SGR2N60UF

FAIRCHILD
SEMICONDUCTOR®

IGBT

SGR2N60UF
## 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 = 1.2A
- High input impedance

Applications

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

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G E **D-PAK**

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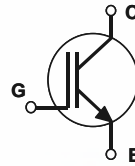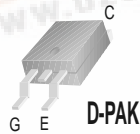
Absolute Maximum Ratings $T_C = 25°C$ unless otherwise noted

Symbol	Description		SGR2N60UF	Units
V_{CES}	Collector-Emitter Voltage		600	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Collector Current	@ T_C = 25°C	2.4	A
	Collector Current	@ T_C = 100°C	1.2	A
$I_{CM\,(1)}$	Pulsed Collector Current		10	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	25	W
	Maximum Power Dissipation	@ T_C = 100°C	10	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	--	5.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (PCB Mount) (2)	--	50	°C/W

Notes :
(2) Mounted on 1" squre PCB (FR4 or G-10 Material)

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	$I_C = 1.2mA$, $V_{CE} = V_{GE}$	3.5	4.5	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 1.2A$, $V_{GE} = 15V$	--	2.1	2.6	V
		$I_C = 2.4A$, $V_{GE} = 15V$	--	2.6	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{CE} = 30V$, $V_{GE} = 0V$, f = 1MHz	--	98	--	pF
C_{oes}	Output Capacitance		--	18	--	pF
C_{res}	Reverse Transfer Capacitance		--	4	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300 V$, $I_C = 1.2A$, $R_G = 200\Omega$, $V_{GE} = 15V$, Inductive Load, $T_C = 25°C$	--	15	--	ns
t_r	Rise Time		--	20	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	80	130	ns
t_f	Fall Time		--	95	160	ns
E_{on}	Turn-On Switching Loss		--	30	--	uJ
E_{off}	Turn-Off Switching Loss		--	13	--	uJ
E_{ts}	Total Switching Loss		--	43	70	uJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300 V$, $I_C = 1.2A$, $R_G = 200\Omega$, $V_{GE} = 15V$, Inductive Load, $T_C = 125°C$	--	19	--	ns
t_r	Rise Time		--	24	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	115	200	ns
t_f	Fall Time		--	176	250	ns
E_{on}	Turn-On Switching Loss		--	36	--	uJ
E_{off}	Turn-Off Switching Loss		--	27	--	uJ
E_{ts}	Total Switching Loss		--	63	100	uJ
Q_g	Total Gate Charge	$V_{CE} = 300 V$, $I_C = 1.2A$, $V_{GE} = 15V$	--	9	14	nC
Q_{ge}	Gate-Emitter Charge		--	3	5	nC
Q_{gc}	Gate-Collector Charge		--	1.5	3	nC
L_e	Internal Emitter Inductance	Measured 5mm from PKG	--	7.5	--	nH
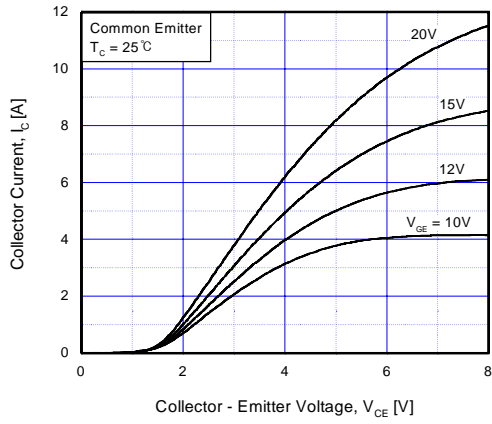
Fig 1. Typical Output Characteristics
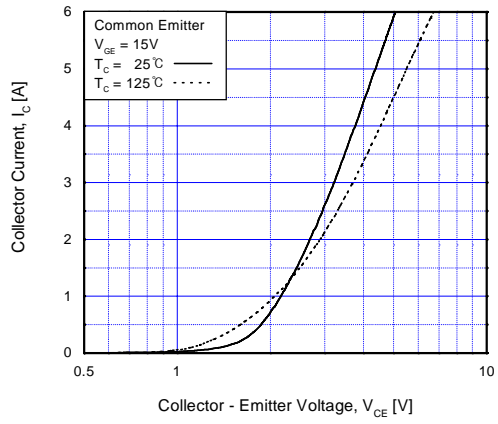

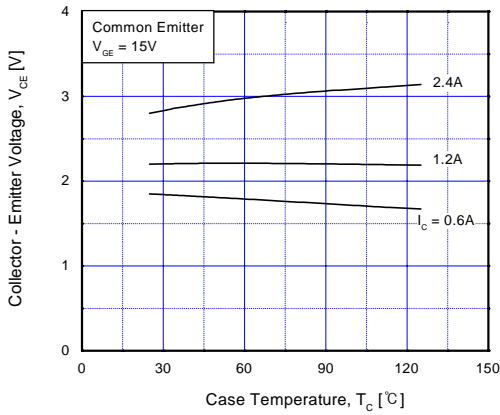**Fig 2. Typical Saturation Voltage Characteristics**

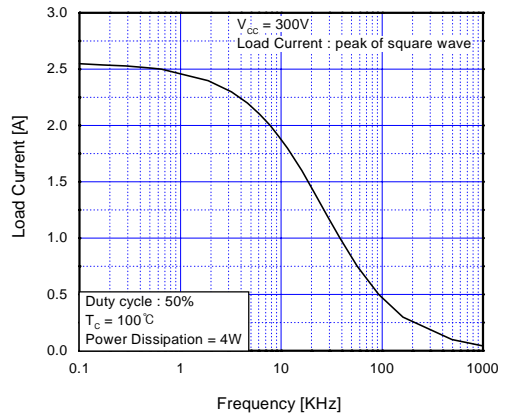**Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level**
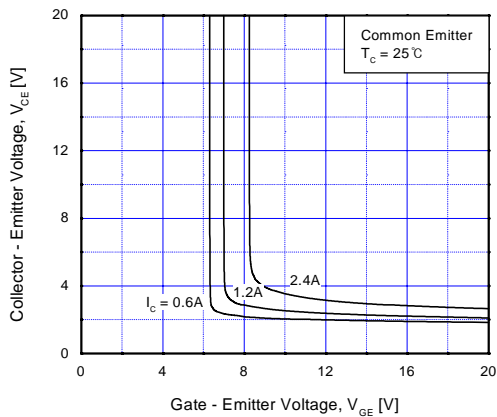

Fig 4. Load Current vs. Frequency
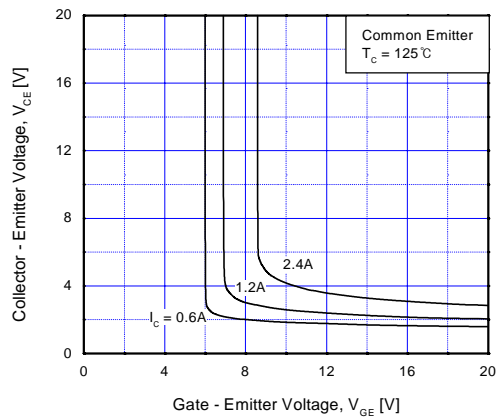

Fig 5. Saturation Voltage vs. V$_{GE}$
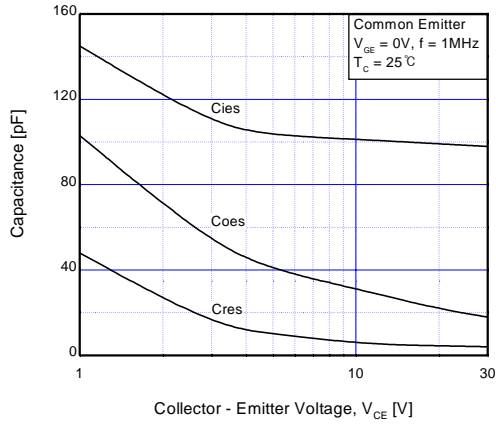

Fig 6. Saturation Voltage vs. V$_{GE}$

Fig 7. Capacitance Characteristics
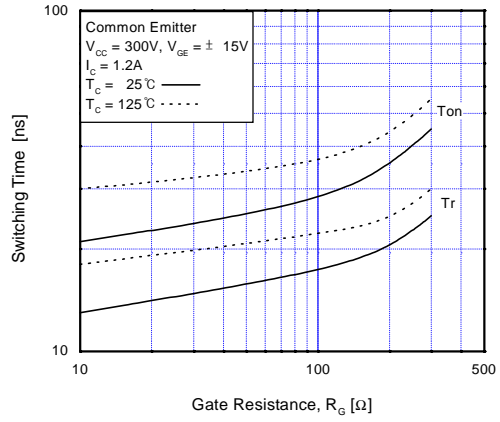
**Fig 8. Turn-On Characteristics vs.
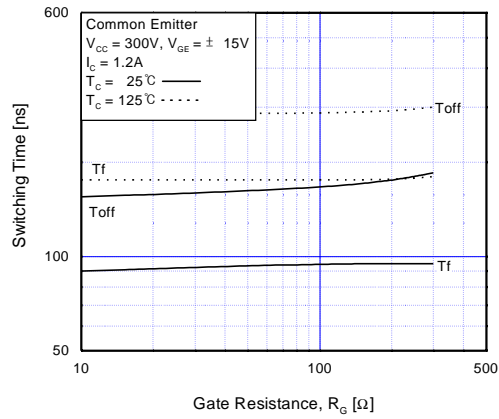Gate Resistance**

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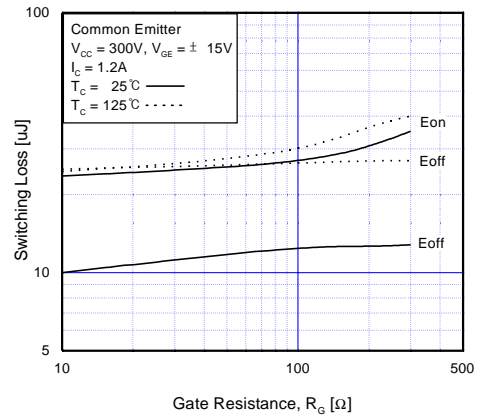Gate Resistance**

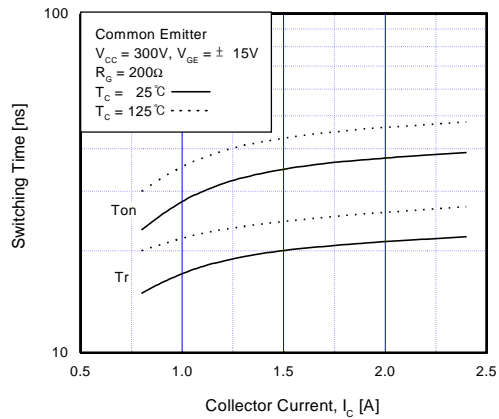**Fig 10. Switching Loss vs. Gate Resistance**
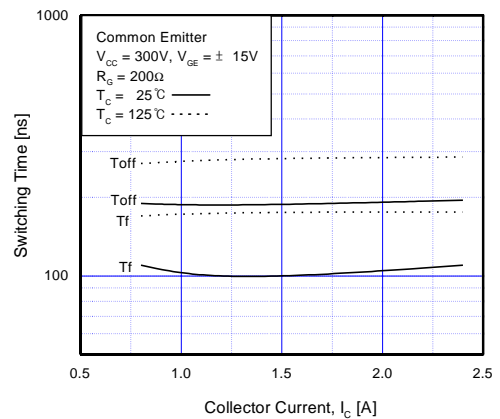

**Fig 11. Turn-On Characteristics vs.
Collector Current**
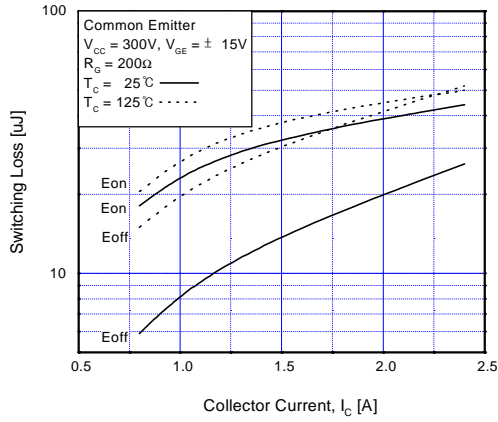

**Fig 12. Turn-Off Characteristics vs.
Collector Current**

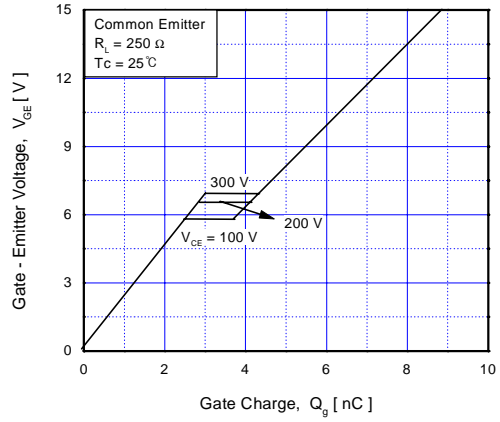**Fig 13. Switching Loss vs. Collector Current**
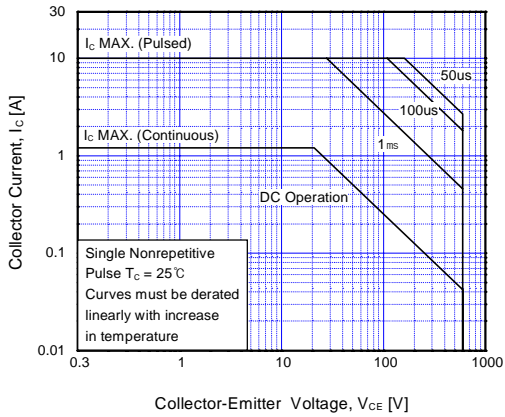

Fig 14. Gate Charge Characteristics

Fig 15. SOA Characteristics
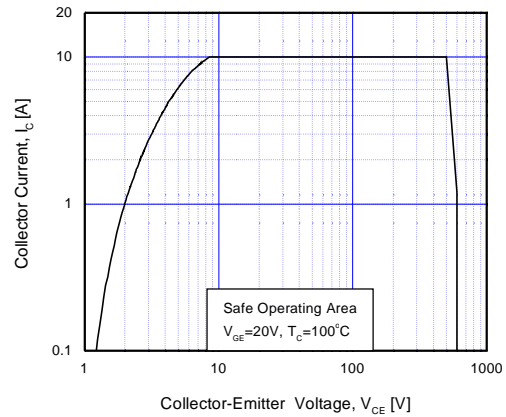
Fig 16. Turn-Off SOA Characteristics
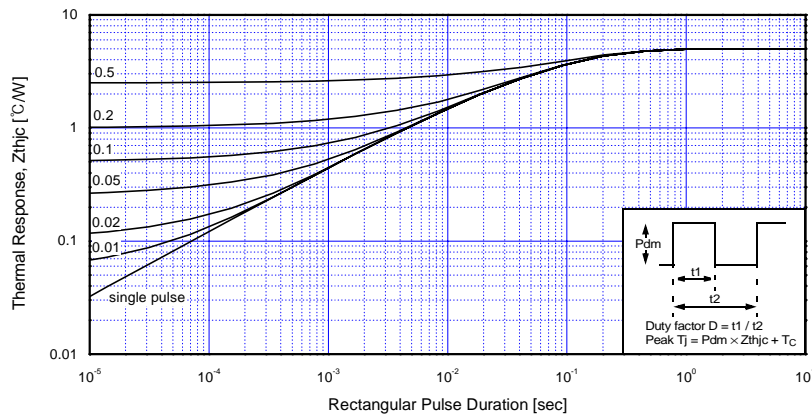
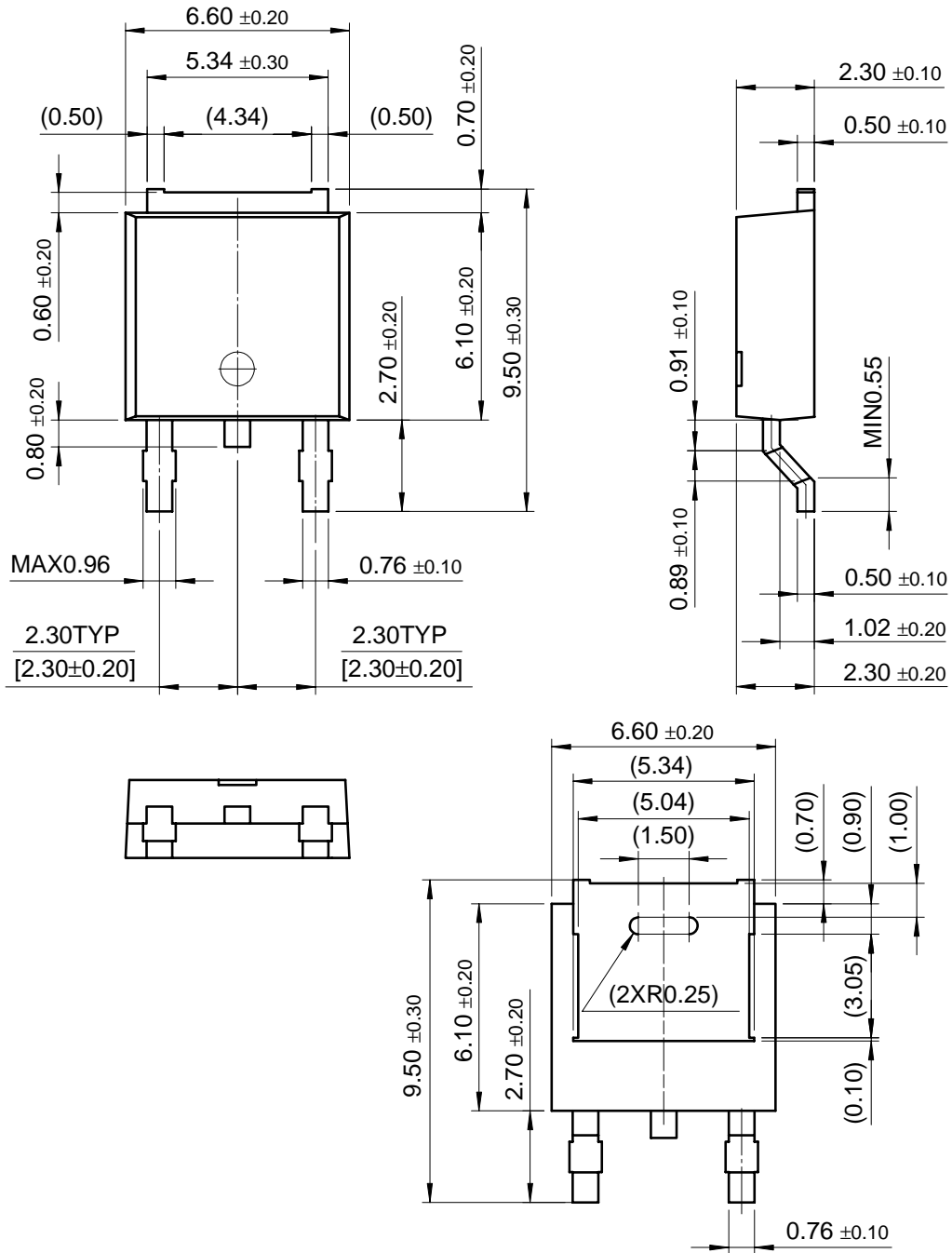**Fig 17. Transient Thermal Impedance of IGBT**

Package Dimension

D-PAK

MAX0.96

2.30TYP
[2.30±0.20]

2.30TYP
[2.30±0.20]

MIN0.55

Dimensions in Millimeters

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