QUAD PRECISION CMOS VOLTAGE COMPARATOR WITH PUSH-PULL DRIVER

GENERAL DESCRIPTION

The ALD4302 is a monolithic high performance quad voltage comparator built with advanced silicon gate CMOS technology. It features very high typical input impedance of $10^{12}\Omega$; low input bias current of 10pA; fast response time of 120ns; very low power dissipation of 150μA per comparator; and single +5V or dual ±5V power supply operation.

The input voltage range includes ground, making this comparator ideal for single supply low level signal detection with high source impedance. The outputs can source and sink current, allowing application flexibility, and can be used in either wired-OR connection without pull up resistor or push-pull configuration. The ALD4302 can be used in wired-OR connection with other open drain circuits such as the ALD2301 and ALD2303 voltage comparators.

The ALD4302 is ideal for a great variety of precision voltage comparator applications, especially low level signal detection circuits requiring low standby power, yet retaining high output current capability.

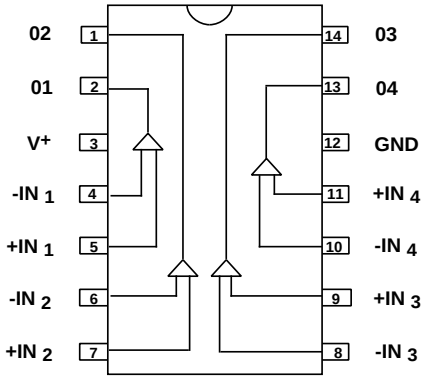
FEATURES

- Guaranteed to drive 200Ω loads
- Fanout of 30 LS TTL loads
- Low supply current of 150μA each comparator
- Extremely low input bias currents -- 10pA
- Virtually eliminates source impedance effects
- Low operating supply voltage of 3V to 12V
- Single +5V and dual supply ±5V operation
- High speed for both large and small signals - 120ns for TTL inputs and 400ns for 5mV overdrive
- CMOS, NMOS and TTL compatible
- Push-pull outputs
- High output sinking current -- 60mA
- Low supply current spikes
- High gain -- 100V/mV

APPLICATIONS

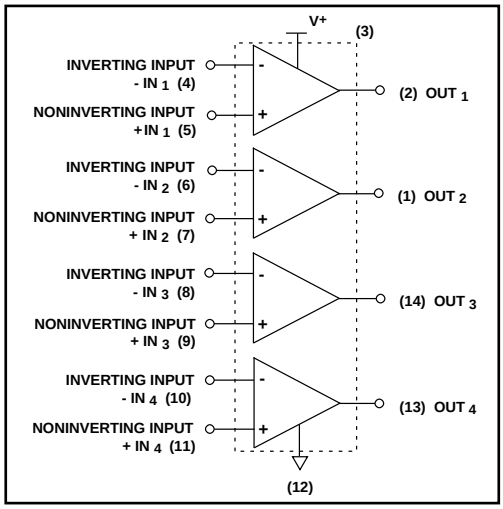
- MOSFET driver
- High source impedance voltage comparison circuits
- Multiple limit window comparator
- Power supply voltage monitor
- Photo-detector sensor circuit
- High speed LED driver
- Oscillators
- Battery operated instruments
- Remote signal detection
- Multiple relay drivers

PIN CONFIGURATION



DB, PB, SB PACKAGE

BLOCK DIAGRAM



ORDERING INFORMATION

Operating Temperature Range*		
-55°C to +125°C	0°C to 70°C	0°C to +70°C
14-Pin CERDIP Package	14-Pin Small Outline Package(SOIC)	14-Pin Plastic Dip Package
ALD4302A DB ALD4302 DB	ALD4302A SB ALD4302 SB	ALD4302A PB ALD4302 PB

* Contact factory for industrial temperature range

ABSOLUTE MAXIMUM RATINGS

Supply voltage, V^+ ____ 13.2V
Differential input voltage range ____ -0.3V to V^+ +0.3V
Power dissipation ____ 600 mW
Operating temperature range PB, SB package ____ 0°C to +70°C
DB package ____ -55°C to +125°C
Storage temperature range ____ -65°C to +150°C
Lead temperature, 10 seconds ____ +260°C

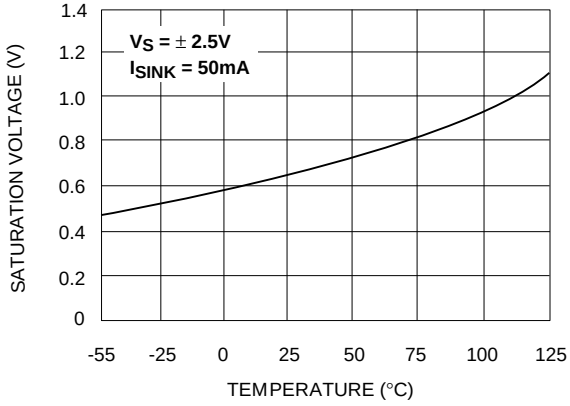
OPERATING ELECTRICAL CHARACTERISTICS
T_A = 25°C V^+= +5V unless otherwise specified

Parameter	Symbol	4302A			4302			Unit	Test Conditions
		Min	Typ	Max	Min	Typ	Max		
Voltage Supply	V_S V^+	±1.5 3		±6 12	±1.5 3		±6 12	V V	Dual Supply Single Supply
Supply Current	I_S		600	1000		600	1000	µA	R_{LOAD} = ∞
Voltage Gain	A_{VD}	30	100		30	100		V/mV	R_{LOAD} ≥15KΩ
Input Offset Voltage	V_{OS}			5			10	mV	R_{LOAD} =1.5KΩ
Input Offset Current [1]	I_{OS}		10	200 800		10	200 800	pA	0°C ≤ T_A ≤ 70°C
Input Bias Current [1]	I_B		10	200 1000		10	200 1000	pA	0°C ≤ T_A ≤ 70°C
Common Mode Input Voltage Range [2]	V_{ICR}	-0.3		V^+-1.5	-0.3		V^+ -1.5	V	
Low Level Output Voltage	V_{OL}		0.18	0.4		0.18	0.4	V	I_{SINK} =12mA V_{INPUT} =1V Differential
Low Level Output Current	I_{OL}	24	60		24	60		mA	V_{OL} =1.0V
High Level Output Voltage	V_{OH}	3.5	4.5		3.5	4.5		V	I_{OH} = -2mA
Response Time [2]	t_{RP}		400			400		ns	R_L = 5.1KΩ C_L = 15pF 100mV Input Step/5mV Overdrive
			120			120		ns	R_L = 5.1KΩ C_L = 15pF TTL- Level Input Step

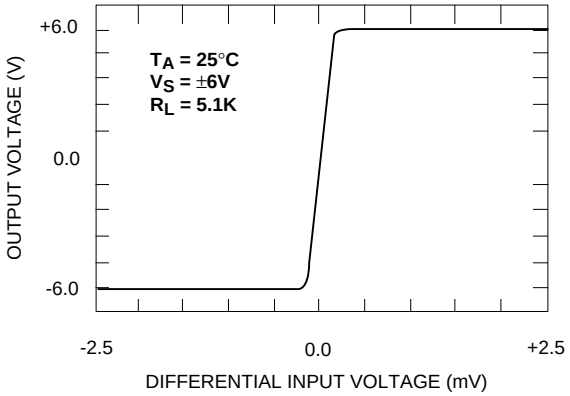
Notes: [1] Consists of junction leakage currents
[2] Sample tested parameters

TYPICAL PERFORMANCE CHARACTERISTICS

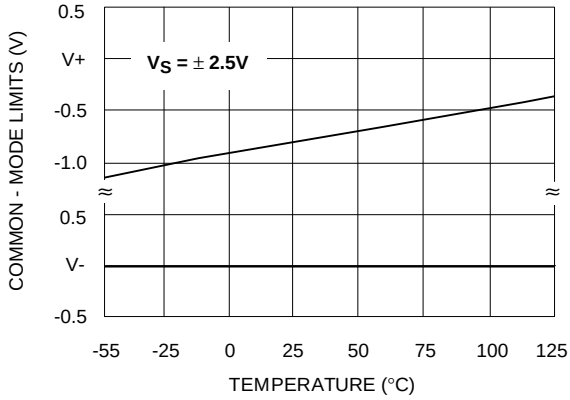
SATURATION VOLTAGE vs. TEMPERATURE



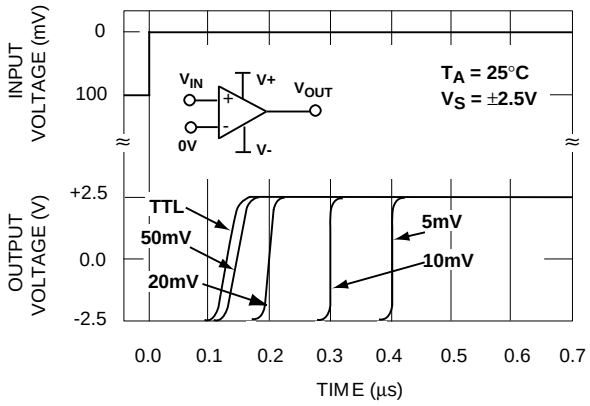
TRANSFER FUNCTION



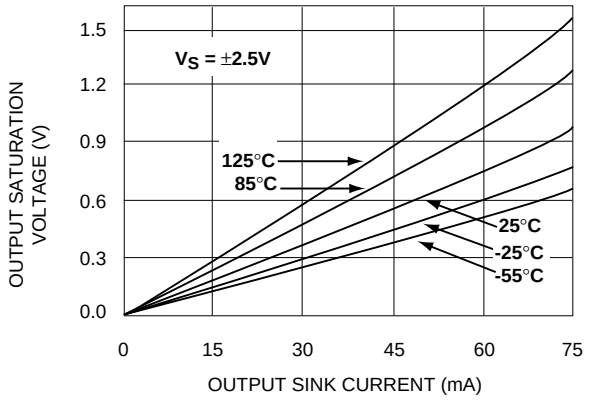
COMMON - MODE VOLTAGE REFERRED TO SUPPLY VOLTAGE



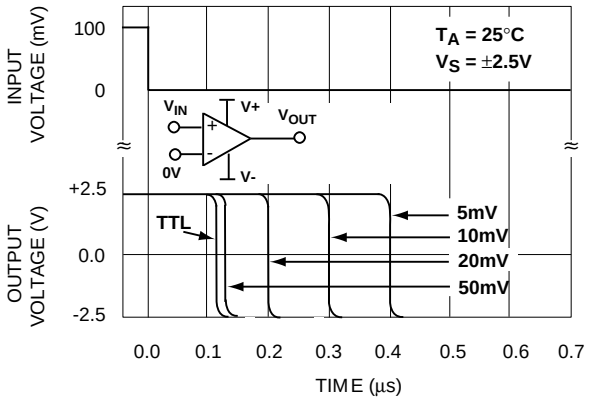
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



SATURATION VOLTAGE vs. SINK CURRENT

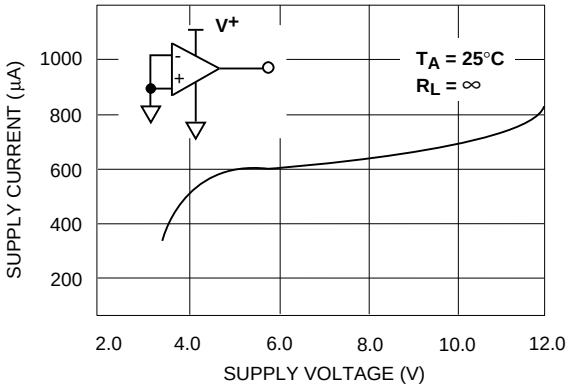


RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES

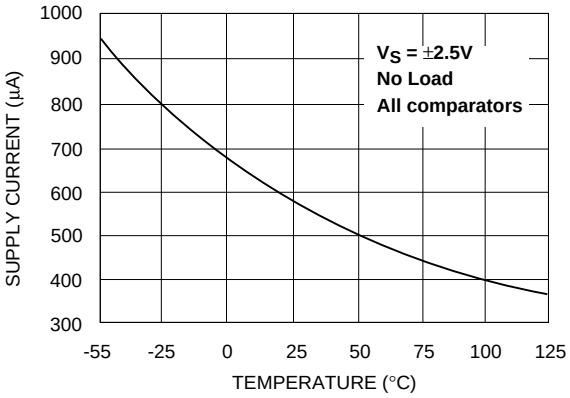


TYPICAL PERFORMANCE CHARACTERISTICS

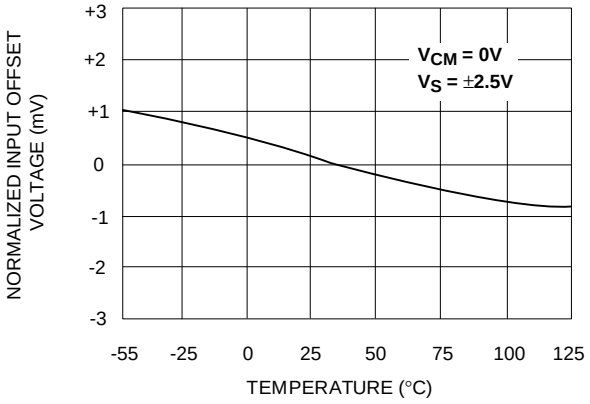
TOTAL SUPPLY CURRENT vs. TOTAL SUPPLY VOLTAGE



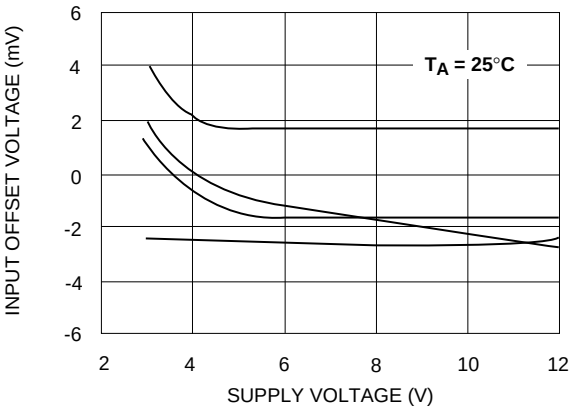
SUPPLY CURRENT vs. TEMPERATURE



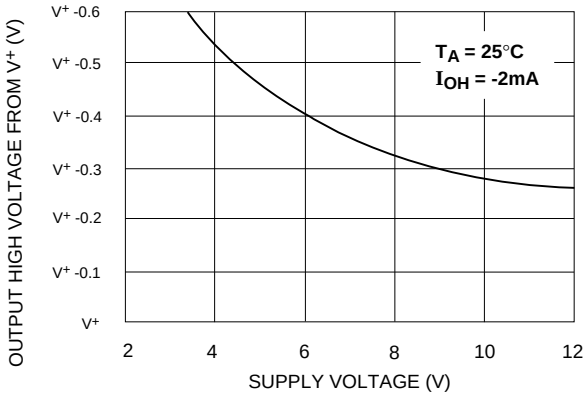
NORMALIZED INPUT OFFSET VOLTAGE vs. TEMPERATURE



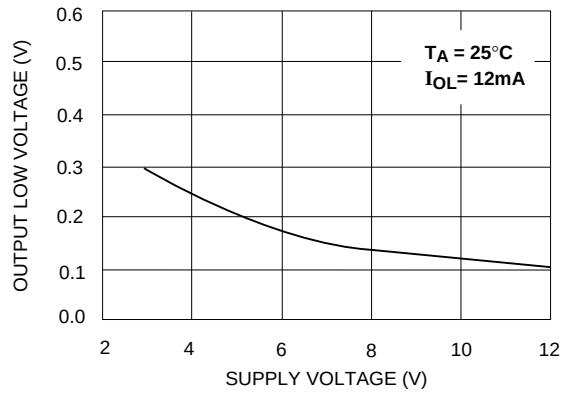
INPUT OFFSET VOLTAGE vs. SUPPLY VOLTAGE REPRESENTATIVE SAMPLES



OUTPUT HIGH VOLTAGE vs. SUPPLY VOLTAGE

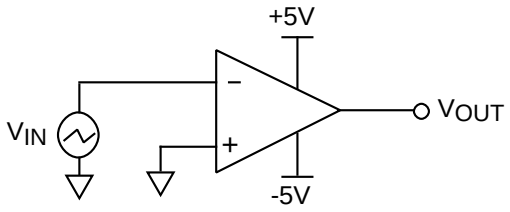


OUTPUT LOW VOLTAGE vs. SUPPLY VOLTAGE



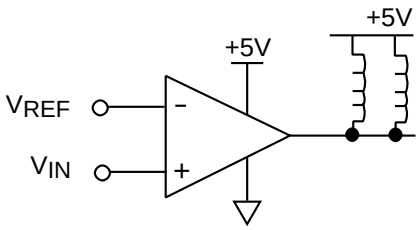
TYPICAL APPLICATIONS

ZERO CROSSING DETECTOR



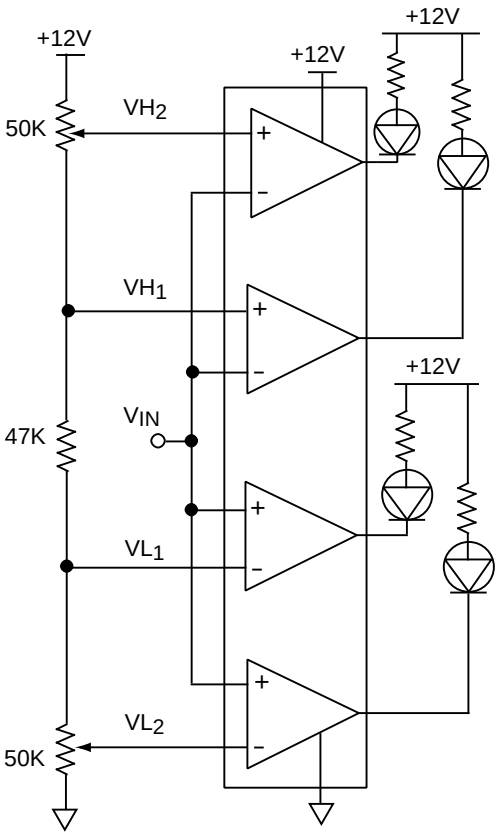
1/4 ALD4302

MULTIPLE RELAY DRIVE



1/4 ALD4302

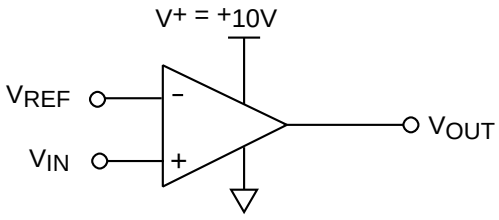
DOUBLE DUAL LIMIT WINDOW COMPARATOR



ALD4302

VL_1 and VH_1 first limit window send warning.
VL_2 and VH_2 second limit window execute system cutoff.

VOLTAGE LEVEL TRANSLATOR



1/4 ALD4302

V_{REF} = 1.4V for TTL input

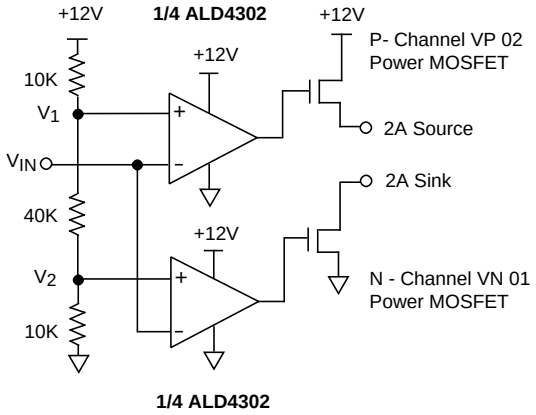
$V_{REF} = \frac{V^+}{2}$ for CMOS input

Output V_{OUT} swings from rail- to- rail

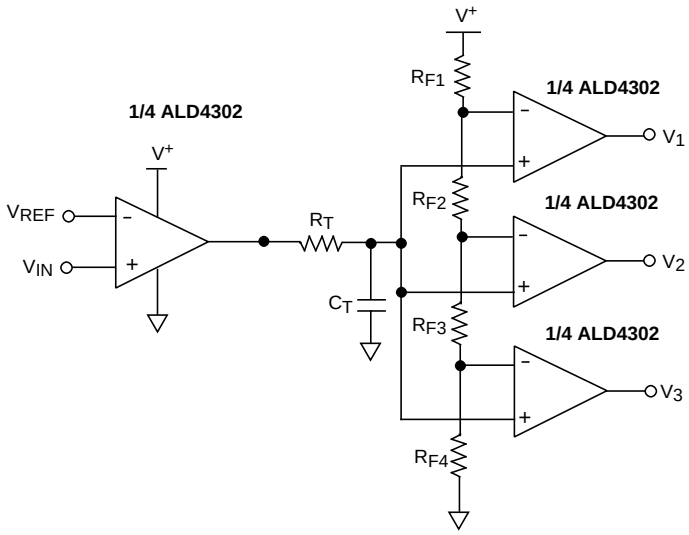
TYPICAL APPLICATIONS

PUSH-PULL COMPLEMENTARY POWER MOSFET DRIVER

This circuit eliminates crossover current in the complementary power transistors. The outputs can be used to source and sink different loads or tied together to provide push-pull drive.



TIME DELAY GENERATOR



Design & Operating Notes:

1. As each output sources up to 10mA in the output high state, the output stage of a wired-OR low output circuit must be able to sink this current and still provide desired output voltage levels. For TTL output levels, this consideration limits the number to a maximum of three ALD4302 outputs wired-OR together.
2. In order to minimize stray oscillation, all unused inputs must be tied to ground.
3. The input bias and offset currents are essentially input protection diode reverse bias leakage currents, and are typically less than 1 pA at room temperature. These currents are a function of ambient temperature, and would have to be considered in applications where very high source impedance or high accuracy are involved.
4. The high output sinking current of 60mA for each output offers flexibility in many applications, as a separate buffer or driver would not be necessary to drive the intended load. However, as the circuit normally operates close to ambient temperature due to its very low power consumption, thermal effects caused by large output current transients must be considered in certain applications.