

FAIRCHILD
SEMICONDUCTOR®

IGBT

SGH20N60RUF

Short Circuit Rated IGBT

General Description

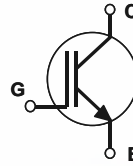
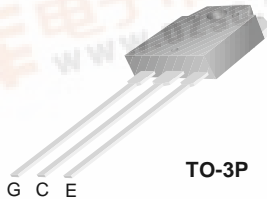
Fairchild's RUF series of Insulated Gate Bipolar Transistors (IGBTs) provide low conduction and switching losses as well as short circuit ruggedness. The RUF series is designed for applications such as motor control, uninterrupted power supplies (UPS) and general inverters where short circuit ruggedness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

Features

- Short circuit rated 10us @ $T_C = 100^\circ\text{C}$, $V_{GE} = 15\text{V}$
- High speed switching
- Low saturation voltage : $V_{CE(sat)} = 2.2\text{V}$ @ $I_C = 20\text{A}$
- High input impedance

Applications

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



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Description	SGH20N60RUF	Units
V_{CES}	Collector-Emitter Voltage	600	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C = 25^\circ\text{C}$	32	A
	Collector Current @ $T_C = 100^\circ\text{C}$	20	A
$I_{CM(1)}$	Pulsed Collector Current	60	A
T_{SC}	Short Circuit Withstand Time @ $T_C = 100^\circ\text{C}$	10	us
P_D	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	195	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	75	W
T_J	Operating Junction Temperature	-55 to +150	$^\circ\text{C}$
T_{stg}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temp. for Soldering Purposes, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

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	--	0.64	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	$^\circ\text{C/W}$



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	$V_{GE} = 0V, I_C = 250\mu A$	600	--	--	V
$\frac{\Delta BV_{CES}}{\Delta T_J}$	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	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	$I_C = 20mA, V_{CE} = V_{GE}$	5.0	6.0	8.5	V
$V_{CE(sat)}$	Collector to Emitter	$I_C = 20A, V_{GE} = 15V$	--	2.2	2.8	V
	Saturation Voltage	$I_C = 32A, V_{GE} = 15V$	--	2.5	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{CE} = 30V, V_{GE} = 0V,$ $f = 1MHz$	--	1323	--	pF
C_{oes}	Output Capacitance		--	254	--	pF
C_{res}	Reverse Transfer Capacitance		--	47	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300V, I_C = 20A,$ $R_G = 10\Omega, V_{GE} = 15V,$ Inductive Load, $T_C = 25^\circ C$	--	30	--	ns
t_r	Rise Time		--	49	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	48	70	ns
t_f	Fall Time		--	152	200	ns
E_{on}	Turn-On Switching Loss		--	524	--	μJ
E_{off}	Turn-Off Switching Loss		--	473	--	μJ
E_{ts}	Total Switching Loss	--	997	1400	μJ	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300V, I_C = 20A,$ $R_G = 10\Omega, V_{GE} = 15V,$ Inductive Load, $T_C = 125^\circ C$	--	30	--	ns
t_r	Rise Time		--	51	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	52	75	ns
t_f	Fall Time		--	311	400	ns
E_{on}	Turn-On Switching Loss		--	568	--	μJ
E_{off}	Turn-Off Switching Loss		--	1031	--	μJ
E_{ts}	Total Switching Loss	--	1599	2240	μJ	
T_{sc}	Short Circuit Withstand Time	$V_{CC} = 300V, V_{GE} = 15V$ @ $T_C = 100^\circ C$	10	--	--	μs
Q_g	Total Gate Charge	$V_{CE} = 300V, I_C = 20A,$ $V_{GE} = 15V$	--	55	80	nC
Q_{ge}	Gate-Emitter Charge		--	10	15	nC
Q_{gc}	Gate-Collector Charge		--	25	40	nC
L_e	Internal Emitter Inductance	Measured 5mm from PKG	--	14	--	nH

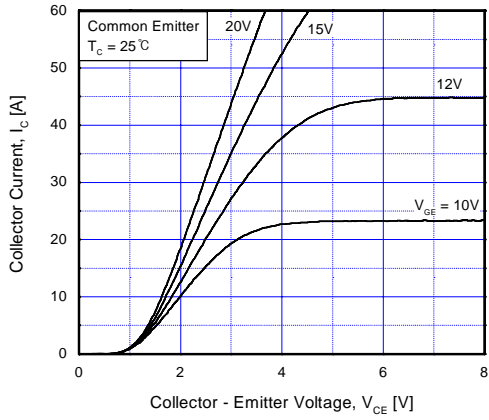


Fig 1. Typical Output Characteristics

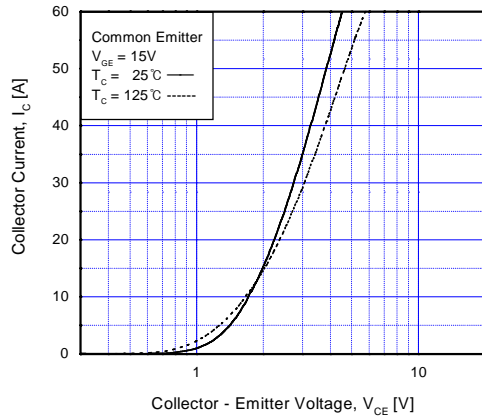


Fig 2. Typical Saturation Voltage Characteristics

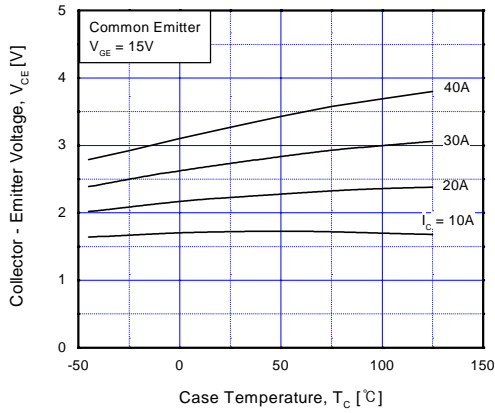


Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level

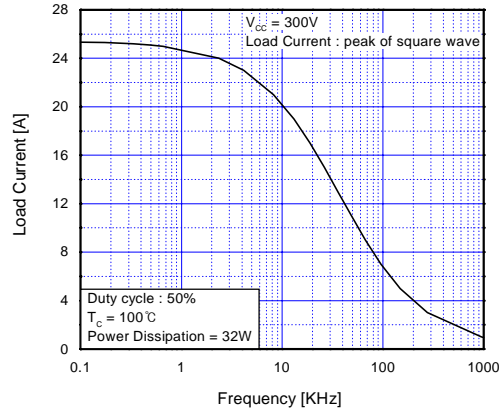


Fig 4. Load Current vs. Frequency

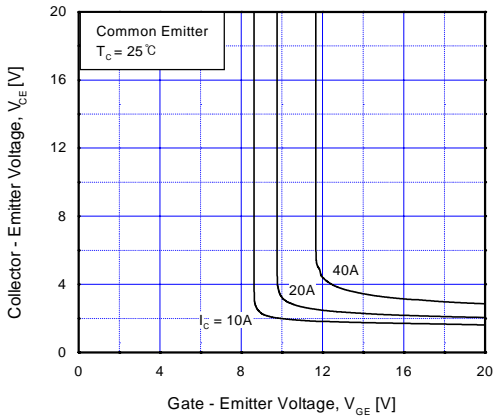


Fig 5. Saturation Voltage vs. V_{GE}

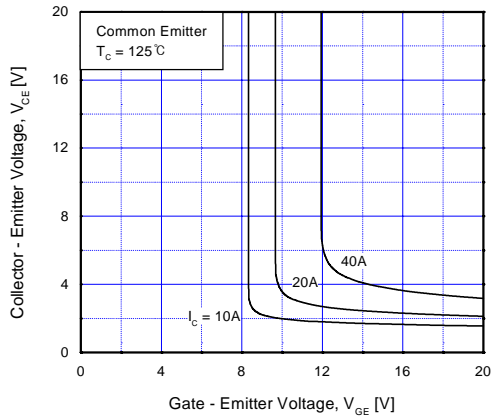


Fig 6. Saturation Voltage vs. V_{GE}

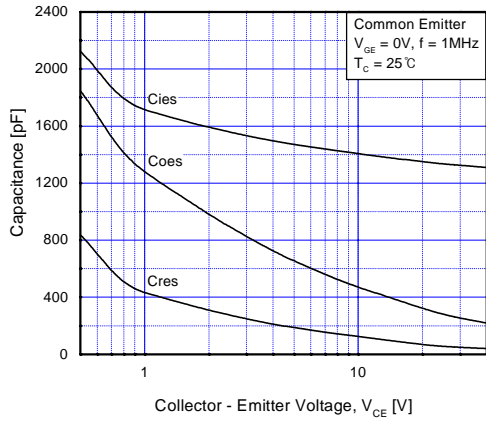


Fig 7. Capacitance Characteristics

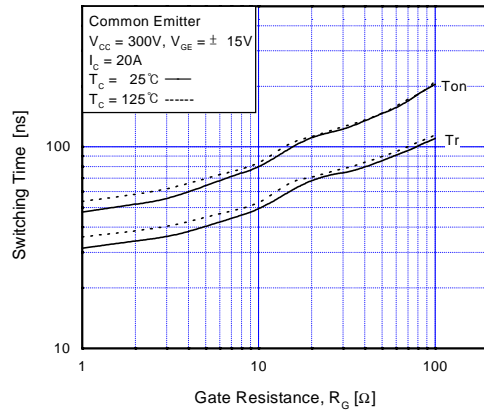


Fig 8. Turn-On Characteristics vs. Gate Resistance

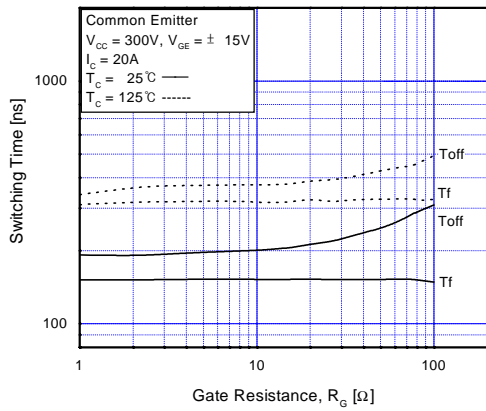


Fig 9. Turn-Off Characteristics vs. Gate Resistance

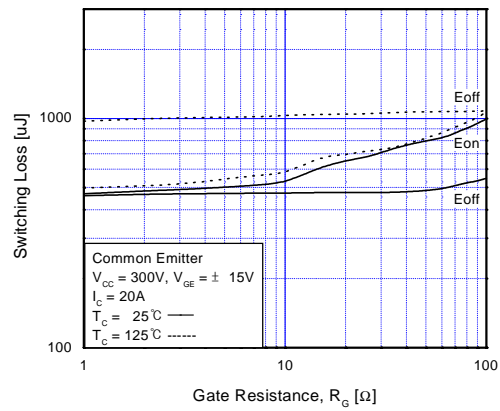


Fig 10. Switching Loss vs. Gate Resistance

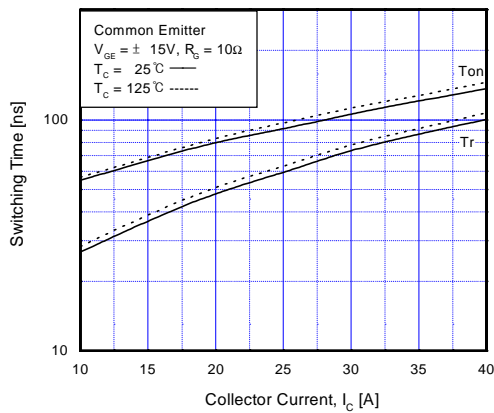


Fig 11. Turn-On Characteristics vs. Collector Current

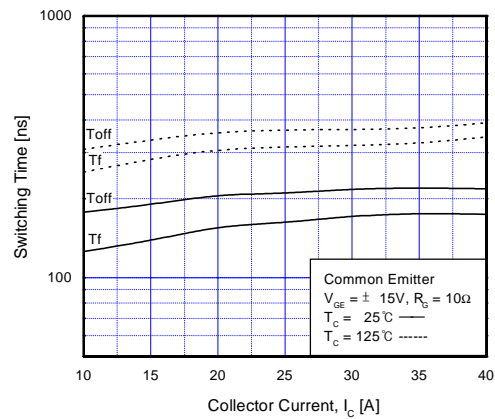


Fig 12. Turn-Off Characteristics vs. Collector Current

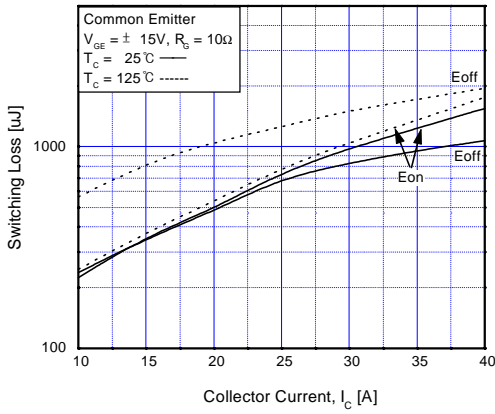


Fig 13. Switching Loss vs. Collector Current

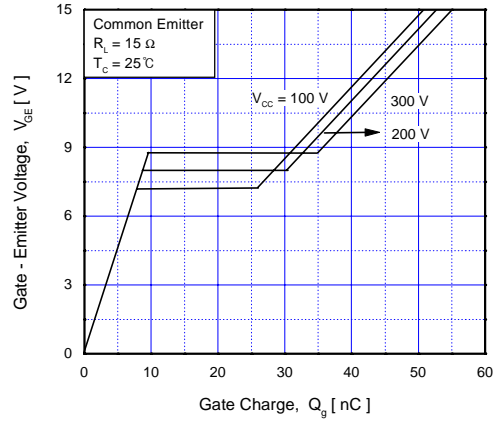


Fig 14. Gate Charge Characteristics

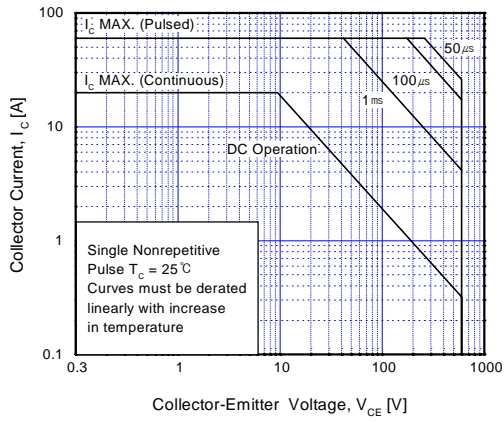


Fig 15. SOA Characteristics

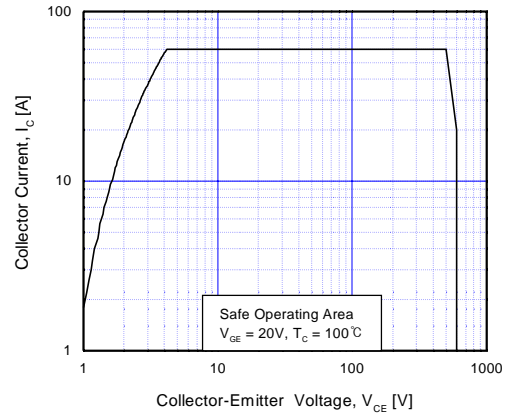


Fig 16. Turn-Off SOA Characteristics

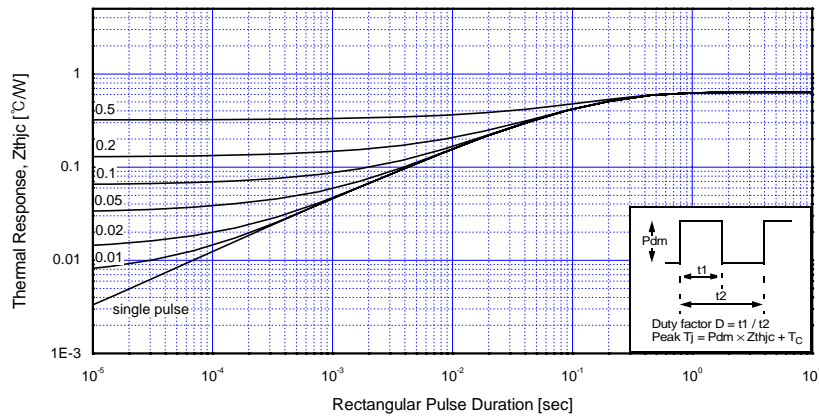
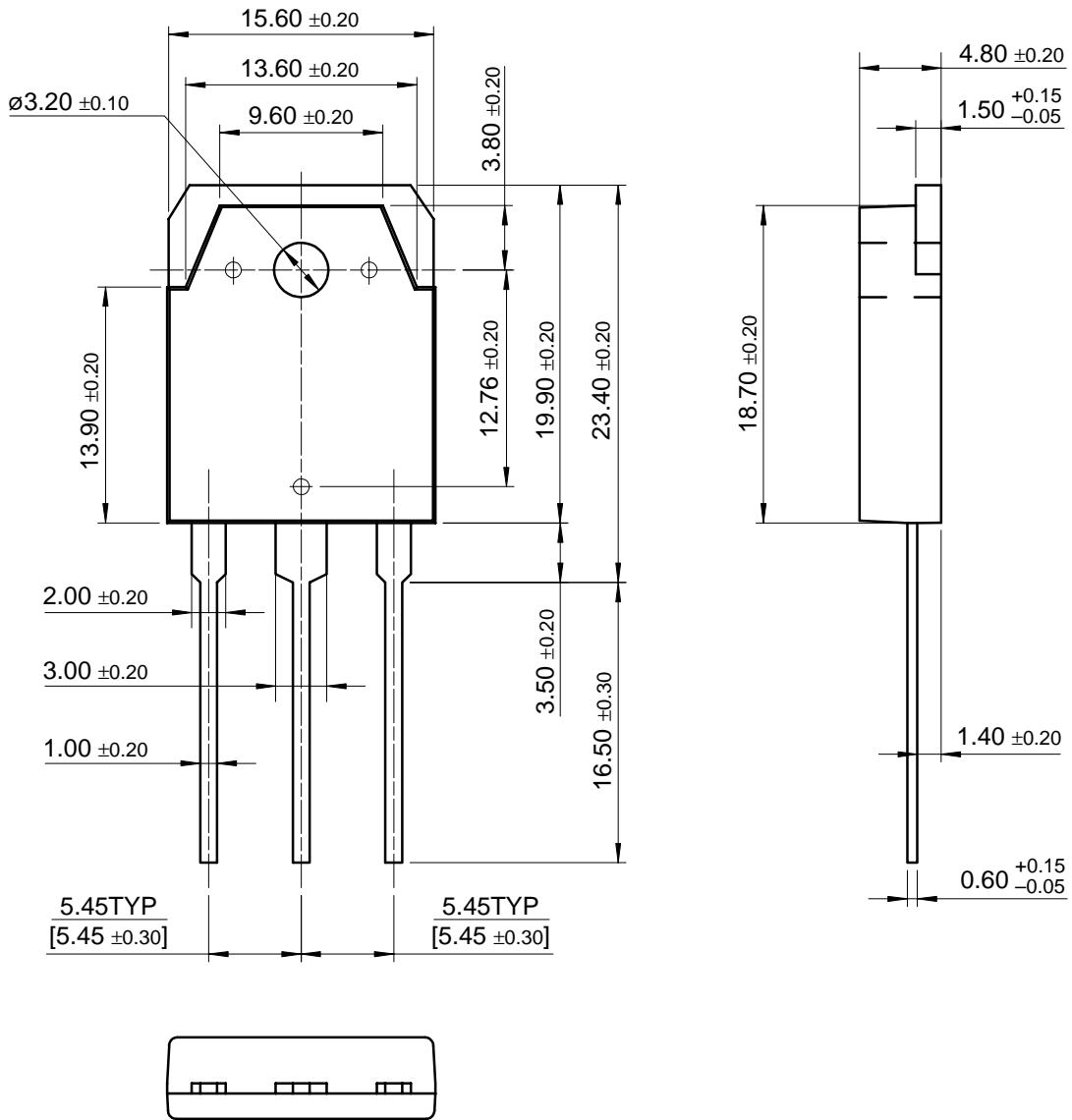


Fig 17. Transient Thermal Impedance of IGBT

Package Dimension

TO-3P



SGH20N60RUF

Dimensions in Millimeters

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