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FAIRCHILD
SEMICONDUCTOR®

August 2011

FGA90N33ATD
330V, 90A PDP Trench IGBT

Features

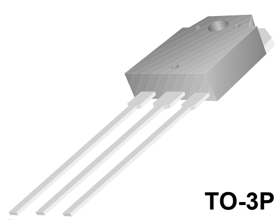
- High current capability
- Low saturation voltage: $V_{CE(sat)}$ =1.1V @ I_C = 20A
- High input impedance
- Fast switching
- RoHS compliant

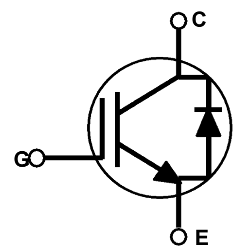
Applications

- 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.





Absolute Maximum Ratings

Symbol	Description		Ratings	Units
V_{CES}	Collector to Emitter Voltage		330	V
V_{GES}	Gate to Emitter Voltage		± 30	V
I_C	Collector Current	@ T_C = 25°C	90	A
$I_{C\ pulse(1)}$	Pulsed Collector Current	@ T_C = 25°C	220	A
$I_{C\ pulse(2)}$	Pulsed Collector Current	@ T_C = 25°C	330	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	223	W
	Maximum Power Dissipation	@ T_C = 100°C	89	W
T_J	Operating Junction Temperature		-55 to +150	°C
T_{stg}	Storage Temperature Range		-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	-	0.56	°C/W
$R_{\theta JC}$(Diode)	Thermal Resistance, Junction to Case	-	1.16	°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, Pulse width<5usec
*I_C pluse limited by max Tj

Package Marking and Ordering Information

Device Marking	Device	Package	Packaging Type	Qty per Tube	Max Qty per Box
FGA90N33ATD	FGA90N33ATDTU	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 = 400μA	330	-	-	V
I_{CES}	Collector Cut-Off Current	V_{CE} = V_{CES}, V_{GE} = 0V	-	-	400	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}	2.5	4.0	5.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 20A, V_{GE} = 15V	-	1.1	1.4	V
		I_C = 45A, V_{GE} = 15V,	-	1.3	-	V
		I_C = 90A, V_{GE} = 15V,	-	1.6	-	V
		I_C = 90A, V_{GE} = 15V, T_C = 125°C	-	1.7	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz	-	2200	-	pF
C_{oes}	Output Capacitance		-	135	-	pF
C_{res}	Reverse Transfer Capacitance		-	100	-	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	-	23	-	ns
t_r	Rise Time		-	40	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	100	-	ns
t_f	Fall Time		-	180	240	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	-	20	-	ns
t_r	Rise Time		-	40	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	110	-	ns
t_f	Fall Time		-	250	300	ns
Q_g	Total Gate Charge	V_{CE} = 200V, I_C = 20A, V_{GE} = 15V	-	95	-	nC
Q_{ge}	Gate to Emitter Charge		-	12	-	nC
Q_{gc}	Gate to Collector Charge		-	40	-	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	-	0.96	-	
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

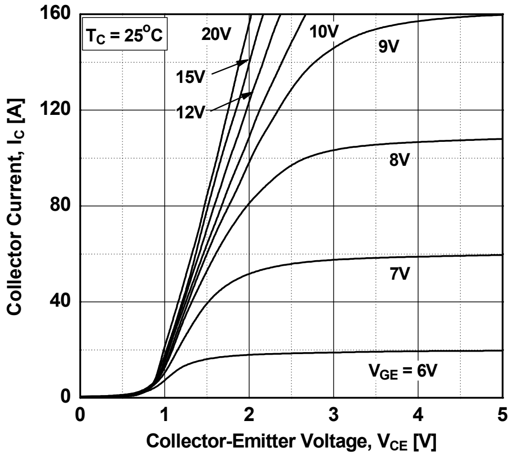


Figure 2. Typical Output Characteristics

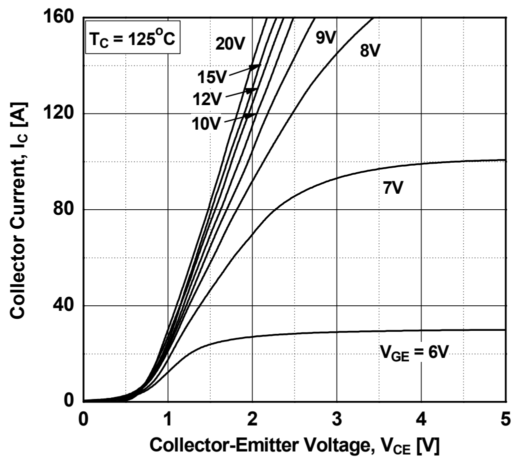


Figure 3. Typical Saturation Voltage Characteristics

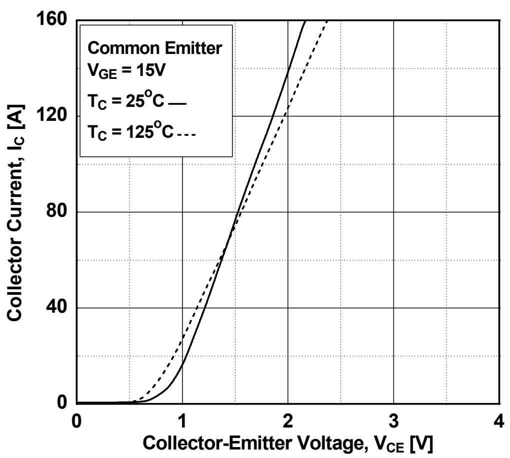


Figure 4. Transfer Characteristics

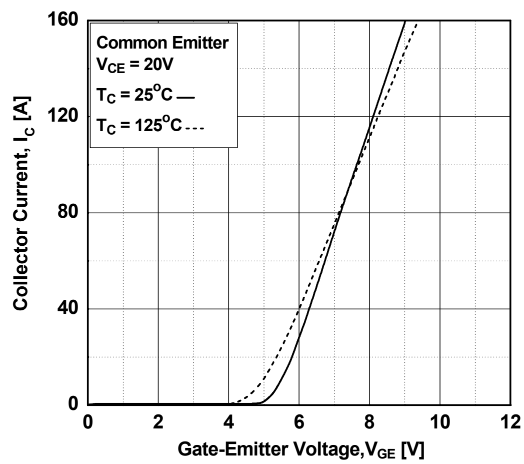


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

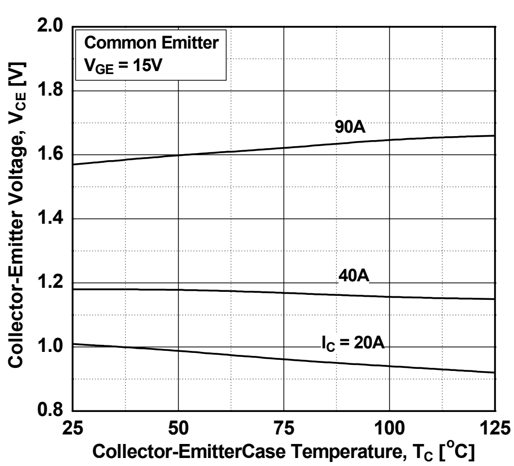
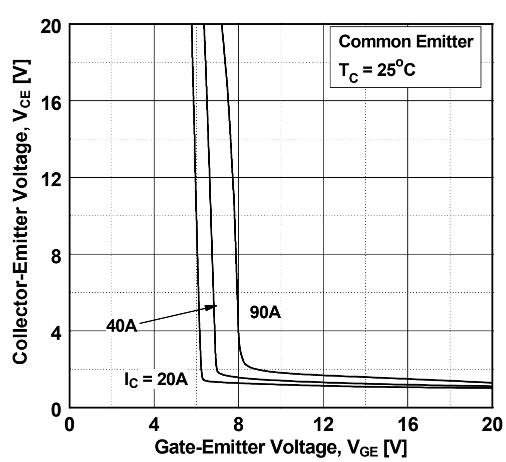


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

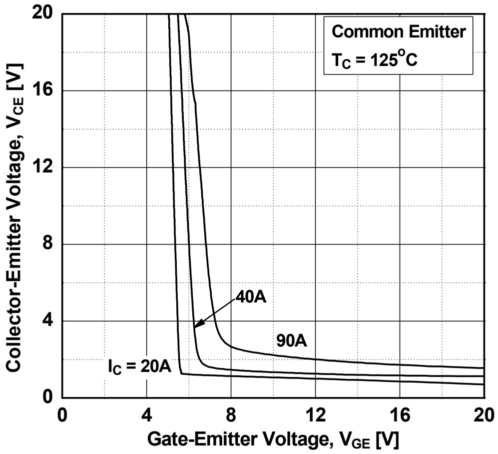


Figure 8. Capacitance Characteristics

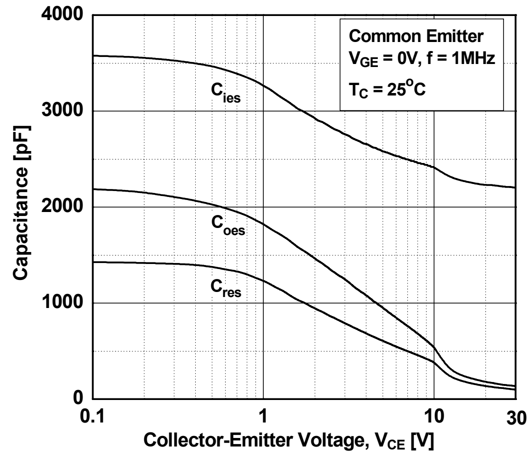


Figure 9. Gate charge Characteristics

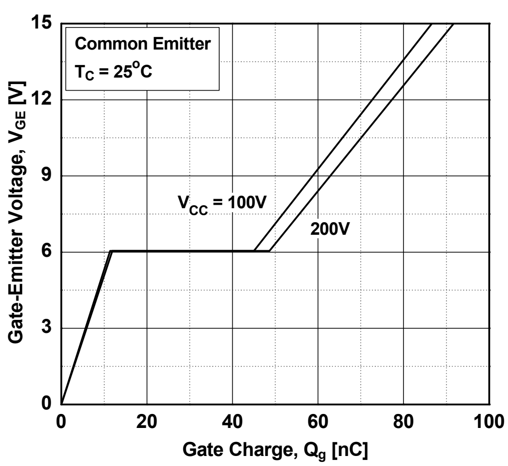


Figure 10. SOA Characteristics

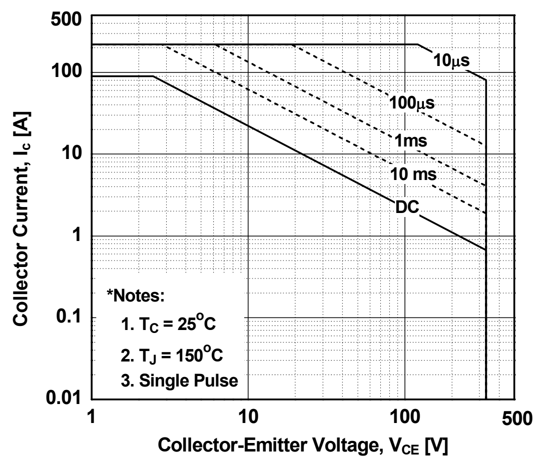


Figure 11. Turn-on Characteristics vs. Gate Resistance

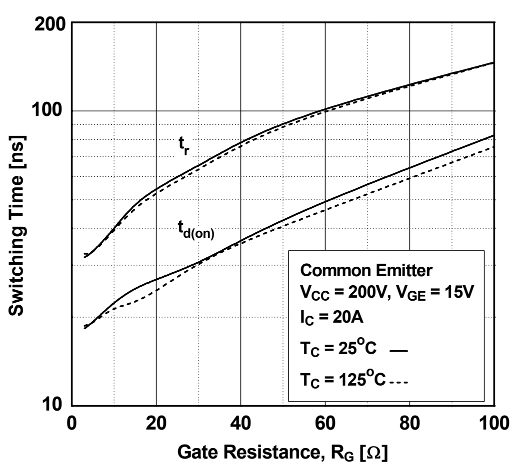
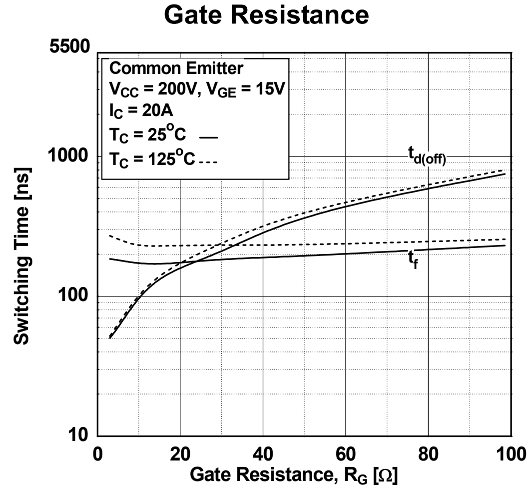


Figure 12. Turn-off Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-on Characteristics vs. Collector Current

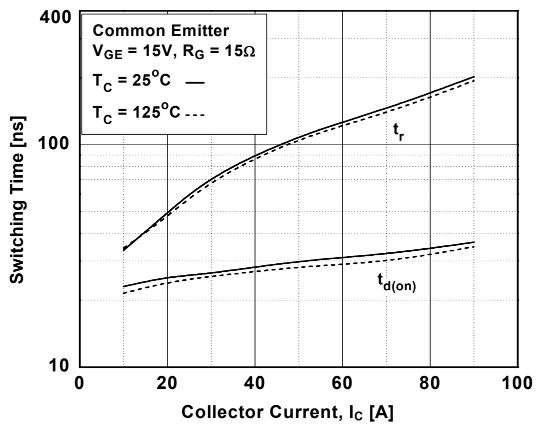


Figure 14. Turn-off Characteristics vs. Collector Current

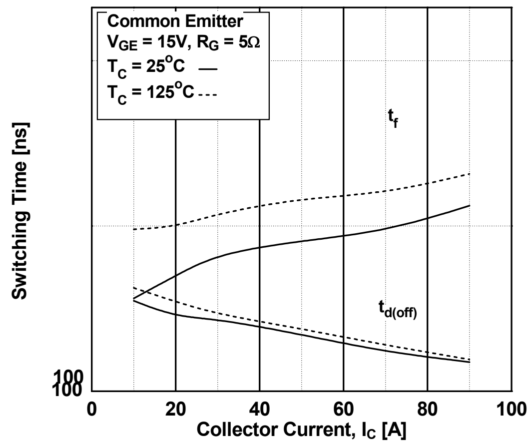


Figure 15. Turn off Switching SOA Characteristics

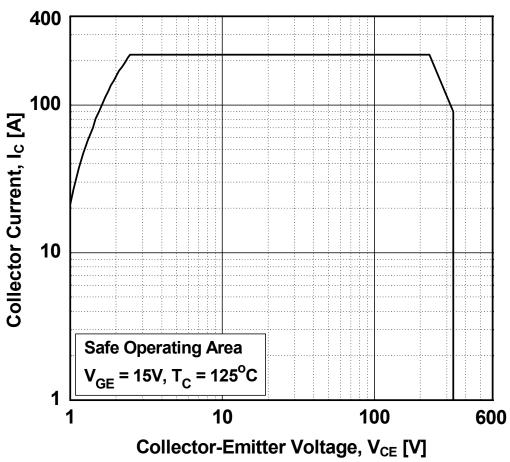
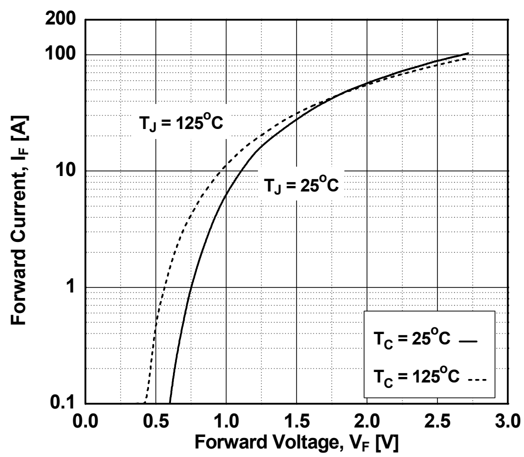


Figure 16. Forward Characteristics



Typical Performance Characteristics

Figure 17. Reverse Recovery Current

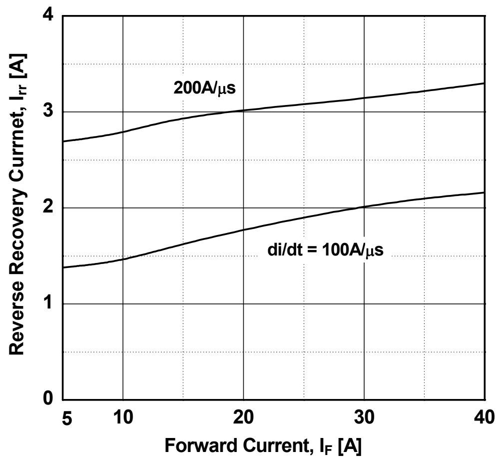


Figure 18. Stored Charge

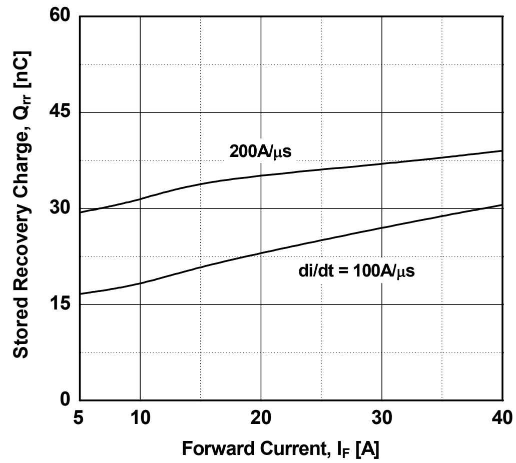


Figure 19. Reverse Recovery Current

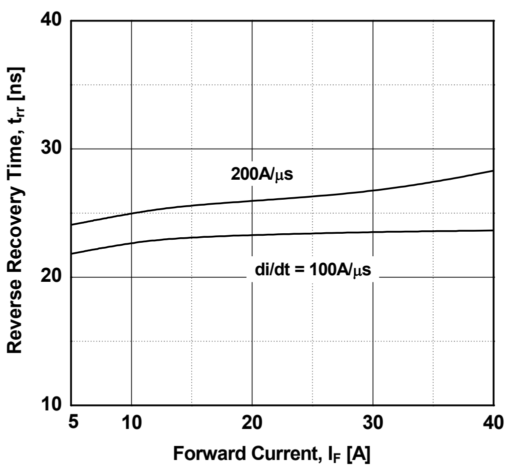
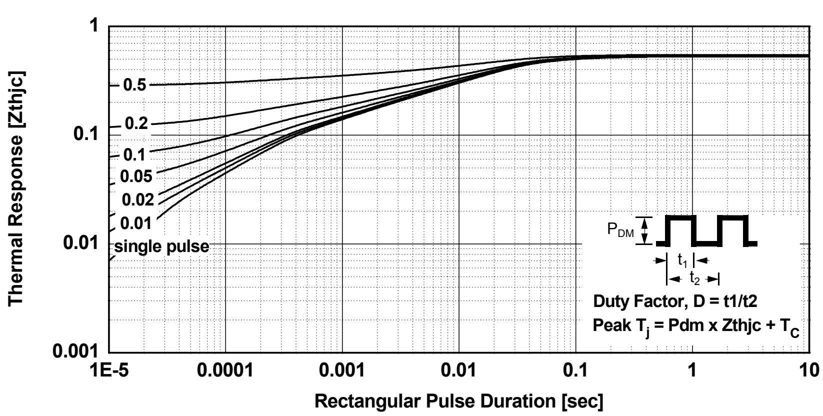
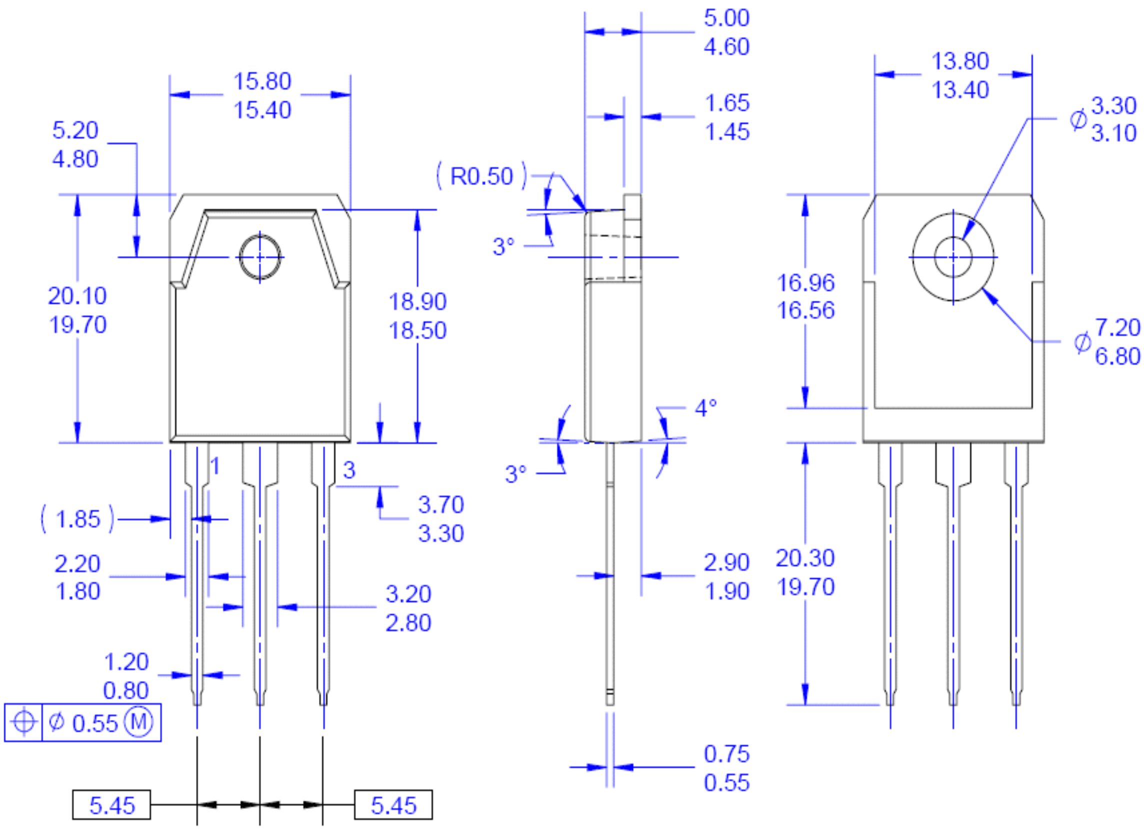


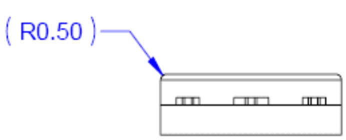
Figure 20.Transient Thermal Impedance of IGBT



Mechanical Dimensions

TO-3PN





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E) THIS PACKAGE IS INTENDED ONLY FOR TO3PN.
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Dimensions in Millimeters

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Datasheet Identification	Product Status	Definition
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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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