Wuxi Unigroup Microelectronics Co.,Ltd.

60V N-Channel Trench MOSFET

General Description

- **Trench Power SGT technology**
- Very low on-resistance $R_{DS(ON)}$
- Low Gate Charge
- Excellent Gate Charge x $R_{DS(ON)}$ Product

Applications

- High Frequency Switching and Synchronous Rectification

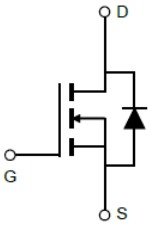
Product Summary

V_{DS}	60V
I_D (at V_{GS}=10V)	60A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 9mΩ

100% UIS Tested

RoHS

TO-220



Part Number	Package Type	Form	Marking
TSP12N06A	TO-220	Tube	P12N06A

Absolute Maximum Ratings (T_A =25°C unless otherwise noted)

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current [B]	T_C =25°C	I_D	60	A
	T_C =100°C		36	
Pulsed Drain Current [A]		I_{DM}	240	A
Avalanche Current [A]		I_{AS}	36	A
Single Pulse Avalanche Energy L =0.3mH [A]		E_{AS}	65	mJ
Power Dissipation [C]	T_C =25°C	P_D	56.5	W
	T_C =100°C		44	W
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C

Thermal Characteristics

Parameter		Symbol	Maximum	Units
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	1.7	°C/W
Maximum Junction-to-Ambient	Steady-State	$R_{\theta JA}$	50	

Electrical Characteristics(T_J =25ºC unless otherwise noted)

Symbol	Parameter	Conditions		Value			Units
				Min	Typ	Max	
STATIC PARAMETERS							
BV_{DSS}	Drain-Source Breakdown Voltage	I_D =250μA,V_{GS} =0V		60	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} =60V, V_{GS} =0V	T_J =25ºC	--	--	1	μA
			T_J =125ºC	--	--	100	
I_{GSS}	Gate-Body Leakage Current	V_{DS} =0V, V_{GS} =±20V		--	--	±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} =V_{GS}, I_D =250μA		2	--	4	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} =10V, I_D =20A		--	6.5	9	mΩ
g_{FS}	Forward Transconductance	V_{DS} =5V, I_D =20A		--	85	--	S
V_{SD}	Diode Forward Voltage	I_S =1A, V_{GS} =0V		--	--	1	V
I_S	Maximum Body-Diode Continuous Current [B]			--	--	46	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS} =0V, V_{DS} =30V, f =1MH_Z		--	2455	--	pF
C_{oss}	Output Capacitance			--	240	--	
C_{rss}	Reverse Transfer Capacitance			--	34	--	
SWITCHING PARAMETERS							
Q_g	Total Gate Charge	V_{GS} =10V,V_{DS} =30V, I_D =20A		--	45	--	nC
Q_{gs}	Gate Source Charge			--	13.5	--	
Q_{gd}	Gate Drain Charge			--	11.5	--	
$t_{D(on)}$	Turn-On Delay Time	V_{GS} =10V,V_{DS} =30V, I_D =20A, R_G =3Ω		--	8	--	ns
t_r	Turn-On Rise Time			--	3	--	
$T_{D(off)}$	Turn-Off Delay Time			--	25	--	
t_f	Turn-Off Fall Time			--	4	--	
t_{rr}	Body Diode Reverse Recovery Time	I_F =20A, di/dt =500A/μs		--	25	--	ns
Q_{rr}	Body Diode Reverse Recovery Charge			--	110	--	nC

A. Single pulse width limited by maximum junction temperature.

B. The maximum current rating is package limited.

C. The power dissipation P_D is based on $T_{J(MAX)}$ =175ºC, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 1. Output Characteristics

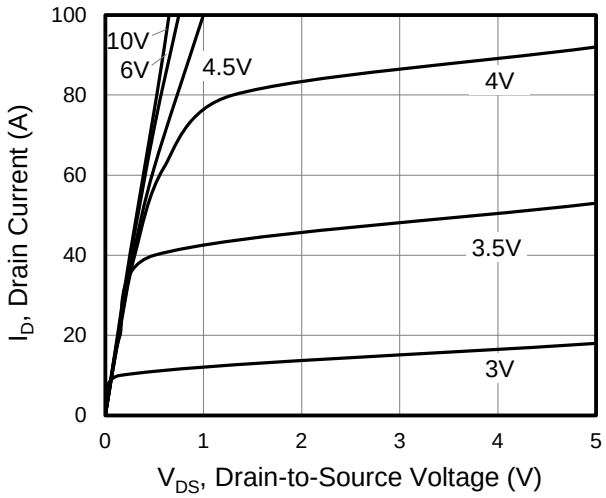


Figure 2. Transfer Characteristics

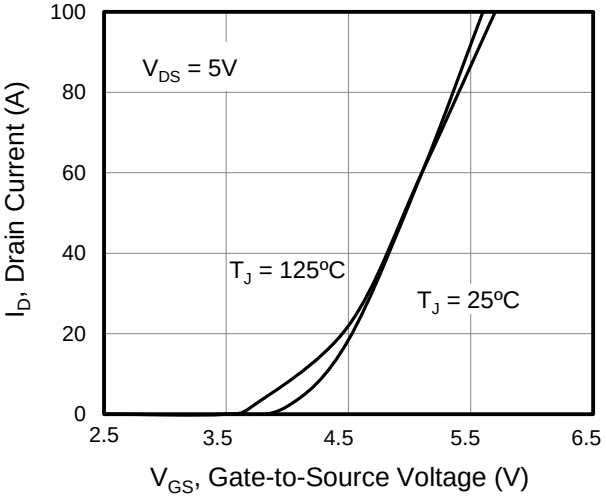


Figure 3. On-Resistance vs. Drain Current

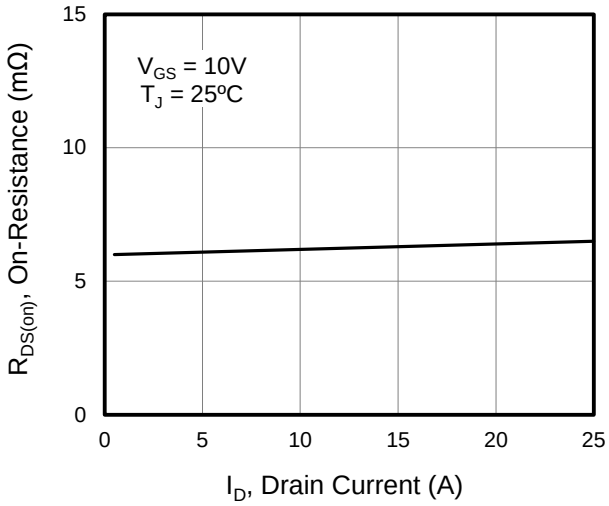


Figure 4. Capacitance

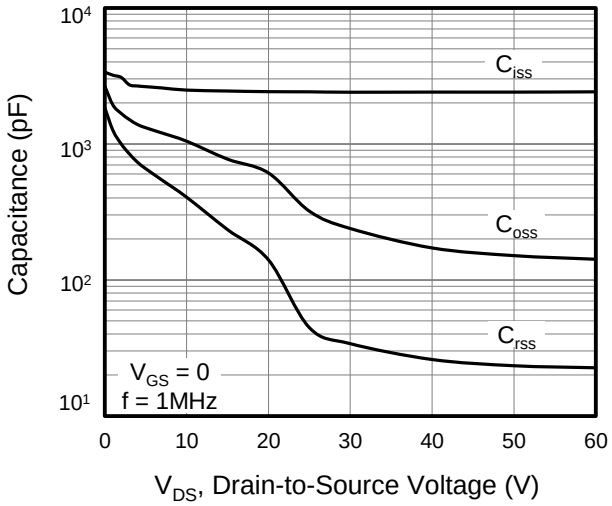


Figure 5. Gate Charge

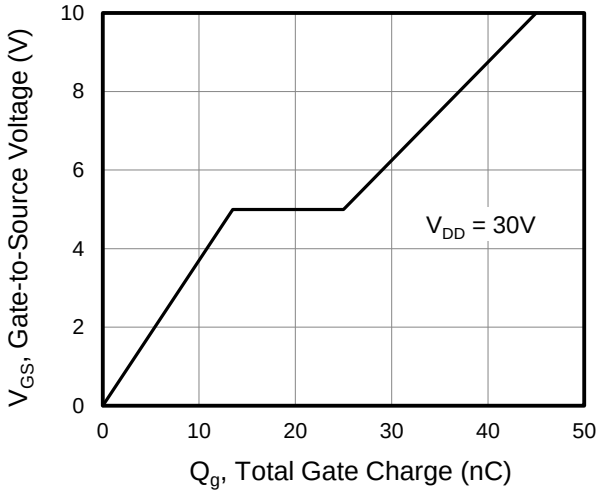
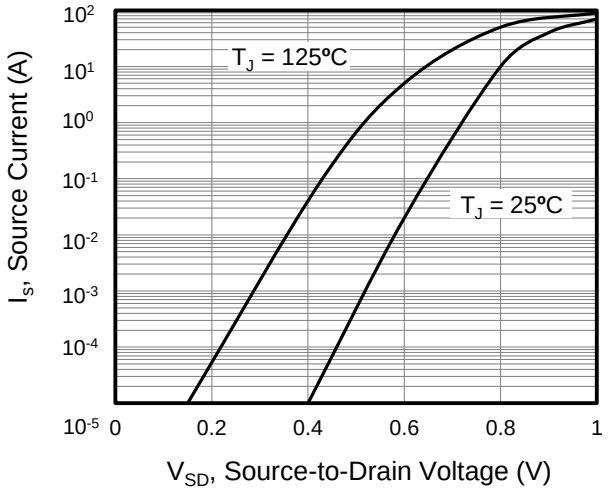


Figure 6. Body Diode Forward Voltage



Typical Characteristics T_J = 25ºC, unless otherwise noted

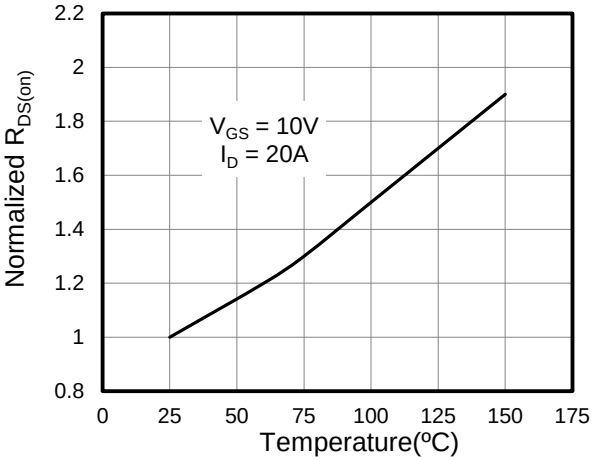


Figure 7: On-Resistance vs. Junction Temperature

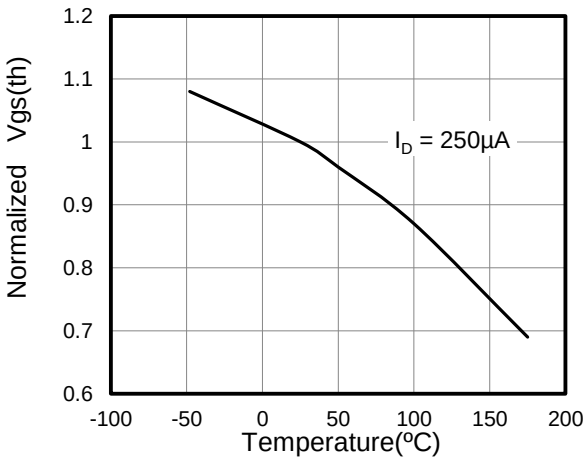


Figure 8: Vgs(th) vs. Junction Temperature

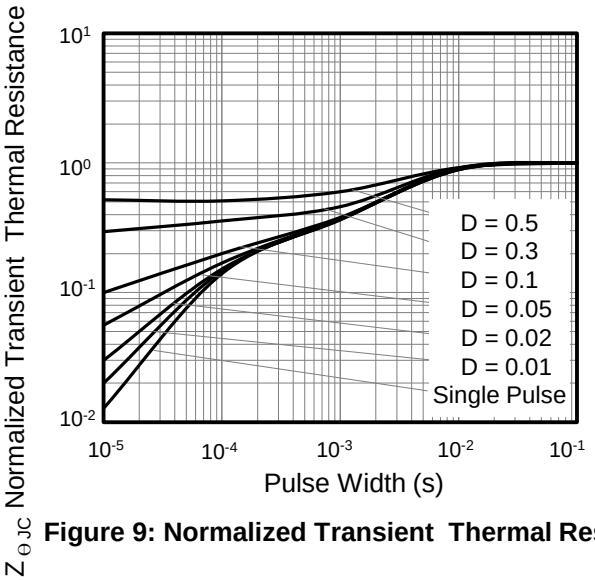


Figure 9: Normalized Transient Thermal Resistance

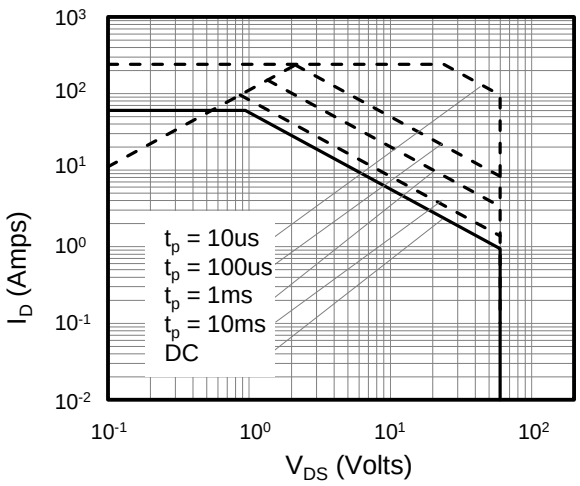


Figure 10: Safe Operating Area

Figure A：Gate Charge Test Circuit and Waveform

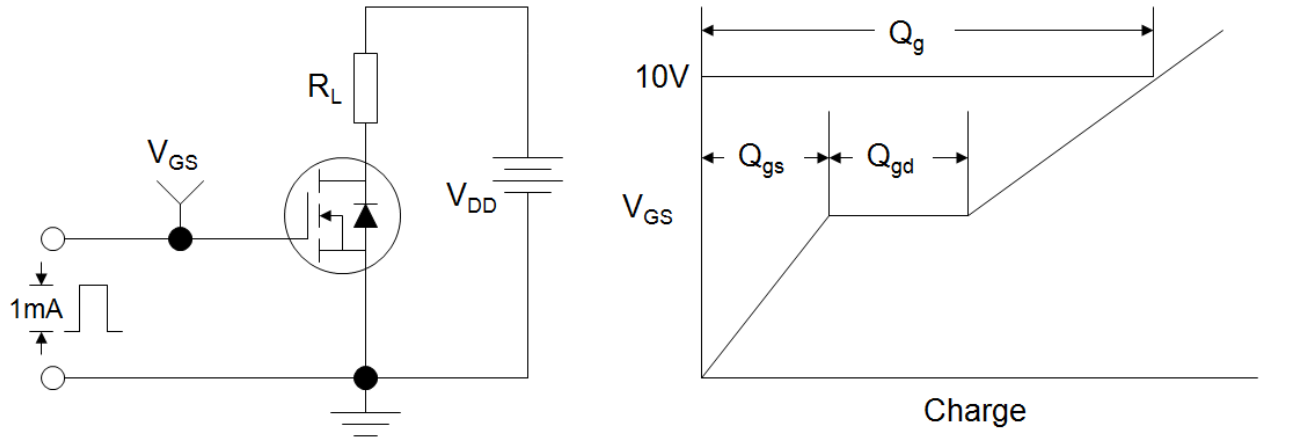


Figure B：Resistive Switching Test Circuit and Waveform

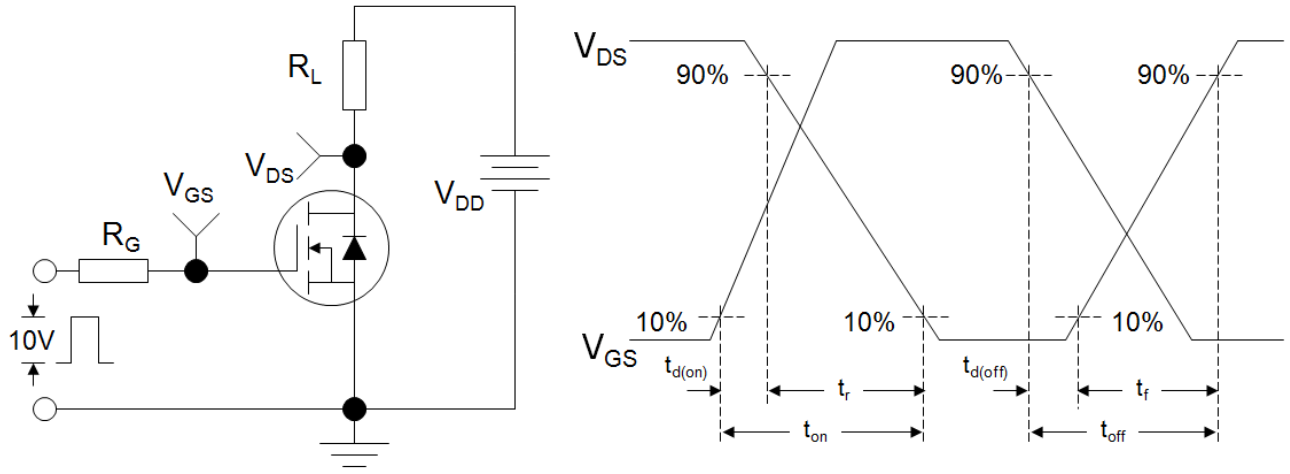
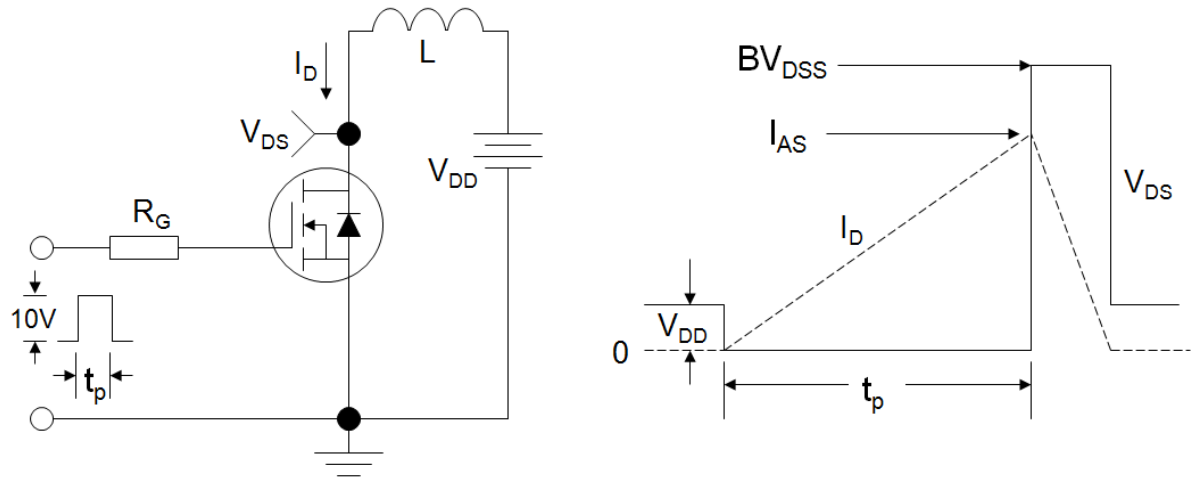


Figure C：Unclamped Inductive Switching Test Circuit and Waveform



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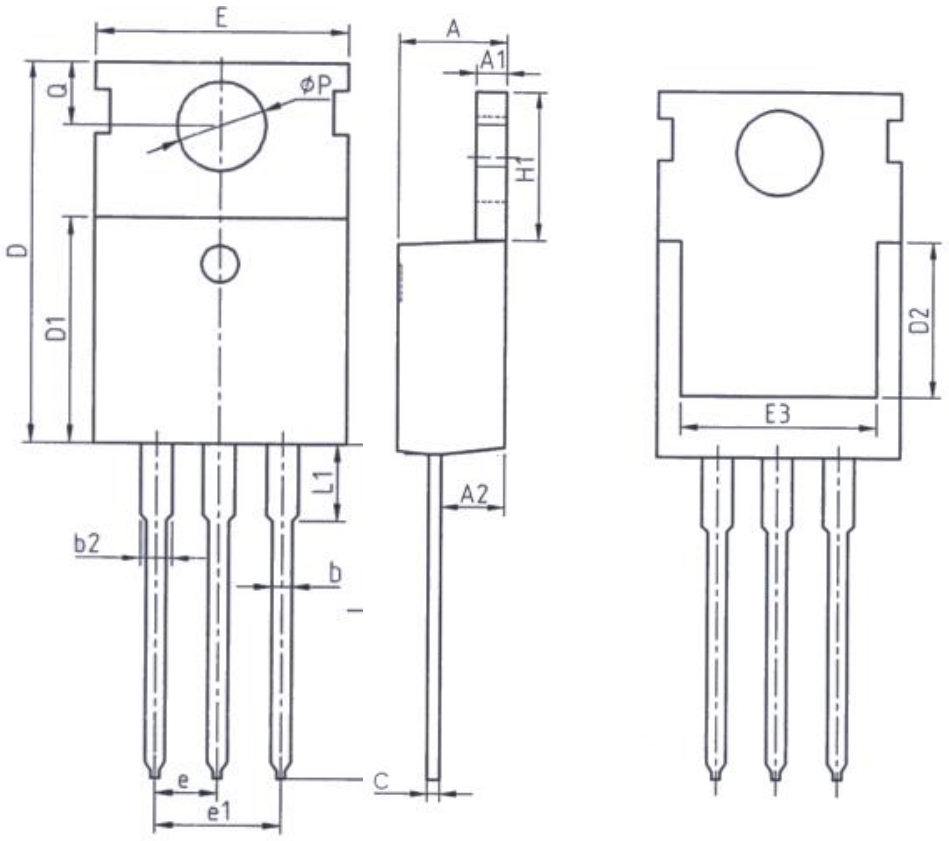

Unit: mm		
Symbol	Min.	Max.
A	4.37	4.77
A1	1.25	1.45
A2	2.20	2.60
b	0.70	0.95
b2	1.17	1.47
c	0.40	0.65
D	15.10	16.10
D1	8.80	9.40
D2	5.50	–

Unit: mm		
Symbol	Min.	Max.
E	9.70	10.30
E3	7.00	–
e	2.54BSC	
e1	5.08BSC	
H1	6.25	6.85
L	12.75	13.80
L1	–	3.40
P	3.40	3.80
Q	2.60	3.00

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