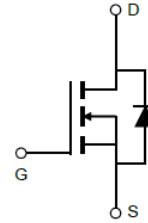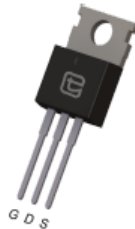Wuxi Unigroup Microelectronics Co.,Ltd.

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
$R_{DS(ON)}$ (at V_{GS} =4.5V)	< 13.5mΩ

100% UIS Tested

RoHS

TO-220

Part Number	Package Type	Form	Marking
TSP12N06AT	TO-220	Tube	P12N06AT

Absolute Maximum Ratings (T_A =25⁰C 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 =25⁰C	I_D	60	A
	T_C =100⁰C		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 =25⁰C	P_D	56.5	W
	T_C =100⁰C		44	W
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	⁰C

Thermal Characteristics

Parameter		Symbol	Maximum	Units
Maximum Junction-to-Case	Steady-State	$R_{\Theta JC}$	1.7	⁰C/W
Maximum Junction-to-Ambient	Steady-State	$R_{\Theta JA}$	50	

Electrical Characteristics(T_J =25⁰C 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 =25⁰C	--	--	1	μA
			T_J =125⁰C	--	--	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		1.1	--	2.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} =10V, I_D = 20A		--	6.5	9	mΩ
		V_{GS} = 4.5V, I_D = 20A		--	10.7	13.5	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(10V)	Total Gate Charge	V_{GS} =10V,V_{DS} =30V, I_D =20A		--	45	--	nC
Q_g(4.5V)				--	24	--	
Q_{gs}	Gate Source Charge			--	6.8	--	
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 $T_{J(MAX)}$ =175⁰C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

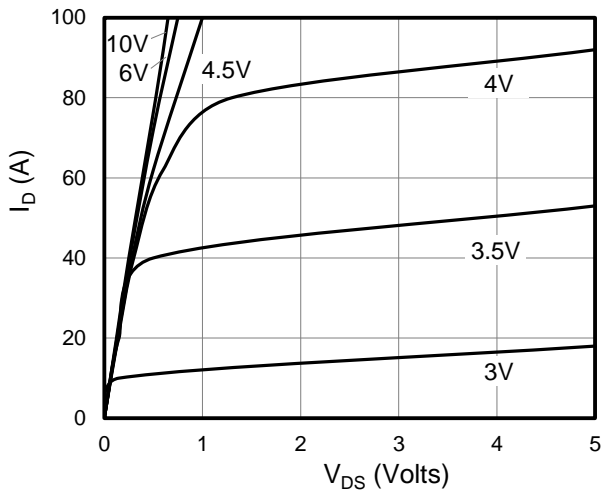**Typical Characteristics** $T_J = 25^\circ$C, unless otherwise noted
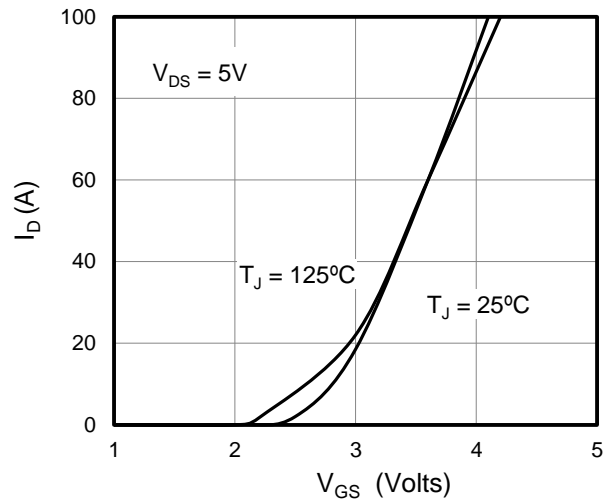

Figure 1: On-Region Characteristics

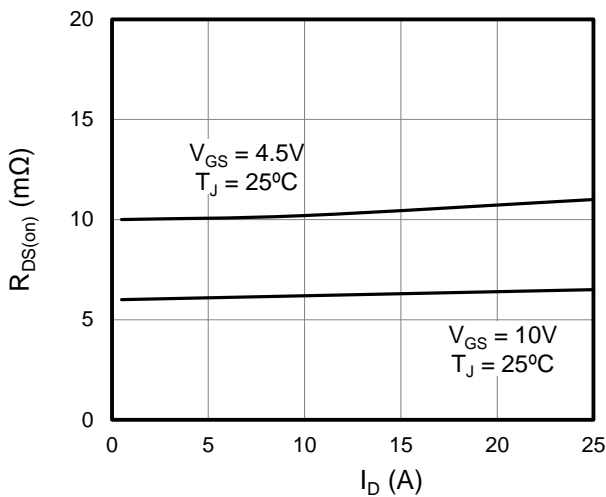**Figure 2: Transfer Characteristics**

Figure 3: On-Resistance vs. Drain Current

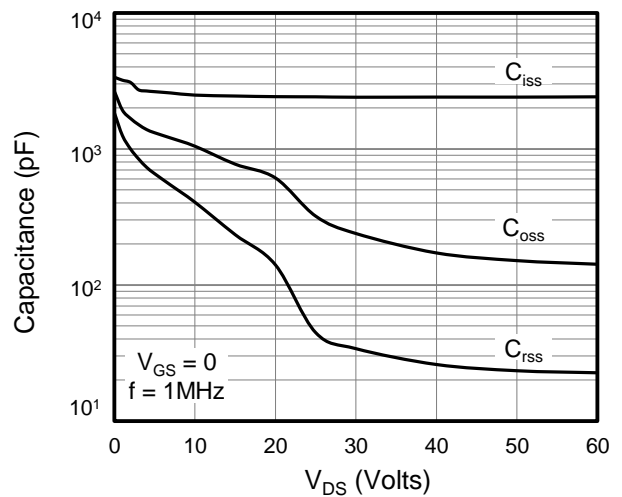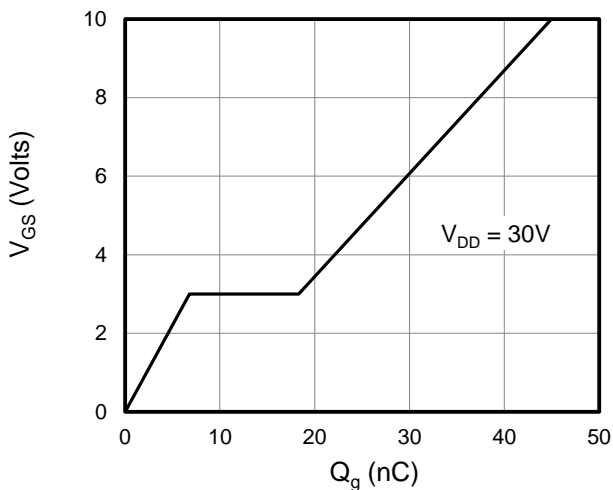**Figure 4: Capacitance Characteristics**
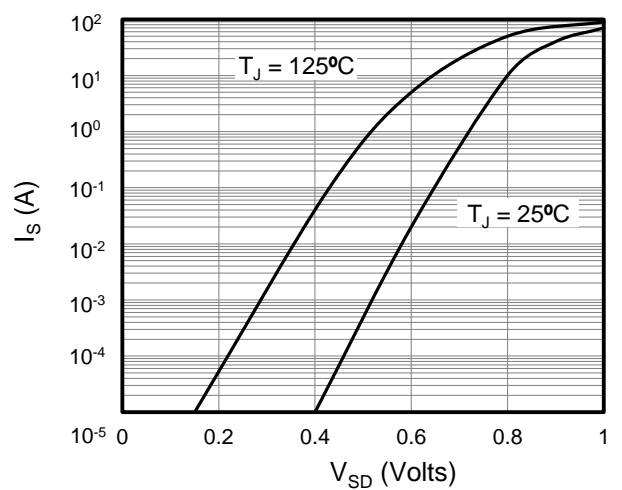

Figure 5: Gate Charge Characteristics

Figure 6: Body Diode Forward Voltage

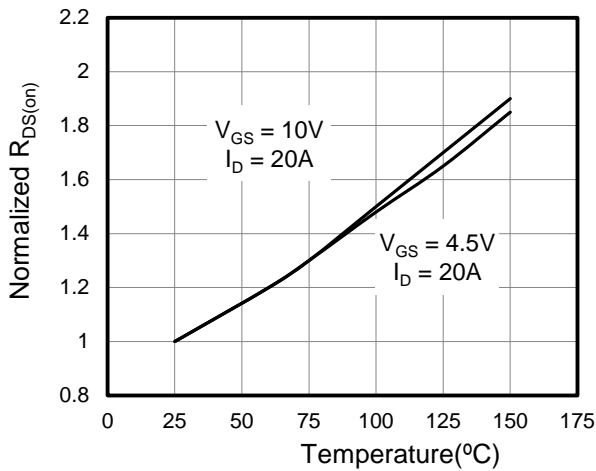**Typical Characteristics** $T_J = 25^oC$, unless otherwise noted
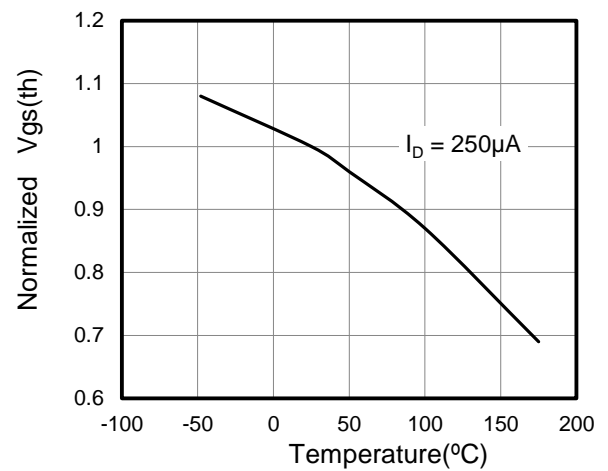
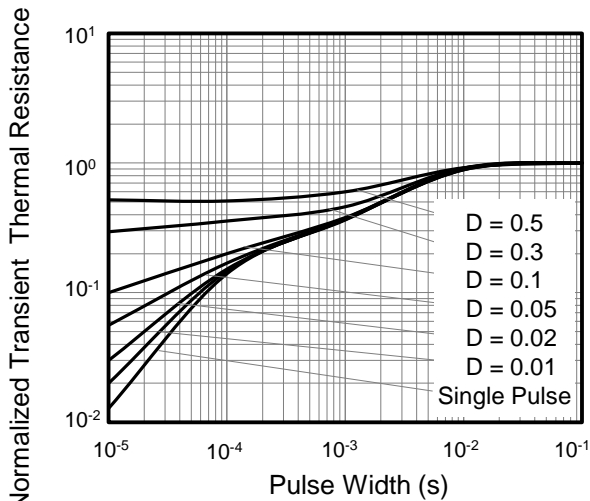Figure 7: On-Resistance vs. Junction Temperature

Figure 8: Vgs(th) vs. Junction Temperature

Figure 9: Normalized Transient Thermal Resistance

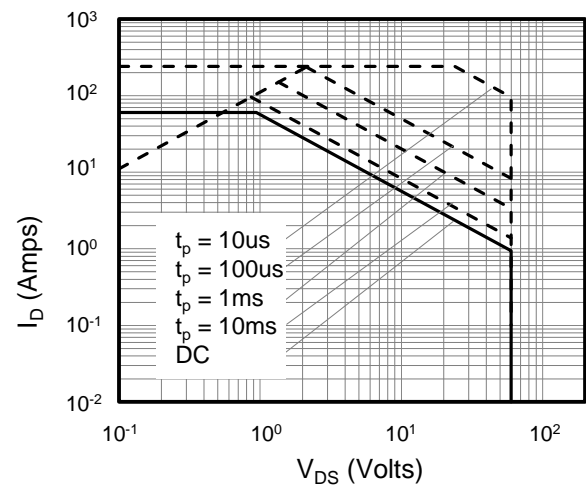Figure 10: Safe Operating Area

Figure A：Gate Charge Test Circuit and Waveform

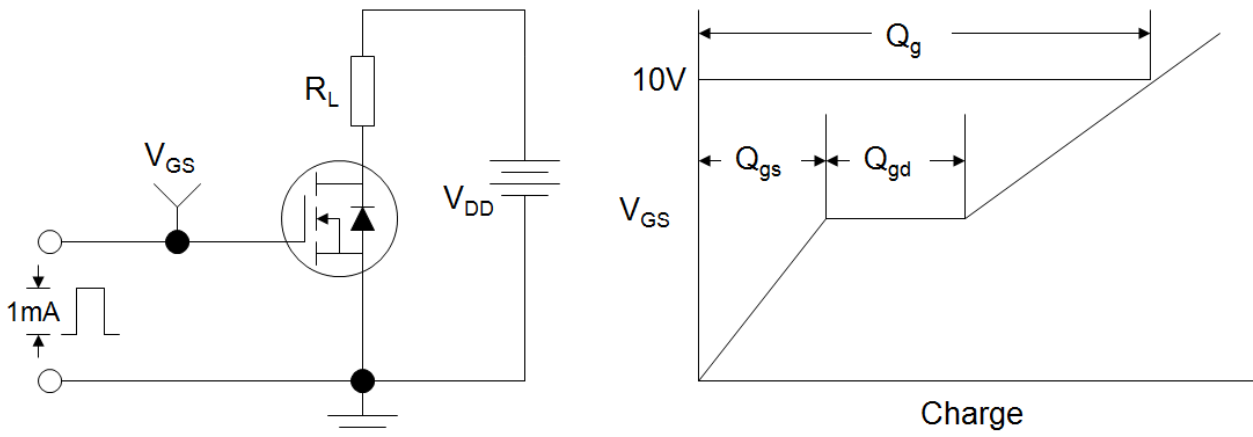**Figure B：Resistive Switching Test Circuit and Waveform**

Figure C：Unclamped Inductive Switching Test Circuit and Waveform
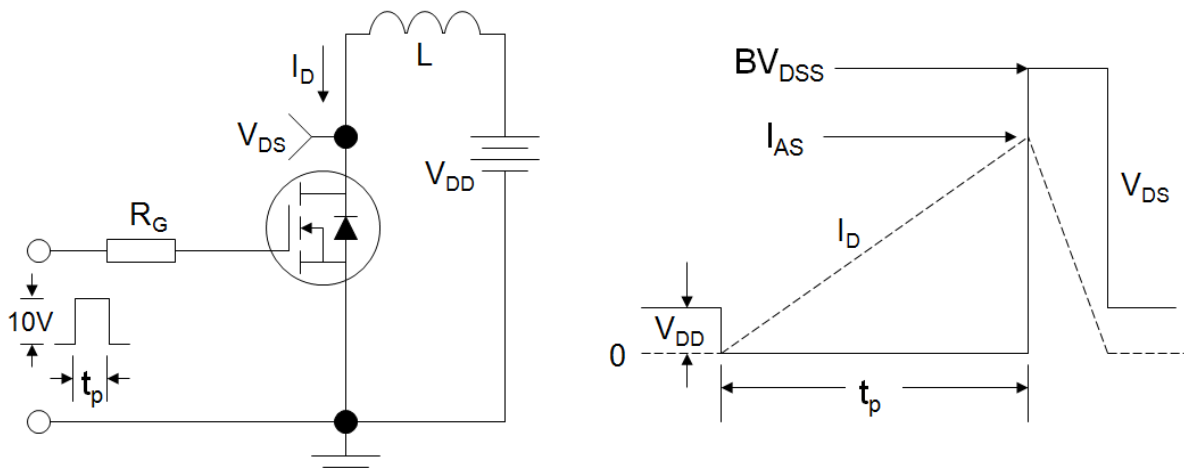
TO-220
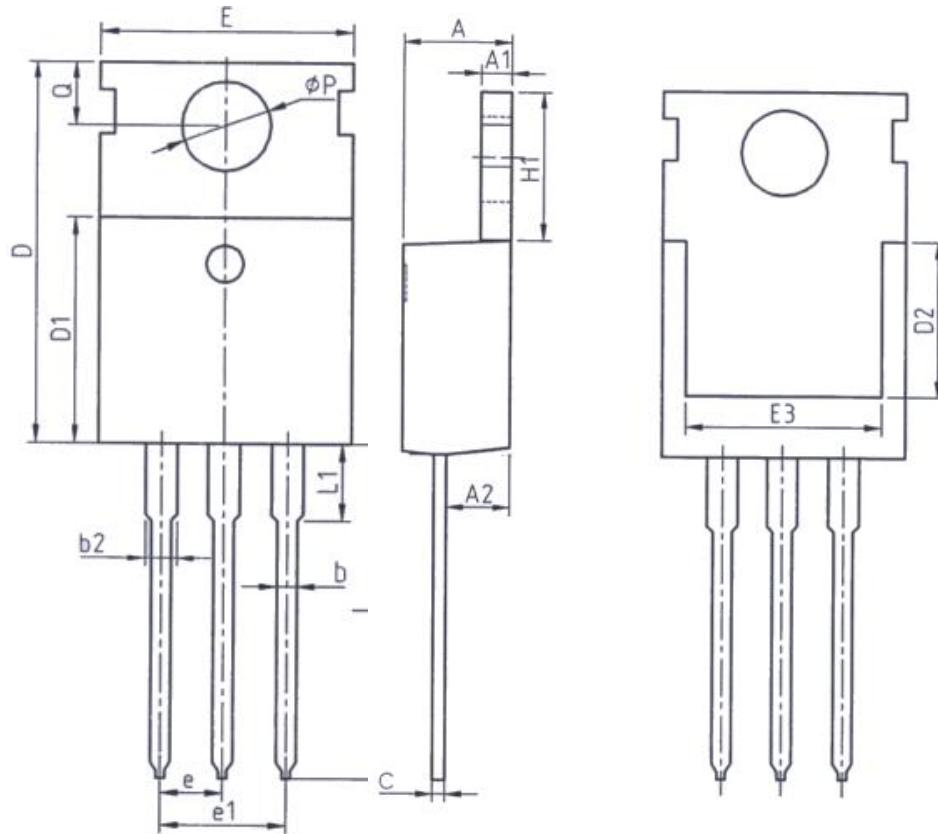
Unit: mm		
Symbol	Min.	Max.
A	4.37	4.77
A1	1.25	1.45
A2	2.20	2.60
b	0.70	0.95
b2	1.17	1.47
c	0.40	0.65
D	15.10	16.10
D1	8.80	9.40
D2	5.50	–

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

Disclaimer

All product specifications and data are subject to change without notice.

For documents and material available from this datasheet, Wuxi Unigroup does not warrant or assume any legal liability or responsibility for the accuracy, completeness of any product or technology disclosed hereunder.

No license, express or implied, by estoppels or otherwise, to any intellectual property rights is granted by this document or by any conduct of Wuxi Unigroup.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling Wuxi Unigroup products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Wuxi Unigroup for any damages arising or resulting from such use or sale.

Wuxi Unigroup disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Wuxi Unigroup's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

Wuxi Unigroup Microelectronics CO., LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.

In the event that any or all Wuxi Unigroup products (including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.

Information (including circuit diagrams and circuit parameters) herein is for example only. It is not guaranteed for volume production. Wuxi Unigroup believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.