



**MOTOROLA**

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# General Purpose Transistor Array One Differentially Connected Pair and Three Isolated Transistor Arrays

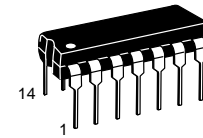
The MC3346 is designed for general purpose, low power applications for consumer and industrial designs.

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

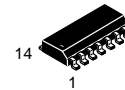
## MC3346

### GENERAL PURPOSE TRANSISTOR ARRAY

#### SEMICONDUCTOR TECHNICAL DATA



**P SUFFIX**  
PLASTIC PACKAGE  
CASE 646



**D SUFFIX**  
PLASTIC PACKAGE  
CASE 751A  
(SO-14)

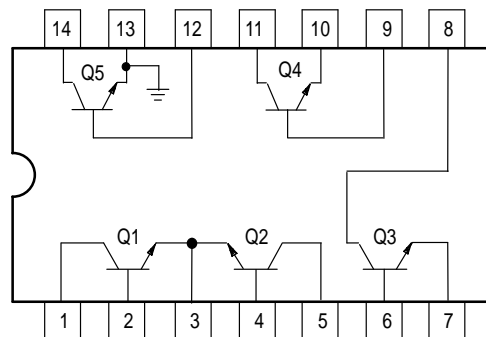
#### MAXIMUM RATINGS

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	$V_{CIO}$	20	Vdc
Collector Current – Continuous	$I_C$	50	mAdc
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.2 10	W mW/ $^\circ\text{C}$
Operating Temperature Range	$T_A$	-40 to +85	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-65 to +150	$^\circ\text{C}$

#### ORDERING INFORMATION

Device	Operating Temperature Range	Package
MC3346D	$T_A = -40^\circ$ to $+85^\circ\text{C}$	SO-14
MC3356P		Plastic DIP

#### PIN CONNECTIONS



Pin 13 is connected to substrate and must remain at the lowest circuit potential.

# MC3346

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = +25°C, unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
<b>STATIC CHARACTERISTICS</b>					
Collector–Base Breakdown Voltage (I <sub>C</sub> = 10 μAdc)	V <sub>(BR)CBO</sub>	20	60	–	Vdc
Collector–Emitter Breakdown Voltage (I <sub>C</sub> = 1.0 mAdc)	V <sub>(BR)CEO</sub>	15	–	–	Vdc
Collector–Substrate Breakdown Voltage (I <sub>C</sub> = 10 μA)	V <sub>(BR)CIO</sub>	20	60	–	Vdc
Emitter–Base Breakdown Voltage (I <sub>E</sub> = 10 μAdc)	V <sub>(BR)EBO</sub>	5.0	7.0	–	Vdc
Collector–Base Cutoff Current (V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0)	I <sub>CBO</sub>	–	–	40	nAdc
DC Current Gain (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 3.0 Vdc) (I <sub>C</sub> = 1.0 mAdc, V <sub>CE</sub> = 3.0 Vdc) (I <sub>C</sub> = 10 μAdc, V <sub>CE</sub> = 3.0 Vdc)	h <sub>FE</sub>	– 40 –	140 130 60	– – –	–
Base–Emitter Voltage (V <sub>CE</sub> = 3.0 Vdc, I <sub>E</sub> = 1.0 mAdc) (V <sub>CE</sub> = 3.0 Vdc, I <sub>E</sub> = 10 mAdc)	V <sub>BE</sub>	– –	0.72 0.8	– –	Vdc
Input Offset Current for Matched Pair Q1 and Q2 (V <sub>CE</sub> = 3.0 Vdc, I <sub>C</sub> = 1.0 mAdc)	I <sub>O1</sub> – I <sub>O2</sub>	–	0.3	2.0	μAdc
Magnitude of Input Offset Voltage (V <sub>CE</sub> = 3.0 Vdc, I <sub>C</sub> = 1.0 mAdc)	–	–	0.5	5.0	mVdc
Temperature Coefficient of Base–Emitter Voltage (V <sub>CE</sub> = 3.0 Vdc, I <sub>C</sub> = 1.0 mAdc)	$\frac{\Delta V_{BE}}{D_T}$	–	–1.9	–	mV/°C
Temperature Coefficient	$\frac{  \Delta V_{IO}  }{D_T}$	–	1.0	–	μV/°C
Collector–Emitter Cutoff Current (V <sub>CE</sub> = 10 Vdc, I <sub>B</sub> = 0)	I <sub>CEO</sub>	–	–	0.5	μAdc

## DYNAMIC CHARACTERISTICS

Low Frequency Noise Figure (V <sub>CE</sub> = 3.0 Vdc, I <sub>C</sub> = 100 μAdc, R <sub>S</sub> = 1.0 kΩ, f = 1.0 kHz)	NF	–	3.25	–	dB
Forward Current Transfer Ratio (V <sub>CE</sub> = 3.0 Vdc, I <sub>C</sub> = 1.0 mAdc, f = 1.0 kHz)	h <sub>FE</sub>	–	110	–	–
Short Circuit Input Impedance (V <sub>CE</sub> = 3.0 Vdc, I <sub>C</sub> = 1.0 mAdc)	h <sub>ie</sub>	–	3.5	–	kΩ
Open Circuit Output Impedance (V <sub>CE</sub> = 3.0 Vdc, I <sub>C</sub> = 1.0 mAdc)	h <sub>oe</sub>	–	15.6	–	μmhos
Reverse Voltage Transfer Ratio (V <sub>CE</sub> = 3.0 Vdc, I <sub>C</sub> = 1.0 mAdc)	h <sub>re</sub>	–	1.8	–	x10 <sup>–4</sup>
Forward Transfer Admittance (V <sub>CE</sub> = 3.0 Vdc, I <sub>C</sub> = 1.0 mAdc, f = 1.0 MHz)	y <sub>fe</sub>	–	31–j1.5	–	–
Input Admittance (V <sub>CE</sub> = 3.0 Vdc, I <sub>C</sub> = 1.0 mAdc, f = 1.0 MHz)	y <sub>ie</sub>	–	0.3 + j0.04	–	–
Output Admittance (V <sub>CE</sub> = 3.0 Vdc, I <sub>C</sub> = 1.0 mAdc, f = 1.0 MHz)	y <sub>oe</sub>	–	0.001 + j0.03	–	–
Current–Gain – Bandwidth Product (V <sub>CE</sub> = 3.0 Vdc, I <sub>C</sub> = 3.0 mAdc)	f <sub>T</sub>	300	550	–	MHz
Emitter–Base Capacitance (V <sub>EB</sub> = 3.0 Vdc, I <sub>E</sub> = 0)	C <sub>eb</sub>	–	0.6	–	pF
Collector–Base Capacitance (V <sub>CB</sub> = 3.0 Vdc, I <sub>C</sub> = 0)	C <sub>cb</sub>	–	0.58	–	pF
Collector–Substrate Capacitance (V <sub>CS</sub> = 3.0 Vdc, I <sub>C</sub> = 0)	C <sub>Cl</sub>	–	2.8	–	pF

Figure 1. Collector Cutoff Current versus Temperature (Each Transistor)

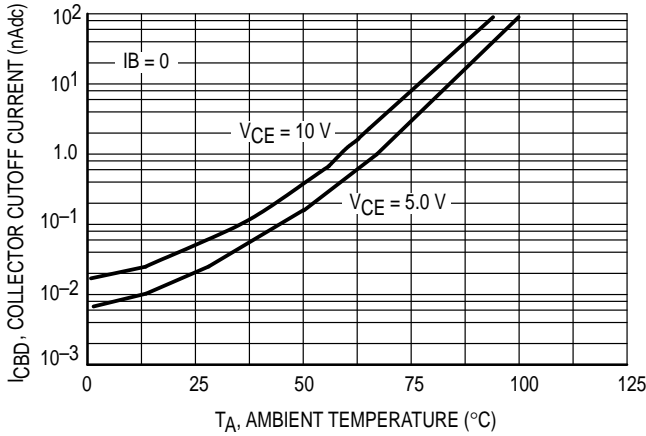


Figure 2. Collector Cutoff Current versus Temperature (Each Transistor)

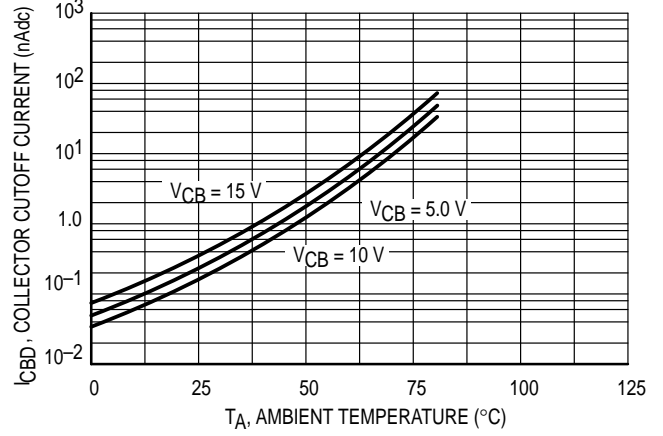


Figure 3. Input Offset Characteristics for Q1 and Q2

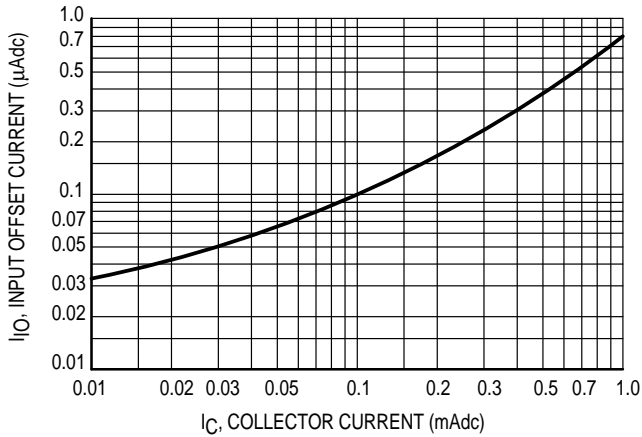


Figure 4. Base-Emitter and Input Offset Voltage Characteristics

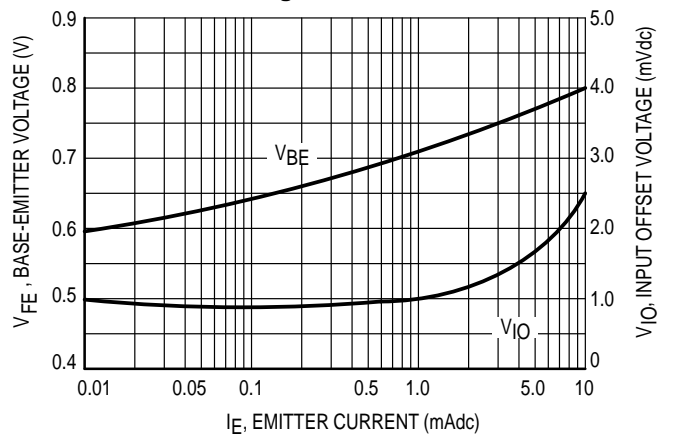
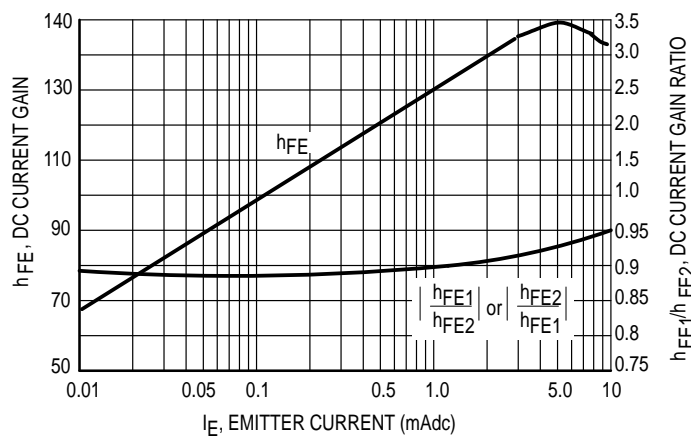


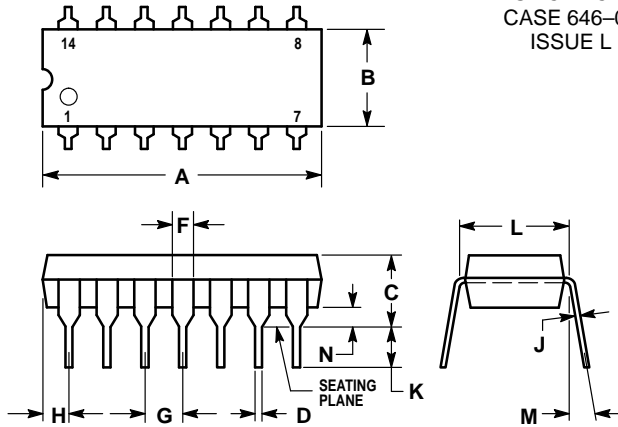
Figure 5. DC Current Gain



# MC3346

## OUTLINE DIMENSIONS

### P SUFFIX PLASTIC PACKAGE CASE 646-06 ISSUE L

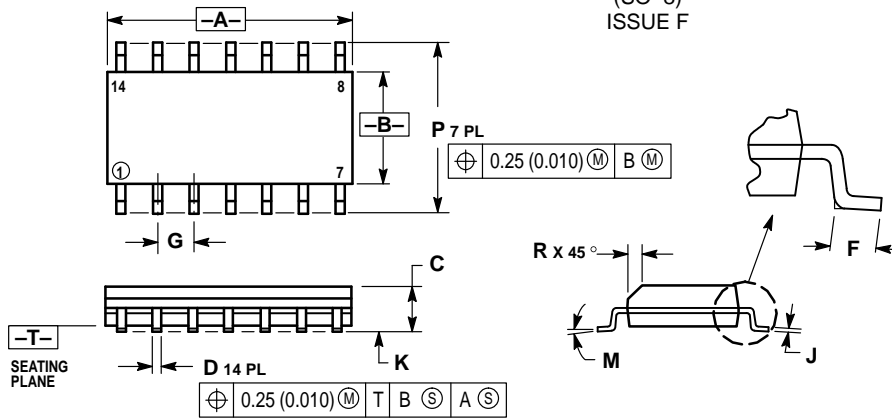


#### NOTES:

- LEADS WITHIN 0.13 (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
- DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
- DIMENSION B DOES NOT INCLUDE MOLD FLASH.
- ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.715	0.770	18.16	19.56
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
F	0.040	0.070	1.02	1.78
G	0.100 BSC		2.54 BSC	
H	0.052	0.095	1.32	2.41
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.300 BSC		7.62 BSC	
M	0° 10°		0° 10°	
N	0.015	0.039	0.39	1.01

### D SUFFIX PLASTIC PACKAGE CASE 751A-03 (SO-8) ISSUE F



#### NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER.
- DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
- MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
- DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0° 7°		0° 7°	
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

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