ON Semiconductor

Is Now



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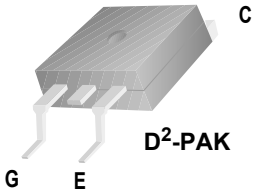
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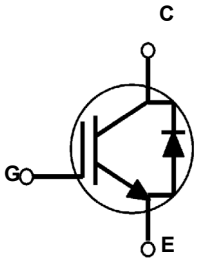
FGB20N60SFD-F085
600V, 20A Field Stop IGBT

Features
- High current capability
- Low saturation voltage: $V_{CE(sat)}$ = 2.2V @ I_C = 20A
- High input impedance
- Fast switching
- Qualified to Automotive Requirements of AEC-Q101
- RoHS complaint

Applications
- Inverters, SMPS, PFC, UPS
- Automotive Chargers, Converters, High Voltage Auxiliaries

General Description
Using novel field-stop IGBT technology, ON Semiconductor's new series of field-stop IGBTs offers the optimum performance for automotive chargers, inverters, and other applications where low conduction and switching losses are essential.





Absolute Maximum Ratings

Symbol	Description		Ratings	Units
V_{CES}	Collector to Emitter Voltage		600	V
V_{GES}	Gate to Emitter Voltage		± 20	V
I_C	Collector Current	@ T_C = 25°C	40	A
	Collector Current	@ T_C = 100°C	20	A
$I_{CM\ (1)}$	Pulsed Collector Current	@ T_C = 25°C	60	A
I_F	Diode Forward Current	@ T_C = 25°C	20	A
	Diode Forward Current	@ T_C = 100°C	10	A
$I_{FM(1)}$	Pulsed Diode Maximum Forward Current		60	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	208	W
	Maximum Power Dissipation	@ T_C = 100°C	83	W
T_J	Operating Junction Temperature		-55 to +150	°C
T_{stg}	Storage Temperature Range		-55 to +150	°C
T_L	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds		300	°C

Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$(IGBT)(2)	Thermal Resistance, Junction to Case	0.6	°C/W
$R_{\theta JC}$(Diode)	Thermal Resistance, Junction to Case	2.6	°C/W

Symbol	Parameter	Typ.	Units
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (PCB Mount)(2)	75	°C/W

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Package Marking and Ordering Information

Device Marking	Device	Package	Packaging Type	Qty per Tube	Max Qty per Box
FGB20N60SFD	FGB20N60SFD-F085	TO-263	Tube	50ea	-

Electrical Characteristics of the IGBT T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{CES}	Collector to Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 250μA	600	-	-	V
$\frac{\Delta BV_{CES}}{\Delta T_J}$	Temperature Coefficient of Breakdown Voltage	V_{GE} = 0V, I_C = 250μA	-	0.79	-	V/°C
I_{CES}	Collector Cut-Off Current	V_{CE} = V_{CES}, V_{GE} = 0V	-	-	250	μA
		ICES at 80%*BVCES, 150°C	-	-	250	
I_{GES}	G-E Leakage Current	V_{GE} = V_{GES}, V_{CE} = 0V	-	-	±400	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 250μA, V_{CE} = V_{GE}	4.0	4.8	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 20A, V_{GE} = 15V	-	2.2	2.85	V
		I_C = 20A, V_{GE} = 15V, T_C = 125°C	-	2.4	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz	-	940	1250	pF
C_{oes}	Output Capacitance		-	110	146	pF
C_{res}	Reverse Transfer Capacitance		-	40	53	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 400V, I_C = 20A, R_G = 10Ω, V_{GE} = 15V, Inductive Load, T_C = 25°C	-	10	13	ns
t_r	Rise Time		-	16	21	ns
$t_{d(off)}$	Turn-Off Delay Time		-	90	120	ns
t_f	Fall Time		-	24	36	ns
E_{on}	Turn-On Switching Loss		-	0.31	0.41	mJ
E_{off}	Turn-Off Switching Loss		-	0.13	0.21	mJ
E_{ts}	Total Switching Loss		-	0.44	0.59	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 400V, I_C = 20A, R_G = 10Ω, V_{GE} = 15V, Inductive Load, T_C = 125°C	-	12	16	ns
t_r	Rise Time		-	16	21	ns
$t_{d(off)}$	Turn-Off Delay Time		-	95	126	ns
t_f	Fall Time		-	28	43	ns
E_{on}	Turn-On Switching Loss		-	0.45	0.60	mJ
E_{off}	Turn-Off Switching Loss		-	0.21	0.38	mJ
E_{ts}	Total Switching Loss		-	0.66	0.88	mJ
Q_g	Total Gate Charge	V_{CE} = 400V, I_C = 20A, V_{GE} = 15V	-	63	95	nC
Q_{ge}	Gate to Emitter Charge		-	7	11	nC
Q_{gc}	Gate to Collector Charge		-	32	48	nC

Electrical Characteristics of the Diode T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max	Units
V_{FM}	Diode Forward Voltage	I_F = 10A	T_C = 25°C	-	1.9	2.5	V
			T_C = 125°C	-	1.7	-	
t_{rr}	Diode Reverse Recovery Time	I_{ES} = 10A, dI_{ES}/dt = 200A/μs	T_C = 25°C	-	111	-	ns
			T_C = 125°C	-	204	-	
Q_{rr}	Diode Reverse Recovery Charge		T_C = 25°C	-	174	244	nC
			T_C = 125°C	-	463	-	

Notes:

1: Repetitive rating: Pulse width limited by max. junction temperature

2:Rthjc for D2-PAK: according to Mil standard 883-1012 test method.

Rthja for D2-PAK: according to JESD51-2, test method environmental condition and JESD51-3,low effective thermal conductivity test board for leaded surface mount package. thermal measurements. JESD51-2: Integrated Circuits Thermal Test Method Environmental Conditions - Natural Convection (Still Air).

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

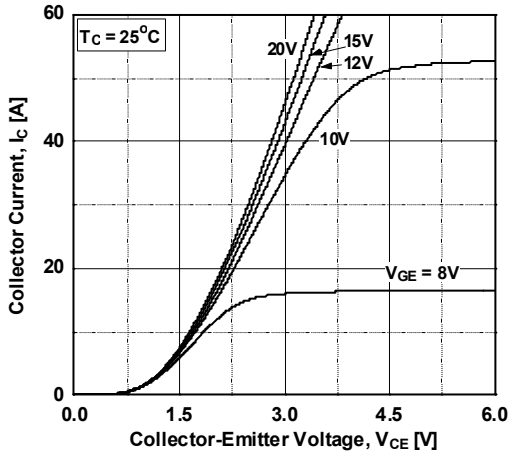


Figure 2. Typical Output Characteristics

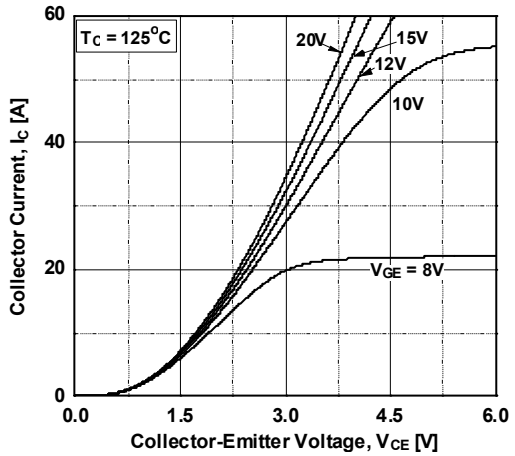


Figure 3. Typical Saturation Voltage Characteristics

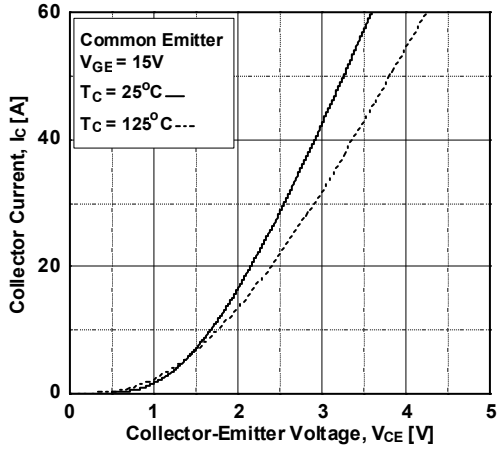


Figure 4. Transfer Characteristics

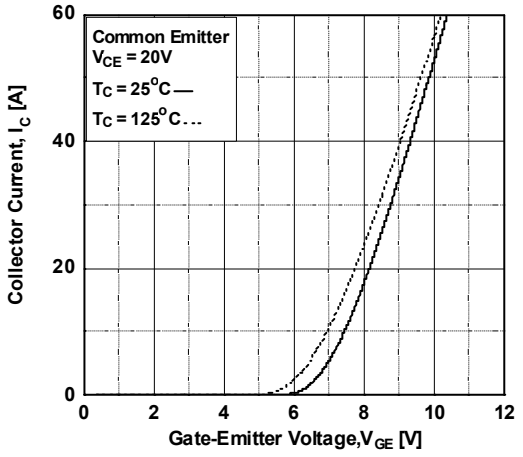


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

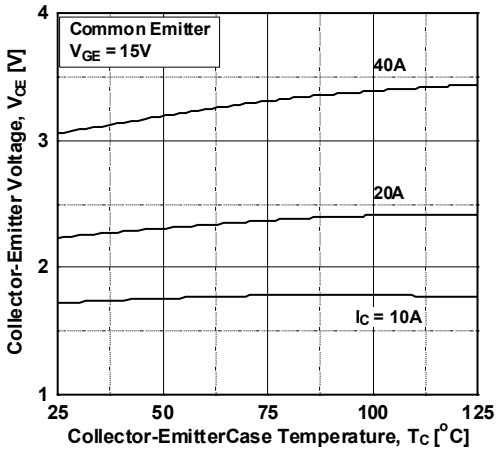
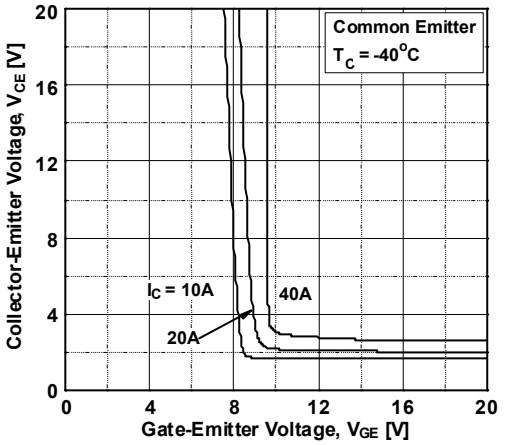


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

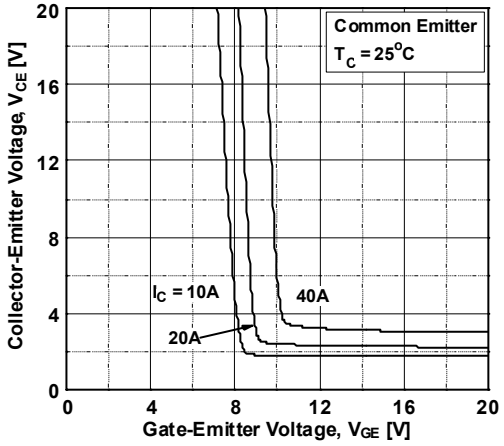


Figure 8. Saturation Voltage vs. V_{GE}

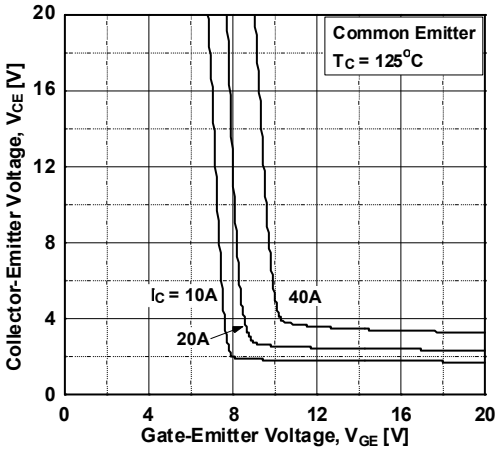


Figure 9. Capacitance Characteristics

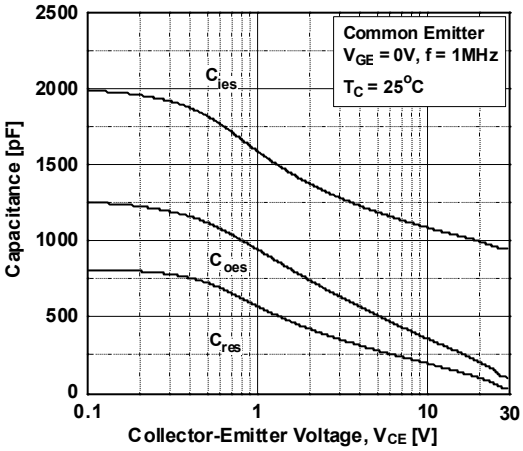


Figure 10. Gate charge Characteristics

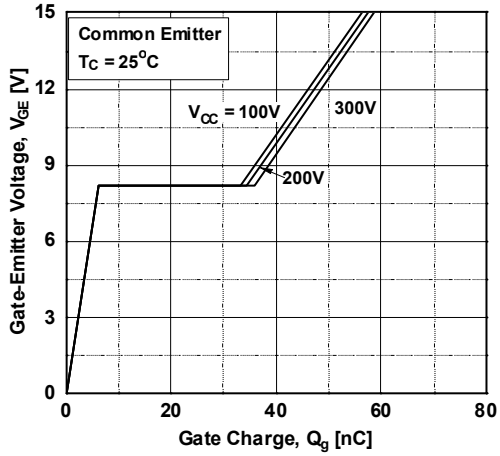


Figure 11. SOA Characteristics

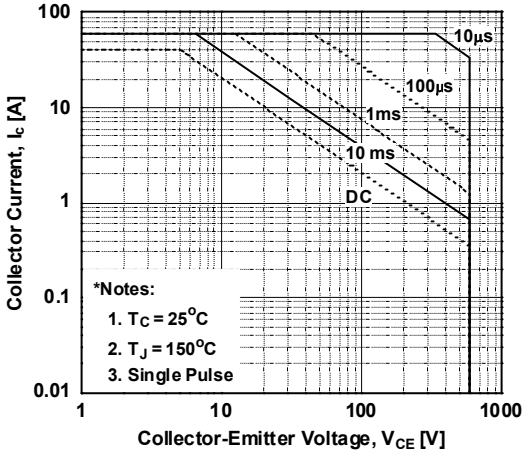
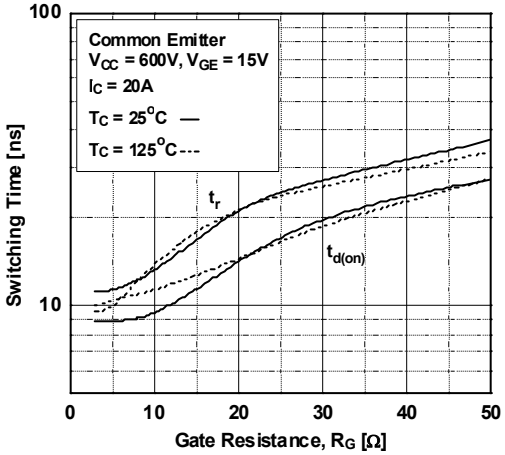


Figure 12. Turn-on Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-off Characteristics vs. Gate Resistance

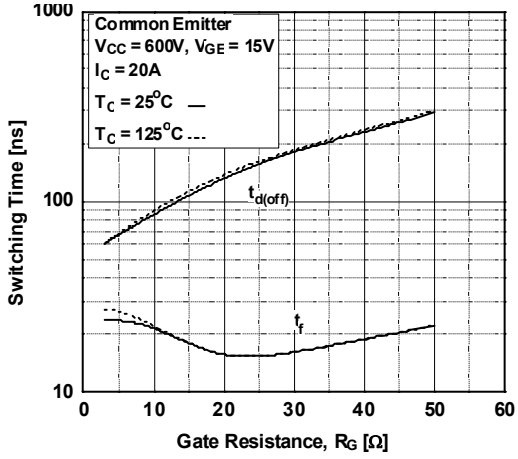


Figure 14. Turn-on Characteristics vs. Collector Current

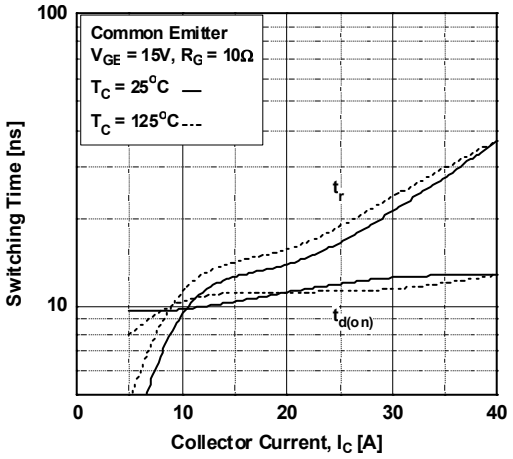


Figure 15. Turn-off Characteristics vs. Collector Current

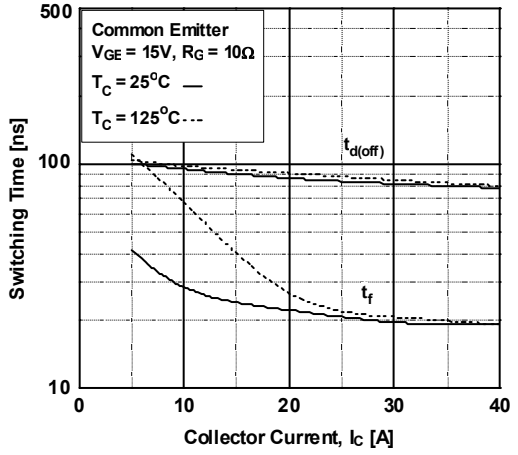


Figure 16. Switching Loss vs. Gate Resistance

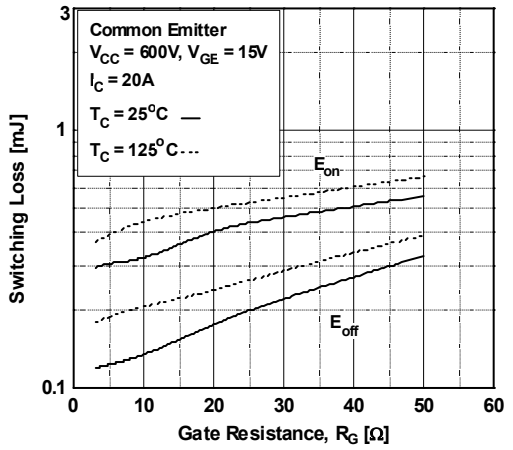


Figure 17. Switching Loss vs. Collector Current

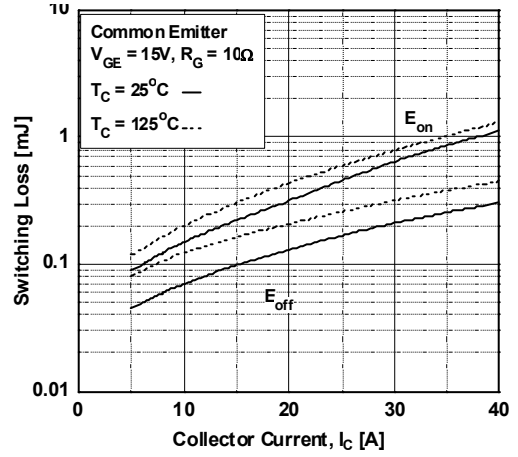
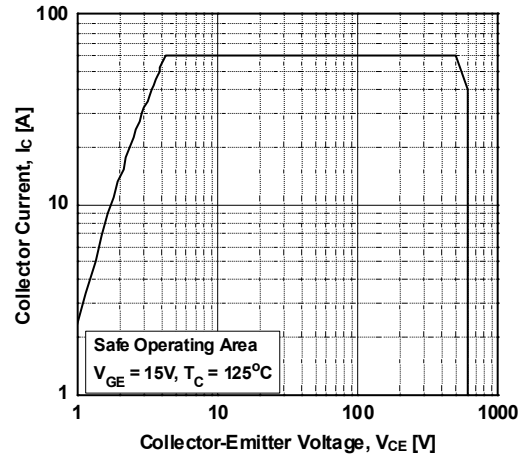


Figure 18. Turn off Switching SOA Characteristics



Typical Performance Characteristics

Figure 19. Forward Characteristics

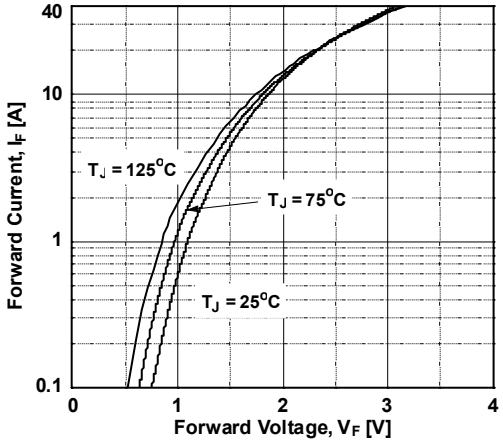


Figure 20. Typical Reverse Current vs. Reverse Voltage

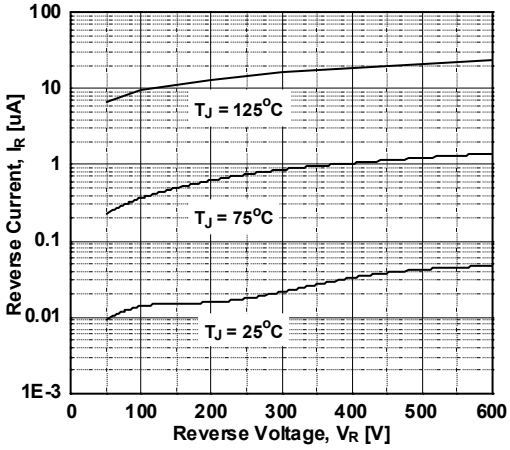


Figure 21. Stored Charge

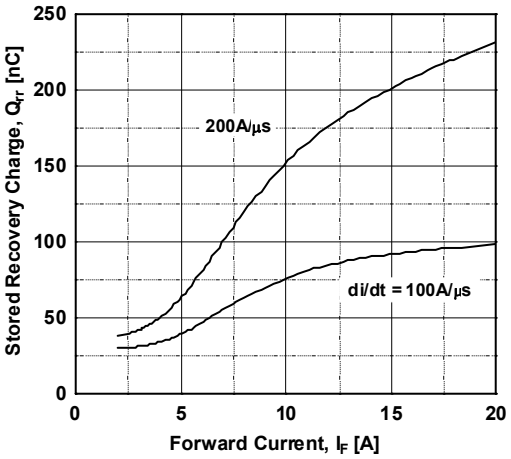


Figure 22. Reverse Recovery Time

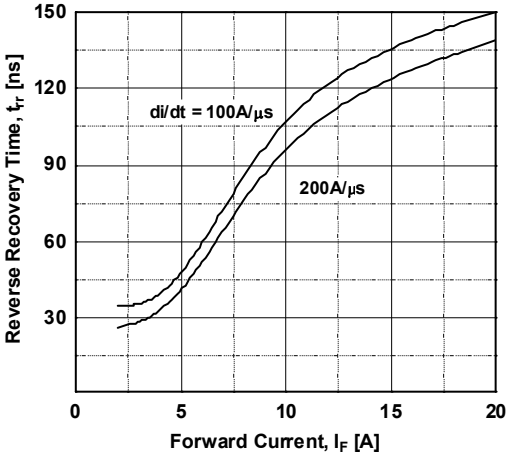
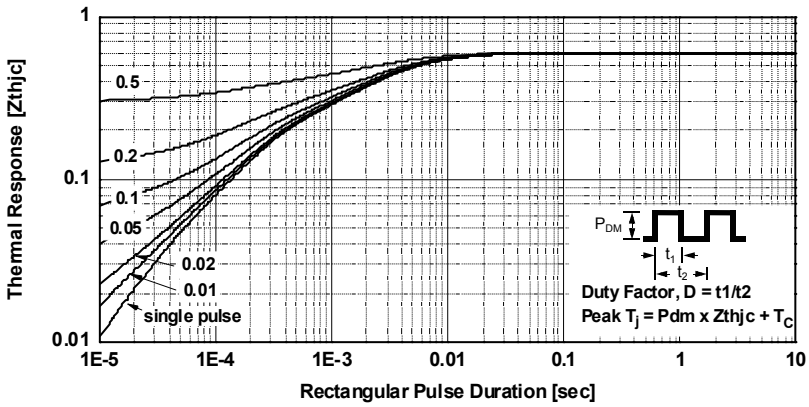
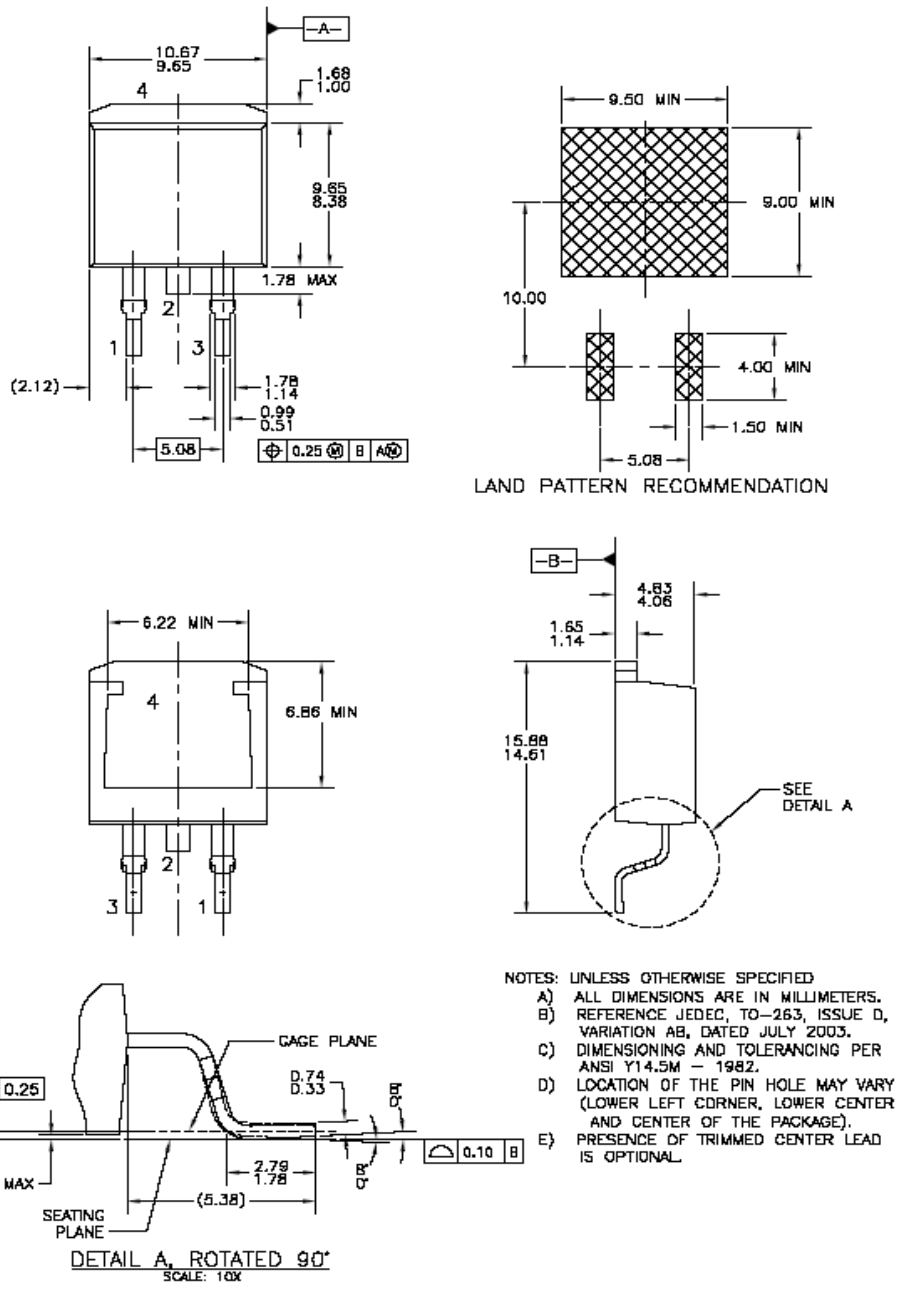


Figure 23.Transient Thermal Impedance of IGBT



Mechanical Dimensions

D^2PAK



Dimensions in Millimeters

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