

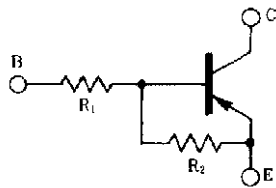
**Phase-out/Discontinued**

# COMPOUND TRANSISTOR AR1 SERIES

**on-chip resistor PNP silicon epitaxial transistor  
For mid-speed switching**

### FEATURES

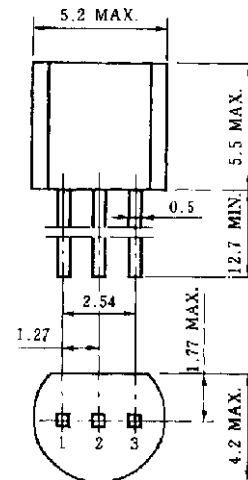
- High current drives such as IC output and actuator available
- On-chip bias resistor
- Low power consumption during drive



### AR1 SERIES LISTS

| Products | R <sub>1</sub> (KΩ) | R <sub>2</sub> (KΩ) |
|----------|---------------------|---------------------|
| AR1A3M   | 1.0                 | 1.0                 |
| AR1F3P   | 2.2                 | 10                  |
| AR1L3N   | 4.7                 | 10                  |
| AR1A4M   | 10                  | 10                  |
| AR1L2Q   | 0.47                | 4.7                 |
| AR1F2Q   | 0.22                | 2.2                 |
| AR1A4A   | —                   | 10                  |

### PACKAGE DRAWING (UNIT: mm)



Electrode Connection  
 1. Emitter EIAJ : SC-43B  
 2. Collector JEDEC : TO-92  
 3. Base IEC : PA33

### ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

| Parameter                    | Symbol                  | Ratings     | Unit |
|------------------------------|-------------------------|-------------|------|
| Collector to base voltage    | V <sub>CBO</sub>        | -60         | V    |
| Collector to emitter voltage | V <sub>CEO</sub>        | -60         | V    |
| Emitter to base voltage      | V <sub>EBO</sub>        | -10         | V    |
| Collector current (DC)       | I <sub>C(DC)</sub>      | -1.0        | A    |
| Collector current (Pulse)    | I <sub>C(pulse)</sub> * | -2.0        | A    |
| Base current (DC)            | I <sub>B(DC)</sub>      | -0.02       | A    |
| Total power dissipation      | P <sub>T</sub>          | 750         | mW   |
| Junction temperature         | T <sub>j</sub>          | 150         | °C   |
| Storage temperature          | T <sub>stg</sub>        | -55 to +150 | °C   |

\* PW ≤ 10 ms, duty cycle ≤ 50 %

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**AR1A3M**

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

| Parameter                | Symbol              | Conditions   | MIN. | TYP. | MAX. | Unit |
|--------------------------|---------------------|--|------|------|------|------|
| Collector cutoff current | ICBO                | V <sub>CB</sub> = -60 V, I <sub>E</sub> = 0        |      |      | -100 | nA   |
| DC current gain          | h <sub>FE1</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -0.1 A  | 50   |      |      | -    |
| DC current gain          | h <sub>FE2</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -0.5 A  | 100  |      |      | -    |
| DC current gain          | h <sub>FE3</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -1.0 A  | 50   |      |      | -    |
| Low level output voltage | V <sub>OL</sub> **  | V <sub>IN</sub> = -5.0 V, I <sub>C</sub> = -0.4 A  |      |      | -0.4 | V    |
| Low level input voltage  | V <sub>IL</sub> **  | V <sub>CE</sub> = -5.0 V, I <sub>C</sub> = -100 μA |      |      | -0.3 | V    |
| Input resistance         | R <sub>1</sub>      |  | 0.7  | 1.0  | 1.3  | kΩ   |
| E-to-B resistance        | R <sub>2</sub>      |  | 0.7  | 1.0  | 1.3  | kΩ   |

\*\* PW ≤ 350 μs, duty cycle ≤ 2 %

**AR1F3P**

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

| Parameter                | Symbol              | Conditions   | MIN. | TYP. | MAX. | Unit |
|--------------------------|---------------------|--|------|------|------|------|
| Collector cutoff current | ICBO                | V <sub>CB</sub> = -60 V, I <sub>E</sub> = 0        |      |      | -100 | nA   |
| DC current gain          | h <sub>FE1</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -0.1 A  | 150  |      |      | -    |
| DC current gain          | h <sub>FE2</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -0.5 A  | 100  |      |      | -    |
| DC current gain          | h <sub>FE3</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -1.0 A  | 50   |      |      | -    |
| Low level output voltage | V <sub>OL</sub> **  | V <sub>IN</sub> = -5.0 V, I <sub>C</sub> = -0.35 A |      |      | -0.3 | V    |
| Low level input voltage  | V <sub>IL</sub> **  | V <sub>CE</sub> = -5.0 V, I <sub>C</sub> = -100 μA |      |      | -0.3 | V    |
| Input resistance         | R <sub>1</sub>      |  | 1.54 | 2.2  | 2.86 | kΩ   |
| E-to-B resistance        | R <sub>2</sub>      |  | 7    | 10   | 13   | kΩ   |

\*\* PW ≤ 350 μs, duty cycle ≤ 2 %

**AR1L3N**

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

| Parameter                | Symbol              | Conditions   | MIN. | TYP. | MAX. | Unit |
|--------------------------|---------------------|--|------|------|------|------|
| Collector cutoff current | ICBO                | V <sub>CB</sub> = -60 V, I <sub>E</sub> = 0        |      |      | -100 | nA   |
| DC current gain          | h <sub>FE1</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -0.1 A  | 150  |      |      | -    |
| DC current gain          | h <sub>FE2</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -0.5 A  | 100  |      |      | -    |
| DC current gain          | h <sub>FE3</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -1.0 A  | 50   |      |      | -    |
| Low level output voltage | V <sub>OL</sub> **  | V <sub>IN</sub> = -5.0 V, I <sub>C</sub> = -0.2 A  |      |      | -0.3 | V    |
| Low level input voltage  | V <sub>IL</sub> **  | V <sub>CE</sub> = -5.0 V, I <sub>C</sub> = -100 μA |      |      | -0.3 | V    |
| Input resistance         | R <sub>1</sub>      |  | 3.29 | 4.7  | 6.11 | kΩ   |
| E-to-B resistance        | R <sub>2</sub>      |  | 7    | 10   | 13   | kΩ   |

\*\* PW ≤ 350 μs, duty cycle ≤ 2 %

**AR1A4M**

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

| Parameter                | Symbol              | Conditions   | MIN. | TYP. | MAX. | Unit |
|--------------------------|---------------------|--|------|------|------|------|
| Collector cutoff current | ICBO                | V <sub>CB</sub> = -60 V, I <sub>E</sub> = 0        |      |      | -100 | nA   |
| DC current gain          | h <sub>FE1</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -0.1 A  | 150  |      |      | -    |
| DC current gain          | h <sub>FE2</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -0.5 A  | 100  |      |      | -    |
| DC current gain          | h <sub>FE3</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -1.0 A  | 50   |      |      | -    |
| Low level output voltage | V <sub>OL</sub> **  | V <sub>IN</sub> = -5.0 V, I <sub>C</sub> = -0.1 A  |      |      | -0.2 | V    |
| Low level input voltage  | V <sub>IL</sub> **  | V <sub>CE</sub> = -5.0 V, I <sub>C</sub> = -100 μA |      |      | -0.3 | V    |
| Input resistance         | R <sub>1</sub>      |  | 7    | 10   | 13   | kΩ   |
| E-to-B resistance        | R <sub>2</sub>      |  | 7    | 10   | 13   | kΩ   |

\*\* PW ≤ 350 μs, duty cycle ≤ 2 %

**AR1L2Q**

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

| Parameter                | Symbol              | Conditions   | MIN. | TYP. | MAX.  | Unit |
|--------------------------|---------------------|--|------|------|-------|------|
| Collector cutoff current | ICBO                | V <sub>CB</sub> = -60 V, I <sub>E</sub> = 0        |      |      | -100  | nA   |
| DC current gain          | h <sub>FE1</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -0.1 A  | 150  |      |       | -    |
| DC current gain          | h <sub>FE2</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -0.5 A  | 100  |      |       | -    |
| DC current gain          | h <sub>FE3</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -1.0 A  | 50   |      |       | -    |
| Low level output voltage | V <sub>OL</sub> **  | V <sub>IN</sub> = -5.0 V, I <sub>C</sub> = -0.5 A  |      |      | -0.55 | V    |
| Low level input voltage  | V <sub>IL</sub> **  | V <sub>CE</sub> = -5.0 V, I <sub>C</sub> = -100 μA |      |      | -0.3  | V    |
| Input resistance         | R <sub>1</sub>      |  | 329  | 470  | 611   | Ω    |
| E-to-B resistance        | R <sub>2</sub>      |  | 3.29 | 4.7  | 6.11  | kΩ   |

\*\* PW ≤ 350 μs, duty cycle ≤ 2 %

**AR1F2Q**

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

| Parameter                | Symbol              | Conditions   | MIN. | TYP. | MAX.  | Unit |
|--------------------------|---------------------|--|------|------|-------|------|
| Collector cutoff current | ICBO                | V <sub>CB</sub> = -60 V, I <sub>E</sub> = 0        |      |      | -100  | nA   |
| DC current gain          | h <sub>FE1</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -0.1 A  | 80   |      |       | -    |
| DC current gain          | h <sub>FE2</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -0.5 A  | 100  |      |       | -    |
| DC current gain          | h <sub>FE3</sub> ** | V <sub>CE</sub> = -2.0 V, I <sub>C</sub> = -1.0 A  | 50   |      |       | -    |
| Low level output voltage | V <sub>OL</sub> **  | V <sub>IN</sub> = -5.0 V, I <sub>C</sub> = -0.5 A  |      |      | -0.55 | V    |
| Low level input voltage  | V <sub>IL</sub> **  | V <sub>CE</sub> = -5.0 V, I <sub>C</sub> = -100 μA |      |      | -0.3  | V    |
| Input resistance         | R <sub>1</sub>      |  | 154  | 220  | 286   | Ω    |
| E-to-B resistance        | R <sub>2</sub>      |  | 1.54 | 2.2  | 2.86  | kΩ   |

\*\* PW ≤ 350 μs, duty cycle ≤ 2 %

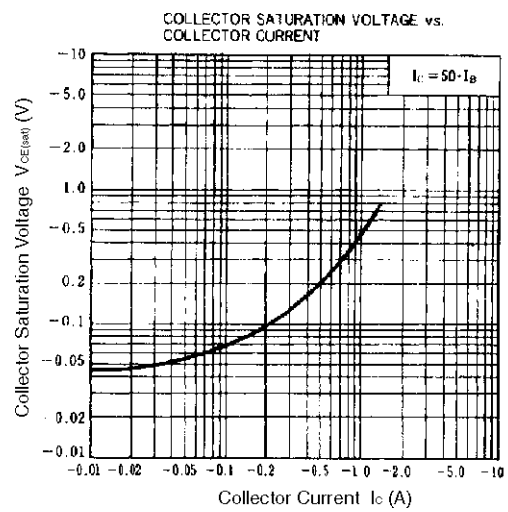
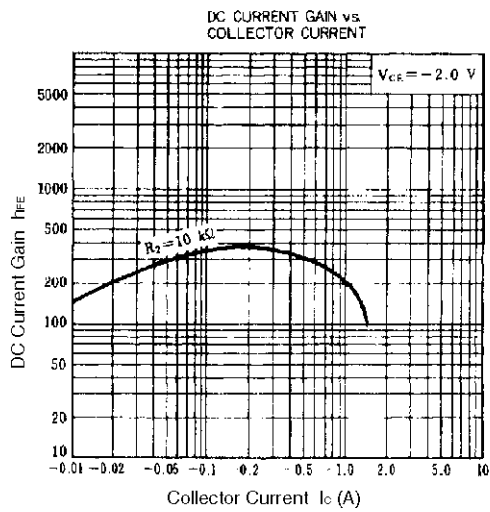
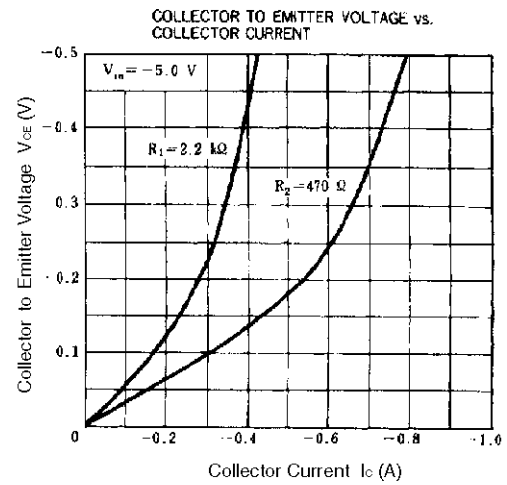
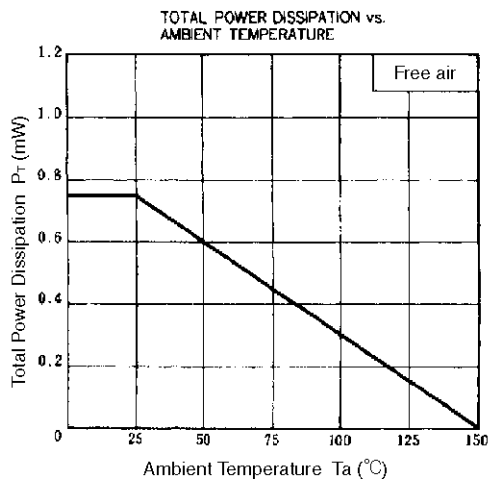
**AR1A4A**

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

| Parameter                    | Symbol             | Conditions  | MIN. | TYP.  | MAX.  | Unit       |
|------------------------------|--------------------|---|------|-------|-------|------------|
| Collector cutoff current     | $I_{CBO}$          | $V_{CB} = -60\text{ V}, I_E = 0$                        |      |       | -100  | nA         |
| DC current gain              | $h_{FE1}^{**}$     | $V_{CE} = -2.0\text{ V}, I_C = -0.1\text{ A}$           | 150  |       |       | -          |
| DC current gain              | $h_{FE2}^{**}$     | $V_{CE} = -2.0\text{ V}, I_C = -0.5\text{ A}$           | 100  |       |       | -          |
| DC current gain              | $h_{FE3}^{**}$     | $V_{CE} = -2.0\text{ V}, I_C = -1.0\text{ A}$           | 50   |       |       | -          |
| Collector saturation voltage | $V_{CE(sat)}^{**}$ | $I_C = -500\text{ mA}, I_B = -10\text{ mA}$             |      | -0.20 | -0.35 | V          |
| Low level input voltage      | $V_{IL}^{**}$      | $V_{CE} = -5.0\text{ V}, I_C = -100\text{ }\mu\text{A}$ |      |       | -0.3  | V          |
| Input resistance             | $R_1$              |   | -    | -     | -     | $\Omega$   |
| E-to-B resistance            | $R_2$              |   | 7    | 10    | 13    | k $\Omega$ |

\*\*  $PW \leq 350\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$

TYPICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )



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