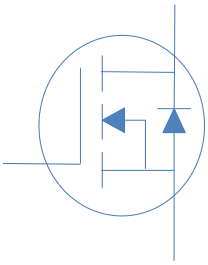
60V N-Ch Power MOSFET

V_{DS}	60	V
$R_{DS(on),typ}$	4.8	m
$I_{D\ (Sillicon\ Limited)}$	56	A



Part Number	Package	Marking
HGA053N06S	TO-220F	GA053N06S

Absolute Maximum Ratings at T_j=25℃ (unless otherwise specified)

Parameter	Symbol	Conditions	Value	Unit
Continuous Drain Current (Silicon Limited)	I_D	T_C=25℃	56	A
		T_C=100℃	40	
Drain to Source Voltage	V_{DS}	-	60	V
Gate to Source Voltage	V_{GS}	-	±20	V
Pulsed Drain Current	I_{DM}	-	250	A
Avalanche Energy, Single Pulse	E_{AS}	L=0.4mH, T_C=25℃	80	mJ
Power Dissipation	P_D	T_C=25℃	33	W
Operating and Storage Temperature	T_J, T_{stg}	-	-55 to175	℃

Absolute Maximum Ratings

Parameter	Symbol	Max	Unit
Thermal Resistance Junction-Case	$R_{\ JC}$	4.5	℃/W
Thermal Resistance Junction-Ambient	$R_{\ JA}$	60	℃/W

Electrical Characteristics at T_j=25℃ (unless otherwise specified)

Static Characteristics

Parameter	Symbol	Conditions	Value			Unit
			min	typ	max	
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_D=250 A	60	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}=V_{DS}, I_D=250 A	2	2.9	4	
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS}=0V, V_{DS}=60V, T_j=25℃	-	-	1	A
		V_{GS}=0V, V_{DS}=60V, T_j=100℃	-	-	100	
Gate to Source Leakage Current	I_{GSS}	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
Drain to Source on Resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=20A	-	4.8	5.6	m
Transconductance	g_{fs}	V_{DS}=5V, I_D=20A	-	60	-	S
Gate Resistance	R_G	V_{GS}=0V, V_{DS} Open, f=1MHz	-	1.9	-	

Dynamic Characteristics

Parameter	Symbol	Conditions	min	typ	max	Unit
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=30V, f=1MHz	-	2207	-	pF
Output Capacitance	C_{oss}		-	660	-	
Reverse Transfer Capacitance	C_{rss}		-	24	-	
Total Gate Charge (10V)	Q_g (10V)	V_{DD}=30V, I_D=20A, V_{GS}=10V	-	35	-	nC
Gate to Source Charge	Q_{gs}		-	11	-	
Gate to Drain (Miller) Charge	Q_{gd}		-	7	-	
Turn on Delay Time	$t_{d(on)}$	V_{DD}=30V, I_D=20A, V_{GS}=10V, R_G=10 ,	-	11	-	ns
Rise time	t_r		-	7	-	
Turn off Delay Time	$t_{d(off)}$		-	34	-	
Fall Time	t_f		-	8	-	

Reverse Diode Characteristics

Parameter	Symbol	Conditions	min	typ	max	Unit
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_F=20A	-	0.9	1.2	V
Reverse Recovery Time	t_{rr}	V_R=30V, I_F=20A, dI_F/dt=300A/ s	-	30	-	ns
Reverse Recovery Charge	Q_{rr}		-	68	-	nC

Fig 1. Typical Output Characteristics

Figure 2. On-Resistance vs. Gate-Source Voltage

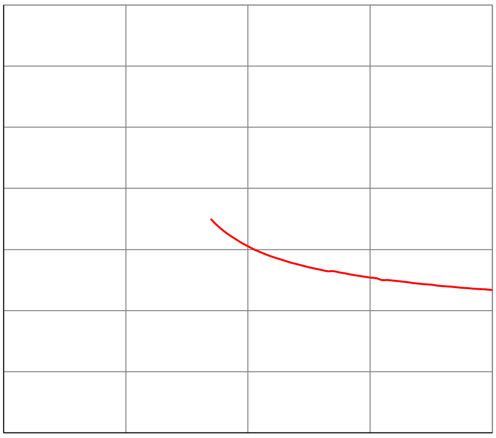


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

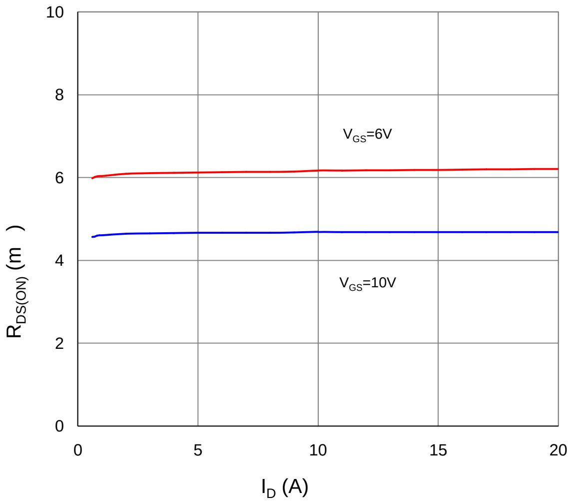


Figure 4. Normalized On-Resistance vs. Junction Temperature

Figure 5. Typical Transfer Characteristics

Figure 6. Typical Source-Drain Diode Forward Voltage

Figure 7. Typical Gate-Charge vs. Gate-to-Source Voltage

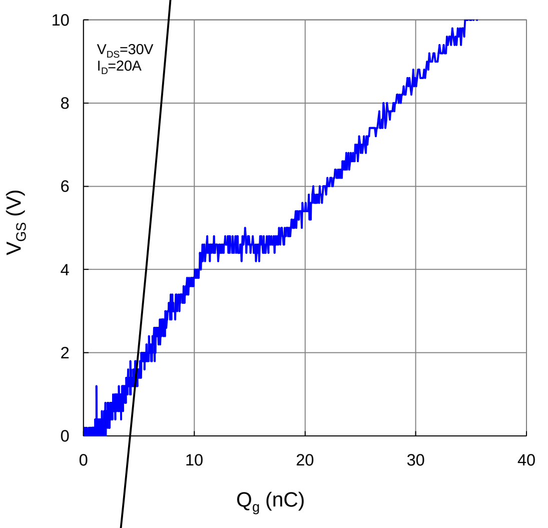


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

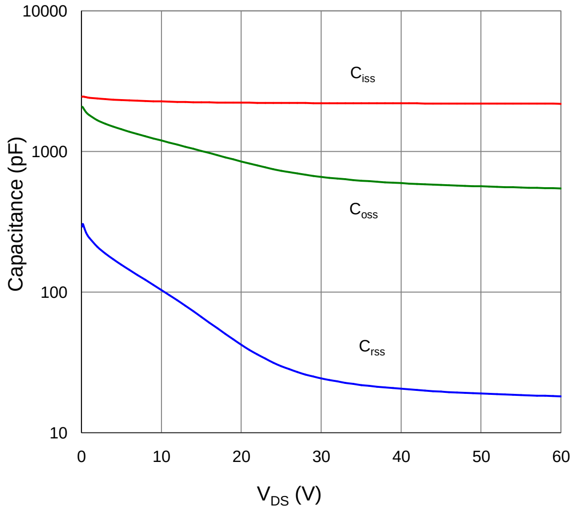


Figure 9. Maximum Safe Operating Area

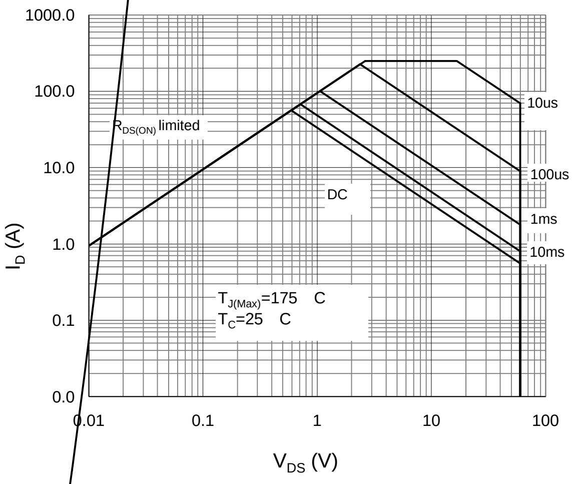


Figure 10. Maximun Drain Current vs. Case Temperature

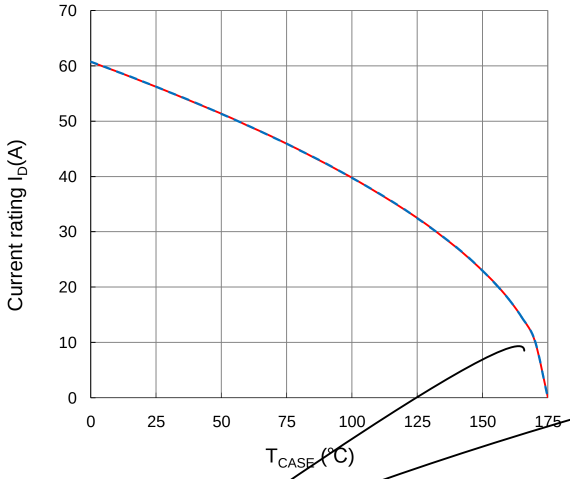
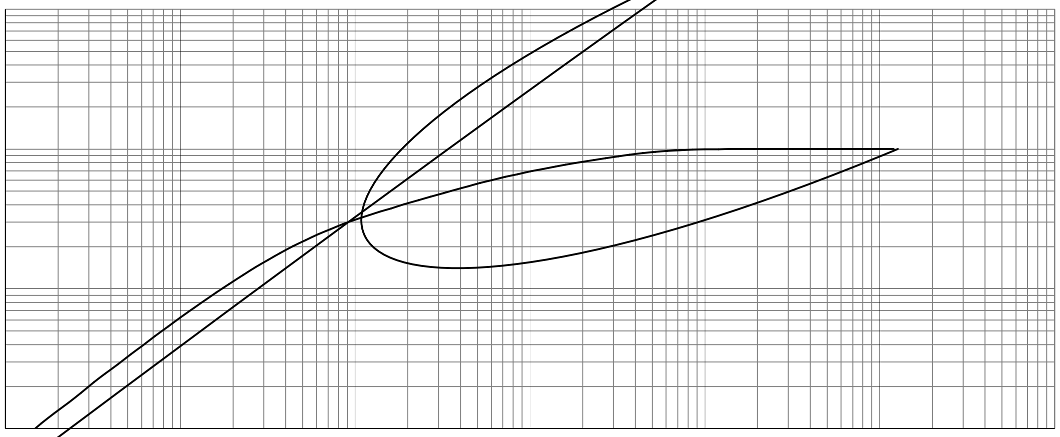
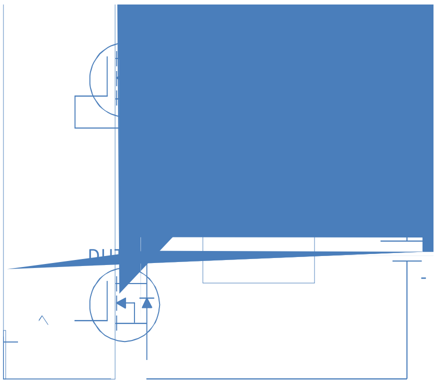
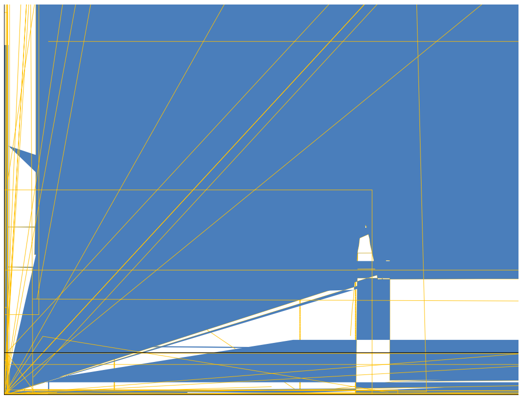


Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Case

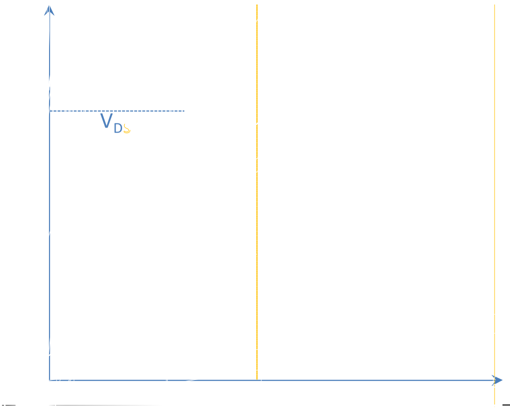


Inductive switching Test

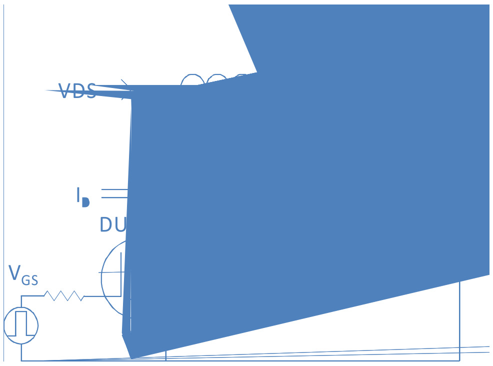




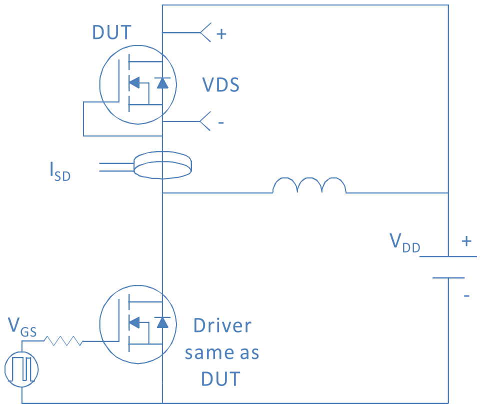
Gate Charge Test

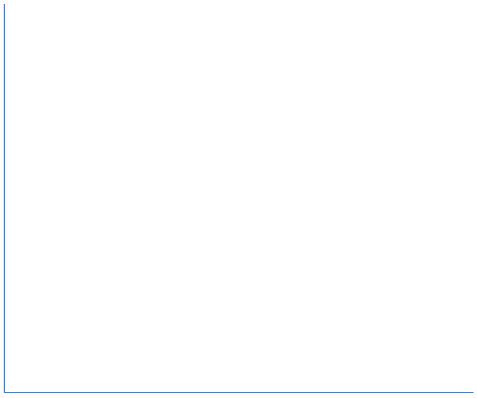


Uclamped Inductive Switching (UIS) Test



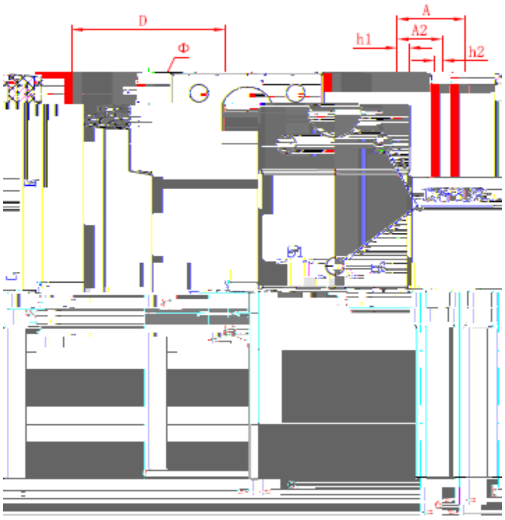
Diode Recovery Test





Package Outline

TO-220F, 3 leads



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.350	4.650	0.169	0.185
A1	1.300 REF.		0.051 REF.	
A2	2.850	3.150	0.112	0.124
A3	2.600	2.800	0.102	0.110
b	0.500	0.750	0.020	0.030
b1	0.800	1.050	0.031	0.041
b2	1.100	1.350	0.043	0.053
c	0.500	0.750	0.020	0.030
D	9.960	10.360	0.392	0.408
E	14.800	15.200	0.583	0.598
e	2.540 TYP.		0.100 TYP.	
F	2.700 REF.		0.106 REF.	
Φ	3.500 REF.		0.138 REF.	
h	0.000	0.300	0.000	0.012
h1	0.800 REF.		0.031 REF.	
h2	0.500 REF.		0.020 REF.	
L	28.000	28.400	1.102	1.118
L1	1.100	1.300	0.043	0.051
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]