



**MOTOROLA**  
Semiconductors

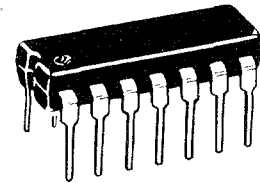
**MC3346P**  
**MC3386P**

**ONE DIFFERENTIALLY-CONNECTED  
PAIR AND THREE  
ISOLATED TRANSISTOR ARRAY**

The MC3346P and MC3386P are designed for general-purpose, low power applications for consumer and industrial designs.

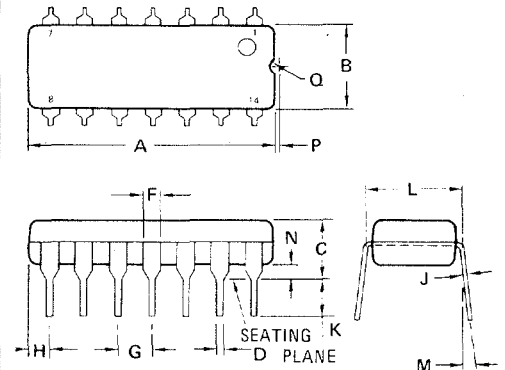
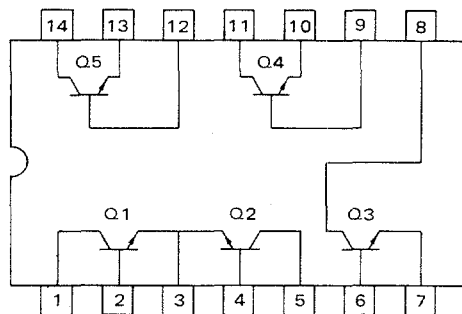
- Guaranteed Base-Emitter Voltage Matching
- Operating Current Range Specified – 10  $\mu$ A to 10 mA
- Five General-Purpose Transistors in One Package

**GENERAL-PURPOSE  
TRANSISTOR ARRAY**  
SILICON MONOLITHIC  
INTEGRATED CIRCUIT



**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	15	Vdc
Collector-Base Voltage	$V_{CBO}$	20	Vdc
Emitter-Base Voltage	$V_{EB}$	5.0	Vdc
Collector-Substrate Voltage	$V_{CISO}$	20	Vdc
Collector Current – Continuous	$I_C$	50	mA dc
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$ Derate Each Transistor @ $25^\circ\text{C}$	$P_D$	1.2 10 300	Watts mW/ $^\circ\text{C}$ mW/ $^\circ\text{C}$
Operating Junction Temperature Range	$T_A$	0 to +85	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-65 to +150	$^\circ\text{C}$



**NOTES:**

1. LEADS WITHIN 0.13 mm (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
2. DIMENSION "L" TO CENTER OF LEADS WHEN FORMED PARALLEL

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	18.16	18.80	0.715	0.740
B	6.10	6.60	0.240	0.260
C	4.06	4.57	0.160	0.180
D	0.38	0.51	0.015	0.020
F	1.02	1.52	0.040	0.060
G	2.54 BSC		0.100 BSC	
H	1.32	1.83	0.052	0.072
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.37	7.87	0.290	0.310
M	— 10 <sup>0</sup>		— 10 <sup>0</sup>	
N	0.51	1.02	0.020	0.040
P	0.13	0.38	0.005	0.015
Q	0.51	0.76	0.020	0.030

CASE 646

## ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	MC3346P			MC3386P			Unit
		Min	Typ	Max	Min	Typ	Max	
<b>STATIC CHARACTERISTICS</b>								
Collector-Base Breakdown Voltage ( $I_C = 10 \mu\text{A}$ )	$BV_{CBO}$	20	60	—	20	60	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = 1.0 \text{ mA}$ )	$BV_{CEO}$	15	—	—	15	—	—	Vdc
Collector-Substrate Breakdown Voltage ( $I_C = 10 \mu\text{A}$ )	$BV_{C10}$	20	60	—	20	60	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 10 \mu\text{A}$ )	$BV_{EBO}$	5.0	7.0	—	5.0	7.0	—	Vdc
Collector-Base Cutoff Current ( $V_{CB} = 10 \text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	—	—	40	—	—	100	nA
DC Current Gain ( $I_C = 10 \text{ mA}$ , $V_{CE} = 3.0 \text{ Vdc}$ ) ( $I_C = 1.0 \text{ mA}$ , $V_{CE} = 3.0 \text{ Vdc}$ ) ( $I_C = 10 \mu\text{A}$ , $V_{CE} = 3.0 \text{ Vdc}$ )	$h_{FE}$	— 40 —	140 130 60	— — —	— 40 —	— 130 —	— — —	—
Base-Emitter Voltage ( $V_{CE} = 3.0 \text{ Vdc}$ , $I_E = 1.0 \text{ mA}$ ) ( $V_{CE} = 3.0 \text{ Vdc}$ , $I_E = 10 \text{ mA}$ )	$V_{BE}$	— —	0.72 0.80	— —	— —	0.72 0.80	— —	Vdc
Input Offset Current for Matched Pair Q1 and Q2 ( $V_{CE} = 3.0 \text{ Vdc}$ , $I_C = 1.0 \text{ mA}$ )	$ I_{O1} $ $ I_{O2} $	—	0.3	2.0	—	0.3	—	$\mu\text{A}$
Magnitude of Input Offset Voltage ( $V_{CE} = 3.0 \text{ Vdc}$ , $I_C = 1.0 \text{ mA}$ )	—	—	0.5	5.0	—	0.5	—	mVdc
Temperature Coefficient of Base-Emitter Voltage ( $V_{CE} = 3.0 \text{ Vdc}$ , $I_C = 1.0 \text{ mA}$ )	$\frac{\Delta V_{BE}}{\Delta T}$	—	-1.9	—	—	-1.9	—	$\text{mV}/^\circ\text{C}$
Temperature Coefficient	$\frac{ I_{O1} }{\Delta T}$	—	1.0	—	—	1.0	—	$\mu\text{V}/^\circ\text{C}$
Collector-Emitter Cutoff Current ( $V_{CB} = 10 \text{ Vdc}$ , $I_E = 0$ )	$I_{CEO}$	—	—	0.5	—	—	5.0	$\mu\text{A}$
<b>DYNAMIC CHARACTERISTICS</b>								
Low Frequency Noise Figure ( $V_{CE} = 3.0 \text{ Vdc}$ , $I_C = 100 \mu\text{A}$ , $R_S = 1.0 \text{ k}\Omega$ , $f = 1.0 \text{ kHz}$ )	NF	—	3.25	—	—	3.25	—	dB
Forward Current Transfer Ratio ( $V_{CE} = 3.0 \text{ Vdc}$ , $I_C = 1.0 \text{ mA}$ , $f = 1.0 \text{ kHz}$ )	$h_{FE}$	—	110	—	—	110	—	—
Short-Circuit Input Impedance ( $V_{CE} = 3.0 \text{ Vdc}$ , $I_C = 1.0 \text{ mA}$ )	$h_{ie}$	—	3.5	—	—	3.5	—	$\text{k}\Omega$
Open-Circuit Output Impedance ( $V_{CE} = 3.0 \text{ Vdc}$ , $I_C = 1.0 \text{ mA}$ )	$h_{oe}$	—	15.6	—	—	15.6	—	$\mu\text{mhos}$
Reverse Voltage Transfer Ratio ( $V_{CE} = 3.0 \text{ Vdc}$ , $I_C = 1.0 \text{ mA}$ )	$h_{re}$	—	1.8	—	—	1.8	—	$\times 10^{-4}$
Forward Transfer Admittance ( $V_{CE} = 3.0 \text{ Vdc}$ , $I_C = 1.0 \text{ mA}$ , $f = 1.0 \text{ MHz}$ )	$y_{fe}$	—	31-j1.5	—	—	31-j1.5	—	—
Input Admittance ( $V_{CE} = 3.0 \text{ Vdc}$ , $I_C = 1.0 \text{ mA}$ , $f = 1.0 \text{ MHz}$ )	$y_{ie}$	—	0.3+j0.04	—	—	0.3+j0.04	—	—
Output Admittance ( $V_{CE} = 3.0 \text{ Vdc}$ , $I_C = 1.0 \text{ mA}$ , $f = 1.0 \text{ MHz}$ )	$y_{oe}$	—	0.001+j0.03	—	—	0.001+j0.03	—	—
Current-Gain • Bandwidth Product ( $V_{CE} = 3.0 \text{ Vdc}$ , $I_C = 3.0 \text{ mA}$ )	$f_T$	300	550	—	—	550	—	MHz
Emitter-Base Capacitance ( $V_{EB} = 3.0 \text{ Vdc}$ , $I_E = 0$ )	$C_{eb}$	—	0.6	—	—	0.6	—	pF
Collector-Base Capacitance ( $V_{CB} = 3.0 \text{ Vdc}$ , $I_C = 0$ )	$C_{cb}$	—	0.58	—	—	0.58	—	pF
Collector-Substrate Capacitance ( $V_{CS} = 3.0 \text{ Vdc}$ , $I_C = 0$ )	$C_{C1}$	—	2.8	—	—	2.8	—	pF



TYPICAL CHARACTERISTICS

FIGURE 1 - COLLECTOR CUTOFF CURRENT versus TEMPERATURE (Each Transistor)

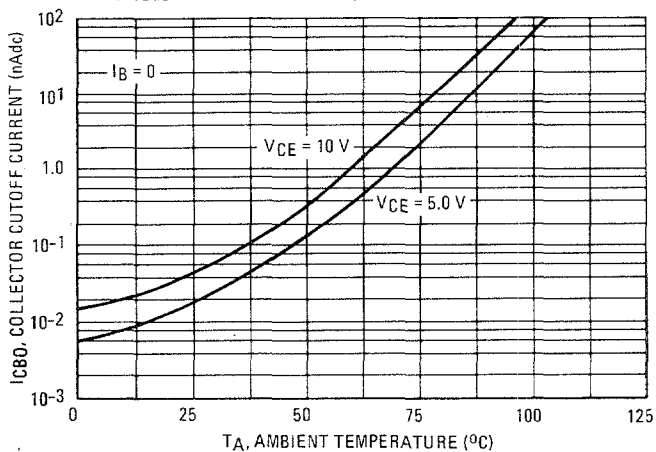


FIGURE 2 - COLLECTOR CUTOFF CURRENT versus TEMPERATURE (Each Transistor)

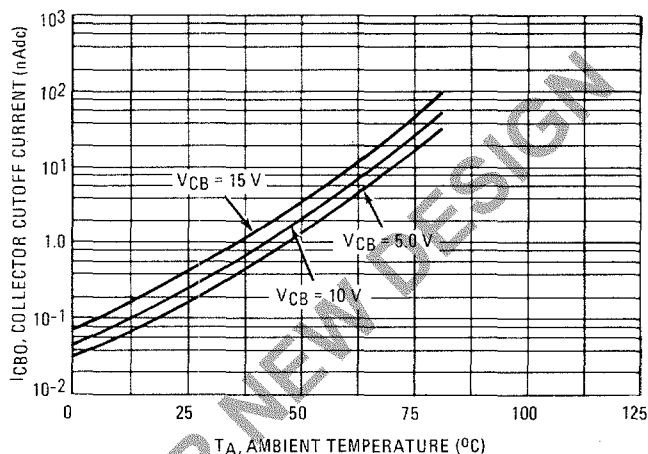


FIGURE 3 - INPUT OFFSET CHARACTERISTICS FOR Q1 and Q2

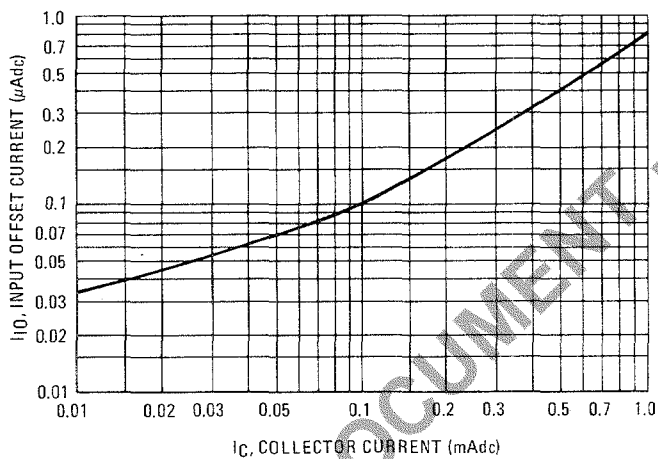


FIGURE 4 - BASE-EMITTER AND INPUT OFFSET VOLTAGE CHARACTERISTICS

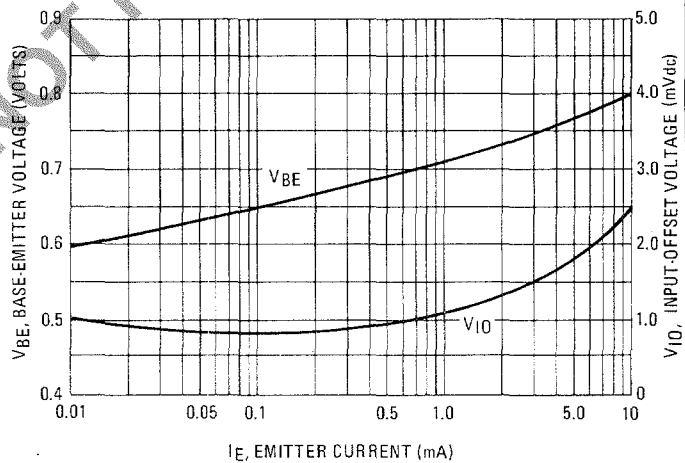
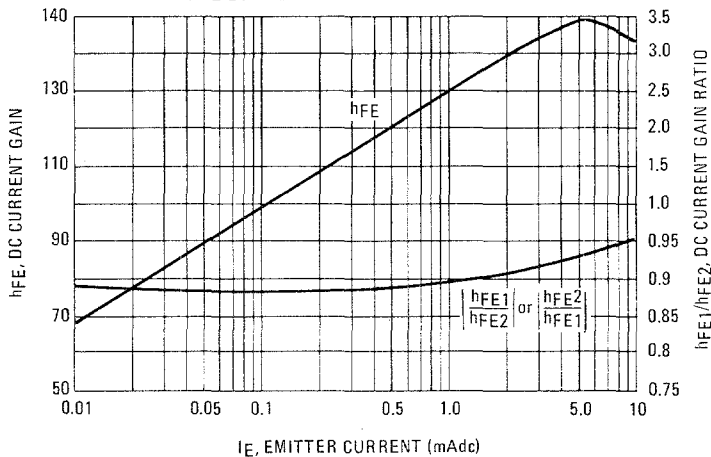


FIGURE 5 - DC CURRENT GAIN



ARCHIVE DOCUMENT - NOT FOR NEW DESIGN



**MOTOROLA Semiconductor Products Inc.**