



## 2SB904/2SD1213

### 30V/12A High-Speed Switching Applications

#### Applications

- Large current switching of relay drivers, high-speed inverters, converters.

#### Features

- Low collector-to-emitter saturation voltage :  $V_{CE(sat)} = -0.5V$  (PNP),  $0.4V$  (NPN) max.
- Large current capacity.

( ) : 2SB904

#### Specifications

##### Absolute Maximum Ratings at $T_a = 25^\circ C$

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	$V_{CBO}$		(-)60	V
Collector-to-Emitter Voltage	$V_{CEO}$		(-)30	V
Emitter-to-Base Voltage	$V_{EBO}$		(-)6	V
Collector Current	$I_C$		(-)20	A
Collector Current (Pulse)	$I_{CP}$		(-)30	A
Collector Dissipation	$P_C$		2.5	W
		$T_c = 25^\circ C$	60	W
Junction Temperature	$T_j$		150	$^\circ C$
Storage Temperature	$T_{stg}$		-55 to +150	$^\circ C$

##### Electrical Characteristics at $T_a = 25^\circ C$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	$I_{CBO}$	$V_{CB} = (-)40V, I_E = 0$			(-)0.1	mA
Emitter Cutoff Current	$I_{EBO}$	$V_{EB} = (-)4V, I_C = 0$			(-)0.1	mA
DC Current Gain	$h_{FE1}$	$V_{CE} = (-)2V, I_C = (-)1A$	70*		280*	
	$h_{FE2}$	$V_{CE} = (-)2V, I_C = (-)10A$	30			
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = (-)8A, I_B = (-)0.4A$		(-)0.25	(-)0.5	V
				0.2	0.4	V

\* : The 2SB904/2SD1213 are classified as follows according to  $h_{FE}$  at 1A.

70	Q	140	100	R	200	140	S	280
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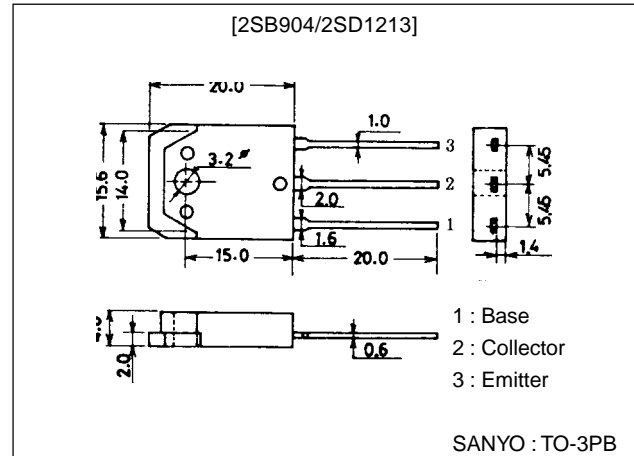
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#### Package Dimensions

unit:mm

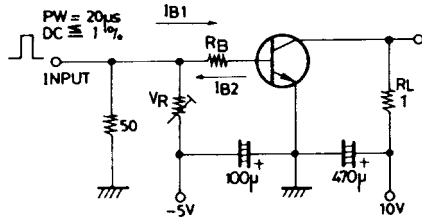
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# 2SB904/2SD1213

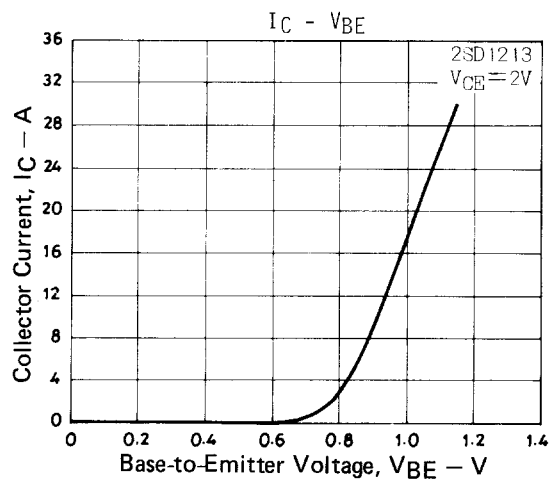
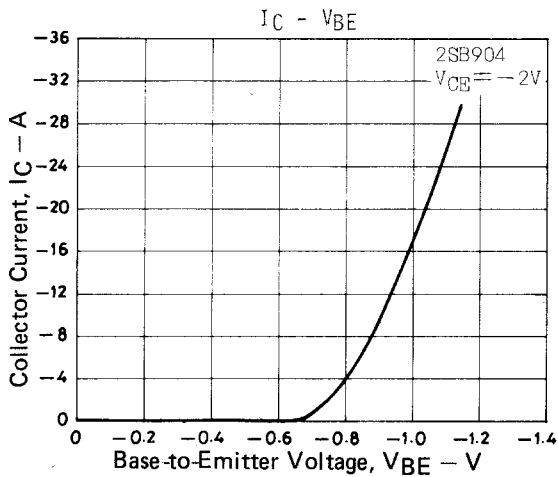
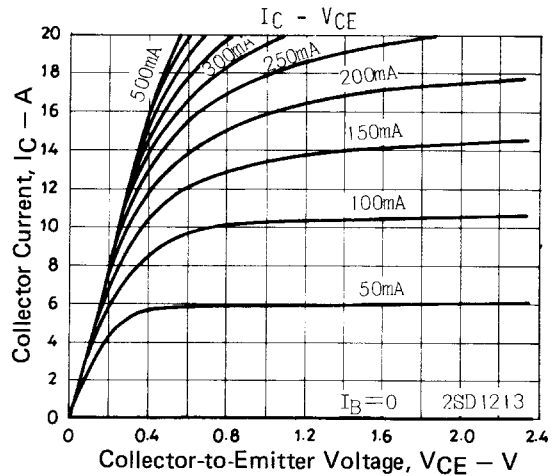
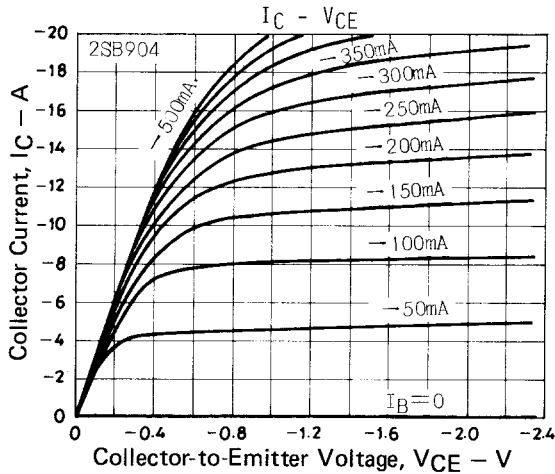
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Gain-Bandwidth Product	$f_T$	$V_{CE}=(-)5V, I_C=(-)1A$		120		MHz
Collector-to-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C=(-)1mA, I_E=0$	(-)60			V
Collector-to-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C=(-)1mA, R_{BE}=\infty$	(-)30			V
Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E=(-)1mA, I_C=0$	(-)6			V
Turn-ON Time	$t_{on}$	See specified Test Circuit		300		ns
Storage Time	$t_{stg}$	See specified Test Circuit		(300)		ns
				600		ns
Fall Time	$t_f$	See specified Test Circuit		20		ns

## Switching Time Test Circuit

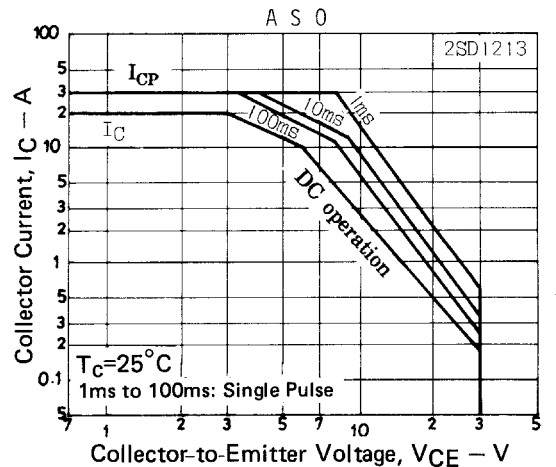
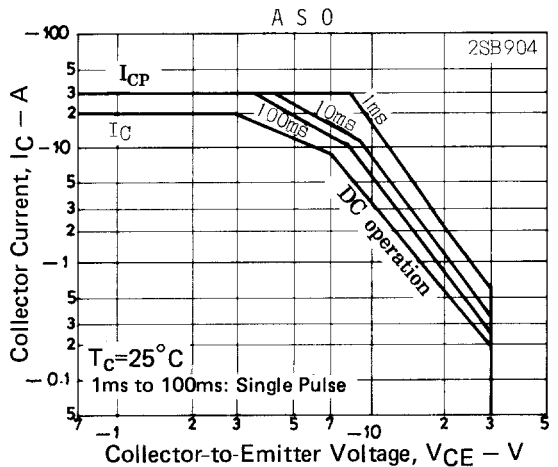
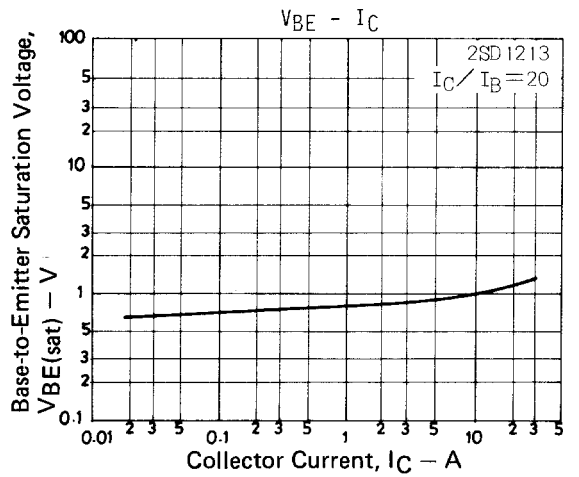
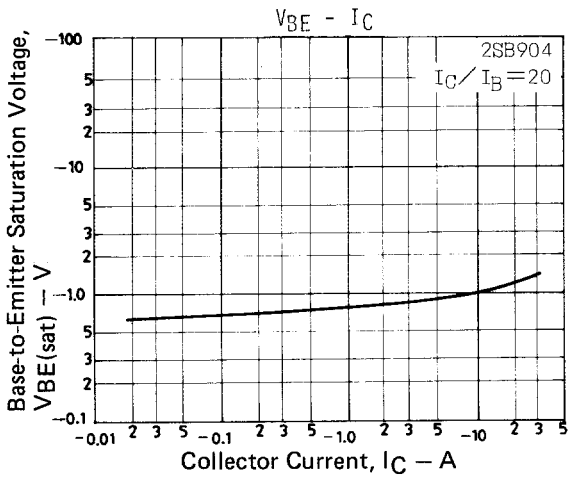
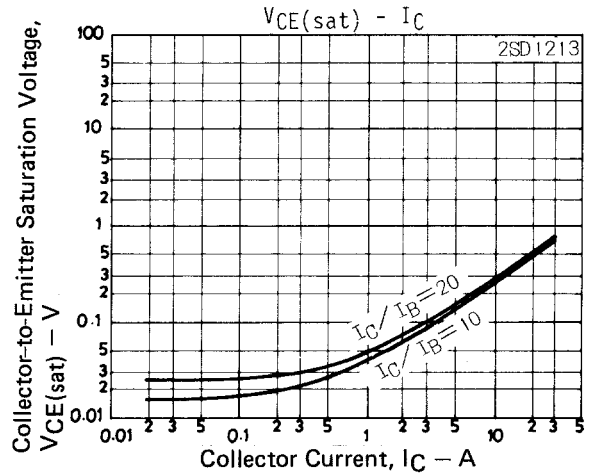
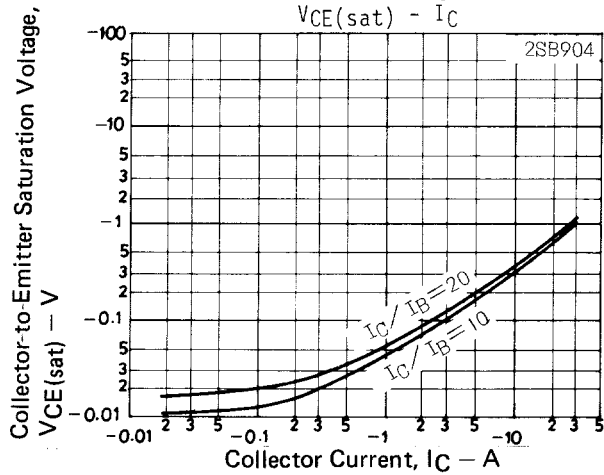
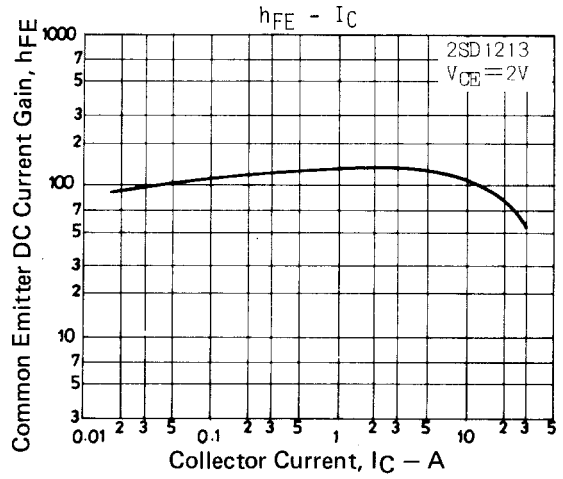
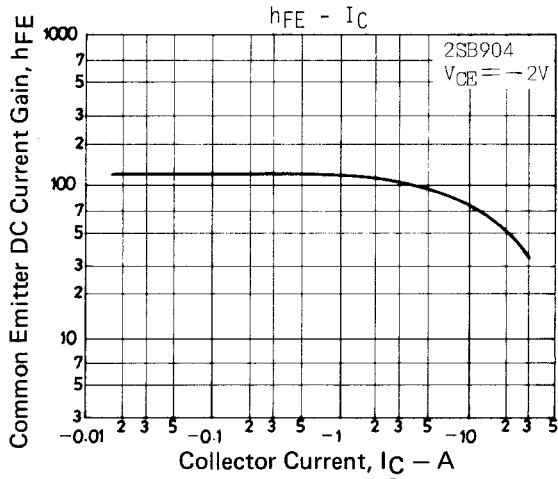


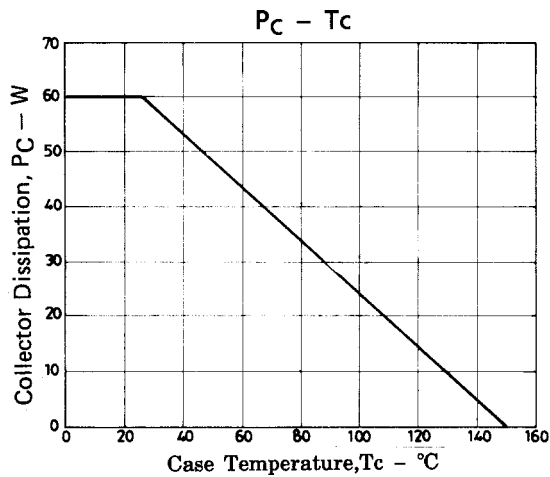
$$20I_{B1} = -20I_{B2} = I_C = 10A$$

(For PNP, the polarity is reversed)  
Unit (resistance :  $\Omega$ , capacitance : F)



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