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FAIRCHILD

May 2014

FGD3245G2_F085 / FGB3245G2_F085

EcoSPARK®2 320mJ, 450V, N-Channel Ignition IGBT

Features

- SCIS Energy = 320mJ at T_J = 25°C
- Logic Level Gate Drive
- Low Saturation Voltage
- Qualified to AEC Q101
- RoHS Compliant

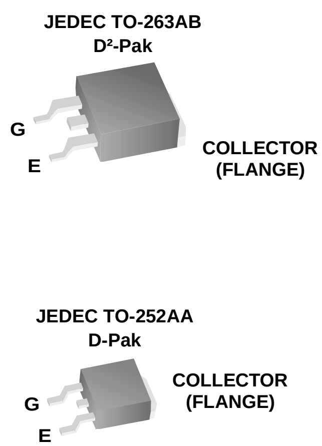
Applications

- Automotive Ignition Coil Driver Circuits
- Coil On Plug Applications

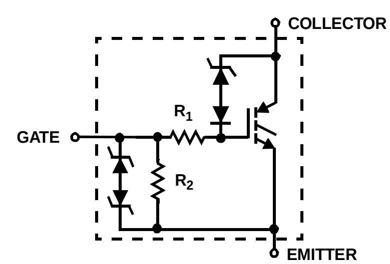
General Description

The FGB3245G2_F085 and FGD3245G2 are N-channel IGBTs designed in Fairchild's EcoSPARK-2 technology which helps in eliminating external protection circuitry. The technology is optimized for driving the coil in the harsh environment of automotive ignition systems and offers outstanding Vsat and SCIS Energy capability also at elevated operating temperatures. The logic level gate input is ESD protected and features an integrated gate resistor. An integrated zener-circuitry clamps the IGBT's collecter- to-emitter voltage at 450V which enables systems requiring a higher spark voltage

Package



Symbol



Device Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter	Rating	Units
BV_{CER}	Collector to Emitter Breakdown Voltage (I_C = 1mA)	450	V
BV_{ECS}	Emitter to Collector Voltage - Reverse Battery Condition (I_C = 10mA)	28	V
E_{SCIS25}	Self Clamping Inductive Switching Energy (Note 1)	320	mJ
$E_{SCIS150}$	Self Clamping Inductive Switching Energy (Note 2)	180	mJ
I_{C25}	Collector Current Continuous, at V_{GE} = 4.0V, T_C = 25°C	23	A
I_{C110}	Collector Current Continuous, at V_{GE} = 4.0V, T_C = 110°C	23	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	1.1	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
	CDM-Electrostatic Discharge Voltage at 1Ω	2	kV

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGD3245G2	FGD3245G2_F085	TO252AA	330mm	16mm	2500 units
FGB3245G2	FGB3245G2_F085	TO263AB	330mm	24mm	800 units

Electrical Characteristics T_A = 25°C unless otherwise noted

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		420	-	480	V
BV_{CES}	Collector to Emitter Breakdown Voltage	I_{CE} = 10mA, V_{GE} = 0V, R_{GE} = 0, T_J = -40 to 150°C		440	-	500	V
BV_{ECS}	Emitter to Collector Breakdown Voltage	I_{CE} = -75mA, 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	-	1.13	1.25	V
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	I_{CE} = 10A, V_{GE} = 4.5V,	T_J = 150°C	-	1.32	1.50	V
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	I_{CE} = 15A, V_{GE} = 4.5V,	T_J = 150°C	-	1.64	1.85	V

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		-	23	-	nC
$V_{GE(TH)}$	Gate to Emitter Threshold Voltage	I_{CE} = 1mA, V_{CE} = $V_{GE,}$	T_J = 25°C	1.3	1.6	2.2	V
			T_J = 150°C	0.75	1.1	1.8	
V_{GEP}	Gate to Emitter Plateau Voltage	V_{CE} = 12V, I_{CE} = 10A		-	2.7	-	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,		-	0.9	4	μs
t_{rR}	Current Rise Time-Resistive			-	2.6	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,		-	5.4	15	μs
t_{fL}	Current Fall Time-Inductive			-	2.7	15	μs
E_{SCIS}	Self Clamped Inductive Switching	L = 3.0 mHy,R_G = 1KΩ, V_{GE} = 5V, (Note 1)	T_J = 25°C	-	-	320	mJ

Thermal Characteristics

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

Notes:

1: Self Clamping Inductive Switching Energy (E_{SCIS25}) of 320 mJ is based on the test conditions that starting Tj=25°C; L=3mHy, I_{SCIS}=14.6A,V_{CC}=100V during inductor charging and V_{CC}=0V during the time in clamp.

2: Self Clamping Inductive Switching Energy ($E_{SCIS150}$) of 180 mJ is based on the test conditions that starting Tj=150°C; L=3mHy, I_{SCIS}=10.9A,V_{CC}=100V during inductor charging and V_{CC}=0V during the time in clamp.

Typical Performance Curves

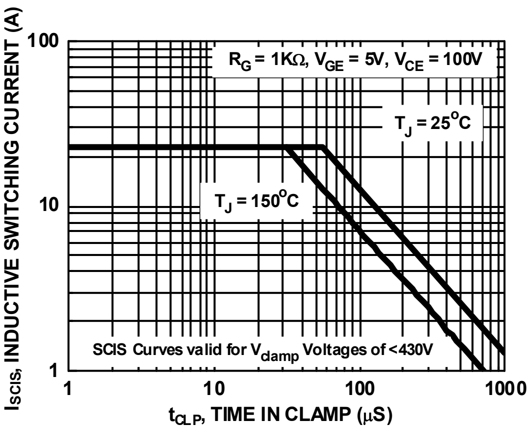


Figure 1. Self Clamped Inductive Switching Current vs. Time in Clamp

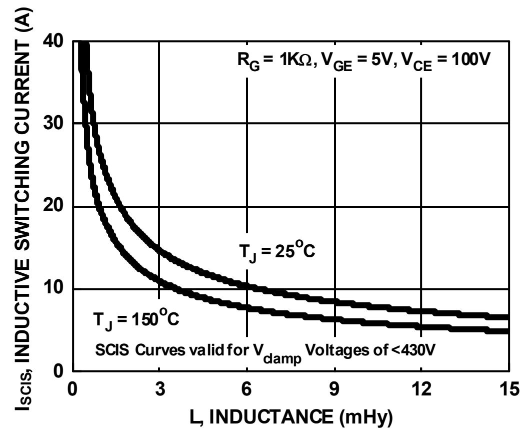


Figure 2. Self Clamped Inductive Switching Current vs. Inductance

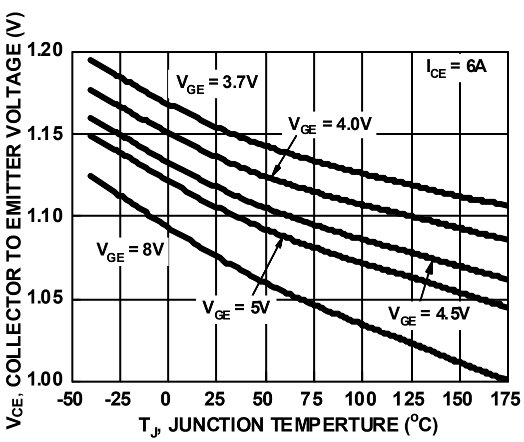


Figure 3. Collector to Emitter On-State Voltage vs. Junction Temperature

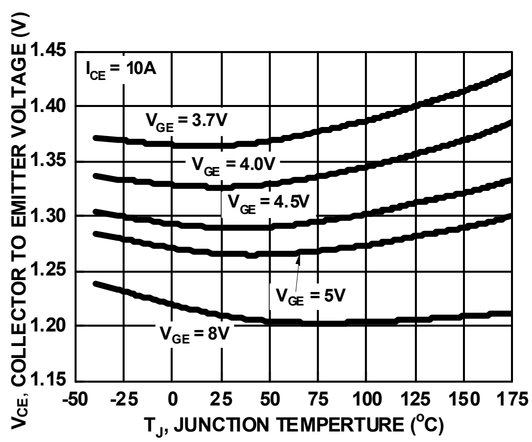


Figure 4. Collector to Emitter On-State Voltage vs. Junction Temperature

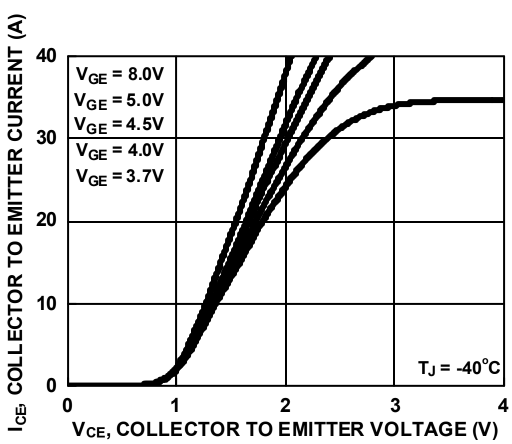


Figure 5. Collector to Emitter On-State Voltage vs. Collector Current

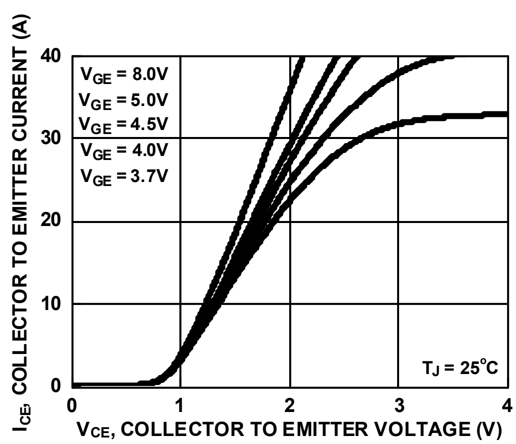


Figure 6. Collector to Emitter On-State Voltage vs. Collector Current

Typical Performance Curves (Continued)

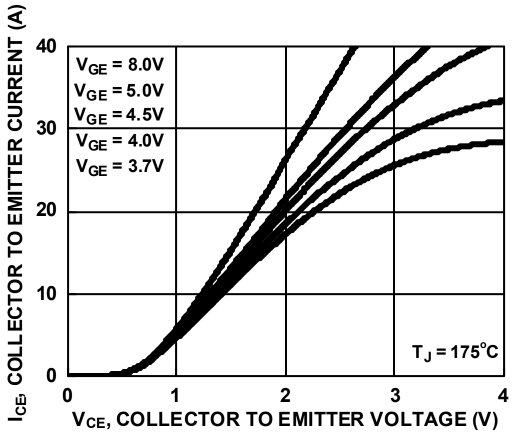


Figure 7. Collector to Emitter On-State Voltage vs. Collector Current

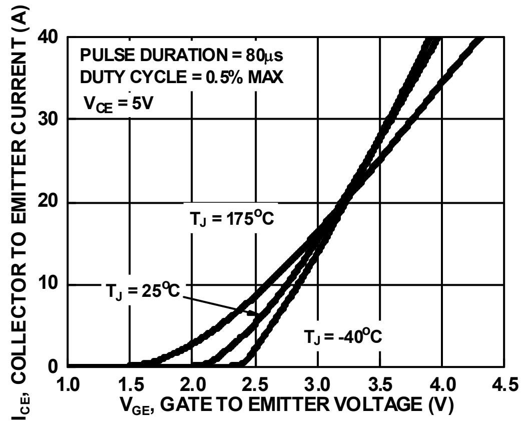


Figure 8. Transfer Characteristics

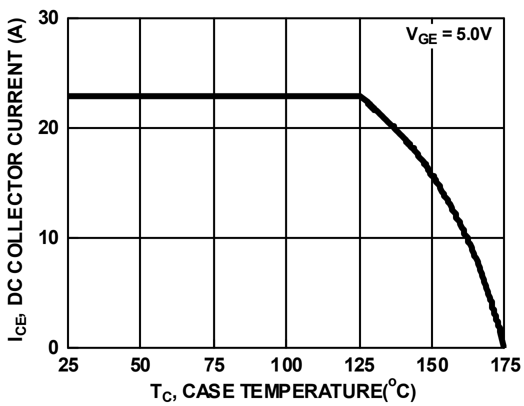


Figure 9. DC Collector Current vs. Case Temperature

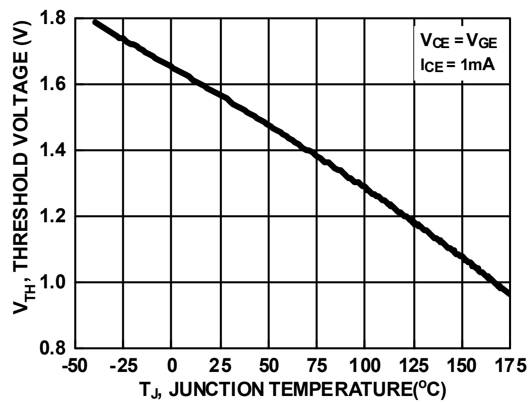


Figure 10. Threshold Voltage vs. Junction Temperature

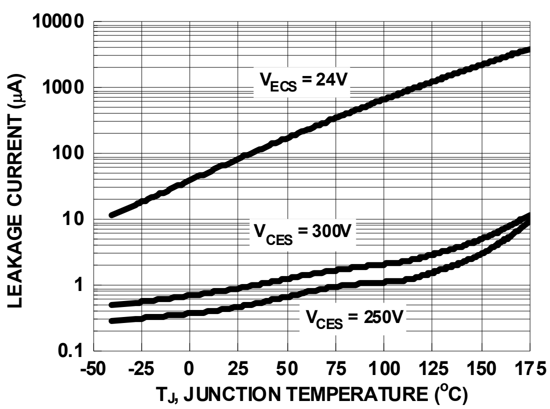


Figure 11. Leakage Current vs. Junction Temperature

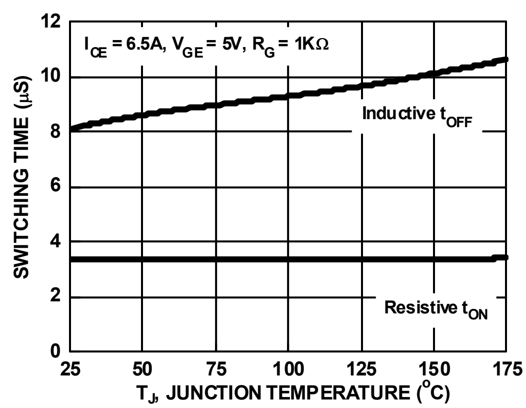


Figure 12. Switching Time vs. Junction Temperature

Typical Performance Curves (Continued)

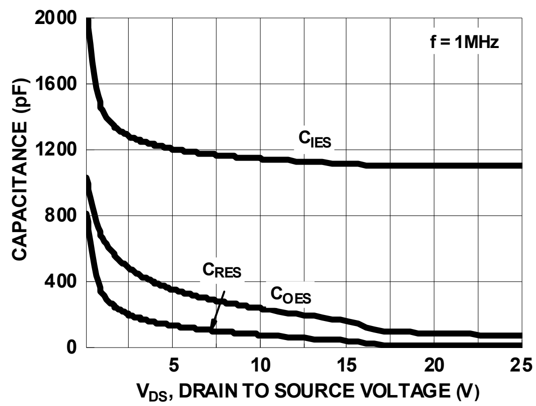


Figure 13. Capacitance vs. Collector to Emitter Voltage

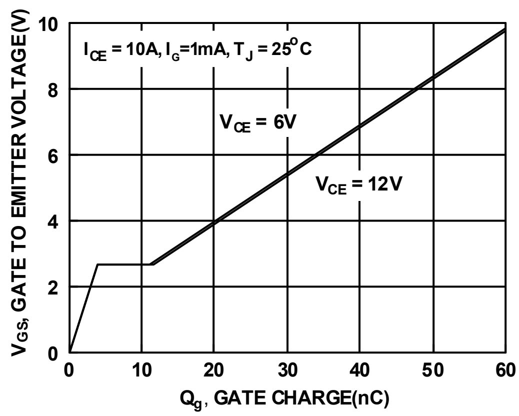


Figure 14. Gate Charge

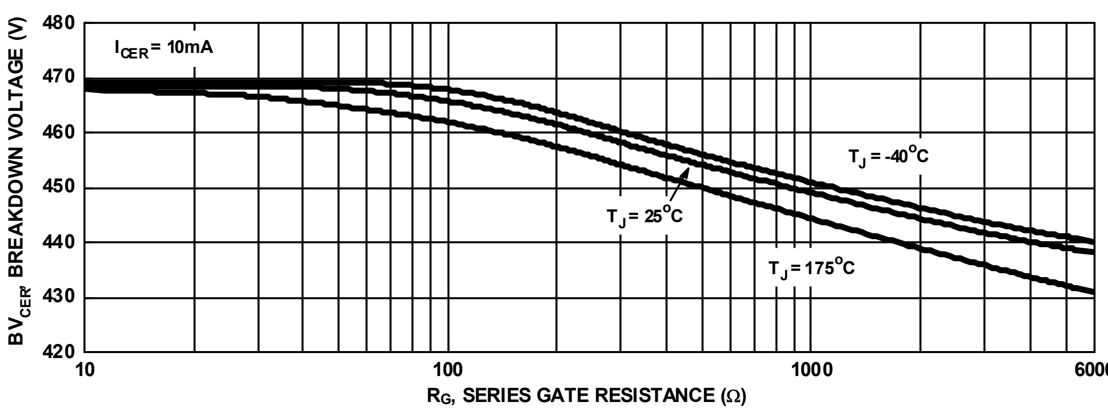


Figure 15. Break down Voltage vs. Series Gate Resistance

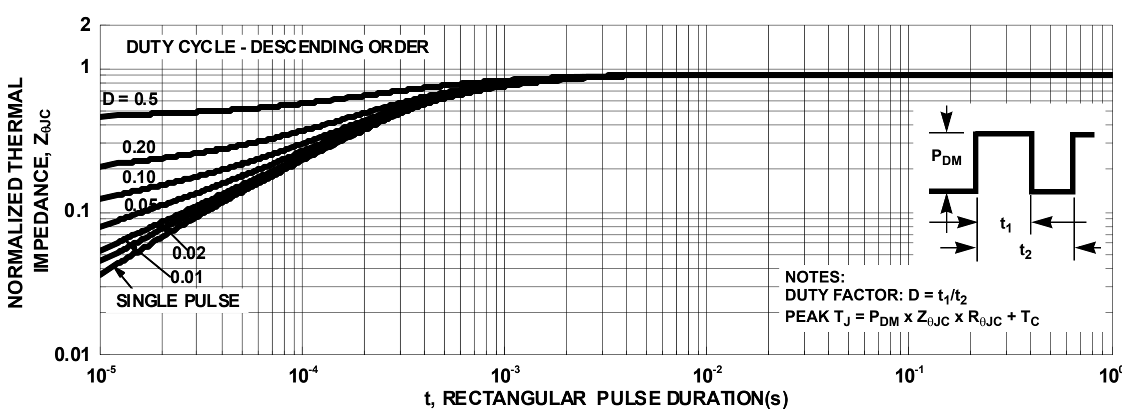


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

Test Circuit and Waveforms

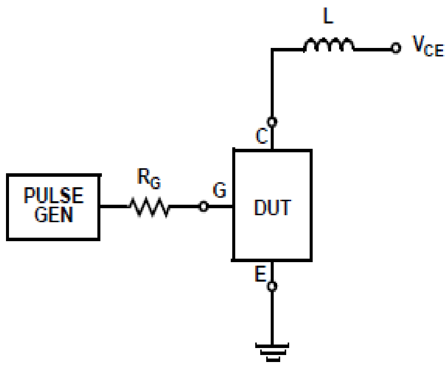


Figure 17. Inductive Switching Test Circuit

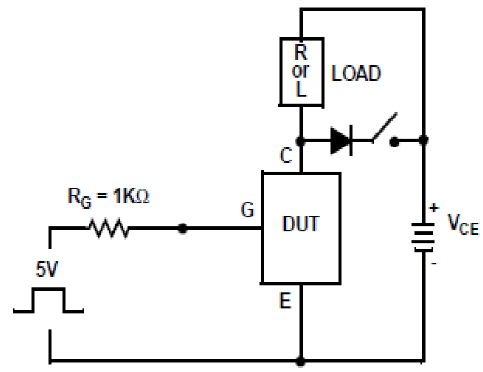


Figure 18. t_{ON} and t_{OFF} Switching Test Circuit

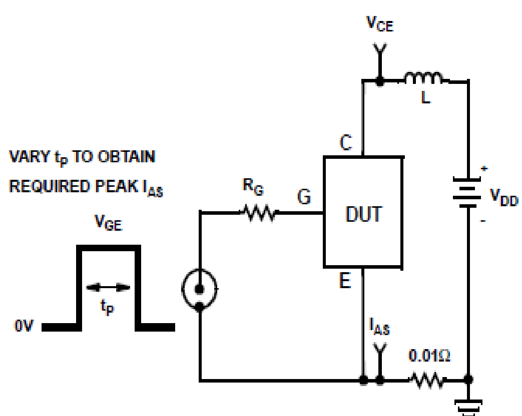


Figure 19. Energy Test Circuit

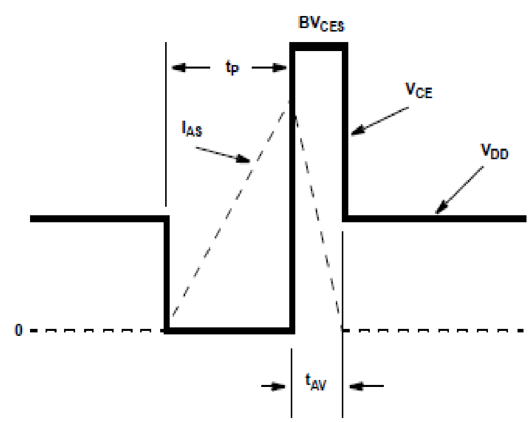


Figure 20. Energy Waveforms

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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