



SLP5N65S / SLF5N65S

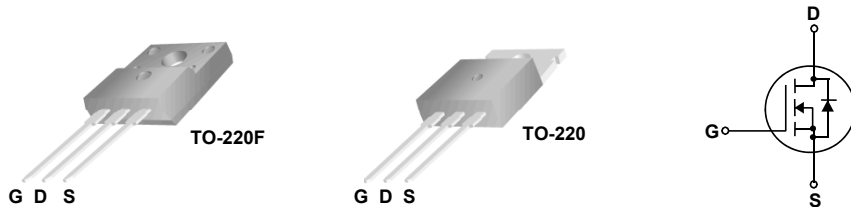
SLP5N65S / SLF5N65S 650V N-Channel MOSFET

General Description

This Power MOSFET is produced using Maple semi's advanced planar stripe DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies, active power factor correction based on half bridge topology.

Features

- 4.5A, 650V, $R_{DS(on)} = 2.5\Omega @ V_{GS} = 10V$
- Low gate charge (typical 13.3nC)
- High ruggedness
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



Absolute Maximum Ratings T_C = 25° C unless otherwise noted

| Symbol | Parameter | SLP5N65S | SLF5N65S | Units |
|-----------------------------------|---|-------------|----------|-------|
| V _{DSS} | Drain-Source Voltage | 650 | | V |
| I _D | Drain Current - Continuous (T _C = 25°C) - Continuous (T _C = 100°C) | 4.5 | | A |
| | | 2.5 | | A |
| I _{DM} | Drain Current - Pulsed (Note 1) | 16 | | A |
| V _{GSS} | Gate-Source Voltage | ±30 | | V |
| E _{AS} | Single Pulsed Avalanche Energy (Note 2) | 128 | | mJ |
| I _{AR} | Avalanche Current (Note 1) | 4.5 | | A |
| E _{AR} | Repetitive Avalanche Energy (Note 1) | 3.5 | | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | 5.5 | | V/ns |
| P _D | Power Dissipation (T _C = 25°C) | 104 | 36 | W |
| T _J , T _{STG} | Operating and Storage Temperature Range | -55 to +150 | | °C |
| T _L | Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds | 300 | | °C |

Thermal Characteristics

| Symbol | Parameter | Max | | Units |
|------------------|---|----------|----------|-------|
| | | SLP5N65S | SLF5N65S | |
| R _{θJC} | Thermal Resistance, Junction-to-Case | 1.20 | 3.47 | °C/W |
| R _{θJS} | Thermal Resistance, Case-to-Sink Typ. | 62.5 | 62.5 | °C/W |
| R _{θJA} | Thermal Resistance, Junction-to-Ambient | 110 | 110 | °C/W |

Electrical Characteristics $T_C = 25^\circ \text{C}$ unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|--|-----|------|------|---------------------|
| Off Characteristics | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0 \text{ V}, I_D = 250 \text{ }\mu\text{A}$ | 650 | -- | -- | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250 \text{ }\mu\text{A}$, Referenced to 25°C | -- | 0.6 | -- | V/ $^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 650 \text{ V}, V_{GS} = 0 \text{ V}$ | -- | -- | 25 | μA |
| | | $V_{DS} = 520 \text{ V}, T_C = 125^\circ\text{C}$ | -- | -- | 250 | μA |
| I_{GSSF} | Gate-Body Leakage Current, Forward | $V_{GS} = 30 \text{ V}, V_{DS} = 0 \text{ V}$ | -- | -- | 100 | nA |
| I_{GSSR} | Gate-Body Leakage Current, Reverse | $V_{GS} = -30 \text{ V}, V_{DS} = 0 \text{ V}$ | -- | -- | -100 | nA |
| On Characteristics | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250 \text{ }\mu\text{A}$ | 2.0 | -- | 4.0 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS} = 10 \text{ V}, I_D = 2.0 \text{ A}$ | -- | 1.8 | 2.5 | Ω |
| g_{FS} | Forward Transconductance | $V_{DS} = 40 \text{ V}, I_D = 2.0 \text{ A}$ (Note 4) | -- | 2.5 | -- | S |
| Dynamic Characteristics | | | | | | |
| C_{iss} | Input Capacitance | $V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1.0 \text{ MHz}$ | -- | 590 | -- | pF |
| C_{oss} | Output Capacitance | | -- | 48 | -- | pF |
| C_{riss} | Reverse Transfer Capacitance | | -- | 5 | -- | pF |
| Switching Characteristics | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 300 \text{ V}, I_D = 4.5 \text{ A},$ $R_G = 25 \text{ }\Omega$ (Note 4, 5) | -- | 23 | -- | ns |
| t_r | Turn-On Rise Time | | -- | 33 | -- | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 61 | -- | ns |
| t_f | Turn-Off Fall Time | | -- | 200 | -- | ns |
| Q_g | Total Gate Charge | $V_{DS} = 480 \text{ V}, I_D = 4.5 \text{ A},$ $V_{GS} = 10 \text{ V}$ (Note 4, 5) | -- | 13.3 | -- | nC |
| Q_{gs} | Gate-Source Charge | | -- | 3.0 | -- | nC |
| Q_{gd} | Gate-Drain Charge | | -- | 4.8 | -- | nC |
| Drain-Source Diode Characteristics and Maximum Ratings | | | | | | |
| I_S | Maximum Continuous Drain-Source Diode Forward Current | | -- | -- | 4.5 | A |
| I_{SM} | Maximum Pulsed Drain-Source Diode Forward Current | | -- | -- | 16 | A |
| V_{SD} | Drain-Source Diode Forward Voltage | $V_{GS} = 0 \text{ V}, I_S = 4.5 \text{ A}$ | -- | -- | 1.4 | V |
| t_{rr} | Reverse Recovery Time | $V_{GS} = 0 \text{ V}, I_S = 4.5 \text{ A},$ | -- | 390 | -- | ns |
| Q_{rr} | Reverse Recovery Charge | $di_F / dt = 100 \text{ A}/\mu\text{s}$ (Note 4) | -- | 1.5 | -- | μC |

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $I_{AS} = 4.5 \text{ A}, L = 25 \text{ mH}, V_{DD} = 50 \text{ V}, R_G = 25 \text{ }\Omega$, Starting $T_J = 25^\circ \text{C}$
3. $I_{SD} \leq 4.5 \text{ A}, di/dt \leq 200 \text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ \text{C}$
4. Pulse Test : Pulse width $\leq 300 \mu\text{s}$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Typical Characteristics

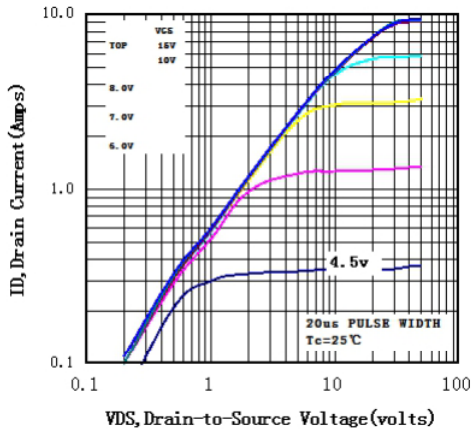


Figure 1. Typical Output Characteristics
Tc=25°C

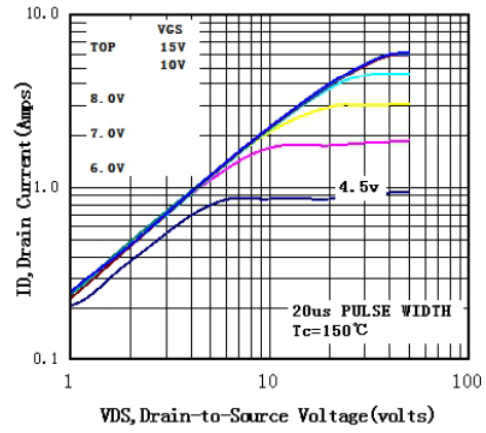


Figure 2. Typical Output Characteristics
Tc=150°C

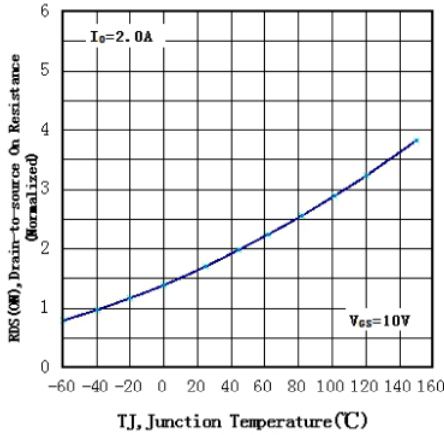


Figure 3. Normalized Resistance VS
Temperature

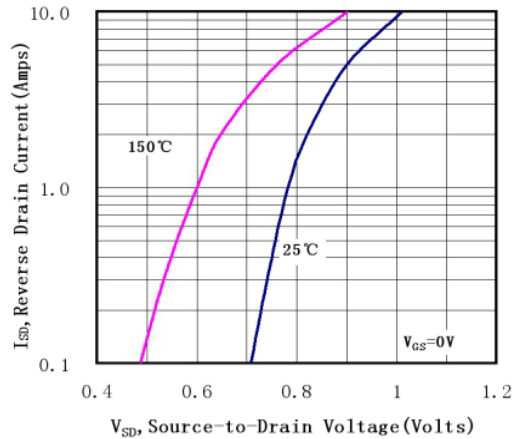


Figure 4. Typical Source-Drain Diode
Forward Voltage

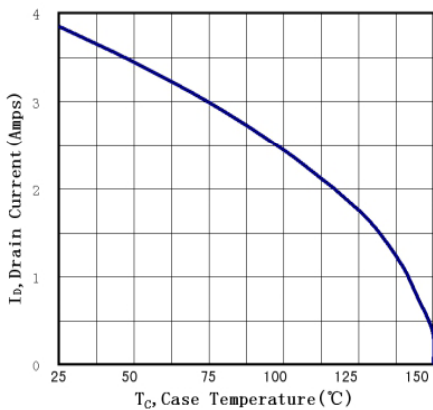


Figure 5. Maximum Current VS
Case Temperature

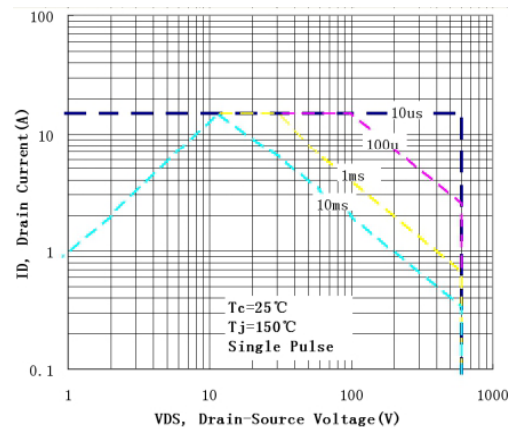


Figure 6-1. Maximum Safe Operating Area
TO-220F

Typical Characteristics (Continued)

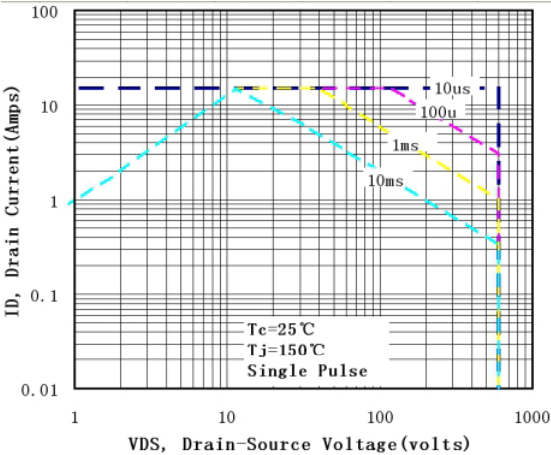
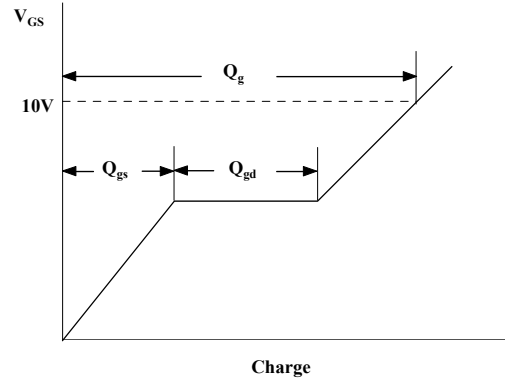
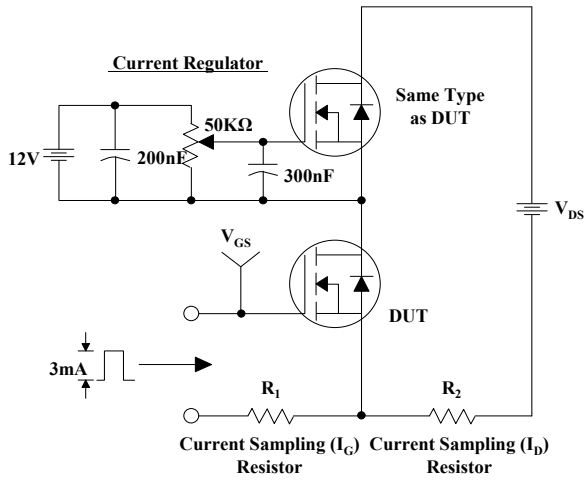
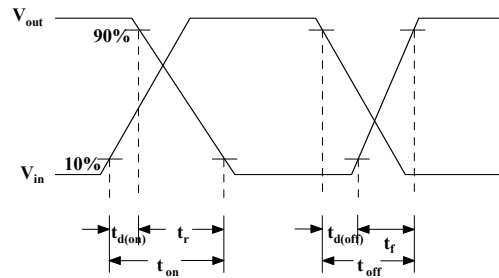
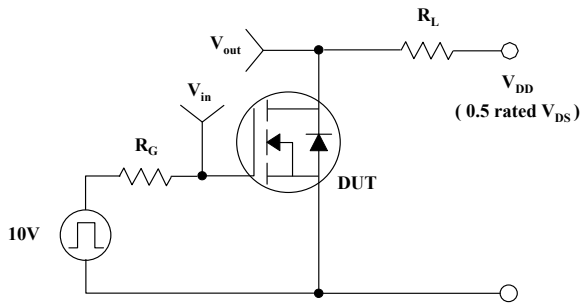


Figure 6-2. Maximum Safe Operating Area TO-220

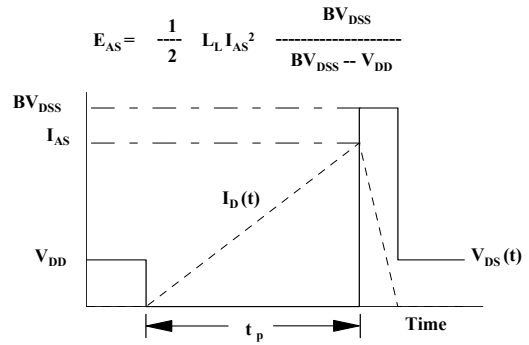
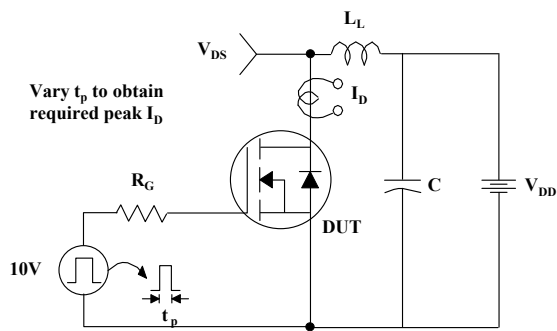
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms

