

General-Purpose N-P-N Transistor Array

Three Isolated Transistors and One Differentially-Connected Transistor Pair

For Low-Power Applications from DC to 120MHz

Applications

- General-purpose use in signal processing systems operating in the DC to 120-MHz range
- Temperature compensated amplifiers
- See RCA Application Note, ICAN-5296 "Application of the RCA-CA3018 Integrated-Circuit Transistor Array" for suggested applications.

RCA-CA3086* consists of five general-purpose silicon n-p-n transistors on a common monolithic substrate. Two of the transistors are internally connected to form a differentially-connected pair.

The transistors of the CA3086 are well suited to a wide variety of applications in low-power systems at frequencies from DC to 120 MHz. They may be used as discrete transistors in conventional circuits. However, they also provide the very significant inherent advantages unique to integrated circuits, such as compactness, ease of physical handling and thermal matching.

The CA3086 is supplied in a 14-lead dual-in-line plastic package.

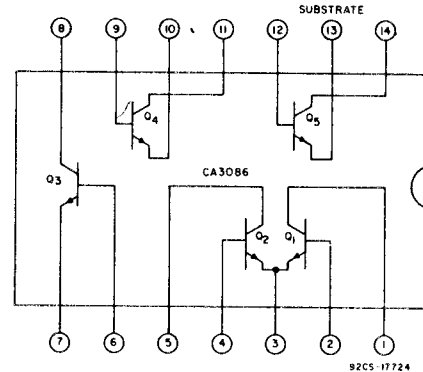


Fig.1— Functional diagram of the CA3086.

*Formerly developmental type TA6044

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

Dissipation:

Any one transistor	300	mW
Total package up to $T_A = 55^\circ\text{C}$	750	mW
Above $T_A = 55^\circ\text{C}$	derate linearly 6.67	mW/ $^\circ\text{C}$

Ambient Temperature Range:

Operating	-40 to + 85	$^\circ\text{C}$
Storage	-65 to + 150	$^\circ\text{C}$

The following ratings apply for each transistor in the device:

Collector-to-Emitter Voltage, V_{CEO}	15	V
Collector-to-Base Voltage, V_{CBO}	20	V
Collector-to-Substrate Voltage, V_{CISO}^*	20	V
Emitter-to-Base Voltage, V_{EBO}	5	V
Collector Current, I_C	50	mA

*The collector of each transistor in the CA3086 is isolated from the substrate by an integral diode. The substrate (terminal 13) must be connected to the most negative point in the external circuit to maintain isolation between transistors and to provide for normal transistor action. To avoid undesirable coupling between transistors, the substrate (terminal 13) should be maintained at either DC or signal (AC) ground. A suitable bypass capacitor can be used to establish a signal ground.

ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$
For Equipment Design

CHARACTERISTICS	SYMBOLS	TEST CONDITIONS	Typ. Characteristic Curves Fig. No.	LIMITS			UNITS
				Min.	Typ.	Max.	
Collector-to-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = 10 \mu\text{A}, I_E = 0$	—	20	60	—	V
Collector-to-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 1\text{mA}, I_B = 0$	—	15	24	—	V
Collector-to-Substrate Breakdown Voltage	$V_{(BR)CIO}$	$I_C = 10 \mu\text{A}, I_{CI} = 0$	—	20	60	—	V
Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = 10 \mu\text{A}, I_C = 0$	—	5	7	—	V
Collector-Cutoff Current	I_{CBO}	$V_{CB} = 10\text{V}, I_E = 0$	2	—	0.002	100	nA
Collector-Cutoff Current	I_{CEO}	$V_{CE} = 10\text{V}, I_B = 0$	3	—	See Curve	5	μA
DC Forward-Current Transfer Ratio	h_{FE}	$V_{CE} = 3\text{V}, I_C = 1\text{mA}$	4	40	100	—	

TYPICAL STATIC CHARACTERISTICS FOR EACH TRANSISTOR

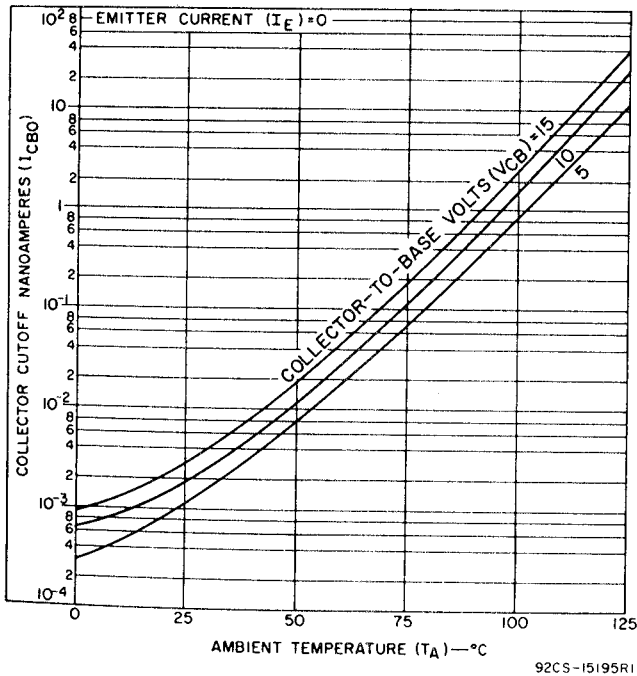


Fig.2— I_{CBO} vs T_A .

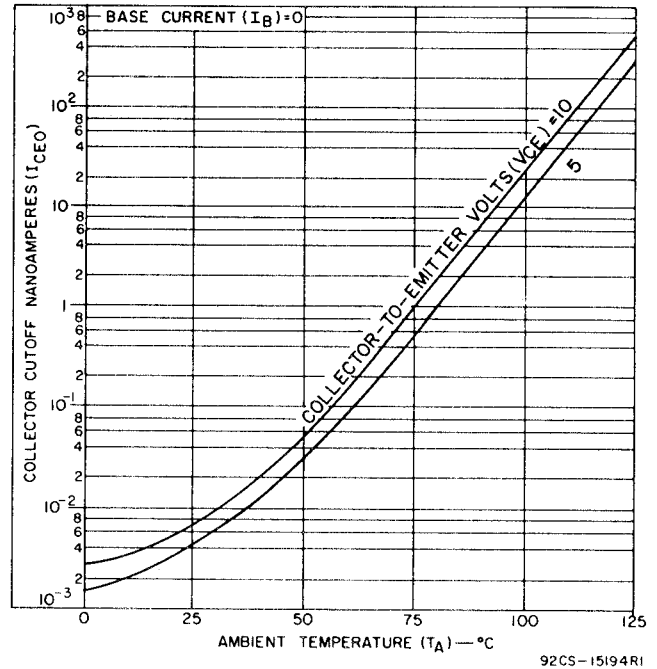


Fig.3— I_{CEO} vs T_A .

TYPICAL STATIC CHARACTERISTICS FOR EACH TRANSISTOR

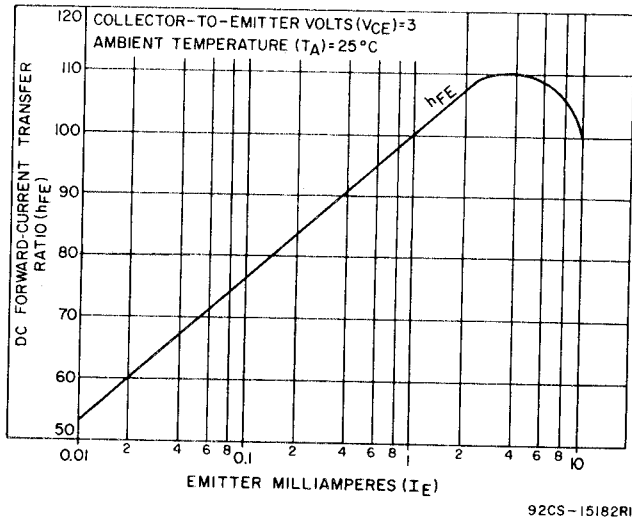


Fig.4 - h_{FE} vs I_E

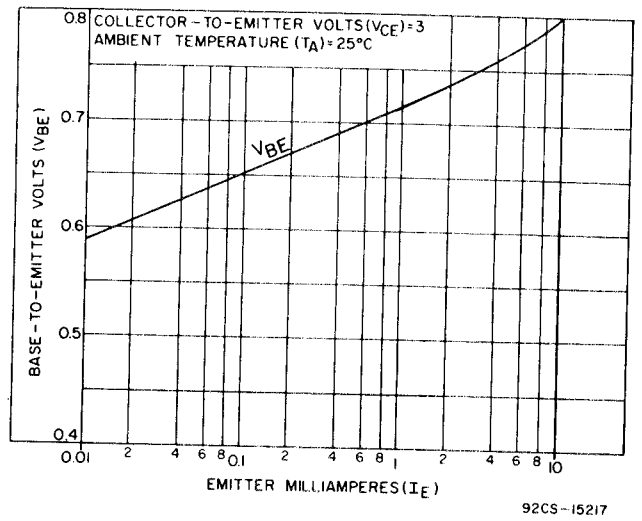


Fig.5 - V_{BE} vs I_E

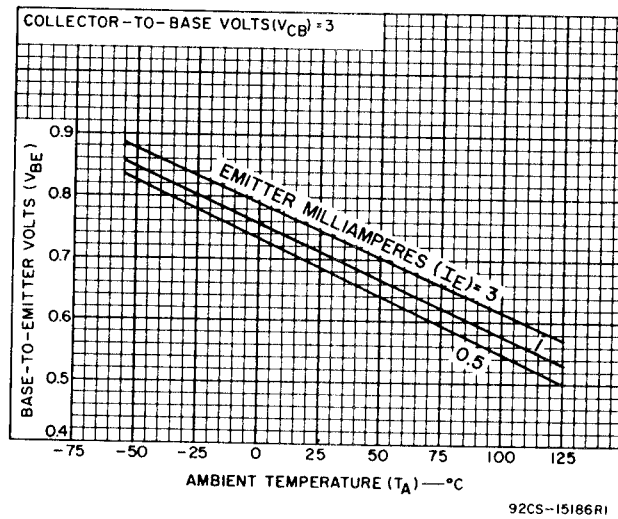
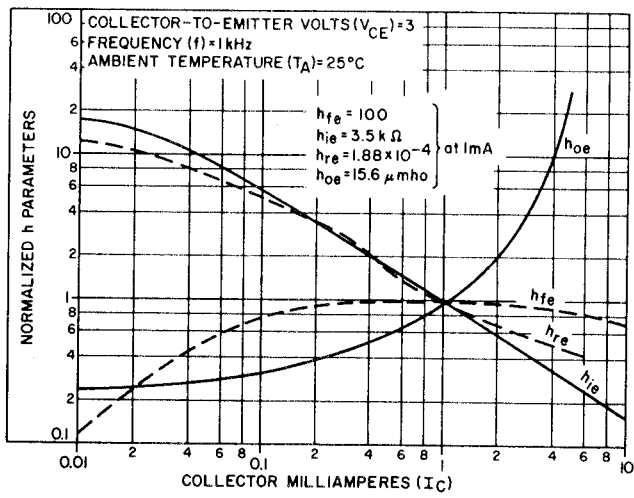


Fig.6 - V_{BE} vs T_A

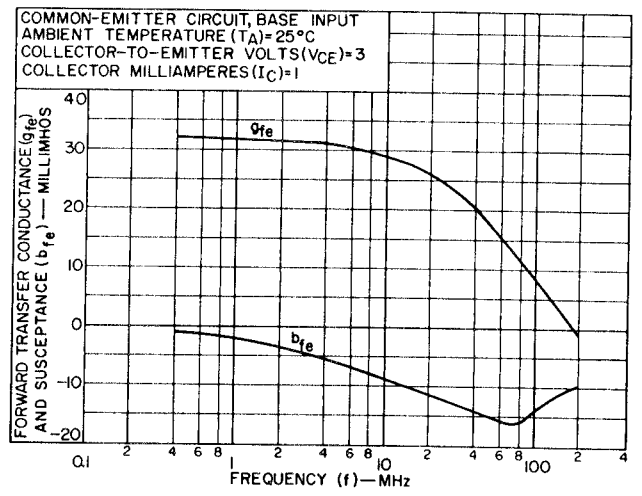
ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$
 Typical Values Intended Only for Design Guidance

CHARACTERISTICS	SYMBOL	TEST CONDITIONS		Typ. Characteristics Curves Fig. No.	TYPICAL VALUES	UNITS
DC Forward-Current Transfer Ratio	h_{FE}	$V_{CE} = 3\text{V}$	$I_C = 10\text{mA}$	4	100	
			$I_C = 10\mu\text{A}$	4	54	
Base-to-Emitter Voltage	V_{BE}	$V_{CE} = 3\text{V}$	$I_E = 1\text{mA}$	5	0.715	V
			$I_E = 10\text{mA}$	5	0.800	V
V_{BE} Temperature Coefficient	$\Delta V_{BE}/\Delta T$	$V_{CE} = 3\text{V}, I_C = 1\text{mA}$		6	-1.9	mV/ $^\circ\text{C}$
Collector-to-Emitter Saturation Voltage	V_{CEsat}	$I_B = 1\text{mA}, I_C = 10\text{mA}$		—	0.23	V
Noise Figure (low frequency)	NF	$f = 1\text{kHz}, V_{CE} = 3\text{V}, I_C = 100\mu\text{A}, R_S = 1\text{k}\Omega$		—	3.25	dB
Low-Frequency, Small-Signal Equivalent-Circuit Characteristics:						
Forward Current-Transfer Ratio	h_{fe}			7	100	—
Short-Circuit Input Impedance	h_{ie}	$f = 1\text{kHz}, V_{CE} = 3\text{V}, I_C = 1\text{mA}$		7	3.5	k Ω
Open-Circuit Output Impedance	h_{oe}			7	15.6	μmho
Open-Circuit Reverse-Voltage Transfer Ratio	h_{re}			7	1.8×10^{-4}	—
Admittance Characteristics:						
Forward Transfer Admittance	y_{fe}			8	$31 - j1.5$	mmho
Input Admittance	y_{ie}	$f = 1\text{MHz}, V_{CE} = 3\text{V}, I_C = 1\text{mA}$		9	$0.3 + j0.04$	mmho
Output Admittance	y_{oe}			10	$0.001 + j0.03$	mmho
Reverse Transfer Admittance	y_{re}			11	See Curve	—
Gain-Bandwidth Product	f_T	$V_{CE} = 3\text{V}, I_C = 3\text{mA}$		12	550	MHz
Emitter-to-Base Capacitance	C_{EBO}	$V_{EB} = 3\text{V}, I_E = 0$		—	0.6	pF
Collector-to-Base Capacitance	C_{CBO}	$V_{CB} = 3\text{V}, I_C = 0$		—	0.58	pF
Collector-to-Substrate Capacitance	C_{CIO}	$V_{CI} = 3\text{V}, I_C = 0$		—	2.8	pF



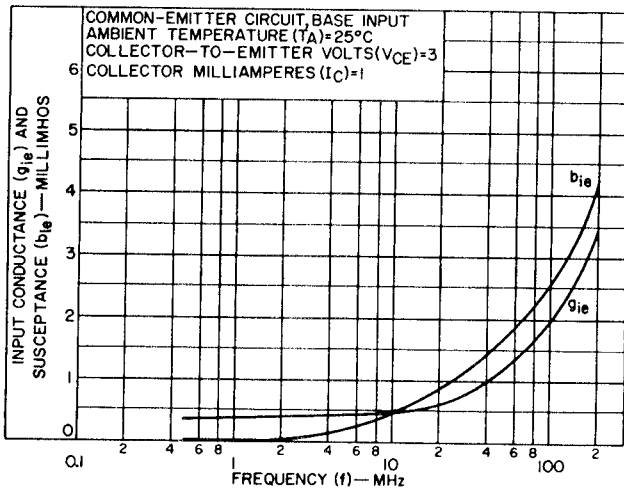
92CS-15190R2

Fig. 7— Normalized h_{fe} , h_{ie} , h_{oe} , h_{re} vs I_C .



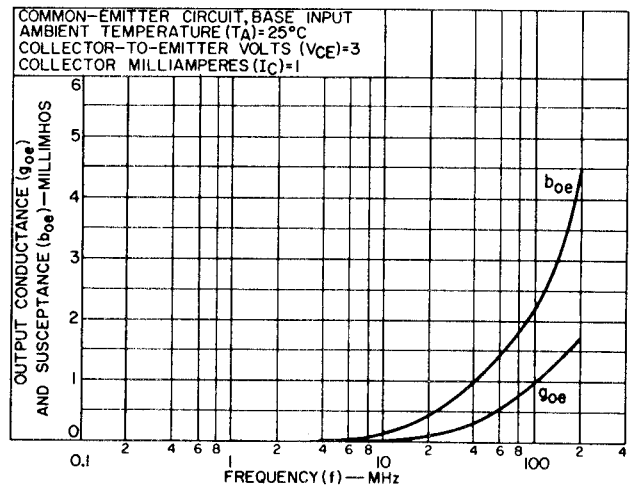
92CS-14257

Fig. 8— y_{fe} vs f .



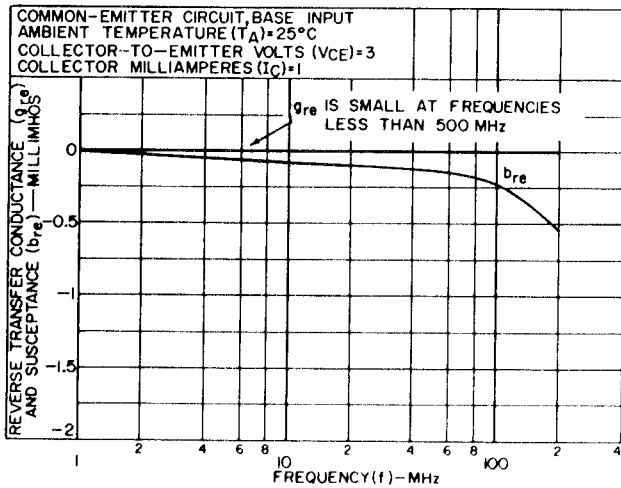
92CS-14259R1

Fig. 9— y_{ie} vs f .



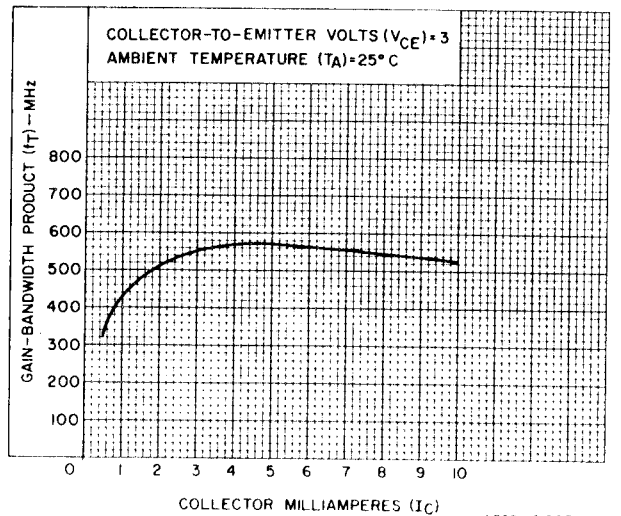
92CS-14260R1

Fig. 10— y_{oe} vs f .



92CS-14258R1

Fig. 11— y_{re} vs f .

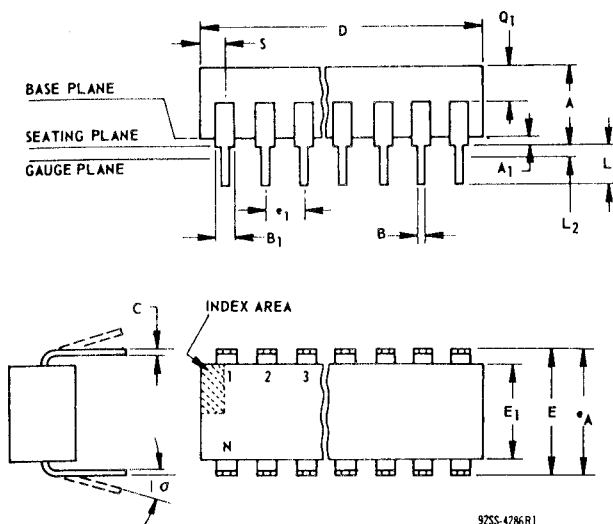


92CS-15196R1

Fig. 12— f_T vs I_C .

DIMENSIONAL OUTLINE

14-LEAD DUAL-IN-LINE PLASTIC PACKAGE—JEDEC MO-001-AB



SYMBOL	INCHES		NOTE	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	0.155	0.200		3.94	5.08
A ₁	0.020	0.050		0.51	1.27
B	0.014	0.020		0.356	0.508
B ₁	0.050	0.065		1.27	1.65
C	0.008	0.012		0.204	0.304
D	0.745	0.770		18.93	19.55
E	0.300	0.325		7.62	8.25
E ₁	0.240	0.260		6.10	6.60
e ₁	0.100 TP		2	2.54 TP	
e _A	0.300 TP		2, 3	7.62 TP	
L	0.125	0.150		3.18	3.81
L ₂	0.000	0.030		0.000	0.76
α	0°	15°	4	0°	15°
N	14		5	14	
N ₁	0		6	0	
Q ₁	0.040	0.075		1.02	1.90
S	0.065	0.090		1.66	2.28

NOTES:

1. Refer to Rules for Dimensioning Axial Lead Product Outlines.
2. Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
3. e_A applies in zone L₂ when unit installed.
4. α applies to spread leads prior to installation.
5. N is the maximum quantity of lead positions.
6. N₁ is the quantity of allowable missing leads.