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## FGB3056\_F085

### EcoSPARK<sup>®</sup> 300mJ, 560V, N-Channel Ignition IGBT

#### Features

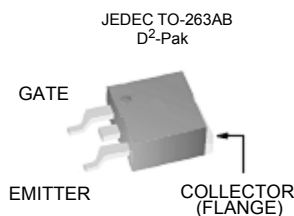
- SCIS Energy = 300mJ at  $T_J = 25^\circ\text{C}$
- Logic Level Gate Drive

#### Applications

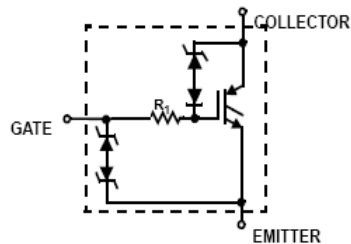
- Automotive Ignition Coil Driver Circuits
- Coil On Plug Applications



#### 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 ( $I_C = 2\text{mA}$ )	560	V
$BV_{ECS}$	Emitter to Collector Voltage - Reverse Battery Condition ( $I_C = -20\text{mA}$ )	20	V
$E_{SCIS25}$	$I_{SCIS} = 14.2\text{A}$ , $L = 3.0\text{mH}$ , $R_{GE} = 1\text{K}\Omega$ $T_C = 25^\circ\text{C}$	300	mJ
$E_{SCIS150}$	$I_{SCIS} = 10.8\text{A}$ , $L = 3.0\text{mH}$ , $R_{GE} = 1\text{K}\Omega$ $T_C = 150^\circ\text{C}$	170	mJ
$I_{C25}$	Collector Current Continuous, at $V_{GE} = 5\text{V}$ , $T_C = 25^\circ\text{C}$	29	A
$I_{C110}$	Collector Current Continuous, at $V_{GE} = 5\text{V}$ , $T_C = 110^\circ\text{C}$	24	A
$V_{GEM}$	Gate to Emitter Voltage Continuous	$\pm 10$	V
$P_D$	Power Dissipation Total, at $T_C = 25^\circ\text{C}$	200	W
	Power Dissipation Derating, for $T_C > 25^\circ\text{C}$	1.33	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	$^\circ\text{C}$
$T_{PKG}$	Reflow soldering according to JESD020C	260	$^\circ\text{C}$
ESD	HBM-Electrostatic Discharge Voltage at 100pF, 1500 $\Omega$	4	kV

FGB3056\_F085 EcoSPARK<sup>®</sup> 300mJ, 560V, N-Channel Ignition IGBT

**Thermal Characteristics**

$R_{\theta JC}$	Thermal Resistance Junction to Case	0.75	°C/W
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**Electrical Characteristics of the IGBT**  $T_A = 25^\circ\text{C}$  unless otherwise noted

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

$BV_{\text{CER}}$	Collector to Emitter Breakdown Voltage	$V_{\text{GE}} = 0\text{V}, I_{\text{CE}} = 2\text{mA},$ $R_{\text{GE}} = 1\text{K}\Omega,$ $T_J = -40 \text{ to } 150^\circ\text{C}$	530	560	600	V
$BV_{\text{CES}}$	Collector to Emitter Breakdown Voltage	$V_{\text{GE}} = 0\text{V}, I_{\text{CE}} = 10\text{mA},$ $R_{\text{GE}} = 0\Omega,$ $T_J = -40 \text{ to } 150^\circ\text{C}$	-	595	-	V
$BV_{\text{ECS}}$	Emitter to Collector Breakdown Voltage	$V_{\text{GE}} = 0\text{V}, I_{\text{CE}} = -75\text{mA},$ $T_J = 25^\circ\text{C}$	20	26	-	V
$BV_{\text{GES}}$	Gate to Emitter Breakdown Voltage	$I_{\text{GES}} = \pm 5\text{mA}$	$\pm 12$	$\pm 14$	-	V
$I_{\text{CER}}$	Collector to Emitter Leakage Current	$V_{\text{CE}} = 250\text{V}, R_{\text{GE}} = 1\text{K}\Omega$	$T_J = 25^\circ\text{C}$	-	-	40 $\mu\text{A}$
			$T_J = 150^\circ\text{C}$	-	-	1 mA
$I_{\text{ECS}}$	Emitter to Collector Leakage Current	$V_{\text{EC}} = 20\text{V}$	$T_J = 25^\circ\text{C}$	-	-	1 mA
			$T_J = 150^\circ\text{C}$	-	-	40
$R_1$	Series Gate Resistance		-	100	-	$\Omega$

**On State Characteristics**

$V_{\text{CE(SAT)}}$	Collector to Emitter Saturation Voltage	$V_{\text{GE}} = 5\text{V}, I_{\text{CE}} = 2\text{A}$	$T_J = 25^\circ\text{C}$	-	1.0	1.1	V
$V_{\text{CE(SAT)}}$	Collector to Emitter Saturation Voltage	$V_{\text{GE}} = 5\text{V}, I_{\text{CE}} = 8\text{A}$	$T_J = 150^\circ\text{C}$	-	1.3	1.55	V

**Dynamic Characteristics**

Q <sub>G(ON)</sub>	Gate Charge	V <sub>GE</sub> = 5V, V <sub>CE</sub> = 12V, I <sub>CE</sub> = 10A		-	15.6	20	nC
V <sub>GE(TH)</sub>	Gate to Emitter Threshold Voltage	I <sub>CE</sub> = 1mA, V <sub>CE</sub> = V <sub>GE</sub> ,	T <sub>J</sub> = 25°C	1.3	1.6	2.2	V
			T <sub>J</sub> = 150°C	-	1.1	-	
V <sub>GEP</sub>	Gate to Emitter Plateau Voltage	V <sub>CE</sub> = 12V, I <sub>CE</sub> = 10A		-	2.8	-	V

**Switching Characteristics**

$t_{\text{d(ON)R}}$	Current Turn-On Delay Time-Resistive	$V_{\text{CE}} = 14\text{V}, R_L = 1\Omega$	-	0.8	1.3	$\mu\text{s}$
$t_{\text{rR}}$	Current Rise Time-Resistive	$V_{\text{GE}} = 5\text{V}, R_G = 1\text{K}\Omega$	-	1.48	2.4	$\mu\text{s}$
$t_{\text{d(OFF)L}}$	Current Turn-Off Delay Time-Inductive	$V_{\text{CE}} = 300\text{V}, L = 1\text{mH},$	-	5.1	8.2	$\mu\text{s}$
$t_{\text{fL}}$	Current Fall Time-Inductive	$V_{\text{GE}} = 5\text{V}, R_G = 1\text{K}\Omega$	-	1.1	1.8	$\mu\text{s}$

**Ordering Information**

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGB3056	FGB3056_F085	TO-263AB	330mm	24mm	800units

## Typical Performance Curves

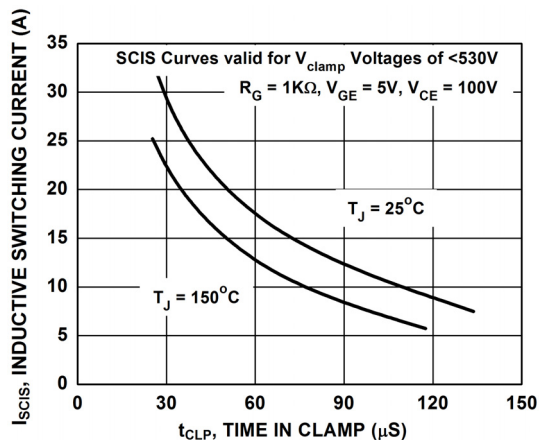


Figure 1. Self Clamped Inductive Switching Current vs. Time in Clamp

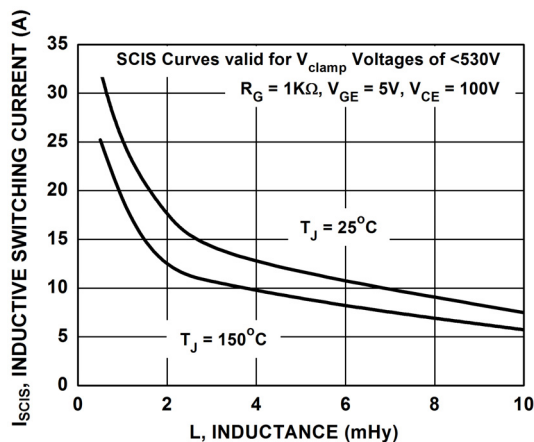


Figure 2. Self Clamped Inductive Switching Current vs. Inductance

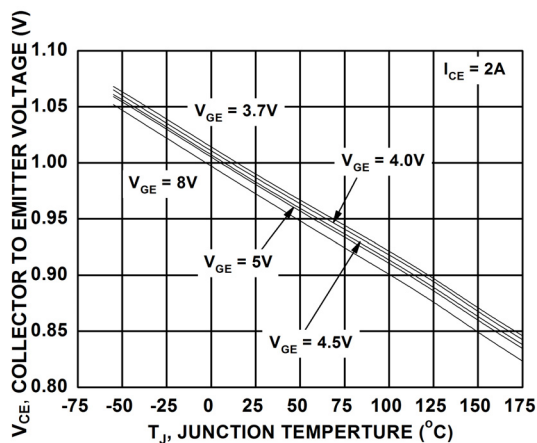


Figure 3. Collector to Emitter On-State Voltage vs. Junction Temperature

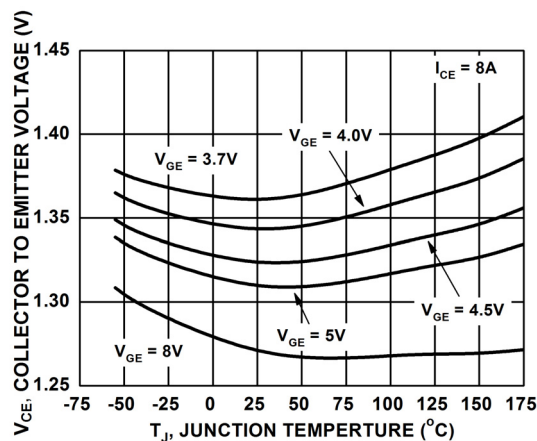


Figure 4. Collector to Emitter On-State Voltage vs. Junction Temperature

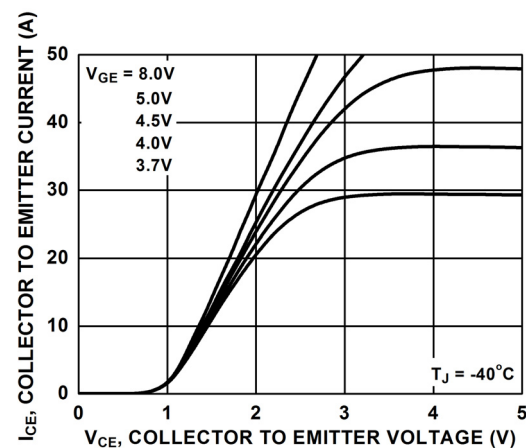


Figure 5. Collector to Emitter On-State Voltage vs. Collector Current

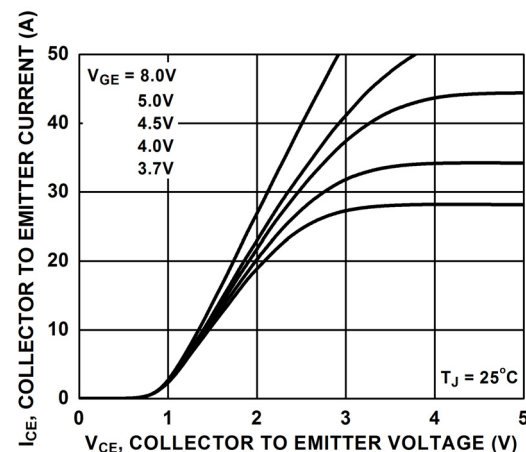


Figure 6. Collector to Emitter On-State Voltage vs. Collector Current

## Typical Performance Curves (Continued)

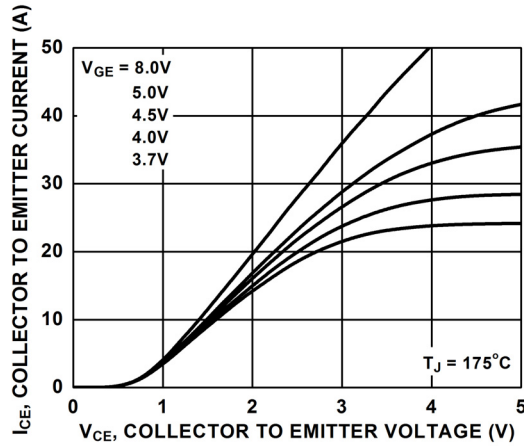


Figure 7. Collector to Emitter On-State Voltage vs. Collector Current

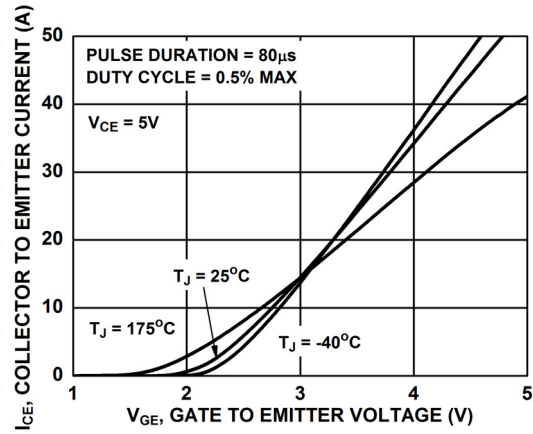


Figure 8. Transfer Characteristics

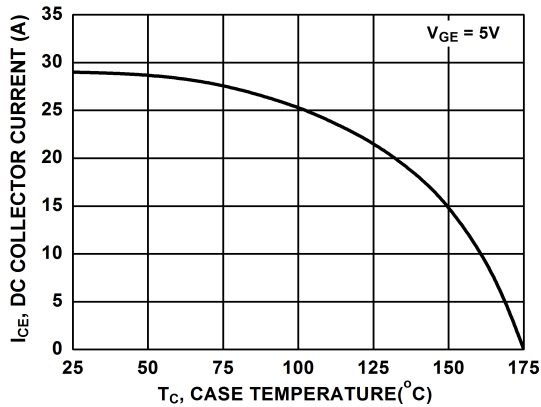


Figure 9. DC Collector Current vs. Case Temperature

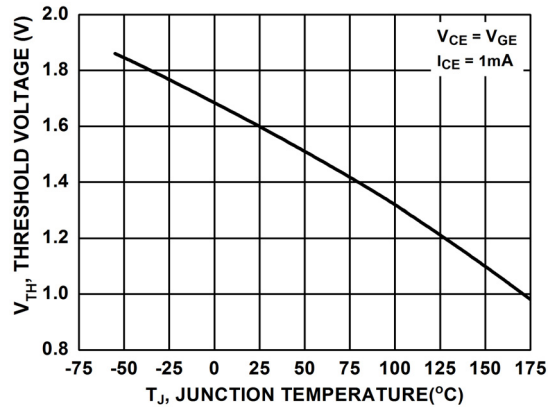


Figure 10. Threshold Voltage vs. Junction Temperature

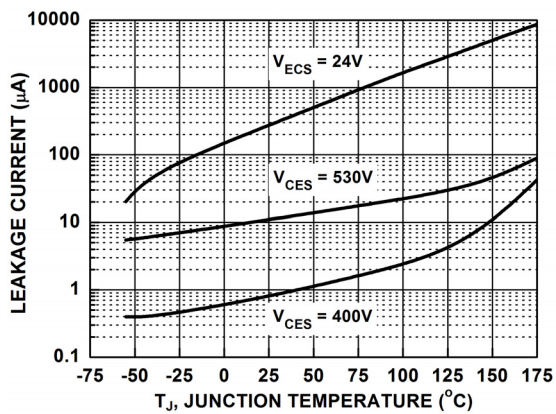


Figure 11. Leakage Current vs. Junction Temperature

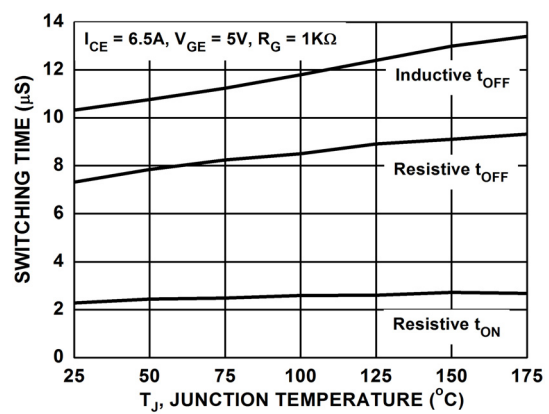


Figure 12. Switching Time vs. Junction Temperature

## Typical Performance Curves (Continued)

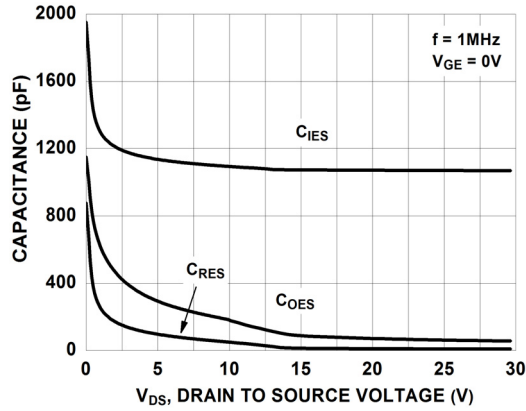


Figure 13. Capacitance vs. Collector to Emitter Voltage

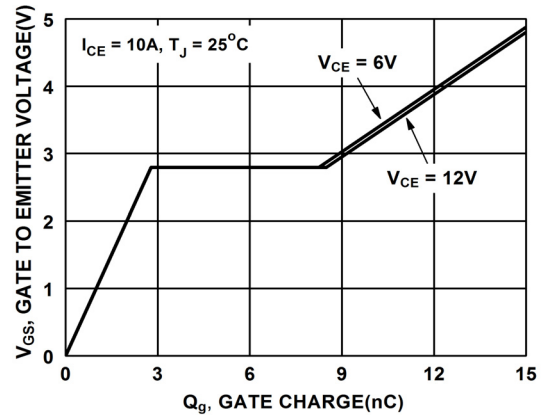


Figure 14. Gate Charge

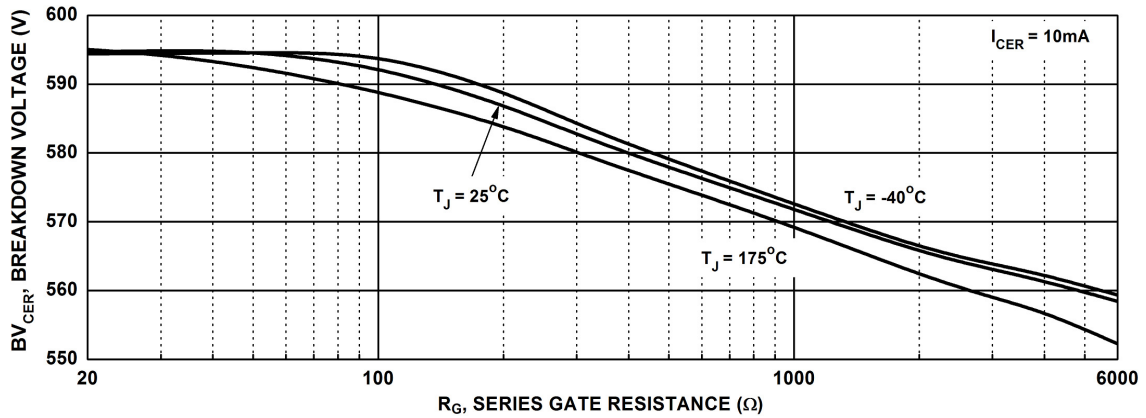


Figure 15. Break down Voltage vs. Series Gate Resistance

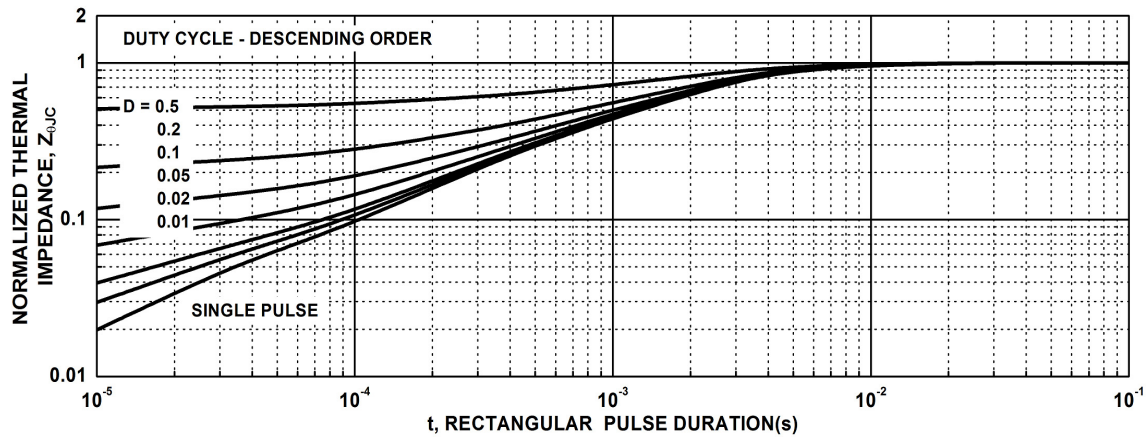


Figure 16. IGBT Normalized Transient Thermal Impedance, Junction to Case

## Typical Performance Curves

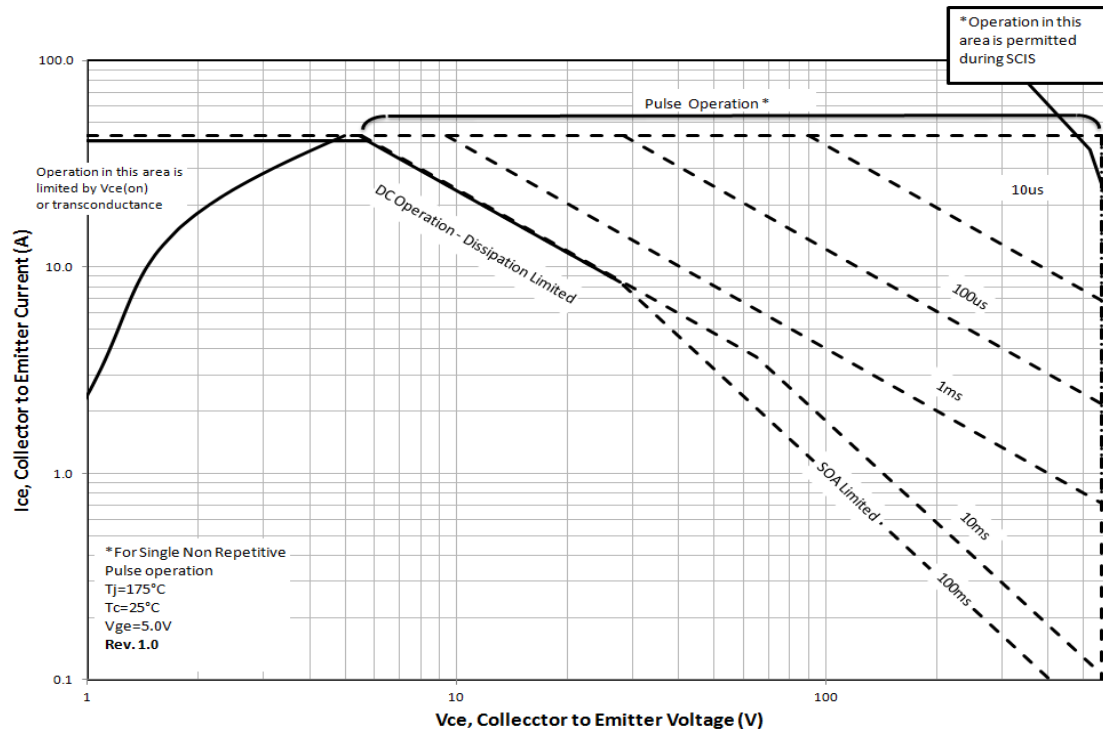
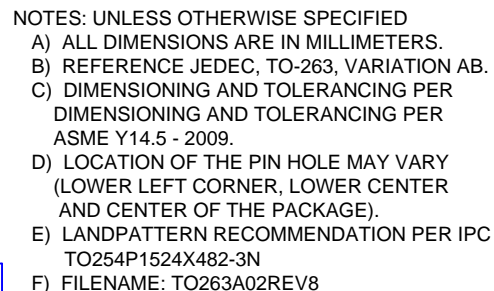
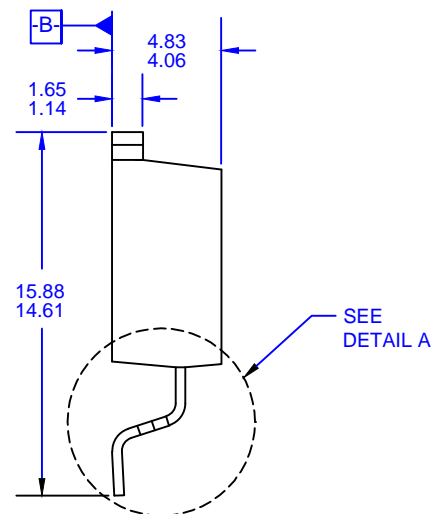
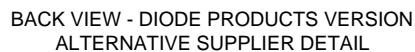
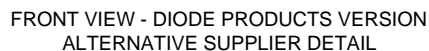


Figure 17. Forward Safe Operating Area



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