

SLP5N65S/SLF5N65S

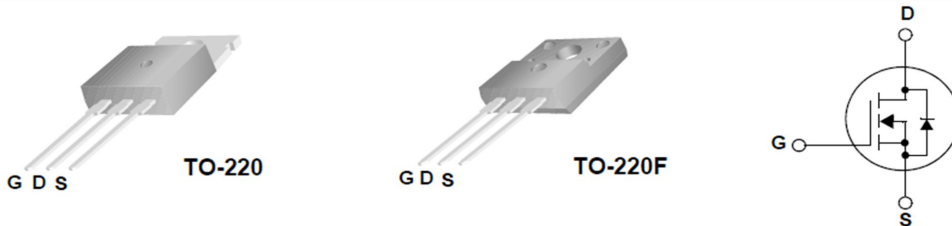
650V N-Channel MOSFET

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, $R_{DS(on)Max} = 2.5\Omega @ V_{GS} = 10V$
- Low gate charge (typical 13nC)
- High ruggedness
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



Absolute Maximum Ratings

$T_C = 25^\circ C$ unless otherwise noted

Symbol	Parameter	SLP5N65S	SLF5N65S	Units
V_{DSS}	Drain-Source Voltage	650		V
I_D	Drain Current - Continuous ($T_C = 25^\circ C$)	4.5		A
	- Continuous ($T_C = 100^\circ C$)	2.4		A
I_{DM}	Drain Current - Pulsed (Note 1)	16		A
V_{GSS}	Gate-Source Voltage	± 30		V
EAS	Single Pulsed Avalanche Energy (Note 2)	113		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 ($T_C = 25^\circ C$)	106	36	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150		$^\circ C$
T_L	Maximum lead temperature for soldering purposes,	300		$^\circ C$
	1/8" from case for 5 seconds			

Thermal Characteristics

Symbol	Parameter	Max.		Units
		SLP5N65S	SLF5N65S	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.20	3.47	$^\circ C/W$
$R_{\theta JS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	--	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	$^\circ C/W$

Electrical Characteristics

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \text{ }\mu\text{A}$	650	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \text{ }\mu\text{A}$, Referenced to 25°C	--	0.6	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650 \text{ V}, V_{GS} = 0 \text{ V}$	--	--	10	μA
		$V_{DS} = 520 \text{ V}, T_C = 125^\circ\text{C}$	--	--	50	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	$V_{GS} = 10 \text{ V}, I_D = 2.0 \text{ A}$	--	2.0	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	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, f = 1.0 \text{ MHz}$	--	600	--	pF
C_{oss}	Output Capacitance		--	53.8	--	pF
C_{riss}	Reverse Transfer Capacitance		--	3.2	--	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 100 \text{ V}, I_D = 2.0 \text{ A}, R_G = 25 \Omega$ (Note 4, 5)	--	30	--	ns
t_r	Turn-On Rise Time		--	10	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	60	--	ns
t_f	Turn-Off Fall Time		--	50	--	ns
Q_g	Total Gate Charge		$V_{DS} = 100 \text{ V}, I_D = 3.0 \text{ A}, V_{GS} = 10 \text{ V}$ (Note 4, 5)	--	13	--
Q_{gs}	Gate-Source Charge	--		3.6	--	nC
Q_{gd}	Gate-Drain Charge	--		2	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current	--	--	4.0	A	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	16	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = 4.0 \text{ A}$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_S = 4.0 \text{ A}$,	--	230	--	ns
Q_{rr}	Reverse Recovery Charge	$di_F / dt = 100 \text{ A}/\mu\text{s}$ (Note 4)	--	1.6	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $I_{AS} = 4.0 \text{ A}, L = 15 \text{ mH}, V_{DD} = 50 \text{ V}, R_G = 25 \Omega$, Starting $T_J = 25^\circ \text{C}$
3. $I_{SD} \leq 4.0 \text{ A}, di/dt \leq 200 \text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, 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

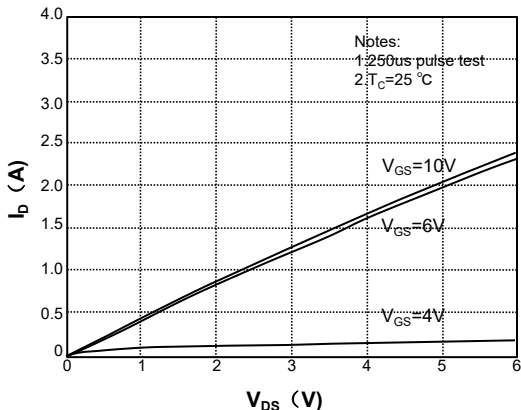


Figure 1. Typical Output Characteristics

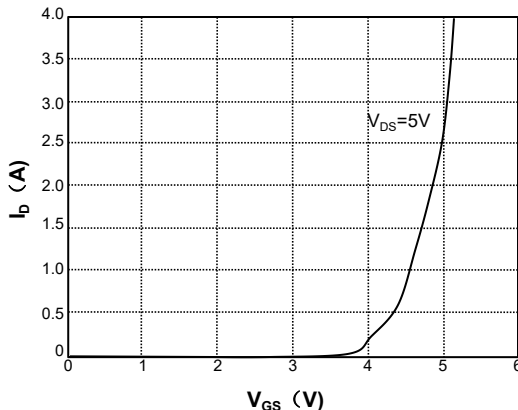


Figure 2. Transfer Characteristics

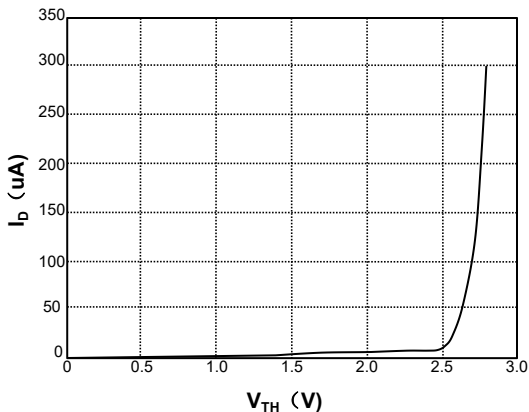


Figure 3. Drain Current VS Gate Threshold Voltage

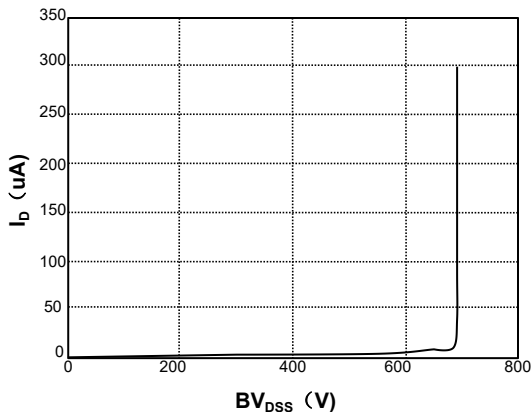


Figure 4. Drain Current VS DS Breakdown Voltage

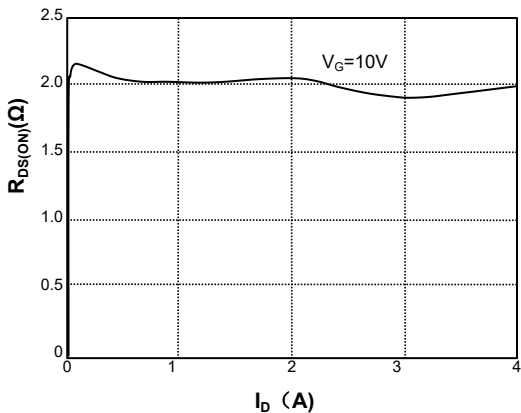


Figure 5. $R_{DS(ON)}$ VS Drain Current

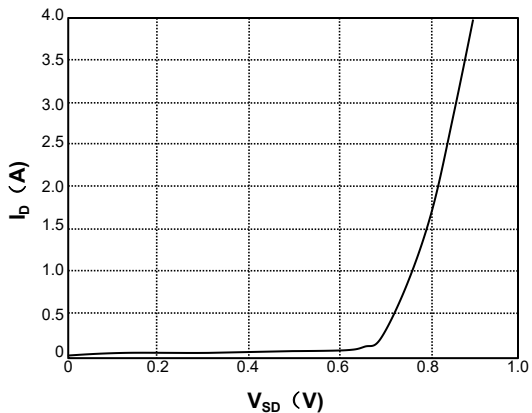


Figure 6. Drain Current vs Source Drain Voltage, V_{SD}

Typical Characteristics (Continued)

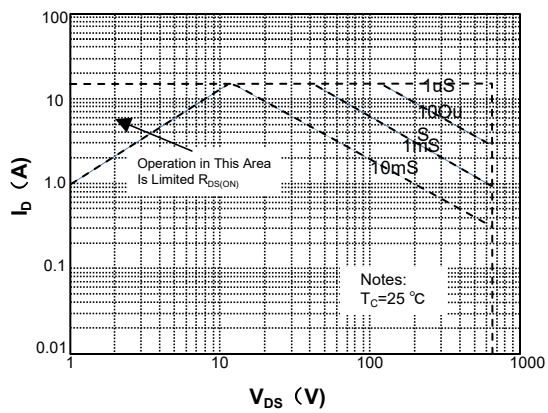
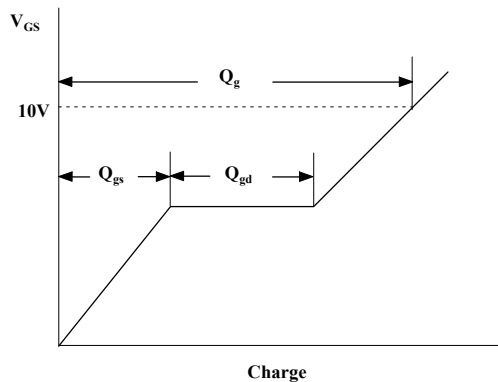
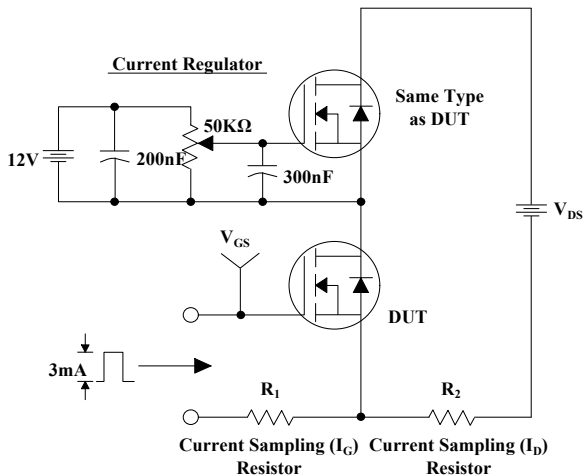
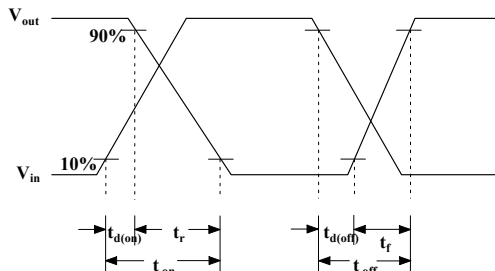
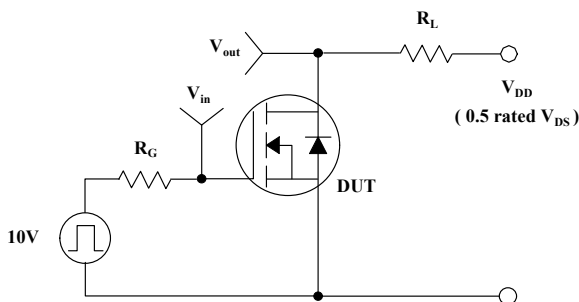


Figure 6. Maximum Safe Operating Area

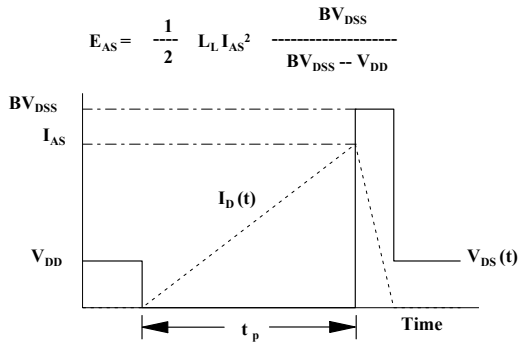
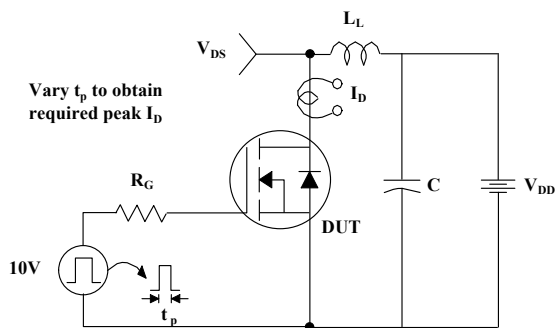
Gate Charge Test Circuit & Waveform



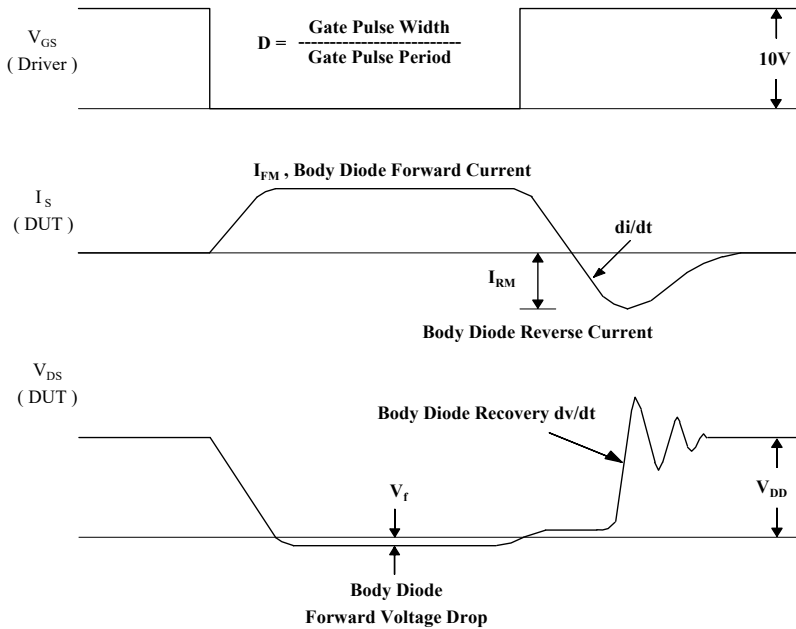
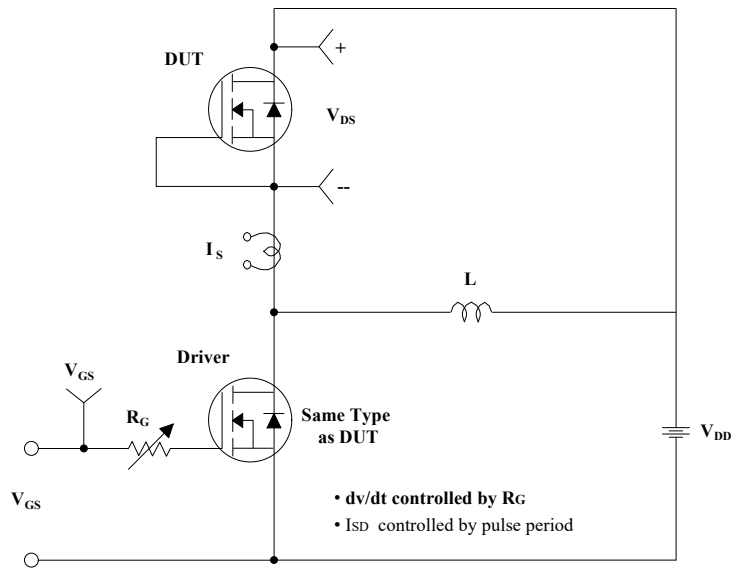
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms



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