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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

May 2014

FGB3040G2_F085 / FGD3040G2_F085
FGP3040G2_F085 / FGI3040G2_F085

EcoSPARK®2 300mJ, 400V, N-Channel Ignition IGBT

Features

- SCIS Energy = 300mJ at T_J = 25°C
- Logic Level Gate Drive
- Qualified to AEC Q101
- RoHS Compliant

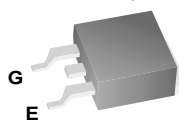### Applications

- Automotive Ignition Coil Driver Circuits
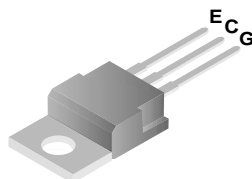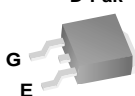- Coil On Plug Applications

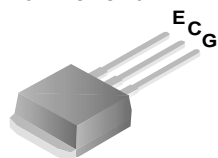100% RoHS COMPLIANT

Package

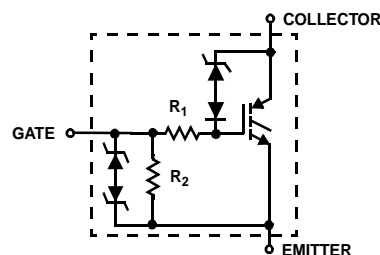JEDEC TO-263AB
D²-Pak

JEDEC TO-220AB

JEDEC TO-252AA
D-Pak

JEDEC TO-262AA

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)	300	mJ
E$_{SCIS150}$	Self Clamping Inductive Switching Energy (Note 2)	170	mJ
I$_{C25}$	Collector Current Continuous, at V_{GE} = 5.0V, T_C = 25°C	41	A
I$_{C110}$	Collector Current Continuous, at V_{GE} = 5.0V, T_C = 110°C	25.6	A
V$_{GEM}$	Gate to Emitter Voltage Continuous	±10	V
P$_D$	Power Dissipation Total, at T_C = 25°C	150	W
	Power Dissipation Derating, for T_C > 25°C	1	W/°C
T$_J$	Operating Junction Temperature Range	-55 to +175	°C
T$_{STG}$	Storage Junction Temperature Range	-55 to +175	°C
T$_L$	Max. Lead Temp. for Soldering (Leads at 1.6mm from case for 10s)	300	°C
T$_{PKG}$	Reflow soldering according to JESD020C	260	°C
ESD	HBM-Electrostatic Discharge Voltage at100pF, 1500Ω	4	kV
	CDM-Electrostatic Discharge Voltage at 1Ω	2	kV

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Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGB3040G2	FGB3040G2_F085	TO-263AB	330mm	24mm	800
FGD3040G2	FGD3040G2_F085	TO-252AA	330mm	16mm	2500
FGP3040G2	FGP3040G2_F085	TO-220AB	Tube	N/A	50
FGI3040G2	FGI3040G2_F085	TO-262AA	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	-	1.15	1.25	V
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	I_{CE} = 10A, V_{GE} = 4.5V,	T_J = 150°C	-	1.35	1.50	V
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	I_{CE} = 15A, V_{GE} = 4.5V,	T_J = 150°C	-	1.68	1.85	V
E_{SCIS}	Self Clamped Inductive Switching	L = 3.0 mHy, R_G = 1KΩ, V_{GE} = 5V, (Note 1)	T_J = 25°C	-	-	300	mJ
Thermal Characteristics							
$R_{θJC}$	Thermal Resistance Junction to Case			-	-	1	°C/W

Notes:

1: Self Clamping Inductive Switching Energy (E_{SCIS25}) of 300 mJ is based on the test conditions that starting Tj=25°C; L=3mHy, I_{SCIS}=14.2A, V_{CC}=100V during inductor charging and V_{CC}=0V during the time in clamp.

2: Self Clamping Inductive Switching Energy ($E_{SCIS150}$) of 170 mJ is based on the test conditions that starting Tj=150°C; L=3mHy, I_{SCIS}=10.8A, 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							
$Q_{G(ON)}$	Gate Charge	I_{CE} = 10A, V_{CE} = 12V, V_{GE} = 5V		-	21	-	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							
$t_{d(ON)R}$	Current Turn-On Delay Time-Resistive	V_{CE} = 14V, R_L = 1Ω		-	0.9	4	μs
t_{rR}	Current Rise Time-Resistive	V_{GE} = 5V, R_G = 1KΩ T_J = 25°C,		-	1.9	7	μs
$t_{d(OFF)L}$	Current Turn-Off Delay Time-Inductive	V_{CE} = 300V, L = 1mH,		-	4.8	15	μs
t_{fL}	Current Fall Time-Inductive	V_{GE} = 5V, R_G = 1KΩ I_{CE} = 6.5A, T_J = 25°C,		-	2.0	15	μs

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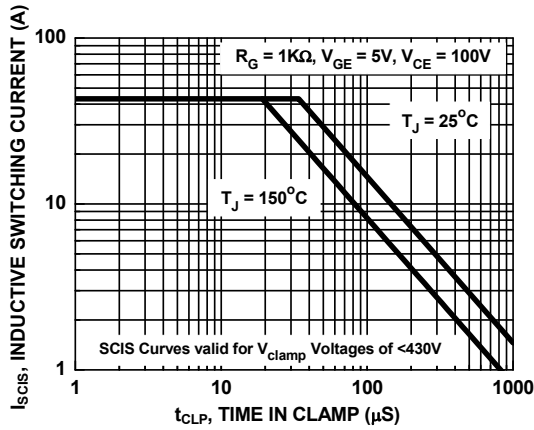
Figure 1. Self Clamped Inductive Switching
Current vs. Time in Clamp
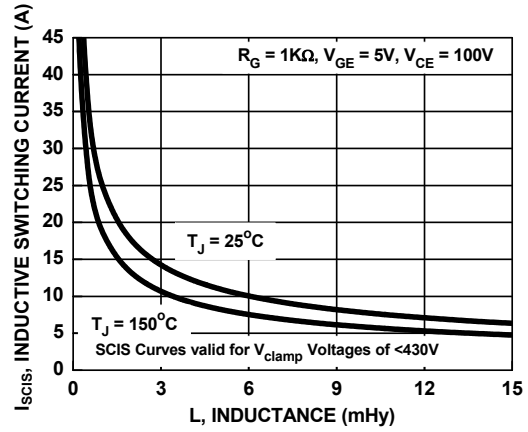
Figure 2. Self Clamped Inductive Switching
Current vs. Inductance
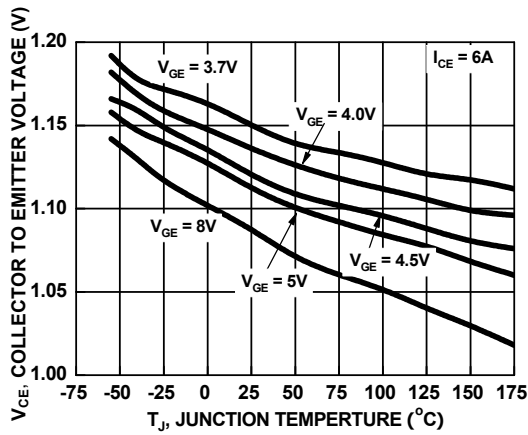
Figure 3. Collector to Emitter On-State Voltage
vs. Junction Temperature
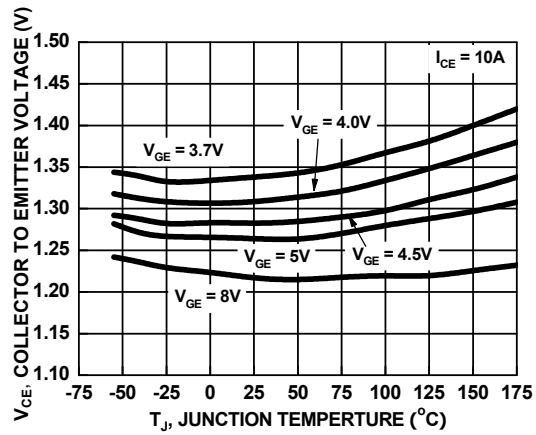
Figure 4. Collector to Emitter On-State Voltage
vs. Junction Temperature
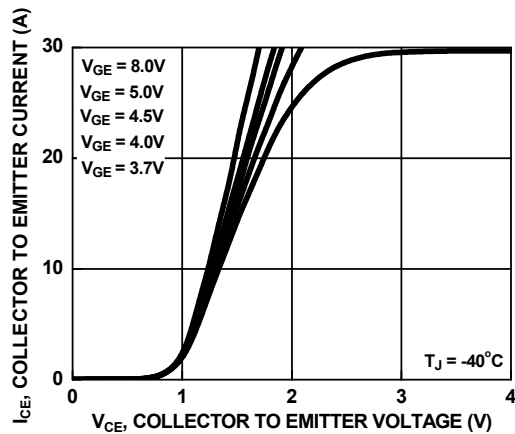
Figure 5. Collector to Emitter On-State Voltage
vs. Collector Current
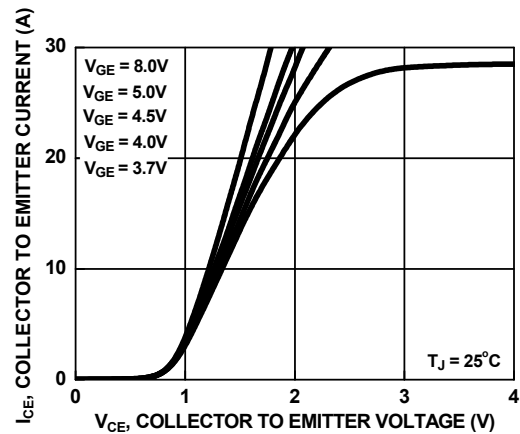
Figure 6. Collector to Emitter On-State Voltage
vs. Collector Current

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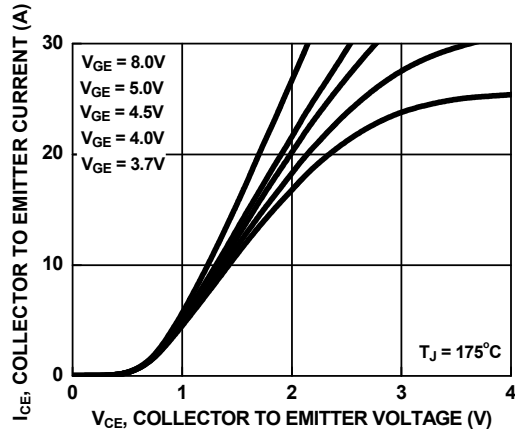
Figure 7. Collector to Emitter On-State Voltage vs. Collector Current
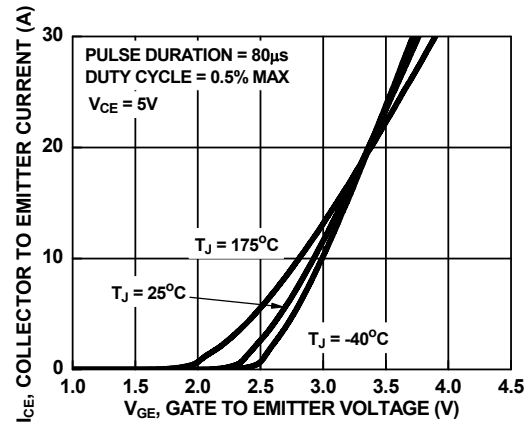
Figure 8. Transfer Characteristics
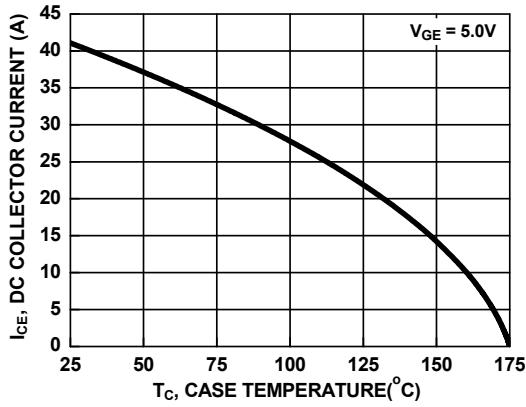
Figure 9. DC Collector Current vs. Case Temperature
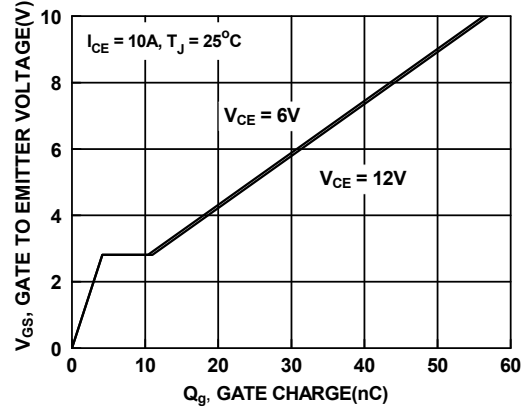
Figure 10. Gate Charge
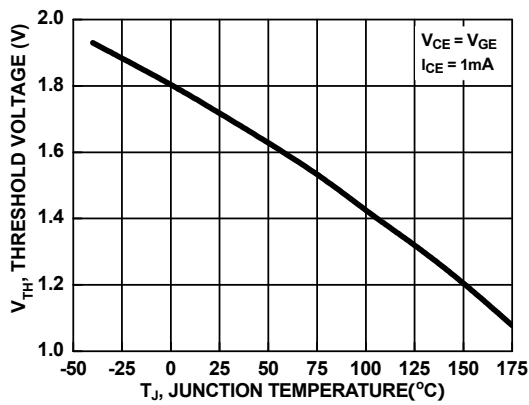
Figure 11. Threshold Voltage vs. Junction Temperature
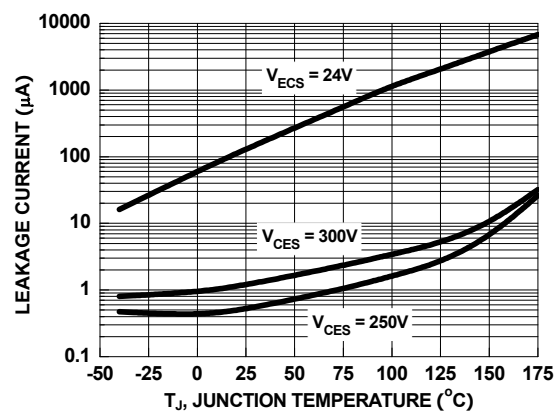
Figure 12. Leakage Current vs. Junction Temperature

Typical Performance Curves (Continued)
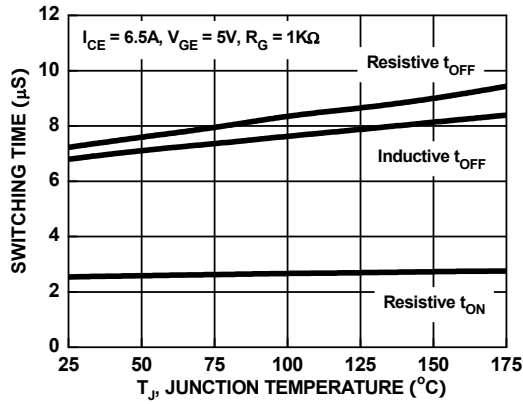
Figure 13. Switching Time vs. Junction Temperature
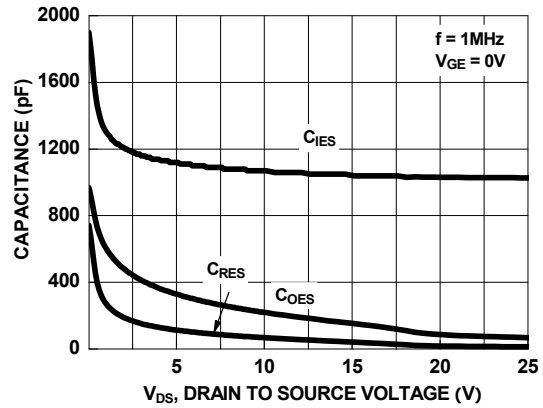
Figure 14. Capacitance vs. Collector to Emitter Voltage
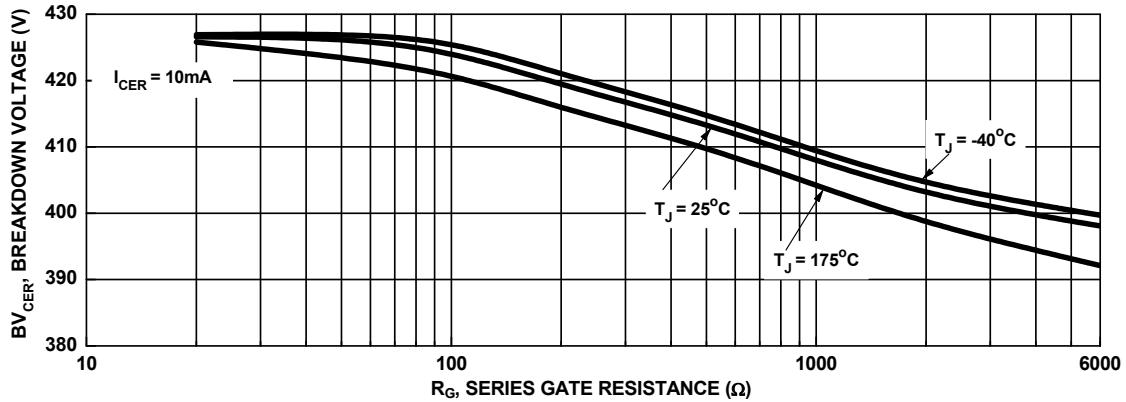
Figure 15. Break down Voltage vs. Series Gate Resistance
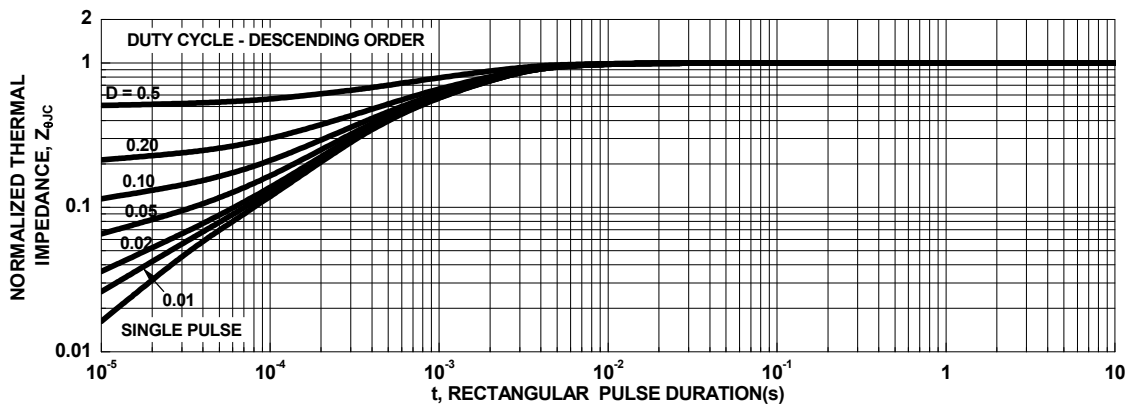
Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

Typical Performance Curves
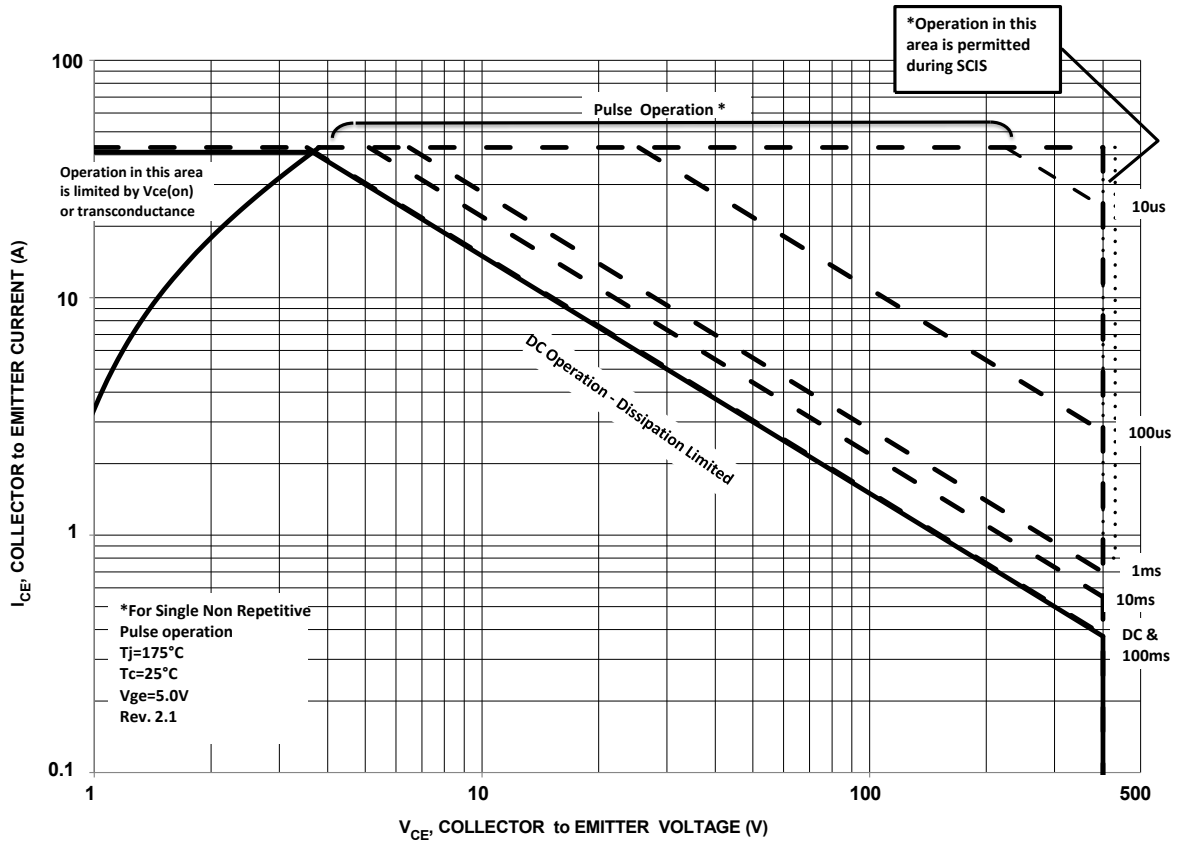
Figure 17. Forward Safe Operating Area

Test Circuit and Waveforms
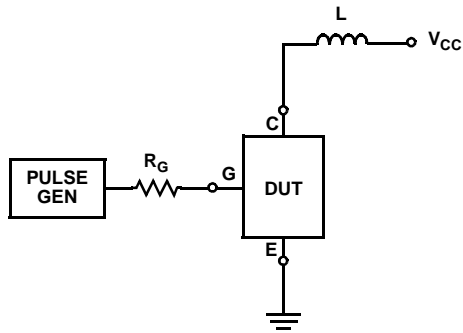
Figure 18. Inductive Switching Test Circuit
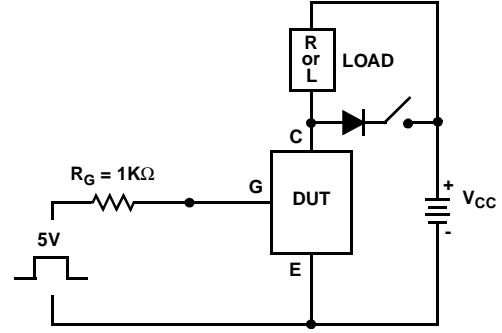
Figure 19. t_{ON} and t_{OFF} Switching Test Circuit
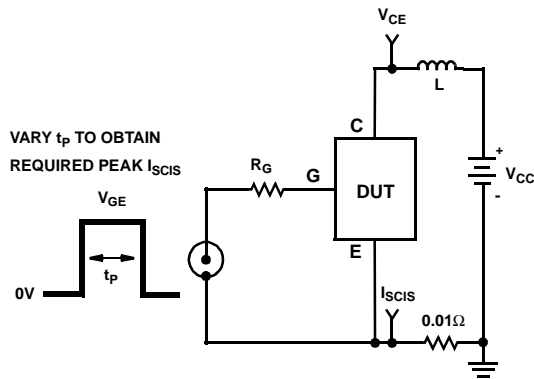
Figure 20. Energy Test Circuit
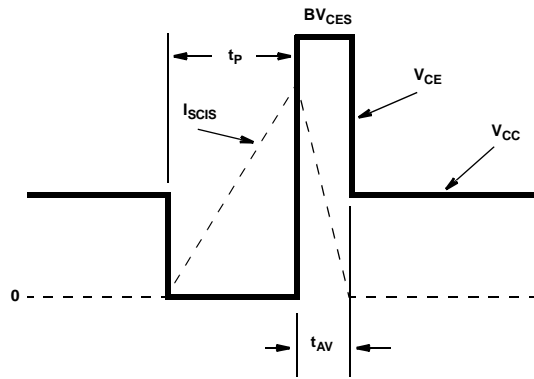
Figure 21. Energy Waveforms

PRODUCT STATUS DEFINITIONS
Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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