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October 2013

ISL9V3040D3S / ISL9V3040S3S / ISL9V3040P3 / ISL9V3040S3

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

General Description

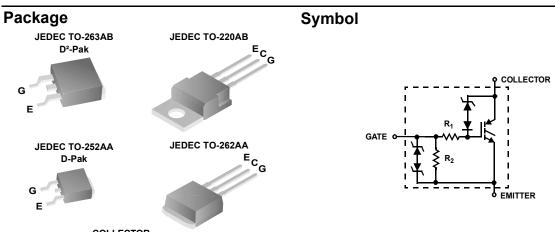
The ISL9V3040D3S, ISL9V3040S3S, ISL9V3040P3, and ISL9V3040S3 are the next generation ignition IGBTs that offer outstanding SCIS capability in the space saving D-Pak (TO-252), as well as the industry standard D²-Pak (TO-263), and TO-262 and TO-220 plastic packages. This device is intended for use in automotive 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.

Formerly Developmental Type 49362

Applications

- Automotive Ignition Coil Driver CircuitsCoil- On Plug Applications
- Features
- Space saving D-Pak package availability
- SCIS Energy = 300mJ at T₁ = 25° C
- Logic Level Gate Drive



COLLECTOR (FLANGE)

Device Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter	Ratings	Units V
BV _{CER}	Collector to Emitter Breakdown Voltage (I _C = 1 mA)	430	
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} = 14.2A, L = 3.0 mHy	300	mJ
E _{SCIS150}	At Starting T _J = 150°C, I _{SCIS} = 10.6A, L = 3.0 mHy	170	mJ
I _{C25}	Collector Current Continuous, At T _C = 25°C, See Fig 9	21	A
I _{C110}	Collector Current Continuous, At T _C = 110°C, See Fig 9	17	Α
V _{GEM}	Gate to Emitter Voltage Continuous	±10	V
PD	Power Dissipation Total T _C = 25°C	150	W
	Power Dissipation Derating T _C > 25°C	1.0	W/°C
Τ _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, 1500 Ω	4	kV

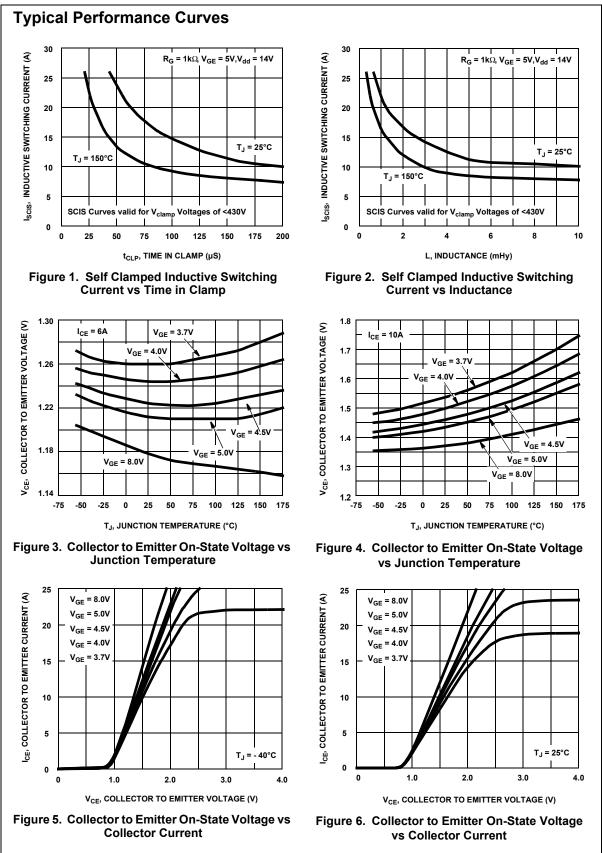
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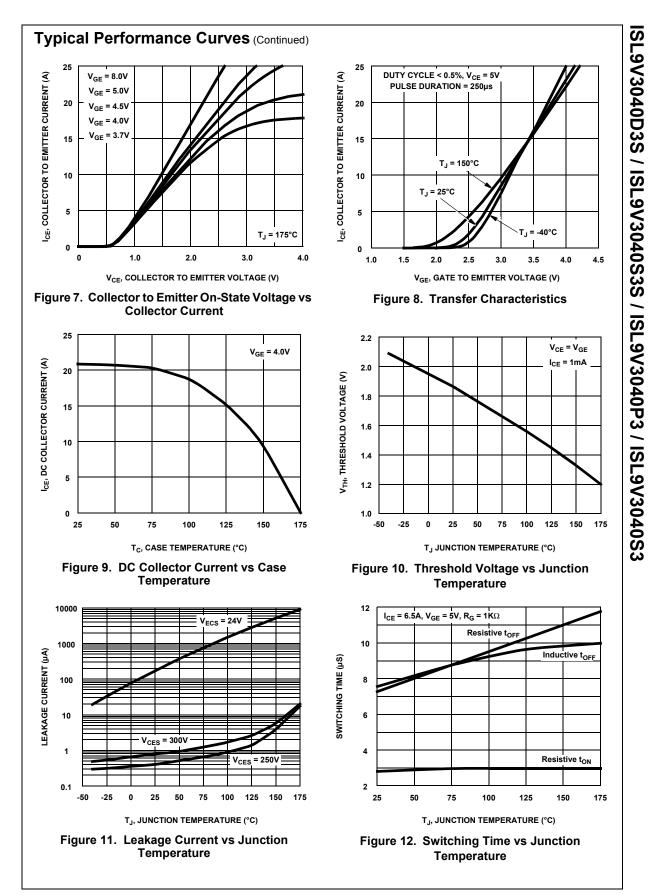
SEMICONDUCTOR®

T State Characteristics BV_{CER} Collector to Emitter Breakdown Voltage $ _{C} = 2mA, V_{GE} = 0, R_G = 1K\Omega, See Fig. 15 T_J = 40 to 150°C370400430VBV_{CES}Collector to Emitter Breakdown Voltage _{C} = 10mA, V_{GE} = 0, R_G = 0, See Fig. 15 T_J = 40 to 150°C390420450VBV_{ECS}Emitter to Collector Breakdown Voltage _{C} = 75mA, V_{GE} = 0, R_G = 182, V_T_J = 40 to 150°C300VBV_{ECS}Gate to Emitter Breakdown Voltage _{C} = 75mA, V_{GE} = 0V, T_C = 25°C300VI_{CER}Collector to Emitter Breakdown Voltage _{GES} = \pm 2mA\pm 12\pm 14-VBV_{ECS}Gate to Emitter Breakdown Voltage _{GES} = \pm 2mA\pm 12\pm 14-VI_{CER}Collector to Emitter Leakage CurrentV_{CER} = 250V, R_G = 150°C1mAI_{ECS}Emitter to Collector Leakage CurrentV_{EC} = 24V, SeeT_C = 25°C1mAR_2Gate to Emitter Resistance70-\Omega\OmegaN_{CE(SAT)}Collector to Emitter Saturation Voltage _C = 10A, V_{CE} = 4.5V, See Fig. 31.581.80VV_{CE(SAT)}Collector to Emitter Saturation Voltage _C = 10A, V_{CE} = 12V, C_{C} - 1.581.80VV_{CE(SAT)}Collector to Emitter Saturation Voltage _C = 10A, V_{CE} = 12V, C_{C} - 1.581.80VV_{CE(SAT)}Collector to Emitter Satur$	Device M	Device Marking Device		P	Package Reel Size		Tape Width		Quantity		
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ectrical Characteristics $T_A = 25^{\circ}C$ unless otherwise notedSymbolParameterTest ConditionsMinTypMaxUnitf State Characteristics BV_{CER} Collector to Emitter Breakdown Voltage $ _C = 2mA, V_{OE} = 0, R_G = 1K\Omega, See Fig. 15$ $T_J = -40 to 150^{\circ}C$ 370400430V BV_{CES} Collector to Emitter Breakdown Voltage $ _C = 10mA, V_{OE} = 0, R_G = 0, See Fig. 15$ $T_J = -40 to 150^{\circ}C$ 390420450V BV_{ECS} Emitter to Collector Breakdown Voltage $ _C = 75mA, V_{OE} = 0V, G = 0V, R_G = 0, See Fig. 15$ $T_J = -40 to 150^{\circ}C$ 30V BV_{ECS} Emitter to Collector Breakdown Voltage $ _{CES} = 2mA + 12 \pm 14$ -VV $ _{CER}$ Collector to Emitter Breakdown Voltage $ _{CES} = 12mA + 12 \pm 14$ -V $ _{CER}$ Collector to Emitter Leakage Current $V_{CE} = 24V, See Fig. 1$ $T_C = 25^{\circ}C 1 + 12$ mA I_{ECS} Emitter to Collector Leakage Current $V_{CE} = 24V, See Fig. 3$ $T_C = 25^{\circ}C 1 + 14$ mA R_1 Series Gate Resistance10K-26K Ω R_2 Gate to Emitter Resistance10K-26K Ω $V_{CE(SAT)}$ Collector to Emitter Saturation Voltage $V_C = 6A, V_C = 150^{\circ}C, - 1.58$ 1.80V $V_{CE(SAT)}$ Collector to Emitter Saturation Voltage $V_C = 10A, V_C = 12V, See Fig. 1$ -1.7-nC $V_{CE(SAT)}$ Collector to Emitter Saturation Voltage $V_C $							_				
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $	BV _{CES}	Collector	r to Emitter Breakdown Voltage		$I_{C} = 10$ mA, $V_{GE} = 0$, R _G = 0, See Fig. 15		390	420	450	V	
$\begin{array}{c ccr} I_{CER} & Collector to Emitter Leakage Current} & V_{CER} = 250V, \\ R_G = 1K\Omega, \\ See Fig. 11 & T_C = 25^\circ C & - & - & 1 & mA \\ \hline T_C = 150^\circ C & - & - & 1 & mA \\ \hline T_C = 150^\circ C & - & - & 1 & mA \\ \hline T_C = 150^\circ C & - & - & 1 & mA \\ \hline T_C = 150^\circ C & - & - & 1 & mA \\ \hline T_C = 150^\circ C & - & - & 1 & mA \\ \hline T_C = 150^\circ C & - & - & 40 & mA \\ \hline T_C = 150^\circ C & - & - & 40 & mA \\ \hline T_C = 150^\circ C & - & - & 40 & mA \\ \hline T_C = 150^\circ C & - & - & 40 & mA \\ \hline T_C = 150^\circ C & - & - & 40 & mA \\ \hline T_C = 150^\circ C & - & - & 1 & mA \\ \hline T_C = 150^\circ C & - & - & 40 & mA \\ \hline T_C = 150^\circ C & - & - & 40 & mA \\ \hline T_C = 150^\circ C & - & - & 10 & M \\ \hline T_C = 150^\circ C & - & - & 10 & M \\ \hline T_C = 101 & T_C = 150^\circ C & - & 1.25 & 1.60 & V \\ \hline V_{CE(SAT)} & Collector to Emitter Saturation Voltage & I_C = 6A, \\ \hline V_{CE(SAT)} & Collector to Emitter Saturation Voltage & I_C = 10A, \\ \hline V_{CE(SAT)} & Collector to Emitter Saturation Voltage & I_C = 15A, \\ \hline V_{CE(SAT)} & Collector to Emitter Saturation Voltage & I_C = 15A, \\ \hline V_{CE(SAT)} & Collector to Emitter Saturation Voltage & I_C = 15A, \\ \hline V_{CE(SAT)} & Collector to Emitter Saturation Voltage & I_C = 10A, \\ \hline V_{CE(SAT)} & Collector to Emitter Saturation Voltage & I_C = 10A, \\ \hline V_{CE(SAT)} & Collector to Emitter Saturation Voltage & I_C = 10A, \\ \hline V_{CE} = 4.5V & See Fig. 14 & - & 1.70 & - & nC \\ \hline V_{GE} = 5V, See Fig. 12 & - & 1.8 & V \\ \hline V_{CE(TH)} & Gate to Emitter Threshold Voltage & I_C = 10A, \\ \hline V_{GE} = V_{GE} & T_C = 150^\circ C & 0.75 & - & 1.8 & V \\ \hline V_{CE} = V_{GE} & SU, \\ \hline V_{CE} = Gate to Emitter Plateau Voltage & I_C = 10A, \\ \hline V_{CE} = V_{CE} & 10A, \\ \hline V_{CE} = SV, R_G = 1K\Omega & - & 0.7 & 4 & \mu s \\ \hline T_{d} & Current Turn-On Delay Time-Resistive & \\ \hline V_{CE} = 5V, R_G = 1K\Omega & - & 2.8 & 15 & \mu s \\ \hline T_{d} & Current Turn-Off Delay Time-Inductive & \\ \hline T_{d} = 25^\circ C, See Fig. 12 & - & 2.8 & 15 & \mu s \\ \hline SCIS & Self Clamped Inductive Switching & \\ \hline T_{d} = 25^\circ V, R_G = 1K\Omega & - & - & 300 & m. \\ \hline T_{d} = 25^\circ V, R_G = 1K\Omega & - & - & 300 & m. \\ \hline T_{d} = 25^\circ V, R_G = 1K\Omega & - & -$	BV _{ECS}	Emitter t	Collector Breakdown Voltage				30	-	-	V	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	BV _{GES}	Gate to I	Emitter Breakdown Voltage	9			±12	±14	-	V	
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R2Gate to Emitter Resistance10K-26KΩState Characteristics $V_{CE(SAT)}$ Collector to Emitter Saturation Voltage $ _{C} = 6A, V_{GE} = 4V$ $T_{C} = 25^{\circ}C, V_{GE} = 125^{\circ}C, V_{GE} = 125^{\circ}C, V_{GE} = 45^{\circ}C, V_{GE} = 55^{\circ}C, See Fig. 14$ -17-nC $V_{GE(TH)}$ Gate to Emitter Threshold Voltage $I_{C} = 10A, V_{CE} = 12V, V_{CE} = 12^{\circ}C, V$					Fig. 11	T _C = 150°C			40	mA	
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$ \begin{array}{c} V_{CE(SAT)} \\ V_{CE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline V_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline C_{GE(SAT)} \\ \hline C_{GE(SAT)} \\ \hline C_{GE(SAT)} \\ \hline Collector to Emitter Saturation Voltage \\ \hline C_{C} = 10A, V_{CE} = 12V, \\ \hline V_{GE} = V_{GE}, \\ \hline C_{GE(TH)} \\ \hline Cate to Emitter Plateau Voltage \\ \hline C_{C} = 10A, V_{CE} = 12V, \\ \hline T_{C} = 150^{\circ}C, \\ \hline C_{C} = 10A, V_{CE} = 12V, \\ \hline T_{C} = 100^{\circ}C, \\ \hline T_{C} = 100^{\bullet}C, \\ \hline T_{C} = 10^{\bullet}C, \\ \hline T_{C} = 10^{\bullet}C, \\ \hline T$	-	1					10K	-	26K	Ω	
$\begin{array}{ c c c c c c } \hline V_{GE} = 4V & See Fig. 3 \\ \hline V_{CE(SAT)} & Collector to Emitter Saturation Voltage & I_C = 10A, & T_C = 150^\circ C, & - & 1.58 & 1.80 & V \\ \hline V_{CE(SAT)} & Collector to Emitter Saturation Voltage & I_C = 15A, & T_C = 150^\circ C & - & 1.90 & 2.20 & V \\ \hline V_{GE(SAT)} & Collector to Emitter Saturation Voltage & I_C = 15A, & T_C = 150^\circ C & - & 1.90 & 2.20 & V \\ \hline V_{GE} = 4.5V & V_{GE} = 4.5V & T_C = 150^\circ C & - & 1.90 & 2.20 & V \\ \hline V_{GE} = 5V, See Fig. 14 & - & 17 & - & nC \\ \hline V_{GE} = 5V, See Fig. 14 & - & 17 & - & nC \\ \hline V_{GE} = 5V, See Fig. 14 & - & 17 & - & nC \\ \hline V_{GE} = 10MA, & T_C = 25^\circ C & 1.3 & - & 2.2 & V \\ \hline V_{CE} = V_{GE}, & See Fig. 10 & T_C = 150^\circ C & 0.75 & - & 1.8 & V \\ \hline V_{GE} = 0 & Gate to Emitter Threshold Voltage & I_C = 10A, V_{CE} = 12V & - & 3.0 & - & V \\ \hline V_{ICHIN} & Current Turn-On Delay Time-Resistive & V_{CE} = 14V, R_L = 1\Omega & - & 0.7 & 4 & \mu s \\ \hline t_{rR} & Current Turn-On Delay Time-Resistive & V_{CE} = 5V, R_G = 1K\Omega & - & 2.1 & 7 & \mu s \\ \hline t_{d(OFF)L} & Current Turn-Off Delay Time-Inductive & V_{CE} = 300V, L = 500\mu Hy, & - & 4.8 & 15 & \mu s \\ \hline t_{rL} & Current Fall Time-Inductive & V_{GE} = 5V, R_G = 1K\Omega & - & 2.8 & 15 & \mu s \\ \hline SCIS & Self Clamped Inductive Switching & T_J = 25^\circ C, L = 3.0 & mHy, & - & - & 300 & m. \\ \hline \end{array}$	n State (Charact	eristics								
$\begin{array}{c} V_{GE(SAT)} & One of the analyse of the second seco$	V _{CE(SAT)}	Collector	or to Emitter Saturation Voltage				-	1.25	1.60	V	
V _{GE} = 4.5Vvnamic Characteristics $Q_{G(ON)}$ Gate Charge $I_C = 10A, V_{CE} = 12V, V_{GE} = 5V, See Fig. 14$ -17-nC $V_{GE(TH)}$ Gate to Emitter Threshold Voltage $I_C = 1.0mA, V_{CE} = V_{GE}, See Fig. 10$ $T_C = 25^{\circ}C$ 1.3-2.2V V_{GE} V_{GE} V_{GE} V_{GE} $T_C = 25^{\circ}C$ 1.3-2.2V V_{GE} V_{GE} V_{GE} V_{GE} $T_C = 150^{\circ}C$ 0.75 -1.8V V_{GEP} Gate to Emitter Plateau Voltage $I_C = 10A, V_{CE} = 12V$ - 3.0 -V V_{GEP} Gate to Emitter Plateau Voltage $I_C = 10A, V_{CE} = 12V$ - 3.0 -V V_{GEP} Gate to Emitter Plateau Voltage $I_C = 10A, V_{CE} = 12V$ - 3.0 -V V_{GEP} Gate to Emitter Plateau Voltage $I_C = 10A, V_{CE} = 12V$ - 3.0 -V V_{GEP} Gate to Emitter Plateau Voltage $V_{CE} = 14V, R_L = 1\Omega$ - 3.0 -V $t_{d(ON)R}$ Current Turn-On Delay Time-Resistive $V_{CE} = 300V, L = 500\mu$ Hy,- 4.8 15 μ s $t_{d(OFF)L}$ Current Turn-Off Delay Time-Inductive $V_{CE} = 300V, L = 500\mu$ Hy,- 4.8 15 μ s $T_J = 25^{\circ}C, See Fig. 12$ C 2.8 15 μ s 300 m_A SCISSelf Clamped Inductive Switching $T_J = 25^{\circ}C, L = 3.0$ mHy, $R_G = 1K\Omega, V_{GE} = 5V, See$ <t< td=""><td>V_{CE(SAT)}</td><td>Collector</td><td colspan="2">ector to Emitter Saturation Voltage</td><td></td><td>See Fig. 4</td><td>-</td><td>1.58</td><td>1.80</td><td></td></t<>	V _{CE(SAT)}	Collector	ector to Emitter Saturation Voltage			See Fig. 4	-	1.58	1.80		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	V _{CE(SAT)}	Collector	ector to Emitter Saturation Voltage			T _C = 150°C	-	1.90	2.20	V	
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$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	V _{GE(TH)}	Gate to	Emitter Threshold Voltage			-		-			
vitching Characteristics $t_{d(ON)R}$ Current Turn-On Delay Time-Resistive $V_{CE} = 14V, R_L = 1\Omega$ -0.74 μ s t_{rR} Current Rise Time-Resistive $V_{GE} = 5V, R_G = 1K\Omega$ -2.17 μ s $t_{d(OFF)L}$ Current Turn-Off Delay Time-Inductive $V_{CE} = 300V, L = 500\mu$ Hy,-4.815 μ s t_{fL} Current Fall Time-Inductive $V_{CE} = 5V, R_G = 1K\Omega$ -2.815 μ sSCISSelf Clamped Inductive Switching $T_J = 25^\circ$ C, L = 3.0 mHy, R_G = 1K\Omega, V_{GE} = 5V, See300m.					See Fig. 10	U	0.75	-	1.8	V	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	V _{GEP}	Gate to	Emitter Plateau Voltage		$I_{\rm C}$ = 10A, $V_{\rm CE}$	= 12V	-	3.0	-	V	
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t_{fL} Current Fall Time-Inductive $V_{GE} = 5V, R_G = 1K\Omega$ $T_J = 25^{\circ}C, See Fig. 12$ -2.815 μs SCISSelf Clamped Inductive Switching $T_J = 25^{\circ}C, See Fig. 12$ 300m.R_G = 1K\Omega, V_{GE} = 5V, See Fig. 1 & 2Fig. 1 & 2300m.		Current	Rise Time-Resistive		V _{GE} = 5V, R _G = 1KΩ T _J = 25°C, See Fig. 12		-	2.1	7	μs	
TLT_J = 25°C, See Fig. 12SCISSelf Clamped Inductive Switching $T_J = 25°C, L = 3.0 \text{ mHy},$ $R_G = 1K\Omega, V_{GE} = 5V, See$ Fig. 1 & 2-300m.	t _{d(OFF)L}			tive			-	4.8	15	μs	
$R_G = 1K\Omega$, $V_{GE} = 5V$, See Fig. 1 & 2	t _{fL}	Current	Fall Time-Inductive		T _J = 25°C, See Fig. 12		-	2.8	15	μs	
ermal Characteristics	SCIS	Self Clar	nped Inductive Switching	$R_G = 1K\Omega$, $V_{GE} = 5V$, See		-	-	300	mJ		
	ermal C	haracte	eristics								

ISL9V3040D3S / ISL9V3040S3S / ISL9V3040P3 / ISL9V3040S3 Rev. C2, Oct 2013

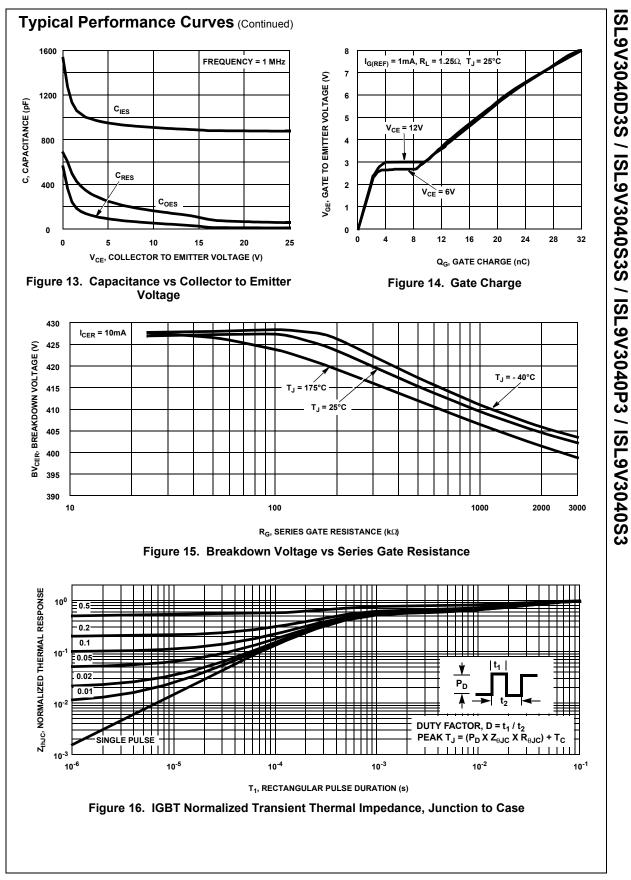


ISL9V3040D3S / ISL9V3040S3S / ISL9V3040P3 / ISL9V3040S3



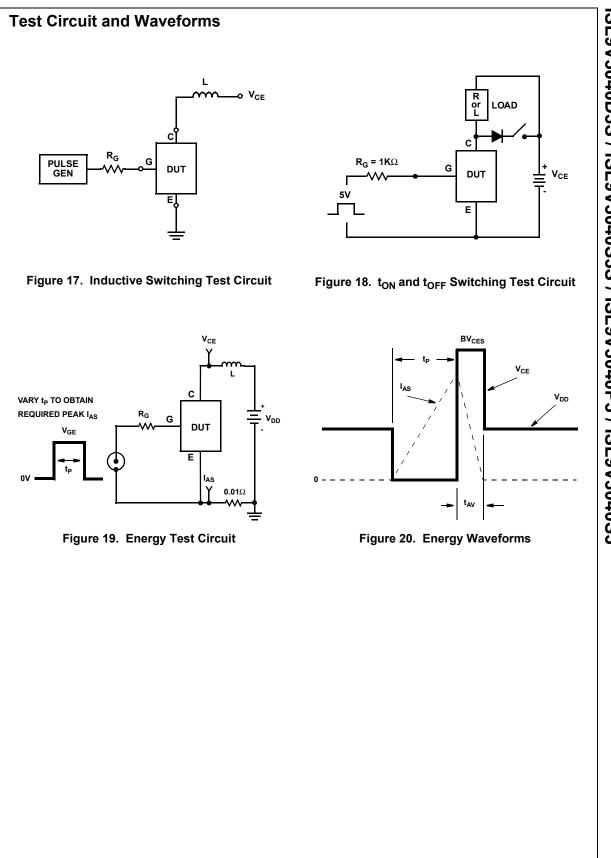
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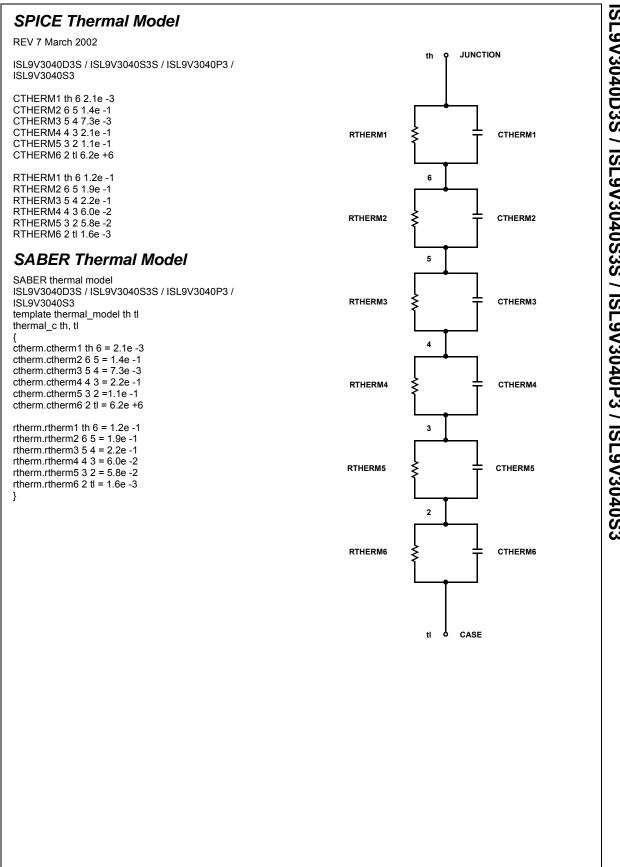


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