< SMALL-SIGNAL TRANSISTOR >

# 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
  VCE(sat)=−0.3V max

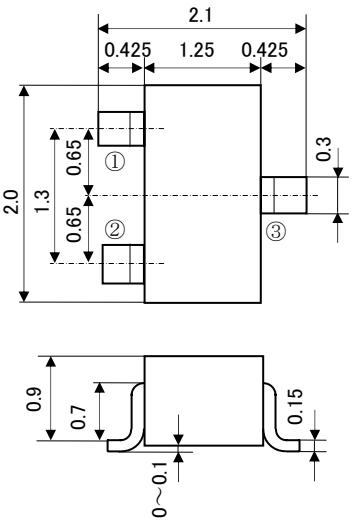
## APPLICATION

For Hybrid IC,small type machine low frequency voltageAmplify application

## OUTLINE DRAWING

Unit:mm

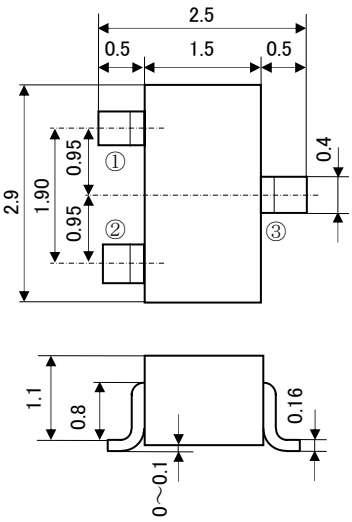
2SA1602A




JEITA:SC-70
JEDEC:−

TERMINAL CONNECTER
①:BASE
②:EMITTER
③:COLLECTOR

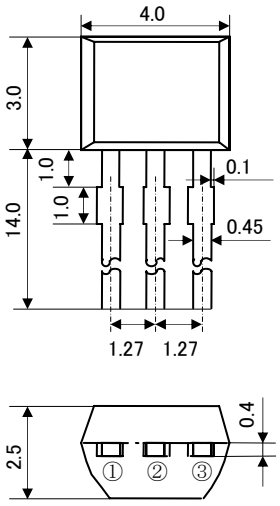
2SA1235A




JEITA:SC-59
JEDEC:TO-236 類似

TERMINAL CONNECTER
①:BASE
②:EMITTER
③:COLLECTOR

2SA1993




JEITA:−
JEDEC:−

TERMINAL CONNECTER
①:EMITTER
②:COLLECTOR
③:BASE

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## MAXIMUM RATINGS(Ta＝25℃)

| 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 |
| Tj | Junction temperature | +150 | | | ℃ |
| Tstg | Storage temperature | −55～+150 | | | ℃ |

## ELECTRICAL CHARACTERISTICS(Ta=25℃)

| Parameter | Symbol | Test conditions | | Limits | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | |
| $V_{(BR)CEO}$ | C to E break down voltage | $I_C$=−100μA, $R_{BE}$=∞ | | −50 | | | V |
| $I_{CBO}$ | Collector cut off current | 2SA1993 | $V_{CB}$=−50V, $I_E$=0 | | | −0.1 | μA |
| | Emitter cut off current | 2SA1235A,2SA1602A | $V_{CB}$=−60V, $I_E$=0 | | | −0.1 | |
| $I_{EBO}$ | DC forward current gain | $V_{EB}$=−6V, $I_C$=0 | | | | −0.1 | μA |
| $h_{FE}$* | DC forward current gain | $V_{CE}$=−6V, $I_C$=−1mA | | 150 | | 500 | — |
| $h_{FE}$ | C to E Saturation Vlotage | 2SA1993 | $V_{CE}$=−6V, $I_C$=−0.1mA | 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,RG=10kΩ | | | | 20 | dB |

*: It shows hFE classification in below table.

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

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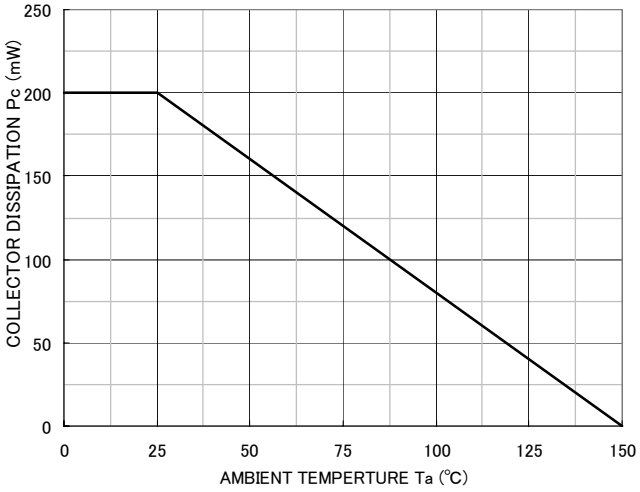
FOR LOW FREQUENCY AMPLIFY APPLICATION

SILICON PNP EPITAXIAL TYPE(Super mini type)

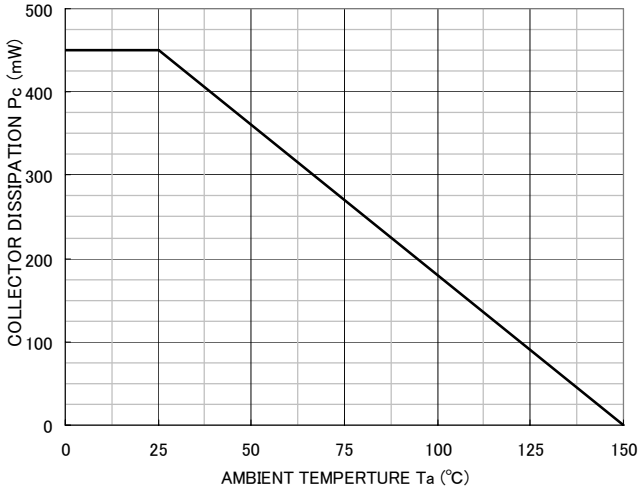
2SA1235A、2SA1602

COLLECTOR DISSIPATION VS.AMBIENT TEMPERTURE




2SA1993

COLLECTOR DISSIPATION VS.AMBIENT TEMPERTURE

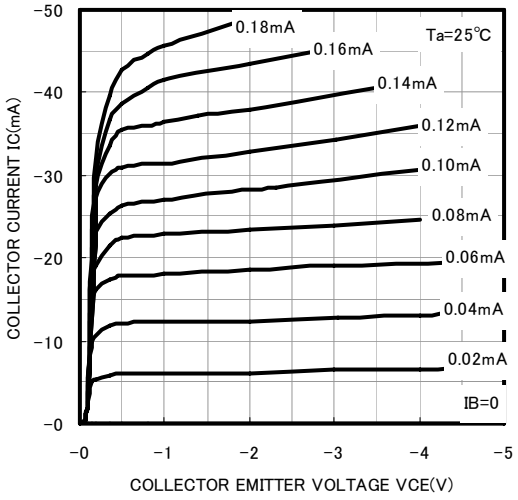


# 2SA1235A 2SA1602A 2SA1993

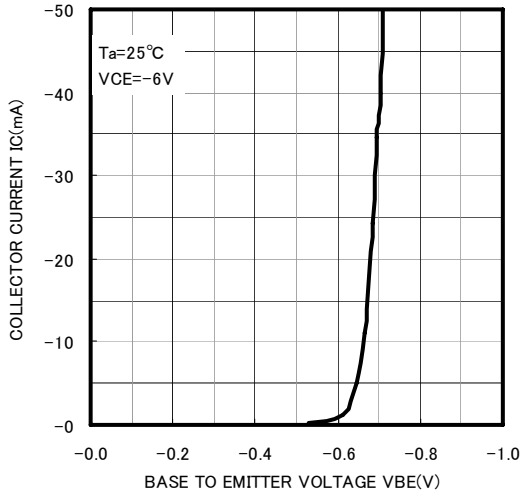
FOR LOW FREQUENCY AMPLIFY APPLICATION

SILICON PNP EPITAXIAL TYPE(Super mini type)

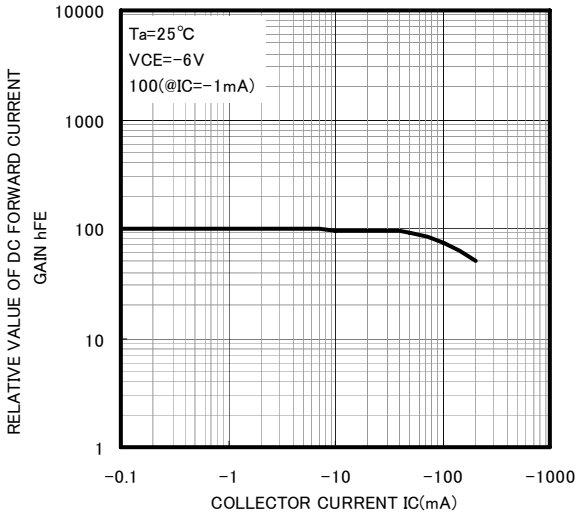
COMMON EMITTER OUTPUT



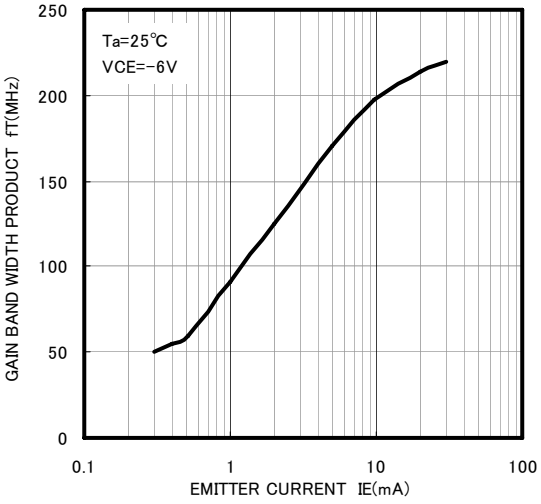

COMMON EMITTER TRANSFER



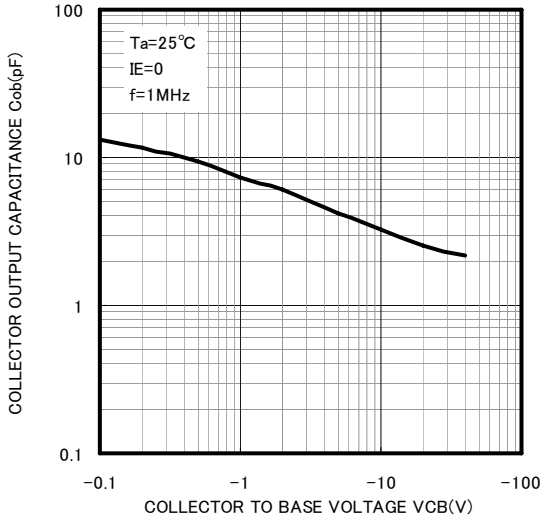

DC FORWARD CURRENT GAIN
VS. COLLECTOR CURRENT




GAIN BAND WIDTH PRODUCT
VS. EMITTER CURRENT




COLLECTOR OUTPUT CAPACITANCE
VS. COLLECTOR TO BASE VOLTAGE



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