

H6B65M

650V, 6A IGBT with soft and fast recovery anti-parallel diode

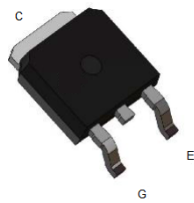
Features

- High efficient turn-on di/dt controllability
- Low VCE(SAT) enable high efficiencies
- Low Turn-off switching loss and softness
- Very Good EMI and High Short-Circuit Ruggedness

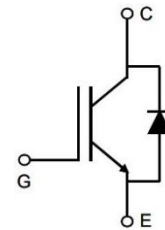
Product Summary

V_{CE}	650V
$I_C(T_C=100^{\circ}\text{C})$	6A
$V_{CE(sat)}(T_J=25^{\circ}\text{C})$	1.73V

View and Internal Schematic Diagram



TO252/DPAK



Internal Schematic

Marking Information

TO252/DPAK



NOTE:
 LOGO - HX
 6B65M - Part number code
 Y - Year code
 W - Week code
 L&T - Assembly lot code

Ordering Information

Part Number	Package	Packing	Qty
H06B65M	TO-252/DPAK	Tape & Reel	2500pcs

Maximum Ratings (@TA = +25°C unless otherwise specified.)

Parameters		Symbol	Max	Units
Collector-Emitter Voltage		V_{CE}	650	V
Gate-Emitter Voltage		V_{GE}	±30	V
Continuous Collector Current	$T_C = +25^{\circ}\text{C}$ $T_C = +100^{\circ}\text{C}$	I_C	12 6	A
Pulsed Collector Current, Limited by T_{Jmax}		I_{CM}	35	A
Turn off SOA, $V_{CE} \leq 650\text{V}$, Limited by T_{Jmax}		I_{LM}	35	A
Continuous Diode Forward Current	$T_C = +25^{\circ}\text{C}$ $T_C = +100^{\circ}\text{C}$	I_F	12 6	A
Short Circuit with standing time $V_{GE}=15\text{V}, V_{CC} \leq 400\text{V}, T_J \leq 175^{\circ}\text{C}$		t_{SC}	5	us

Power Dissipation	$T_C = +25^{\circ}\text{C}$ $T_C = +100^{\circ}\text{C}$	P_D	69 28	W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	$^{\circ}\text{C}$
Maximum lead temperature for soldering purpose, 1/8" from case for 5s		T_L	300	$^{\circ}\text{C}$

Thermal Characteristics

Characteristic	Symbol	Typ	Unit
Maximum Junction-to-Ambient	$R_{\theta JA}$	40	$^{\circ}\text{C/W}$
Maximum IGBT Junction-to-Case	$R_{\theta JC}$	1.8	$^{\circ}\text{C/W}$
Maximum Diode Junction-to-Case	$R_{\theta JC}$	2.2	$^{\circ}\text{C/W}$

Electrical Characteristics (@ $T_A = +25^{\circ}\text{C}$ unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Units	
STATIC PARAMETERS							
BV _{CES}	Collector-Emitter Breakdown Voltage	I _C =1mA, V _{GE} =0V	650	-	-	V	
V _{CE(sat)}	Collector-Emitter Saturation Voltage	V _{GE} =15V, I _C =6A	T _J =25°C	-	1.73	1.98	V
			T _J =125°C	-	2.05	-	
			T _J =175°C	-	2.21	-	
V _F	Diode Forward Voltage	V _{GE} =0V, I _C =6A	T _J =25°C	-	1.9	2.25	V
			T _J =125°C	-	1.58	-	
			T _J =175°C	-	1.3	-	
V _{GE(th)}	Gate-Emitter Threshold Voltage	V _{CE} =5V I _C =1mA	-	5.3	-	V	
I _{CES}	Zero Gate Voltage Collector current	V _{CE} =650V, V _{GE} =0A	T _J =25°C	-	-	10	uA
			T _J =125°C	-	-	100	
			T _J =175°C	-	-	5000	
I _{GES}	Gate-Emitter leakage current	V _{CE} =0V, V _{GE} = ±30V	-	-	±100	nA	
g _{FS}	Forward Trans conductance	V _{CE} =20V, I _C =6A	-	2.8		S	
DYNAMIC PARAMETERS							
C _{ies}	Input Capacitance	V _{GE} =0V, V _{CC} =25V, f=1MHz	-	243	-	pF	
C _{oes}	Output Capacitance		-	36	-	pF	
C _{res}	Reverse Transfer Capacitance		-	22	-	pF	
Q _g	Total Gate Charge	V _{GE} =15V, V _{CC} =520V, I _C =6A	-	10	-	nC	
Q _{ge}	Gate to Emitter Charge		-	3.2	-	nC	
Q _{gc}	Gate to Collector Charge		-	3.5	-	nC	
I _{C(SC)}	Short circuit collector current	V _{GE} =15V,V _{CC} =400V, t _{sc} ≤5us, T _J ≤175°C	-	30	-	A	
R _g	Gate resistance	f=1MHz	-	6	-	Ω	
SWITCHING PARAMETERS, (Load Inductive, T _J =25°C)							
t _{D(on)}	Turn-On Delay Time	T _J =25°C, V _{GE} =15V, V _{CC} =400V,	-	6	-	ns	
t _r	Turn-On Rise Time		-	21	-	ns	
t _{D(off)}	Turn-Off Delay Time		-	39	-	N	

t _f	Turn-Off Fall Time	I _c =6A, R _G =60Ω	-	121	-	ns
E _{on}	Turn-On Energy		-	0.09	-	mJ
E _{off}	Turn-Off Energy		-	0.13	-	mJ
E _{total}	Total Switching Energy		-	0.22	-	mJ
t _{rr}	Diode Reverse Recovery Time	T _J =25°C, I _F =6A, di/dt=200A/μs, V _{CC} =400V	-	91	-	ns
Q _{rr}	Diode Reverse Recovery Charge		-	0.25	-	uC
I _{rm}	Diode Peak Reverse Recovery Current		-	4.9	-	A
SWITCHING PARAMETERS, (Load Inductive, T _J =175°C)						
t _{D(on)}	Turn-On Delay Time	T _J =175°C, V _{GE} =15V, V _{CC} =400V, I _c =6A, R _G =60Ω	-	8	-	ns
t _r	Turn-On Rise Time		-	27	-	ns
t _{D(off)}	Turn-Off Delay Time		-	57	-	ns
t _f	Turn-Off Fall Time		-	180	-	ns
E _{on}	Turn-On Energy		-	0.11	-	mJ
E _{off}	Turn-Off Energy		-	0.19	-	mJ
E _{total}	Total Switching Energy		-	0.3	-	mJ
t _{rr}	Diode Reverse Recovery Time	T _J =175°C, I _F =6A, di/dt=200A/μs, V _{CC} =400V	-	122	-	ns
Q _{rr}	Diode Reverse Recovery Charge		-	0.44	-	uC
I _{rm}	Diode Peak Reverse Recovery Current		-	6.5	-	nC

TYPICAL ELECTRICAL AND THERMAL CHARACTERIS

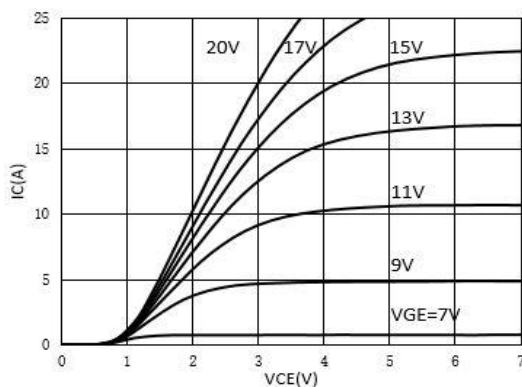


Figure1: Output Characteristics ($T_J=25^\circ C$)

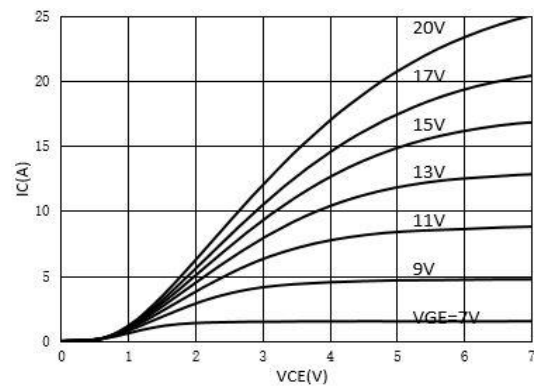


Figure 2: Output Characteristic ($T_J=175^\circ C$)

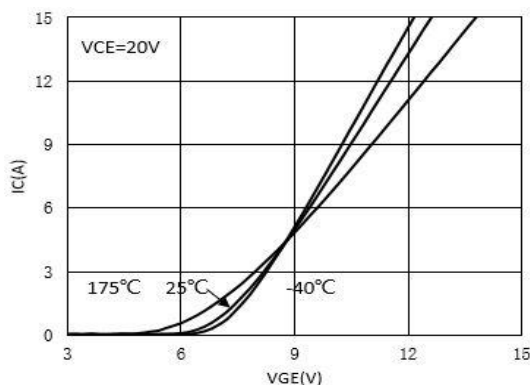


Figure3:Transfer Characteristic

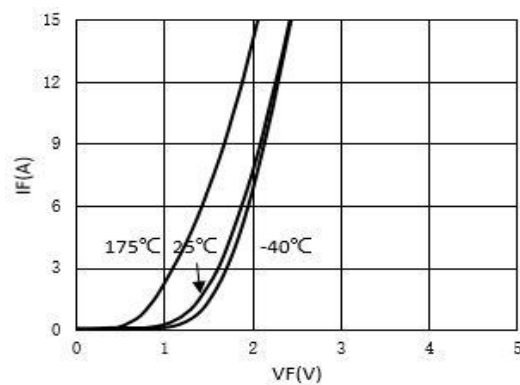


Figure 4: Diode Characteristic

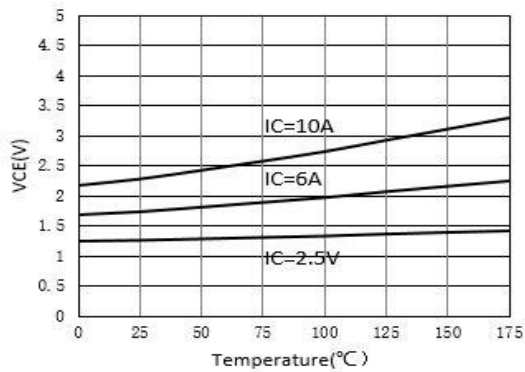


Figure 5: Collector-Emitter Saturation Voltage vs. Junction Temperature

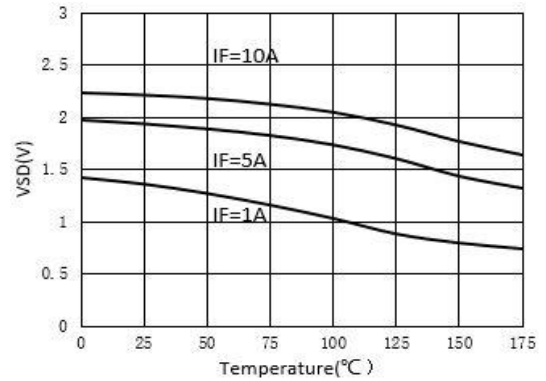


Figure 6: Diode Forward Voltage vs. Junction Temperature

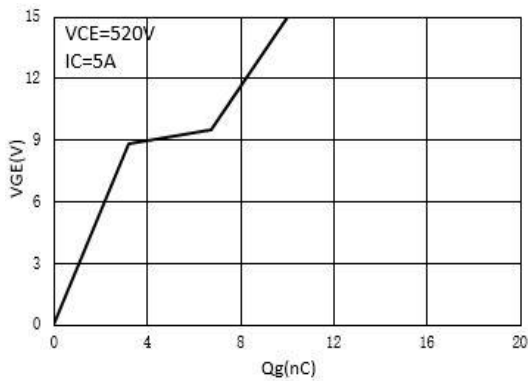


Figure 7: Gate-Charge Characteristics

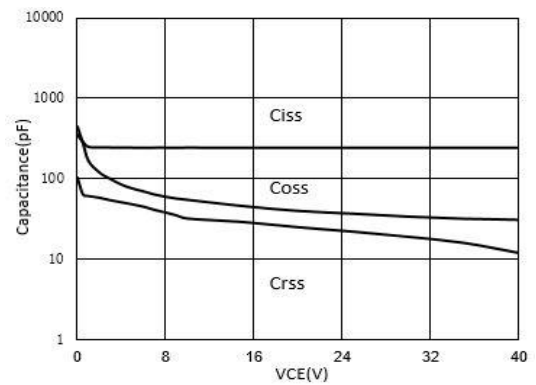


Figure 8: Capacitance Characteristics

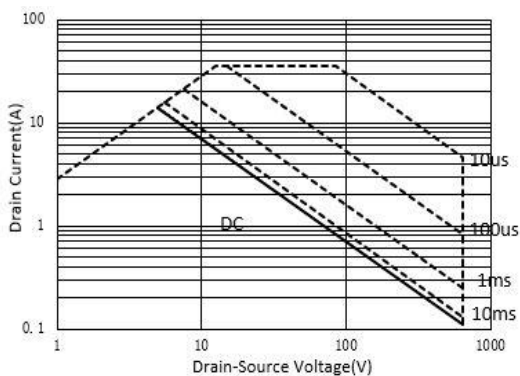


Figure 9: Forward Bias Safe Operating Area

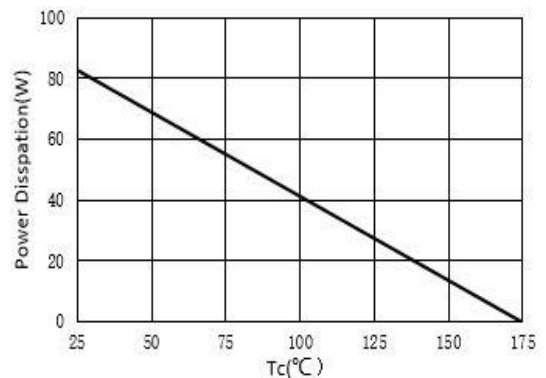


Figure 10: Power Dissipation as Function of Case

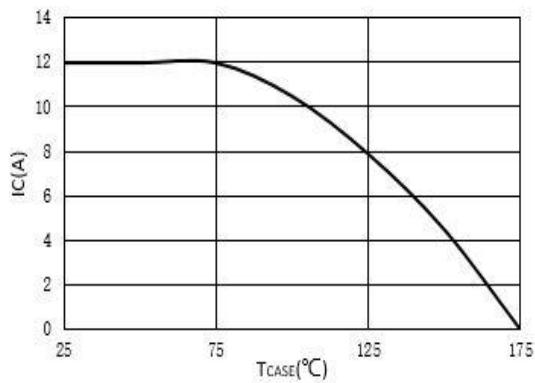


Figure 11: Current De-rating

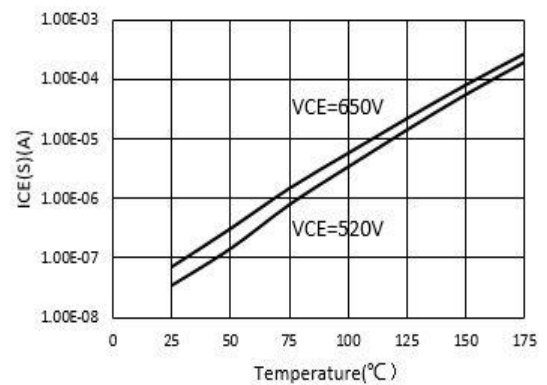


Figure 12: Diode Reverse Leakage Current vs. Junction Temperature

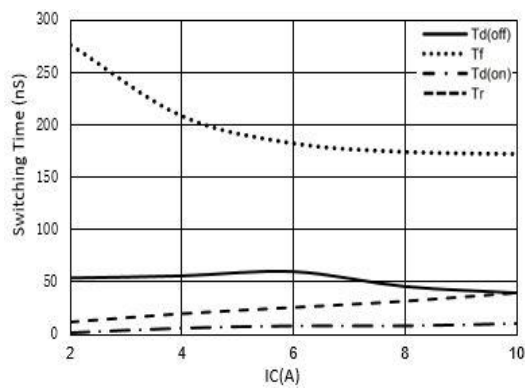


Figure 13: Switching Time vs. I_C
($T_J=175^\circ\text{C}$, $V_{GE}=15\text{V}$, $V_{CE}=400\text{V}$, $R_g=60\Omega$)

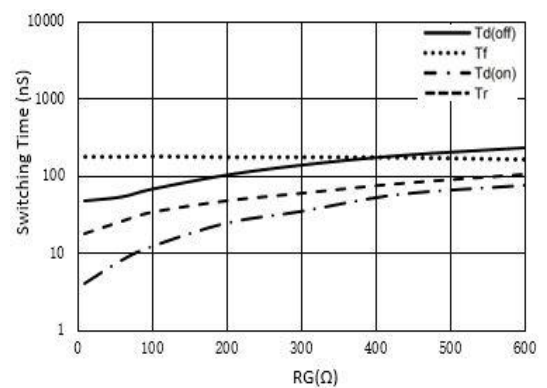


Figure 14: Switching Time vs. R_g
($T_J=175^\circ\text{C}$, $V_{GE}=15\text{V}$, $V_{CE}=400\text{V}$, $I_C=6\text{A}$)

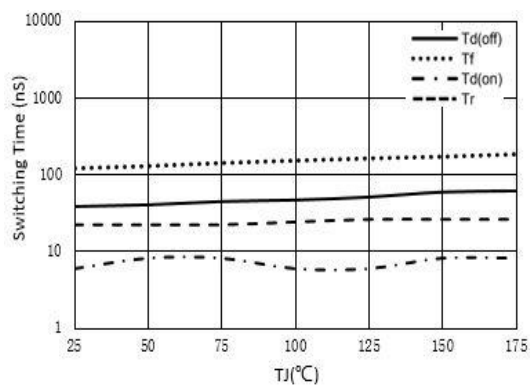


Figure 15: Switching Time vs. T_J
($V_{GE}=15\text{V}$, $V_{CE}=400\text{V}$, $I_C=6\text{A}$, $R_g=60\Omega$)

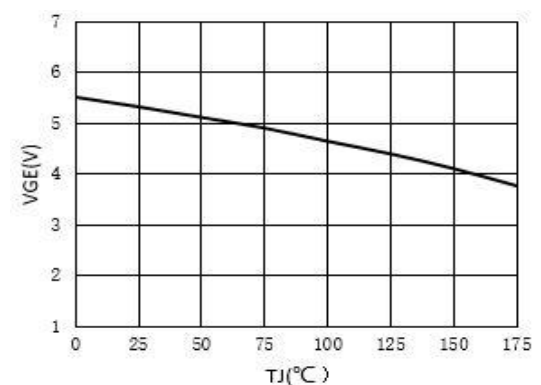


Figure 16: V_{CE} vs. T_J

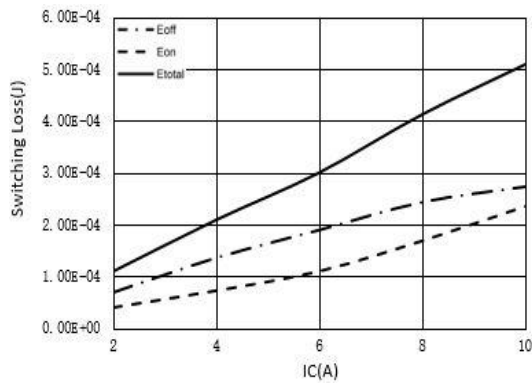


Figure 17: Switching Loss vs. I_c
($T_J=175^\circ\text{C}$, $V_{GE}=15\text{V}$, $V_{CE}=400\text{V}$, $R_g=60\Omega$)

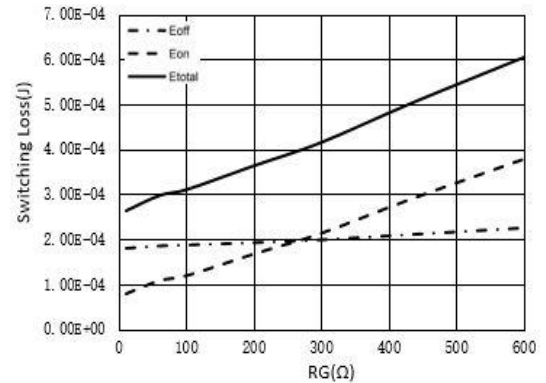


Figure 18: Switching Loss vs. R_g
($T_J=175^\circ\text{C}$, $V_{GE}=15\text{V}$, $V_{CE}=400\text{V}$, $I_c=6\text{A}$)

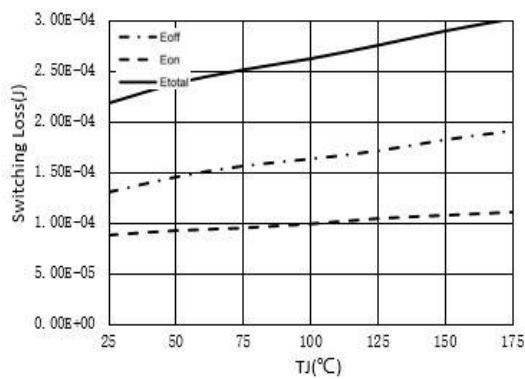


Figure 19: Switching Loss vs. T_J
($V_{GE}=15\text{V}$, $V_{CE}=400\text{V}$, $I_c=6\text{A}$, $R_g=60\Omega$)

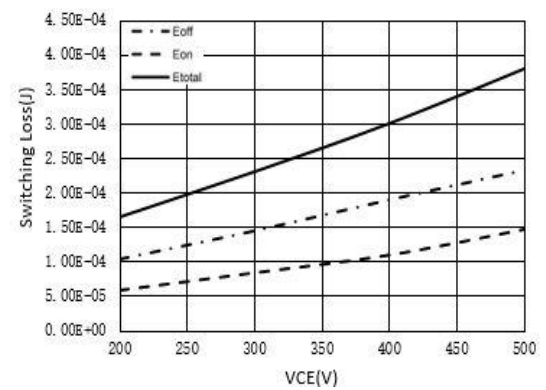


Figure 20: Switching Loss vs. V_{CE}
($T_J=175^\circ\text{C}$, $V_{GE}=15\text{V}$, $I_c=6\text{A}$, $R_g=60\Omega$)

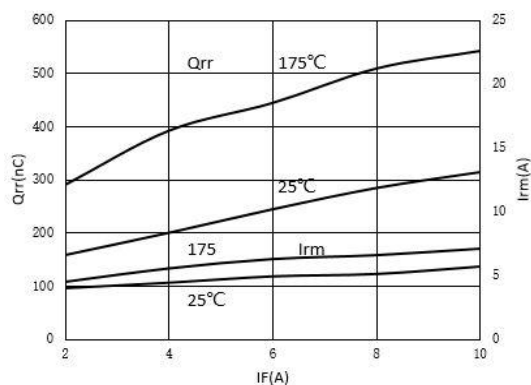


Figure 21: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current
($V_{GE}=15\text{V}$, $V_{CE}=400\text{V}$, $di/dt=200\text{A/us}$)

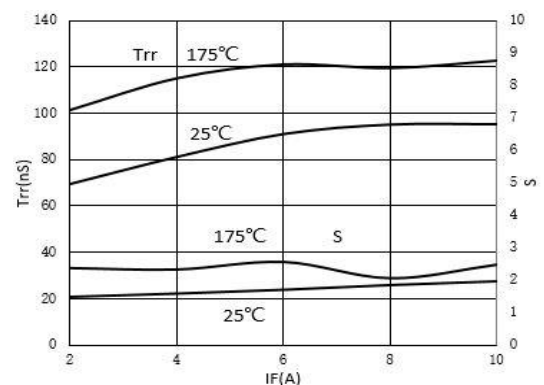


Figure 22: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current
($V_{GE}=15\text{V}$, $V_{CE}=400\text{V}$, $di/dt=200\text{A/us}$)

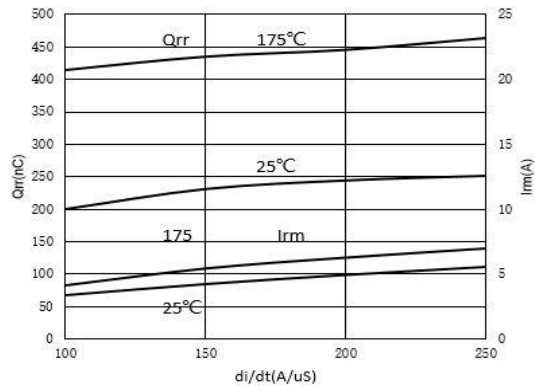


Figure 23: Diode Reverse Recovery Charge and Peak Current vs. di/dt
($V_{GE}=15V, V_{CE}=400V, di/dt=200A/us$)

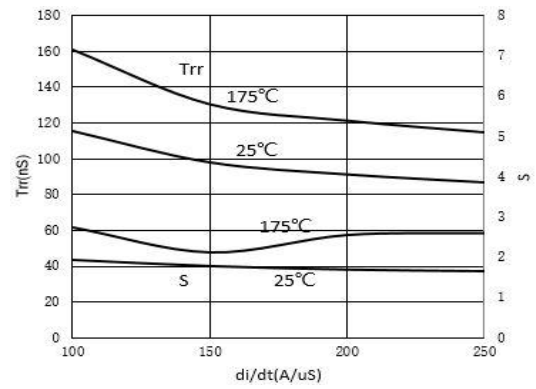


Figure 24: Diode Reverse Recovery Time and Softness Factor vs. di/dt
($V_{GE}=15V, V_{CE}=400V, di/dt=200A/us$)

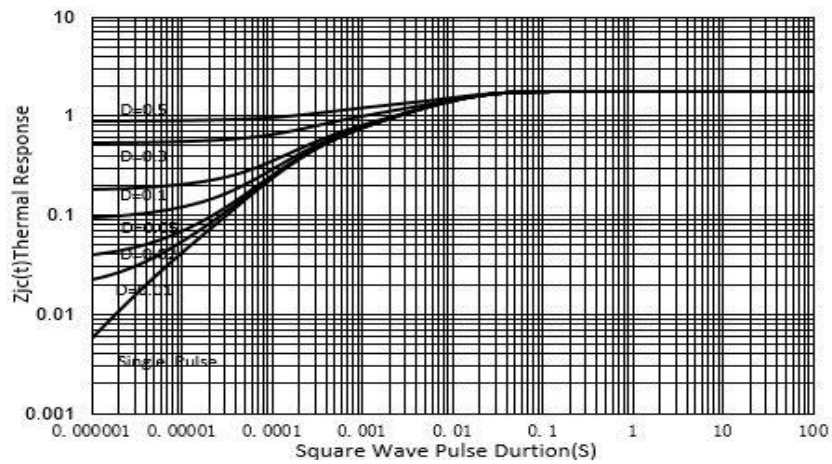


Figure 25: Normalized Maximum Transient Thermal Impedance for IGB

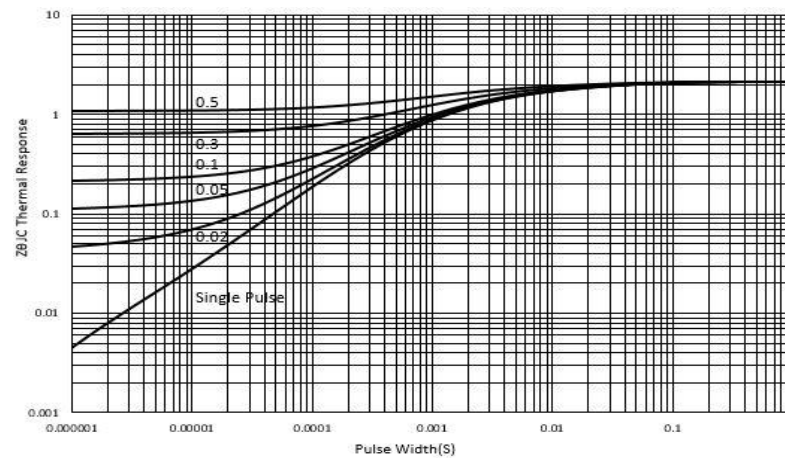
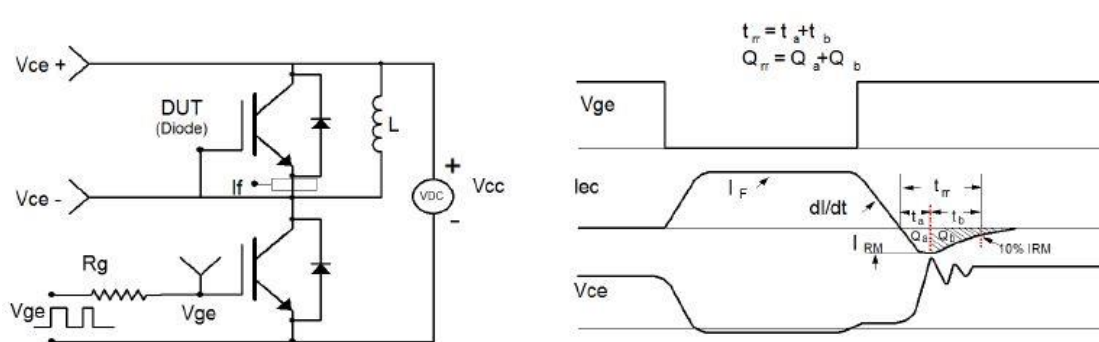
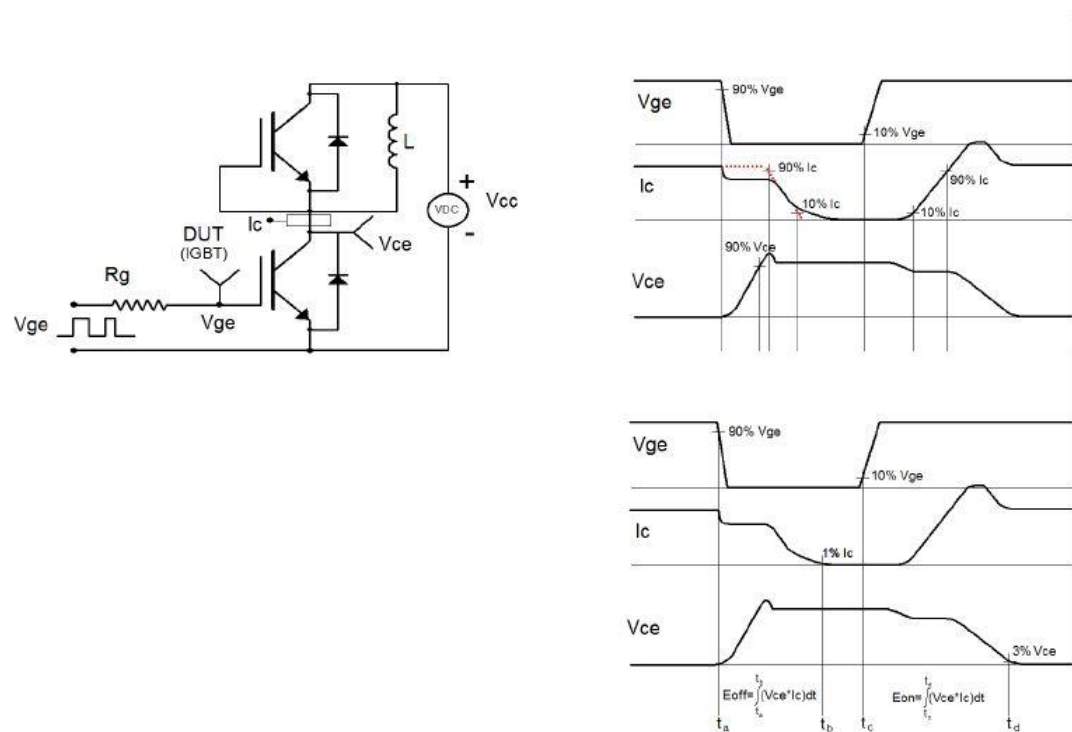
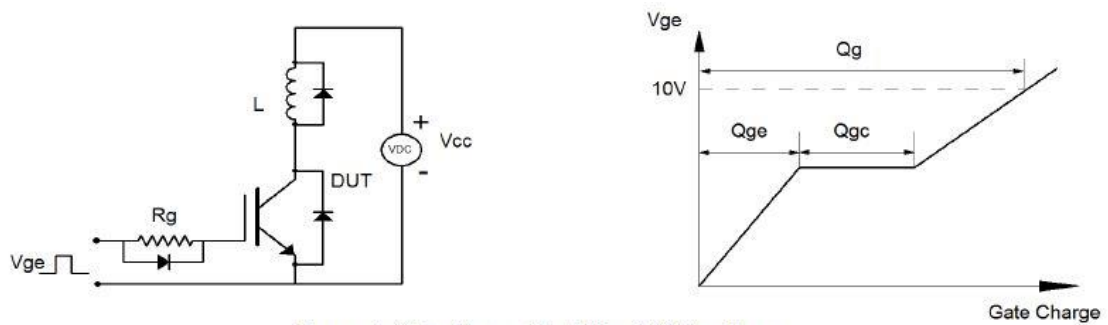
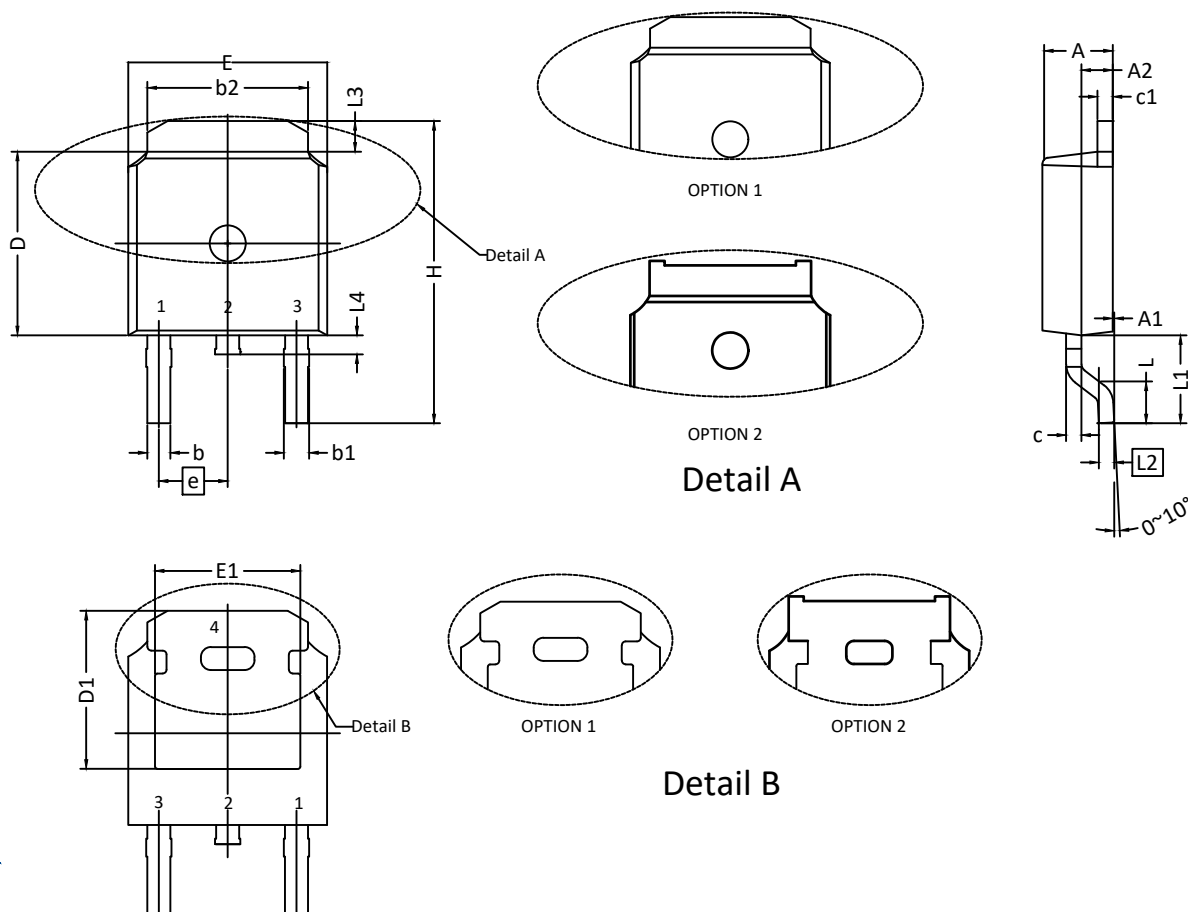


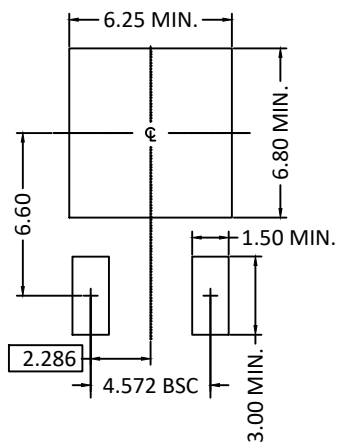
Figure 26: Normalized Maximum Transient Thermal Impedance for Diode



TO252 PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



UNIT: mm

NOTE:

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS. MOLD FLASH SHOULD BE LESS THAN 6 MILS.
2. DIMENSION L IS MEASURED IN GAUGE PLANE.
3. TOLERANCE 0.10 mm UNLESS OTHERWISE SPECIFIED.
4. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
5. REFER TO JEDEC TO-252 (AA).

SYMBOLS	DIMENSION IN MM			DIMENSION IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	2.184	2.286	2.400	0.086	0.090	0.094
A1	0.000	---	0.200	0.000	---	0.008
A2	0.889	1.041	1.170	0.035	0.041	0.046
b	0.635	0.762	0.889	0.025	0.030	0.035
b1	0.680	0.840	1.143	0.027	0.033	0.045
b2	4.953	5.340	5.500	0.195	0.210	0.217
c	0.450	0.508	0.610	0.018	0.020	0.024
c1	0.450	0.508	0.630	0.018	0.020	0.025
D	5.969	6.096	6.223	0.235	0.240	0.245
D1	5.210	5.249	5.380	0.205	0.207	0.212
E	6.350	6.604	6.800	0.250	0.260	0.268
E1	4.318	4.826	4.920	0.170	0.190	0.194
e	2.286 BSC			0.090 BSC		
e1	4.572 BSC			0.180 BSC		
H	9.398	10.033	10.500	0.370	0.395	0.413
L	1.270	1.520	2.032	0.050	0.060	0.080
L1	2.921 REF.			0.115 REF.		
L2	0.408	0.508	0.608	0.016	0.020	0.024
L3	0.889	1.016	1.270	0.035	0.040	0.050
L4	0.600	---	1.016	0.024	---	0.040