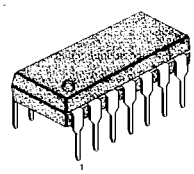
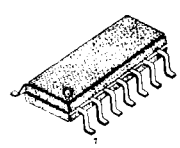
QUAD OPERATIONAL AMPLIFIER

The KA3303 series is a monolithic Quad operational amplifier consisting or 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.

14 DIP



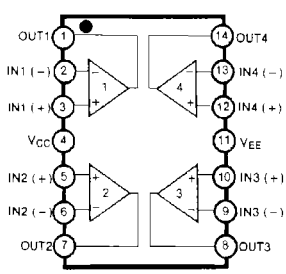
14 SOP



FEATURES

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

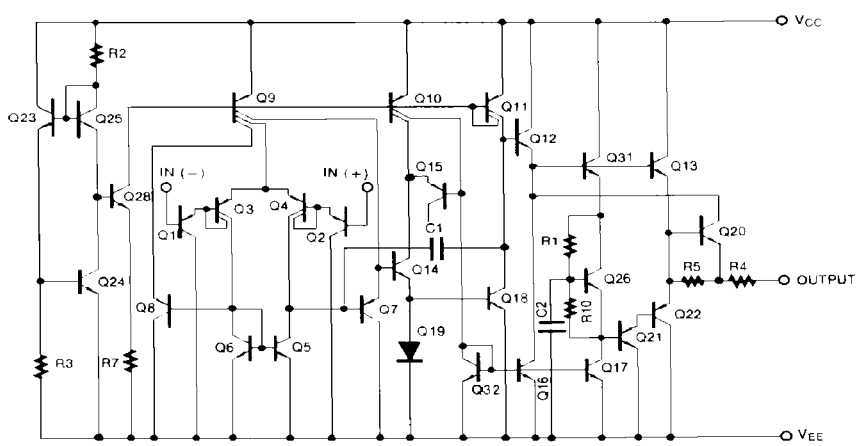
BLOCK DIAGRAM



ORDERING IN FORMATION

Device	Package	Operating Temperature
KA3403	14 DIP	0 ~ + 70℃
KA3403D	14 SOP	
KA3303	14 DIP	-40 ~ + 85℃
KA3303D	14 SOP	

SCHEMATIC DIAGRAM



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ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	± 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	P_D	670	mW
Operating Temperature KA3303	T_{OPR}	-40 ~ + 85	℃
KA3403		0 ~ + 70	℃
Storage Temperature	T_{STG}	-65 ~ + 150	℃

ELECTRICAL CHARACTERISTICS

(V_{CC} = +15V, V_{EE} = -15V for KA3403, V_{CC} = +14V, V_{EE} = GND for KA3303, T_A = 25℃, unless otherwise specified)

Characteristic	Symbol	Test Conditions	KA3303			KA3403			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	$V_{O(P-P)}$ =± 10V	20	200		20	200		V/mV
		R_L = 2KΩ NOTE 1	15			15			
Input Impedance	R_I		0.3	1.0		0.3	1.0		MΩ
Output Voltage Swing	$V_{O(P-P)}$	R_L = 10KΩ	+12	+12.5		± 12	± 13.5		V
		R_L = 2KΩ	+10	+12		± 10	± 13		
		R_L = 2KΩ 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≧ 10KΩ	70	90		70	90		dB
Power Supply Current	I_{CC}	$V_{O(P)}$ = 0, R_L =		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	μ V/V
Negative Supply Rejection Ratio	PSRR(-)						30	150	μ V/V
Average Temperature Coefficient of Input Offset Current	Δ I_{IO}/Δ T			50			50		pA/℃
Total Harmonic distortion	THD	V_{CC}= 5V, V_{CE}= -5V F = 1KHz, Input level = 1.55Vp-p				-	0.1	0.4	%

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ELECTRICAL CHARACTERISTICS (Continued)

(V_{CC}= +15V, V_{EE}= -15V for KA3403. V_{CC}= +14V, V_{EE}=GND for KA3303, T_A=25℃, unless otherwise specified)

Characteristic	Symbol	Test Conditions	KA3303			KA3403			Unit
			Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage Drift	$\Delta V_{IO}/\Delta T$			10			10		μV/℃
Gain Bandwidth	GBW	G_V=1,R_L=2KΩ ,$V_{O(P-P)}$=20V_{P-P},THD=5%		9.0			9.0		KHz
Small Signal Bandwidth	BW	G_V=1,R_L=10KΩ ,$V_{O(P-P)}$=50mV		1.0			1.0		MHz
Slew Rate	SR	G_V=1,V_I= -10V to +10V		0.4			0.4		V/μs
Rise Time	t_{RES}	G_V=1,R_L=10KΩ ,$V_{O(P-P)}$=50mV		0.35			0.35		μs
Fall Time	t_F	G_V=1,R_L=10KΩ ,$V_{O(P-P)}$=50mV		0.35			0.35		μs
Over Shoot	OS	G_V=1,R_L=10KΩ ,$V_{O(P-P)}$=50mV		20			20		%
Phase Margin	MPH	G_V=1,R_L=2KΩ ,C_L =200pF		60			60		Degress
Crossover Distortion	CD	V_I =30mV_{P-P},$V_{O(P-P)}$=2.0V_{P-P},f =10KHz		1.0			1.0		5%

NOTE 1
KA3403: 0≤ T_A≤ +70℃
KA3303: -40≥ T_A≥ +85℃

ELECTRICAL CHARACTERISTICS

(V_{CC} = 5.0V, V_{EE} = GND, T_A=25℃ unless otherwise specified)

Characteristic	Symbol	Test Conditions	KA3303			KA3403			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 = 2.0KΩ	10	200		10	200		V/mV
Power Supply Rejection Ratio	PSRR				150			150	μV/V
Output Voltage Range	$V_{O(P-P)}$	R_L = 10KΩ , V_{CC} = 5.0V	3.3	3.5		3.3	3.5		V
		R_L =10KΩ , 5.0V≥ V_{CC}≥ 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 = 1KHz to 20KHz		120			120		dB

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TYPICAL PERFORMANCE CHARACTERISTICS

Fig. 1 OPEN LOOP FREQUENCY RESPONSE

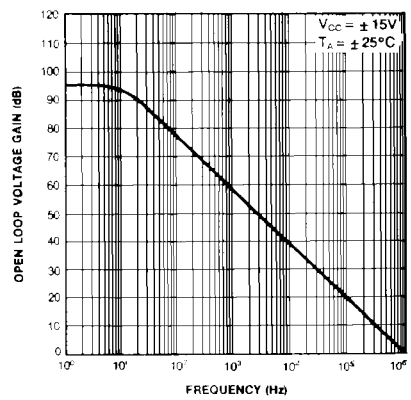


Fig. 2. Wave Response

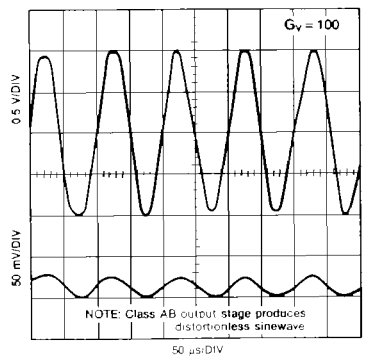


Fig. 3 OUTPUT SWING

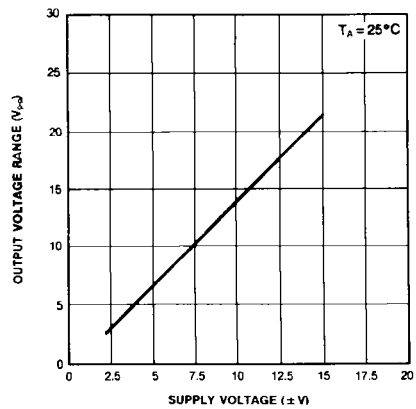


Fig. 4 OUTPUT VOLTAGE vs FREQUENCY

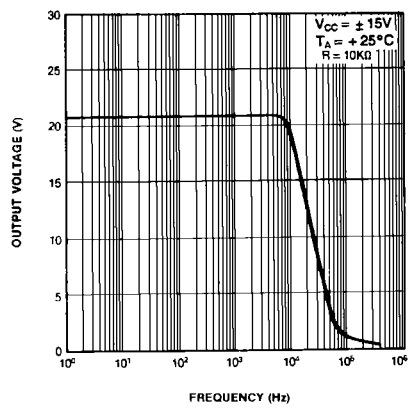


Fig. 5 INPUT BIAS CURRENT vs TEMPERATURE

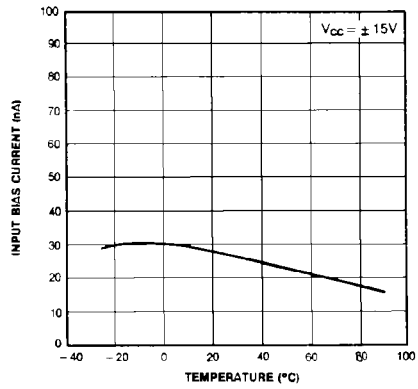
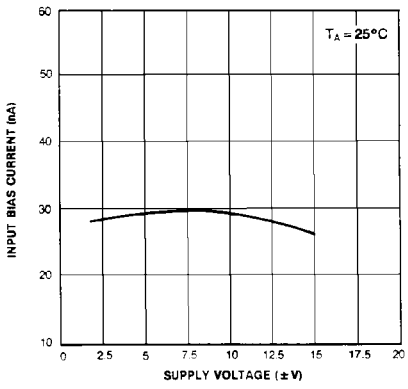


Fig. 6 INPUT BIAS CURRENT vs SUPPLY VOLTAGE



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