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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.

FAIRCHILD SEMICONDUCTOR®

August 2011

ISL9V5036P3_F085

EcoSPARK® 500mJ, 360V, N-Channel Ignition IGBT

General Description

The ISL9V5036P3_F085 is the next generation IGBT that offer outstanding SCIS capability in the TO-220 plastic package. This device is intended for use in automotive ignition circuit, specifically as coil driver. Internal diode provide voltage clamping without the need for external component.

EcoSPARK® devices can be custom made to specific clamp voltages. Contact your nearest Fairchild sales office for more information.

Formerly Developmental Type 49443

Applications

- Automotive Ignition Coil Driver Circuits
- Coil-On Plug Applications

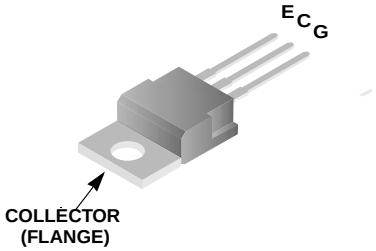
Features

- Industry Standard TO-220 package
- SCIS Energy = 500mJ at $T_J = 25^oC$
- Logic Level Gate Drive
- Qualified to AEC Q101
- RoHS Compliant

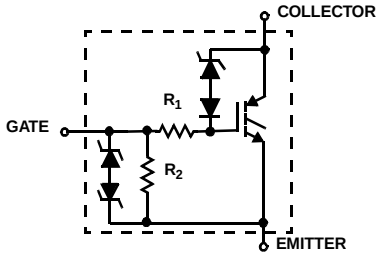
100% RoHS COMPLIANT

Package

JEDEC TO-220AB



Symbol



Device Maximum Ratings $T_A = 25°C$ unless otherwise noted

Symbol	Parameter	Ratings	Units
BV_{CER}	Collector to Emitter Breakdown Voltage (I_C = 1 mA)	390	V
BV_{ECS}	Emitter to Collector Voltage - Reverse Battery Condition (I_C = 10 mA)	24	V
E_{SCIS25}	At Starting T_J = 25°C, I_{SCIS} = 38.5A, L = 670 µHy	500	mJ
$E_{SCIS150}$	At Starting T_J = 150°C, I_{SCIS} = 30A, L = 670 µHy	300	mJ
I_{C25}	Collector Current Continuous, At T_C = 25°C, See Fig 9	46	A
I_{C110}	Collector Current Continuous, At T_C = 110°C, See Fig 9	31	A
V_{GEM}	Gate to Emitter Voltage Continuous	±10	V
P_D	Power Dissipation Total T_C = 25°C	250	W
	Power Dissipation Derating T_C > 25°C	1.67	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 at 100pF, 1500Ω	4	kV

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
V5036P	ISL9V5036P3_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_C = 2mA, V_{GE} = 0, R_G = 1KΩ, See Fig. 15 T_J = -40 to 150°C		330	360	390	V
BV_{CES}	Collector to Emitter Breakdown Voltage	I_C = 10mA, V_{GE} = 0, R_G = 0, See Fig. 15 T_J = -40 to 150°C		360	390	420	V
BV_{ECS}	Emitter to Collector Breakdown Voltage	I_C = -75mA, V_{GE} = 0V, T_C = 25°C		30	-	-	V
BV_{GES}	Gate to Emitter Breakdown Voltage	I_{GES} = ± 2mA		±12	±14	-	V
I_{CER}	Collector to Emitter Leakage Current	V_{CER} = 250V, R_G = 1KΩ, See Fig. 11	T_C = 25°C	-	-	25	µA
			T_C = 150°C	-	-	1	mA
I_{ECS}	Emitter to Collector Leakage Current	V_{EC} = 24V, See Fig. 11	T_C = 25°C	-	-	1	mA
			T_C = 150°C	-	-	40	mA
R_1	Series Gate Resistance			-	75	-	Ω
R_2	Gate to Emitter Resistance			10K	-	30K	Ω
On State Characteristics							
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	I_C = 10A, V_{GE} = 4.0V	T_C = 25°C, See Fig. 4	-	1.17	1.60	V
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	I_C = 15A, V_{GE} = 4.5V	T_C = 150°C	-	1.50	1.80	V
Dynamic Characteristics							
$Q_{G(ON)}$	Gate Charge	I_C = 10A, V_{CE} = 12V, V_{GE} = 5V, See Fig. 14		-	32	-	nC
$V_{GE(TH)}$	Gate to Emitter Threshold Voltage	I_C = 1.0mA, V_{CE} = V_{GE}, See Fig. 10	T_C = 25°C	1.3	-	2.2	V
			T_C = 150°C	0.75	-	1.8	V
V_{GEP}	Gate to Emitter Plateau Voltage	I_C = 10A,	V_{CE} = 12V	-	3.0	-	V
Switching Characteristics							
$t_{d(ON)R}$	Current Turn-On Delay Time-Resistive	V_{CE} = 14V, R_L = 1Ω, V_{GE} = 5V, R_G = 1KΩ T_J = 25°C, See Fig. 12		-	0.7	4	µs
t_{rR}	Current Rise Time-Resistive			-	2.1	7	µs
$t_{d(OFF)L}$	Current Turn-Off Delay Time-Inductive	V_{CE} = 300V, L = 2mH, V_{GE} = 5V, R_G = 1KΩ T_J = 25°C, See Fig. 12		-	10.8	15	µs
t_{fL}	Current Fall Time-Inductive			-	2.8	15	µs
SCIS	Self Clamped Inductive Switching	T_J = 25°C, L = 670 µH, R_G = 1KΩ, V_{GE} = 5V, See Fig. 1 & 2		-	-	500	mJ
Thermal Characteristics							
$R_{\theta JC}$	Thermal Resistance Junction-Case			-	-	0.6	°C/W

Typical Characteristics

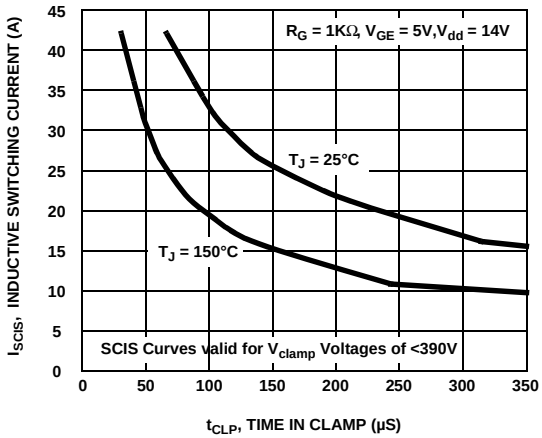


Figure 1. Self Clamped Inductive Switching Current vs Time in Clamp

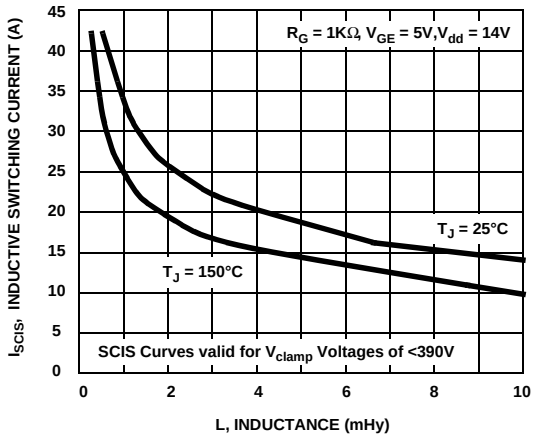


Figure 2. Self Clamped Inductive Switching Current vs Inductance

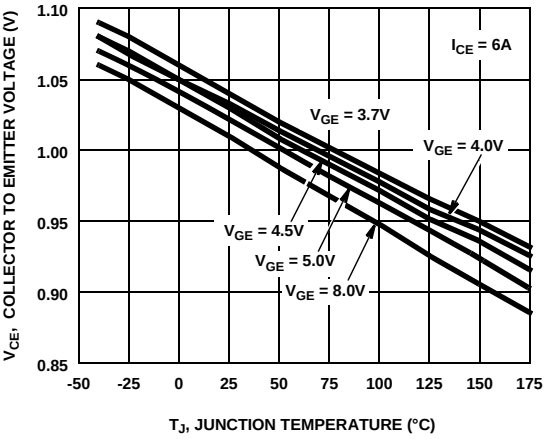


Figure 3. Collector to Emitter On-State Voltage vs Junction Temperature

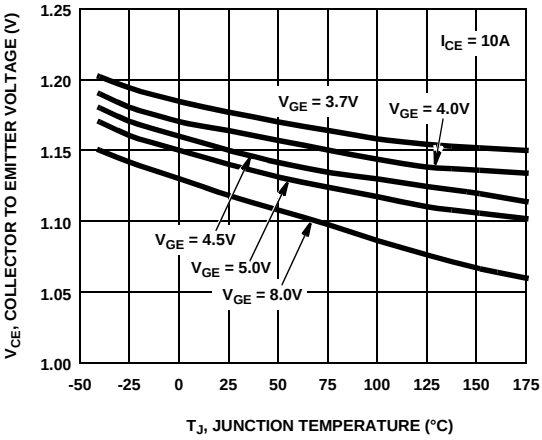


Figure 4.Collector to Emitter On-State Voltage vs Junction Temperature

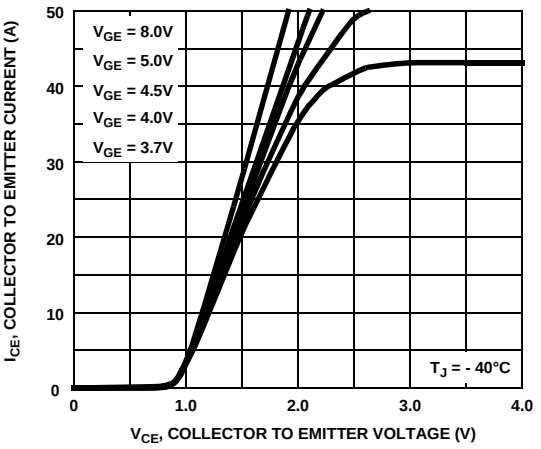


Figure 5. Collector Current vs Collector to Emitter On-State Voltage

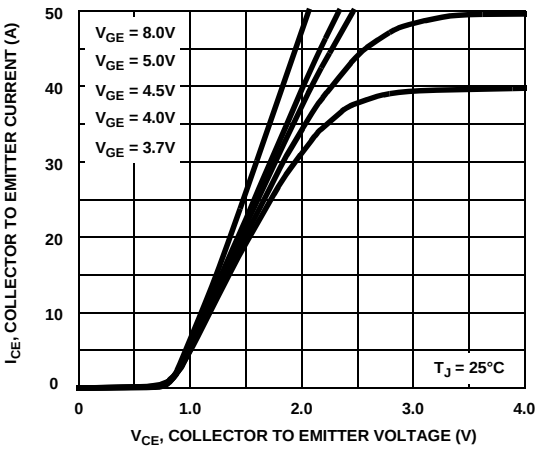


Figure 6. Collector Current vs Collector to Emitter On-State Voltage

Typical Characteristics (Continued)

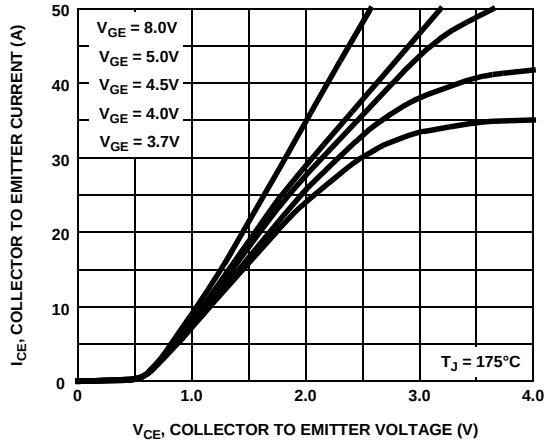


Figure 7. Collector to Emitter On-State Voltage vs Collector Current

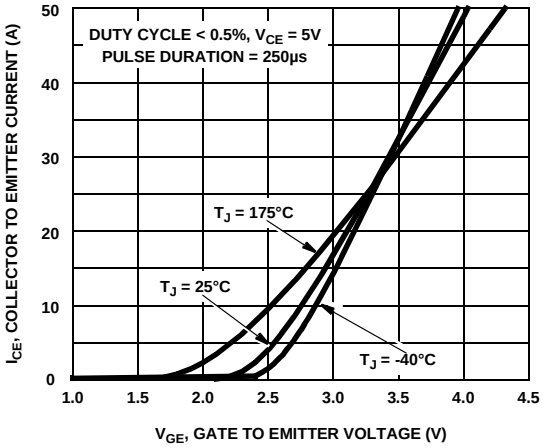


Figure 8. Transfer Characteristics

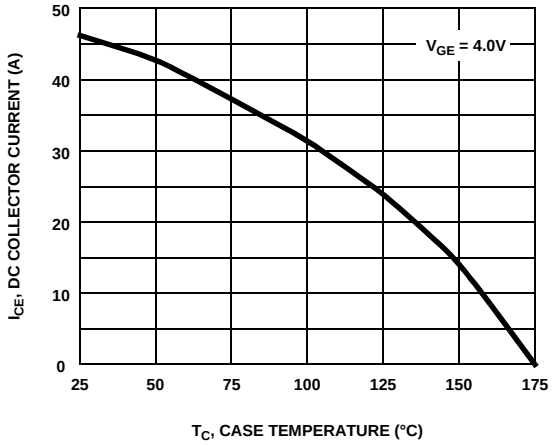


Figure 9. DC Collector Current vs Case Temperature

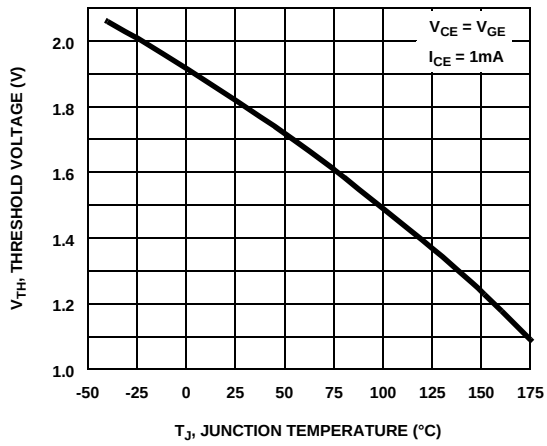


Figure 10. Threshold Voltage vs Junction Temperature

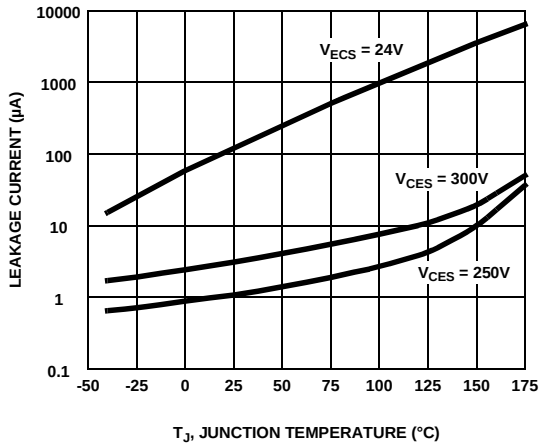


Figure 11. Leakage Current vs Junction Temperature

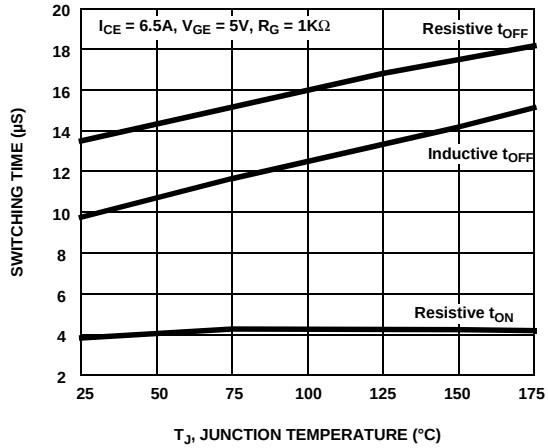


Figure 12. Switching Time vs Junction Temperature

Typical Characteristics (Continued)

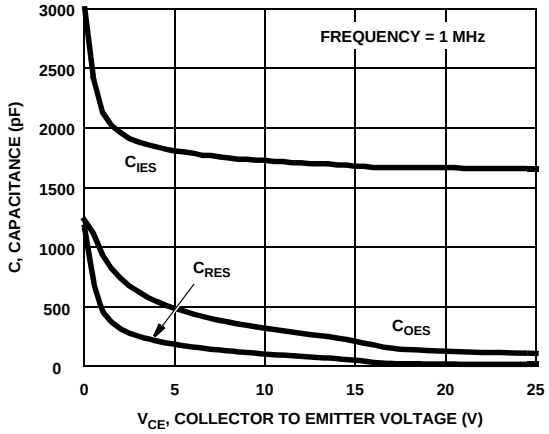


Figure 13. Capacitance vs Collector to Emitter Voltage

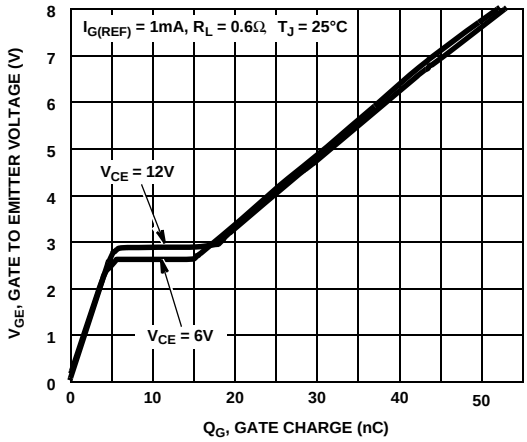


Figure 14. Gate Charge

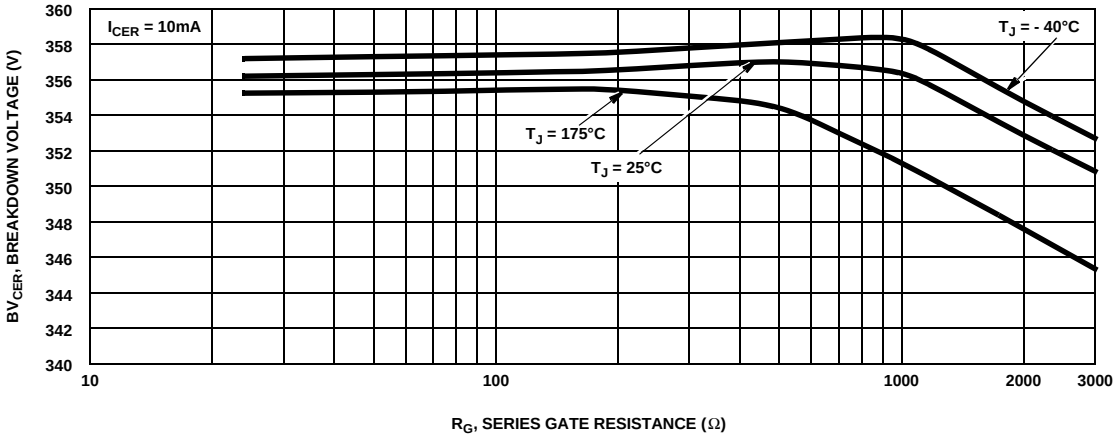


Figure 15. Breakdown Voltage vs Series Gate Resistance

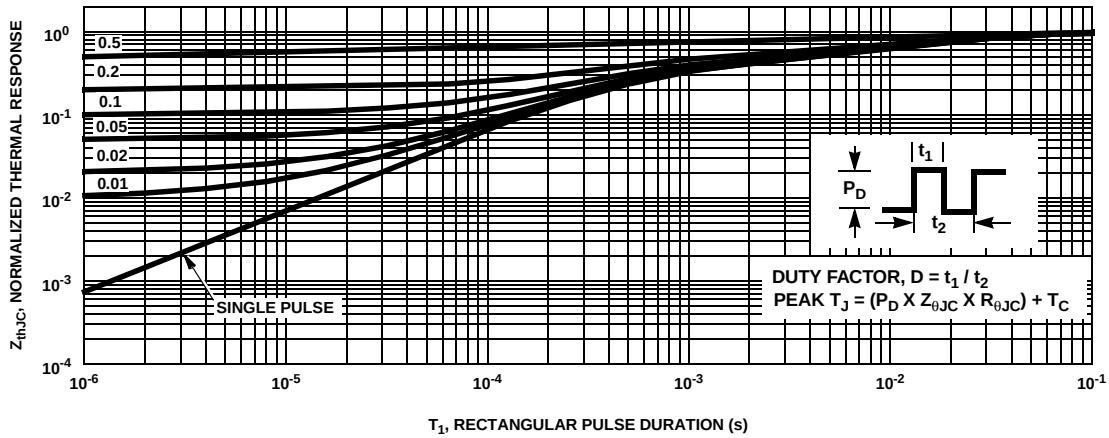


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

Test Circuits and Waveforms

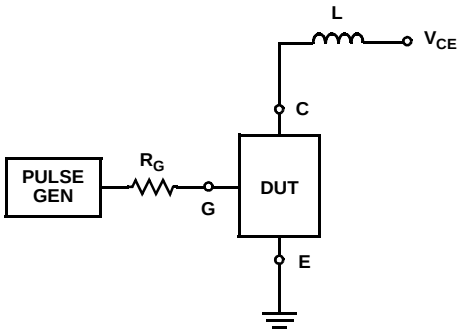


Figure 17. Inductive Switching Test Circuit

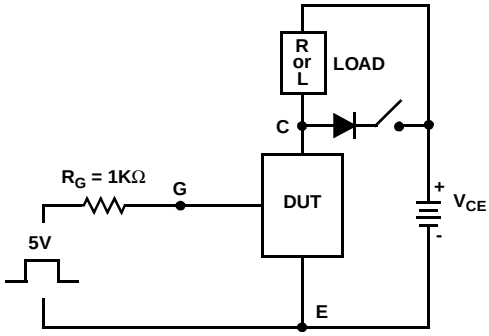


Figure 18. t_{ON} and t_{OFF} Switching Test Circuit

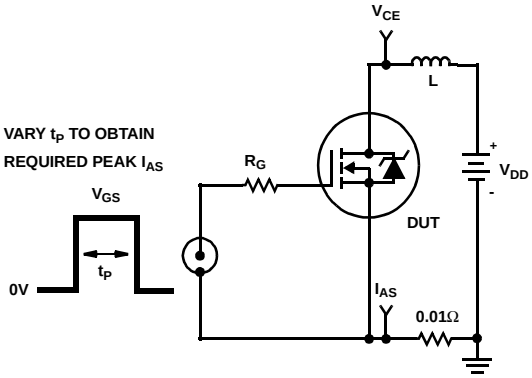


Figure 19. Energy Test Circuit

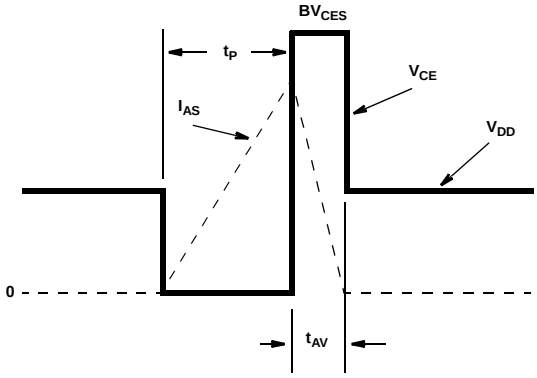


Figure 20. Energy Waveforms

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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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