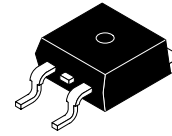


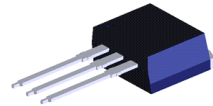
# EcoSPARK<sup>®</sup> Ignition IGBT

## 20 mJ, 360 V, N-Channel Ignition IGBT

### FGB3236-F085, FGI3236-F085



D<sup>2</sup>PAK-3  
CASE 418AJ



I2PAK (TO-262 3 LD)  
CASE 418AV

#### Features

- Industry Standard D<sup>2</sup>PAK Package
- SCIS Energy = 330 mJ at T<sub>J</sub> = 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<sub>A</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Value	Units
BV <sub>CER</sub>	Collector to Emitter Breakdown Voltage (I <sub>C</sub> = 1 mA)	360	V
BV <sub>ECS</sub>	Emitter to Collector Voltage – Reverse Battery Condition (I <sub>C</sub> = 10 mA)	24	V
E <sub>SCIS25</sub>	Self Clamping Inductive Switching Energy (I <sub>SCIS</sub> = 14.7 A, L = 3.0 mH, T <sub>J</sub> = 25°C)	320	mJ
E <sub>SCIS150</sub>	Self Clamping Inductive Switching Energy (I <sub>SCIS</sub> = 10.4 A, L = 3.0 mH, T <sub>J</sub> = 150°C)	160	mJ
I <sub>C25</sub>	Collector Current Continuous at V <sub>GE</sub> = 4.0 V, T <sub>C</sub> = 25°C	44	A
I <sub>C110</sub>	Collector Current Continuous at V <sub>GE</sub> = 4.0 V, T <sub>C</sub> = 110°C	27	A
V <sub>GEM</sub>	Gate to Emitter Voltage Continuous	±10	V
P <sub>D</sub>	Power Dissipation Total, at T <sub>C</sub> = 25°C	187	W
	Power Dissipation Derating, for T <sub>C</sub> > 25°C	1.25	W/°C
T <sub>J</sub>	Operating Junction Temperature Range	-40 to +175	°C
T <sub>STG</sub>	Storage Junction Temperature Range	-40 to +175	°C
T <sub>L</sub>	Max. Lead Temperature for Soldering (Leads at 1.6 mm from case for 10 s)	300	°C
T <sub>PKG</sub>	Max. Lead Temperature for Soldering (Package Body for 10 s)	260	°C
ESD	Electrostatic Discharge Voltage at 100 pF, 1500 Ω	4	kV

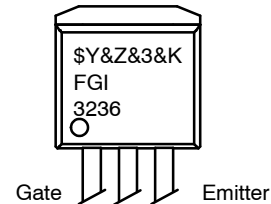
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

#### MARKING DIAGRAM



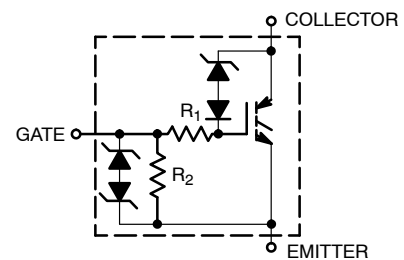
- A = Assembly Location
- Y = Year
- WW = Work Week
- XXXX = Device Code
- G = Pb-Free Package

Collector (Flange)



- \$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
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### 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	$I_{GES} = \pm 2\text{ mA}$	$\pm 12$	$\pm 14$	-	V	
$I_{CES}$	Collector to Emitter Leakage Current	$V_{CES} = 250\text{ V}$ , see Figure 11	$T_J = 25^\circ\text{C}$	-	-	25	$\mu\text{A}$
			$T_J = 150^\circ\text{C}$	-	-	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	-	$\Omega$	
$R_2$	Gate to Emitter Resistance		10K	-	30K	$\Omega$	

### 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	$\mu\text{s}$
$t_{rR}$	Current Rise Time-Resistive		-	1.7	7	
$t_{d(OFF)L}$	Current Turn-Off Delay Time-Inductive	$V_{CE} = 300\text{ V}$ , $L = 500\text{ }\mu\text{Hy}$ , $V_{GE} = 5\text{ V}$ , $R_G = 1\text{ k}\Omega$ , $T_J = 25^\circ\text{C}$ , see Figure 12	-	5.4	15	
$t_{fL}$	Current Fall Time-Inductive		-	1.64	15	
SCIS	Self Clamped Inductive Switching	$T_J = 25^\circ\text{C}$ , $L = 3.0\text{ mHy}$ , $I_{CE} = 14.7\text{ A}$ , $V_{GE} = 5\text{ V}$ , $R_G = 1\text{ k}\Omega$ , see Figures 1 & 2	-	-	320	mJ

### THERMAL CHARACTERISTICS

$R_{\theta JC}$	Thermal Resistance Junction to Case	All Packages	-	-	0.8	$^\circ\text{C/W}$
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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 <sup>†</sup>
FGB3236-F085	FGB3236	D <sup>2</sup> PAK (Pb-Free)	800 units / Tape & Reel
FGB3236-F085C	FGB3236	D <sup>2</sup> PAK (Pb-Free)	800 units / Tape & Reel
FGI3236-F085	FGI3236	I2PAK (TO-262 3 LD) (Pb-Free)	400 units / Tube

<sup>†</sup>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

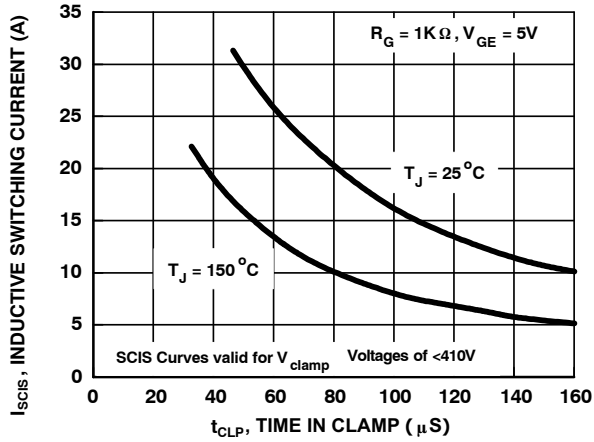


Figure 1. Self Clamped Inductive Switching Current vs. Time in Clamp

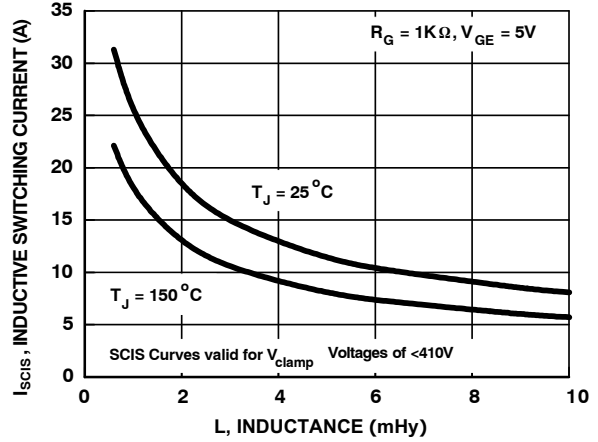


Figure 2. Self Clamped Inductive Switching Current vs. Inductance

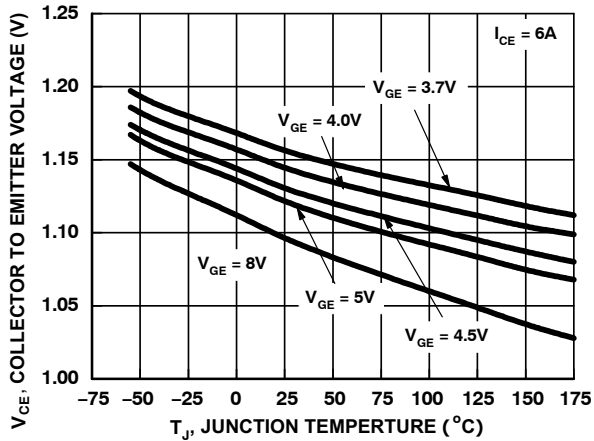


Figure 3. Collector to Emitter On-State Voltage vs. Junction Temperature

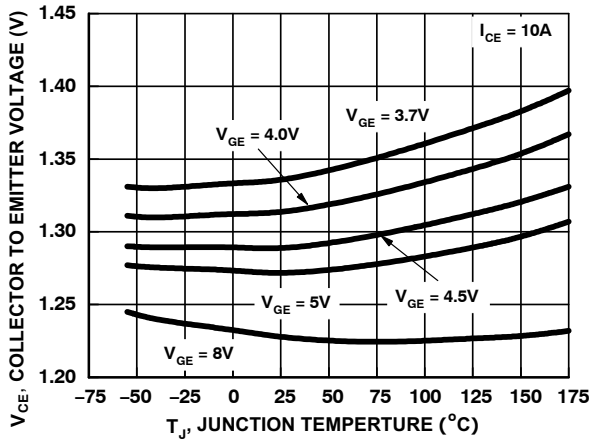


Figure 4. Collector to Emitter On-State Voltage vs. Junction Temperature

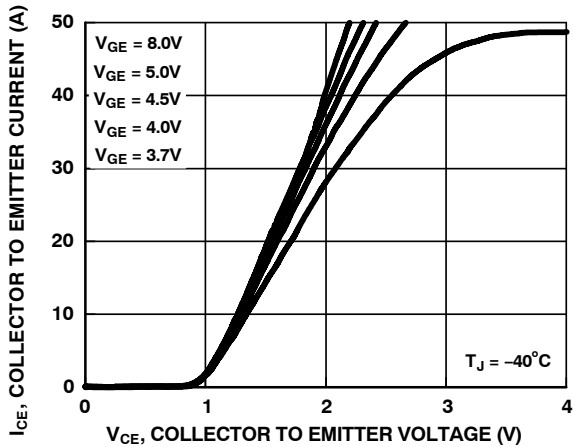


Figure 5. Collector to Emitter On-State Voltage vs. Collector Current

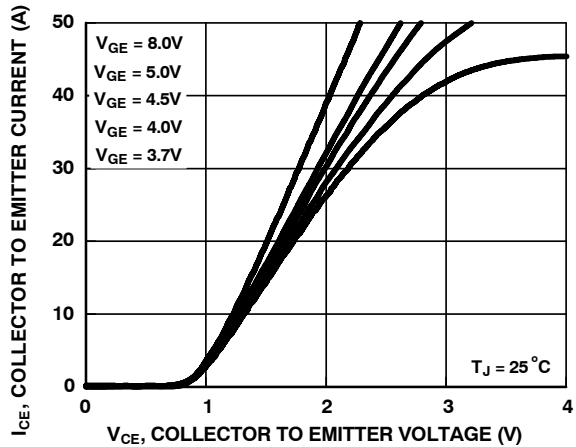


Figure 6. Collector to Emitter On-State Voltage vs. Collector Current

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

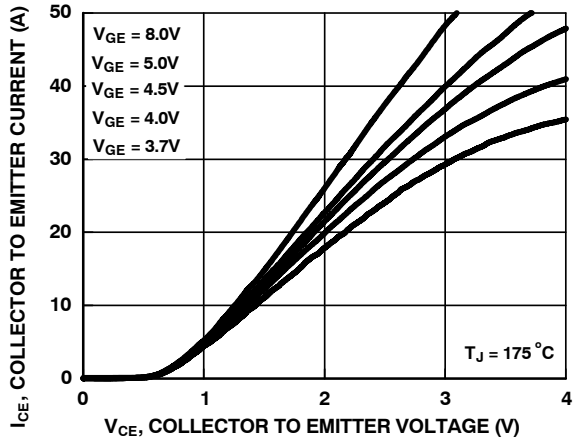


Figure 7. Collector to Emitter On-State Voltage vs. Collector Current

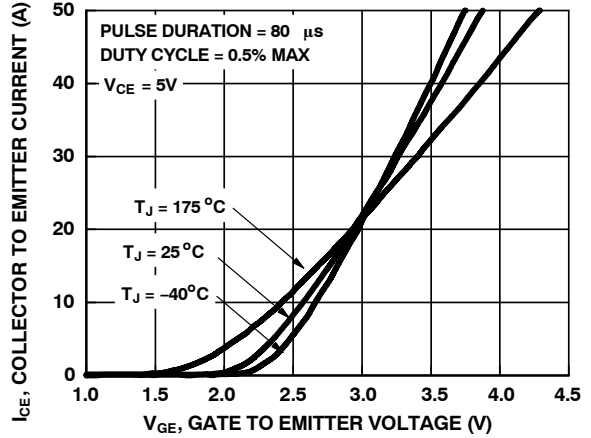


Figure 8. Transfer Characteristics

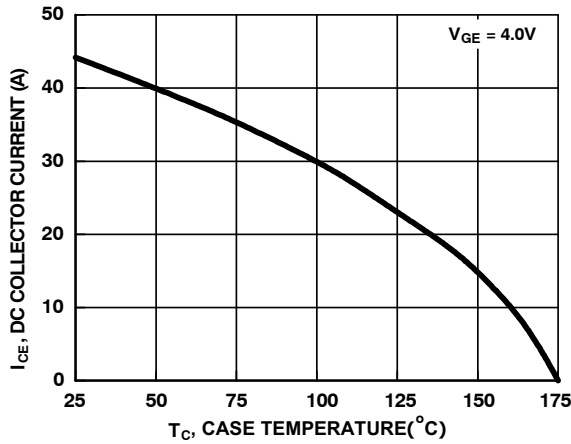


Figure 9. DC Collector Current vs. Case Temperature

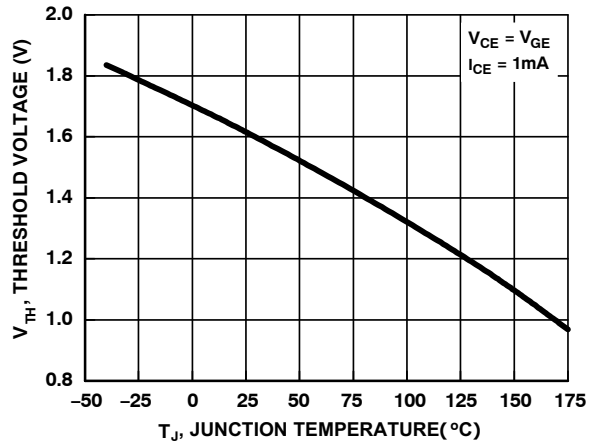


Figure 10. Threshold Voltage vs. Junction Temperature

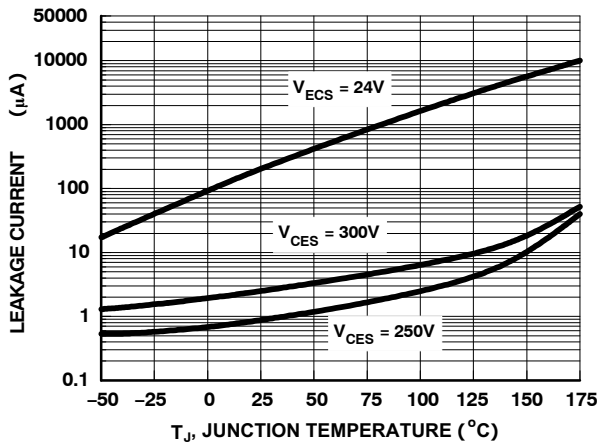


Figure 11. Leakage Current vs. Junction Temperature

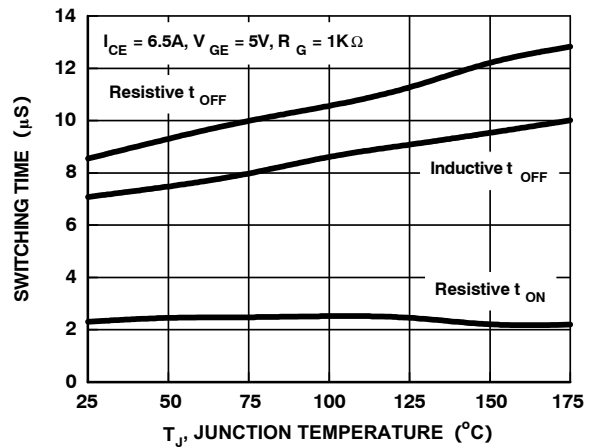


Figure 12. Switching Time vs. Junction Temperature

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

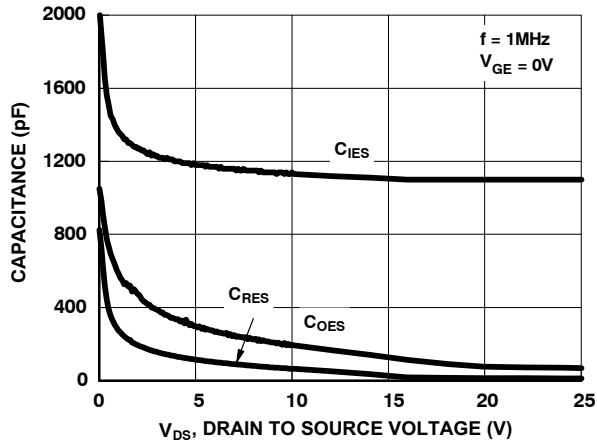


Figure 13. Capacitance vs. Collector to Emitter Voltage

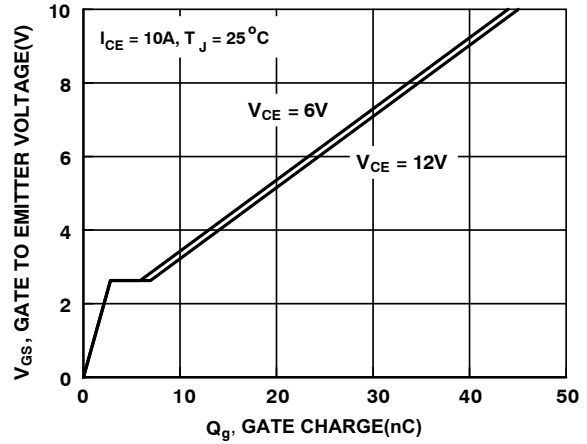


Figure 14. Gate Charge

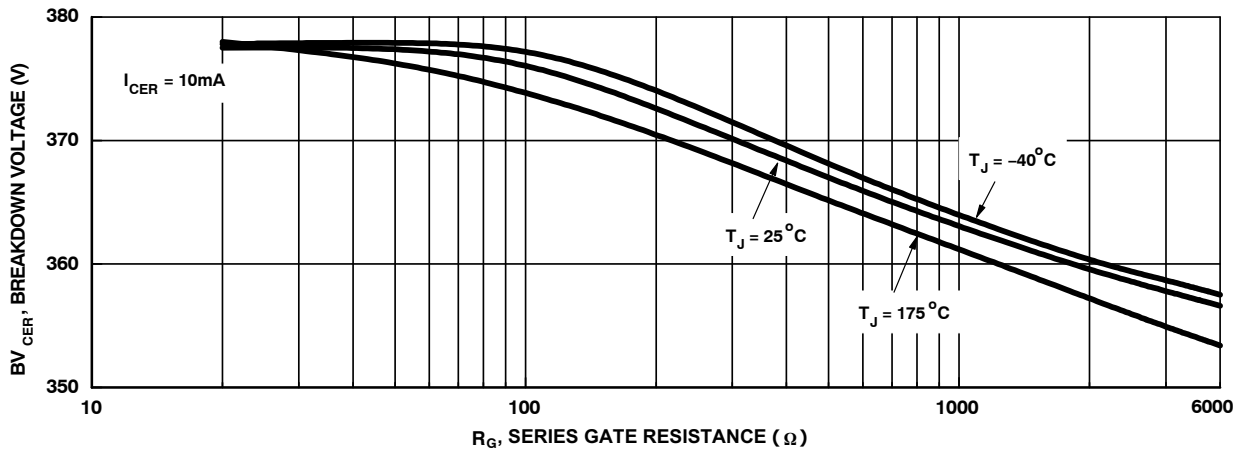


Figure 15. Break Down Voltage vs. Series Gate Resistance

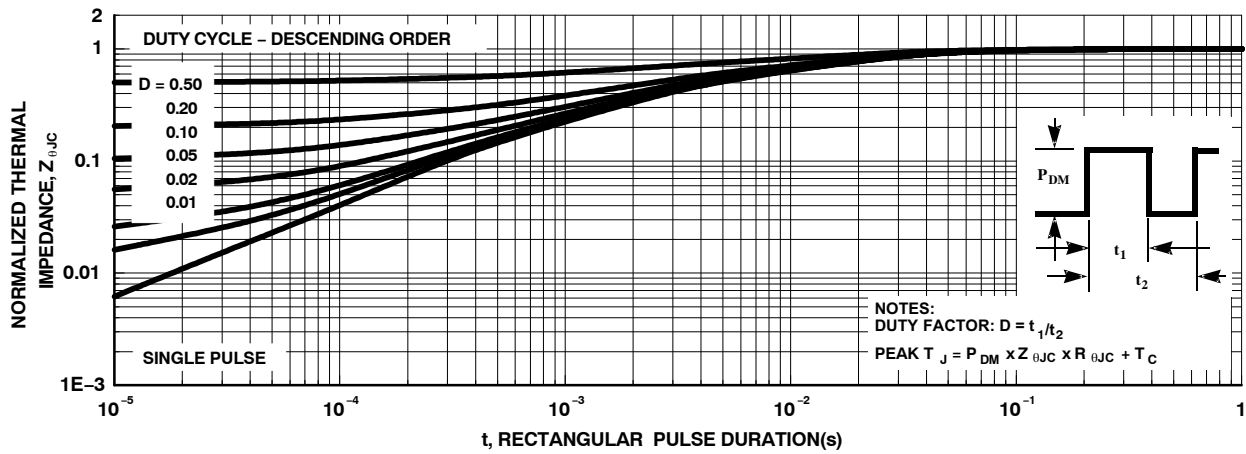


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

TEST CIRCUIT AND WAVEFORMS

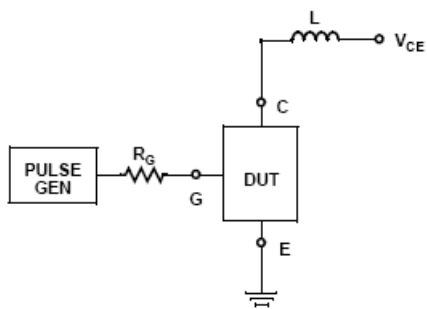


Figure 17. Inductive Switching Test Circuit

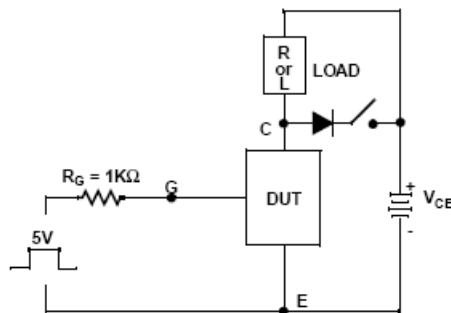


Figure 18.  $t_{ON}$  and  $t_{OFF}$  Switching Test Circuit

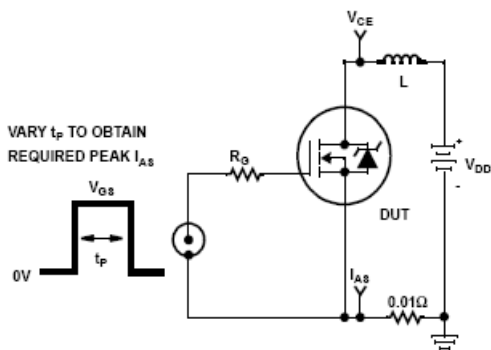


Figure 19. Energy Test Circuit

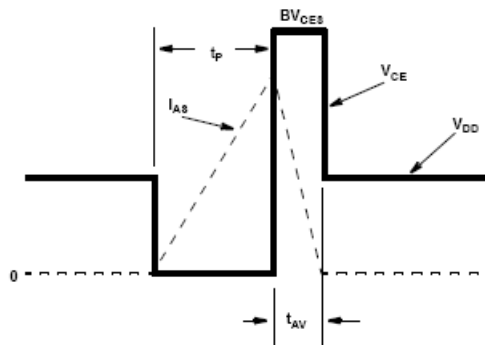
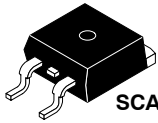


Figure 20. Energy Waveforms

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



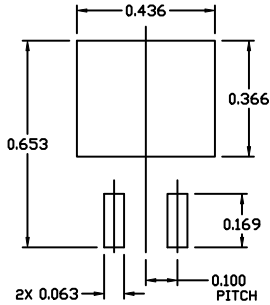
SCALE 1:1

### D<sup>2</sup>PAK-3 (TO-263, 3-LEAD)

#### CASE 418AJ

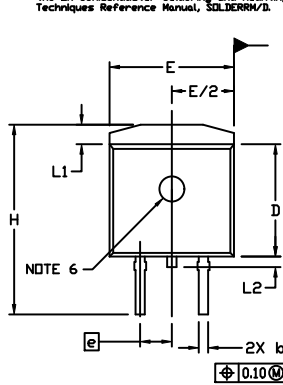
#### ISSUE F

DATE 11 MAR 2021



#### RECOMMENDED MOUNTING FOOTPRINT

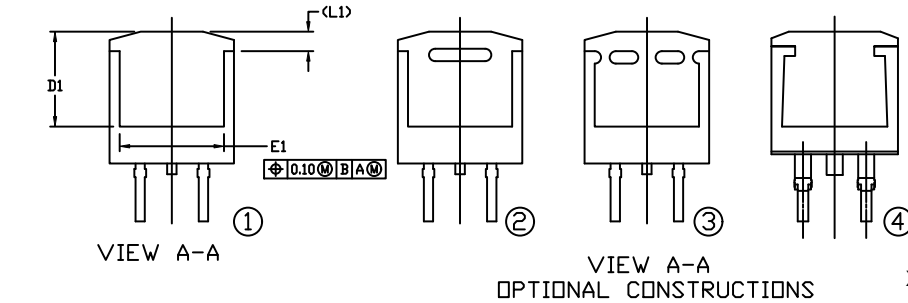
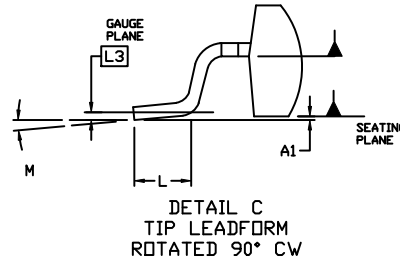
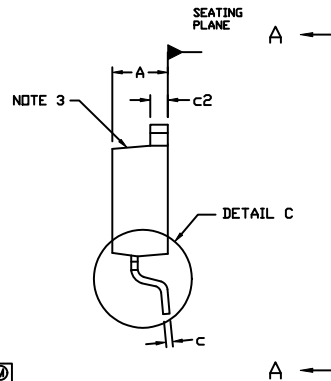
■ For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



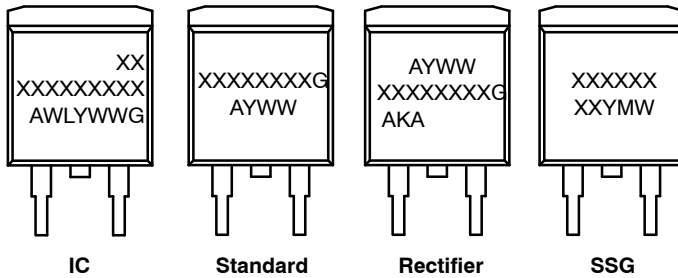
#### NOTES:

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. Ⓛ, Ⓞ ... 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*



#### 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

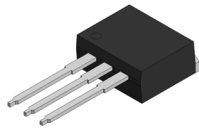
\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

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:	D <sup>2</sup> PAK-3 (TO-263, 3-LEAD)	PAGE 1 OF 1

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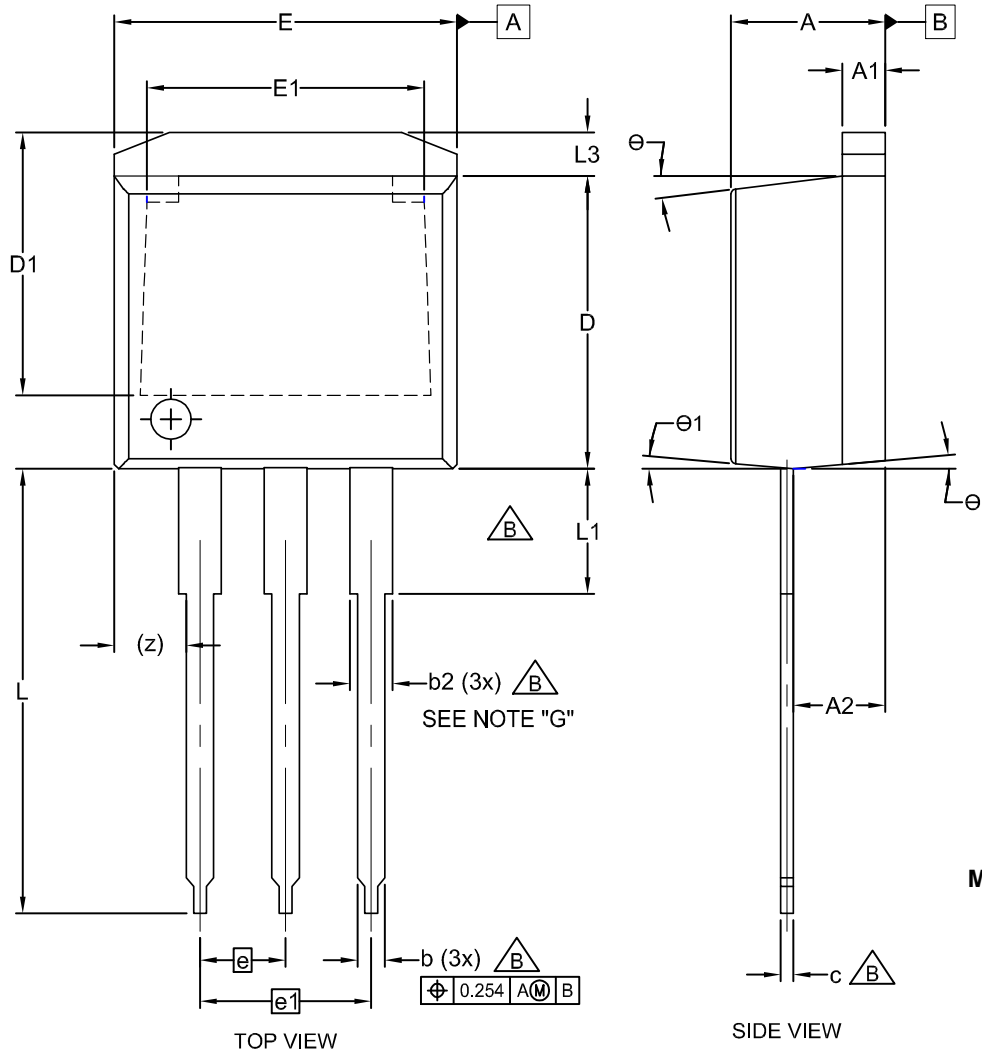


# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



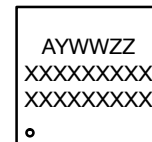
I2PAK (TO-262 3 LD)  
CASE 418AV  
ISSUE A

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:

- A. EXCEPT WHERE NOTED CONFORMS TO TO262 JEDEC VARIATION AA.
- B. DOES NOT COMPLY JEDEC STD. VALUE.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- E. DIMENSION AND TOLERANCE AS PER ANSI Y14.5-1994.
- F. LOCATION OF PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF PACKAGE)
- G. MAXIMUM WIDTH FOR F102 DEVICE = 1.35 MAX.

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<b>DESCRIPTION:</b>	<b>I2PAK (TO-262 3 LD)</b>	<b>PAGE 1 OF 1</b>

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