HGA059N12SL P-1

120V N-Ch Power MOSFET

V_{DS}	120	V
$R_{DS(on),typ}$	5	mΩ
I_D	67	A

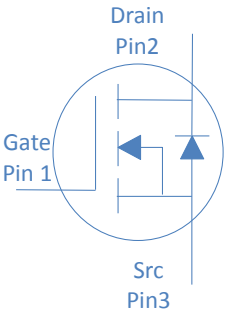
Feature

- ◇ High Speed Power Smooth Switching, Logic Level
- ◇ Enhanced Body diode dv/dt capability
- ◇ Enhanced Avalanche Ruggedness
- ◇ 100% UIS Tested, 100% Rg Tested
- ◇ Lead Free

Application

- ◇ Synchronous Rectification in SMPS
- ◇ Hard Switching and High Speed Circuit
- ◇ Power Tools
- ◇ UPS
- ◇ Motor Control

TO-220F



Part Number	Package	Marking
HGA059N12SL	TO-220F	GA059N12SL

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

Parameter	Symbol	Conditions	Value	Unit
Continuous Drain Current	I_D	T_C=25℃	67	A
		T_C=100℃	47	
Drain to Source Voltage	V_{DS}	-	120	V
Gate to Source Voltage	V_{GS}	-	±20	V
Pulsed Drain Current	I_{DM}	-	540	A
Avalanche Energy, Single Pulse	E_{AS}	L=0.4mH, T_C=25℃	720	mJ
Power Dissipation	P_D	T_C=25℃	58	W
Operating and Storage Temperature	T_J, T_{stg}	-	-55 to175	℃

Absolute Maximum Ratings

Parameter	Symbol	Max	Unit
Thermal Resistance Junction-Case	$R_{\Theta JC}$	2.6	℃/W
Thermal Resistance Junction-Ambient	$R_{\Theta JA}$	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=250μA	120	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}=V_{DS}, I_D=250μA	1.4	1.8	2.4	
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS}=0V, V_{DS}=120V, T_j=25℃	-	-	1	μA
		V_{GS}=0V, V_{DS}=120V, 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	-	5	5.9	mΩ
		V_{GS}=4.5V, I_D=20A	-	5.3	7.2	
Transconductance	g_{fs}	V_{DS}=5V, I_D=20A	-	90	-	S
Gate Resistance	R_G	V_{GS}=0V, V_{DS} Open, f=1MHz	-	0.7	-	Ω

Dynamic Characteristics

Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=60V, f=1MHz	-	7690	-	pF
Output Capacitance	C_{oss}		-	441	-	
Reverse Transfer Capacitance	C_{rss}		-	18.5	-	
Total Gate Charge	Q_g (10V)	V_{DD}=60V, I_D=20A, V_{GS}=10V	-	110	-	nC
Total Gate Charge	Q_g (4.5V)		-	50	-	
Gate to Source Charge	Q_{gs}		-	20	-	
Gate to Drain (Miller) Charge	Q_{gd}		-	34	-	
Turn on Delay Time	$t_{d(on)}$	V_{DD}=60V, I_D=20A, V_{GS}=10V, R_G=10Ω,	-	30	-	ns
Rise time	t_r		-	21	-	
Turn off Delay Time	$t_{d(off)}$		-	50	-	
Fall Time	t_f		-	17	-	

Reverse Diode Characteristics

Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_F=20A	-	0.9	1.2	V
Reverse Recovery Time	t_{rr}	V_R=60V, I_F=20A, dI_F/dt=500A/μs	-	80	-	ns
Reverse Recovery Charge	Q_{rr}		-	420	-	nC

Fig 1. Typical Output Characteristics

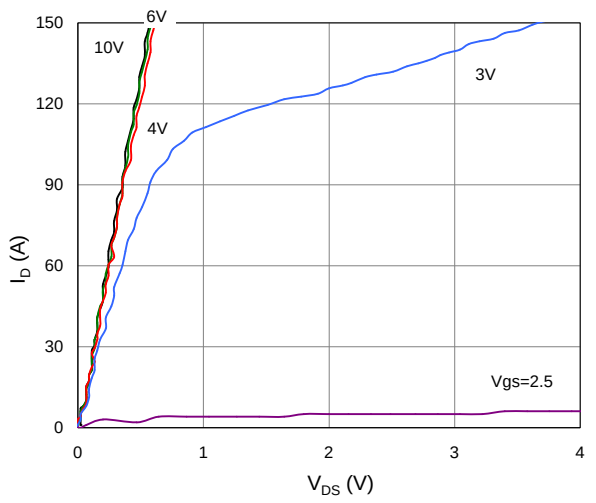


Figure 2. On-Resistance vs. Gate-Source Voltage

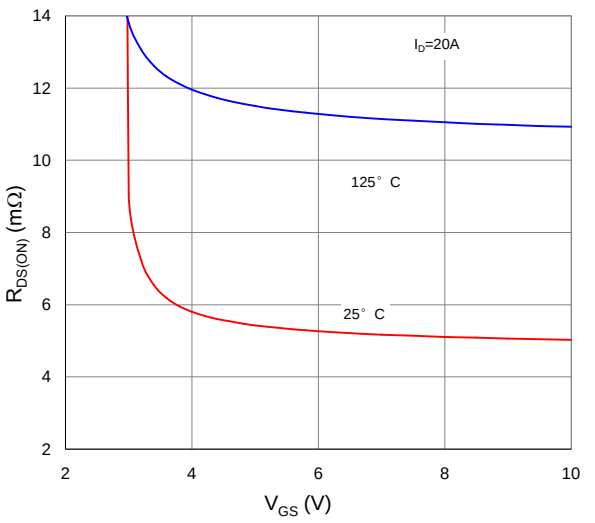


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

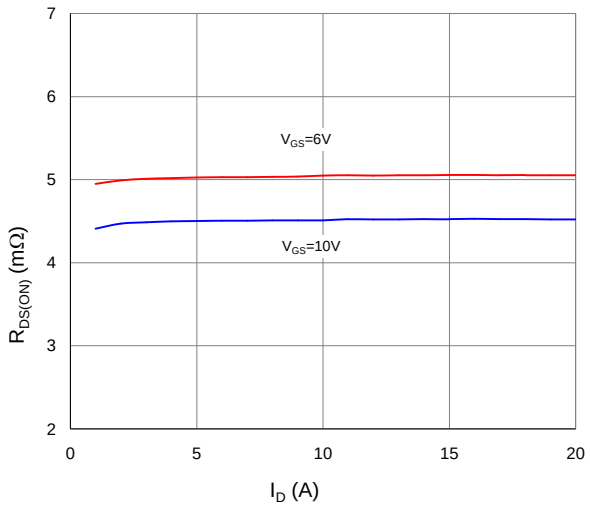


Figure 4. Normalized On-Resistance vs. Junction Temperature

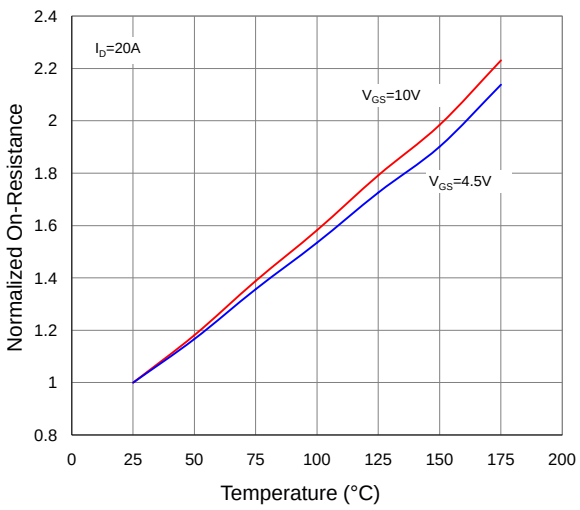


Figure 5. Typical Transfer Characteristics

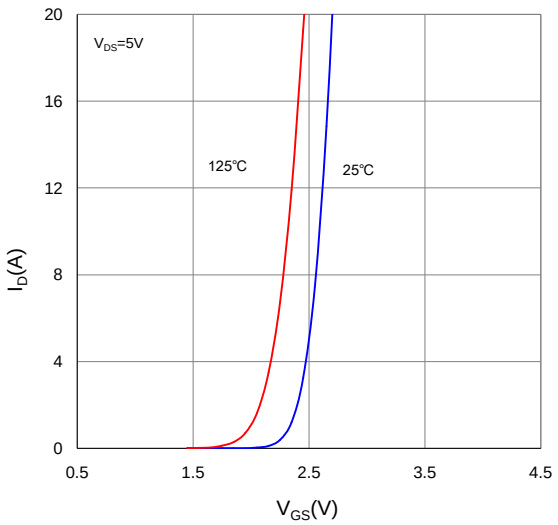


Figure 6. Typical Source-Drain Diode Forward Voltage

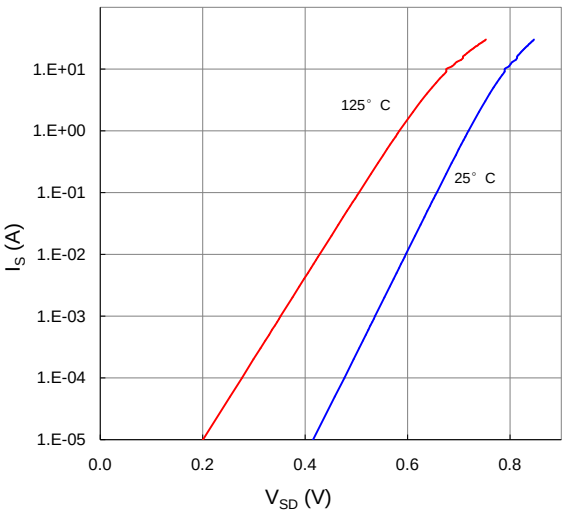


Figure 7. Typical Gate-Charge vs. Gate-to-Source Voltage

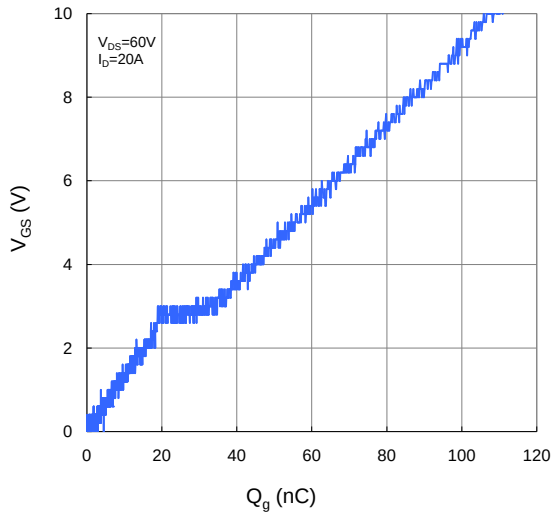


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

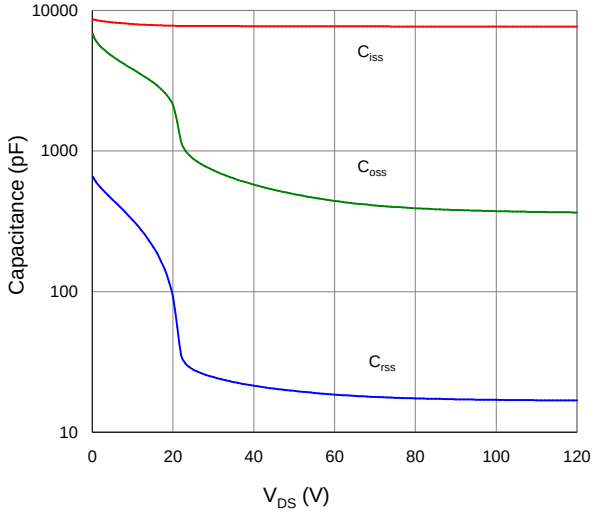


Figure 9. Maximum Safe Operating Area

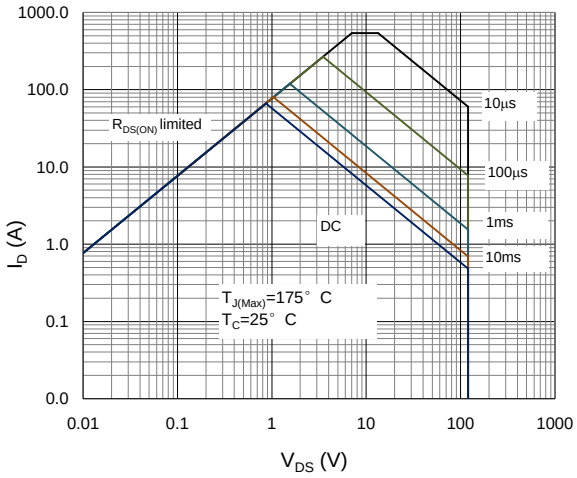


Figure 10. Maximun Drain Current vs. Case Temperature

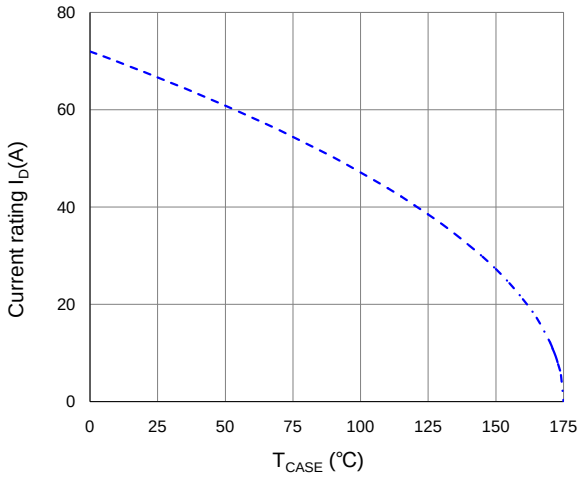
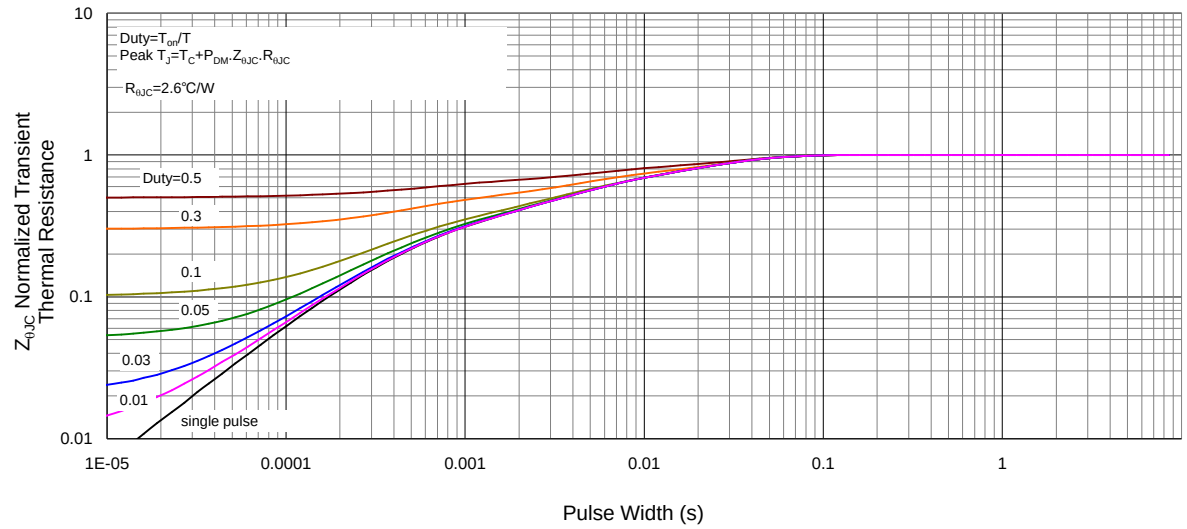
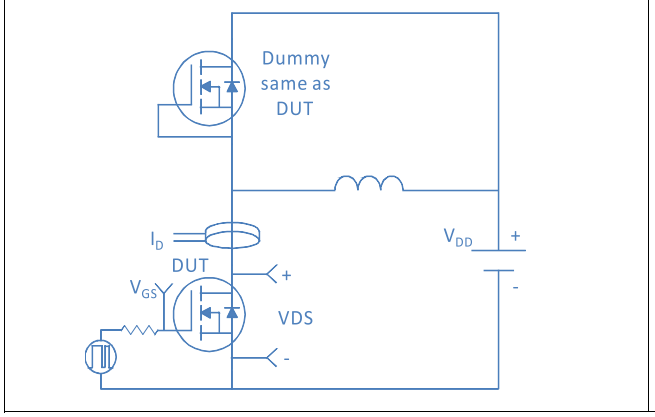
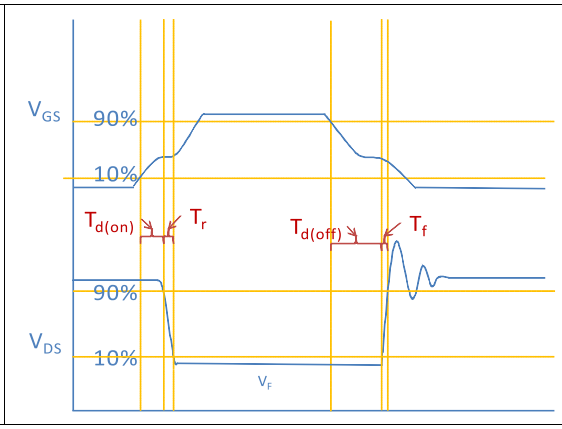


Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Case

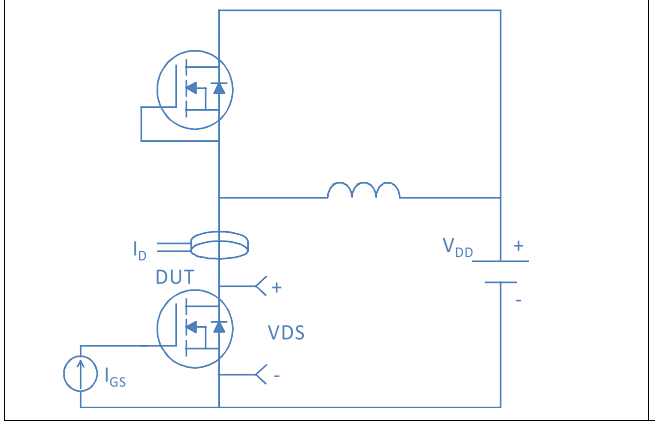


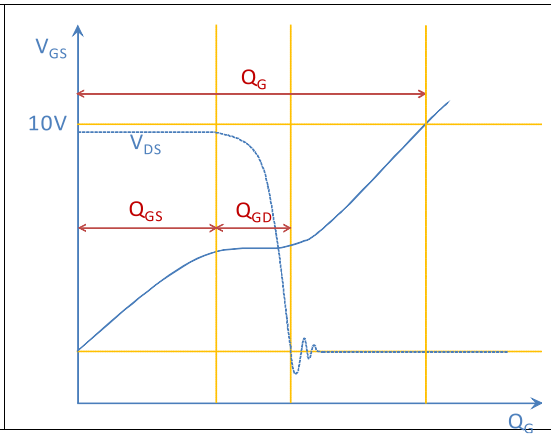
Inductive switching Test



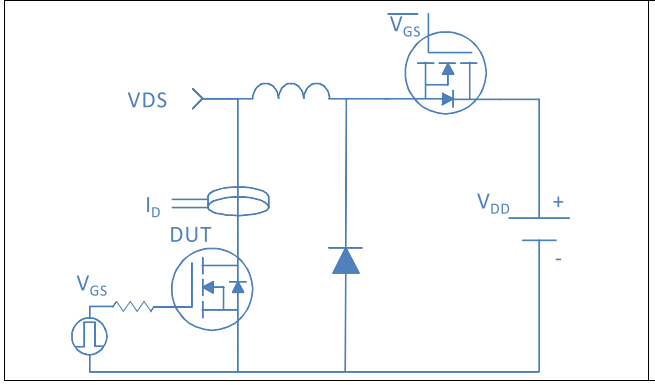


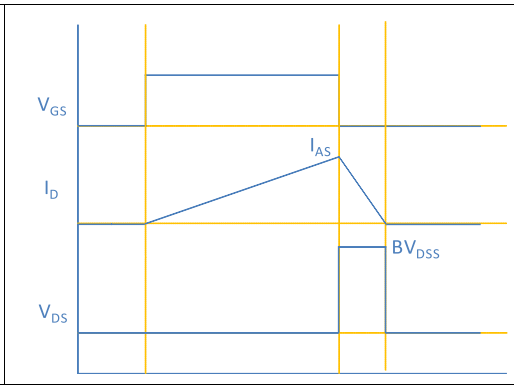
Gate Charge Test



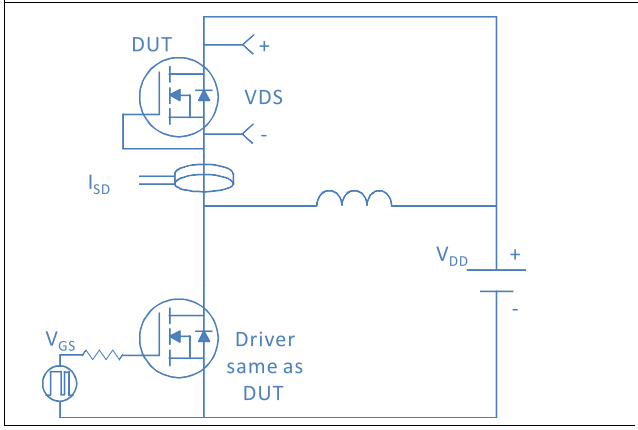


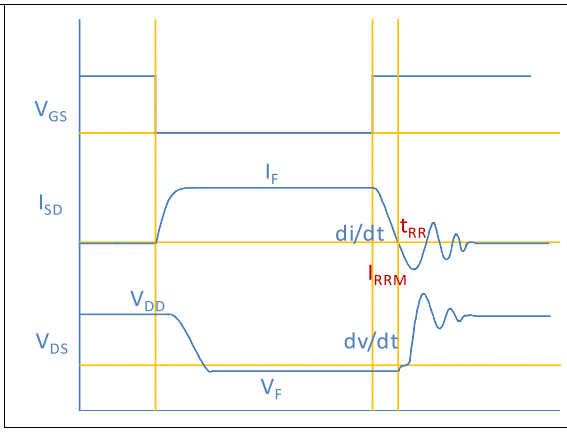
Uclamped Inductive Switching (UIS) Test



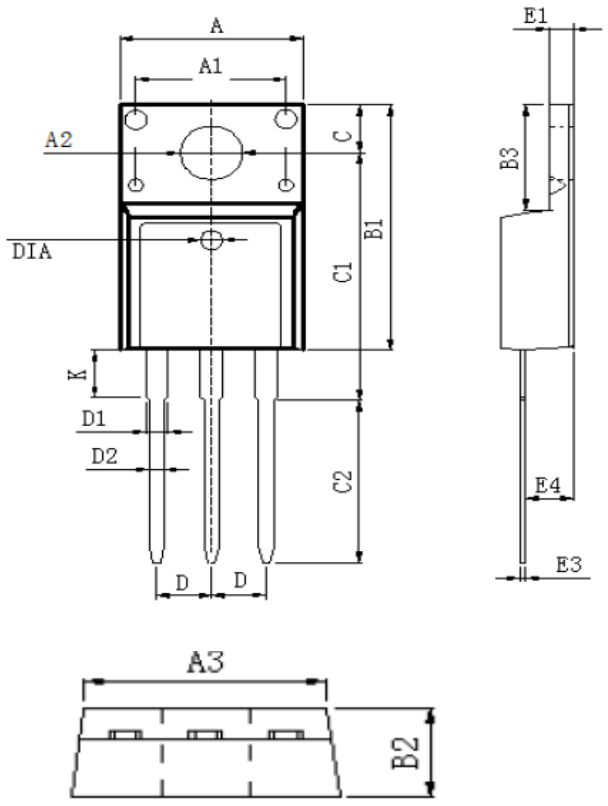


Diode Recovery Test





TO-220F, 3 leads



DIM	MILLIMETERS
A	10.16±0.3
A1	7.00±0.1
A2	3.3±0.2
A3	9.5±0.2
B1	15.87±0.3
B2	4.7±0.2
B3	6.68±0.4
C	3.3±0.2
C1	12.57±0.3
C2	10.02±0.5
D	2.54±0.05
D1	1.28±0.2
D2	0.8±0.1
K	3.1±0.3
E1	2.54±0.1
E3	0.5±0.1
E4	2.76±0.2
DIA	⊙1.5(deep 0.2)

Unit :mm