

## 65V N-Ch Power MOSFET

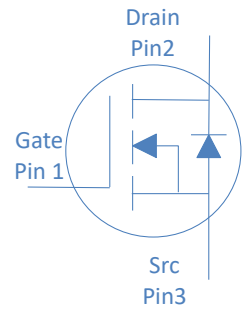
### Feature

- ◇ High Speed Power Smooth Switching
- ◇ 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

$V_{DS}$		65	V
$R_{DS(on),typ}$	TO-263	1	mΩ
$R_{DS(on),typ}$	TO-247	1.2	mΩ
$I_D$ (Silicon Limited)		417	A
$I_D$ (Package Limited)		180	A



Part Number	Package	Marking
HGB012NE6A	TO-263	GB012NE6A
HGK012NE6A	TO-247	GK012NE6A

TO-263



TO-247



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

Parameter	Symbol	Conditions	Value	Unit
Continuous Drain Current (Silicon Limited)	$I_D$	$T_C=25^\circ\text{C}$	417	A
		$T_C=100^\circ\text{C}$	295	
		$T_C=25^\circ\text{C}$	180	
Continuous Drain Current (Package Limited)		$T_C=25^\circ\text{C}$	180	
Drain to Source Voltage	$V_{DS}$	-	65	V
Gate to Source Voltage	$V_{GS}$	-	$\pm 20$	V
Pulsed Drain Current	$I_{DM}$	-	1000	A
Avalanche Energy, Single Pulse	$E_{AS}$	$L=0.4\text{mH}, T_C=25^\circ\text{C}$	720	mJ
Power Dissipation	$P_D$	$T_C=25^\circ\text{C}$	429	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	$R_{\theta JC}$	0.35	$^\circ\text{C/W}$
Thermal Resistance Junction-Ambient	$R_{\theta JA}$	60	$^\circ\text{C/W}$

**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	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	65	-	-	V	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	2	2.6	4	V	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS}=0V, V_{DS}=60V, T_J=25^{\circ}\text{C}$	-	-	1	$\mu A$	
		$V_{GS}=0V, V_{DS}=60V, T_J=100^{\circ}\text{C}$	-	-	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	-	1	1.2	m $\Omega$
			TO-247	-	1.2	1.4	
Transconductance	$g_{fs}$	$V_{DS}=5V, I_D=20A$	-	85	-	S	
Gate Resistance	$R_G$	$V_{GS}=0V, V_{DS}$ Open, $f=1\text{MHz}$	-	0.7	-	$\Omega$	

**Dynamic Characteristics**

Input Capacitance	$C_{iss}$	$V_{GS}=0V, V_{DS}=30V, f=1\text{MHz}$	-	18330	-	pF
Output Capacitance	$C_{oss}$		-	6011	-	
Reverse Transfer Capacitance	$C_{rss}$		-	347	-	
Total Gate Charge	$Q_g$	$V_{DD}=30V, I_D=20A, V_{GS}=10V$	-	280	-	nC
Gate to Source Charge	$Q_{gs}$		-	58	-	
Gate to Drain (Miller) Charge	$Q_{gd}$		-	60	-	
Turn on Delay Time	$t_{d(on)}$	$V_{DD}=30V, I_D=20A, V_{GS}=10V,$ $R_G=10\Omega,$	-	34	-	ns
Rise time	$t_r$		-	32	-	
Turn off Delay Time	$t_{d(off)}$		-	74	-	
Fall Time	$t_f$		-	26	-	

**Reverse Diode Characteristics**

Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_F=20A$	-	0.9	-	V
Reverse Recovery Time	$t_{rr}$	$V_R=30V, I_F=20A, di_F/dt=100A/\mu s$	-	102	-	ns
Reverse Recovery Charge	$Q_{rr}$		-	213	-	nC

Fig 1. Typical Output Characteristics

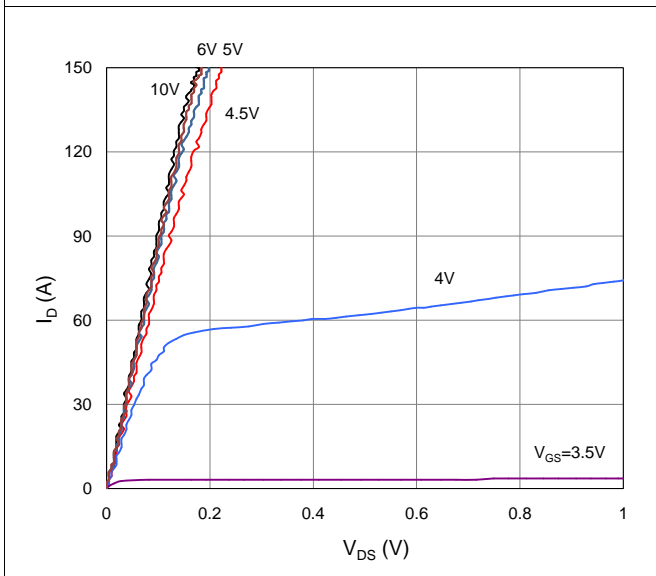


Figure 2. On-Resistance vs. Gate-Source Voltage

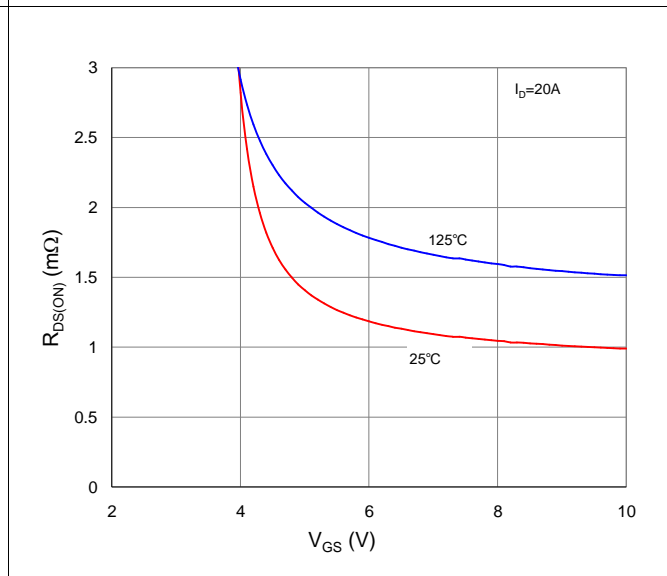


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

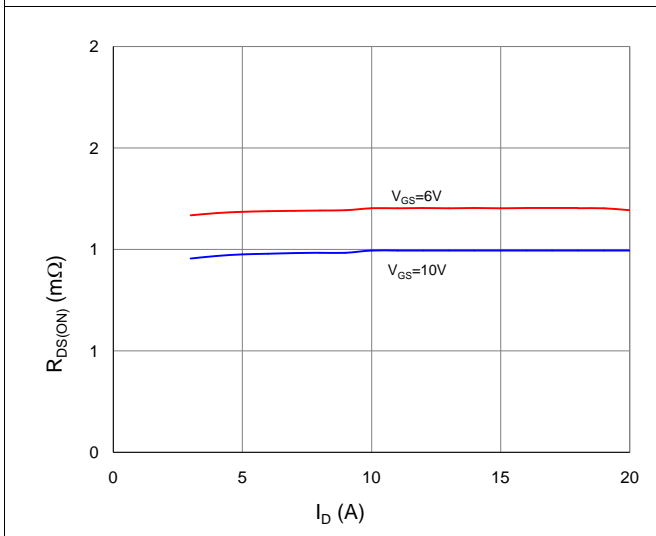


Figure 4. Normalized On-Resistance vs. Junction Temperature

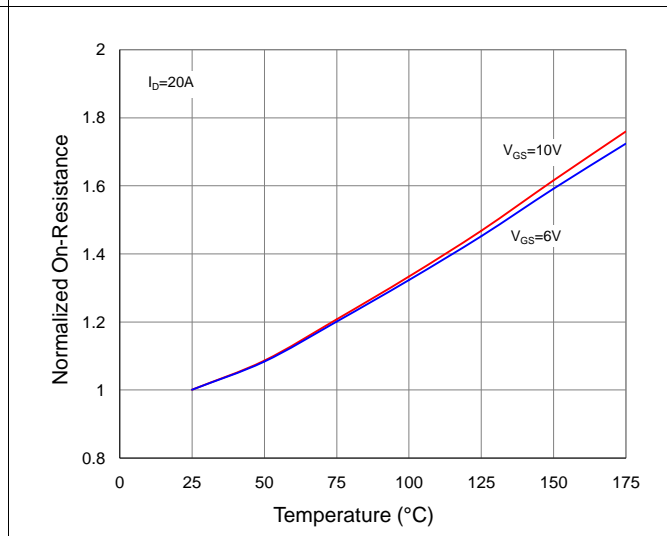


Figure 5. Typical Transfer Characteristics

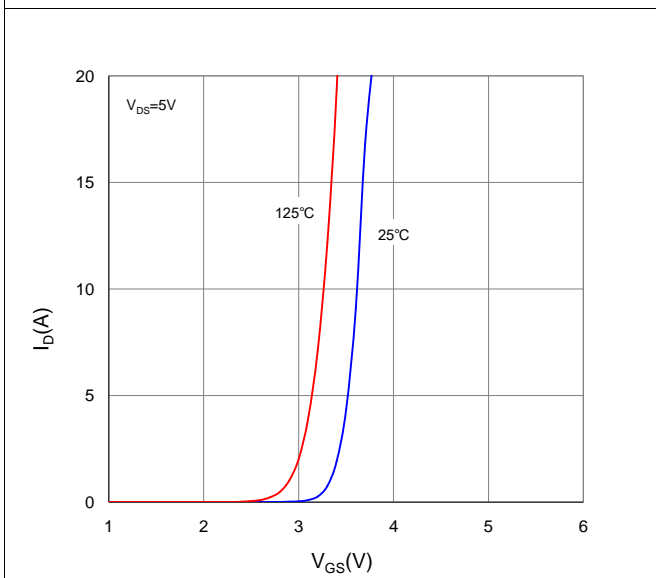


Figure 6. Typical Source-Drain Diode Forward Voltage

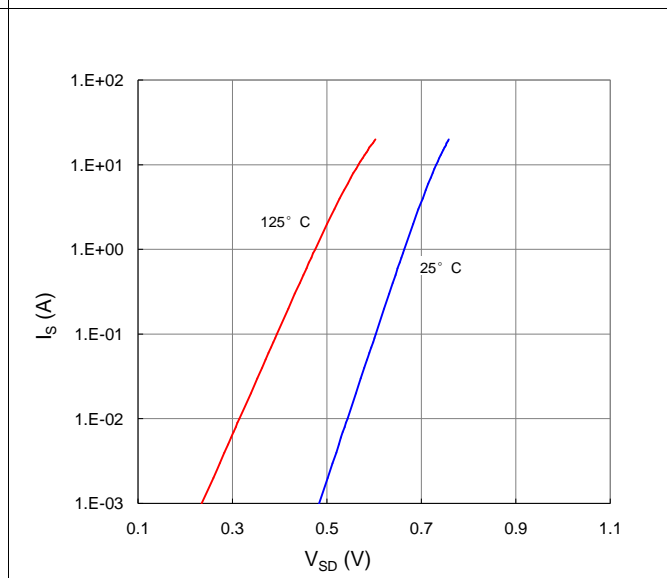


Figure 7. Typical Gate-Charge vs. Gate-to-Source Voltage

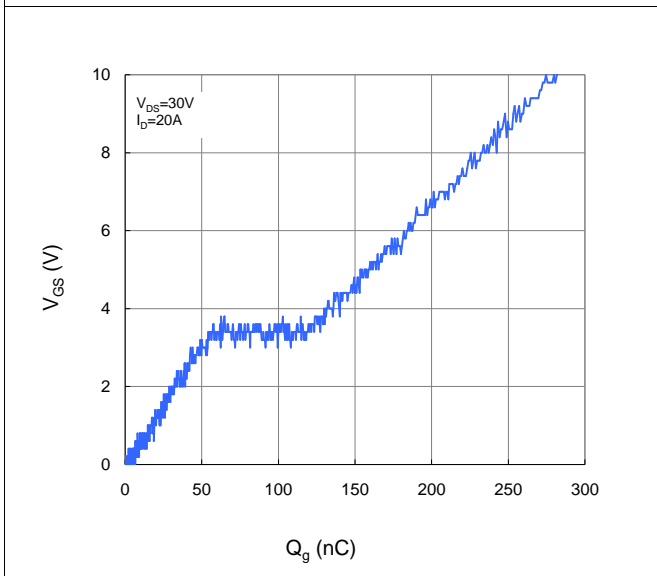


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

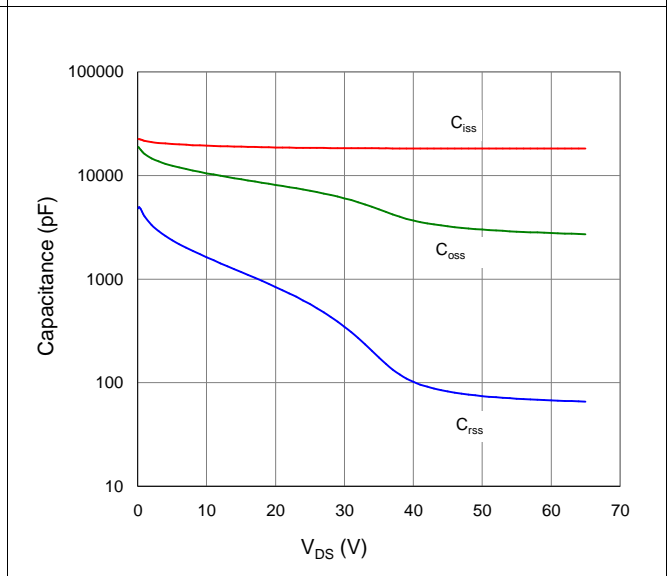


Figure 9. Maximum Safe Operating Area

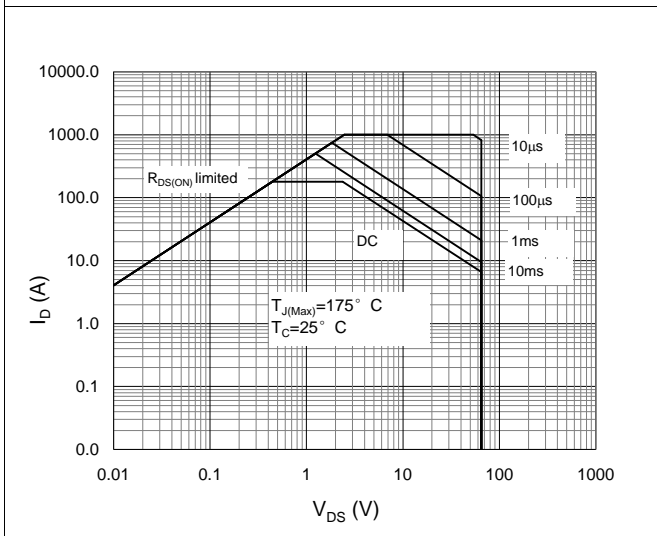


Figure 10. Maximum Drain Current vs. Case Temperature

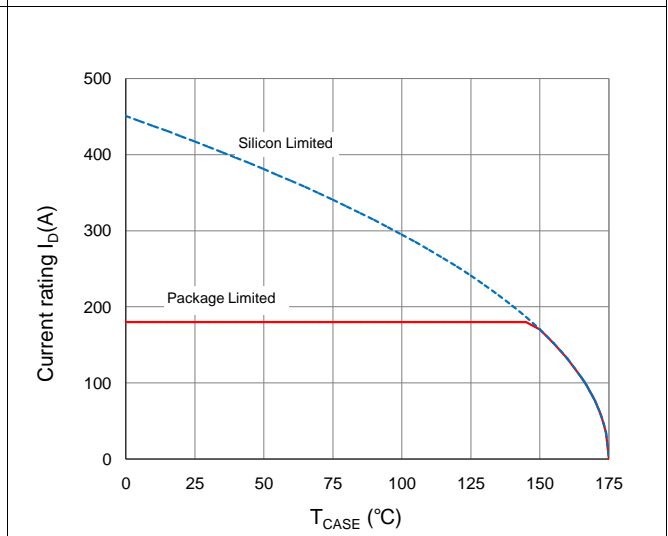
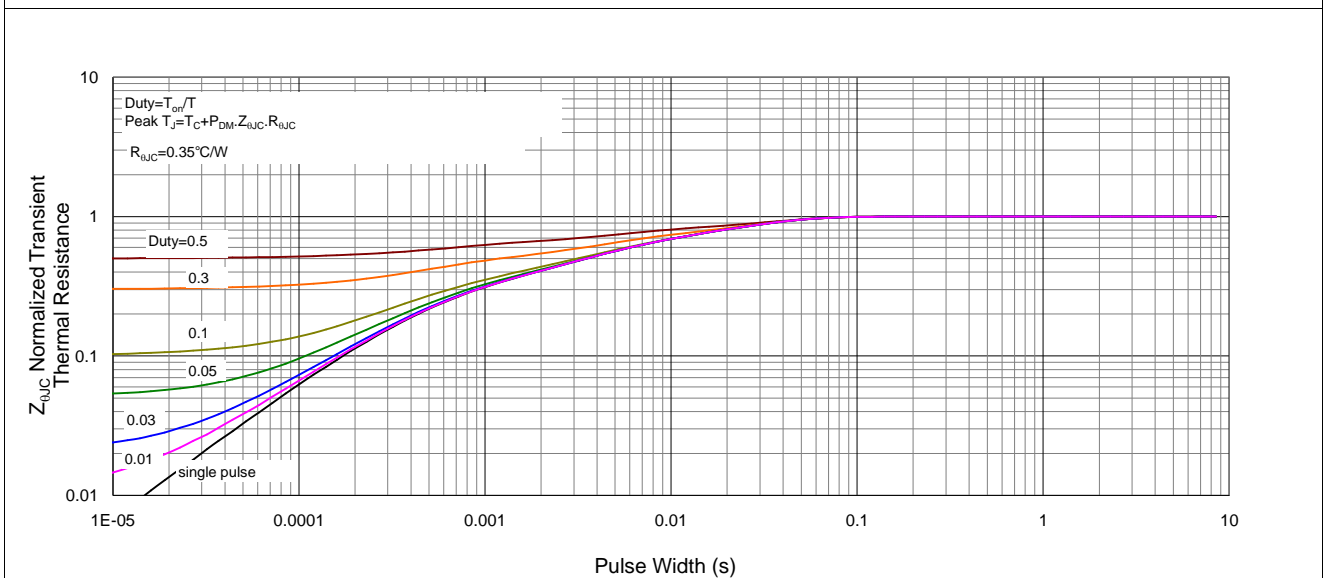
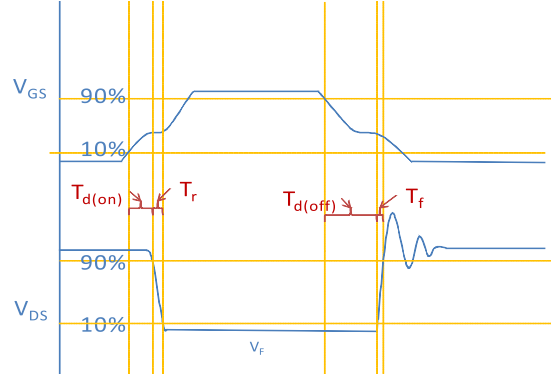
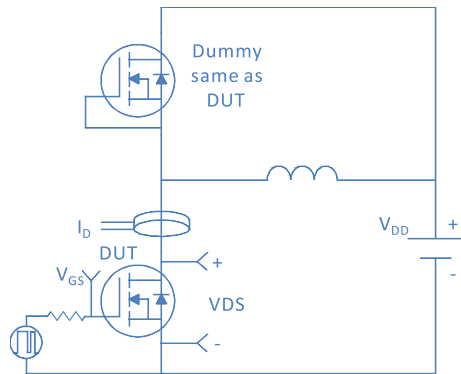


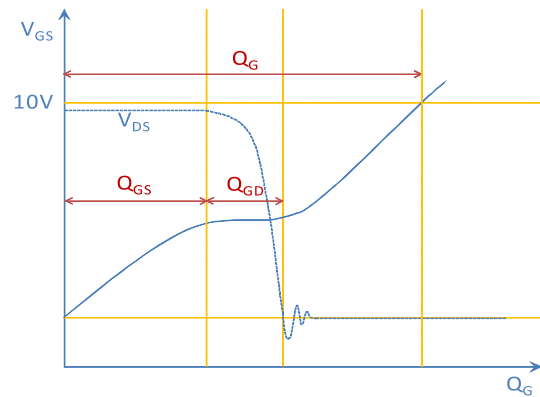
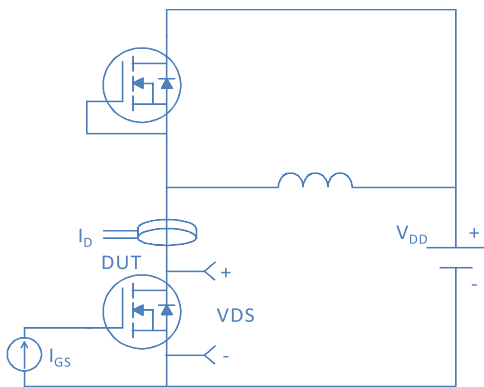
Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Case



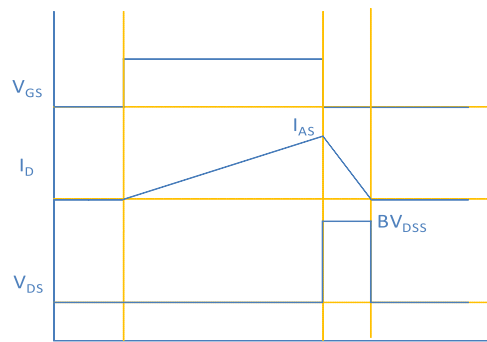
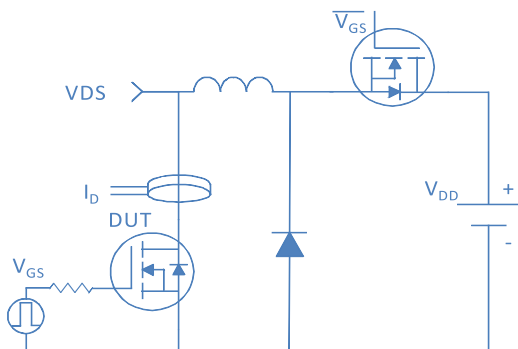
### Inductive switching Test



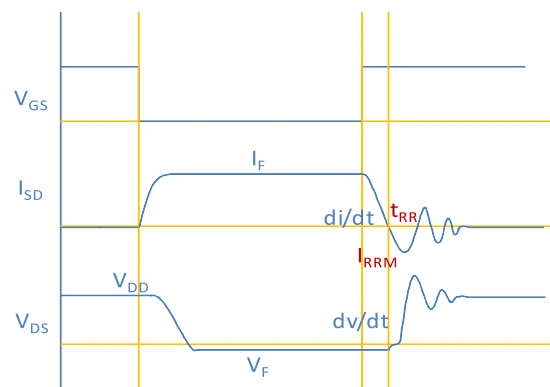
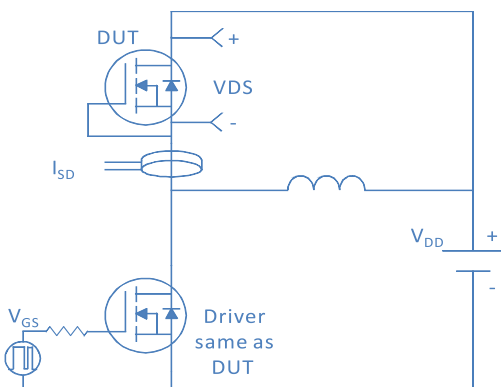
### Gate Charge Test



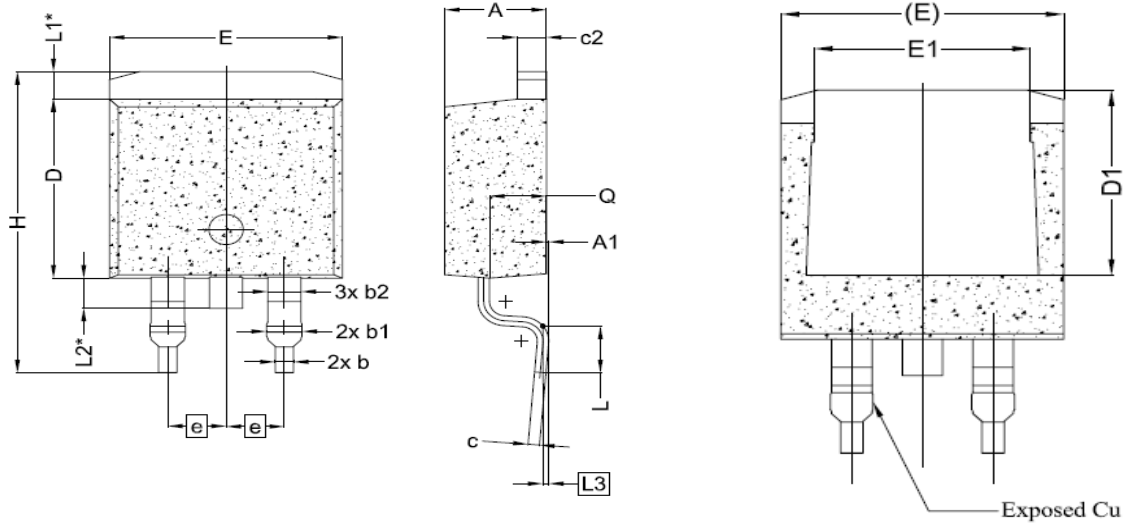
### Unclamped Inductive Switching (UIS) Test



### Diode Recovery Test

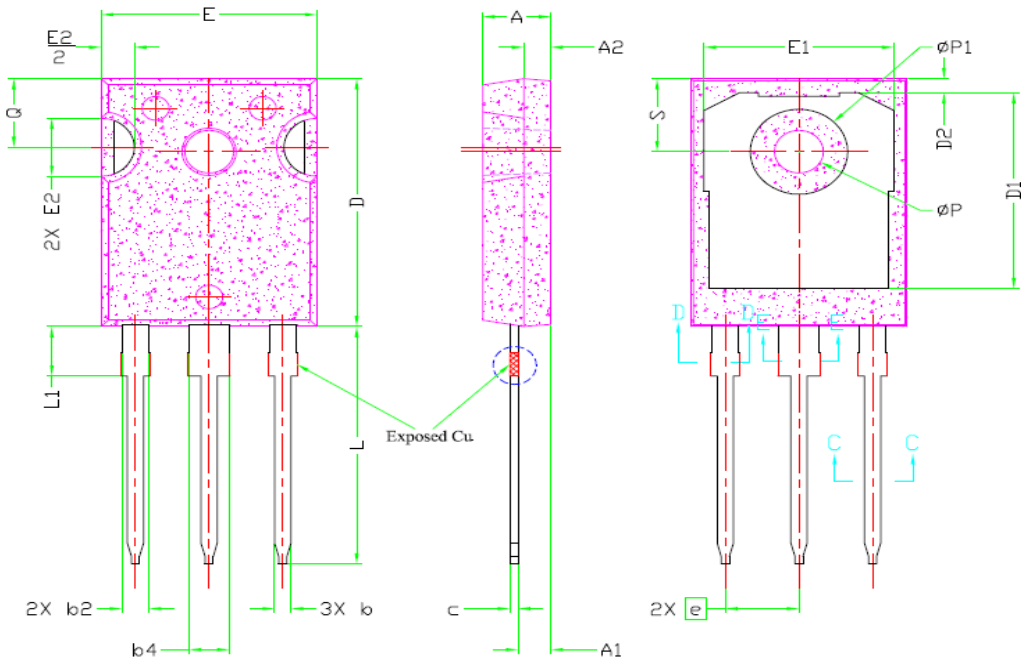


TO-263, 2 leads



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	4.24	4.44	4.64
A1	0.00	0.10	0.25
b	0.70	0.80	0.90
b1	1.20	1.55	1.75
b2	1.20	1.45	1.70
c	0.40	0.50	0.60
c2	1.15	1.27	1.40
D	8.82	8.92	9.02
D1	6.86	7.65	—
E	9.96	10.16	10.36
E1	6.89	7.77	7.89
e	2.54 BSC		
H	14.61	15.00	15.88
L	1.78	2.32	2.79
L1	1.36 REF.		
L2	1.50 REF.		
L3	0.25 BSC		
Q	2.30	2.48	2.70

TO-247, 3 leads



SYMBOL	DIMENSIONS			NOTES
	MIN.	NOM.	MAX.	
A	4.83	5.02	5.21	
A1	2.29	2.41	2.55	
A2	1.50	2.00	2.49	
b	1.12	1.20	1.33	
b1	1.12	1.20	1.28	
b2	1.91	2.00	2.39	6
b3	1.91	2.00	2.34	
b4	2.87	3.00	3.22	6, 8
b5	2.87	3.00	3.18	
c	0.55	0.60	0.69	6
c1	0.55	0.60	0.65	
D	20.80	20.95	21.10	4
D1	16.25	16.55	17.65	5
D2	0.51	1.19	1.35	
E	15.75	15.94	16.13	4
E1	13.46	14.02	14.16	5
E2	4.32	4.91	5.49	3
e	5.44BSC			
L	19.81	20.07	20.32	
L1	4.10	4.19	4.40	6
ØP	3.56	3.61	3.65	7
ØP1	7.19REF.			
Q	5.39	5.79	6.20	
S	6.04	6.17	6.30	