

MC3303/MC3403

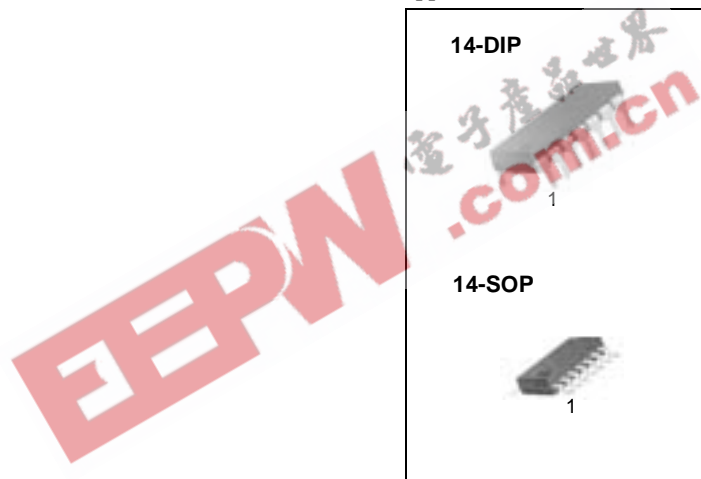
Quad Operational Amplifier

Features

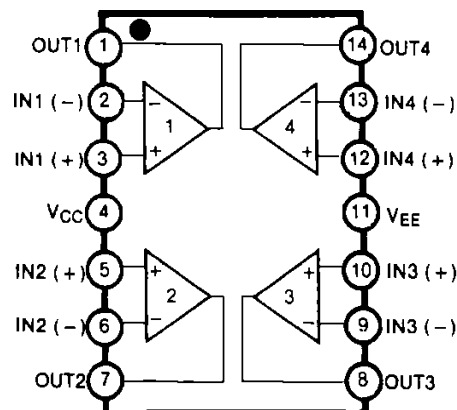
- Output voltage can swing to GND or negative supply
- Wide power supply range;
- Single supply of 3.0V to 36V
- Dual supply of $\pm 1.5V$ to $\pm 18V$
- Electrical characteristics similar to the KA741
- Class AB output stage for minimal crossover distortion
- Short circuit protected output.

Description

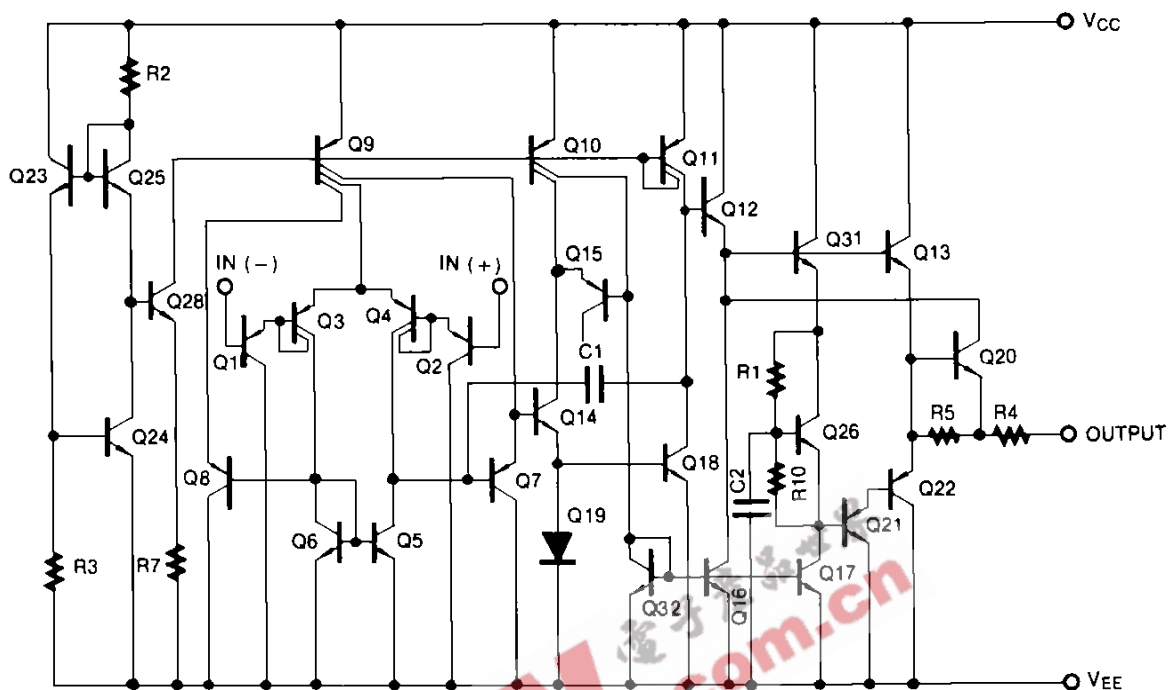
The MC3303/MC3403 series is a monolithic Quad operational amplifier consisting of four independent amplifiers. The device has high gain, internally frequency compensated operational amplifiers designed to operate from a single power supply or dual power supplies over a wide range of voltages. The common mode input range includes the negative supply, thereby eliminating the necessity for external biasing components in many applications.



Internal Block Diagram



Schematic Diagram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Supply Voltage	VCC	± 18 or $+36$	V
Differential Input Voltage	$V_{I(DIFF)}$	36	V
Input Voltage	V_I	± 18	V
Output Short Circuit Duration	-	Continuous	-
Power Dissipation	PD	670	mW
Operating Temperature			
MC3303	TOPR	$-40 \sim +85$	$^{\circ}\text{C}$
MC3403		$0 \sim +70$	$^{\circ}\text{C}$
Storage Temperature	TSTG	$-65 \sim +150$	$^{\circ}\text{C}$

Electrical Characteristics

($V_{CC} = +15V$, $V_{EE} = -15V$ for MC3403, $V_{CC} = +14V$, $V_{EE} = GND$ for MC3303, $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Conditions	MC3303			MC3403			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Input Offset Voltage	V_{IO}		-	1.5	8.0	-	1.5	10	mV
		NOTE 1	-	-	10	-	-	12	
Input Offset Current	I_{IO}		-	5	75	-	5	50	nA
		NOTE 1	-	-	150	-	-	100	
Input Bias Current	I_{BIAS}		-	30	200	-	30	200	nA
		NOTE 1	-	-	500	-	-	400	
Large Signal Voltage Gain	G_V	$V_{O(P-P)} = \pm 10V$ $R_L = 2K\Omega$	20	200	-	20	200	-	V/mV
		NOTE 1	15	-	-	15	-	-	
Input Impedance	R_I	-	0.3	1.0	-	0.3	1.0	-	$M\Omega$
Output Voltage Swing	$V_{O(P-P)}$	$R_L = 10K\Omega$	+12	+12.5	-	± 12	± 13.5	-	V
		$R_L = 2K\Omega$	+10	+12	-	± 10	± 13	-	
		$R_L = 2K\Omega$ NOTE 1	+10	-	-	± 10	-	-	
Input Common Mode Voltage Range	$V_{I(R)}$	-	12V - V_{EE}	12.5V - V_{EE}	-	13V - V_{EE}	13.5V - V_{EE}	-	V
Common Mode Rejection Ratio	CMRR	$R_S \geq 10K\Omega$	70	90	-	70	90	-	dB
Power Supply Current	I_{CC}	$V_{O(P)} = 0$, $R_L = \infty$	-	2.8	7.0	-	2.3	7.0	mA
Output Short Circuit Current	I_{SC}	Each amplifier	± 10	± 30	± 45	± 10	± 20	± 45	mA
Positive Supply Rejection Ratio	PSRR(+)	-	-	30	150	-	30	150	$\mu V/V$
Negative Supply Rejection Ratio	PSRR(-)	-	-	-	-	-	30	150	$\mu V/V$

Electrical Characteristics (Continued)

($V_{CC} = +15V$, $V_{EE} = -15V$ for MC3403, $V_{CC} = +14V$, $V_{EE} = GND$ for MC3303, $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Conditions	MC3303			MC3403			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Average Temperature Coefficient of Input Offset Current (Note2)	$\Delta I_{IO}/\Delta T$	-	-	50	-	-	50	-	pA/°C
Input Offset Voltage Drift (Note2)	$\Delta V_{IO}/\Delta T$	-	-	10	-	-	10	-	$\mu\text{V}/^\circ\text{C}$
Power Bandwidth (Note2)	GBW	$G_V=1, R_L=2K\Omega$, $V_{O(P-P)}=20V_{P-P}$, $THD=5\%$	-	9.0	-	-	9.0	-	KHz
Small Signal Bandwidth (Note2)	BW	$G_V=1, R_L=10K\Omega$, $V_{O(P-P)}=50mV$	-	1.0	-	-	1.0	-	MHz
Slew Rate (Note2)	SR	$G_V=1, V_I = -10V$ to $+10V$	-	0.4	-	-	0.4	-	V/ μs
Rise Time (Note2)	T_R	$G_V=1, R_L=10K\Omega$, $V_{O(P-P)}=50mV$	-	0.35	-	-	0.35	-	μs
Fall Time (Note2)	T_F	$G_V=1, R_L=10K\Omega$, $V_{O(P-P)}=50mV$	-	0.35	-	-	0.35	-	μs
Over Shoot (Note2)	OS	$G_V=1, R_L=10K\Omega$, $V_{O(P-P)}=50mV$	-	20	-	-	20	-	%
Phase Margin (Note2)	MPH	$G_V=1, R_L=2K\Omega$, $C_L = 200pF$	-	60	-	-	60	-	Degree
Crossover Distortion (Note2)	CD	$V_I = 30mV_{P-P}$, $V_{O(P-P)}=2.0V_{P-P}$, $f = 10KHz$	-	1.0	-	-	1.0	-	%

Note:

- MC3403: $0\text{ }^\circ\text{C} \leq T_A \leq +70\text{ }^\circ\text{C}$, MC3303: $-40\text{ }^\circ\text{C} \leq T_A \leq +85\text{ }^\circ\text{C}$
- Guaranteed by design.

Electrical Characteristics

($V_{CC} = 5.0V$, $V_{EE} = GND$, $T_A = 25\text{ }^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	MC3303			MC3403			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Input Offset Voltage	V_{IO}	-	-	-	10	-	2.0	10	mV
Input Offset Current	I_{IO}	-	-	-	75	-	30	50	nA
Input Bias Current	I_{BIAS}	-	-	-	500	-	200	500	nA
Large Signal Open Loop Voltage Gain	G_V	$R_L = 2.0K\Omega$	10	200	-	10	200	-	V/mV
Power Supply Rejection Ratio	PSRR	-	-	-	150	-	-	150	$\mu\text{V/V}$
Output Voltage Range	$V_{O(P-P)}$	$R_L = 10K\Omega$, $V_{CC} = 5.0V$	3.3	3.5	-	3.3	3.5	-	V
		$R_L = 10K\Omega$, $5.0V \leq V_{CC} \leq 30V$	$V_{CC} - 2.0$	$V_{CC} - 1.7$	-	$V_{CC} - 2.0$	$V_{CC} - 1.7$	-	
Supply Current	I_{CC}	-	-	2.5	7.0	-	2.5	7.0	mA
Channel Separation	CS	$f = 1\text{KHz to } 20\text{KHz}$	-	120	-	-	120	-	dB

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Typical Performance Characteristics

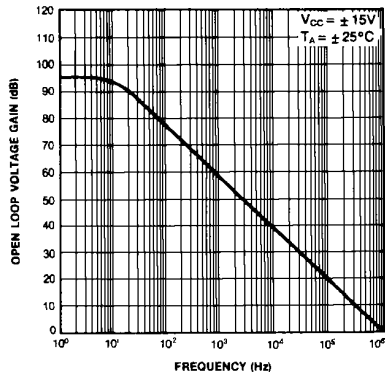


Figure 1. Open Loop Frequency Response

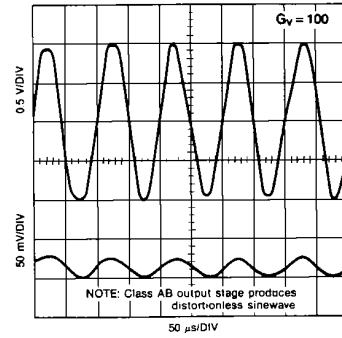


Figure 2. Wave Response

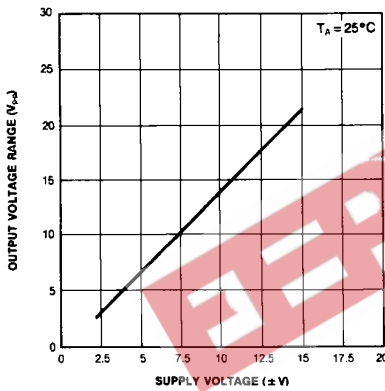


Figure 3. Output Swing

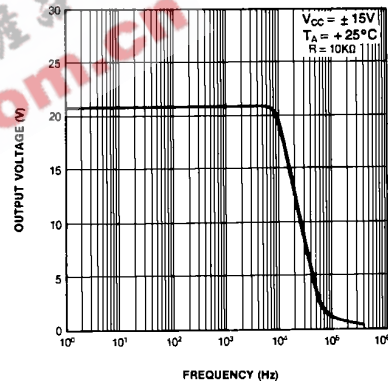


Figure 4. Output Voltage vs Frequency

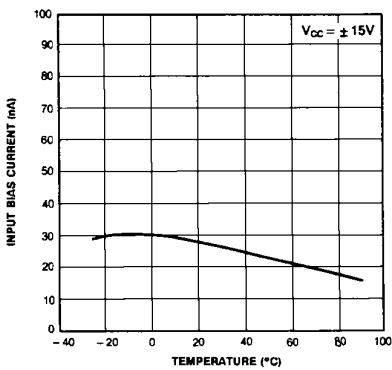


Figure 5. Input Bias Current vs Temperature

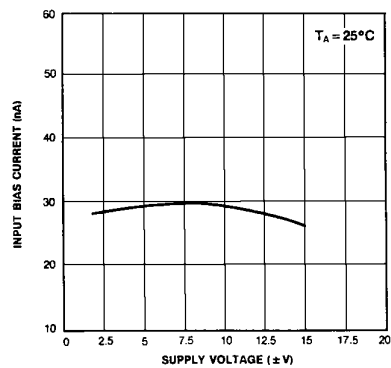


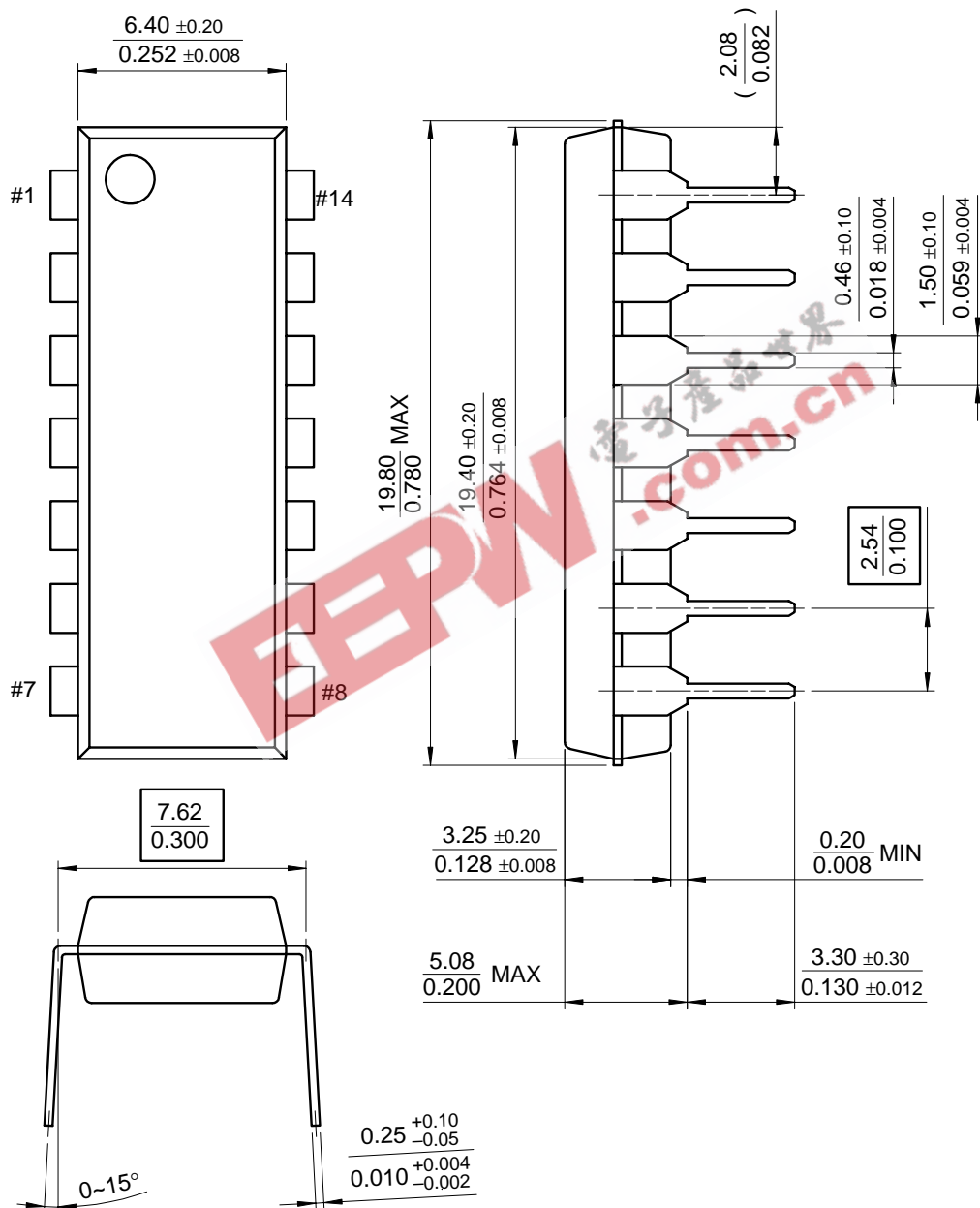
Figure 6. Input Bias Current vs Supply Voltage

Mechanical Dimensions

Package

Dimensions in millimeters

14-DIP



Ordering Information

Product Number	Package	Operating Temperature
MC3403P	14-DIP	0 ~ + 70°C
MC3403D	14-SOP	
MC3303P	14-DIP	-40 ~ + 85°C
MC3303D	14-SOP	

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