



FGL40N120AND

1200V NPT IGBT

Features

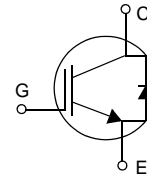
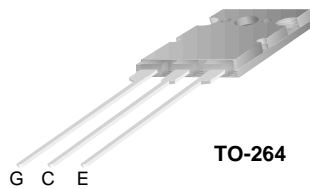
- High speed switching
- Low saturation voltage : $V_{CE(sat)} = 2.6\text{ V @ } I_C = 40\text{ A}$
- High input impedance
- CO-PAK, IGBT with FRD : $t_{rr} = 75\text{ ns (typ.)}$

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.



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

Notes:

(1) Pulse width limited by max. junction temperature

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	$^\circ\text{C/W}$

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} /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 $T_C = 25^\circ\text{C}$ unless otherwise noted

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

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

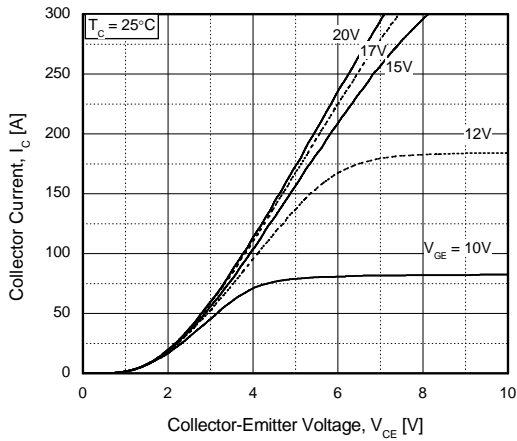


Figure 2. Typical Saturation Voltage Characteristics

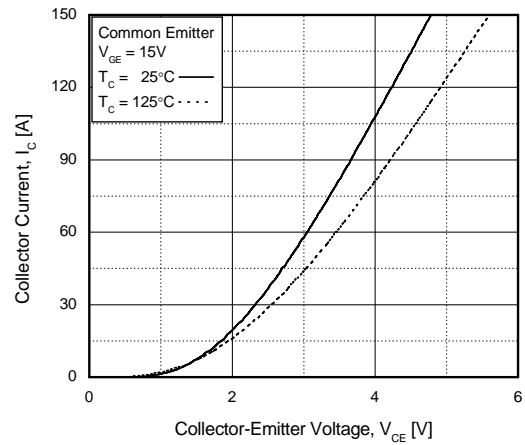


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

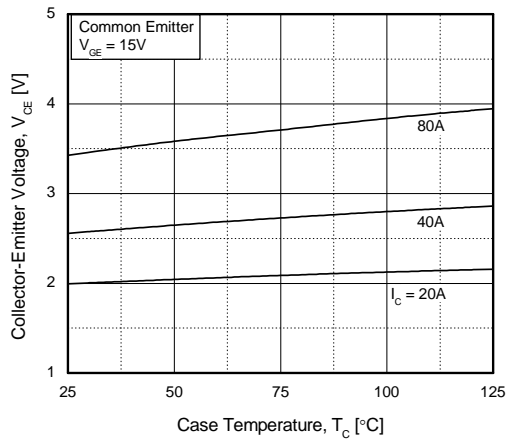


Figure 4. Load Current vs. Frequency

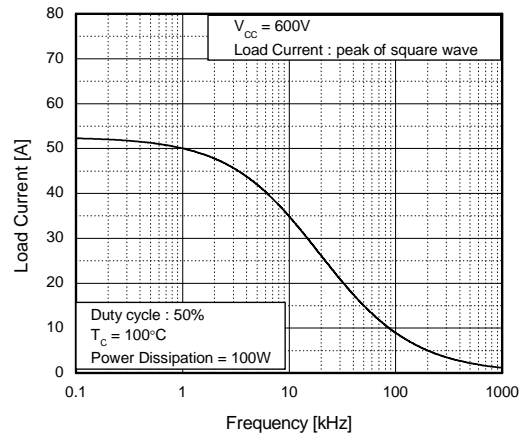


Figure 5. Saturation Voltage vs. V_GE

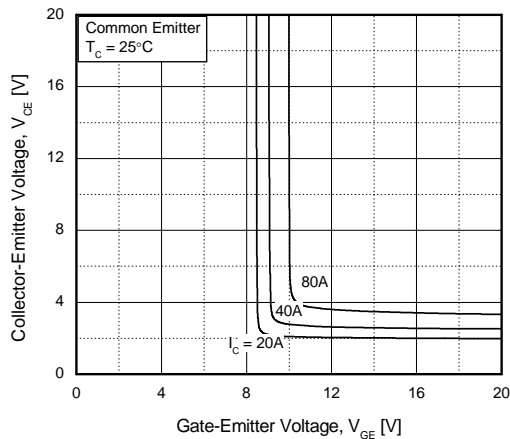
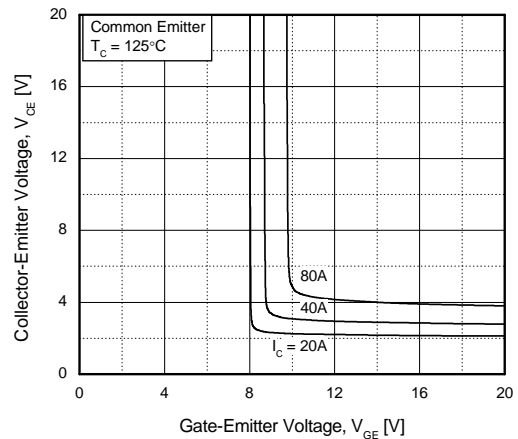


Figure 6. Saturation Voltage vs. V_GE



Typical Performance Characteristics (Continued)

Figure 7. Capacitance Characteristics

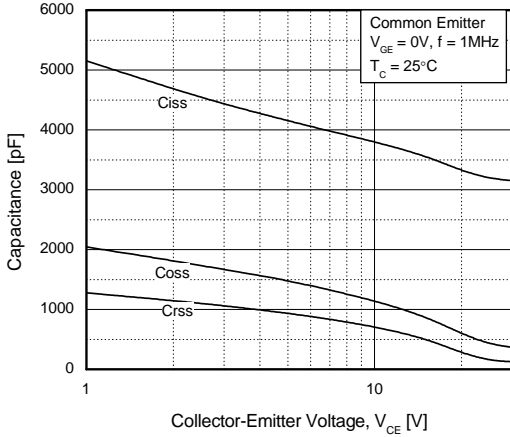


Figure 8. Turn-On Characteristics vs. Gate Resistance

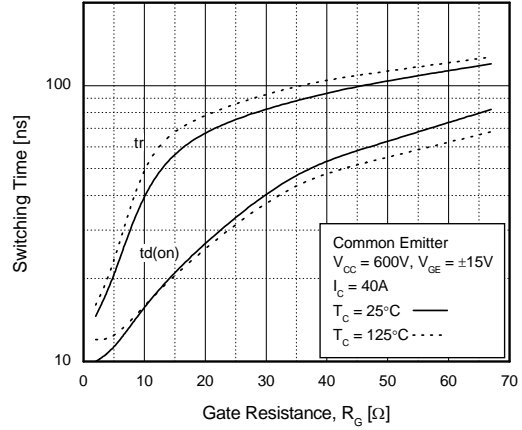


Figure 9. Turn-Off Characteristics vs. Gate Resistance

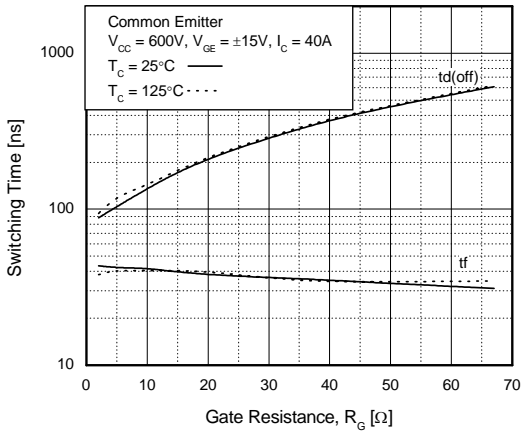


Figure 10. Switching Loss vs. Gate Resistance

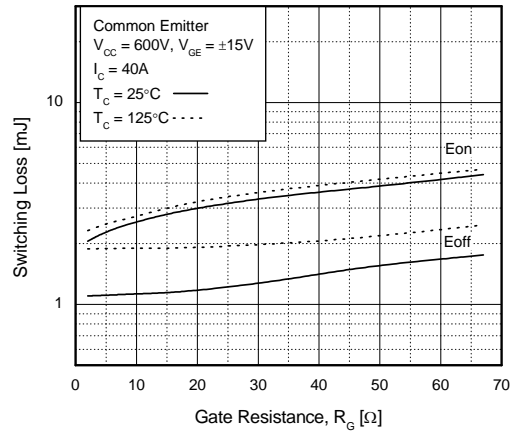


Figure 11. Turn-On Characteristics vs. Collector Current

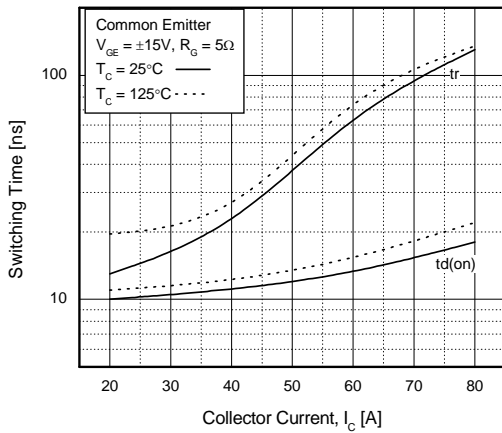
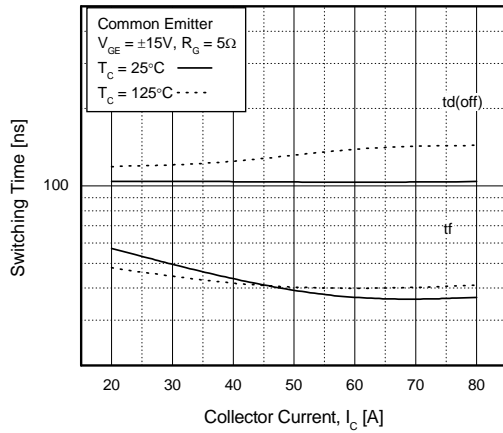


Figure 12. Turn-Off Characteristics vs. Collector Current



Typical Performance Characteristics (Continued)

Figure 13. Switching Loss vs. Collector Current

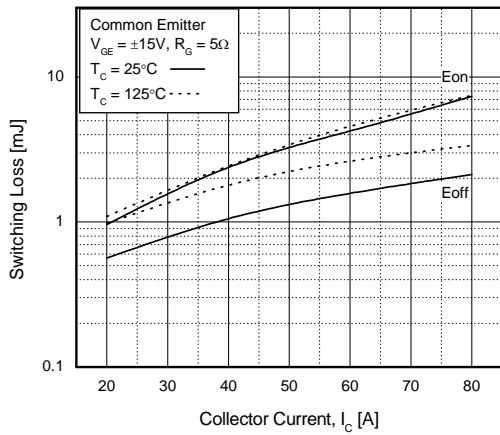


Figure 14. Gate Charge Characteristics

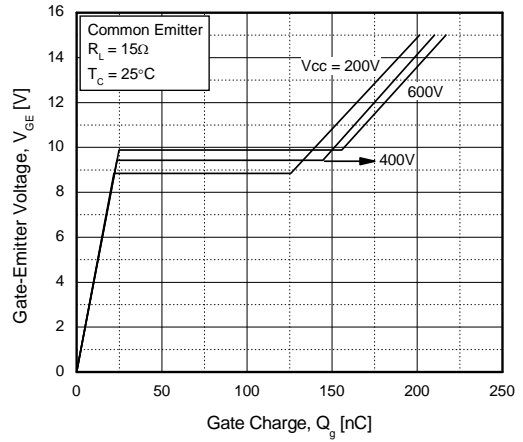


Figure 15. SOA Characteristics

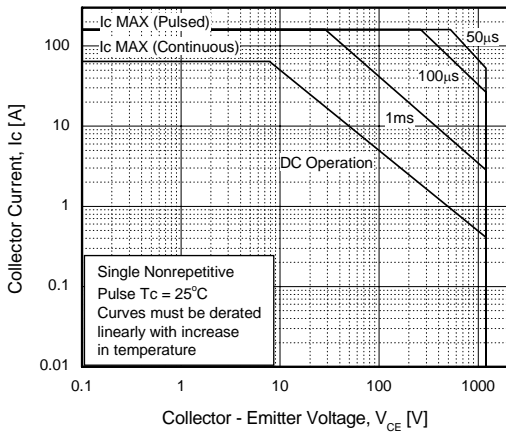


Figure 16. Turn-Off SOA

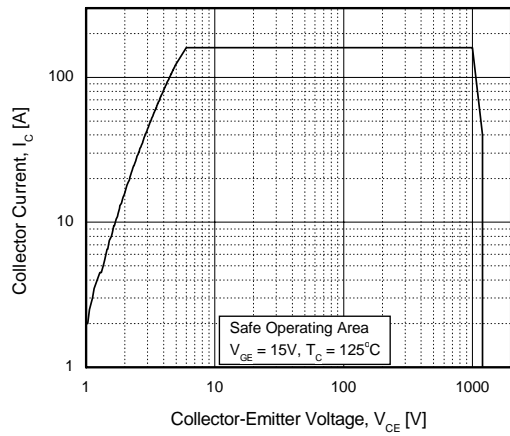


Figure 17. Forward Characteristics

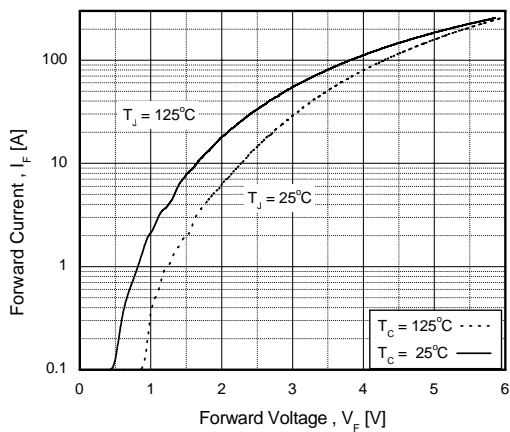
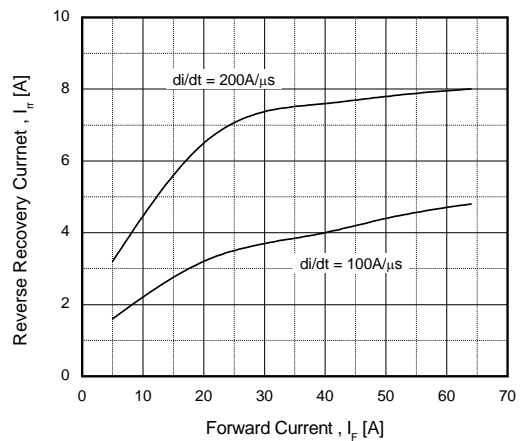


Figure 18. Reverse Recovery Current



Typical Performance Characteristics (Continued)

Figure 19. Stored Charge

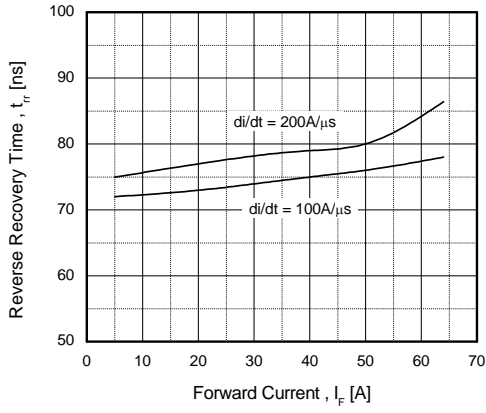


Figure 20. Reverse Recovery Time

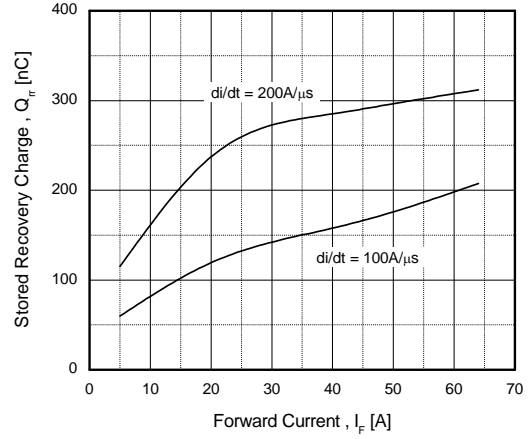
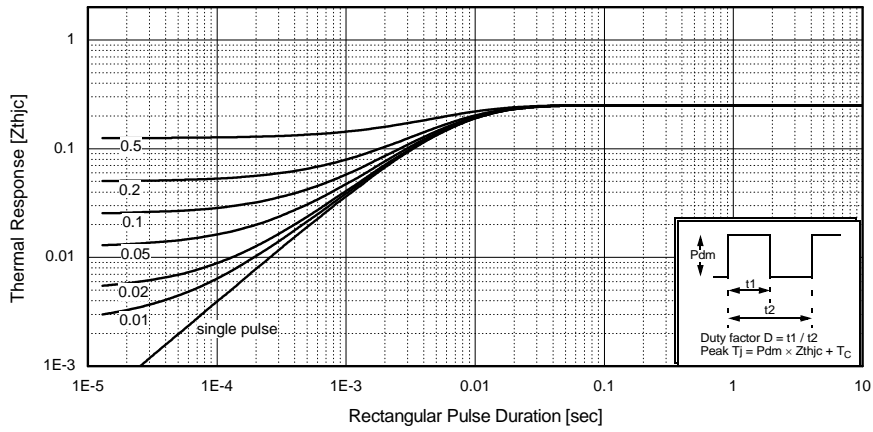






Figure 21. Transient Thermal Impedance of IGBT





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Rev. I33

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