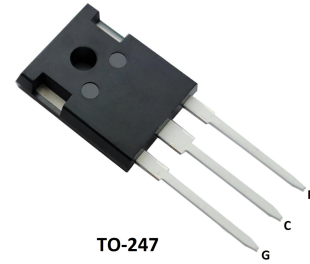


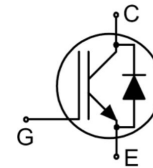
### Features

- Fast Switching & Low  $V_{CE[sat]}$
- High Input Impedance
- $V_{CE(sat)} = 1.7V$
- High Input Impedance
- Short circuit withstand time 5  $\mu s$



### Applications

- PFC
- UPS
- Inverter
- Welding Machine



### Absolute Maximum Ratings

Parameter		Symbol	Value	Unit
Collector-emitter voltage		$V_{CES}$	650	V
Gate-emitter voltage		$V_{GES}$	$\pm 20$	
Collector current	$T_C = 25^\circ C$	$I_C$	80	A
	$T_C = 100^\circ C$		40	
Pulsed collector current, pulse time limited by $T_{jmax}$		$I_{CM}$	120	
Diode forward current @ $T_C = 100^\circ C$		$I_F$	40	
Diode pulsed current, Pulse time limited by $T_{jmax}$		$I_{FM}$	120	
Power dissipati	$T_C = 25^\circ C$	$P_D$	375	
Operating Junction and storage temperature rang		$T_J$	-55 to 175	$^\circ C$
		$T_{stg}$	-55 to 175	

① These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heat sink, assuming maximum junction temperature of  $T_{J(MAX)} = 175^\circ C$ .

② The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to case  $R_{\theta JC}$  and case to ambient.

### Electrical Characteristics ( $T_C = 25^\circ C$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Collector-emitter breakdown voltag	$BV_{CES}$	$I_C = 500 \mu A, V_{GE} = 0V$	650	-	-	V
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 250 \mu A$	4.0	5.0	6.0	
Zero gate voltage collector current	$I_{CES}$	$V_{CE} = 650V, V_{GE} = 0V$	-	-	1000	$\mu A$
Gate-emitter leakage current	$I_{GES}$	$V_{GE} = 20V, V_{CE} = 0V$	-	-	$\pm 100$	nA

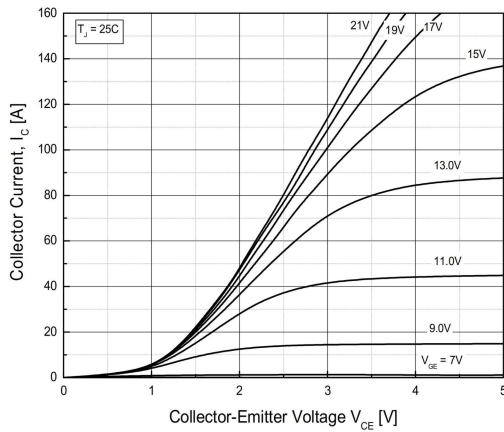
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 30A, V_{GE} = 15V, T_C = 25^\circ C$	-	1.7	-	V
<b>Dynamic and Switching Characteristi</b>						
Total gate charg	$Q_g$	$V_{CE} = 520V, I_C = 40A,$ $V_{GE} = 15V$	-	219	-	nC
Gate emitter charge	$Q_{ge}$		-	26	-	nC
Gate Collector Charge	$Q_{gc}$		-	115	-	nC
Input capacitanc	$C_{ies}$	$V_{CE} = 25V, V_{GE} = 0V,$ $f = 1MHz$	-	2900	-	pF
Reverse transfer capacitanc	$C_{res}$		-	131	-	
Output capacitance	$C_{oes}$		-	210	-	
Turn-on delay time	$t_{d(on)}$	$V_{GE} = 15V, V_{CC} = 400V,$ $I_C = 40A, R_G = 7.9\Omega,$ Inductive Load, $T_C = 25^\circ C$	-	58	-	nS
Rise tim	$t_r$		-	54	-	
Turn-off delay time	$t_{d(off)}$		-	245	-	
Fall time	$t_f$		-	40	-	mJ
Turn-on switching energy	$E_{on}$		-	1.15	-	
Turn-off switching energy	$E_{off}$		-	0.35	-	
Total switching energy	$E_{ts}$	-	1.5	-		
Turn-on delay time	$t_{d(on)}$	$V_{GE} = 15V, V_{CC} = 400V,$ $I_C = 40A, R_G = 7.9\Omega,$ Inductive Load, $T_C = 125^\circ C$	-	61	-	nS
Rise tim	$t_r$		-	60	-	
Turn-off delay time	$t_{d(off)}$		-	260	-	
Fall time	$t_f$		-	38	-	mJ
Turn-on switching energy	$E_{on}$		-	1.8	-	
Turn-off switching energy	$E_{off}$		-	0.38	-	
Total switching energy	$E_{ts}$	-	2.18	-		
<b>Diode Characteristics (Tc =25°C unless otherwise specified)</b>						
Forward voltag	$V_F$	$I_F = 20A, T_C = 25^\circ C$	-	1.4	-	V
Reverse recovery time	$t_{rr}$	$I_F = 40A, di/dt = 1000A/\mu S$ $T_C = 25^\circ C$	-	80	-	nS
Reverse recovery current	$I_{rr}$		-	25	-	A
Reverse recovery charge	$Q_{rr}$		-	1	-	uC

## Thermal Characteristics

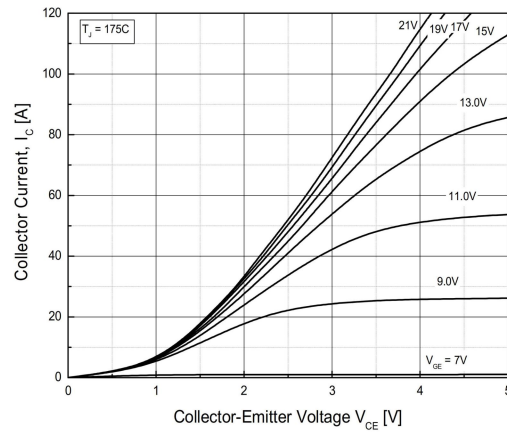
Parameter	Symbol	Value	Unit
Thermal resistance junction-to-ambien	$R_{\theta JA}$	40	°C/W
Thermal resistance junction-to-case for IGBT	$R_{\theta JC}$	0.4	
Thermal resistance junction-to-case for Diode	$R_{\theta JC}$	1.2	

### Typical Performance Characteristic

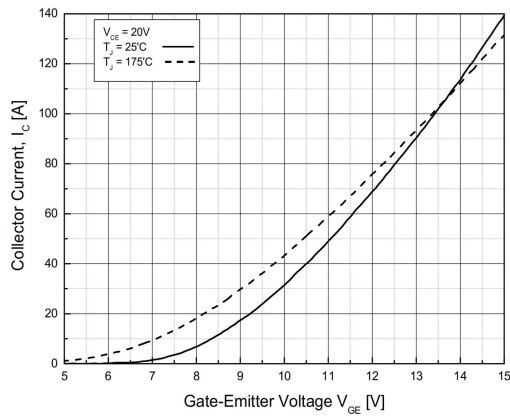
Typical Output Characteristics( $T_J=25^\circ\text{C}$ )



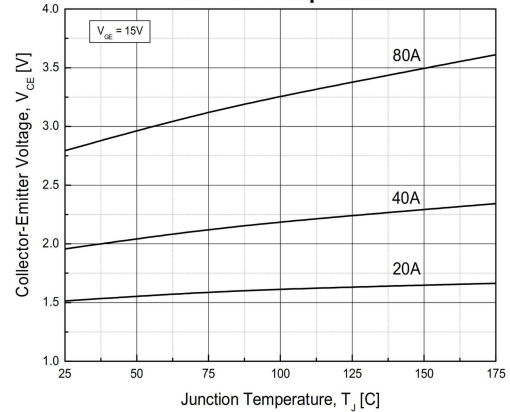
Typical Output Characteristics( $T_J=175^\circ\text{C}$ )



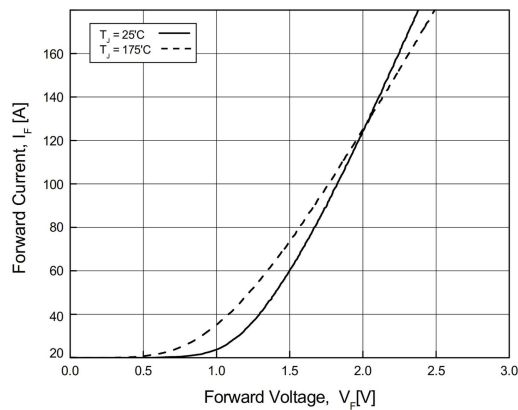
Typical Transfer Characteristics



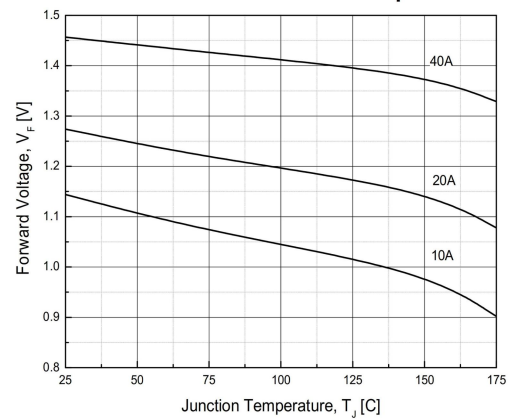
Typical Collector-Emitter Saturation Voltage - Junction Temperature



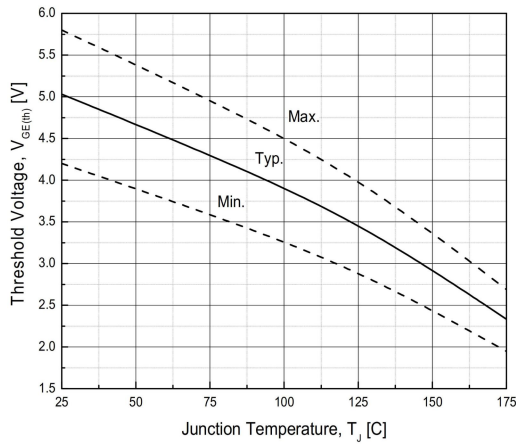
Diode Forward Characteristics



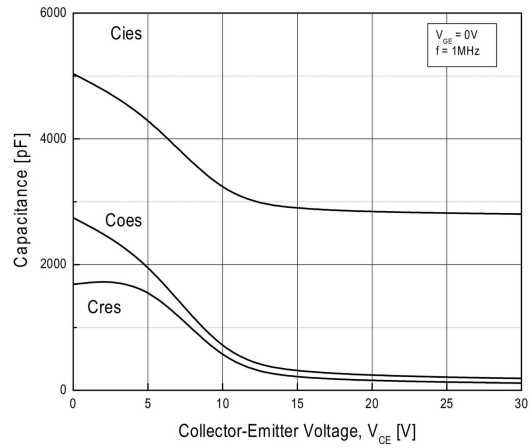
Diode Forward-Junction Temperature



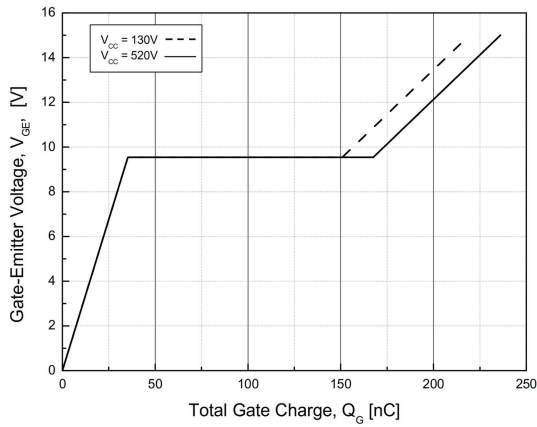
**Threshold Voltage-Junction Temperature**



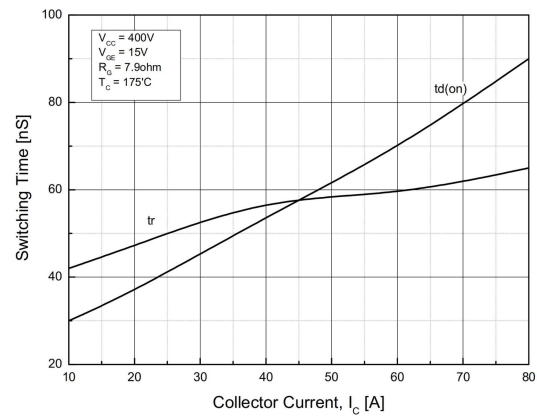
**Typical Capacitance**



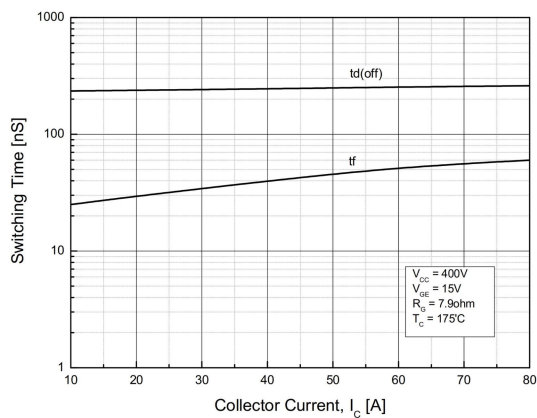
**Typical Gate Charge**



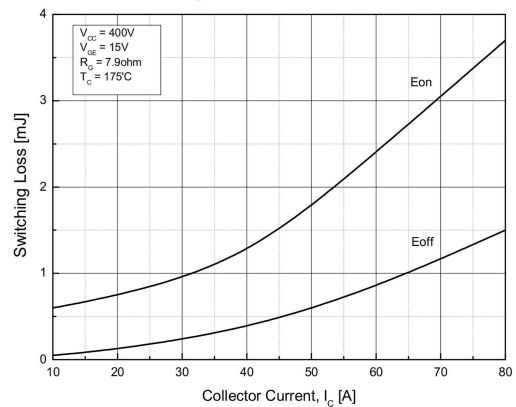
**Typical Turn on-Collector Current**



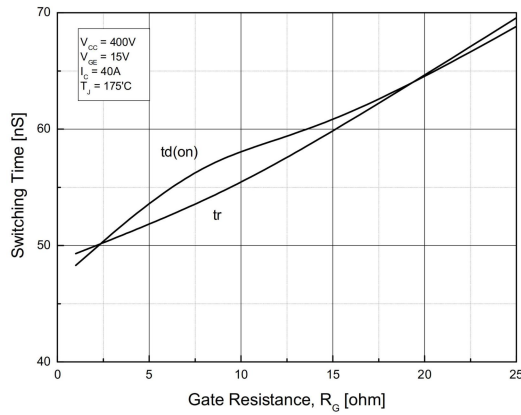
**Typical Turn off-Collector Current**



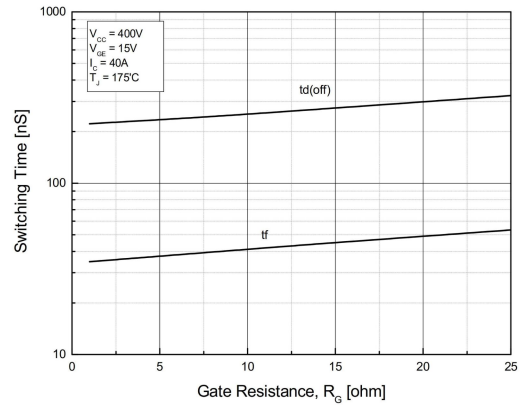
**Switching Loss-Collector Current**



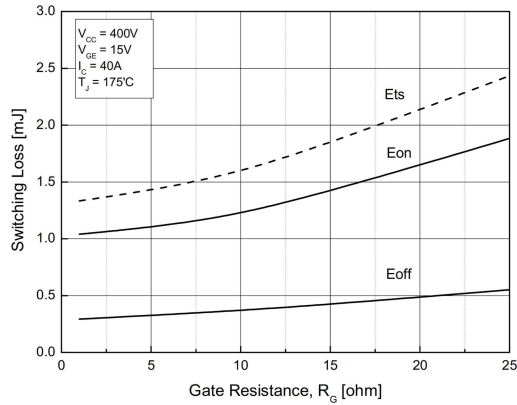
**Turn on Characteristics-Gate Resistance**



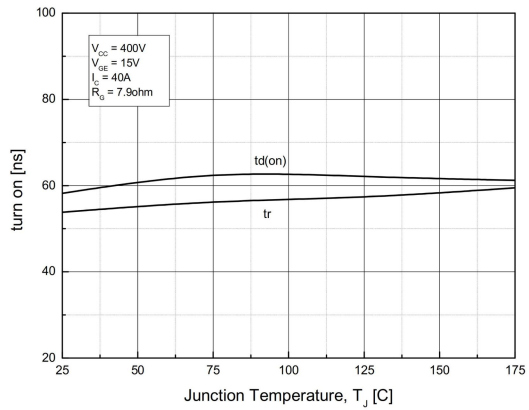
**Turn off Characteristics-Gate Resistance**



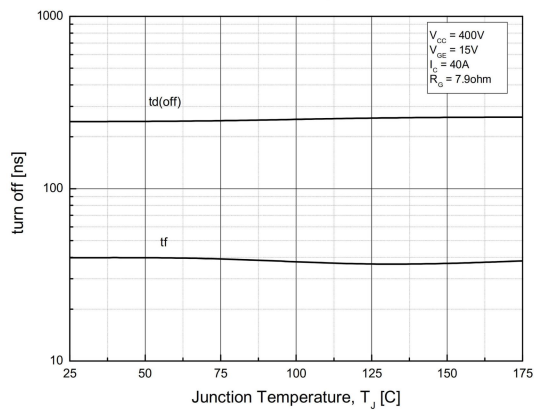
**Switching Loss-Gate Resistance**



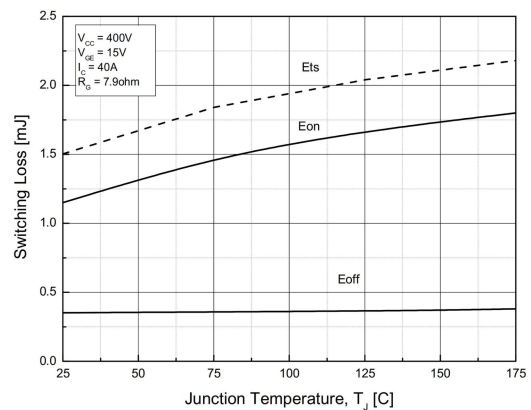
**Turn on Characteristics -Junction Temperature**



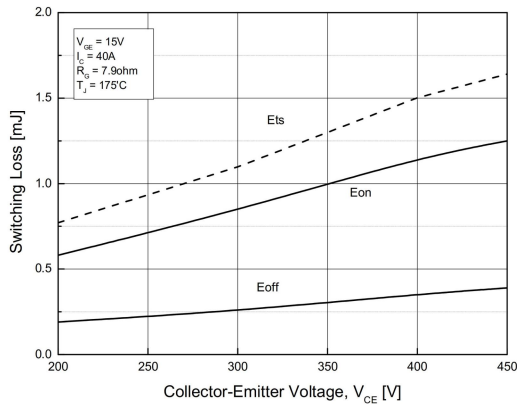
**Turn off Characteristics -Junction Temperature**



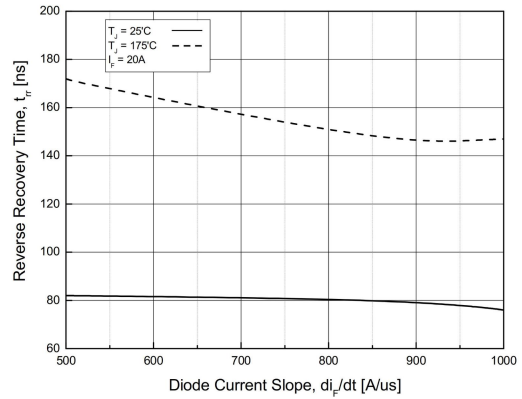
**Switching Loss-Junction Temperature**



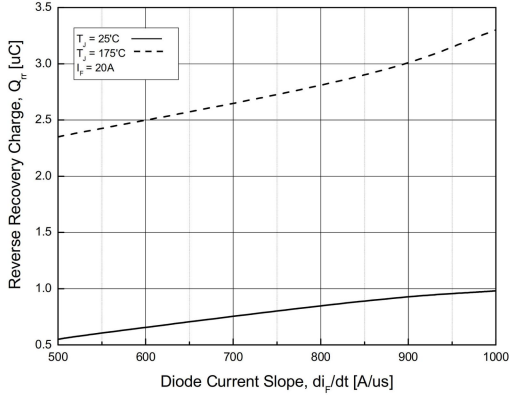
**Switching Loss-Collector Emitter Voltage**



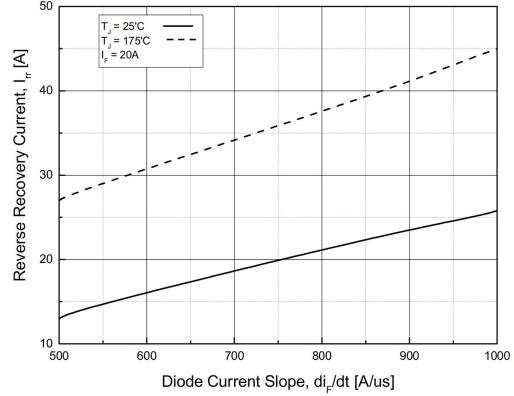
**Reverse Recovery Time -Diode Current Slope**



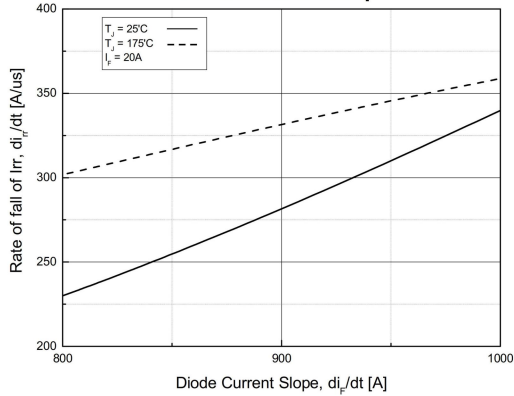
**Reverse Recovery Charge -Diode Current Slope**



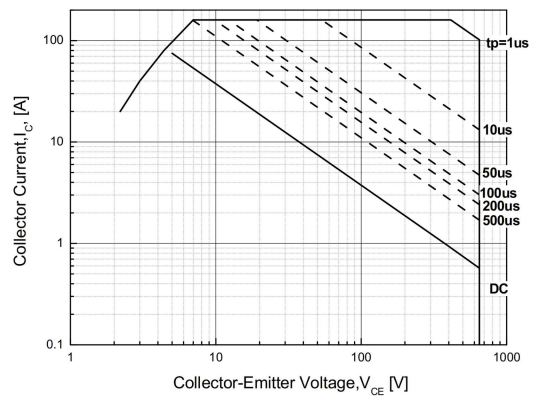
**Reverse Recovery Current -Diode current slope**



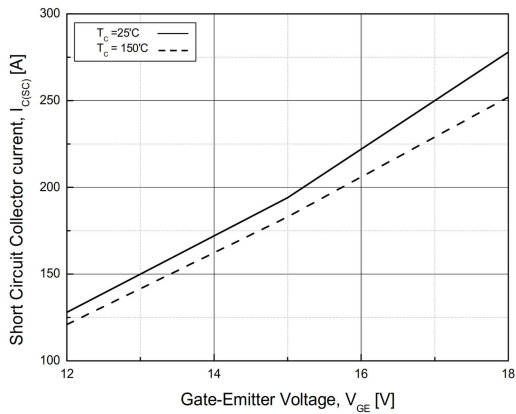
**Rate of fall of reverse recovery current -Diode Current Slope**



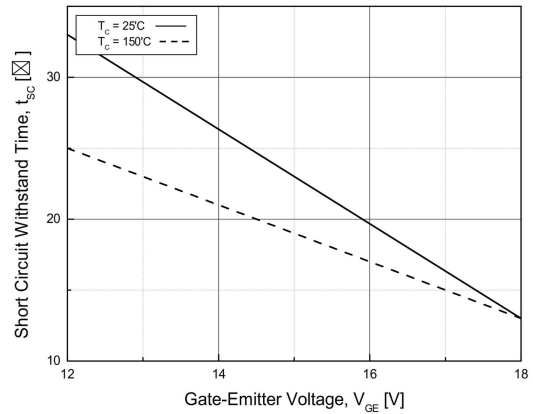
**Forward Bias Safe Operating Area**



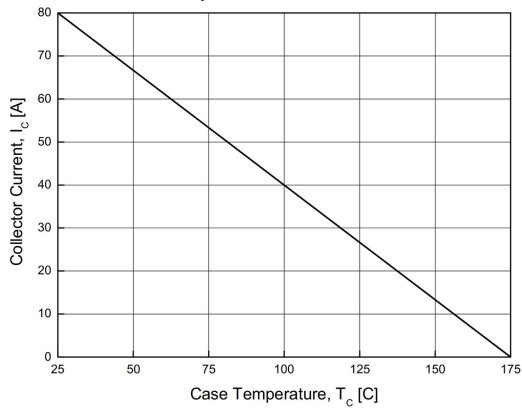
Typical Short Circuit Collector Current



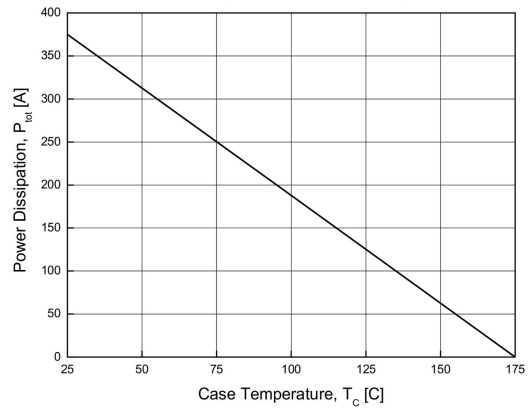
Typical Short Circuit Withstand Time



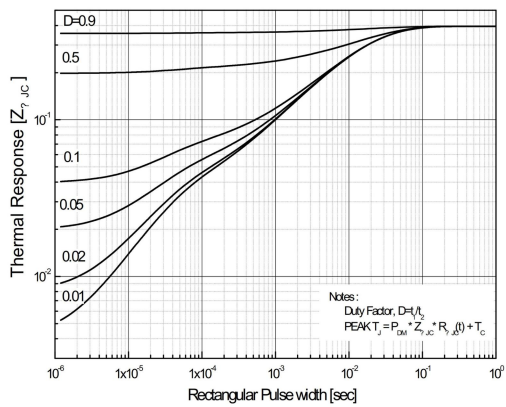
Case Temperature-Collector Current



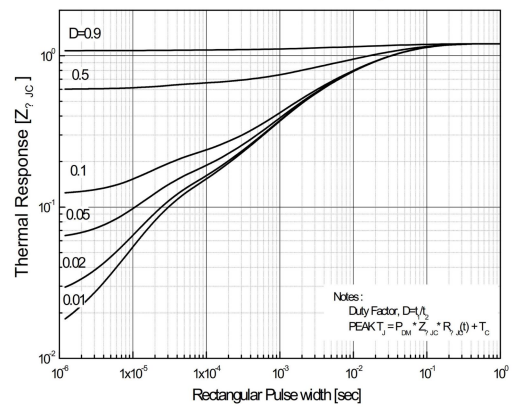
Power Dissipation-Case Temperature



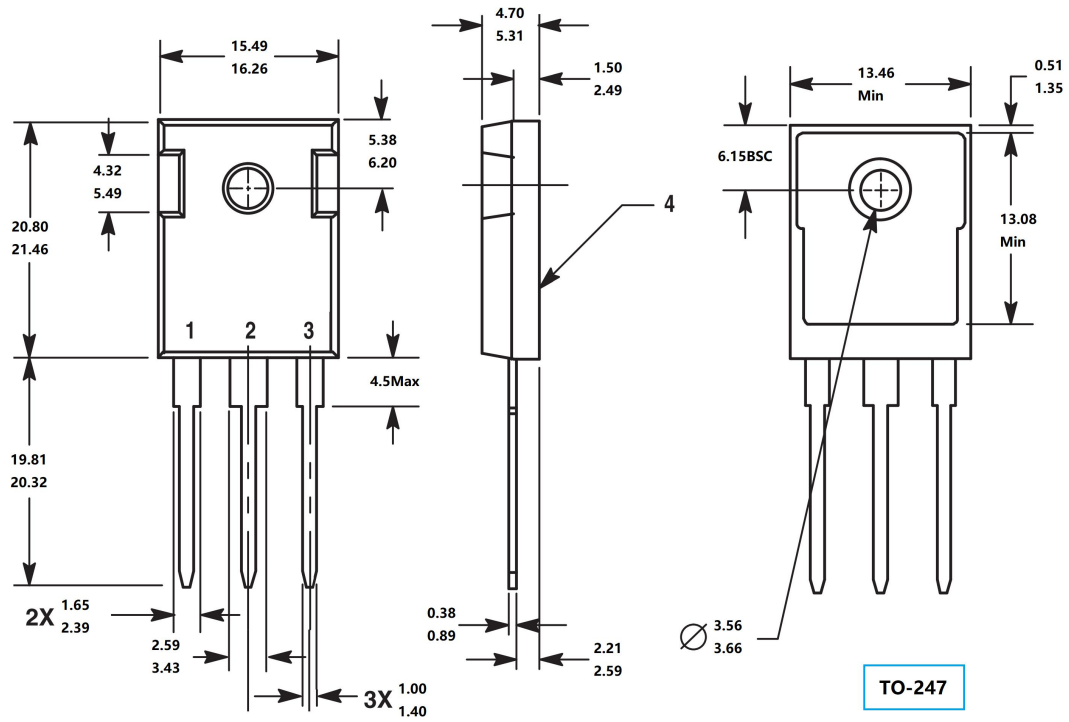
IGBT Transient Thermal Impedance



FRD Transient Thermal Impedance



### Package outline dimension





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