

# FGD2736G3-F085V

## EcoSPARK<sup>®</sup> 3 Ignition IGBT

270 mJ, 360 V, N-Channel Ignition IGBT

### Features

- SCIS Energy = 270 mJ at  $T_J = 25^\circ\text{C}$
- Logic Level Gate Drive
- Low Saturation Voltage
- RoHS Compliant
- AEC-Q101 Qualified and PPAP Capable

### Applications

- Automotive Ignition Coil Driver Circuits
- High Current Ignition System
- Coil on Plug Applications

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

Symbol	Parameter	Value	Units
$BV_{CER}$	Collector-to-Emitter Breakdown Voltage ( $I_C = 1\text{ mA}$ )	360	V
$BV_{ECS}$	Emitter-to-Collector Voltage - Reverse Battery Condition ( $I_C = 10\text{ mA}$ )	28	V
$E_{SCIS25}$	ISCIS = 13.4 A, L = 3.0 mHy, $R_{GE} = 1\text{ K}\Omega$ $T_C = 25^\circ\text{C}$ (Note 1)	270	mJ
$E_{SCIS150}$	ISCIS = 10.8 A, L = 3.0 mHy, $R_{GE} = 1\text{ K}\Omega$ $T_C = 150^\circ\text{C}$ (Note 2)	170	mJ
$I_{C25}$	Collector Current Continuous at $V_{GE} = 5.0\text{ V}$ , $T_C = 25^\circ\text{C}$	37.5	A
$I_{C110}$	Collector Current Continuous at $V_{GE} = 5.0\text{ V}$ , $T_C = 110^\circ\text{C}$	24.3	A
$V_{GEM}$	Gate-to-Emitter Voltage Continuous	$\pm 10$	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/ $^\circ\text{C}$
$T_J/T_{STG}$	Operating Junction and Storage Temperature Range	-40 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 $\Omega$	4	kV
	CDM - Electrostatic Discharge Voltage at 1 $\Omega$	2	kV

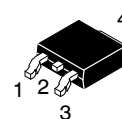
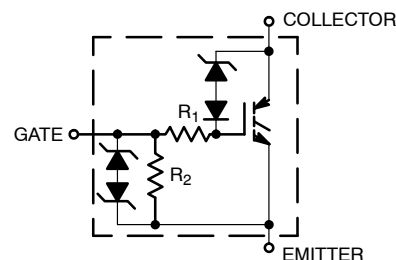
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Self clamped inductive Switching Energy ( $E_{SCIS25}$ ) of 270 mJ is based on the test conditions that is starting  $T_J = 25^\circ\text{C}$ , L = 3 mHy, ISCIS = 13.4 A, VCC = 100 V during inductor charging and VCC = 0 V during time in clamp.
2. Self Clamped inductive Switching Energy ( $E_{SCIS150}$ ) of 170 mJ is based on the test conditions that is starting  $T_J = 150^\circ\text{C}$ , L = 3mHy, ISCIS = 10.8 A, VCC = 100 V during inductor charging and VCC = 0 V during time in clamp.



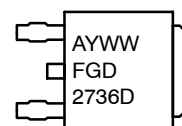
ON Semiconductor<sup>®</sup>

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DPAK (SINGLE GAUGE)  
CASE 369C

### MARKING DIAGRAM



A = Assembly Location  
Y = Year  
WW = Work Week  
FGD2736D = Device Code

### ORDERING INFORMATION

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

# FGD2736G3–F085V

## THERMAL RESISTANCE RATINGS

Characteristic	Symbol	Max	Units
Junction-to-Case – Steady State (Drain)	$R_{\theta JC}$	1.1	°C/W

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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### OFF CHARACTERISTICS

$BV_{CER}$	Collector-to-Emitter Breakdown Voltage	$I_{CE} = 2\text{ mA}$ , $V_{GE} = 0\text{ V}$ , $R_{GE} = 1\text{ k}\Omega$ , $T_J = -40\text{ to }150^\circ\text{C}$	330	–	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	–	410	V	
$BV_{ECS}$	Emitter-to-Collector Breakdown Voltage	$I_{CE} = -75\text{ mA}$ , $V_{GE} = 0\text{ V}$ , $T_J = 25^\circ\text{C}$	28	–	–	V	
$BV_{GES}$	Gate-to-Emitter Breakdown Voltage	$I_{GES} = \pm 2\text{ mA}$	$\pm 11$	$\pm 14$	–	V	
$I_{CER}$	Collector-to-Emitter Leakage Current	$V_{CE} = 175\text{ V}$ $R_{GE} = 1\text{ k}\Omega$	$T_J = 25^\circ\text{C}$	–	–	25	$\mu\text{A}$
			$T_J = 150^\circ\text{C}$	–	–	1	mA
$I_{ECS}$	Emitter-to-Collector Leakage Current	$V_{EC} = 24\text{ V}$	$T_J = 25^\circ\text{C}$	–	–	1	mA
			$T_J = 150^\circ\text{C}$	–	–	40	
$R_1$	Series Gate Resistance		–	110	–	$\Omega$	
$R_2$	Gate-to-Emitter Resistance		10K	–	30K	$\Omega$	

### ON CHARACTERISTICS

$V_{CE(SAT)}$	Collector-to-Emitter Saturation Voltage	$I_{CE} = 6\text{ A}$ , $V_{GE} = 4\text{ V}$ , $T_J = 25^\circ\text{C}$	–	1.25	1.35	V
$V_{CE(SAT)}$	Collector-to-Emitter Saturation Voltage	$I_{CE} = 10\text{ A}$ , $V_{GE} = 4.5\text{ V}$ , $T_J = 25^\circ\text{C}$	–	1.45	1.65	V
$V_{CE(SAT)}$	Collector-to-Emitter Saturation Voltage	$I_{CE} = 10\text{ A}$ , $V_{GE} = 4.5\text{ V}$ , $T_J = 150^\circ\text{C}$	–	1.60	1.80	V

### DYNAMIC CHARACTERISTICS

$Q_{G(ON)}$	Gate Charge	$I_{CE} = 10\text{ A}$ , $V_{CE} = 12\text{ V}$ , $V_{GE} = 5\text{ V}$	–	18	–	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	$V_{CE} = 12\text{ V}$ , $I_{CE} = 10\text{ A}$	–	3.0	–	V	

### SWITCHING CHARACTERISTICS

$t_{d(ON)R}$	Current Turn-On Delay Time–Resistive	$V_{CE} = 14\text{ V}$ , $R_L = 1\text{ }\Omega$ , $V_{GE} = 5\text{ V}$ , $R_G = 470\text{ }\Omega$ , $T_J = 25^\circ\text{C}$	–	0.9	4	$\mu\text{s}$
$t_{rR}$	Current Rise Time–Resistive		–	3.0	7	
$t_{d(OFF)L}$	Current Turn-Off Delay Time–Inductive	$V_{CE} = 300\text{ V}$ , $L = 1\text{ mH}$ , $V_{GE} = 5\text{ V}$ , $R_G = 470\text{ }\Omega$ , $I_{CE} = 6.5\text{ A}$ , $T_J = 25^\circ\text{C}$	–	4.4	15	
$t_{fL}$	Current Fall Time–Inductive		–	1.9	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 DEVICE ORDERING INFORMATION

Device Marking	Device	Package	Reel Diameter	Tape Width	Qty <sup>†</sup>
FGD2736G3	FGD2736G3–F085V	DPAK (Pb–Free)	330 mm	16 mm	2500

<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 CHARACTERISTICS

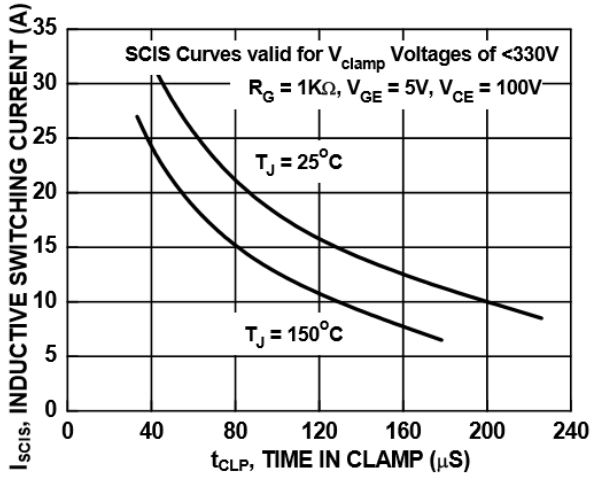


Figure 1. Self Clamped Inductive Switching Current vs. Time in Clamp

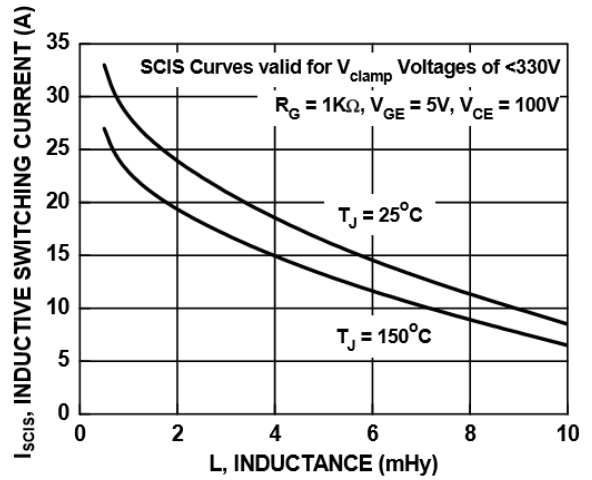


Figure 2. Self Clamped Inductive Switching Current vs. Inductance

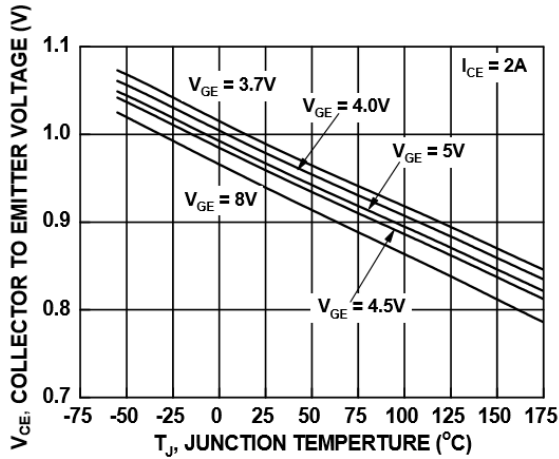


Figure 3. Collector-to-Emitter On-State Voltage vs. Junction Temperature

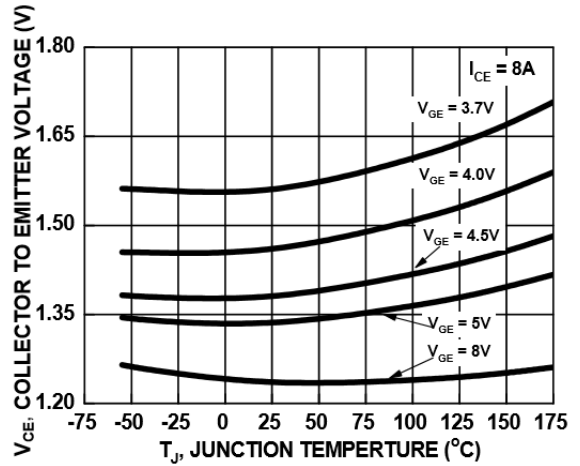


Figure 4. Collector-to-Emitter On-State Voltage vs. Junction Temperature

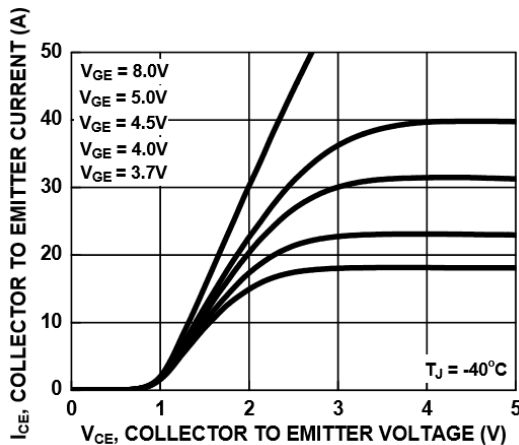


Figure 5. Collector-to-Emitter On-State Voltage vs. Collector Current

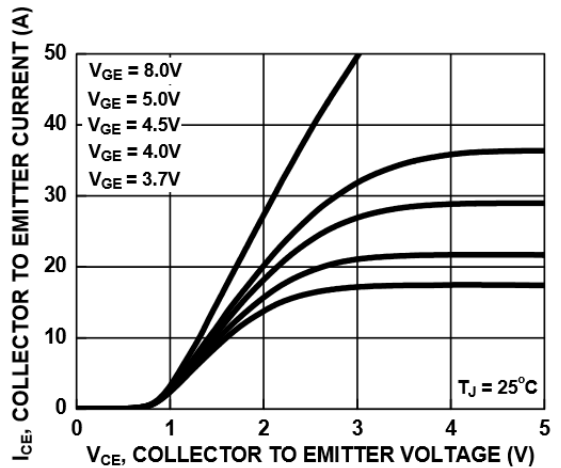


Figure 6. Collector-to-Emitter On-State Voltage vs. Collector Current

TYPICAL CHARACTERISTICS

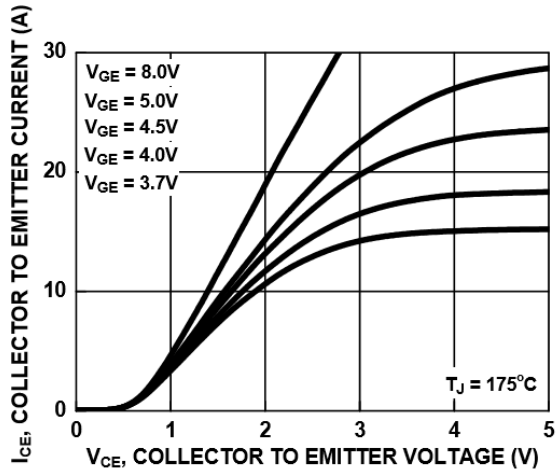


Figure 7. Collector-to-Emitter On-State Voltage vs. Collector Current

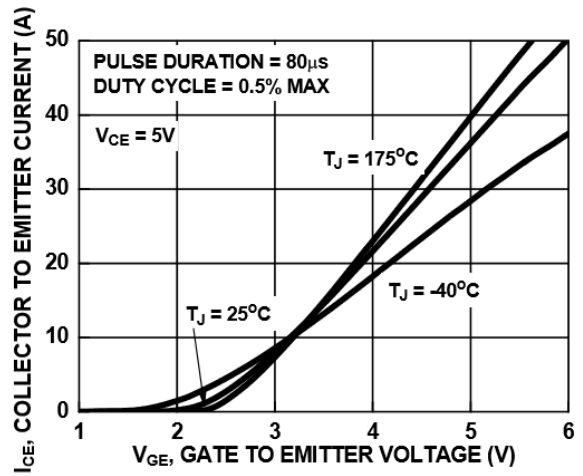


Figure 8. Transfer Characteristics

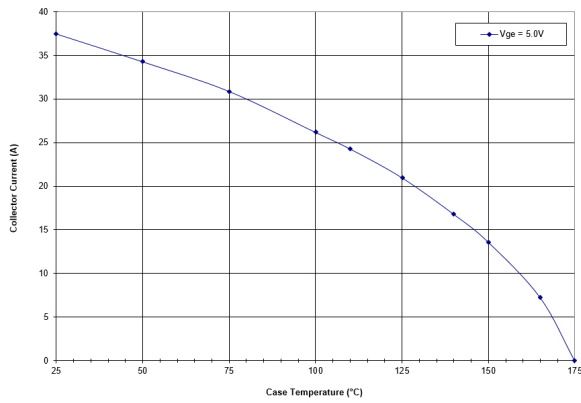


Figure 9. Current Derating

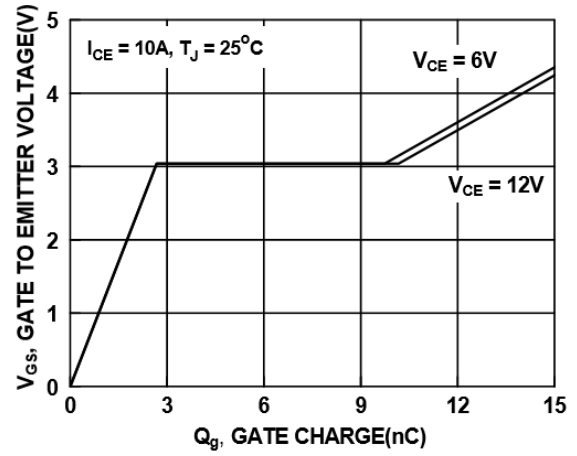


Figure 10. Gate Charge

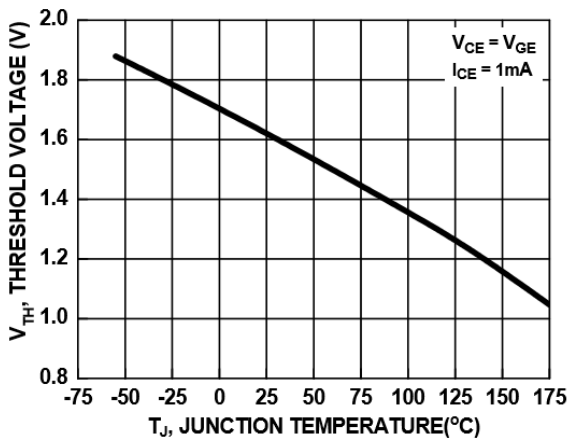


Figure 11. Threshold Voltage vs. Junction Temperature

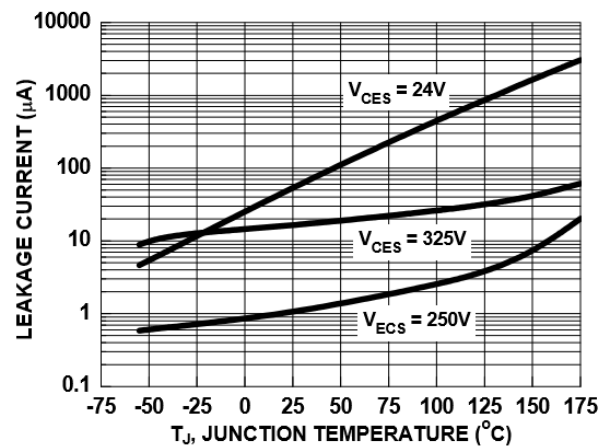


Figure 12. Leakage Current vs. Junction Temperature

# FGD2736G3-F085V

## TYPICAL CHARACTERISTICS

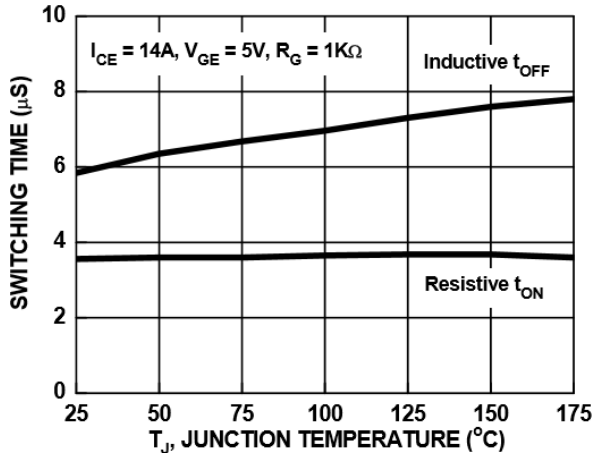


Figure 13. Switching Time vs. Junction Temperature

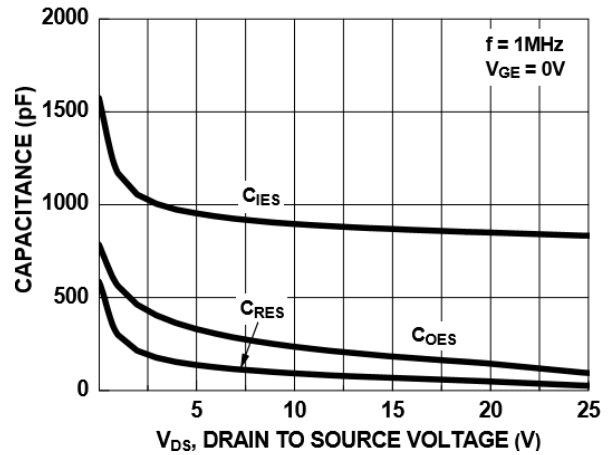


Figure 14. Capacitance vs. Collector-to-Emitter Voltage

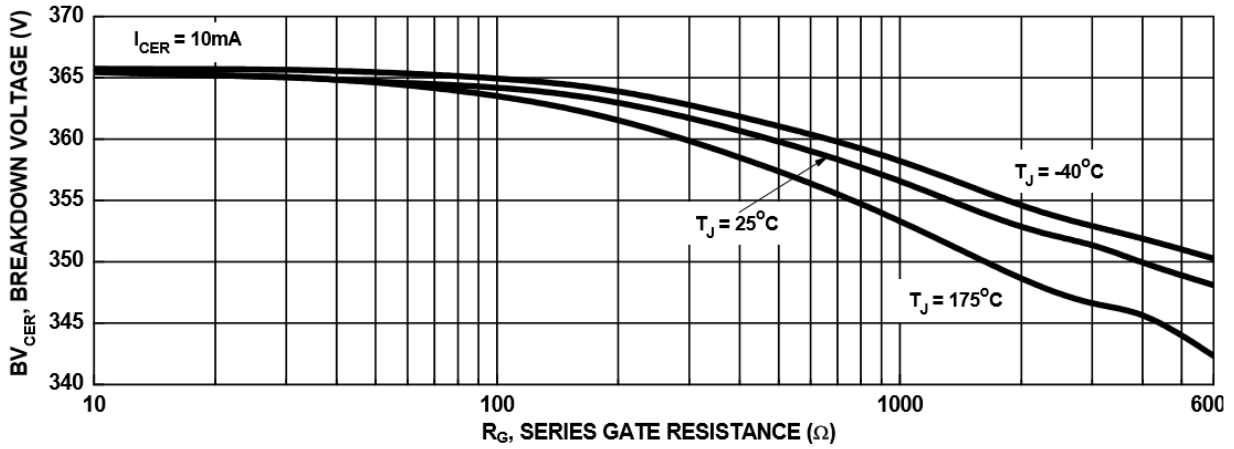


Figure 15. Break Down Voltage vs. Series Resistance

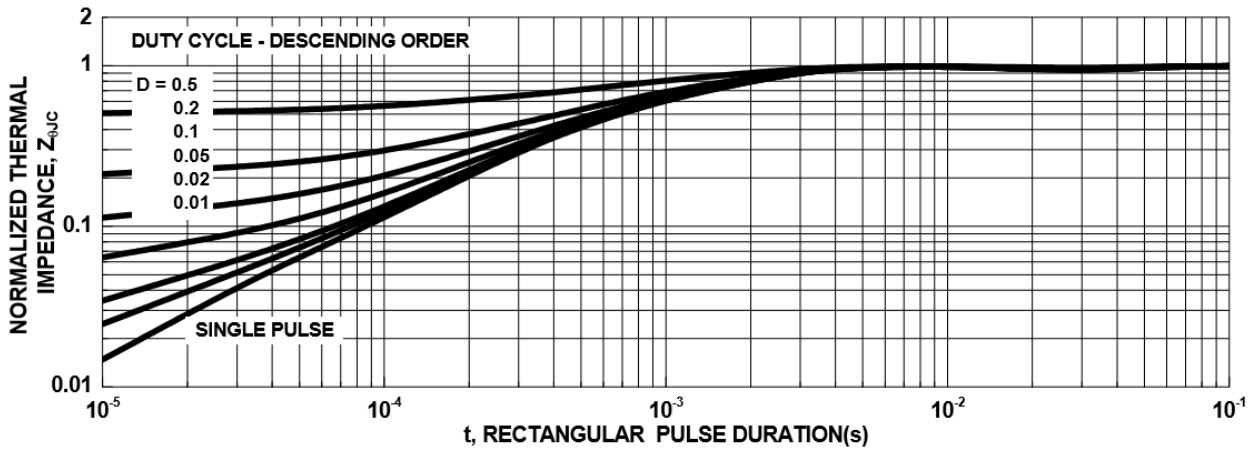


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction-to-Case

TEST CIRCUITS AND WAVEFORMS

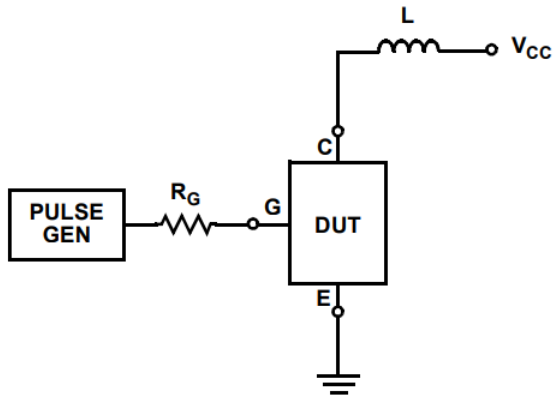


Figure 17. Inductive Switching Test Circuit

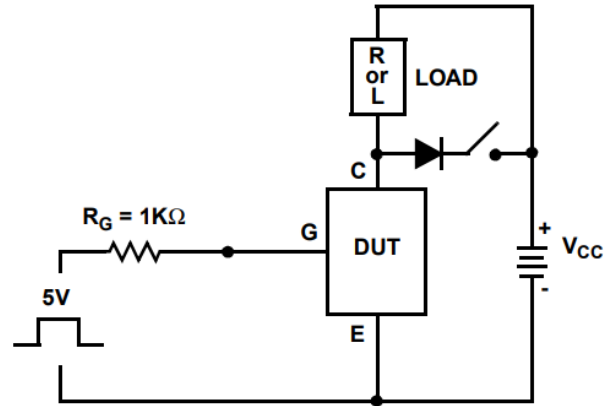


Figure 18.  $t_{ON}$  and  $t_{OFF}$  Switching Test Circuit

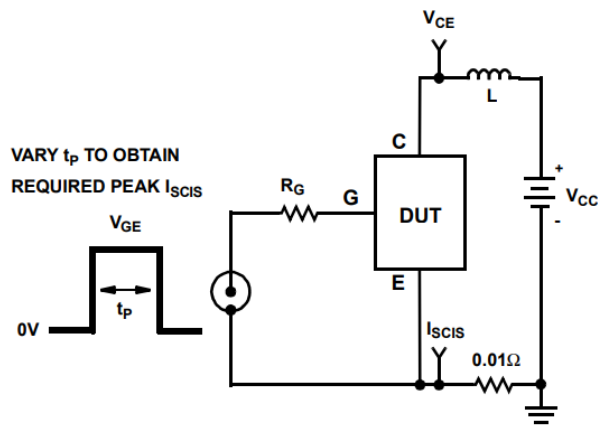


Figure 19. Energy Test Circuit

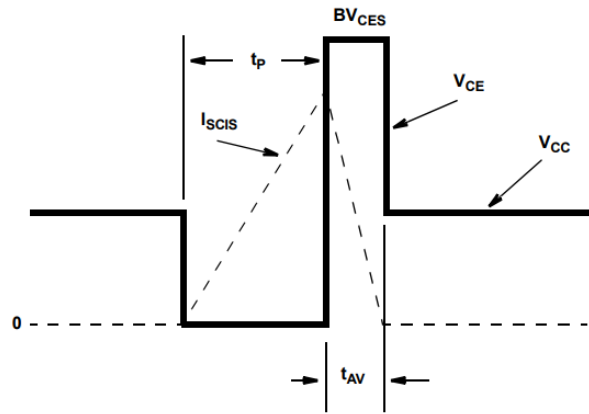


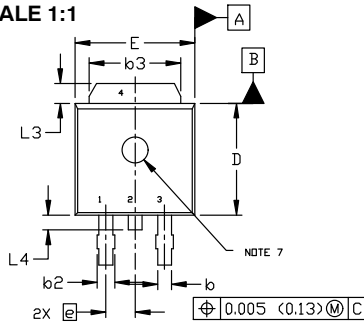
Figure 20. Energy Waveforms



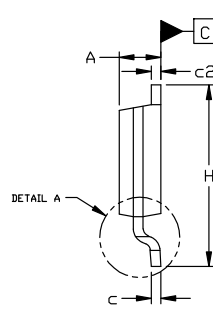
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CASE 369C  
ISSUE G

DATE 31 MAY 2023

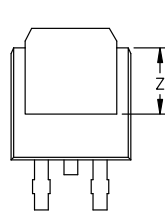
SCALE 1:1



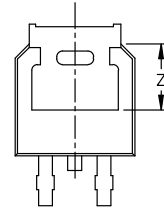
TOP VIEW



SIDE VIEW

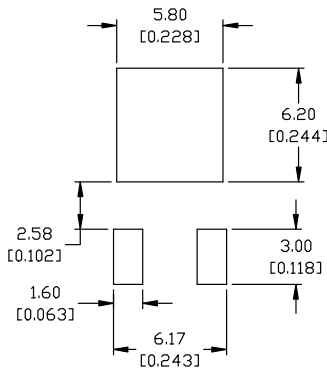


BOTTOM VIEW



BOTTOM VIEW

ALTERNATE CONSTRUCTIONS



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.

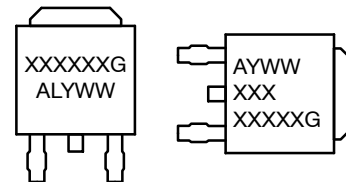
- STYLE 1: PIN 1. BASE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR
- STYLE 2: PIN 1. GATE  
2. DRAIN  
3. SOURCE  
4. DRAIN
- STYLE 3: PIN 1. ANODE  
2. CATHODE  
3. ANODE  
4. CATHODE
- STYLE 4: PIN 1. CATHODE  
2. ANODE  
3. GATE  
4. ANODE
- STYLE 5: PIN 1. GATE  
2. ANODE  
3. CATHODE  
4. ANODE
- STYLE 6: PIN 1. MT1  
2. MT2  
3. GATE  
4. MT2
- STYLE 7: PIN 1. GATE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR
- STYLE 8: PIN 1. N/C  
2. CATHODE  
3. ANODE  
4. CATHODE
- STYLE 9: PIN 1. ANODE  
2. CATHODE  
3. RESISTOR ADJUST  
4. CATHODE
- STYLE 10: PIN 1. CATHODE  
2. ANODE  
3. CATHODE  
4. ANODE

NOTES:

1. DIMENSIONING AND TOLERANCING ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3, AND Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
7. OPTIONAL MOLD FEATURE.

DIM	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.086	0.094	2.18	2.38
A1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.028	0.045	0.72	1.14
b3	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
E	0.250	0.265	6.35	6.73
e	0.090	BSC	2.29	BSC
H	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.114	REF	2.90	REF
L2	0.020	BSC	0.51	BSC
L3	0.035	0.050	0.89	1.27
L4	----	0.040	---	1.01
Z	0.155	----	3.93	---

GENERIC MARKING DIAGRAM\*



- IC
- Discrete
- XXXXXX = Device Code
- A = Assembly Location
- L = Wafer Lot
- Y = Year
- WW = Work Week
- G = Pb-Free Package

\*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.

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onsemi Website: [www.onsemi.com](http://www.onsemi.com)

### ONLINE SUPPORT: [www.onsemi.com/support](http://www.onsemi.com/support)

For additional information, please contact your local Sales Representative at [www.onsemi.com/support/sales](http://www.onsemi.com/support/sales)

