FAIRCHILD SEMICONDUCTOR®

January 2006

FGL40N120AND
1200V NPT IGBT

Features

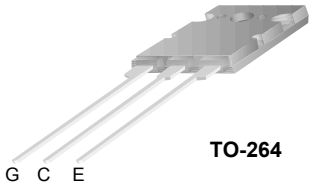
- High speed switching
- Low saturation voltage : $V_{CE(sat)}$ = 2.6 V @ I_C = 40A
- High input impedance
- CO-PAK, IGBT with FRD : t_{rr} = 75ns (typ.)

Description

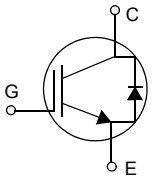
Employing NPT technology, Fairchild's AND series of IGBTs provides low conduction and switching losses. The AND series offers an solution for application such as induction heating (IH), motor control, general purpose inverters and uninterruptible power supplies (UPS).

Applications

Induction Heating, UPS, AC & DC motor controls and general purpose inverters.



TO-264



Absolute Maximum Ratings

Symbol	Parameter		FGL40N120AND	Units
V_{CES}	Collector-Emitter Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		±25	V
I_C	Collector Current	@T_C = 25°C	64	A
	Collector Current	@T_C = 100°C	40	A
$I_{CM(1)}$	Pulsed Collector Current		120	A
I_F	Diode Continuous Forward Current	@T_C = 100°C	40	A
I_{FM}	Diode Maximum Forward Current		240	A
P_D	Maximum Power Dissipation	@T_C = 25°C	500	W
	Maximum Power Dissipation	@T_C = 100°C	200	W
SCWT	Short Circuit Withstand Time, V_{CE} = 600V, V_{GE} = 15V, T_C = 125°C		10	μs
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) Pulse width limited by max. junction temperature

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$(IGBT)	Thermal Resistance, Junction-to-Case	--	0.25	°C/W
$R_{\theta JC}$(DIODE)	Thermal Resistance, Junction-to-Case	--	0.7	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	25	°C/W

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Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGL40N120AND	FGL40N120AND	TO-264	-	-	25

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{CES}	Collector-Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 1mA	1200	--	--	V
$BV_{CES}/\Delta T_J$	Temperature Coefficient of Breakdown Voltage	V_{GE} = 0V, I_C = 1mA	--	0.6	--	V/°C
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 = 250μA, V_{CE} = V_{GE}	3.5	5.5	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 40A, V_{GE} = 15V	--	2.6	3.2	V
		I_C = 40A, V_{GE} = 15V, T_C = 125°C	--	2.9	--	V
		I_C = 64A, V_{GE} = 15V	--	3.15	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30V, V_{GE} = 0V f = 1MHz	--	3200	--	pF
C_{oes}	Output Capacitance		--	370	--	pF
c_{res}	Reverse Transfer Capacitance		--	125	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600V, I_C = 40A, R_G = 5Ω, V_{GE} = 15V, Inductive Load, T_C = 25°C	--	15	--	ns
t_r	Rise Time		--	20	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	110	--	ns
t_f	Fall Time		--	40	80	ns
E_{on}	Turn-On Switching Loss		--	2.3	3.45	mJ
E_{off}	Turn-Off Switching Loss		--	1.1	1.65	mJ
E_{ts}	Total Switching Loss		--	3.4	5.1	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600V, I_C = 40A, R_G = 5Ω, V_{GE} = 15V, Inductive Load, T_C = 125°C	--	20	--	ns
t_r	Rise Time		--	25	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	120	--	ns
t_f	Fall Time		--	45	--	ns
E_{on}	Turn-On Switching Loss		--	2.5	--	mJ
E_{off}	Turn-Off Switching Loss		--	1.8	--	mJ
E_{ts}	Total Switching Loss		--	4.3	--	mJ
Q_g	Total Gate charge	V_{CE} = 600V, I_C = 40A, V_{GE} = 15V	--	25	38	nC
Q_{ge}	Gate-Emitter Charge		--	130	195	nC
Q_{gc}	Gate-Collector Charge		--	220	330	nC

Electrical Characteristics of DIODE T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_{FM}	Diode Forward Voltage	I_F = 40A	T_C = 25°C	--	3.2	4.0	V
			T_C = 125°C	--	2.7	--	
t_{rr}	Diode Reverse Recovery Time	I_F = 40A, di/dt = 200A/μs	T_C = 25°C	--	75	112	nS
			T_C = 125°C	--	130	--	
I_{rr}	Diode Peak Reverse Recovery Current		T_C = 25°C	--	8	12	A
			T_C = 125°C	--	13	--	
Q_{rr}	Diode Reverse Recovery Charge		T_C = 25°C	--	300	450	nC
			T_C = 125°C	--	845	--	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

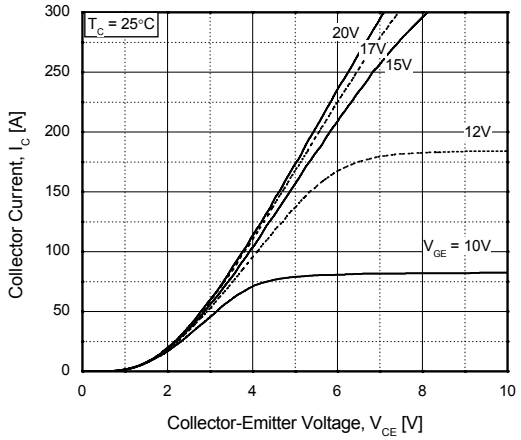


Figure 2. Typical Saturation Voltage Characteristics

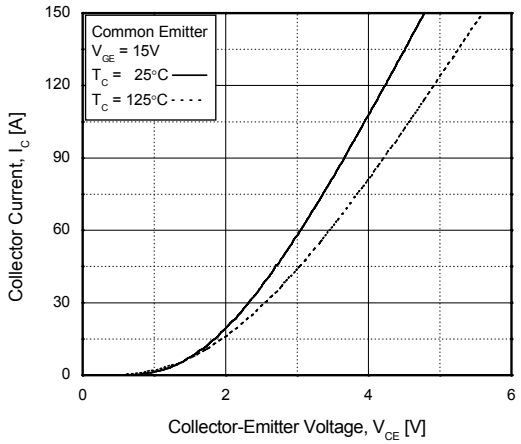


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

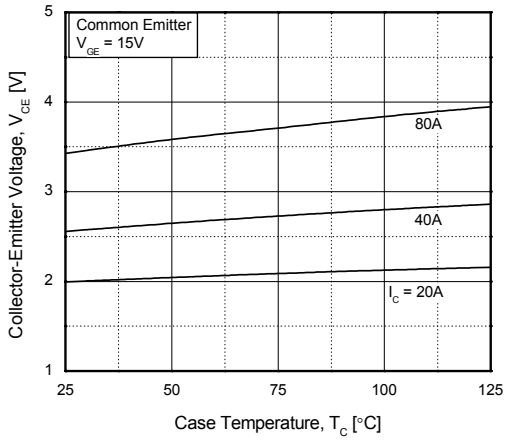


Figure 4. Load Current vs. Frequency

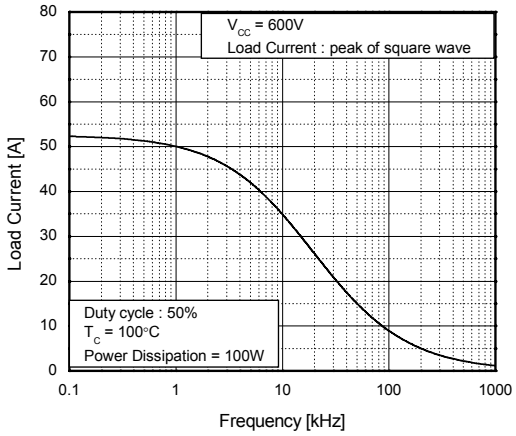


Figure 5. Saturation Voltage vs. V_{GE}

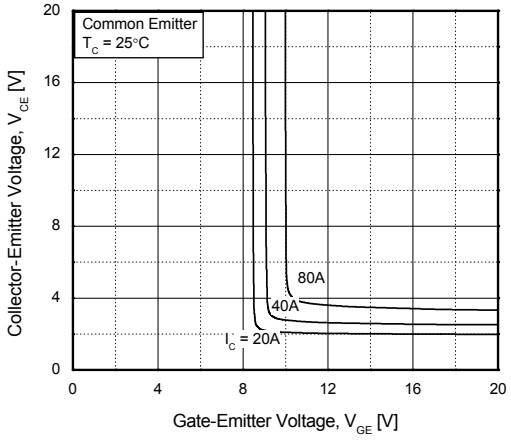
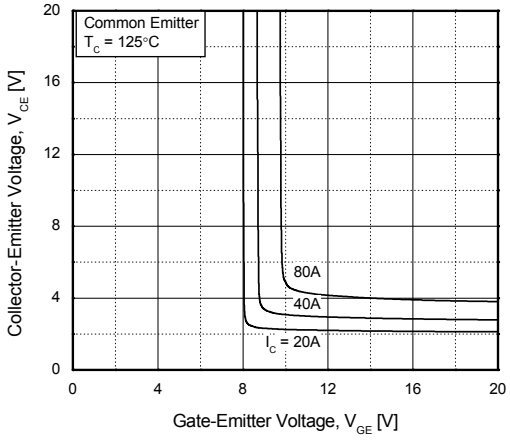


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics (Continued)

Figure 7. Capacitance Characteristics

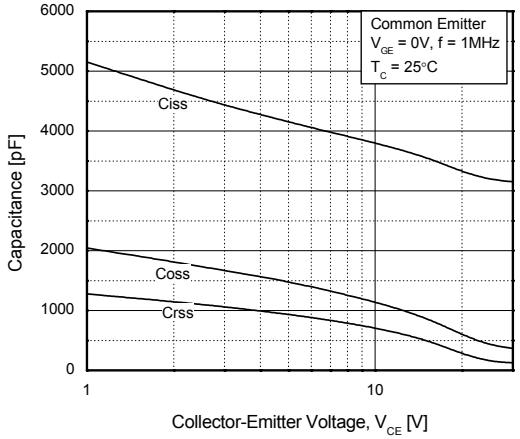


Figure 8. Turn-On Characteristics vs. Gate Resistance

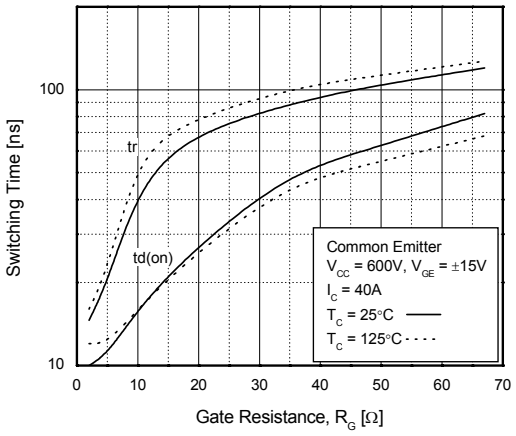


Figure 9. Turn-Off Characteristics vs. Gate Resistance

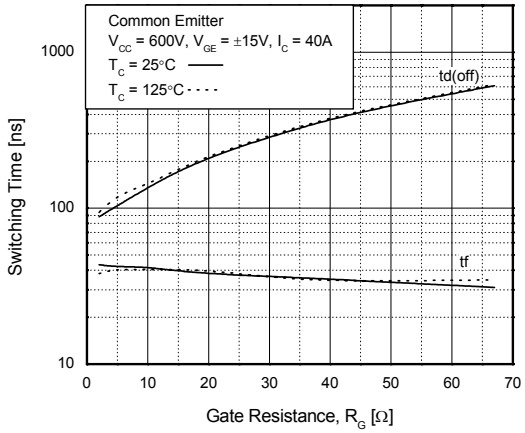


Figure 10. Switching Loss vs. Gate Resistance

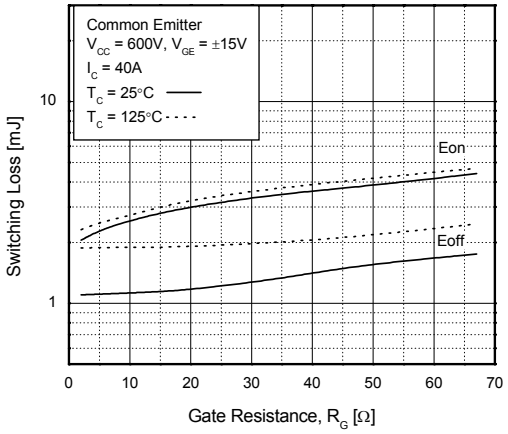


Figure 11. Turn-On Characteristics vs. Collector Current

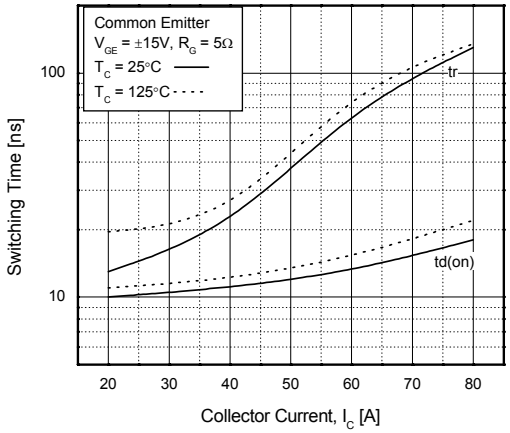
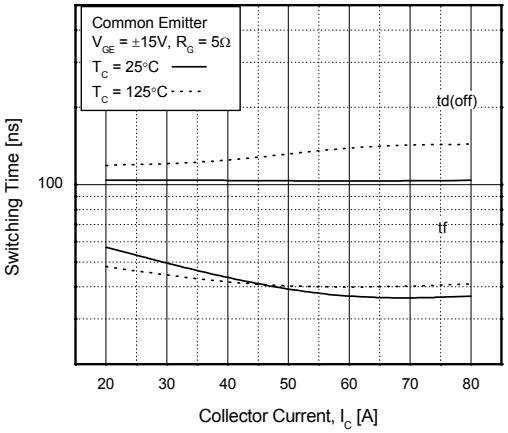


Figure 12. Turn-Off Characteristics vs. Collector Current



Typical Performance Characteristics (Continued)

Figure 13. Switching Loss vs. Collector Current

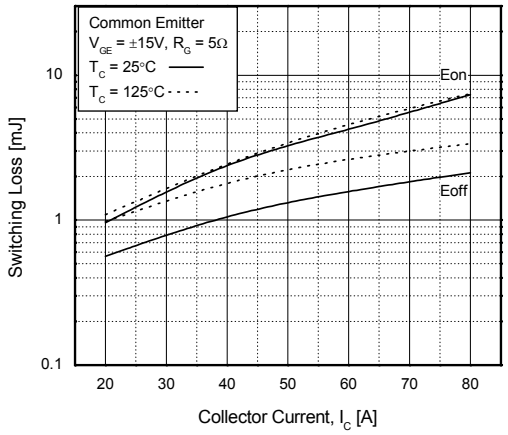


Figure 14. Gate Charge Characteristics

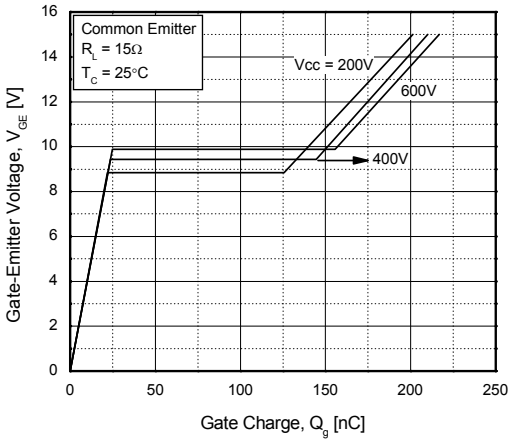


Figure 15. SOA Characteristics

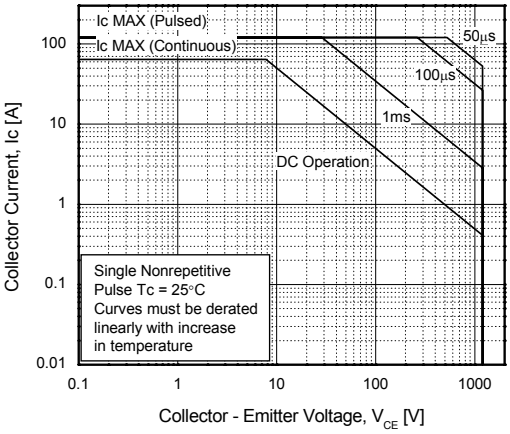


Figure 16. Turn-Off SOA

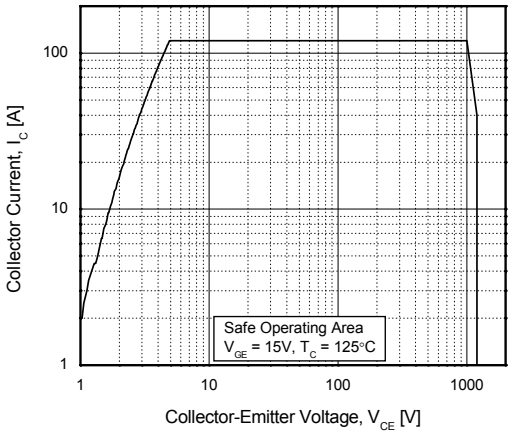


Figure 17. Forward Characteristics

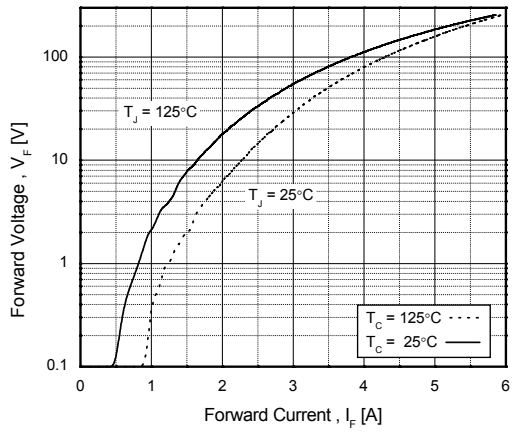
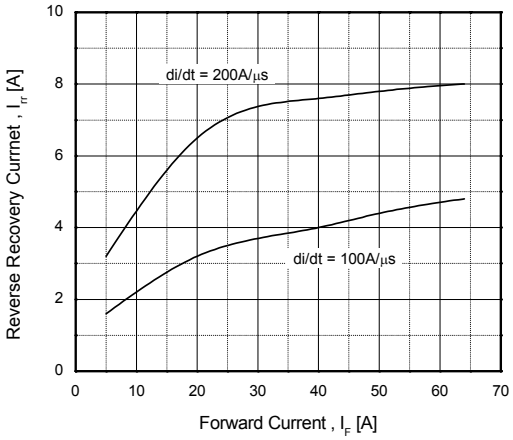


Figure 18. Reverse Recovery Current



Typical Performance Characteristics (Continued)

Figure 19. Stored Charge

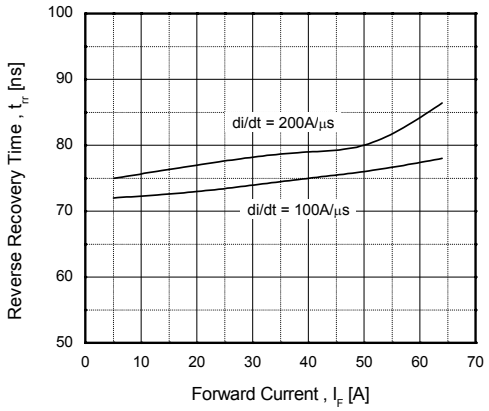


Figure 20. Reverse Recovery Time

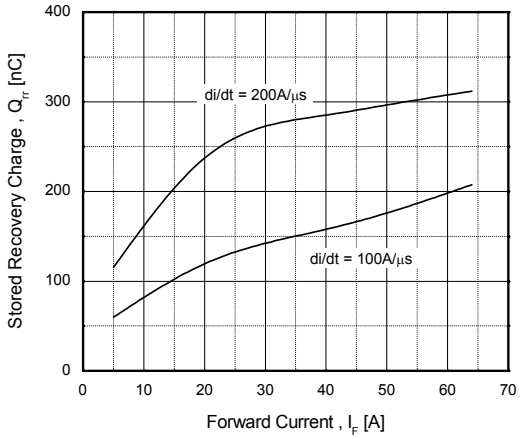
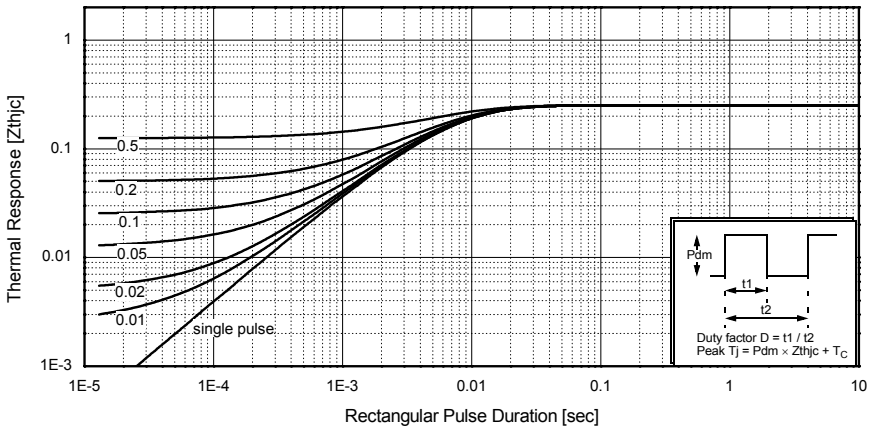
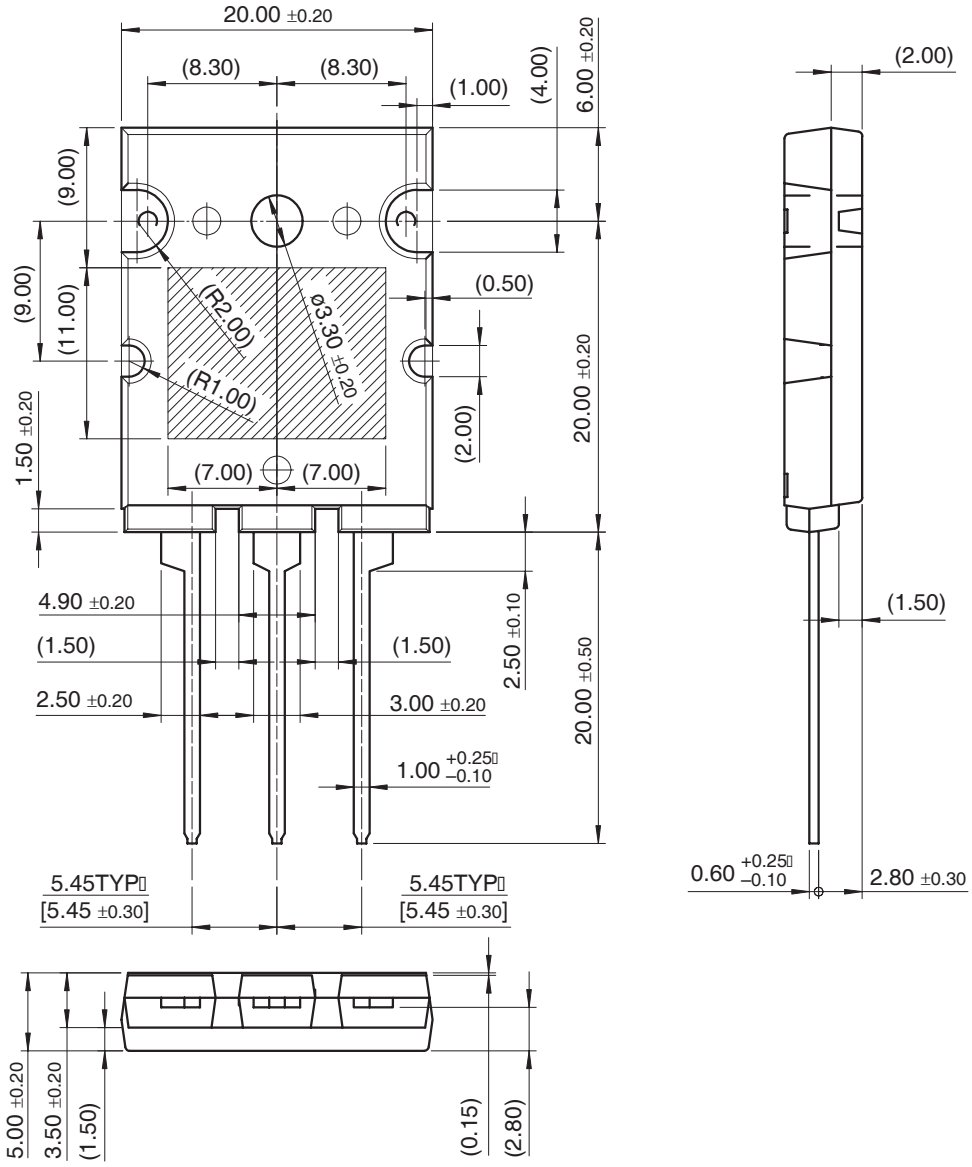


Figure 21. Transient Thermal Impedance of IGBT



Mechanical Dimensions

TO-264



Dimensions in Millimeters

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EnSigna™	ImpliedDisconnect™	OCXPro™	ScalarPump™	VCX™
FACT™	IntelliMAX™	OPTOLOGIC®	SILENT SWITCHER®	Wire™
FACT Quiet Series™		OPTOPLANAR™	SMART START™	
		PACMAN™	SPM™	
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Programmable Active Droop™		PowerEdge™	SuperSOT™-3	

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