

November 2009

ISL9V2540S3ST EcoSPARK® N-Channel Ignition IGBT

250mJ, 400V

Features ■ SCIS Energy = 250mJ 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

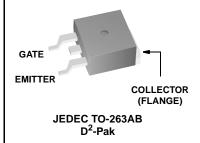
General Description

The ISL9V2540S3ST is a next generation ignition IGBT that offers outstanding SCIS capability in the industry standard D²-Pak (TO-263) plastic package. This device is intended for use in automotive ignition circuits, specifically as a coil driver. Internal diodes provide voltage clamping without the need for external components.

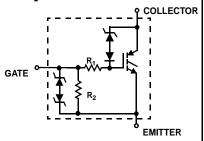
EcoSPARK® devices can be custom made to specific clamp voltages. Contact your nearest Fairchild sales office for more information.



Package



Symbol



Device Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
BV _{CFR}	Collector to Emitter Breakdown Voltage (I _C = 1 mA)	430	V
BV _{FCS}	Emitter to Collector Voltage - Reverse Battery Condition (I _C = 10 mA)	24	V
E _{SCIS25}	At Starting T _J = 25°C, I _{SCIS} = 12.9A, L = 3.0mHy	250	mJ
E _{SCIS150}	At Starting $T_J = 150$ °C, $I_{SCIS} = 10A$, $L = 3.0$ mHy	150	mJ
I _{C25}	Collector Current Continuous, At T _C = 25°C, See Fig 9	15.5	Α
I _{C110}	Collector Current Continuous, At T _C = 110°C, See Fig 9	15.3	Α
V_{GEM}	Gate to Emitter Voltage Continuous	±10	V
P _D	Power Dissipation Total T _C = 25°C	166.7	W
	Power Dissipation Derating T _C > 25°C	1.11	W/°C
T_1	Operating Junction Temperature Range	-40 to 175	°C
T _{STG}	Storage Junction Temperature Range	-40 to 175	°C
Tı	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 (HBM)	4	kV

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
V2540S	ISL9V2540S3ST	TO-263AB	330mm	24mm	800 units

Electrical Characteristics T_A = 25°C unless otherwise noted

Collector to Emitter Saturation Voltage

Symbol	Parameter	Test Con	ditions	Min	Typ	Max	Units
ff State	Characteristics						
BV _{CER}	Collector to Emitter Breakdown Voltage	$I_C = 2\text{mA}$, $V_{GE} = 0$, $R_G = 1\text{K}\Omega$, See Fig. 15 $T_{J} = -40$ to 150°C		370	400	430	V
BV _{CES}	Collector to Emitter Breakdown Voltage	$I_C = 10$ mA, $V_{GE} = 0$, $R_G = 0$, See Fig. 15 $T_{J} = -40$ to 150°C		390	420	450	V
BV _{ECS}	Emitter to Collector Breakdown Voltage	$I_C = -75$ mA, $V_{GE} = 0$ V, $T_C = 25$ °C		30	-	-	V
BV_{GFS}	Gate to Emitter Breakdown Voltage	$I_{GES} = \pm 2mA$		±12	±14	-	V
	I_{CER} Collector to Emitter Leakage Current $V_{CER} = 250V$, $R_G = 1KΩ$, See Fig. 11	$V_{CER} = 250V,$	$T_C = 25$ °C	-	-	25	μΑ
-		T _C = 150°C	-	-	1	mA	
I _{ECS}	Emitter to Collector Leakage Current	V _{EC} = 24V, See Fig. 11	$T_C = 25^{\circ}C$	-	-	1	mA
			$T_{\rm C} = 150^{\circ}{\rm C}$	-	-	40	mA
R ₁	Series Gate Resistance		<u> </u>	-	70	-	Ω
R_2	Gate to Emitter Resistance			10K	-	26K	Ω
n State	Characteristics						
V _{CE(SAT)}	Collector to Emitter Saturation Voltage	$I_C = 6A$, $V_{GF} = 4V$	T _C = 25°C, See Fig. 3	-	1.37	1.8	V

 $I_C = 10A$,

T_C = 150°C

See Fig. 4

1.77

2.2

 $V_{CE(SAT)}$

$Q_{G(ON)}$	Gate Charge	$I_C = 10A$, $V_{CE} = 12$ $V_{GF} = 5V$, See Fig.		-	15.1	-	nC
V _{GE(TH)}	Gate to Emitter Threshold Voltage	$I_C = 1.0 \text{mA}, T_C$	= 25°C	1.3	-	2.2	V
		$V_{CE} = V_{GE}$, See Fig. 10	= 150°C	0.75	-	1.8	V
V_{GEP}	Gate to Emitter Plateau Voltage	$I_{C} = 10A,$ $V_{CF} = 12V$		-	3.1	-	V
vitching	g Characteristics						1
t _{d(ON)R}	Current Turn-On Delay Time-Resistive	$V_{CE} = 14V, R_{L} = 10$	-	-	0.61	-	μs
t _{riseR}	Current Rise Time-Resistive	$V_{GE} = 5V$, $R_G = 1K\Omega$ $T_J = 25^{\circ}C$		-	2.17	-	μs
t _{d(OFF)I}	Current Turn-Off Delay Time-Inductive	$V_{CE} = 300V, L = 50$	0μΗy,	_	3.64	-	με
t _{fL}	Current Fall Time-Inductive	$V_{GE} = 5V$, $R_G = 1K\Omega$ $T_{.1} = 25^{\circ}C$, See Fig. 12		-	2.36	i	μs
SCIS	Self Clamped Inductive Switching	$T_J = 25$ °C, L = 3.0n $R_G = 1$ K Ω , $V_{GE} = 5$ Fig. 1 & 2	•	-	-	250	m

Typical Performance Curves

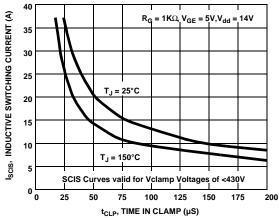


Figure 1. Self Clamped Inductive Switching Current vs Time in Clamp

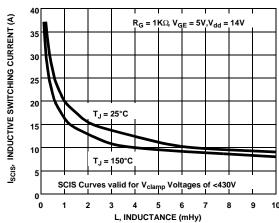


Figure 2. Self Clamped Inductive Switching Current vs Inductance

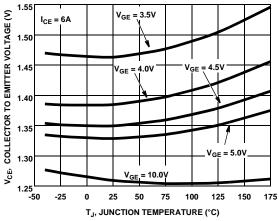


Figure 3. Collector to Emitter On-State Voltage vs Junction Temperature

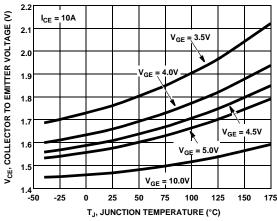


Figure 4. Collector to Emitter On-State Voltage vs Junction Temperature

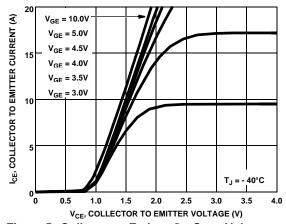


Figure 5. Collector to Emitter On-State Voltage vs Collector Current

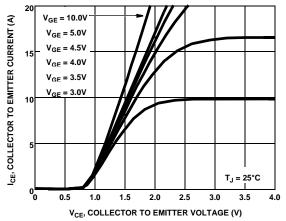
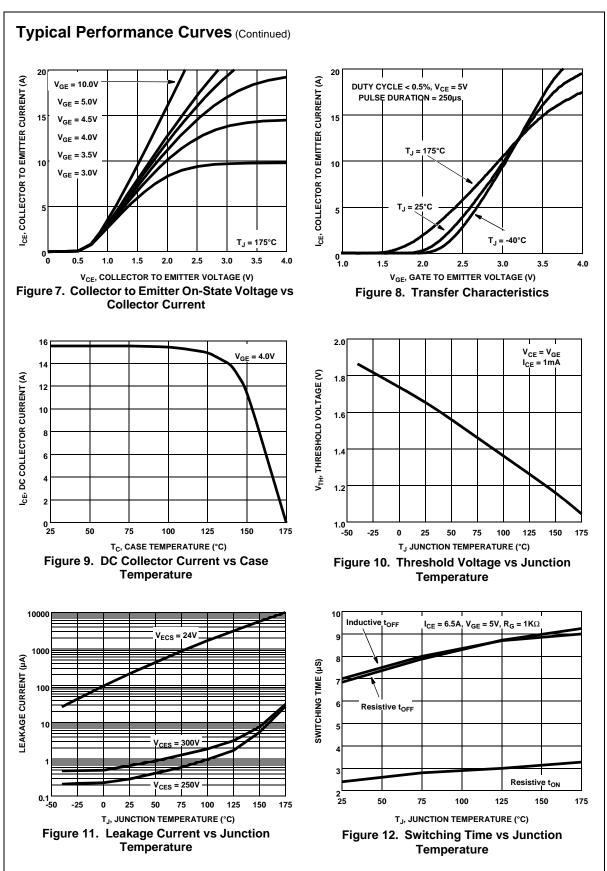


Figure 6. Collector to Emitter On-State Voltage vs Collector Current



Typical Performance Curves (Continued)

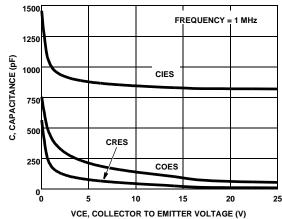


Figure 13. Capacitance vs Collector to Emitter Voltage

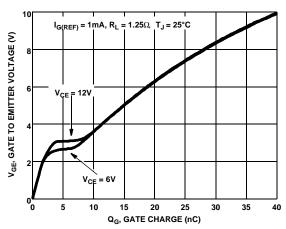


Figure 14. Gate Charge

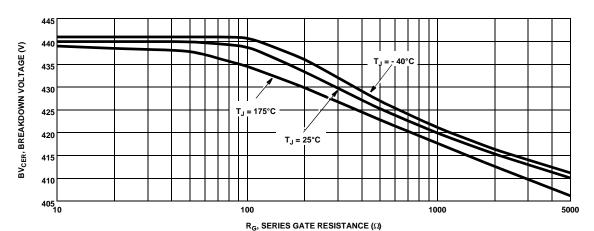


Figure 15. Breakdown Voltage vs Series Gate Resistance

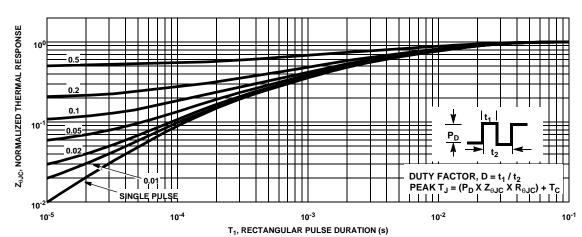
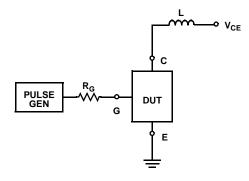


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

Test Circuit and Waveforms



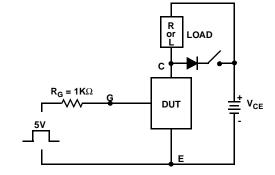
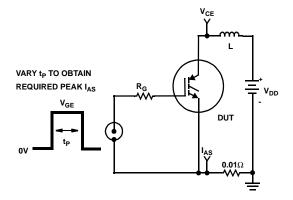
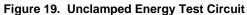


Figure 17. Inductive Switching Test Circuit

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





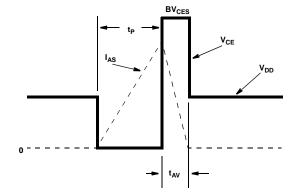
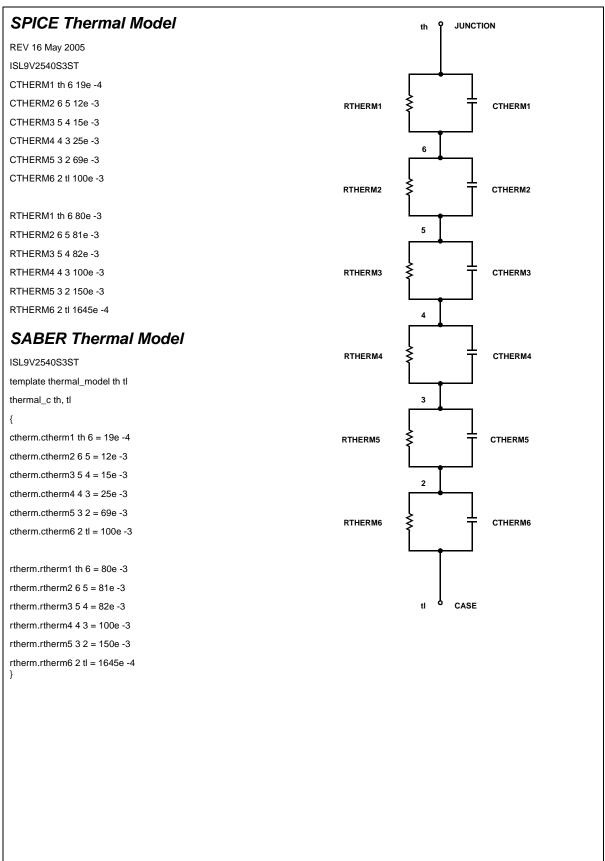


Figure 20. Unclamped Energy Waveforms







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