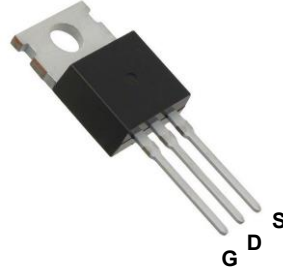
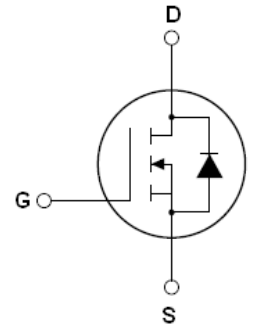


Main Product Characteristics

| | |
|---------------|------------|
| $V_{(BR)DSS}$ | 650V |
| $R_{DS(ON)}$ | 89mΩ(Typ.) |
| | 99mΩ(Max.) |
| I_D | 38A |



TO-220



Schematic Diagram

Features and Benefits

- Advanced MOSFET process technology
- Ideal for battery operated systems, load switching, power converters and other general purpose applications
- Low on-resistance with low gate charge
- Fast switching and reverse body recovery



Description

The SSFH6538 utilizes the latest techniques to achieve high cell density and low on-resistance. These features make this device extremely efficient and reliable for use in high efficiency switch mode power supply and a wide variety of other applications.

Absolute Maximum Ratings and Thermal Characteristics

($T_C=25^{\circ}C$ unless otherwise specified)

| Parameter | Symbol | Value | Unit |
|--|-----------------|-------------|----------------|
| Drain-Source Voltage ($V_{GS}=0V$) | V_{DS} | 650 | V |
| Gate-Source Voltage ($V_{DS}=0V$) AC ($f>1$ Hz) | V_{GS} | ± 30 | V |
| Continuous Drain Current at $T_C=25^{\circ}C$ | $I_{D(DC)}$ | 38 | A |
| Continuous Drain Current at $T_C=100^{\circ}C$ | $I_{D(DC)}$ | 24 | A |
| Pulsed Drain Current ¹ | $I_{DM(pluse)}$ | 152 | A |
| Maximum Power Dissipation($T_C=25^{\circ}C$) | P_D | 322 | W |
| Derate above $25^{\circ}C$ | | 2.58 | W/ $^{\circ}C$ |
| Single Pulse Avalanche Energy ² | E_{AS} | 841 | mJ |
| Avalanche Current ¹ | I_{AR} | 7 | A |
| Repetitive Avalanche Energy, t_{AR} Limited by T_{JMAX} ¹ | E_{AR} | 3.9 | mJ |
| Drain Source Voltage Slope, $V_{DS}\leq 480V$, | dv/dt | 50 | V/nS |
| Reverse Diode dv/dt , $V_{DS}\leq 480V$, $I_{SD}<I_D$ | dv/dt | 50 | V/nS |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 to +150 | $^{\circ}C$ |
| Thermal Resistance, Junction-to-Case (Maximum) | $R_{\theta JC}$ | 0.39 | $^{\circ}C/W$ |
| Thermal Resistance, Junction-to-Ambient (Maximum) | $R_{\theta JA}$ | 62 | $^{\circ}C/W$ |

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

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|--|--------------|---|-----|------|-----------|------------|
| On/off States | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=500\mu A$ | 650 | -- | -- | V |
| Zero Gate Voltage Drain Current($T_C=25^\circ\text{C}$) | I_{DSS} | $V_{DS}=650V, V_{GS}=0V$ | -- | -- | 3 | μA |
| Zero Gate Voltage Drain Current($T_C=125^\circ\text{C}$) | I_{DSS} | $V_{DS}=650V, V_{GS}=0V$ | -- | -- | 100 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | -- | -- | ± 100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$ | 3 | 3.5 | 4 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=19A$ | -- | 89 | 99 | m Ω |
| Dynamic Characteristics | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS}=50V, V_{GS}=0V, F=1.0\text{MHz}$ | -- | 2800 | 3200 | pF |
| Output Capacitance | C_{oss} | | -- | 97 | -- | pF |
| Reverse Transfer Capacitance | C_{rss} | | -- | 1.5 | -- | pF |
| Total Gate Charge | Q_g | $V_{DS}=480V, I_D=38A, V_{GS}=10V$ | -- | 45 | 55 | nC |
| Gate-Source Charge | Q_{gs} | | -- | 15 | -- | nC |
| Gate-Drain Charge | Q_{gd} | | -- | 11.5 | -- | nC |
| Switching Times | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=380V, I_D=19A, R_G=1.7\Omega, V_{GS}=10V$ | -- | 16 | -- | nS |
| Turn-on Rise Time | t_r | | -- | 13 | -- | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | -- | 71 | -- | nS |
| Turn-Off Fall Time | t_f | | -- | 13 | -- | nS |
| Source- Drain Diode Characteristics | | | | | | |
| Source-drain Current(Body Diode) | I_{SD} | $T_C=25^\circ\text{C}$ | -- | -- | 38 | A |
| Pulsed Source-drain Current(Body Diode) | I_{SDM} | | -- | -- | 152 | A |
| Forward On Voltage | V_{SD} | $T_J=25^\circ\text{C}, I_{SD}=28A, V_{GS}=0V$ | -- | 0.9 | 1.2 | V |
| Reverse Recovery Time | t_{rr} | $T_J=25^\circ\text{C}, I_F=19A, di/dt=100A/\mu S$ | -- | 180 | -- | nS |
| Reverse Recovery Charge | Q_{rr} | | -- | 1.6 | -- | μC |
| Peak Reverse Recovery Current | I_{rrm} | | -- | 18 | -- | A |

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature

2. $T_J=25^\circ\text{C}, V_{DD}=50V, V_G=10V, R_G=25\Omega$

Typical Electrical and Thermal Characteristic Curves

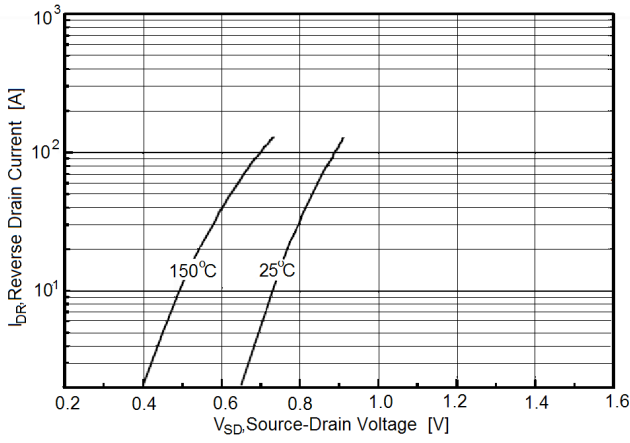


Figure 1. Source-Drain Diode Forward Voltage

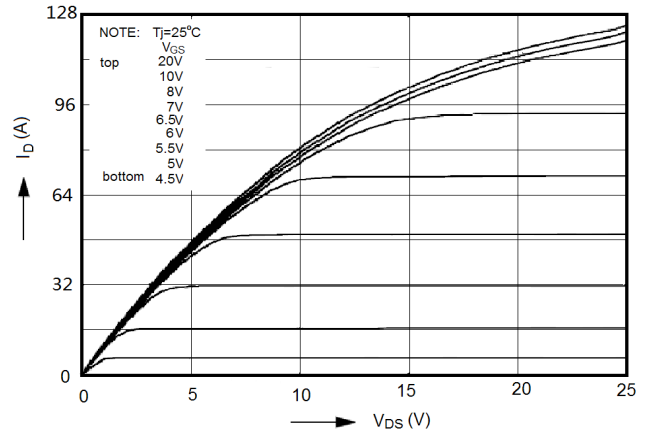


Figure 2. Output Characteristics

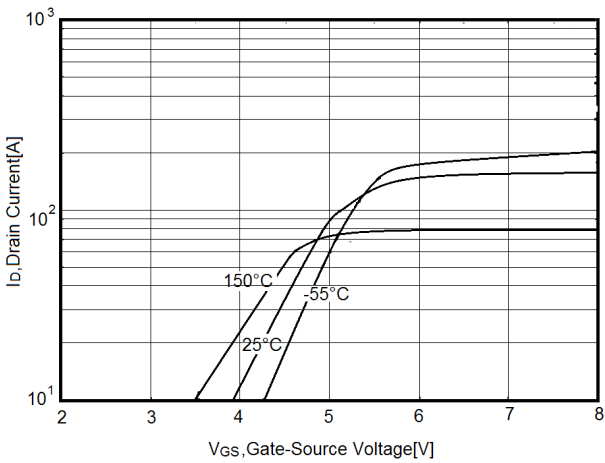


Figure 3. Transfer Characteristics

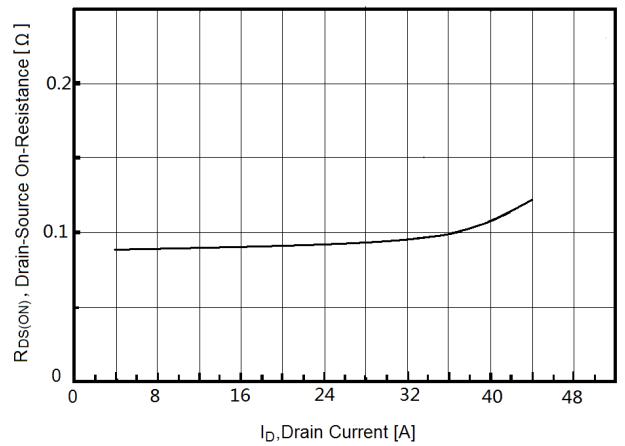


Figure 4. Static Drain-source on Resistance

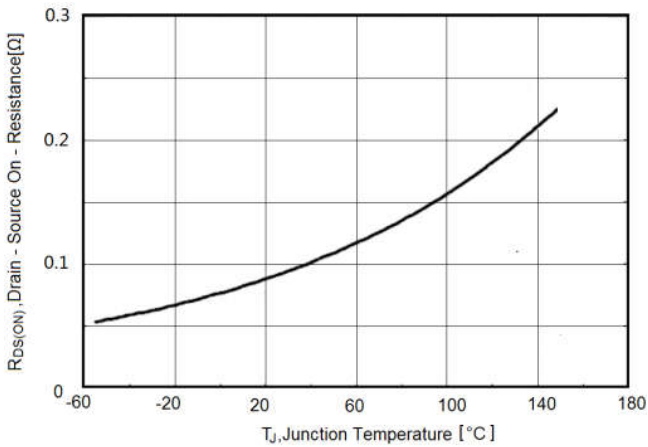


Figure 5. R_{DS(ON)} vs Junction Temperature

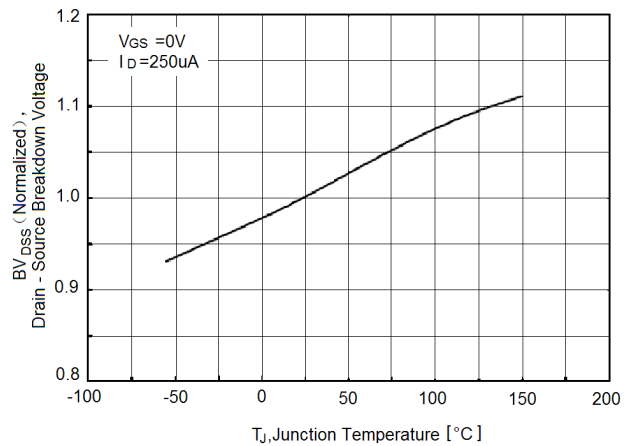


Figure 6. BV_{DSS} vs Junction Temperature

Typical Electrical and Thermal Characteristic Curves

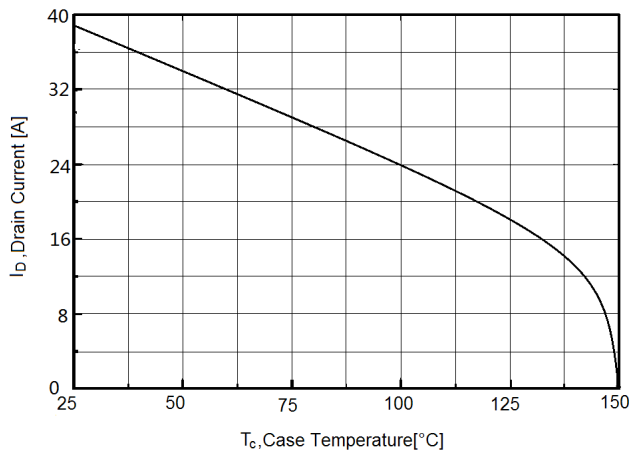


Figure 7. Maximum I_D vs Junction Temperature

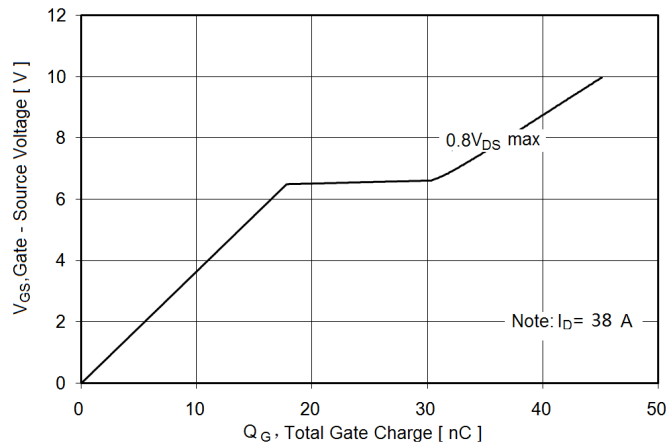


Figure 8. Gate Charge Waveforms

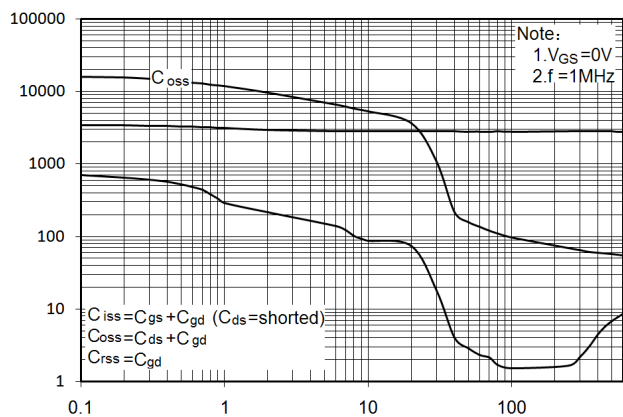


Figure 9. Capacitance

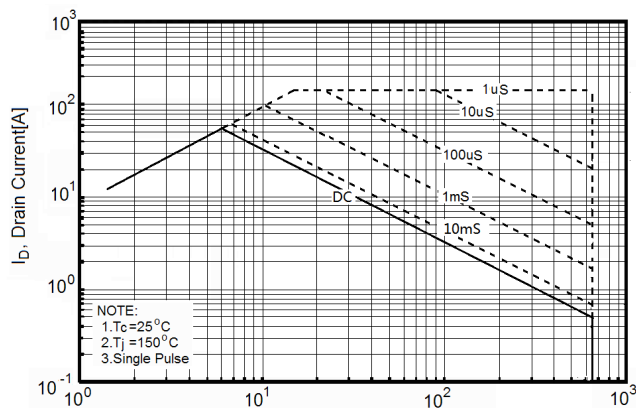


Figure 10. Safe Operating Area

Test Circuit & Waveform

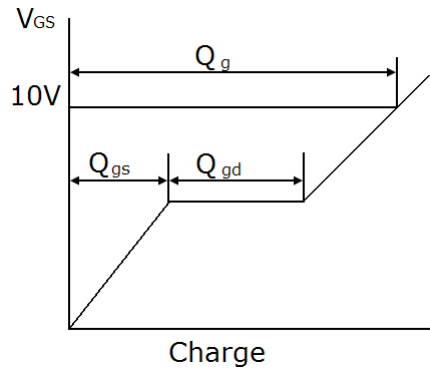
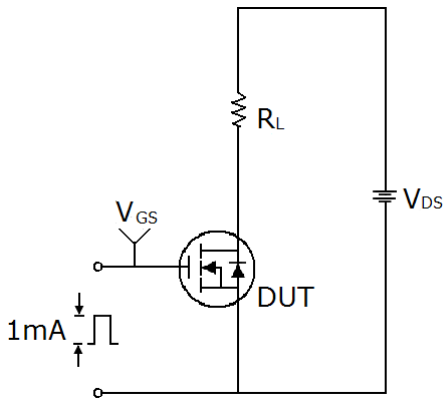


Figure 11. Gate Charge Test Circuit & Waveform

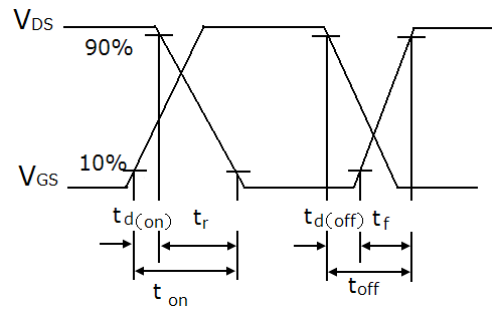
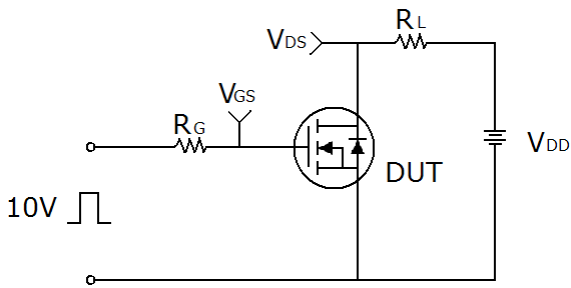


Figure 12. Switch Time Test Circuit & Waveform

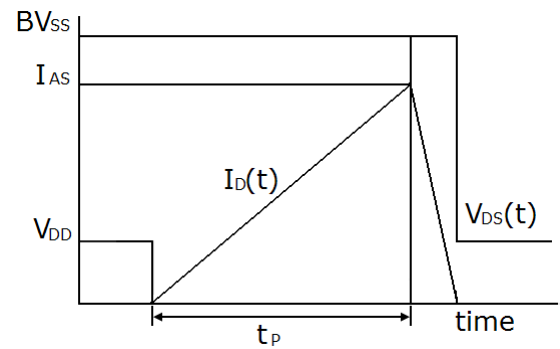
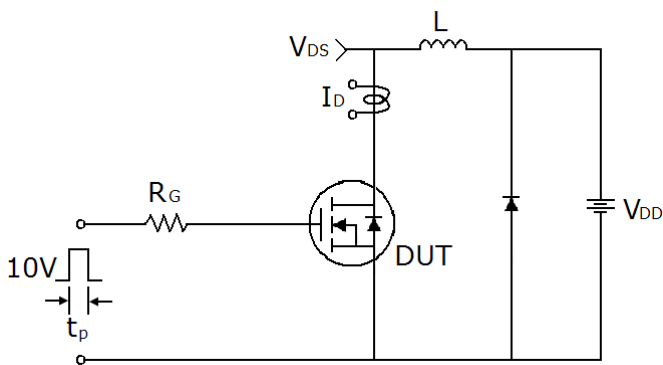
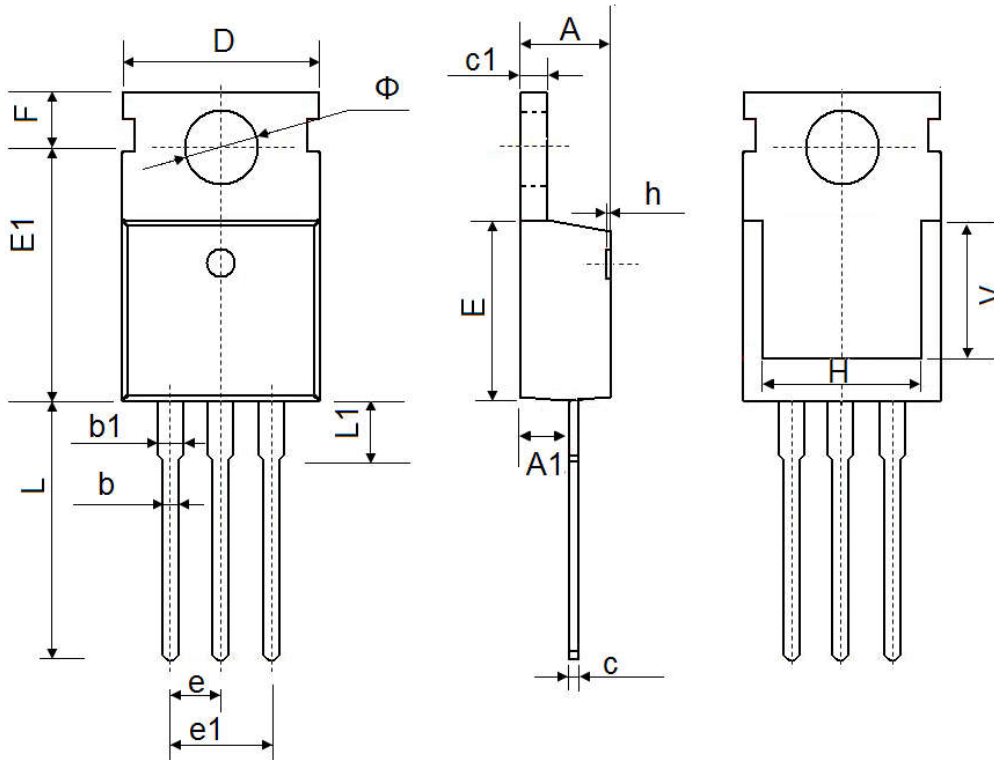


Figure 13. Unclamped Inductive Switching Test Circuit & Waveforms

Package Outline Dimensions

TO-220



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 4.400 | 4.600 | 0.173 | 0.181 |
| A1 | 2.250 | 2.550 | 0.089 | 0.100 |
| b | 0.710 | 0.910 | 0.028 | 0.036 |
| b1 | 1.170 | 1.370 | 0.046 | 0.054 |
| c | 0.330 | 0.650 | 0.013 | 0.026 |
| c1 | 1.200 | 1.400 | 0.047 | 0.055 |
| D | 9.910 | 10.250 | 0.390 | 0.404 |
| E | 8.9500 | 9.750 | 0.352 | 0.384 |
| E1 | 12.650 | 12.950 | 0.498 | 0.510 |
| e | 2.540 TYP. | | 0.100 TYP. | |
| e1 | 4.980 | 5.180 | 0.196 | 0.204 |
| F | 2.650 | 2.950 | 0.104 | 0.116 |
| H | 7.900 | 8.100 | 0.311 | 0.319 |
| h | 0.000 | 0.300 | 0.000 | 0.012 |
| L | 12.900 | 13.400 | 0.508 | 0.528 |
| L1 | 2.850 | 3.250 | 0.112 | 0.128 |
| V | 7.500 REF. | | 0.295 REF. | |
| φ | 3.400 | 3.800 | 0.134 | 0.150 |