

# Bipolar Transistor

50 V, 10 A, Low  $V_{CE(sat)}$ ,  
NPN TO-220F-3FS

## 2SC6144SG

### Features

- Adoption of MBIT Process
- Large Current Capacitance ( $I_C = 10\text{ A}$ )
- Low Collector-to-Emitter Saturation Voltage ( $V_{CE(sat)} = 180\text{ mV (typ.)}$ )
- High-speed Switching ( $t_f = 25\text{ ns (typ.)}$ )

### Applications

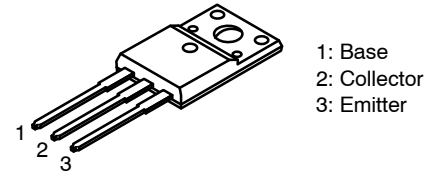
- Relay Drivers, Lamp Drivers, Motor Drivers

### Specifications

#### ABSOLUTE MAXIMUM RATINGS at $T_a = 25^\circ\text{C}$

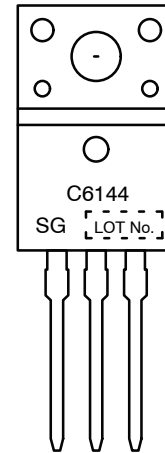
Parameter	Symbol	Conditions	Ratings	Units
Collector-to-Base Voltage	$V_{CBO}$		60	V
Collector-to-Emitter Voltage	$V_{CEO}$		50	V
Emitter-to-Base Voltage	$V_{EBO}$		5	V
Collector Current	$I_C$		10	A
Collector Current (Pulse)	$I_{CP}$		13	A
Base Current	$I_B$		2	A
Collector Dissipation	$P_C$	$T_C = 25^\circ\text{C}$ , $P_T \leq 1\text{ s}$	25	W
Junction Temperature	$T_j$		150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

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.

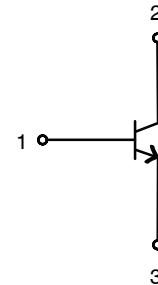


TO-220F-3FS  
CASE 221AM

### MARKING DIAGRAM



### ELECTRICAL CONNECTION



### ORDERING INFORMATION

Device	Package	Shipping
2SC6144SG	TO-220F-3FS (Pb-Free)	50 Units / Tube

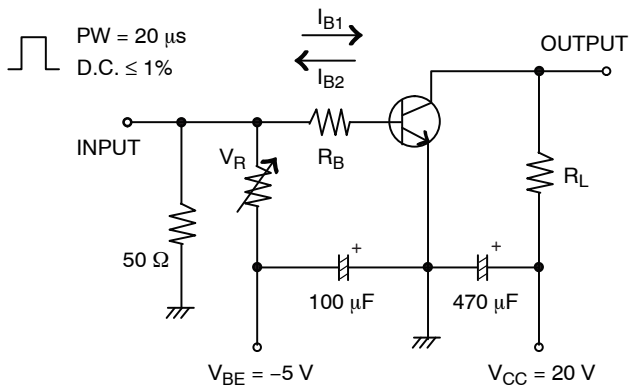
## 2SC6144SG

### ELECTRICAL CHARACTERISTICS at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Units
			Min	Typ	Max	
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	$h_{FE}$	$V_{CE} = 2\text{ V}, I_C = 270\text{ mA}$	200	–	560	
Gain–Bandwidth Product	$f_T$	$V_{CE} = 10\text{ V}, I_C = 3\text{ A}$	–	330	–	MHz
Output Capacitance	$C_{ob}$	$V_{CB} = 10\text{ V}, f = 1\text{ MHz}$	–	60	–	pF
Collector–to–Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 6\text{ A}, I_B = 300\text{ mA}$	–	180	360	mV
Base–to–Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = 6\text{ A}, I_B = 300\text{ mA}$	–	–	1.2	V
Collector–to–Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = 100\ \mu\text{A}, I_E = 0\text{ A}$	60	–	–	V
Collector–to–Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 1\text{ mA}, R_{BE} = \infty$	50	–	–	V
Emitter–to–Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = 100\ \mu\text{A}, I_C = 0\text{ A}$	5	–	–	V
Turn–On Time	$t_{ON}$	See specified Test Circuit.	–	62	–	ns
Storage Time	$t_{stg}$		–	350	–	ns
Fall Time	$t_f$		–	25	–	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



$$I_C = 20\text{ A} \quad I_{B1} = -20\text{ A} \quad I_{B2} = 5\text{ A}$$

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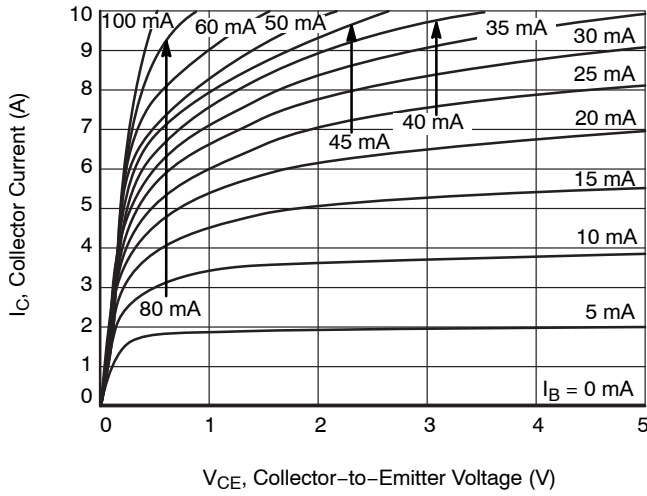


Figure 1.  $I_C - V_{CE}$

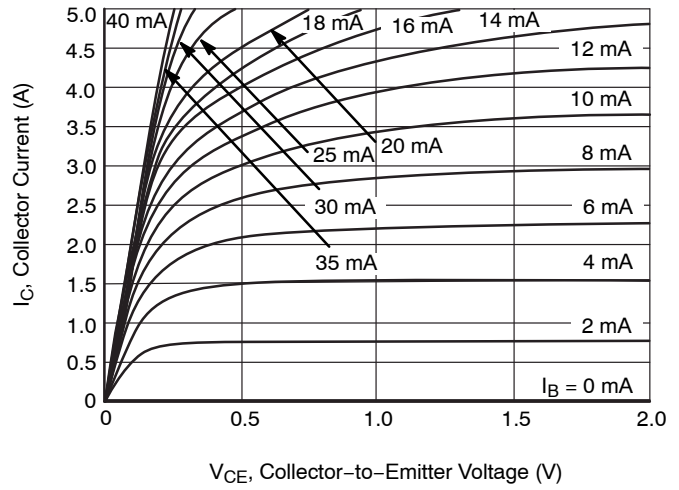


Figure 2.  $I_C - V_{CE}$

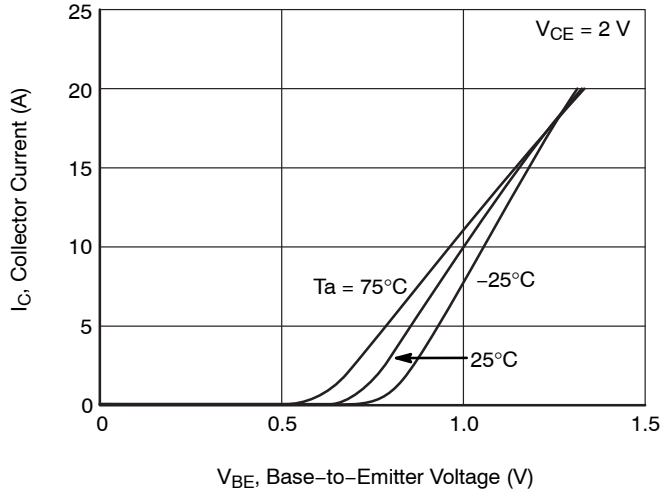


Figure 3.  $I_C - V_{BE}$

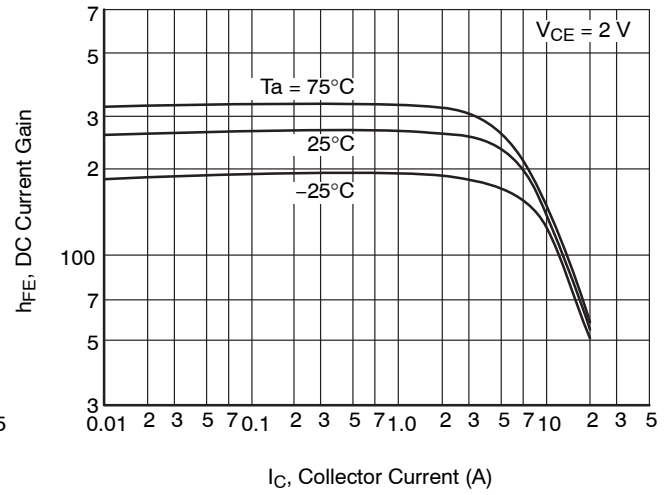


Figure 4.  $h_{FE} - I_C$

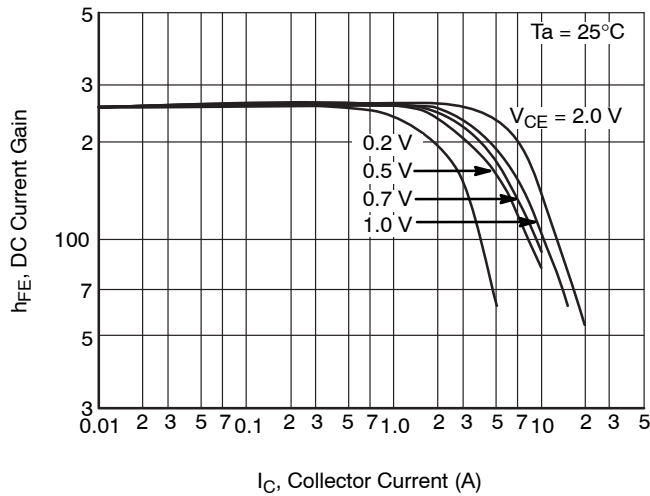


Figure 5.  $h_{FE} - I_C$

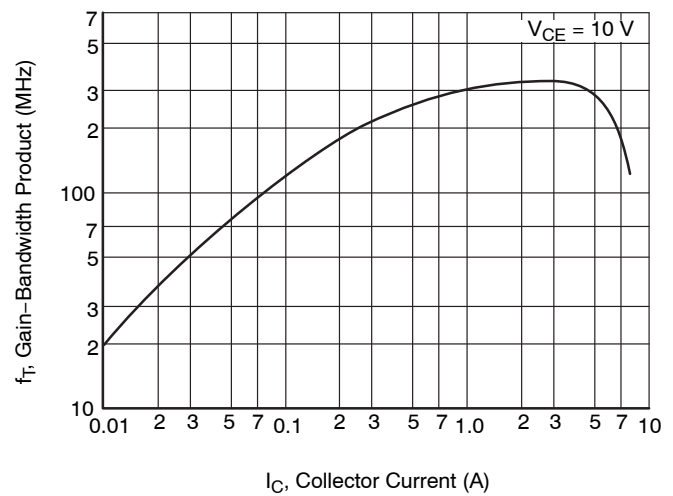
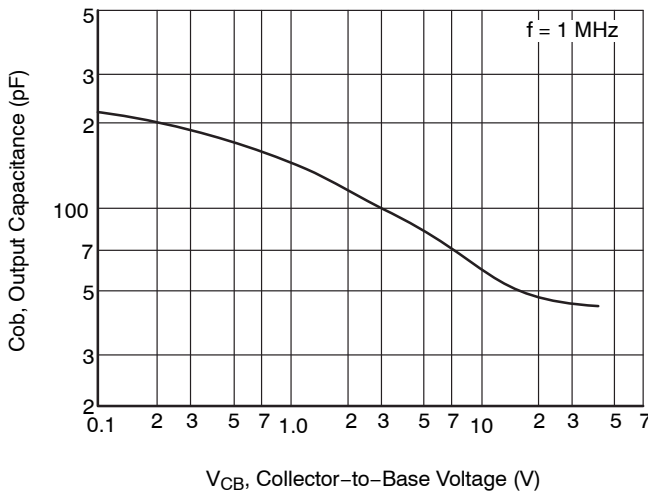
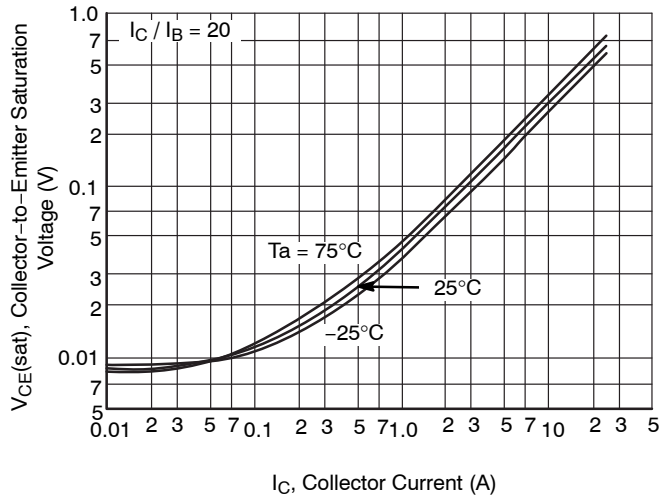


Figure 6.  $f_T - I_C$

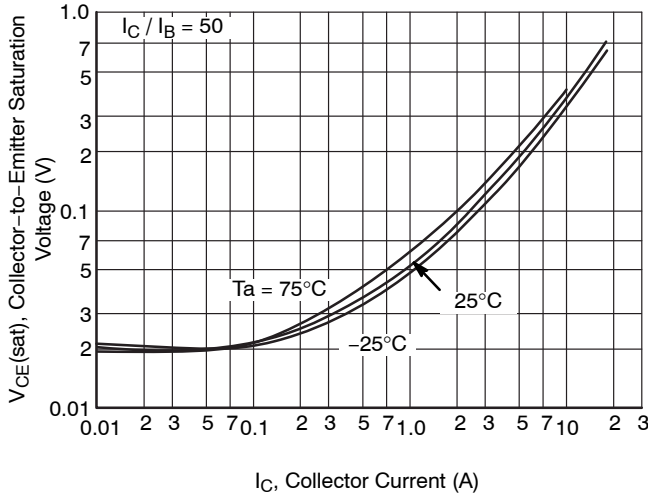
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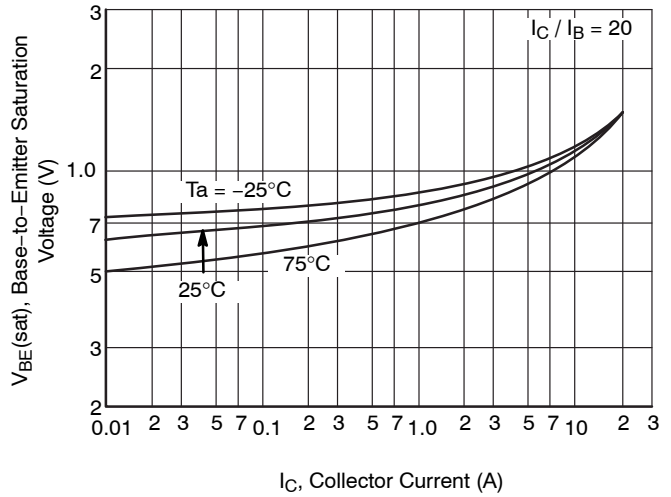
**Figure 7. Cob - VCB**



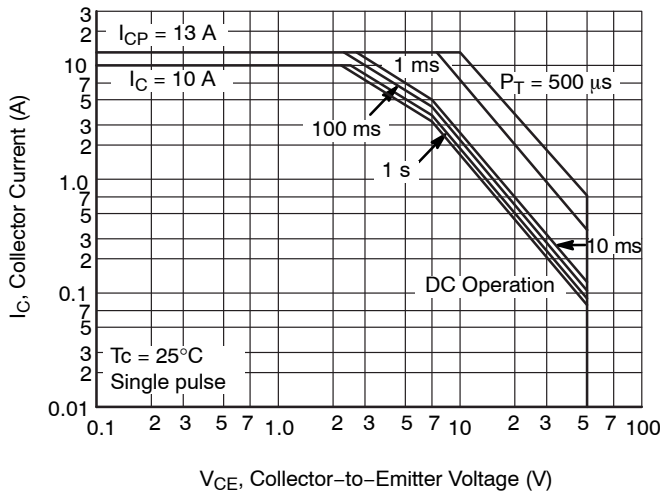
**Figure 8. VCE(sat) - IC**



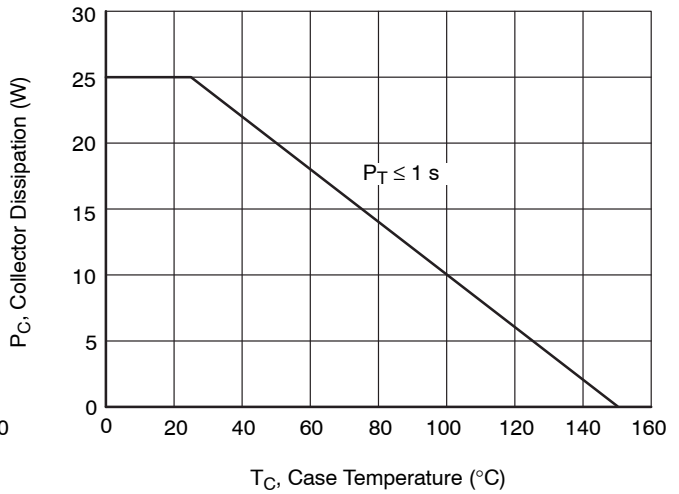
**Figure 9. VCE(sat) - IC**



**Figure 10. VBE(sat) - IC**



**Figure 11. Forward Bias ASO**

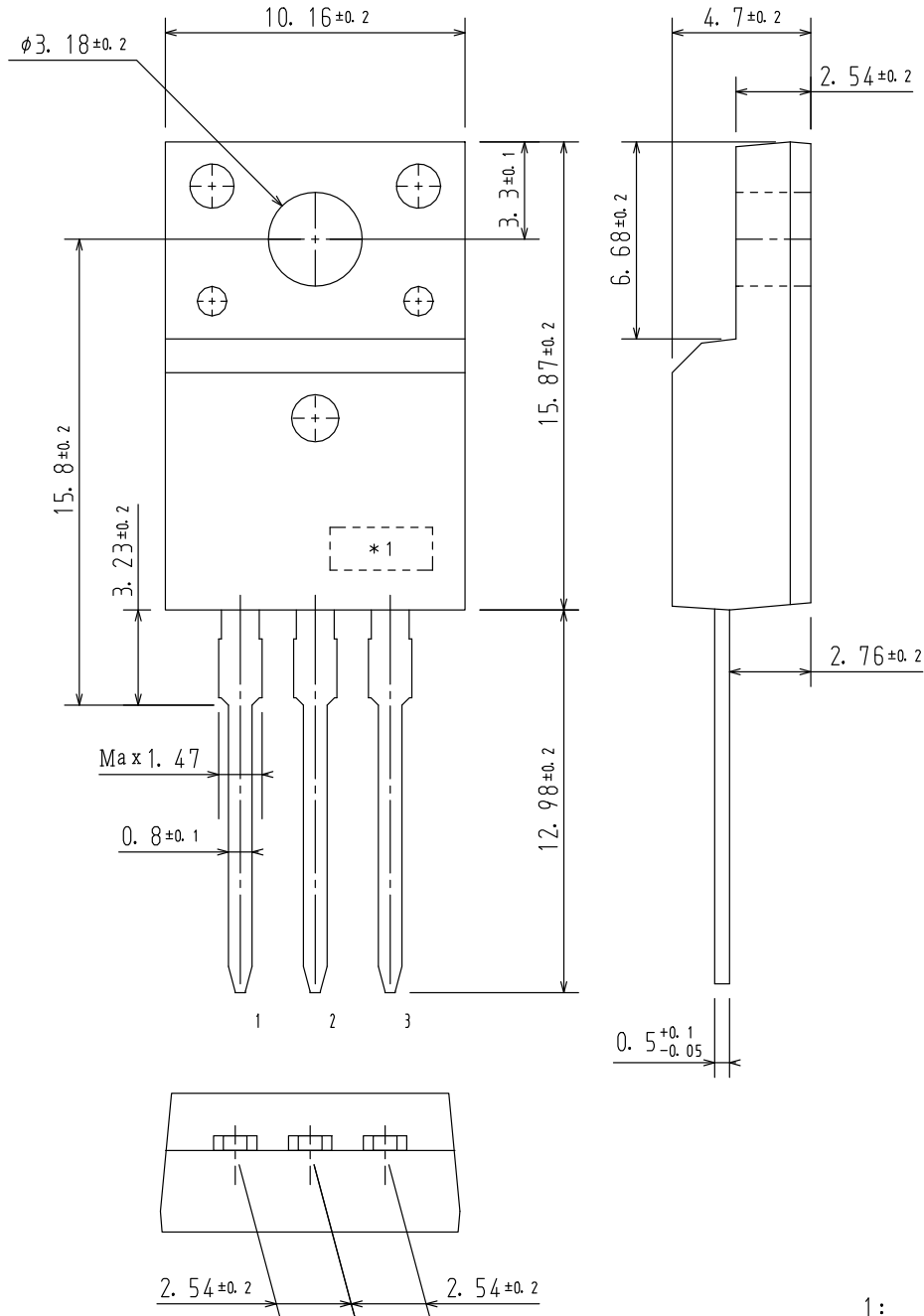


**Figure 12. PC - TC**

**MECHANICAL CASE OUTLINE**  
**PACKAGE DIMENSIONS**

**TO-220F-3FS**  
**CASE 221AM**  
**ISSUE O**

DATE 30 JAN 2012



\*1 Lot indication

1:  
2:  
3:

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