

**2SA1235A 2SA1602A**

**2SA1993**

FOR LOW FREQUENCY AMPLIFY APPLICATION  
SILICON PNP EPITAXIAL TYPE(Super mini type)

## FEATURE

- Super mini package for easy mounting
- Excellent linearity of DC forward gain
- Small collector to emitter saturation voltage  
 $V_{CE(sat)} = -0.3V$  max

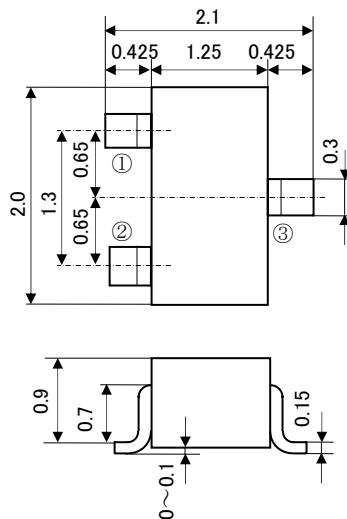
## APPLICATION

For Hybrid IC, small type machine low frequency  
voltage Amplify application

## OUTLINE DRAWING

Unit: mm

**2SA1602A**

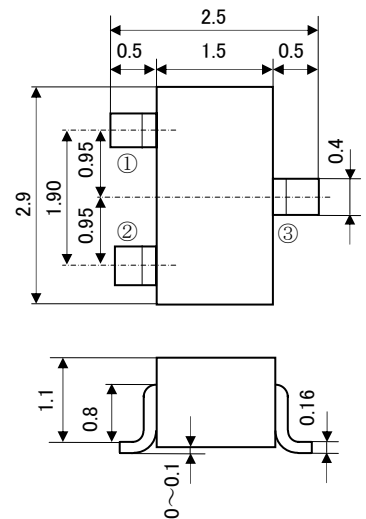


JEITA: SC-70  
JEDEC: —

TERMINAL CONNECTER

- ①: BASE  
②: EMITTER  
③: COLLECTOR

**2SA1235A**

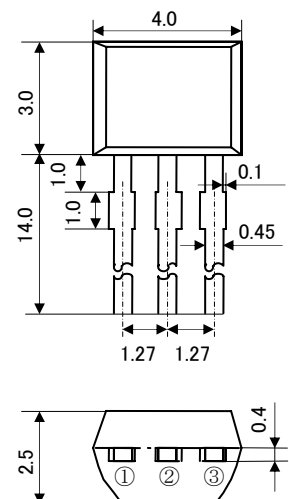


JEITA: SC-59  
JEDEC: TO-236 類似

TERMINAL CONNECTER

- ①: BASE  
②: EMITTER  
③: COLLECTOR

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JEITA: —  
JEDEC: —

TERMINAL CONNECTER

- ①: EMITTER  
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③: BASE

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SILICON PNP EPITAXIAL TYPE(Super mini type)**MAXIMUM RATINGS(Ta=25°C)**

| Symbol    | Parameter                    | Ratings  |          |         | Unit |
|-----------|------------------------------|----------|----------|---------|------|
|           |                              | 2SA1235A | 2SA1602A | 2SA1993 |      |
| $V_{CBO}$ | Collector to Base voltage    | -60      | -60      | -50     | V    |
| $V_{EBO}$ | Emitter to Base voltage      | -6       |          |         | V    |
| $V_{CEO}$ | Collector to Emitter voltage | -50      |          |         | V    |
| $I_C$     | Collector current            | 200      |          |         | mA   |
| $P_C$     | Collector dissipation        | 200      | 200      | 450     | mW   |
| $T_j$     | Junction temperature         | +150     |          |         | °C   |
| $T_{stg}$ | Storage temperature          | -55~+150 |          |         | °C   |

**ELECTRICAL CHARACTERISTICS(Ta=25°C)**

| Parameter     | Symbol                       | Test conditions                                         | Limits |     |      | Unit    |
|---------------|------------------------------|---------------------------------------------------------|--------|-----|------|---------|
|               |                              |                                                         | Min    | Typ | Max  |         |
| $V_{(BR)CEO}$ | C to E break down voltage    | $I_C = -100\mu A, R_{BE} = \infty$                      | -50    |     |      | V       |
| $I_{CBO}$     | Collector cut off current    | 2SA1993                                                 |        |     | -0.1 | $\mu A$ |
|               | Emitter cut off current      | 2SA1235A, 2SA1602A                                      |        |     | -0.1 |         |
| $I_{EBO}$     | DC forward current gain      | $V_{EB} = -6V, I_C = 0$                                 |        |     | -0.1 | $\mu A$ |
| $h_{FE}^*$    | DC forward current gain      | $V_{CE} = -6V, I_C = -1mA$                              | 150    |     | 500  | —       |
| $h_{FE}$      | C to E Saturation Voltage    | 2SA1993                                                 | 50     |     |      | —       |
|               |                              | 2SA1235A, 2SA1602A                                      | 90     |     |      | —       |
| $V_{CE(sat)}$ | Gain bandwidth product       | $I_C = -100mA, I_B = -10mA$                             |        |     | -0.3 | V       |
| $f_T$         | Collector output capacitance | $V_{CE} = -6V, I_E = 10mA$                              |        | 200 |      | MHz     |
| Cob           | C to E break down voltage    | $V_{CB} = -6V, I_E = 0, f = 1MHz$                       |        | 4.0 |      | pF      |
| NF            | Noise figure                 | $V_{CE} = -6V, I_E = 0.3mA, f = 100Hz, R_G = 10k\Omega$ |        |     | 20   | dB      |

\*: It shows hFE classification in below table.

|     |          | E       | F       |
|-----|----------|---------|---------|
| hFE | 2SA1235A | 150~300 | 250~500 |
|     | 2SA1602A |         |         |
|     | 2SA1993  |         |         |

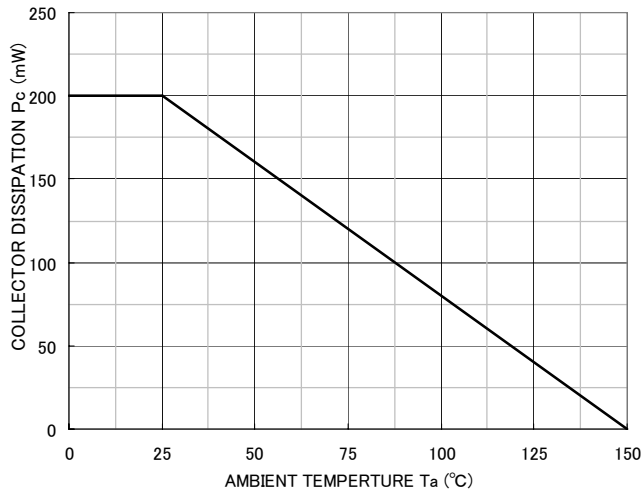
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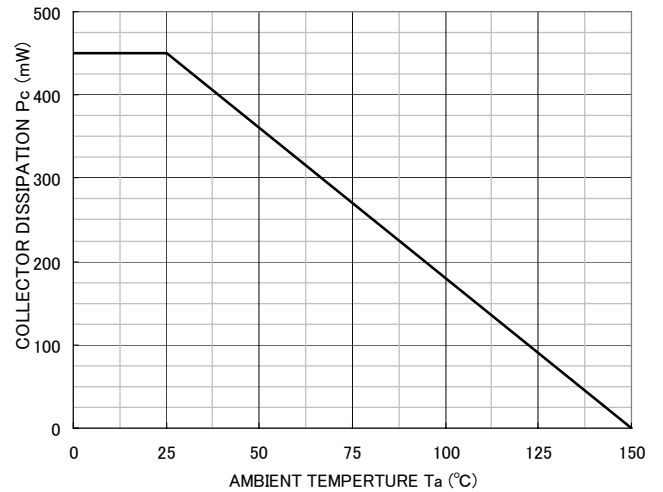
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COLLECTOR DISSIPATION VS.AMBIENT TEMPERTURE



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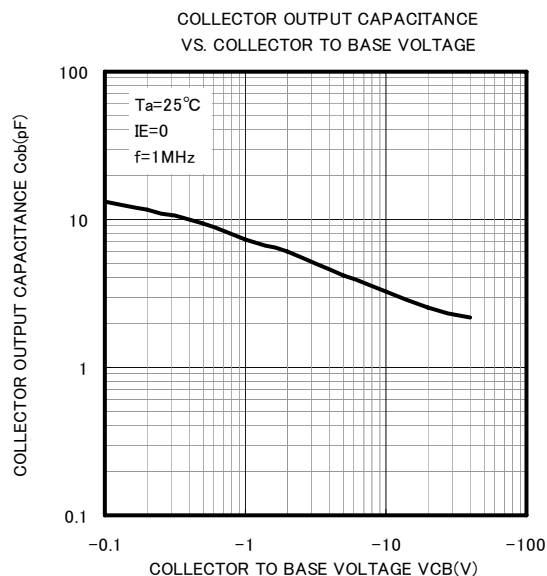
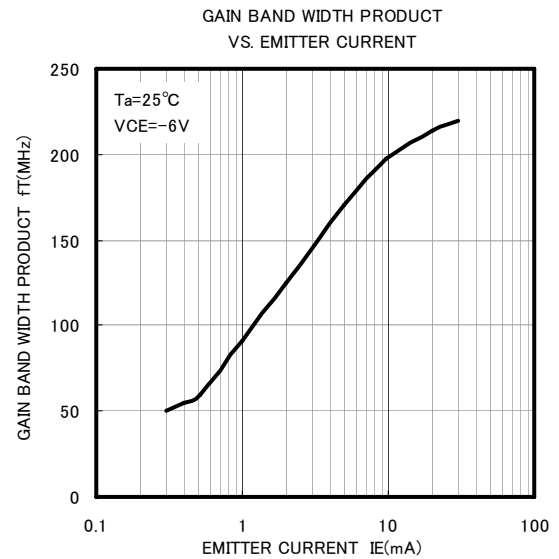
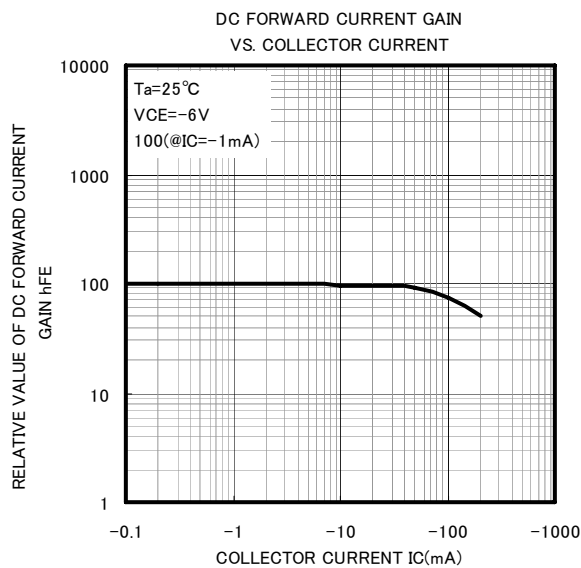
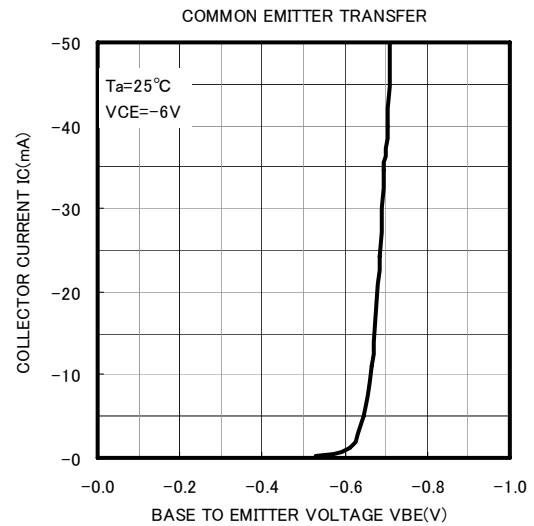
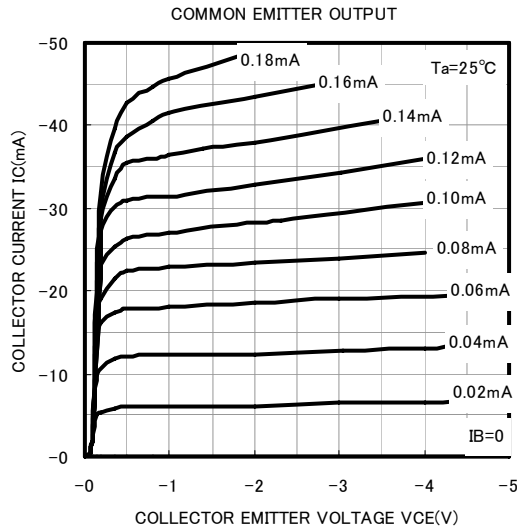
COLLECTOR DISSIPATION VS.AMBIENT TEMPERTURE



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