TS5N65
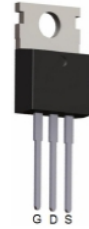
5.0Amps, 650V N-Channel Power Mosfet

DRAWING

Features

◈ 5.0A,650V,R_{DSON}=2.6Ω@V_{GS}=10V

◈ Ultra low gate charge(typical 15nc)

◈ Low reverse transfer capacitance (C_{RSS}=typical 6.5 PF)

◈ Fast switching capability

◈ Avalanche energy specified

◈ Improved dv/dt capability，high ruggedness

General Description

◈ Package:TO-220C

◈ This is a high voltage and high current power MOSFET, Designed to have better characteristics, such as fast switching time , low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies ,PWM motor controls. High efficient DC to DC converters and bridge circuits.
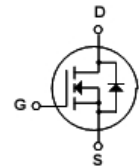
Absolute Maximum Ratings

Symbol	Parameter	Spec	Units
V_{DSS}	Drain-Source Voltage	650	V
I_D	Drain Current -Continuous(Tc=25℃)	5.0	A
I_{AR}	Avalanche Current (Note 2)	5.0	A
I_{DM}	Drain Current -Pulsed (Note 2)	20	A
V_{GSS}	Gate-Source Voltage	±30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 3)	210	mJ
E_{AR}	Repetitive Avalanche Energy (Note 2)	10	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 4)	4.5	V/ns
P_D	Power Dissipation	100	W
Tj	Junction Temperature	+150	℃
Topr	Operating Temperature Range	-55 to +150	℃
T_{stg}	Storage Temperature	-55 to +150	℃

Note: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

　　　　 Absolute maximum ratings are stress ratings only and functional device operation is not implied.

　　　2. Pulse width limited by $T_{J(MAX)}$

　　　3. L = 16.8mH, I_{AS} = 5A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C

　　　4.I_{SD} ≤ 4.5A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25℃

Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{θJC}$	Thermal Resistance, Junction-to-Case	_	1.25	℃/W
$R_{θJA}$	Thermal Resistance, Junction-to-Ambient	_	62.5	℃/W

Electrical Characteristics(Tc=25℃ unless otherwise noted)

Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BV$_{DSS}$	Drain-Source Breakdown Voltage	V$_{GS}$=0V,I$_D$=250uA	650	_	_	V
BV$_{DSS}$/T$_J$	Breakdown Voltage Temperature Coefficient	ID=250uA,Referenced to 25℃	_	0.6	_	V/℃
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$=650V,V$_{GS}$=0V	_	_	1	uA
I$_{GSSF}$	Gate-Body Leakage Current,Forward	Vgs=30V,Vds=0V	_	_	100	nA
I$_{GSSR}$	Gate-Body Leakage Current,Reverse	Vgs=-30V,Vds=0V	_	_	-100	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V$_{GSTH}$	Gate Threshold Voltage	VDS=VGS,ID=250uA	2.0	_	4.0	V
R$_{DSON}$	Static Drain-Source On-Resistance	VGS=10V,ID=2.5A	_	2.6	2.8	Ω

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Cjss	Input Capacitance		_	515	670	pF
Coss	Output Capacitance	VDS=25V,VGS=0V,f=1.0MH$_Z$	_	55	72	pF
Crss	Reverse Transfer Capacitance		_	6.5	8.5	pF

Switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
t$_{don}$	Turn-On Delay Time	V$_{DD}$=325V	_	10	30	ns
t$_r$	Turn-On Rise Time	I$_D$=5.0A	_	42	90	ns
t$_{doff}$	Turn-Off Delay Time	R$_G$=25Ω (Note 1.2)	_	38	85	ns
t$_f$	Turn-Off Fall Time		_	46	100	ns
Q$_g$	Total Gate Charge	V$_{DS}$=520V	_	15	19	nc
Q$_{gs}$	Gate-Source Charge	I$_D$=5.0A	_	2.5		nc
Q$_{gd}$	Gate-Drain Charge	V$_{GS}$=10V (Note 1.2)	_	6.6		nc

Drain-Source Diode Characteristics and Maximum Ratings

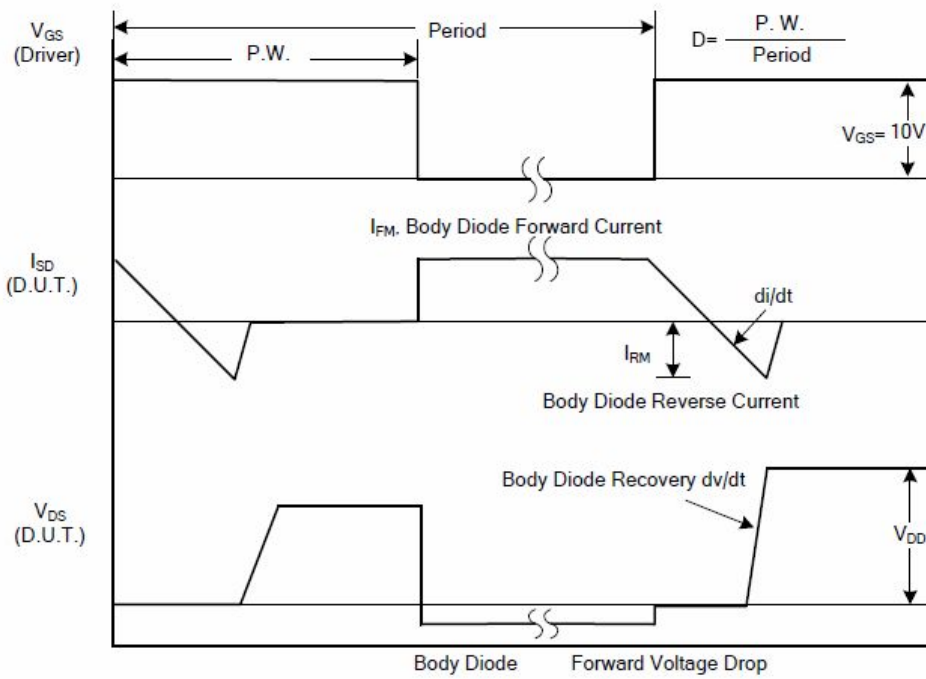| Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Is	Maximum Continuous Drain-source diode forward current		_	_	5.0	A
Ism	Maximum pulsed drain-source diode diode forward current		_	_	20	A
Vsd	Drain-source diode forward Voltage	VGS=0V,IS=5A	_	_	1.4	V
Trr	Reverse Recovery Time	VGS=0V,IS=5A	_	300	_	ns
Qrr	Reverse Recovery charge	dif/dt=100A/us (Note 1)	_	2.2	_	uc

Note 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%

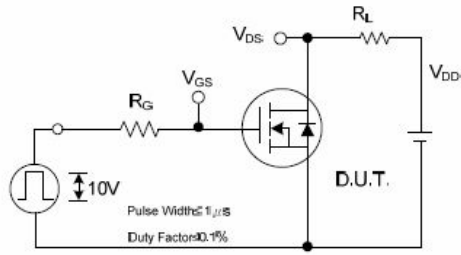   **2.** Essentially independent of operating temperature
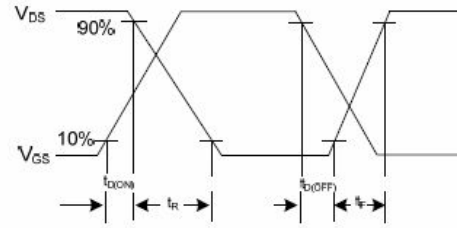
Test circuits and waveforms
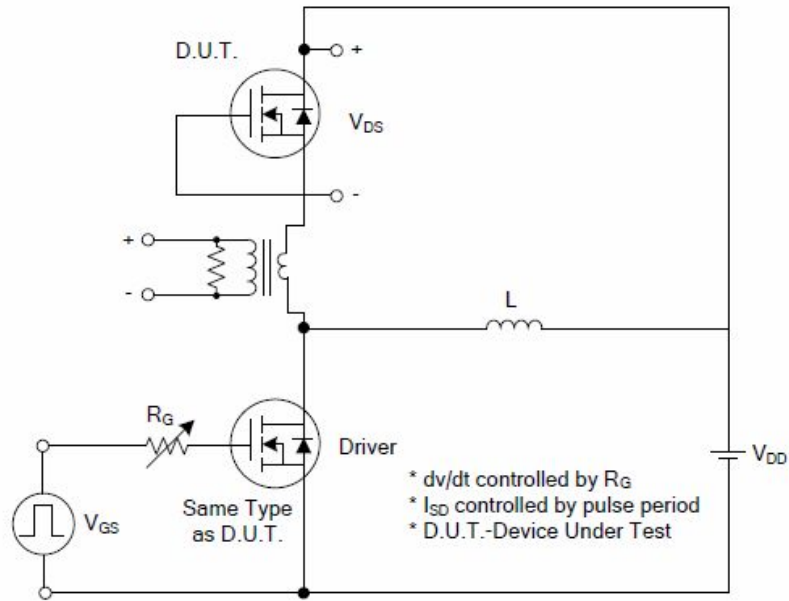
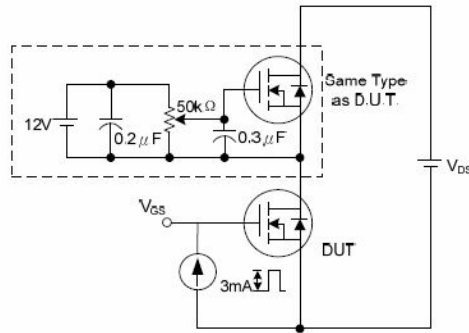Peak Diode Recovery dv/dt Test Circuit

* dv/dt controlled by R_G
* I_{SD} controlled by pulse period
* D.U.T.-Device Under Test

$$D = \frac{P.W.}{Period}$$
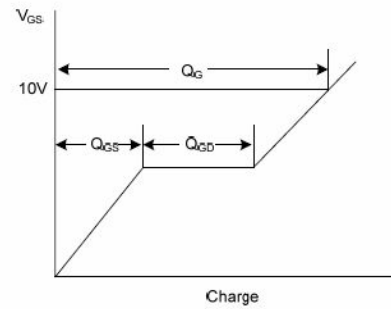
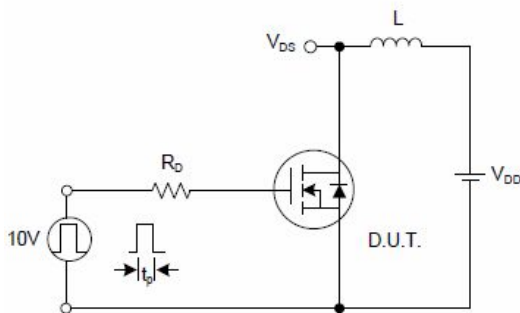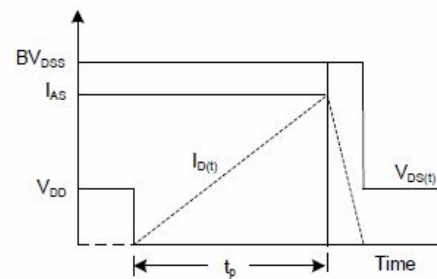Peak Diode Recovery dv/dt Waveforms

Switching Test Circuit

Switching Waveforms

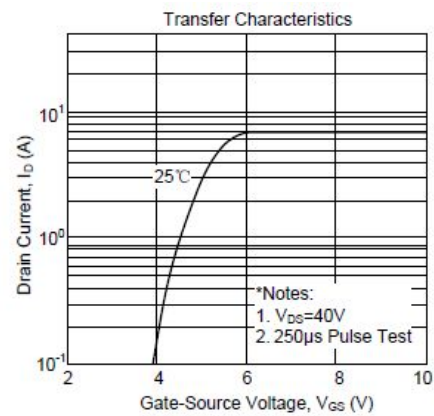**Gate Charge Test Circuit**

Gate Charge Waveform

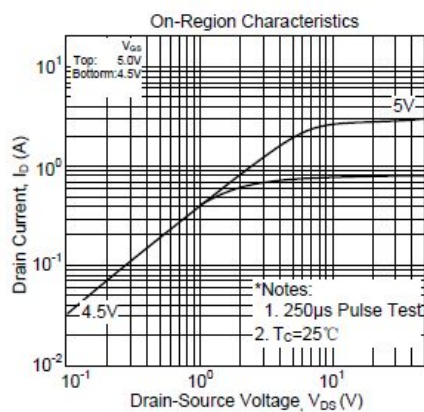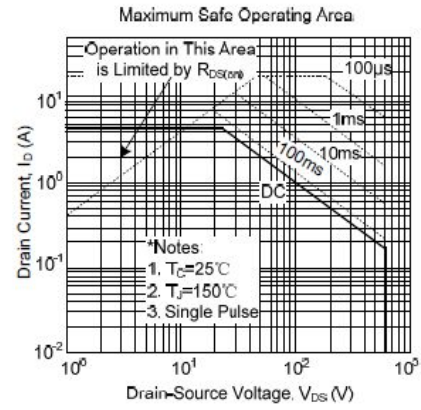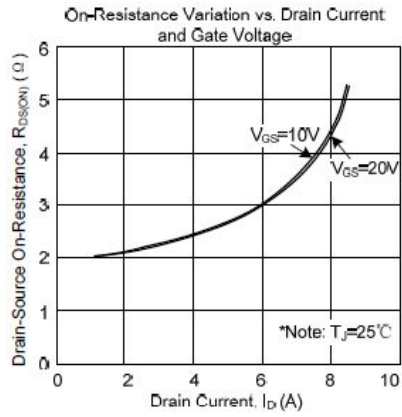**Unclamped Inductive Switching Test Circuit**

Unclamped Inductive Switching Waveforms

Typical Characteristics

On-Region Characteristics

V_{GS}
Top: 5.0V
Bottom: 4.5V

5V

4.5V

*Notes:
1. 250μs Pulse Test
2. T_C=25℃

Drain Current, I_D (A)

Drain-Source Voltage, V_{DS} (V)

Transfer Characteristics

25℃

*Notes:
1. V_{DS}=40V
2. 250μs Pulse Test

Drain Current, I_D (A)

Gate-Source Voltage, V_{GS} (V)

On-Resistance Variation vs. Drain Current and Gate Voltage

Maximum Safe Operating Area

Mechanical Dimensions