

# ON Semiconductor

## Is Now

The logo for onsemi, featuring the word "onsemi" in a dark teal, lowercase, sans-serif font. The letter "i" is stylized with a white dot and a teal vertical bar. A small orange triangle is positioned above the top right of the "i". A trademark symbol (TM) is located to the right of the logo.

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ON Semiconductor®

## FGD3325G2-F085

### EcoSPARK®2 330mJ, 250V, N-Channel Ignition IGBT

#### Features

- SCIS Energy = 330mJ at  $T_j = 25^\circ\text{C}$
- Logic Level Gate Drive
- Qualified to AEC Q101
- RoHS Compliant

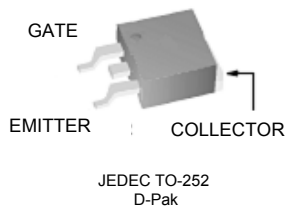
#### Applications

- Automotive Ignition Coil Driver Circuits
- Coil On Plug Applications

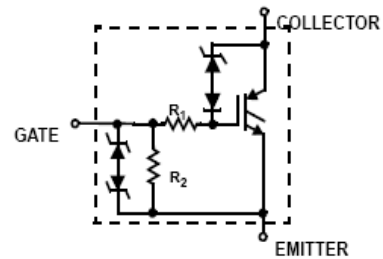


FGD3325G2-F085 EcoSPARK®2 330mJ, 250V, N-Channel Ignition IGBT

#### Package



#### Symbol



**Absolute Maximum Ratings**  $T_A = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Ratings	Units
$BV_{CER}$	Collector to Emitter Breakdown Voltage ( $I_C = 1\text{mA}$ )	250	V
$BV_{ECS}$	Emitter to Collector Voltage - Reverse Battery Condition ( $I_C = 10\text{mA}$ )	28	V
$E_{SCIS25}$	$I_{SCIS} = 14.8\text{A}$ , $L = 3.0\text{mH}$ , $R_{GE} = 1\text{K}\Omega$	$T_C = 25^\circ\text{C}$	330 mJ
$E_{SCIS150}$	$I_{SCIS} = 11.4\text{A}$ , $L = 3.0\text{mH}$ , $R_{GE} = 1\text{K}\Omega$	$T_C = 150^\circ\text{C}$	195 mJ
$I_{C25}$	Collector Current Continuous, at $V_{GE} = 5.0\text{V}$ , $T_C = 25^\circ\text{C}$	41	A
$I_{C110}$	Collector Current Continuous, at $V_{GE} = 5.0\text{V}$ , $T_C = 110^\circ\text{C}$	25	A
$V_{GEM}$	Gate to Emitter Voltage Continuous	$\pm 10$	V
$P_D$	Power Dissipation Total, at $T_C = 25^\circ\text{C}$	$T_C = 25^\circ\text{C}$	150 W
	Power Dissipation Derating, for $T_C > 25^\circ\text{C}$	$T_C > 25^\circ\text{C}$	1.0 W/ $^\circ\text{C}$
$T_J$	Operating Junction Temperature Range	-55 to +175	$^\circ\text{C}$
$T_{STG}$	Storage Junction Temperature Range	-55 to +175	$^\circ\text{C}$
$T_L$	Max. Lead Temp. for Soldering (Leads at 1.6mm from case for 10s)	300	$^\circ\text{C}$
$T_{PKG}$	Reflow soldering according to JESD020C	260	$^\circ\text{C}$
ESD	HBM-Electrostatic Discharge Voltage at 100pF, 1500 $\Omega$	4	kV
	CDM-Electrostatic Discharge Voltage at 1 $\Omega$	2	kV

**Package Marking and Ordering Information**

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGD3325G2	FGD3325G2-F085	TO252	330mm	16mm	2500 units

**Electrical Characteristics**  $T_A = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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**Off State Characteristics**

$BV_{CER}$	Collector to Emitter Breakdown Voltage	$I_{CE} = 2\text{mA}$ , $V_{GE} = 0$ , $R_{GE} = 1\text{K}\Omega$ , $T_J = -40$ to $150^\circ\text{C}$	225	-	275	V	
$BV_{CES}$	Collector to Emitter Breakdown Voltage	$I_{CE} = 10\text{mA}$ , $V_{GE} = 0\text{V}$ , $R_{GE} = 0$ , $T_J = -40$ to $150^\circ\text{C}$	240	-	290	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	$I_{GES} = \pm 2\text{mA}$	$\pm 12$	$\pm 14$	-	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		-	120	-	$\Omega$	
$R_2$	Gate to Emitter Resistance		10K	-	30K	$\Omega$	

**On State Characteristics**

$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	$I_{CE} = 6\text{A}$ , $V_{GE} = 4\text{V}$ ,	$T_J = 25^\circ\text{C}$	-	1.15	1.25	V
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	$I_{CE} = 10\text{A}$ , $V_{GE} = 4.5\text{V}$ ,	$T_J = 150^\circ\text{C}$	-	1.35	1.50	V
$V_{CE(SAT)}$	Collector to Emitter Saturation Voltage	$I_{CE} = 15\text{A}$ , $V_{GE} = 4.5\text{V}$ ,	$T_J = 150^\circ\text{C}$	-	1.68	1.85	V

**Electrical Characteristics**  $T_A = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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**Dynamic Characteristics**

$Q_{G(ON)}$	Gate Charge	$I_{CE} = 10\text{A}, V_{CE} = 12\text{V}, V_{GE} = 5\text{V}$	-	21	-	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	1.5	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	$V_{CE} = 14\text{V}, R_L = 1\Omega$	-	0.8	4	$\mu\text{s}$
$t_{rR}$	Current Rise Time-Resistive	$V_{GE} = 5\text{V}, R_G = 1\text{K}\Omega$ $T_J = 25^\circ\text{C},$	-	1.2	7	$\mu\text{s}$
$t_{d(OFF)L}$	Current Turn-Off Delay Time-Inductive	$V_{CE} = 190\text{V}, L = 1\text{mH},$	-	5.1	15	$\mu\text{s}$
$t_{fL}$	Current Fall Time-Inductive	$V_{GE} = 5\text{V}, R_G = 1\text{K}\Omega$ $I_{CE} = 6.5\text{A}, T_J = 25^\circ\text{C},$	-	2.2	15	$\mu\text{s}$

**Thermal Characteristics**

$R_{\theta JC}$	Thermal Resistance Junction to Case		-	-	1	$^\circ\text{C/W}$
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## Typical Performance Curves

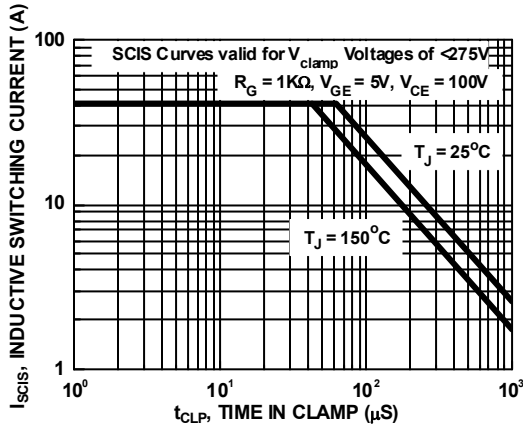


Figure 1. Self Clamped Inductive Switching Current vs. Time in Clamp

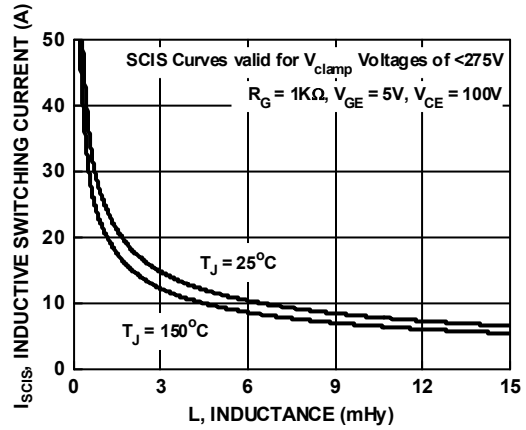


Figure 2. Self Clamped Inductive Switching Current vs. Inductance

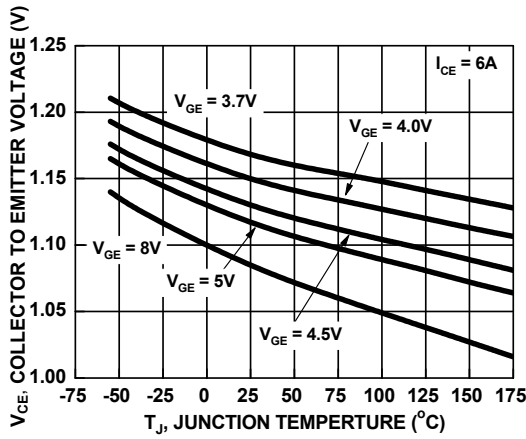


Figure 3. Collector to Emitter On-State Voltage vs. Junction Temperature

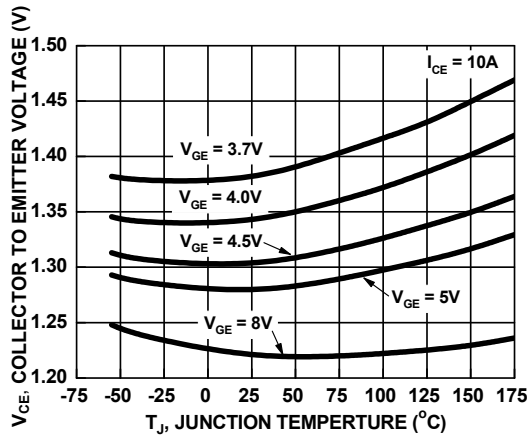


Figure 4. Collector to Emitter On-State Voltage vs. Junction Temperature

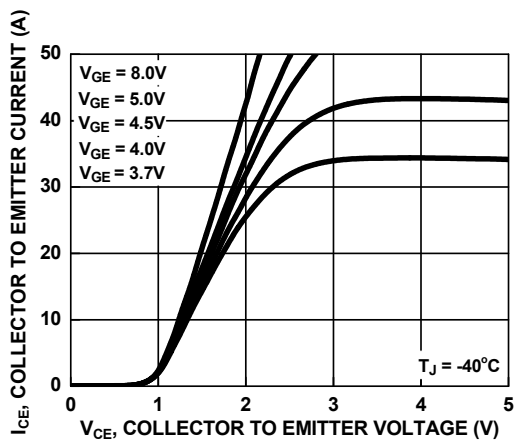


Figure 5. Collector to Emitter On-State Voltage vs. Collector Current

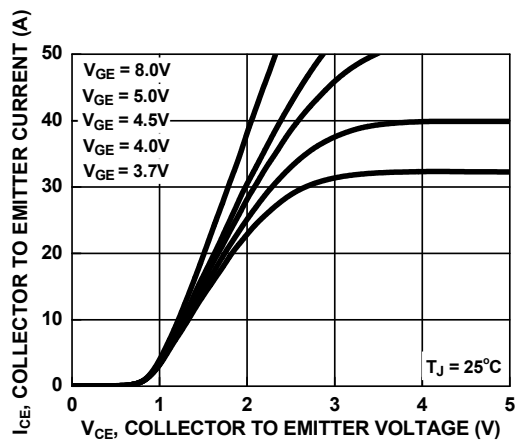


Figure 6. Collector to Emitter On-State Voltage vs. Collector Current

Typical Performance Curves (Continued)

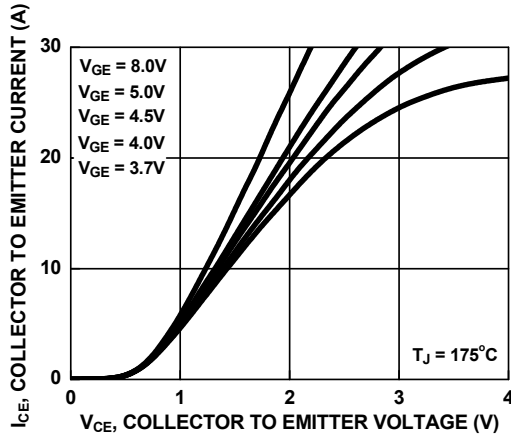


Figure 7. Collector to Emitter On-State Voltage vs. Collector Current

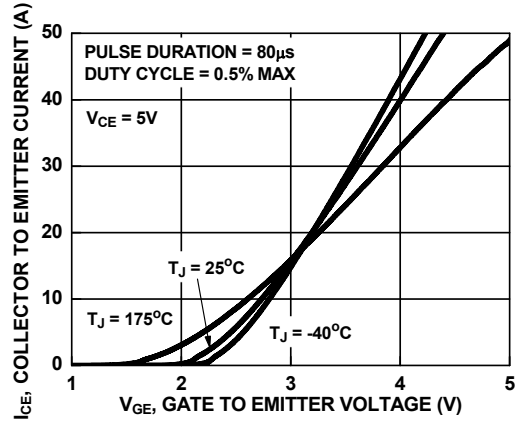


Figure 8. Transfer Characteristics

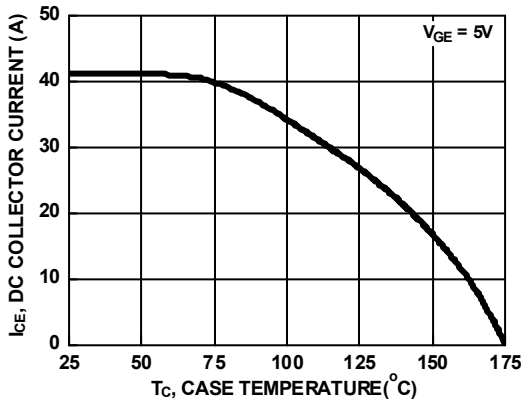


Figure 9. DC Collector Current vs. Case Temperature

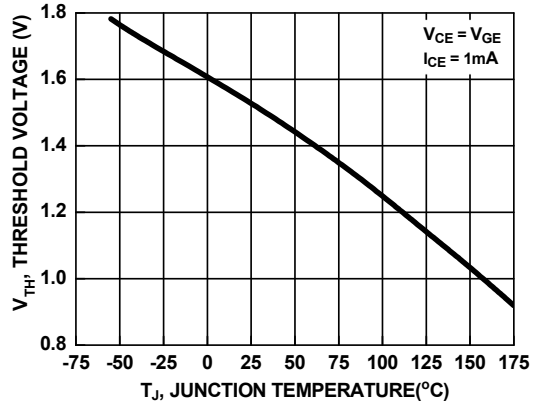


Figure 10. Threshold Voltage vs. Junction Temperature

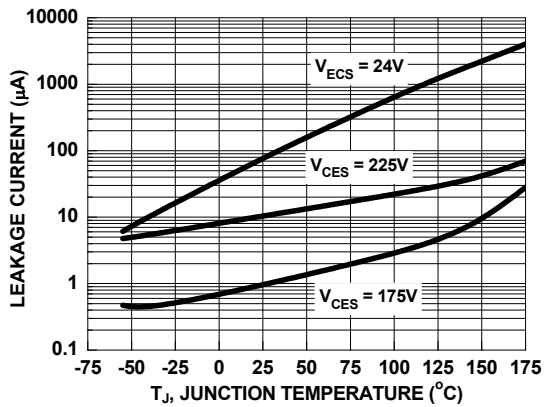


Figure 11. Leakage Current vs. Junction Temperature

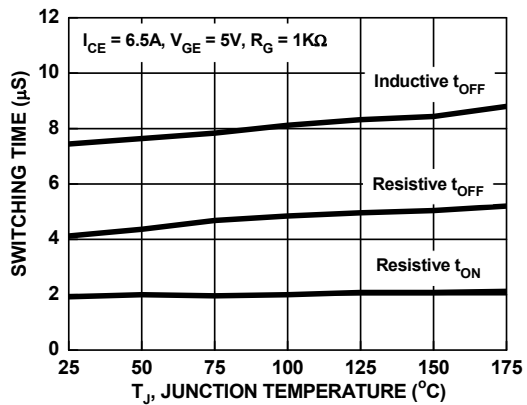


Figure 12. Switching Time vs. Junction Temperature

Typical Performance Curves (Continued)

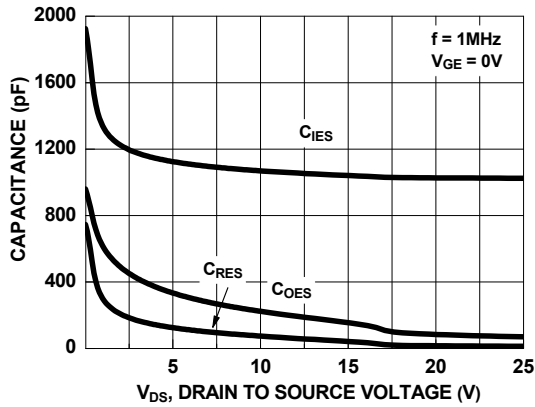


Figure 13. Capacitance vs. Collector to Emitter Voltage

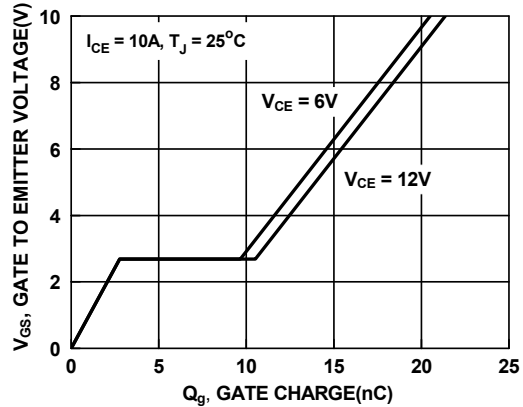


Figure 14. Gate Charge

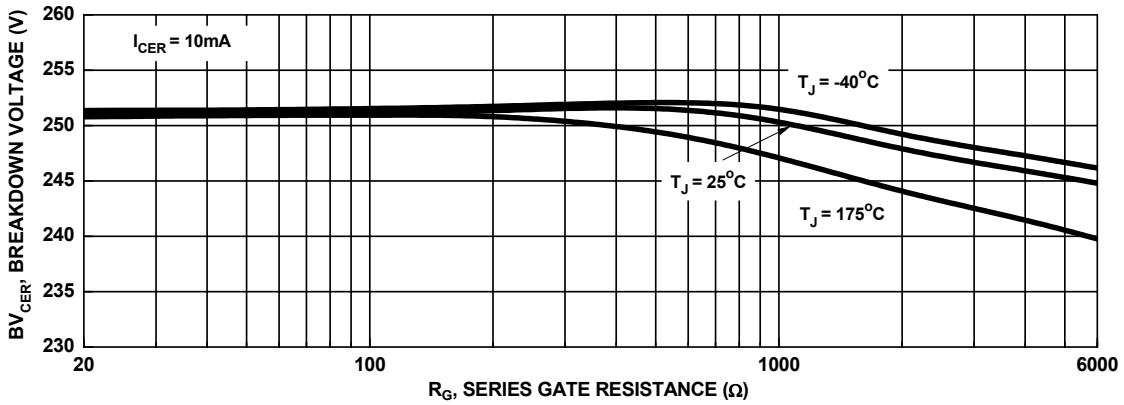


Figure 15. Break down Voltage vs. Series Gate Resistance

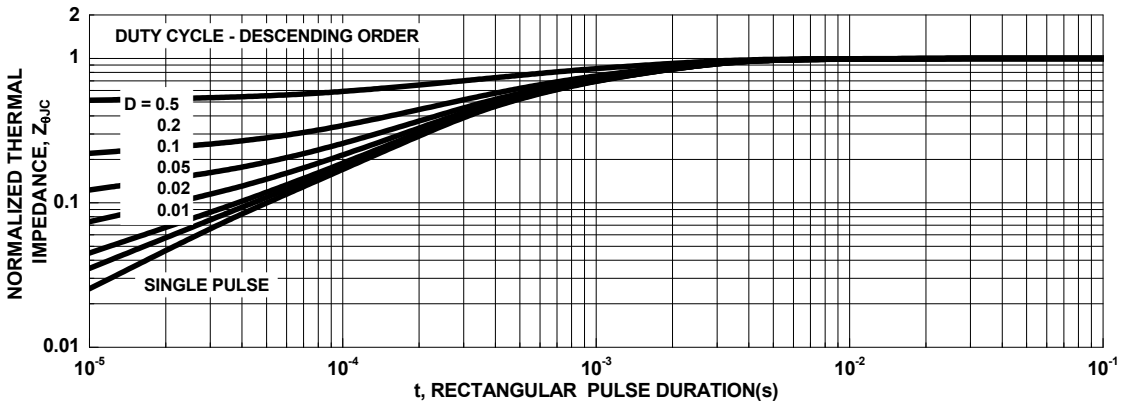
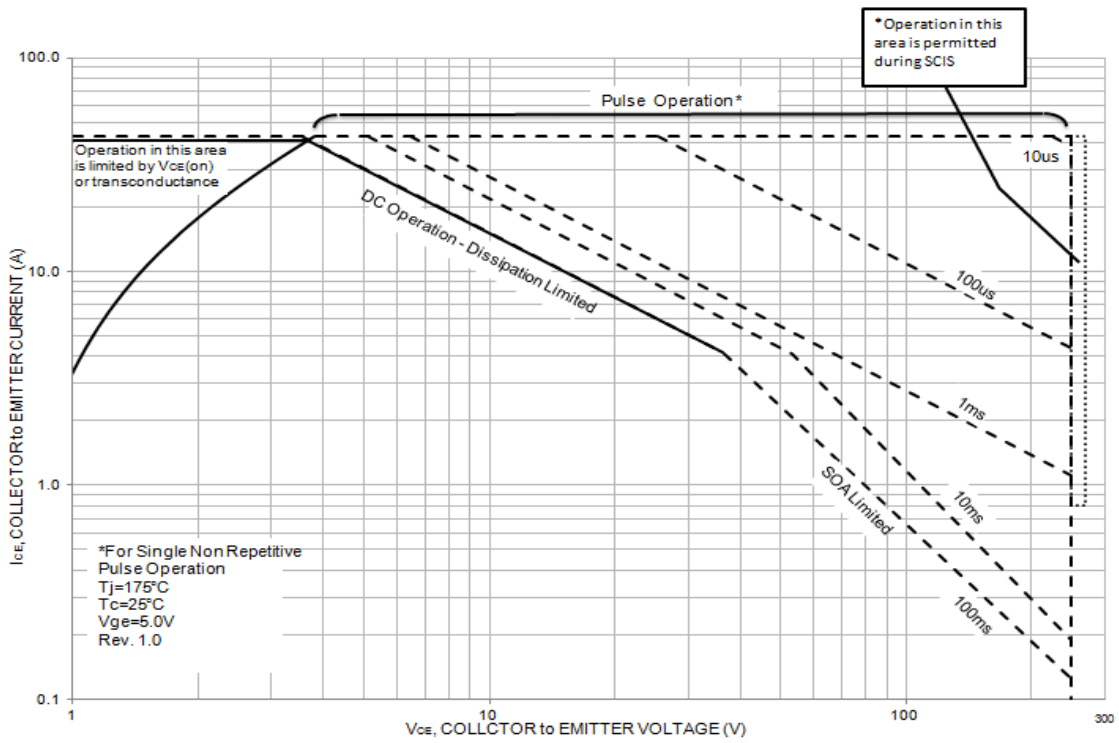


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

Typical Performance Curves





## Test Circuit and Waveforms

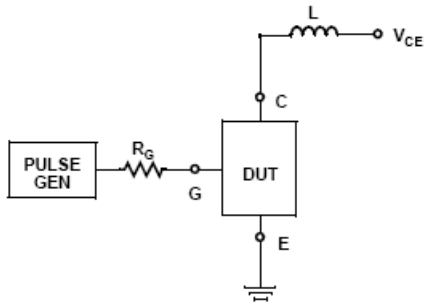


Figure 17. Inductive Switching Test Circuit

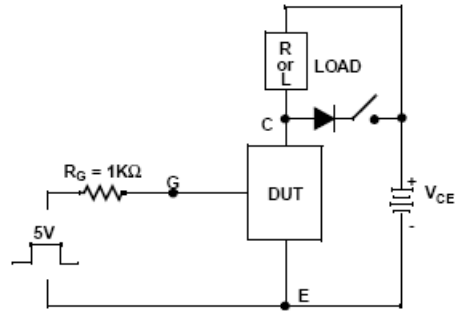


Figure 18.  $t_{ON}$  and  $t_{OFF}$  Switching Test Circuit

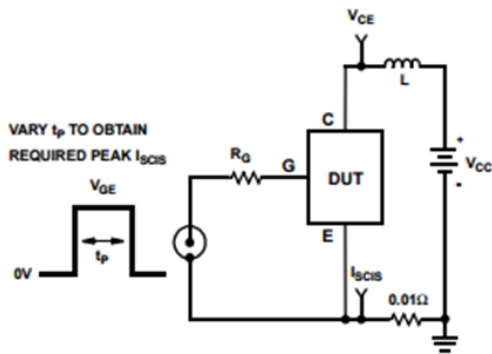


Figure 19. Energy Test Circuit

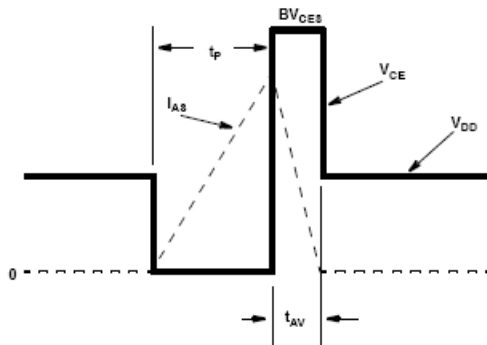
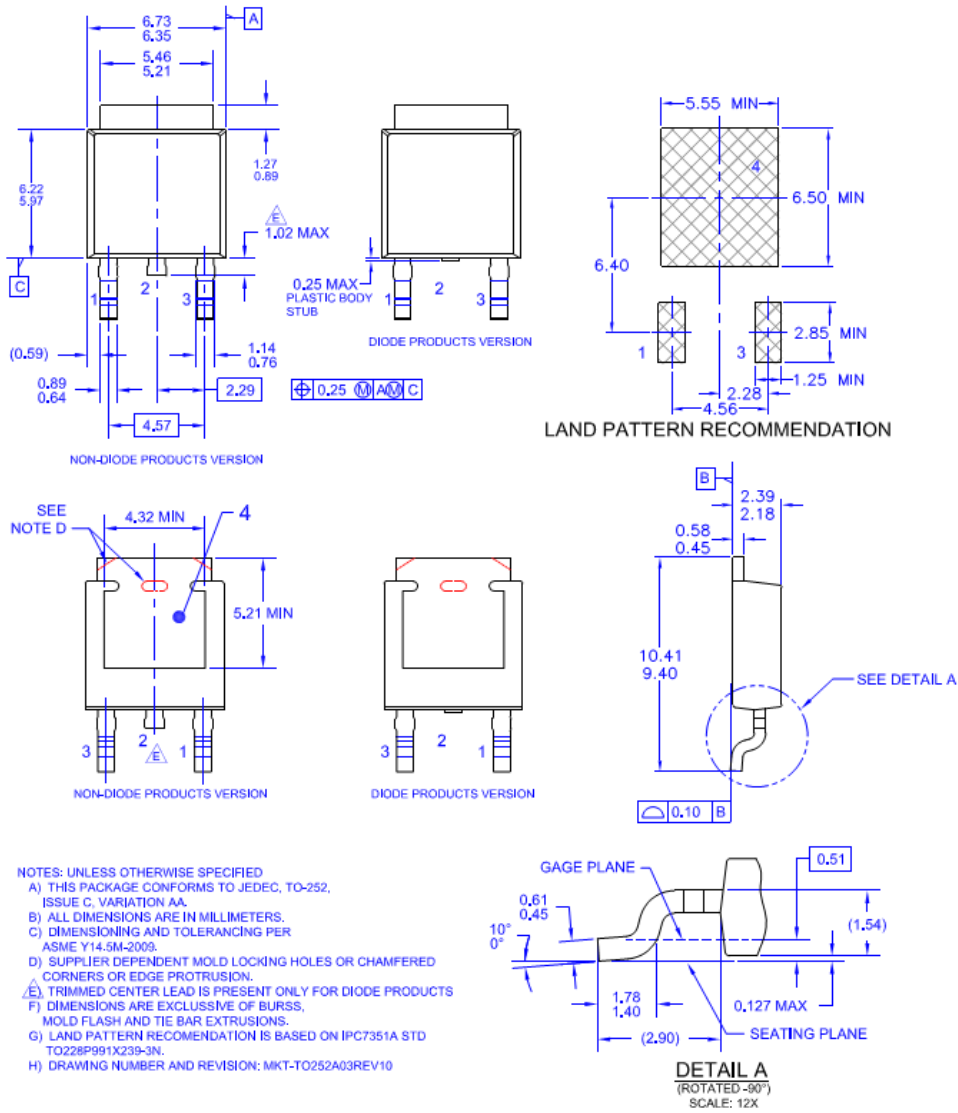


Figure 20. Energy Waveforms

# Mechanical Dimensions

## D-PAK



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