Thermal Characteristics

Symbol	Parameter	FGH60T65SHD-F155	Unit
$R_{\theta JC}$(IGBT)	Thermal Resistance, Junction to Case, Max.	0.43	$^oC/W$
$R_{\theta JC}$(Diode)	Thermal Resistance, Junction to Case, Max.	1.25	$^oC/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	$^oC/W$

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantit
FGH60T65SHD-F155	FGH60T65SHD	TO-247 G03	Tube	-	-	30

Electrical Characteristics of the IGBT

T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{CES}	Collector to Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 1 mA	650	-	-	V
ΔBV_{CES} / ΔT_J	Temperature Coefficient of Breakdown Voltage	I_C = 1 mA, Reference to 25^{o}C	-	0.6	-	V/^{o}C
I_{CES}	Collector Cut-Off Current	$V_{CE} = V_{CES}$, V_{GE} = 0 V	-	-	250	μA
I_{GES}	G-E Leakage Current	$V_{GE} = V_{GES}$, V_{CE} = 0 V	-	-	±400	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 60 mA, $V_{CE} = V_{GE}$	4.0	5.5	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 60 A, V_{GE} = 15 V	-	1.6	2.1	V
		I_C = 60 A, V_{GE} = 15 V, T_C = 175^{o}C	-	2.14	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30 V, V_{GE} = 0 V, f = 1MHz	-	2980	-	pF
C_{oes}	Output Capacitance		-	110	-	pF
C_{res}	Reverse Transfer Capacitance		-	36	-	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 400 V, I_C = 60 A, R_G = 6 Ω, V_{GE} = 15 V, Inductive Load, T_C = 25^{o}C	-	26	-	ns
t_r	Rise Time		-	48	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	87	-	ns
t_f	Fall Time		-	47	-	ns
E_{on}	Turn-On Switching Loss		-	1.69	-	mJ
E_{off}	Turn-Off Switching Loss		-	0.63	-	mJ
E_{ts}	Total Switching Loss		-	2.32	-	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 400 V, I_C = 60 A, R_G = 6 Ω, V_{GE} = 15 V, Inductive Load, T_C = 175^{o}C	-	25	-	ns
t_r	Rise Time		-	60	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	93	-	ns
t_f	Fall Time		-	72	-	ns
E_{on}	Turn-On Switching Loss		-	2.54	-	mJ
E_{off}	Turn-Off Switching Loss		-	1.04	-	mJ
E_{ts}	Total Switching Loss		-	3.58	-	mJ

Electrical Characteristics of the IGBT (Continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max	Unit
Q_g	Total Gate Charge	V_{CE} = 400 V, I_C = 60 A, V_{GE} = 15 V	-	102	-	nC
Q_{ge}	Gate to Emitter Charge		-	18.4	-	nC
Q_{gc}	Gate to Collector Charge		-	37.5	-	nC

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

Symbol	Parameter	Test Conditions		Min.	Typ.	Max	Unit
V_{FM}	Diode Forward Voltage	I_F = 30 A	T_C = 25°C	-	2.3	2.7	V
			T_C = 175°C	-	1.9	-	
E_{rec}	Reverse Recovery Energy	I_F =30 A, dI_F/dt = 200 A/μs	T_C = 175°C	-	50	-	uJ
t_{rr}	Diode Reverse Recovery Time		T_C = 25°C	-	34.6	-	ns
			T_C = 175°C	-	197	-	
Q_{rr}	Diode Reverse Recovery Charge		T_C = 25°C	-	58.6	-	nC
			T_C = 175°C	-	810	-	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

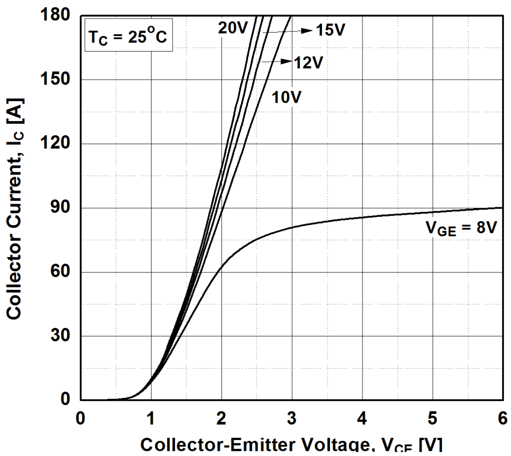


Figure 2. Typical Output Characteristics

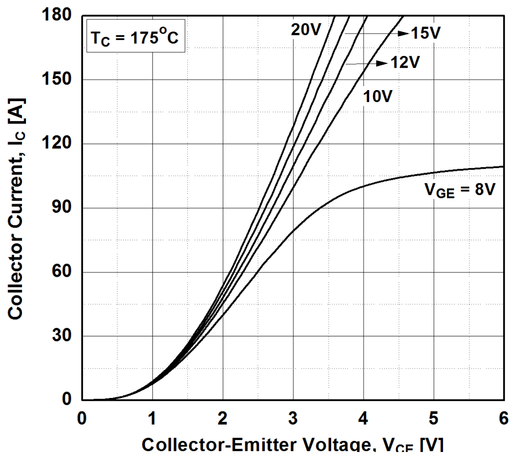


Figure 3. Typical Saturation Voltage Characteristics

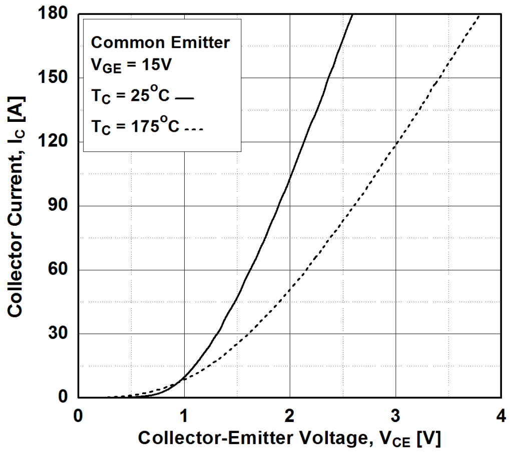


Figure 4. Saturation Voltage vs. Case Temperature at Variant Current Level

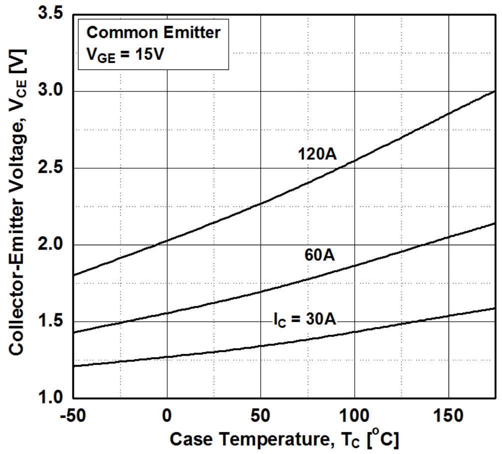


Figure 5. Saturation Voltage vs. V_{GE}

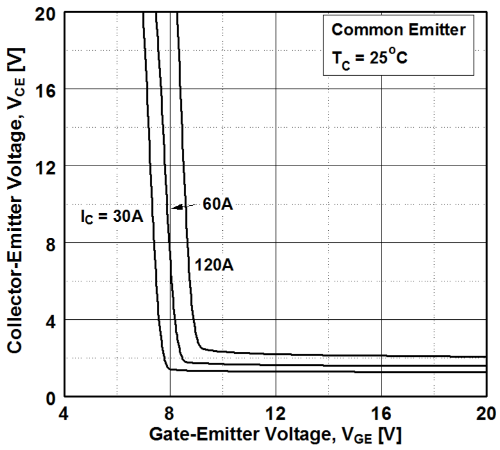
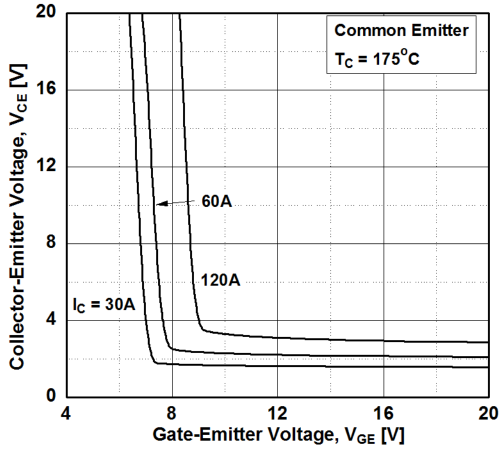


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics

Figure 7. Capacitance Characteristics

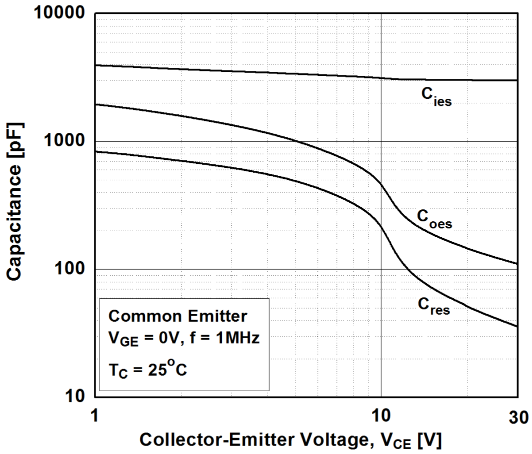


Figure 8. Gate Charge Characteristics

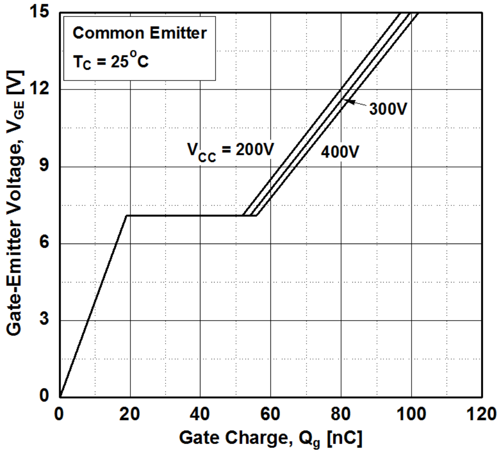


Figure 9. Turn-on Characteristics vs. Gate Resistance

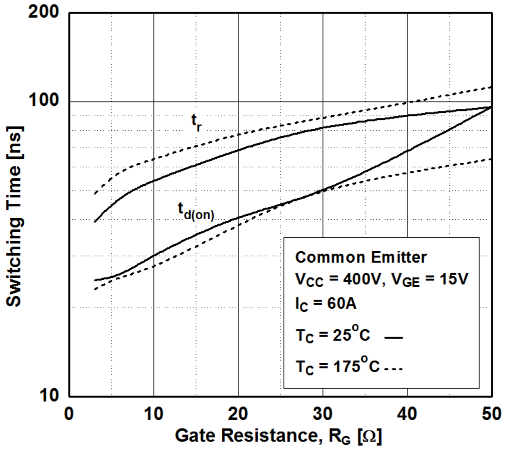


Figure 10. Turn-off Characteristics vs. Gate Resistance

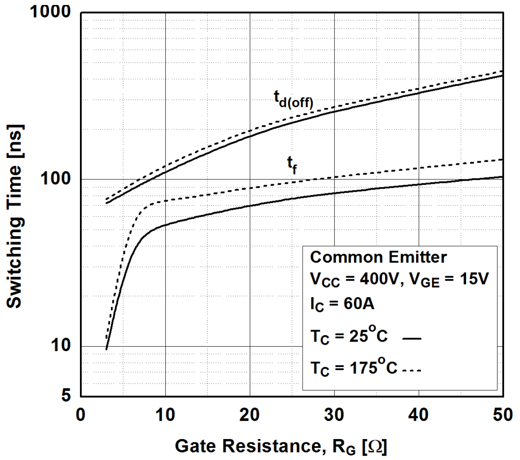


Figure 11. Switching Loss vs. Gate Resistance

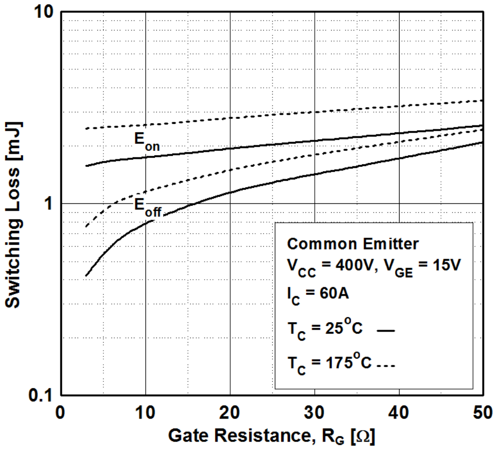
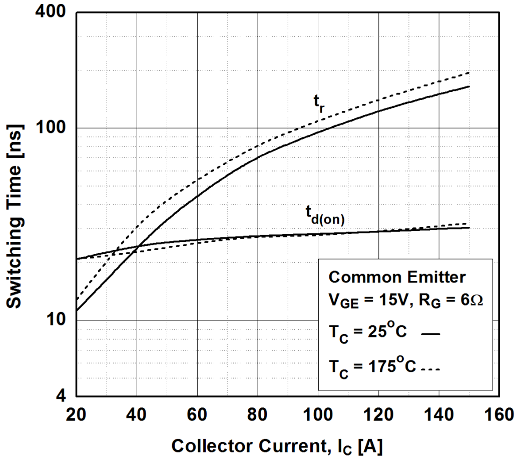


Figure 12. Turn-on Characteristics vs. Collector Current



Typical Performance Characteristics

Figure 13. Turn-off Characteristics vs. Collector Current

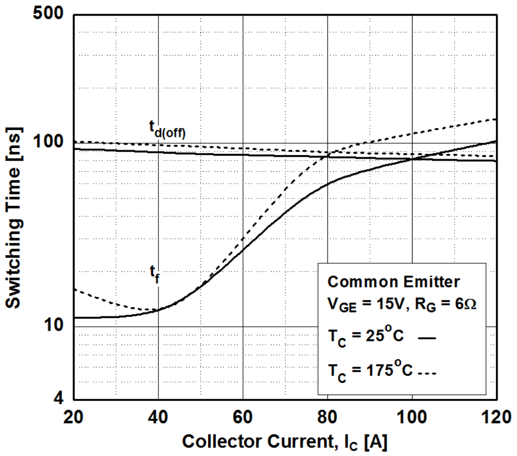


Figure 14. Switching Loss vs. Collector Current

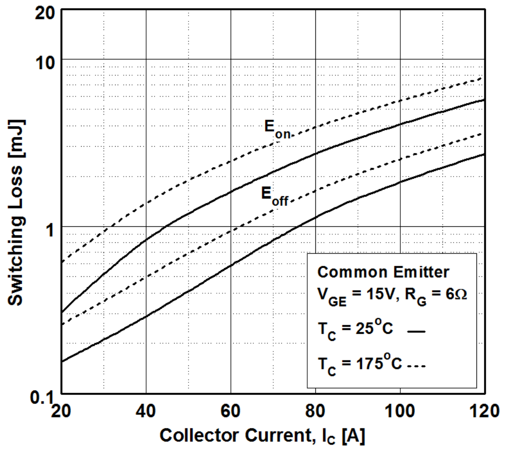


Figure 15. Load Current Vs. Frequency

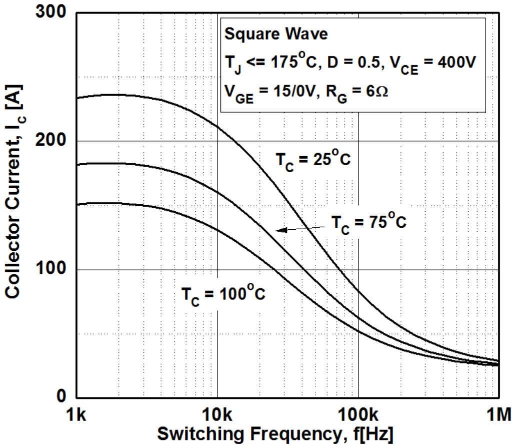


Figure 16. SOA Characteristics

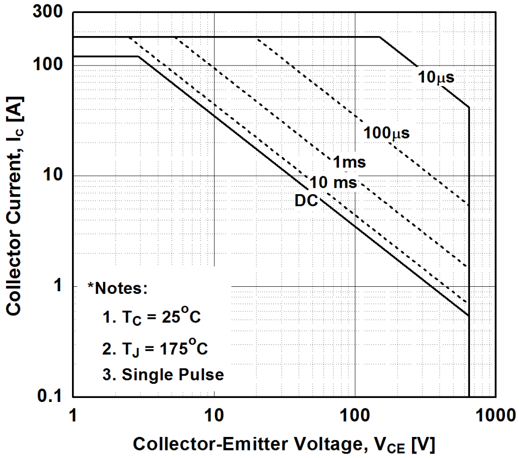


Figure 17. Forward Characteristics

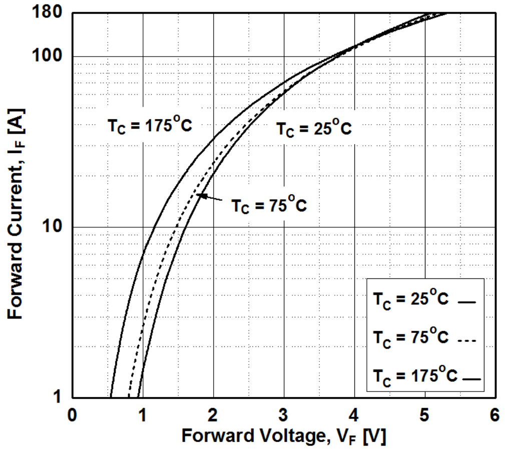
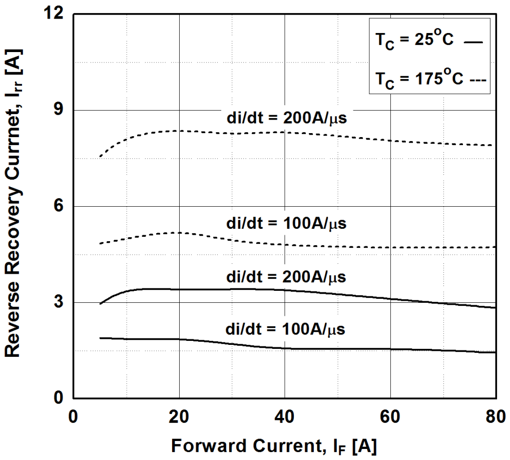


Figure 18. Reverse Recovery Current



Typical Performance Characteristics

Figure 19. Reverse Recovery Time

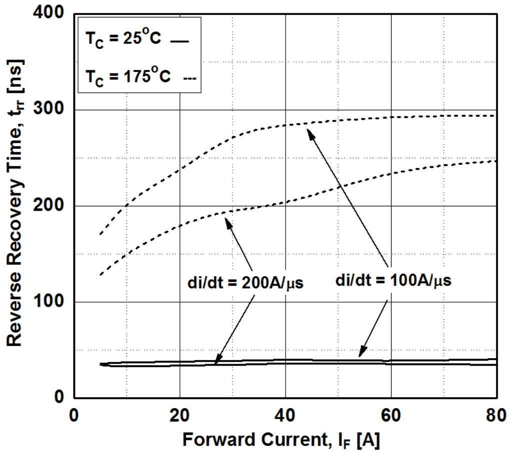


Figure 20. Stored Charge

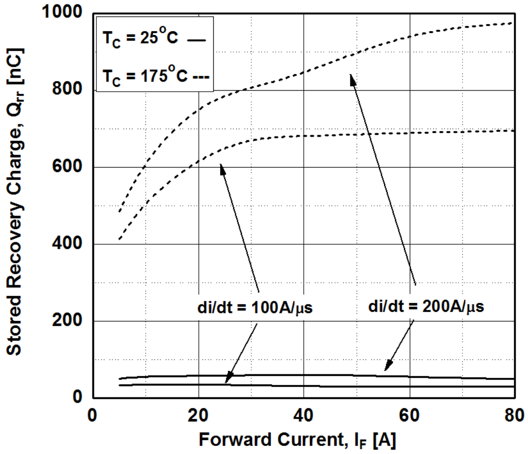


Figure 21.Transient Thermal Impedance of IGBT

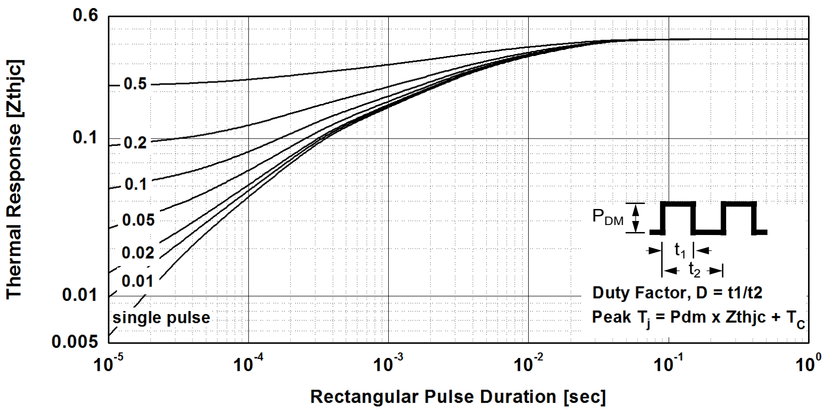
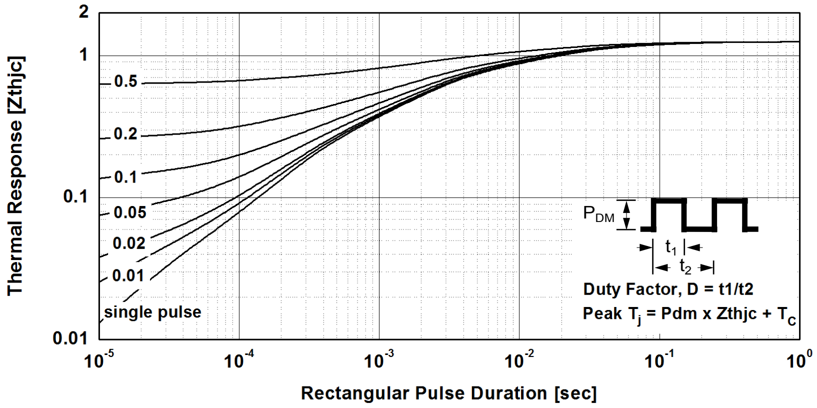


Figure 22.Transient Thermal Impedance of Diode



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