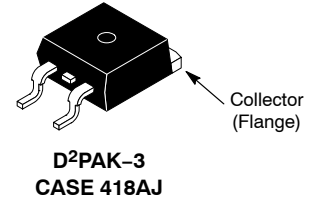


EcoSPARK[®] 2 HV-HE IGBT

500 mJ, 650 V, N-Channel PTC Heater IGBT

FGB5065G2-F085



Features

- SCIS Energy = 500 mJ at $T_J = 25^\circ\text{C}$
- Logic Level Gate Drive
- RoHS Compliant
- Pending AEC-Q101 Qualification and PPAP Capable

Applications

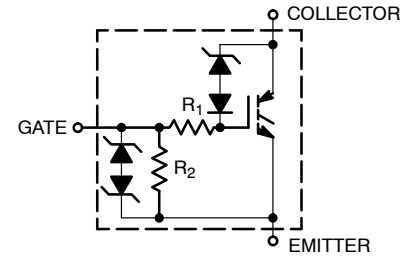
- PTC Heater Circuits
- High Current Systems
- Rugged Applications

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

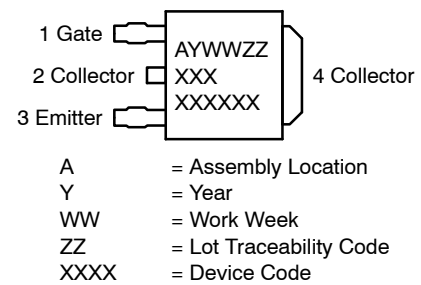
Symbol	Parameter	Value	Unit
BV_{CER}	Collector-to-Emitter Breakdown Voltage ($I_C = 1 \text{ mA}$)	650	V
BV_{ECS}	Emitter-to-Collector Voltage – Reverse Battery Condition ($I_C = 10 \text{ mA}$)	28	V
E_{SCIS25}	Self Clamping Inductive Switching Energy (Note 1)	500	mJ
E_{SCIS150}	Self Clamping Inductive Switching Energy (Note 2)	300	mJ
I_{C25}	Collector Current Continuous at $V_{\text{GE}} = 5.0 \text{ V}$, $T_C = 25^\circ\text{C}$	78	A
I_{C100}	Collector Current Continuous at $V_{\text{GE}} = 5.0 \text{ V}$, $T_C = 100^\circ\text{C}$	55	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	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
T_L	Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	300	$^\circ\text{C}$
T_{PKG}	Reflow Soldering according to JESD020C	260	$^\circ\text{C}$
ESD	HBM-Electrostatic Discharge Voltage at 100 pF, 1500 Ω	8	kV
	CDM-Electrostatic Discharge Voltage at 1 Ω	2	kV

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Self clamped inductive Switching Energy (E_{SCIS25}) of 500 mJ is based on the test conditions that is starting $T_J = 25^\circ\text{C}$, $L = 3 \text{ mHy}$, $I_{\text{SCIS}} = 18.3 \text{ A}$, $V_{\text{CC}} = 100 \text{ V}$ during inductor charging and $V_{\text{CC}} = 0 \text{ V}$ during time in clamp.
2. Self Clamped inductive Switching Energy (E_{SCIS150}) of 300 mJ is based on the test conditions that is starting $T_J = 150^\circ\text{C}$, $L = 3 \text{ mHy}$, $I_{\text{SCIS}} = 14.2 \text{ A}$, $V_{\text{CC}} = 100 \text{ V}$ during inductor charging and $V_{\text{CC}} = 0 \text{ V}$ during time in clamp.



MARKING DIAGRAM



ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

FGB5065G2-F085

THERMAL RESISTANCE RATINGS

Characteristic	Symbol	Max	Units
Junction-to-Case – Steady State (Drain)	$R_{\theta JC}$	0.5	°C/W

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

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

OFF CHARACTERISTICS

BV_{CER}	Collector-to-Emitter Breakdown Voltage	$I_{CE} = 2\text{ mA}, V_{GE} = 0\text{ V}, R_{GE} = 1\text{ k}\Omega, T_J = -40\text{ to }150^\circ\text{C}$	615	650	685	V	
BV_{CES}	Collector-to-Emitter Breakdown Voltage	$I_{CE} = 10\text{ mA}, V_{GE} = 0\text{ V}, R_{GE} = 0, T_J = -40\text{ to }150^\circ\text{C}$	635	680	710	V	
BV_{ECS}	Emitter-to-Collector Breakdown Voltage	$I_{CE} = -75\text{ mA}, V_{GE} = 0\text{ V}, T_J = 25^\circ\text{C}$	28	-	-	V	
BV_{GES}	Gate-to-Emitter Breakdown Voltage	$I_{GES} = \pm 2\text{ mA}$	± 12	± 14	-	V	
I_{CER}	Collector-to-Emitter Leakage Current	$V_{CE} = 250\text{ V}, R_{GE} = 1\text{ k}\Omega$	$T_J = 25^\circ\text{C}$	-	-	25	μA
			$T_J = 150^\circ\text{C}$	-	-	1	mA
I_{ECS}	Emitter-to-Collector Leakage Current	$V_{EC} = 24\text{ V}$	$T_J = 25^\circ\text{C}$	-	-	1	mA
			$T_J = 150^\circ\text{C}$	-	-	40	
R_1	Series Gate Resistance		-	115	-	Ω	
R_2	Gate-to-Emitter Resistance		10K	-	30K	Ω	

ON CHARACTERISTICS

$V_{CE(SAT)}$	Collector-to-Emitter Saturation Voltage	$I_{CE} = 10\text{ A}, V_{GE} = 4.5\text{ V}, T_J = 25^\circ\text{C}$	-	1.12	1.33	V
		$I_{CE} = 30\text{ A}, V_{GE} = 5\text{ V}, T_J = 25^\circ\text{C}$	-	1.56	1.80	
		$I_{CE} = 50\text{ A}, V_{GE} = 10\text{ V}, T_J = 25^\circ\text{C}$	-	1.80	2.15	
		$I_{CE} = 15\text{ A}, V_{GE} = 5\text{ V}, T_J = 150^\circ\text{C}$	-	1.26	-	

DYNAMIC CHARACTERISTICS

$Q_{G(ON)}$	Gate Charge	$I_{CE} = 10\text{ A}, V_{CE} = 12\text{ V}, V_{GE} = 5\text{ V}$	-	40	-	nC
$V_{GE(TH)}$	Gate-to-Emitter Threshold Voltage	$I_{CE} = 1\text{ mA}, V_{CE} = V_{GE}$	$T_J = 25^\circ\text{C}$	1.3	-	2.2
			$T_J = 150^\circ\text{C}$	0.75	-	1.8
V_{GEP}	Gate-to-Emitter Plateau Voltage	$V_{CE} = 12\text{ V}, I_{CE} = 10\text{ A}$	-	2.7	-	V

SWITCHING CHARACTERISTICS

$t_{d(ON)R}$	Current Turn-On Delay Time-Resistive	$V_{CE} = 14\text{ V}, R_L = 1\ \Omega, V_{GE} = 5\text{ V}, R_G = 470\ \Omega, T_J = 25^\circ\text{C}$	-	0.77	3	μs
t_{rR}	Current Rise Time-Resistive		-	1.5	7	
$t_{d(OFF)L}$	Current Turn-Off Delay Time-Inductive	$V_{CE} = 300\text{ V}, L = 1\text{ mH}, V_{GE} = 5\text{ V}, R_G = 470\ \Omega, I_{CE} = 6.5\text{ A}, T_J = 25^\circ\text{C}$	-	6.7	12	
t_{fL}	Current Fall Time-Inductive		-	3.4	15	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

PACKAGE MARKING AND ORDERING INFORMATION

Device	Package	Shipping [†]
FGB5065G2-F085	D ² PAK (Pb-Free)	800 Units / Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

TYPICAL CHARACTERISTICS

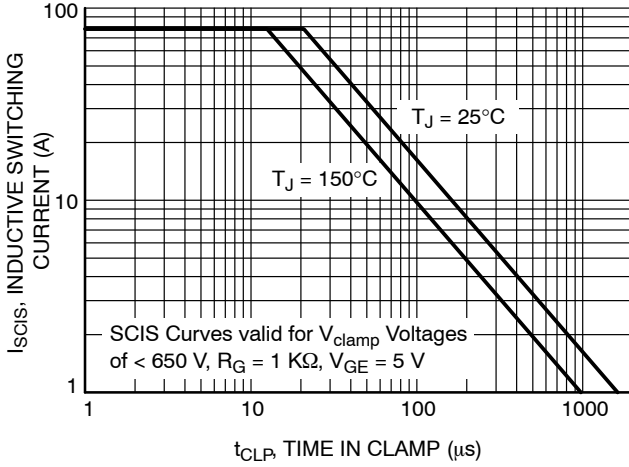


Figure 1. Self-Clamped Inductive Switching Current vs. Time in Clamp

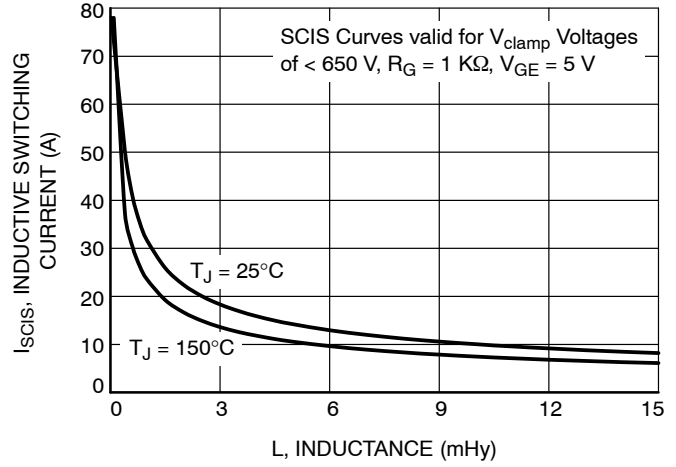


Figure 2. Self-Clamped Inductive Switching Current vs. Inductance

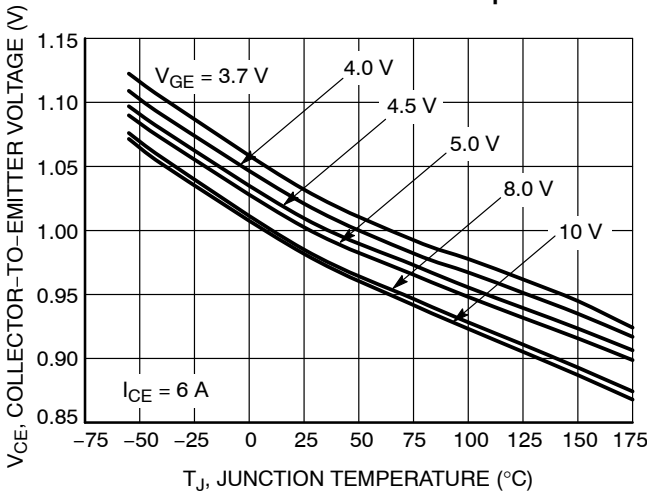


Figure 3. Collector-to-Emitter On-State Voltage vs. Junction Temperature

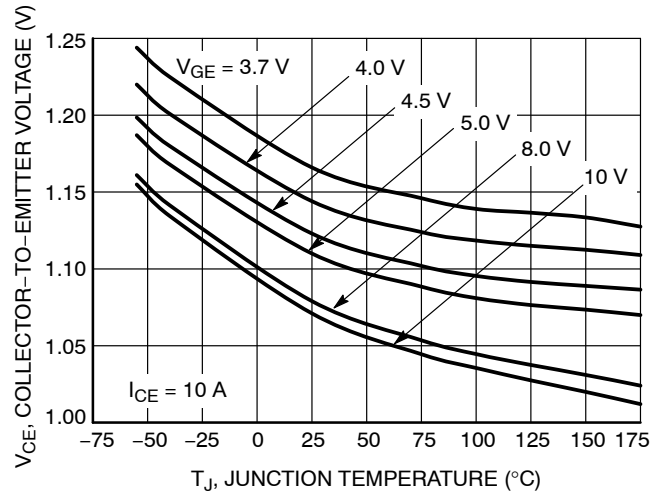


Figure 4. Collector-to-Emitter On-State Voltage vs. Junction Temperature

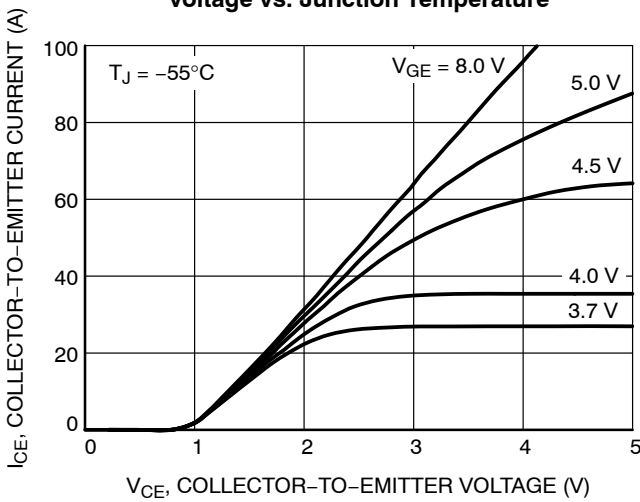


Figure 5. Collector-to-Emitter On-State Voltage vs. Collector Current

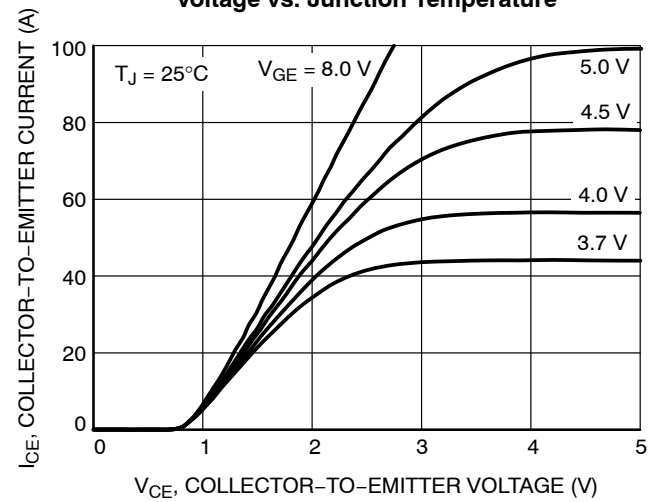


Figure 6. Collector-to-Emitter On-State Voltage vs. Collector Current

TYPICAL CHARACTERISTICS

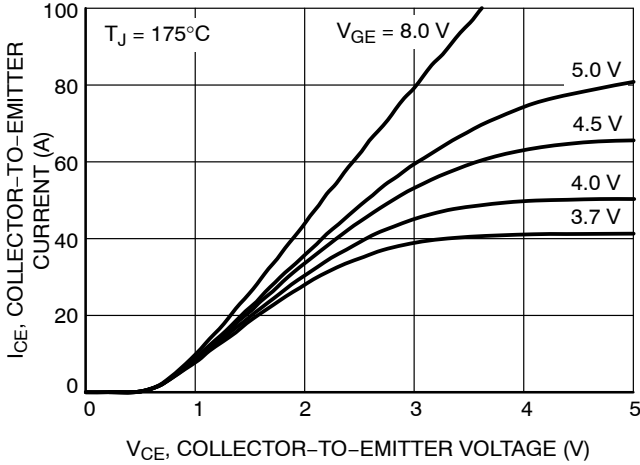


Figure 7. Collector-to-Emitter On-State Voltage vs. Collector Current

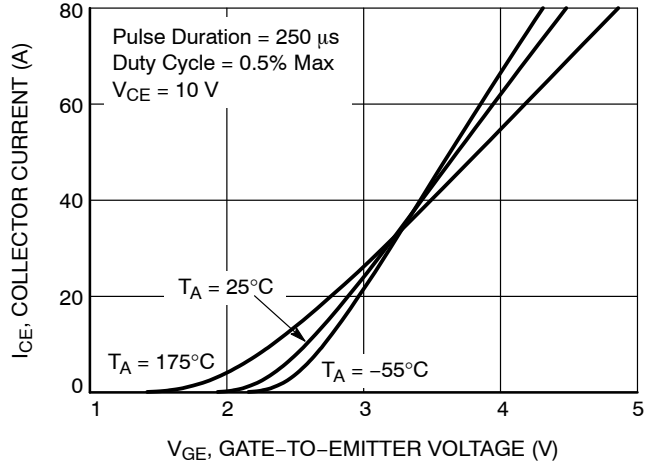


Figure 8. Transfer Characteristics

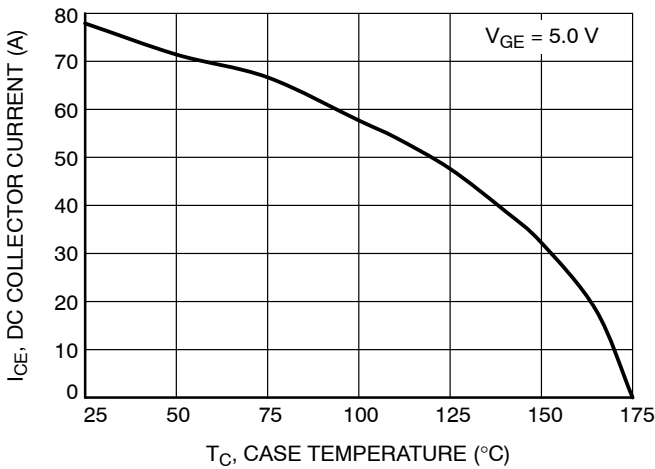


Figure 9. DC Collector Current vs. Case Temperature

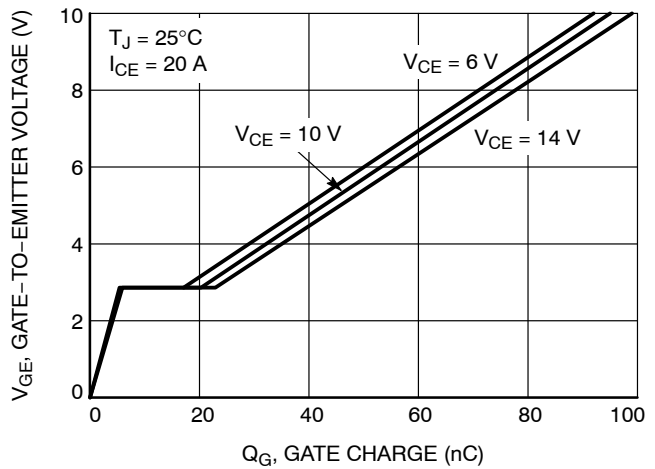


Figure 10. Gate Charge

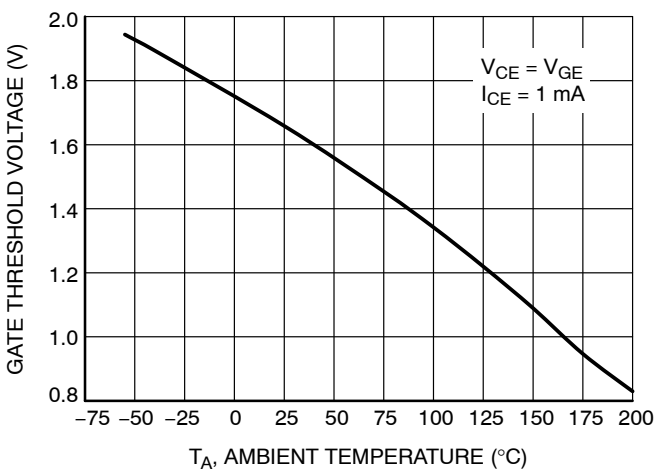


Figure 11. Threshold Voltage vs. Junction Temperature

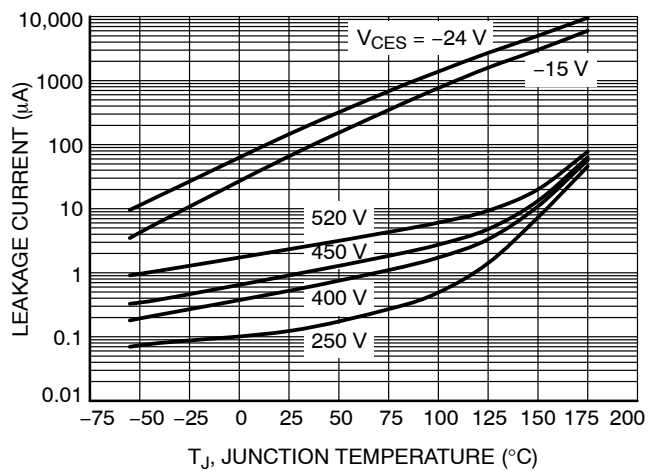


Figure 12. Leakage Current vs. Junction Temperature

TYPICAL CHARACTERISTICS

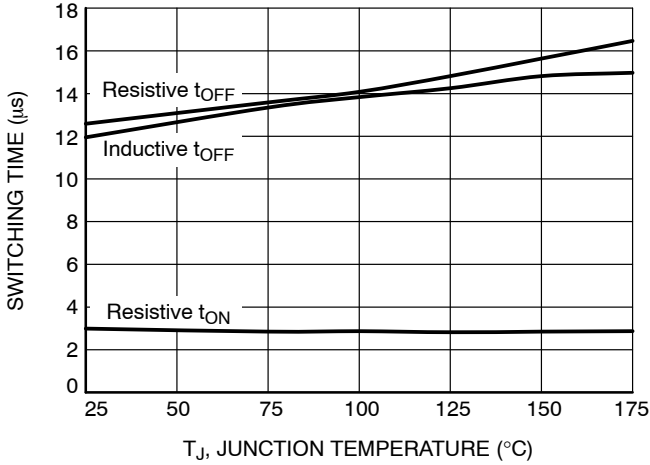


Figure 13. Switching Time vs. Junction Temperature

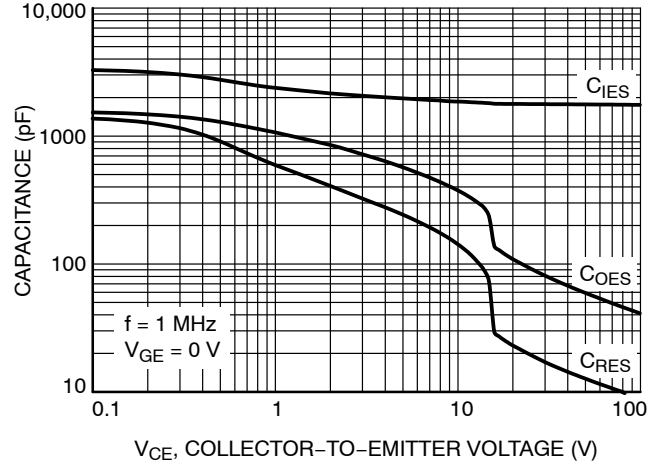


Figure 14. Capacitance vs. Collector to Emitter Voltage

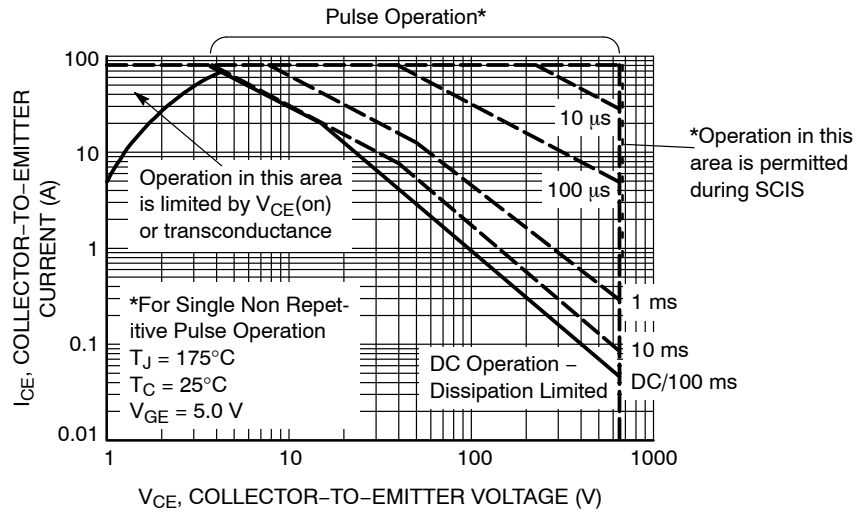


Figure 15. Forward Bias Safe Operating Area

FGB5065G2-F085

TYPICAL CHARACTERISTICS

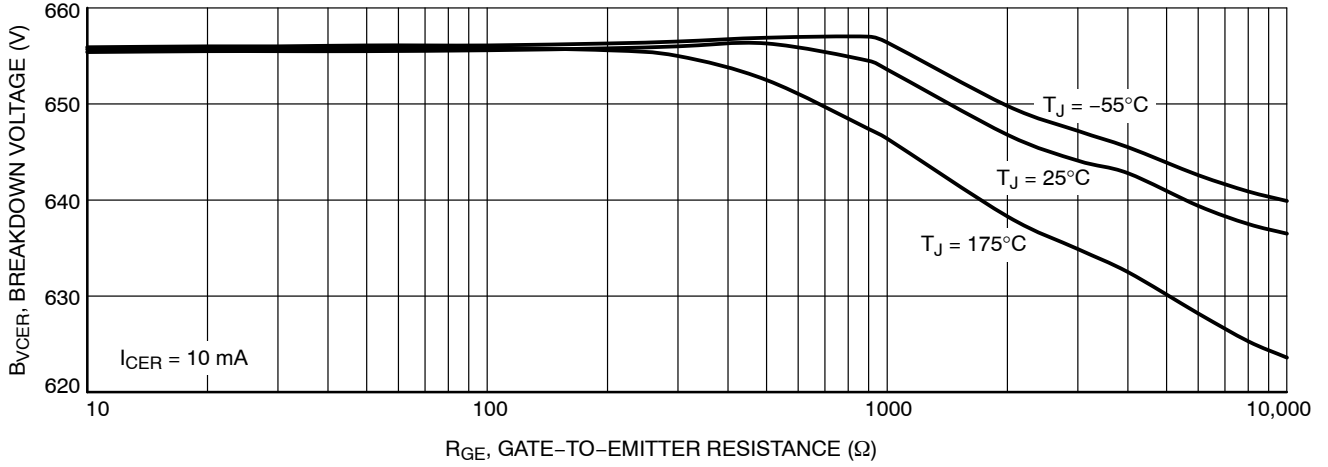


Figure 16. Breakdown Voltage vs. Series Resistance

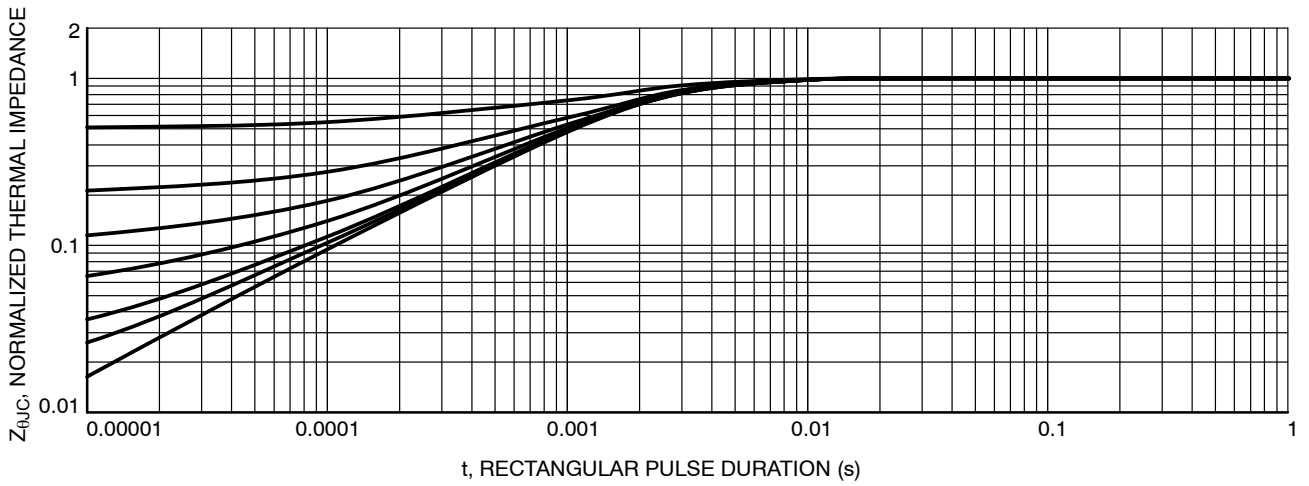


Figure 17. Normalized Transient Thermal Impedance, Junction to Case ($Z_{\theta_{JC}}$)

TEST CIRCUIT AND WAVEFORMS

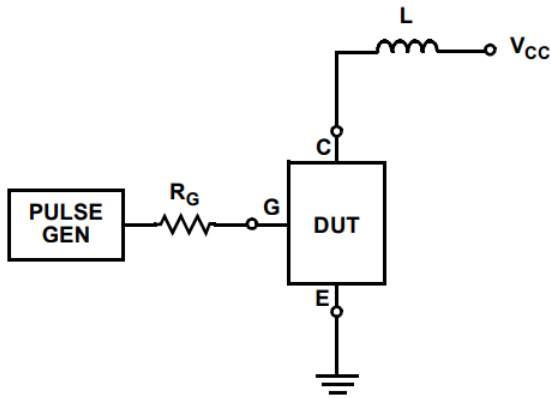


Figure 18. Inductive Switching Test Circuit

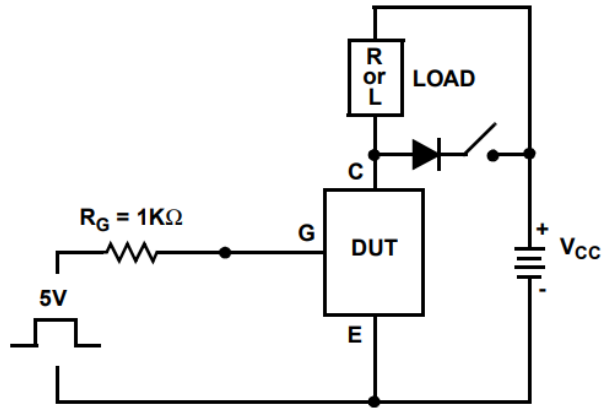


Figure 19. t_{ON} and t_{OFF} Switching Test Circuit

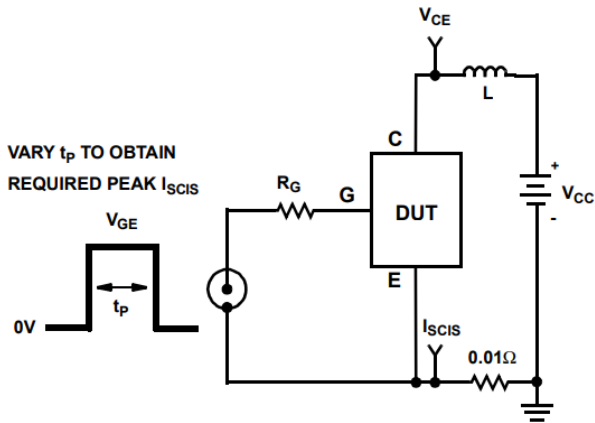


Figure 20. Energy Test Circuit

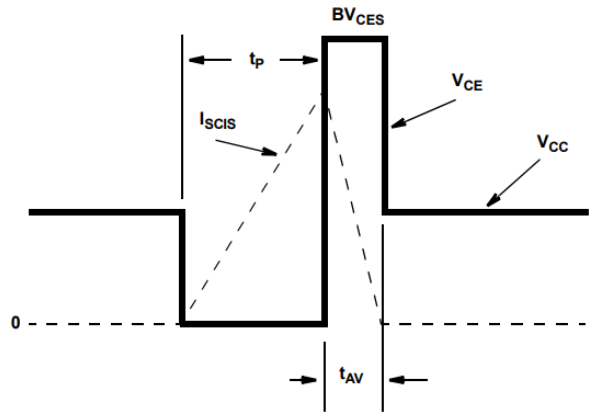
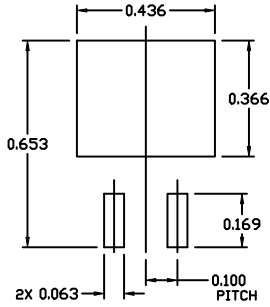


Figure 21. Energy Waveforms

FGB5065G2-F085

PACKAGE DIMENSIONS

D²PAK-3 (TO-263, 3-LEAD) CASE 418AJ ISSUE F



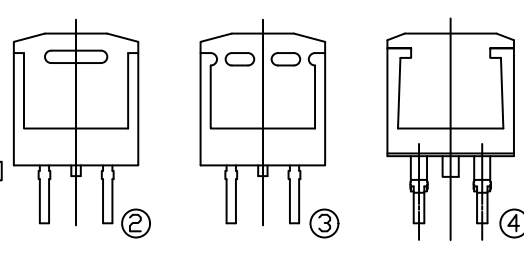
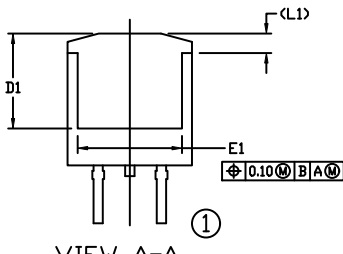
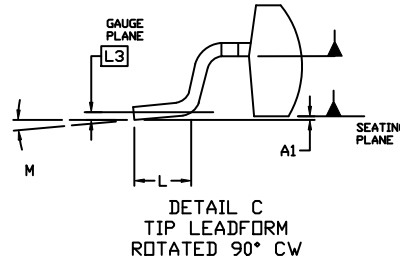
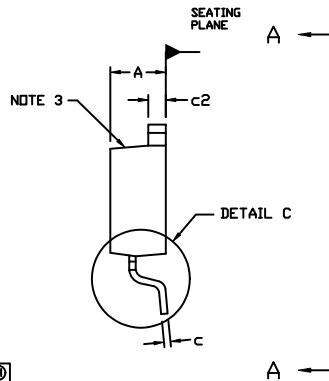
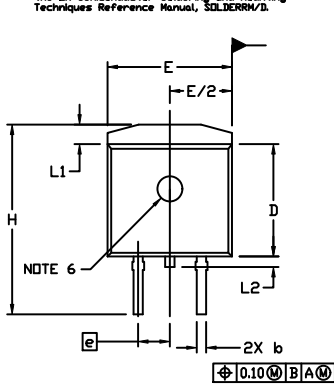
RECOMMENDED MOUNTING FOOTPRINT

For additional information on our Pb-Free strategy and soldering details, please download the IN Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. CHAMFER OPTIONAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
5. THERMAL PAD CONTOUR IS OPTIONAL WITHIN DIMENSIONS E, L1, D1, AND E1.
6. OPTIONAL MOLD FEATURE.
7. Ⓚ, Ⓛ ... OPTIONAL CONSTRUCTION FEATURE CALL OUTS.

DIM	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.160	0.190	4.06	4.83
A1	0.000	0.010	0.00	0.25
b	0.020	0.039	0.51	0.99
c	0.012	0.029	0.30	0.74
c2	0.045	0.065	1.14	1.65
D	0.330	0.380	8.38	9.65
D1	0.260	---	6.60	---
E	0.380	0.420	9.65	10.67
E1	0.245	---	6.22	---
e	0.100 BSC	---	2.54 BSC	---
H	0.575	0.625	14.60	15.88
L	0.070	0.110	1.78	2.79
L1	---	0.066	---	1.68
L2	---	0.070	---	1.78
L3	0.010 BSC	---	0.25 BSC	---
M	0°	8°	0°	8°



VIEW A-A
OPTIONAL CONSTRUCTIONS

onsemi, Onsemi, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries. onsemi owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of onsemi's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marketing.pdf. onsemi reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and onsemi makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does onsemi 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 onsemi products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by onsemi. "Typical" parameters which may be provided in onsemi 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. onsemi does not convey any license under any of its intellectual property rights nor the rights of others. onsemi 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 onsemi products for any such unintended or unauthorized application, Buyer shall indemnify and hold onsemi 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 onsemi was negligent regarding the design or manufacture of the part. onsemi 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:
Email Requests to: orderlit@onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
Voice Mail: 1 800-282-9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative