

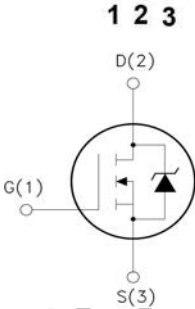


**WGF20N60SE**

**Features:**

- Low Intrinsic Capacitances.
- Excellent Switching Characteristics.
- Extended Safe Operating Area.
- Unrivalled Gate Charge :Qg=75 nC (Typ.).
- $V_{DSS}=600V, I_D=20A$
- $R_{DS(on)} : 0.42\Omega$  (Max) @ $V_G=10V$
- 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
$V_{DSS}$	Drain-Source Voltage	600	V
$I_D$	Drain Current	Tc=25°C	20
		Tc=100°C	12.5
$V_{GSS}$	Gate-Source Voltage	±30	V
$E_{AS}$	Single Pulse Avalanche Energy (note1)	580	mJ
$I_{AR}$	Avalanche Current (note2)	20	A
$P_D$	Power Dissipation (Tc=25°C)	84	W
$T_j$	Junction Temperature(Max)	150	°C
$T_{stg}$	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
$R_{\theta JC}$	Thermal Resistance, Junction to Case	-	1.48	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	-	62.5	

**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	600	-	-	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> =250μA, Reference to 25°C	-	0.71	-	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =650V, V <sub>GS</sub> =0V	-	-	10	μA
		V <sub>DS</sub> =520V, T <sub>c</sub> =125°C	-	-	100	
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> =10A, V <sub>GS</sub> =10V	-	0.35	0.42	Ω
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0, f=1.0MHz	-	3420	-	pF
C <sub>oss</sub>	Output Capacitance		-	325	-	
C <sub>rss</sub>	Reverse Transfer Capacitance		-	25	-	
<b>Switching Characteristics</b>						
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =325V, I <sub>D</sub> =20A R <sub>G</sub> =25Ω (Note 3,4)	-	62	135	ns
T <sub>r</sub>	Turn-On Rise Time		-	140	290	
T <sub>d(off)</sub>	Turn-Off Delay Time		-	230	470	
T <sub>f</sub>	Turn-Off Rise Time		-	65	140	
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =520V, V <sub>GS</sub> =10V, I <sub>D</sub> =20A (Note 3,4)	-	75	98	nC
Q <sub>gs</sub>	Gate-Source Charge		-	13.5	18	
Q <sub>gd</sub>	Gate-Drain Charge		-	36	-	
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Max. Diode Forward Current	-	-	-	20	A
I <sub>SM</sub>	Max. Pulsed Forward Current	-	-	-	80	
V <sub>SD</sub>	Diode Forward Voltage	I <sub>D</sub> =20A	-	-	1.4	V
T <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> =20A, V <sub>GS</sub> =0V diF/dt=100A/μs (Note3)	-	530	-	nS
Q <sub>rr</sub>	Reverse Recovery Charge		-	10.5	-	μC

Notes : 1, L=3.45mH, I<sub>AS</sub>=20A, 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. On-Region Characteristics

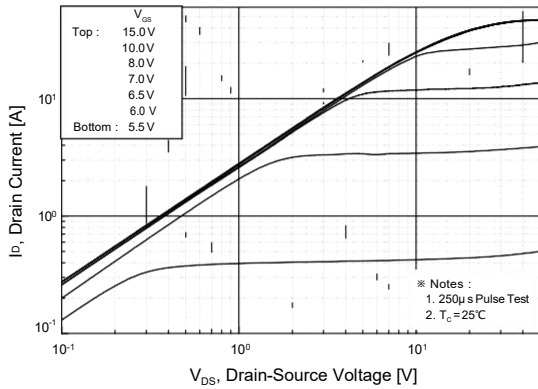


Figure 2. Transfer Characteristics

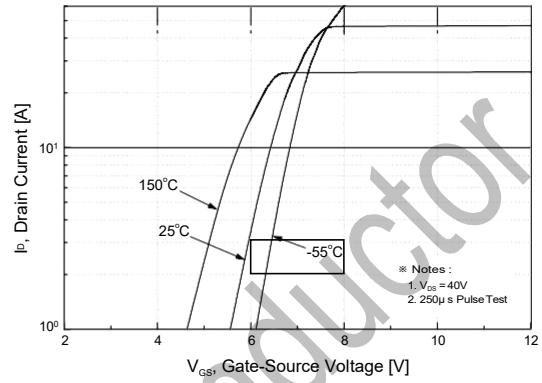


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

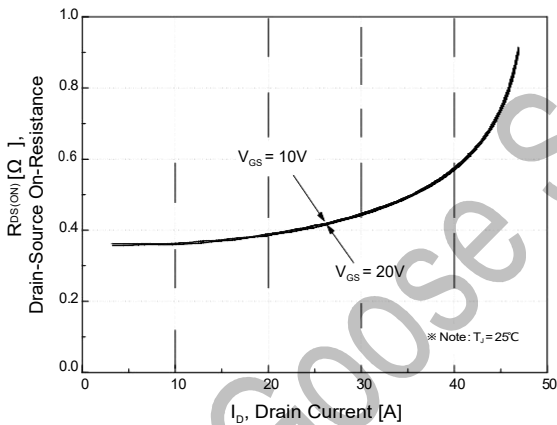


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

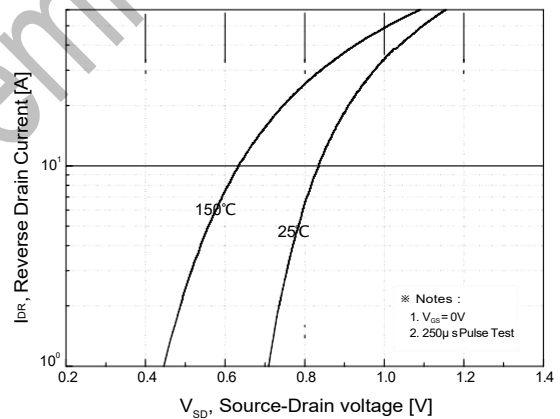


Figure 5. Capacitance Characteristics

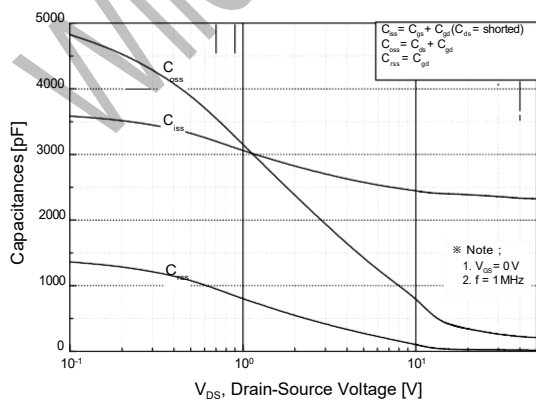
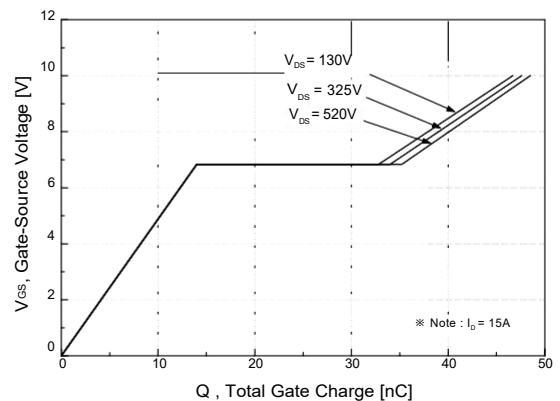


Figure 6. Gate Charge Characteristics



Typical Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

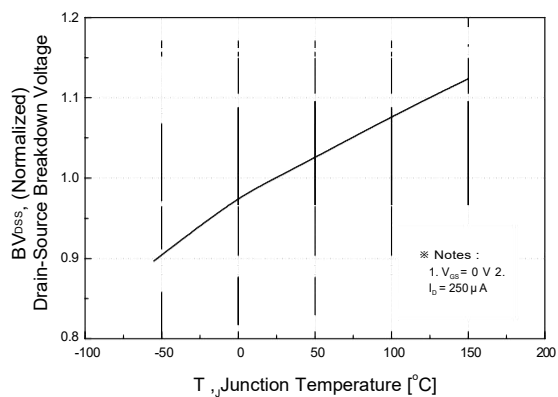


Figure 8. On-Resistance Variation vs. Temperature

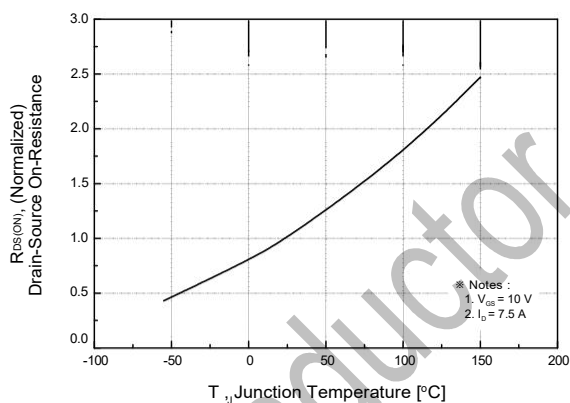


Figure 9 Safe Operating Area

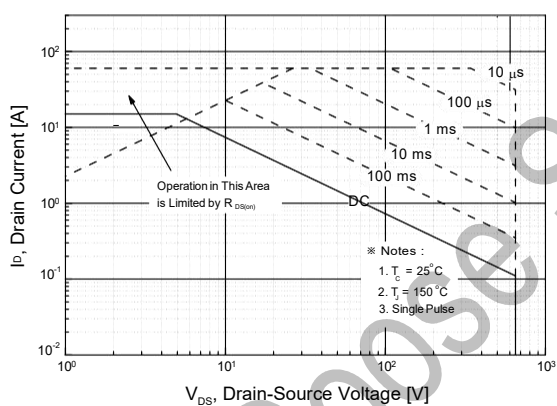


Figure 10. Maximum Drain Current vs. Case Temperature

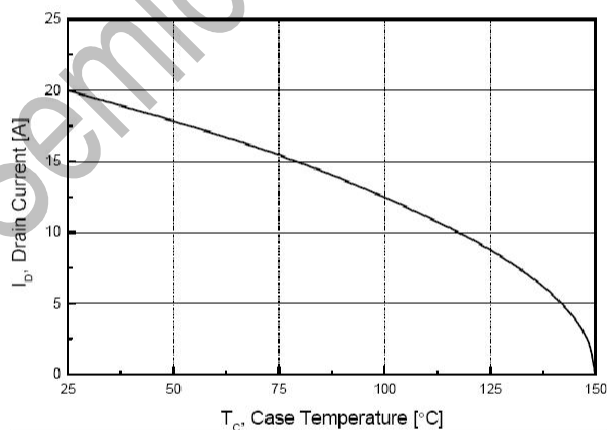
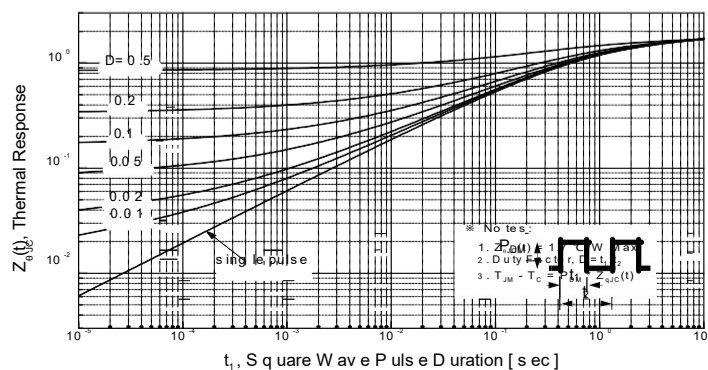
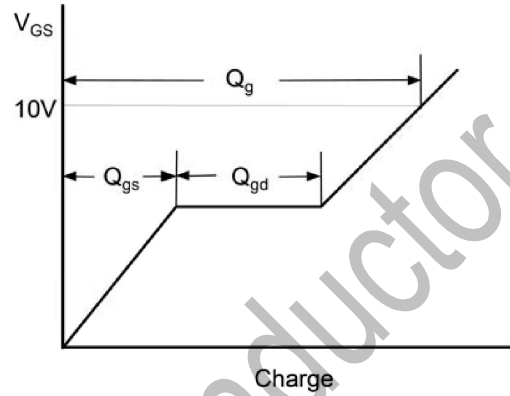
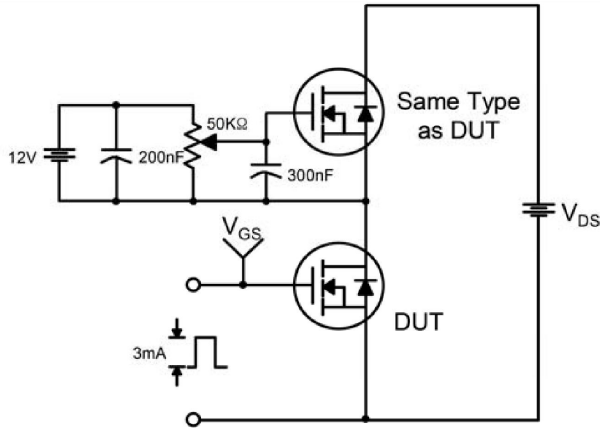


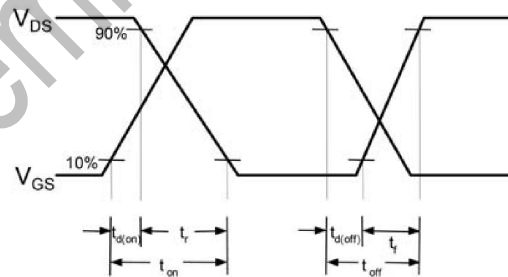
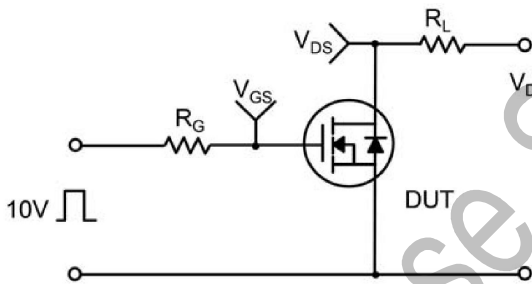
Figure 11 Transient Thermal Response Curve



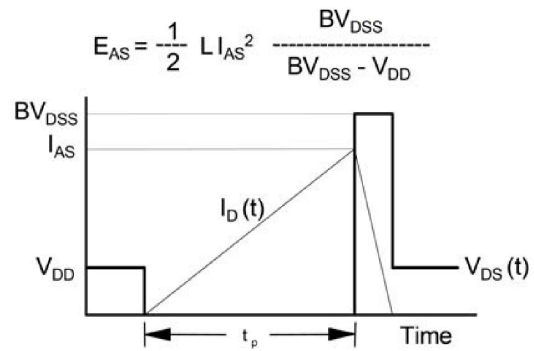
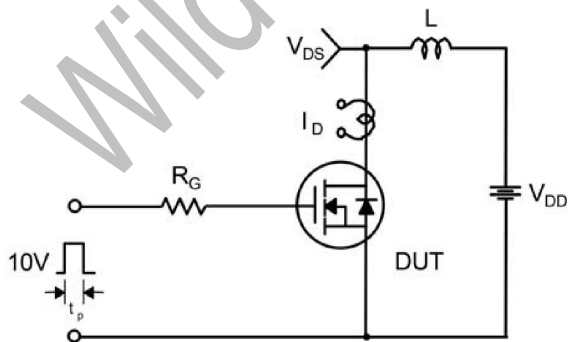
**Gate Charge Test Circuit & Waveform**



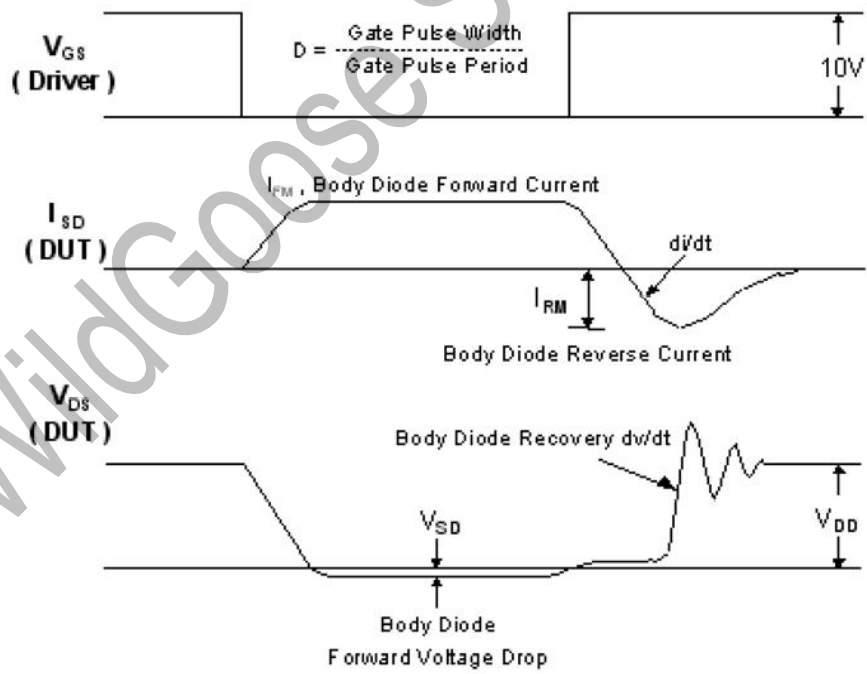
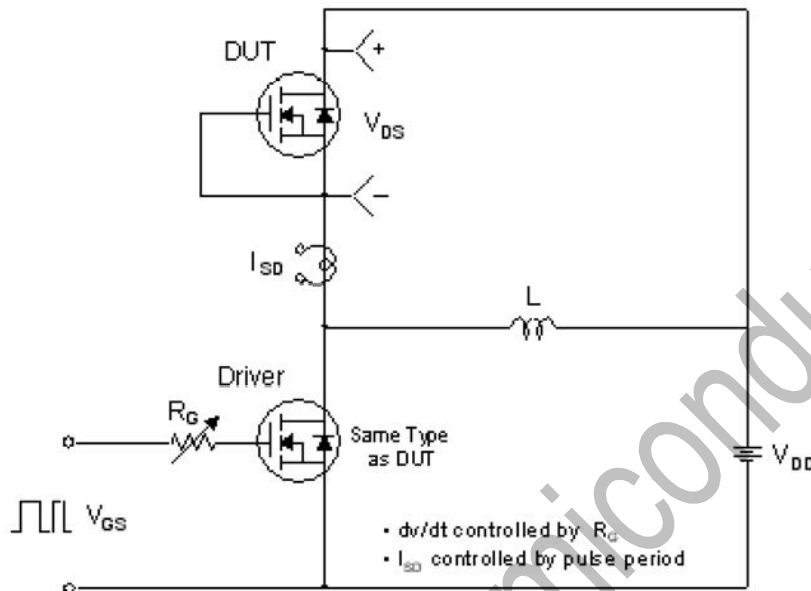
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**



Peak Diode Recovery dv/dt Test Circuit & Waveform





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