

Bipolar Transistors Silicon NPN Epitaxial Type

## 2SC4116

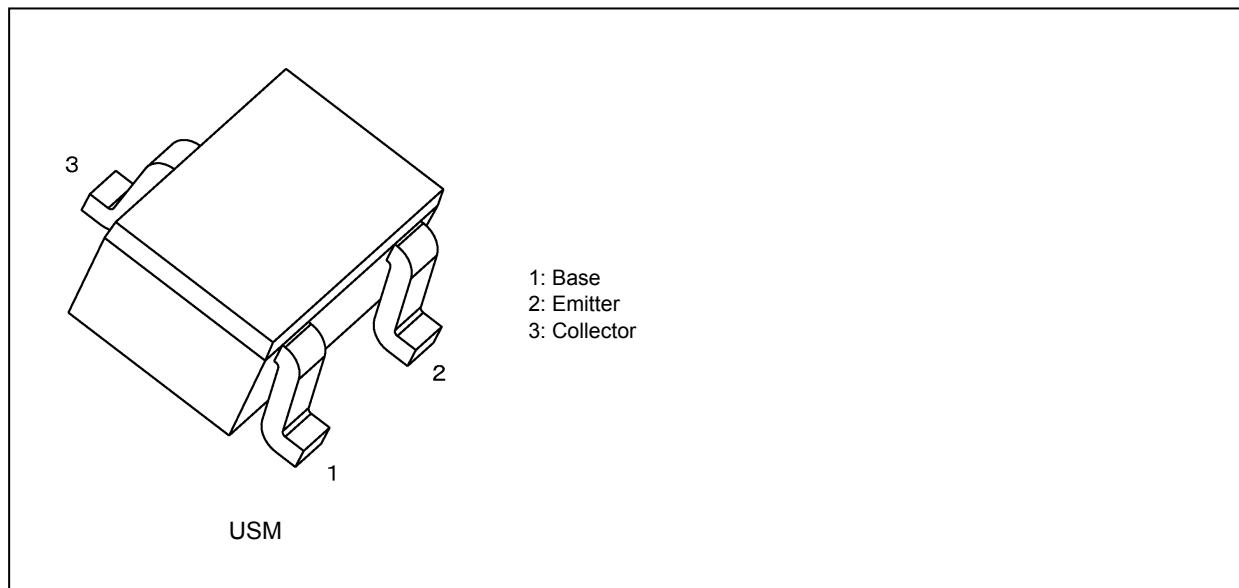
### 1. Applications

- Low-Frequency Amplifiers
- Audio Frequency General Purpose Amplifier Applications
- AM Amplifiers

### 2. Features

- (1) AEC-Q101 qualified (Please see the orderable part number list)
- (2) High voltage:  $V_{CEO} = 50\text{ V}$
- (3) High collector current:  $I_C = 150\text{ mA}$  (max)
- (4) High  $h_{FE}$ :  $h_{FE} = 70$  to  $700$
- (5) Excellent  $h_{FE}$  linearity:  $h_{FE}(I_C = 0.1\text{ mA})/h_{FE}(I_C = 2\text{ mA}) = 0.95$  (typ.)
- (6) Low noise:  $NF = 1\text{ dB}$  (typ.),  $10\text{ dB}$  (max)
- (7) Complementary to 2SA1586
- (8) Small package

### 3. Packaging



Start of commercial production

1987-01

### 4. Orderable part number

| Orderable part number |                 | AEC-Q101     | Note                    |
|-----------------------|-----------------|--------------|-------------------------|
| 2SC4116-O             | 2SC4116-O,LF    | —            | General Use             |
|                       | 2SC4116-O,LXGF  | YES (Note 1) | Unintended Use (Note 1) |
|                       | 2SC4116-O,LXHF  | YES          | Automotive Use          |
| 2SC4116-Y             | 2SC4116-Y,LF    | —            | General Use             |
|                       | 2SC4116-Y,LXGF  | YES (Note 1) | Unintended Use (Note 1) |
|                       | 2SC4116-Y,LXHF  | YES          | Automotive Use          |
| 2SC4116-GR            | 2SC4116-GR,LF   | —            | General Use             |
|                       | 2SC4116-GR,LXGF | YES (Note 1) | Unintended Use (Note 1) |
|                       | 2SC4116-GR,LXHF | YES          | Automotive Use          |
| 2SC4116-BL            | 2SC4116-BL,LF   | —            | General Use             |
|                       | 2SC4116-BL,LXGF | YES (Note 1) | Unintended Use (Note 1) |
|                       | 2SC4116-BL,LXHF | YES          | Automotive Use          |

Note 1: For more information, please contact our sales or use the inquiry form on our website.

### 5. Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a = 25^\circ\text{C}$ )

| Characteristics             |                    | Symbol    | Rating     | Unit             |
|-----------------------------|--------------------|-----------|------------|------------------|
| Collector-base voltage      |                    | $V_{CBO}$ | 60         | V                |
| Collector-emitter voltage   |                    | $V_{CEO}$ | 50         | V                |
| Emitter-base voltage        |                    | $V_{EBO}$ | 5          | V                |
| Collector current (DC)      |                    | $I_C$     | 150        | mA               |
| Base current                |                    | $I_B$     | 30         | mA               |
| Collector power dissipation | (Note 2), (Note 4) | $P_C$     | 200        | mW               |
|                             | (Note 3)           |           | 100        |                  |
| Junction temperature        | (Note 2)           | $T_j$     | 150        | $^\circ\text{C}$ |
|                             | (Note 3)           |           | 125        |                  |
| Storage temperature         | (Note 2)           | $T_{stg}$ | -55 to 150 | $^\circ\text{C}$ |
|                             | (Note 3)           |           | -55 to 125 |                  |

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 2: For devices with the ordering part number ending in LF(T).

Note 3: For devices with the ordering part number ending in XGF(T, XHF(T).

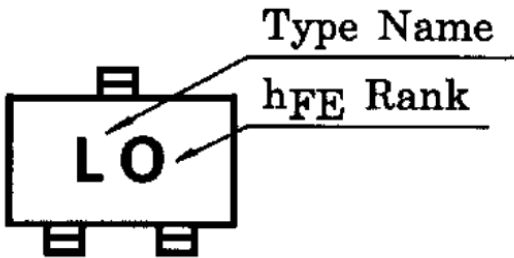
Note 4: Device mounted on an 25.4 mm × 25.4 mm × 1.6 mm FR4 glass epoxy board (Cu pad: 0.5 mm<sup>2</sup> × 3)

6. Electrical Characteristics (Unless otherwise specified, T<sub>a</sub> = 25 °C)

| Characteristics                      | Symbol               | Note     | Test Condition                                                                       | Min | Typ. | Max  | Unit |
|--------------------------------------|----------------------|----------|--------------------------------------------------------------------------------------|-----|------|------|------|
| Collector cut-off current            | I <sub>CBO</sub>     |          | V <sub>CB</sub> = 60 V, I <sub>E</sub> = 0 mA                                        | —   | —    | 0.1  | μA   |
| Emitter cut-off current              | I <sub>EBO</sub>     |          | V <sub>EB</sub> = 5 V, I <sub>C</sub> = 0 mA                                         | —   | —    | 0.1  | μA   |
| DC current gain                      | h <sub>FE</sub>      | (Note 5) | V <sub>CE</sub> = 6 V, I <sub>C</sub> = 2 mA                                         | 70  | —    | 700  | —    |
| Collector-emitter saturation voltage | V <sub>CE(sat)</sub> |          | I <sub>C</sub> = 100 mA, I <sub>B</sub> = 10 mA                                      | —   | 0.1  | 0.25 | V    |
| Transition frequency                 | f <sub>T</sub>       |          | V <sub>CE</sub> = 10 V, I <sub>C</sub> = 1 mA                                        | 80  | —    | —    | MHz  |
| Collector output capacitance         | C <sub>ob</sub>      |          | V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0 A, f = 1 MHz                              | —   | 2.0  | 3.5  | pF   |
| Noise figure                         | NF                   |          | V <sub>CE</sub> = 6 V, I <sub>C</sub> = 0.1 mA,<br>f = 1 kHz, R <sub>G</sub> = 10 kΩ | —   | 1.0  | 10   | dB   |

Note 5: h<sub>FE</sub> classification O (O): 70 to 140, Y (Y): 120 to 240, GR (G): 200 to 400, BL (L): 350 to 700  
( ) marking symbol

7. Marking



## 8. Characteristics Curves (Note)

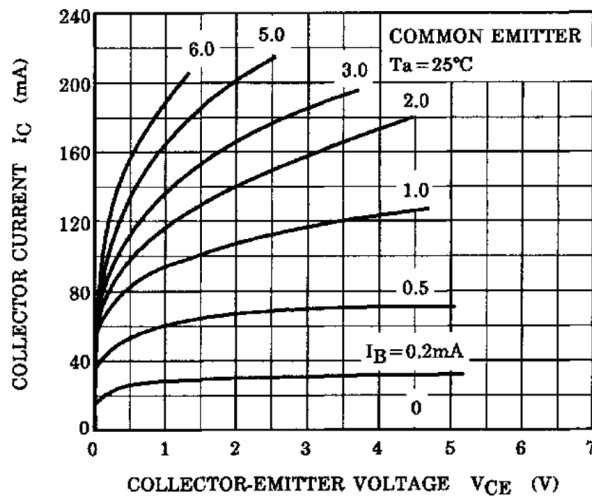


Fig. 8.1  $I_C - V_{CE}$

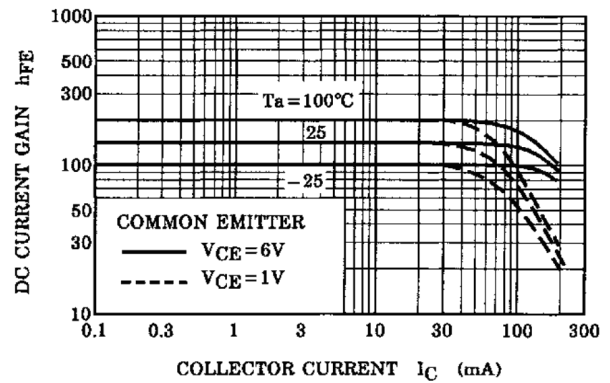


Fig. 8.2  $h_{FE} - I_C$

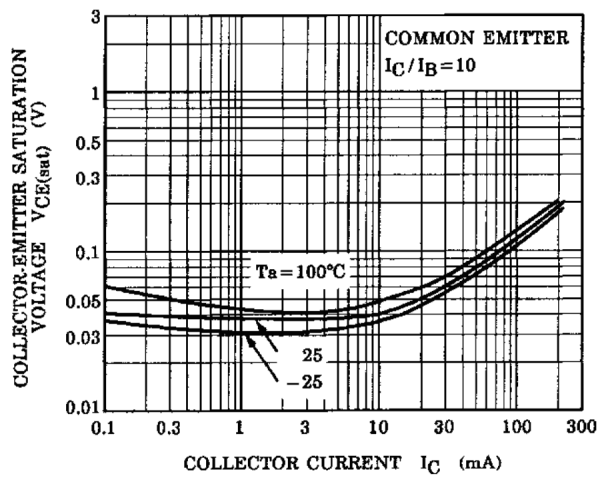


Fig. 8.3  $V_{CE(sat)} - I_C$

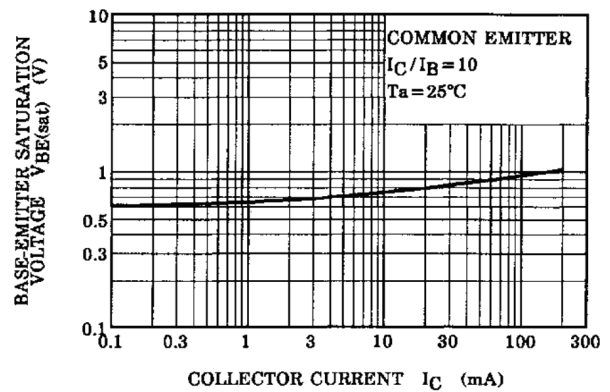


Fig. 8.4  $V_{BE(sat)} - I_C$

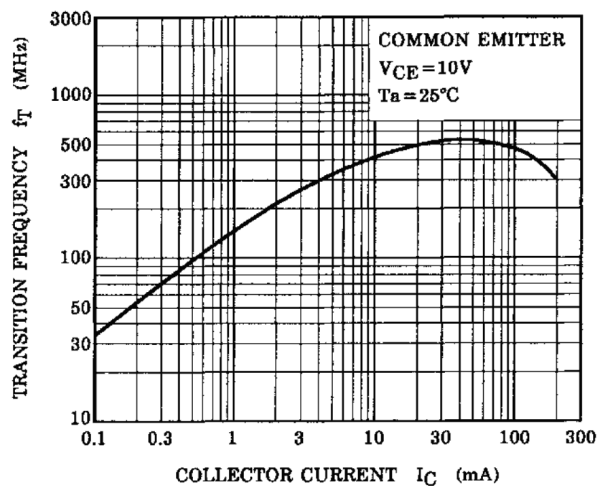


Fig. 8.5  $f_T - I_C$

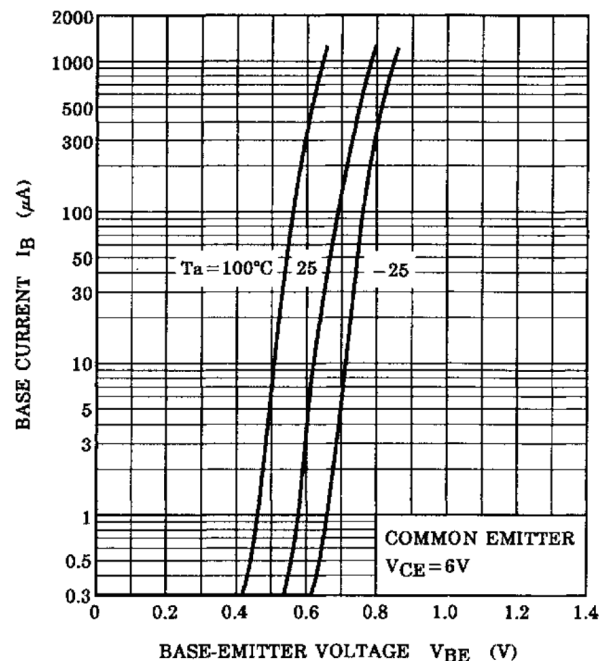


Fig. 8.6  $I_B - V_{BE}$

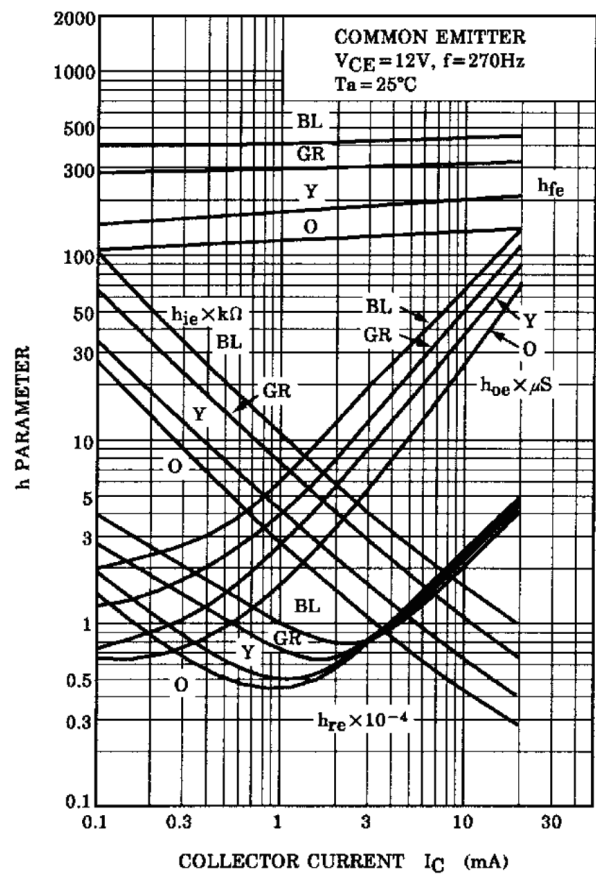


Fig. 8.7 h PARAMETER -  $I_C$

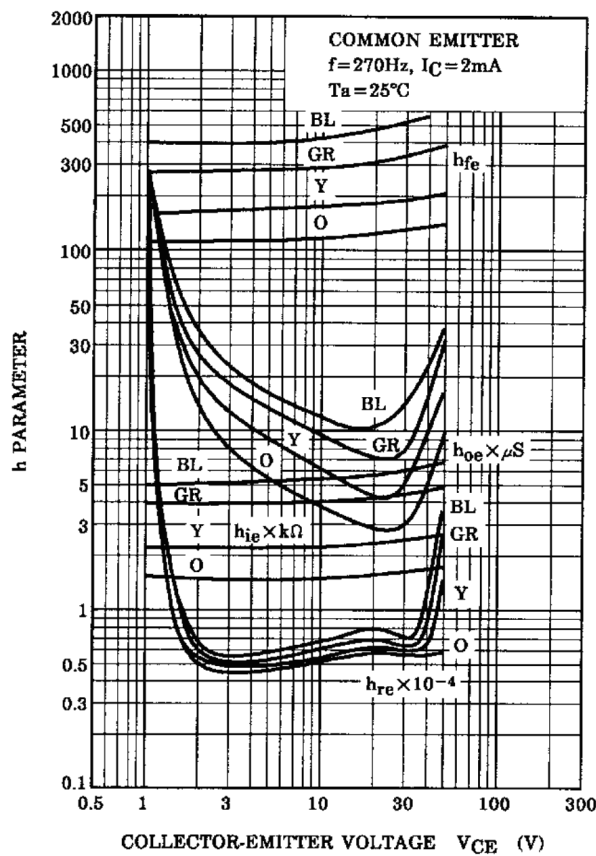


Fig. 8.8 h PARAMETER -  $V_{CE}$

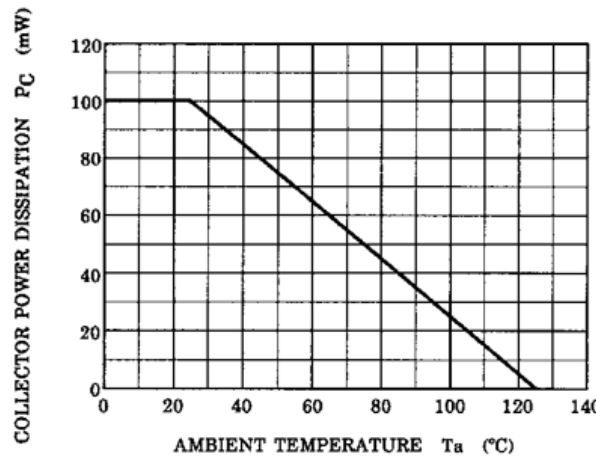


Fig. 8.9  $P_C - T_a$

Reference only with  $T_j$  of  $125^\circ C$ .

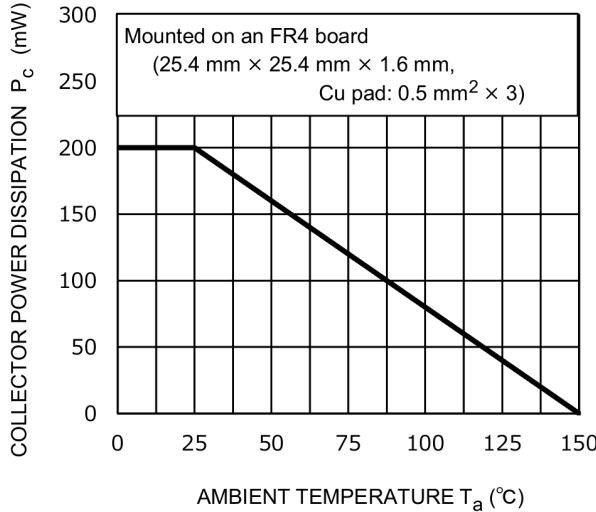


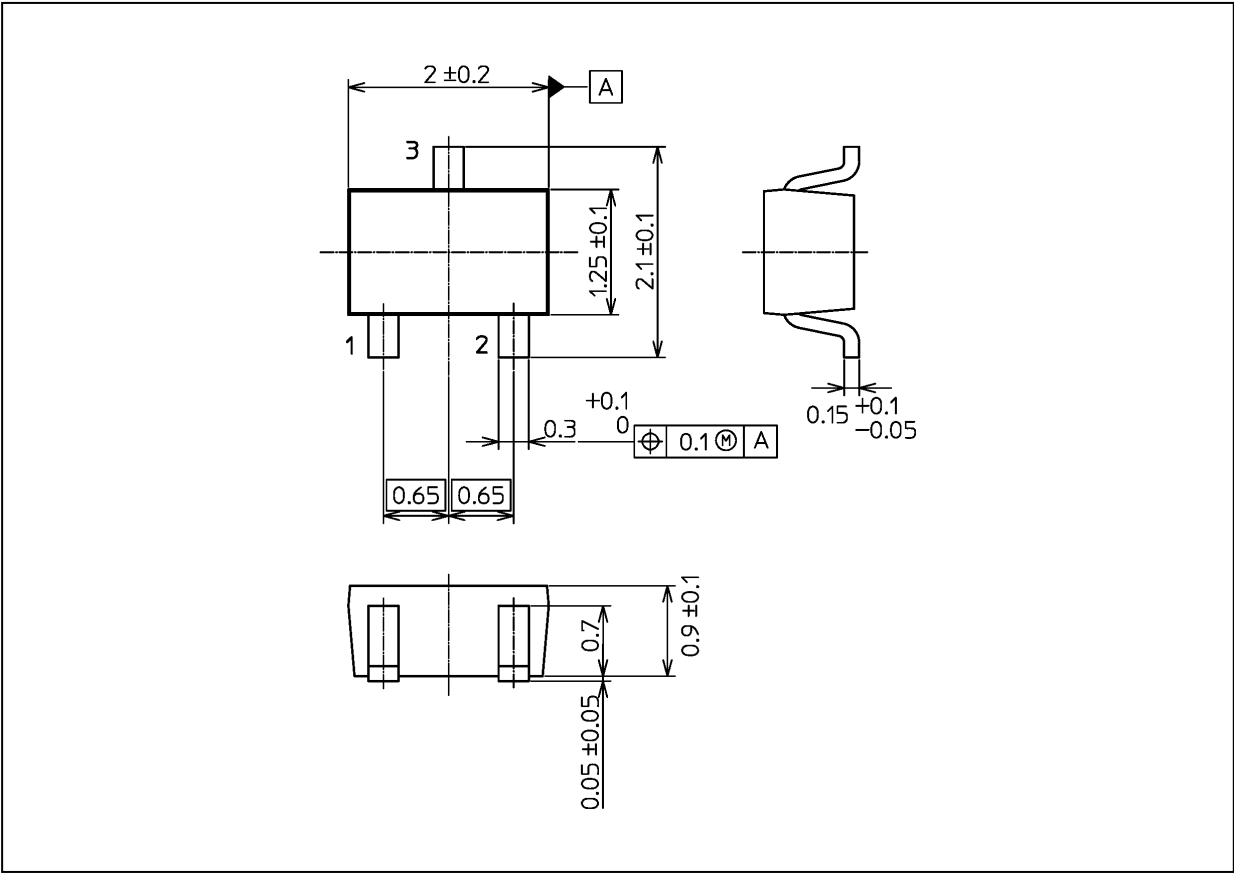
Fig. 8.10  $P_C - T_a$

Reference only with  $T_j$  of  $150^\circ C$ .

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

Package Dimensions

Unit: mm



Weight: 6.0 mg (typ.)

| Package Name(s) |
|-----------------|
| Nickname: USM   |

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