

## CA3118, CA3146, CA3183

T-43-25

## High-Voltage Transistor Arrays

## Features

- Matched general-purpose transistors
- $V_{BE}$  matched  $\pm 5\text{mV}$  max.
- Operation from DC to 120 MHz (CA3118AT, T; CA3146AE, E)
- Low-noise figure: 3.2dB typ. at 1kHz (CA3118AT, T; CA3146AE, E)
- High  $I_C$ : 75mA max. (CA3183AE, E)

RCA-CA3118AT, CA3118T, CA3146AE, CA3146E, CA3183AE, and CA3183E\* are general-purpose high-voltage silicon n-p-n transistor arrays on a common monolithic substrate.

Types CA3118AT and CA3118T consist of four transistors with two of the transistors connected in a Darlington configuration. These types are well suited for a wide variety of applications in low-power systems in the DC through VHF range. Both types are supplied in a hermetically sealed 12-lead TO-5 type package and operate over the full military temperature range. (CA3118AT and CA3118T are high-voltage versions of the popular predecessor type CA3018.

Types CA3146AE and CA3146E consist of five transistors with two of the transistors connected to form a differentially-connected pair. These types are recommended for low-power applications in the DC through VHF range. Both types are supplied in a 14-lead dual-in-line plastic package and operate over the ambient temperature range of  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$ . (CA3146AE and CA3146E are high-voltage versions of the popular predecessor type CA3046.)

Types CA3183AE and CA3183E consist of five high-current transistors with independent connections for each transistor. In addition two of these transistors (Q1 and Q2) are matched at low-current (i.e. 1mA) for applications where offset para-

## Applications

- General use in signal processing systems in DC through VHF range
- Custom designed differential amplifiers
- Temperature compensated amplifiers
- Lamp and relay drivers (CA3183AE, E)
- Thyristor firing (CA3183AE, E)

meters are of special importance. A special substrate terminal is also included for greater flexibility in circuit design. Both types are supplied in a 16-lead dual-in-line plastic package and operate over the ambient temperature range of  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$ . (CA3183AE and CA3183E are high-voltage versions of the popular predecessor type CA3083.)

The types with an "A" suffix are premium versions of their non-"A" counterparts and feature tighter control of breakdown voltages making them more suitable for higher voltage applications.

For detailed application information, see companion Application Note, ICAN-5296 "Application of the RCA CA3018 Integrated Circuit Transistor Array."

## \* Formerly Developmental Types Nos.

|          |          |          |          |
|----------|----------|----------|----------|
| CA3118AT | - TA6091 | CA3146E  | - TA6181 |
| CA3118T  | - TA6182 | CA3183AE | - TA6094 |
| CA3146AE | - TA6084 | CA3183E  | - TA6183 |

| TYPE                             | $P_T$      | $I_C$      | $V_{CEO}$ | $V_{CBO}$ | $V_{CE\text{ sat.}}$<br>at 10 mA | $h_{FE}$<br>at 1 mA,<br>& $V_{CE}=5V$ | $V_{IO}$           | $I_{IO}$        | $T_A$ Range |
|----------------------------------|------------|------------|-----------|-----------|----------------------------------|---------------------------------------|--------------------|-----------------|-------------|
|                                  | max.<br>mW | max.<br>mA | max.<br>V | max.<br>V | typ.<br>V                        | typ.                                  | Diff. Pair at 1 mA |                 | (Operating) |
|                                  |            |            |           |           |                                  |                                       | max.<br>mV         | max.<br>$\mu A$ | $^{\circ}C$ |
| VALUES APPLY FOR EACH TRANSISTOR |            |            |           |           |                                  |                                       |                    |                 |             |
| CA3118AT                         | 300        | 50         | 40        | 50        | 0.33                             | 95                                    | $\pm 5$            | 2               | -55 - +125  |
| CA3118T                          | 300        | 50         | 30        | 40        | 0.33                             | 95                                    | $\pm 5$            | 2               | -55 - +125  |
| CA3146AE                         | 300        | 50         | 40        | 50        | 0.33                             | 95                                    | $\pm 5$            | 2               | -40 - +85   |
| CA3146E                          | 300        | 50         | 30        | 40        | 0.33                             | 95                                    | $\pm 5$            | 2               | -40 - +85   |
| CA3183AE                         | 500        | 75         | 40        | 50        | 0.16                             | 75                                    | $\pm 5$            | 2.5             | -40 - +85   |
| CA3183E                          | 500        | 75         | 30        | 40        | 0.16                             | 75                                    | $\pm 5$            | 2.5             | -40 - +85   |

● Caution on Total Package Power Dissipation: The maximum total package dissipation rating for the CA3118 Series circuits is 450 mW at temperatures up to  $+85^\circ\text{C}$ , then derate linearly at  $5\text{ mW}/^\circ\text{C}$ . The maximum total package dissipation rating for the CA3146 and CA3183 Series circuits is 750 mW at temperatures up to  $+55^\circ\text{C}$ , then derate linearly at  $6.67\text{ mW}/^\circ\text{C}$ .

File Number 532

## CA3118, CA3146, CA3183

MAXIMUM RATINGS, Absolute-Maximum Values at  $T_A = 25^\circ\text{C}$ 

## Power Dissipation:

## Any one transistor —

|                                      |     |    |
|--------------------------------------|-----|----|
| CA3118AT, CA3118T, CA3146AE, CA3146E | 300 | mW |
| CA3183AE, CA3183E                    | 500 | mW |

## Total package —

|                                                                 |                      |                      |
|-----------------------------------------------------------------|----------------------|----------------------|
| Up to $85^\circ\text{C}$ (CA3118AT, CA3118T)                    | 450                  | mW                   |
| Up to $55^\circ\text{C}$ (CA3146AE, CA3146E, CA3183AE, CA3183E) | 750                  | mW                   |
| Above $85^\circ\text{C}$ (CA3118AT, CA3118T)                    | derate linearly 5    | mW/ $^\circ\text{C}$ |
| Above $55^\circ\text{C}$ (CA3146AE, CA3146E, CA3183AE, CA3183E) | derate linearly 6.67 | mW/ $^\circ\text{C}$ |

## Ambient Temperature Range:

## Operating —

|                                      |                 |                  |
|--------------------------------------|-----------------|------------------|
| CA3118AT, CA3118T                    | $-55$ to $+125$ | $^\circ\text{C}$ |
| CA3146AE, CA3146E, CA3183AE, CA3183E | $-40$ to $+85$  | $^\circ\text{C}$ |

## Storage (all types)

|  |                 |                  |
|--|-----------------|------------------|
|  | $-65$ to $+150$ | $^\circ\text{C}$ |
|--|-----------------|------------------|

The following ratings apply for each transistor in the device:

Collector-to-Emitter Voltage ( $V_{CE0}$ ):

|                              |    |   |
|------------------------------|----|---|
| CA3118AT, CA3146AE, CA3183AE | 40 | V |
| CA3118T, CA3146E, CA3183E    | 30 | V |

Collector-to-Base Voltage ( $V_{CBO}$ ):

|                              |    |   |
|------------------------------|----|---|
| CA3118AT, CA3146AE, CA3183AE | 50 | V |
| CA3118T, CA3146E, CA3183E    | 40 | V |

Collector-to-Substrate Voltage ( $V_{CIS}$ ):

|                              |    |   |
|------------------------------|----|---|
| CA3118AT, CA3146AE, CA3183AE | 50 | V |
| CA3118T, CA3146E, CA3183E    | 40 | V |

Emitter-to-Base Voltage ( $V_{EB0}$ ) all types

|  |   |   |
|--|---|---|
|  | 5 | V |
|--|---|---|

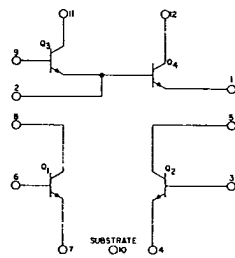
## Collector Current —

|                                      |    |    |
|--------------------------------------|----|----|
| CA3118AT, CA3118T, CA3146AE, CA3146E | 50 | mA |
| CA3183AE, CA3183E                    | 75 | mA |

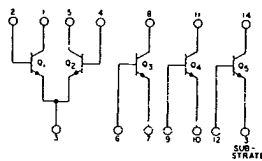
Base Current ( $I_B$ ) — CA3183AE, CA3183E

|  |    |    |
|--|----|----|
|  | 20 | mA |
|--|----|----|

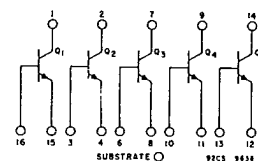
■ The collector of each transistor is isolated from the substrate by an integral diode. The substrate must be connected to a voltage which is more negative than any collector voltage in order to maintain isolation between transistors and provide normal transistor action. To avoid undesired coupling between transistors, the substrate terminal should be maintained at either DC or signal (AC) ground. A suitable bypass capacitor can be used to establish a signal ground.



CA3118AT, CA3118T



CA3146AE, CA3146E



CA3183AE, CA3183E

Fig. 1 — Schematic diagrams of high-voltage arrays.

## COMPARISON OF RELATED PREDECESSOR TYPE WITH TYPES IN THIS DATA BULLETIN

|          | DATA<br>FILE<br>NO. | $V_{CE0}$<br>min. | $V_{CBO}$<br>min. | $V_{CE}$ sat.<br>typ. V<br>$I_C=10\text{ mA}$ | $V_{BE}$<br>typ. V<br>$I_C=1\text{ mA}$ | $I_C$<br>max. mA | $C_{CB}$<br>typ. pF | $C_{CI}$<br>typ. pF | $C_{EB}$<br>typ. pF |
|----------|---------------------|-------------------|-------------------|-----------------------------------------------|-----------------------------------------|------------------|---------------------|---------------------|---------------------|
| CA3018   | 338                 | 15                | 20                | 0.23                                          | 0.715                                   | 50               | 0.58                | 2.8                 | 0.6                 |
| CA3018A  | 338                 | 15                | 20                | 0.23                                          | 0.715                                   | 50               | 0.58                | 2.8                 | 0.6                 |
| CA3118AT |                     | 40                | 50                | 0.33                                          | 0.730                                   | 50               | 0.37                | 2.2                 | 0.7                 |
| CA3118T  |                     | 30                | 40                | 0.33                                          | 0.730                                   | 50               | 0.37                | 2.2                 | 0.7                 |
| CA3046   | 341                 | 15                | 20                | 0.23                                          | 0.715                                   | 50               | 0.58                | 2.8                 | 0.6                 |
| CA3146AE |                     | 40                | 50                | 0.33                                          | 0.730                                   | 50               | 0.37                | 2.2                 | 0.7                 |
| CA3146E  |                     | 30                | 40                | 0.33                                          | 0.730                                   | 50               | 0.37                | 2.2                 | 0.7                 |
| CA3083   | 481                 | 15                | 20                | 0.4                                           | 0.74                                    | 100              | —                   | —                   | —                   |
| CA3183AE |                     | 40                | 50                | 1.7                                           | 0.75                                    | 75               | —                   | —                   | —                   |
| CA3183E  |                     | 30                | 40                | 1.7                                           | 0.75                                    | 75               | —                   | —                   | —                   |

NOTE: Related predecessor types are shown in shaded areas.

## CA3118, CA3146, CA3183

STATIC ELECTRICAL CHARACTERISTICS — CA3118 and CA3146 Series

| CHARACTERISTICS                                                                             | SYMBOL                           | TEST CONDITIONS                                                   |                                                               | Typ.<br>Char.<br>Curve<br>Fig. No. | LIMITS    |                  |      |           |      |       | UNITS |
|---------------------------------------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------|------------------------------------|-----------|------------------|------|-----------|------|-------|-------|
|                                                                                             |                                  | T <sub>A</sub> = 25°C                                             | CA3118AT, CA3146AE                                            |                                    |           | CA3118T, CA3146E |      |           |      |       |       |
|                                                                                             |                                  |                                                                   | Min.                                                          |                                    | Typ.      | Max.             | Min. | Typ.      | Max. |       |       |
| For Each Transistor :                                                                       |                                  |                                                                   |                                                               |                                    |           |                  |      |           |      |       |       |
| Collector-to-Base Breakdown Voltage                                                         | V <sub>(BR)CBO</sub>             | I <sub>C</sub> = 10 μA, I <sub>E</sub> = 0                        | —                                                             | 50                                 | 72        | —                | 40   | 72        | —    | V     |       |
| Collector-to-Emitter Breakdown Voltage                                                      | V <sub>(BR)CEO</sub>             | I <sub>C</sub> = 1mA, I <sub>B</sub> = 0                          | —                                                             | 40                                 | 56        | —                | 30   | 56        | —    | V     |       |
| Collector-to-Substrate Breakdown Voltage                                                    | V <sub>(BR)CIO</sub>             | I <sub>C1</sub> = 10 μA, I <sub>B</sub> = 0<br>I <sub>E</sub> = 0 | —                                                             | 50                                 | 72        | —                | 40   | 72        | —    | V     |       |
| Emitter-to-Base Breakdown Voltage                                                           | V <sub>(BR)EBO</sub>             | I <sub>E</sub> = 10 μA, I <sub>C</sub> = 0                        | —                                                             | 5                                  | 7         | —                | 5    | 7         | —    | V     |       |
| Collector-Cutoff Current                                                                    | I <sub>CEO</sub>                 | V <sub>CE</sub> = 10V, I <sub>B</sub> = 0                         | 2                                                             | —                                  | see curve | 5                | —    | see curve | 5    | μA    |       |
| Collector-Cutoff Current                                                                    | I <sub>CBO</sub>                 | V <sub>CB</sub> = 10V, I <sub>E</sub> = 0                         | 3                                                             | —                                  | 0.002     | 100              | —    | 0.002     | 100  | nA    |       |
| DC Forward-Current Transfer Ratio                                                           | h <sub>FE</sub>                  | V <sub>CE</sub> =5V                                               | I <sub>C</sub> =10mA                                          | 4                                  | —         | 85               | —    | —         | 85   | —     | —     |
|                                                                                             |                                  |                                                                   | I <sub>C</sub> =1mA                                           | 4                                  | 30        | 100              | —    | 30        | 100  | —     |       |
|                                                                                             |                                  |                                                                   | I <sub>C</sub> =10μA                                          | 4                                  | —         | 90               | —    | —         | 90   | —     |       |
| Base-to-Emitter Voltage                                                                     | V <sub>BE</sub>                  | V <sub>CE</sub> = 3V, I <sub>C</sub> = 1mA                        | 5                                                             | 0.63                               | 0.73      | 0.83             | 0.63 | 0.73      | 0.83 | V     |       |
| Collector-to-Emitter Saturation Voltage                                                     | V <sub>CEsat</sub>               | I <sub>C</sub> = 10mA, I <sub>B</sub> = 1mA                       | 6                                                             | —                                  | 0.33      | —                | —    | 0.33      | —    | V     |       |
| For transistors Q3 and Q4 (Darlington Configuration):                                       |                                  |                                                                   |                                                               |                                    |           |                  |      |           |      |       |       |
| Collector-Cutoff Current                                                                    | CA3118AT and CA3118T only        | I <sub>CEO</sub>                                                  | V <sub>CE</sub> = 10V, I <sub>B</sub> = 0                     | —                                  | —         | —                | 5    | —         | —    | —     | μA    |
| DC Forward-Current Transfer Ratio                                                           |                                  | h <sub>FE</sub>                                                   | V <sub>CE</sub> = 5V, I <sub>C</sub> = 1mA                    | 7                                  | 1500      | 9000             | —    | 1500      | 9000 | —     | —     |
| Base-to-Emitter (Q3 to Q4)                                                                  | V <sub>BE</sub>                  | V <sub>CE</sub> =5V                                               | I <sub>E</sub> = 10mA                                         | 8                                  | —         | 1.46             | —    | —         | 1.46 | —     | V     |
|                                                                                             |                                  |                                                                   | I <sub>E</sub> = 1mA                                          | 8,9                                | —         | 1.32             | —    | —         | 1.32 | —     |       |
| Magnitude of Base-to-Emitter Temperature Coefficient                                        | $\frac{\Delta V_{BE}}{\Delta T}$ | V <sub>CE</sub> = 5V, I <sub>E</sub> = 1mA                        | —                                                             | —                                  | 4.4       | —                | —    | 4.4       | —    | mV/°C |       |
| For transistors Q1 and Q2 (AS a Differential Amplifier):                                    |                                  |                                                                   |                                                               |                                    |           |                  |      |           |      |       |       |
| Magnitude of Input Offset Voltage<br> V <sub>BE1</sub> - V <sub>BE2</sub>                   | V <sub>IO</sub>                  | V <sub>CE</sub> = 5V, I <sub>E</sub> = 1mA                        | 10,11                                                         | —                                  | 0.48      | 5                | —    | 0.48      | 5    | mV    |       |
| Magnitude of h <sub>FE</sub> Ratio                                                          | CA3118AT and CA3118T only        | V <sub>CE</sub> = 5V, I <sub>C1</sub> = I <sub>C2</sub> = 1mA     | —                                                             | 0.9                                | 1.0       | 1.1              | 0.9  | 1.0       | 1.1  | —     |       |
| Magnitude of Base-to-Emitter Temperature Coefficient                                        | $\frac{\Delta V_{BE}}{\Delta T}$ | V <sub>CE</sub> = 5V, I <sub>E</sub> = 1mA                        | —                                                             | —                                  | 1.9       | —                | —    | 1.9       | —    | mV/°C |       |
| Magnitude of V <sub>IO</sub> (V <sub>BE1</sub> - V <sub>BE2</sub> ) Temperature Coefficient | $\frac{\Delta V_{IO}}{\Delta T}$ | V <sub>CE</sub> = 5V, I <sub>C1</sub> = I <sub>C2</sub> = 1mA     | —                                                             | —                                  | 1.1       | —                | —    | 1.1       | —    | μV/°C |       |
| Magnitude of Input Offset Current<br> I <sub>IO1</sub> - I <sub>IO2</sub>                   | CA3146AE and CA3146E only        | I <sub>IO</sub>                                                   | V <sub>CE</sub> = 5V, I <sub>C1</sub> = I <sub>C2</sub> = 1mA | 12                                 | —         | 0.3              | 2    | —         | 0.3  | 2     | μA    |

## CA3118, CA3146, CA3183

DYNAMIC ELECTRICAL CHARACTERISTICS — CA3118 and CA3146 Series

| CHARACTERISTICS                                                 | SYM-BOL  | TEST CONDITIONS                                                                                                    |                           | CA3118AT<br>CA3146AE |                      |      | CA3118T<br>CA3146E |                      |      | UNITS            |
|-----------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------|----------------------|------|--------------------|----------------------|------|------------------|
|                                                                 |          | $T_A = 25^\circ\text{C}$                                                                                           | Typ. Char. Curve Fig. No. | Min.                 | Typ.                 | Max. | Min.               | Typ.                 | Max. |                  |
| Low Frequency Noise Figure                                      | NF       | $f = 1\text{ kHz}, V_{CE} = 5\text{ V}, I_C = 100\text{ }\mu\text{A}, \text{Source resistance} = 1\text{ k}\Omega$ | 14                        | —                    | 3.25                 | —    | —                  | 3.25                 | —    | dB               |
| Low-Frequency, Small-Signal Equivalent-Circuit Characteristics: |          |                                                                                                                    |                           |                      |                      |      |                    |                      |      |                  |
| Forward-Current Transfer Ratio                                  | $h_{fe}$ | $f = 1\text{ kHz}, V_{CE} = 5\text{ V}, I_C = 1\text{ mA}$                                                         | 16                        | —                    | 100                  | —    | —                  | 100                  | —    | —                |
| Short-Circuit Input Impedance                                   | $h_{ie}$ |                                                                                                                    | 16                        | —                    | 2.7                  | —    | —                  | 3.5                  | —    | $\text{k}\Omega$ |
| Open-Circuit Output Impedance                                   | $h_{oe}$ |                                                                                                                    | 16                        | —                    | 15.6                 | —    | —                  | 15.6                 | —    | $\mu\text{mho}$  |
| Open-Circuit Reverse Voltage Transfer Ratio                     | $h_{re}$ |                                                                                                                    | 16                        | —                    | $1.8 \times 10^{-4}$ | —    | —                  | $1.8 \times 10^{-4}$ | —    | —                |
| Admittance Characteristics:                                     |          |                                                                                                                    |                           |                      |                      |      |                    |                      |      |                  |
| Forward Transfer Admittance                                     | $Y_{fe}$ | $f = 1\text{ MHz}, V_{CE} = 5\text{ V}, I_C = 1\text{ mA}$                                                         | 17                        | —                    | $31 \pm 1.5$         | —    | —                  | $31 \pm 1.5$         | —    | $\text{mmho}$    |
| Input Admittance                                                | $Y_{ie}$ |                                                                                                                    | 18                        | —                    | $0.35 \pm 0.04$      | —    | —                  | $0.3 \pm 0.04$       | —    | $\text{mmho}$    |
| Output Admittance                                               | $Y_{oe}$ |                                                                                                                    | 19                        | —                    | $0.001 \pm 0.03$     | —    | —                  | $0.001 \pm 0.03$     | —    | $\text{mmho}$    |
| Reverse Transfer Admittance                                     | $Y_{re}$ |                                                                                                                    | 20                        | —                    | See curve            | —    | —                  | See curve            | —    | $\text{mmho}$    |
| Gain-Bandwidth Product                                          | $f_T$    | $V_{CE} = 5\text{ V}, I_C = 3\text{ mA}$                                                                           | 21                        | 300                  | 500                  | —    | 300                | 500                  | —    | MHz              |
| Emitter-to-Base Capacitance                                     | $C_{EB}$ | $V_{EB} = 5\text{ V}, I_E = 0$                                                                                     | 22                        | —                    | 0.70                 | —    | —                  | 0.70                 | —    | pF               |
| Collector-to-Base Capacitance                                   | $C_{CB}$ | $V_{CB} = 5\text{ V}, I_C = 0$                                                                                     | 22                        | —                    | 0.37                 | —    | —                  | 0.37                 | —    | pF               |
| Collector-to-Substrate Capacitance                              | $C_{CI}$ | $V_{CI} = 5\text{ V}, I_C = 0$                                                                                     | 22                        | —                    | 2.2                  | —    | —                  | 2.2                  | —    | pF               |

STATIC ELECTRICAL CHARACTERISTICS — CA3183 Series

| CHARACTERISTICS                                          | SYMBOL        | TEST CONDITIONS                       |          | Typ. Char Curve Fig. No. | LIMITS |         |      |      |      |               | UNITS |
|----------------------------------------------------------|---------------|---------------------------------------|----------|--------------------------|--------|---------|------|------|------|---------------|-------|
|                                                          |               | $T_A = 25^{\circ}\text{C}$            | CA3183AE |                          |        | CA3183E |      |      |      |               |       |
|                                                          |               |                                       | Min.     |                          | Typ.   | Max.    | Min. | Typ. | Max. |               |       |
| For Each Transistor:                                     |               |                                       |          |                          |        |         |      |      |      |               |       |
| Collector-to-Base Breakdown Voltage                      | $V_{(BR)CBO}$ | $I_C=100\mu\text{A}, I_E=0$           | —        | 50                       | —      | —       | 40   | —    | —    | V             |       |
| Collector-to-Emitter Breakdown Voltage                   | $V_{(BR)CEO}$ | $I_C=1\text{mA}, I_B=0$               | —        | 40                       | —      | —       | 30   | —    | —    | V             |       |
| Collector-to-Substrate Breakdown Voltage                 | $V_{(BR)CIO}$ | $I_{CI}=100\mu\text{A}, I_B=0, I_E=0$ | —        | 50                       | —      | —       | 40   | —    | —    | V             |       |
| Emitter-to-Base Breakdown Voltage                        | $V_{(BR)EBO}$ | $I_E=500\mu\text{A}, I_C=0$           | —        | 5                        | —      | —       | 5    | —    | —    | V             |       |
| Collector-Cutoff Current                                 | $I_{CEO}$     | $V_{CE}=10\text{V}, I_B=0$            | 23       | —                        | —      | 10      | —    | —    | 10   | $\mu\text{A}$ |       |
| Collector Cutoff Current                                 | $I_{CBO}$     | $V_{CB}=10\text{V}, I_E=0$            | 24       | —                        | —      | 1       | —    | —    | 1    | $\mu\text{A}$ |       |
| DC Forward-Current Transfer Ratio                        | $h_{FE}$      | $V_{CE}=3\text{V}, I_C=10\text{mA}$   | 25, 26   | 40                       | —      | —       | 40   | —    | —    | —             |       |
|                                                          |               | $V_{CE}=5\text{V}, I_C=50\text{mA}$   | —        | 40                       | —      | —       | 40   | —    | —    | —             |       |
| Base-to-Emitter Voltage                                  | $V_{BE}$      | $V_{CE}=3\text{V}, I_C=10\text{mA}$   | 27       | 0.65                     | 0.75   | 0.85    | 0.65 | 0.75 | 0.85 | V             |       |
| Collector-to-Emitter Saturation Voltage                  | $*V_{CEsat}$  | $I_C=50\text{mA}, I_B=5\text{mA}$     | 28       | —                        | 1.7    | 3.0     | —    | 1.7  | 3.0  | V             |       |
| For Transistors Q1 and Q2 (As a Differential Amplifier): |               |                                       |          |                          |        |         |      |      |      |               |       |
| Absolute Input Offset Voltage                            | $ V_{IO} $    | $V_{CE}=3\text{V}, I_C=1\text{mA}$    | 29       | —                        | 0.47   | 5       | —    | 0.47 | 5    | mV            |       |
| Absolute Input Offset Current                            | $ I_{IO} $    |                                       | 30       | —                        | 0.78   | 2.5     | —    | 0.78 | 2.5  | $\mu\text{A}$ |       |

\* A maximum dissipation of 5 transistors  $\times 150\text{ mW} = 750\text{ mW}$  is possible for a particular application.

# CA3118, CA3146, CA3183

## TYPICAL STATIC CHARACTERISTICS CURVES - CA3118 and CA3146 SERIES

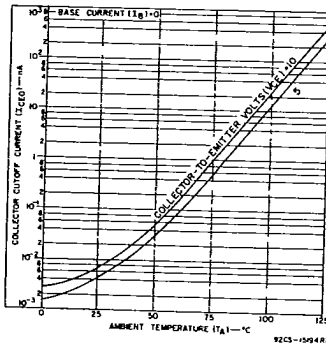


Fig. 2 -  $I_{CEO}$  vs.  $T_A$  for any transistor.

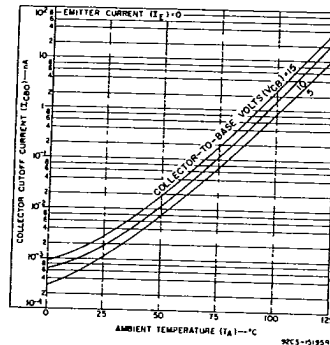


Fig. 3 -  $I_{CBO}$  vs.  $T_A$  for any transistor.

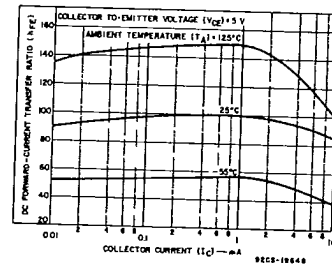


Fig. 4 -  $h_{FE}$  vs.  $I_C$  for any transistor.

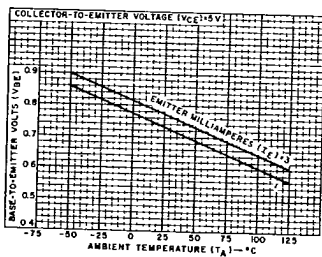


Fig. 5 -  $V_{BE}$  vs.  $T_A$  for any transistor.

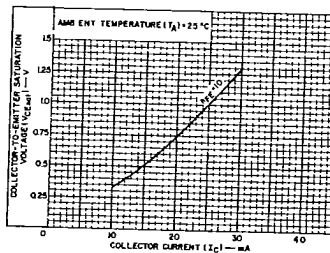


Fig. 6 -  $V_{CE\text{ sat}}$  vs.  $I_C$  for any transistor.

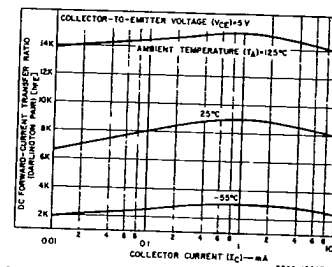


Fig. 7 -  $h_{FE}$  vs.  $I_C$  for Darlington pair (Q3 and Q4) for types CA3118AT and CA3118T.

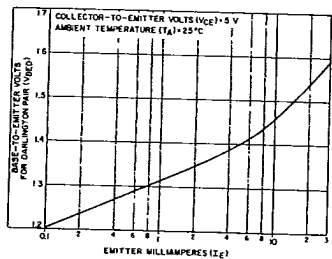


Fig. 8 -  $V_{BE}$  vs.  $I_E$  for Darlington pair (Q3 and Q4).

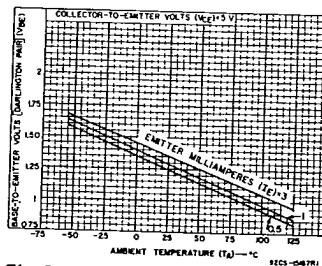


Fig. 9 -  $V_{BE}$  vs.  $T_A$  for Darlington pair (Q3 and Q4).

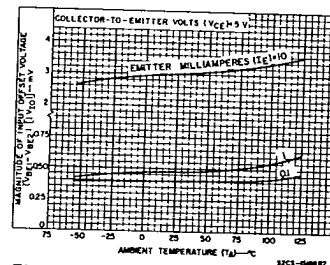


Fig. 10 -  $V_{IO}$  vs.  $T_A$  for Q1 and Q2.

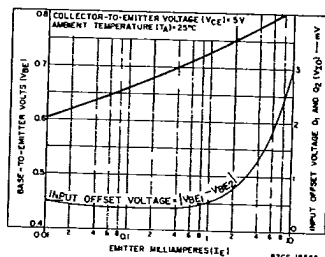


Fig. 11 -  $V_{BE}$  and  $V_{IO}$  vs.  $I_E$  for Q1 and Q2.

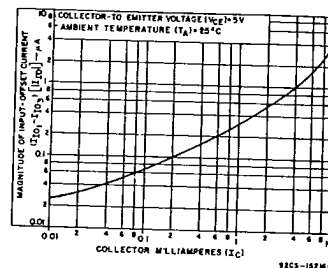
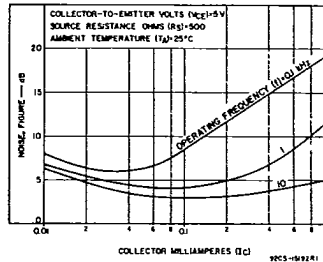
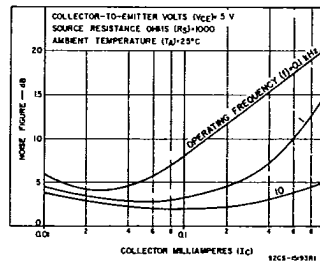
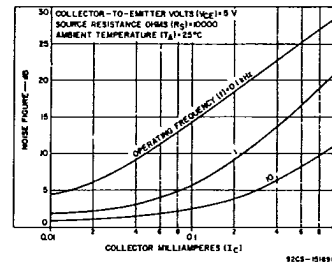
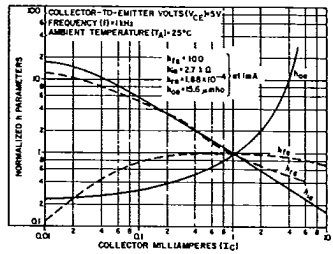
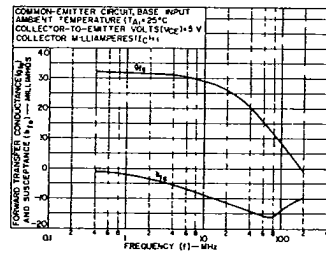
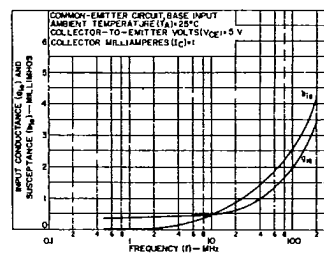
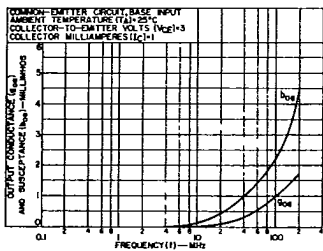
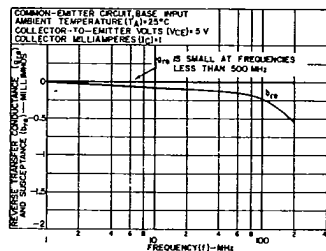
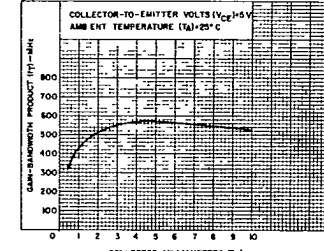
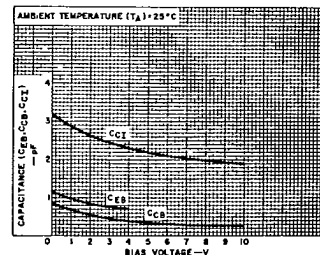


Fig. 12 -  $I_{IO}$  vs.  $I_C$  (Q1 and Q2) for types CA3146AE and CA3146E.

## CA3118, CA3146, CA3183

TYPICAL DYNAMIC CHARACTERISTICS CURVES (FOR ANY TRANSISTOR) - CA3118, CA3146 SERIES

Fig. 13 - NF vs.  $I_C$  @  $R_S = 500 \Omega$ .Fig. 14 - NF vs.  $I_C$  @  $R_S = 1k \Omega$ .Fig. 15 - NF vs.  $I_C$  @  $R_S = 10k \Omega$ .Fig. 16 -  $h_{fe}$ ,  $h_{ie}$ ,  $h_{oe}$ ,  $h_{re}$  vs.  $I_C$ Fig. 17 -  $y_{fe}$  vs.  $f$ .Fig. 18 -  $y_{ie}$  vs.  $f$ .Fig. 19 -  $y_{oe}$  vs.  $f$ .Fig. 20 -  $y_{re}$  vs.  $f$ .Fig. 21 -  $f_T$  vs.  $I_C$ Fig. 22 -  $C_{EB}$ ,  $C_{CB}$ ,  $C_{CJ}$  vs. bias voltage

# CA3118, CA3146, CA3183

## TYPICAL STATIC CHARACTERISTICS CURVES - CA3183 SERIES

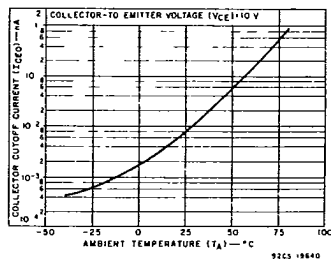


Fig. 23 -  $I_{CEO}$  vs.  $T_A$  for any transistor.

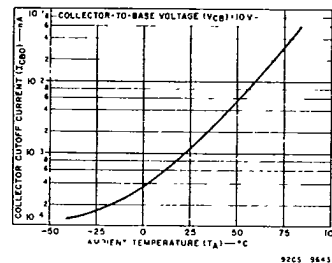


Fig. 24 -  $I_{CBO}$  vs.  $T_A$  for any transistor.

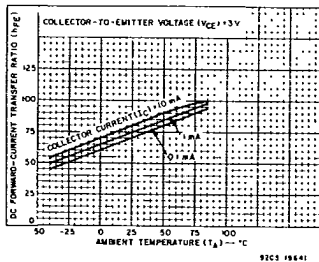


Fig. 25 -  $h_{FE}$  vs.  $T_A$  for any transistor.

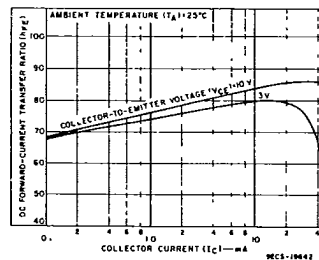


Fig. 26 -  $h_{FE}$  vs.  $I_C$  for any transistor.

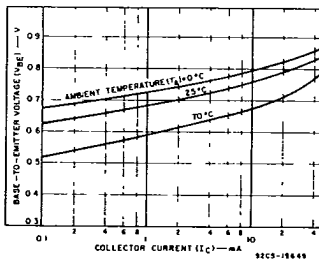


Fig. 27 -  $V_{BE}$  vs.  $I_C$  for any transistor.

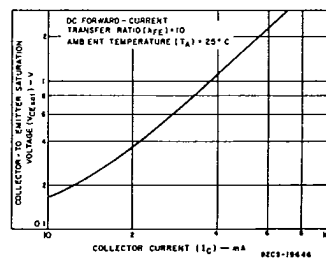


Fig. 28 -  $V_{CE sat}$  vs.  $I_C$  for any transistor.

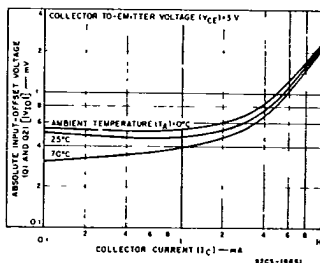


Fig. 29 -  $|V_{IO}|$  vs.  $I_C$  for differential amplifier (Q1 and Q2).

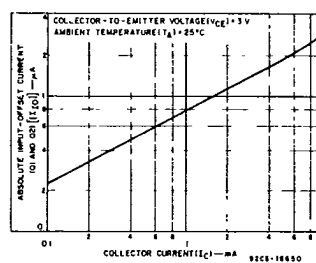


Fig. 30 -  $|I_{IO}|$  vs.  $I_C$  for differential amplifier (Q1 and Q2).