Ordering number: EN2046A

SANYO No.2046A

# 2SB1165/2SD1722

PNP/NPN Epitaxial Planar Silicon Transistors

## 50V/5A Switching Applications

**Applications**

. Relay drivers, high-speed inverters, converters

**Features**

. Low collector-to-emitter saturation voltage
. High $f_T$
. Excellent linearity of $h_{FE}$
. Fast switching time

( ): 2SB1165

**Absolute Maximum Ratings at** Ta=25°C

| | | | | unit |
|---|---|---|---|---|
| Collector-to-Base Voltage | $V_{CBO}$ | | (-)60 | V |
| Collector-to-Emitter Voltage | $V_{CEO}$ | | (-)50 | V |
| Emitter-to-Base Voltage | $V_{EBO}$ | | (-)6 | V |
| Collector Current | $I_C$ | | (-)5 | A |
| Collector Current (Pulse) | $I_{CP}$ | | (-)8 | A |
| Collector Dissipation | $P_C$ | | 1.2 | W |
| | | Tc=25°C | 20 | W |
| Junction Temperature | Tj | | 150 | °C |
| Storage Temperature | Tstg | | -55 to +150 | °C |

**Electrical Characteristics at** Ta=25°C

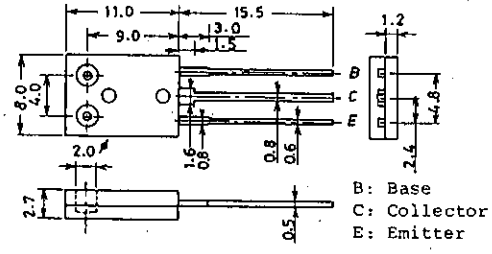
| | | | min | typ | max | unit |
|---|---|---|---|---|---|---|
| Collector Cutoff Current | $I_{CBO}$ | $V_{CB}$=(-)40V, $I_E$=0 | | | (-)1 | μA |
| Emitter Cutoff Current | $I_{EBO}$ | $V_{EB}$=(-)4V, $I_C$=0 | | | (-)1 | μA |
| DC Current Gain | $h_{FE}(1)$ | $V_{CE}$=(-)2V, $I_C$=(-)0.5A | 70 | | 400* | |
| | $h_{FE}(2)$ | $V_{CE}$=(-)2V, $I_C$=(-)4A | 35 | | | |
| Gain-Bandwidth Product | $f_T$ | $V_{CE}$=(-)5V, $I_C$=(-)1A | | 180 | | MHz |
| | | | | (130) | | MHz |
| Output Capacitance | $C_{ob}$ | $V_{CB}$=(-)10V, f=1MHz | | 40 | | pF |
| | | | | (60) | | pF |
| C-E Saturation Voltage | $V_{CE(sat)}$ | $I_C$=(-)3A, $I_B$=(-)0.15A | | 220 | 400 | mV |
| | | | | (-280) | (-550) | mV |

Continued on next page.

*: The 2SB1165/2SD1722 are classified by 0.5A $h_{FE}$ as follows:

| | | | |
|---|---|---|---|
| 70 Q 140 | 100 R 200 | 140 S 280 | 200 T 400 |

**Package Dimensions** 2043A
(unit:mm)




B: Base
C: Collector
E: Emitter

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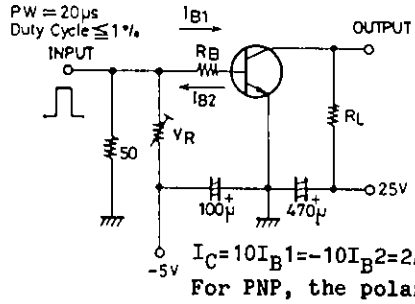
TOKYO OFFICE Tokyo Bldg.,1-10,1 Chome, Ueno, Taito-ku, TOKYO, 110 JAPAN

Continued from preceding page.

| | | | min | typ | max | unit |
|---|---|---|---|---|---|---|
| B-E Saturation Voltage | $V_{BE(sat)}$ | $I_C$=(-)3A, $I_B$=(-)0.15A | | (-)0.95 | (-)1.3 | V |
| C-B Breakdown Voltage | $V_{(BR)CBO}$ | $I_C$=(-)10μA, $I_E$=0 | (-)60 | | | V |
| C-E Breakdown Voltage | $V_{(BR)CEO}$ | $I_C$=(-)1mA, $R_{BE}$=∞ | (-)50 | | | V |
| E-B Breakdown Voltage | $V_{(BR)EBO}$ | $I_E$=(-)10μA, $I_C$=0 | (-)6 | | | V |
| Turn-on Time | $t_{on}$ | See specified Test Circuit. | | 50 | | ns |
| | | | | (50) | | ns |
| Storage Time | tstg | " | | 500 | | ns |
| | | | | (450) | | ns |
| Fall Time | $t_f$ | " | | 20 | | ns |
| | | | | (20) | | ns |

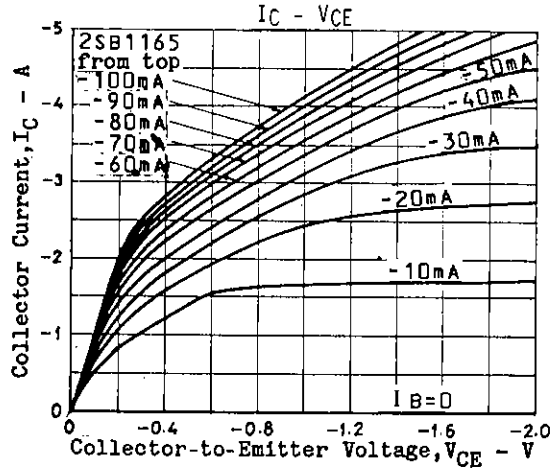
**Switching Time Test Circuit**

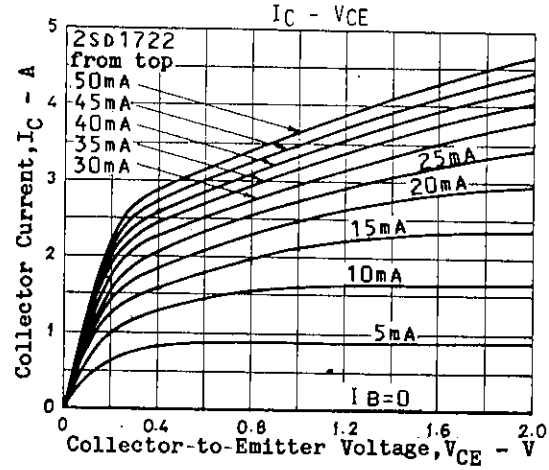


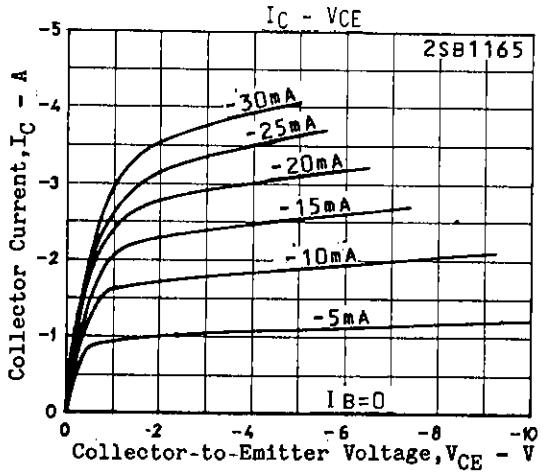

$I_C = 10I_{B1} = -10I_{B2} = 2A$

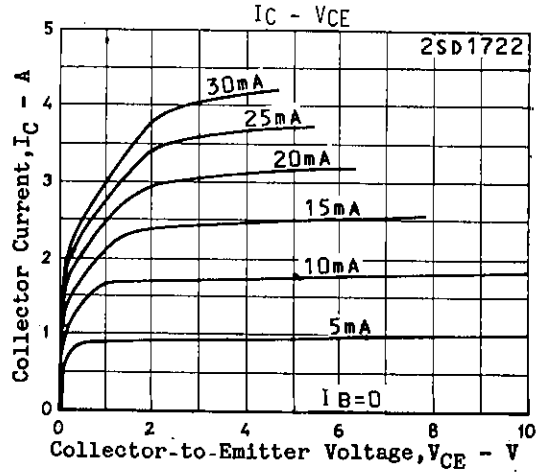
**For PNP, the polarity is reversed.**

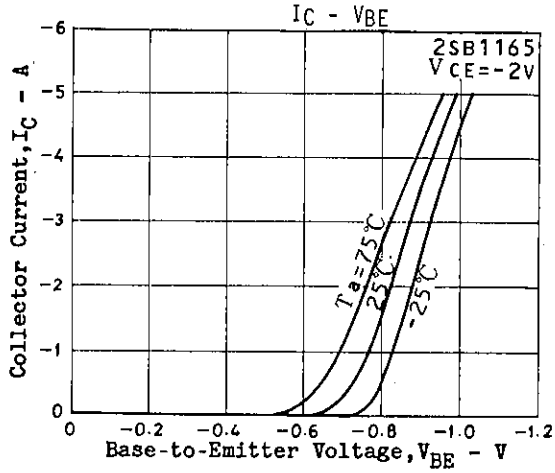
Unit (Resistance : Ω, Capacitance : F)

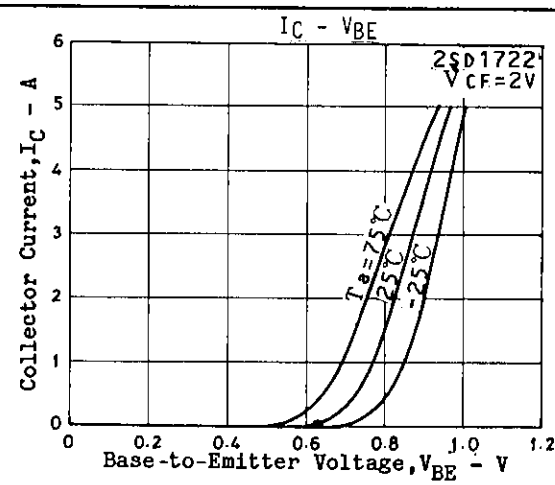


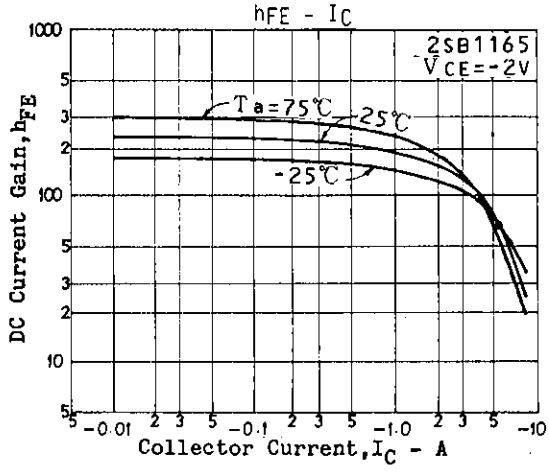



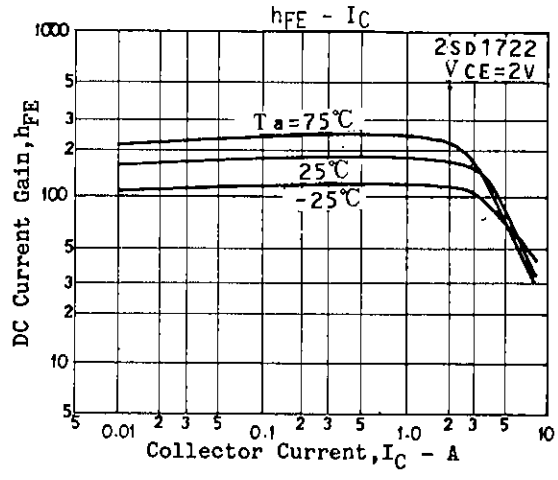



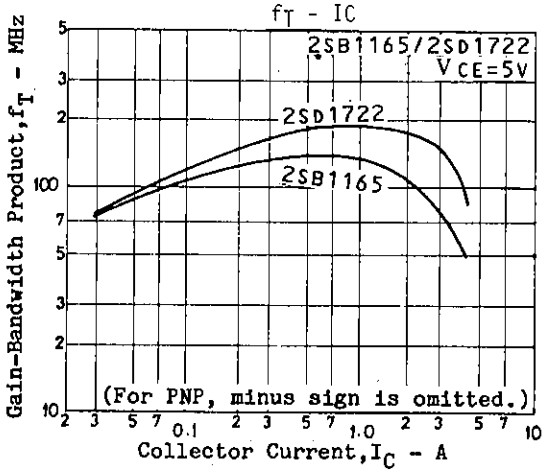



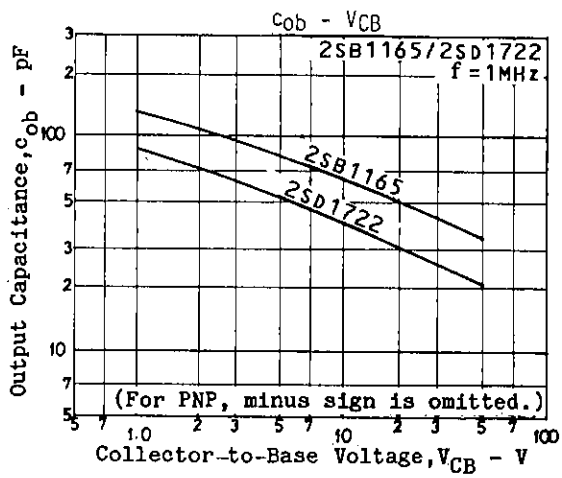

IC - VBE
2SB1165
VCE=-2V
Ta=75℃
25℃
-25℃
Collector Current, IC - A
Base-to-Emitter Voltage, VBE - V

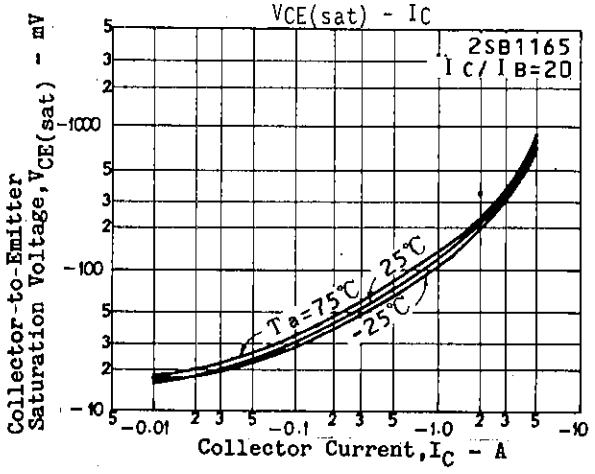

IC - VBE
2SD1722
VCE=2V
Ta=75℃
25℃
-25℃
Collector Current, IC - A
Base-to-Emitter Voltage, VBE - V

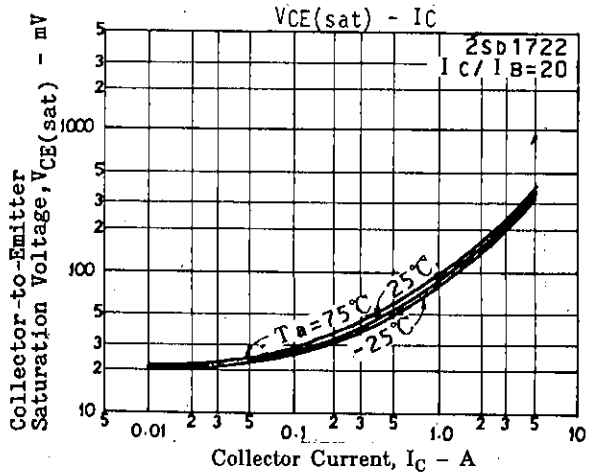

hFE - IC
2SB1165
VCE=-2V
Ta=75℃
25℃
-25℃
DC Current Gain, hFE
Collector Current, IC - A


hFE - IC
2SD1722
VCE=2V
Ta=75℃
25℃
-25℃
DC Current Gain, hFE
Collector Current, IC - A


fT - IC
2SB1165/2SD1722
VCE=5V
2SD1722
2SB1165
(For PNP, minus sign is omitted.)
Gain-Bandwidth Product, fT - MHz
Collector Current, IC - A


Cob - VCB
2SB1165/2SD1722
f=1MHz
2SB1165
2SD1722
(For PNP, minus sign is omitted.)
Output Capacitance, Cob - pF
Collector-to-Base Voltage, VCB - V


VCE(sat) - IC
2SB1165
IC/IB=20
Ta=75℃
25℃
-25℃
Collector-to-Emitter Saturation Voltage, VCE(sat) - mV
Collector Current, IC - A


VCE(sat) - IC
2SD1722
IC/IB=20
Ta=75℃
25℃
-25℃
Collector-to-Emitter Saturation Voltage, VCE(sat) - mV
Collector Current, IC - A