

Pb Free Plating Product

TSU45N60

45A,60V Typical N-Channel Trench Power MOSFET



General Description

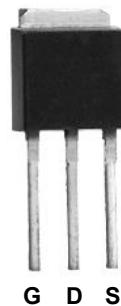
The TSU45N60 is N-channel MOS Field Effect Transistor designed for high current switching applications. Rugged E_{AS} capability and ultra low R_{DS(ON)} is suitable for PWM.

Features

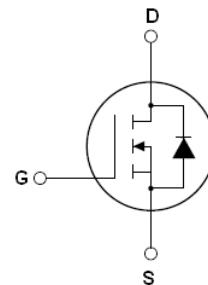
- V_{DS}=60V; I_D=45A@ V_{GS}=10V;
R_{DS(ON)}<14 mΩ @ V_{GS}=10V
- Ultra Low On-Resistance
- High UIS and UIS 100% Test

Application

- Hard Switched and High Frequency Circuits
- Uninterruptible Power Supply
- Inverter/Amplifier Application
- Motor Control Application



TO-251 Top View



Schematic Diagram

V_{DSS} = 60 V

I_{DSS} = 45 A

R_{DS(ON)} = 11 mΩ

Table 1. Absolute Maximum Ratings (TA=25°C)

Symbol	Parameter	Value	Unit
V _{DS}	Drain-Source Voltage (V _{GS} =0V)	60	V
V _{GS}	Gate-Source Voltage (V _{DS} =0V)	±25	V
I _D (DC)	Drain Current (DC) at T _c =25°C	45	A
I _D (DC)	Drain Current (DC) at T _c =100°C	32	A
I _{DM} (pulse)	Drain Current-Continuous@ Current-Pulsed ^(Note 1)	180	A
P _D	Maximum Power Dissipation(Tc=25°C)	55	W
E _{AS}	Single Pulse Avalanche Energy ^(Note 2)	182	mJ
T _J , T _{STG}	Operating Junction and Storage Temperature Range	-55 To 175	°C

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

2.E_{AS} condition:T_J=25°C,V_{DD}=30V,V_G=10V, R_G=25Ω

Table 2. Thermal Characteristic

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	2.7	°C/W

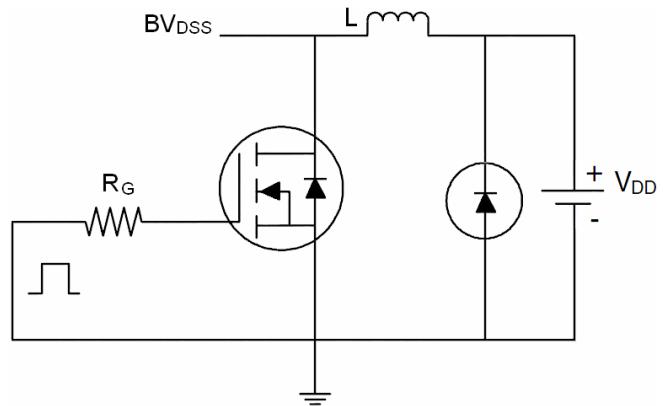
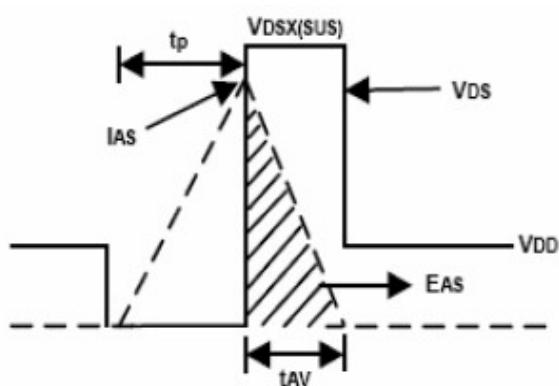
Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
On/Off States						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60			V
I_{DSS}	Zero Gate Voltage Drain Current($T_c=25^\circ C$)	$V_{DS}=60V, V_{GS}=0V$		1		μA
I_{DSS}	Zero Gate Voltage Drain Current($T_c=100^\circ C$)	$V_{DS}=60V, V_{GS}=0V$		5		μA
I_{GSS}	Gate-Body Leakage Current	$V_{GS}=\pm 25V, V_{DS}=0V$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2		4	V
$R_{DS(on)}$	Drain-Source On-State Resistance	$V_{GS}=10V, I_D=40A$		11	14	$m\Omega$
Dynamic Characteristics						
g_{FS}	Forward Transconductance	$V_{DS}=10V, I_D=15A$	18			S
C_{iss}	Input Capacitance	$V_{DS}=25V, V_{GS}=0V$ $f=1.0MHz$		1659		PF
C_{oss}	Output Capacitance			276		PF
C_{rss}	Reverse Transfer Capacitance			128		PF
Q_g	Total Gate Charge	$V_{DS}=30V, I_D=15A$ $V_{GS}=10V$		37.6		nC
Q_{gs}	Gate-Source Charge			6.7		nC
Q_{gd}	Gate-Drain Charge			10		nC
Switching Times						
$t_{d(on)}$	Turn-on Delay Time	$V_{DS}=30V, R_L=2.5\Omega$ $V_{GS}=10V, R_G=3\Omega$		6		nS
t_r	Turn-on Rise Time			6.9		nS
$t_{d(off)}$	Turn-Off Delay Time			12.5		nS
t_f	Turn-Off Fall Time			14.8		nS
Source-Drain Diode Characteristics						
I_{SD}	Source-Drain Current(Body Diode)			45		A
I_{SDM}	Pulsed Source-Drain Current(Body Diode)			180		A
V_{SD}	Forward On Voltage ^(Note 1)	$T_J=25^\circ C, I_{SD}=1A, V_{GS}=0V$		0.74	1	V
t_{rr}	Reverse Recovery Time ^(Note 1)	$T_J=25^\circ C, I_F=15A$ $di/dt=100A/\mu s$		27		nS
Q_{rr}	Reverse Recovery Charge ^(Note 1)			30		nC
t_{on}	Forward Turn-on Time	Intrinsic turn-on time is negligible(turn-on is dominated by L_S+L_D)				

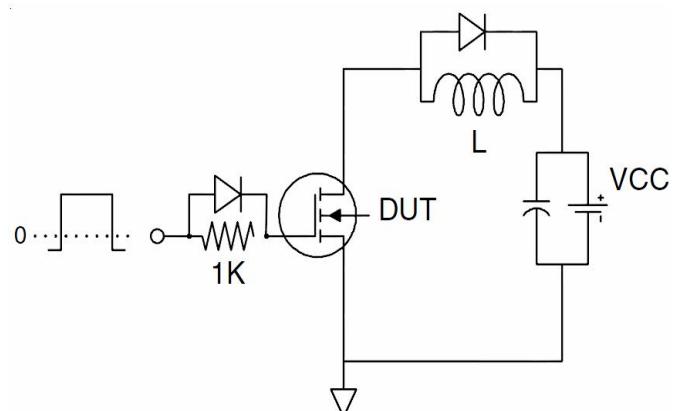
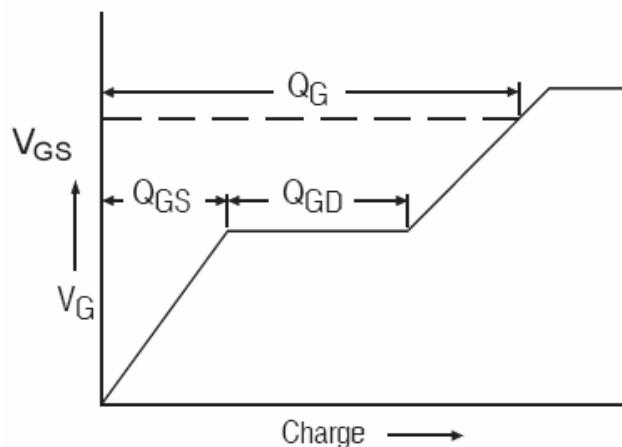
Notes 1.Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 1.5%, Starting $T_J=25^\circ C$

Test Circuit

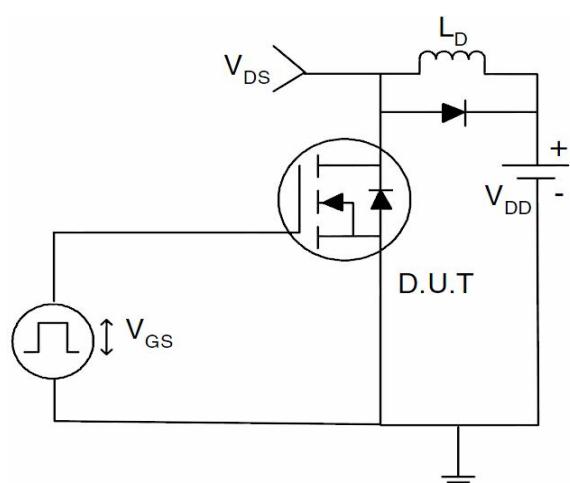
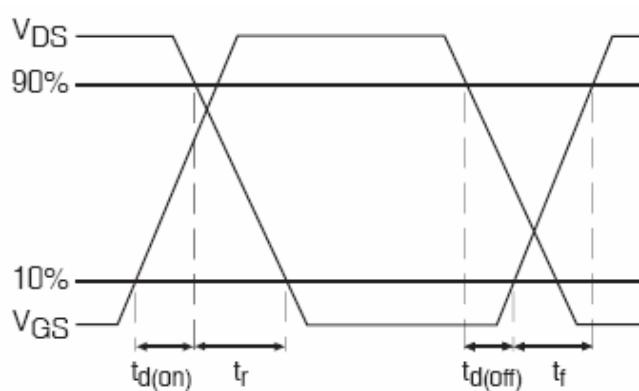
1) E_{AS} Test Circuits



2) Gate Charge Test Circuit:



3) Switch Time Test Circuit:



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (Curves)

Figure1. Safe Operating Area

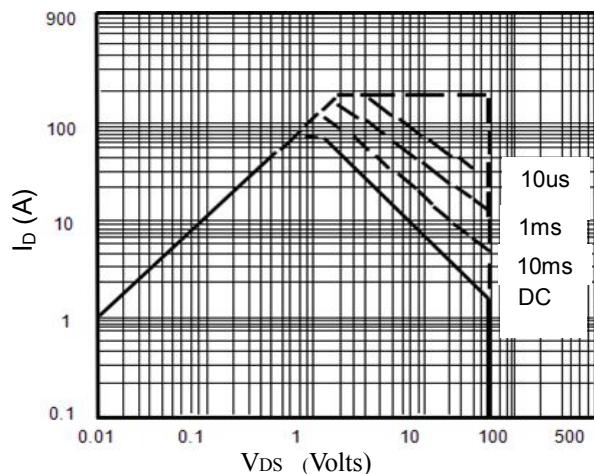


Figure2. Source-Drain Diode Forward Voltage

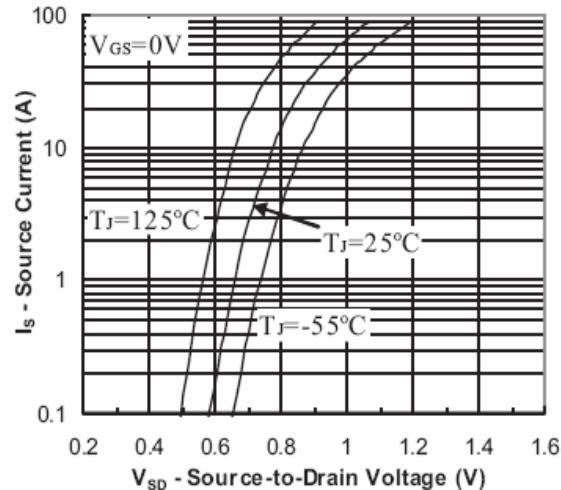


Figure3. Output Characteristics

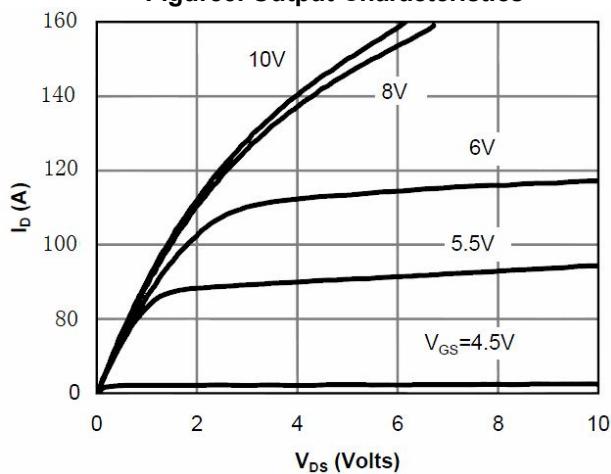


Figure4. Transfer Characteristics

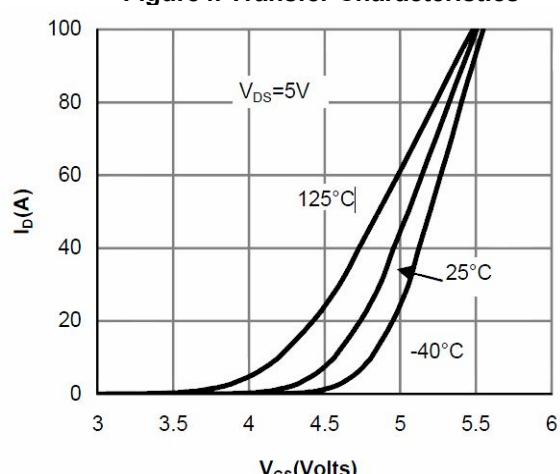


Figure5. Static Drain-Source On Resistance

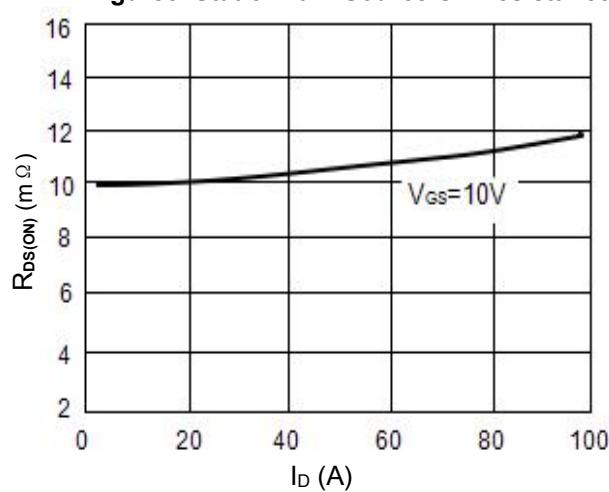


Figure6. RDS(ON) vs Junction Temperature

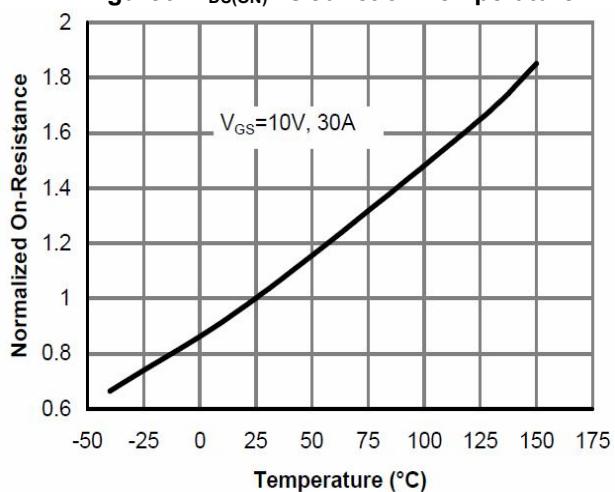
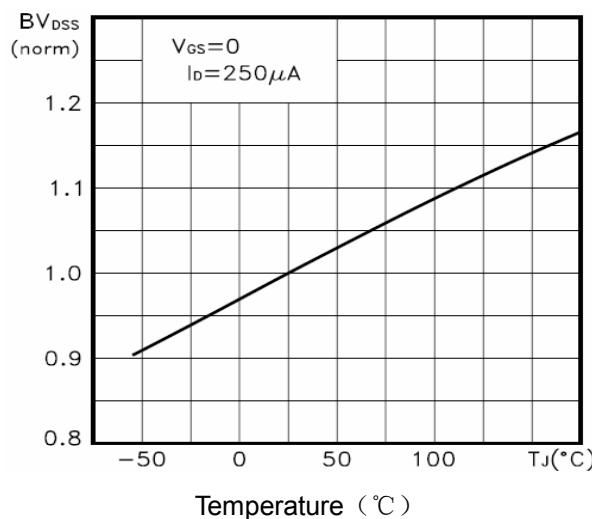
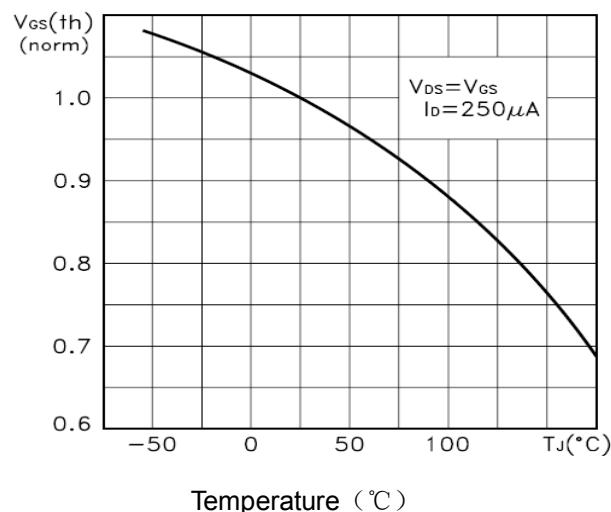
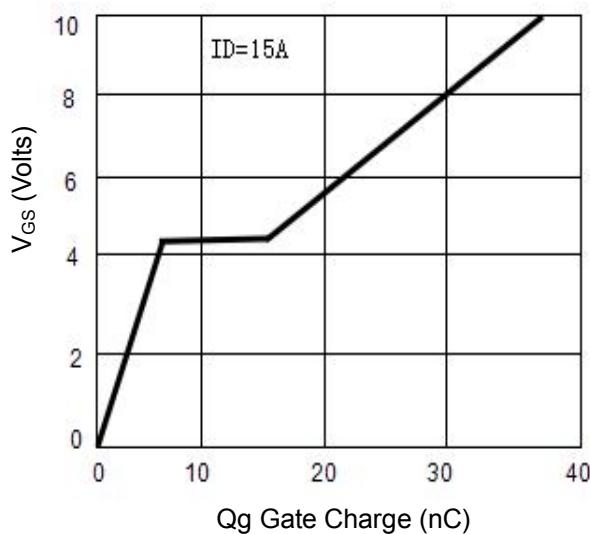
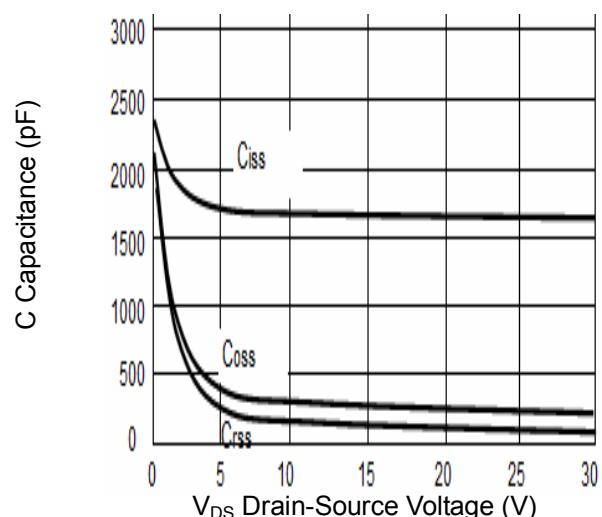


Figure7. BV_{DSS} vs Junction Temperature**Figure8. $V_{GS(th)}$ vs Junction Temperature****Figure9. Gate Charge Waveforms****Figure10. Capacitance****Figure11. Normalized Maximum Transient Thermal Impedance**