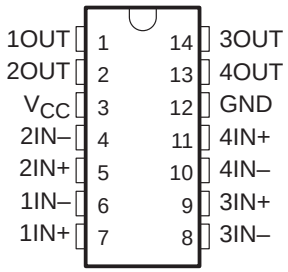
LM3302
QUADRUPLE DIFFERENTIAL COMPARATOR

SLCS014 –OCTOBER 1977 –REVISED APRIL 1988

- **Single Supply or Dual Supplies**
- **Wide Range of Supply Voltage 2 V to 28 V**
- **Low Supply Current Drain Independent of Supply Voltage . . . 0.8 mA Typ**
- **Low Input Bias Current . . . 25 nA Typ**
- **Low Input Offset Current . . . 3 nA Typ**
- **Low Input Offset Voltage . . . 3 mV Typ**
- **Common-Mode Input Voltage Range Includes Ground**
- **Differential Input Voltage Range Equal to Maximum-Rated Supply Voltage . . . ± 28 V**
- **Low Output Saturation Voltage**
- **Output Compatible With TTL, MOS, and CMOS**

D, J, OR N PACKAGE
(TOP VIEW)



description

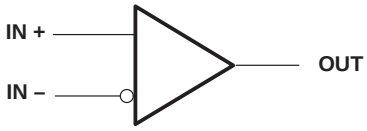
This device consists of four independent voltage comparators that are designed to operate from a single power supply over a wide range of voltages. Operation from dual supplies is also possible so long as the difference between the two supplies is 2 V to 28 V and V_{CC} is a least 1.5 V more positive than the input common-mode voltage. Current drain is independent of the supply voltage. The outputs can be connected to other open-collector outputs to achieve wired-AND relationships.

AVAILABLE OPTIONS

T_A	V_{IO} max at 25°C	PACKAGE		
		SMALL OUTLINE (D)†	CERAMIC DIP (J)	PLASTIC DIP (N)
–40°C to 85°C	20 mV	LM3302D	LM3302J	LM3302N

† The D packages are available taped and reeled. Add the suffix R to the device type, when ordering (i.e., LM3302DR).

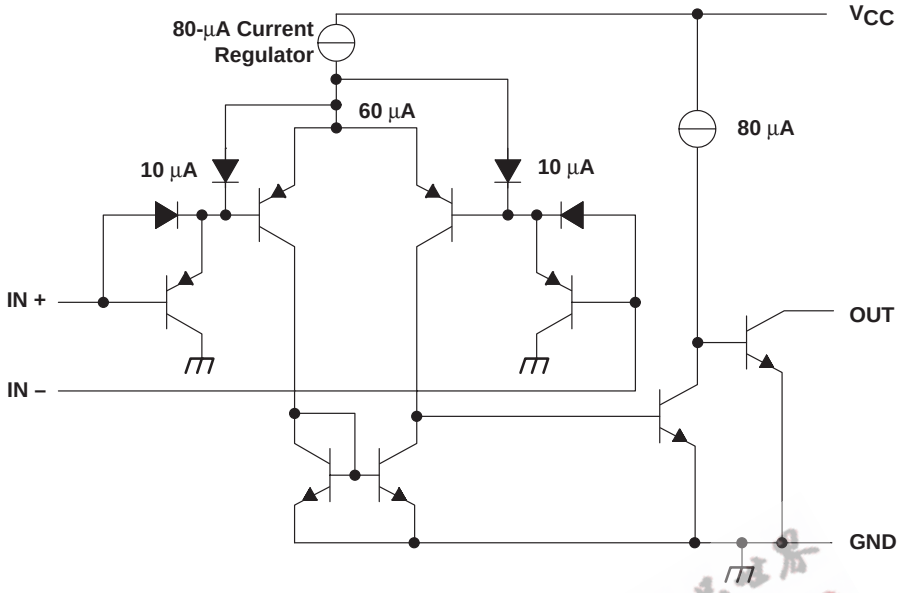
symbol (each comparator)



PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

Copyright © 1988, Texas Instruments Incorporated

schematic



Current values shown are nominal.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, V_{CC} (see Note 1) . . . . . 28 V
Differential input voltage, V_{ID} (see Note 2) . . . . . ±28 V
Input voltage range, V_I (either input), V_I . . . . . – 0.3 V to 28 V
Output voltage, V_O . . . . . 28 V
Output current, I_O . . . . . 20 mA
Duration of output short-circuit to ground (see Note 3) . . . . . unlimited
Continuous total dissipation . . . . . See Dissipation Rating Table
Operating free-air temperature range, T_A . . . . . – 40°C to 85°C
Storage temperature range . . . . . – 65°C to 150°C
Lead temperature range 1,6 mm (1/16 inch) from case for 60 seconds: J package . . . . . 300°C
Lead temperature range 1,6 mm (1/16 inch) from case for 10 seconds: D or N package . . . . . 260°C

† Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. There are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the recommended operating conditions section of this specification is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. All voltage values, except differential voltages, are with respect to the network ground.
2. Differential voltages are at IN+ with respect to IN –.
3. Short circuits from the output to V_{CC} can cause excessive heating and eventual destruction.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING	$T_A = 85°C$ POWER RATING
D	950 mW	7.6 mW/°C	608 mW	494 mW
J	1025 mW	8.2 mW/°C	656 mW	533 mW
N	1150 mW	9.2 mW/°C	736 mW	598 mW

electrical characteristics at specified free-air temperature, V_{CC} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS ‡		T_A	MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage	V_{CC} = 5 V to 28 V, V_O = 1.4 V	V_{IC} = V_{ICR} min,	25°C		3	20	mV
				– 40°C to 85°C			40	
I_{IO}	Input offset voltage	V_O = 1.4 V		25°C		3	100	nA
				– 40°C to 85°C			300	
I_{IB}	Input bias current			25°C		– 25	– 500	nA
				– 40°C to 85°C			–1000	
V_{ICR}	Common-mode input voltage range			25°C	0 to V_{CC} – 1.5			V
				– 40°C to 85°C	0 to V_{CC} – 2			
A_{VD}	Large-signal differential voltage amplification	V_{CC} = 15 V, RL = 15 Ω to V_{CC}	V_O = 1.4 V to 11.4 V,	25°C	2	30		V/mV
I_{OH}	High-level output current	V_{ID} = 1 V,	V_{OH} = 5 V	25°C		0.1		nA
				– 40°C to 85°C			1	µA
V_{OL}	Low-level output voltage	V_{ID} = 1 V,	V_{OH} = 5 V	25°C		150	500	mV
				– 40°C to 85°C			700	
I_{OL}	Low-level output current	V_{ID} = 1 V,	V_{OL} = 1.5 V	25°C	6	16		mA
I_{CC}	Supply current (four comparators)	V_O = 2.5 V,	No load	25°C		0.8		mA

‡ All characteristics are measured with zero common-mode input voltage unless otherwise specified.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Response time	R_L = 5.1 kΩ to 5 V, C_L = 15 pF †, See Note 4	100-mV input step with 5-mV overdrive		1.3		µs
		TTL-level input step		0.3		

† C_L includes probe and jig capacitance.

NOTE 4: The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V.

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.

Copyright © 1998, Texas Instruments Incorporated