

FGL40N120ANDTU-HX1200V NPT IGBT

General Description

The FGL40N120ANDTU-HXAND series of IGBTs, leveraging Non-Punch-Through (NPT) technology, boasts low conduction and switching losses, making it an ideal solution for various applications including induction heating (IH), motor control systems, general-purpose inverters, as well as uninterruptible power supplies (UPS).

Features

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

Absolute Maximum Ratings

Symbol	Parameter	FGL40N120ANDTU-HX	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 25	V
I_C	Collector Current @ $T_C = 25^\circ\text{C}$	64	A
	Collector Current @ $T_C = 100^\circ\text{C}$	40	A
$I_{CM(1)}$	Pulsed Collector Current	160	A
I_F	Diode Continuous Forward Current @ $T_C = 100^\circ\text{C}$	40	A
I_{FM}	Diode Maximum Forward Current	240	A
P_D	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	500	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	200	W
$SCWT$	Short Circuit Withstand Time, $V_{CE} = 600\text{V}, V_{GE} = 15\text{V}, T_C = 125^\circ\text{C}$	10	μs
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	$^\circ\text{C}$

Thermal Characteristics

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

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} / ΔT _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	--	220	330	nC
Q _{ge}	Gate-Emitter Charge		--	25	38	nC
Q _{gc}	Gate-Collector Charge		--	130	195	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 _o C	--	3.2	4.0	V
			T _C = 125 _o C	--	2.7	--	
t _{rr}	Diode Reverse Recovery Time	I _F = 40A, di/dt = 200A/μs	T _C = 25 _o C	--	75	112	nS
			T _C = 125 _o C	--	130	--	
I _{rr}	Diode Peak Reverse Recovery Current		T _C = 25 _o C	--	8	12	A
			T _C = 125 _o C	--	13	--	
Q _{rr}	Diode Reverse Recovery Charge		T _C = 25 _o C	--	300	450	nC
			T _C = 125 _o C	--	845	--	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

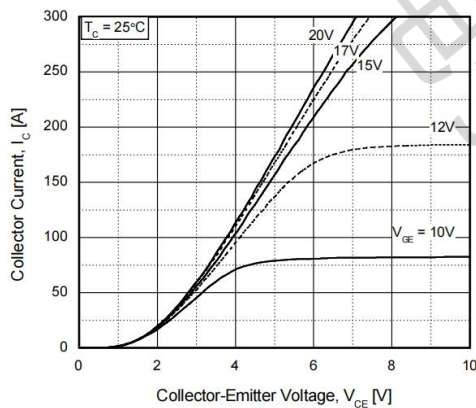


Figure 2. Typical Saturation Voltage Characteristics

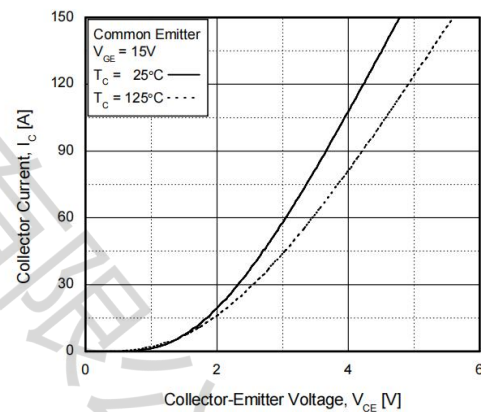


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

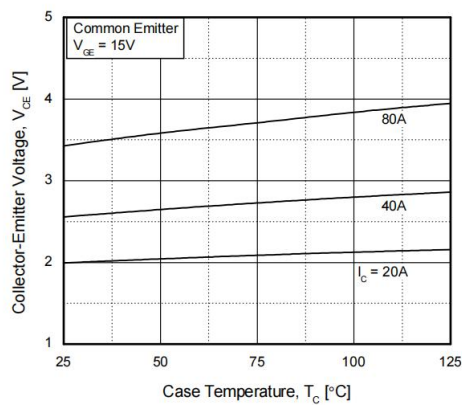


Figure 4. Load Current vs. Frequency

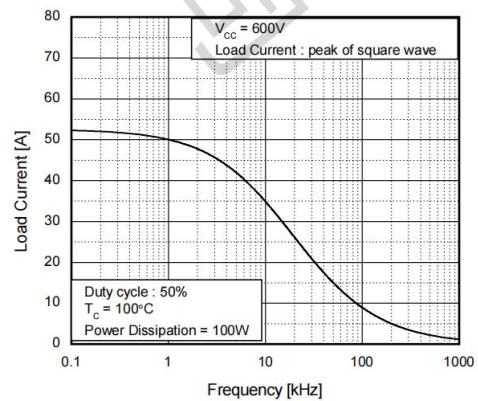


Figure 5. Saturation Voltage vs. V_{GE}

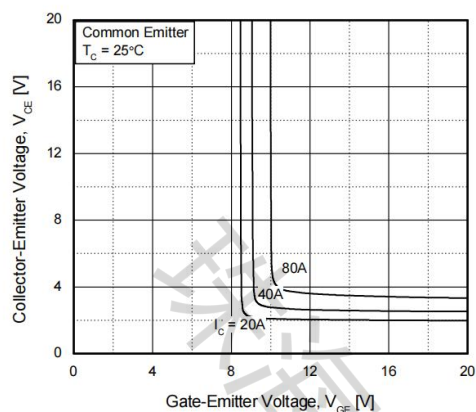


Figure 6. Saturation Voltage vs. V_{GE}

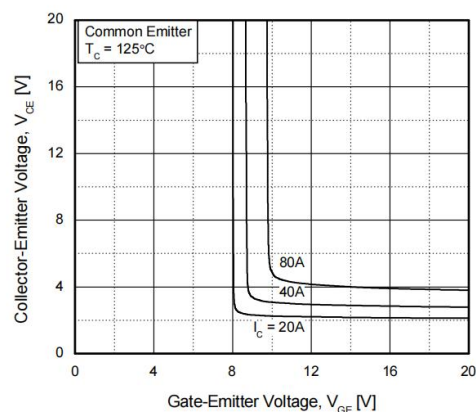


Figure 7. Capacitance Characteristics

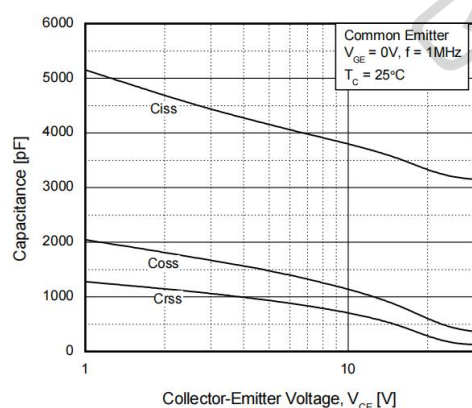


Figure 8. Turn-On Characteristics vs. Gate Resistance

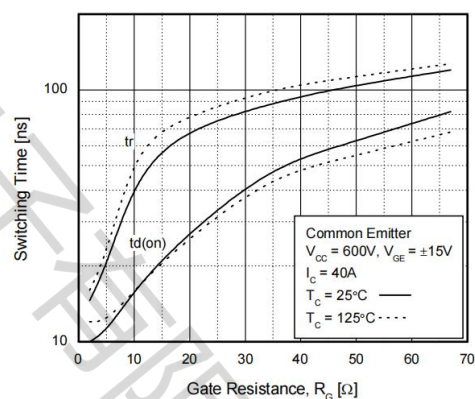


Figure 9. Turn-Off Characteristics vs. Gate Resistance

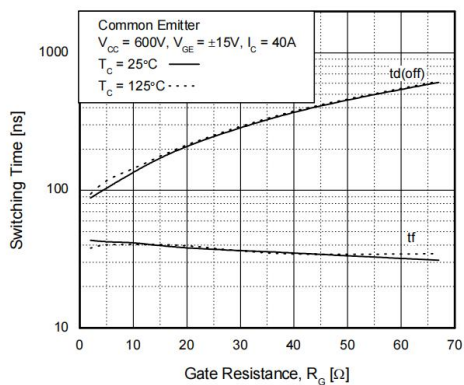


Figure 10. Switching Loss vs. Gate Resistance

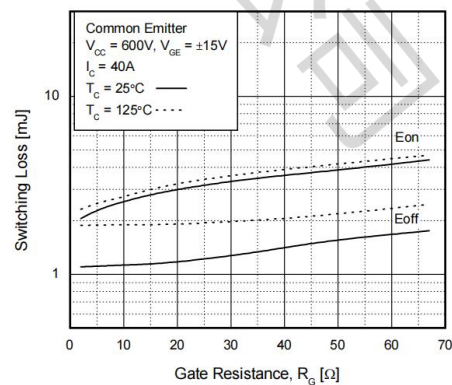


Figure 11. Turn-On Characteristics vs. Collector Current

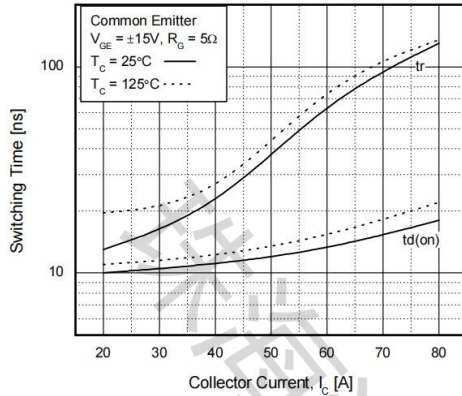


Figure 12. Turn-Off Characteristics vs. Collector Current

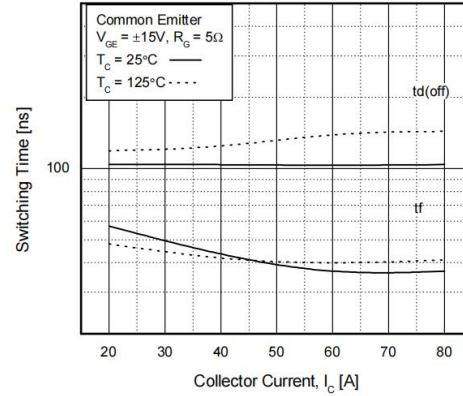


Figure 13. Switching Loss vs. Collector Current

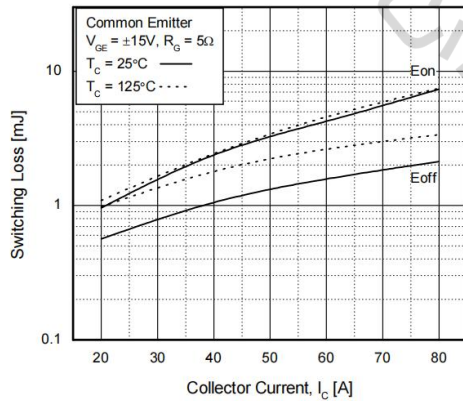


Figure 14. Gate Charge Characteristics

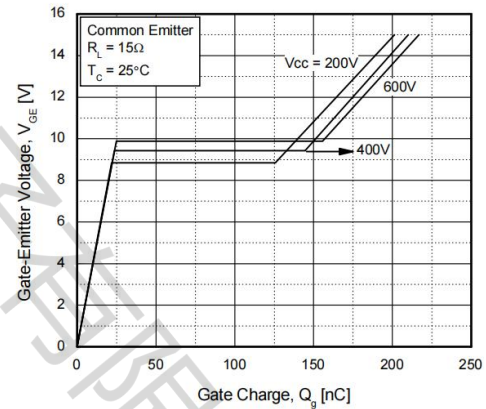


Figure 15. SOA Characteristics

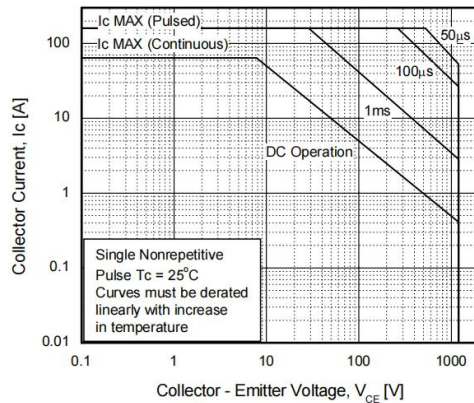


Figure 16. Turn-Off SOA

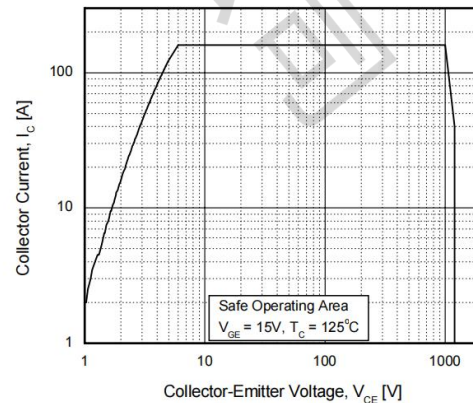


Figure 17. Forward Characteristics

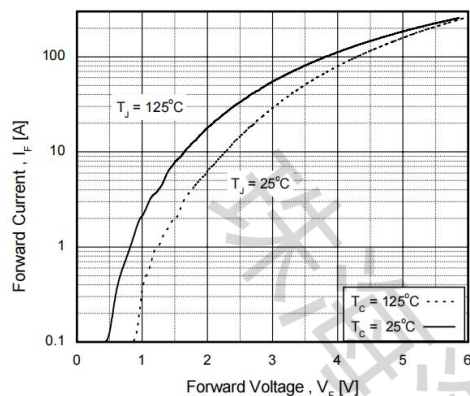


Figure 18. Reverse Recovery Current

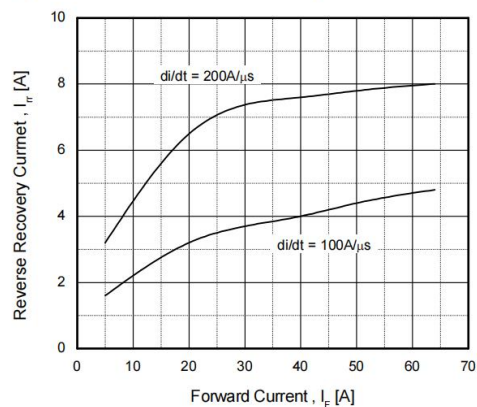


Figure 19. Stored Charge

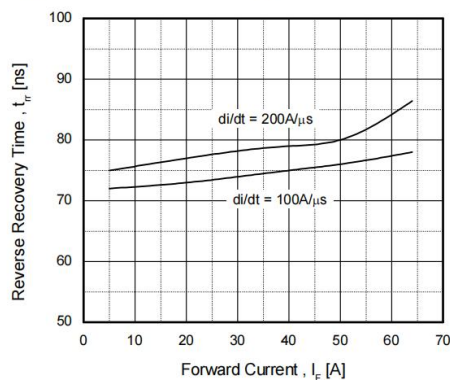


Figure 20. Reverse Recovery Time

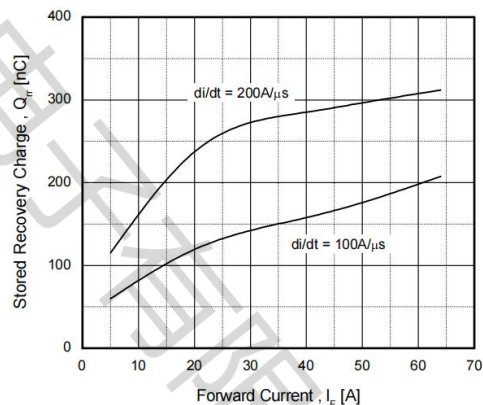
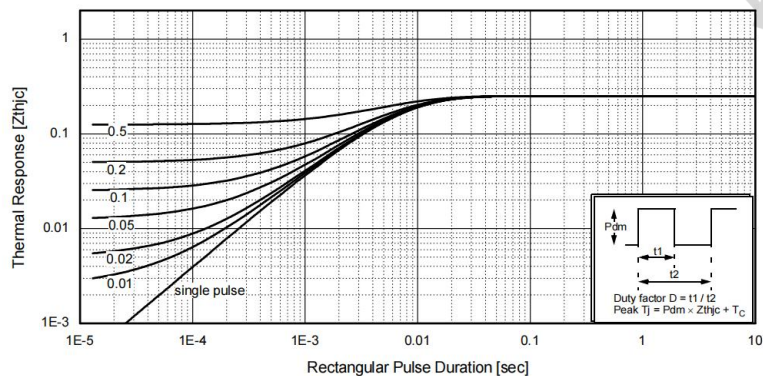
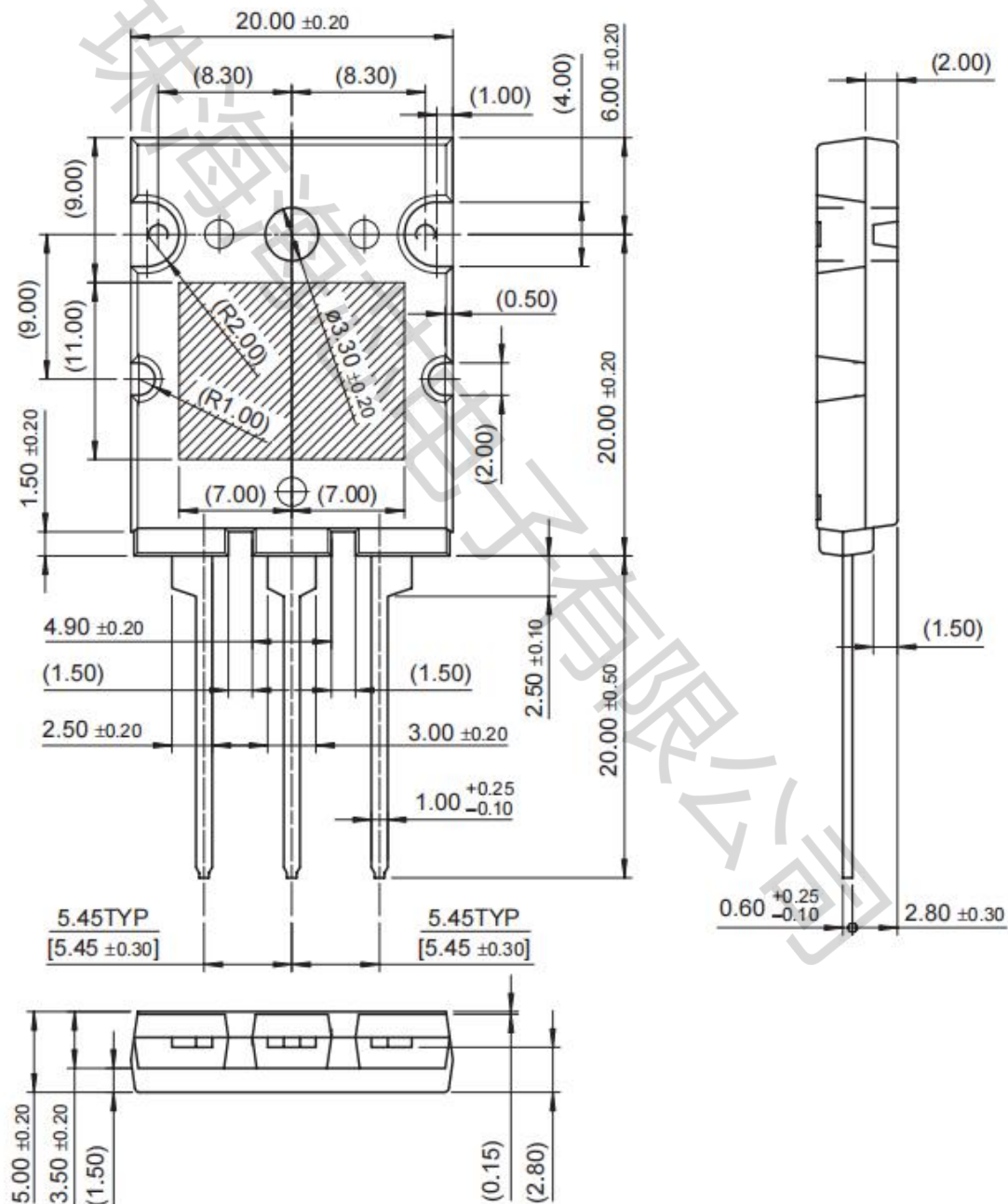


Figure 21. Transient Thermal Impedance of IGBT



Mechanical Dimensions

TO-264



Part Number	Package Type	Package	quantity
FGL40N120ANDTU-HX	TO-264	管装	25