FAIRCHILD SEMICONDUCTOR®

November 2008

FGA70N33BTD
330V, 70A PDP IGBT

Features

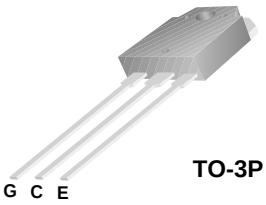
- High current capability
- Low saturation voltage: $V_{CE(sat)}$ =1.7V @ I_C = 70A
- High input impedance
- Fast switching
- RoHS Compliant

Applications

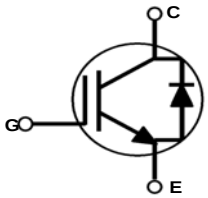
- PDP System

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°C	160	A
$I_{C\ pulse(2)}$*	Pulsed Collector Current @ T_C = 25°C	220	A
P_D	Maximum Power Dissipation @ T_C = 25°C	149	W
	Maximum Power Dissipation @ T_C = 100°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°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 Temperrature	-55 to +150	°C
T_L	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds	300	°C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$(IGBT)	Thermal Resistance, Junction to Case	--	0.84	°C/W
$R_{\theta JC}$(Diode)	Thermal Resistance, Junction to Case	--	1.57	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	--	40	°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 Tj

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Package Marking and Ordering Information

Device Marking	Device	Package	Packaging Type	Qty per Tube	Max Qty per Box
FGA70N33BTD	FGA70N33BTDTU	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						
BV_{CES}	Collector to Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 250μA	330	--	--	V
$\Delta B_{VCES}/\Delta T_J$	Temperature Coefficient of Breakdown Voltage	V_{GE} = 0V, I_C = 250uA	--	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 = 250μA, 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°C	--	1.7	--	V
		I_C = 70A, V_{GE} = 15V, T_C = 125°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 = 5Ω, V_{GE} = 15V, Resistive Load, T_C = 25°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 = 5Ω, V_{GE} = 15V, Resistive Load, T_C = 125°C	--	13	--	ns
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	--	nC
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°C unless otherwise noted

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

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

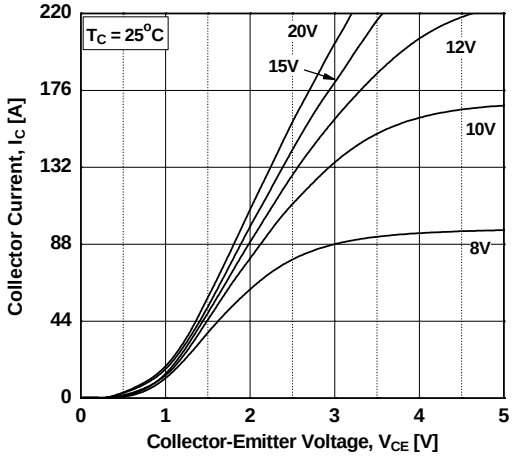


Figure 2. Typical Output Characteristics

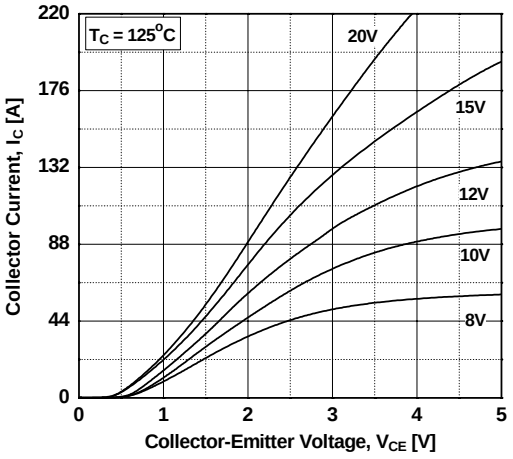


Figure 3. Typical Saturation Voltage Characteristics

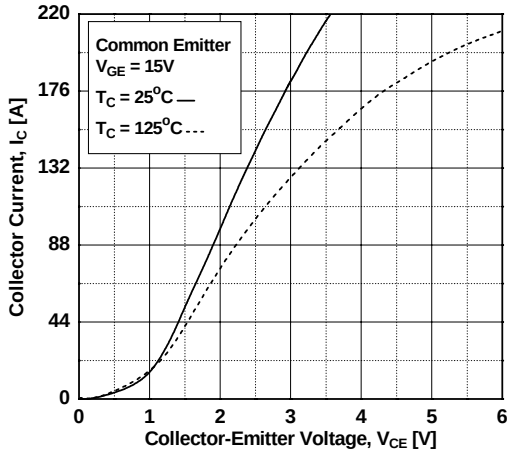


Figure 4. Transfer Characteristics

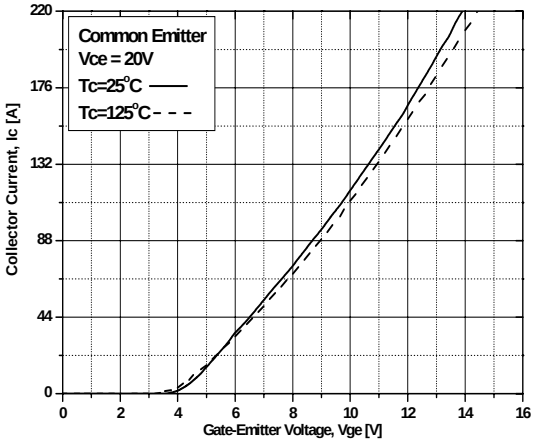


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

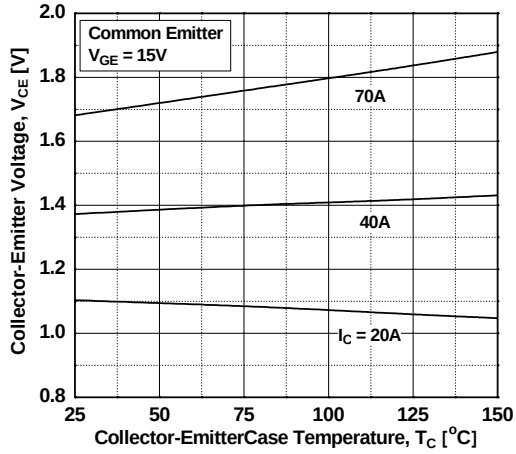
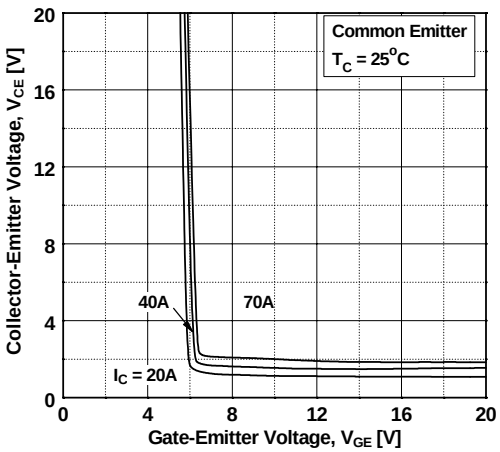


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

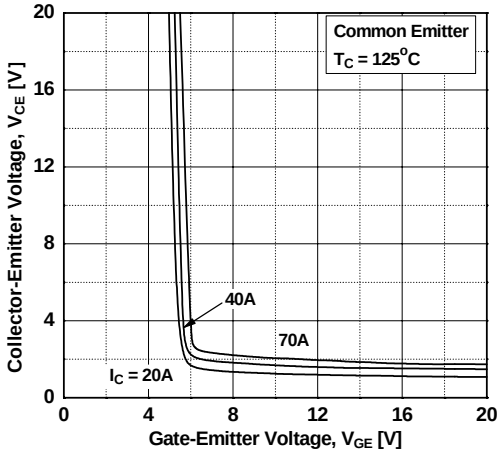


Figure 8. Capacitance Characteristics

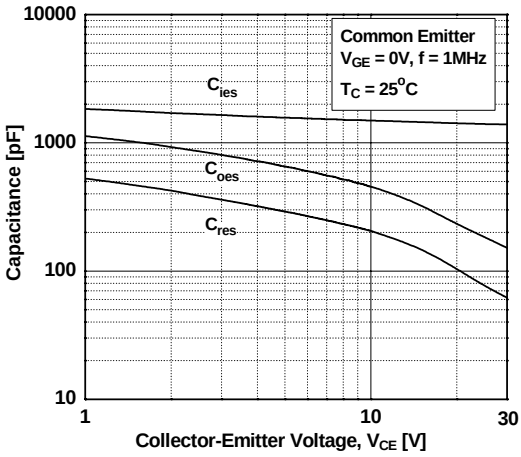


Figure 9. Gate charge Characteristics

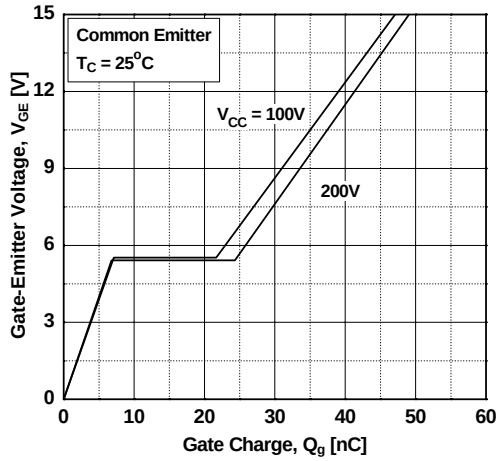


Figure 10. SOA Characteristics

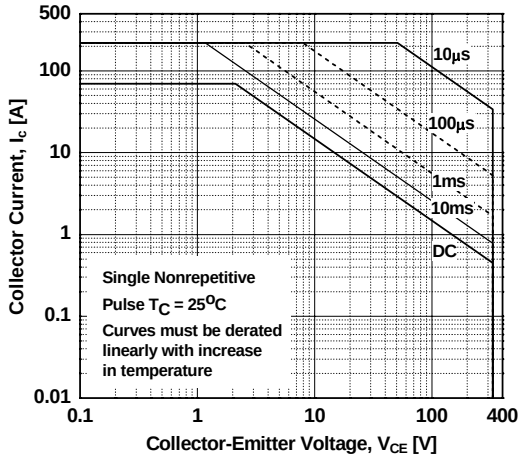


Figure 11. Turn-on Characteristics vs. Gate Resistance

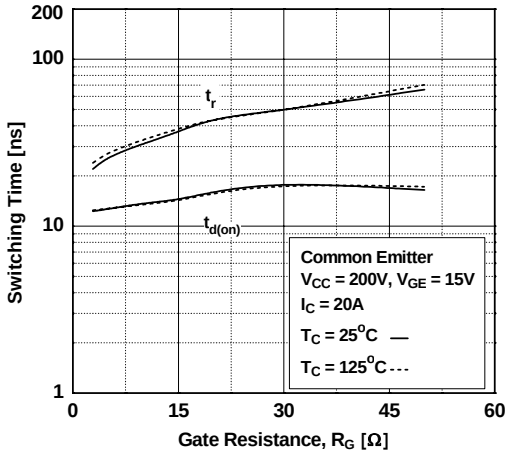
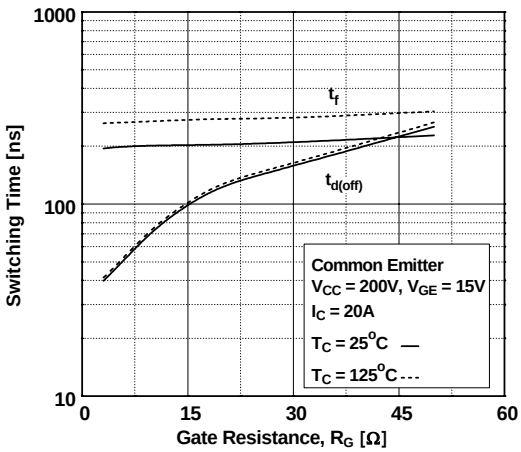


Figure 12. Turn-off Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-on Characteristics vs. Collector Current

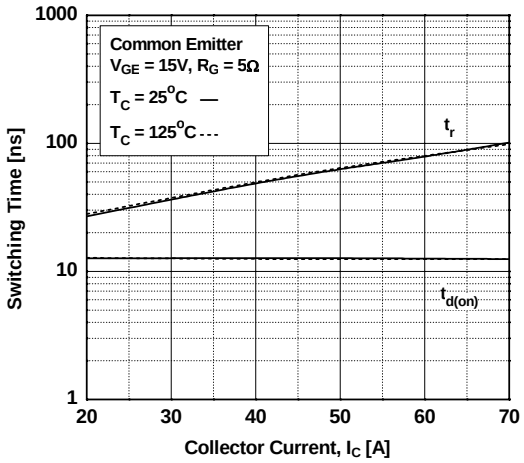


Figure 14. Turn-off Characteristics vs. Collector Current

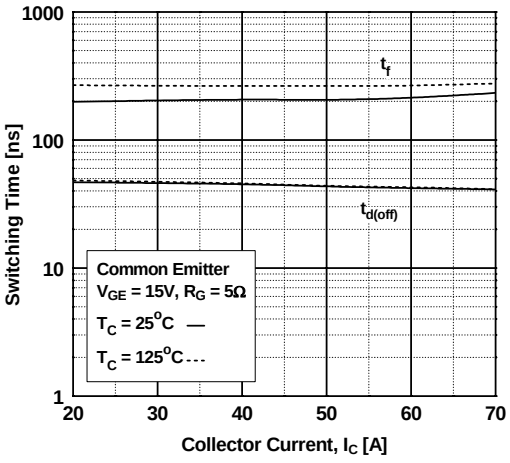


Figure 15. Switching Loss vs. Gate Resistance

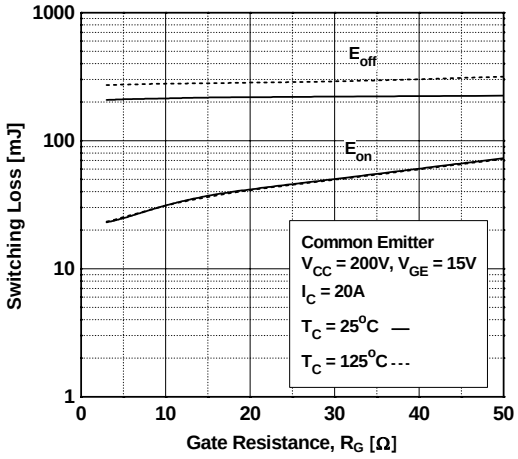


Figure 16. Switching Loss vs. Collector Current

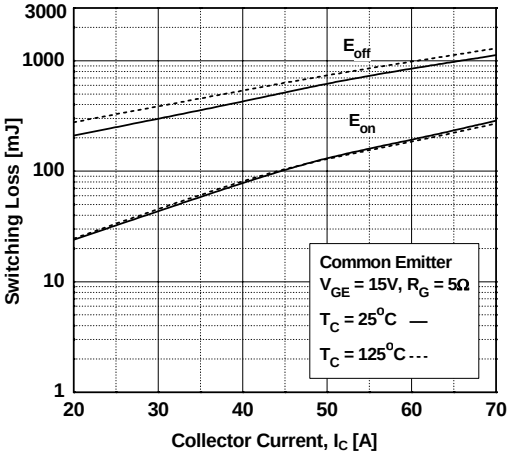


Figure 17. Turn off Switching SOA Characteristics

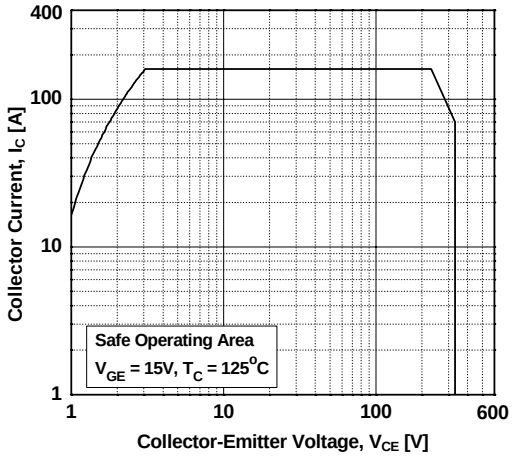
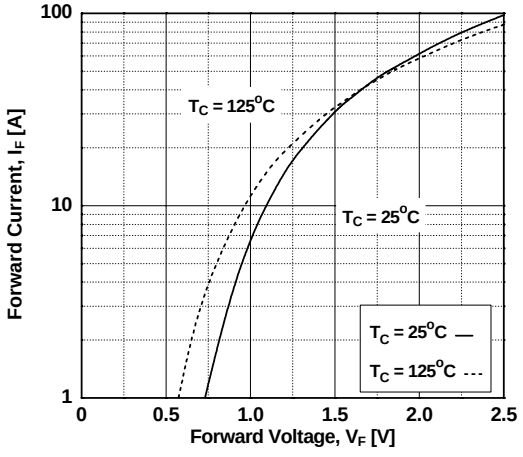


Figure 18. Forward Characteristics



Typical Performance Characteristics

Figure 19. Reverse Recovery Current

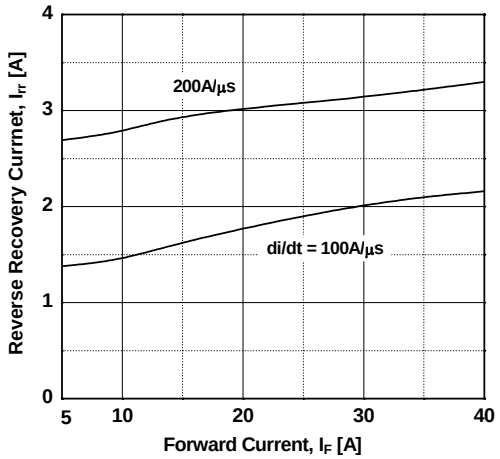


Figure 20. Stored Charge

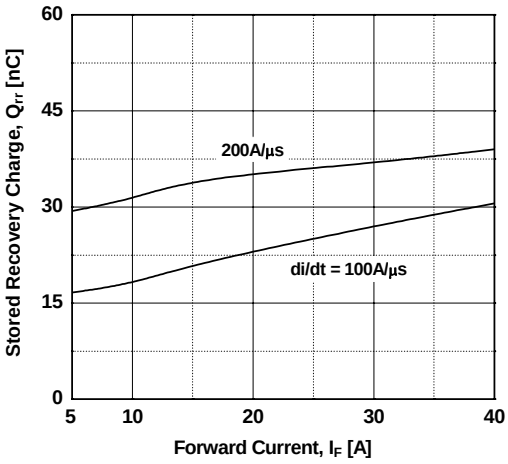


Figure 21. Reverse Recovery Time

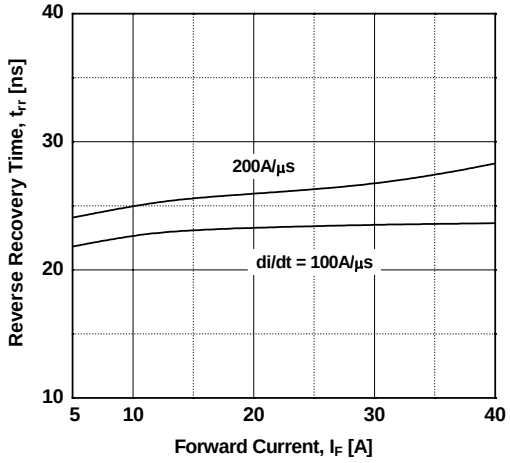
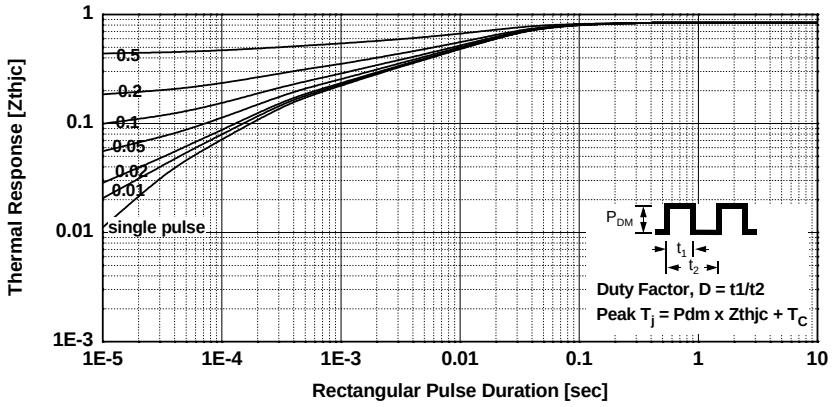
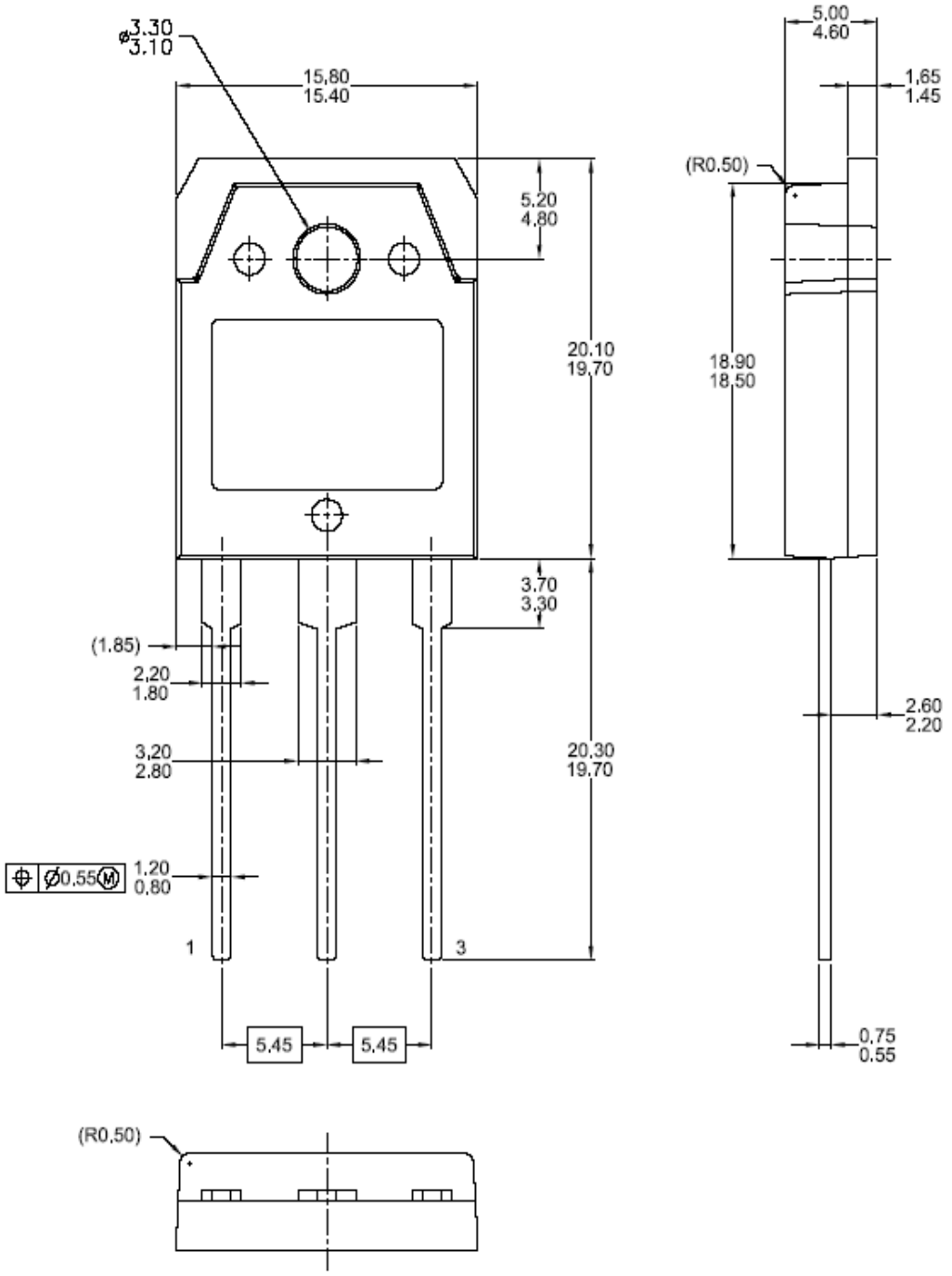


Figure 22.Transient Thermal Impedance of IGBT



Mechanical Dimensions

TO-3P



Dimensions in Millimeters

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Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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