April 2001

IGBT

SGS13N60UF

Ultra-Fast IGBT

General Description

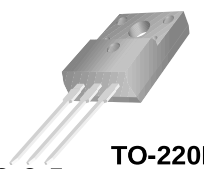
Fairchild's UF series of Insulated Gate Bipolar Transistors (IGBTs) provides low conduction and switching losses. The UF series is designed for applications such as motor control and general inverters where high speed switching is a required feature.

Features

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

Application

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



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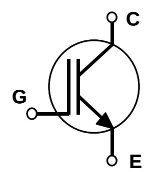
TO-220F



Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Description		SGS13N60UF	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	45	W
	Maximum Power Dissipation	@ T_C = 100°C	18	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	--	2.7	°C/W
$R_{\theta JA}$	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 = 250uA	600	--	--	V
ΔB_{VCES}/ ΔT_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 = 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 = 50Ω, 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	--	µJ
E_{off}	Turn-Off Switching Loss		--	95	--	µJ
E_{ts}	Total Switching Loss		--	180	270	µJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 6.5A, R_G = 50Ω, 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	--	µJ
E_{off}	Turn - Off Switching Loss		--	165	--	µJ
E_{ts}	Total Switching Loss		--	345	500	µJ
Q_g	Total Gate Charge	V_{CE} = 300 V, 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
Le	Internal Emitter Inductance	Measured 5mm from PKG	--	7.5	--	nH

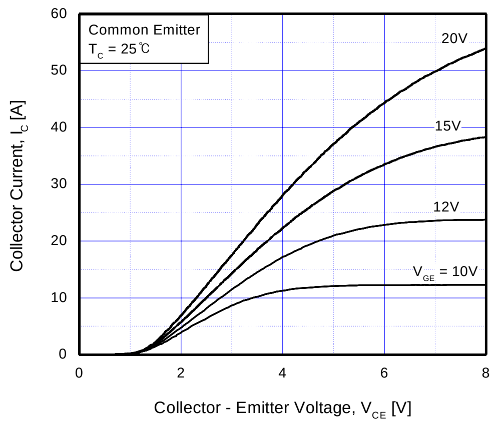


Fig 1. Typical Output Chacracteristics

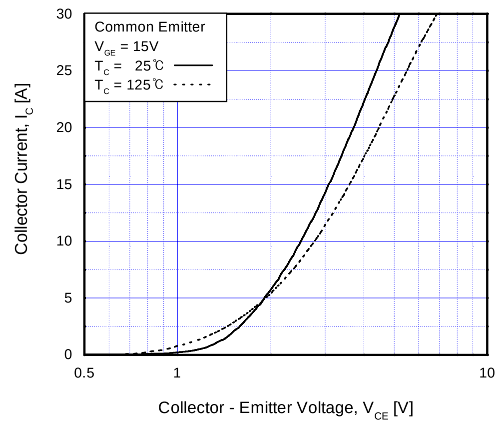


Fig 2. Typical Saturation Voltage Characteristics

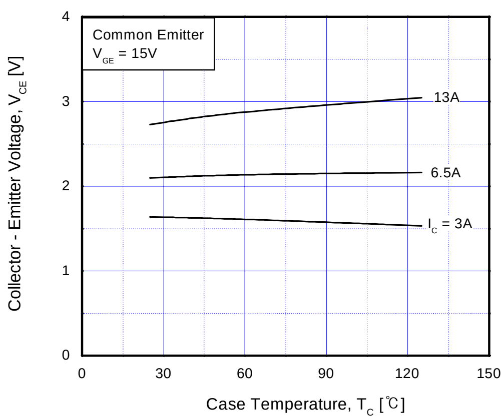


Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level

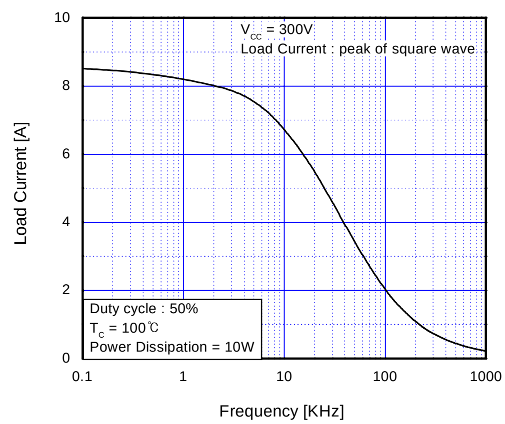


Fig 4. Load Current vs. Frequency

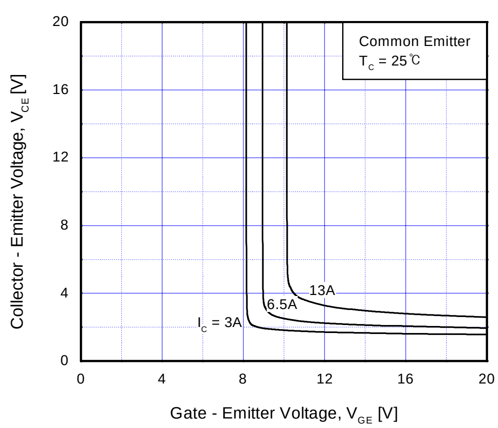


Fig 5. Saturation Voltage vs. V_{GE}

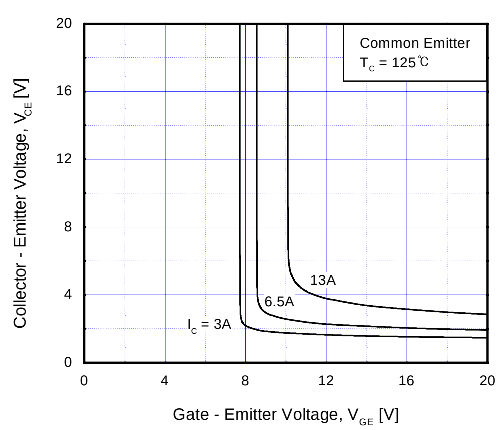


Fig 6. Saturation Voltage vs. V_{GE}

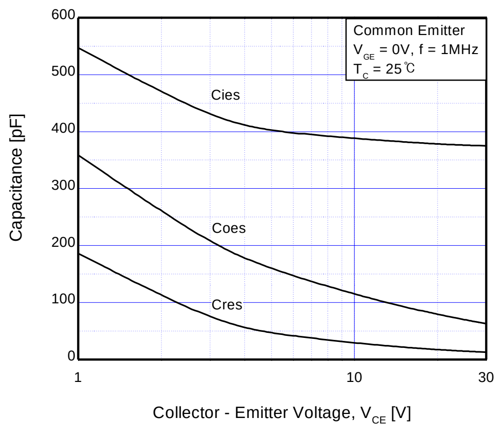


Fig 7. Capacitance Characteristics

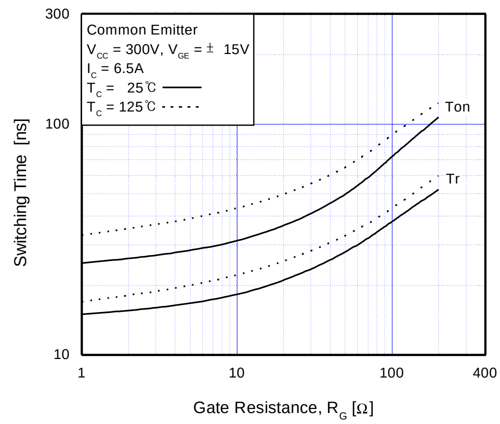


Fig 8. Turn-On Characteristics vs. Gate Resistance

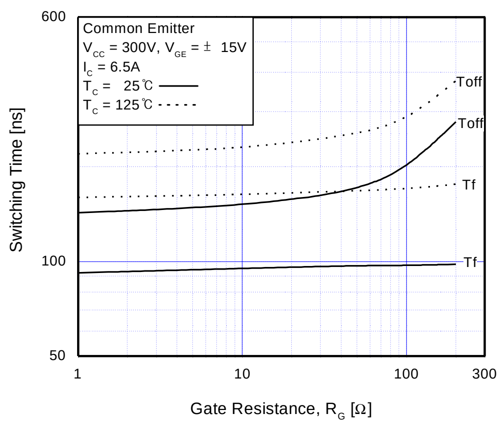


Fig 9. Turn-Off Characteristics vs. Gate Resistance

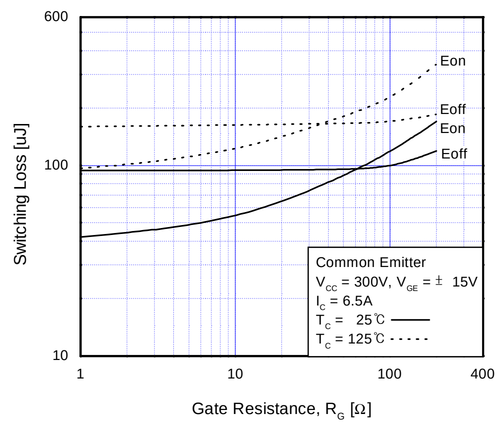


Fig 10. Switching Loss vs. Gate Resistance

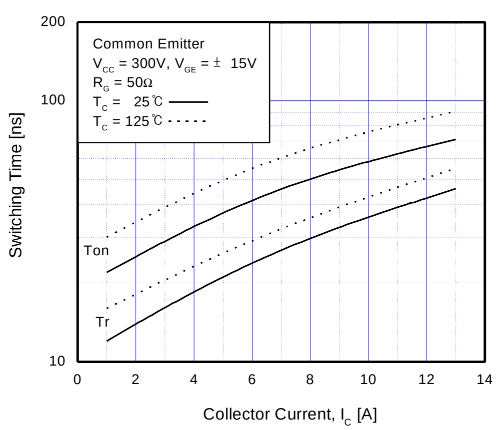


Fig 11. Turn-On Characteristics vs. Collector Current

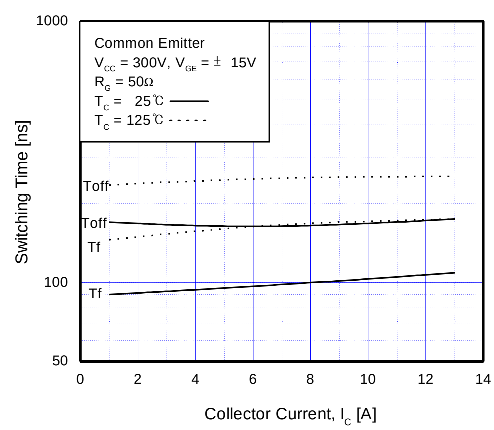


Fig 12. Turn-Off Characteristics vs. Collector Current

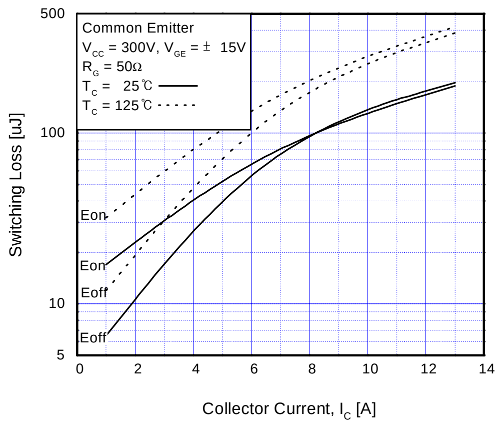


Fig 13. Switching Loss vs. Collector Current

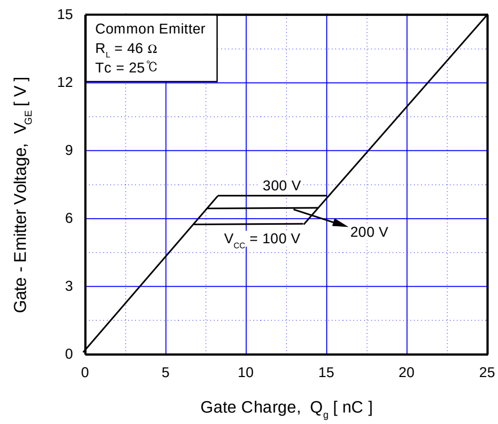


Fig 14. Gate Charge Characteristics

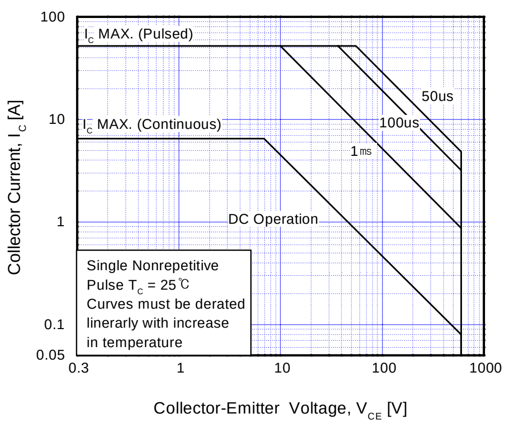


Fig 15. SOA Characteristics

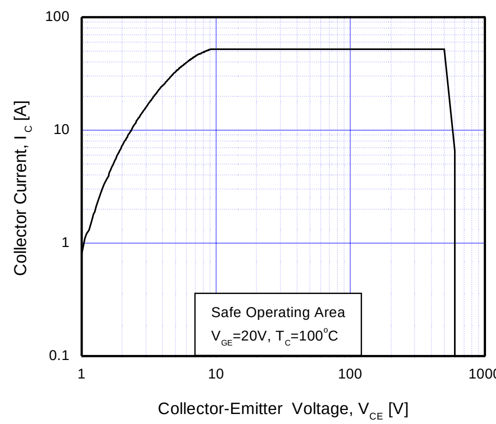


Fig 16. Turn-Off SOA Characteristics

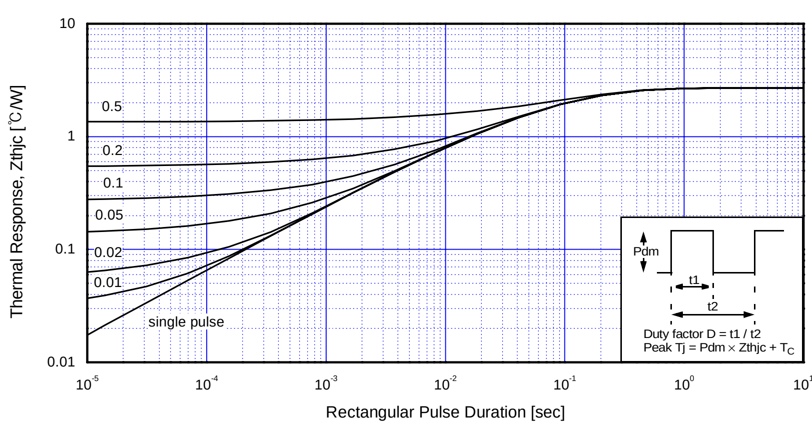
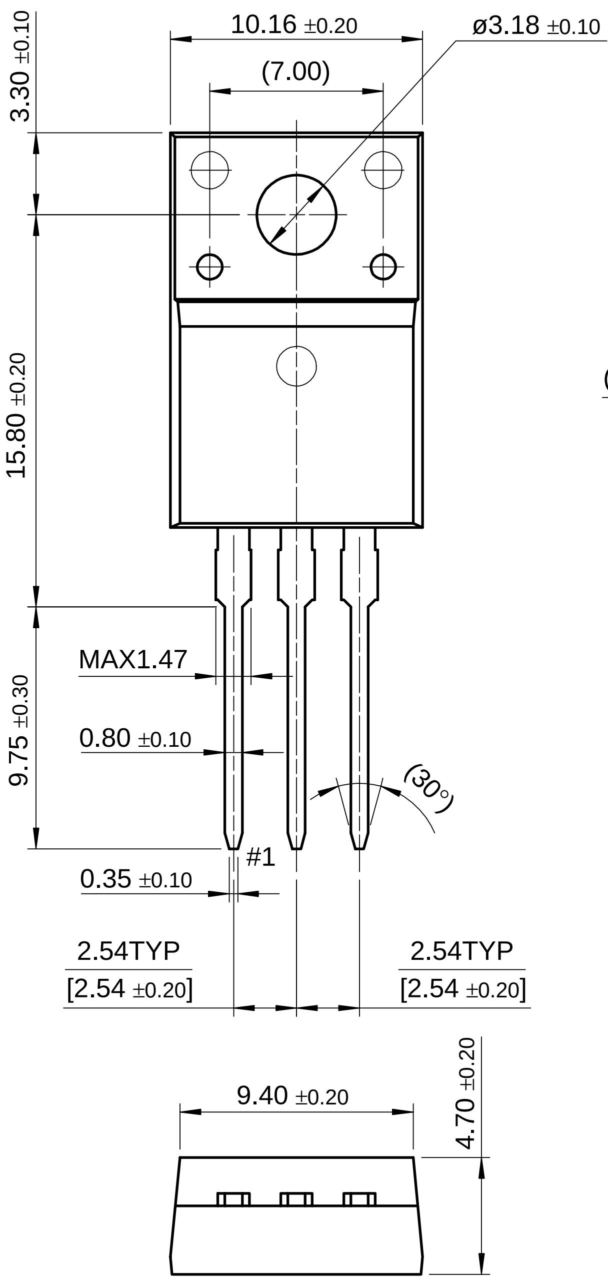


Fig 17. Transient Thermal Impedance of IGBT

Package Dimension

TO-220F (FS PKG CODE AQ)



Dimensions in Millimeters

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