gate to Source Cut-off Voltage

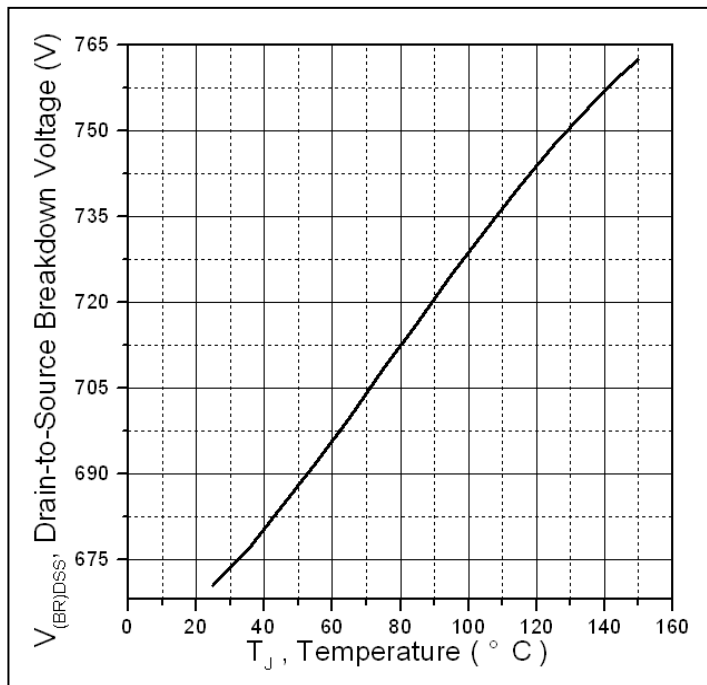


Figure 3. Drain-to-Source Breakdown Voltage vs. Temperature

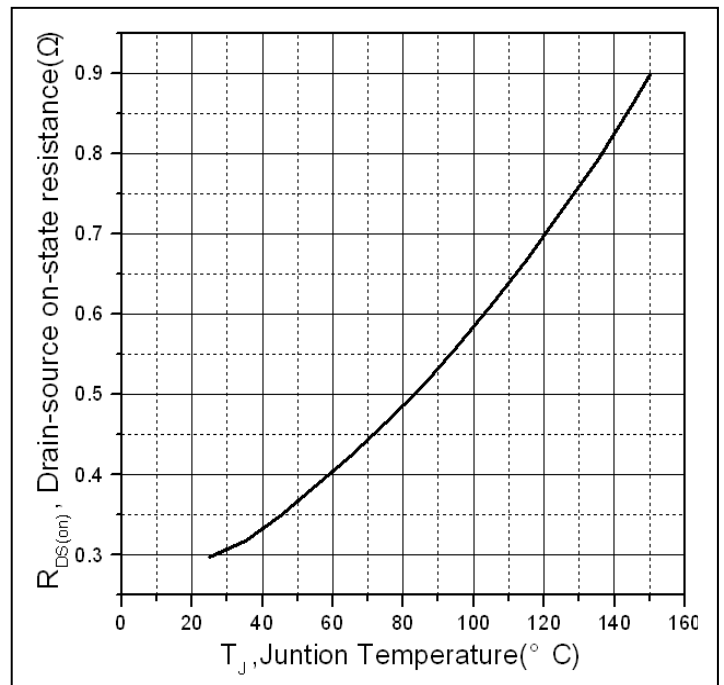


Figure 4. Normalized On-Resistance Vs. Case Temperature

Typical Electrical and Thermal Characteristics

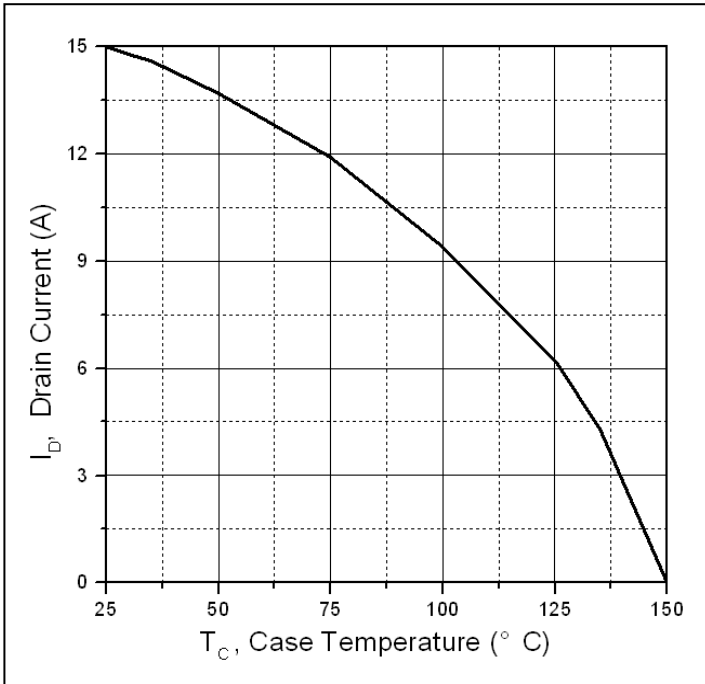


Figure 5. Maximum Drain Current Vs. Case Temperature

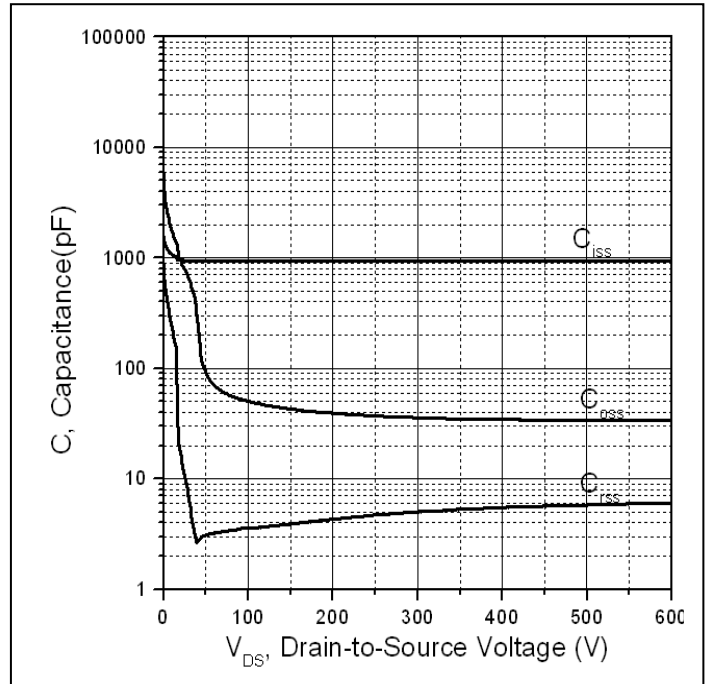
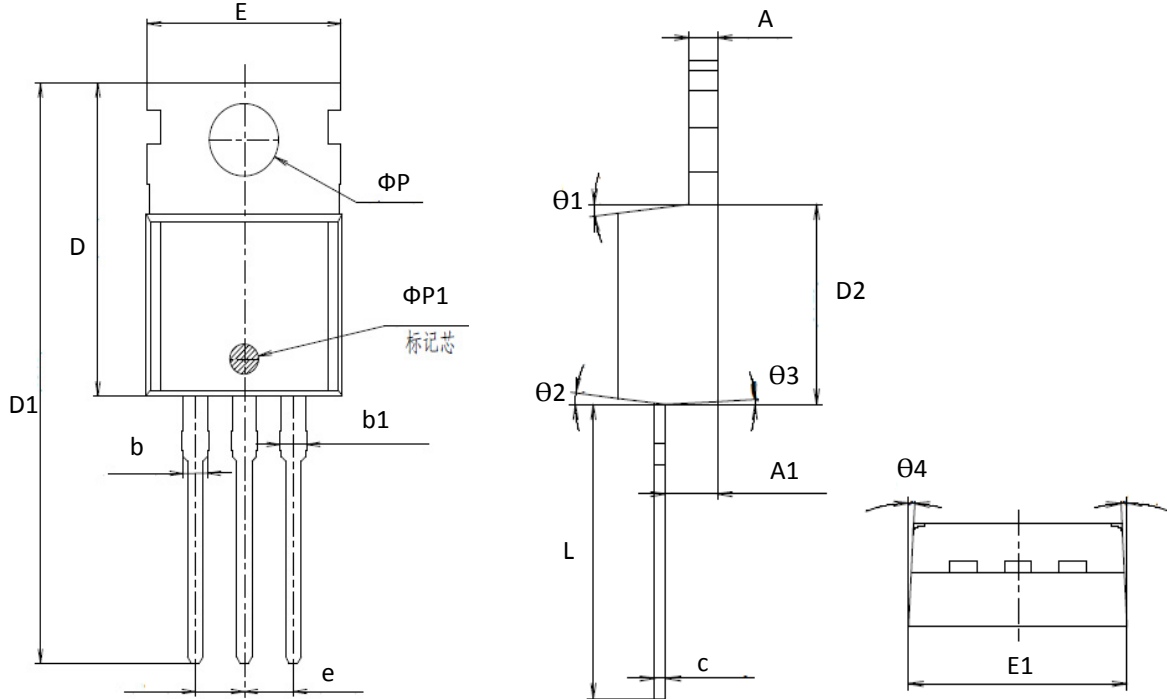


Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage

Mechanical Data

TO-220 PACKAGE OUTLINE DIMENSION



| Symbol | Dimensions In Millimeters | | | Dimensions 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° | - | - | 7° | - |
| θ2 | - | 7° | - | - | 7° | - |
| θ3 | - | 3° | - | 5° | 7° | 9° |
| θ4 | - | 3° | - | 1° | 3° | 5° |

Ordering and Marking Information

Device Marking: SSF18NS60

Package (Available)
 TO-220
 Operating Temperature Range
 C : -55 to 150 °C

Devices per Unit

| Package Type | Units/Tube | Tubes/Inner Box | Units/Inner Box | InnerBoxes/ CartonBox | 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 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 |