

# Low frequency transistor (−20V, −5A)

## 2SB1386 / 2SB1412 / 2SB1326

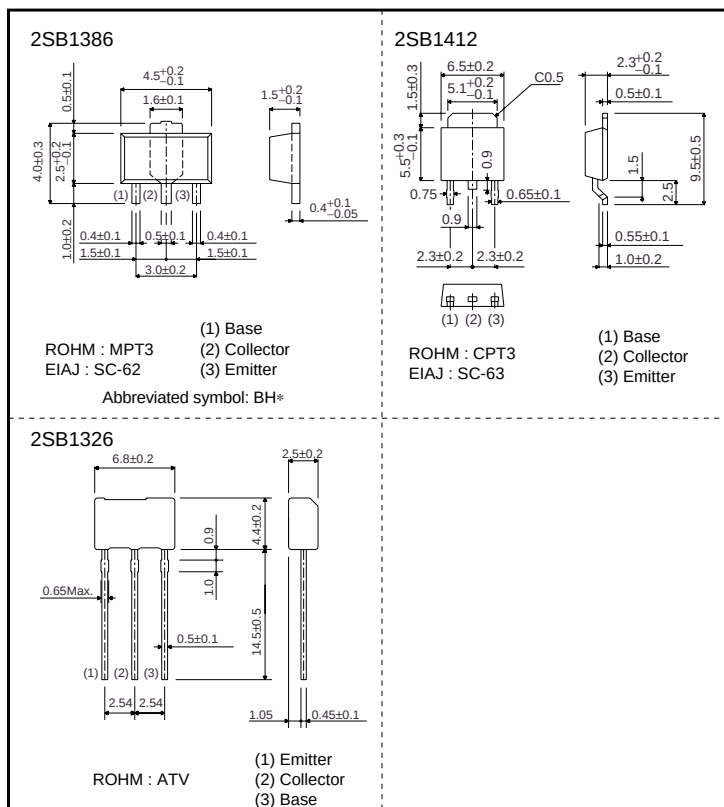
### ●Features

- 1) Low  $V_{CE(sat)}$ .  
 $V_{CE(sat)} = -0.35V$  (Typ.)  
( $I_C/I_B = -4A / -0.1A$ )
- 2) Excellent DC current gain characteristics.
- 3) Complements the 2SD2098 / 2SD2118 / 2SD2097.

### ●Structure

Epitaxial planar type  
PNP silicon transistor

### ●External dimensions (Units : mm)



# 2SB1386 / 2SB1412 / 2SB1326

## Transistors

### ●Absolute maximum ratings (Ta=25°C)

| Parameter                   |         | Symbol           | Limits   | Unit                    |
|-----------------------------|---------|------------------|----------|-------------------------|
| Collector-base voltage      |         | V <sub>CB0</sub> | −30      | V                       |
| Collector-emitter voltage   |         | V <sub>CE0</sub> | −20      | V                       |
| Emitter-base voltage        |         | V <sub>EB0</sub> | −6       | V                       |
| Collector current           |         | I <sub>C</sub>   | −5       | A(DC)                   |
|                             |         |                  | −10      | A(Pulse) *1             |
| Collector power dissipation | 2SB1386 | P <sub>C</sub>   | 0.5      | W                       |
|                             |         |                  | 2        | W *2                    |
|                             | 2SB1412 |                  | 1        | W                       |
|                             |         |                  | 10       | W(T <sub>C</sub> =25°C) |
|                             | 2SB1326 |                  | 1        | W *3                    |
| Junction temperature        |         | T <sub>J</sub>   | 150      | °C                      |
| Storage temperature         |         | T <sub>stg</sub> | −55~+150 | °C                      |

\*1 Single pulse, Pw=10ms

\*2 When mounted on a 40×40×0.7 mm ceramic board.

\*3 Printed circuit board glass epoxy board 1.6 mm thick with copper plating 100mm<sup>2</sup> or larger.

### ●Electrical characteristics (Ta=25°C)

| Parameter                            |                 | Symbol               | Min. | Typ. | Max. | Unit | Conditions                                          |
|--------------------------------------|-----------------|----------------------|------|------|------|------|-----------------------------------------------------|
| Collector-base breakdown voltage     |                 | BV <sub>CB0</sub>    | −30  | −    | −    | V    | I <sub>C</sub> =−50μA                               |
| Collector-emitter breakdown voltage  |                 | BV <sub>CE0</sub>    | −20  | −    | −    | V    | I <sub>C</sub> =−1mA                                |
| Emitter-base breakdown voltage       |                 | BV <sub>EB0</sub>    | −6   | −    | −    | V    | I <sub>E</sub> =−50μA                               |
| Collector cutoff current             |                 | I <sub>CB0</sub>     | −    | −    | −0.5 | μA   | V <sub>CB</sub> =−20V                               |
| Emitter cutoff current               |                 | I <sub>EB0</sub>     | −    | −    | −0.5 | μA   | V <sub>EB</sub> =−5V                                |
| Collector-emitter saturation voltage |                 | V <sub>CE(sat)</sub> | −    | −    | −1.0 | V    | I <sub>C</sub> /I <sub>B</sub> =−4A/−0.1A           |
| DC current transfer ratio            | 2SB1386,2SB1412 | h <sub>FE</sub>      | 82   | −    | 390  | −    | V <sub>CE</sub> =−2V, I <sub>C</sub> =−0.5A         |
|                                      | 2SB1326         |                      | 120  | −    | 390  | −    |                                                     |
| Transition frequency                 |                 | f <sub>T</sub>       | −    | 120  | −    | MHz  | V <sub>CE</sub> =−6V, I <sub>E</sub> =50mA, f=30MHz |
| Output capacitance                   |                 | C <sub>ob</sub>      | −    | 60   | −    | pF   | V <sub>CB</sub> =−20V, I <sub>E</sub> =0A, f=1MHz   |

\*Measured using pulse current.

### ●Packaging specifications and h<sub>FE</sub>

| Type    | h <sub>FE</sub> | Package                      | Taping |      |      |
|---------|-----------------|------------------------------|--------|------|------|
|         |                 | Code                         | T100   | TL   | TV2  |
|         |                 | Basic ordering unit (pieces) | 1000   | 2500 | 2500 |
| 2SB1386 | PQR             |                              | ○      | −    | −    |
| 2SB1412 | PQR             |                              | −      | ○    | −    |
| 2SB1326 | QR              |                              | −      | −    | ○    |

h<sub>FE</sub> values are classified as follows :

| Item            | P      | Q       | R       |
|-----------------|--------|---------|---------|
| h <sub>FE</sub> | 82~180 | 120~270 | 180~390 |

## Transistors

## ●Electrical characteristic curves

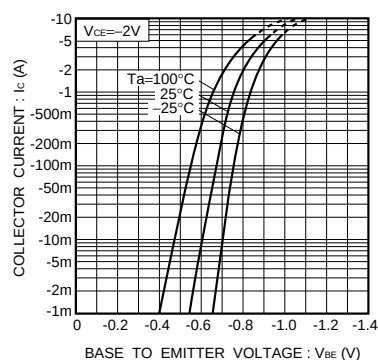


Fig.1 Grounded emitter propagation characteristics

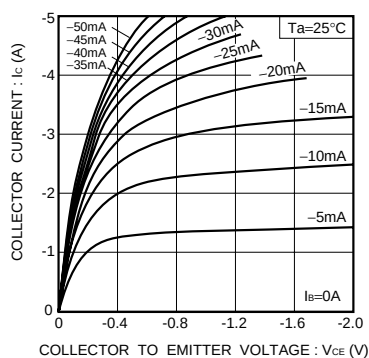


Fig.2 Grounded emitter output characteristics

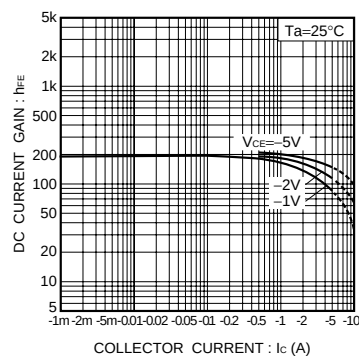


Fig.3 DC current gain vs. collector current (I)

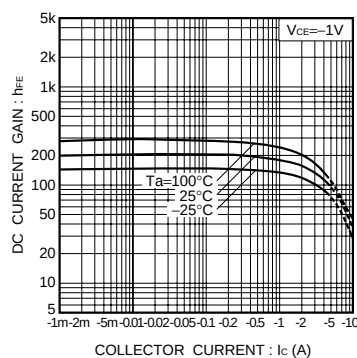


Fig.4 DC current gain vs. collector current (II)

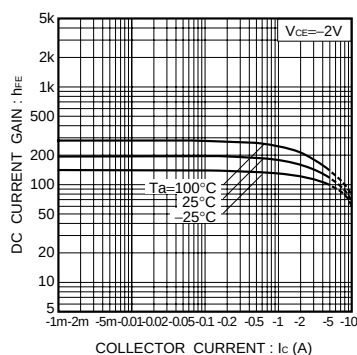


Fig.5 DC current gain vs. collector current (III)

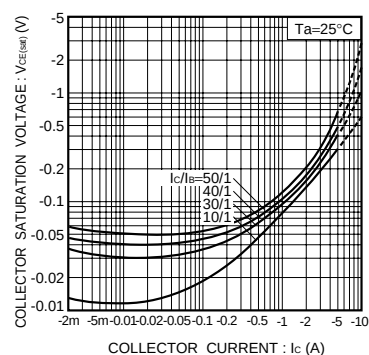


Fig.6 Collector-emitter saturation voltage vs. collector current (I)

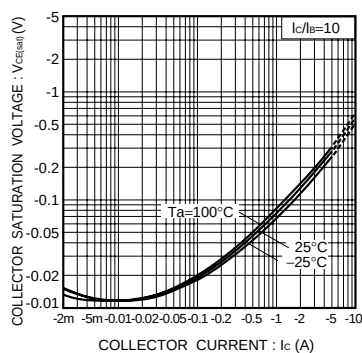


Fig.7 Collector-emitter saturation voltage vs. collector current (II)

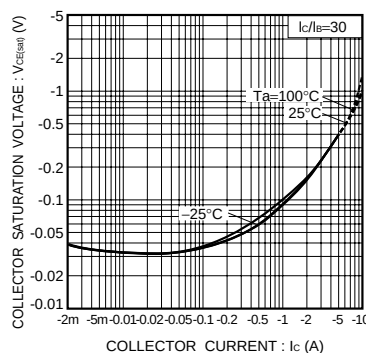


Fig.8 Collector-emitter saturation voltage vs. collector current (III)

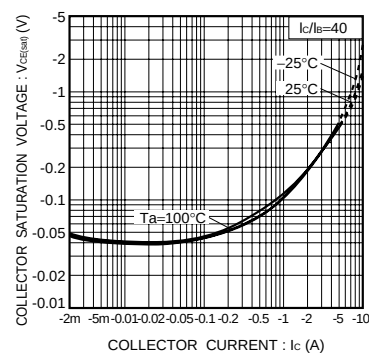


Fig.9 Collector-emitter saturation voltage vs. collector current (IV)

## Transistors

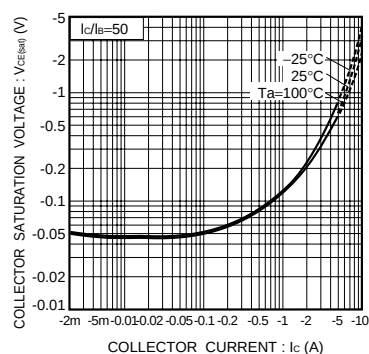


Fig.10 Collector-emitter saturation voltage vs. collector current (V)

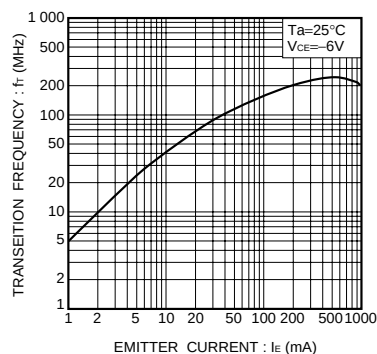


Fig.11 Gain bandwidth product vs. emitter current

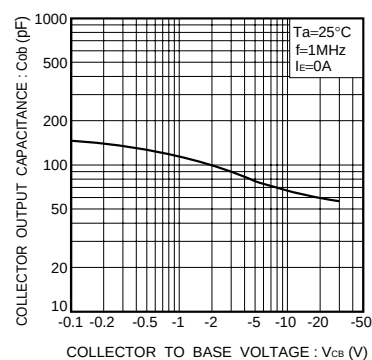


Fig.12 Collector output capacitance vs. collector-base voltage

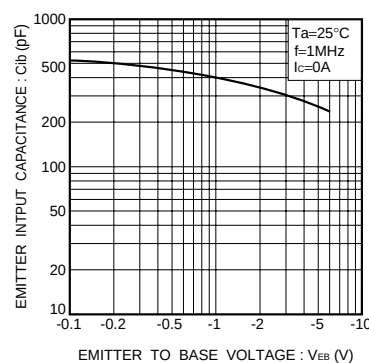


Fig.13 Emitter input capacitance vs. emitter-base voltage

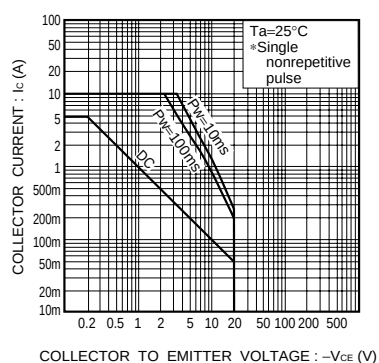


Fig.14 Safe operation area (2SB1412)