

EcoSPARK® Ignition IGBT

20 mJ, 360 V, N-Channel Ignition IGBT

FGB3236-F085, FGI3236-F085

Features

- Industry Standard D²PAK Package
- SCIS Energy = 330 mJ at T_J = 25°C
- Logic Level Gate Drive
- AEC-Q101 Qualified and PPAP Capable
- RoHS Compliant

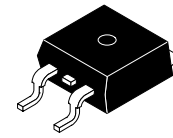
Applications

- Automotive Ignition Coil Driver Circuits
- Coil On Plug Applications

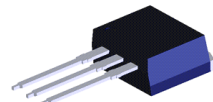
MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Value	Units
BV _{CER}	Collector to Emitter Breakdown Voltage (I _C = 1 mA)	360	V
BV _{ECS}	Emitter to Collector Voltage – Reverse Battery Condition (I _C = 10 mA)	24	V
ESCIS25	Self Clamping Inductive Switching Energy (I _{SCIS} = 14.7 A, L = 3.0 mH, T _J = 25°C)	320	mJ
ESCIS150	Self Clamping Inductive Switching Energy (I _{SCIS} = 10.4 A, L = 3.0 mH, T _J = 150°C)	160	mJ
I _{C25}	Collector Current Continuous at V _{GE} = 4.0 V, T _C = 25°C	44	A
I _{C110}	Collector Current Continuous at V _{GE} = 4.0 V, T _C = 110°C	27	A
V _{GEM}	Gate to Emitter Voltage Continuous	±10	V
P _D	Power Dissipation Total, at T _C = 25°C	187	W
	Power Dissipation Derating, for T _C > 25°C	1.25	W/°C
T _J	Operating Junction Temperature Range	–40 to +175	°C
T _{STG}	Storage Junction Temperature Range	–40 to +175	°C
T _L	Max. Lead Temperature for Soldering (Leads at 1.6 mm from case for 10 s)	300	°C
T _{PKG}	Max. Lead Temperature for Soldering (Package Body for 10 s)	260	°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.

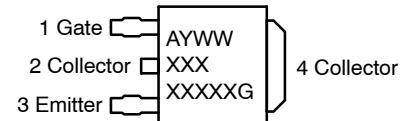


D²PAK-3
CASE 418AJ



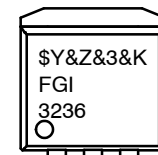
I2PAK (TO-262 3 LD)
CASE 418AV

MARKING DIAGRAM



A = Assembly Location
Y = Year
WW = Work Week
XXXX = Device Code
G = Pb-Free Package

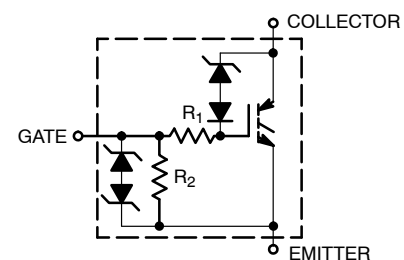
Collector (Flange)



Gate Emitter

\$Y = onsemi Logo
&Z = Assembly Plant Code
&3 = Numeric Date Code
&K = Lot Code
FGI3236 = Specific Device Code

SYMBOL



ORDERING INFORMATION

See detailed ordering and shipping information on page 3 of this data sheet.

FGB3236–F085, FGI3236–F085

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

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

OFF STATE CHARACTERISTICS

BV_{CER}	Collector to Emitter Breakdown Voltage	$I_{CE} = 2\text{ mA}$, $V_{GE} = 0\text{ V}$, $R_{GE} = 1\text{ k}\Omega$, see Figure 15 $T_J = -40\text{ to }150^\circ\text{C}$	330	363	390	V
BV_{CES}	Collector to Emitter Breakdown Voltage	$I_{CE} = 10\text{ mA}$, $V_{GE} = 0\text{ V}$, $R_{GE} = 0$, $T_J = -40\text{ to }150^\circ\text{C}$	350	378	410	V
BV_{ECS}	Emitter to Collector Breakdown Voltage	$I_{CE} = -75\text{ mA}$, $V_{GE} = 0\text{ V}$, $T_J = 25^\circ\text{C}$	30	–	–	V
BV_{GES}	Gate to Emitter Breakdown Voltage	$I_{GES} = \pm 2\text{ mA}$	± 12	± 14	–	V
I_{CES}	Collector to Emitter Leakage Current	$V_{CES} = 250\text{ V}$, see Figure 11	$T_J = 25^\circ\text{C}$	–	–	25 μA
			$T_J = 150^\circ\text{C}$	–	–	1 mA
I_{ECS}	Emitter to Collector Leakage Current	$V_{EC} = 24\text{ V}$, see Figure 11	$T_J = 25^\circ\text{C}$	–	–	1 mA
			$T_J = 150^\circ\text{C}$	–	–	40
R_1	Series Gate Resistance		–	120	–	Ω
R_2	Gate to Emitter Resistance		10K	–	30K	Ω

ON STATE CHARACTERISTICS

$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	$I_{CE} = 6\text{ A}$, $V_{GE} = 4\text{ V}$, $T_C = 25^\circ\text{C}$, see Figure 3	–	1.14	1.4	V
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	$I_{CE} = 10\text{ A}$, $V_{GE} = 4.5\text{ V}$, $T_C = 150^\circ\text{C}$, see Figure 4	–	1.32	1.7	V
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	$I_{CE} = 15\text{ A}$, $V_{GE} = 4.5\text{ V}$, $T_C = 150^\circ\text{C}$	–	1.61	2.05	V
$I_{CE(ON)}$	Collector to Emitter On State Current	$V_{GE} = 5\text{ V}$, $V_{CE} = 5\text{ V}$	50	–	–	A

DYNAMIC CHARACTERISTICS

$Q_{G(ON)}$	Gate Charge	$I_{CE} = 10\text{ A}$, $V_{CE} = 12\text{ V}$, $V_{GE} = 5\text{ V}$, see Figure 14	–	20	–	nC
$V_{GE(TH)}$	Gate to Emitter Threshold Voltage	$I_{CE} = 1\text{ mA}$, $V_{CE} = V_{GE}$, see Figure 10	$T_C = 25^\circ\text{C}$	1.3	1.6	2.2 V
			$T_C = 150^\circ\text{C}$	0.75	1.1	1.8
V_{GEP}	Gate to Emitter Plateau Voltage	$V_{CE} = 12\text{ V}$, $I_{CE} = 10\text{ A}$	–	2.6	–	V

SWITCHING CHARACTERISTICS

$t_{d(ON)R}$	Current Turn–On Delay Time–Resistive	$V_{CE} = 14\text{ V}$, $R_L = 1\text{ }\Omega$, $V_{GE} = 5\text{ V}$, $R_G = 1\text{ k}\Omega$, $T_J = 25^\circ\text{C}$, see Figure 12	–	0.65	4	μs
t_{rR}	Current Rise Time–Resistive		–	1.7	7	
$t_{d(OFF)L}$	Current Turn–Off Delay Time–Inductive	$V_{CE} = 300\text{ V}$, $L = 500\text{ }\mu\text{H}$, $V_{GE} = 5\text{ V}$, $R_G = 1\text{ k}\Omega$, $T_J = 25^\circ\text{C}$, see Figure 12	–	5.4	15	
t_{fL}	Current Fall Time–Inductive		–	1.64	15	
SCIS	Self Clamped Inductive Switching	$T_J = 25^\circ\text{C}$, $L = 3.0\text{ mH}$, $I_{CE} = 14.7\text{ A}$, $V_{GE} = 5\text{ V}$, $R_G = 1\text{ k}\Omega$, see Figures 1 & 2	–	–	320	mJ

THERMAL CHARACTERISTICS

$R_{\theta JC}$	Thermal Resistance Junction to Case	All Packages	–	–	0.8	$^\circ\text{C/W}$
-----------------	-------------------------------------	--------------	---	---	-----	--------------------

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.

FGB3236–F085, FGI3236–F085

PACKAGE MARKING AND ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
FGB3236–F085	FGB3236	D ² PAK (Pb–Free)	800 units / Tape & Reel
FGB3236–F085C	FGB3236	D ² PAK (Pb–Free)	800 units / Tape & Reel
FGI3236–F085	FGI3236	I2PAK (TO–262 3 LD) (Pb–Free)	400 units / Tube

[†]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 PERFORMANCE CHARACTERISTICS

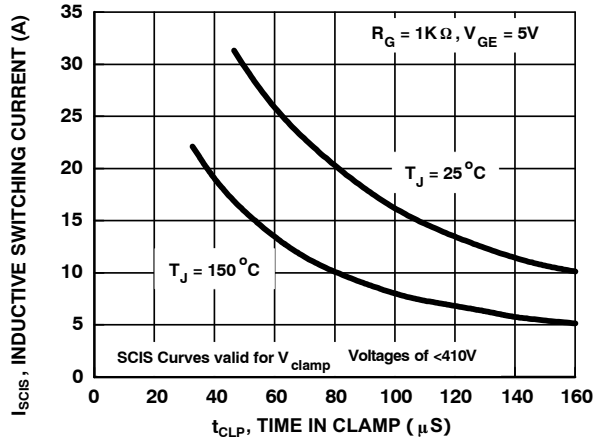


Figure 1. Self Clamped Inductive Switching Current vs. Time in Clamp

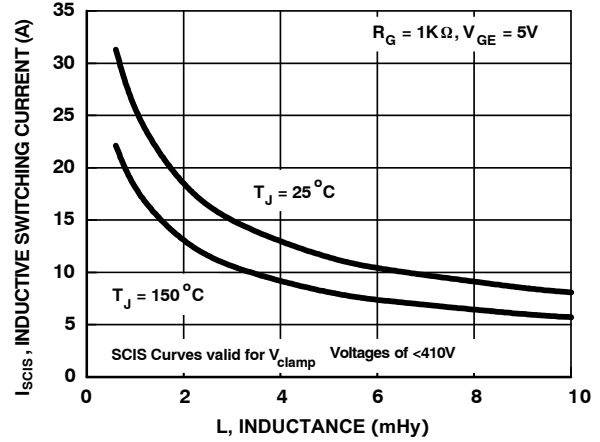


Figure 2. Self Clamped Inductive Switching Current vs. Inductance

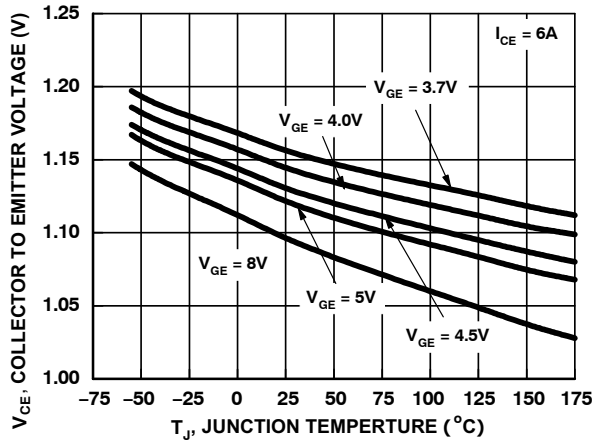


Figure 3. Collector to Emitter On-State Voltage vs. Junction Temperature

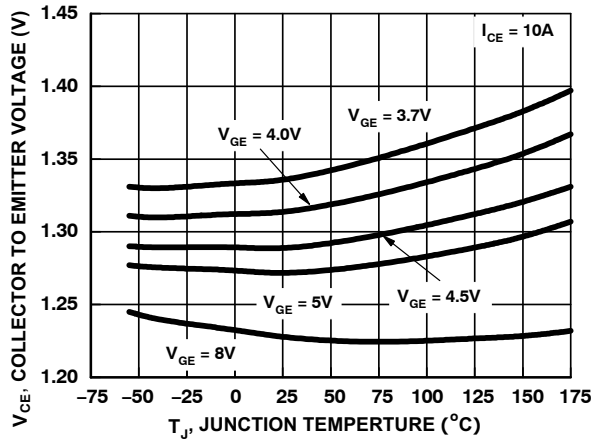


Figure 4. Collector to Emitter On-State Voltage vs. Junction Temperature

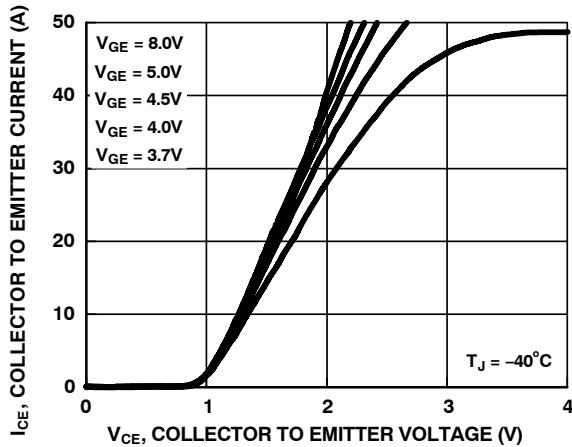


Figure 5. Collector to Emitter On-State Voltage vs. Collector Current

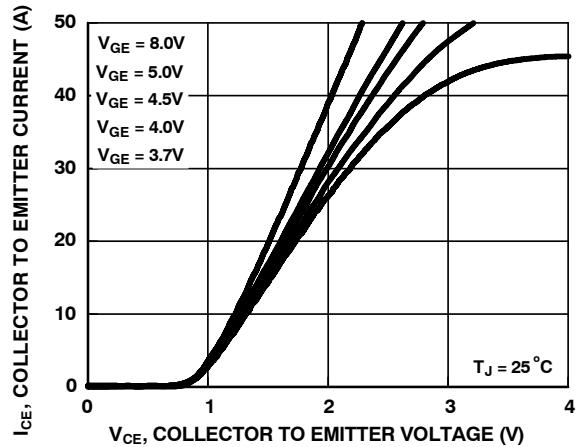


Figure 6. Collector to Emitter On-State Voltage vs. Collector Current

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

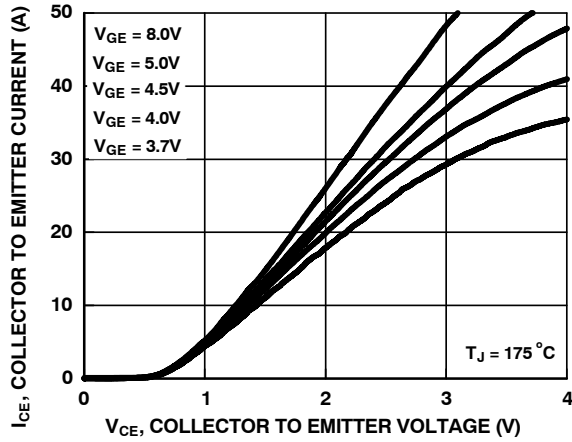


Figure 7. Collector to Emitter On-State Voltage vs. Collector Current

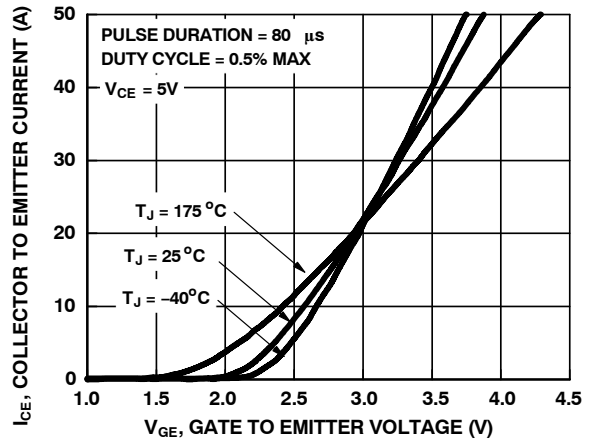


Figure 8. Transfer Characteristics

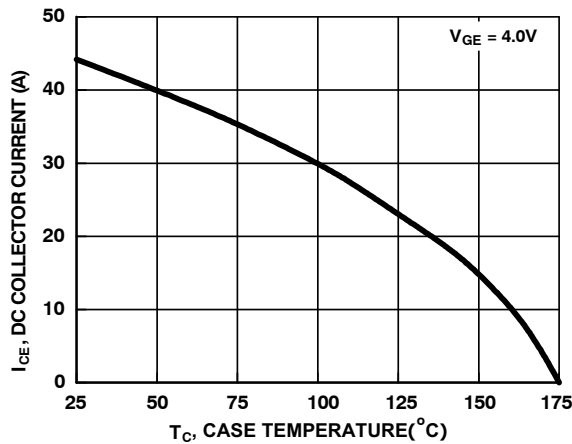


Figure 9. DC Collector Current vs. Case Temperature

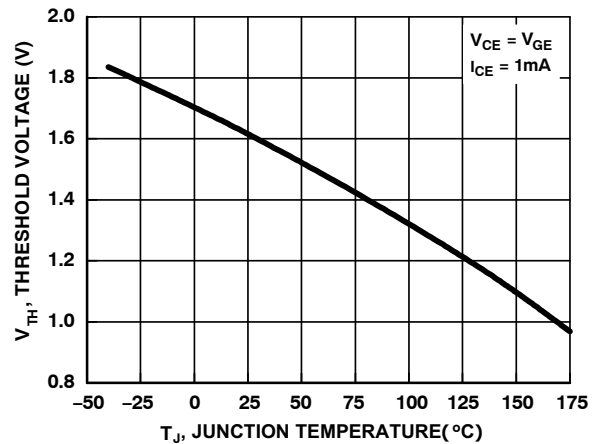


Figure 10. Threshold Voltage vs. Junction Temperature

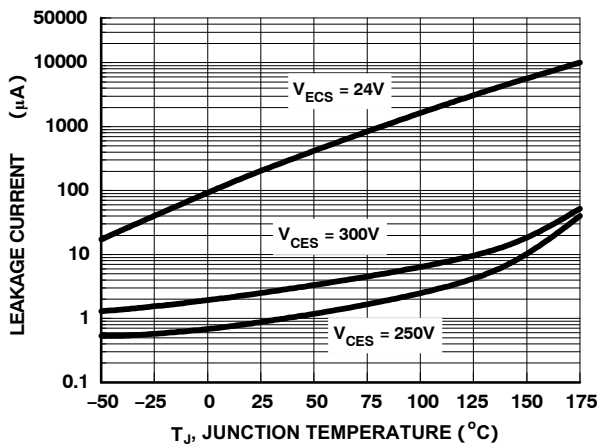


Figure 11. Leakage Current vs. Junction Temperature

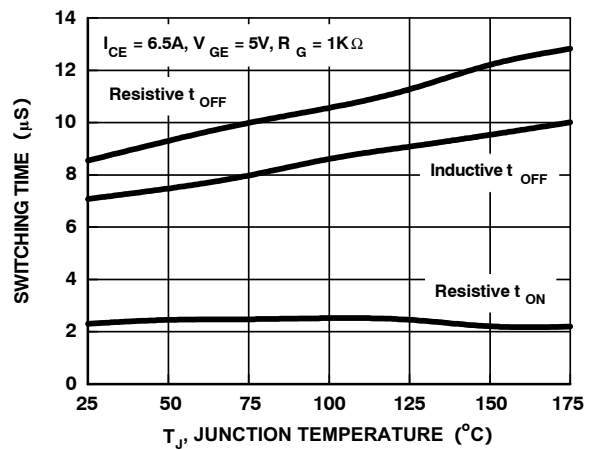


Figure 12. Switching Time vs. Junction Temperature

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

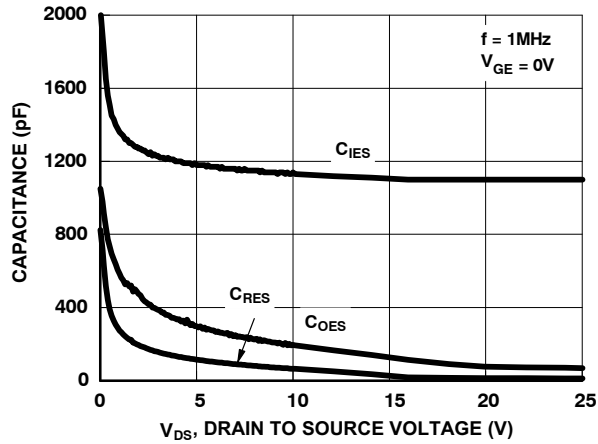


Figure 13. Capacitance vs. Collector to Emitter Voltage

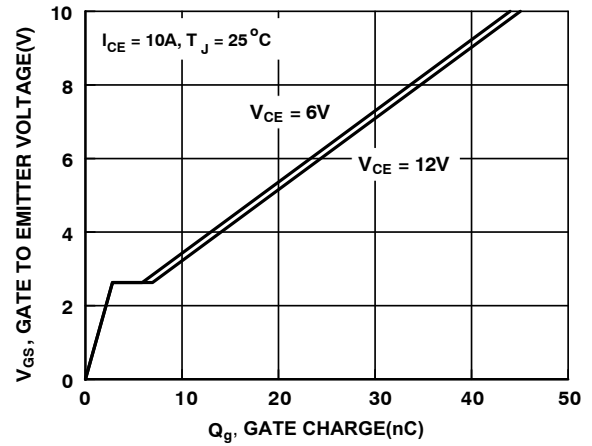


Figure 14. Gate Charge

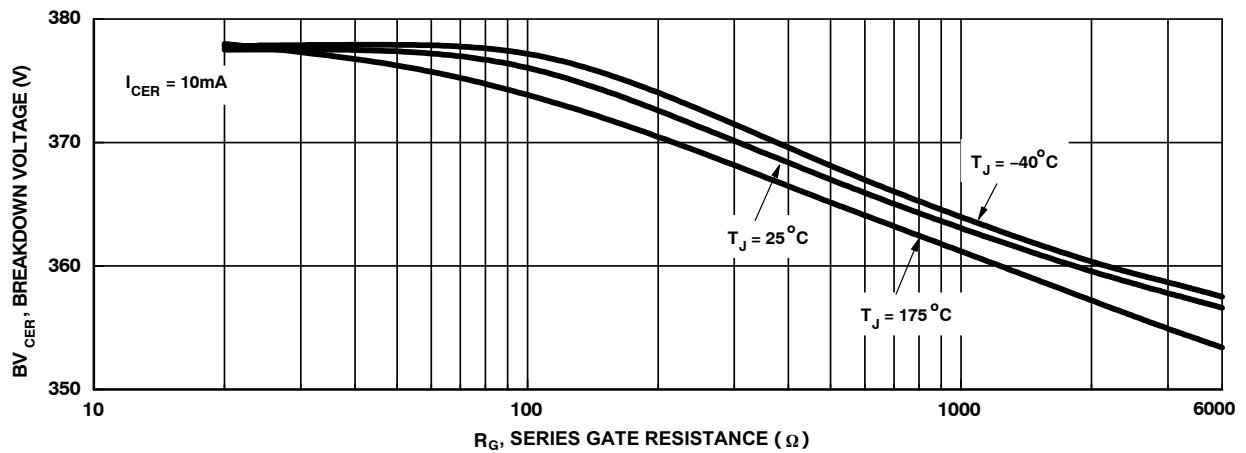


Figure 15. Break Down Voltage vs. Series Gate Resistance

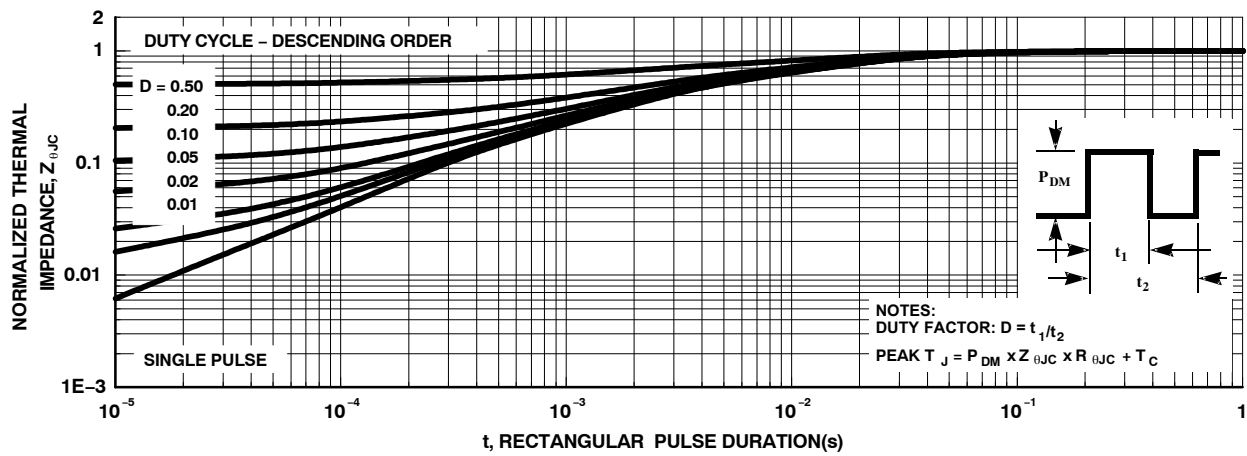


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

TEST CIRCUIT AND WAVEFORMS

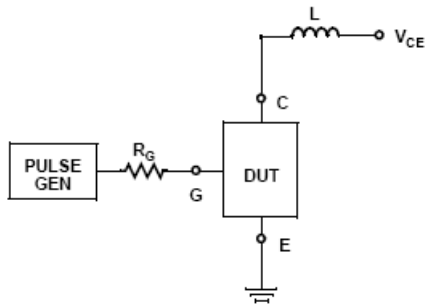


Figure 17. Inductive Switching Test Circuit

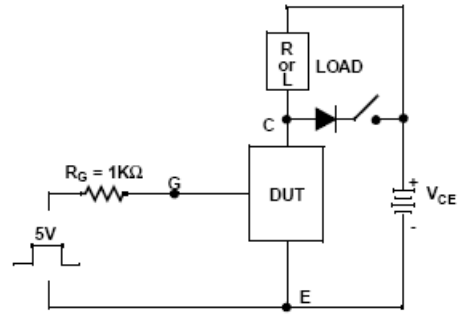


Figure 18. t_{ON} and t_{OFF} Switching Test Circuit

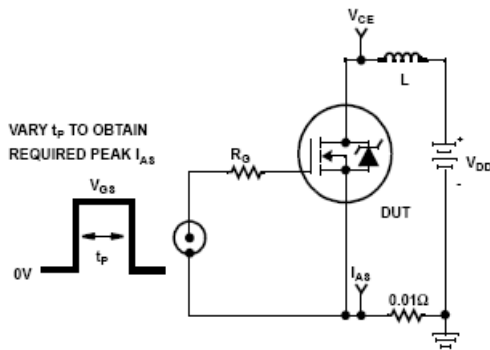


Figure 19. Energy Test Circuit

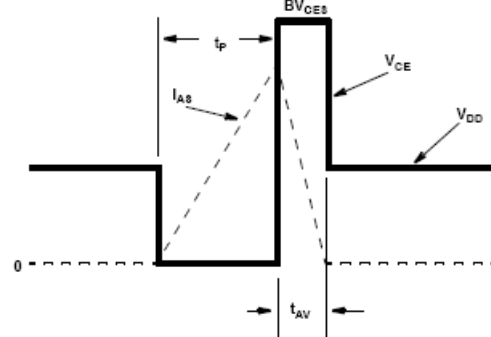
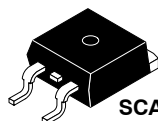


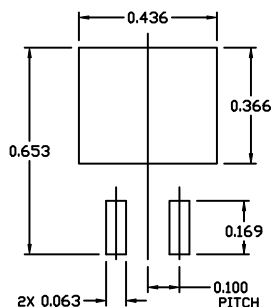
Figure 20. Energy Waveforms



SCALE 1:1

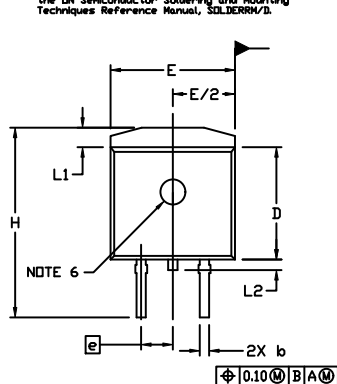
D²PAK-3 (TO-263, 3-LEAD)
CASE 418AJ
ISSUE F

DATE 11 MAR 2021



**RECOMMENDED
MOUNTING FOOTPRINT**

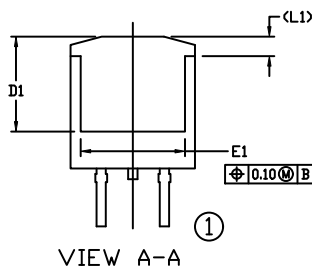
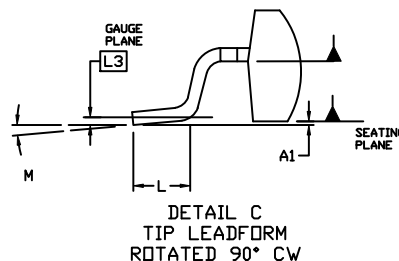
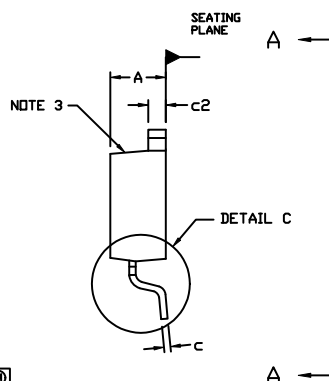
For additional information on our Pb-free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



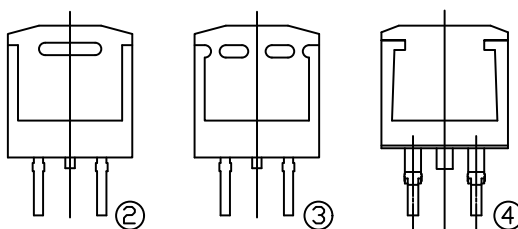
NOTES:

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. ①, ② ... 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°

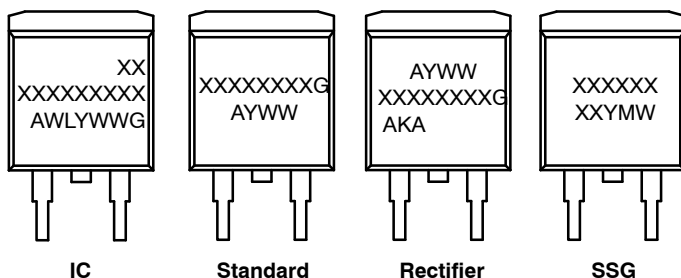


VIEW A-A



VIEW A-A
OPTIONAL CONSTRUCTIONS

GENERIC MARKING DIAGRAMS*

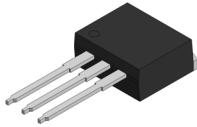


XXXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
W = Week Code (SSG)
M = Month Code (SSG)
G = Pb-Free Package
AKA = Polarity Indicator

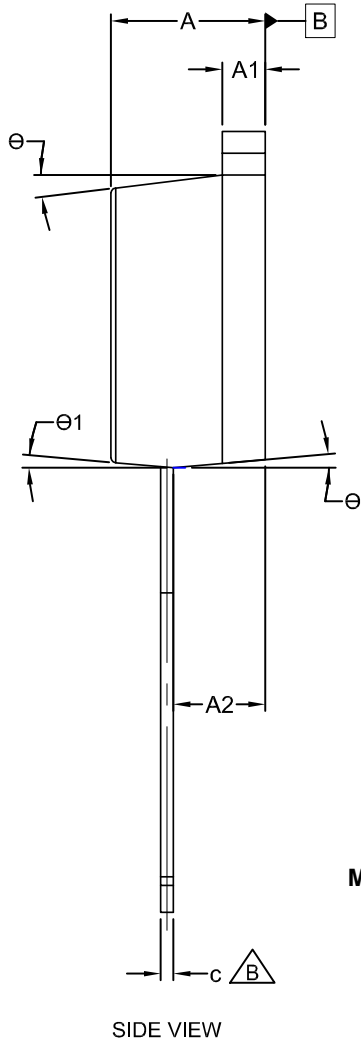
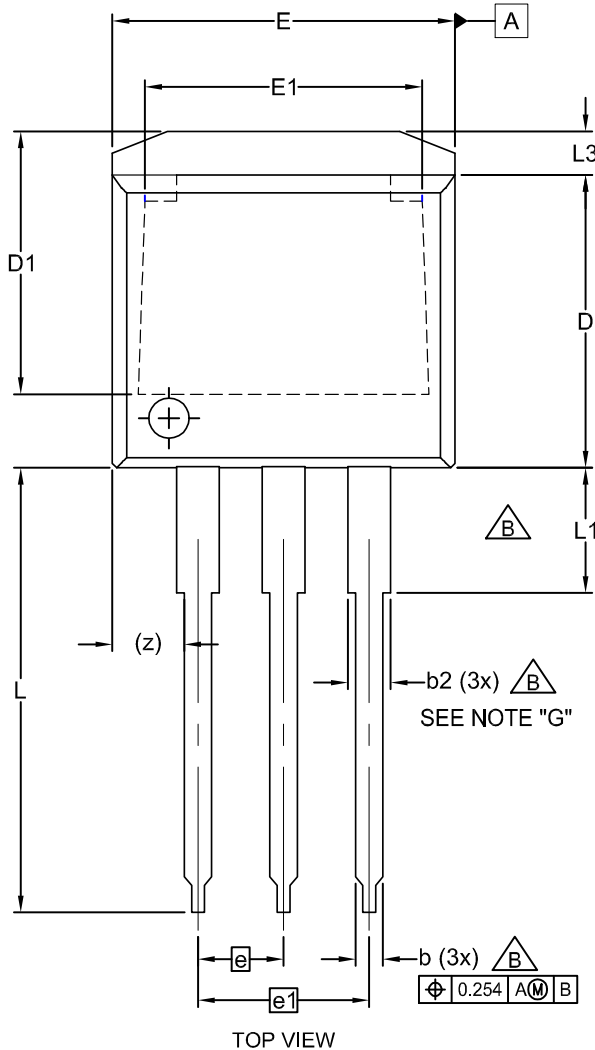
*This information is generic. Please refer to device data sheet for actual part marking. Pb-free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

DOCUMENT NUMBER:	98AON56370E	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	D²PAK-3 (TO-263, 3-LEAD)	PAGE 1 OF 1

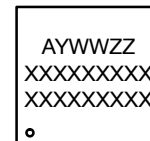
onsemi and Onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding 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.


I2PAK (TO-262 3 LD)
CASE 418AV
ISSUE A

DATE 30 AUG 2022



DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.06	4.45	4.83
A1	1.14	1.27	1.40
A2	2.03	2.41	2.79
b	0.64	0.77	0.90
b2	1.14	1.46	1.78
c	0.33	0.49	0.64
D	8.64	9.15	9.65
D1	6.86	7.37	7.88
E	9.65	9.97	10.29
E1	6.22	7.28	8.33
e	2.54 BSC		
e1	5.08 BSC		
L	12.70	13.72	14.73
L1	2.80	3.38	3.96
L3	1.00	1.20	1.40
z	2.13 REF		
θ	0°	--	7°
θ1	0°	--	5°

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.

NOTES:

- EXCEPT WHERE NOTED CONFORMS TO T262 JEDEC VARIATION AA.
- DOES NOT COMPLY JEDEC STD. VALUE.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- DIMENSION AND TOLERANCE AS PER ANSI Y14.5-1994.
- LOCATION OF PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF PACKAGE)
- MAXIMUM WIDTH FOR F102 DEVICE = 1.35 MAX.

DOCUMENT NUMBER:	98AON13814G	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	I2PAK (TO-262 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

Mouser Electronics

Authorized Distributor

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

[onsemi:](#)

[FGB3236-F085](#) [FGI3236-F085](#) [FGB3236-F085C](#)