FAIRCHILD
SEMICONDUCTOR®

December 2011

FGD3440G2_F085

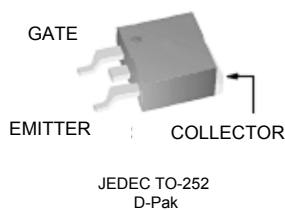## EcoSPARK®2 335mJ, 400V, N-Channel Ignition IGBT

Features

- SCIS Energy = 335mJ at T_J = 25°C

- Logic Level Gate Drive

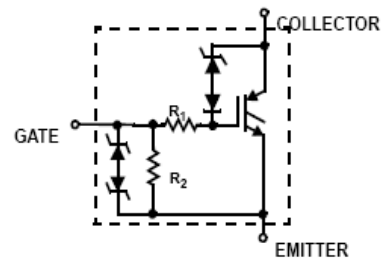- Qualified to AEC Q101

- RoHS Compliant

Applications

- Automotive Ignition Coil Driver Circuits

- Coil On Plug Applications

100% RoHS COMPLIANT

Package

GATE

EMITTER   COLLECTOR

JEDEC TO-252
D-Pak

Symbol

COLLECTOR

GATE

R_1

R_2

EMITTER

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
FGD3440G2	FGD3440G2_F085	TO252	330mm	16mm	2500 units

Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units

Off State Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
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

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
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

Electrical Characteristics T_A = 25°C unless otherwise noted

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	-	1.0	4	µs
t_{rR}	Current Rise Time-Resistive	V_{GE} = 5V, R_G = 1KΩ T_J = 25°C,	-	2.0	7	µs
$t_{d(OFF)L}$	Current Turn-Off Delay Time-Inductive	V_{CE} = 300V, L = 1mH,	-	5.3	15	µs
t_{fL}	Current Fall Time-Inductive	V_{GE} = 5V, R_G = 1KΩ I_{CE} =6.5A, T_J = 25°C,	-	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

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.

FGD3440G2_F085 EcoSPARK® 2 335mJ, 400V, N-Channel Ignition IGBT

Typical Performance Curves
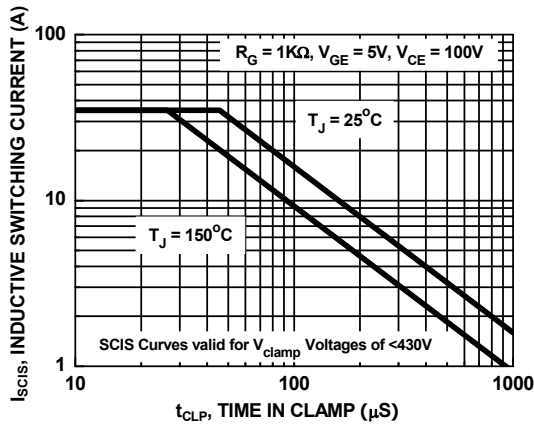
Figure 1. Self Clamped Inductive Switching Current vs. Time in Clamp
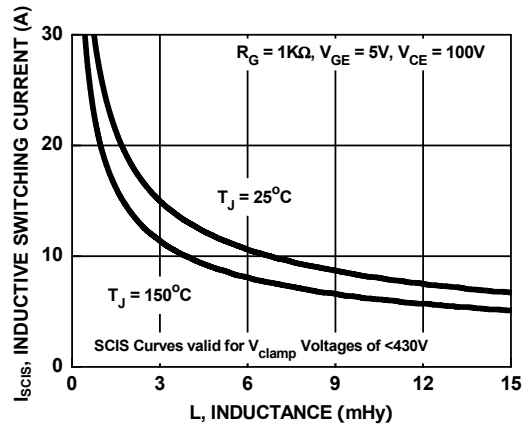
Figure 2. Self Clamped Inductive Switching Current vs. Inductance
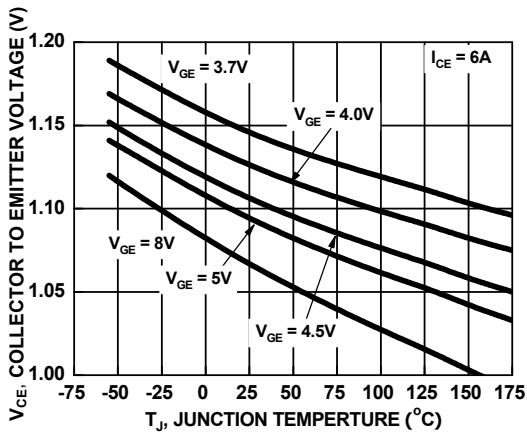
Figure 3. Collector to Emitter On-State Voltage vs. Junction Temperature
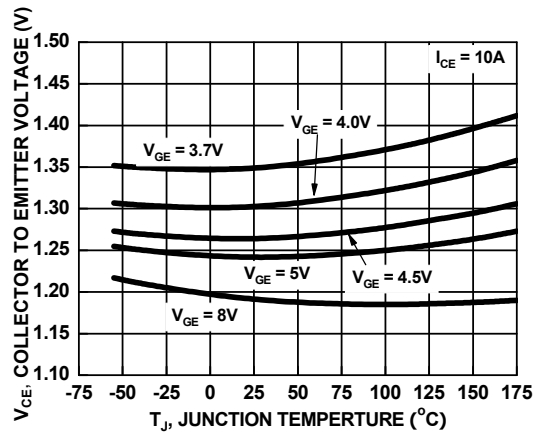
Figure 4. Collector to Emitter On-State Voltage vs. Junction Temperature
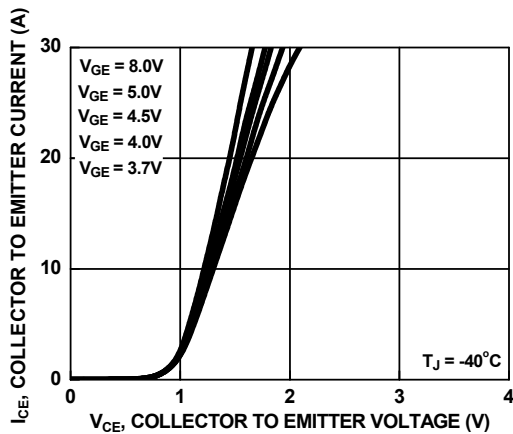
Figure 5. Collector to Emitter On-State Voltage vs. Collector Current
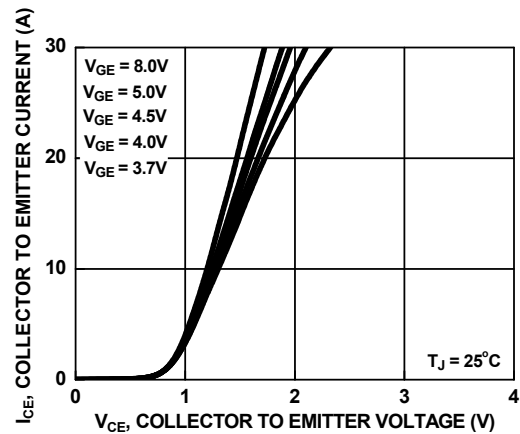
Figure 6. Collector to Emitter On-State Voltage vs. Collector Current

Typical Performance Curves (Continued)
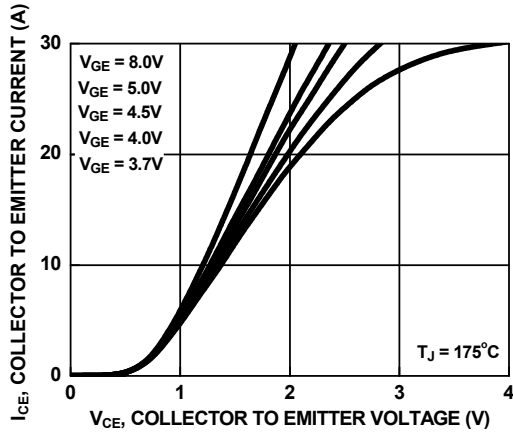
Figure 7. Collector to Emitter On-State Voltage vs. Collector Current
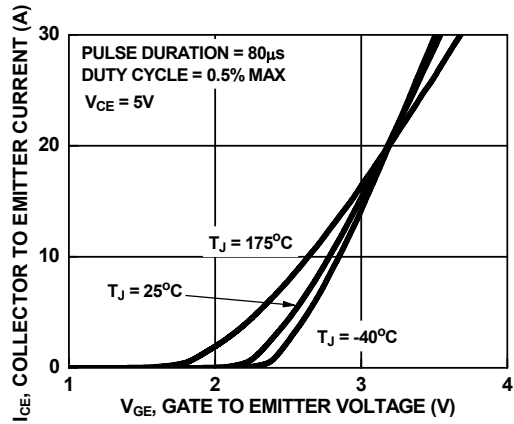
Figure 8. Transfer Characteristics
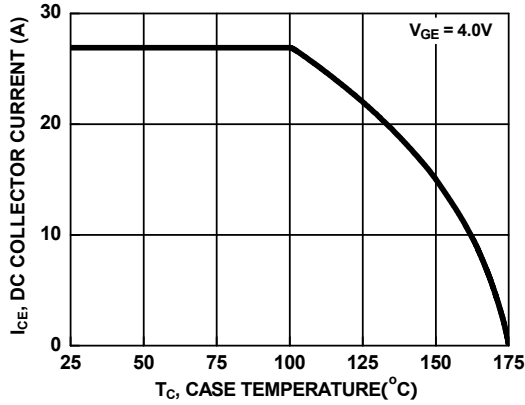
Figure 9. DC Collector Current vs. Case Temperature
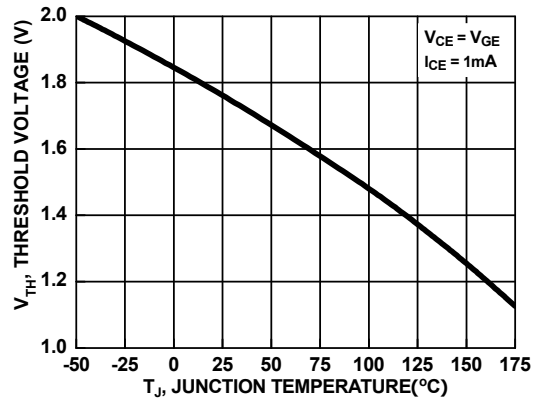
Figure 10. Threshold Voltage vs. Junction Temperature
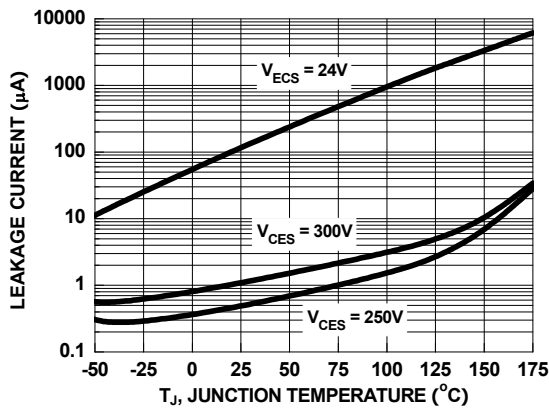
Figure 11. Leakage Current vs. Junction Temperature
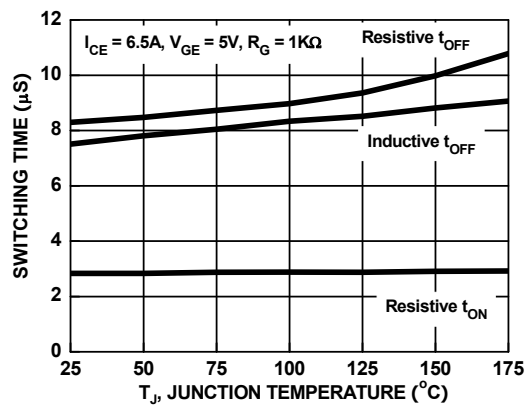
Figure 12. Switching Time vs. Junction Temperature

Typical Performance Curves (Continued)
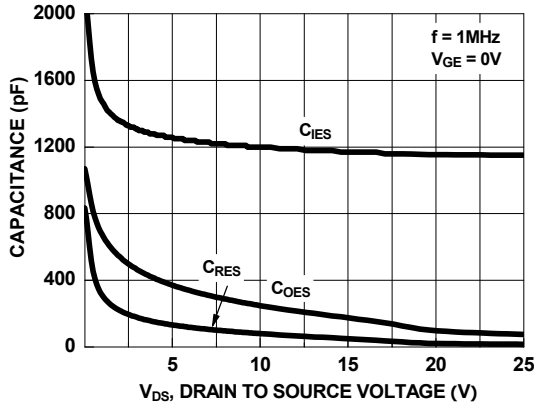
Figure 13. Capacitance vs. Collector to Emitter Voltage
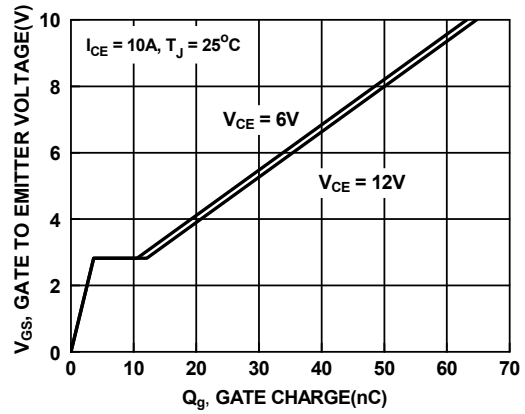
Figure 14. Gate Charge
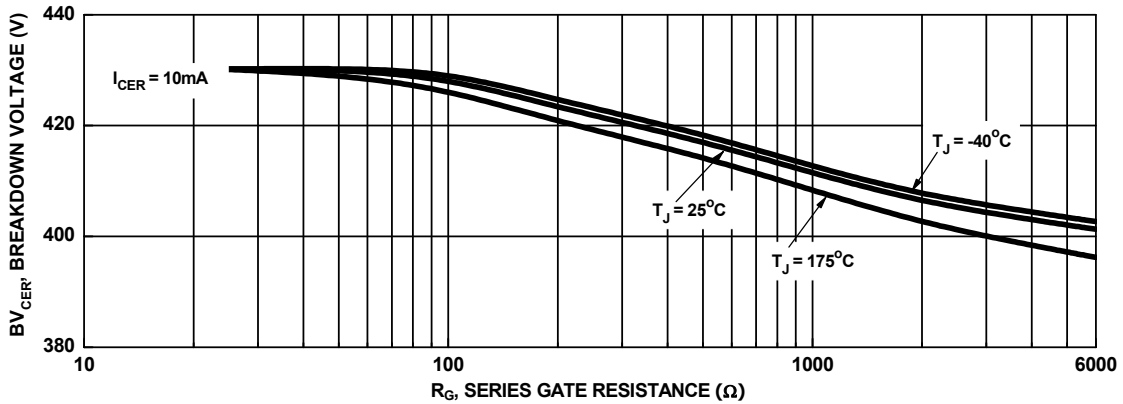
Figure 15. Break down Voltage vs. Series Gate Resistance

NOTES:
DUTY FACTOR: D = t_1/t_2
PEAK T_J = P_{DM} x $Z_{\theta JC}$ x $R_{\theta JC}$ + T_C
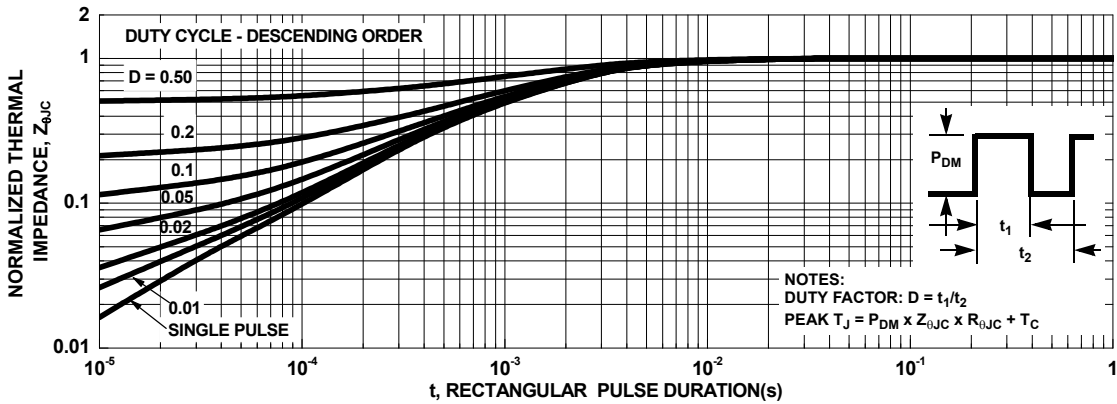
Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

Test Circuit and Waveforms
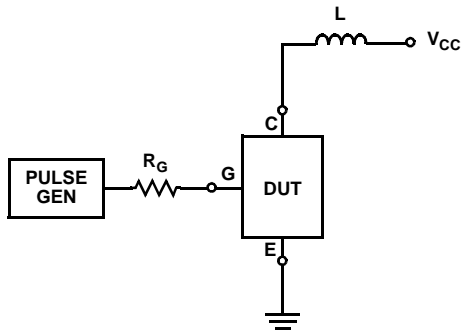
Figure 17. Inductive Switching Test Circuit
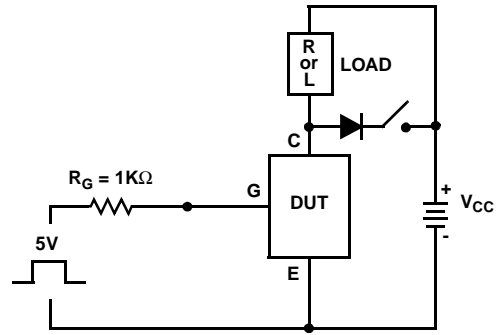
Figure 18. t_{ON} and t_{OFF} Switching Test Circuit
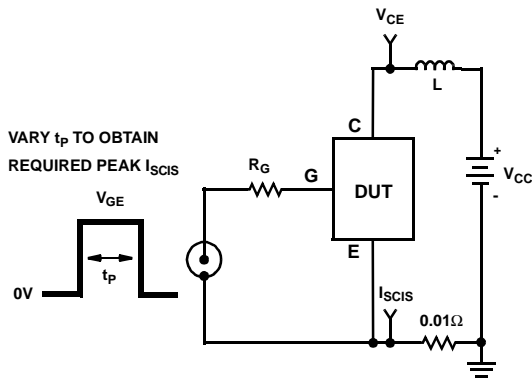
Figure 19. Energy Test Circuit
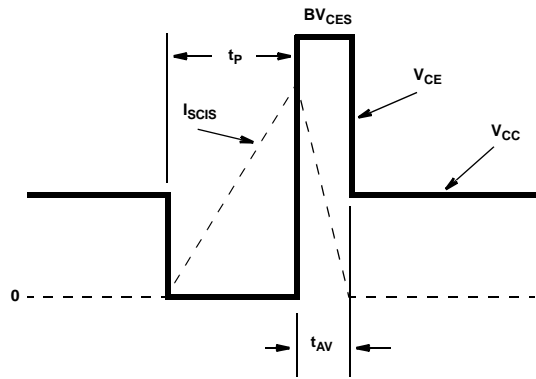
Figure 20. Energy Waveforms

Mechanical Dimensions

D-PAK

Dimensions in Millimeters

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