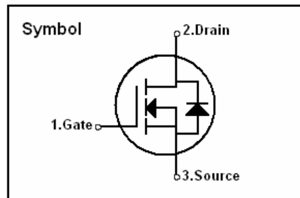
SHENZHEN HAOLIN ELECTRONICS TECHNOLOGY CO., LTD

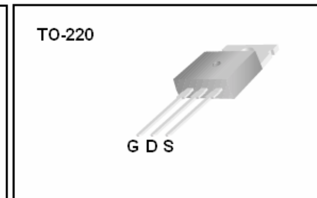
# TO-220F/TO-220 Plastic-Encapsulate Transistors

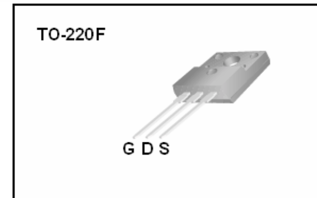
## *600V N-Channel MOSFET*

### Features

- 7.5A,600v,RDS(on)=1.2Ω@VGS=10V
- Gate charge (Typical 30nC)
- High ruggedness
- Fast switching
- 100% AvalancheTested
- Improved dv/dt capability




### General Description

This Power MOSFET is produced using Truesemi's advanced planar stripe, DMOS technology. This latest technology has been especially designed to minimize on-state resistance, have a high rugged avalanche characteristics. These devices are well suited for high efficiency switch mode power supplies, active power factor correction, electronic lamp ballasts based on half bridge topology.

### Absolute Maximum Ratings

| Symbol | Parameter | HF8N60M | HP8N60 | Units |
|---|---|---|---|---|
| VDSS | Drain to Source Voltage | 600 | | V |
| ID | Continuous Drain Current(@TC = 25°C) | 7.5 | 7.5* | A |
| | Continuous Drain Current(@TC = 100°C) | 4.5 | 4.5* | A |
| IDM | Drain Current Pulsed (Note 1) | 30 | 30* | A |
| VGS | Gate to Source Voltage | ±30 | | V |
| EAS | Single Pulsed Avalanche Energy (Note 2) | 285 | | mJ |
| EAR | Repetitive Avalanche Energy (Note 1) | 15.5 | | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | 4.5 | | V/ns |
| PD | Total Power Dissipation(@TC = 25 °C) | 165 | 55 | W |
| | Derating Factor above 25 °C | 1.21 | 0.4 | W/°C |
| TSTG, TJ | Operating Junction Temperature & Storage Temperature | -55 ~ 150 | | °C |
| TL | Maximum Lead Temperature for soldering purpose, 1/8 from Case for 5 seconds. | 300 | | °C |

### Thermal Characteristics

| Symbol | Parameter | HF8N60 | HP8N60 | Units |
|---|---|---|---|---|
| RθJC | Thermal Resistance, Junction-to-Case | 0.85 | 2.2 | °C/W |
| RθCS | Thermal Resistance, Case-to-Sink Typ | 0.5 | -- | °C/W |
| RθJA | Thermal Resistance, Junction-to-Ambient | 62.5 | 62.5 | °C/W |

## Electrical Characteristics ( TC = 25 °C unless otherwise noted )

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = 250uA | 600 | -- | -- | V |
| $\Delta BV_{DSS} / \Delta T_J$ | Breakdown Voltage Temperature coefficient | $I_D$ = 250uA, referenced to 25 °C | -- | 0.57 | -- | V/°C |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$ = 600V, $V_{GS}$ = 0V | -- | -- | 10 | uA |
| | | $V_{DS}$ = 480V, $T_C$ = 125 °C | -- | -- | 100 | uA |
| $I_{GSS}$ | Gate-Source Leakage, Forward | $V_{GS}$ = 30V, $V_{DS}$ = 0V | -- | -- | 100 | nA |
| | Gate-source Leakage, Reverse | $V_{GS}$ = -30V, $V_{DS}$ = 0V | -- | -- | -100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250uA | 2.0 | -- | 4.0 | V |
| $R_{DS(ON)}$ | Static Drain-Source On-state Resistance | $V_{GS}$ =10 V, $I_D$ = 3.75A | -- | 0.85 | 1.2 | Ω |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$ =0 V, $V_{DS}$ =25V, f = 1MHz | -- | 1255 | -- | pF |
| $C_{oss}$ | Output Capacitance | | -- | 115 | -- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | -- | 14.2 | -- | |
| **Dynamic Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD}$ =300V, $I_D$ =7.5A, $R_G$ =25Ω (Note 4, 5) | -- | 22 | -- | ns |
| $t_r$ | Rise Time | | -- | 90 | -- | |
| $t_{d(off)}$ | Turn-off Delay Time | | -- | 76 | -- | |
| $t_f$ | Fall Time | | -- | 44 | -- | |
| $Q_g$ | Total Gate Charge | $V_{DS}$ =480V, $V_{GS}$ =10V, $I_D$ =7.5A (Note 4, 5) | -- | 30 | -- | nC |
| $Q_{gs}$ | Gate-Source Charge | | -- | 5.2 | -- | |
| $Q_{gd}$ | Gate-Drain Charge(Miller Charge) | | -- | 16.3 | -- | |

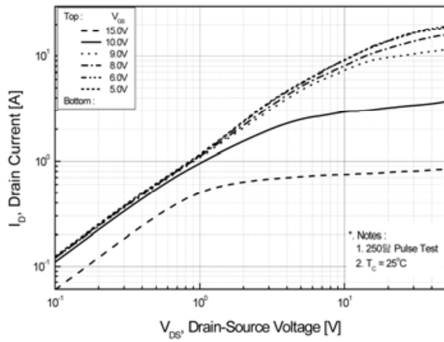
## Source-Drain Diode Ratings and Characteristics

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit. |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current | Integral Reverse p-n Junction | -- | -- | 7.5 | A |
| $I_{SM}$ | Pulsed Source Current | Diode in the MOSFET | -- | -- | 30 | |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=7.5A, $V_{GS}$ =0V | -- | -- | 1.5 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_S$=7.5A, $V_{GS}$=0V,d$I_F$/dt=100A/us | -- | 390 | -- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | $I_S$=7.5A, $V_{GS}$=0V,d$I_F$/dt=100A/us | -- | 3.3 | -- | uC |

※ NOTES

1. Repeativity rating : pulse width limited by junction temperature
2. L = 20mH, $I_{AS}$ =7.5A, $V_{DD}$ = 50V, $R_G$ = 50Ω , Starting $T_J$ = 25°C
3. $I_{SD}$ ≤ 7.5A, di/dt ≤ 200A/us, $V_{DD}$ ≤ $BV_{DSS}$, Starting $T_J$ = 25°C
4. Pulse Test : Pulse Width ≤ 300us, Duty Cycle ≤ 2%
5. Essentially independent of operating temperature

**Fig 1. On-State Characteristics**



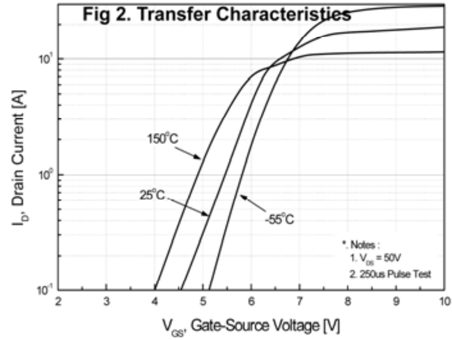




**Fig 3. On Resistance Variation vs. Drain Current and Gate Voltage**

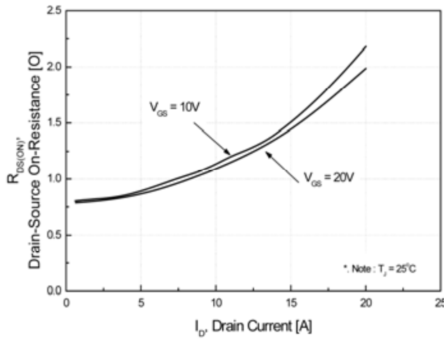



**Fig 4. On State Current vs.**

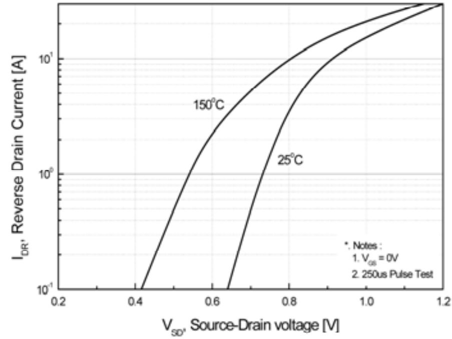



**Fig 5. Capacitance Characteristics ( Non-Repetitive )**

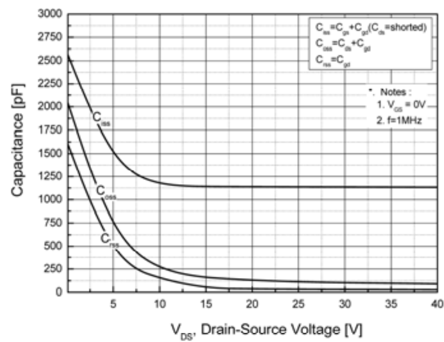



**Fig 6. Gate Charge Characteristics**

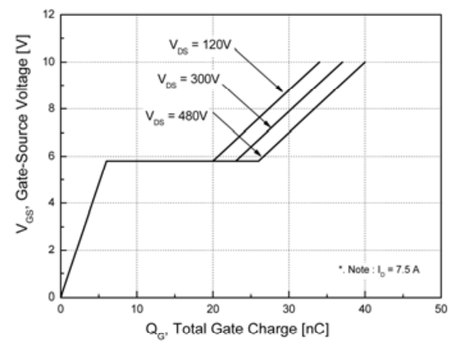


**Fig 7. Breakdown Voltage Variation vs. Junction Temperature**

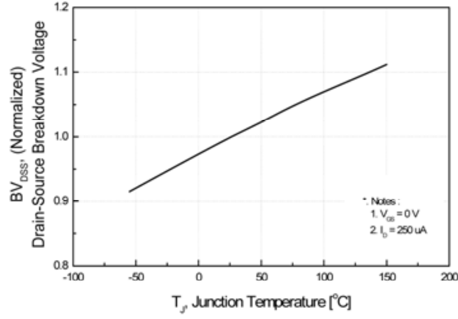



**Fig 8. On-Resistance Variation vs. Junction Temperature**

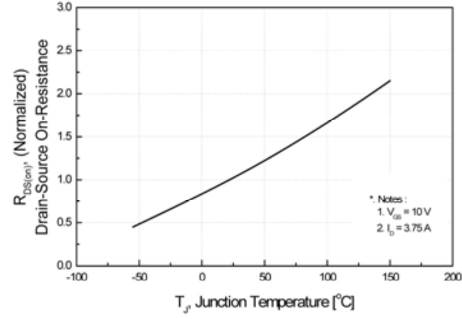



**Fig 9-1 . Maximum Safe Operating Area fo TSP8N60M**

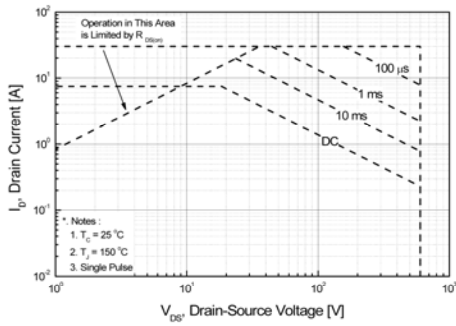



**Fig 9-2 . Maximum Safe Operating Area for TSF8N60M**

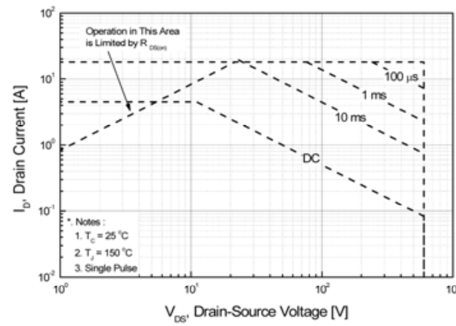



**Fig 10. Maximum Drain Current vs. Case Temperature**

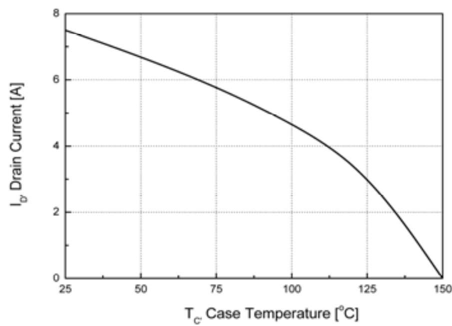


Fig 11-1 . Transient Thermal Response Curve fo TSP8N60M

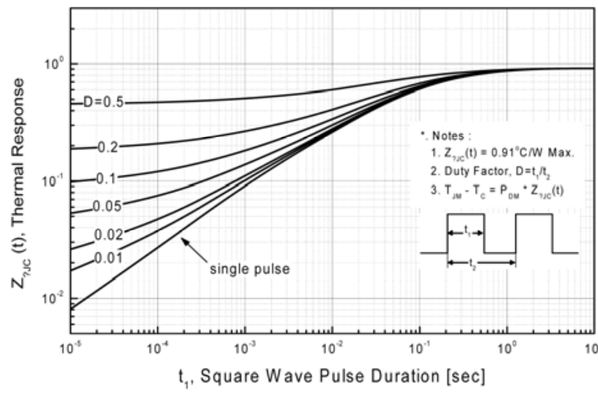



Fig 11-2 . Transient Thermal Response Curve for TSF8N60M

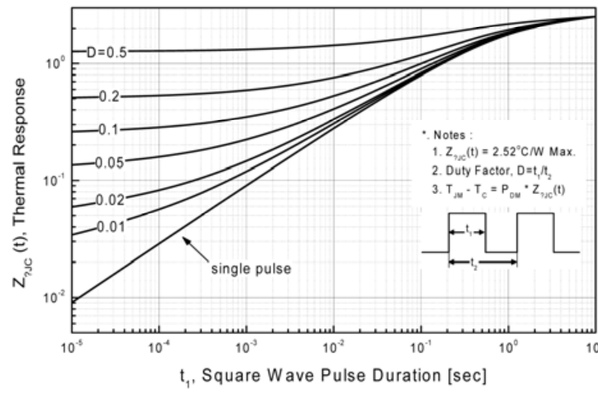


Fig. 12. Gate Charge Test Circuit & Waveforms

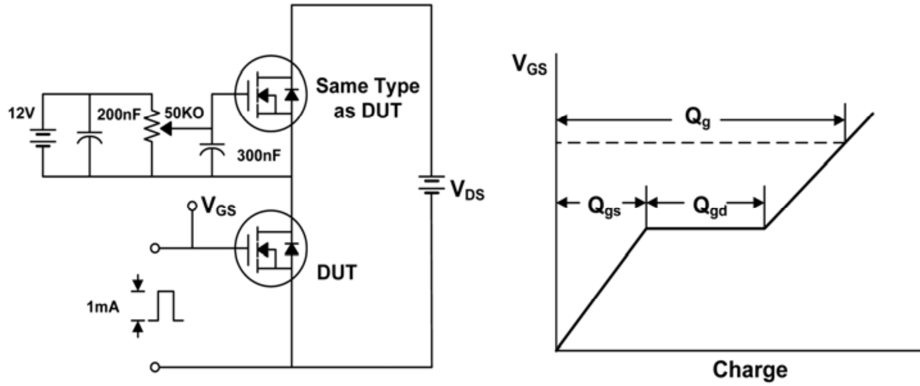



Fig 13. Switching Time Test Circuit & Waveforms

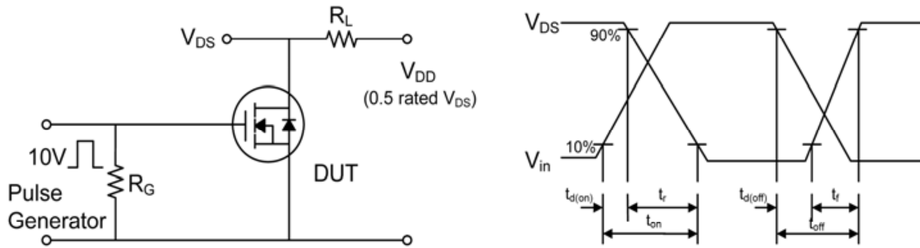



Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

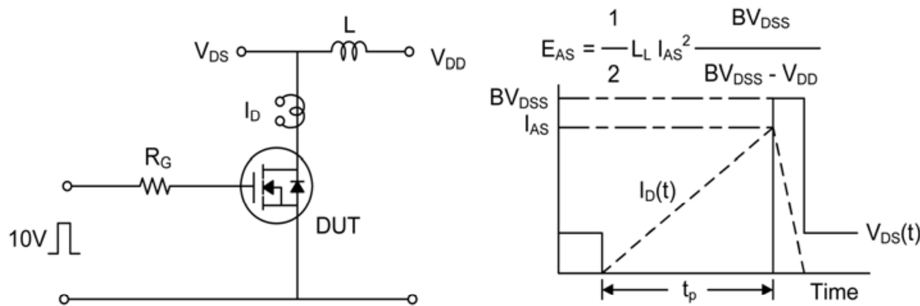


**Fig. 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms**