

|              |          |  |
|--------------|----------|--|
| <b>SANYO</b> | No.2103A | <h1 style="margin: 0;">2SA1509/2SC3899</h1> <p style="margin: 0;">PNP/NPN Epitaxial Planar Silicon Transistors</p> <p style="margin: 0;">Switching Applications<br/>(with Bias Resistance)</p> |
|--------------|----------|--|

**Applications**

- Switching circuits, inverter circuits, interface circuits, driver circuits

**Features**

- On-chip bias resistance:  $R_1 = 47k\Omega$
- Small-sized package: SPA

( ): 2SA1509

**Absolute Maximum Ratings at  $T_a = 25^\circ C$**

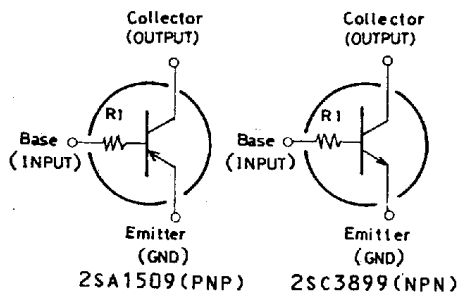
|                              |           |             | unit       |
|------------------------------|-----------|-------------|------------|
| Collector to Base Voltage    | $V_{CBO}$ | (-) 50      | V          |
| Collector to Emitter Voltage | $V_{CEO}$ | (-) 50      | V          |
| Emitter to Base Voltage      | $V_{EBO}$ | (-) 5       | V          |
| Collector Current            | $I_C$     | (-) 100     | mA         |
| Collector Current (Pulse)    | $I_{CP}$  | (-) 200     | mA         |
| Collector Dissipation        | $P_C$     | 300         | mW         |
| Junction Temperature         | $T_j$     | 150         | $^\circ C$ |
| Storage Temperature          | $T_{stg}$ | -55 to +150 | $^\circ C$ |

**Electrical Characteristics at  $T_a = 25^\circ C$**

|   |               |                                       | min    | typ     | max     | unit    |
|---|---------------|---------------------------------------|--------|---------|---------|---------|
| Collector Cutoff Current                | $I_{CBO}$     | $V_{CB} = (-) 40V, I_E = 0$           |        |         | (-) 0.1 | $\mu A$ |
| Emitter Cutoff Current                  | $I_{EBO}$     | $V_{EB} = (-) 5V, I_C = 0$            |        |         | (-) 0.1 | $\mu A$ |
| DC Current Gain                         | $h_{FE}$      | $V_{CE} = (-) 5V, I_C = (-) 10mA$     | 100    |         |         |         |
| Gain-Bandwidth Product                  | $f_T$         | $V_{CE} = (-) 10V, I_C = (-) 5mA$     |        | 250     |         | MHz     |
|   |               |                                       |        | (200)   |         | MHz     |
| Output Capacitance                      | $c_{ob}$      | $V_{CB} = (-) 10V, f = 1MHz$          |        | 3.7     |         | pF      |
|   |               |                                       |        | (5.5)   |         | pF      |
| Collector to Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C = (-) 5mA, I_B = (-) 0.25mA$     |        | (-) 0.1 | (-) 0.3 | V       |
| Collector to Base Breakdown Voltage     | $V_{(BR)CBO}$ | $I_C = (-) 10\mu A, I_E = 0$          | (-) 50 |         |         | V       |
| Collector to Emitter Breakdown Voltage  | $V_{(BR)CEO}$ | $I_C = (-) 100\mu A, R_{BE} = \infty$ | (-) 50 |         |         | V       |

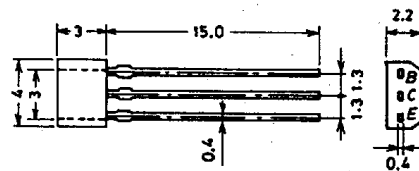
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**Electrical Connection**



**Case Outline 2033**

(unit:mm)



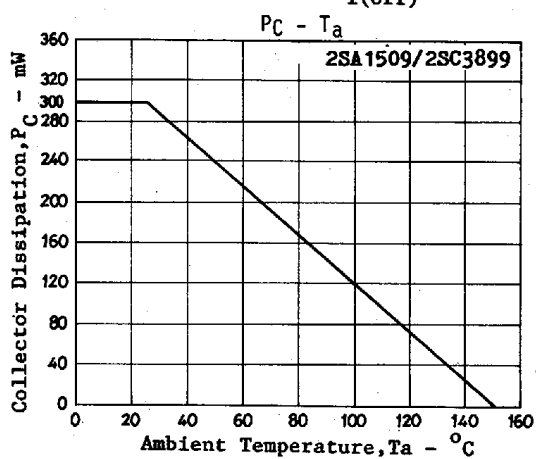
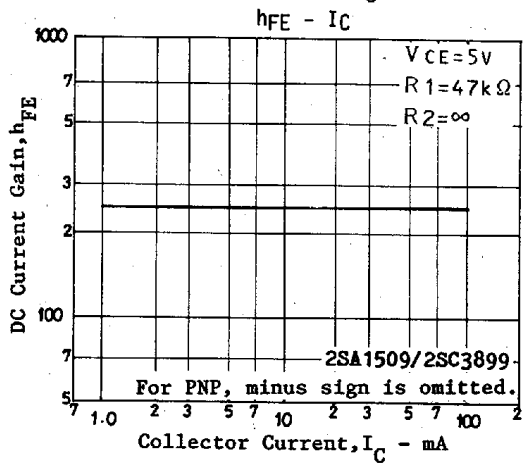
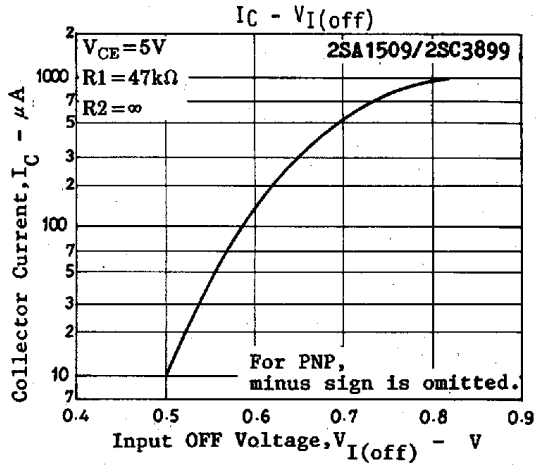
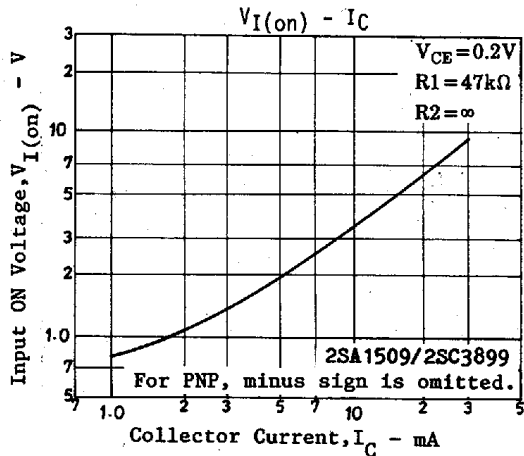
B: Base  
C: Collector  
E: Emitter  
SANYO: SPA

Specifications and information herein are subject to change without notice.

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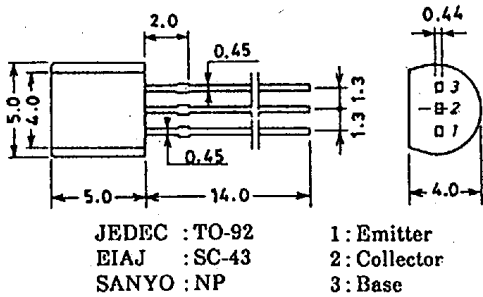
|                         |              |  | min    | typ     | max    | unit       |
|-------------------------|--------------|--|--------|---------|--------|------------|
| Input OFF-State Voltage | $V_{I(off)}$ | $V_{CE} = (-)5V,$<br>$I_{C} = (-)100\mu A$ | (-)0.4 | (-)0.55 | (-)0.8 | V          |
| Input ON-State Voltage  | $V_{I(on)}$  | $V_{CE} = (-)0.2V,$<br>$I_{C} = (-)5mA$    | (-)0.8 | (-)2.0  | (-)4.0 | V          |
| Input Resistance        | $R_1$        |  | 33     | 47      | 61     | k $\Omega$ |



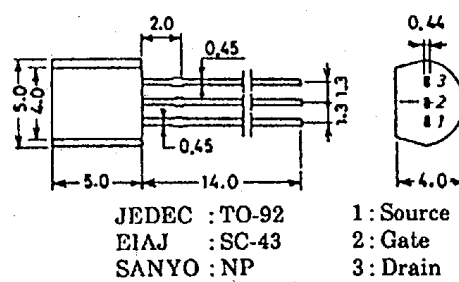
# CASE OUTLINES OF LEAD FORMED SMALL SIGNAL TRANSISTORS

- All of Sanyo lead formed small signal transistor case outlines are illustrated below.
- All dimensions are in mm, and dimensions which are not followed by min. or max. are represented by typical values.
- No marking is indicated.

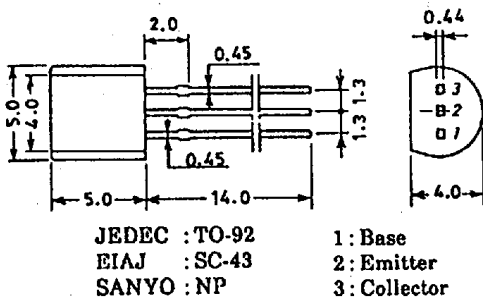
Case Outline 2003A/2003B (unit : mm)



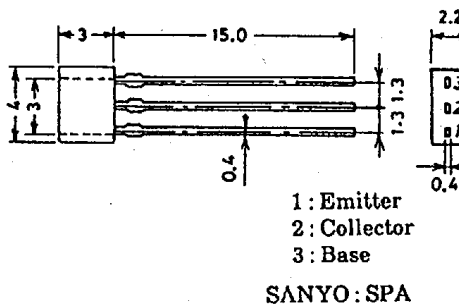
Case Outline 2019A/2019B (unit : mm)



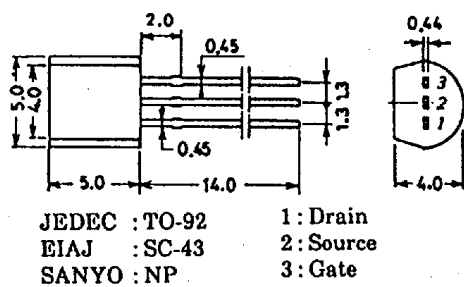
Case Outline 2004A (unit : mm)



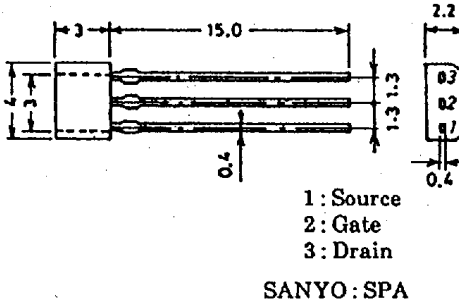
Case Outline 2033 (unit : mm)



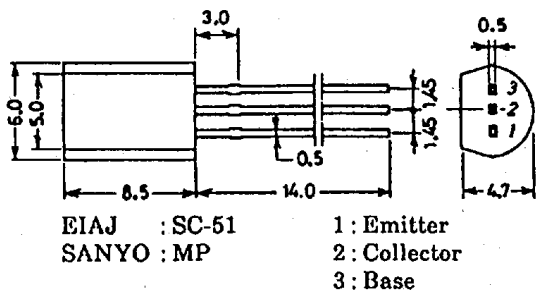
Case Outline 2005A (unit : mm)



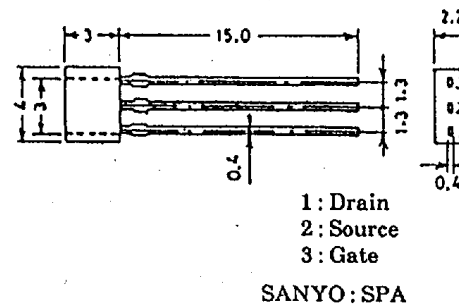
Case Outline 2034/2034A (unit : mm)



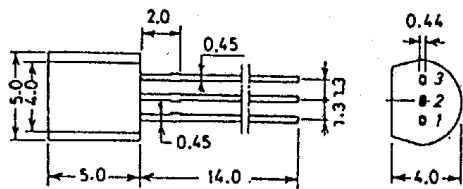
Case Outline 2006A (unit : mm)



Case Outline 2040 (unit : mm)



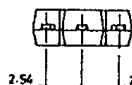
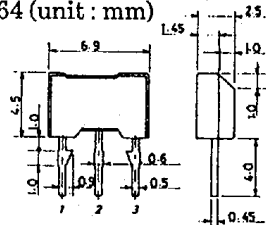
Case Outline 2061 (unit : mm)



JEDEC : TO-92  
EIAJ : SC-43  
SANYO : NP

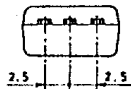
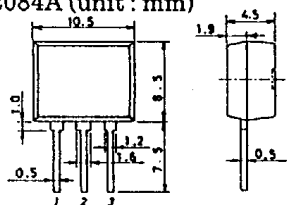
1 : Emitter  
2 : Base  
3 : Collector

Case Outline 2064 (unit : mm)



1 : Emitter  
2 : Collector  
3 : Base  
SANYO : NMP

Case Outline 2084A (unit : mm)



1 : Emitter  
2 : Collector  
3 : Base  
SANYO : FLP