



March 2009



## FGA50N100BNT

### 1000V, 50A NPT-Trench IGBT CO-PAK

#### Features

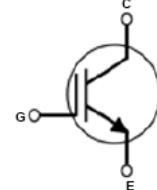
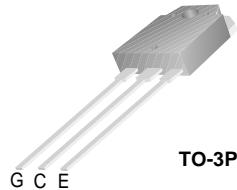
- High Speed Switching
- Low Saturation Voltage :  $V_{CE(sat)} = 2.5$  V @  $I_C = 60A$
- High Input Impedance
- RoHS Compliant

#### Applications

- UPS, PFC, I-H Jar, Induction Heater, Home Appliance.

#### General Description

Trench insulated gate bipolar transistors (IGBTs) with NPT technology show outstanding performance in conduction and switching characteristics as well as enhanced avalanche ruggedness. These devices are well suited for UPS, PFC, I-H Jar, induction Heater and Home Appliance.



#### Absolute Maximum Ratings

Symbol	Description	Ratings	Units
$V_{CES}$	Collector to Emitter Voltage	1000	V
$V_{GES}$	Gate to Emitter Voltage	$\pm 25$	V
$I_C$	Collector Current @ $T_C = 25^\circ C$	50	A
	Collector Current @ $T_C = 100^\circ C$	35	A
$I_{CM(1)}$	Pulsed Collector Current	200	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ C$	156	W
	Maximum Power Dissipation @ $T_C = 100^\circ C$	63	W
$T_J$	Operating Junction Temperature	-55 to +150	$^\circ C$
$T_{stg}$	Storage Temperature Range	-55 to +150	$^\circ C$
$T_L$	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds	300	$^\circ C$

##### Notes:

1: Repetitive rating : Pulse width limited by max. junction temperature

#### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{0JC}(\text{IGBT})$	Thermal Resistance, Junction to Case	-	0.8	$^\circ C/W$
$R_{0JA}$	Thermal Resistance, Junction to Ambient	-	40.0	$^\circ C/W$

## Package Marking and Ordering Information

Device Marking	Device	Package	Packaging Type	Qty per Tube	Max Qty per Box
FGA50N100BNT	FGA50N100BNTU	TO-3PN	Rail / Tube	30ea	-

## Electrical Characteristics of the IGBT $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
<b>Off Characteristics</b>						
$\text{BV}_{\text{CES}}$	Collector to Emitter Breakdown Voltage	$\text{V}_{\text{GE}} = 0\text{V}$ , $\text{I}_C = 1\text{mA}$	1000	-	-	V
$\text{I}_{\text{CES}}$	Collector Cut-Off Current	$\text{V}_{\text{CE}} = 1000\text{V}$ , $\text{V}_{\text{GE}} = 0\text{V}$	-	-	1.0	mA
$\text{I}_{\text{GES}}$	G-E Leakage Current	$\text{V}_{\text{GE}} = \pm 25\text{V}$ , $\text{V}_{\text{CE}} = 0\text{V}$	-	-	$\pm 500$	nA
<b>On Characteristics</b>						
$\text{V}_{\text{GE}(\text{th})}$	G-E Threshold Voltage	$\text{I}_C = 60\text{mA}$ , $\text{V}_{\text{CE}} = \text{V}_{\text{GE}}$	4.0	5.5	7.0	V
$\text{V}_{\text{CE}(\text{sat})}$	Collector to Emitter Saturation Voltage	$\text{I}_C = 10\text{A}$ , $\text{V}_{\text{GE}} = 15\text{V}$	-	1.5	1.8	V
		$\text{I}_C = 60\text{A}$ , $\text{V}_{\text{GE}} = 15\text{V}$		2.5	2.9	V
		$\text{I}_C = 60\text{A}$ , $\text{V}_{\text{GE}} = 15\text{V}$ , $T_C = 125^\circ\text{C}$	-	3.1	-	V
<b>Dynamic Characteristics</b>						
$\text{C}_{\text{ies}}$	Input Capacitance	$\text{V}_{\text{CE}} = 10\text{V}$ , $\text{V}_{\text{GE}} = 0\text{V}$ , $f = 1\text{MHz}$	-	6000	-	pF
$\text{C}_{\text{oes}}$	Output Capacitance		-	260	-	pF
$\text{C}_{\text{res}}$	Reverse Transfer Capacitance		-	200	-	pF
<b>Switching Characteristics</b>						
$t_{\text{d}(\text{on})}$	Turn-On Delay Time	$\text{V}_{\text{CC}} = 600\text{V}$ , $\text{I}_C = 60\text{A}$ , $\text{R}_G = 10\Omega$ , $\text{V}_{\text{GE}} = 15\text{V}$ , Inductive Load, $T_C = 25^\circ\text{C}$	-	34	-	ns
$t_r$	Rise Time		-	68	-	ns
$t_{\text{d}(\text{off})}$	Turn-Off Delay Time		-	243	-	ns
$t_f$	Fall Time		-	65	100	ns
$Q_g$	Total Gate Charge	$\text{V}_{\text{CE}} = 600\text{V}$ , $\text{I}_C = 60\text{A}$ , $\text{V}_{\text{GE}} = 15\text{V}$ , $T_C = 25^\circ\text{C}$	-	257	350	nC
$Q_{\text{ge}}$	Gate to Emitter Charge		-	45	-	nC
$Q_{\text{gc}}$	Gate to Collector Charge		-	95	-	nC

## Typical Performance Characteristics

Figure 1. Typical Output Characteristics

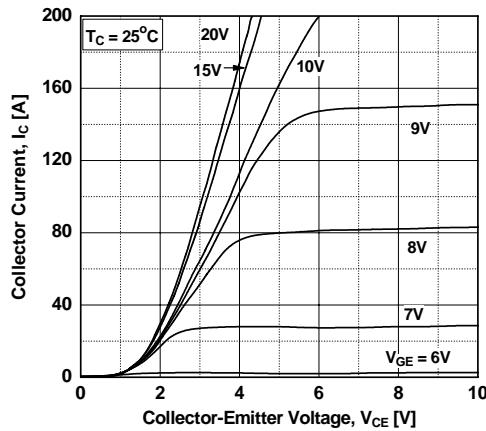


Figure 2. Typical Output Characteristics

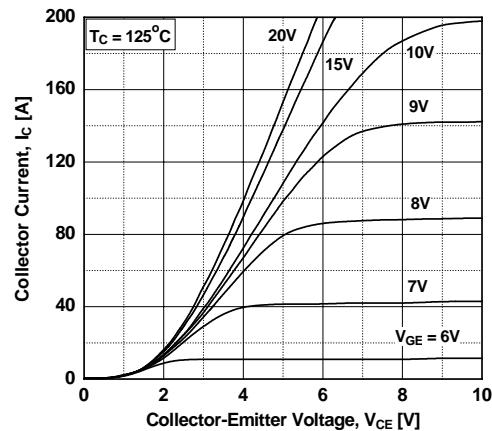


Figure 3. Typical Saturation Voltage Characteristics

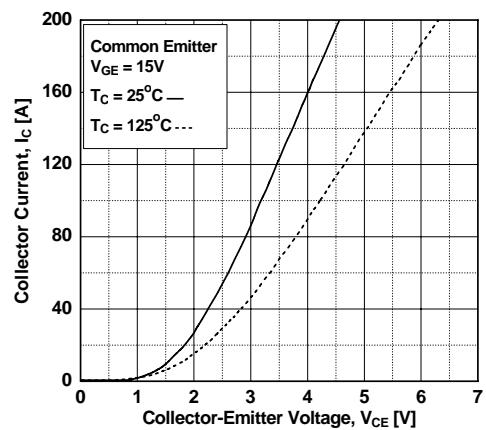


Figure 4. Transfer Characteristics

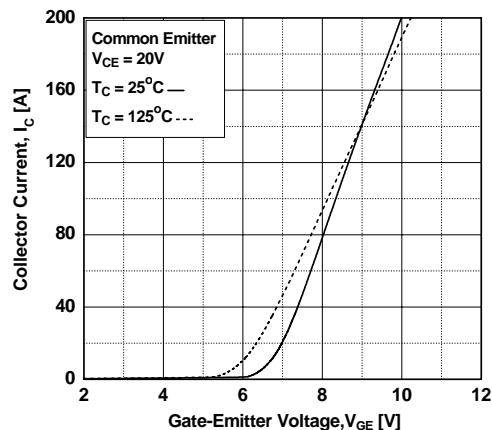


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

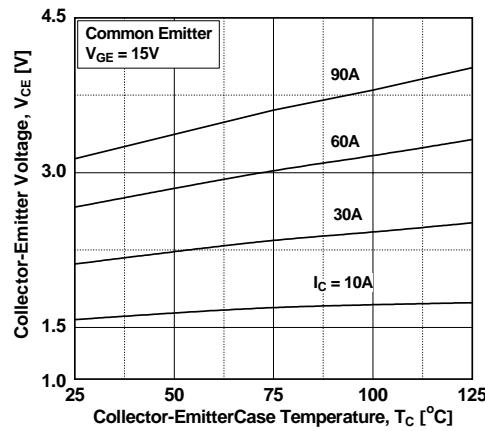
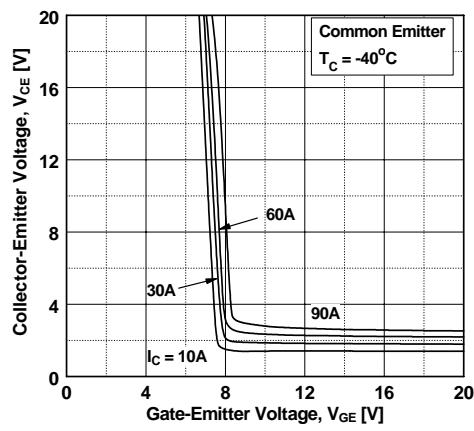


Figure 6. Saturation Voltage vs.  $V_{GE}$



## Typical Performance Characteristics

Figure 7. Saturation Voltage vs.  $V_{GE}$

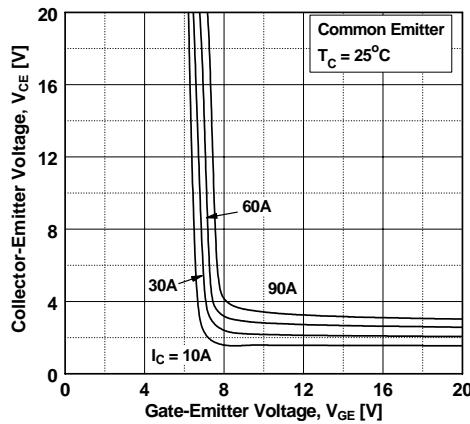


Figure 9. Capacitance Characteristics

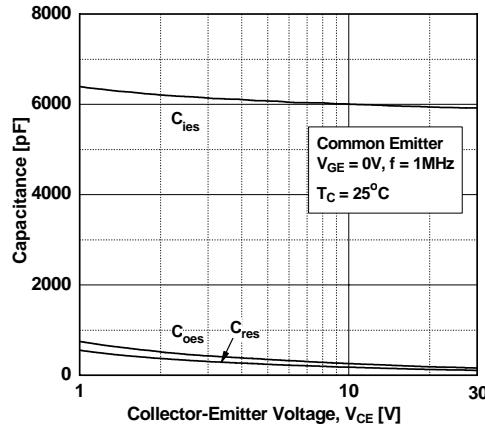


Figure 11. SOA Characteristics

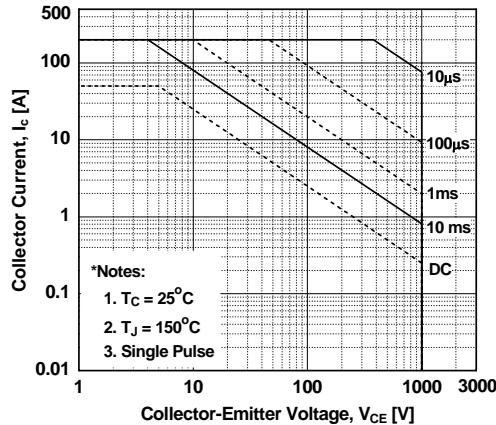


Figure 8. Saturation Voltage vs.  $V_{GE}$

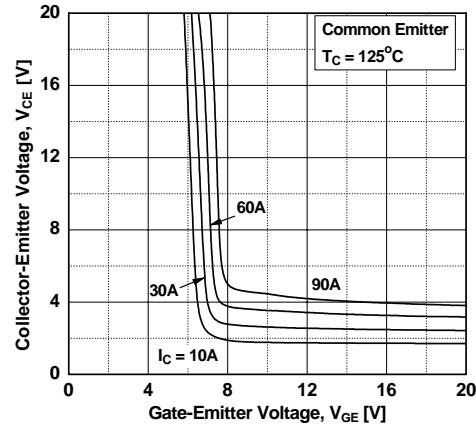


Figure 10. Gate charge Characteristics

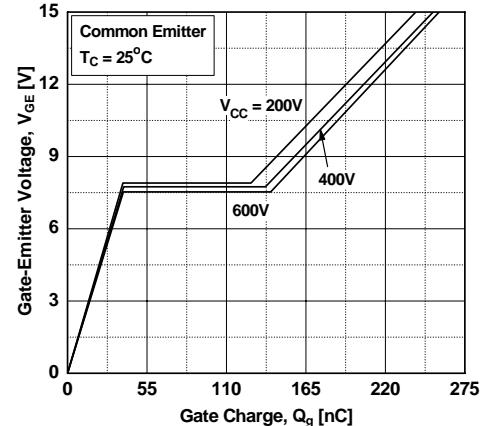
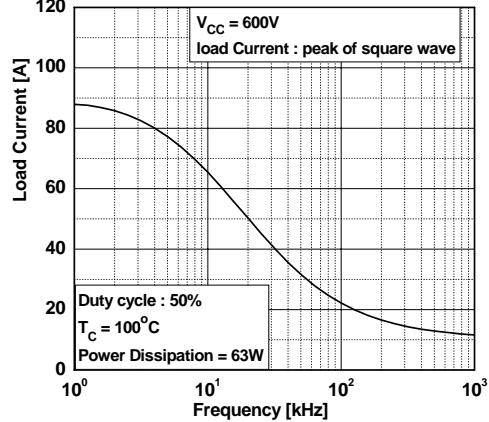


Figure 12. Load Current vs. Frequency



## Typical Performance Characteristics

Figure 13. Turn-on Characteristics vs. Gate Resistance

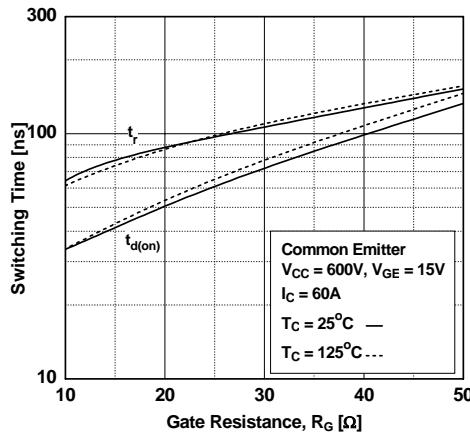


Figure 14. Turn-off Characteristics vs. Gate Resistance

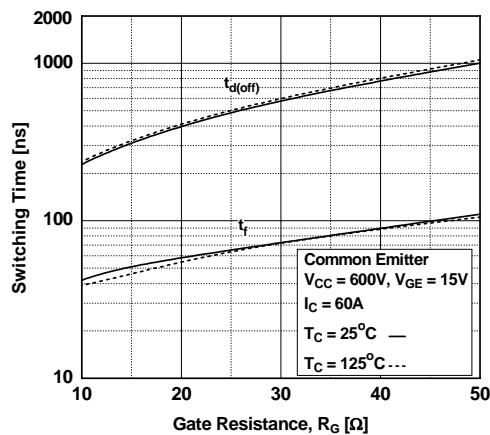


Figure 15. Turn-on Characteristics vs. Collector Current

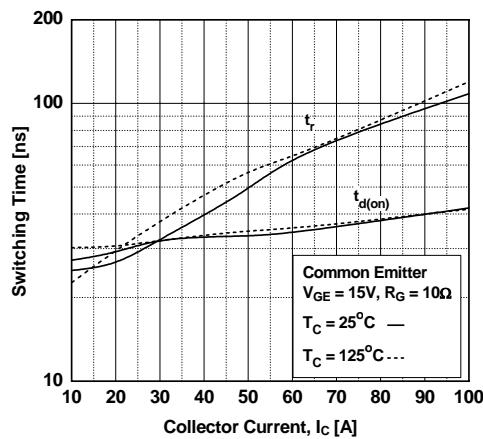


Figure 16. Turn-off Characteristics vs. Collector Current

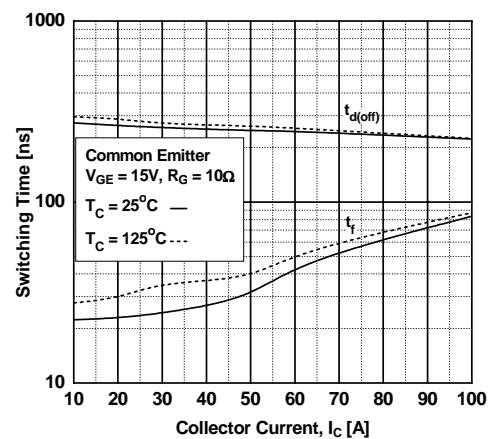


Figure 17. Switching Loss vs. Gate Resistance

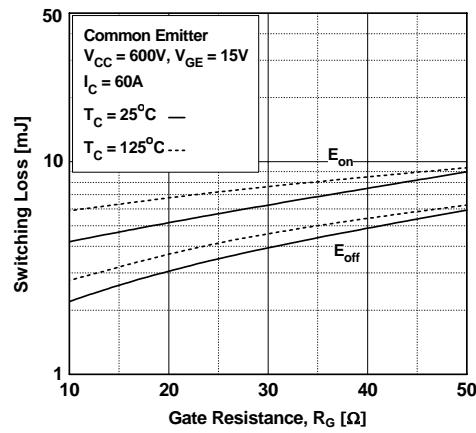
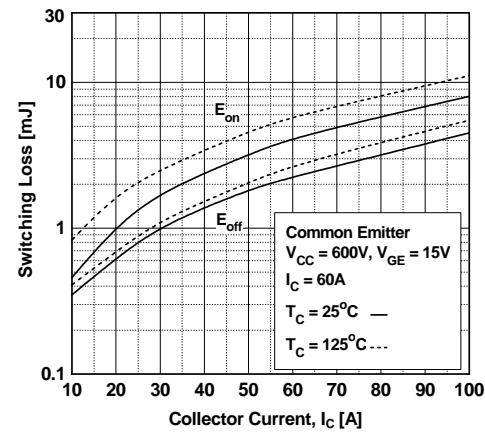


Fig 18. Switching Loss vs. Collector Current



## Typical Performance Characteristics

Figure 19. Turn off Switching SOA Characteristics

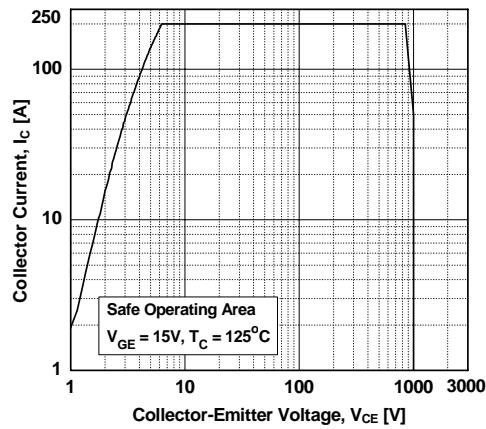
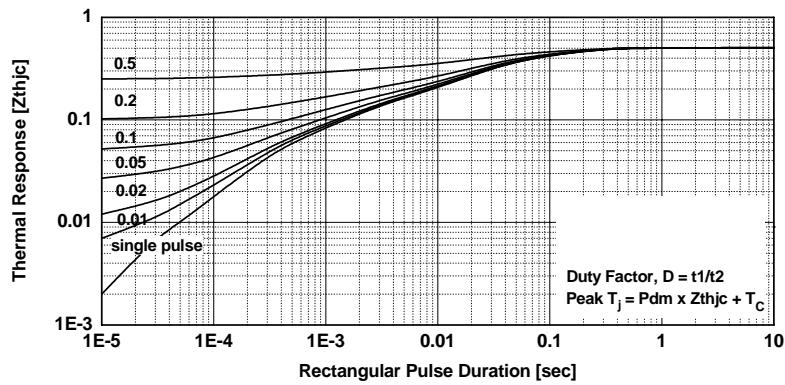
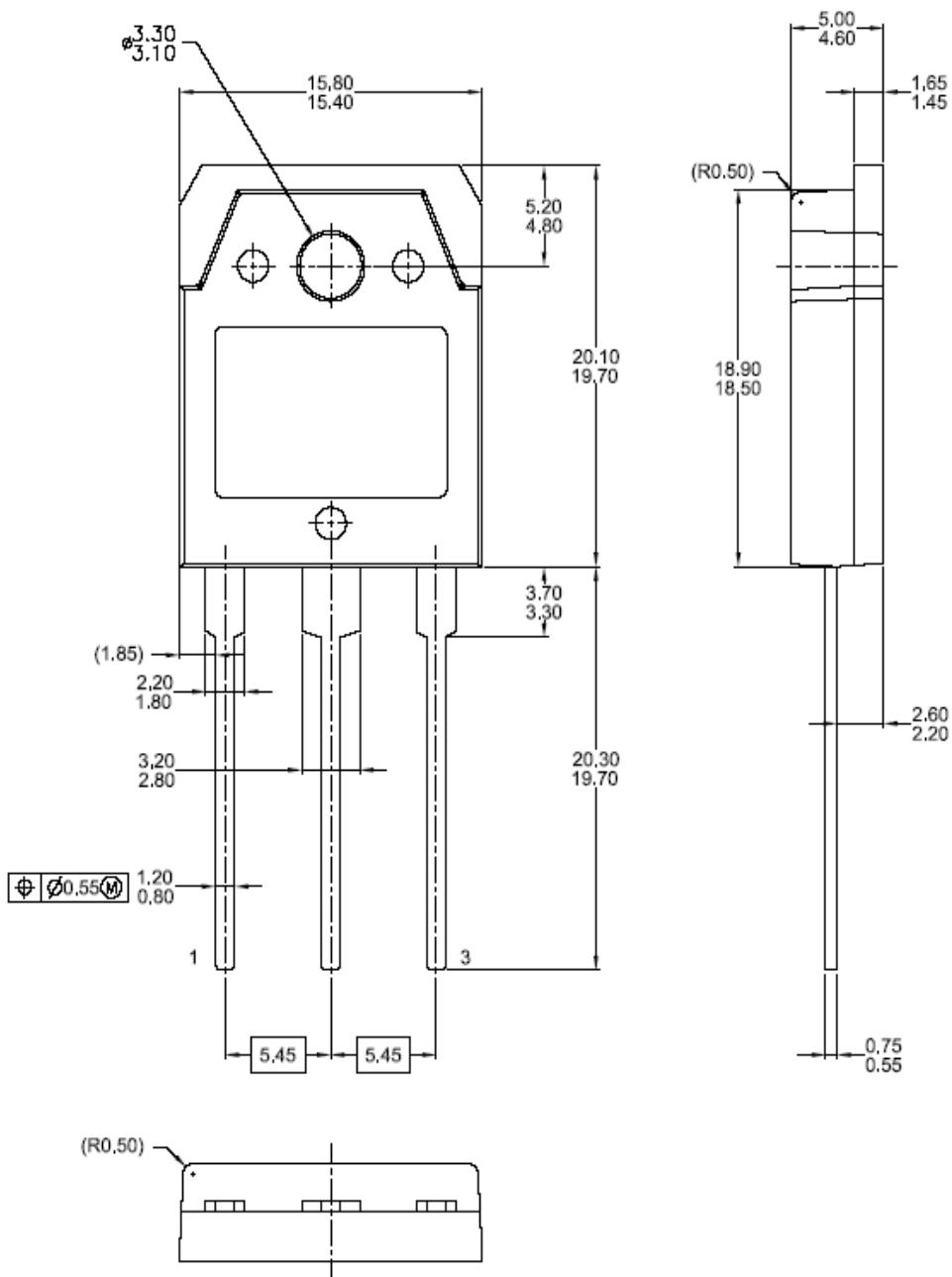


Figure 20. Transient Thermal Impedance of IGBT



## Mechanical Dimensions

### TO-3PN





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