


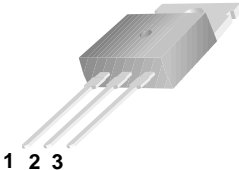
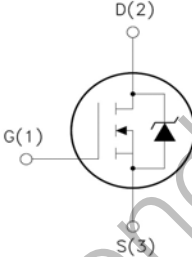
## WGP12N60SE

**Features:**

- Low Intrinsic Capacitances
- Excellent Switching Characteristics
- Extended Safe Operating Area
- Unrivalled Gate Charge :Qg= 44nC (Typ.)
- BVDSS=650V, ID=12A
- R<sub>DS(on)</sub> :0.6 Ω (Max) @VG=10V
- 100% Avalanche Tested



**TO-220**

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	600	V
I <sub>D</sub>	Drain Current	T <sub>j</sub> =25°C	12
		T <sub>j</sub> =100°C	7.9
V <sub>GSS</sub>	Gate - Source voltage	±30	V
E <sub>AS</sub>	Single Pulse Avalanche Energy (note1)	660	mJ
I <sub>AR</sub>	Avalanche Current (note2)	12	A
P <sub>D</sub>	Power Dissipation (T <sub>j</sub> =25°C)	44	W
T <sub>j</sub>	Junction Temperature(Max)	150	°C
T <sub>stg</sub>	Storage Temperature	-55~+150	°C
TL	Maximum lead temperature for soldering purpose, 1/8μS from case for 5 seconds	300	°C

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJC</sub>	Thermal Resistance, Junction to Case	-	2.8	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient	-	62.5	°C/W

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=250\mu A, V_{GS}=0$	600	-	-	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D=250\mu A$ , Reference to 25°C	-	0.71	-	V/°C
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=600V, V_{GS}=0V$	-	-	10	$\mu A$
		$V_{DS}=520V, T_J=125^\circ C$	-	-	100	
$I_{GSSF}$	Gate-body leakage Current, Forward	$V_{GS}=+30V, V_{DS}=0V$	-	-	100	nA
$I_{GSSR}$	Gate-body leakage Current, Reverse	$V_{GS}=-30V, V_{DS}=0V$	-	-	-100	
<b>On Characteristics</b>						
$V_{GS(TH)}$	Gate Threshold Voltage	$I_D=250\mu A, V_{DS}=V_{GS}$	2	-	4	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$I_D=6.0A, V_{GS}=10V$	-	0.5	0.6	$\Omega$
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=25V, V_{GS}=0, f=1.0MHz$	-	1890	-	$\mu F$
$C_{oss}$	Output Capacitance		-	150	-	
$C_{rss}$	Reverse Transfer Capacitance		-	18	-	
<b>Switching Characteristics</b>						
$T_d(on)$	Turn-On Delay Time	$V_{DD}=300V, I_D=12A, R_G=25\Omega$ (Note 3,4)	-	30	70	ns
$T_r$	Turn-On Rise Time		-	80	165	
$T_d(off)$	Turn-Off Delay Time		-	144	300	
$T_f$	Turn-Off Rise Time		-	77	165	
$Q_g$	Total Gate Charge	$V_{DS}=520V, V_{GS}=10V, I_D=12A$ (Note 3,4)	-	44	47	nC
$Q_{gs}$	Gate-Source Charge		-	6.7	-	
$Q_{gd}$	Gate-Drain Charge		-	18.5	-	
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Max. Diode Forward Current	-	-	-	12	A
$I_{SM}$	Max. Pulsed Forward Current	-	-	-	48	
$V_{SD}$	Diode Forward Voltage	$I_D=12A$	-	-	1.4	V
$T_{rr}$	Reverse Recovery Time	$I_S=12A, V_{GS}=0V$ $di_F/dt=100A/\mu s$	-	380	-	nS
$Q_{rr}$	Reverse Recovery Charge	(Note3)	-	3.5	-	$\mu C$

Notes : 1, L=0.5mH, IAS=12A, VDD=50V, RG=25 $\Omega$ , Starting T<sub>J</sub> =25°C

2, Repetitive Rating : Pulse width limited by maximum junction temperature

3, Pulse Test : Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ 

4, Essentially Independent of Operating Temperature

Typical Characteristics

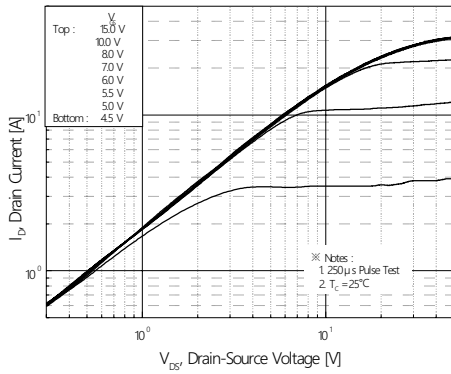


Figure 1. On-Region Characteristics

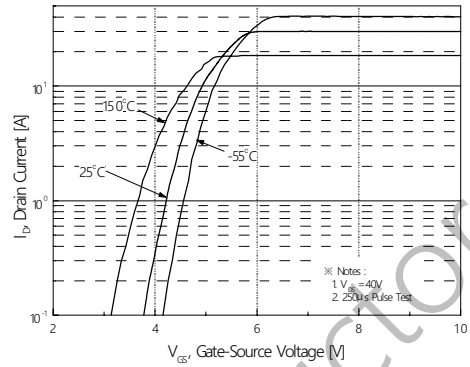


Figure 2. Transfer Characteristics

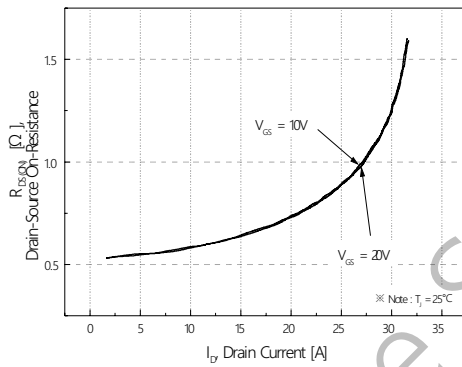


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

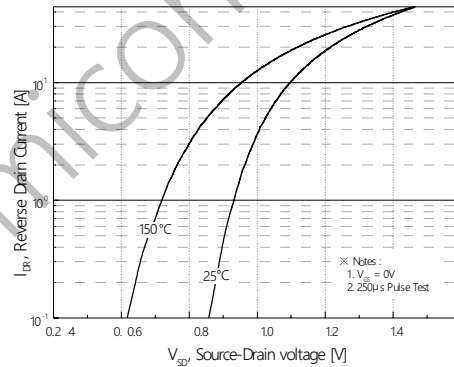


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

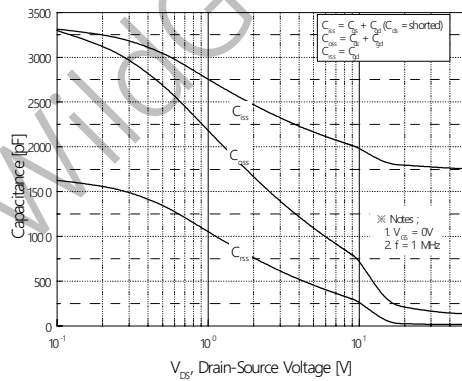


Figure 5. Capacitance Characteristics

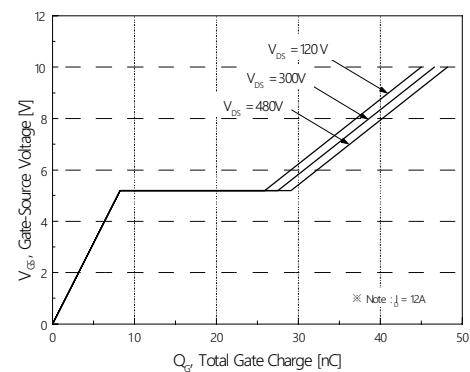


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

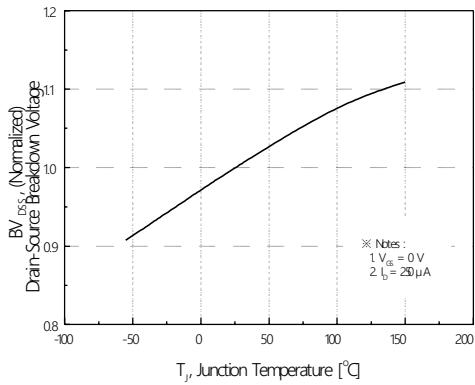


Figure 7. Breakdown Voltage Variation vs Temperature

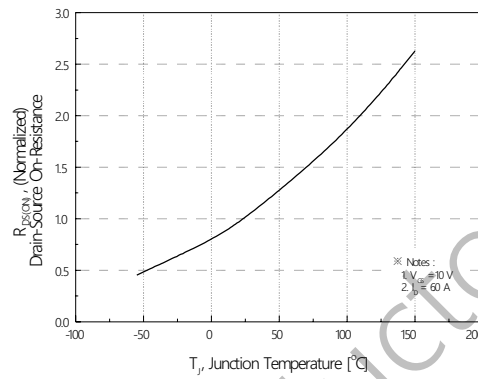


Figure 8. On-Resistance Variation vs Temperature

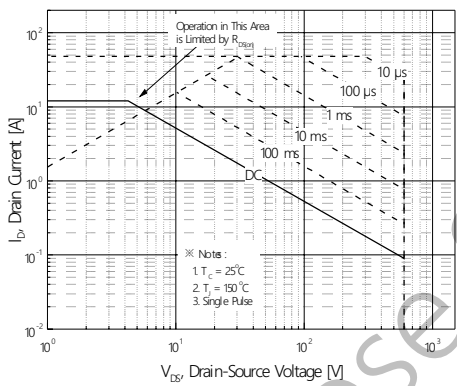


Figure 9-2. Maximum Safe Operating Area

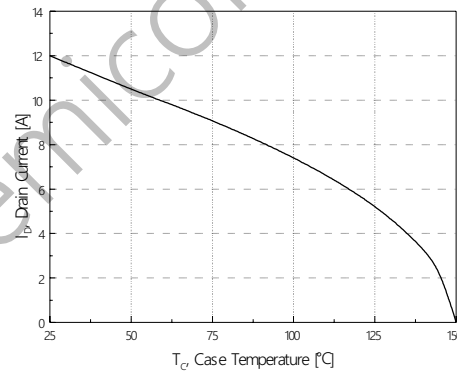


Figure 10. Maximum Drain Current vs Case Temperature

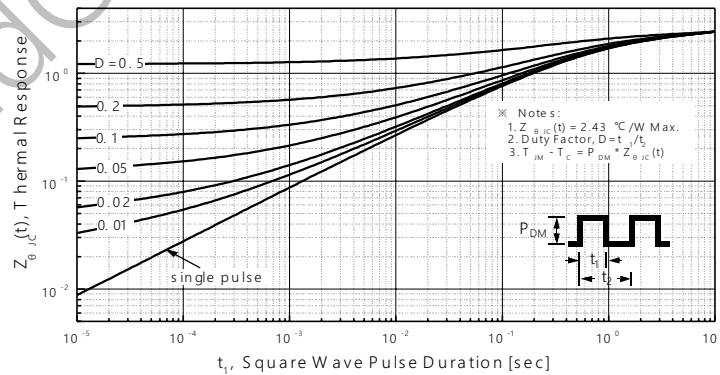
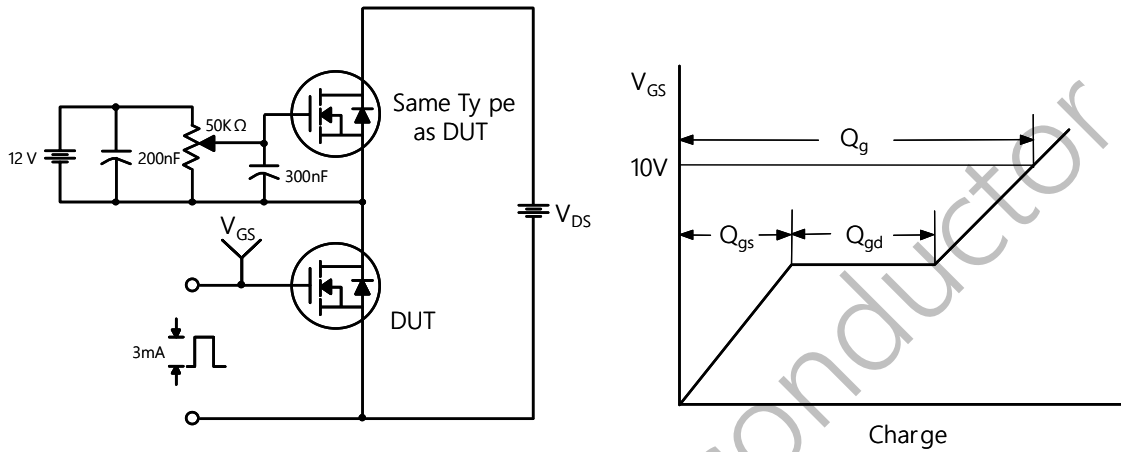
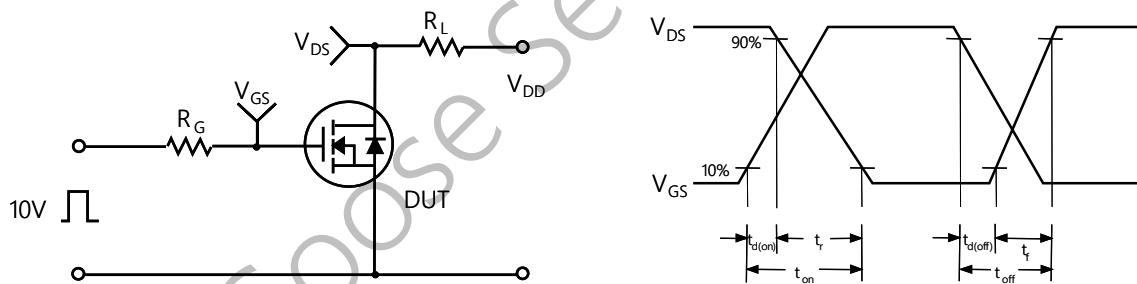


Figure 11-2. Transient Thermal Response Curve

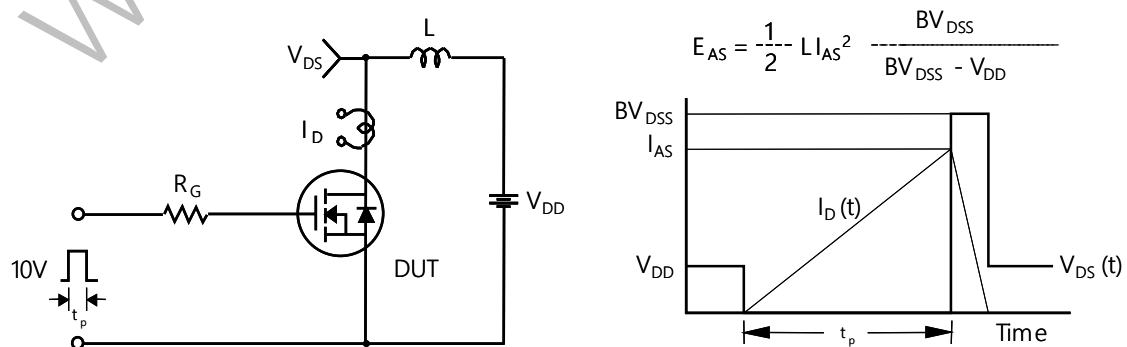
Gate Charge Test Circuit & Waveform



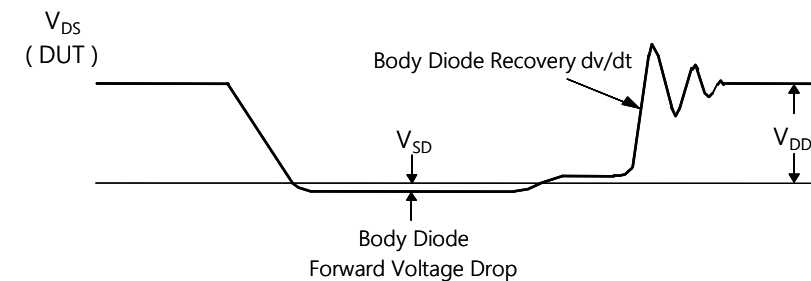
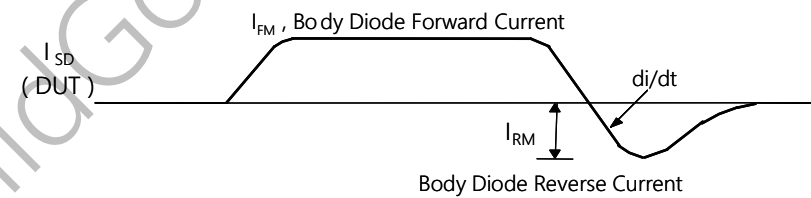
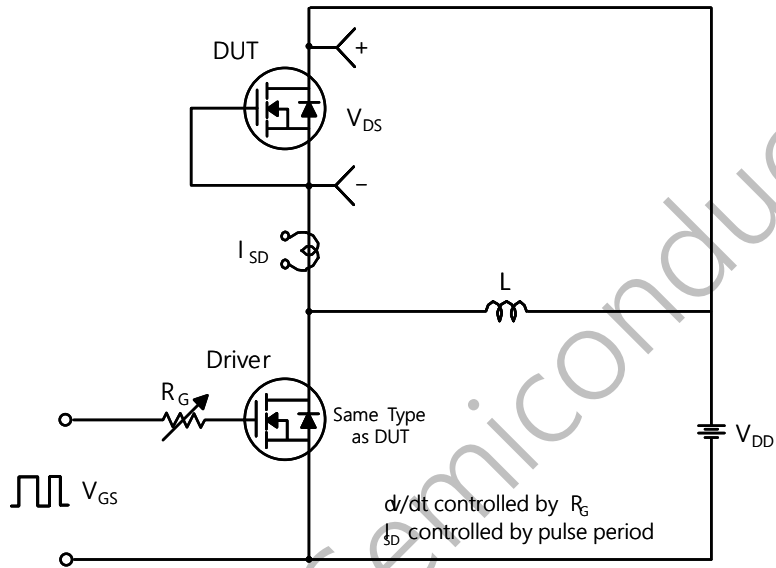
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

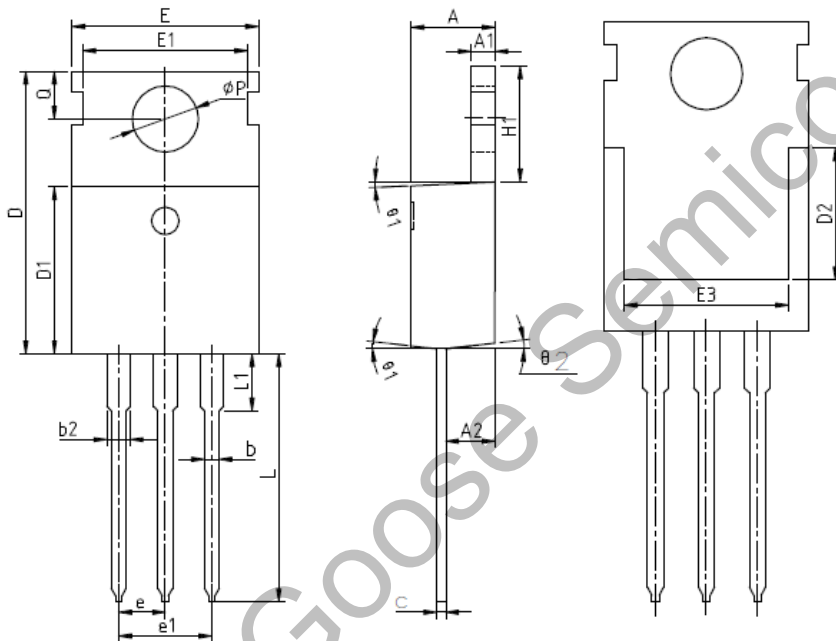


Peak Diode Recovery dv/dt Test Circuit & Waveforms



**Package Dimension**

TO-220



SYMBOL	MIN	NOM	MAX
A	4.27	4.57	4.87
A1	1.15	1.30	1.45
A2	2.10	2.40	2.70
b	0.70	0.80	1.00
b2	1.17	1.27	1.50
c	0.40	0.50	0.65
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.70	6.70	7.00
E	9.70	10.00	10.30
E1	-	8.70	-
E2	9.65	10.00	10.35
E3	7.00	8.00	8.40
e	2.54 BSC		
e1	5.08 BSC		
H1	6.00	6.50	6.85
L	12.75	13.50	13.90
L1	-	3.10	3.40
ΦP	3.45	3.60	3.75
Q	2.60	2.80	3.00
θ 1	4°	7°	10°
θ 2	0°	3°	6°

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