

AU2901 Quad Voltage Comparator

Preliminary Specification

Linear Products

DESCRIPTION

The AU2901 consists of four independent precision voltage comparators, with an offset voltage specification as low as 2.0mV max for each comparator, which were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. These comparators also have a unique characteristic in that the input common-mode voltage range includes ground, even though they are operated from a single power supply voltage.

The AU2901 was designed to directly interface with TTL and CMOS. When operated from both plus and minus power supplies, the AU2901 will directly interface with MOS logic where their low power drain is a distinct advantage over standard comparators.

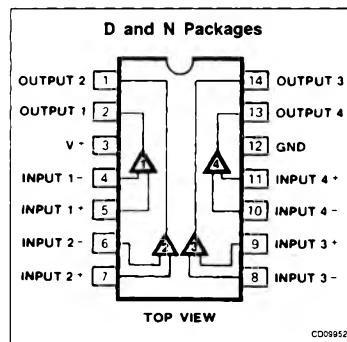
FEATURES

- Wide single supply voltage range 2.0V_{DC} to 36V_{DC} or dual supplies $\pm 1.0\text{V}_{\text{DC}}$ to $\pm 18\text{V}_{\text{DC}}$
- Very low supply current drain (0.8mA) independent of supply voltage (1.0mW/comparator at 5.0V_{DC})
- Low input biasing current 25nA
- Low input offset current $\pm 5\text{nA}$ and offset voltage
- Input common-mode voltage range includes ground
- Differential input voltage range equal to the power supply voltage
- Low output 250mV at 4mA saturation voltage
- Output voltage compatible with TTL, DTL, ECL, MOS and CMOS logic systems

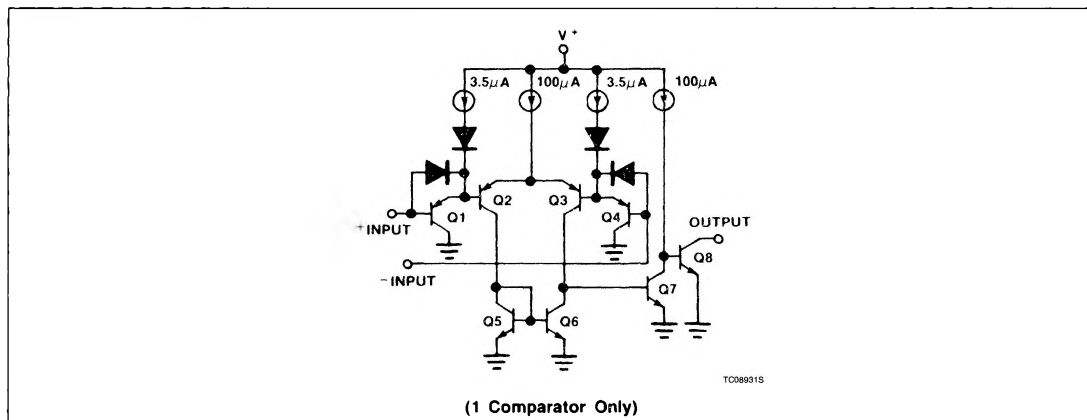
APPLICATIONS

- A/D converters
- Wide range VCO
- MOS clock generator
- High voltage logic gate
- Multivibrators

PIN CONFIGURATION



EQUIVALENT CIRCUIT



Quad Voltage Comparator

AU2901

ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
14-Pin Plastic SO	-40°C to +125°C	AU2901D
14-Pin Plastic DIP	-40°C to +125°C	AU2901N

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V_{CC}	V_{CC} supply voltage	36 or ± 18	V_{DC}
V_{DIFF}	Differential input voltage	36	V_{DC}
V_{IN}	Input voltage	-0.3 to +36	V_{DC}
P_{DMAX}	Maximum power dissipation, $T_A = 25^\circ\text{C}$ (still-air) ¹ N package D package	1420 1040	mW mW
	Output short-circuit to ground ²	Continuous	
I_{IN}	Input current ($V_{IN} < -0.3V_{DC}$) ³	50	mA
T_A	Operating temperature range AU2901	-40 to +125	°C
T_{STG}	Storage temperature range	-65 to +150	°C
T_{SOLD}	Lead soldering temperature (10sec max)	300	°C

NOTE:

- Derate above 25°C, at the following rates:
N Package at 11.4mW/°C
D Package at 8.3mW/°C
- Short circuits from the output to V_+ can cause excessive heating and eventual destruction. The maximum output current is approximately 20mA independent of the magnitude of V_+ .
- This input current will only exist when the voltage at any of the input leads is driven negative. It is due to the collector-base junction of the input PNP transistors becoming forward biased and thereby acting as input diode clamps. In addition to this diode action, there is also lateral NPN parasitic transistor action on the IC chip. This transistor action can cause the output voltages of the comparators to go to the V_+ voltage level (or to ground for a large overdrive) for the time duration that an input is driven negative. This is not destructive and normal output states will reestablish when the input voltage, which was negative, again returns to a value greater than $-0.3V_{DC}$.

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AU2901

DC AND AC ELECTRICAL CHARACTERISTICS $V_+ = 5V_{DC}$, AU2901: $-40^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$, unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	AU2901			UNIT
			Min	Typ	Max	
V_{OS}	Input offset voltage ²	$T_A = 25^\circ\text{C}$ Over temp.		± 2.0 ± 9	± 7.0 ± 15	mV
V_{CM}	Input common-mode voltage ³ range	$T_A = 25^\circ\text{C}$ Over temp.	0 0		$V_+ - 1.5$ $V_+ - 2.0$	V
V_{IDR}	Differential input voltage ¹	Keep all $V_{INs} \geq 0V_{DC}$ (or V_- if need)			V_+	V
I_{BIAS}	Input bias current ⁴	$I_{IN(+)}$ or $I_{IN(-)}$ with output in linear range $T_A = 25^\circ\text{C}$ Over temp.		25 200	250 500	nA
I_{OS}	Input offset current	$I_{IN(+)} - I_{IN(-)}$ $T_A = 25^\circ\text{C}$ Over temp.		± 5 ± 50	± 50 ± 200	nA nA
I_{OL}	Output sink current	$V_{IN(-)} \geq 1V_{DC}$, $V_{IN(+)} = 0$, $V_O \leq 1.5V_{DC}$, $T_A = 25^\circ\text{C}$	6.0	16		mA
I_{OH}	Output leakage current	$V_{IN(+)} \geq 1V_{DC}$, $V_{IN(-)} = 0$, $V_O = 5V_{DC}$, $T_A = 25^\circ\text{C}$, $V_O = 30V_{DC}$, Over temp.		0.1	1.0	nA μA
I_{CC}	Supply current	$V_+ = 28V$, $R_L = \infty$ on comparators, $T_A = 25^\circ\text{C}$ $V_+ = 30V$		0.8 1.0	2.0 2.5	mA
A_V	Voltage gain	$R_L \geq 15k\Omega$, $V_+ = 15V_{DC}$	25	100		V/mV
V_{OL}	Saturation voltage	$V_{IN(-)} \geq 1V_{DC}$, $V_{IN(+)} = 0$, $I_{SINK} \leq 4\text{mA}$, $T_A = 25^\circ\text{C}$ Over temp.		400	400 700	mV
t_{LSR}	Large-signal response time	$V_{IN} = \text{TTL logic swing}$, $V_{REF} = 1.4V_{DC}$, $V_{RL} = 5V_{DC}$, $R_L = 5.1k\Omega$, $T_A = 25^\circ\text{C}$		300		ns
t_R	Response time ⁵	$V_{RL} = 5V_{DC}$, $R_L = 5.1k\Omega$, $T_A = 25^\circ\text{C}$		1.3		μs

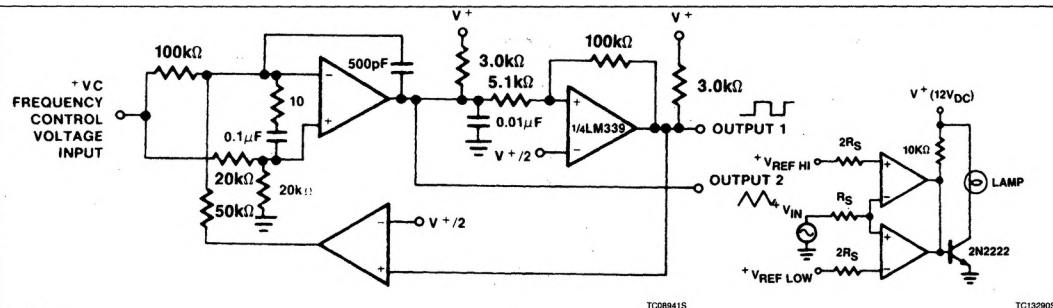
NOTES:

- Positive excursions of input voltage may exceed the power supply level by 17V. As long as the other voltage remains within the common-mode range, the comparator will provide a proper output state. The low input voltage state must not be less than $-0.3V_{DC}$ (or $0.3V_{DC}$ below the magnitude of the negative power supply, if used).
- At output switch point, $V_O \approx 1.4V_{DC}$, $R_S = 0\Omega$ with V_+ from $5V_{DC}$ to $30V_{DC}$; and over the full input common-mode range ($0V_{DC}$ to $V_+ - 1.5V_{DC}$).
- The input common-mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is $V_+ - 1.5V$, but either or both inputs can go to $30V_{DC}$ without damage.
- The direction of the input current is out of the IC due to the PNP input stage. This current is essentially constant, independent of the state of the output so no loading change exists on the reference or input lines.
- The response time specified is for a 100mV input step with a 5mV overdrive. For larger overdrive signals, 300ns can be obtained (see Typical Performance Characteristics section).

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AU2901

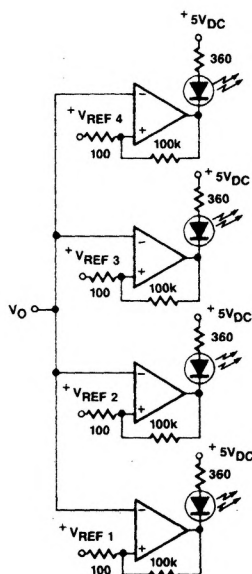
TYPICAL APPLICATIONS



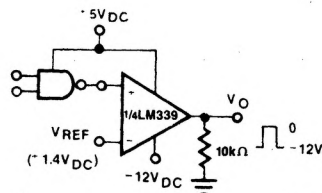
NOTES:
 $V+ = +30V_{DC}$
 $+250mV_{DC} \leq V_C \leq +50V_{DC}$
 $700Hz \leq f_O \leq 100kHz$

Two-Decade High-Frequency VCO

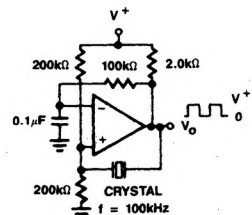
Limit Comparator



Visible Voltage Indicator



TTL-to-MOS Logic Converter



Crystal-Controlled Oscillator

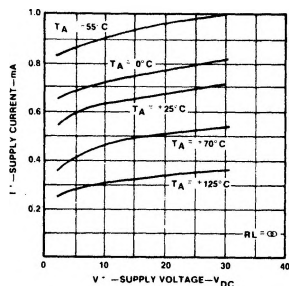
NOTE:
 Inputs of unused comparators should be grounded.

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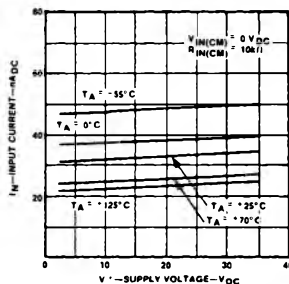
TYPICAL PERFORMANCE CHARACTERISTICS

Supply Current



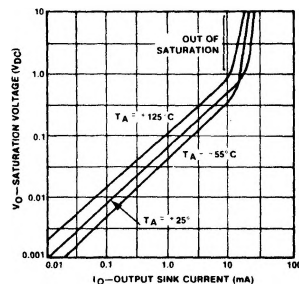
OP055705

Input Current



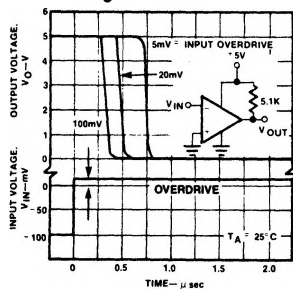
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Output Saturation Voltage



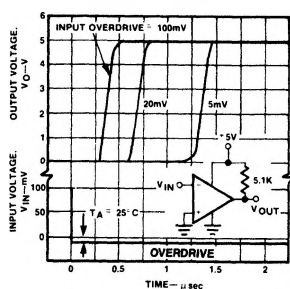
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Response Time for Various Input Overdrives — Negative Transition



OP056005

Response Time for Various Input Overdrives — Positive Transition



OP056105