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# SGP23N60UF

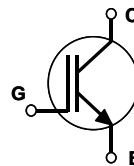
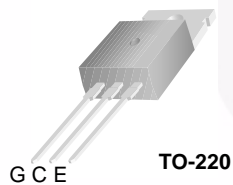
## 600V PT IGBT

### General Description

Fairchild's UF series IGBTs provide low conduction and switching losses. UF series is designed for the applications such as general inverters and PFC where High Speed Switching is required feature.

### Features

- 12 A, 600 V,  $T_C = 100^\circ\text{C}$
- Low Saturation Voltage:  $V_{CE(sat)} = 2.1\text{ V @ } I_C = 12\text{ A}$
- Typical Fall Time. . . . .220ns at  $T_J = 125^\circ\text{C}$
- High Input Impedance



### Applications

General Inverter, PFC

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

Symbol	Description	Ratings	Unit	
$V_{CES}$	Collector-Emitter Voltage	600	V	
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V	
$I_C$	Collector Current	@ $T_C = 25^\circ\text{C}$	23	A
	Collector Current	@ $T_C = 100^\circ\text{C}$	12	A
$I_{CM(1)}$	Pulsed Collector Current		92	A
$P_D$	Maximum Power Dissipation	@ $T_C = 25^\circ\text{C}$	100	W
	Maximum Power Dissipation	@ $T_C = 100^\circ\text{C}$	40	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.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	1.2	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	$^\circ\text{C}/\text{W}$

**Electrical Characteristics of the IGBT**  $T_C = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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**Off Characteristics**

$BV_{CES}$	Collector-Emitter Breakdown Voltage	$V_{GE} = 0\text{ V}, I_C = 250\text{ }\mu\text{A}$	600	--	--	V
$\frac{\Delta BV_{CES}}{\Delta T_J}$	Temperature Coefficient of Breakdown Voltage	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	--	0.6	--	$\text{V}/^\circ\text{C}$
$I_{CES}$	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0\text{ V}$	--	--	250	$\mu\text{A}$
$I_{GES}$	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0\text{ V}$	--	--	$\pm 100$	nA

**On Characteristics**

$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 12\text{ mA}, V_{CE} = V_{GE}$	3.5	4.5	6.5	V
$V_{CE(sat)}$	Collector to Emitter	$I_C = 12\text{ A}, V_{GE} = 15\text{ V}$	--	2.1	2.6	V
	Saturation Voltage	$I_C = 23\text{ A}, V_{GE} = 15\text{ V}$	--	2.6	--	V

**Dynamic Characteristics**

$C_{ies}$	Input Capacitance	$V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V},$ $f = 1\text{ MHz}$	--	720	--	pF
$C_{oes}$	Output Capacitance		--	100	--	pF
$C_{res}$	Reverse Transfer Capacitance		--	25	--	pF

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300\text{ V}, I_C = 12\text{ A},$ $R_G = 23\text{ }\Omega, V_{GE} = 15\text{ V},$ Inductive Load, $T_C = 25^\circ\text{C}$	--	17	--	ns
$t_r$	Rise Time		--	27	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	60	130	ns
$t_f$	Fall Time		--	70	150	ns
$E_{on}$	Turn-On Switching Loss		--	115	--	$\mu\text{J}$
$E_{off}$	Turn-Off Switching Loss		--	135	--	$\mu\text{J}$
$E_{ts}$	Total Switching Loss		--	250	400	$\mu\text{J}$
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300\text{ V}, I_C = 12\text{ A},$ $R_G = 23\text{ }\Omega, V_{GE} = 15\text{ V},$ Inductive Load, $T_C = 125^\circ\text{C}$	--	23	--	ns
$t_r$	Rise Time		--	32	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	100	200	ns
$t_f$	Fall Time		--	220	250	ns
$E_{on}$	Turn-On Switching Loss		--	205	--	$\mu\text{J}$
$E_{off}$	Turn-Off Switching Loss		--	320	--	$\mu\text{J}$
$E_{ts}$	Total Switching Loss		--	525	800	$\mu\text{J}$

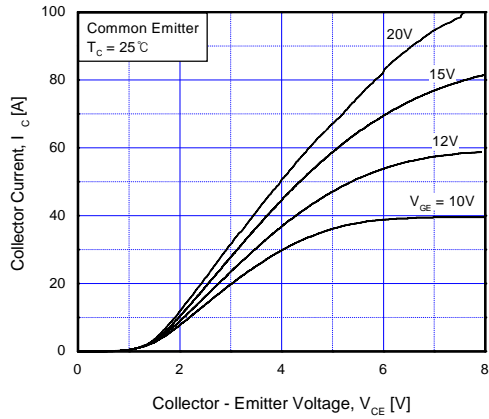


Fig 1. Typical Output Characteristics

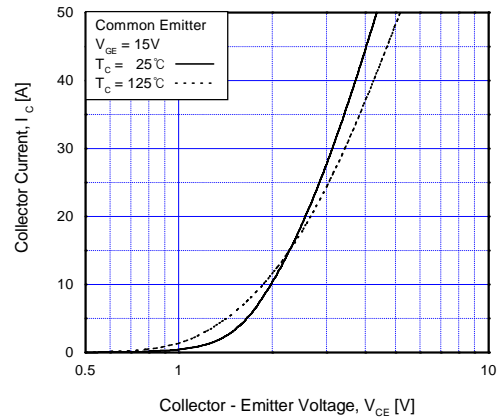


Fig 2. Typical Saturation Voltage Characteristics

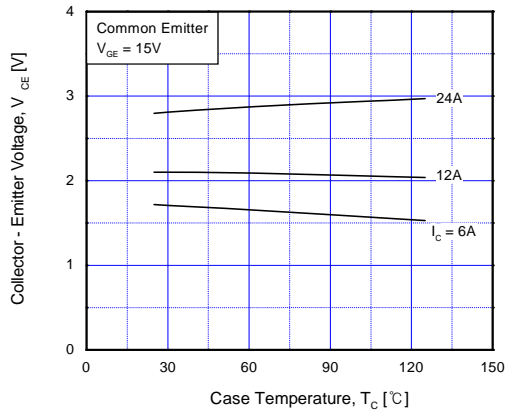


Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level

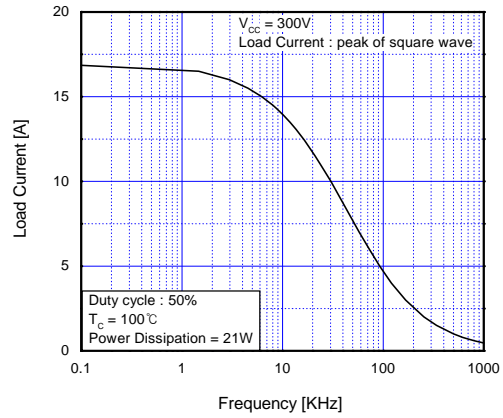


Fig 4. Load Current vs. Frequency

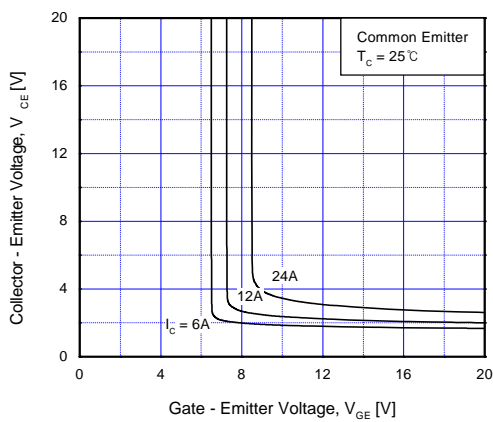


Fig 5. Saturation Voltage vs.  $V_{GE}$

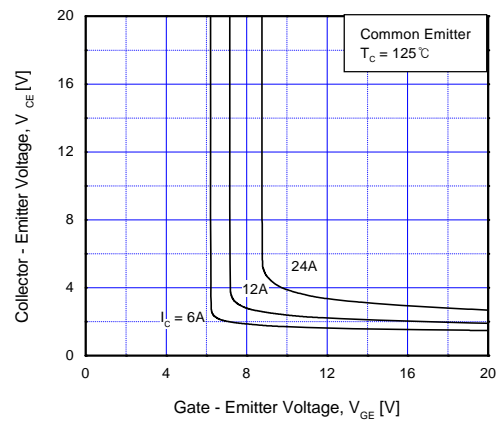
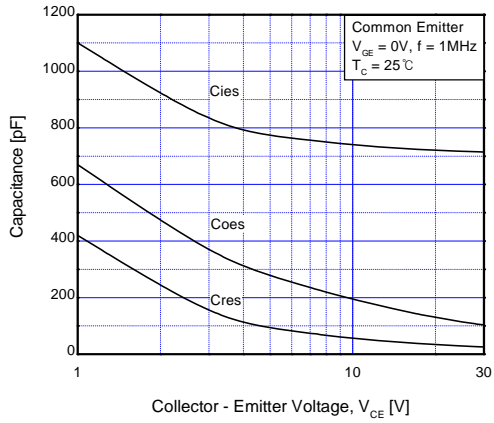
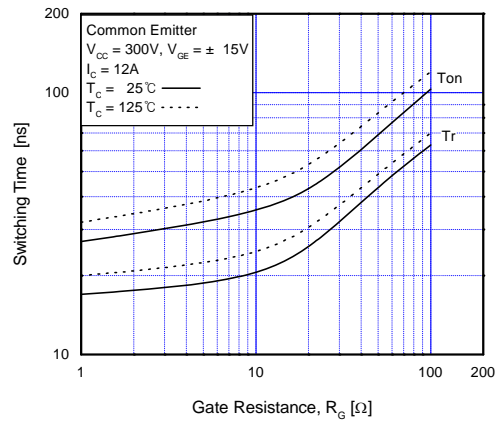


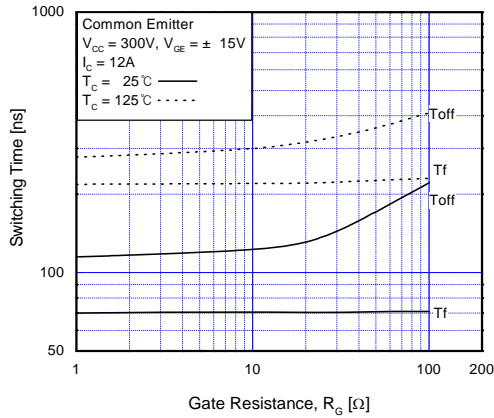
Fig 6. Saturation Voltage vs.  $V_{GE}$



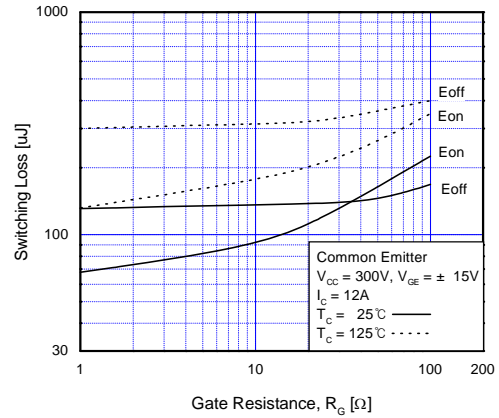
**Fig 7. Capacitance Characteristics**



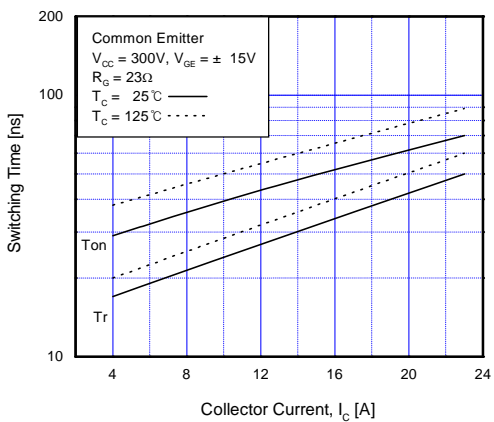
**Fig 8. Turn-On Characteristics vs. Gate Resistance**



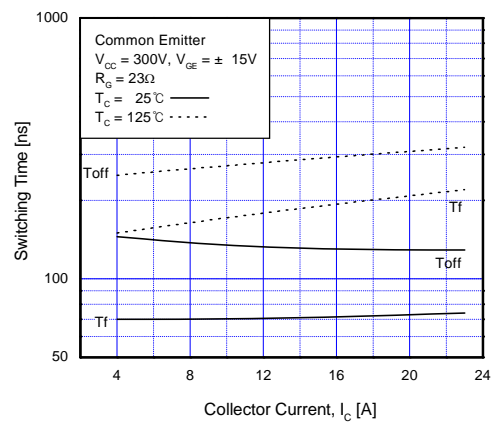
**Fig 9. Turn-Off Characteristics vs. Gate Resistance**



**Fig 10. Switching Loss vs. Gate Resistance**



**Fig 11. Turn-On Characteristics vs. Collector Current**



**Fig 12. Turn-Off Characteristics vs. Collector Current**

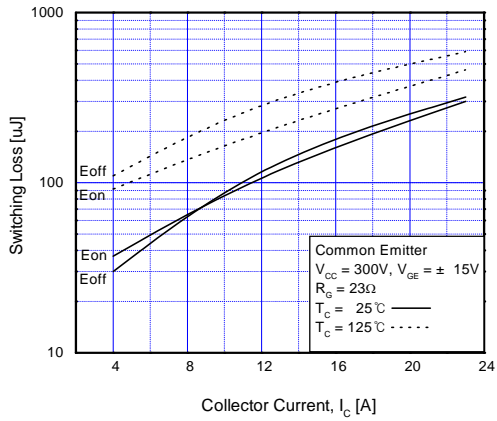


Fig 13. Switching Loss vs. Collector Current

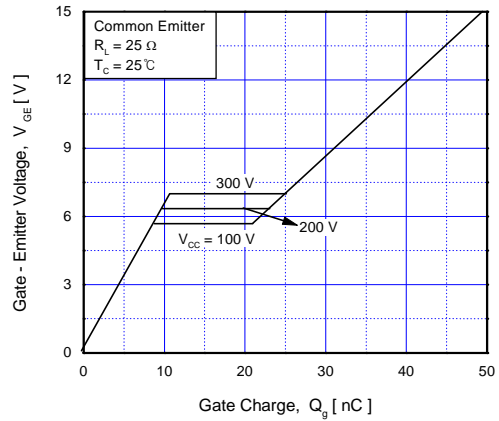


Fig 14. Gate Charge Characteristics

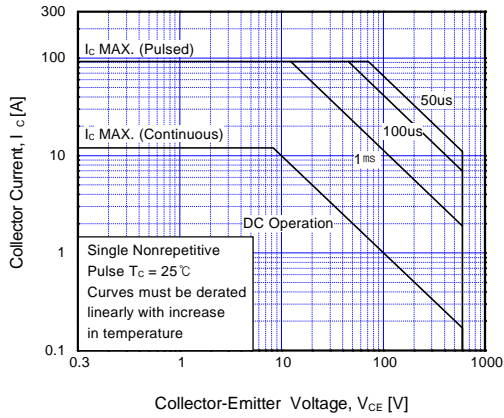


Fig 15. SOA Characteristics

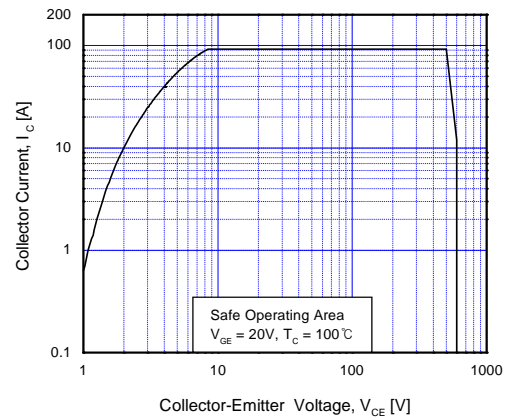


Fig 16. Turn-Off SOA Characteristics

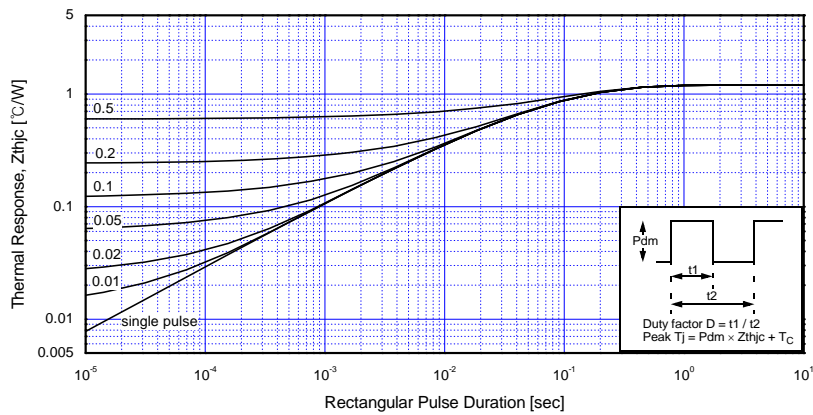


Fig 17. Transient Thermal Impedance of IGBT

## Mechanical Dimensions

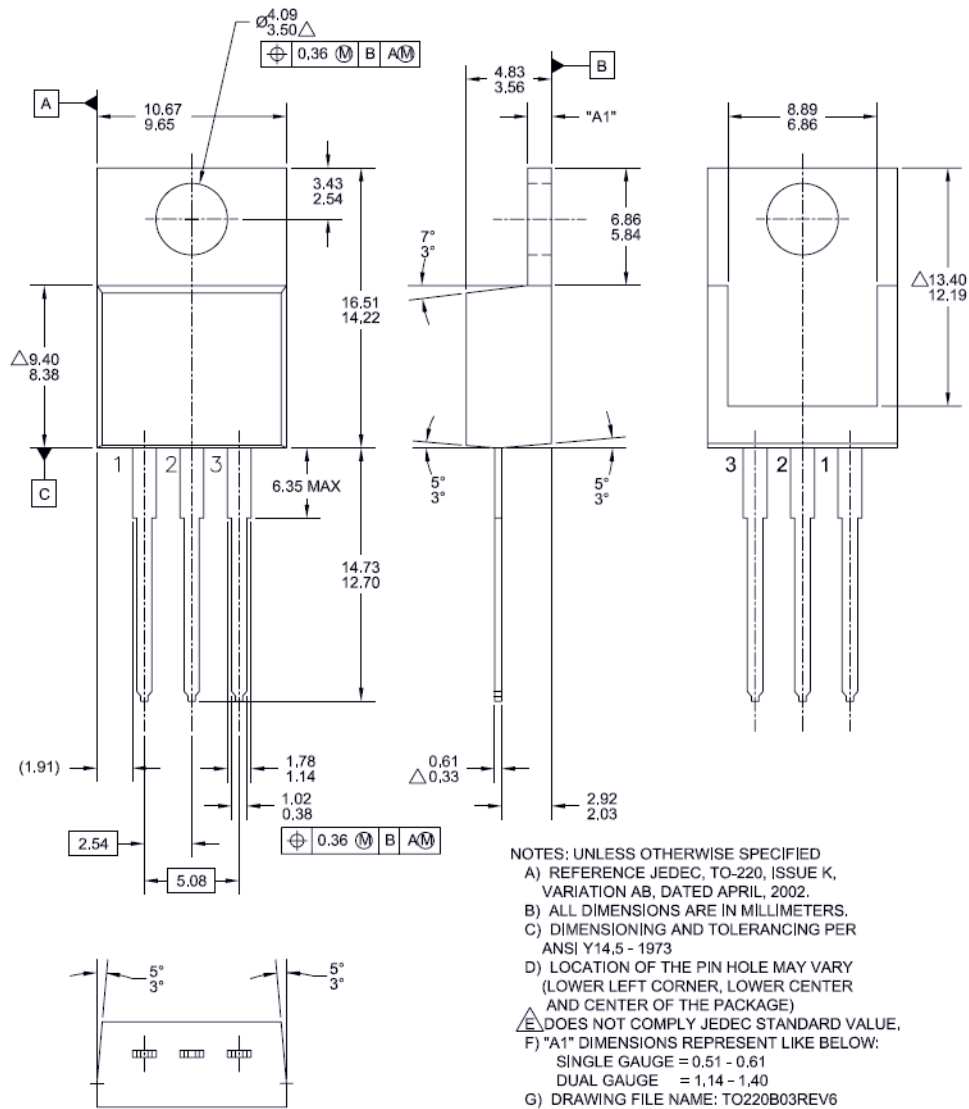


Figure 18. TO-220 3L - TO-220, MOLDED, 3LEAD, JEDEC VARIATION AB

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


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