FAIRCHILD SEMICONDUCTOR™

September 2000

IGBT

FGL40N150D

General Description

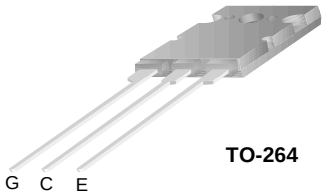
Fairchild's Insulated Gate Bipolar Transistor (IGBT) provides low conduction and switching losses. FGL40N150D is designed for the Induction Heating applications.

Features

- High Speed Switching
- Low Saturation Voltage : $V_{CE(sat)}$ = 3.5 V @ I_C = 40A
- High Input Impedance
- Built-in Fast Recovery Diode

Application

Home Appliance, Induction Heater, IH JAR, Micro Wave Oven



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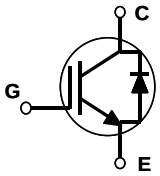

Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Description		FGL40N150D	Units
V_{CES}	Collector-Emitter Voltage		1500	V
V_{GES}	Gate-Emitter Voltage		± 25	V
I_C	Collector Current	@ T_C = 25°C	40	A
	Collector Current	@ T_C = 100°C	20	A
$I_{CM\ (1)}$	Pulsed Collector Current		120	A
I_F	Diode Continuous Forward Current	@ T_C = 100°C	10	A
I_{FM}	Diode Maximum Forward Current		100	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	200	W
	Maximum Power Dissipation	@ T_C = 100°C	80	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	Typ.	Max.	Units
$R_{\theta JC}$(IGBT)	Thermal Resistance, Junction-to-Case	--	0.625	°C/W
$R_{\theta JC}$(DIODE)	Thermal Resistance, Junction-to-Case	--	0.83	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	25	°C/W

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{CES}	Collector-Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 3mA	1500	--	--	V
I_{CES}	Collector Cut-Off Current	V_{CE} = V_{CES}, V_{GE} = 0V	--	--	3.0	mA
I_{GES}	G-E Leakage Current	V_{GE} = V_{GES}, V_{CE} = 0V	--	--	± 100	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 40mA, V_{CE} = V_{GE}	3.5	5.0	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 40A, V_{GE} = 15V	2.5	3.5	4.5	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz	--	2450	--	pF
C_{oes}	Output Capacitance		--	220	--	pF
C_{res}	Reverse Transfer Capacitance		--	75	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600 V, I_C = 40A, R_G = 51Ω, V_{GE} = 15V, Resistive Load, T_C=25°C	--	100	200	ns
t_r	Rise Time		--	350	700	ns
$t_{d(off)}$	Turn-Off Delay Time		--	200	400	ns
t_f	Fall Time		--	100	300	ns
Q_g	Total Gate Charge	V_{CE} = 600 V, I_C = 40A, V_{GE} = 15V	--	110	170	nC
Q_{ge}	Gate-Emitter Charge		--	15	25	nC
Q_{gc}	Gate-Collector Charge		--	40	60	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 = 10A	--	1.3	1.8	V
t_{rr}	Diode Reverse Recovery Time	I_F = 10A, di/dt = 200A/us	--	170	300	ns

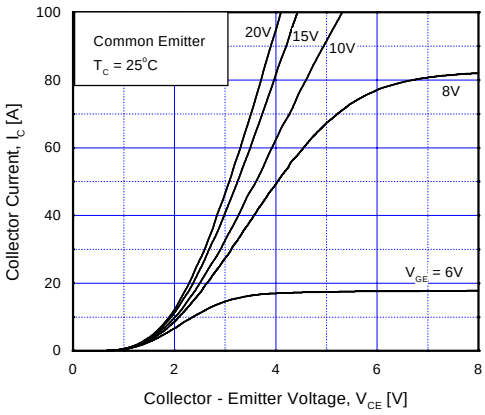

Fig 1. Typical Output Characteristics

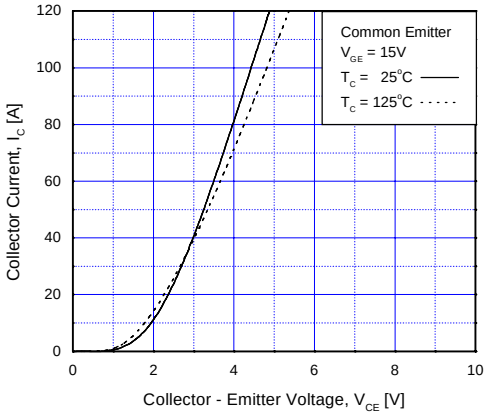

Fig 2. Typical Output Characteristics

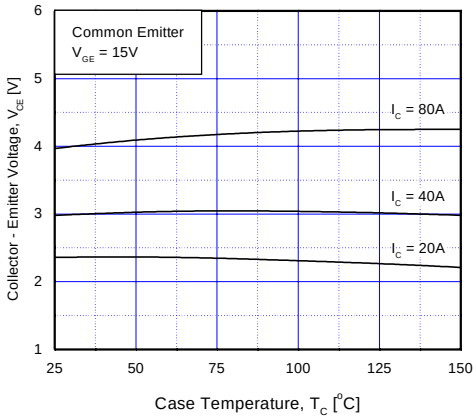

Fig 3. Collector to Emitter Saturation Voltage vs. Case Temperature

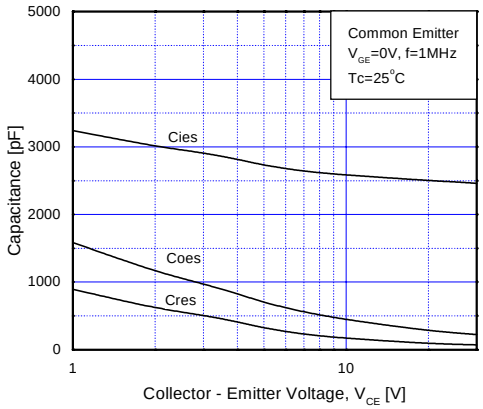

Fig 4. Typical Capacitance vs. Collector to Emitter Voltage

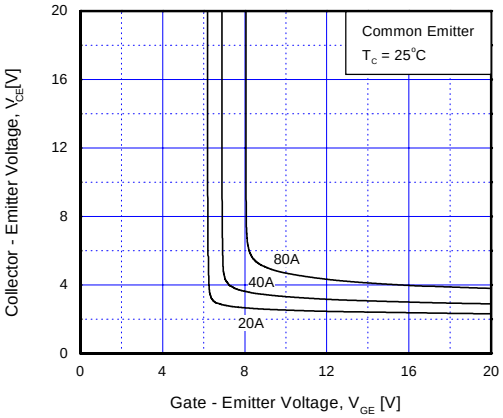

Fig 5. Saturation Voltage vs. V_{GE}

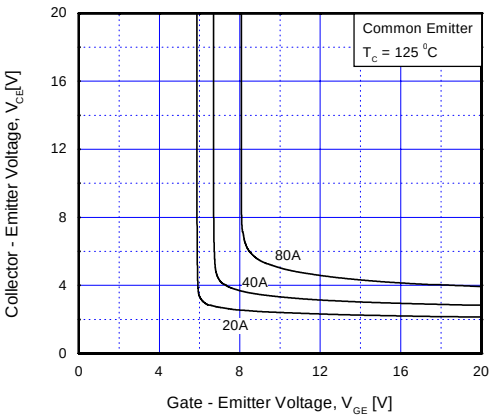

Fig 6. Saturation Voltage vs. V_{GE}

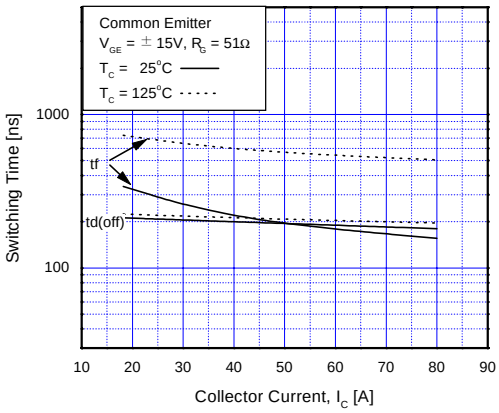

Fig 7. Turn-Off Characteristics vs. Collector Current

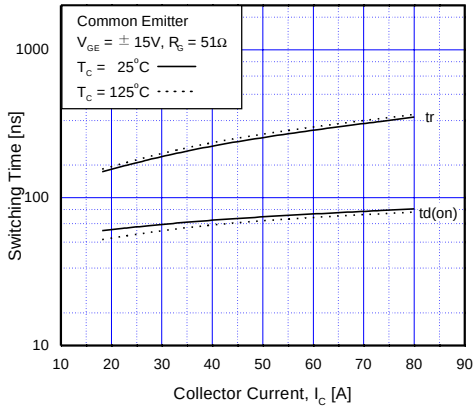

Fig 8. Turn-On Characteristics vs. Collector Current

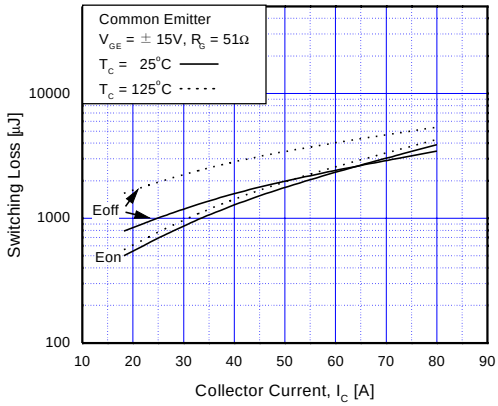

Fig 9. Switching Loss vs. Collector Current

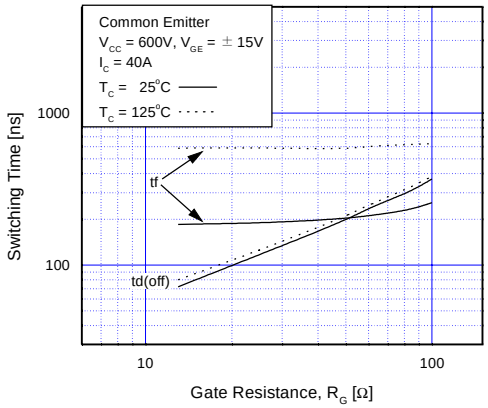

Fig 10. Turn-Off Characteristics vs. Gate Resistance

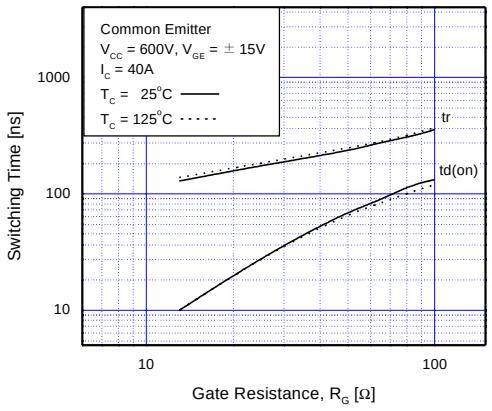

Fig 11. Turn-On Characteristics vs. Gate Resistance

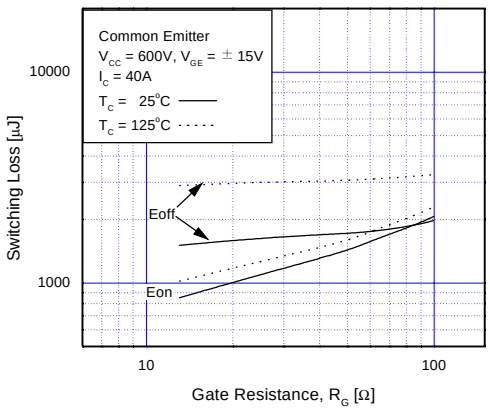

Fig 12. Switching Loss vs. Gate Resistance

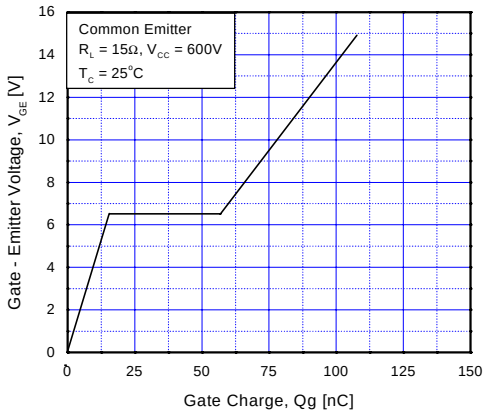

Fig 13. Gate Charge Characteristics

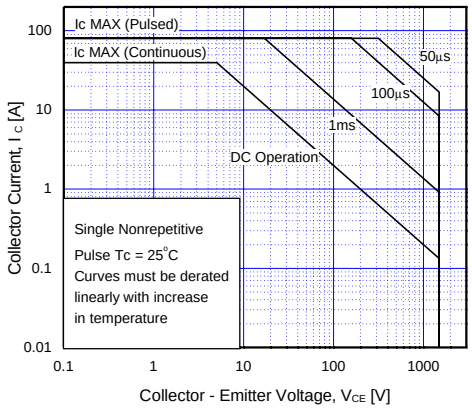

Fig 14. SOA Characteristics

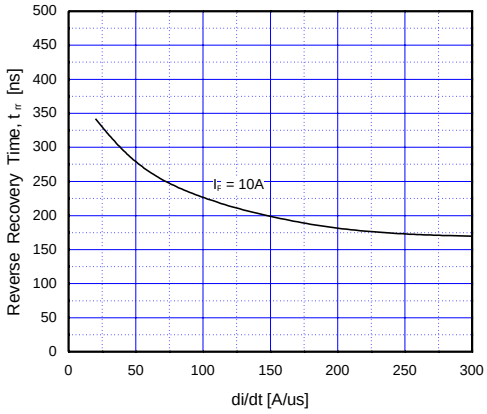

Fig 15. Typical T_{rr} vs. di/dt

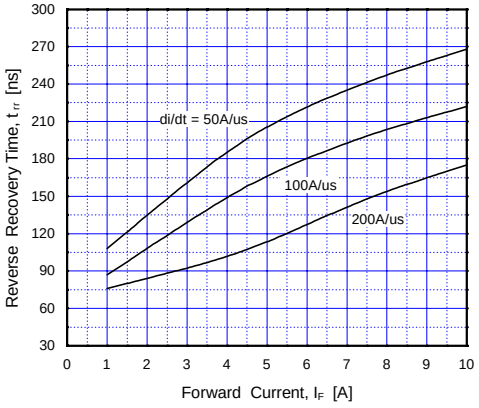

Fig 16. Typical T_{rr} vs. Forward Current

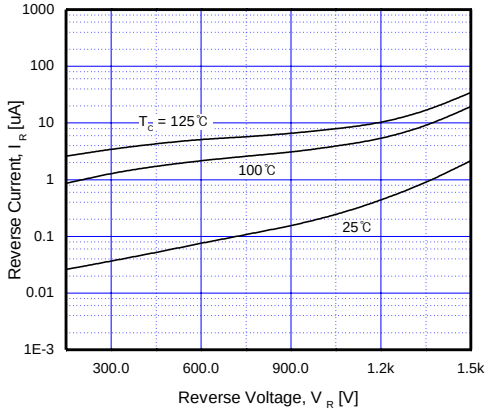

Fig 17. Reverse Current vs. Reverse Voltage

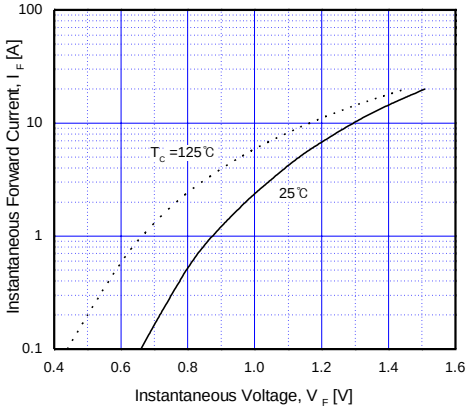

Fig 18. Typical Forward Voltage Drop vs. Forward Current

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