

élantec

HIGH PERFORMANCE ANALOG INTEGRATED CIRCUITS

EL2252/EL2252C

Dual 50 MHz Comparator/Pin Receiver

Features

- Fast response—7 ns
- Inputs tolerate large overdrives with no speed nor bias current penalties
- Propagation delay is relatively constant with variations of input Slew Rate, overdrive, temperature, and supply voltage
- Output provides proper CMOS or TTL logic levels
- Hysteresis is available on-chip
- Large voltage gain—8000 V/V
- Not oscillation-prone
- Can detect 4 ns glitches
- MIL-STD-883 Rev. C compliant

Applications

- Pin receiver for automatic test equipment
- Data communications line receiver
- Frequency counter input
- Pulse squarer

Ordering Information

Part No.	Temp. Range	Package	Outline #
EL2252CJ	0°C to +75°C	14-Pin CerDIP	MDP0014
EL2252CN	0°C to +75°C	14-Pin P-DIP	MDP0031
EL2252CM	0°C to +75°C	20-Lead SOL	MDP0027
EL2252J	-55°C to +125°C	14-Pin CerDIP	MDP0014
EL2252J/883B	-55°C to +125°C	14-Pin CerDIP	MDP0014

General Description

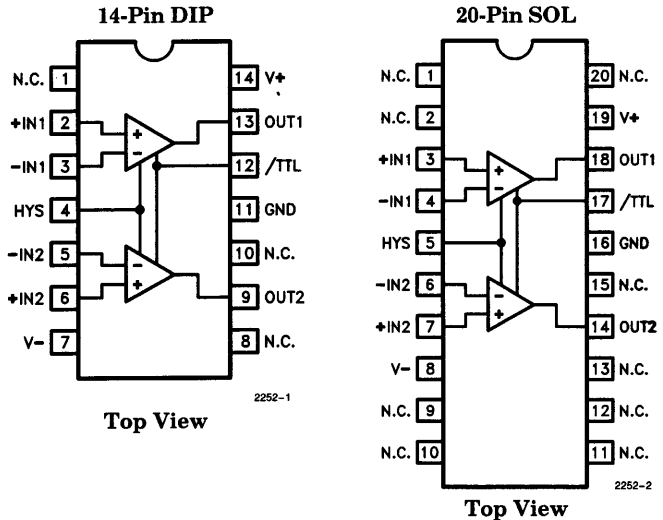
The EL2252 dual comparator replaces the traditional input buffer + attenuator + ECL comparator + ECL to TTL translator circuit blocks used in digital equipment. The EL2252 provides a quick 7 ns propagation delay while complying with $\pm 10V$ inputs. Input accuracy and propagation delay is maintained even with input signal Slew Rates as great as $4000 V/\mu s$. The EL2252 can run on supplies as low as $-5.2V$ and $+9V$ and comply with ECL and CMOS inputs, or use supplies as great as $\pm 18V$ for much greater input range.

The EL2252 has a /TTL pin which, when grounded, restricts the output V_{OH} to a TTL swing to minimize propagation delay. When left open, the output V_{OH} increases to a valid CMOS level.

The comparators are well behaved and have little tendency to oscillate over a variety of input and output source and load impedances. They do not oscillate even when the inputs are held in the linear range of the device. To improve output stability in the presence of input noise, an internal 60 mV of hysteresis is available by connecting the HYS pin to $V-$.

Elantec's products and facilities comply with MIL-STD-883 Revision C, MIL-I-45208A, and other applicable quality specifications. For information on Elantec's military processing, see Elantec document, QRA-2; "Elantec's Military Processing, Monolithic Integrated Circuits".

Connection Diagrams



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Absolute Maximum Ratings (T_A = 25°C)

Voltage between V+ and V-	36V	Operating Junction Temperature	
Voltage at V+	18V	CerDIP	175°C
Voltage between -IN and +IN pins	36V	Plastic DIP, SOL	150°C
Output Current	12 mA	Storage Temperature Range	-65° to +150C
Current into +IN, -IN, HYS or /TTL	5 mA	Lead Temperature	
Internal Power Dissipation	See Curves	DIP Package	
Operating Ambient Temperature Range		(Soldering, <10 seconds)	300°C
EL2252	-55°C to +125°C	SOL Package	
EL2252C	-25°C to +85°C	Vapor Phase (<60 seconds)	215°C
		Infrared (<15 seconds)	220°C

Important Note:

All parameters having Min/Max specifications are guaranteed. The Test Level column indicates the specific device testing actually performed during production and Quality inspection. Elantec performs most electrical tests using modern high-speed automatic test equipment, specifically the LTX77 Series system. Unless otherwise noted, all tests are pulsed tests, therefore T_J = T_C = T_A.

Test Level	Test Procedure
I	100% production tested and QA sample tested per QA test plan QCX0002.
II	100% production tested at T _A = 25°C and QA sample tested at T _A = 25°C, T _{MAX} and T _{MIN} per QA test plan QCX0002.
III	QA sample tested per QA test plan QCX0002.
IV	Parameter is guaranteed (but not tested) by Design and Characterization Data.
V	Parameter is typical value at T _A = 25°C for information purposes only.

DC Electrical Characteristics V_S = ±15V; HYS and /TTL grounded; T_A = 25°C unless otherwise specified

Parameter	Description	Temp	Min	Typ	Max	Test Level		Units
						EL2252	EL2252C	
V _{OS}	Input Offset Voltage	25°C		1	6	I	I	mV
		Full			10	I	III	mV
TCV _{OS}	Average Offset Voltage Drift	Full		7		V	V	µV/C
I _B	Input Bias Current at Null	25°C		6	12	I	I	µA
		Full			17	I	III	µA
I _{OS}	Input Offset Current	25°C		0.2	1	I	I	µA
		Full			2	I	III	µA
R _{IN, diff}	Input Differential Resistance	25°C		30		V	V	kΩ
R _{IN, comm}	Input Common-Mode Resistance	25°C		10		V	V	MΩ
C _{IN}	Input Capacitance	25°C		2		V	V	pF
V _{CM+}	Positive Common-Mode Input Range	Full	10	13		I	II	V
V _{CM-}	Negative Common-Mode Input Range	Full	-9	-12		I	II	V
A _{VOL}	Large Signal Voltage Gain V _O = 0.8V to 2.0V	25°C	4000	8000		I	I	V/V
		Full	3000			I	III	V/V

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EL2252/EL2252C

Dual 50 MHz Comparator/Pin Receiver

DC Electrical Characteristics

$V_S = \pm 15V$; HYS and /TTL grounded; $T_A = 25^\circ C$ unless otherwise specified — Contd.

Parameter	Description	Temp	Min	Typ	Max	Test Level		Units
						EL2252	EL2252C	
CMRR	Common-Mode Rejection Ratio (Note 1)	Full	70	95		I	II	dB
PSRR	Power-Supply Rejection Ratio (Note 2)	Full	70	90		I	II	dB
V_{HYS}	Peak-to-Peak Input Hysteresis with HYS connected to V-	$25^\circ C$		60		V	V	mV
V_{OH}	High Level Output, CMOS Mode	Full	4.0	4.6	5.1	I	II	V
	TTL Mode	Full	2.4	2.7	3.2	I	II	V
V_{OL}	Low Level Output, $I_1 = 0$	Full	-0.2	0.2	0.4	I	II	V
	$I_1 = 5 \text{ mA}$	Full	-0.2	0.4	0.8	I	II	V
I_{S+}	Positive Supply Current	Full		16	19	I	II	mA
I_{S-}	Negative Supply Current	Full		17	20	I	II	mA

AC Electrical Characteristics

$V_S = \pm 15V$; $C_L = 10 \text{ pF}$; $T_A = 25^\circ C$; TTL output threshold is 1.4V, CMOS output threshold is 2.5V; unless otherwise specified

Parameter	Description	Min	Typ	Max	Test Level		Units
					EL2252	EL2252C	
T_{PD+}, T_{PD-}	Input to Output Propagation Delay, $0 < V_{IN} < 5V$, 500 mV Overdrive, 2000 V/ μs Input Slew Rate TTL Output Swing		6	9	II	II	ns
	CMOS Output Swing		8		V	V	ns
T_{PD+}, T_{PD-}	Input to Output Propagation Delay, $-2V < V_{IN} < -1V$, 200 mV Overdrive, 2 ns Input Rise Time TTL Output Swing		5	9	III	III	ns
	CMOS Output Swing		9		V	V	ns
T_{PDSYM}	Propagation Delay Change between Positive and Negative Input Slopes		1.25		V	V	ns

Note 1: Two tests are performed with $V_{CM} = 0V$ to $-9V$ and $V_{CM} = 0V$ to $10V$.

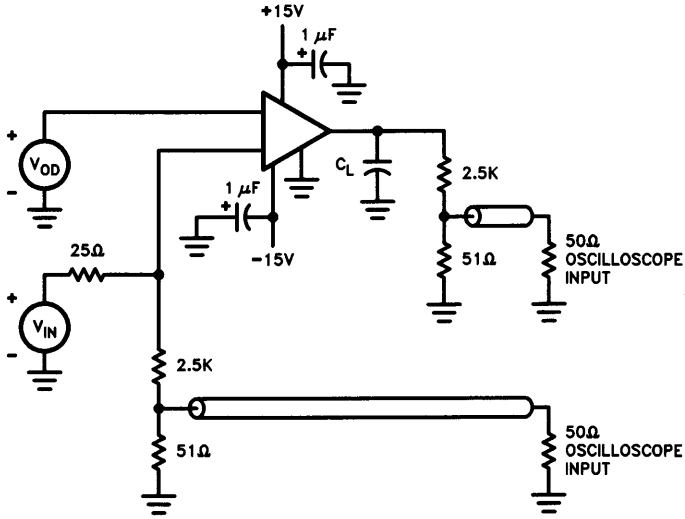
Note 2: Two tests are performed with $V_+ = 15V$, V_- changed from $-10V$ to $-15V$;
 $V_- = -15V$, V_+ changed from $10V$ to $15V$.

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Dual 50 MHz Comparator/Pin Receiver

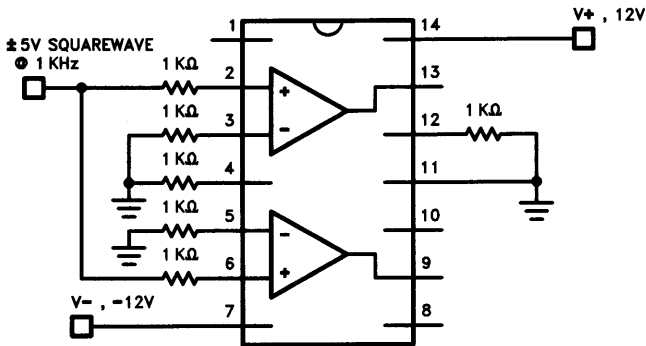
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AC Test Circuit



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Burn-In Circuit

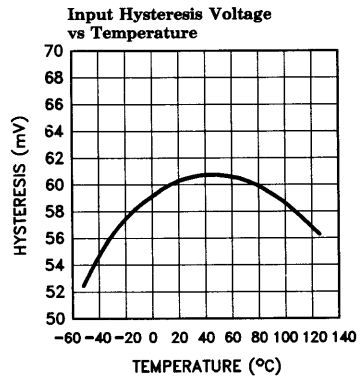
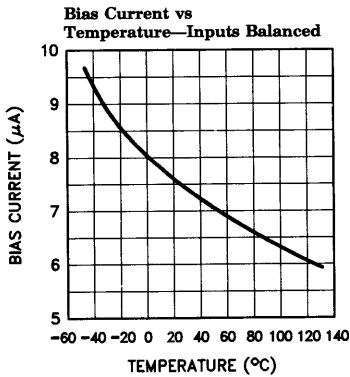
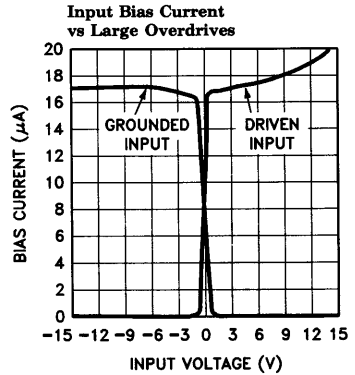
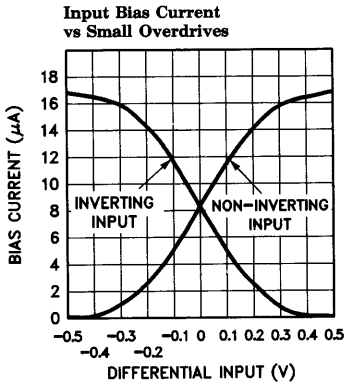


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EL2252/EL2252C

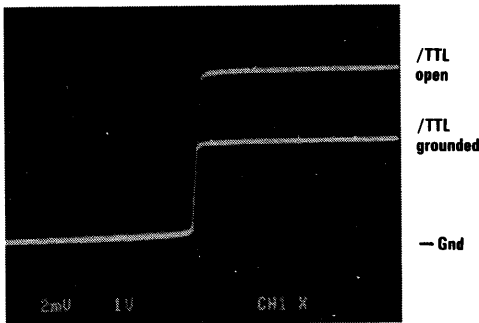
Dual 50 MHz Comparator/Pin Receiver

Typical Performance Curves



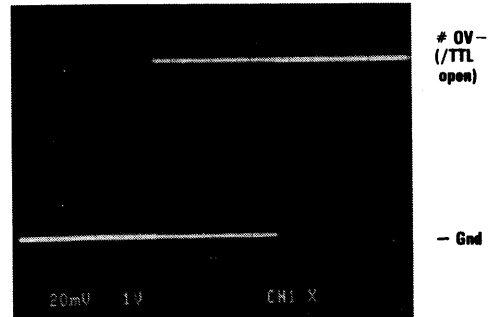
2252-5

Input/Output Transfer Function—HYS Open



2252-6

Input/Output Transfer Function—HYS Connected to V



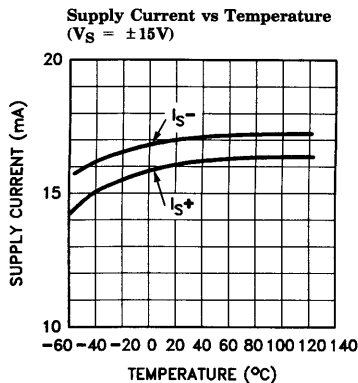
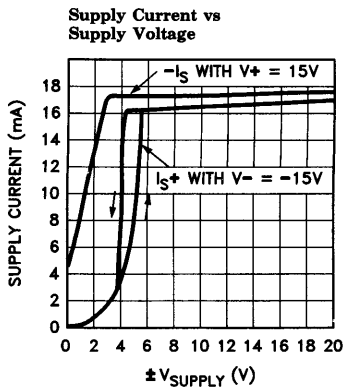
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EL2252/EL2252C

Dual 50 MHz Comparator/Pin Receiver

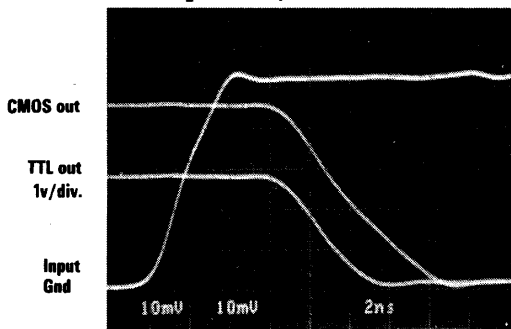
EL2252/EL2252C

Typical Performance Curves — Contd.



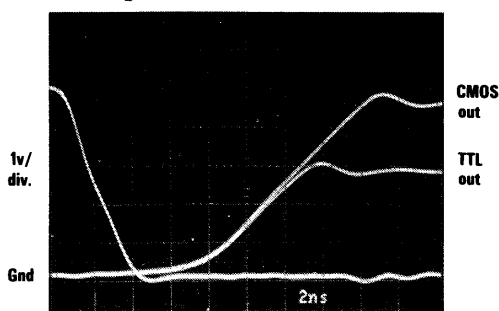
2252-8

Output Delay—0.5V Overdrive



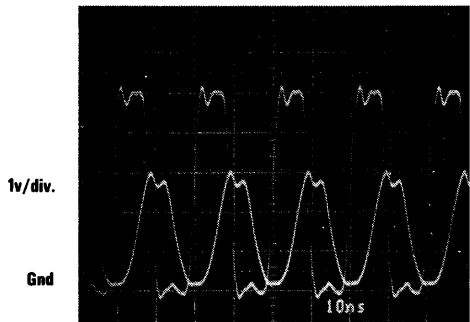
2252-9

Output Delay—0.5V Overdrive



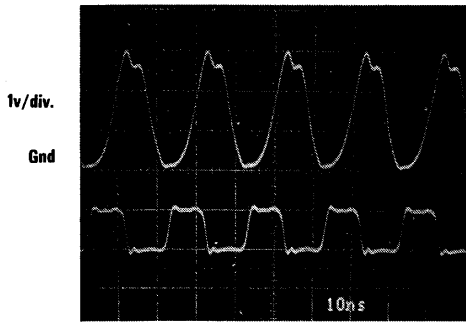
2252-10

Output with 50 MHz CMOS Input



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Output with 50 MHz ECL Input



2252-12

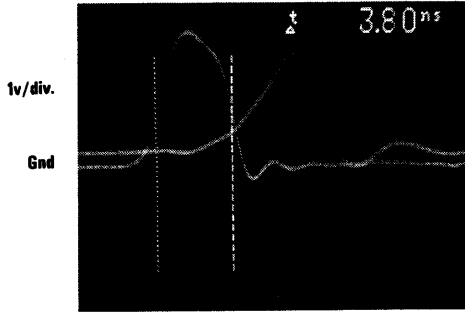
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Dual 50 MHz Comparator/Pin Receiver

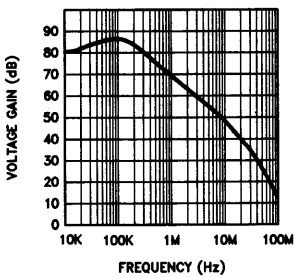
Typical Performance Curves — Contd.

4 ns TTL Glitch Detection

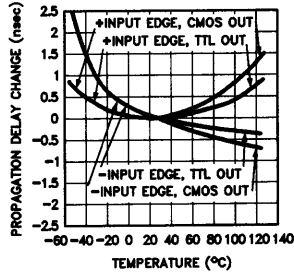


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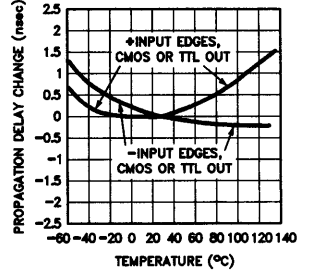
Gain vs Frequency



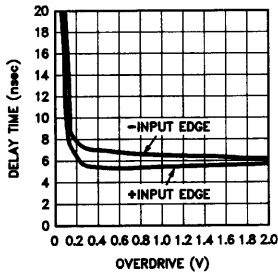
Propagation Delay vs Temperature, CMOS Input



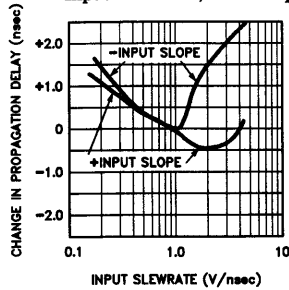
Propagation Delay vs Temperature, ECL Input



Propagation Delay vs Overdrive, CMOS Input



Propagation Delay vs Input Slew Rate, CMOS Input



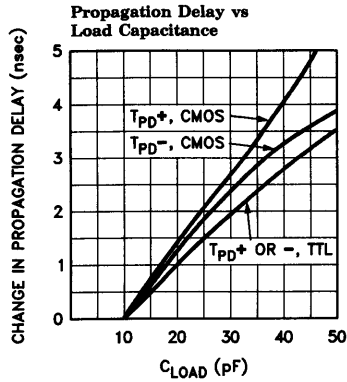
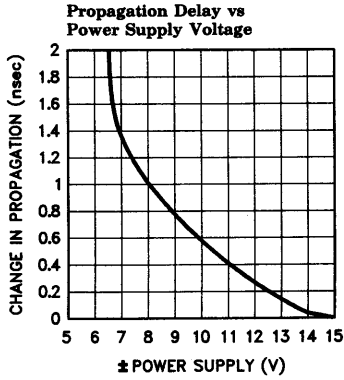
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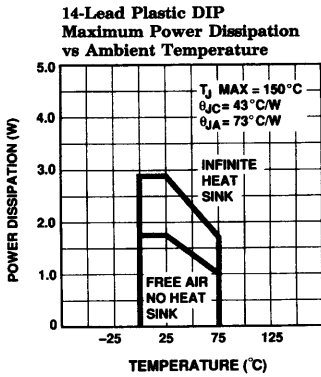
Dual 50 MHz Comparator/Pin Receiver

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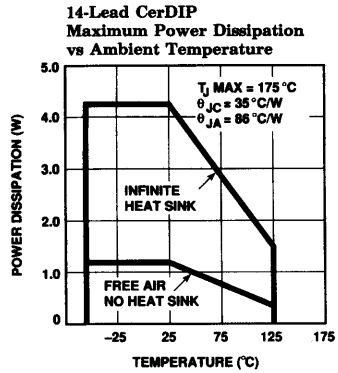
Typical Performance Curves — Contd.



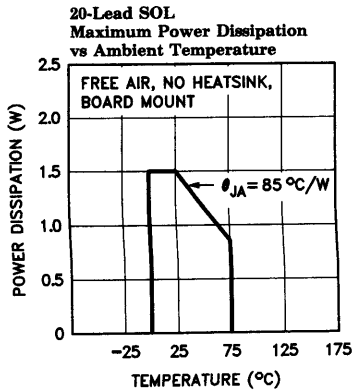
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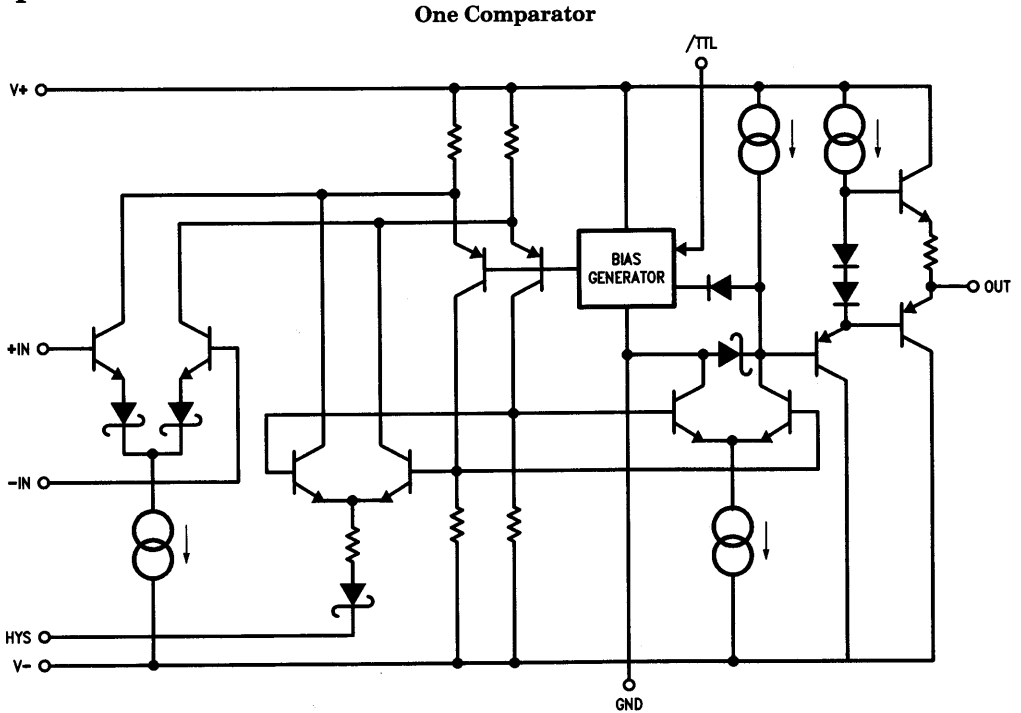
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EL2252/EL2252C

Dual 50 MHz Comparator/Pin Receiver

Simplified Schematic



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Applications Information

The EL2252 is very easy to use and is relatively oscillation-free, but a few items must be attended. The first is that both supplies should be bypassed closely. $1\ \mu\text{F}$ tantalums are very good and no additional smaller capacitors are necessary. The EL2252 requires V^- to be at least 5V to preserve AC performance. V^+ must be at least 6V for a TTL output swing, 8V for CMOS outputs.

The input voltage range will be referred to the more positive of the two inputs. That is, bringing an input as negative as V^- will not cause problems; it's the other input's level that must be considered. The typical input range is $+13/-12\text{V}$

when the supplies are $\pm 15\text{V}$. This range diminishes over temperature and varies with processing; it is wise to set power supplies such that V^+ is 5V more positive than the most positive input signal and V^- more negative than 6V below the most negative input. $\pm 12\text{V}$ supplies will easily encompass all CMOS and ECL logic inputs. If the input exceeds the device's common-mode input capability, the EL2252 propagation delay and input bias current will increase. Fault currents will occur with inputs a diode below V^- or above V^+ . No damage nor V_{OS} shift will occur even when fault currents within the absolute maximum ratings.

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Dual 50 MHz Comparator/Pin Receiver

EL 2252/EL 2252C

Applications Information — Contd.

One of the few ways in which oscillations can be induced is by connecting a high-Q reactive source impedance to the EL2252 inputs. Such sources are long wires and unterminated coaxial lines. The source impedance should be de-Q'ed. One method is to connect a series resistor to the EL2252 input of around 100Ω value. More resistance will calm the system more effectively, but at the expense of comparator response time. Another method is to install a "snubber" network from comparator input to ground. A snubber is a resistor in series with a small capacitor, around 100Ω and 33 pF. Each physical and electrical environment will require different treatments, although many need none.

The major use of the HYS pin is to suppress noise superimposed on the input signal. By shorting the HYS pin to V^- a ± 30 mV hysteresis is placed around the V_{OS} of the comparator input. Leaving the pin open, or more appropriately, grounding the HYS pin removes all hysteresis. Connecting a resistor between HYS and V^- allows an adjustment of the peak-to-peak hysteresis level. Unfortunately, an external resistor cannot track the internal devices properly, so temperature and unit-to-unit variations of hys-

teresis are increased. The relationship between the resistor and resulting hysteresis level is not linear, but a 1.5k resistor will approximately halve the nominal value.

The time delay of the EL2252 will increase by about 0.7 ns when using full hysteresis.

The EL2252 is specifically designed to be tolerant of large inputs. It will exhibit very much increased delay times for input overdrives below 100 mV. If very small overdrives must be sensed, the EL2018 or EL2019 comparators would be good choices, although they lose accuracies with signal input Slew Rates above 400 V/ μ s. The EL2252 keeps its timing accuracy with input Slew Rates between 100 V/ μ s and 4000 V/ μ s of input Slew Rate.

The output stage drives tens of pF load capacitances without increased overshoot, but propagation delay increases about 1 ns per 10 pF. The output circuit is not a traditional TTL stage, and using an external pullup resistor will not change the V_{OH} . In general setting the output swing to TTL (by grounding the /TTL pin) will optimize overall propagation delay and \pm swing symmetry.

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EL2252D Die

Dual 50 MHz Comparator/Pin Receiver

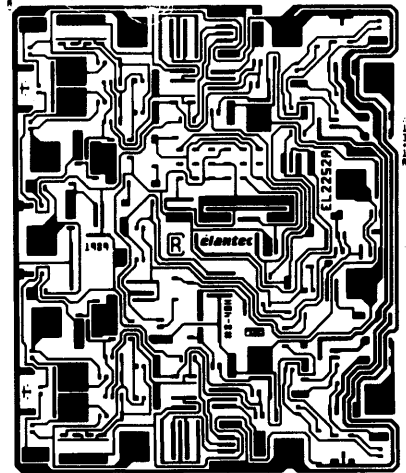
Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$)

	Voltage between $V+$ and $V-$	36V
	Voltage at $V+$	18V
	Voltage between $-IN$ and $+IN$ Pins	36V
	Output Current	12 mA
	Current into $+IN$, $-IN$, HYS, or /TTL	5 mA
T_J	Maximum Junction Temperature	175°C

Important Note:

For AC electrical characteristics, refer to the typical electrical table and performance curves in the package data sheet. These characteristics are guaranteed but not tested in die form. Unless otherwise noted, all tests are pulsed tests, therefore $T_J = T_C = T_A$.

Test Level	Test Procedure
I	100% production tested in wafer form. See remarks under Electrical Testing in the General Die section.



DIE SIZE: 65 x 77 MILS

DC Electrical Characteristics $V_S = \pm 15\text{V}$; HYS and i/m TTL grounded; $T_A = 25^\circ\text{C}$

Parameter	Description	Min	Typ	Max	Test Level	Units
V_{OS}	Input Offset Voltage		1	6	I	mV
I_B	Input Bias Current $V_{CM} = 0\text{V}$, pin 2 or 3		6	12	I	μA
I_{OS}	Input Offset Current $V_{CM} = 0\text{V}$		0.2	1	I	μA
CMRR	Common-Mode Rejection Ratio (Note 1)	70	95		I	dB
PSRR	Power Supply Rejection Ratio (Note 2)	70	90		I	dB
V_{CM+} V_{CM-}	Common Mode Input Range	10	13		I	V
		-9	-12		I	V
A_{VOL}	Large Signal Voltage Gain ($V_{OUT} = 0.8\text{V} + 0.20\text{V}$)	4,000	8,000		I	V/V
V_{OL}	Output Voltage Logic Low $I_{OL} = 0\text{ mA}$	-0.2	0.2	0.4	I	V
	$I_{OL} = 5\text{ mA}$	-0.2	0.4	0.8	I	V
V_{OH}	Output Voltage Logic High CMOS Mode	4	4.6	5.1	I	V
	TTL Mode	2.4	2.7	3.2	I	V
I_{S+}	Positive Supply Current		16	19	I	mA
I_{S-}	Negative Supply Current		17	20	I	mA

Note 1: Two tests are performed with $V_{CM} = 0\text{V}$ to -9V and $V_{CM} = 0\text{V}$ to 10V .

Note 2: Two tests are performed with $V+ = +15\text{V}$, $V-$ changed from -10V to -15V ; $V- = -15\text{V}$, $V+$ changed from 10V to 15V .