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FAIRCHILD

May 2014

FGB3440G2_F085 / FGD3440G2_F085 FGP3440G2_F085

EcoSPARK®2 335mJ, 400V, N-Channel Ignition IGBT

Features

- SCIS Energy = 335mJ at T_J = 25°C
- Logic Level Gate Drive
- Qualified to AEC Q101
- RoHS Compliant

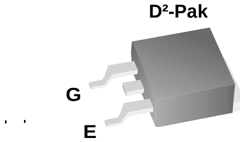
Applications

- Automotive Ignition Coil Driver Circuits
- Coil On Plug Applications

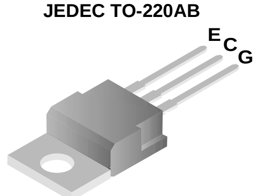
100% RoHS COMPLIANT

Package

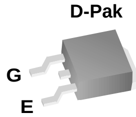
JEDEC TO-263AB
D²-Pak



JEDEC TO-220AB

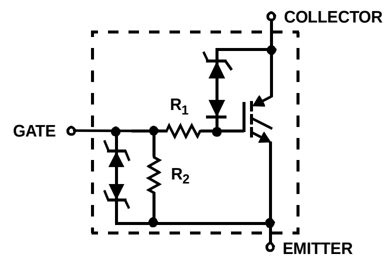


JEDEC TO-252AA
D-Pak



COLLECTOR
(FLANGE)

Symbol



Device Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
BV_{CER}	Collector to Emitter Breakdown Voltage (I_C = 1mA)	400	V
BV_{ECS}	Emitter to Collector Voltage - Reverse Battery Condition (I_C = 10mA)	28	V
E_{SCIS25}	Self Clamping Inductive Switching Energy (Note 1)	335	mJ
$E_{SCIS150}$	Self Clamping Inductive Switching Energy (Note 2)	195	mJ
I_{C25}	Collector Current Continuous, at V_{GE} = 4.0V, T_C = 25°C	26.9	A
I_{C110}	Collector Current Continuous, at V_{GE} = 4.0V, T_C = 110°C	25	A
V_{GEM}	Gate to Emitter Voltage Continuous	±10	V
P_D	Power Dissipation Total, at T_C = 25°C	166	W
	Power Dissipation Derating, for T_C > 25°C	1.1	W/°C
T_J	Operating Junction Temperature Range	-40 to +175	°C
T_{STG}	Storage Junction Temperature Range	-40 to +175	°C
T_L	Max. Lead Temp. for Soldering (Leads at 1.6mm from case for 10s)	300	°C
T_{PKG}	Max. Lead Temp. for Soldering (Package Body for 10s)	260	°C
ESD	Electrostatic Discharge Voltage at100pF, 1500Ω	4	kV

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGB3440G2	FGB3440G2_F085	TO-263AB	330mm	24mm	800
FGD3440G2	FGD3440G2_F085	TO-252AA	330mm	16mm	2500
FGP3440G2	FGP3440G2_F085	TO-220AB	Tube	N/A	50

Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
Off State Characteristics							
BV_{CER}	Collector to Emitter Breakdown Voltage	I_{CE} = 2mA, V_{GE} = 0, R_{GE} = 1KΩ, T_J = -40 to 150°C		370	400	430	V
BV_{CES}	Collector to Emitter Breakdown Voltage	I_{CE} = 10mA, V_{GE} = 0V, R_{GE} = 0, T_J = -40 to 150°C		390	420	450	V
BV_{ECS}	Emitter to Collector Breakdown Voltage	I_{CE} = -20mA, V_{GE} = 0V, T_J = 25°C		28	-	-	V
BV_{GES}	Gate to Emitter Breakdown Voltage	I_{GES} = ±2mA		±12	±14	-	V
I_{CER}	Collector to Emitter Leakage Current	V_{CE} = 250V, R_{GE}=1KΩ	T_J = 25°C	-	-	25	µA
			T_J = 150°C	-	-	1	mA
I_{ECS}	Emitter to Collector Leakage Current	V_{EC} = 24V,	T_J = 25°C	-	-	1	mA
			T_J = 150°C	-	-	40	
R_1	Series Gate Resistance			-	120	-	Ω
R_2	Gate to Emitter Resistance			10K	-	30K	Ω
On State Characteristics							
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	I_{CE} = 6A, V_{GE} = 4V,	T_J = 25°C	-	1.1	1.2	V
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	I_{CE} = 10A, V_{GE} = 4.5V,	T_J = 150°C	-	1.3	1.45	V
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	I_{CE} = 15A, V_{GE} = 4.5V,	T_J = 150°C	-	1.6	1.75	V
E_{SCIS}	Self Clamped Inductive Switching	L = 3.0 mHy, V_{GE} = 5V R_G = 1KΩ, (Note 1)	T_J = 25°C	-	-	335	mJ

Notes:

1: Self Clamping Inductive Switching Energy(E_{SCIS25}) of 335mJ is based on the test conditions that is starting T_J=25 °C; L=3mHy, I_{SCIS}=15A,V_{CC}=100V during inductor charging and V_{CC}=0V during the time in clamp.

2: Self Clamping Inductive Switching Energy ($E_{SCIS150}$) of 195mJ is based on the test conditions that is starting T_J=150 °C; L=3mHy, I_{SCIS}=11.4A,V_{CC}=100V during inductor charging and V_{CC}=0V during the time in clamp.

Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units

Dynamic Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
$Q_{G(ON)}$	Gate Charge	I_{CE} = 10A, V_{CE} = 12V, V_{GE} = 5V		-	24	-	nC
$V_{GE(TH)}$	Gate to Emitter Threshold Voltage	I_{CE} = 1mA, V_{CE} = $V_{GE,}$	T_J = 25°C	1.3	1.7	2.2	V
			T_J = 150°C	0.75	1.2	1.8	
V_{GEP}	Gate to Emitter Plateau Voltage	V_{CE} = 12V, I_{CE} = 10A		-	2.8	-	V

Switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(ON)R}$	Current Turn-On Delay Time-Resistive	V_{CE} = 14V, R_L = 1Ω V_{GE} = 5V, R_G = 1KΩ T_J = 25°C,	-	1.0	4	µs
t_{rR}	Current Rise Time-Resistive		-	2.0	7	µs
$t_{d(OFF)L}$	Current Turn-Off Delay Time-Inductive	V_{CE} = 300V, L = 1mH, V_{GE} = 5V, R_G = 1KΩ I_{CE} =6.5A, T_J = 25°C,	-	5.3	15	µs
t_{fL}	Current Fall Time-Inductive		-	2.3	15	µs

Thermal Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance Junction to Case		-	-	0.9	°C/W

Typical Performance Curves

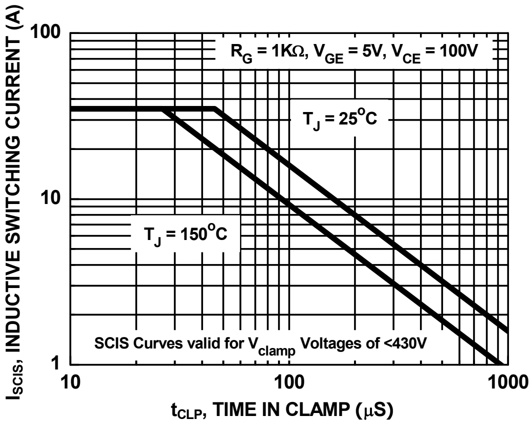


Figure 1. Self Clamped Inductive Switching Current vs. Time in Clamp

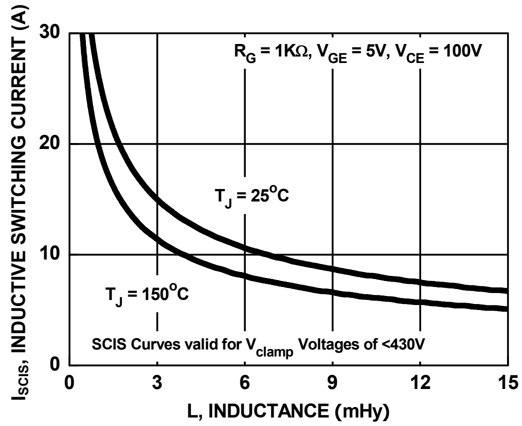


Figure 2. Self Clamped Inductive Switching Current vs. Inductance

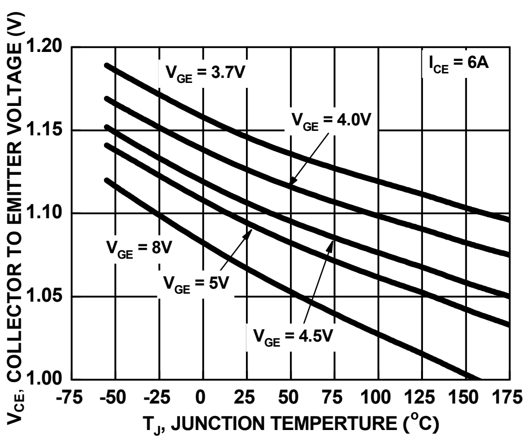


Figure 3. Collector to Emitter On-State Voltage vs. Junction Temperature

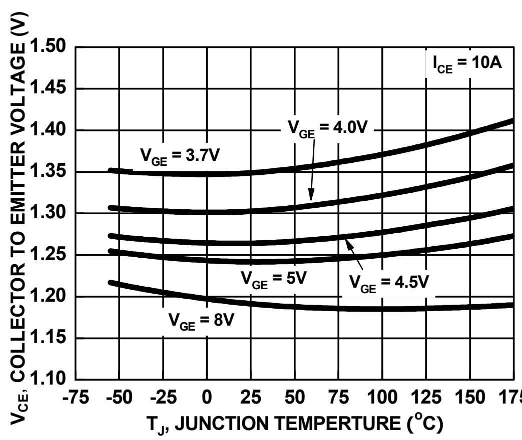


Figure 4. Collector to Emitter On-State Voltage vs. Junction Temperature

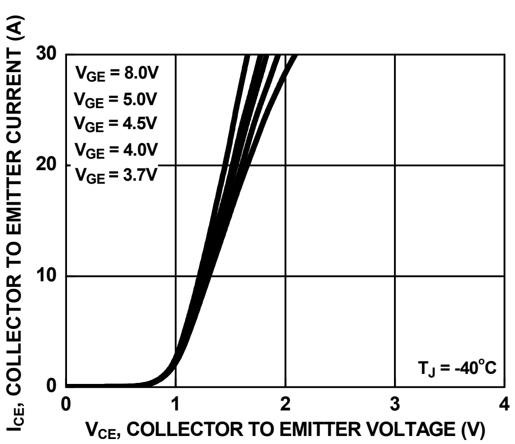


Figure 5. Collector to Emitter On-State Voltage vs. Collector Current

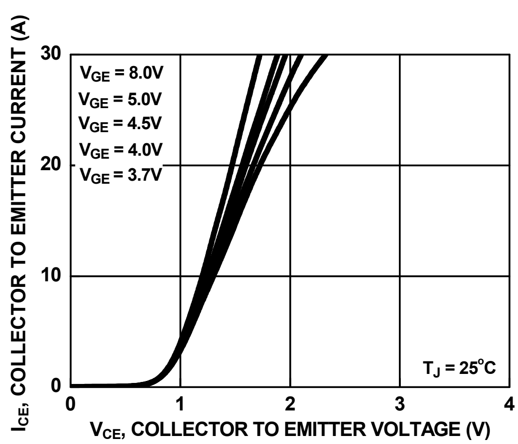


Figure 6. Collector to Emitter On-State Voltage vs. Collector Current

Typical Performance Curves (Continued)

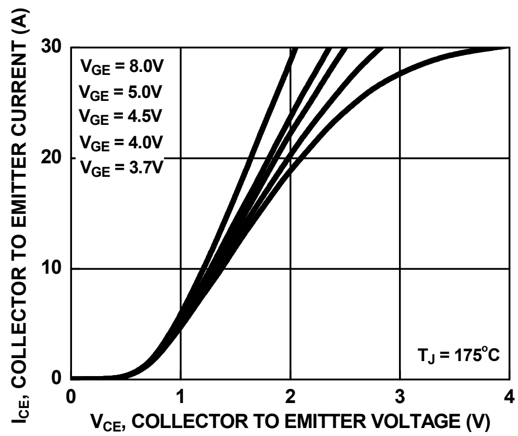


Figure 7. Collector to Emitter On-State Voltage vs. Collector Current

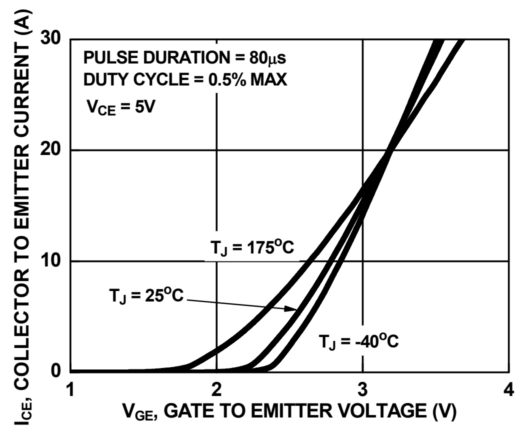


Figure 8. Transfer Characteristics

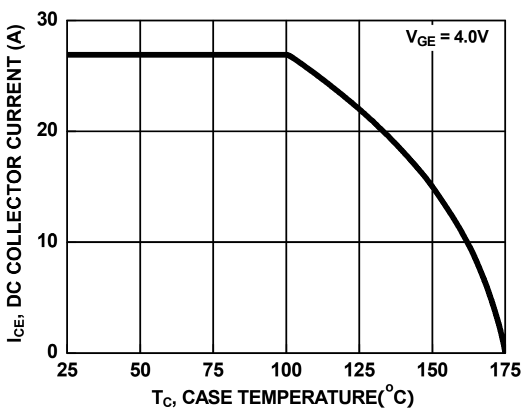


Figure 9. DC Collector Current vs. Case Temperature

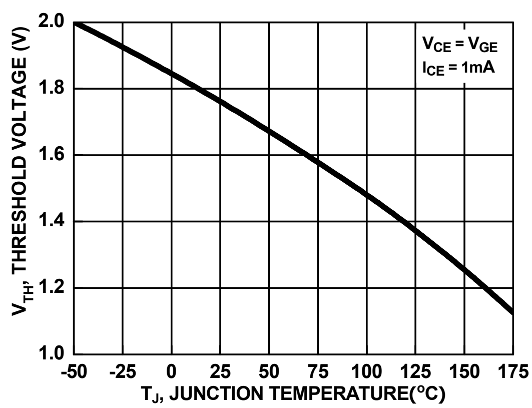


Figure 10. Threshold Voltage vs. Junction Temperature

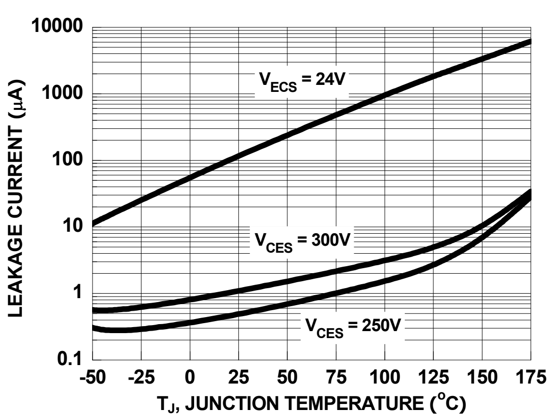


Figure 11. Leakage Current vs. Junction Temperature

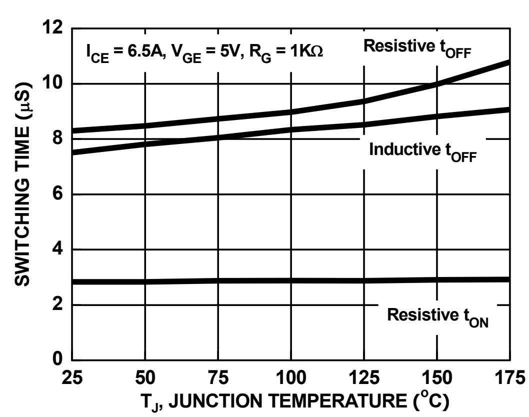


Figure 12. Switching Time vs. Junction Temperature

Typical Performance Curves (Continued)

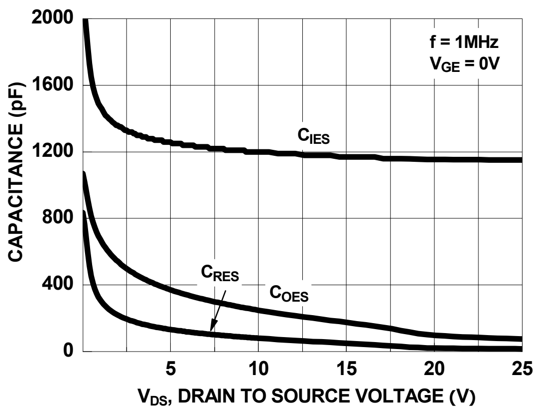


Figure 13. Capacitance vs. Collector to Emitter Voltage

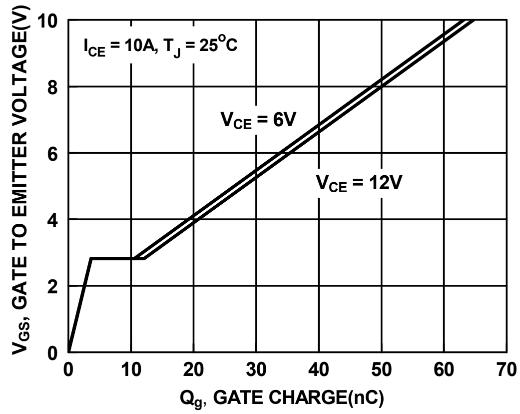


Figure 14. Gate Charge

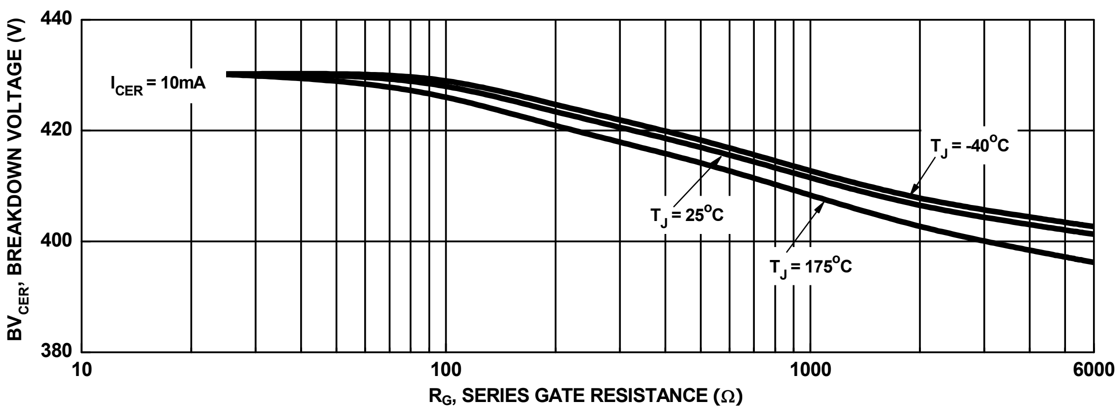


Figure 15. Break down Voltage vs. Series Gate Resistance

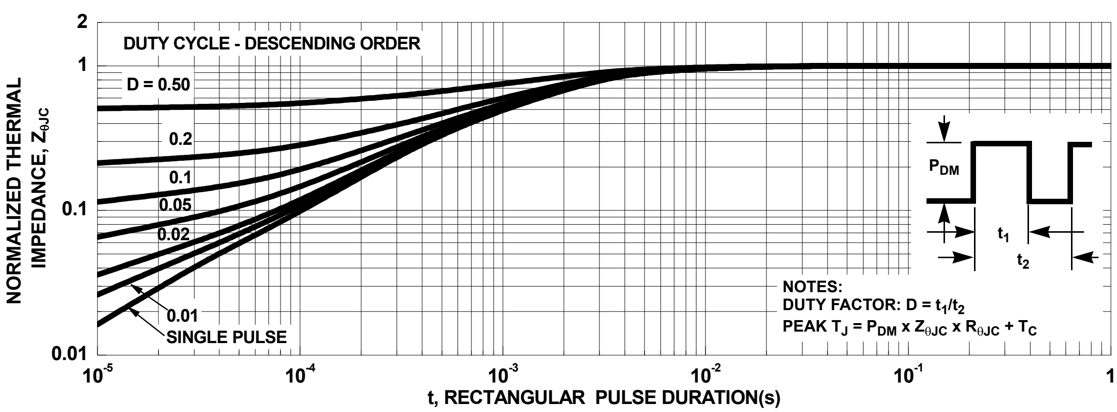


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

Test Circuit and Waveforms

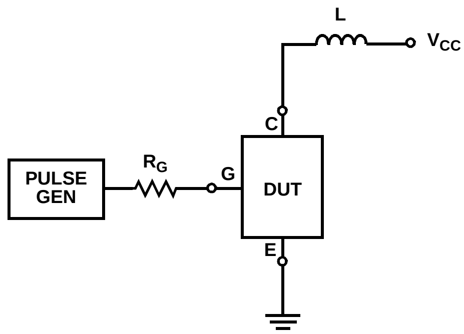


Figure 17. Inductive Switching Test Circuit

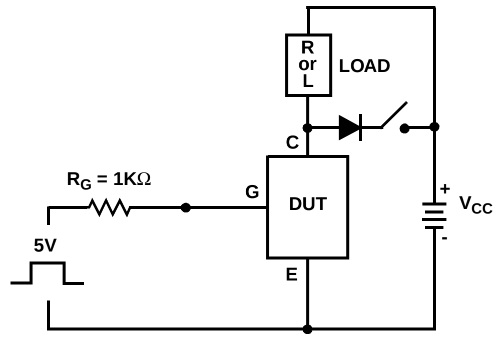


Figure 18. t_{ON} and t_{OFF} Switching Test Circuit

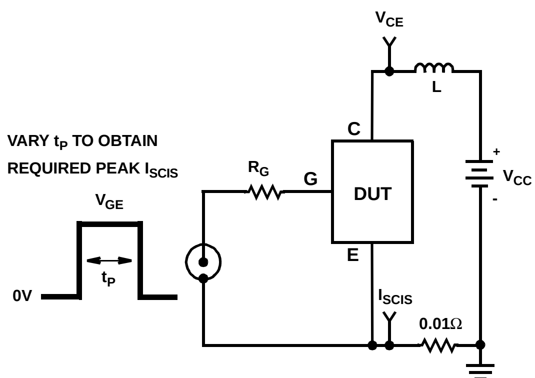


Figure 19. Energy Test Circuit

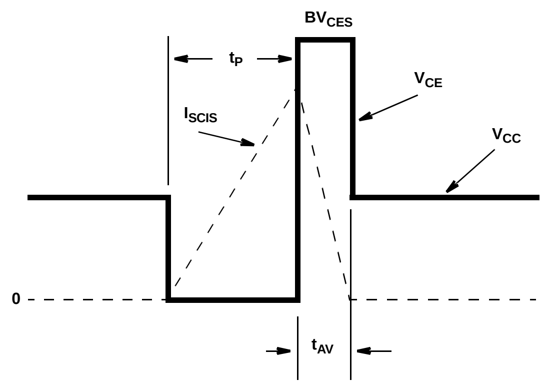


Figure 20. Energy Waveforms

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Rev. I68

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