HARRIS SEMICONDUCTOR

CA5260

BiMOS Microprocessor Operational Amplifiers with MOSFET Input/CMOS Output

March 1993

Features

- MOSFET Input Stage provides
  - Very High Z_I = 1.5TΩ (1.5 x 10^{12}Ω) Typ.
  - Very Low I_I = 5pA Typ. at 15V Operation
    = 2pA Typ. at 5V Operation
- Ideal for Single Supply Applications
- Common Mode Input Voltage Range Includes Negative Supply Rail; Input Terminals Can be Swung 0.5V Below Negative Supply Rail
- CMOS Output Stage Permits Signal Swing to Either (or Both) Supply Rails
- CA5260A, CA5260 Have Full Military Temperature Range Guaranteed Specifications for V+ = 5V
- CA5260A, CA5260 are Guaranteed to Operate Down to 4.5V for A_{OL}
- Fully guaranteed to operate from -55°C to +125°C at V+ = 5V, V- = Gnd

Applications

- Ground Referenced Single Supply Amplifiers
- Fast Sample-Hold Amplifiers
- Long Duration Timers/Monostables
- Ideal Interface with Digital CMOS
- High Input Impedance Wideband Amplifiers
- Voltage Followers (e.g. Follower for Single Supply D/A Converter)
- Voltage Regulators (Permits Control of Output Voltage Down to Zero Volts)
- Wien Bridge Oscillators
- Voltage Controlled Oscillators
- Photo Diode Sensor Amplifiers
- 5V Logic Systems
- Microprocessor Interface

Description

The CA5260A and CA5260 are integrated-circuit operational amplifiers that combine the advantage of both CMOS and bipolar transistors on a monolithic chip. The CA5260 series circuits are dual versions of the popular CA5160 series. They are designed and guaranteed to operate in microprocessor or logic systems that use +5V supplies.

Gate-protected p-channel MOSFET (PMOS) transistors are used in the input circuit to provide very-high-input impedance, very-low-input current, and exceptional speed performance. The use of PMOS field-effect transistors in the input stage results in common-mode input-voltage capability down to 0.5V below the negative-supply terminal, an important attribute in single-supply applications.

A complementary-symmetry MOS (CMOS) transistor-pair, capable of swinging the output voltage to within 10mV of either supply-voltage terminal (at very high values of load impedance), is employed as the output circuit.

The CA5260 Series circuits operate at supply voltages ranging from 4.5V to 16V, or ±2.25V to ±8V when using split supplies.

The CA526OA, CA5260 have guaranteed specifications for 5V operation over the full military temperature range of -55°C to +125°C.

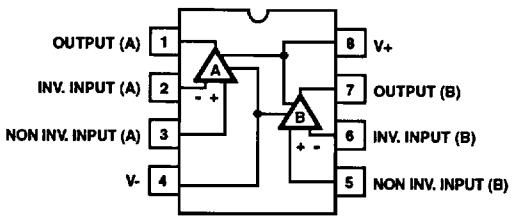
Ordering Information

PART NUMBER	TEMPERATURE RANGE	PACKAGE
CA5260AE	-55°C to +125°C	8 Lead Plastic DIP
CA5260AM	-55°C to +125°C	8 Lead SOIC
CA5260AM96	-55°C to +125°C	8 Lead SOIC*
CA5260AT	-55°C to +125°C	8 Pin TO-5 Can
CA5260E	-55°C to +125°C	8 Lead Plastic DIP
CA5260M	-55°C to +125°C	8 Lead SOIC
CA5260M96	-55°C to +125°C	8 Lead SOIC*
CA5260T	-55°C to +125°C	8 Pin TO-5 Can

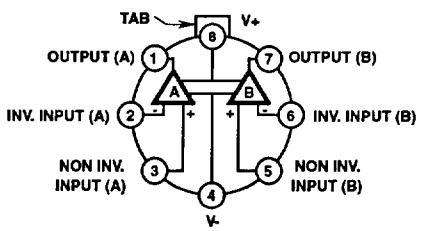
* Denotes Tape and Reel

Pinouts

CA5260 (PDIP, SOIC)
TOP VIEW



CA5260 (TO-5 STYLE CAN)
TOP VIEW



CAUTION: These devices are sensitive to electrostatic discharge. Users should follow proper I.C. Handling Procedures.

File Number **1929.2**

Absolute Maximum Ratings

Supply Voltage (Between V+ and V Terminals) 16V
Differential Input Voltage. 8V
Input Voltage. . . . . (V+ +8 V) to (V- -0.5 V)
Input Current. 1mA
Output Short Circuit Duration (Note 1) . . . . . Indefinite
Junction Temperature . . . . . +175°C
Junction Temperature (Plastic Package) . . . . . +150°C
Lead Temperature (Soldering 10 Sec.). . . . . +300°C

Operating Conditions

Operating Temperature Range (All Types) . . . . . -55°C to +125°C
Storage Temperature Range (All Types) . . . . . -65°C to +150°C

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Electrical Specifications

Typical Values Intended Only for Design Guidance, V+ = 5V, V- = 0V, T_A = +25°C, Unless Otherwise Specified

PARAMETERS	SYMBOL	TEST CONDITIONS	TYPICAL VALUES		UNITS
			CA5260A	CA5260	
Input Resistance	R_I		1.5	1.5	TΩ
Input Capacitance	C_I	f = 1MHz	4.3	4.3	pF
Unity Gain Crossover Frequency	f_T		3	3	MHz
Slew Rate	SR	V_{OUT} = 2.5V_{P-P}	5	5	V/µs
Transient Response		C_L = 25pF, R_L = 2kΩ (Voltage Follower)			
Rise Time	t_R		0.09	0.09	µs
Overshoot	OS		10	10	%
Settling Time (To <0.1%, V_{IN} = 4V_{P-P})	t_S	C_L = 25pF, R_L = 2kΩ (Voltage Follower)	1.8	1.8	µs

Electrical Specifications

T_A = +25°C, V+ = 5V, V- = 0V

PARAMETERS	SYMBOL	TEST CONDITIONS	LIMITS						UNITS
			CA3260A			CA5260			
			MIN	TYP	MAX	MIN	TYP	MAX	
Input Offset Voltage	V_{IO}	V_O = 2.5V	-	1.5	4	-	2	15	mV
Input Offset Current	I_{IO}	V_O = 2.5V	-	1	10	-	1	10	pA
Input Current	I_I	V_O = 2.5V	-	2	15	-	2	15	pA
Common Mode Rejection Ratio	CMRR	V_{CM} = 0 to 1V	80	85	-	70	85	-	dB
		V_{CM} = 0 to 2.5V	50	55	-	50	55	-	dB
Common Mode Input Voltage Range	V_{ICR}+		2.5	3	-	2.5	3	-	V
	V_{ICR}-		-	-0.5	0	-	-0.5	0	V
Power Supply Rejection Ratio	PSRR	ΔV+ = 1V; ΔV- = 1V	75	84	-	70	84	-	dB
Large Signal Voltage Gain (Note 2)	A_{OL}	R_L = ∞, V_O = 0.5 to 4V	107	113	-	105	111	-	dB
		R_L = 10kΩ, V_O = 0.5 to 3.6V	83	86	-	80	86	-	dB
Source Current	I_{SOURCE}	V_O = 0V	1.75	2.2	-	1.75	2.2	-	mA
Sink Current	I_{SINK}	V_O = 5V	1.70	2	-	1.70	2	-	mA

Electrical Specifications T_A = +25°C, V+ = 5V, V- = 0V (Continued)

PARAMETERS	SYMBOL	TEST CONDITIONS	LIMITS						UNITS
			CA3260A			CA5260			
			MIN	TYP	MAX	MIN	TYP	MAX	
Output Voltage	V_{OM}+	R_L = ∞	4.99	5	-	4.99	5	-	V
	V_{OM}-		-	0	0.01	-	0	0.01	V
	V_{OM}+	R_L = 10kΩ	4.4	4.7	-	4.4	4.7	-	V
	V_{OM}-		-	0	0.01	-	0	0.01	V
	V_{OM}+	R_L = 2kΩ	3	3.4	-	3	3.4	-	V
	V_{OM}-		-	0	0.01	-	0	0.01	V
Supply Current	I_{SUPPLY}	V_O = 0V	-	1.60	2.0	-	1.60	2.0	mA
		V_O = 2.5V	-	1.80	2.25	-	1.80	2.25	mA

NOTES:
1. Short circuit may be applied to ground or to either supply.
2. For V+ = 4.5V and V- = GND; V_{OUT} = 0.5V to 3.2V at R_L = 10kΩ.

Electrical Specifications T_A = -55°C to +125°C, V+ = 5V, V- = 0V

PARAMETERS	SYMBOL	TEST CONDITIONS	LIMITS						UNITS
			CA3260A			CA5260			
			MIN	TYP	MAX	MIN	TYP	MAX	
Input Offset Voltage	V_{IO}	V_O = 2.5V	-	2	15	-	3	20	mV
Input Offset Current	I_{IO}	V_O = 2.5V	-	1	10	-	1	10	nA
Input Current	I_I	V_O = 2.5V	-	2	15	-	2	15	nA
Common Mode Rejection Ratio	CMRR	V_{CM} = 0 to 1V	65	78	-	60	78	-	dB
		V_{CM} = 0 to 2.5V	50	60	-	50	60	-	dB
Common Mode Input Voltage Range	V_{ICR}+		2.5	3	-	2.5	3	-	V
	V_{ICR}-		-	-0.5	0	-	-0.5	0	V
Power Supply Rejection Ratio	PSRR	ΔV+ = 1V; ΔV- = 1V	62	65	-	60	65	-	dB
Large Signal Voltage Gain (Note 2)	A_{OL}	R_L = ∞, V_O = 0.5 to 4V	70	78	-	70	78	-	dB
		R_L = 10kΩ, V_O = 0.5 to 3.6V	60	65	-	60	65	-	dB
Source Current	I_{SOURCE}	V_O = 0V	1.3	1.6	-	1.3	1.6	-	mA
Sink Current	I_{SINK}	V_O = 5V	1.2	1.4	-	1.2	1.4	-	mA
Output Voltage	V_{OM}+	R_L = ∞	4.99	5	-	4.99	5	-	V
	V_{OM}-		-	0	0.01	-	0	0.01	V
	V_{OM}+	R_L = 10kΩ	4.2	4.4	-	4.2	4.4	-	V
	V_{OM}-		-	0	0.01	-	0	0.01	V
	V_{OM}+	R_L = 2kΩ	2.5	2.7	-	2.5	2.7	-	V
	V_{OM}-		-	0	0.01	-	0	0.01	V
Supply Current	I_{SUPPLY}	V_O = 0V	-	1.65	2.2	-	1.65	2.2	mA
		V_O = 2.5V	-	1.95	2.35	-	1.95	2.35	mA

NOTES:
1. Short circuit may be applied to ground or to either supply.
2. For V+ = 4.5V and V- = GND; V_{OUT} = 0.5V to 3.2V at R_L = 10kΩ.

Electrical Specifications Each Amplifier at T_A = 25°C, V+ = 15V, V- = 0V, Unless Otherwise Specified.

PARAMETERS	SYMBOL	TEST CONDITIONS	LIMITS						UNITS
			CA3260A			CA5260			
			MIN	TYP	MAX	MIN	TYP	MAX	
Input Offset Voltage	V_{IO}	V± = ±7.5	-	2	5	-	6	15	mV
Input Offset Current	I_{IO}	V± = ±7.5	-	0.5	20	-	0.5	30	pA
Input Current	I_I	V± = ±7.5	-	5	30	-	5	50	pA
Large Signal Voltage Gain	A_{OL}	V_O = 10V_{P-P}, R_L = 10kΩ	50	320	-	50	320	-	kV/V
			94	110	-	94	110	-	dB
Common Mode Rejection Ratio	CMRR		80	95	-	70	90	-	dB
Common Mode Input Voltage Range	V_{ICR}		10	-0.5 to 12	0	10	-0.5 to 12	0	V
Power Supply Rejection Ratio, $\Delta V_{IO}/\Delta V\pm$	PSRR	V± = ±7.5	-	32	150	-	32	320	µV/V
Maximum Output Voltage	V_{OM}+	R_L = 10kΩ	11	13.3	-	11	13.3	-	V
	V_{OM}-		-	0.002	0.01	-	0.002	0.01	V
	V_{OM}+	R_L = ∞	14.99	15	-	14.99	15	-	V
	V_{OM}-		-	0	0.01	-	0	0.01	V
Maximum Output Current	I_{OM}+ (Source)	V_O = 7.5V	12	22	45	12	22	45	mA
	I_{OM}- (Sink)		12	20	45	12	20	45	mA
Total Supply Current, R_L = ∞	I+	V_O (Amp A) = 7.5V V_O (Amp B) = 7.5V	-	9	16.5	-	9	16.5	mA
		V_O (Amp A) = 0V V_O (Amp B) = 0V	-	1.2	4	-	1.2	4	mA
		V_O (Amp A) = 0V V_O (Amp B) = 7.5V	-	5	9.5	-	5	9.5	mA
Input Offset Voltage Temp. Drift	$\Delta V_{IO}/\Delta T$		-	6	-	-	8	-	µV/°C
Crosstalk		f = 1kHz	-	120	-	-	120	-	dB

Schematic Diagram