650V GaN Power Transistor (FET)

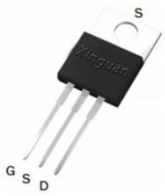
Features

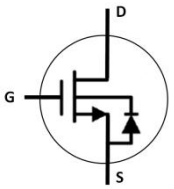
- Easy to use, compatible with standard gate drivers
- Low Q_{rr}, no free-wheeling diode required
- Excellent Q_g x $R_{DS(on)}$ product (FOM)
- Low switching loss
- RoHS compliant and Halogen-free

Product Summary		
V_{DSS}	650	V
$R_{DS(on),max}$	150	mΩ
$Q_{G\ Typ}$	22	nC
$Q_{RR\ Typ}$	65	nC

Applications

- Telecom and datacom
- Industrial
- Automotive
- Servo motors





Packaging

Part Number	Package
XGP6508B	3 Lead TO-220

Maximum ratings, at T_C=25 °C, unless otherwise specified

Symbol	Parameter		Limit Value	Unit
I_D	Continuous drain current @T_C=25°C		21	A
	Continuous drain current @T_C=100°C		16	A
I_{DM}	Pulsed drain current (pulse width: 10us)		85	A
V_{DSS}	Drain to source voltage (T_J = -55°C to 150°C)		650	V
V_{GSS}	Gate to source voltage		±20	V
P_D	Maximum power dissipation @T_C=25°C		83	W
T_C	Operating temperature	Case	-55 to 150	°C
T_J		Junction	-55 to 150	°C
T_S	Storage temperature		-55 to 150	°C
T_{CSOLD}	Soldering peak temperature		260	°C

Thermal Resistance

Symbol	Parameter	Typical	Unit
$R_{\Theta JC}$	Junction-to-case	1.5	°C/W
$R_{\Theta JA}$	Junction-to-ambient	50	°C/W

Electrical Parameters, at T_J=25 °C, unless otherwise specified

Symbol	Min	Typ	Max	Unit	Test Conditions
Forward Device Characteristics					
$V_{DSS-MAX}$	650	-	-	V	V_{GS}=0V
BV_{DSS}	-	1200	-	V	V_{GS}=0V, I_{DSS}=250μA
$V_{GS(th)}$	-	1.62	-	V	V_{DS}=V_{GS}, I_D=500μA
$R_{DS(on)}$[a]	-	125	150	mΩ	V_{GS}=8V, I_D=4A, T_J=25°C
	-	250	-		V_{GS}=8V, I_D=4A, T_J=150°C
I_{DSS}	-	7	15	μA	V_{DS}=700V, V_{GS}=0V, T_J=25°C
	-	20	-	μA	V_{DS}=700V, V_{GS}=0V, T_J=150°C
I_{GSS}	-	-	150	nA	V_{GS}=20V
	-	-	-150	nA	V_{GS}=-20V
C_{ISS}	-	1470	-	pF	V_{GS}=0V, V_{DS}=650V, f=1MHz
C_{OSS}	-	55	-	pF	
C_{RSS}	-	1.5	-	pF	
$C_{O(er)}$	-	70	-	pF	V_{GS}=0V, V_{DS}=0 to 650V
$C_{O(tr)}$	-	120	-	pF	
Q_G	-	22	-	nC	V_{DS}=400V, V_{GS}=0V to 8V, I_D=10A
Q_{GS}	-	4.2	-		
Q_{GD}	-	3.6	-		
$t_{D(on)}$	-	30	-	nS	V_{DS}=400V, V_{GS}=0V to 10V, I_D=10A, R_G=11 Ω
t_R	-	8	-		
$t_{D(off)}$	-	80	-		
t_F	-	9	-		
Reverse Device Characteristics					
V_{SD}	-	1.9	-	V	V_{GS}=0V, I_S=10A, T_J=25°C
	-	3	-		V_{GS}=0V, I_S=10A, T_J=150°C
	-	1.3	-		V_{GS}=0V, I_S=5A, T_J=25°C
t_{RR}	-	30	-	ns	I_S=10A, V_{GS}=0V, d_i/d_t=1000A/us, V_{DD}=400V
Q_{RR}	-	65	-	nC	

Notes:

a. Dynamic on-resistance

Typical Characteristic, at T_C=25 °C, unless otherwise specified

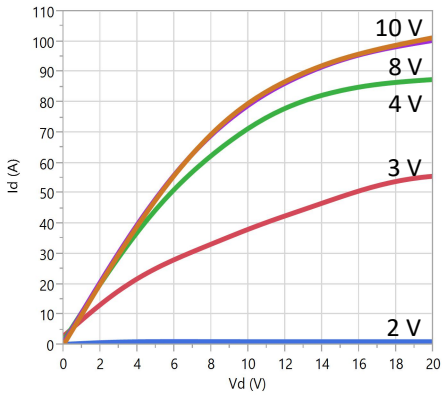


Figure 1. Typical Output Characteristics T_J=25°C

Parameter: V_{GS}

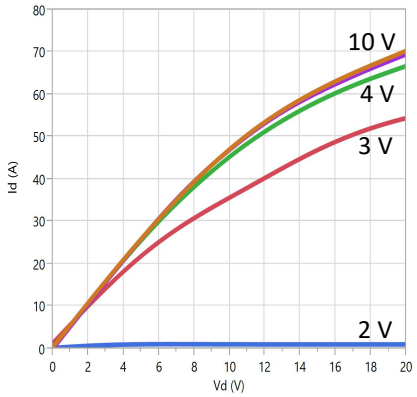


Figure 2. Typical Output Characteristics T_J=150°C

Parameter: V_{GS}

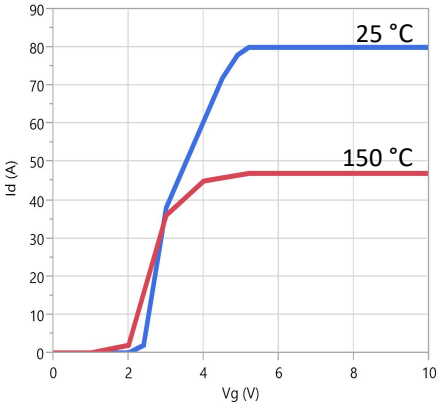


Figure3. Typical Transfer Characteristics

V_{DS}=10V, Parameter: T_J

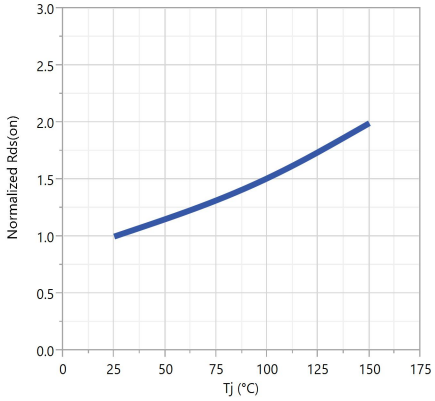


Figure 4. Normalized On-resistance

I_D=4A, V_{GS}=8V

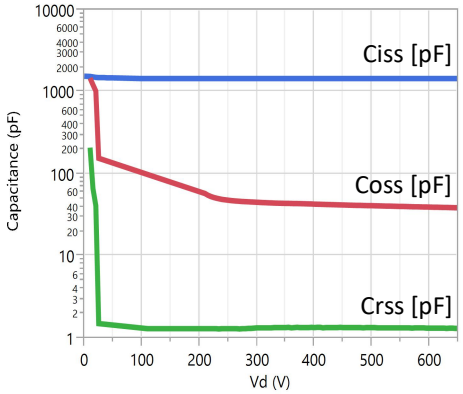


Figure 5. Typical Capacitance

V_{GS}=0V, f=1MHZ

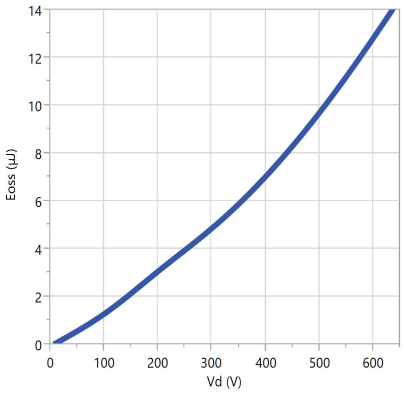


Figure 6. Typical Coss Stored Energy

Typical Characteristic, at T_C=25 °C, unless otherwise specified

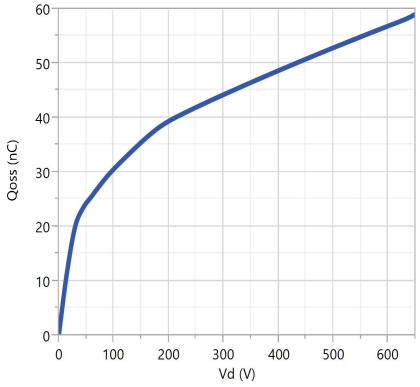


Figure 7.Typical Qoss

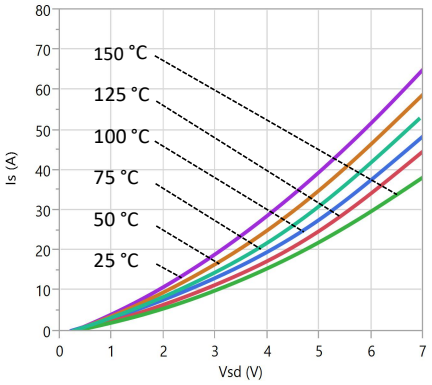


Figure 8. Forward Characteristic of Rev. Diode

Is=f(V_{SD}), Parameter T_J

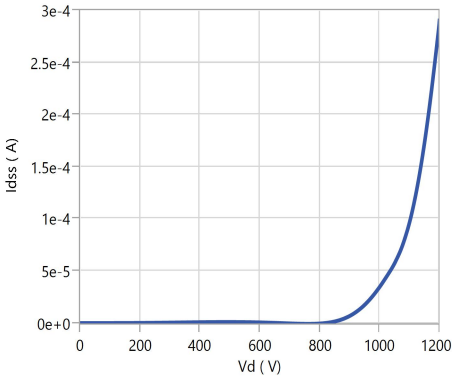


Figure 9. Drain-Source breakdown voltage

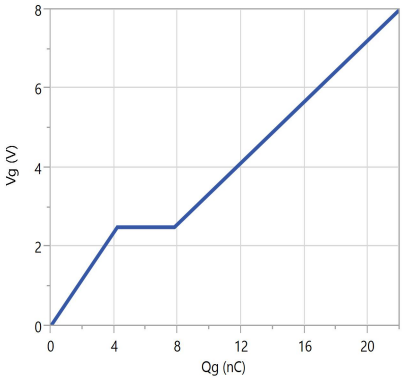


Figure 10.Typical Gate Charger

I_{DS}=10A, V_{DS}=400V

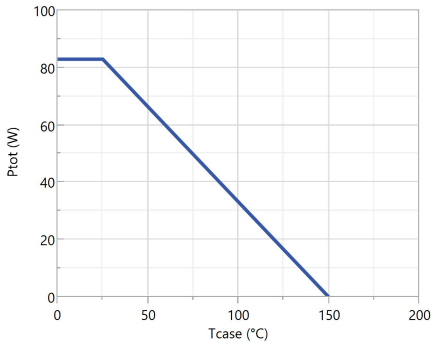


Figure 11.Power Dissipation

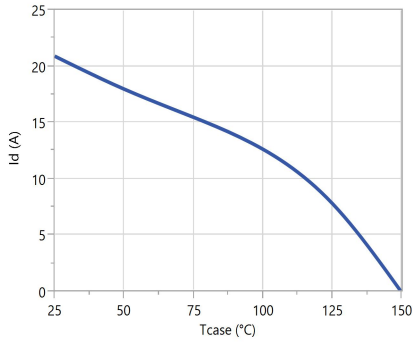


Figure 12.Current Derating

Test Circuits and Waveforms

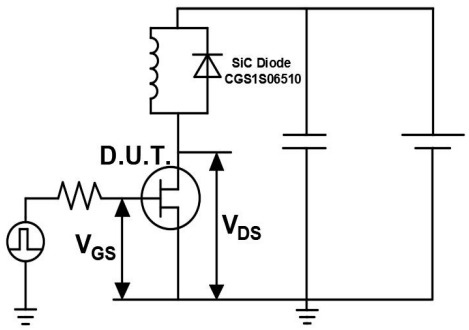


Figure 13. Switching Time Test Circuits

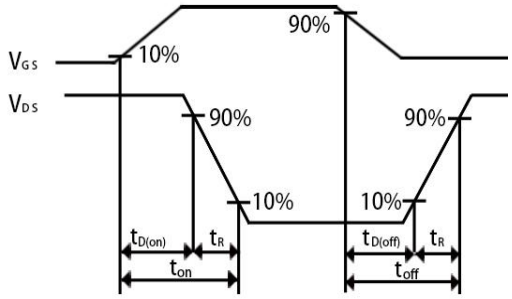


Figure 14. Switching Time Waveform

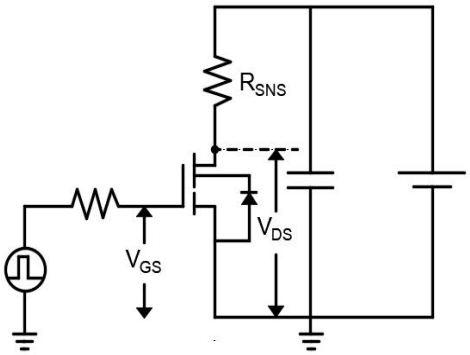


Figure 15. Dynamic $R_{DS(on)eff}$ Test Circuits

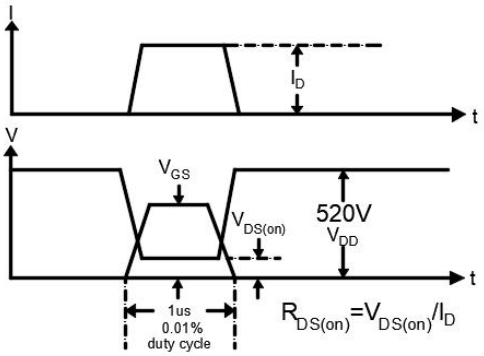


Figure 16. Dynamic $R_{DS(on)eff}$ Waveform

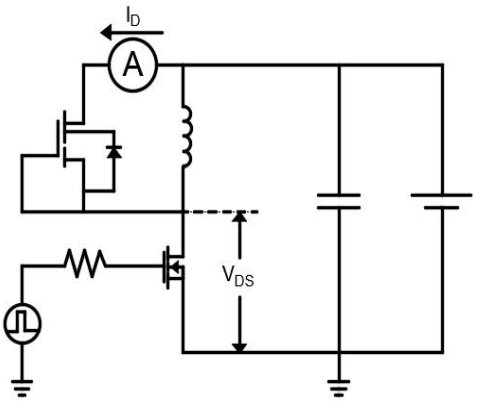


Figure 17. Diode Characteristics Test Circuits

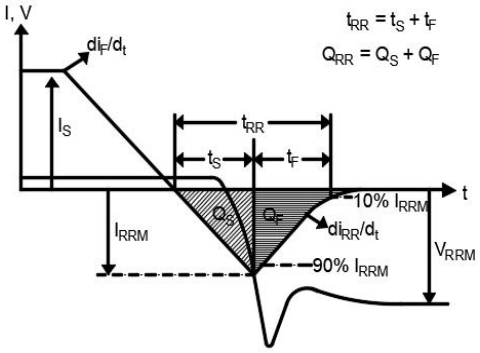
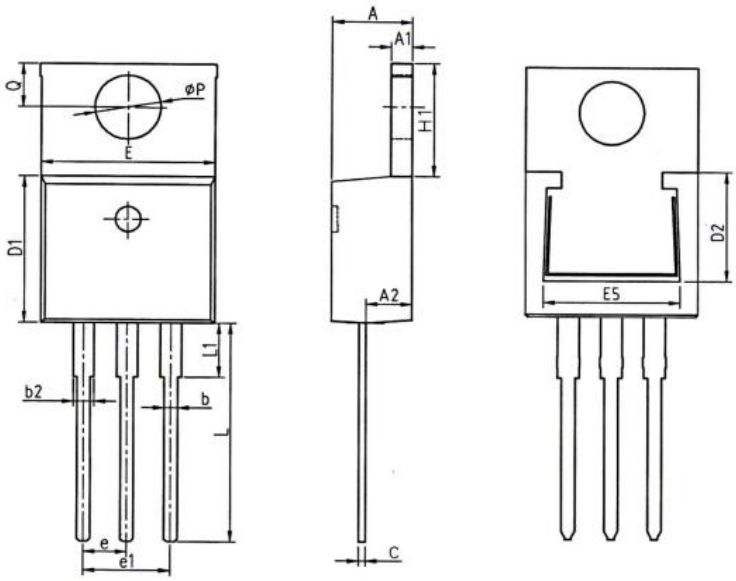


Figure 18. Diode Recovery Waveform

Mechanical **3 Lead TO-220 (PS) Package**

Pin 1: Gate; Pin 2: Source; Pin 3: Drain; Tab: Source



COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
A	4.37	4.57	4.77
A1	1.22	1.27	1.42
A2	2.49	2.69	2.89
b	0.75	0.81	0.96
b2	1.22	1.27	1.47
c	0.30	0.38	0.48
D1	8.50	8.70	8.90
D2	5.20	-	-
E	9.86	10.16	10.36
E5	7.06	-	-
e		2.54 BSC	
e1		5.08 BSC	
H1	6.10	6.30	6.50
L	13.10	13.40	13.70
L1	-	3.75	4.10
ΦP	3.70	3.84	3.99
Q	2.54	2.74	2.94