Preliminary AK2970

Zero Drift operational amplifiers

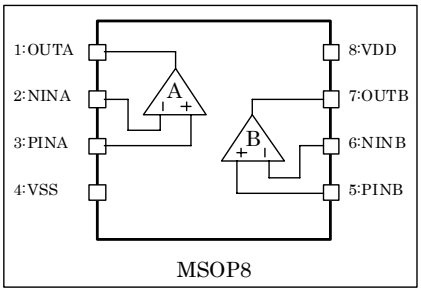
Feature

AK2970 is the dual channel CMOS operational amplifires which is available to output with very low input offset voltage (± 5μV@10V) and near zero input offset dirft.
It's operated with very small current consumptions, 1.5mA typ./ch (VDD:10V), which is available to operate full swing signals in output.
AK2970 is appropriated to Sensor Pre Amp. applications.

☐ Wide Supply Operation Range: 4.5V ~ 13.2V (±2.25V ~ ±6.6V)
☐ Very Low Input Offset Voltage : ± 5μV max. (@VDD:10V)
☐ Near Zero Dirft over time and temperature : ± 20nV/°C max. (@VDD:10V)
☐ Full Swing Outputs to 10kΩ Load
☐ Power Supply Current : 1mA typ./ch (VDD: 10V, No Load)
☐ Gain Bandwidth : 4MHz typ.
☐ Slew Rate : 4V/μsec typ.
☐ Operationg Temperature Range : –40 ~ 125°C
☐ Package : MSOP8

Part Name	Channel Number	Package
AK2970H	2	MSOP8

Pin Location



MSOP8
(AK2970H)

Pin Function Descriptions

Pin number	Name	I/O note)	Function
1	OUTA	AO	Amplifier A Output
2	NINA	AI	Amplifier A Inverted Input
3	PINA	AI	Amplifier A No Inverted Input
4	VSS	PWR	Power Supply Ground
5	PINB	AI	Amplifier B No Inverted Input
6	NINB	AI	Amplifier B Inverted Input
7	OUTB	AO	Amplifier B Output
8	VDD	PWR	Positive Power Supply

Note)
PWR : Power Supply
AI : Analog Input
AO : Analog Output

Absolute Maximum Ratings

VSS=0V ; Note

Parameter	Symbol	Min	Max	Units
Supply Voltage	VDD	−0.3	14	V
Input Voltage	V_{TD}	−0.3	VDD + 0.3	V
Input Current	I_{IN}	−10	+10	mA
Storage Temperature Range	T_{stg}	−55	150	°C

Note : All voltage with respect to ground

WARNING :
Operational at or beyond these limits may result in permanent damage to the device. Normal operation is not guaranteed at these extremes.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Operationg Temperature Range	T_a	−40		125	°C	
Supply Voltage	VDD	4.5		13.2	V	

*We asuumes no responsibility for the usage beyond the conditions in this datasheet.

Electrical Characteristics

☐ DC Characteristics (typical condition is VDD=10V,Ta=25°C)

VDD:10V, Ta:-40 to 125°C, unless otherwise noted

Parameter	Min.	Typ.	Max.	Units	Conditions
Input Voltage Offset		± 1	± 5	μV	Ta=25°C,inverting-amp, gain@60dB
			± 5	μV	VDD:10V,all temperature range, inverting-amp, gain@60dB
			± 10	μV	VDD>5V, all tenperature range, inverting-amp, gain@60dB
			± 20	μV	VDD>4.5V, all tenperature range, inverting-amp, gain@60dB
Input Voltage Offset Drift		± 10	± 20	nV/°C	Inverting-amp,gain@60dB
			± 20	nV/°C	VDD>6V,inverting-amp, gain@60dB
			± 50	nV/°C	VDD>5V,inverting-amp, gain@60dB
			± 70	nV/°C	VDD>4.5V,inverting-amp, gain@60dB
Input Bias Current		± 50		pA	Ta=25°C (@1/2*VDD), Rf=510kΩ : Note1)
Input Common Mode Range	VSS		VDD	V	
Output Voltage Swing	0.1		VDD−0.1	V	RL ≥10kΩ connected to VDD/2
Common Mode Rejection Ratio	110	130		dB	@ Input Common Mode Range
	105	130		dB	VDD>5V @Input Common Mode Range
	85	130		dB	VDD>4.5V @Input Common Mode Range
	100	130		dB	VDD>4.5V @(VSS ~ [VDD-0.1])
Power Supply Rejection Ratio	110	130		dB	13.2V > VDD > 4.5V
Large Signal Voltage Gain	100	130		dB	RL ≥10kΩ connected to VDD/2
Power Supply Current		1.0	1.8	mA/ch	VDD:10V Note 2)
		1.0	2.5	mA/ch	VDD:4.5 ~ 13.2V Note 2)

Note 1) Input Bias Current is defined at the offset voltage(Voff) of the trance impedance amplifier. In case of the return resistance is Rf, the input bias current is expressed a following formula.

Is= Voff/Rf

When using as the trance impedance amplifier, it recommends VCOM=VDD/2.

Note 2) It doesn't include an output drive current.

☐ AC Characteristics

VDD: 10V, Ta:-40 to 125°C, unless otherwise noted

Parameter		Min.	Typ.	Max.	Units	Conditions
Output short current			±70		mA	VDD or VSS is connected to Vout of Voltage follower connection.
				±180	mA	VDD or VSS is connected to Vout of Voltage follower connection. VDD:13.2V
Output current			±20		mA	Vcm:VSS@ [VSS+1V] output Vcm:VDD@ [VDD-1V] output
		±5			mA	VDD:4.5V
Gain Bandwidth (GBW)			4		MHz	Inverting gain:60dB, load capacity: 20pF
				6.5	MHz	VDD:13.2V
		3			MHz	VDD:4.5V
Slew Rate			4		V/μs	|Av|=1 , load capacity: 20pF Defined at 10%⇔90%
				10	V/μs	VDD:13.2V
		1.7			V/μs	VDD:4.5V
Input Voltage Noise			80		nV/√Hz	@1kHz
			0.8		μVpp	0.1~10Hz Note 3)
			0.3		μVpp	0.1~1Hz Note 3)
Overload Recovery Time			50		μsec	Av:50 times, load: 20pF, 200mV input, VDD:10V, the time which reaches within 10 % of the final value.
Input capacitance	Differencial		1.5		pF	
	Common		5		pF	
Maximum Capacitance Loads				150	pF	

Note 3) These are converted from the noise density.

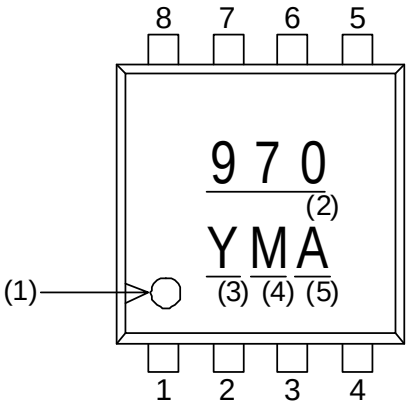
< The following is a reference information.>

- The phase-margin in case of the load drive(150pF) : 70deg typ.
- The chopper clock frequency : 10kHz typ.

Package

1. Marking

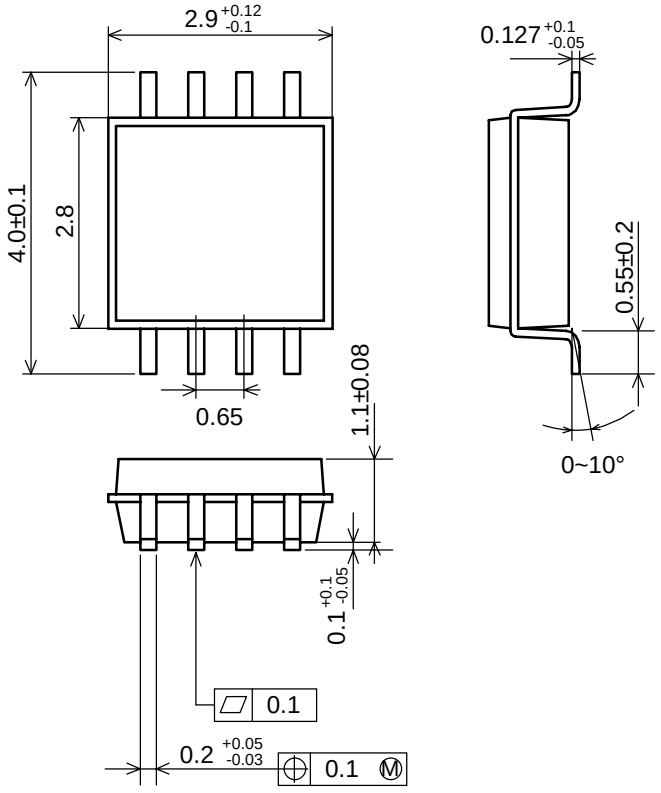
1.1 MSOP8



(1) Pin Number 1 indication mark
(2) Part Number
(3) Date Code (Year)
(4) Date Code (Month)
(5) Lot Number

2. Outline Dimensions

2.1 MSOP8 Package Outline (UNIT:mm)



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