FAIRCHILD

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October 2001

IGBT

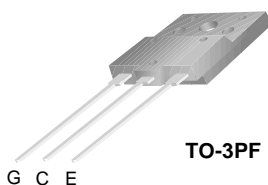# SGF80N60UF

Ultra-Fast IGBT

General Description

Fairchild's Insulated Gate Bipolar Transistor(IGBT) UF series provides low conduction and switching losses. UF series is designed for the applications such as motor control and general inverters where High Speed Switching is required.
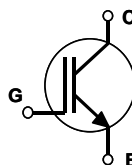
Features

- High Speed Switching
- Low Saturation Voltage : $V_{CE(sat)}$ = 2.1 V @ I_C = 40A
- High Input Impedance

Application

AC & DC Motor controls, General Purpose Inverters, Robotics, Servo Controls

TO-3PF

G C E

Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Description		SGF80N60UF	Units
V_{CES}	Collector-Emitter Voltage		600	V
V_{GES}	Gate-Emitter Voltage		$\pm$ 20	V
I_C	Collector Current	@ T_C = 25°C	80	A
	Collector Current	@ T_C = 100°C	40	A
$I_{CM(1)}$	Pulsed Collector Current		220	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	110	W
	Maximum Power Dissipation	@ T_C = 100°C	45	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
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	1.1	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	°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 = 250uA	600	--	--	V
$\Delta B_{VCES}/\Delta T_J$	Temperature Coeff. 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	--	--	250	uA
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	4.5	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 40A, V_{GE} = 15V	--	2.1	2.6	V
		I_C = 80A, V_{GE} = 15V	--	2.6	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz	--	2790	--	pF
C_{oes}	Output Capacitance		--	350	--	pF
C_{res}	Reverse Transfer Capacitance		--	100	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 40A, R_G = 5Ω, V_{GE} = 15V, Inductive Load, T_C = 25°C	--	23	--	ns
t_r	Rise Time		--	50	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	90	130	ns
t_f	Fall Time		--	50	150	ns
E_{on}	Turn-On Switching Loss		--	570	--	uJ
E_{off}	Turn-Off Switching Loss		--	590	--	uJ
E_{ts}	Total Switching Loss		--	1160	1500	uJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 40A, R_G = 5Ω, V_{GE} = 15V, Inductive Load, T_C = 125°C	--	30	--	ns
t_r	Rise Time		--	55	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	150	200	ns
t_f	Fall Time		--	160	250	ns
E_{on}	Turn- On Switching Loss		--	630	--	uJ
E_{off}	Turn- Off Switching Loss		--	940	--	uJ
E_{ts}	Total Switching Loss		--	1580	2000	uJ
Q_g	Total Gate Charge	V_{CE} = 300 V, I_C = 40A, V_{GE} = 15V	--	175	250	nC
Q_{ge}	Gate-Emitter Charge		--	25	40	nC
Q_{gc}	Gate-Collector Charge		--	60	90	nC
L_e	Internal Emitter Inductance	Measured 5mm from PKG	--	14	--	nH
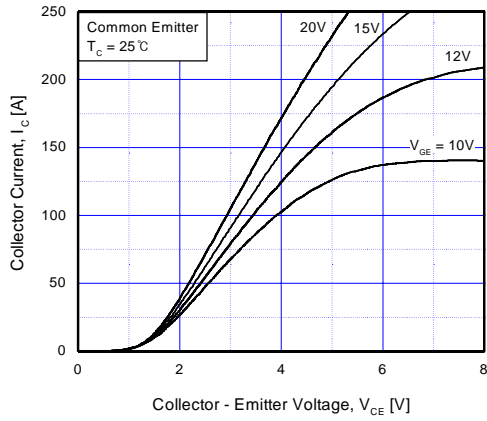
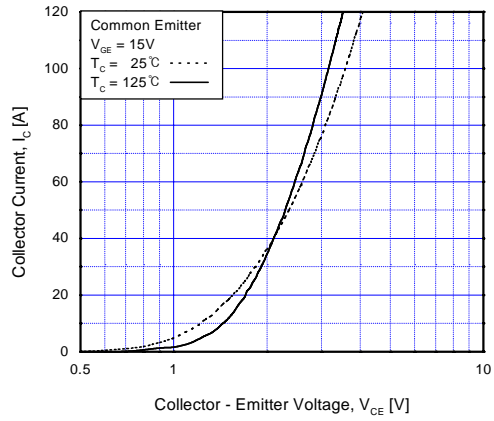**Fig 1. Typical Output Characteristics**

Fig 2. Typical Saturation Voltage Characteristics
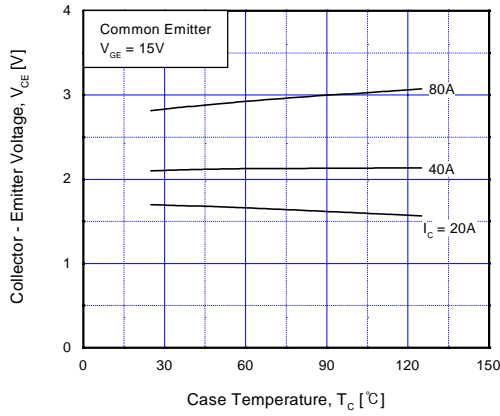

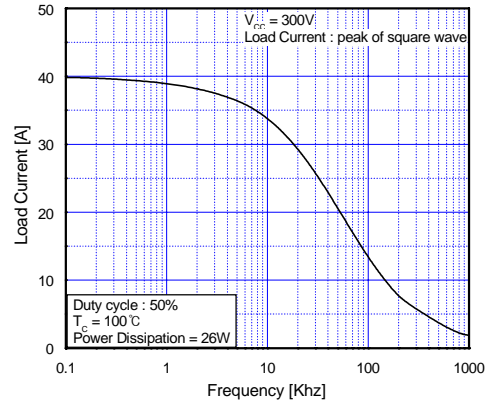**Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level**
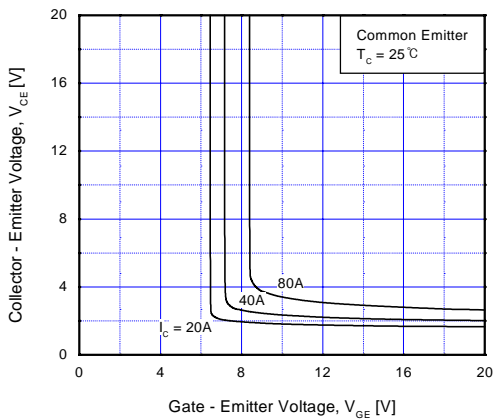

Fig 4. Load Current vs. Frequency

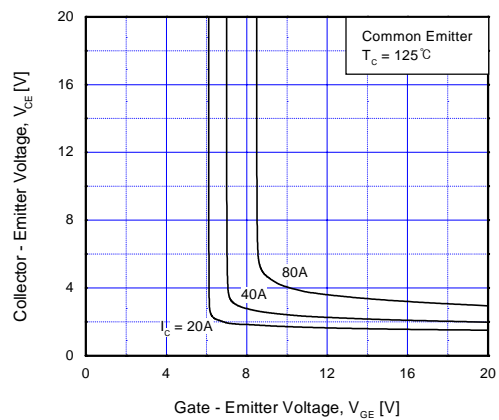**Fig 5. Saturation Voltage vs. V$_{GE}$**
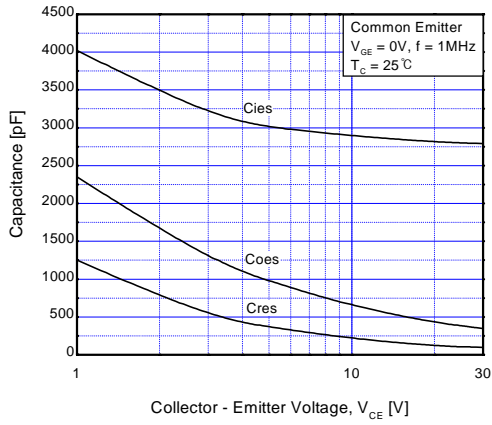

Fig 6. Saturation Voltage vs. V$_{GE}$

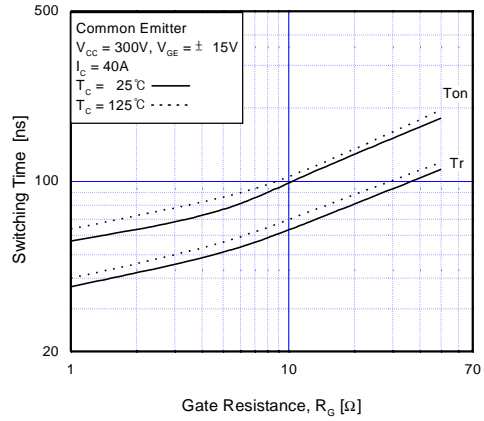**Fig 7. Capacitance Characteristics**

**Fig 8. Turn-On Characteristics vs.
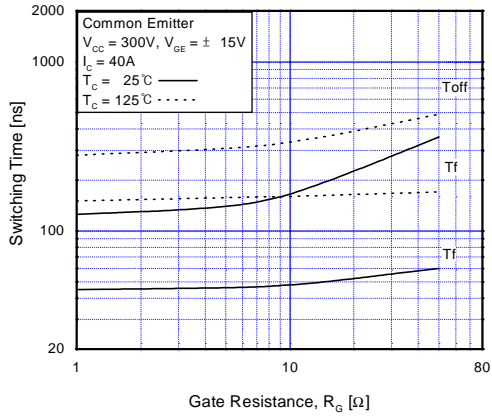Gate Resistance**

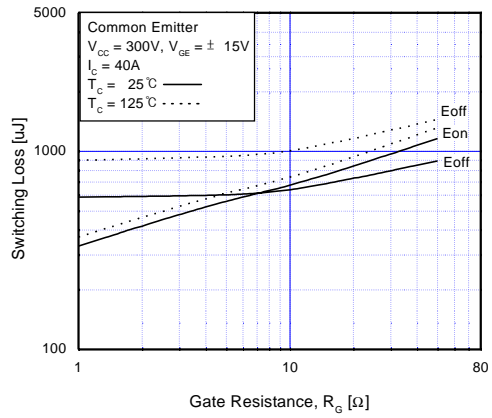**Fig 9. Turn-Off Characteristics vs.
Gate Resistance**

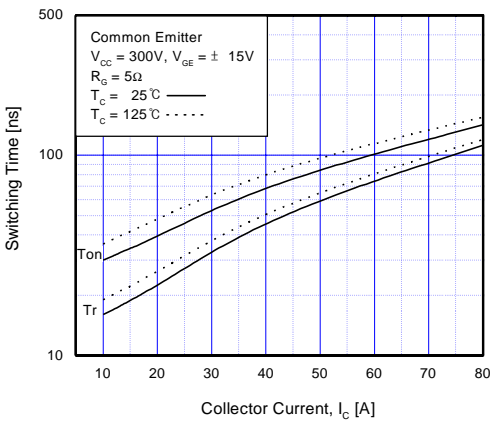**Fig 10. Switching Loss vs. Gate Resistance**
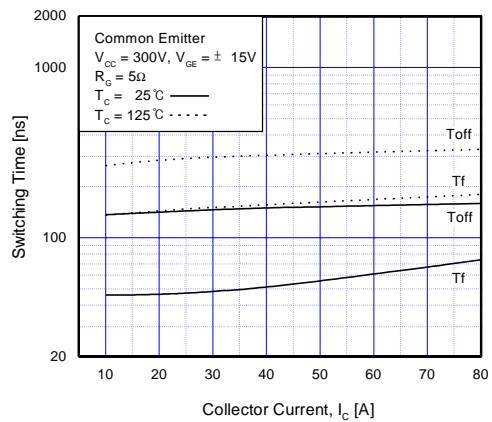

**Fig 11. Turn-On Characteristics vs.
Collector Current**

**Fig 12. Turn-Off Characteristics vs.
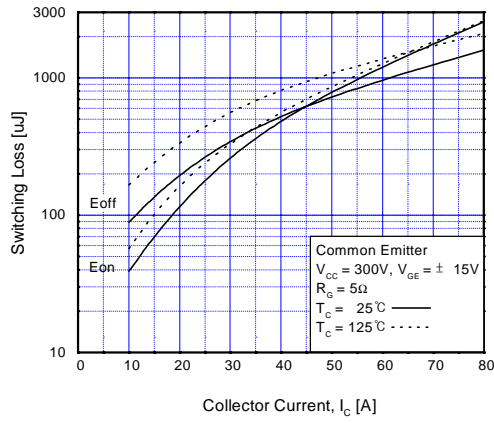Collector Current**

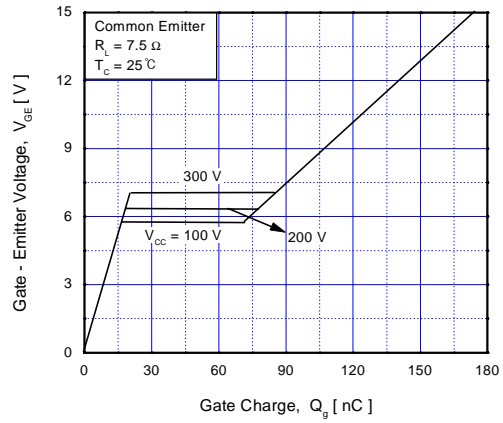**Fig 13. Switching Loss vs. Collector Current**

Fig 14. Gate Charge Characteristics
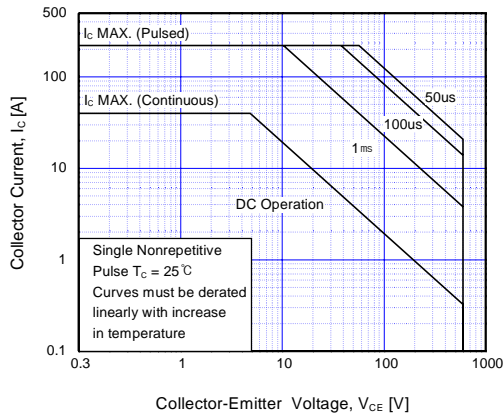
Fig 15. SOA Characteristics
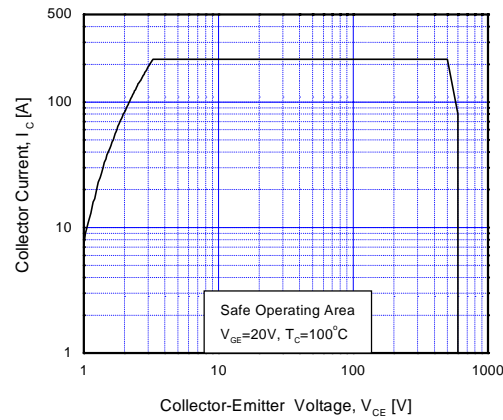
Fig 16. Turn-Off SOA Characteristics
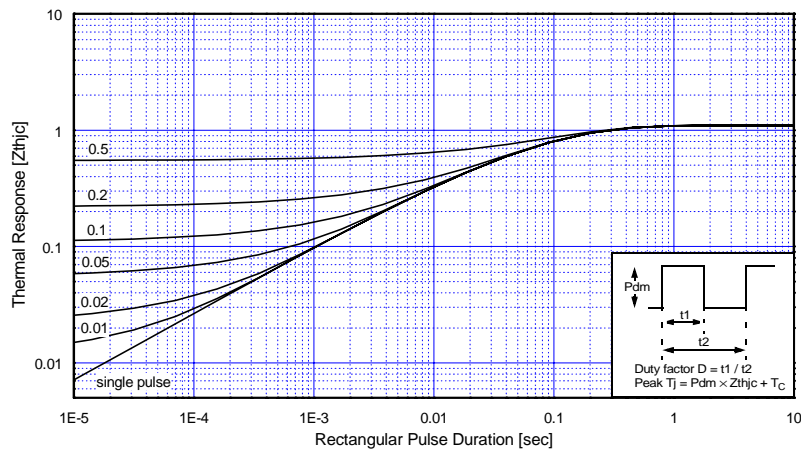
Fig 17. Transient Thermal Impedance of IGBT

Package Dimension

TO-3PF

15.50 ±0.20
ø3.60 ±0.20
4.50 ±0.20
26.50 ±0.20
16.50 ±0.20
14.50 ±0.20
2.00 ±0.20
2.50 ±0.20
14.80 ±0.20

2.00 ±0.20
2.00 ±0.20
4.00 ±0.20
2.00 ±0.20
0.75 +0.20 −0.10

5.45TYP
[5.45 ±0.30]

5.45TYP
[5.45 ±0.30]

5.50 ±0.20
3.00 ±0.20
(1.50)
10.00 ±0.20
10°
0.85 ±0.03
16.50 ±0.20
23.00 ±0.20
22.00 ±0.20
1.50 ±0.20

2.00 ±0.20

3.30 ±0.20

0.90 +0.20 −0.10

3.30 ±0.20
2.00 ±0.20
5.50 ±0.20
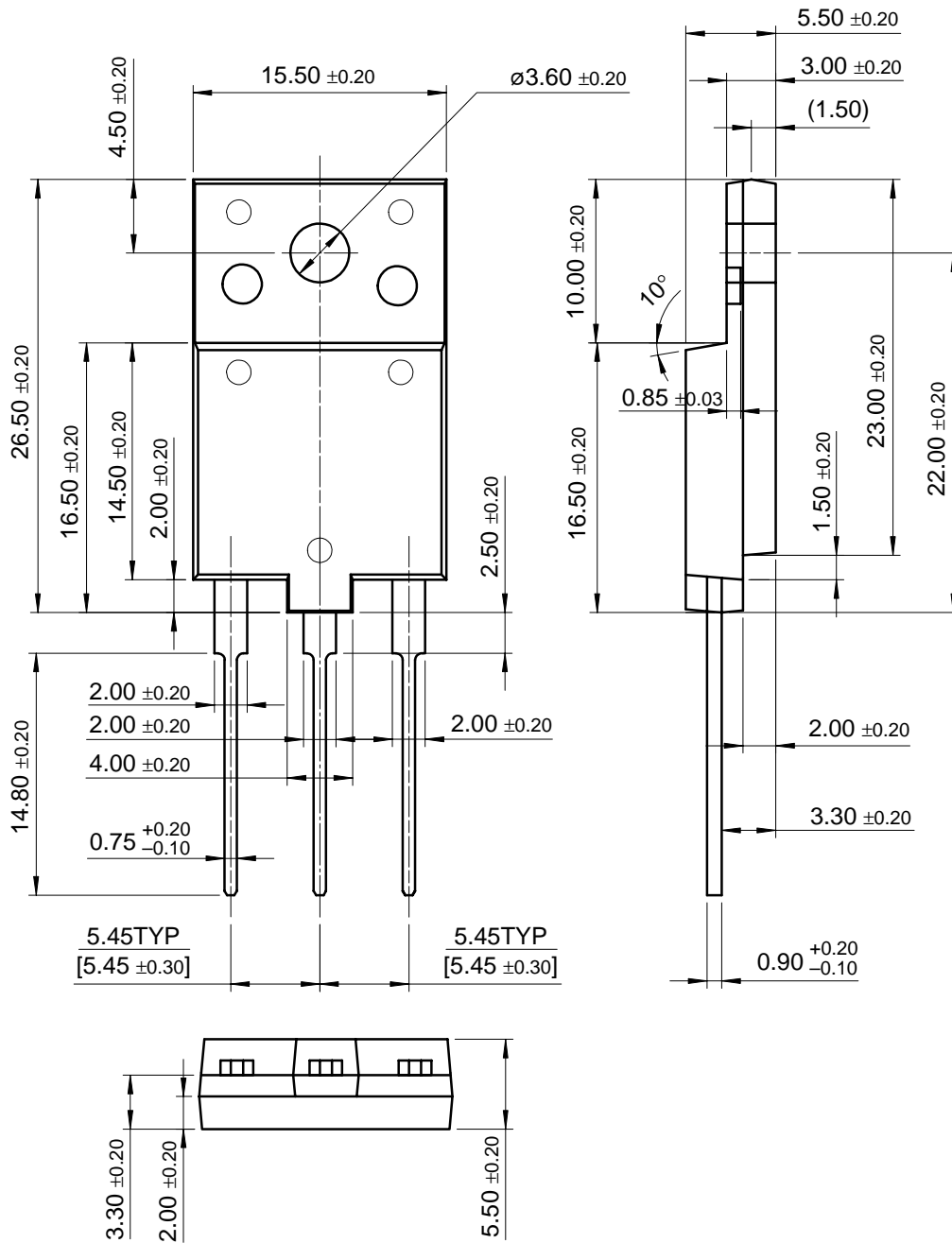
Dimensions in Millimeters

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SGF80N60UF
Discrete, High Performance IGBT

Contents
General description | Features | Applications | Product status/pricing/packaging

General description

Fairchild's Insulated Gate Bipolar Transistor(IGBT) UF series provides low conduction and switching losses. UF series is designed for the applications such as motor control and general inverters where High Speed Switching is required.

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Features

- High speed switching
- Low saturation voltage: $V_{CE}(sat) = 2.1V$ @ $I_C = 40A$
- High input impedance

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Applications

- AC & DC Motor controls, General Purpose Inverters, Robotics, Servo Controls

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Product status/pricing/packaging

Product	Product status	Package type	Leads	Packing method

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