FAIRCHILD SEMICONDUCTOR®

IGBT

SGH20N120RUF

Short Circuit Rated IGBT

General Description

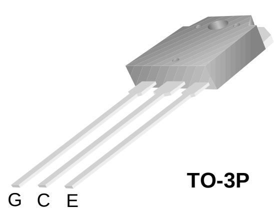
Fairchild's RUF series of Insulated Gate Bipolar Transistors (IGBTs) RUF series provides low conduction and switching losses as well as short circuit ruggedness. The RUF series is designed for the applications such as motor control, uninterrupted power supplies (UPS) and general inverters where short circuit ruggedness is a required feature.

Features

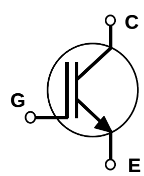
- Short circuit rated 10µs @ T_C = 100°C, V_{GE} = 15V
- High speed switching
- Low saturation voltage : $V_{CE(sat)}$ = 2.3 V @ I_C = 20A
- High input impedance

Applications

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



TO-3P



Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Description		SGH20N120RUF	Units
V_{CES}	Collector-Emitter Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 25	V
I_C	Collector Current	@ T_C = 25°C	32	A
	Collector Current	@ T_C = 100°C	20	A
$I_{CM\ (1)}$	Pulsed Collector Current		60	A
T_{SC}	Short Circuit Withstand Time	@ T_C = 100°C	10	µs
P_D	Maximum Power Dissipation	@ T_C = 25°C	230	W
	Maximum Power Dissipation	@ T_C = 100°C	92	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	--	0.54	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	°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 = 1mA	1200	--	--	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	--	--	1	mA
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 = 20mA, $V_{CE} = V_{GE}$	3.5	5.5	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 20A, V_{GE} = 15V	--	2.3	3.0	V
		I_C = 32A, V_{GE} = 15V	--	2.8	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz	--	2000	--	pF
C_{oes}	Output Capacitance		--	170	--	pF
C_{res}	Reverse Transfer Capacitance		--	60	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600 V, I_C = 20A, R_G = 15Ω, V_{GE} = 15V, Inductive Load, T_C = 25°C	--	30	--	ns
t_r	Rise Time		--	60	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	70	130	ns
t_f	Fall Time		--	150	300	ns
E_{on}	Turn-On Switching Loss		--	1.30	--	mJ
E_{off}	Turn-Off Switching Loss		--	1.30	--	mJ
E_{ts}	Total Switching Loss		--	2.60	3.65	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600 V, I_C = 20A, R_G = 15Ω, V_{GE} = 15V, Inductive Load, T_C = 125°C	--	30	--	ns
t_r	Rise Time		--	70	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	90	165	ns
t_f	Fall Time		--	200	400	ns
E_{on}	Turn-On Switching Loss		--	1.50	--	mJ
E_{off}	Turn-Off Switching Loss		--	2.00	--	mJ
E_{ts}	Total Switching Loss		--	3.50	5.08	mJ
T_{sc}	Short Circuit Withstand Time	V_{CC} = 600 V, V_{GE} = 15V @ T_C = 100°C	10	--	--	µs
Q_g	Total Gate Charge	V_{CE} = 600 V, I_C = 20A, V_{GE} = 15V	--	95	140	nC
Q_{ge}	Gate-Emitter Charge		--	15	25	nC
Q_{gc}	Gate-Collector Charge		--	43	65	nC
L_e	Internal Emitter Inductance	Measured 5mm from PKG	--	14	--	nH

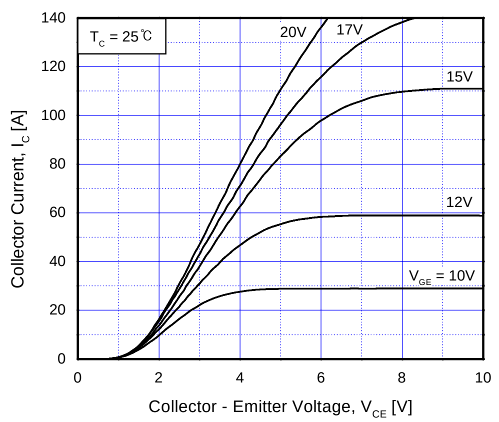


Fig 1. Typical Output Characteristics

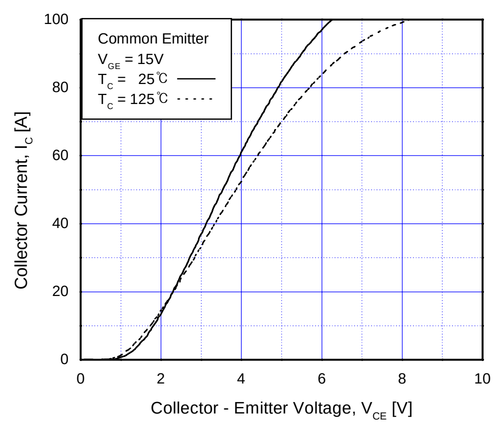


Fig 2. Typical Saturation Voltage Characteristics

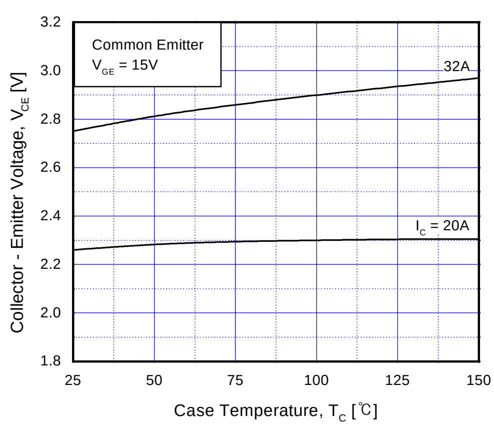


Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level

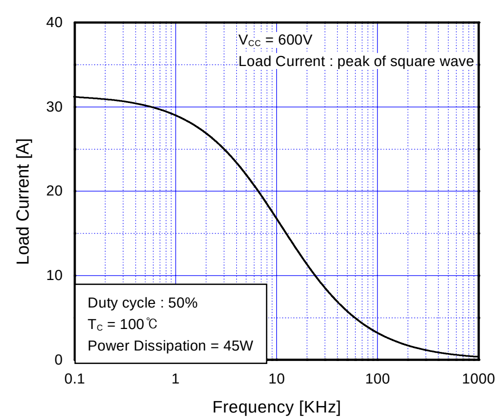


Fig 4. Load Current vs. Frequency

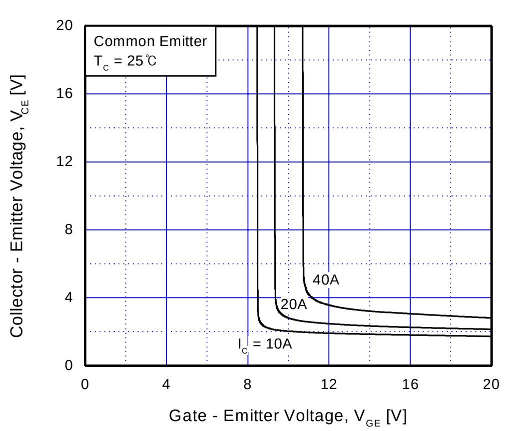


Fig 5. Saturation Voltage vs. V_{GE}

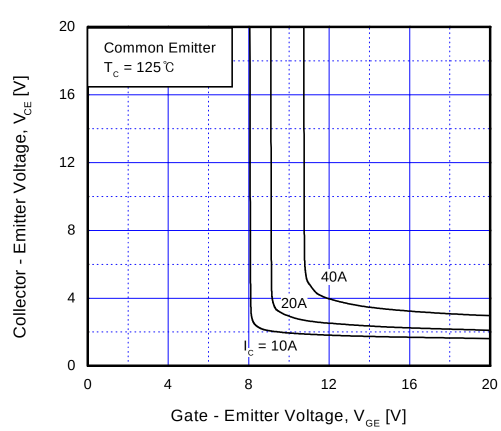


Fig 6. Saturation Voltage vs. V_{GE}

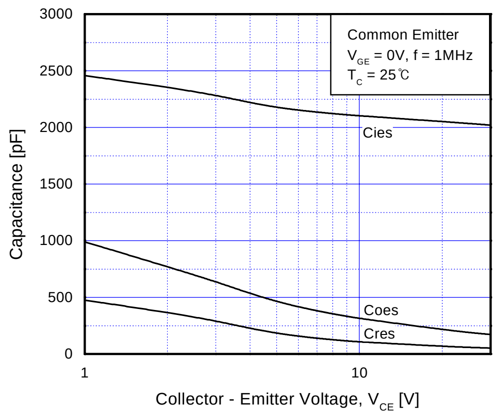


Fig 7. Capacitance Characteristics

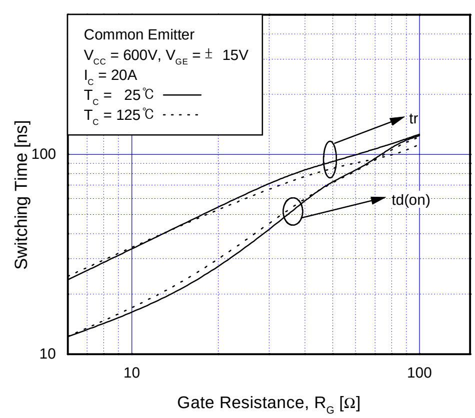


Fig 8. Turn-On Characteristics vs. Gate Resistance

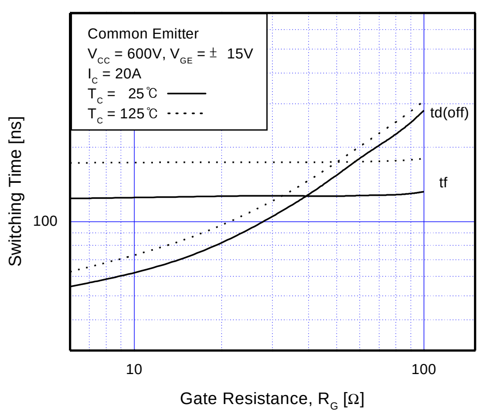


Fig 9. Turn-Off Characteristics vs. Gate Resistance

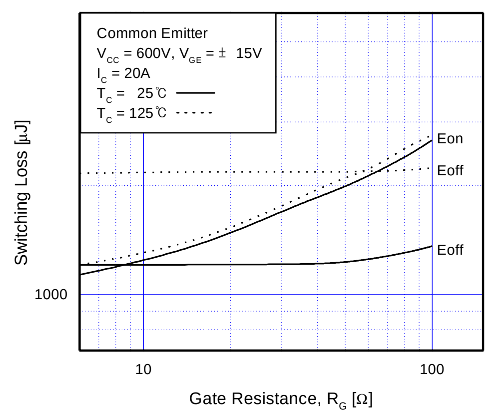


Fig 10. Switching Loss vs. Gate Resistance

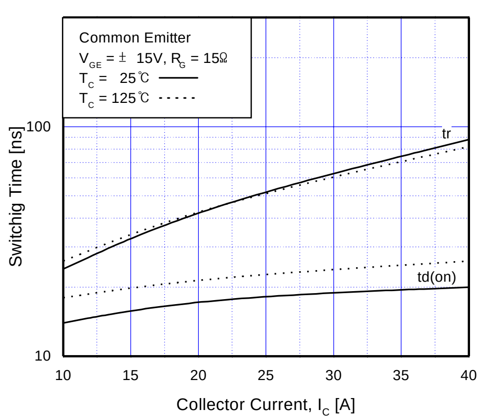


Fig 11. Turn-On Characteristics vs. Collector Current

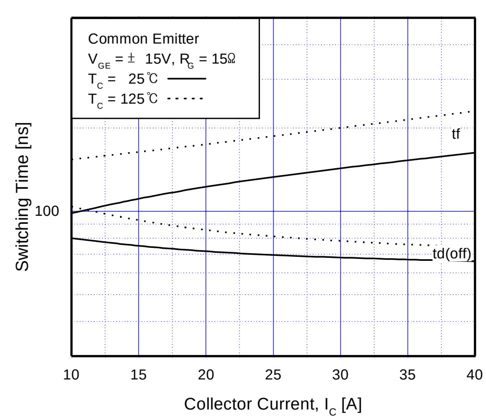


Fig 12. Turn-Off Characteristics vs. Collector Current

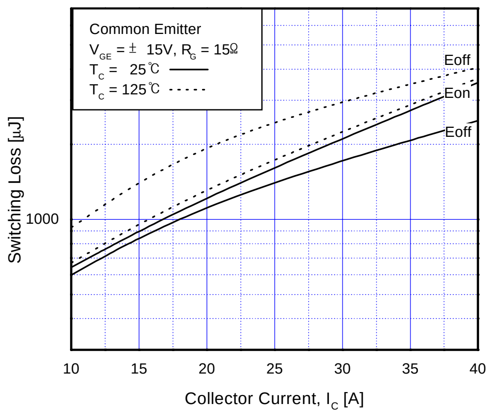


Fig 13. Switching Loss vs. Collector Current

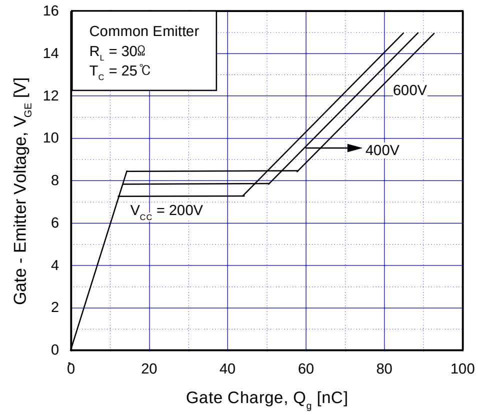


Fig 14. Gate Charge Characteristics

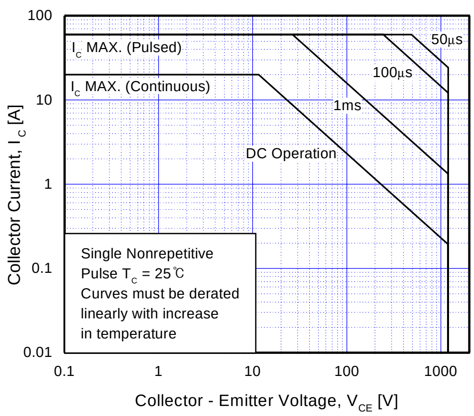


Fig 15. SOA Characteristics

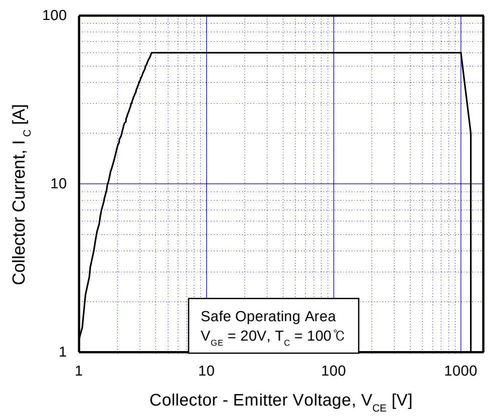


Fig 16. Turn-Off SOA

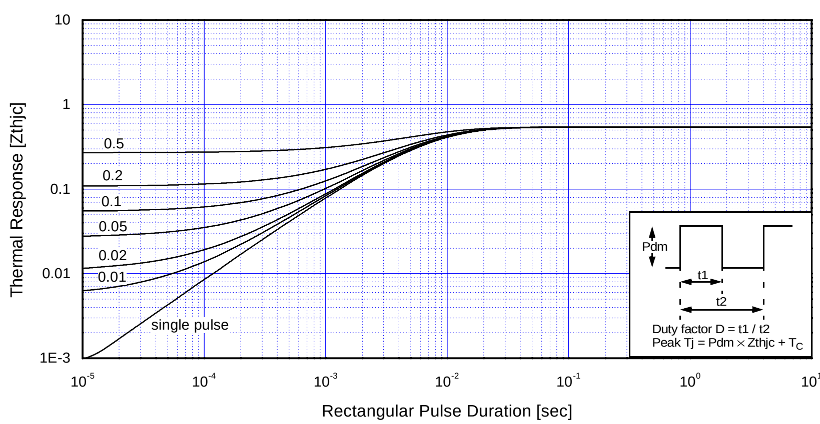
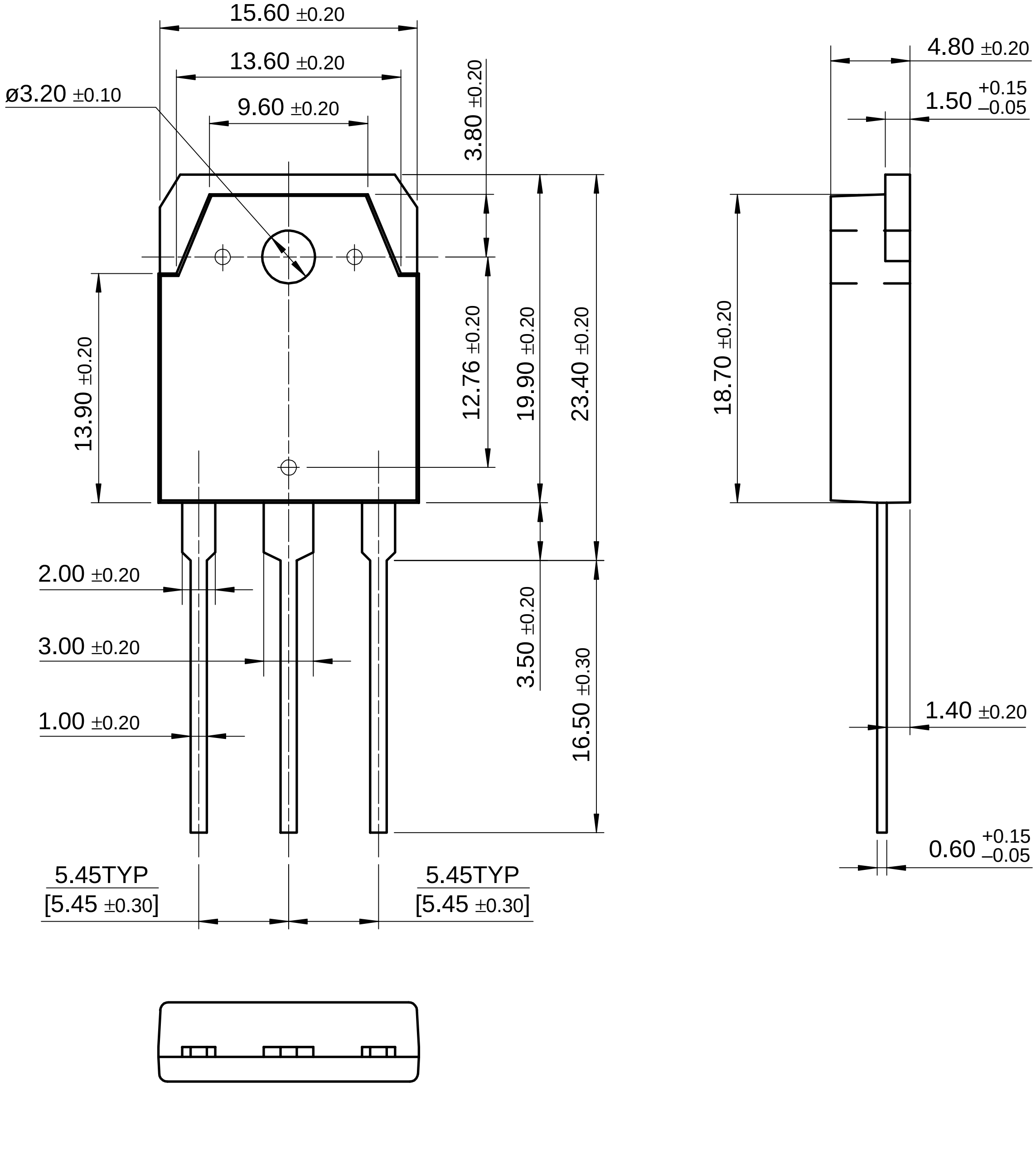


Fig 17. Transient Thermal Impedance of IGBT

Package Dimension

TO-3P (FS PKG CODE AF)



Dimensions in Millimeters

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