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# FGD3050G2

## EcoSPARK™ 2 300mJ, 500V, N-Channel Ignition IGBT

### Features

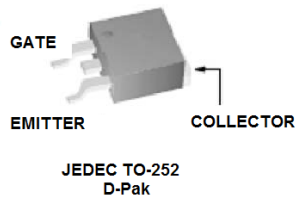
- SCIS Energy = 300mJ at  $T_J = 25^\circ\text{C}$
- Logic Level Gate Drive
- RoHS Compliant



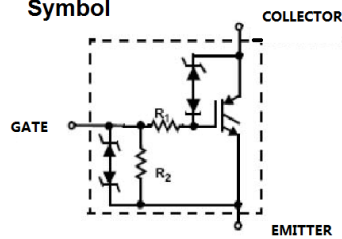
### Applications

- Automotive Ignition Coil Driver Circuits
- Coil On Plug Applications

### Package



### Symbol



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

Symbol	Parameter	Conditions	Ratings	Units
$BV_{CER}$	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
$ESCIS25$	$I_{SCIS} = 14.2\text{A}$ , $L = 3.0\text{mH}$ , $R_{GE} = 1\text{K}\Omega$	$T_C = 25^\circ\text{C}$	300	mJ
$ESCIS150$	$I_{SCIS} = 11.0\text{A}$ , $L = 3.0\text{mH}$ , $R_{GE} = 1\text{K}\Omega$	$T_C = 150^\circ\text{C}$	180	mJ
$I_{C25}$	Collector Current Continuous, at $T_C = 25^\circ\text{C}$ , $V_{GE} = 5.0\text{V}$		32	A
$I_{C110}$	Collector Current Continuous, at $T_C = 110^\circ\text{C}$ , $V_{GE} = 5.0\text{V}$		27	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/ $^\circ\text{C}$
$T_J$	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 Temp for soldering (Leads at 1.6mm from case for 10s)		300	$^\circ\text{C}$
$T_{PKG}$	Max Lead Temp for soldering (Package Body for 10s)		260	$^\circ\text{C}$
ESD	Electrostatic Discharge Voltage at 100pF, 1500 $\Omega$		4	kV

FGD3050G2 EcoSPARK™ 2 300mJ, 500V, N-Channel Ignition IGBT

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance Junction to Case	0.9	°C/W
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### Electrical Characteristics of the IGBT $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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#### Off Characteristics

$BV_{CER}$	Collector to Emitter Breakdown Voltage	$V_{GE} = 0V, I_{CE} = 2mA,$ $R_{GE} = 1K\Omega,$ $T_J = -40 \text{ to } 150^\circ\text{C}$	470	-	530	V	
$BV_{CES}$	Collector to Emitter Breakdown Voltage	$V_{GE} = 0V, I_{CE} = 10mA,$ $R_{GE} = 0\Omega,$ $T_J = -40 \text{ to } 150^\circ\text{C}$	495	-	555	V	
$BV_{ECS}$	Emitter to Collector Breakdown Voltage	$V_{GE} = 0V, I_{CE} = -75mA,$ $T_J = 25^\circ\text{C}$	20	-	-	V	
$BV_{GES}$	Gate to Emitter Breakdown Voltage	$I_{GES} = \pm 5mA$	$\pm 12$	$\pm 14$	-	V	
$I_{CER}$	Collector to Emitter Leakage Current	$V_{CE} = 250V, R_{GE} = 1K\Omega$	$T_J = 25^\circ\text{C}$	-	-	25	$\mu A$
			$T_J = 150^\circ\text{C}$	-	-	1	mA
$I_{ECS}$	Emitter to Collector Leakage Current	$V_{EC} = 15V$	$T_J = 25^\circ\text{C}$	-	-	1	mA
			$T_J = 150^\circ\text{C}$	-	-	40	
$R_1$	Series Gate Resistance		-	111	-	$\Omega$	
$R_2$	Gate to Emitter Resistance		10K	-	30K	$\Omega$	

#### On Characteristics

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

#### Dynamic Characteristics

$Q_{G(ON)}$	Gate Charge	$V_{GE} = 5V, V_{CE} = 12V, I_{CE} = 10A$	-	22	-	nC	
$V_{GE(TH)}$	Gate to Emitter Threshold Voltage	$I_{CE} = 1mA, V_{CE} = V_{GE},$	$T_J = 25^\circ\text{C}$	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	$V_{CE} = 12V, I_{CE} = 10A$	-	2.7	-	V	

#### Switching Characteristics

$t_{d(ON)R}$	Current Turn-On Delay Time-Resistive	$V_{CE} = 14V, R_L = 1\Omega$	-	0.9	4	$\mu s$
$t_{rR}$	Current Rise Time-Resistive	$V_{GE} = 5V, R_G = 1K\Omega$	-	1.6	7	$\mu s$
$t_{d(OFF)L}$	Current Turn-Off Delay Time-Inductive	$V_{CE} = 300V, L = 2mH,$	-	5.4	15	$\mu s$
$t_{fL}$	Current Fall Time-Inductive	$V_{GE} = 5V, R_G = 1K\Omega$	-	1.4	15	$\mu s$

#### Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGD3050G2	FGD3050G2_F085	TO-252AA	330mm	16mm	2500units

## Typical Performance Curves

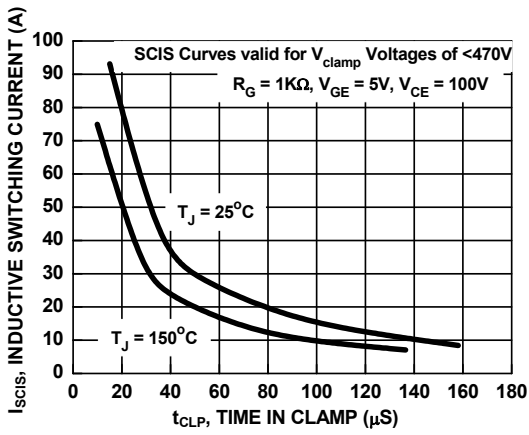


Figure 1. Self Clamped Inductive Switching Current vs. Time in Clamp

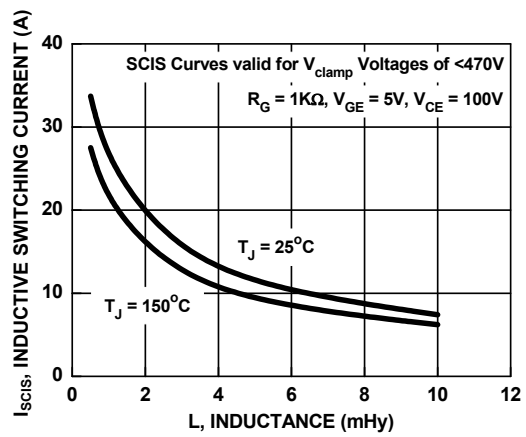


Figure 2. Self Clamped Inductive Switching Current vs. Inductance

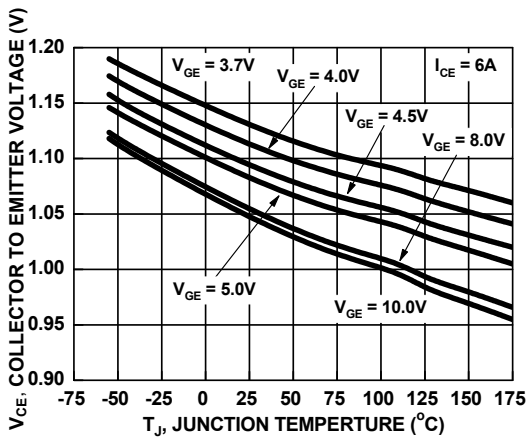


Figure 3. Collector to Emitter On-State Voltage vs. Junction Temperature

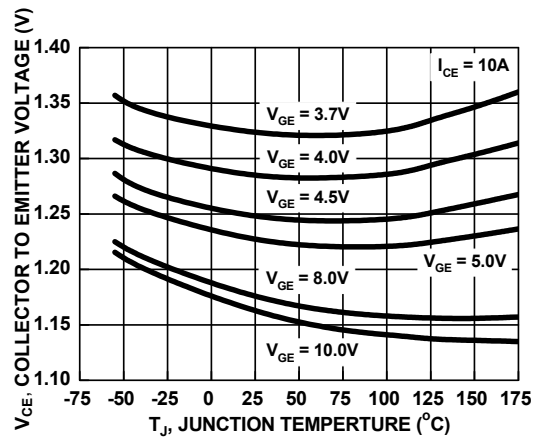


Figure 4. Collector to Emitter On-State Voltage vs. Junction Temperature

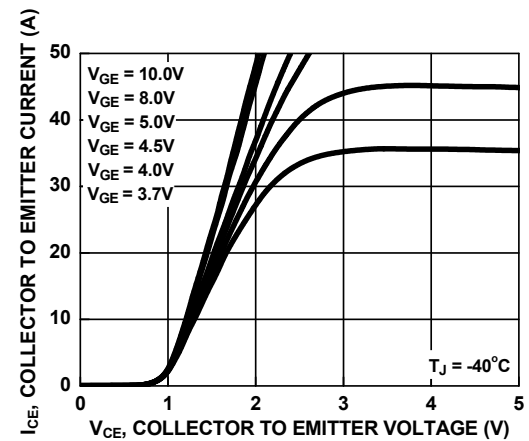


Figure 5. Collector to Emitter On-State Voltage vs. Collector Current

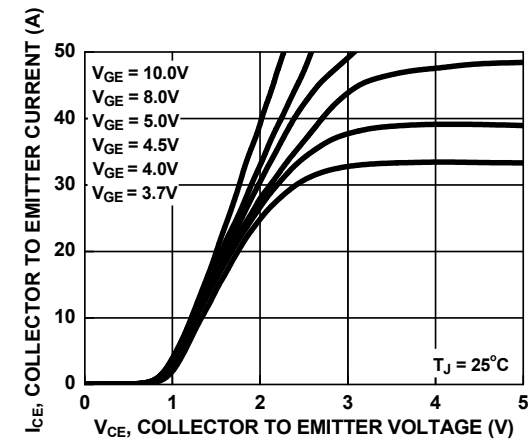


Figure 6. Collector to Emitter On-State Voltage vs. Collector Current

Typical Performance Curves (Continued)

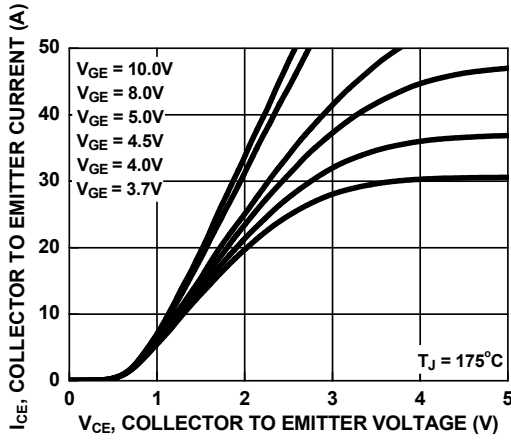


Figure 7. Collector to Emitter On-State Voltage vs. Collector Current

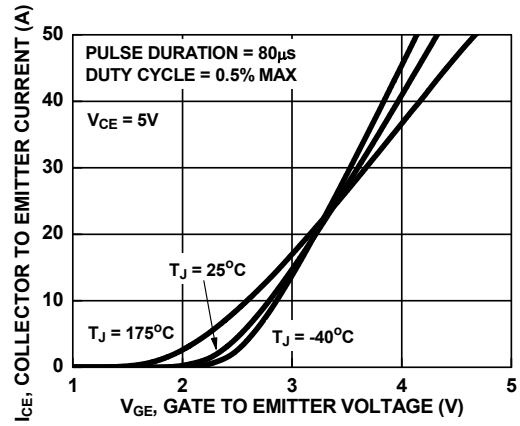


Figure 8. Transfer Characteristics

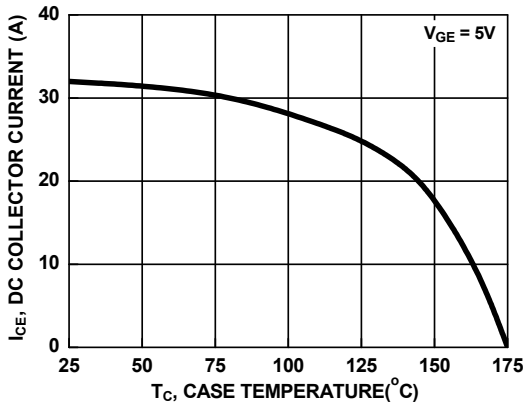


Figure 9. DC Collector Current vs. Case Temperature

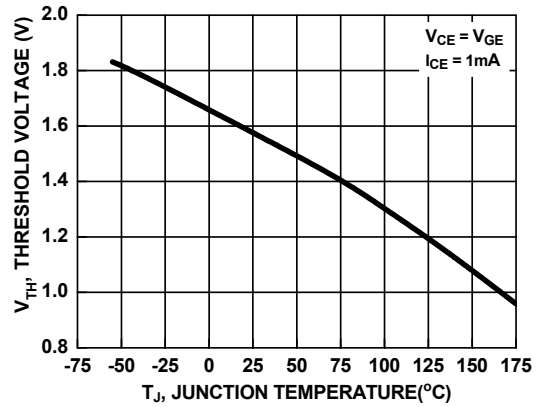


Figure 10. Threshold Voltage vs. Junction Temperature

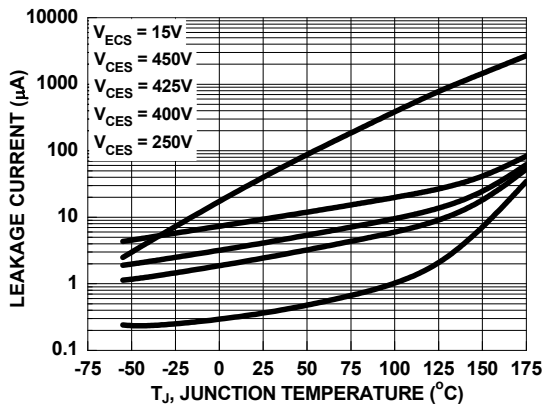


Figure 11. Leakage Current vs. Junction Temperature

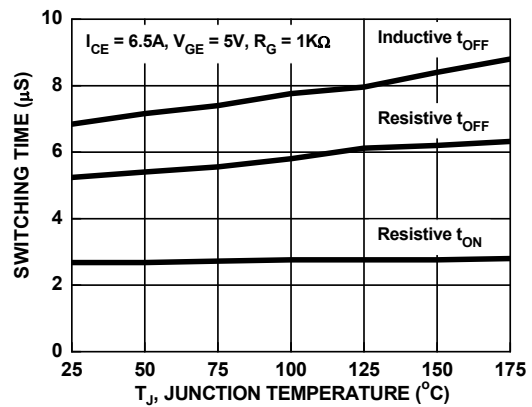


Figure 12. Switching Time vs. Junction Temperature

### Typical Performance Curves

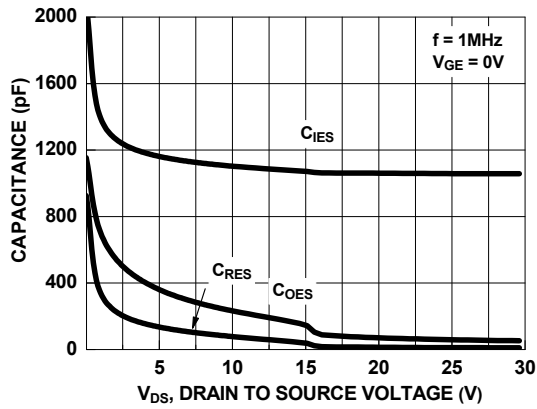


Figure 13. Capacitance vs. Collector to Emitter Voltage

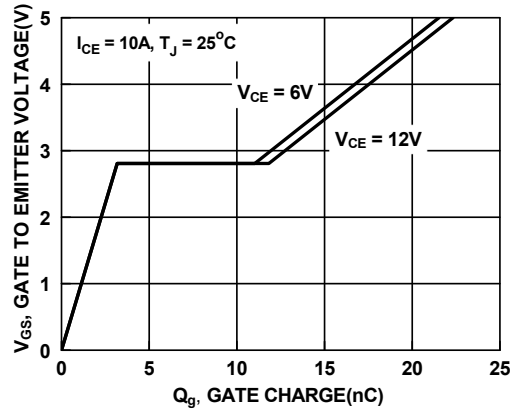


Figure 14. Gate Charge

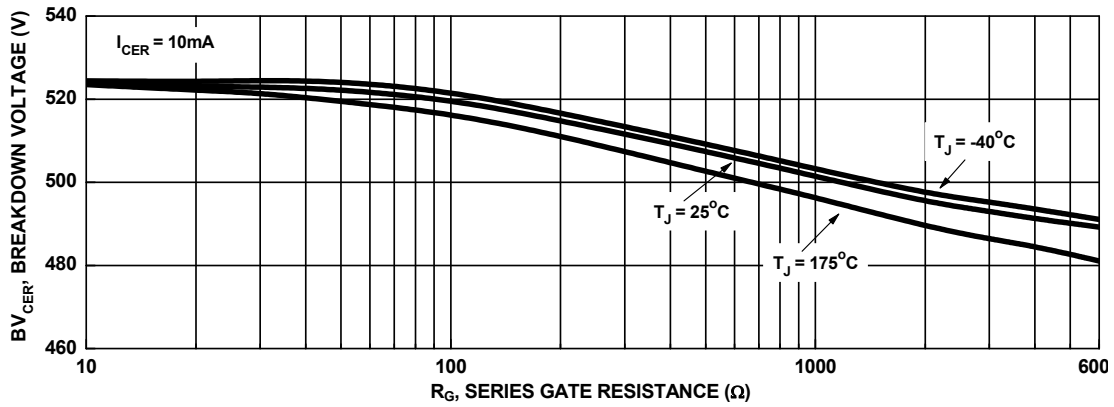


Figure 15. Break down Voltage vs. Series Gate Resistance

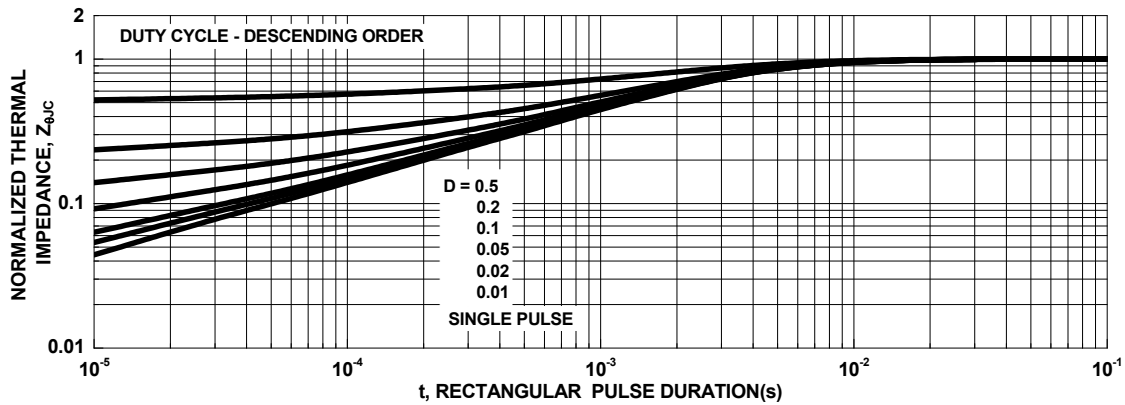


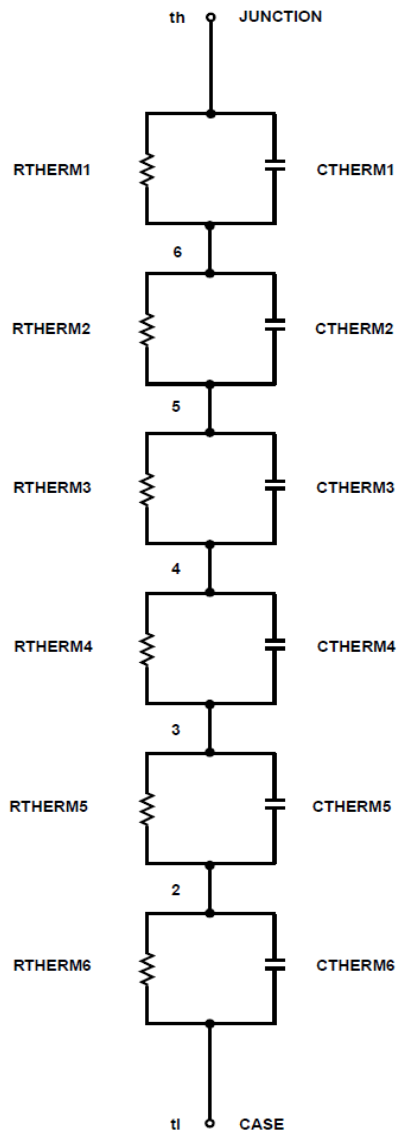
Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

### SPICE Thermal Model

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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 tl 3.7019E-03

R THERM1 th 6 6.6403E-03
R THERM2 6 5 5.8449E-01
R THERM3 5 4 5.3930E-02
R THERM4 4 3 9.2492E-03
R THERM5 3 2 1.5794E-02
R THERM6 2 tl 1.7974E-01
    
```



Physical Dimensions

