

SGM2N60UF

Ultrafast IGBT

General Description

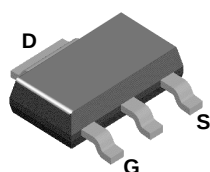
Fairchild's UF series of Insulated Gate Bipolar Transistors (IGBTs) provides low conduction and switching losses. The UF series is designed for applications such as motor control and general inverters where high speed switching is a required feature.

Features

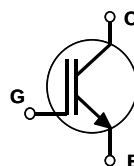
- High speed switching
- Low saturation voltage : $V_{CE(sat)} = 2.1\text{ V @ } I_C = 1.2\text{ A}$
- High input impedance

Applications

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



SOT-223



Absolute Maximum Ratings

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

Symbol	Description	SGM2N60UF	Units
V_{CES}	Collector-Emitter Voltage	600	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C = 25^\circ\text{C}$	2.4	A
	Collector Current @ $T_C = 100^\circ\text{C}$	1.2	A
$I_{CM(1)}$	Pulsed Collector Current	10	A
P_D	Maximum Power Dissipation @ $T_a = 25^\circ\text{C}$	2.1	W
	- Derate above 25°C	0.017	W/ $^\circ\text{C}$
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
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (PCB Mount) (2)	--	60	$^\circ\text{C/W}$

Notes :

(2) Mounted on 1" square PCB (FR4 or G-10 Material)

Electrical Characteristics of the IGBT $T_C = 25^\circ\text{C}$ 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
$\Delta B_{V_{CES}} / \Delta T_J$	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	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	$V_{CC} = 300V, I_C = 1.2A, R_G = 200\Omega, V_{GE} = 15V, \text{Inductive Load, } T_C = 25^\circ C$	--	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	$V_{CC} = 300V, I_C = 1.2A, R_G = 200\Omega, V_{GE} = 15V, \text{Inductive Load, } T_C = 125^\circ C$	--	13	--	uJ
E_{ts}	Total Switching Loss		--	43	70	uJ
$t_{d(on)}$	Turn-On Delay Time		--	19	--	ns
t_r	Rise Time		--	24	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	115	200	ns
t_f	Fall Time	$V_{CE} = 300V, I_C = 1.2A, V_{GE} = 15V$	--	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		--	9	14	nC
Q_{ge}	Gate-Emitter Charge	Measured 5mm from PKG	--	3	5	nC
Q_{gc}	Gate-Collector Charge		--	1.5	3	nC
L_e	Internal Emitter Inductance		--	7.5	--	nH

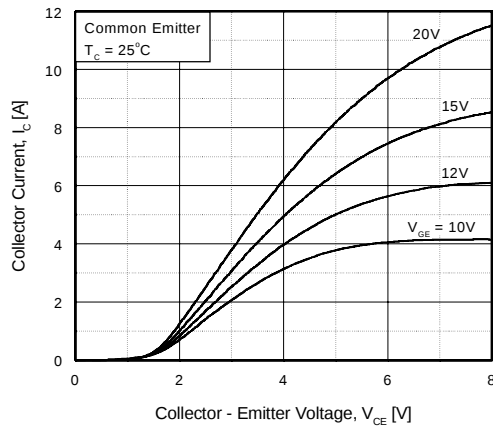


Fig 1. Typical Output Characteristics

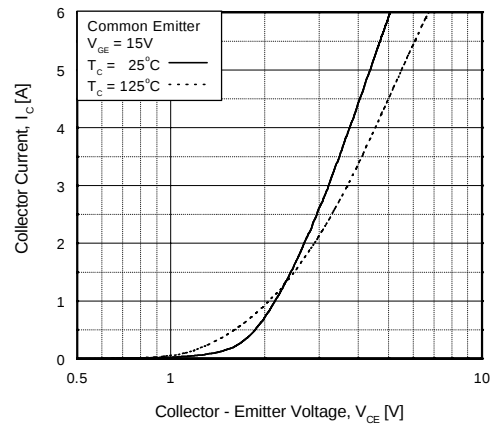


Fig 2. Typical Saturation Voltage Characteristics

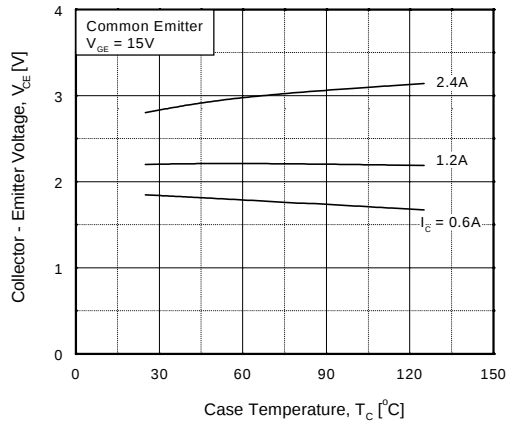


Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level

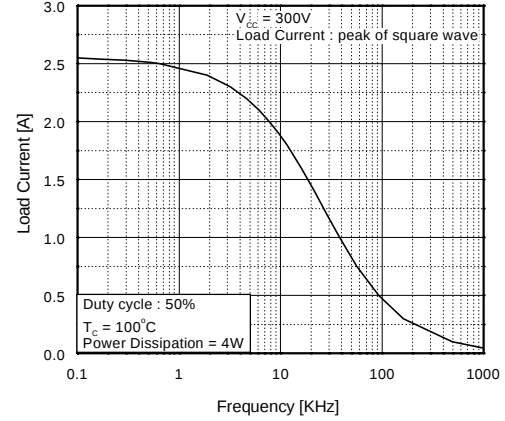


Fig 4. Load Current vs. Frequency

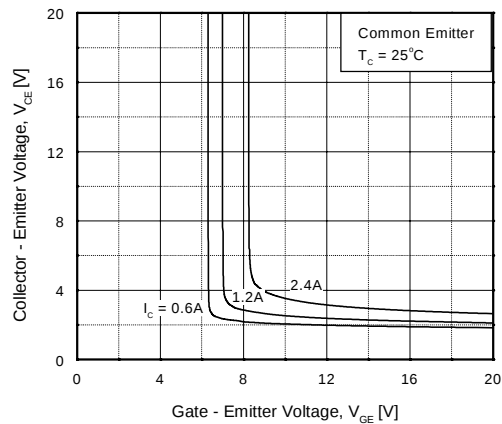


Fig 5. Saturation Voltage vs. V_{GE}

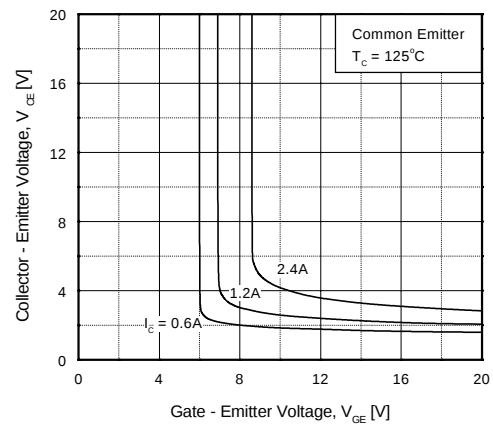


Fig 6. Saturation Voltage vs. V_{GE}

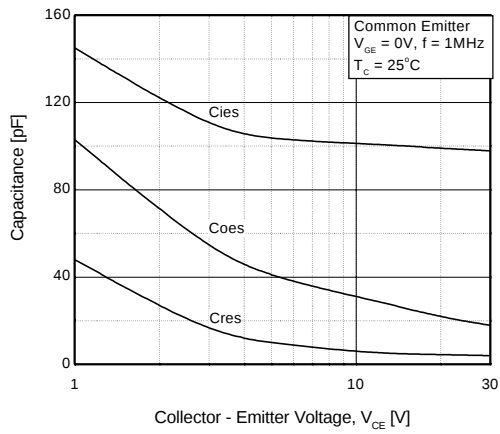


Fig 7. Capacitance Characteristics

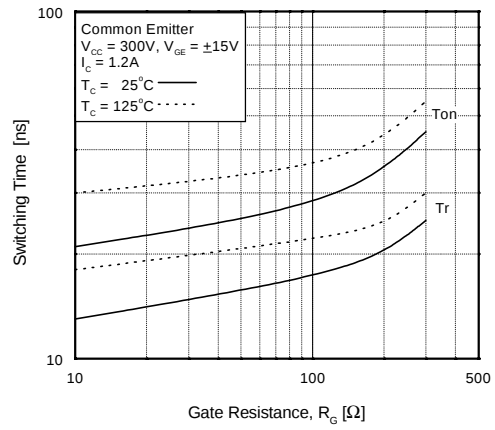


Fig 8. Turn-On Characteristics vs. Gate Resistance

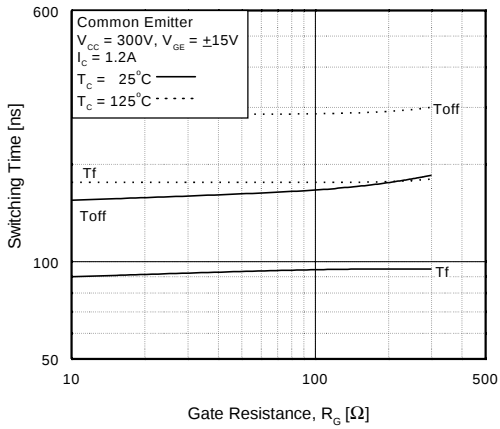


Fig 9. Turn-Off Characteristics vs. Gate Resistance

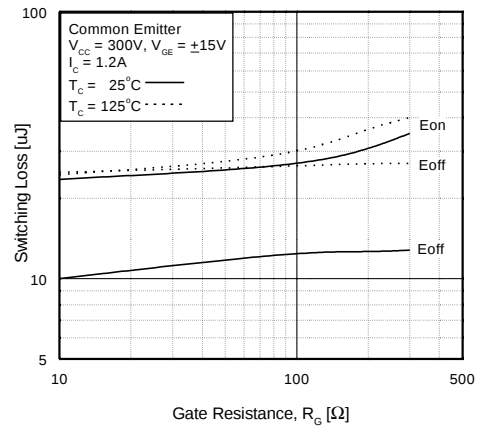


Fig 10. Switching Loss vs. Gate Resistance

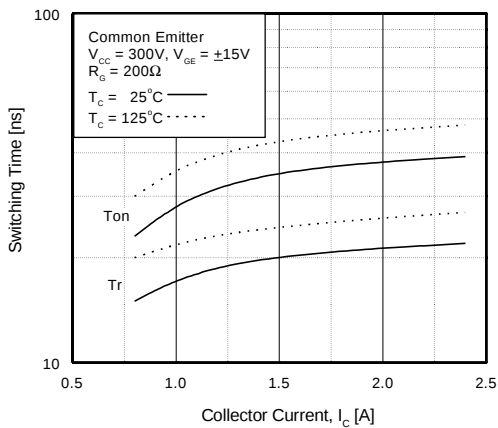


Fig 11. Turn-On Characteristics vs. Collector Current

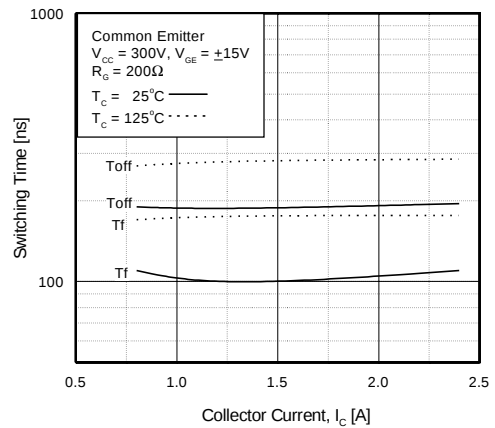


Fig 12. Turn-Off Characteristics vs. Collector Current

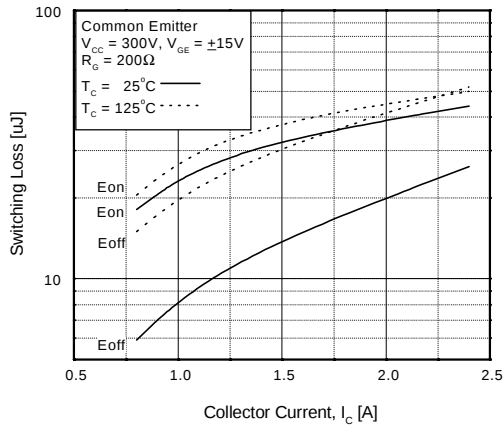


Fig 13. Switching Loss vs. Collector Current

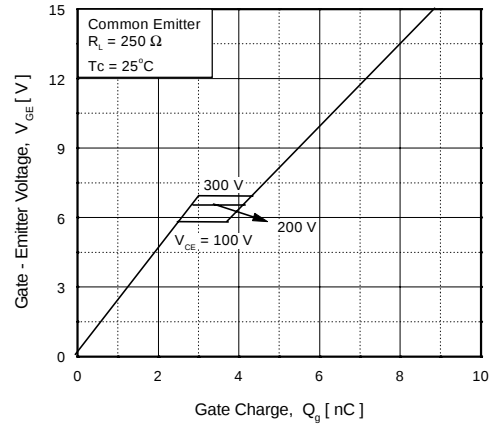


Fig 14. Gate Charge Characteristics

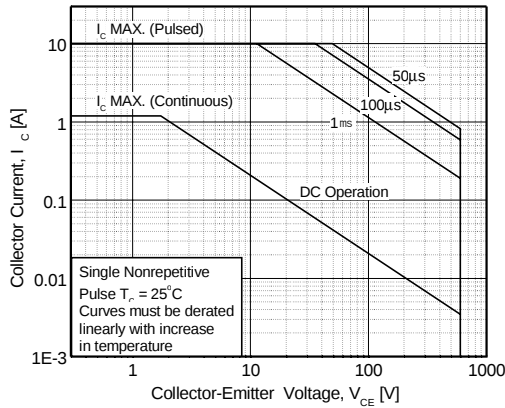


Fig 15. SOA Characteristics

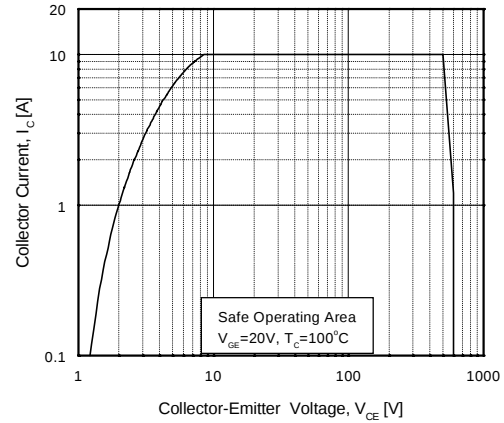


Fig 16. Turn-Off SOA Characteristics

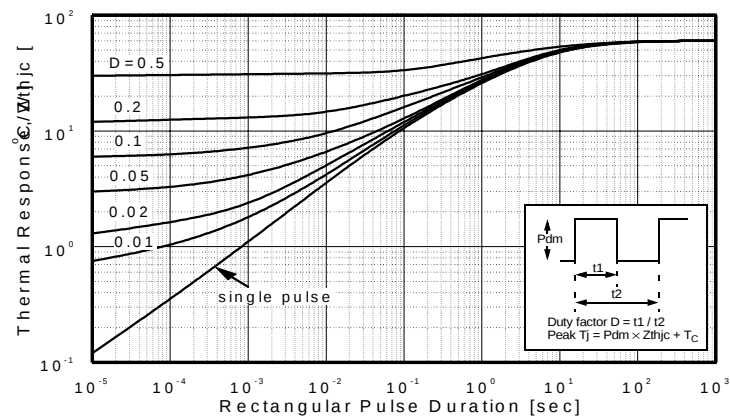


Fig 17. Transient Thermal Impedance of IGBT

Technical drawing of a mechanical part showing three views: front, side, and top. The drawing includes dimensions in millimeters with tolerances and typical values.

Front View Dimensions:

- Overall width: 4.60 ± 0.25
- Overall height: 1.60 ± 0.20
- Base thickness: 0.70 ± 0.10
- Pin diameter: $0.25^{+0.10}_{-0.05}$
- Pin spacing (typical): 2.30 TYP
- Central raised section width: 3.00 ± 0.10
- Central raised section height: 1.75 ± 0.20
- Central raised section thickness: $0.06^{+0.04}_{-0.02}$
- Central raised section width (typical): (0.60)
- Pin diameter (typical): (0.95)
- Pin spacing (typical): (0.95)

Side View Dimensions:

- Overall width: 7.00 ± 0.30
- Base thickness: 0.65 ± 0.20
- Pin diameter: $0.25^{+0.10}_{-0.05}$
- Pin spacing (typical): (0.95)
- Central raised section width: 3.00 ± 0.10
- Central raised section height: 1.75 ± 0.20
- Central raised section thickness: $0.06^{+0.04}_{-0.02}$
- Central raised section width (typical): (0.60)
- Pin diameter (typical): (0.95)
- Pin spacing (typical): (0.95)

Top View Dimensions:

- Overall width: 6.50 ± 0.20
- Base thickness: 0.65 ± 0.20
- Pin diameter: $0.25^{+0.10}_{-0.05}$
- Pin spacing (typical): 2.30 TYP
- Central raised section width: 3.00 ± 0.10
- Central raised section height: 1.75 ± 0.20
- Central raised section thickness: $0.06^{+0.04}_{-0.02}$
- Central raised section width (typical): (0.60)
- Pin diameter (typical): (0.95)
- Pin spacing (typical): (0.95)

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