



Is Now Part of



ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

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.

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ISL9V5045S3ST_F085

EcoSPARK® N-Channel Ignition IGBT

500mJ, 450V

Features

- SCIS Energy = 500mJ at $T_J = 25^\circ\text{C}$
- Logic Level Gate Drive
- Qualified to AEC Q101
- RoHS Compliant

Applications

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

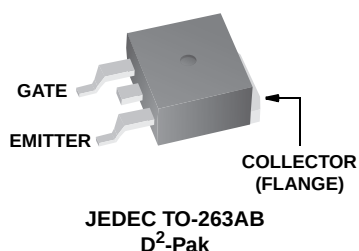
General Description

The ISL9V5045S3ST_F085 is next generation ignition IGBT that offer 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 drivers. Internal diodes provide voltage clamping without the need for external components.

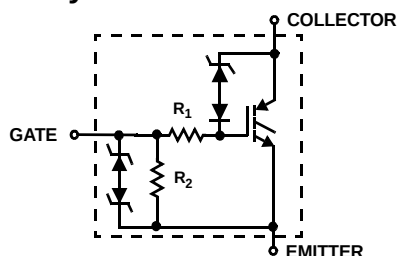
EcoSPARK® devices can be custom made to specific clamp voltages. Contact your nearest Fairchild sales office for more information.



Package



Symbol



Device Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
BV_{CER}	Collector to Emitter Breakdown Voltage ($I_C = 1\text{ mA}$)	480	V
BV_{ECS}	Emitter to Collector Voltage - Reverse Battery Condition ($I_C = 10\text{ mA}$)	24	V
E_{SCIS25}	At Starting $T_J = 25^\circ\text{C}$, $I_{SCIS} = 39.2\text{ A}$, $L = 650\text{ }\mu\text{Hy}$	500	mJ
$E_{SCIS150}$	At Starting $T_J = 150^\circ\text{C}$, $I_{SCIS} = 31.1\text{ A}$, $L = 650\text{ }\mu\text{Hy}$	315	mJ
I_{C25}	Collector Current Continuous, At $T_C = 25^\circ\text{C}$, See Fig 9	51	A
I_{C110}	Collector Current Continuous, At $T_C = 110^\circ\text{C}$, See Fig 9	43	A
V_{GEM}	Gate to Emitter Voltage Continuous	± 10	V
P_D	Power Dissipation Total $T_C = 25^\circ\text{C}$	300	W
	Power Dissipation Derating $T_C > 25^\circ\text{C}$	2	$\text{W}/^\circ\text{C}$
T_J	Operating Junction Temperature Range	-40 to 175	$^\circ\text{C}$
T_{STG}	Storage Junction Temperature Range	-40 to 175	$^\circ\text{C}$
T_L	Max Lead Temp for Soldering (Leads at 1.6mm from Case for 10s)	300	$^\circ\text{C}$
T_{pkg}	Max Lead Temp for Soldering (Package Body for 10s)	260	$^\circ\text{C}$
ESD	Electrostatic Discharge Voltage at 100pF, 1500 Ω	4	kV

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
V5045S	ISL9V5045S3ST_F085	TO-263AB	330mm	24mm	800

Electrical Characteristics $T_A = 25^\circ\text{C}$ 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	420	450	480	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	445	475	505	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} = 320V, 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		-	100	-	Ω	
R ₂	Gate to Emitter Resistance		10K	-	30K	Ω	

On State Characteristics

$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	$I_C = 10\text{ A}$, $V_{GE} = 4.0\text{ V}$	$T_C = 25^\circ\text{C}$, See Fig. 4	-	1.25	1.60	V
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	$I_C = 15\text{ A}$, $V_{GE} = 4.5\text{ V}$	$T_C = 150^\circ\text{C}$	-	1.47	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	$T_C = 25^\circ C$ $T_C = 150^\circ C$	1.3 0.75	- -	2.2 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	$V_{CE} = 14V$, $R_L = 1\Omega$, $V_{GE} = 5V$, $R_G = 1K\Omega$ $T_J = 25^\circ C$, 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	$V_{CE} = 300V$, $L = 2mH$, $V_{GE} = 5V$, $R_G = 1K\Omega$ $T_J = 25^\circ C$, See Fig. 12	-	10.8	15	μs
t_{fL}	Current Fall Time-Inductive		-	2.8	15	μs
SCIS	Self Clamped Inductive Switching	$T_J = 25^\circ C$, $L = 650 \mu H$, $R_G = 1K\Omega$, $V_{GE} = 5V$, See Fig. 1 & 2	-	-	500	mJ

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance Junction-Case	TO-263	-	-	0.5	$^\circ C/W$
-----------------	----------------------------------	--------	---	---	-----	--------------

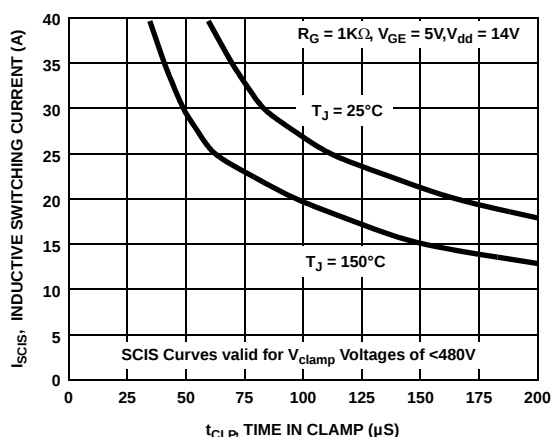
Typical Characteristics

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

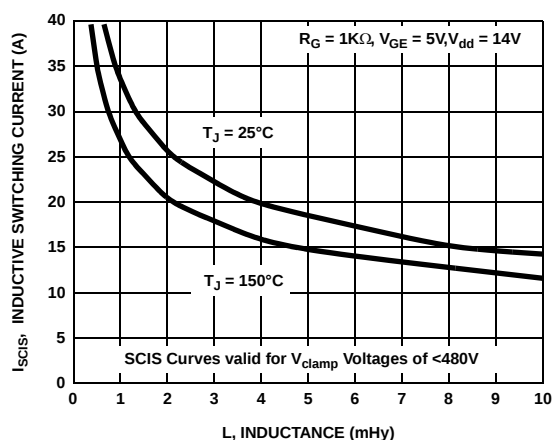


Figure 2. Self Clamped Inductive Switching Current vs Inductance

Typical Characteristics (Continued)

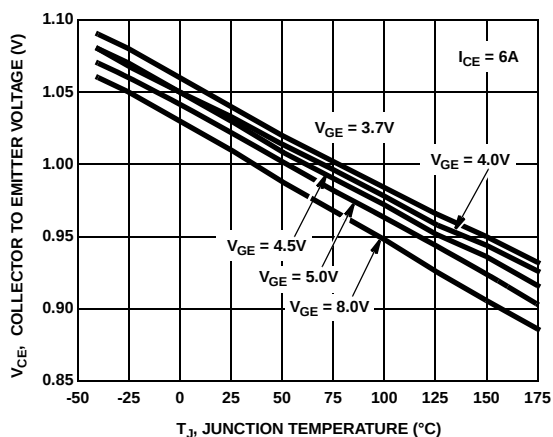


Figure 3. Collector to Emitter On-State Voltage vs Junction Temperature

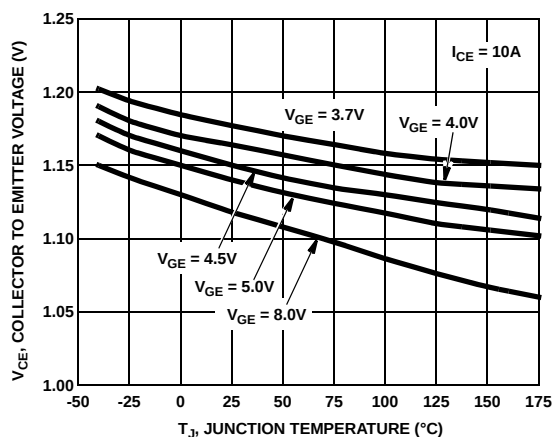


Figure 4. Collector to Emitter On-State Voltage vs Junction Temperature

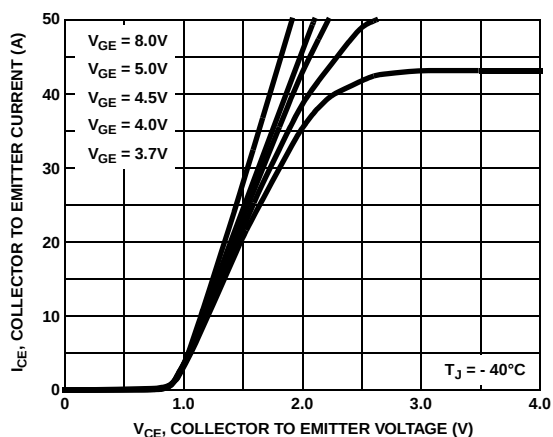


Figure 5. Collector Current vs Collector to Emitter On-State Voltage

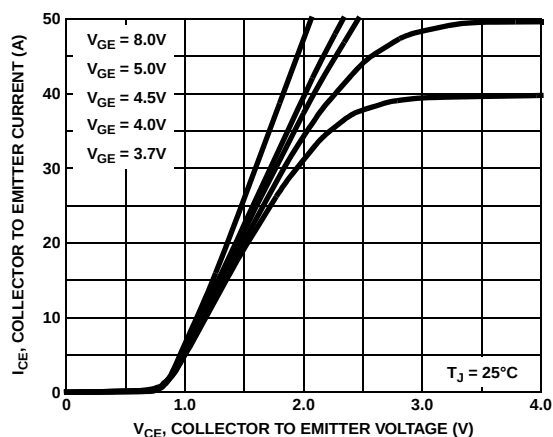


Figure 6. Collector Current vs Collector to Emitter On-State Voltage

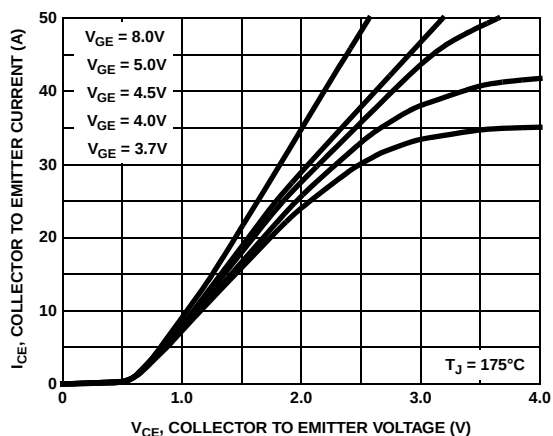


Figure 7. Collector to Emitter On-State Voltage vs Collector Current

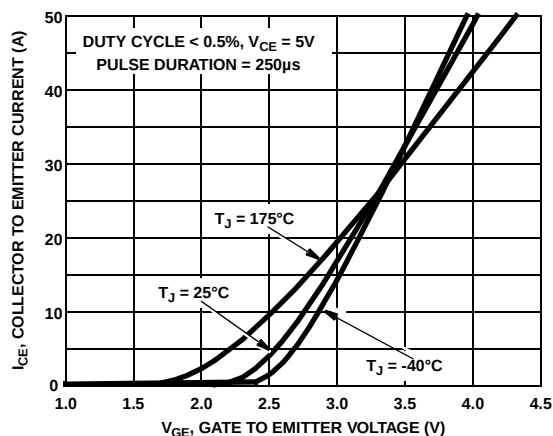


Figure 8. Transfer Characteristics

Typical Characteristics (Continued)

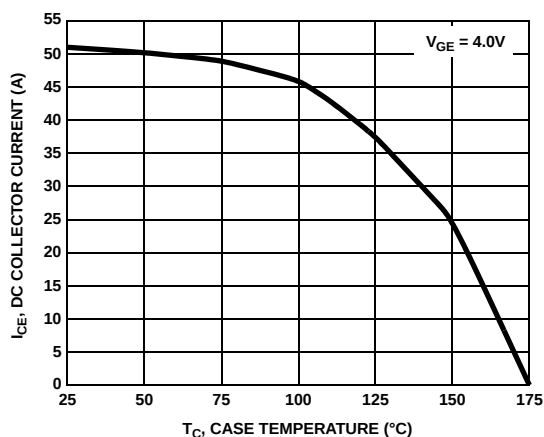


Figure 9. DC Collector Current vs Case Temperature

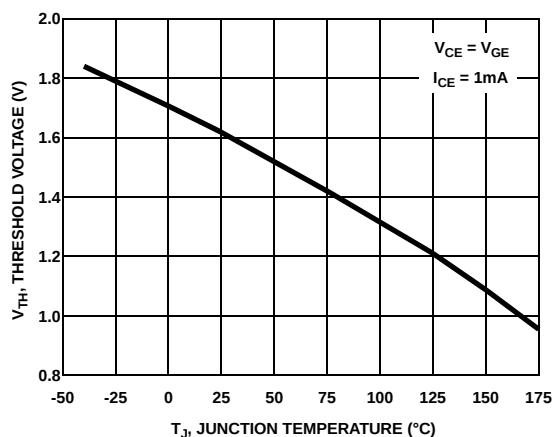


Figure 10. Threshold Voltage vs Junction Temperature

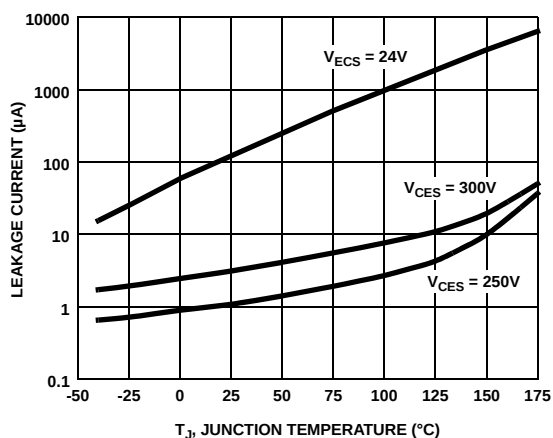


Figure 11. Leakage Current vs Junction Temperature

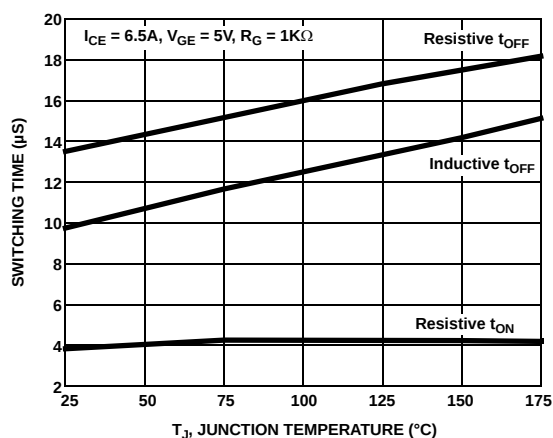


Figure 12. Switching Time vs Junction Temperature

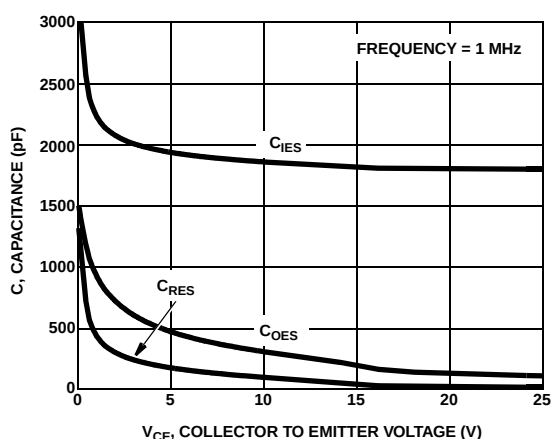


Figure 13. Capacitance vs Collector to Emitter Voltage

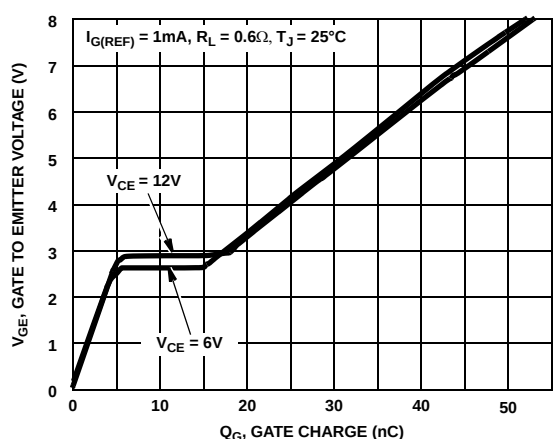


Figure 14. Gate Charge

Typical Characteristics (Continued)

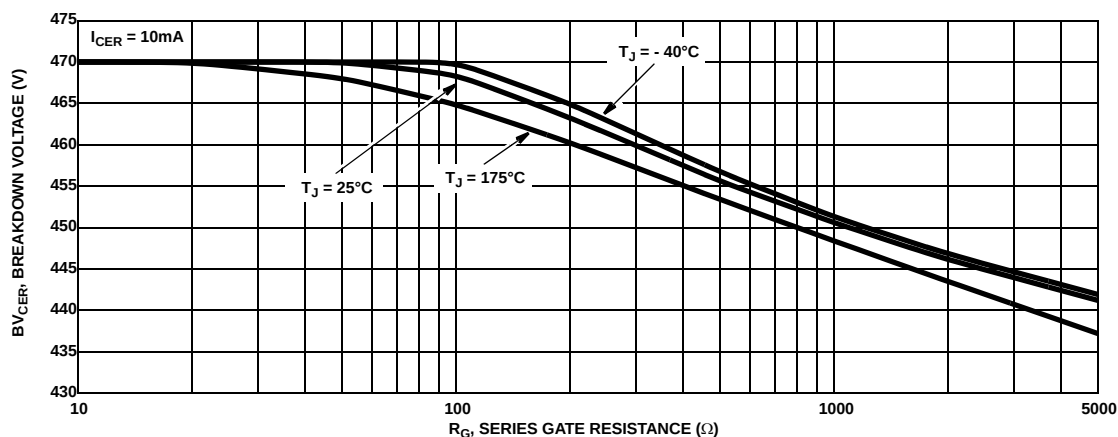


Figure 15. Breakdown Voltage vs Series Gate Resistance

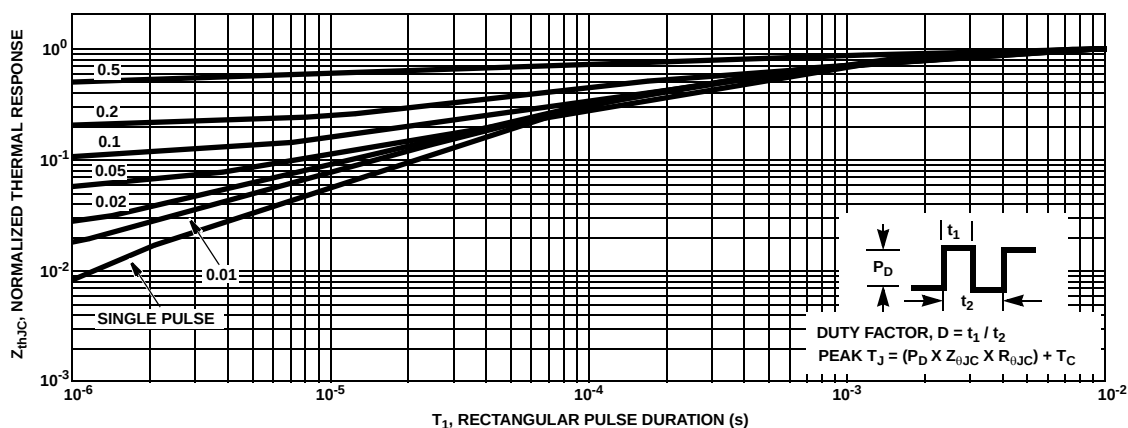


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

Test Circuits and Waveforms

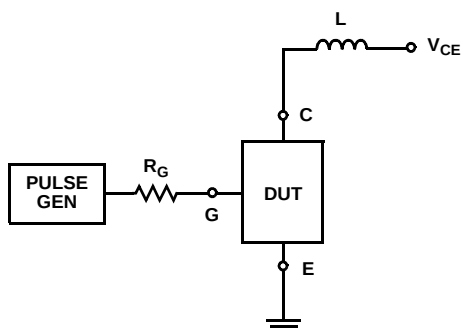


Figure 17. Inductive Switching Test Circuit

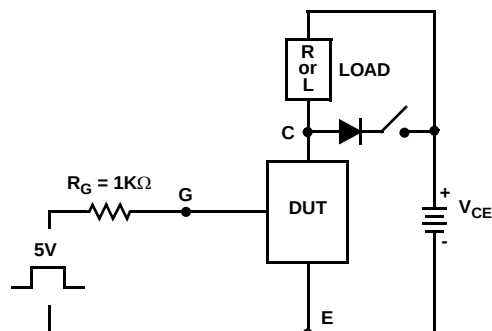


Figure 18. t_{ON} and t_{OFF} Switching Test Circuit

Test Circuits and Waveforms (Continued)

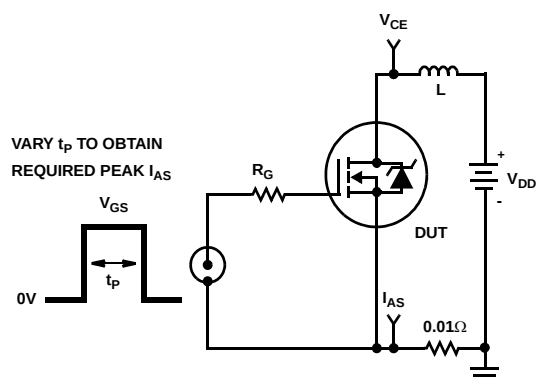


Figure 19. Energy Test Circuit

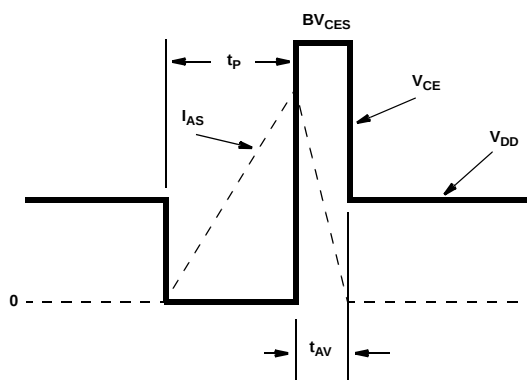


Figure 20. Energy Waveforms

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada

Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910

Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local
Sales Representative