

FGL35N120FTD

1200V, 35A Trench IGBT

Features

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

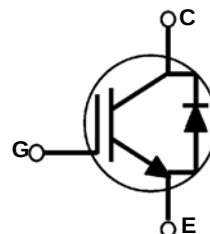
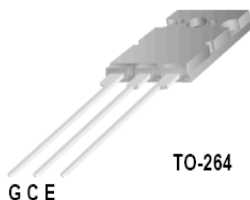
Applications

- 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 @ $T_C = 25^\circ\text{C}$	70	A
	Collector Current @ $T_C = 100^\circ\text{C}$	35	A
$I_{CM(1)}$	Pulsed Collector Current @ $T_C = 25^\circ\text{C}$	105	A
I_F	Diode Continuous Forward Current @ $T_C = 100^\circ\text{C}$	40	A
P_D	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	368	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	147	W
T_J	Operating Junction Temperature	-55 to +150	$^\circ\text{C}$
T_{stg}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

Notes:

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

Thermal Characteristics

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

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 $T_C = 25^\circ\text{C}$ 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

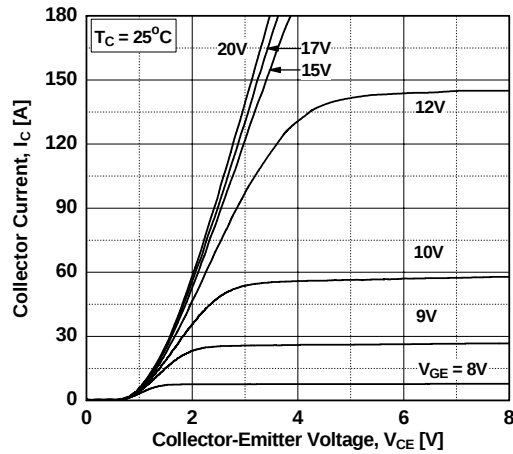


Figure 2. Typical Output Characteristics

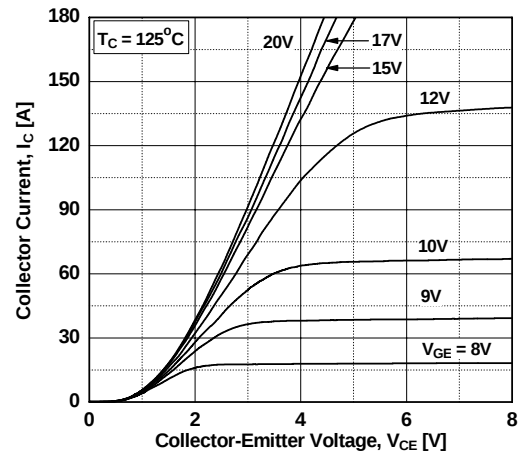


Figure 3. Typical Saturation Voltage Characteristics

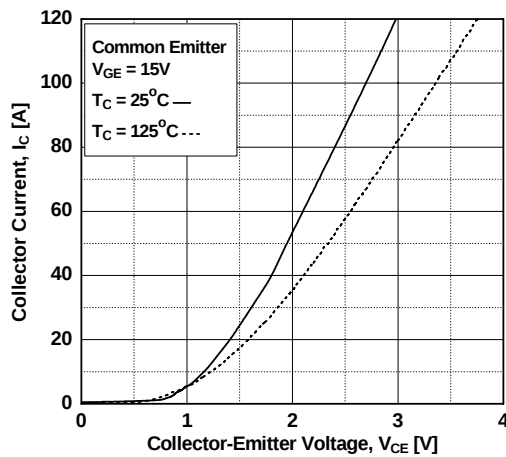


Figure 4. Transfer Characteristics

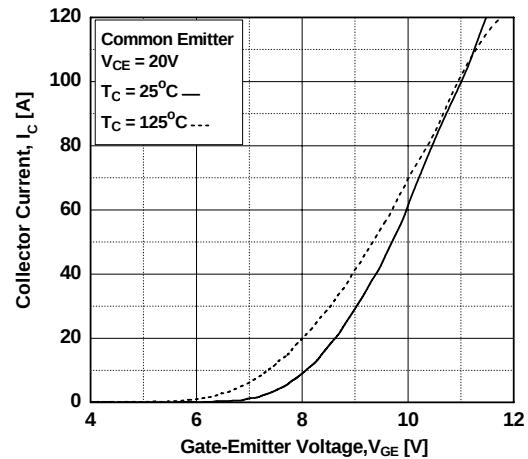


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

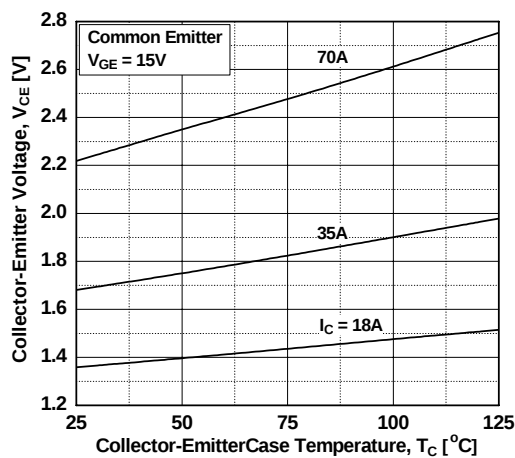
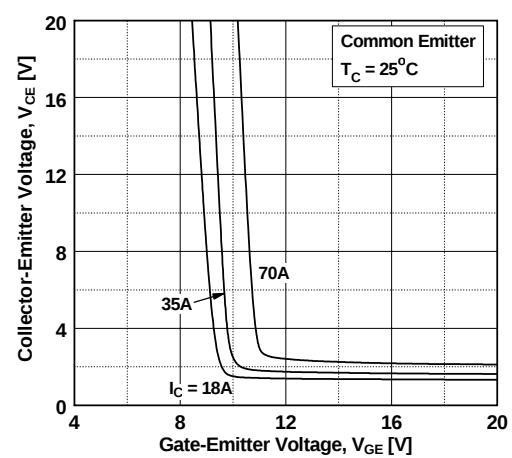


Figure 6. Saturation Voltage vs. Vge



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

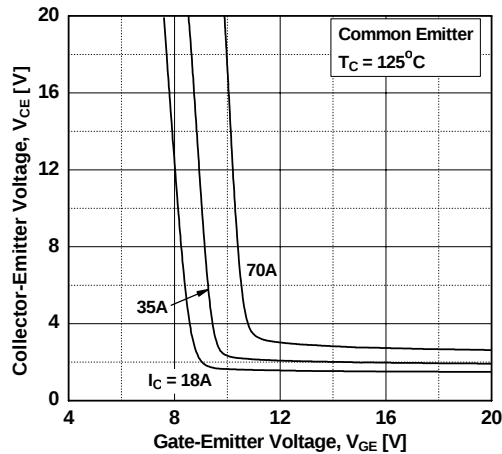


Figure 8. Load Current vs. Frequency

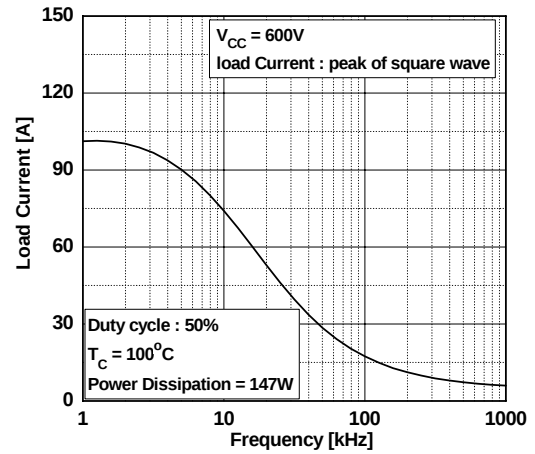


Figure 9. Capacitance Characteristics

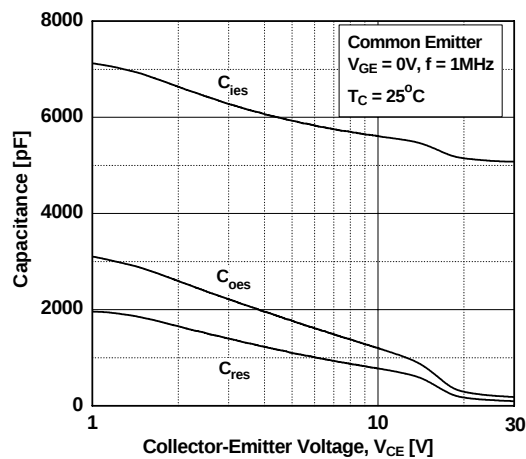


Figure 10. Gate Charge Characteristics

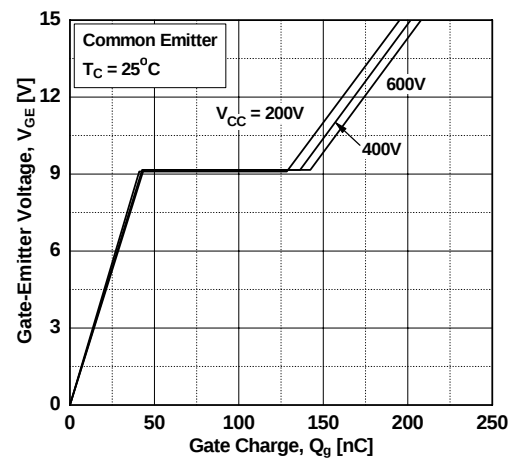


Figure 11. SOA Characteristics

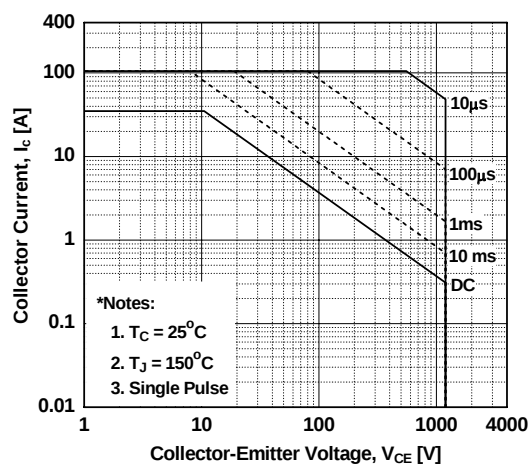
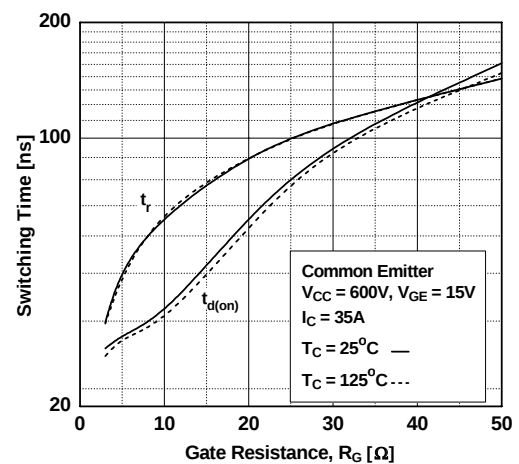


Figure 12. Turn-on Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-off Characteristics vs. Gate Resistance

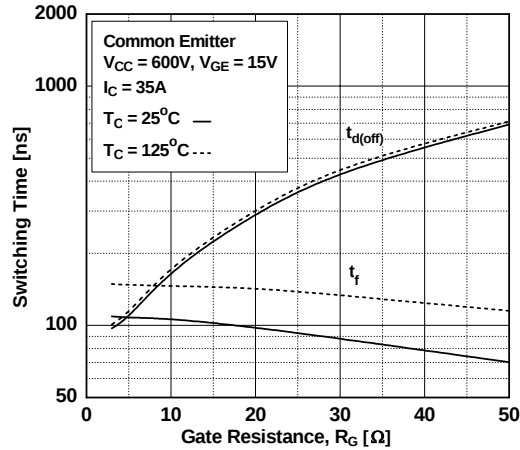


Figure 14. Turn-on Characteristics vs. Collector Current

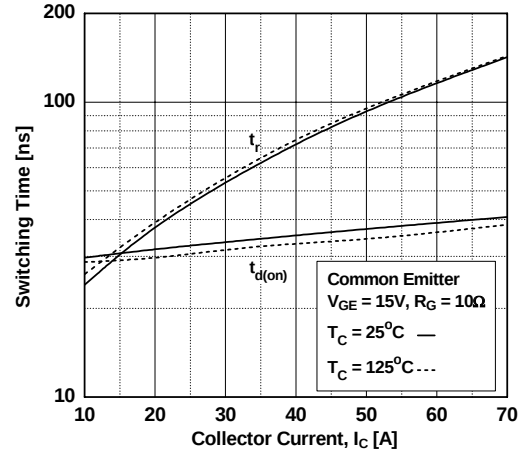


Figure 15. Turn-off Characteristics vs. Collector Current

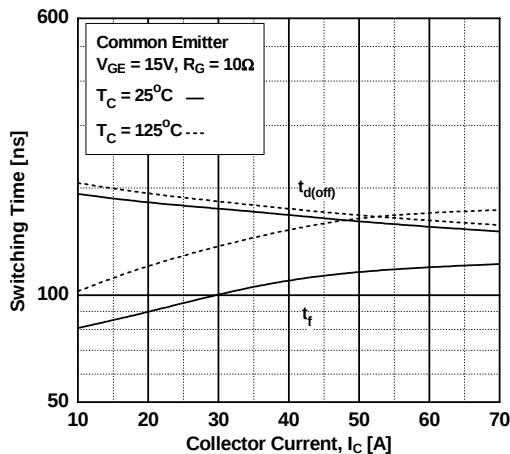


Figure 16. Switching Loss vs. Gate Resistance

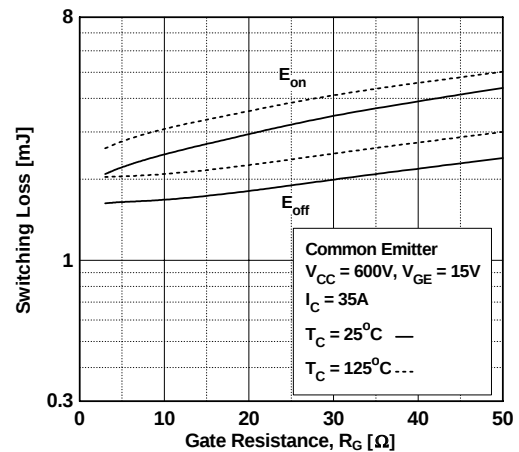


Figure 17. Switching Loss vs. Collector Current

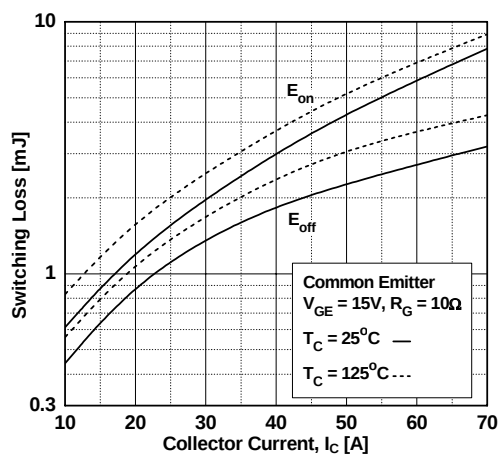
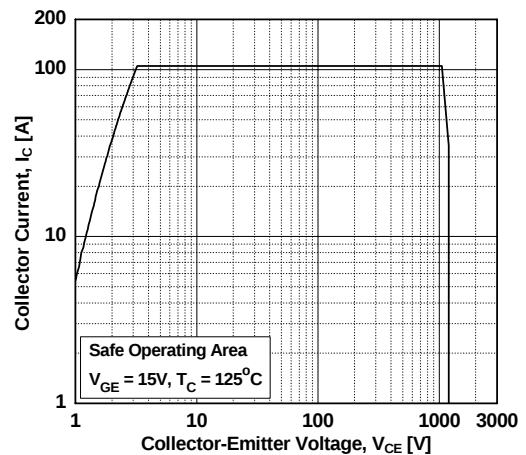


Figure 18. Turn off Swtting SOA Characteristics



Typical Performance Characteristics

Figure 19. Forward Characteristics

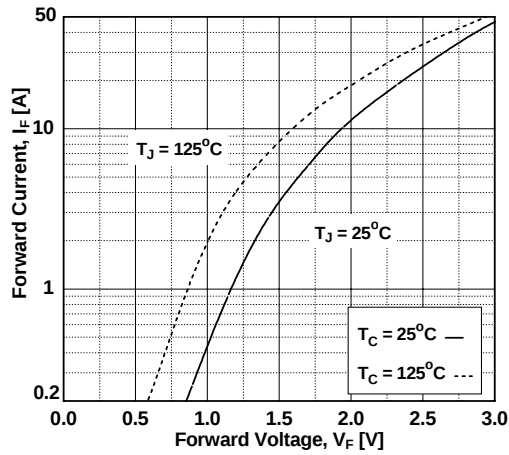


Figure 20. Reverse Recovery Current

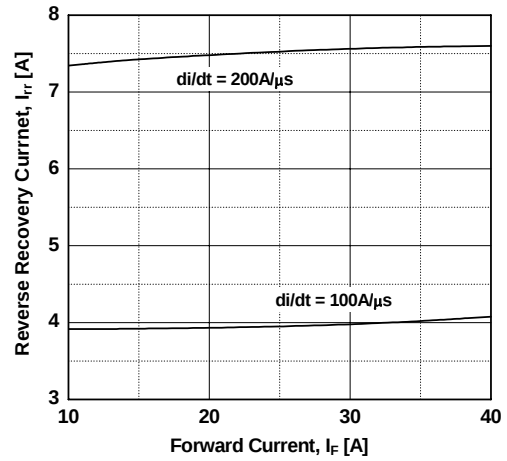


Figure 21. Stored Charge

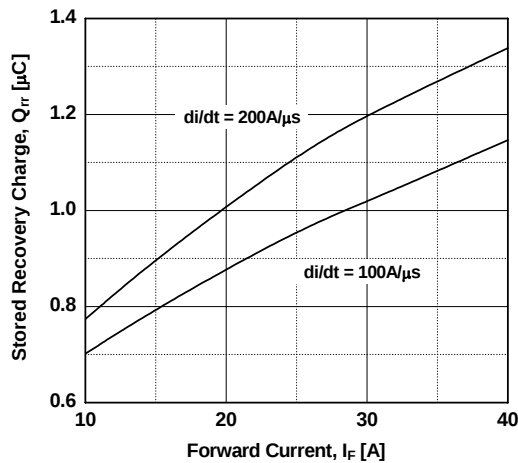


Figure 22. Reverse Recovery Time

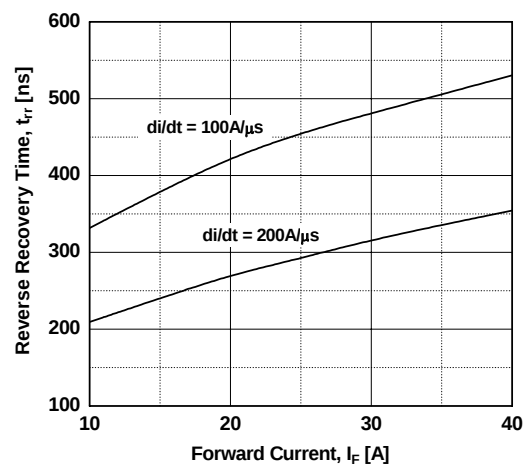
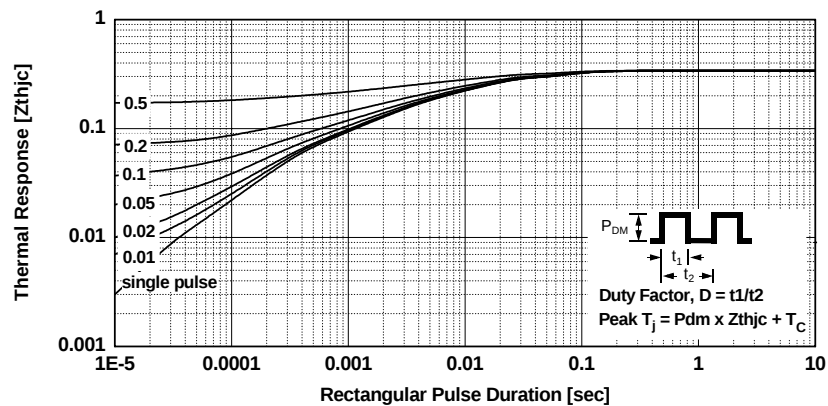


Figure 23. Transient Thermal Impedance of IGBT





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