



**Is Now Part of**



**ON Semiconductor®**

**To learn more about ON Semiconductor, please visit our website at  
[www.onsemi.com](http://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](http://www.onsemi.com). Please email any questions regarding the system integration to [Fairchild\\_questions@onsemi.com](mailto: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](http://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.



## FGB3056\_F085

### EcoSPARK<sup>®</sup> 300mJ, 560V, N-Channel Ignition IGBT

#### Features

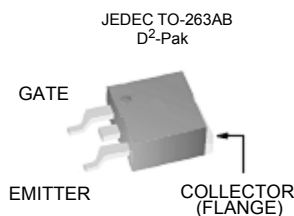
- SCIS Energy = 300mJ at  $T_J = 25^\circ\text{C}$
- Logic Level Gate Drive

#### Applications

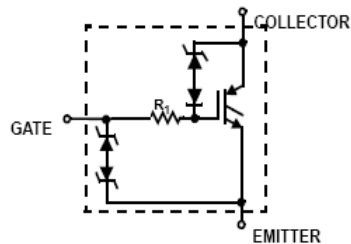
- Automotive Ignition Coil Driver Circuits
- Coil On Plug Applications



#### Package



#### Symbol



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

Symbol	Parameter	Ratings	Units
$BV_{CER}$	Collector to Emitter Breakdown Voltage ( $I_C = 2\text{mA}$ )	560	V
$BV_{ECS}$	Emitter to Collector Voltage - Reverse Battery Condition ( $I_C = -20\text{mA}$ )	20	V
$E_{SCIS25}$	$I_{SCIS} = 14.2\text{A}$ , $L = 3.0\text{mH}$ , $R_{GE} = 1\text{K}\Omega$ $T_C = 25^\circ\text{C}$	300	mJ
$E_{SCIS150}$	$I_{SCIS} = 10.8\text{A}$ , $L = 3.0\text{mH}$ , $R_{GE} = 1\text{K}\Omega$ $T_C = 150^\circ\text{C}$	170	mJ
$I_{C25}$	Collector Current Continuous, at $V_{GE} = 5\text{V}$ , $T_C = 25^\circ\text{C}$	29	A
$I_{C110}$	Collector Current Continuous, at $V_{GE} = 5\text{V}$ , $T_C = 110^\circ\text{C}$	24	A
$V_{GEM}$	Gate to Emitter Voltage Continuous	$\pm 10$	V
$P_D$	Power Dissipation Total, at $T_C = 25^\circ\text{C}$	200	W
	Power Dissipation Derating, for $T_C > 25^\circ\text{C}$	1.33	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	$^\circ\text{C}$
$T_{PKG}$	Reflow soldering according to JESD020C	260	$^\circ\text{C}$
ESD	HBM-Electrostatic Discharge Voltage at 100pF, 1500 $\Omega$	4	kV

FGB3056\_F085 EcoSPARK<sup>®</sup> 300mJ, 560V, N-Channel Ignition IGBT

**Thermal Characteristics**

$R_{\theta JC}$	Thermal Resistance Junction to Case	0.75	°C/W
-----------------	-------------------------------------	------	------

**Electrical Characteristics of the IGBT**  $T_A = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
--------	-----------	-----------------	-----	-----	-----	-------

**Off State Characteristics**

$BV_{\text{CER}}$	Collector to Emitter Breakdown Voltage	$V_{\text{GE}} = 0\text{V}, I_{\text{CE}} = 2\text{mA},$ $R_{\text{GE}} = 1\text{K}\Omega,$ $T_J = -40 \text{ to } 150^\circ\text{C}$	530	560	600	V
$BV_{\text{CES}}$	Collector to Emitter Breakdown Voltage	$V_{\text{GE}} = 0\text{V}, I_{\text{CE}} = 10\text{mA},$ $R_{\text{GE}} = 0\Omega,$ $T_J = -40 \text{ to } 150^\circ\text{C}$	-	595	-	V
$BV_{\text{ECS}}$	Emitter to Collector Breakdown Voltage	$V_{\text{GE}} = 0\text{V}, I_{\text{CE}} = -75\text{mA},$ $T_J = 25^\circ\text{C}$	20	26	-	V
$BV_{\text{GES}}$	Gate to Emitter Breakdown Voltage	$I_{\text{GES}} = \pm 5\text{mA}$	$\pm 12$	$\pm 14$	-	V
$I_{\text{CER}}$	Collector to Emitter Leakage Current	$V_{\text{CE}} = 250\text{V}, R_{\text{GE}} = 1\text{K}\Omega$	$T_J = 25^\circ\text{C}$	-	-	40 $\mu\text{A}$
			$T_J = 150^\circ\text{C}$	-	-	1 mA
$I_{\text{ECS}}$	Emitter to Collector Leakage Current	$V_{\text{EC}} = 20\text{V}$	$T_J = 25^\circ\text{C}$	-	-	1 mA
			$T_J = 150^\circ\text{C}$	-	-	40
$R_1$	Series Gate Resistance		-	100	-	$\Omega$

**On State Characteristics**

$V_{\text{CE(SAT)}}$	Collector to Emitter Saturation Voltage	$V_{\text{GE}} = 5\text{V}, I_{\text{CE}} = 2\text{A}$	$T_J = 25^\circ\text{C}$	-	1.0	1.1	V
$V_{\text{CE(SAT)}}$	Collector to Emitter Saturation Voltage	$V_{\text{GE}} = 5\text{V}, I_{\text{CE}} = 8\text{A}$	$T_J = 150^\circ\text{C}$	-	1.3	1.55	V

**Dynamic Characteristics**

Q <sub>G(ON)</sub>	Gate Charge	V <sub>GE</sub> = 5V, V <sub>CE</sub> = 12V, I <sub>CE</sub> = 10A		-	15.6	20	nC
V <sub>GE(TH)</sub>	Gate to Emitter Threshold Voltage	I <sub>CE</sub> = 1mA, V <sub>CE</sub> = V <sub>GE</sub> ,	T <sub>J</sub> = 25°C	1.3	1.6	2.2	V
			T <sub>J</sub> = 150°C	-	1.1	-	
V <sub>GEP</sub>	Gate to Emitter Plateau Voltage	V <sub>CE</sub> = 12V, I <sub>CE</sub> = 10A		-	2.8	-	V

**Switching Characteristics**

$t_{\text{d(ON)R}}$	Current Turn-On Delay Time-Resistive	$V_{\text{CE}} = 14\text{V}, R_L = 1\Omega$	-	0.8	1.3	$\mu\text{s}$
$t_{\text{rR}}$	Current Rise Time-Resistive	$V_{\text{GE}} = 5\text{V}, R_G = 1\text{K}\Omega$	-	1.48	2.4	$\mu\text{s}$
$t_{\text{d(OFF)L}}$	Current Turn-Off Delay Time-Inductive	$V_{\text{CE}} = 300\text{V}, L = 1\text{mH},$	-	5.1	8.2	$\mu\text{s}$
$t_{\text{fL}}$	Current Fall Time-Inductive	$V_{\text{GE}} = 5\text{V}, R_G = 1\text{K}\Omega$	-	1.1	1.8	$\mu\text{s}$

**Ordering Information**

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGB3056	FGB3056_F085	TO-263AB	330mm	24mm	800units

## Typical Performance Curves

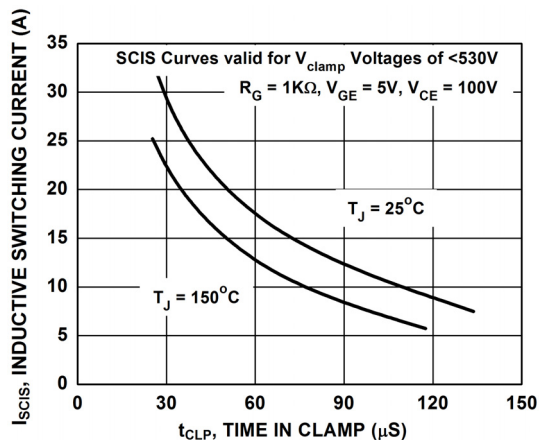


Figure 1. Self Clamped Inductive Switching Current vs. Time in Clamp

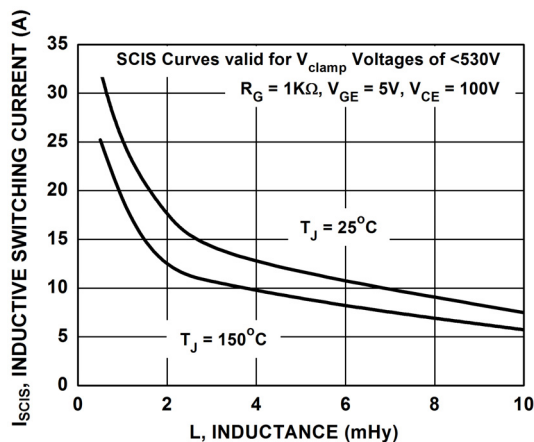


Figure 2. Self Clamped Inductive Switching Current vs. Inductance

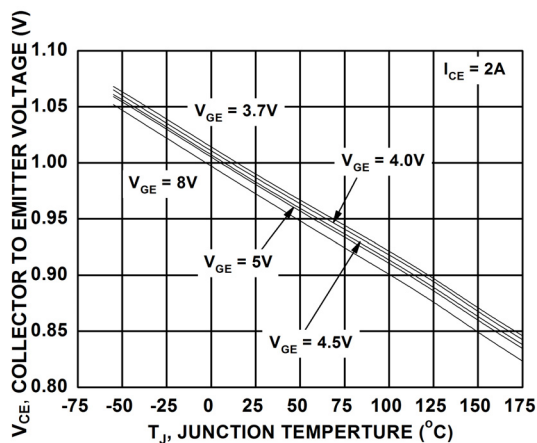


Figure 3. Collector to Emitter On-State Voltage vs. Junction Temperature

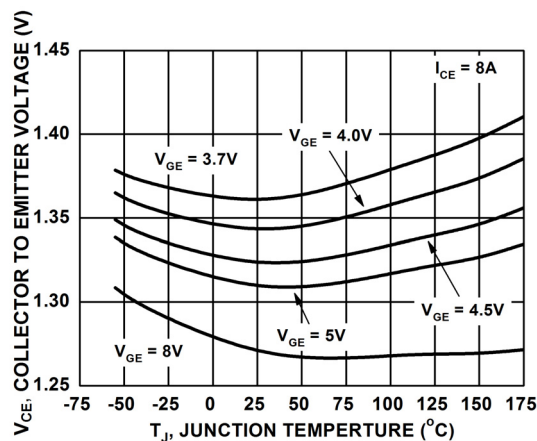


Figure 4. Collector to Emitter On-State Voltage vs. Junction Temperature

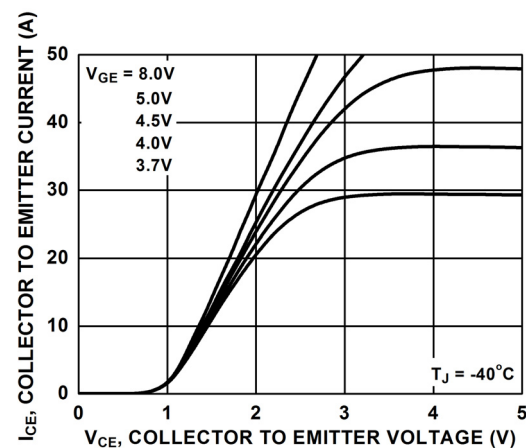


Figure 5. Collector to Emitter On-State Voltage vs. Collector Current

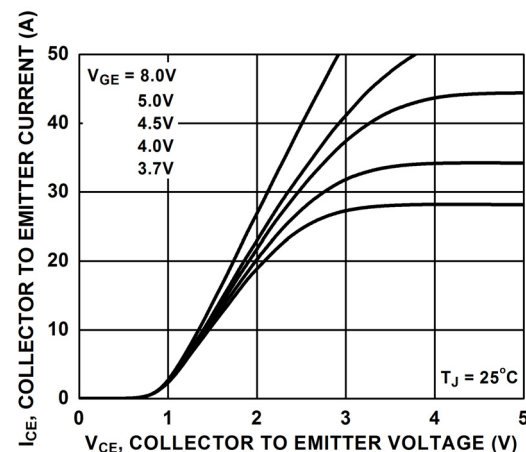


Figure 6. Collector to Emitter On-State Voltage vs. Collector Current

## Typical Performance Curves (Continued)

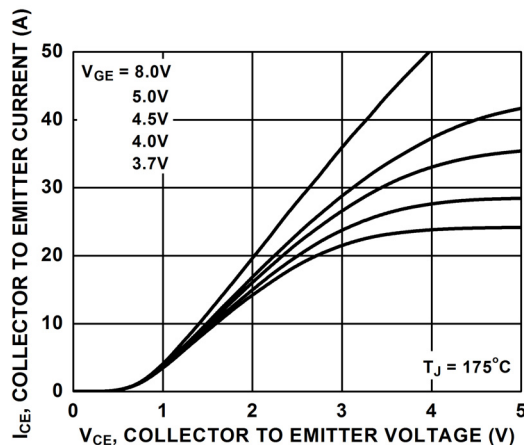


Figure 7. Collector to Emitter On-State Voltage vs. Collector Current

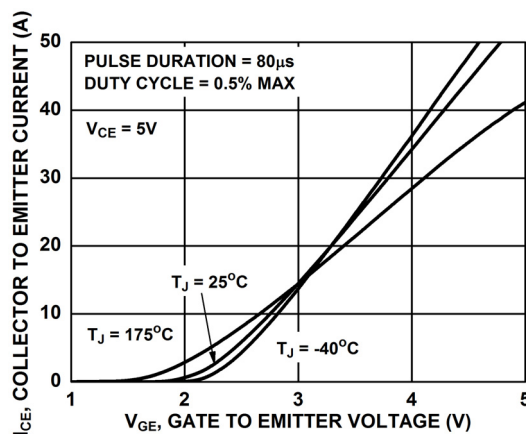


Figure 8. Transfer Characteristics

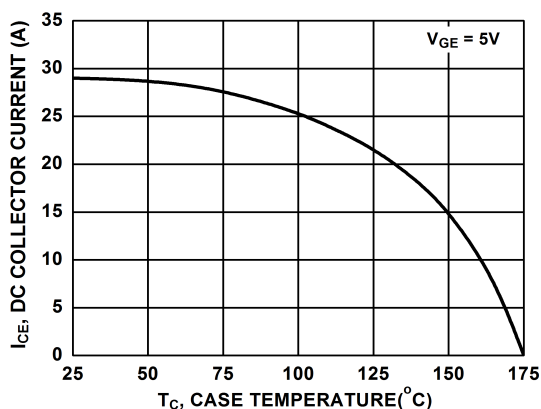


Figure 9. DC Collector Current vs. Case Temperature

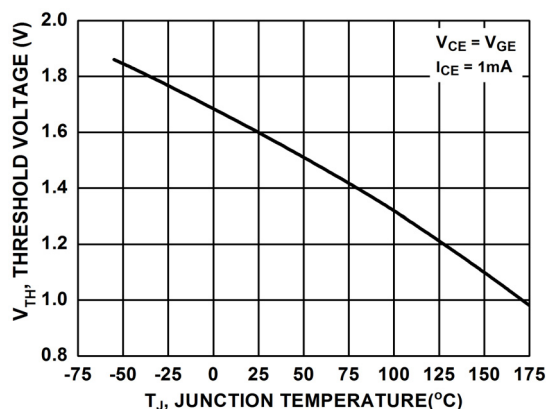


Figure 10. Threshold Voltage vs. Junction Temperature

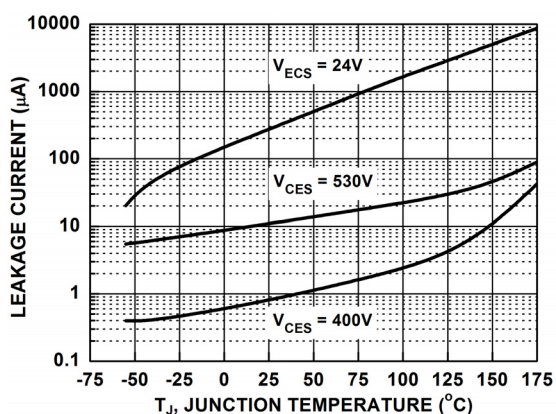


Figure 11. Leakage Current vs. Junction Temperature

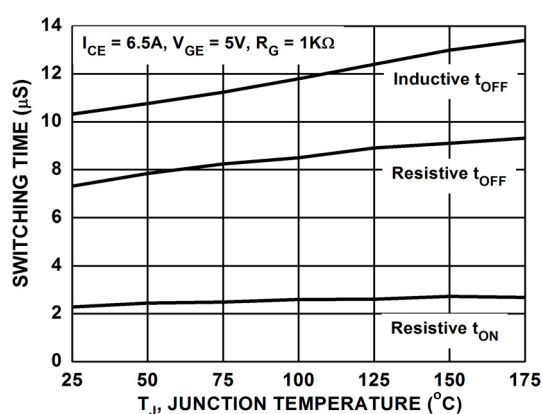


Figure 12. Switching Time vs. Junction Temperature

## Typical Performance Curves (Continued)

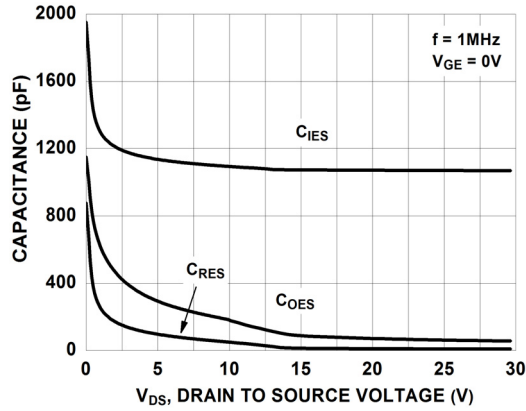


Figure 13. Capacitance vs. Collector to Emitter Voltage

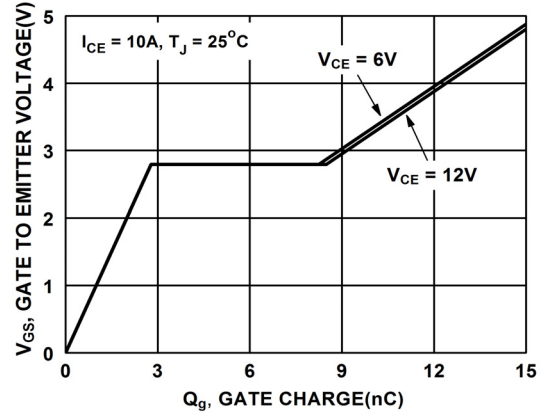


Figure 14. Gate Charge

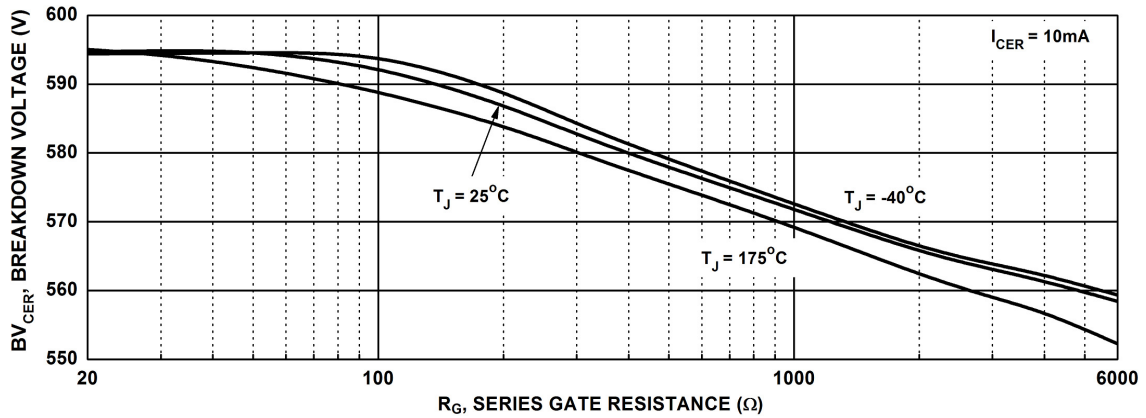


Figure 15. Break down Voltage vs. Series Gate Resistance

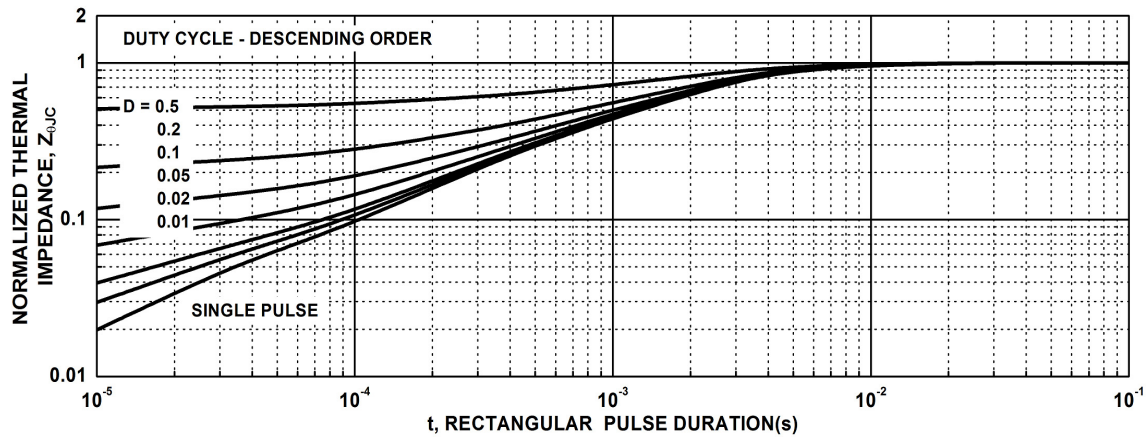


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

## Typical Performance Curves

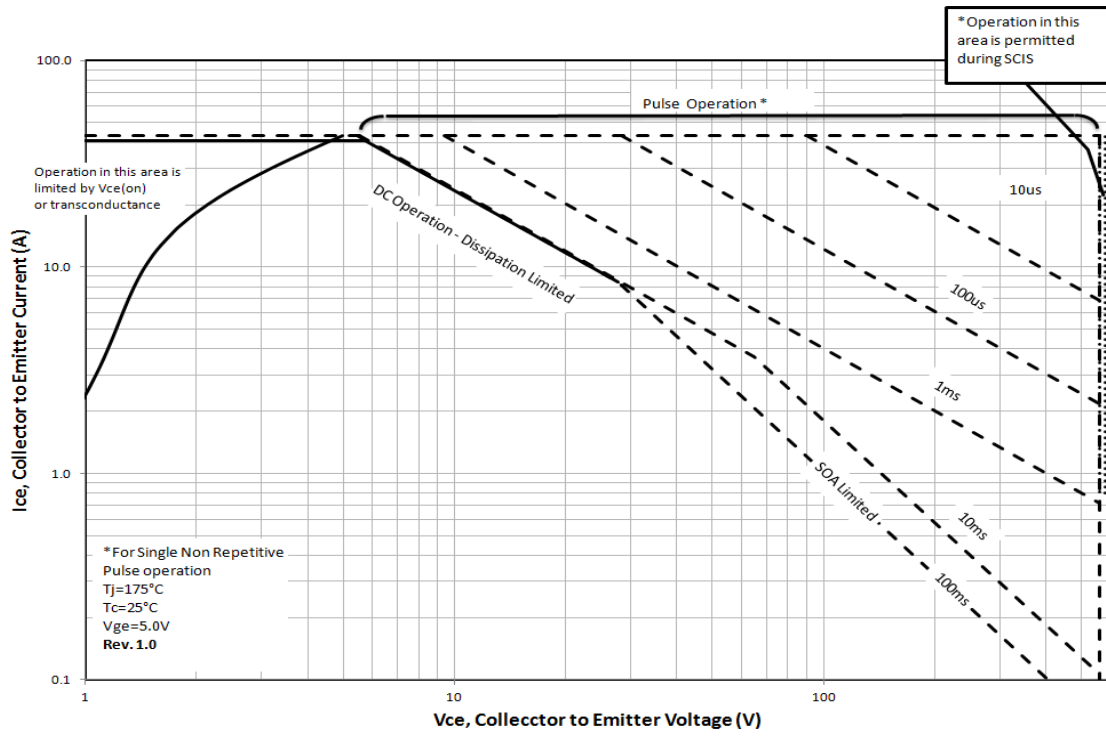
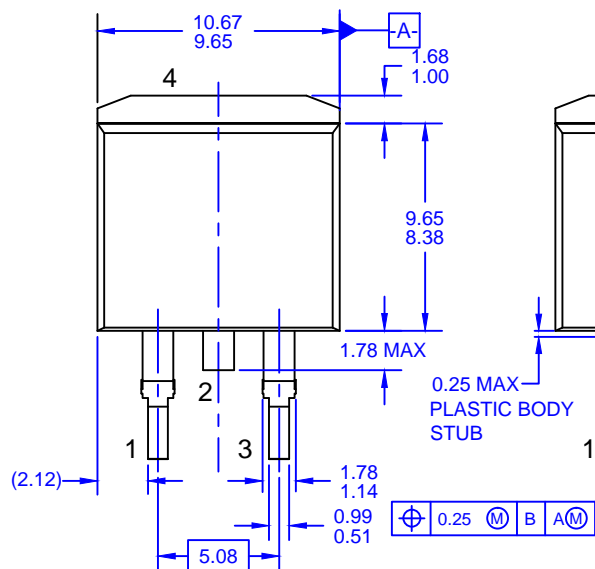
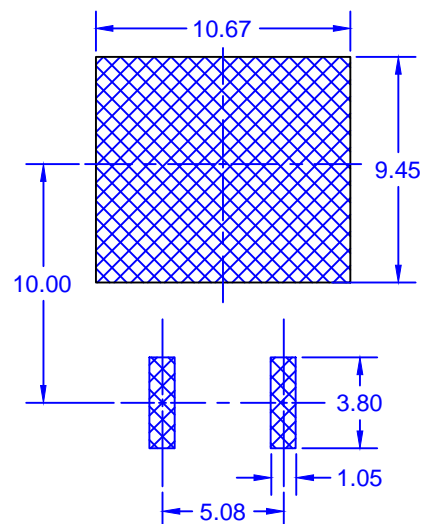


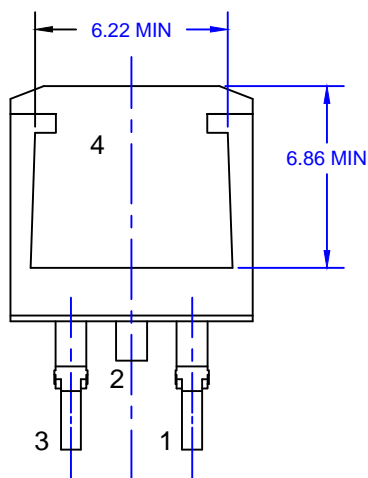
Figure 17. Forward Safe Operating Area



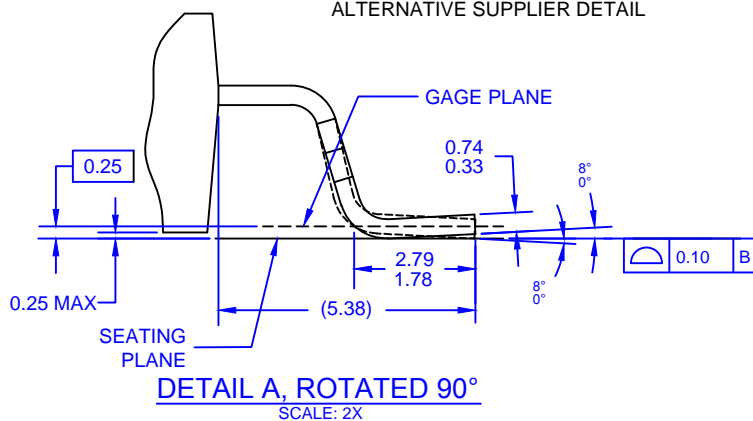
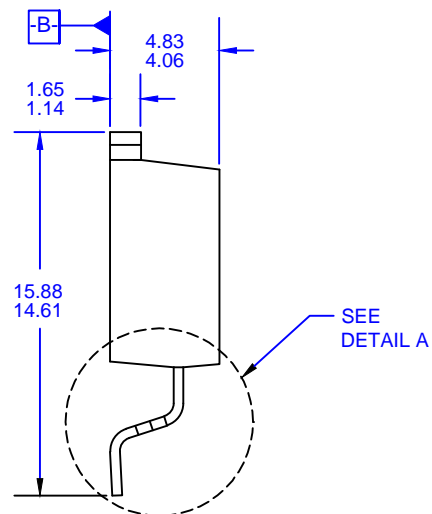
FRONT VIEW - DIODE PRODUCTS VERSION  
ALTERNATIVE SUPPLIER DETAIL



LAND PATTERN RECOMMENDATION  
UNLESS NOTED, ALL DIMS TYPICAL



BACK VIEW - DIODE PRODUCTS VERSION  
ALTERNATIVE SUPPLIER DETAIL



- NOTES: UNLESS OTHERWISE SPECIFIED
- A) ALL DIMENSIONS ARE IN MILLIMETERS.
  - B) REFERENCE JEDEC, TO-263, VARIATION AB.
  - C) DIMENSIONING AND TOLERANCING PER DIMENSIONING AND TOLERANCING PER ASME Y14.5 - 2009.
  - D) LOCATION OF THE PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE).
  - E) LANDPATTERN RECOMMENDATION PER IPC TO254P1524X482-3N
  - F) FILENAME: TO263A02REV8





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](http://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](mailto: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](http://www.onsemi.com)

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

For additional information, please contact your local  
Sales Representative

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[ON Semiconductor:](#)

[FGB3056\\_F085](#)