FAIRCHILD SEMICONDUCTOR®

October 2001

IGBT

FGL60N170D

General Description

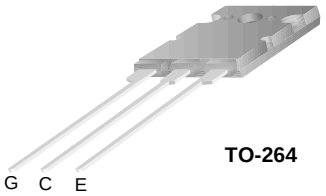
Fairchild's Insulated Gate Bipolar Transistor (IGBT) provides low conduction and switching losses. FGL60N170D is designed for the Induction Heating applications.

Features

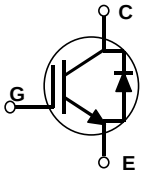
- High Speed Switching
- Low Saturation Voltage : $V_{CE(sat)}$ = 5.0 V @ I_C = 60A
- High Input Impedance
- Built-in Fast Recovery Diode

Application

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



TO-264



Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Description		FGL60N170D	Units
V_{CES}	Collector-Emitter Voltage		1700	V
V_{GES}	Gate-Emitter Voltage		± 25	V
I_C	Collector Current	@ T_C = 25°C	60	A
	Collector Current	@ T_C = 100°C	30	A
$I_{CM\ (1)}$	Pulsed Collector Current		180	A
I_F	Diode Continuous Forward Current	@ T_C = 100°C	15	A
I_{FM}	Diode Maximum Forward Current		150	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 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
$R_{\theta A}$	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	1700	--	--	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 = 60mA, V_{CE} = V_{GE}	3.5	5.0	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 60A, V_{GE} = 15V	-	5.0	6.0	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz	--	2500	--	pF
C_{oes}	Output Capacitance		--	220	--	pF
C_{res}	Reverse Transfer Capacitance		--	80	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600 V, I_C = 60A, 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 = 60A, V_{GE} = 15V	--	120	180	nC
Q_{ge}	Gate-Emitter Charge		--	20	30	nC
Q_{gc}	Gate-Collector Charge		--	45	70	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 = 15 A	--	1.35	1.6	V
		I_F = 60 A	--	1.92	2.2	
trr	Diode Reverse Recovery Time	I_F = 60 A, di/dt = 20 A/uS	--	0.6	1.0	us
I_R	Inatantaneous Reverse Current	V_{RRM} = 1700V	--	0.3	5	uA
C_J	Junction Capacitance	V_{CE} = 10V, V_{GE} = 0V, f = 1MHz	--	80	--	pF

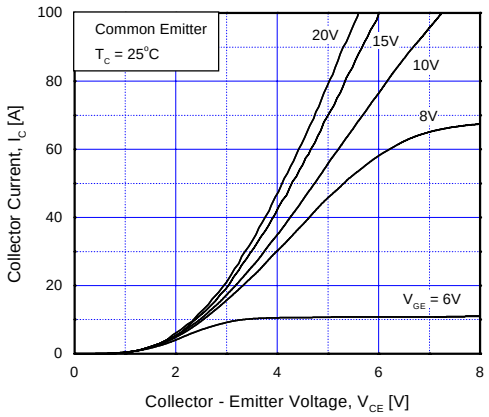


Fig 1. Typical Output Chacracteristics

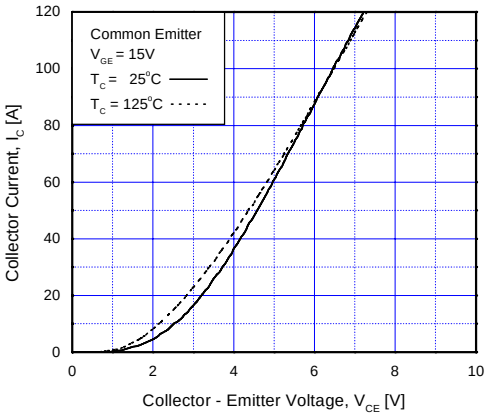


Fig 2. Typical Saturation Voltage Characteristics

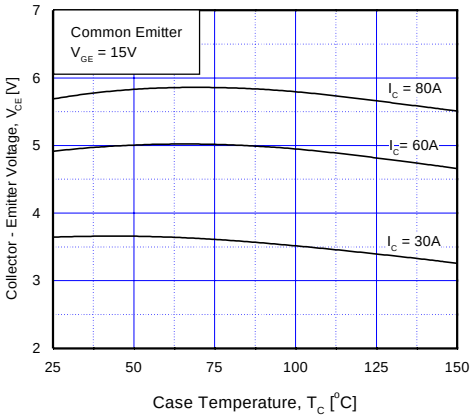


Fig 3. Collector to Emitter Saturation Voltage vs. Case Temperature

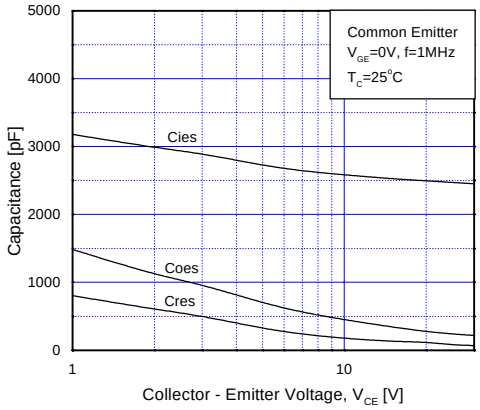


Fig 4. Typical Capacitance vs. Collector to Emitter Voltage

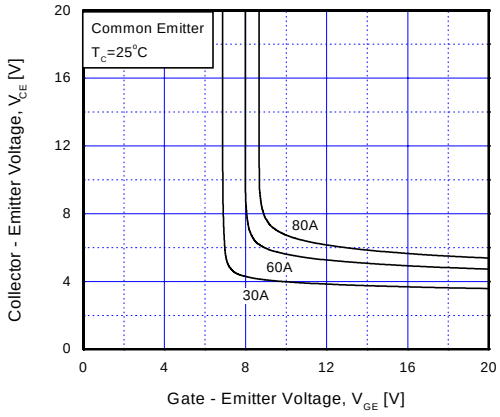


Fig 5. Saturation Voltage vs. V_{GE}

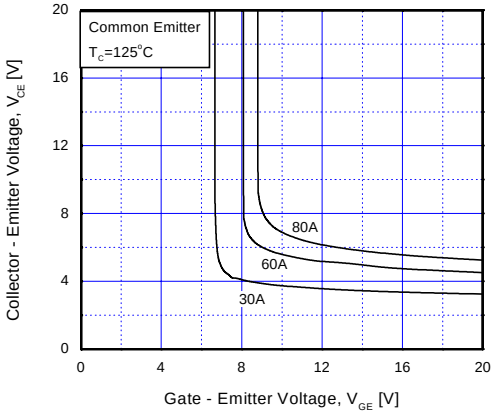


Fig 6. Saturation Voltage vs. V_{GE}

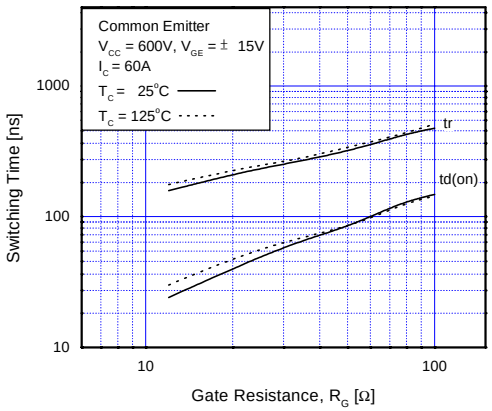


Fig 7. Turn on Characteristics vs. Gate Resistance

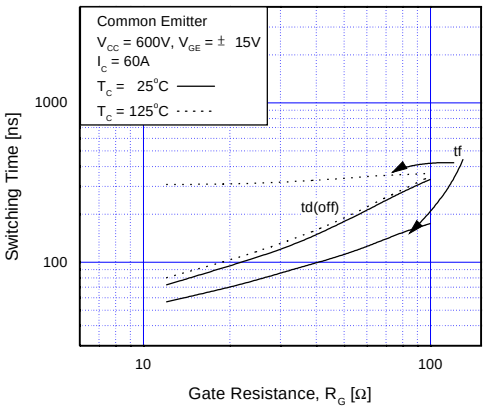


Fig 8. Turn off Characteristics vs. Gate Resistance

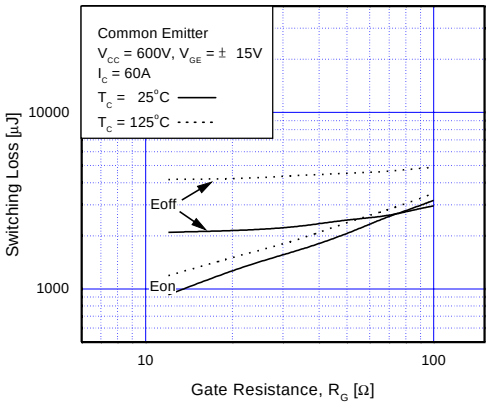


Fig 9. Switching Loss vs. Gate Resistance

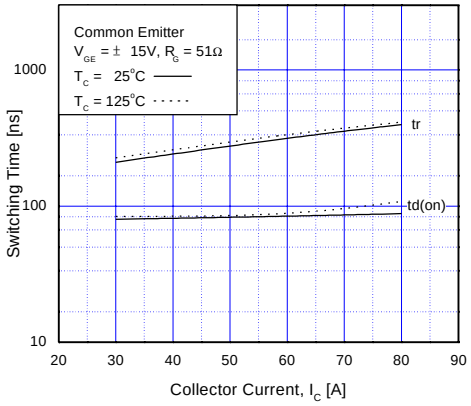


Fig 10. Turn on Characteristics vs. Collector Current

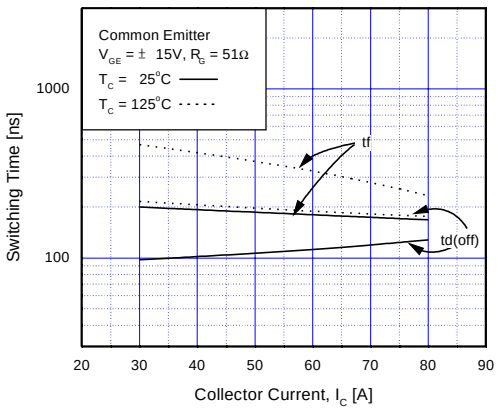


Fig 11. Turn off Characteristics vs. Collector Current

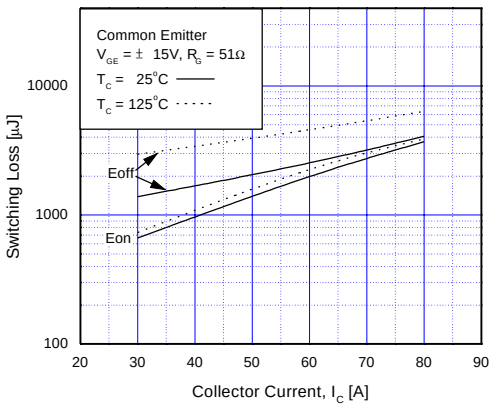


Fig 12. Switching Loss vs. Collector Current

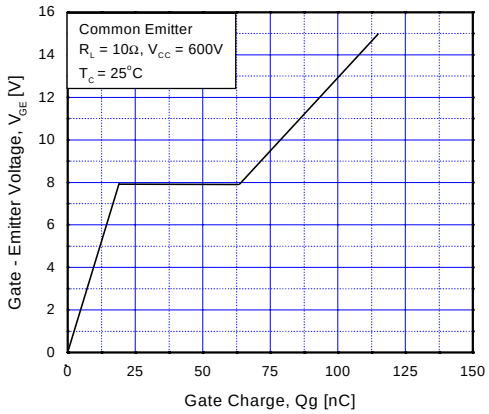


Fig 13. Gate Charge Characteristics

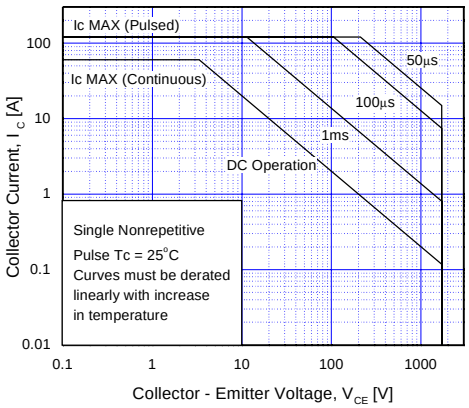


Fig 14. Turn off SOA Characteristics

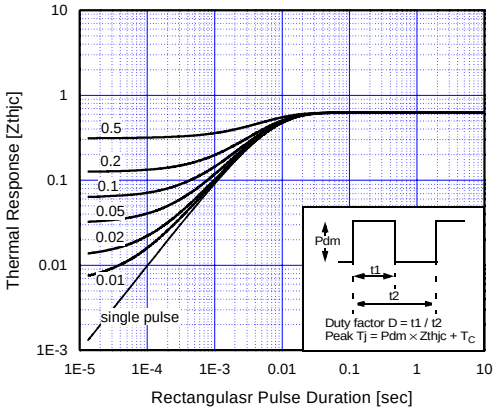


Fig 15. Transient Thermal Impedance of IGBT

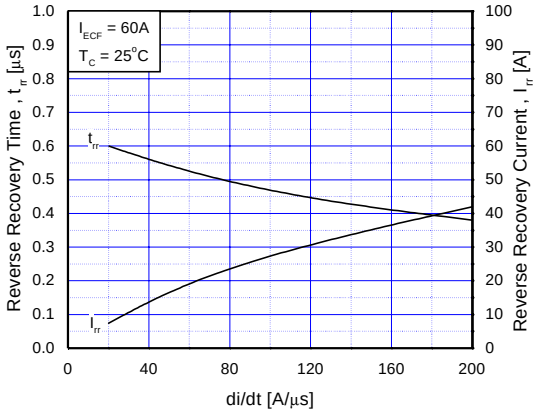


Fig 16. Typical Trr vs. di/dt

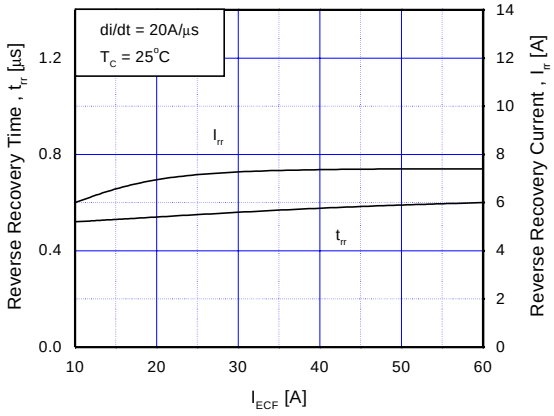


Fig 17. Typical Trr vs. Forward Current

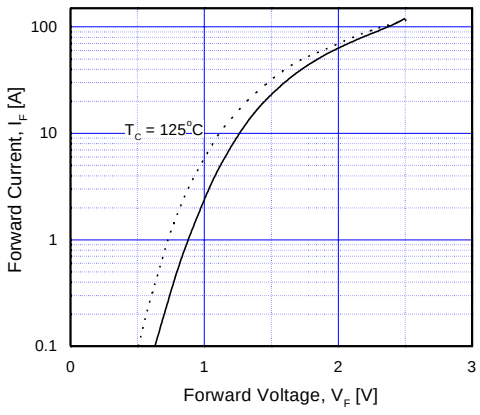


Fig 18. Typical Forward Voltage Drop vs. Forward Current

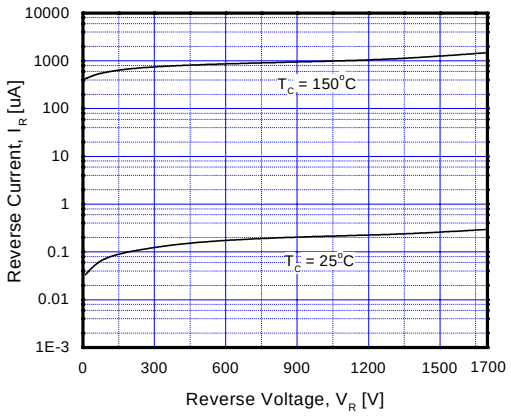


Fig 19. Reverse Current vs. Reverse Voltage

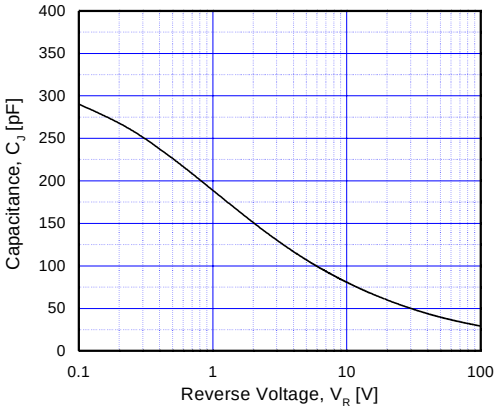
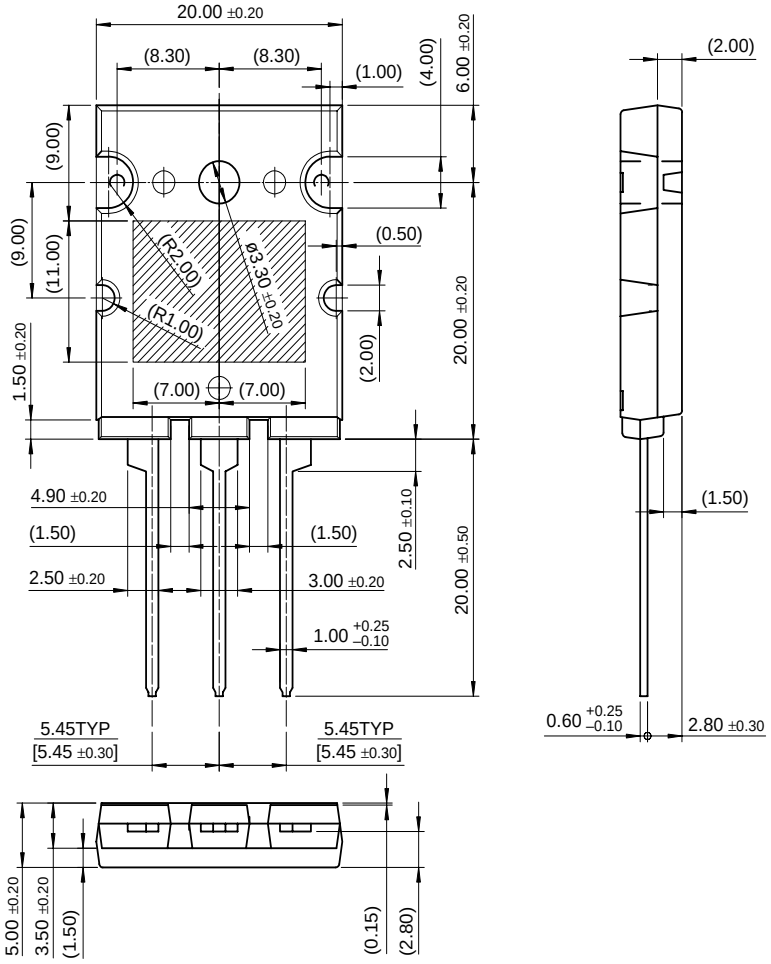


Fig 20. Capacitance vs. Reverse Voltage For Diode

Package Dimension

TO-264



Dimensions in Millimeters

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™	FAST®	OPTOLOGIC™	SMART START™	VCX™
Bottomless™	FASTr™	OPTOPLANAR™	STAR*POWER™	
CoolFET™	FRFET™	PACMAN™	Stealth™	
CROSSVOLT™	GlobalOptoisolator™	POP™	SuperSOT™-3	
DenseTrench™	GTO™	Power247™	SuperSOT™-6	
DOME™	HiSeC™	PowerTrench®	SuperSOT™-8	
EcoSPARK™	ISOPLANAR™	QFET™	SyncFET™	
E^2CMOS™	LittleFET™	QS™	TruTranslation™	
EnSigna™	MicroFET™	QT Optoelectronics™	TinyLogic™	
FACT™	MicroPak™	Quiet Series™	UHC™	
FACT Quiet Series™	MICROWIRE™	SLIENT SWITCHER®	UltraFET®	

STAR*POWER is used under license

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR INTERNATIONAL.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.