FAIRCHILD SEMICONDUCTOR®

February 2010

FGL35N120FTD
1200V, 35A Trench IGBT

Features

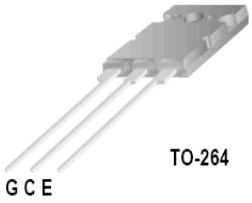
- Field Stop Trench Technology
- High Speed Switching
- Low Saturation Voltage: $V_{CE(sat)}$ = 1.68 V @ I_C = 35A
- High Input Impedance

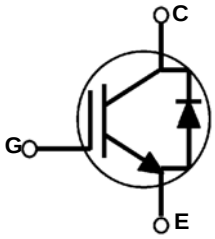
Applications

- Induction Heating And Microwave Oven
- Soft Switching Applications

General Description

Using advanced field stop trench technology, Fairchild's 1200V trench IGBTs offer superior conduction and switching performances, and easy parallel operation with exceptional avalanche ruggedness. This device is designed for soft switching applications.





Absolute Maximum Ratings

Symbol	Description		Ratings	Units
V_{CES}	Collector to Emitter Voltage		1200	V
V_{GES}	Gate to Emitter Voltage		± 25	V
I_C	Collector Current	@ T_C = 25°C	70	A
	Collector Current	@ T_C = 100°C	35	A
$I_{CM\ (1)}$	Pulsed Collector Current	@ T_C = 25°C	105	A
I_F	Diode Continuous Forward Current	@ T_C = 100°C	40	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	368	W
	Maximum Power Dissipation	@ T_C = 100°C	147	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

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

Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{\theta JC}$(IGBT)	Thermal Resistance, Junction to Case	0.34	°C/W
$R_{\theta JC}$(Diode)	Thermal Resistance, Junction to Case	0.9	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	25	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGL35N120FTD	FGL35N120FTDTU	TO-264	-	-	30

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	1200	-	-	V
I_{CES}	Collector Cut-Off Current	V_{CE} = V_{CES}, V_{GE} = 0V	-	-	1	mA
I_{GES}	G-E Leakage Current	V_{GE} = V_{GES}, V_{CE} = 0V	-	-	±250	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 35mA, V_{CE} = V_{GE}	3.5	6.2	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 35A, V_{GE} = 15V	-	1.68	2.2	V
		I_C = 35A, V_{GE} = 15V, T_C = 125°C	-	2.0	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz	-	5090	-	pF
C_{oes}	Output Capacitance		-	180	-	pF
C_{res}	Reverse Transfer Capacitance		-	95	-	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600V, I_C = 35A, R_G = 10Ω, V_{GE} = 15V, Inductive Load, T_C = 25°C	-	34	-	ns
t_r	Rise Time		-	63	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	172	-	ns
t_f	Fall Time		-	107	-	ns
E_{on}	Turn-On Switching Loss		-	2.5	-	mJ
E_{off}	Turn-Off Switching Loss		-	1.7	-	mJ
E_{ts}	Total Switching Loss		-	4.2	-	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600V, I_C = 35A, R_G = 10Ω, V_{GE} = 15V, Inductive Load, T_C = 125°C	-	33	-	ns
t_r	Rise Time		-	66	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	180	-	ns
t_f	Fall Time		-	146	-	ns
E_{on}	Turn-On Switching Loss		-	3.1	-	mJ
E_{off}	Turn-Off Switching Loss		-	2.1	-	mJ
E_{ts}	Total Switching Loss		-	5.2	-	mJ
Q_g	Total Gate Charge	V_{CE} = 600V, I_C = 35A, V_{GE} = 15V	-	210	-	nC
Q_{ge}	Gate to Emitter Charge		-	42	-	nC
Q_{gc}	Gate to Collector Charge		-	101	-	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 = 35A	T_C = 25°C	-	2.7	3.4	V
			T_C = 125°C	-	2.5	-	
t_{rr}	Diode Reverse Recovery Time	I_F = 35A, di/dt = 200A/μs	T_C = 25°C	-	337	-	ns
			T_C = 125°C	-	520	-	
I_{rr}	Diode Peak Reverse Recovery Current		T_C = 25°C	-	7.6	-	A
			T_C = 125°C	-	12.9	-	
Q_{rr}	Diode Reverse Recovery Charge		T_C = 25°C	-	1292	-	nC
			T_C = 125°C	-	3377	-	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

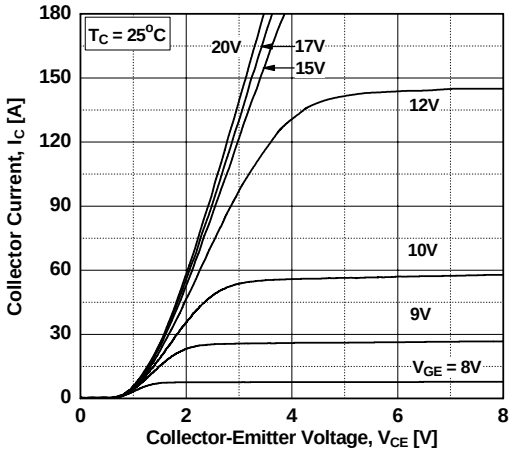


Figure 2. Typical Output Characteristics

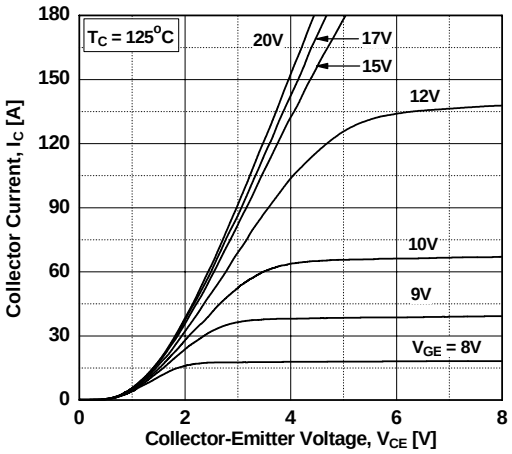


Figure 3. Typical Saturation Voltage Characteristics

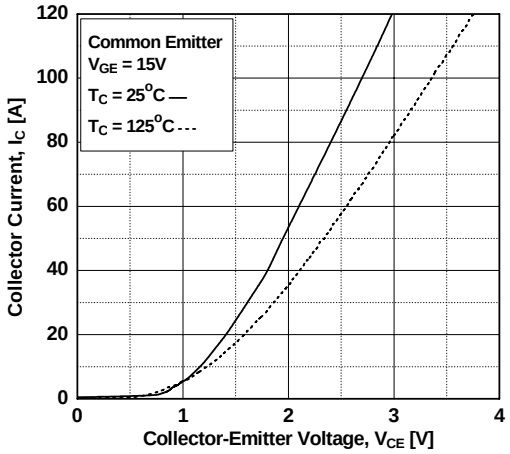


Figure 4. Transfer Characteristics

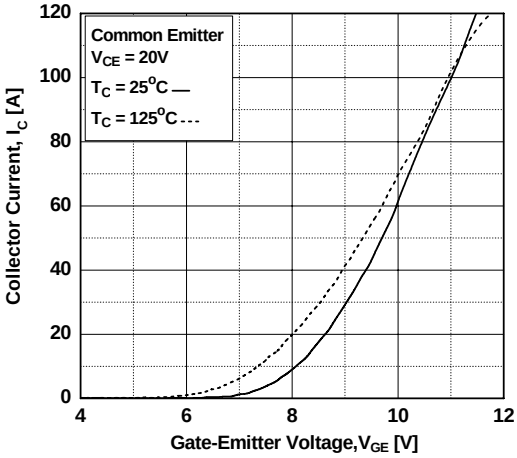


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

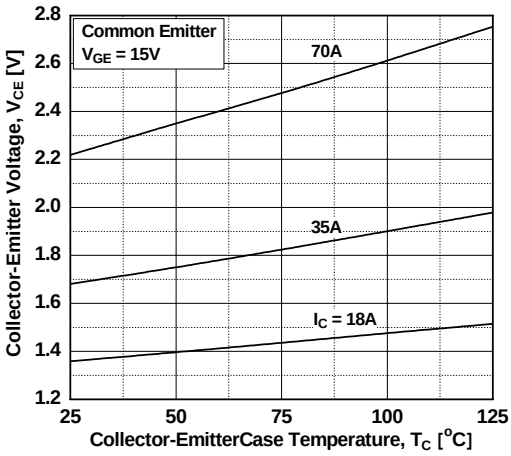
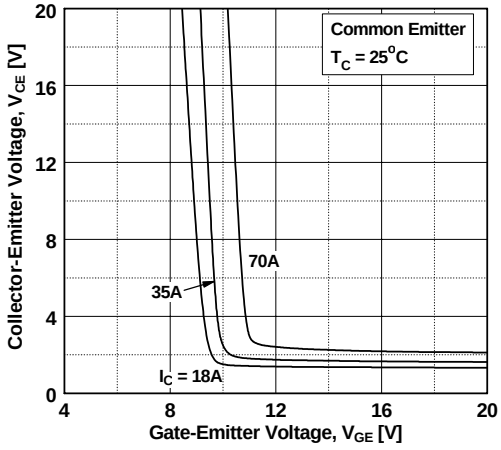


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

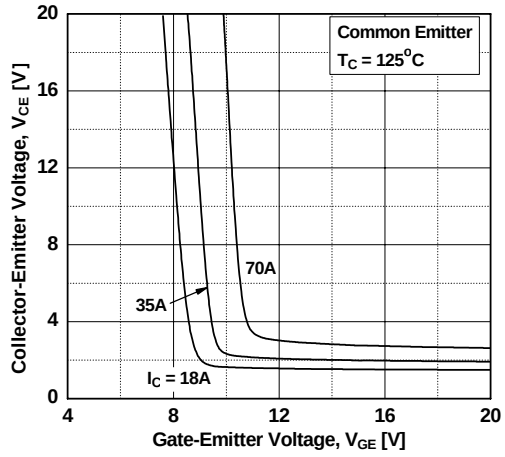


Figure 8. Load Current vs. Frequency

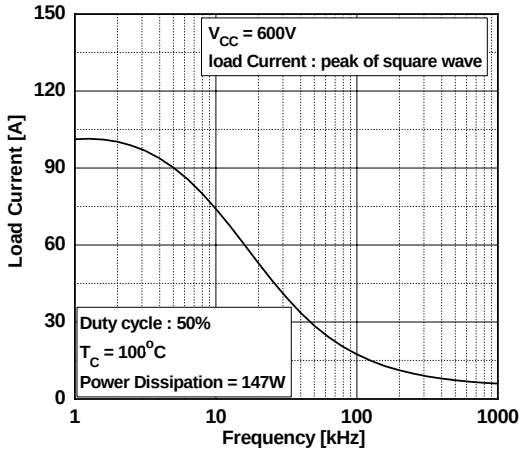


Figure 9. Capacitance Characteristics

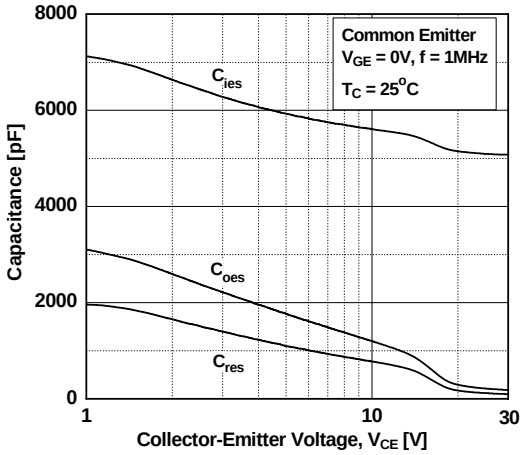


Figure 10. Gate Charge Characteristics

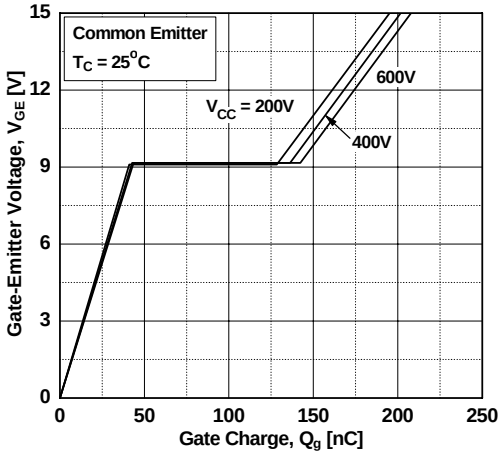


Figure 11. SOA Characteristics

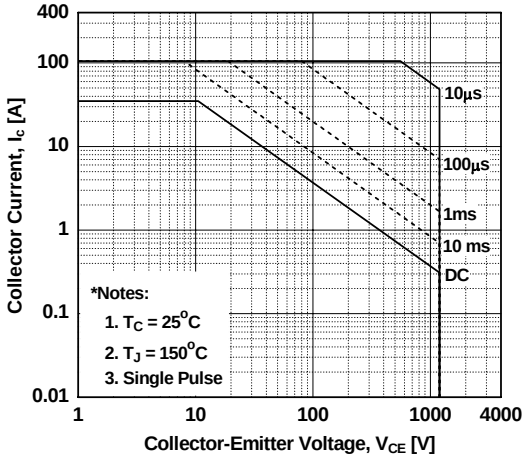
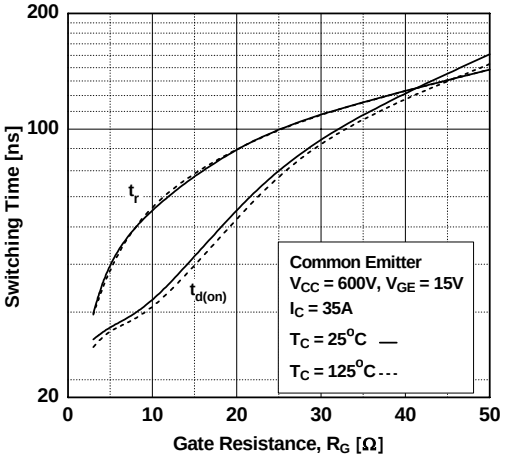


Figure 12. Turn-on Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-off Characteristics vs. Gate Resistance

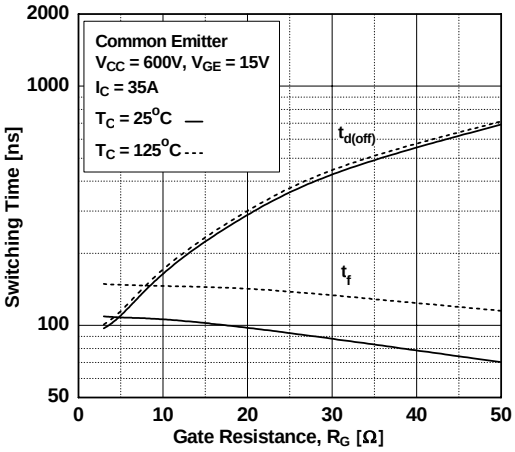


Figure 14. Turn-on Characteristics vs. Collector Current

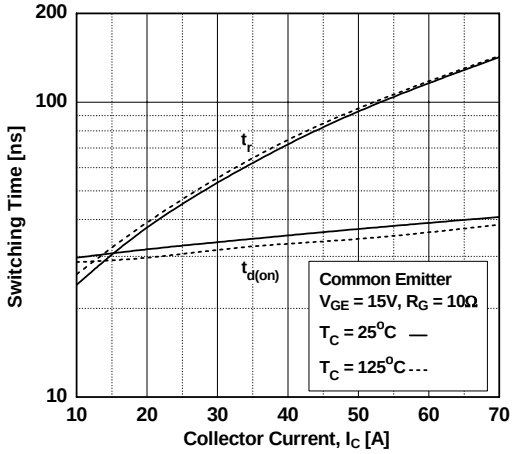


Figure 15. Turn-off Characteristics vs. Collector Current

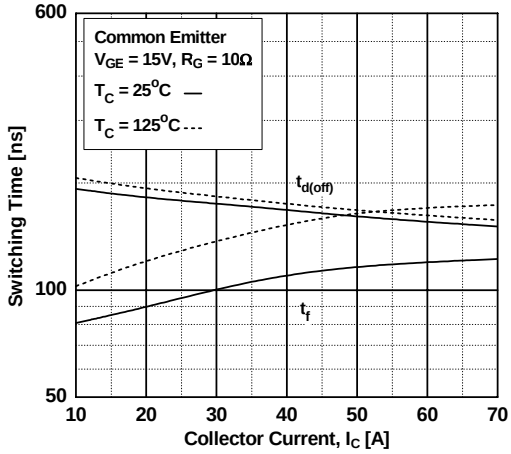


Figure 16.Switching Loss vs. Gate Resistance

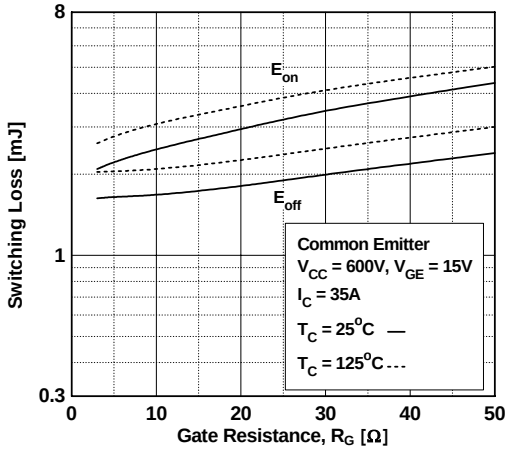


Figure 17. Switching Loss vs. Collector Current

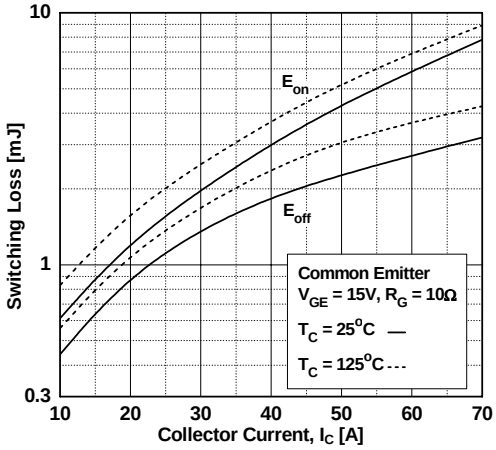
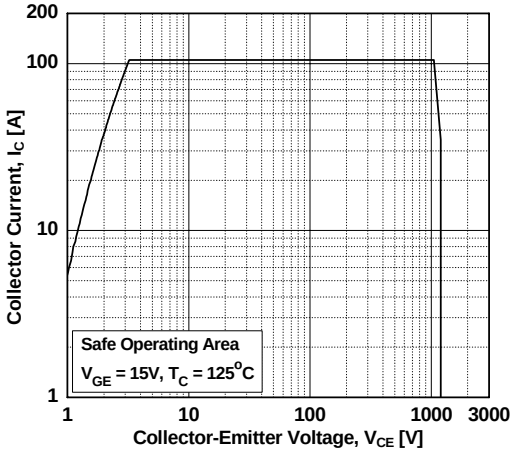


Figure 18. Turn off Switing SOA Characteristics



Typical Performance Characteristics

Figure 19. Forward Characteristics

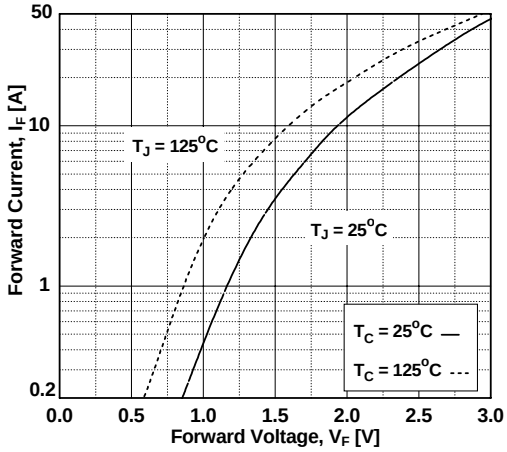


Figure 20. Reverse Recovery Current

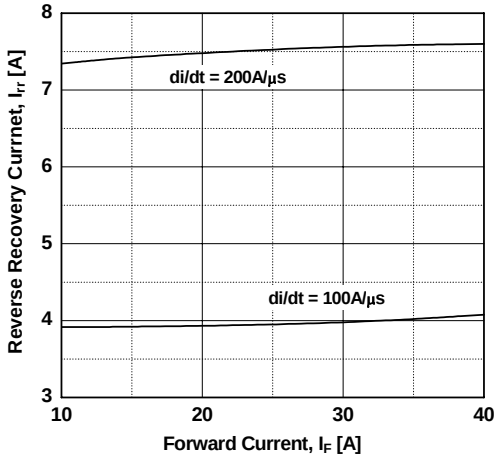


Figure 21. Stored Charge

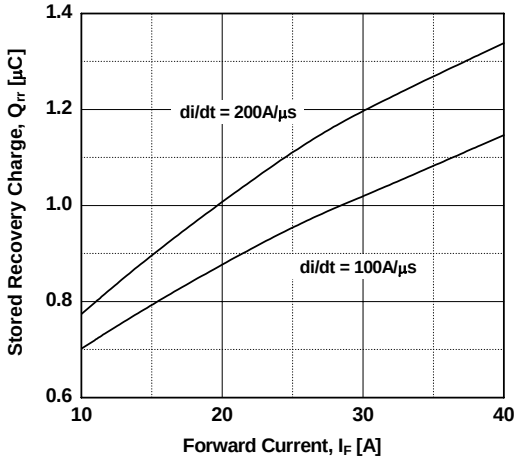


Figure 22. Reverse Recovery Time

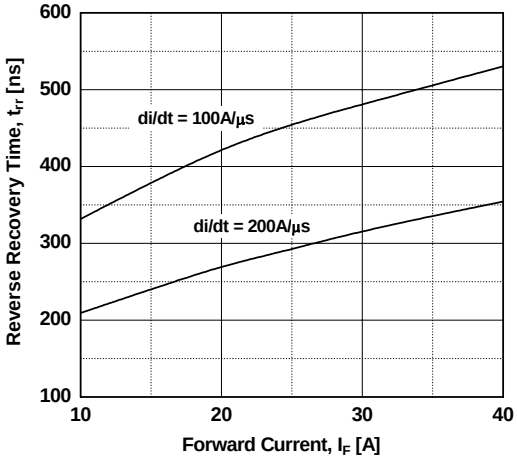
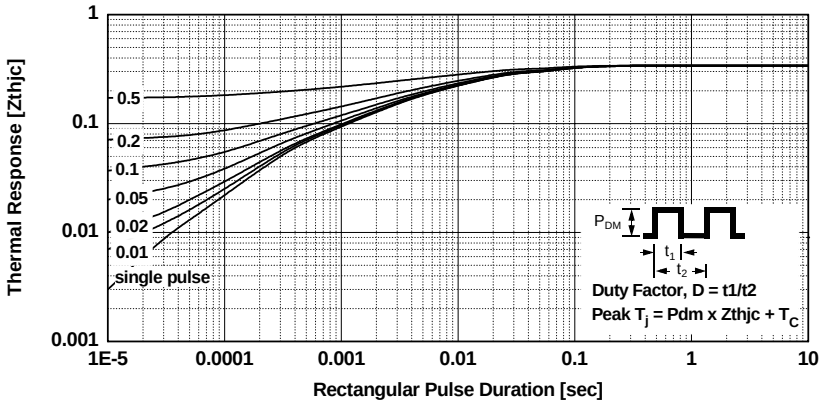
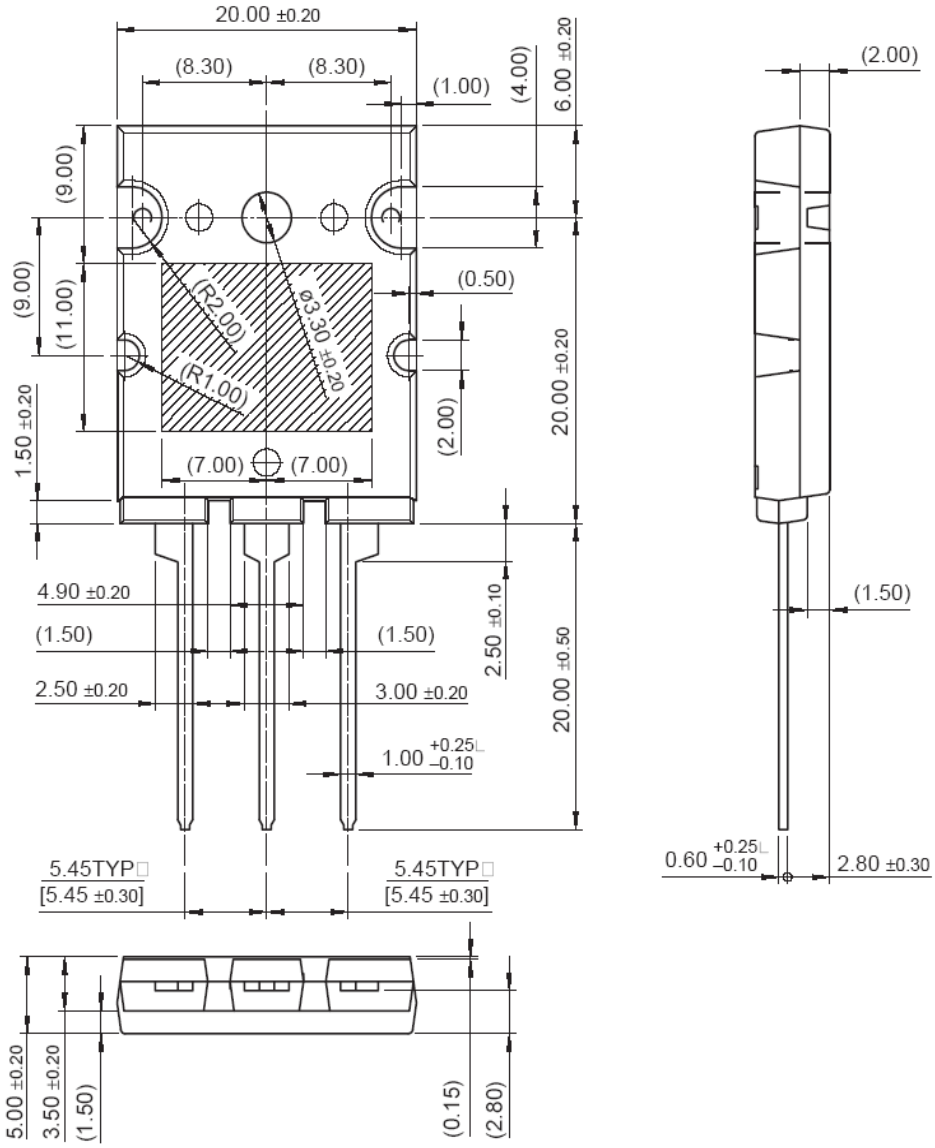


Figure 23.Transient Thermal Impedance of IGBT



Mechanical Dimensions

TO-264



Dimensions in Millimeters

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Definition of Terms

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.