



**THE DATASHEET OF
FGA70N33BTDTU**



FGA70N33BTD

330V, 70A PDP IGBT

Features

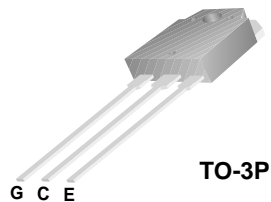
- High current capability
- Low saturation voltage: $V_{CE(sat)} = 1.7V @ I_C = 70A$
- High input impedance
- Fast switching
- RoHS Compliant

Applications

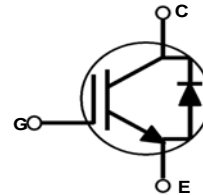
- PDP System

General Description

Using Novel Trench IGBT Technology, Fairchild's new series of trench IGBTs offer the optimum performance for PDP applications where low conduction and switching losses are essential.



TO-3P



Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Description	Ratings	Units
V_{CES}	Collector to Emitter Voltage	330	V
V_{GES}	Gate to Emitter Voltage	± 30	V
$I_{Cpulse(1)*}$	Pulsed Collector Current @ $T_C = 25^\circ C$	160	A
$I_{C\ pulse(2)*}$	Pulsed Collector Current @ $T_C = 25^\circ C$	220	A
P_D	Maximum Power Dissipation @ $T_C = 25^\circ C$	149	W
	Maximum Power Dissipation @ $T_C = 100^\circ C$	60	W
V_{RRM}	Peak Repetitive Reverse Voltage of Diode	330	V
$I_{F(AV)}$	Average Rectified Forward Current of diode @ $T_C = 100^\circ C$	10	A
I_{FSM}	Non-repetitive Peak Surge Current of diode 60Hz Single Half-Sine wave	100	A
T_J, T_{stg}	Operating Junction Temperature and Storage Temperature	-55 to +150	$^\circ C$
T_L	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds	300	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}(IGBT)$	Thermal Resistance, Junction to Case	--	0.84	$^\circ C/W$
$R_{\theta JC}(Diode)$	Thermal Resistance, Junction to Case	--	1.16	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	--	40	$^\circ C/W$

Notes:

- 1: Repetitive test, Pulse width=100usec, Duty=0.1
 - 2: Half Sine Wave, D< 0.01, pluse width < 5usec
- * I_{C_pulse} limited by max T_J

Package Marking and Ordering Information

Device Marking	Device	Package	Packaging Type	Qty per Tube	Max Qty per Box
FGA70N33BTD	FGA70N33BTDU	TO-3P	Tube	30ea	--

Electrical Characteristics of the IGBT T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
V_{CES}	Collector to Emitter Breakdown Voltage	$V_{GE} = 0V, I_C = 250\mu A$	330	--	--	V
$\frac{\Delta V_{CES}}{\Delta T_J}$	Temperature Coefficient of Breakdown Voltage	$V_{GE} = 0V, I_C = 250\mu A$	--	0.3	--	V/°C
I_{CES}	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0V$	--	--	250	μA
I_{GES}	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0V$	--	--	± 400	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 250\mu A, V_{CE} = V_{GE}$	2.3	3.3	4.3	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 20A, V_{GE} = 15V$	--	1.1	--	V
		$I_C = 40A, V_{GE} = 15V,$	--	1.4	--	V
		$I_C = 70A, V_{GE} = 15V, T_C = 25^\circ C$	--	1.7	--	V
		$I_C = 70A, V_{GE} = 15V,$ $T_C = 125^\circ C$	--	1.8	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{CE} = 30V, V_{GE} = 0V,$ $f = 1MHz$	--	1380	--	pF
C_{oes}	Output Capacitance		--	140	--	pF
C_{res}	Reverse Transfer Capacitance		--	60	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 200V, I_C = 20A,$ $R_G = 5\Omega, V_{GE} = 15V,$ Resistive Load, $T_C = 25^\circ C$	--	13	--	ns
t_r	Rise Time		--	26	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	46	--	ns
t_f	Fall Time		--	198	--	ns
$t_{d(on)}$	Turn-On Delay Time		$V_{CC} = 200V, I_C = 20A,$ $R_G = 5\Omega, V_{GE} = 15V,$ Resistive Load, $T_C = 125^\circ C$	--	13	--
t_r	Rise Time	--		28	--	ns
$t_{d(off)}$	Turn-Off Delay Time	--		48	--	ns
t_f	Fall Time	--		268	--	ns
Q_g	Total Gate Charge	$V_{CE} = 200V, I_C = 20A,$ $V_{GE} = 15V$		--	49	--
Q_{ge}	Gate to Emitter Charge		--	6.8	--	nC
Q_{gc}	Gate to Collector Charge		--	17.5	--	nC

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max	Units	
V_{FM}	Diode Forward Voltage	$I_F = 10A$	$T_C = 25^\circ\text{C}$	--	1.1	1.5	V
			$T_C = 125^\circ\text{C}$	--	0.95	--	
t_{rr}	Diode Reverse Recovery Time		$T_C = 25^\circ\text{C}$	--	23	--	ns
			$T_C = 125^\circ\text{C}$	--	36	--	
I_{rr}	Diode Peak Reverse Recovery Current	$I_F = 10A, di/dt = 200A/\mu s$	$T_C = 25^\circ\text{C}$	--	2.8	--	A
			$T_C = 125^\circ\text{C}$	--	5.1	--	
Q_{rr}	Diode Reverse Recovery Charge		$T_C = 25^\circ\text{C}$	--	32	--	nC
			$T_C = 125^\circ\text{C}$	--	91	--	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

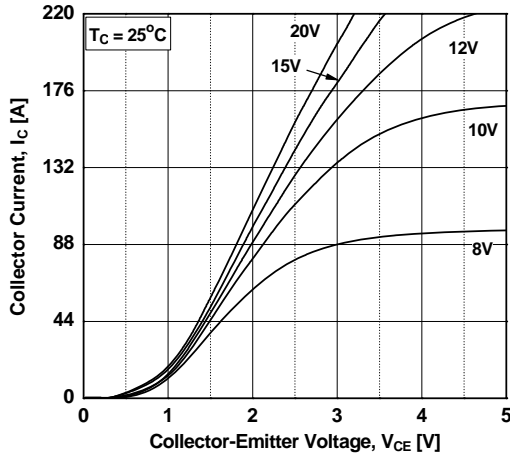


Figure 2. Typical Output Characteristics

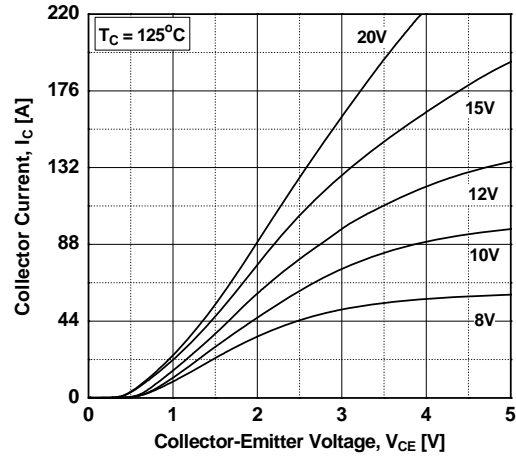


Figure 3. Typical Saturation Voltage Characteristics

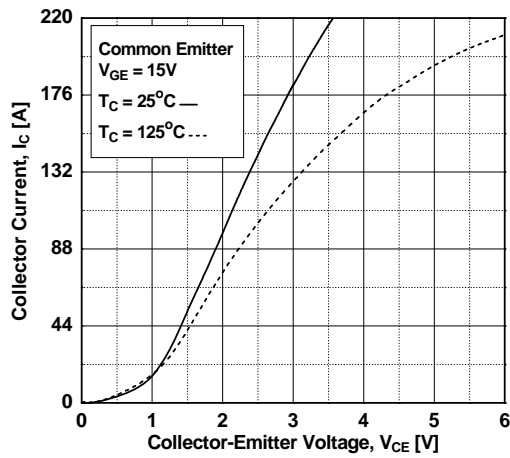


Figure 4. Transfer Characteristics

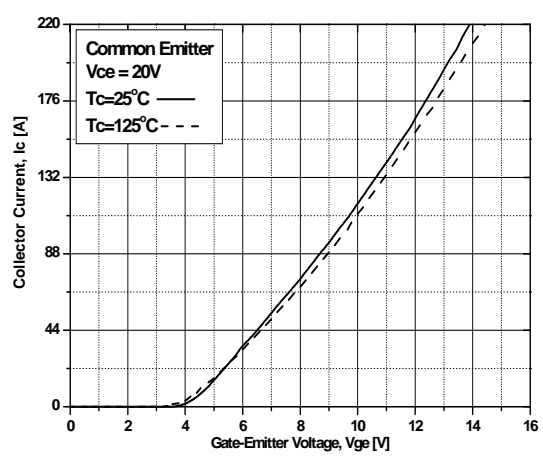


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

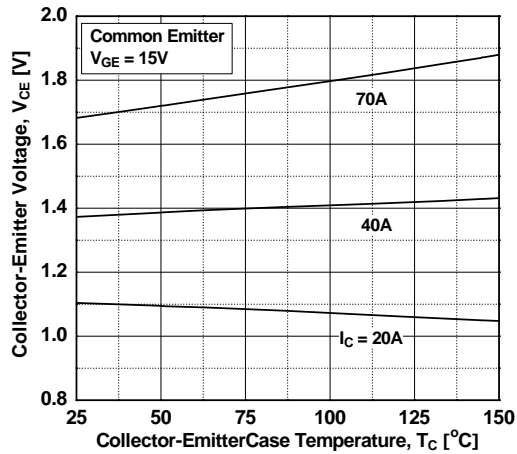
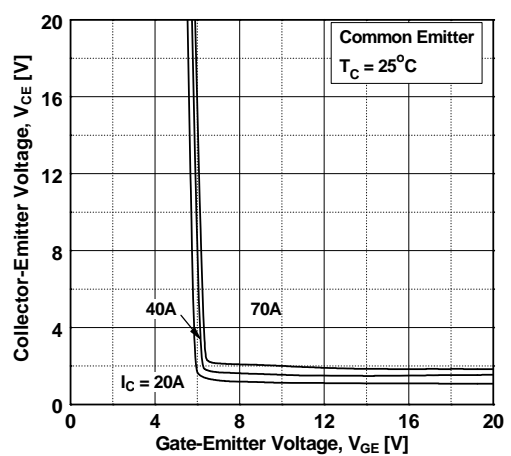


Figure 6. Saturation Voltage vs. Vge



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

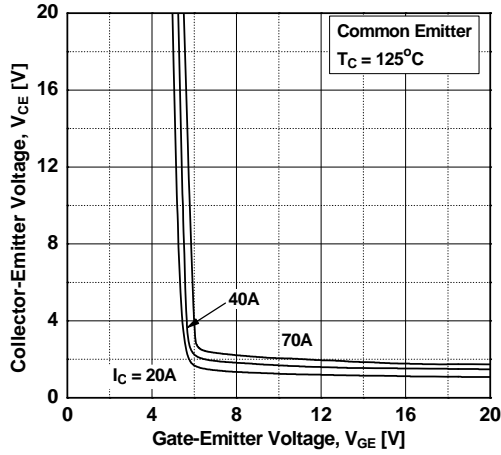


Figure 8. Capacitance Characteristics

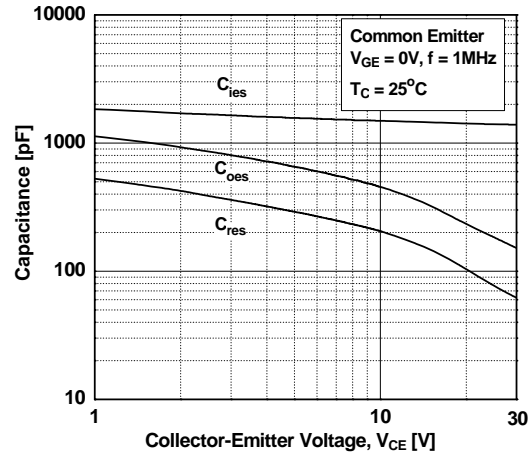


Figure 9. Gate charge Characteristics

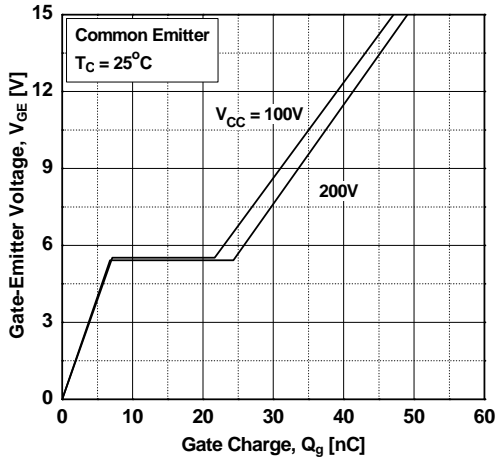


Figure 10. SOA Characteristics

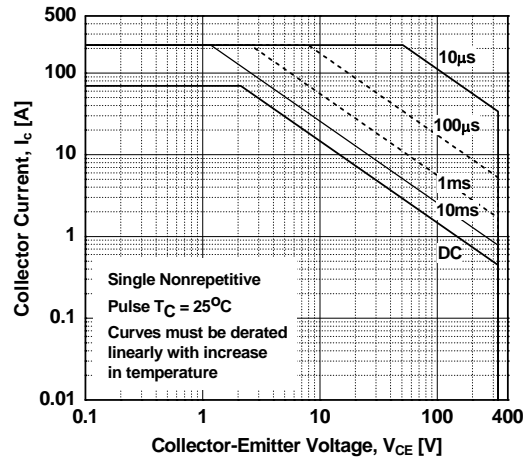


Figure 11. Turn-on Characteristics vs. Gate Resistance

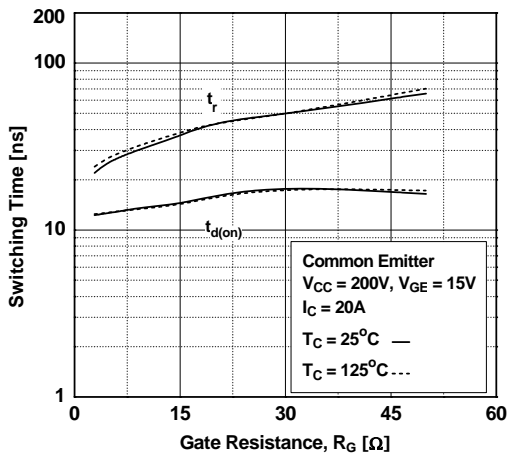
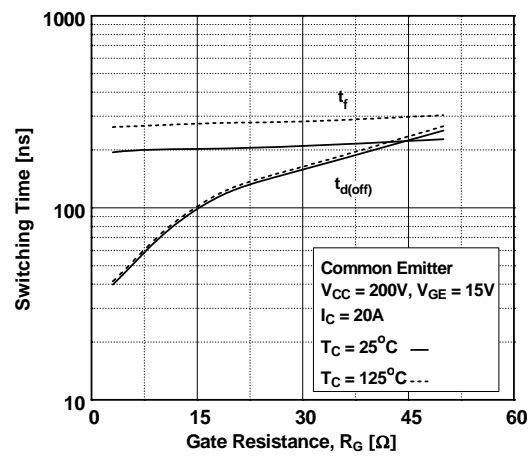


Figure 12. Turn-off Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-on Characteristics vs. Collector Current

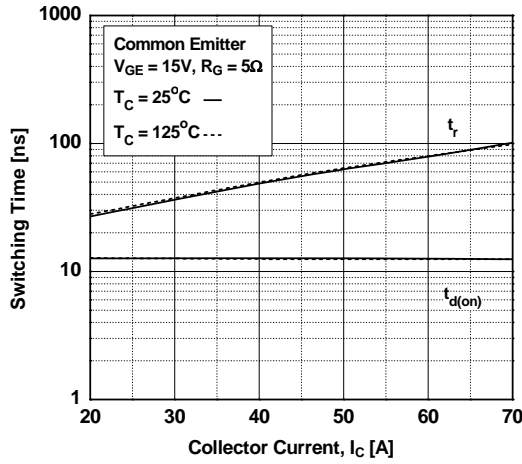


Figure 14. Turn-off Characteristics vs. Collector Current

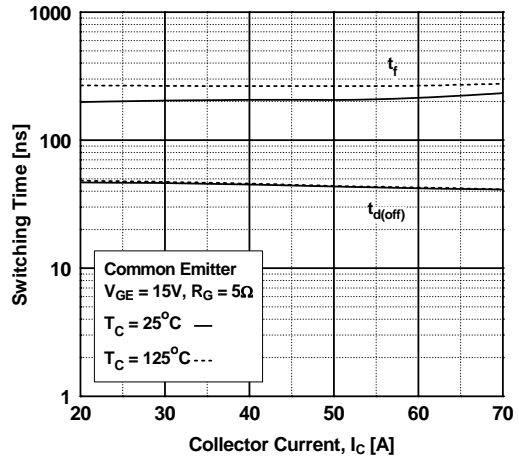


Figure 15. Switching Loss vs. Gate Resistance

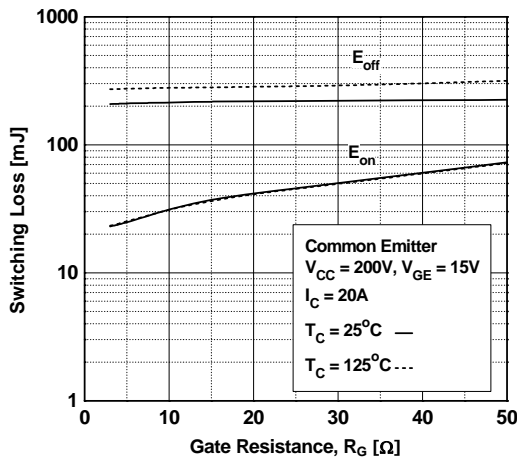


Figure 16. Switching Loss vs. Collector Current

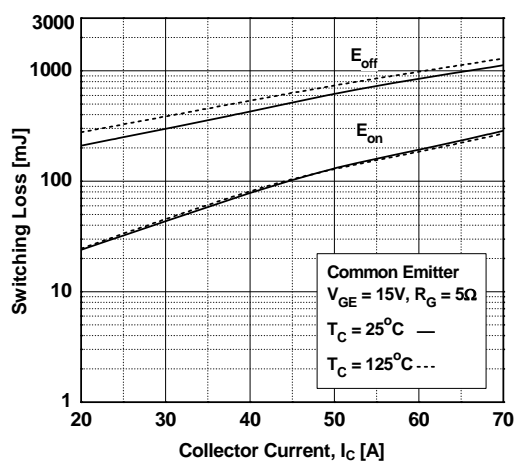
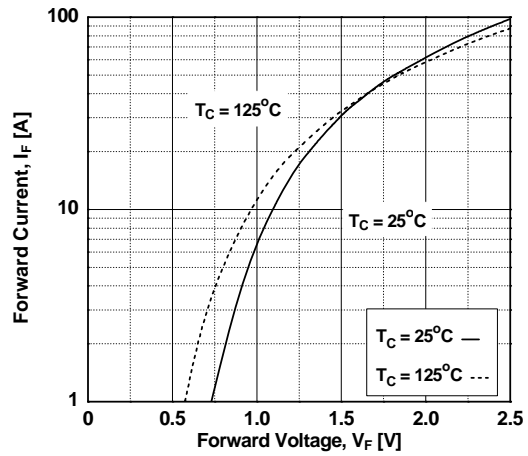
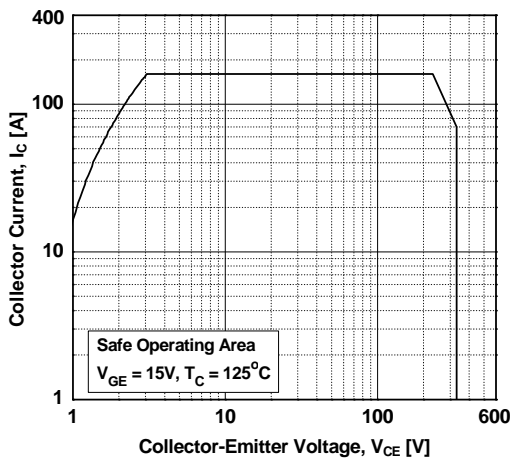


Figure 17. Turn off Switching SOA Characteristics **Figure 18. Forward Characteristics**



Typical Performance Characteristics

Figure 19. Reverse Recovery Current

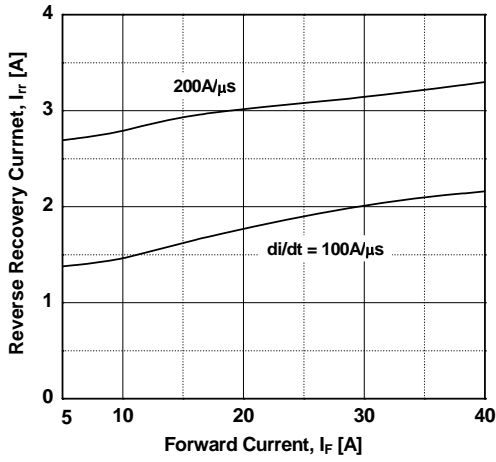


Figure 20. Stored Charge

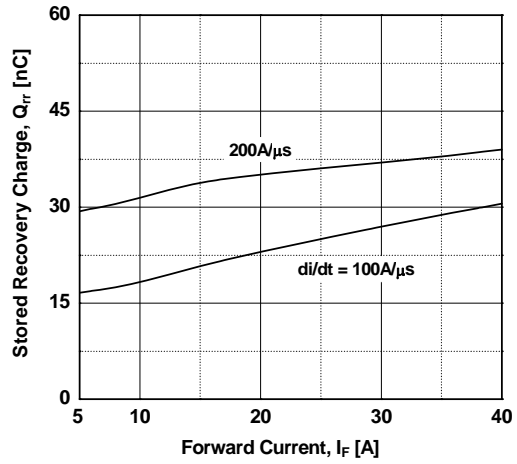


Figure 21. Reverse Recovery Time

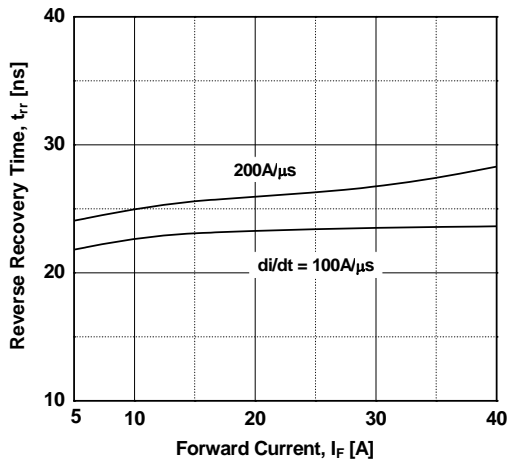
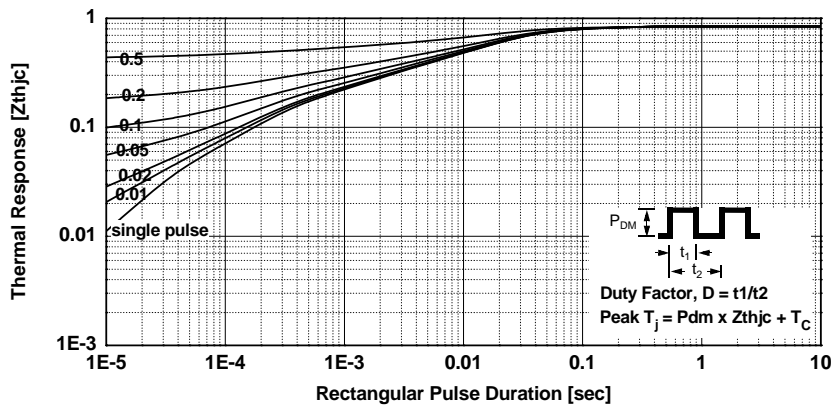
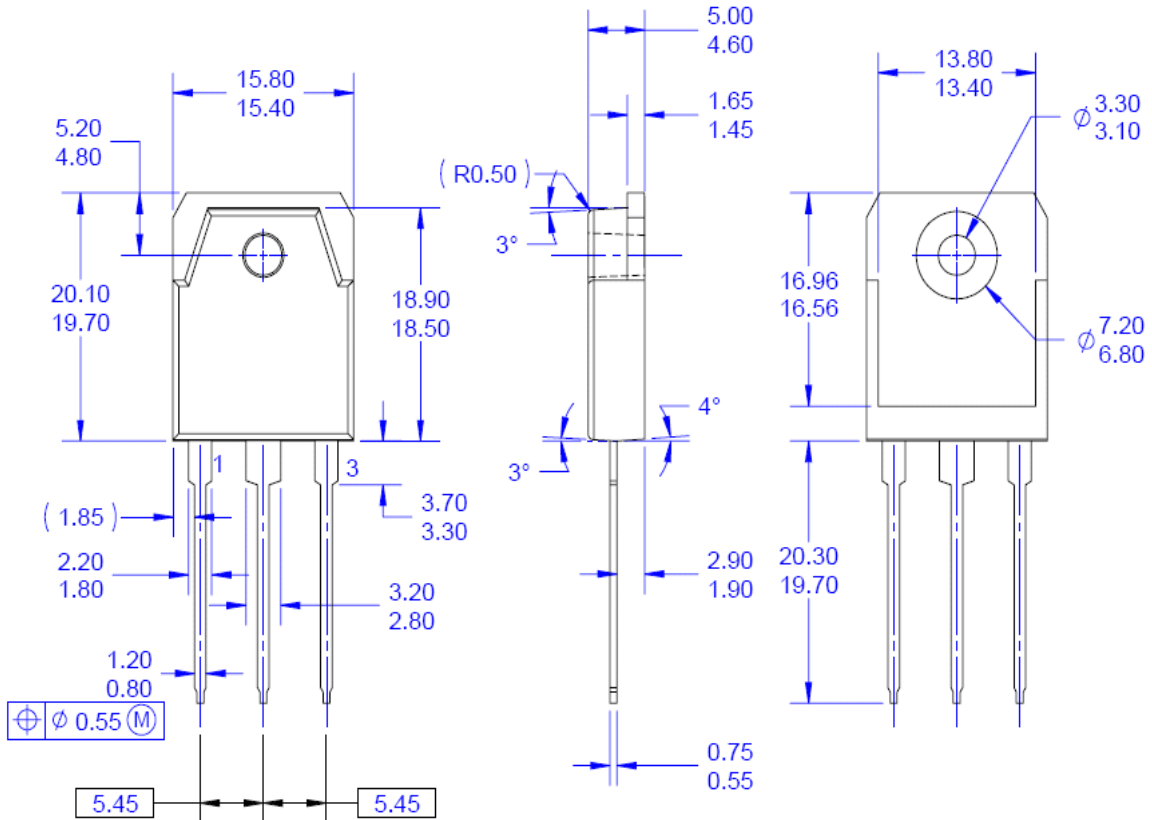


Figure 22. Transient Thermal Impedance of IGBT



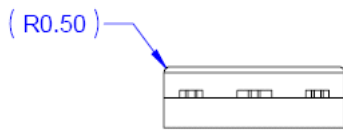
Mechanical Dimensions

TO-3PN



NOTES: UNLESS OTHERWISE SPECIFIED

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- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSION AND TOLERANCING PER ASME14.5
- D) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- E) THIS PACKAGE IS INTENDED ONLY FOR TO3PN.
- F) DRAWING FILE NAME: TO3P03AREV4.




Dimensions in Millimeters



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