ON Semiconductor

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ON Semiconductor® 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 ON Semiconductor sales office for more information.

Formerly Developmental Type 49443

Applications

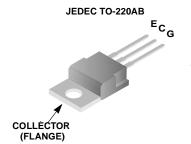
- · Automotive Ignition Coil Driver Circuits
- · Coil-On Plug Applications

Features

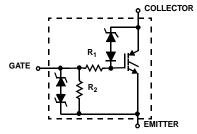
- Industry Standard TO-220 package
- SCIS Energy = 500mJ at T_J = 25°C
- Logic Level Gate Drive
- Qualified to AEC Q101
- · RoHS Compliant



Package



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 $T_J = 25^{\circ}C$, $I_{SCIS} = 38.5A$, $L = 670 \mu Hy$	500	mJ
E _{SCIS150}	At Starting $T_J = 150$ °C, $I_{SCIS} = 30$ A, $L = 670 \mu Hy$	300	mJ
I _{C25}	Collector Current Continuous, At T _C = 25°C, See Fig 9	46	Α
I _{C110}	Collector Current Continuous, At T _C = 110°C, See Fig 9	31	Α
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
TJ	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

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Package	Marking a	and Orderi	ing Info	rmation
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Device Marking	Device	Package	Reel Size	Tape Width	Quantity
V5036P	ISL9V5036P3-F085	TO-220AB	Tube	N/A	50

Test Conditions

Min

Тур

Max

Units

Electrical Characteristics $T_A = 25$ °C unless otherwise noted

Parameter

BV _{CER}	Collector to Emitter Breakdown Voltage	$I_C = 2\text{mA}$, $V_{GE} = 0$, $R_G = 1\text{K}\Omega$, See Fig. 15 $T_J = -40 \text{ to } 150^{\circ}\text{C}$		330	360	390	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		360	390	420	V
BV _{ECS}	Emitter to Collector Breakdown Voltage	$I_C = -75 \text{mA}, V_{GE} = 0 \text{V},$ $T_C = 25^{\circ}\text{C}$		30	-	-	V
BV _{GES}	Gate to Emitter Breakdown Voltage	$I_{GES} = \pm 2mA$		±12	±14	-	V
I _{CER}	Collector to Emitter Leakage Current	V _{CER} = 250V,	$T_C = 25^{\circ}C$	-	-	25	μΑ
		$R_G = 1KΩ$, See Fig. 11	T _C = 150°C	-	-	1	mA
I _{ECS}	Emitter to Collector Leakage Current	$V_{EC} = 24V$, See	$T_C = 25^{\circ}C$	-	-	1	mA
		Fig. 11	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

Symbol

V _{CE(SAT)}	Collector to Emitter Saturation Voltage	,	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	٧

Dynamic Characteristics

_	$Q_{G(ON)}$	Gate Charge	$I_C = 10A$, $V_{CE} = V_{GE} = 5V$, See		-	32	-	nC
Ī	$V_{GE(TH)}$	Gate to Emitter Threshold Voltage	$I_C = 1.0 \text{mA},$	$T_C = 25$ °C	1.3	-	2.2	٧
			V _{CE} = V _{GE,} See Fig. 10	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	$V_{CE} = 14V, R_{L} = 1\Omega,$	-	0.7	4	μs
t _{rR}	Current Rise Time-Resistive	V_{GE} = 5V, R_G = 1K Ω T_J = 25°C, See Fig. 12	-	2.1	7	μs
t _{d(OFF)L}	Current Turn-Off Delay Time-Inductive	$V_{CE} = 300V, L = 2mH,$	-	10.8	15	μs
t _{fL}	Current Fall Time-Inductive	V_{GE} = 5V, R_G = 1K Ω T_J = 25°C, See Fig. 12	-	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

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

t_{CLP}, TIME IN CLAMP (μS)

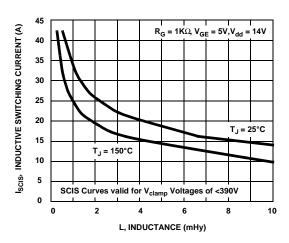


Figure 2. Self Clamped Inductive Switching Current vs Inductance

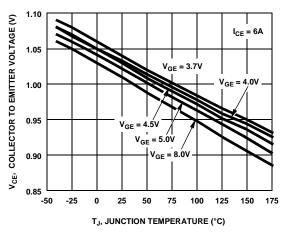


Figure 3. Collector to Emitter On-State Voltage vs Junction Temperature

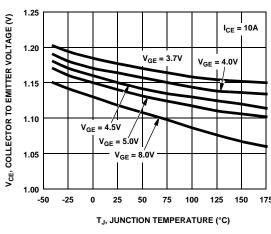


Figure 4.Collector to Emitter On-State Voltage vs Junction Temperature

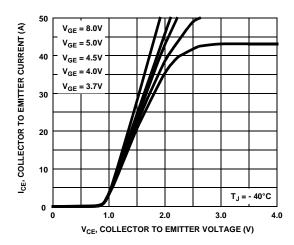


Figure 5. Collector Current vs Collector to Emitter On-State Voltage

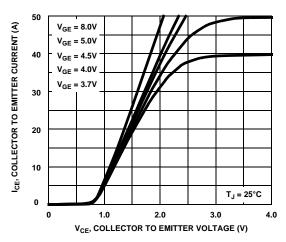
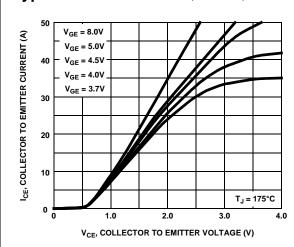


Figure 6. Collector Current vs Collector to Emitter On-State Voltage



Typical Characteristics (Continued)

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

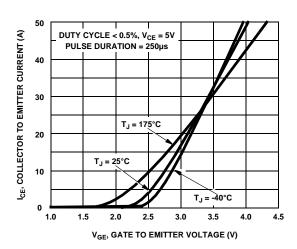


Figure 8. Transfer Characteristics

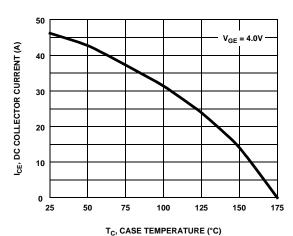


Figure 9. DC Collector Current vs Case Temperature

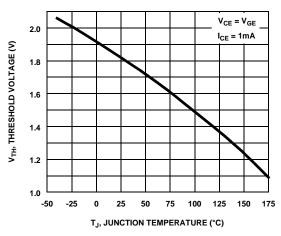


Figure 10. Threshold Voltage vs Junction Temperature

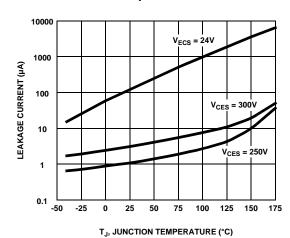


Figure 11. Leakage Current vs Junction Temperature

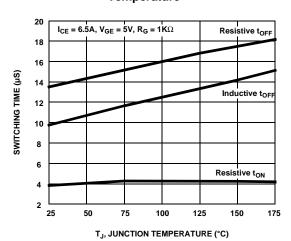
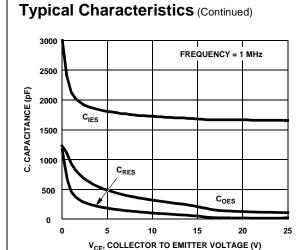


Figure 12. Switching Time vs Junction Temperature



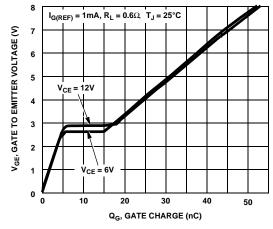


Figure 13. Capacitance vs Collector to Emitter Voltage

Figure 14. Gate Charge

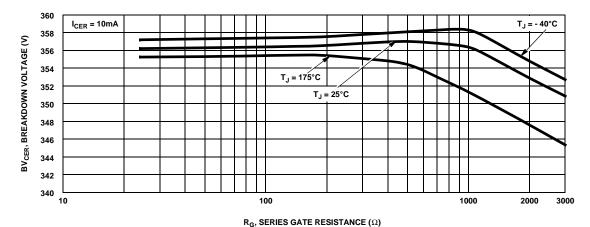


Figure 15. Breakdown Voltage vs Series Gate Resistance

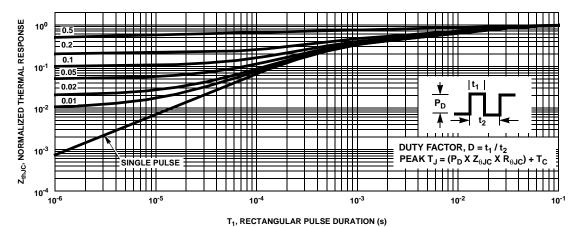


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

Test Circuits and Waveforms

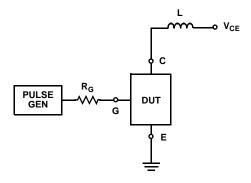


Figure 17. Inductive Switching Test Circuit

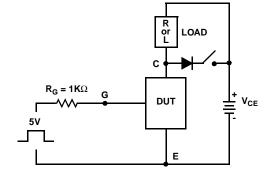


Figure 18. t_{ON} and t_{OFF} Switching Test Circuit

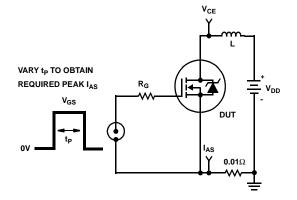


Figure 19. Energy Test Circuit

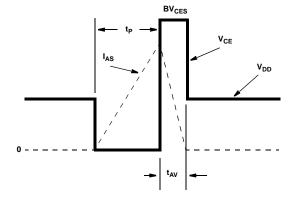


Figure 20. Energy Waveforms

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