FAIRCHILD

SEMICONDUCTOR ®

IGBT

SGP13N60UF

**Ultra-Fast IGBT**

General Description

Fairchild's UF series of Insulated Gate Bipolar Transistors (IGBTs) provides low conduction and switching losses. The UF series is designed for applications such as motor control and general inverters where high speed switching is a required feature.

Features

- High speed switching
- Low saturation voltage : $V_{CE(sat)}$ = 2.1 V @ I_C = 6.5A
- High input impedance

Applications

AC & DC motor controls, general purpose inverters, robotics, and servo controls.

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C

G

E
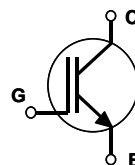
Absolute Maximum Ratings $T_C = 25°C$ unless otherwise noted

Symbol	Description		SGP13N60UF	Units
V_{CES}	Collector-Emitter Voltage		600	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Collector Current	@ T_C = 25°C	13	A
	Collector Current	@ T_C = 100°C	6.5	A
$I_{CM (1)}$	Pulsed Collector Current		52	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	60	W
	Maximum Power Dissipation	@ T_C = 100°C	25	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	--	2.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	°C/W

Electrical Characteristics of the 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 Coefficient of Breakdown Voltage	$V_{GE} = 0V$, $I_C = 1mA$	--	0.6	--	V/°C
I_{CES}	Collector Cut-Off Current	$V_{CE} = V_{CES}$, $V_{GE} = 0V$	--	--	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	$I_C = 6.5mA$, $V_{CE} = V_{GE}$	3.5	4.5	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 6.5A$, $V_{GE} = 15V$	--	2.1	2.6	V
		$I_C = 13A$, $V_{GE} = 15V$	--	2.6	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{CE} = 30V$, $V_{GE} = 0V$, f = 1MHz	--	375	--	pF
C_{oes}	Output Capacitance		--	63	--	pF
C_{res}	Reverse Transfer Capacitance		--	13	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300$ V, $I_C = 6.5A$, $R_G = 50\Omega$, $V_{GE} = 15V$, Inductive Load, $T_C = 25°C$	--	20	--	ns
t_r	Rise Time		--	27	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	70	130	ns
t_f	Fall Time		--	97	150	ns
E_{on}	Turn-On Switching Loss		--	85	--	uJ
E_{off}	Turn-Off Switching Loss		--	95	--	uJ
E_{ts}	Total Switching Loss		--	180	270	uJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300$ V, $I_C = 6.5A$, $R_G = 50\Omega$, $V_{GE} = 15V$, Inductive Load, $T_C = 125°C$	--	30	--	ns
t_r	Rise Time		--	32	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	85	200	ns
t_f	Fall Time		--	168	250	ns
E_{on}	Turn-On Switching Loss		--	180	--	uJ
E_{off}	Turn-Off Switching Loss		--	165	--	uJ
E_{ts}	Total Switching Loss		--	345	500	uJ
Q_g	Total Gate Charge	$V_{CE} = 300V$, $I_C = 6.5A$, $V_{GE} = 15V$	--	25	35	nC
Q_{ge}	Gate-Emitter Charge		--	7	12	nC
Q_{gc}	Gate-Collector Charge		--	8	14	nC
L_e	Internal Emitter Inductance	Measured 5mm from PKG	--	7.5	--	nH
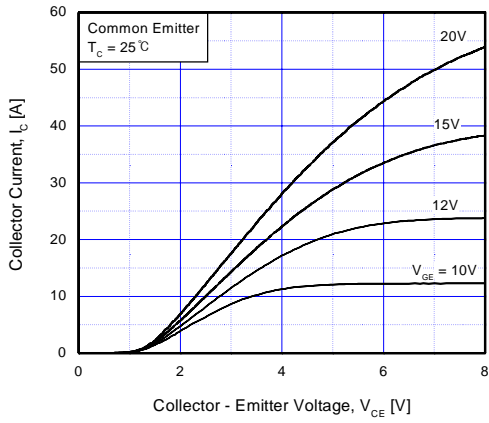
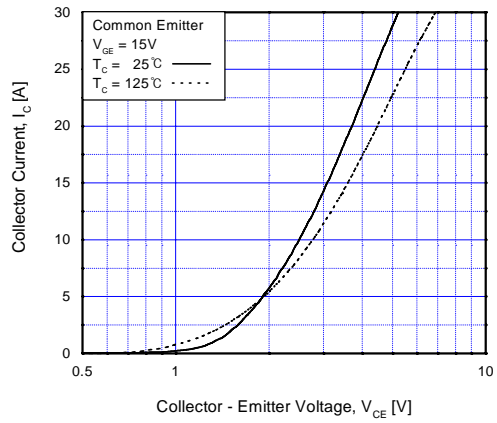**Fig 1. Typical Output Characteristics**

Fig 2. Typical Saturation Voltage Characteristics
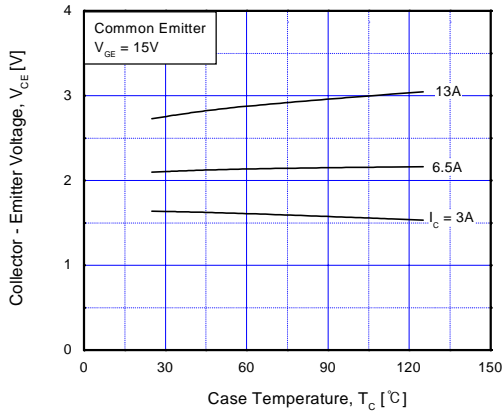

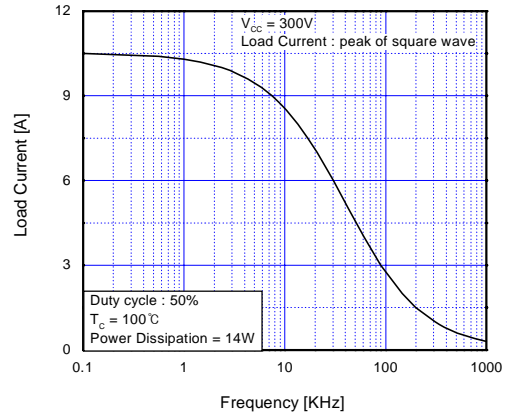**Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level**
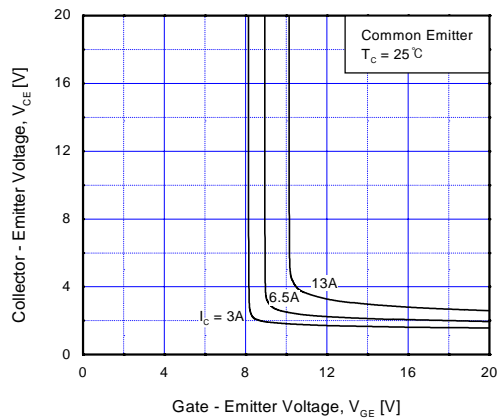

Fig 4. Load Current vs. Frequency

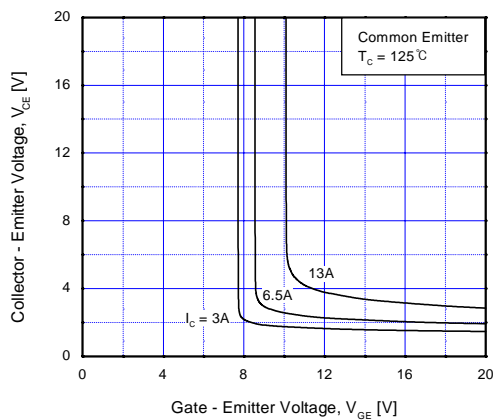**Fig 5. Saturation Voltage vs. V$_{GE}$**
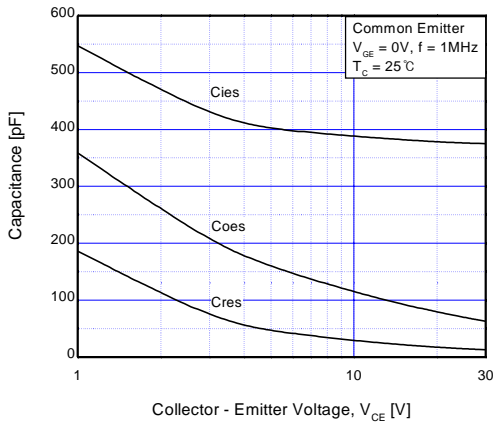

Fig 6. Saturation Voltage vs. V$_{GE}$

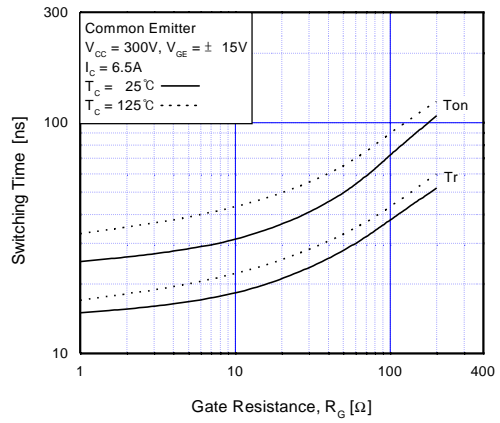**Fig 7. Capacitance Characteristics**

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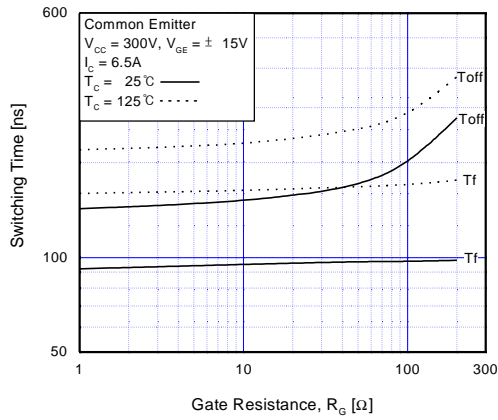Gate Resistance**

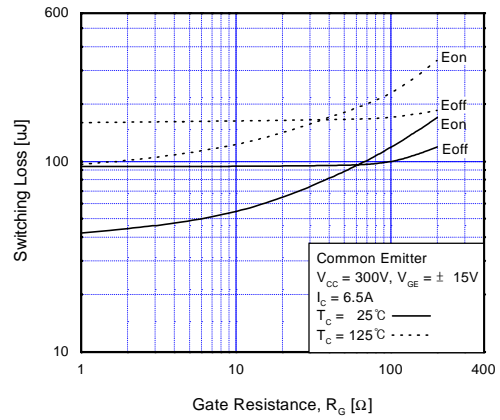**Fig 9. Turn-Off Characteristics vs.
Gate Resistance**

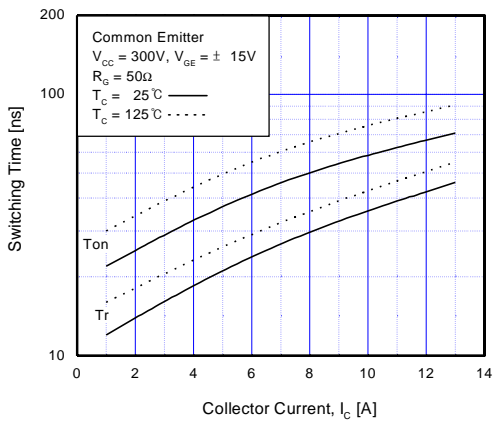**Fig 10. Switching Loss vs. Gate Resistance**
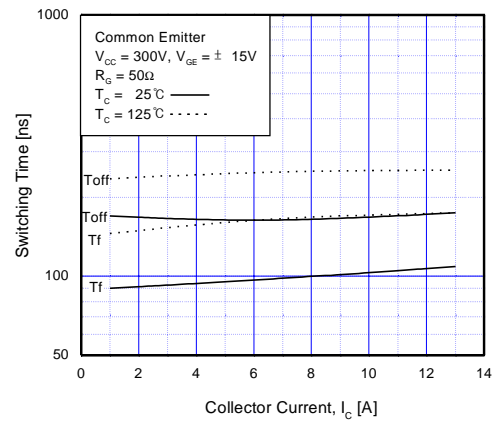

**Fig 11. Turn-On Characteristics vs.
Collector Current**

**Fig 12. Turn-Off Characteristics vs.
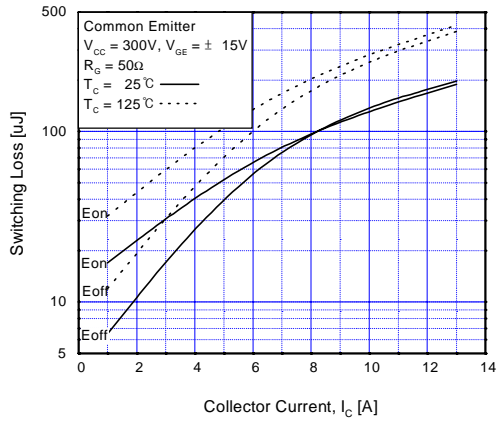Collector Current**
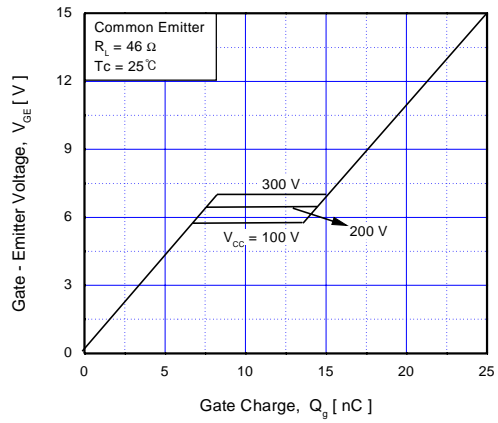
Fig 13. Switching Loss vs. Collector Current

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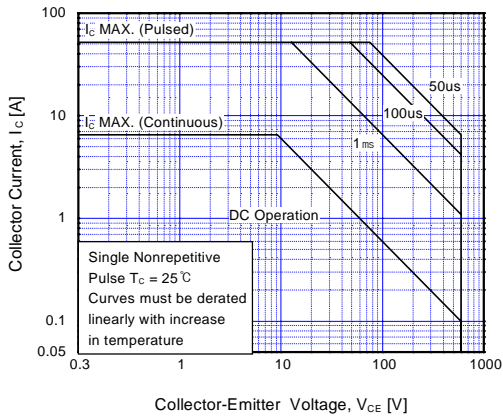
Fig 15. SOA Characteristics
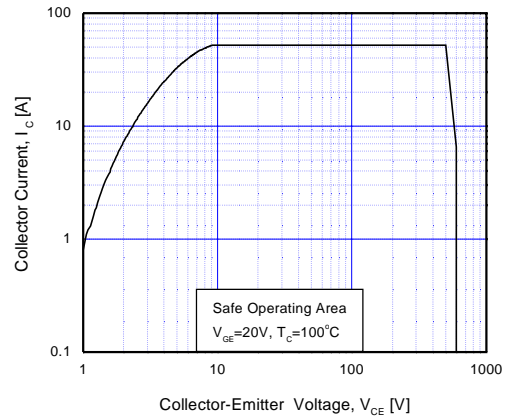
Fig 16. Turn-Off SOA Characteristics
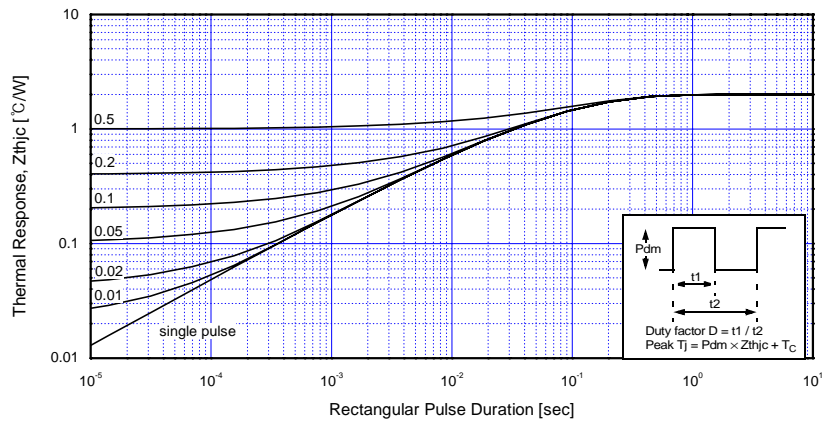
Fig 17. Transient Thermal Impedance of IGBT

Package Dimension

TO-220

9.90 ±0.20

(8.70)

(1.70)

1.30 ±0.10

ø3.60 ±0.10

2.80 ±0.10

(3.70)

15.90 ±0.20

18.95MAX.

9.20 ±0.20

(1.46)

(3.00)

(1.00)

(45°)

13.08 ±0.20

10.08 ±0.30

1.27 ±0.10

1.52 ±0.10

0.80 ±0.10

2.54TYP
[2.54 ±0.20]

2.54TYP
[2.54 ±0.20]

10.00 ±0.20

4.50 ±0.20

1.30 $^{+0.10}_{-0.05}$

0.50 $^{+0.10}_{-0.05}$

2.40 ±0.20
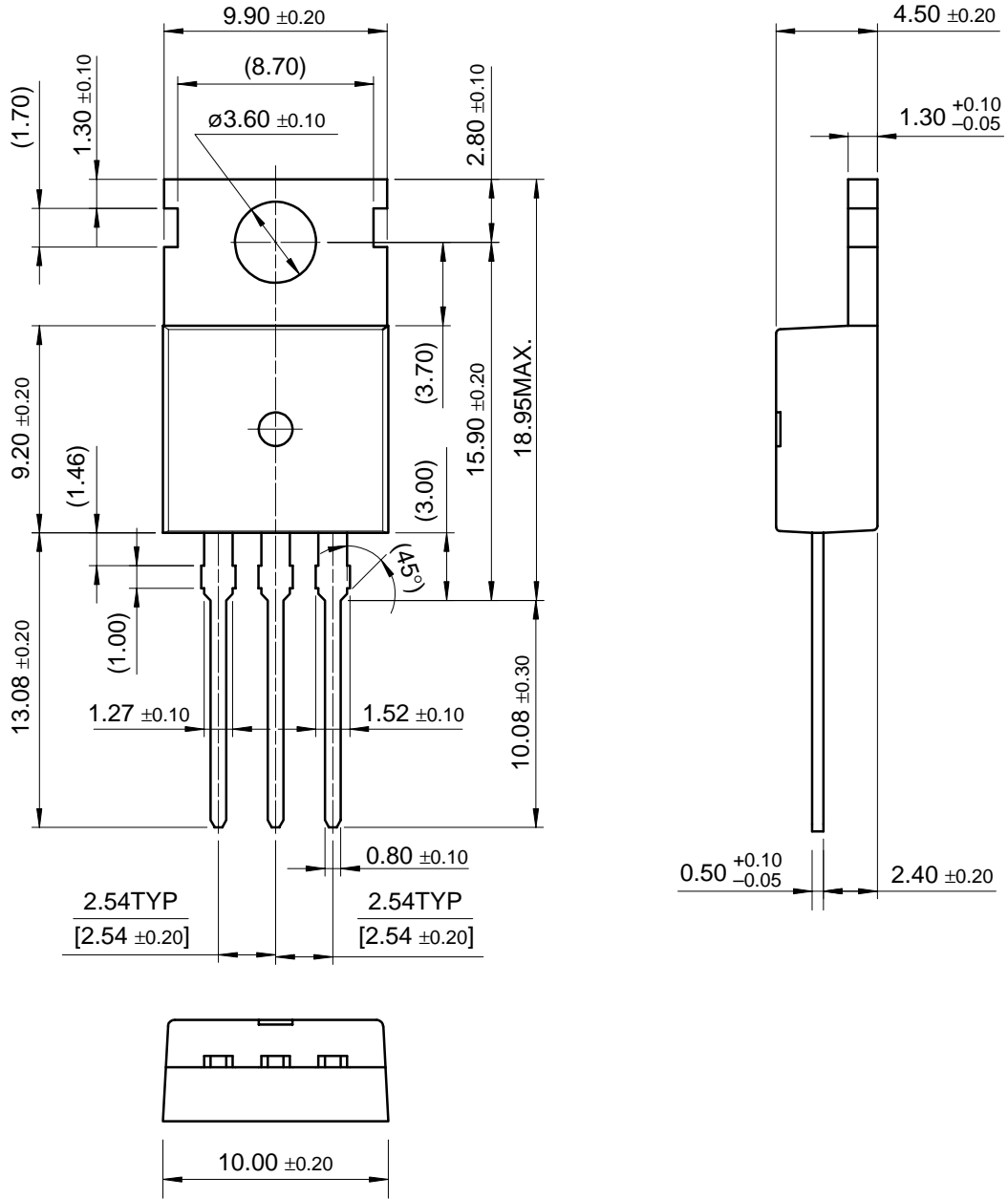
Dimensions in Millimeters

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SGP13N60UF
Discrete, High Performance IGBT

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

General description

Fairchild's UF series of Insulated Gate Bipolar Transistors (IGBTs) provides low conduction and switching losses. The UF series is designed for applications such as motor control and general inverters where high speed switching is a required feature.

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Features

- High Speed Switching
- Low Saturation Voltage : $V_{CE(sat)} = 2.1$ V @ $I_C = 6.5A$
- 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

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