

# Bipolar Transistor

-50 V, -20 A, Low  $V_{CE(sat)}$ ,  
 NPN TO-220F-3SG

## 2SA2210

### Features

- Adoption of MBIT Process
- Low Collector-to-Emitter Saturation Voltage
- Large Current Capacitance
- High-Speed Switching
- This is a Pb-Free Device

### Applications

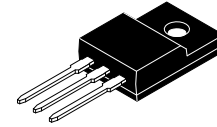
- Relay Drivers, Lamp Drivers, Motor Drivers

### Specifications

#### ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

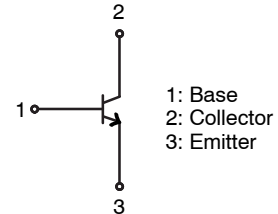
Parameter	Symbol	Condition	Value	Unit
Collector-to-Base Voltage	$V_{CBO}$		-50	V
Collector-to-Emitter Voltage	$V_{CEO}$		-50	V
Emitter-to-Base Voltage	$V_{EBO}$		-6	V
Collector Current	$I_C$		-20	A
Collector Current (Pulse)	$I_{CP}$		-25	A
Base Current	$I_B$		-3	A
Collector Dissipation	$P_C$		2	W
		$T_C = 25^\circ\text{C}$	30	W
Junction Temperature	$T_j$		150	°C
Storage Temperature	$T_{stg}$		-55 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



TO-220 Fullpack, 3-Lead /  
 TO-220F-3SG  
 CASE 221AT

### ELECTRICAL CONNECTION



### MARKING DIAGRAM



A2210 = Device Code  
 YWW = Date Code (Year & Week)  
 ZZ = Assembly Lot

### ORDERING INFORMATION

Device	Package	Shipping
2SA2210-1E	TO-220F (Pb-Free)	50 / Tube

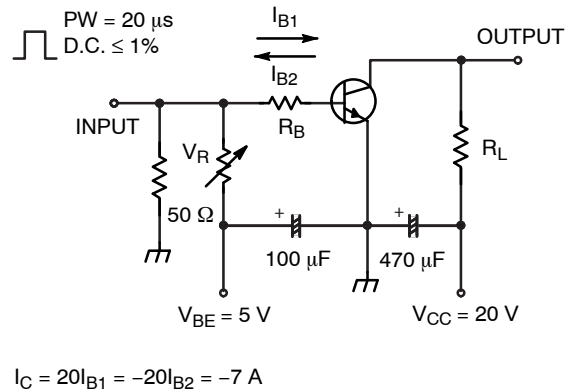
## 2SA2210

### ELECTRICAL CHARACTERISTICS (Ta = 25°C)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector Cutoff Current	$I_{CBO}$	$V_{CB} = -40 \text{ V}, I_E = 0 \text{ A}$	-	-	-10	$\mu\text{A}$
Emitter Cutoff Current	$I_{EBO}$	$V_{EB} = -4 \text{ V}, I_C = 0 \text{ A}$	-	-	-10	$\mu\text{A}$
DC Current Gain	$h_{FE}$	$V_{CE} = -2 \text{ V}, I_C = -1 \text{ A}$	150	-	450	
Gain-Bandwidth Product	$f_T$	$V_{CE} = -10 \text{ V}, I_C = -1 \text{ A}$	-	140	-	MHz
Output Capacitance	$C_{ob}$	$V_{CB} = -10 \text{ V}, f = 1 \text{ MHz}$	-	215	-	pF
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = -7 \text{ A}, I_B = -350 \text{ mA}$	-	-200	-500	mV
Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = -7 \text{ A}, I_B = -350 \text{ mA}$	-	-	-1.2	V
Collector-to-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = -100 \mu\text{A}, I_E = 0 \text{ A}$	-50	-	-	V
Collector-to-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = -1 \text{ mA}, R_{BE} = \infty$	-50	-	-	V
Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = -100 \mu\text{A}, I_C = 0 \text{ A}$	-6	-	-	V
Turn-On Time	$t_{on}$	See specified Test Circuit		60	-	ns
Storage Time	$t_{stg}$			270	-	ns
Fall Time	$t_f$			20	-	ns

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

### Switching Time Test Circuit



**Figure 1. Switching Time Test Circuit**

TYPICAL CHARACTERISTICS

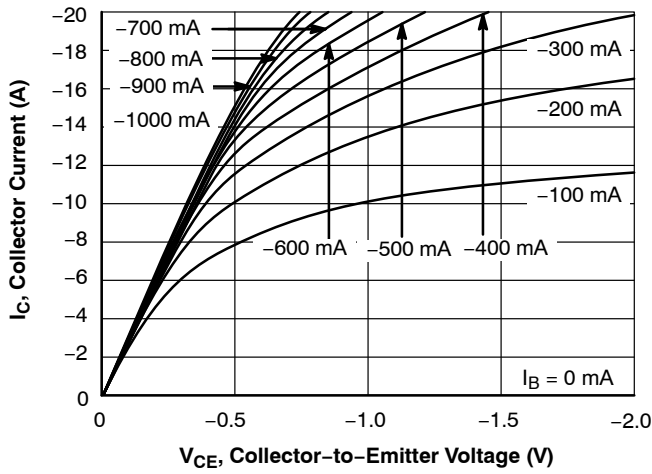


Figure 2.  $I_C - V_{CE}$

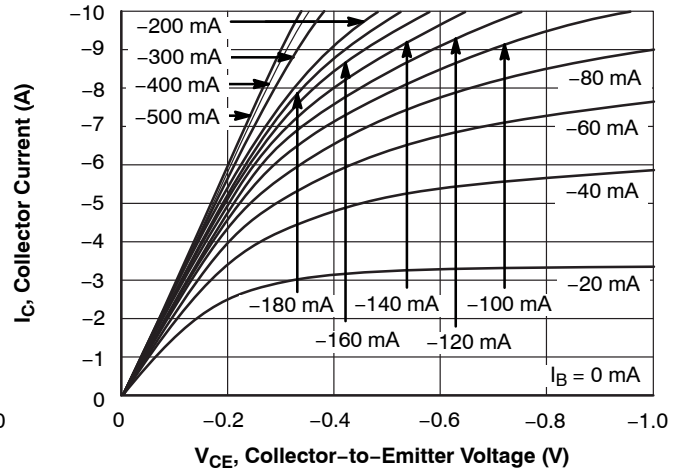


Figure 3.  $I_C - V_{CE}$

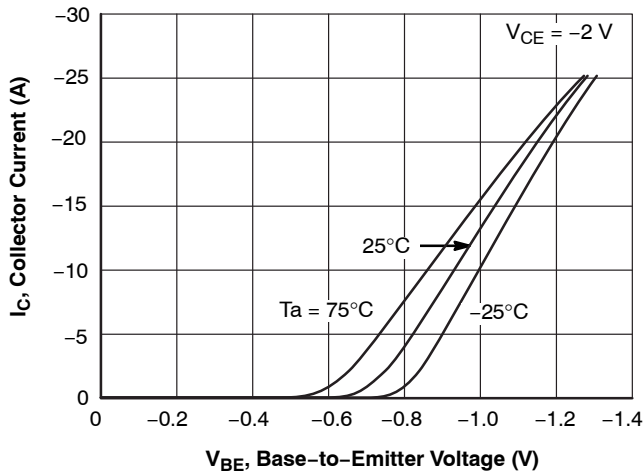


Figure 4.  $I_C - V_{BE}$

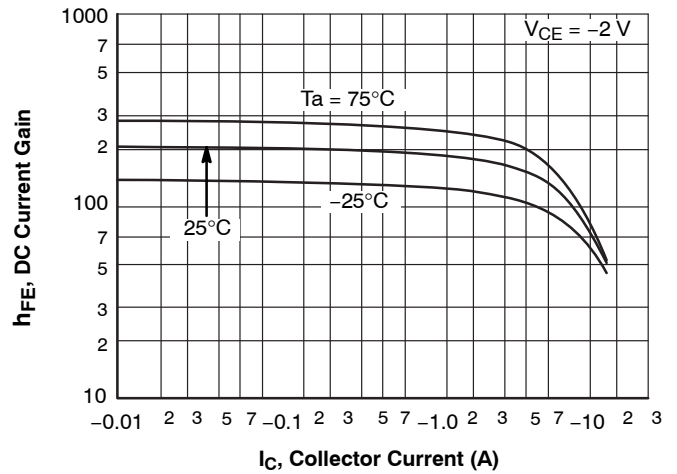


Figure 5.  $h_{FE} - I_C$

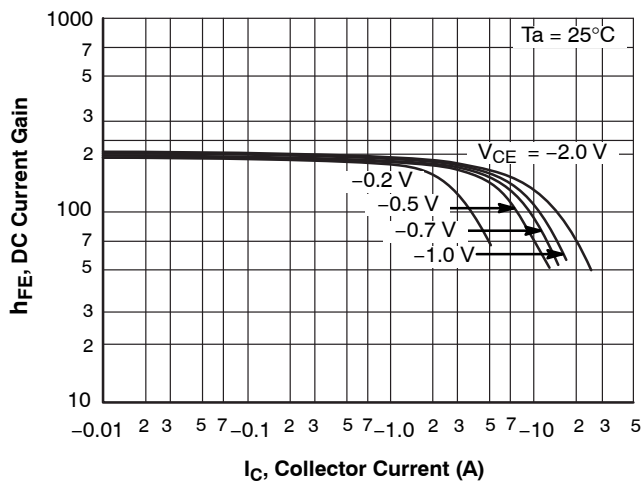


Figure 6.  $h_{FE} - I_C$

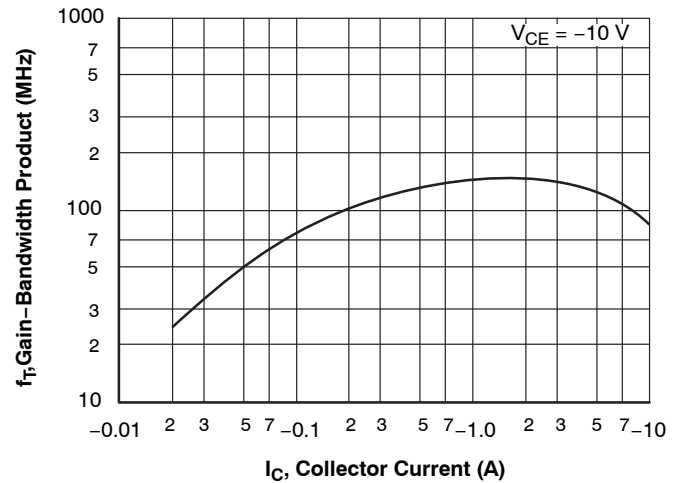


Figure 7.  $F_T - I_C$

TYPICAL CHARACTERISTICS (continued)

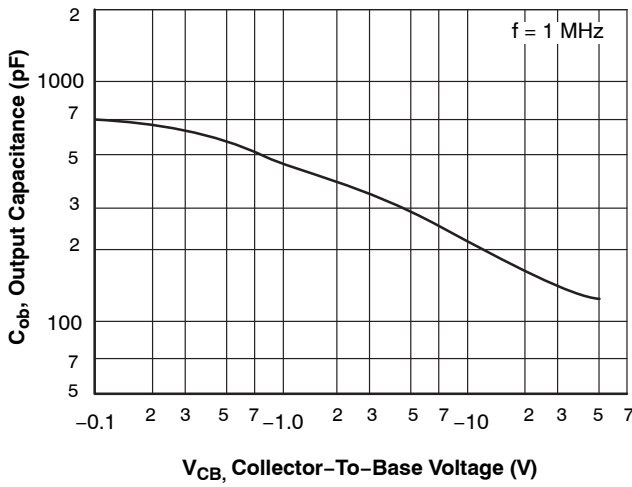


Figure 8.  $C_{ob} - V_{CB}$

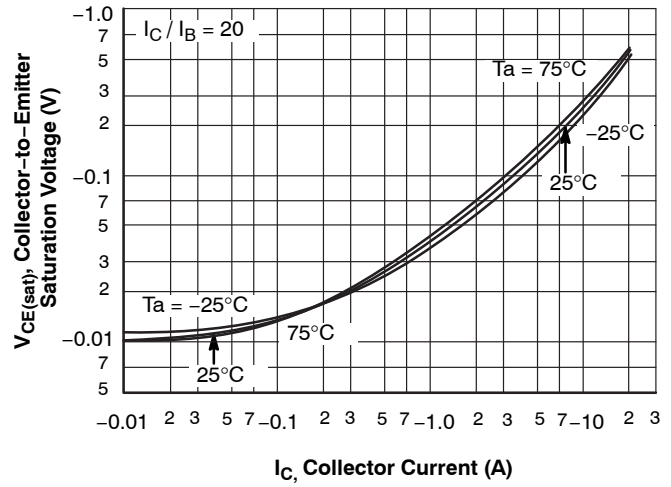


Figure 9.  $V_{CE(sat)} - I_C$

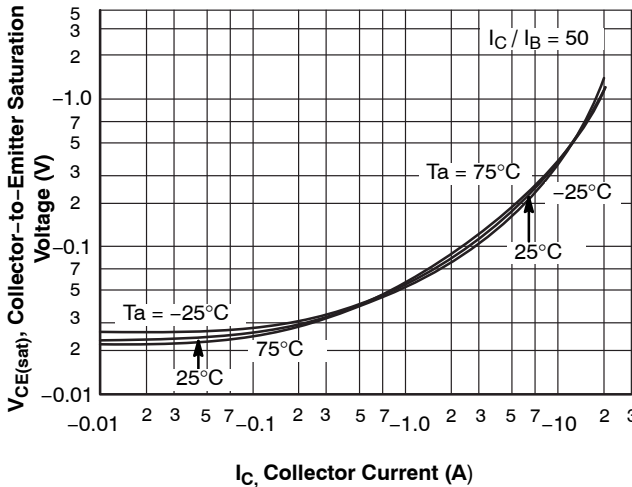


Figure 10.  $V_{CE(sat)} - I_C$

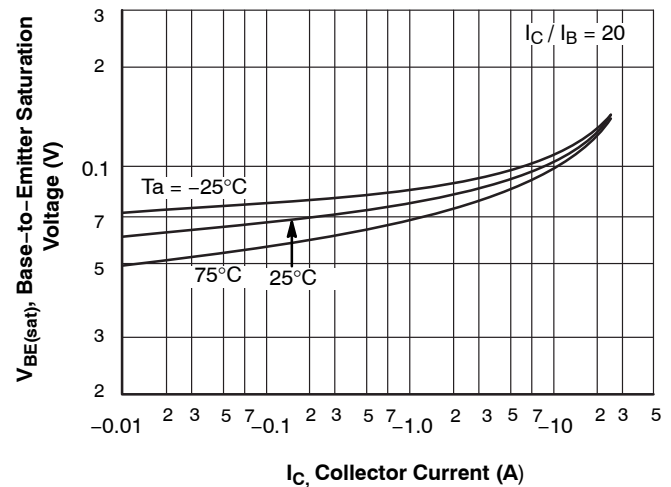


Figure 11.  $V_{BE(sat)} - I_C$

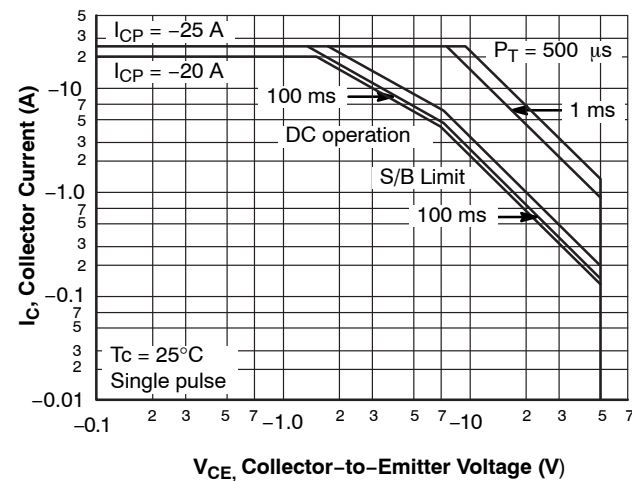


Figure 12. Forward Bias ASO

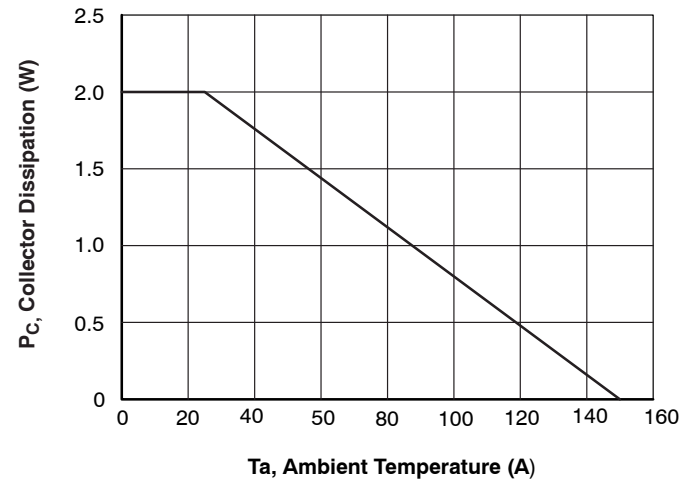


Figure 13.  $P_C - T_a$

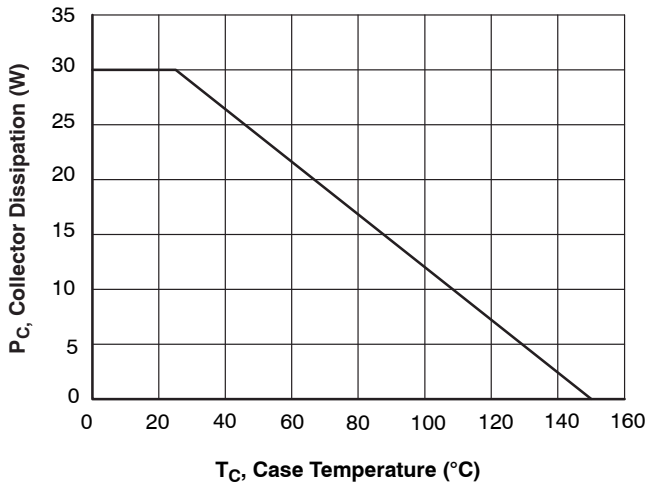
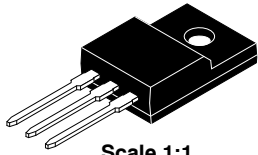


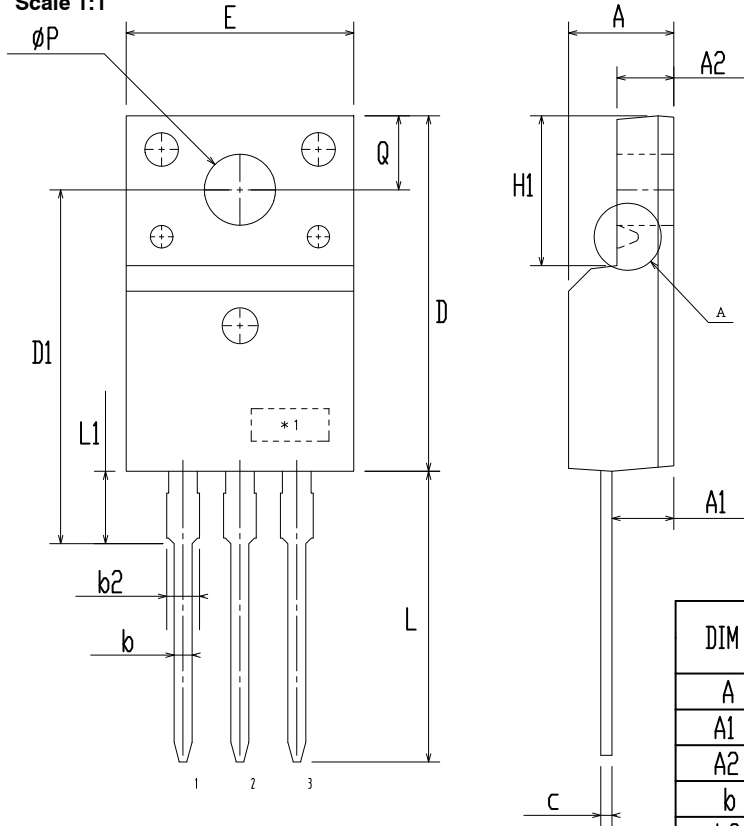
Figure 14.  $P_C - T_C$

**TO-220 Fullpack, 3-Lead / TO-220F-3SG**  
**CASE 221AT**  
**ISSUE B**

DATE 19 JAN 2021



Scale 1:1



DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.50	4.70	4.90
A1	2.56	2.76	2.96
A2	2.34	2.54	2.74
b	0.70	0.80	0.90
b2	~	~	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.60	15.80	16.00
E	9.96	10.16	10.36
e	2.34	2.54	2.74
F	~	0.84	~
H1	6.48	6.68	6.88
L	12.78	12.98	13.18
L1	3.03	3.23	3.43
∅ P	2.98	3.18	3.38
∅ P1	~	1.00	~
Q	3.20	3.30	3.40

**NOTES:**

- A. DIMENSION AND TOLERANCE AS ASME Y14.5-2009
- B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUCTIONS.
- C. OPTION 1 - WITH SUPPORT PIN HOLE  
OPTION 2 - NO SUPPORT PIN HOLE

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