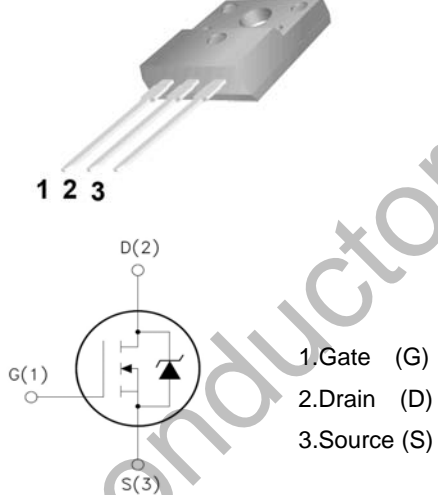


## WGF11N40SE

**Features:**

- Low Intrinsic Capacitances.
- Excellent Switching Characteristics.
- Extended Safe Operating Area.
- Unrivalled Gate Charge :Qg=28nC (Typ.).
- VDSS=400V, ID=11A
- R<sub>DS(on)</sub> : 0.50Ω (Max) @V<sub>G</sub>=10V
- 100% Avalanche Tested

TO-220F



1.Gate (G)  
2.Drain (D)  
3.Source (S)

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

Symbol	Parameter	Value	Unit
V <sub>DSS</sub>	Drain-Source Voltage	400	V
I <sub>D</sub>	Drain Current	T <sub>C</sub> =25°C	11
		T <sub>C</sub> =100°C	6.3
V <sub>GSS</sub>	Gate-Source Voltage	±30	V
E <sub>AS</sub>	Single Pulse Avalanche Energy (note1)	500	mJ
I <sub>AR</sub>	Avalanche Current (note2)	11	A
P <sub>D</sub>	Power Dissipation (Tc=25°C)	45	W
T <sub>j</sub>	Junction Temperature(Max)	150	°C
T <sub>stg</sub>	Storage Temperature	-55~+150	
TL	Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	300	

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJC</sub>	Thermal Resistance, Junction to Case	-	2.7	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient	-	62.5	
R <sub>θCS</sub>	Thermal Resistance, Case to Sink	0.5	-	

### Electrical Characteristics (Ta=25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0	400	-	-	V
ΔBVDSS/ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> =250μA, Reference to 25°C	-	0.55	-	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =400V, V <sub>GS</sub> =0V	-	-	1	μA
		V <sub>DS</sub> =360V, T <sub>c</sub> =125°C	-	-	10	
I <sub>GSSF</sub>	Gate-body leakage Current, Forward	V <sub>GS</sub> =+30V, V <sub>DS</sub> =0V	-	-	100	nA
I <sub>GSSR</sub>	Gate-body leakage Current, Reverse	V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V	-	-	-100	
<b>On Characteristics</b>						
V <sub>GS(TH)</sub>	Gate Threshold Voltage	I <sub>D</sub> =250μA, V <sub>DS</sub> =V <sub>GS</sub>	2	-	4	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	I <sub>D</sub> =5.5A, V <sub>GS</sub> =10V	-	0.43	0.50	Ω
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0, f=1.0MHz	-	1200	-	pF
C <sub>oss</sub>	Output Capacitance		-	150	-	
C <sub>rss</sub>	Reverse Transfer Capacitance		-	20	-	
<b>Switching Characteristics</b>						
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =200V, I <sub>D</sub> =11A R <sub>G</sub> =12Ω (Note 3,4)	-	14	-	ns
T <sub>r</sub>	Turn-On Rise Time		-	25	-	
T <sub>d(off)</sub>	Turn-Off Delay Time		-	44	-	
T <sub>f</sub>	Turn-Off Rise Time		-	28	-	
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =200V, V <sub>GS</sub> =10V, I <sub>D</sub> =11A (Note 3,4)	-	28	35	nC
Q <sub>gs</sub>	Gate-Source Charge		-	7.0	-	
Q <sub>gd</sub>	Gate-Drain Charge		-	11.0	-	
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Max. Diode Forward Current	-	-	-	11	A
I <sub>SM</sub>	Max. Pulsed Forward Current	-	-	-	40	
V <sub>SD</sub>	Diode Forward Voltage	I <sub>D</sub> =11A	-	-	1.5	V
T <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> =11A, V <sub>GS</sub> =0V diF/dt=100A/μs (Note3)	-	303	-	nS
Q <sub>rr</sub>	Reverse Recovery Charge		-	1.8	-	μC

- Notes : 1, L=2.26mH, I<sub>AS</sub>=11A, V<sub>DD</sub>=50V, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C  
 2, Repetitive Rating : Pulse width limited by maximum junction temperature  
 3, Pulse Test : Pulse Width ≤ 300μs, Duty Cycle ≤ 2%  
 4, Essentially Independent of Operating Temperature

Typical Characteristics

Figure 1. Maximum Effective Thermal Impedance, Junction-to-Case

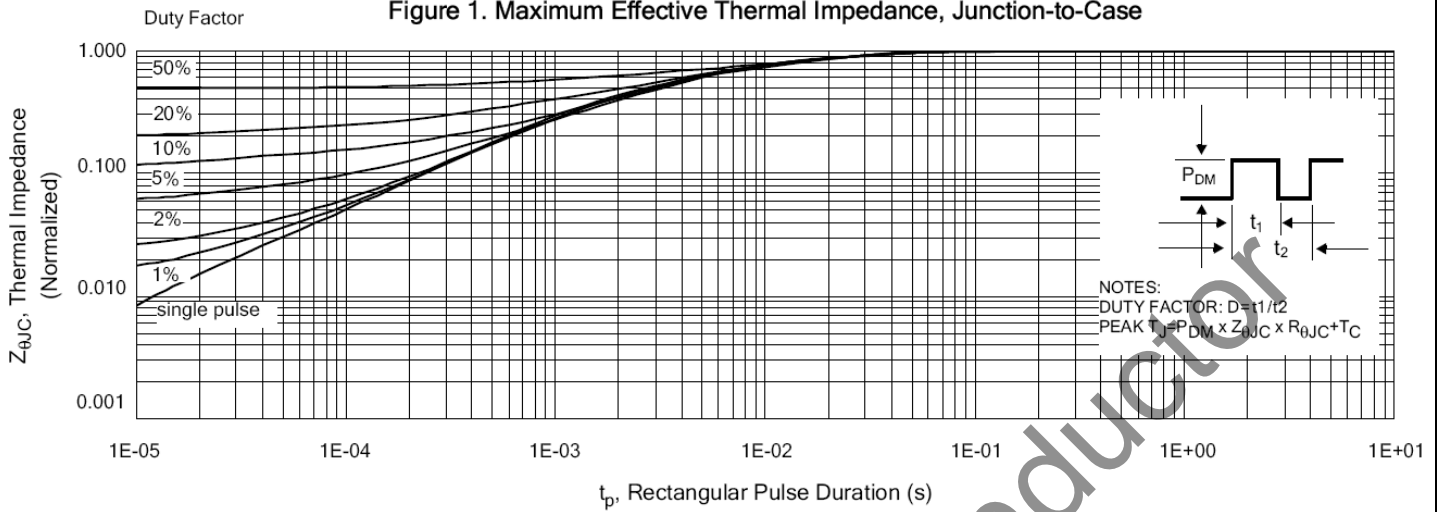


Figure 2. Maximum Power Dissipation vs Case Temperature

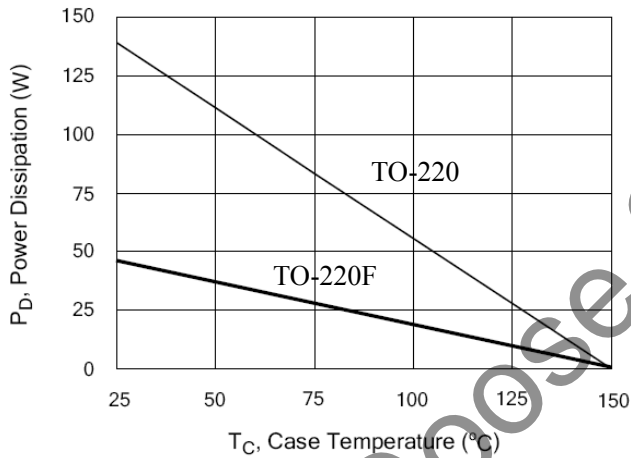


Figure 3. Maximum Continuous Drain Current vs  $T_c$

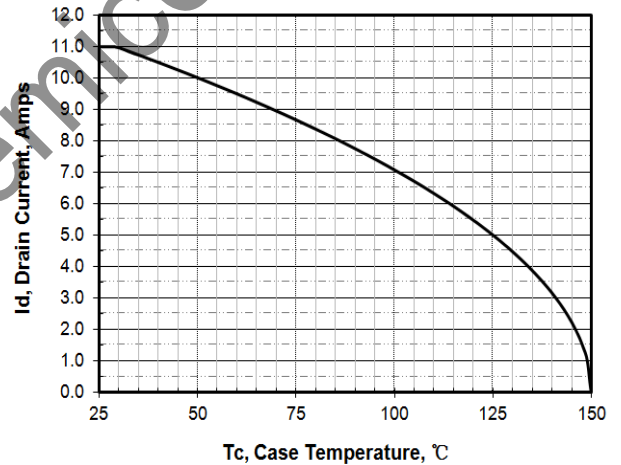


Figure 4. Typical Output Characteristics

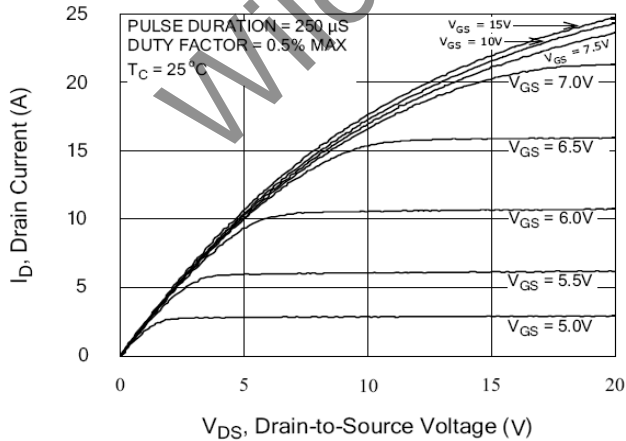
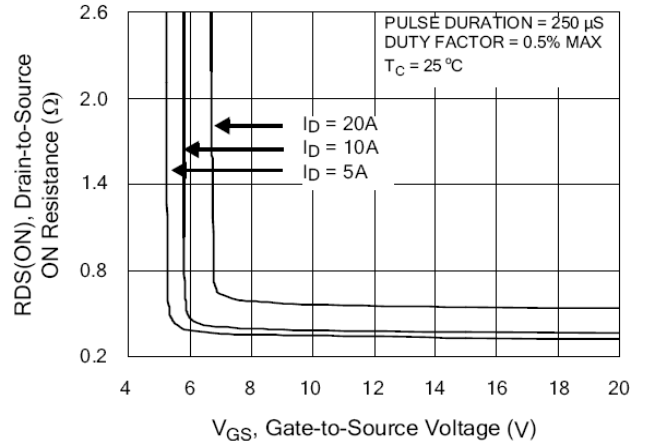


Figure 5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current



Typical Characteristics (Continued)

Figure 11. Typical Breakdown Voltage vs Junction Temperature

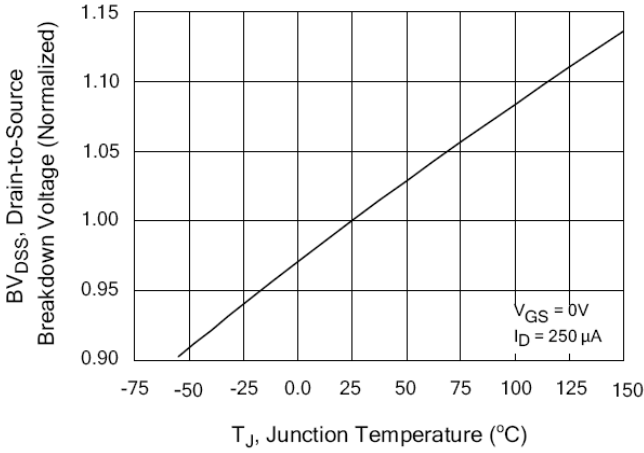


Figure 12. Typical Threshold Voltage vs Junction Temperature

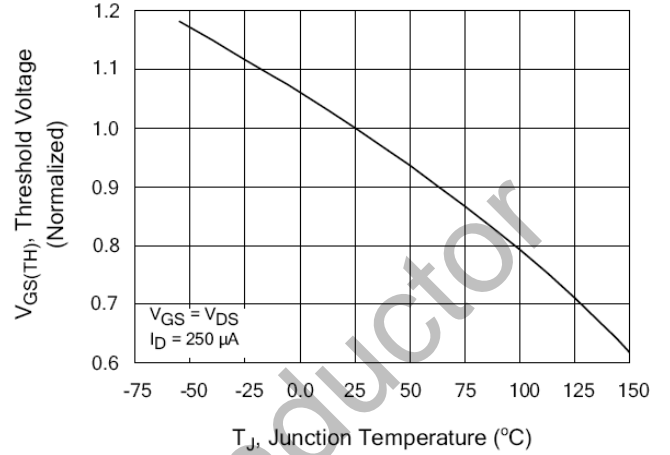


Figure 13. Maximum Safe Operating Area

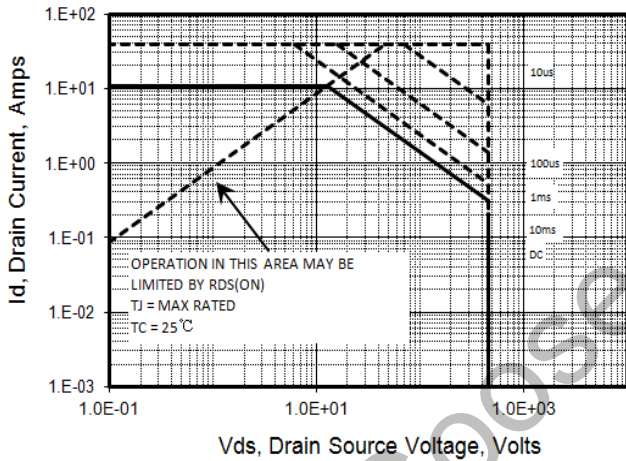


Figure 14. Typical Capacitance vs Drain-to-Source Voltage

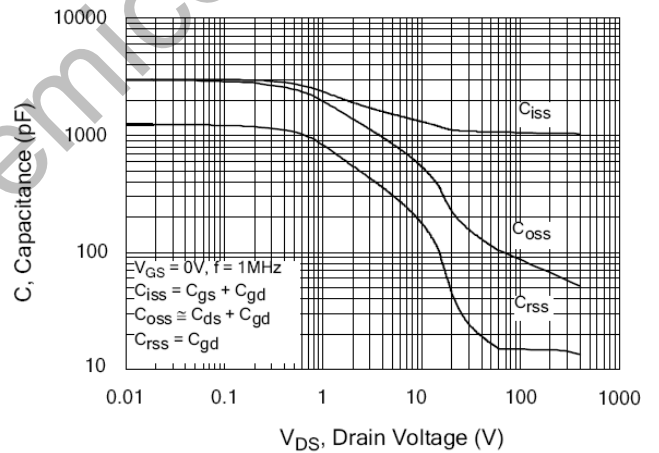


Figure 15. Typical Gate Charge vs Gate-to-Source Voltage

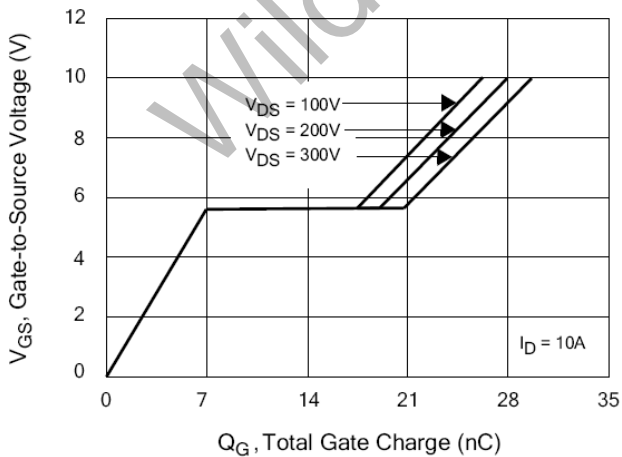
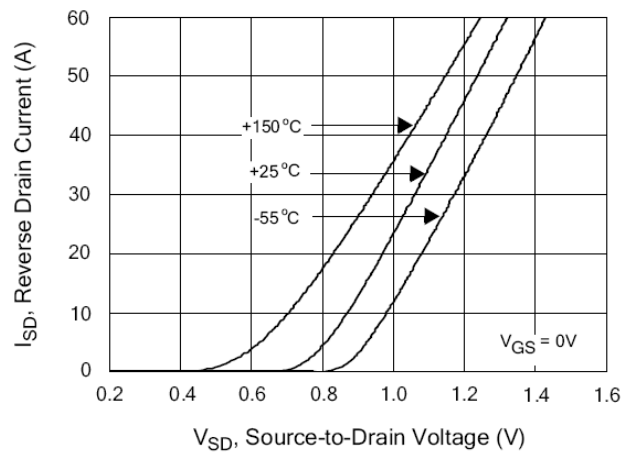
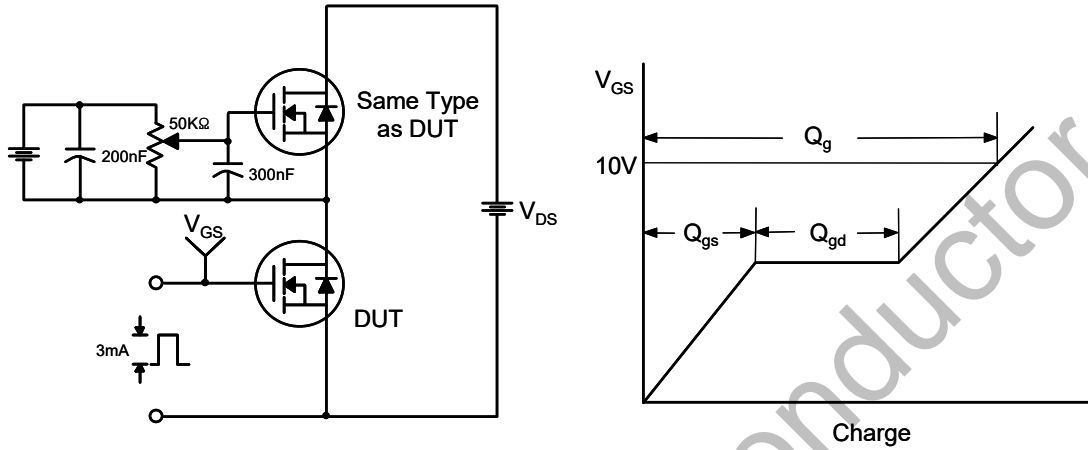


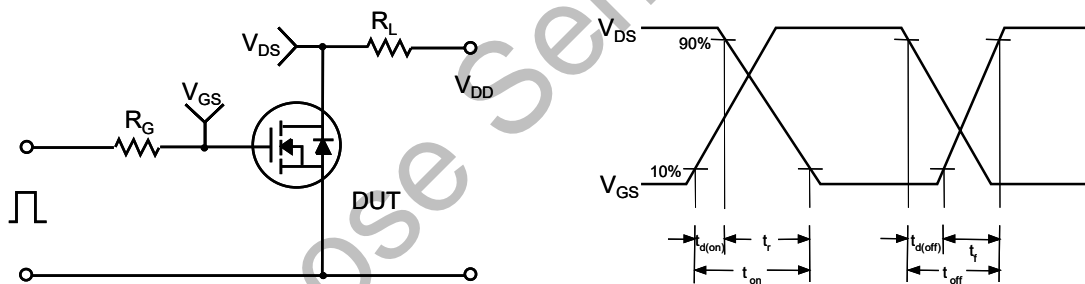
Figure 16. Typical Body Diode Transfer Characteristics



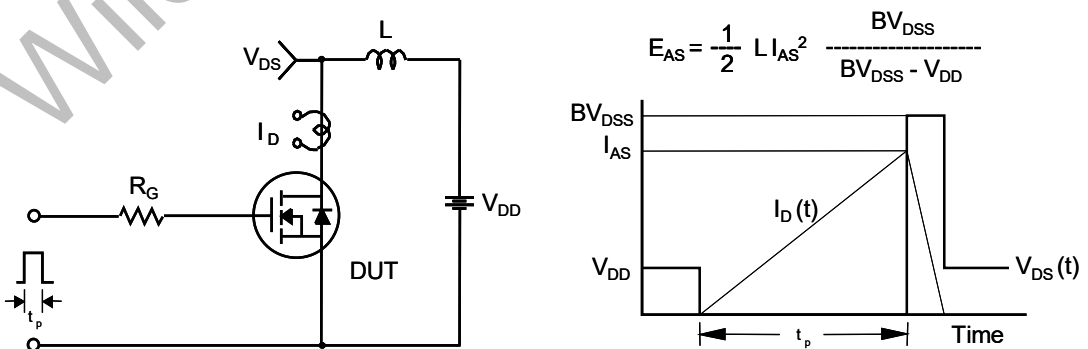
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms

