



April 2001

IGBT

SGS6N60UF

Ultra-Fast IGBT

General Description

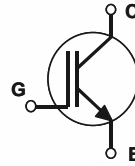
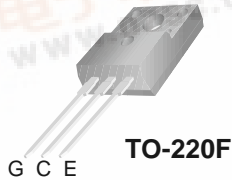
Fairchild's UF series of Insulated Gate Bipolar Transistors (IGBTs) provides low conduction and switching losses. The UF series is designed for applications such as motor control and general inverters where high speed switching is a required feature.

Features

- High speed switching
- Low saturation voltage : $V_{CE(sat)} = 2.1 \text{ V @ } I_C = 3\text{A}$
- High input impedance

Application

AC & DC Motor controls, general purpose inverters, robotics, servo controls



Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Description	SGS6N60UF	Units
V _{CES}	Collector-Emitter Voltage	600	V
V _{GES}	Gate-Emitter Voltage	± 20	V
I _C	Collector Current @ T _C = 25°C	6	A
	Collector Current @ T _C = 100°C	3	A
I _{CM (1)}	Pulsed Collector Current	25	A
P _D	Maximum Power Dissipation @ T _C = 25°C	22	W
	Maximum Power Dissipation @ T _C = 100°C	9	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 _{θJC}	Thermal Resistance, Junction-to-Case	--	5.5	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient	--	62.5	°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	$V_{GE} = 0V, I_C = 250\mu A$	600	--	--	V	
$\frac{\Delta BV_{CES}}{\Delta T_J}$	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	μA	
I_{GES}	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0V$	--	--	± 100	nA	
On Characteristics							
$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 3mA, V_{CE} = V_{GE}$	3.5	4.5	6.5	V	
$V_{CE(sat)}$	Collector to Emitter	$I_C = 3A, V_{GE} = 15V$	--	2.1	2.6	V	
	Saturation Voltage	$I_C = 6A, V_{GE} = 15V$	--	2.6	--	V	
Dynamic Characteristics							
C_{ies}	Input Capacitance	$V_{CE} = 30V, V_{GE} = 0V,$ $f = 1MHz$	--	220	--	pF	
C_{oes}	Output Capacitance		--	22	--	pF	
C_{res}	Reverse Transfer Capacitance		--	7	--	pF	
Switching Characteristics							
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300V, I_C = 3A,$ $R_G = 80\Omega, V_{GE} = 15V,$ Inductive Load, $T_C = 25^\circ C$	--	15	--	ns	
t_r	Rise Time		--	25	--	ns	
$t_{d(off)}$	Turn-Off Delay Time		--	60	130	ns	
t_f	Fall Time		--	70	150	ns	
E_{on}	Turn-On Switching Loss		--	57	--	μJ	
E_{off}	Turn-Off Switching Loss		--	25	--	μJ	
E_{ts}	Total Switching Loss		--	82	120	μJ	
$t_{d(on)}$	Turn-On Delay Time		$V_{CC} = 300V, I_C = 3A,$ $R_G = 80\Omega, V_{GE} = 15V,$ Inductive Load, $T_C = 125^\circ C$	--	22	--	ns
t_r	Rise Time			--	32	--	ns
$t_{d(off)}$	Turn-Off Delay Time	--		80	200	ns	
t_f	Fall Time	--		122	300	ns	
E_{on}	Turn- On Switching Loss	--		65	--	μJ	
E_{off}	Turn- Off Switching Loss	--		46	--	μJ	
E_{ts}	Total Switching Loss	--		111	170	μJ	
Q_g	Total Gate Charge	$V_{CE} = 300V, I_C = 3A,$ $V_{GE} = 15V$		--	15	22	nC
Q_{ge}	Gate-Emitter Charge			--	5	8	nC
Q_{gc}	Gate-Collector Charge		--	4	6	nC	
L_e	Internal Emitter Inductance	Measured 5mm from PKG	--	7.5	--	nH	

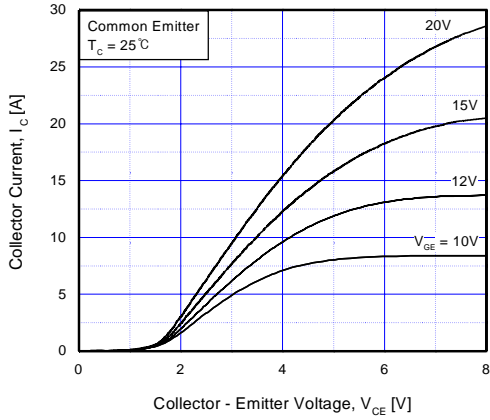


Fig 1. Typical Output Characteristics

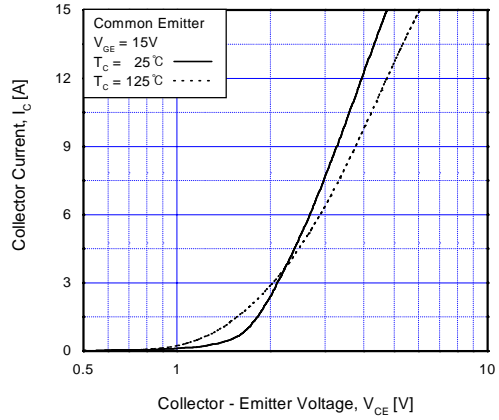


Fig 2. Typical Saturation Voltage Characteristics

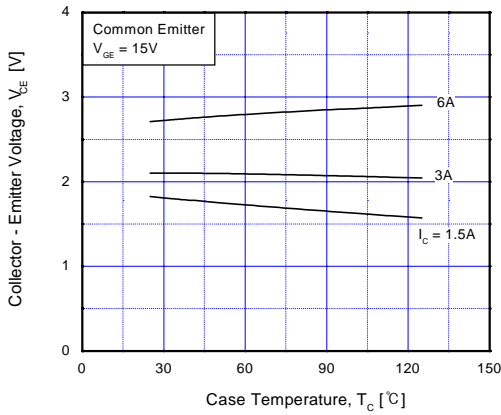


Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level

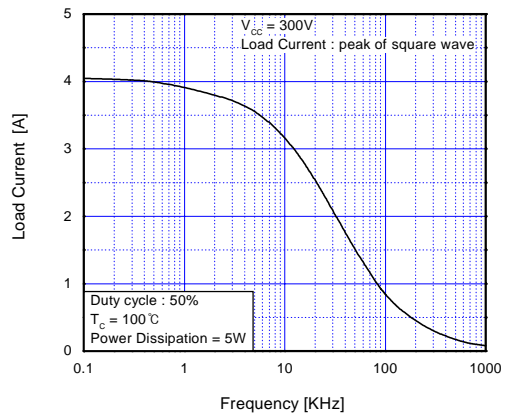


Fig 4. Load Current vs. Frequency

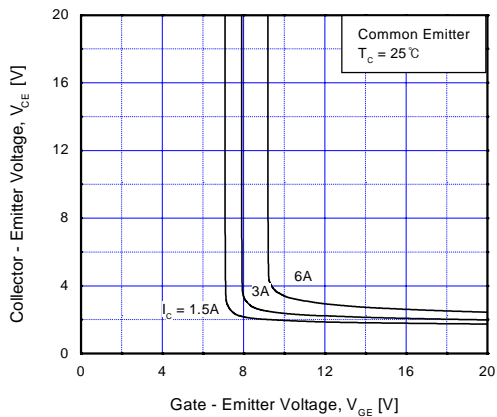


Fig 5. Saturation Voltage vs. V_{GE}

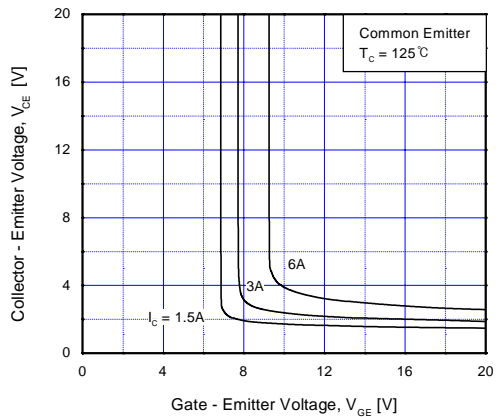


Fig 6. Saturation Voltage vs. V_{GE}

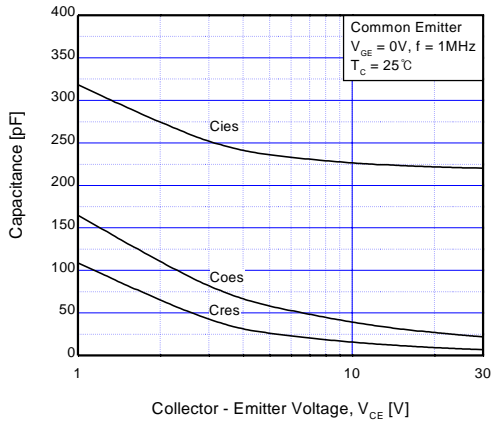


Fig 7. Capacitance Characteristics

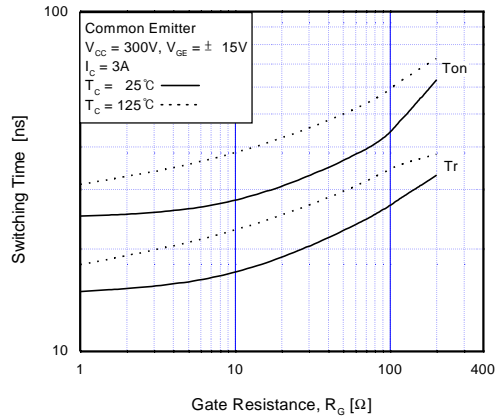


Fig 8. Turn-On Characteristics vs. Gate Resistance

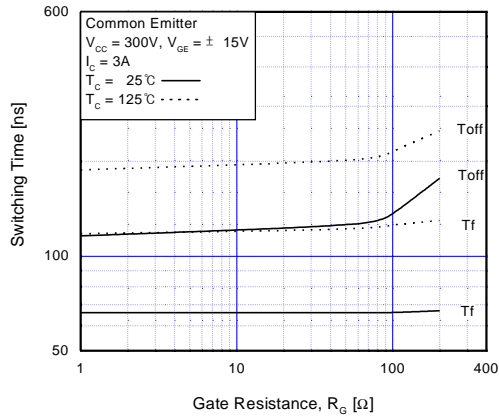


Fig 9. Turn-Off Characteristics vs. Gate Resistance

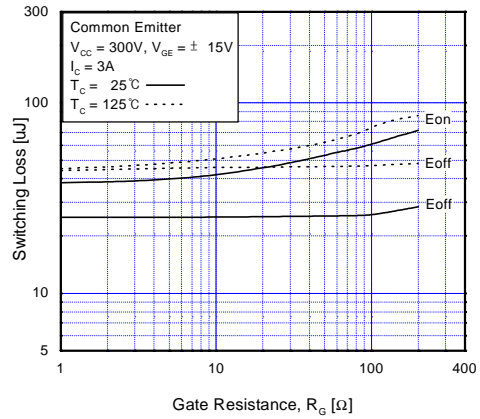


Fig 10. Switching Loss vs. Gate Resistance

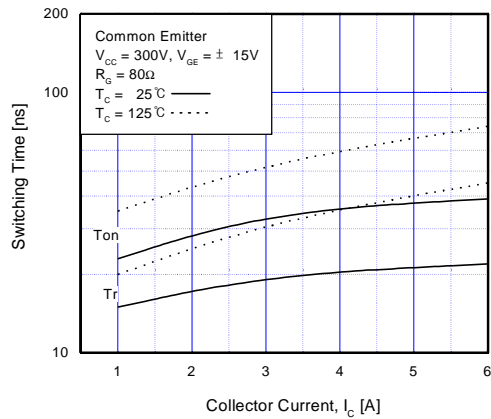


Fig 11. Turn-On Characteristics vs. Collector Current

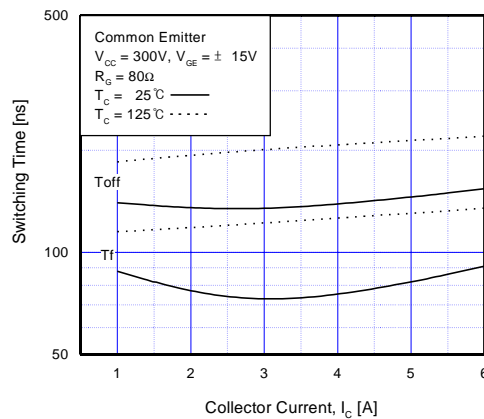


Fig 12. Turn-Off Characteristics vs. Collector Current

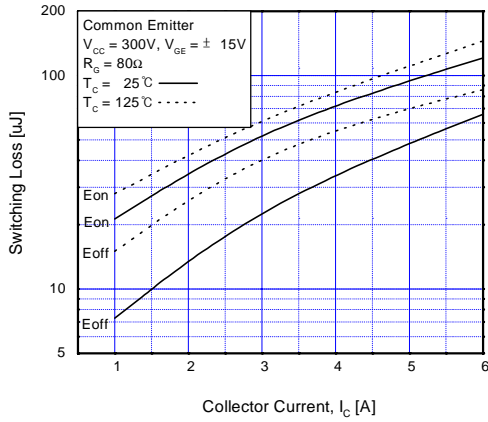


Fig 13. Switching Loss vs. Collector Current

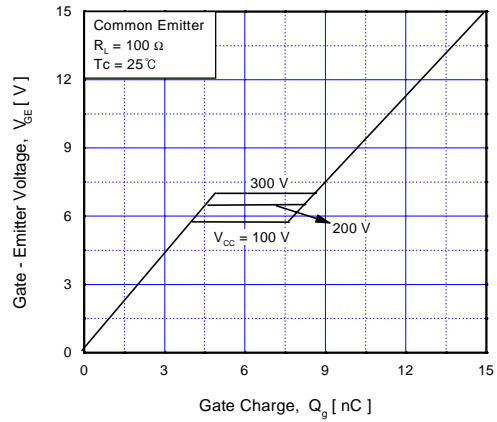


Fig 14. Gate Charge Characteristics

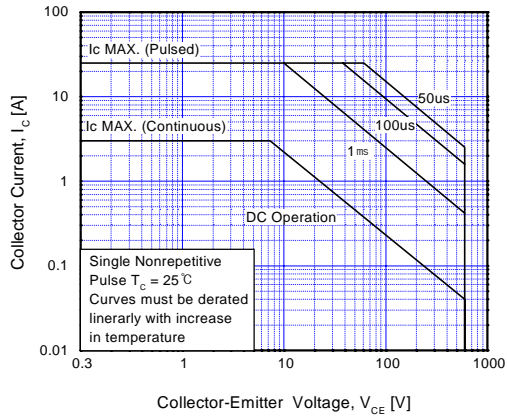


Fig 15. SOA Characteristics

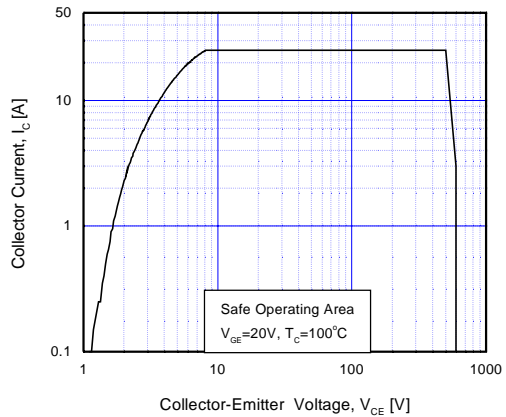


Fig 16. Turn-Off SOA Characteristics

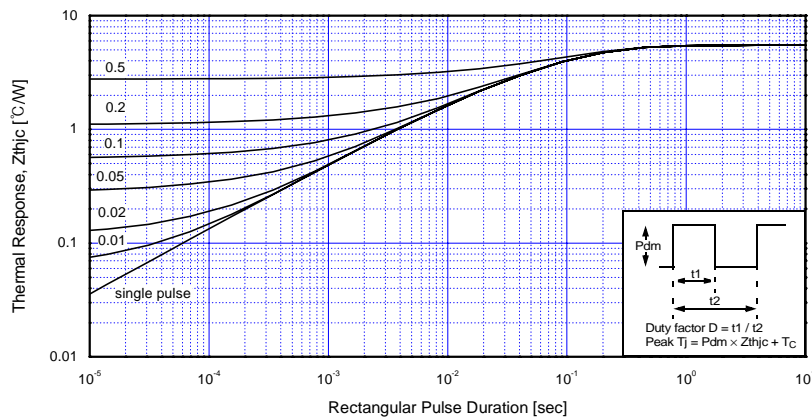
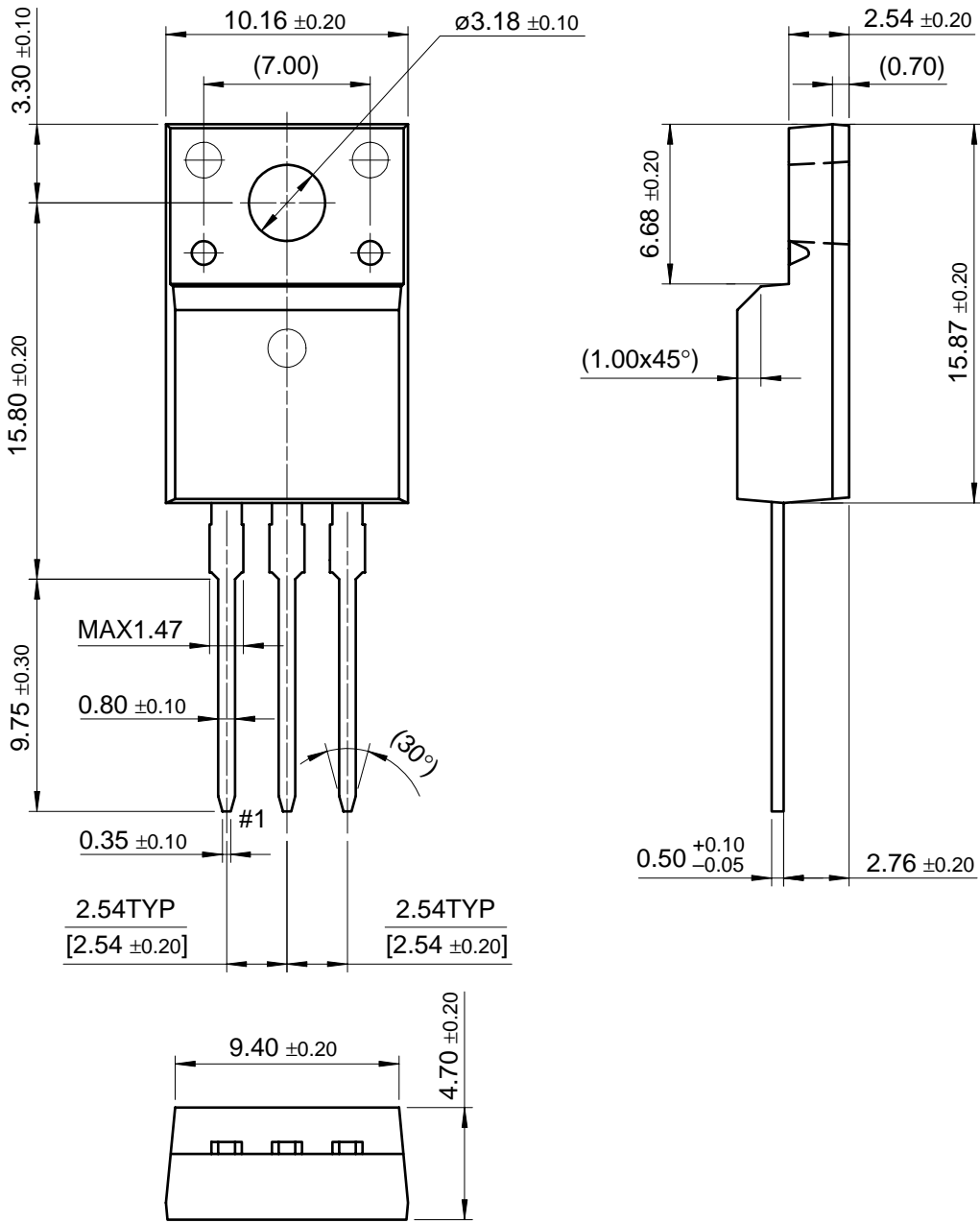


Fig 17. Transient Thermal Impedance of IGBT

Package Dimension

TO-220F (FS PKG CODE AQ)



Dimensions in Millimeters

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