

ECOSPARK[®] II, Ignition IGBT

300 mJ, 500 V, N-Channel Ignition IGBT

FGD3050G2

Features

- SCIS Energy = 300 mJ at $T_J = 25^\circ\text{C}$
- Logic Level Gate Drive
- AEC-Q101 Qualified and PPAP Capable
- This Device is Pb-Free, Halid Free and is RoHS Compliant

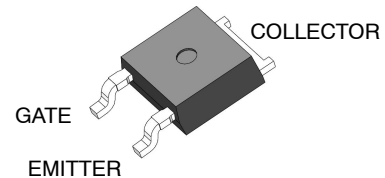
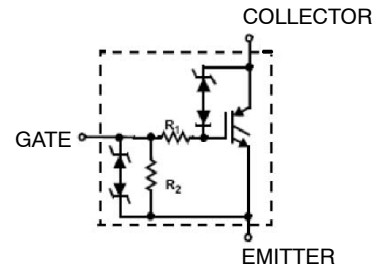
Applications

- Automotive Ignition Coil Driver Circuits
- Coil on Plug Application

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

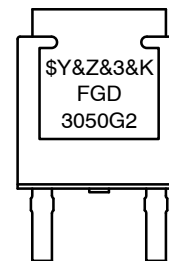
Symbol	Parameter	Value	Unit
BV_{CER}	Collector to Emitter Breakdown Voltage ($I_C = 1\text{ mA}$)	500	V
BV_{ECS}	Emitter to Collector Voltage – Reverse Battery Condition ($I_C = 10\text{ mA}$)	20	V
E_{SCIS25}	$I_{SCIS} = 14.2\text{ A}$, $L = 3.0\text{ mHy}$, $R_{GE} = 1\text{ k}\Omega$ $T_C = 25^\circ\text{C}$	300	mJ
$E_{SCIS150}$	$I_{SCIS} = 11.0\text{ A}$, $L = 3.0\text{ mHy}$, $R_{GE} = 1\text{ k}\Omega$ $T_C = 150^\circ\text{C}$	180	mJ
I_{C25}	Collector Current Continuous at $V_{GE} = 5.0\text{ V}$, $T_C = 25^\circ\text{C}$	32	A
I_{C110}	Collector Current Continuous at $V_{GE} = 5.0\text{ V}$, $T_C = 110^\circ\text{C}$	27	A
V_{GEM}	Gate to Emitter Voltage Continuous	± 10	V
P_D	Power Dissipation Total, $T_C = 25^\circ\text{C}$	150	W
	Power Dissipation Derating, $T_C > 25^\circ\text{C}$	1.1	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 Temperature for Soldering (Leads at 1.6 mm from case for 10 s)	300	$^\circ\text{C}$
T_{PKG}	Max. Lead Temperature for Soldering (Package Body for 10 s)	260	$^\circ\text{C}$
ESD	Electrostatic Discharge Voltage at 100 pF, 1500 Ω	4	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.



DPAK3 (TO-252 3 LD)
CASE 369AS

MARKING DIAGRAM



\$Y = onsemi Logo
&Z = Assembly Plant Code
&3 = 3-Digit Date Code
&K = 2-Digits Lot Run Traceability Code
FGD3050G2 = Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

FGD3050G2

THERMAL CHARACTERISTICS

Symbol	Characteristic	Max	Units
$R_{\theta JC}$	Thermal Resistance Junction to Case	0.9	°C/W

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

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

OFF CHARACTERISTICS

BV_{CER}	Collector to Emitter Breakdown Voltage	$I_{CE} = 2\text{ mA}$, $V_{GE} = 0\text{ V}$, $R_{GE} = 1\text{ k}\Omega$, $T_J = -40\text{ to }150^\circ\text{C}$	470	-	530	V	
BV_{CES}	Collector to Emitter Breakdown Voltage	$I_{CE} = 10\text{ mA}$, $V_{GE} = 0\text{ V}$, $R_{GE} = 0\ \Omega$, $T_J = -40\text{ to }150^\circ\text{C}$	495	-	555	V	
BV_{ECS}	Emitter to Collector Breakdown Voltage	$I_{CE} = -75\text{ mA}$, $V_{GE} = 0\text{ V}$, $T_J = 25^\circ\text{C}$	20	-	-	V	
BV_{GES}	Gate to Emitter Breakdown Voltage	$I_{GES} = \pm 5\text{ mA}$	± 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	$V_{EC} = 15\text{ V}$	$T_J = 25^\circ\text{C}$	-	-	1	mA
			$T_J = 150^\circ\text{C}$	-	-	40	
R_1	Series Gate Resistance		-	111	-	Ω	
R_2	Gate to Emitter Resistance		10	-	30	k Ω	

ON CHARACTERISTICS

$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	$I_{CE} = 6\text{ A}$, $V_{GE} = 4\text{ V}$, $T_J = 25^\circ\text{C}$	-	1.1	1.2	V
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	$I_{CE} = 10\text{ A}$, $V_{GE} = 4.5\text{ V}$, $T_J = 150^\circ\text{C}$	-	1.3	1.45	V
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	$I_{CE} = 15\text{ A}$, $V_{GE} = 4.5\text{ V}$, $T_J = 150^\circ\text{C}$	-	1.6	1.75	V

DYNAMIC CHARACTERISTICS

$Q_{G(ON)}$	Gate Charge	$I_{CE} = 10\text{ A}$, $V_{CE} = 12\text{ V}$, $V_{GE} = 5\text{ V}$	-	22	-	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	1.6	2.2	V
			$T_J = 150^\circ\text{C}$	0.75	1.1	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	$V_{CE} = 14\text{ V}$, $R_L = 1\ \Omega$, $V_{GE} = 5\text{ V}$, $R_G = 1\text{ k}\Omega$,	-	0.9	4	μs
t_{rR}	Current Rise Time-Resistive		-	1.6	7	μs
$t_{d(OFF)L}$	Current Turn-Off Delay Time-Inductive	$V_{CE} = 300\text{ V}$, $L = 2\text{ mH}$, $V_{GE} = 5\text{ V}$, $R_G = 1\text{ k}\Omega$,	-	5.4	15	μs
t_{fL}	Current Fall Time-Inductive		-	1.4	15	μs

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.

TYPICAL CHARACTERISTICS

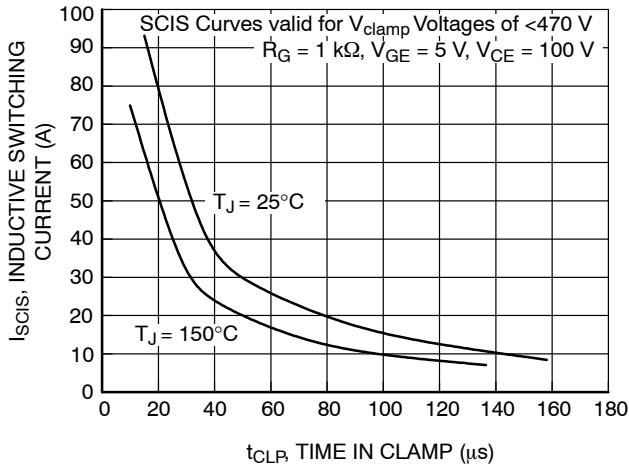


Figure 1. Self Clamped Inductive Switching Current vs. Time in Clamp

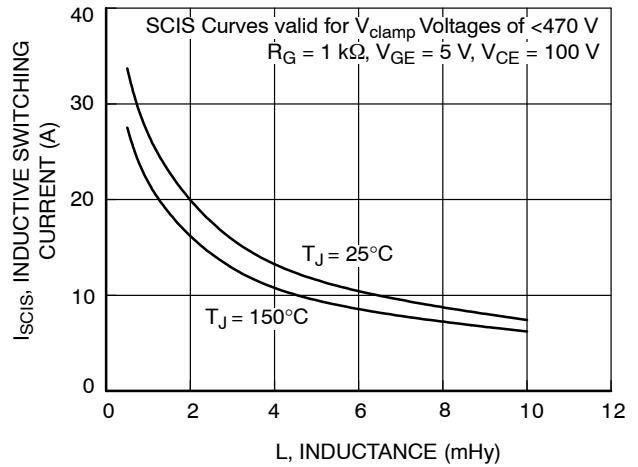


Figure 2. Self Clamped Inductive Switching Current vs. Inductance

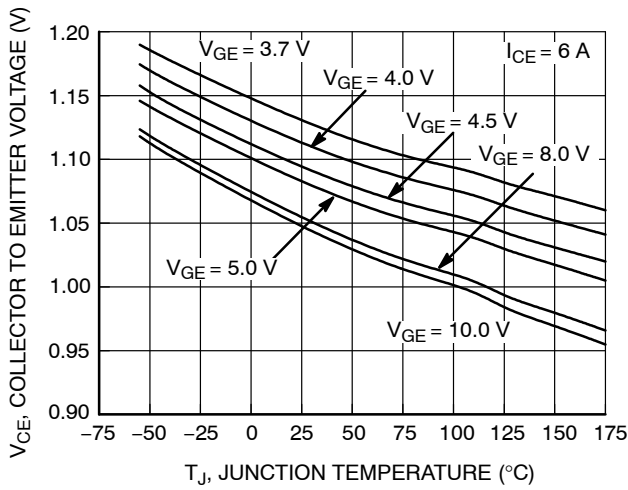


Figure 3. Collector to Emitter On-State Voltage vs. Junction Temperature

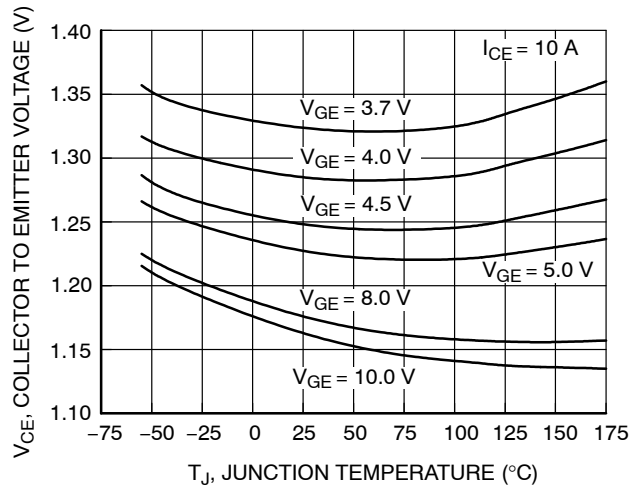


Figure 4. Collector to Emitter On-State Voltage vs. Junction Temperature

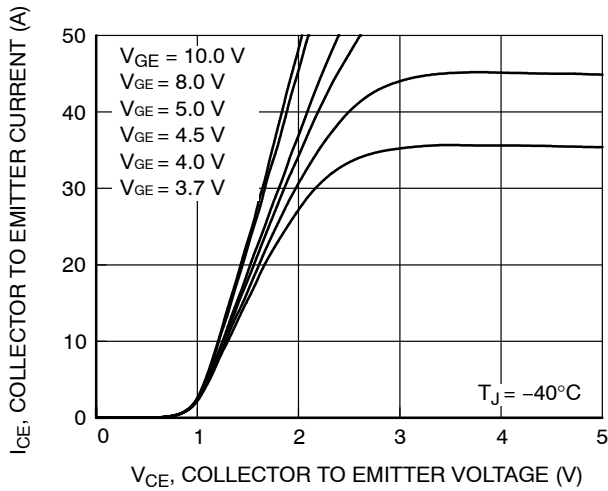


Figure 5. Collector to Emitter On-State Voltage vs. Collector Current

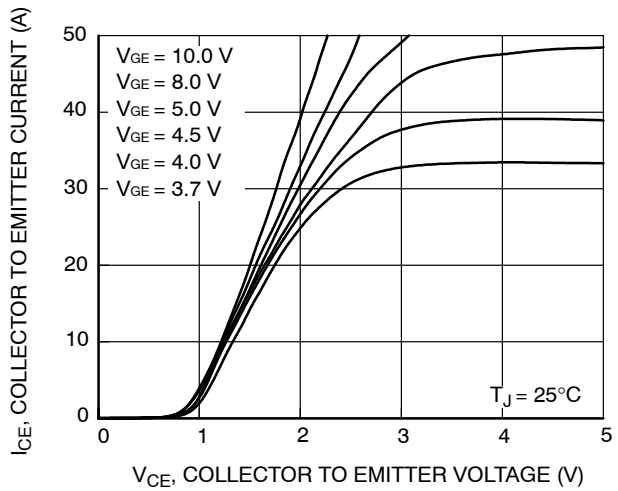


Figure 6. Collector to Emitter On-State Voltage vs. Collector Current

TYPICAL CHARACTERISTICS (continued)

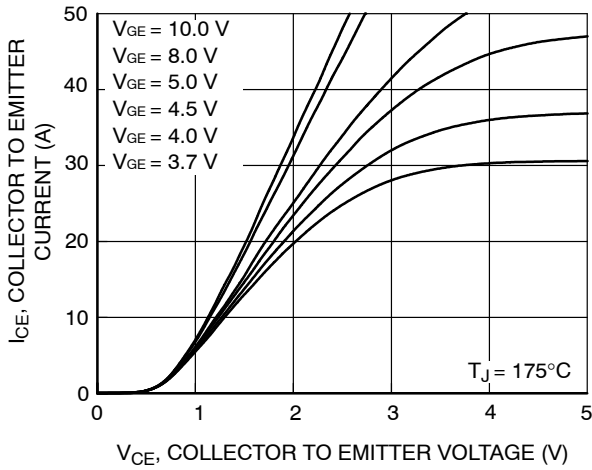


Figure 7. Collector to Emitter On-State Voltage vs. Collector Current

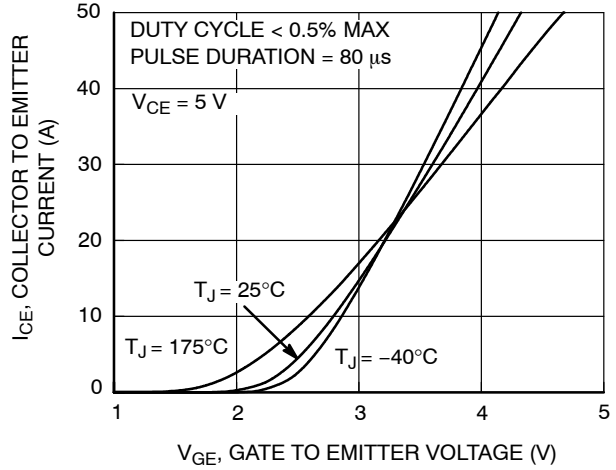


Figure 8. Transfer Characteristics

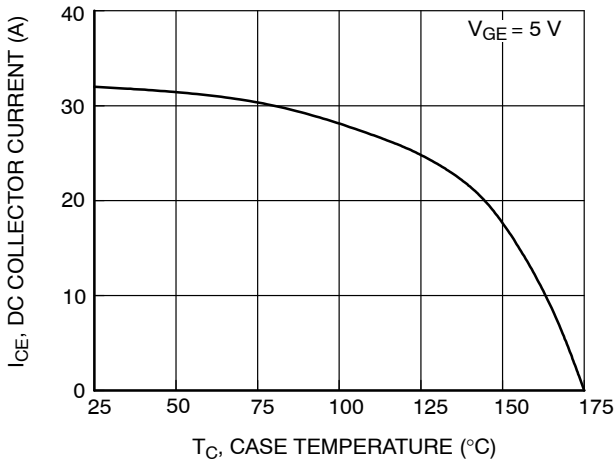


Figure 9. DC Collector Current vs. Case Temperature

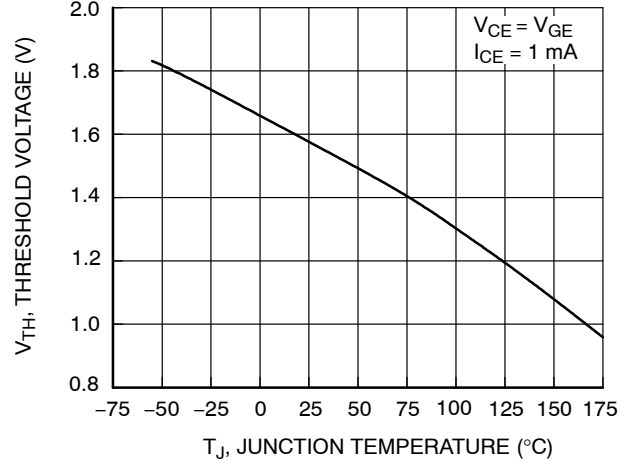


Figure 10. Threshold Voltage vs. Junction Temperature

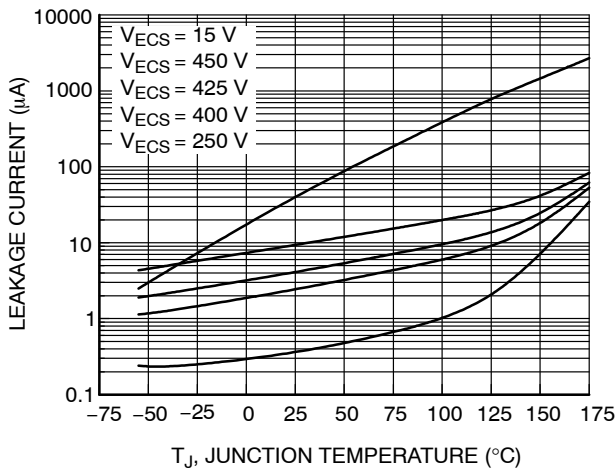


Figure 11. Leakage Current vs. Junction Temperature

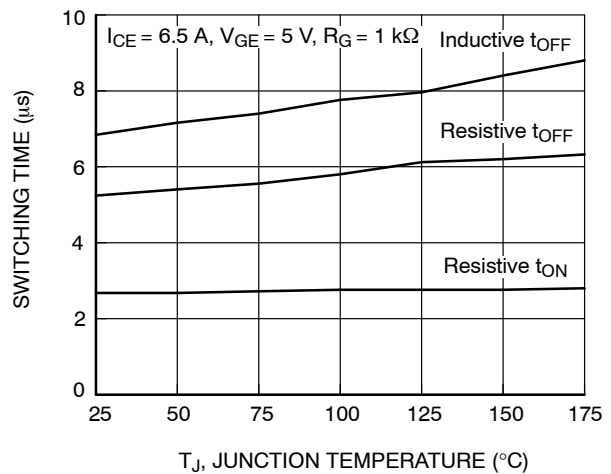


Figure 12. Switching Time vs. Junction Temperature

FGD3050G2

TYPICAL CHARACTERISTICS (continued)

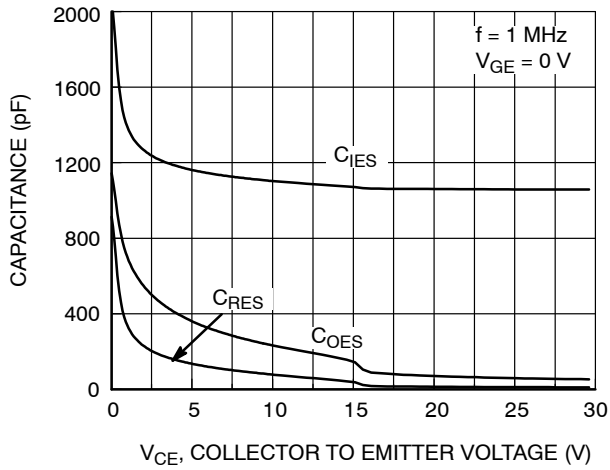


Figure 13. Capacitance vs. Collector to Emitter Voltage

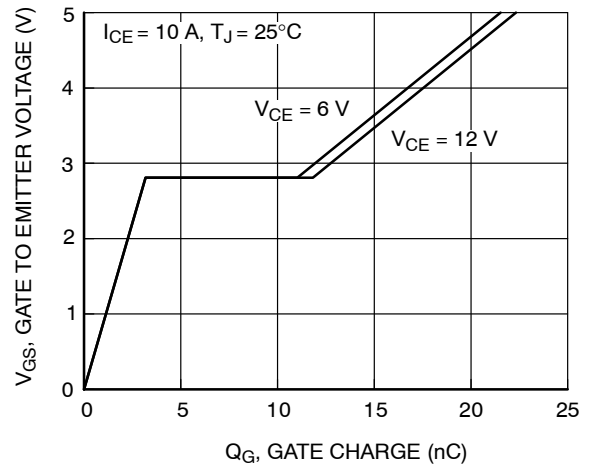


Figure 14. Gate Charge

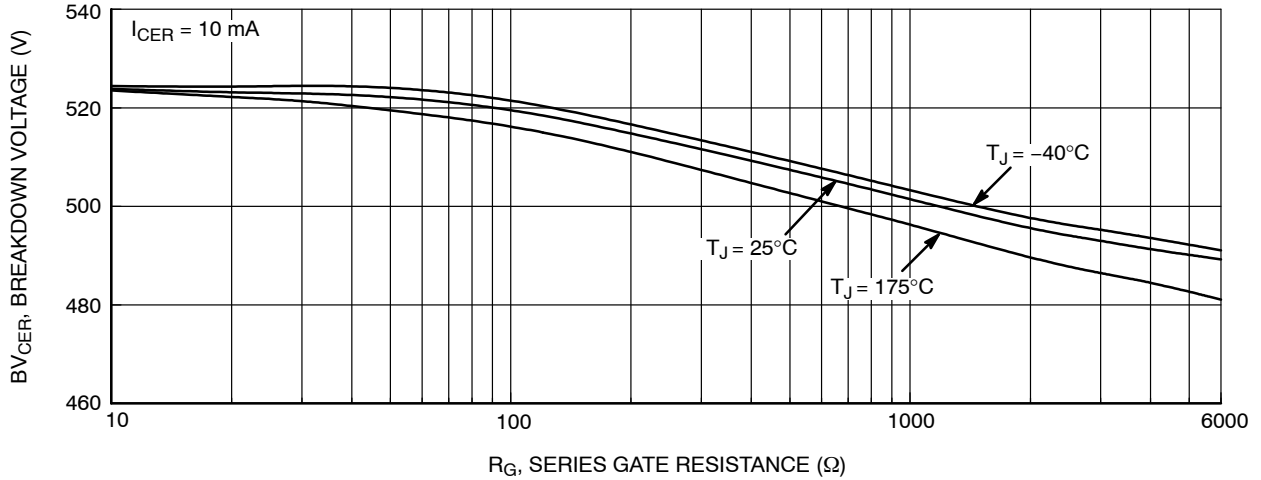


Figure 15. Breakdown Voltage vs. Series Gate Resistance

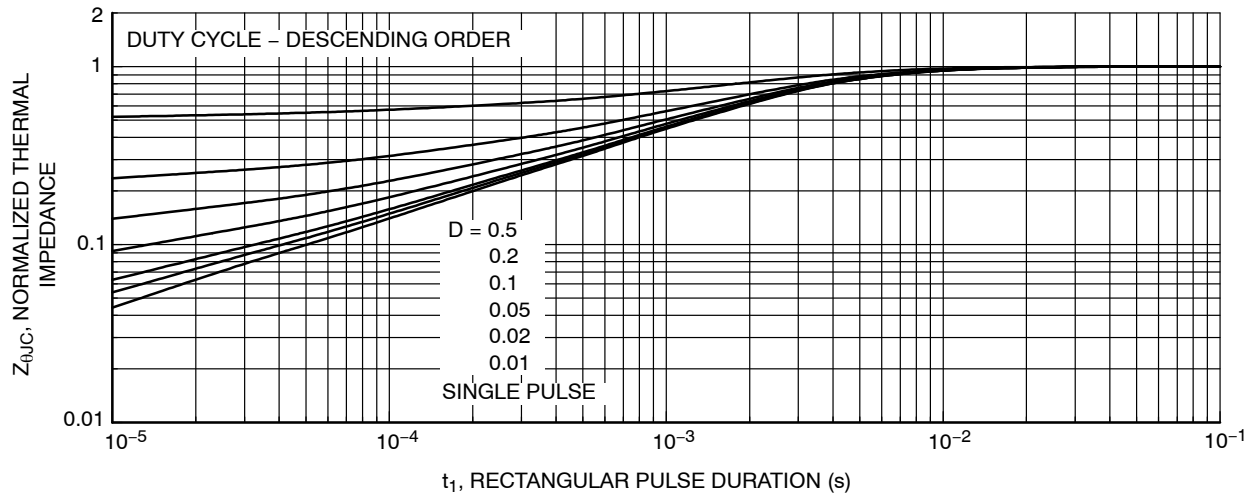


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

FGD3050G2

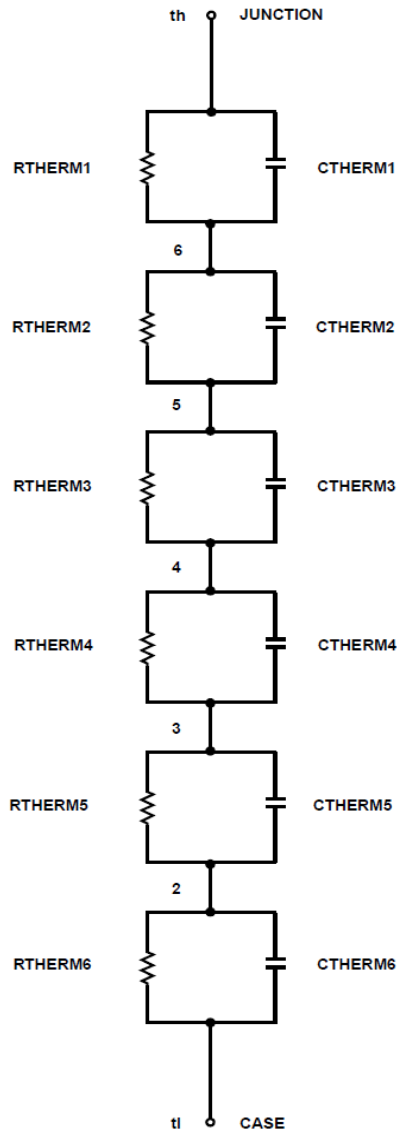
SPICE THERMAL MODEL

```

CTHERM1 th 6 5.7337E-05
CTHERM2 6 5 5.3736E-03
CTHERM3 5 4 1.1141E-03
CTHERM4 4 3 2.8690E-04
CTHERM5 3 2 7.4429E-04
CTHERM6 2 t1 3.7019E-03
    
```

```

RTHERM1 th 6 6.6403E-03
RTHERM2 6 5 5.8449E-01
RTHERM3 5 4 5.3930E-02
RTHERM4 4 3 9.2492E-03
RTHERM5 3 2 1.5794E-02
RTHERM6 2 t1 1.7974E-01
    
```



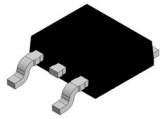
PACKAGE MARKING AND ORDERING INFORMATION

Device	Device Marking	Package	Shipping [†]
FGD3050G2	FGD3050G2	DPAK3 (TO-252 3 LD) (Pb-Free)	2500 / 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](#).

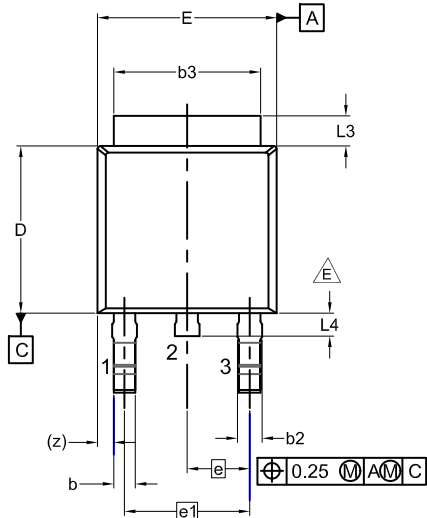
ECOSPARK is a registered trademark of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries.

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

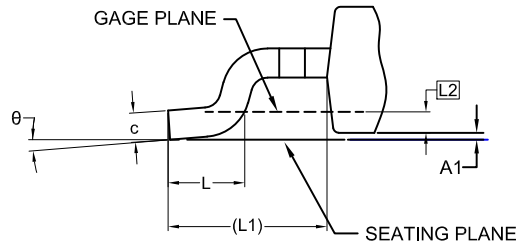


DPAK3 (TO-252 3 LD) CASE 369AS ISSUE A

DATE 28 SEP 2022

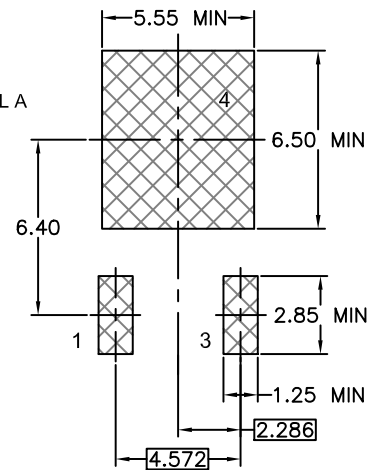
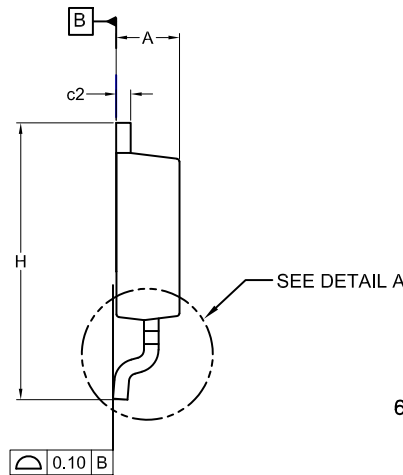
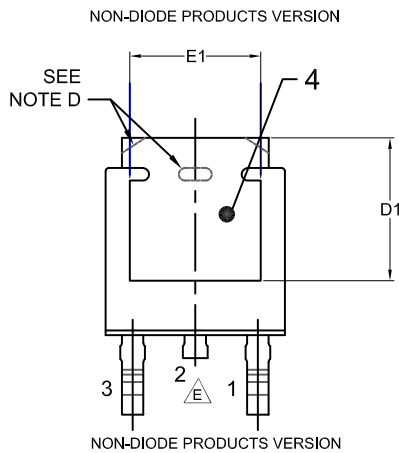


- NOTES: UNLESS OTHERWISE SPECIFIED
 A) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE C, VARIATION AA.
 B) ALL DIMENSIONS ARE IN MILLIMETERS.
 C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
 D) SUPPLIER DEPENDENT MOLD LOCKING HOLES OR CHAMFERED CORNERS OR EDGE PROTRUSION.
 E) FOR DIODE PRODUCTS, L4 IS 0.25 MM MAX.
 F) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
 G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A STD TO228P991X239-3N.



DETAIL A
(ROTATED -90°)
SCALE: 12X

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	2.18	2.29	2.39
A1	0.00	-	0.127
b	0.64	0.77	0.89
b2	0.76	0.95	1.14
b3	5.21	5.34	5.46
c	0.45	0.53	0.61
c2	0.45	0.52	0.58
D	5.97	6.10	6.22
D1	5.21	-	-
E	6.35	6.54	6.73
E1	4.32	-	-
e	2.286 BSC		
e1	4.572 BSC		
H	9.40	9.91	10.41
L	1.40	1.59	1.78
L1	2.90 REF		
L2	0.51 BSC		
L3	0.89	1.08	1.27
L4	-	-	1.02
θ	0°	--	10°



GENERIC MARKING DIAGRAM*



- XXXX = Specific Device Code
- A = Assembly Location
- Y = Year
- WW = Work Week
- ZZ = Assembly Lot Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb-free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

LAND PATTERN RECOMMENDATION

*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

DOCUMENT NUMBER:	98AON13810G	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	DPAK3 (TO-252 3 LD)	PAGE 1 OF 1

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the 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. onsemi does not convey any license under its patent rights nor the rights of others.

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-Marking.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.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales