

**150V N-Ch Power MOSFET**
**Feature**

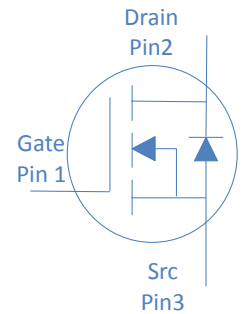
- ◇ Optimized for high speed smooth switching
- ◇ Enhanced Body diode dv/dt capability
- ◇ Enhanced Avalanche Ruggedness
- ◇ 100% UIS Tested, 100% Rg Tested
- ◇ Lead Free, Halogen Free

**Application**

- ◇ DC-DC Conversion
- ◇ Hard Switching and High Speed Circuit
- ◇ Power Tools
- ◇ UPS
- ◇ SSR

$V_{DS}$		150	V
$R_{DS(on),typ}$	TO-263	15.7	mΩ
$R_{DS(on),typ}$	TO-220	16	mΩ
$I_D$ (Silicon Limited)		80	A
$I_D$ (Package Limited)		120	A

**TO-263**

**TO-220**


Part Number	Package	Marking
HGB190N15S	TO-263	GB190N15S
HGP190N15S	TO-220	GP190N15S

**Absolute Maximum Ratings at  $T_j=25^{\circ}\text{C}$  (unless otherwise specified)**

Parameter	Symbol	Conditions	Value	Unit
Continuous Drain Current (Silicon Limited)	$I_D$	$T_C=25^{\circ}\text{C}$	80	A
		$T_C=100^{\circ}\text{C}$	56	
		Continuous Drain Current (Package Limited)	$T_C=25^{\circ}\text{C}$	
Drain to Source Voltage	$V_{DS}$	-	150	V
Gate to Source Voltage	$V_{GS}$	-	$\pm 20$	V
Pulsed Drain Current	$I_{DM}$	-	240	A
Avalanche Energy, Single Pulse	$E_{AS}$	$L=0.3\text{mH}, T_C=25^{\circ}\text{C}$	184	mJ
Power Dissipation	$P_D$	$T_C=25^{\circ}\text{C}$	214	W
Operating and Storage Temperature	$T_J, T_{stg}$	-	-55 to 175	$^{\circ}\text{C}$

**Absolute Maximum Ratings**

Parameter	Symbol	Max	Unit
Thermal Resistance Junction-Case	$R_{\theta JC}$	0.7	$^{\circ}\text{C}/\text{W}$
Thermal Resistance Junction-Ambient	$R_{\theta JA}$	60	$^{\circ}\text{C}/\text{W}$

**Electrical Characteristics at  $T_J=25^{\circ}\text{C}$  (unless otherwise specified)**
**Static Characteristics**

Parameter	Symbol	Conditions	Value			Unit
			min	typ	max	
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	150	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	2	3	4	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS}=0V, V_{DS}=150V, T_J=25^{\circ}\text{C}$	-	-	1	$\mu A$
		$V_{GS}=0V, V_{DS}=150V, T_J=100^{\circ}\text{C}$	-	-	100	
Gate to Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Drain to Source on Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$ TO-263	-	15.7	18.7	$m\Omega$
	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$ TO-220	-	16	19	
Transconductance	$g_{fs}$	$V_{DS}=5V, I_D=20A$	-	50	-	S
Gate Resistance	$R_G$	$V_{GS}=0V, V_{DS}$ Open, $f=1\text{MHz}$	-	3.5	-	$\Omega$

**Dynamic Characteristics**

Input Capacitance	$C_{iss}$	$V_{GS}=0V, V_{DS}=75V, f=1\text{MHz}$	-	2275	-	pF
Output Capacitance	$C_{oss}$		-	165	-	
Reverse Transfer Capacitance	$C_{rss}$		-	5.5	-	
Total Gate Charge	$Q_g$	$V_{DD}=75V, I_D=20A, V_{GS}=10V$	-	27	-	nC
Gate to Source Charge	$Q_{gs}$		-	9	-	
Gate to Drain (Miller) Charge	$Q_{gd}$		-	2	-	
Turn on Delay Time	$t_{d(on)}$	$V_{DD}=75V, I_D=20A, V_{GS}=10V, R_G=10\Omega,$	-	10	-	ns
Rise time	$t_r$		-	29	-	
Turn off Delay Time	$t_{d(off)}$		-	16	-	
Fall Time	$t_f$		-	15	-	

**Reverse Diode Characteristics**

Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_F=20A$	-	0.9	1.2	V
Reverse Recovery Time	$t_{rr}$	$V_R=75V, I_F=20A, di_F/dt=100A/\mu s$	-	90	-	ns
Reverse Recovery Charge	$Q_{rr}$		-	234	-	nC

Fig 1. Typical Output Characteristics

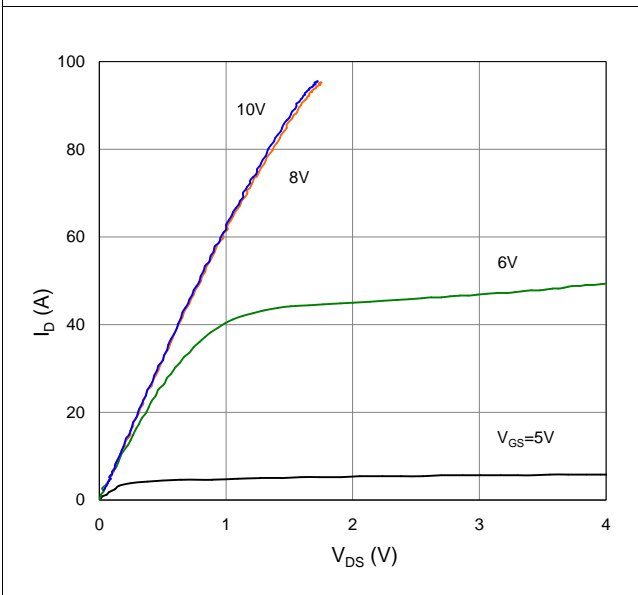


Figure 2. On-Resistance vs. Gate-Source Voltage

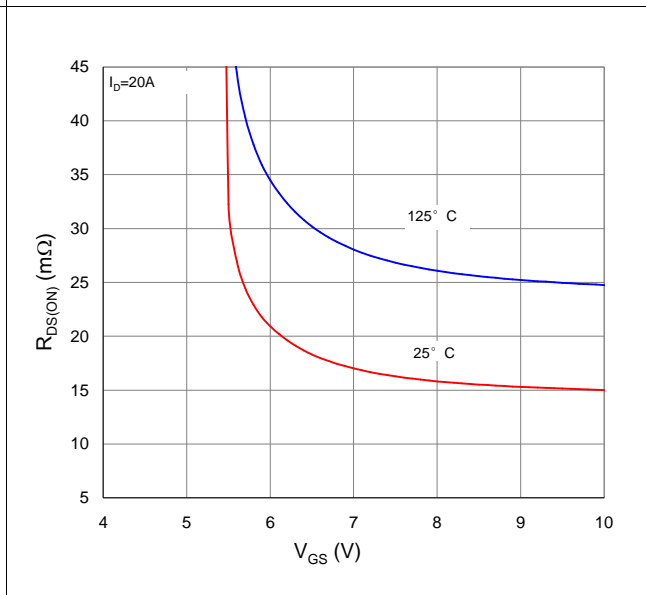


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

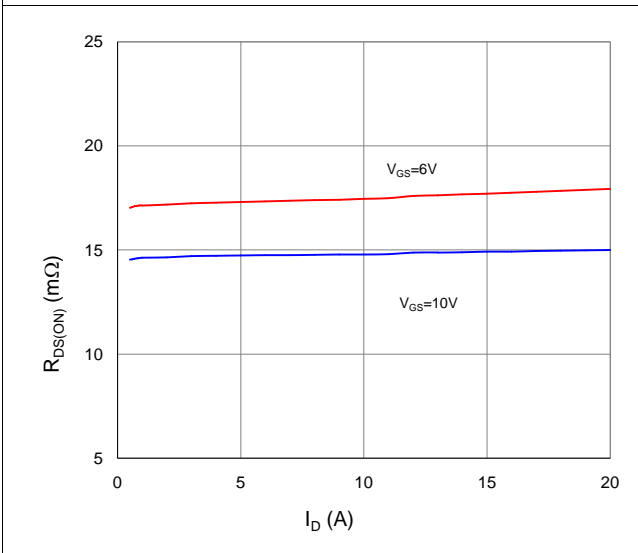


Figure 4. Normalized On-Resistance vs. Junction Temperature

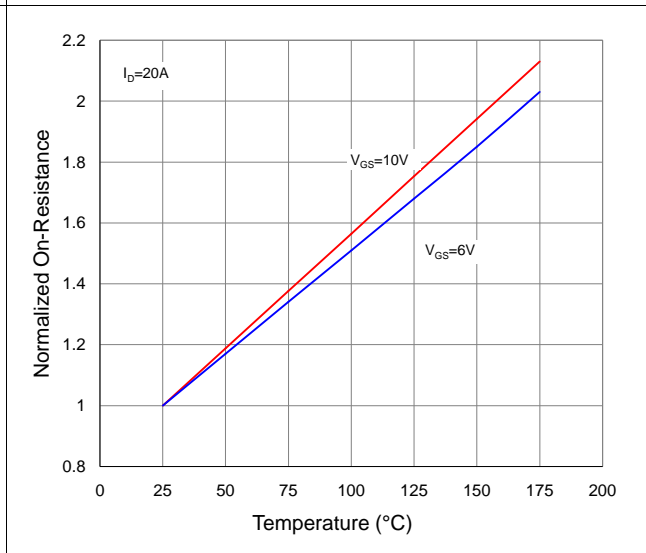


Figure 5. Typical Transfer Characteristics

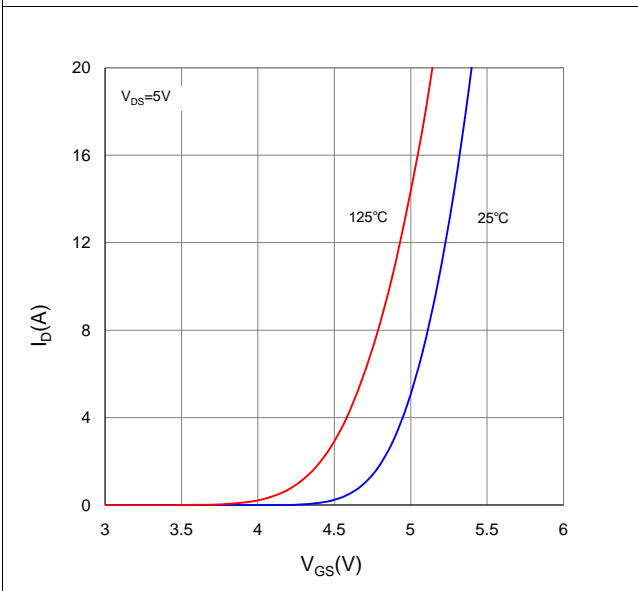


Figure 6. Typical Source-Drain Diode Forward Voltage

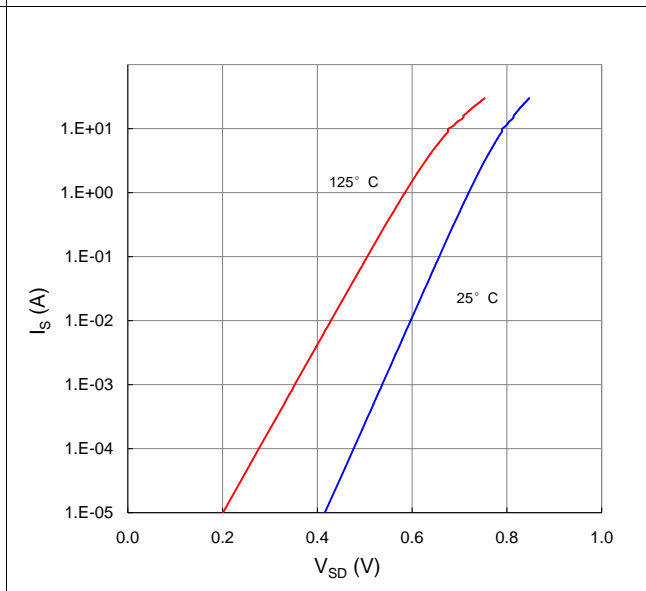


Figure 7. Typical Gate-Charge vs. Gate-to-Source Voltage

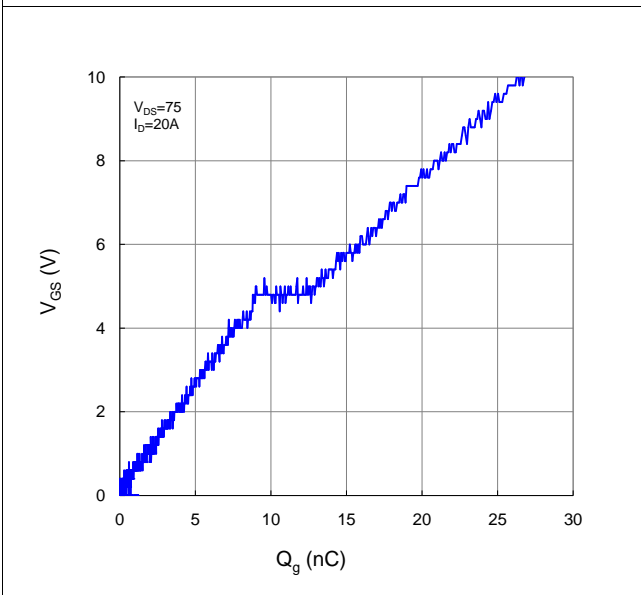


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

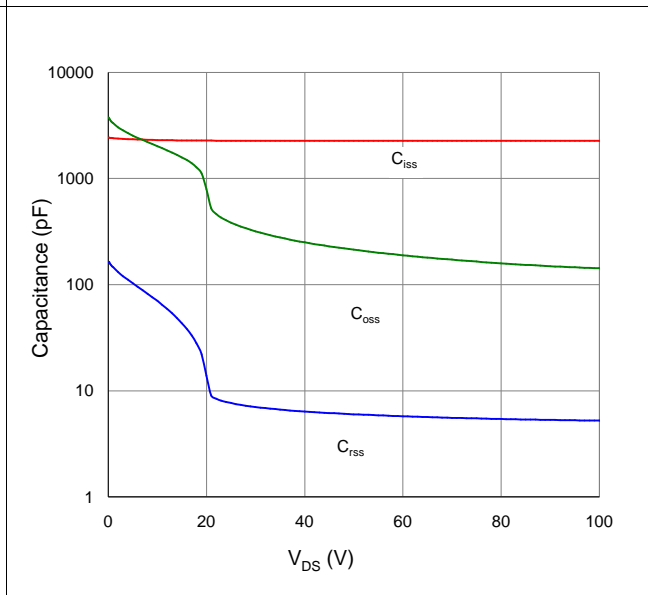


Figure 9. Maximum Safe Operating Area

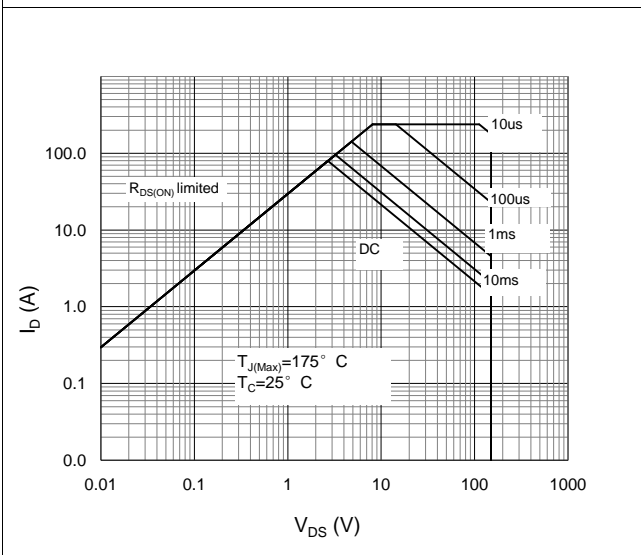


Figure 10. Maximum Drain Current vs. Case Temperature

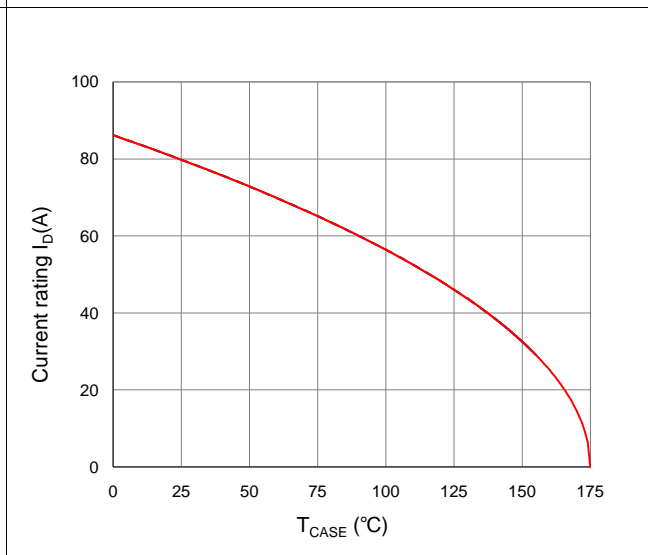
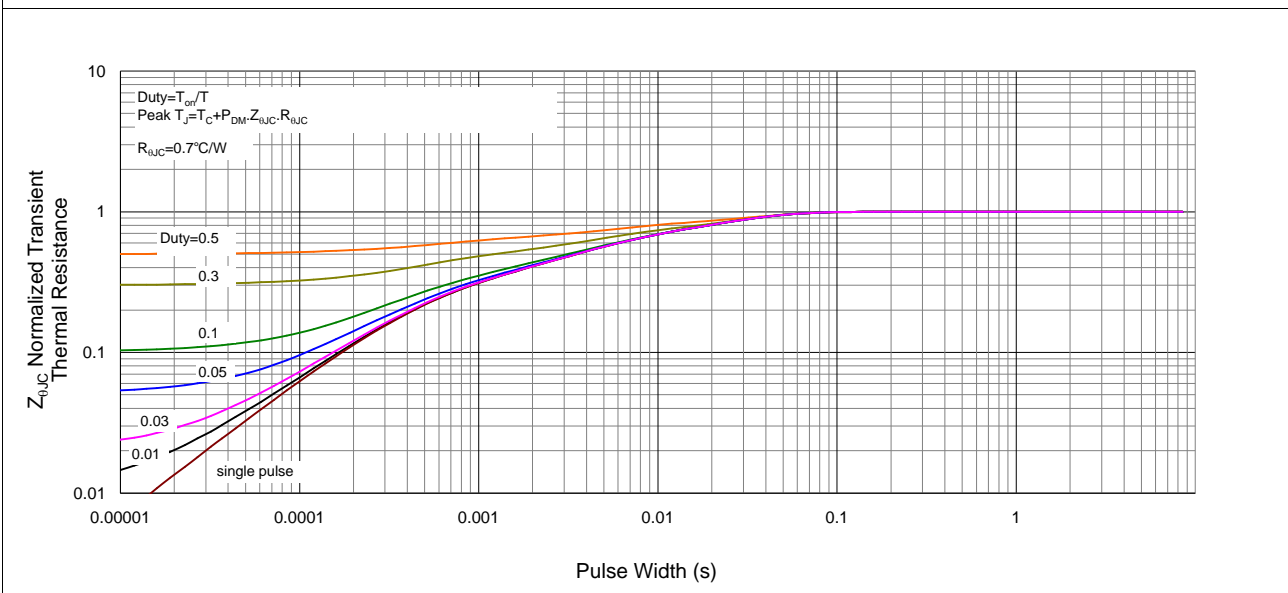
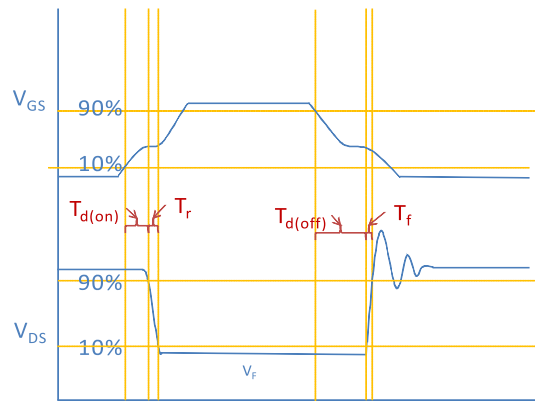
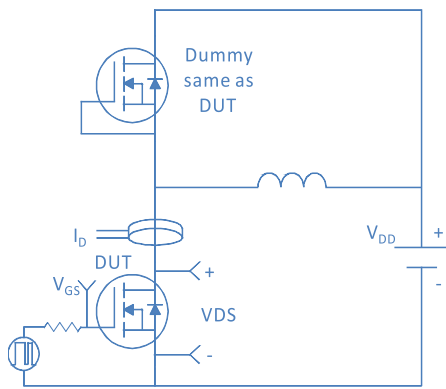


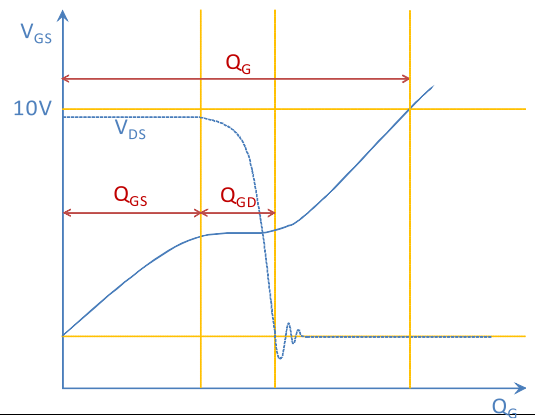
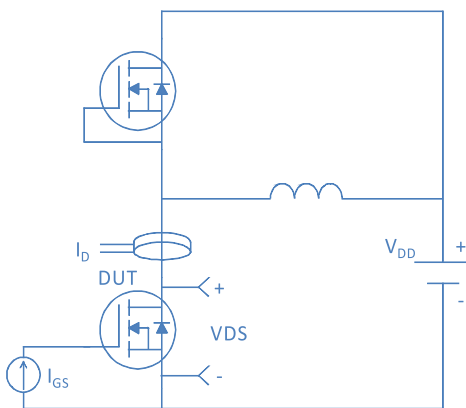
Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Case



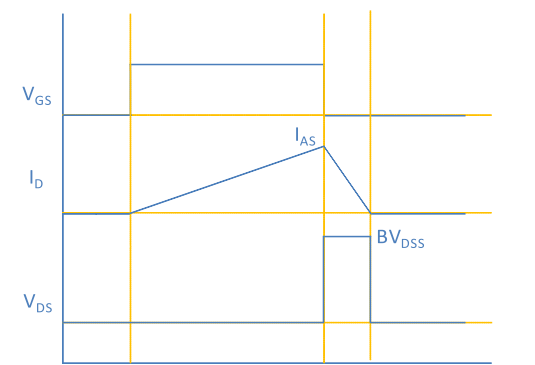
### Inductive switching Test



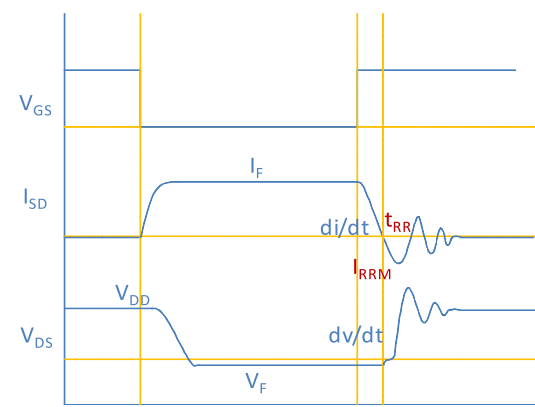
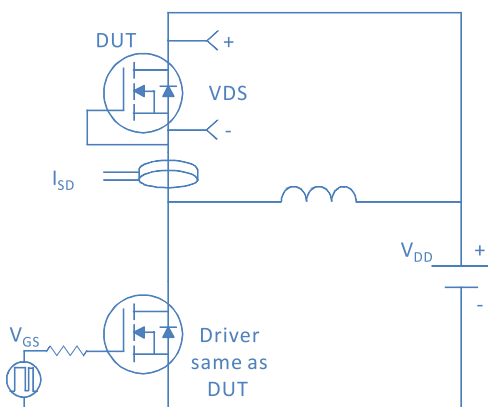
### Gate Charge Test



### Uclamped Inductive Switching (UIS) Test

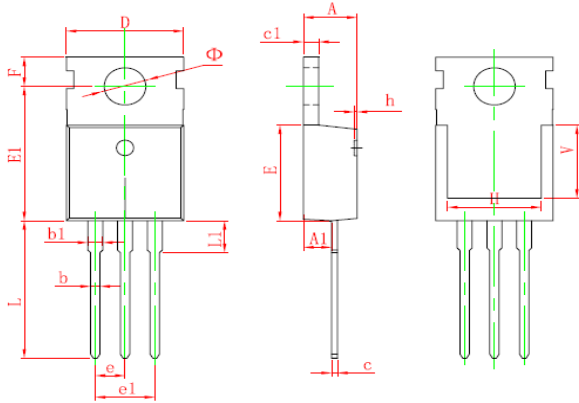


### Diode Recovery Test



## Package Outline

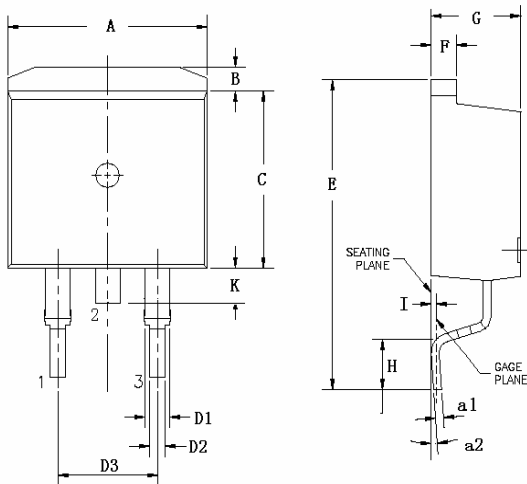
### TO-220, 3 leads



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.950	9.750	0.352	0.384
E1	12.650	13.050	0.498	0.514
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	6.900 REF.		0.276 REF.	
Φ	3.400	3.800	0.134	0.150

### TO-263, 2 leads

Dimensions in mm unless otherwise specified



Symbol	Min	Nom	Max
A	9.66	9.97	10.28
B	1.02	1.17	1.32
C	8.59	9.00	9.40
D1	1.14	1.27	1.40
D2	0.70	0.83	0.95
D3		5.08	
E	15.09	15.24	15.39
F	1.15	1.28	1.40
G	4.30	4.50	4.70
H	2.29	2.54	2.79
I		0.25	
K	1.30	1.45	1.60
a1	0.45	0.55	0.65
a2(degree)	0°		8°