

# DATA SHEET

## **NE521**

High-speed dual-differential  
comparator/sense amp

Product data  
Supersedes data of 1994 Aug 31  
File under Integrated Circuits, IC11 Handbook

2001 Aug 03

# High-speed dual-differential comparator/sense amp

# NE521

## FEATURES

- 12 ns maximum guaranteed propagation delay
- 20  $\mu$ A maximum input bias current
- TTL compatible strobes and outputs
- Large common-mode input voltage range
- Operates from standard supply voltages

## APPLICATIONS

- MOS memory sense amp
- A-to-D conversion
- High-speed line receiver

## PIN CONFIGURATION

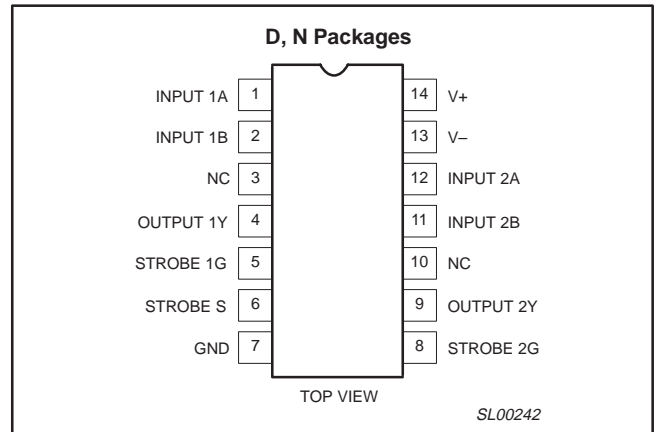


Figure 1. Pin Configuration

## ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
14-Pin Plastic Dual In-Line Package (DIP)	0 °C to +70 °C	NE521N	SOT27-1
14-Pin SO Package	0 °C to +70 °C	NE521D	SOT108-1

## EQUIVALENT SCHEMATIC

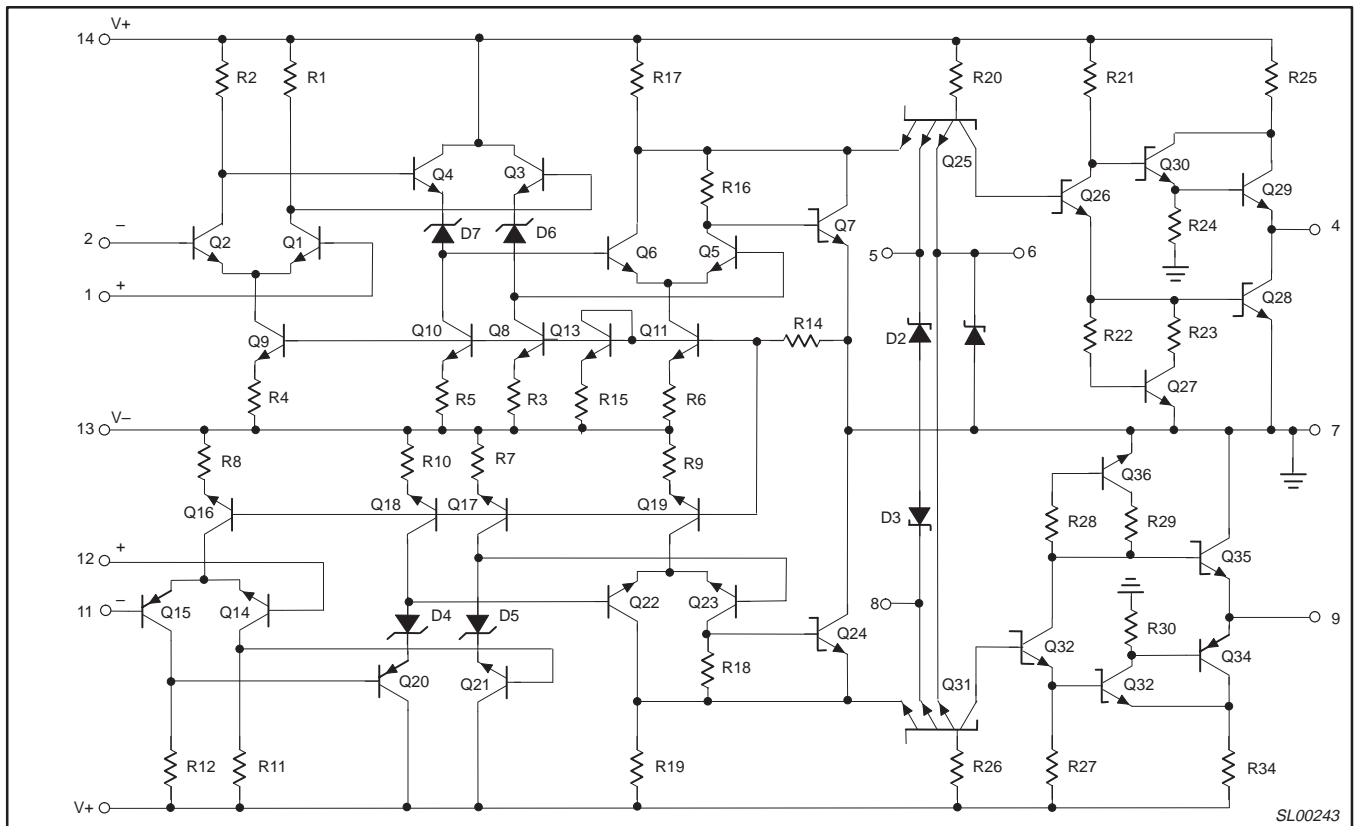


Figure 2. Equivalent Schematic

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## BLOCK DIAGRAM

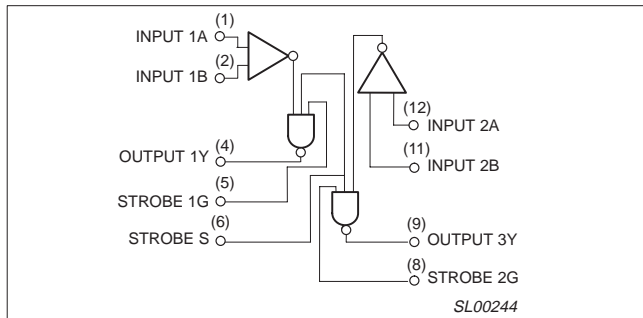


Figure 3. Block Diagram

## LOGIC FUNCTIONS

$V_{ID}$ A <sup>+</sup> , B <sup>-</sup>	STROBE S	STROBE G	OUTPUT (Y)
$V_{ID} \leq -V_{OS}$	H	H	L
$-V_{OS} < V_{ID} < V_{OS}$	H	H	Undefined
$V_{ID} \geq V_{OS}$	H	H	H
X	L	X	H
X	X	L	H

## ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V <sup>+</sup>	Supply voltage Positive	+7	V
V <sup>-</sup>	Supply voltage Negative	-7	V
V <sub>IDR</sub>	Differential input voltage	±6	V
V <sub>IN</sub>	Input voltage Common mode	±5	V
	Strobe/gate	+5.25	V
P <sub>D</sub>	Maximum power dissipation <sup>1</sup> T <sub>amb</sub> = 25 °C (still-air)		
	N package	1420	mW
	D package	1040	mW
T <sub>amb</sub>	Operating temperature range	0 to 70	°C
T <sub>stg</sub>	Storage temperature range	-65 to +150	°C
T <sub>sld</sub>	Lead soldering temperature (10 sec. max)	+230	°C

### NOTES:

1. Derate above 25 °C at the following rates:  
N package at 11.4 mW/°C  
D package at 8.3 mW/°C

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**DC ELECTRICAL CHARACTERISTICS**V+ = +5 V; V- = -5 V, T<sub>amb</sub> = 0 °C to +70 °C, unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			Min	Typ	Max	
V <sub>OS</sub>	Input offset voltage At 25 °C Over temperature range	V+ = +4.75 V; V- = -4.75 V		6	7.5 10	mV mV
I <sub>BIAS</sub>	Input bias current At 25 °C Over temperature range	V+ = +5.25 V; V- = -5.25 V		7.5	20 40	μA μA
I <sub>OS</sub>	Input offset current At 25 °C Over temperature range	V+ = +5.25 V; V- = -5.25 V		1.0	5 12	μA μA
V <sub>CM</sub>	Common-mode voltage range	V+ = +4.75 V; V- = -4.75 V	-3		+3	V
I <sub>IH</sub>	Input current High	V+ = +5.25 V; V- = -5.25 V V <sub>IH</sub> = 2.7 V 1G or 2G strobe Common strobe S			50 100	μA μA
I <sub>IL</sub>	Input Current Low	V <sub>IL</sub> = 0.5 V 1G or 2G strobe Common strobe S			-2.0 -4.0	mA mA
V <sub>OH</sub> V <sub>OL</sub>	Output voltage High Low	V <sub>I(S)</sub> = 2.0 V V+ = +4.75 V; V- = -4.75 V; I <sub>LOAD</sub> = -1 mA V+ = +5.25 V; V- = -5.25 V; I <sub>LOAD</sub> = 20 mA	2.7	3.4	0.5	V V
V+ V-	Supply voltage Positive Negative		4.75 -4.75	5.0 -5.0	5.25 -5.25	V V
I <sub>CC+</sub> I <sub>CC-</sub>	Supply current Positive Negative	V+ = 5.25 V; V- = -5.25 V; T <sub>amb</sub> = 25 °C		27 -15	35 -28	mA mA
I <sub>SC</sub>	Short-circuit output current		-40		-100	mA

**AC ELECTRICAL CHARACTERISTICS**T<sub>amb</sub> = 25 °C; R<sub>L</sub> = 280 Ω; C<sub>L</sub> = 15 pF; V+ = 5 V; V- = 5 V

SYMBOL	PARAMETER	FROM INPUT	TO OUTPUT	LIMITS			UNIT
				Min	Typ	Max	
<b>Large-signal switching speed</b>							
t <sub>PLH(D)</sub>	Propagation delay Low to high <sup>1</sup>	Amp	Output		8	12	ns
t <sub>PHL(D)</sub>	High to low <sup>1</sup>	Amp	Output		6	9	
t <sub>PLH(S)</sub>	Low to high <sup>2</sup>	Strobe	Output		4.5	10	
t <sub>PHL(S)</sub>	High to low <sup>2</sup>	Strobe	Output		3.0	6	
f <sub>MAX</sub>	Max. operating frequency			40	55		MHz

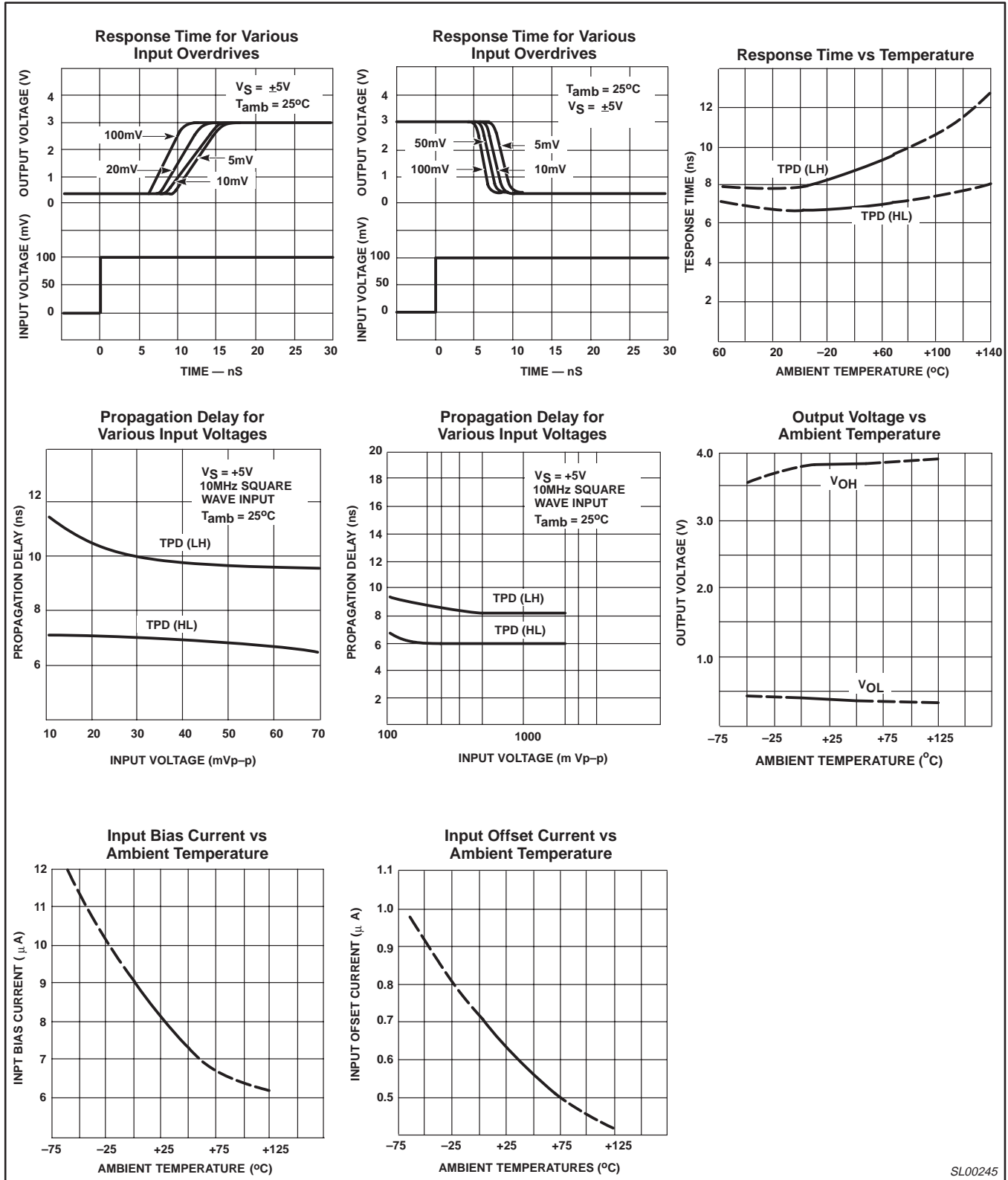
**NOTES:**

- Response time measured from 0 V point of ±100 mV<sub>p-p</sub> 10 MHz square wave to the 1.5 V point of the output.
- Response time measured from 1.5 V point of input to 1.5 V point of the output.

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## TYPICAL PERFORMANCE CHARACTERISTICS



SL00245

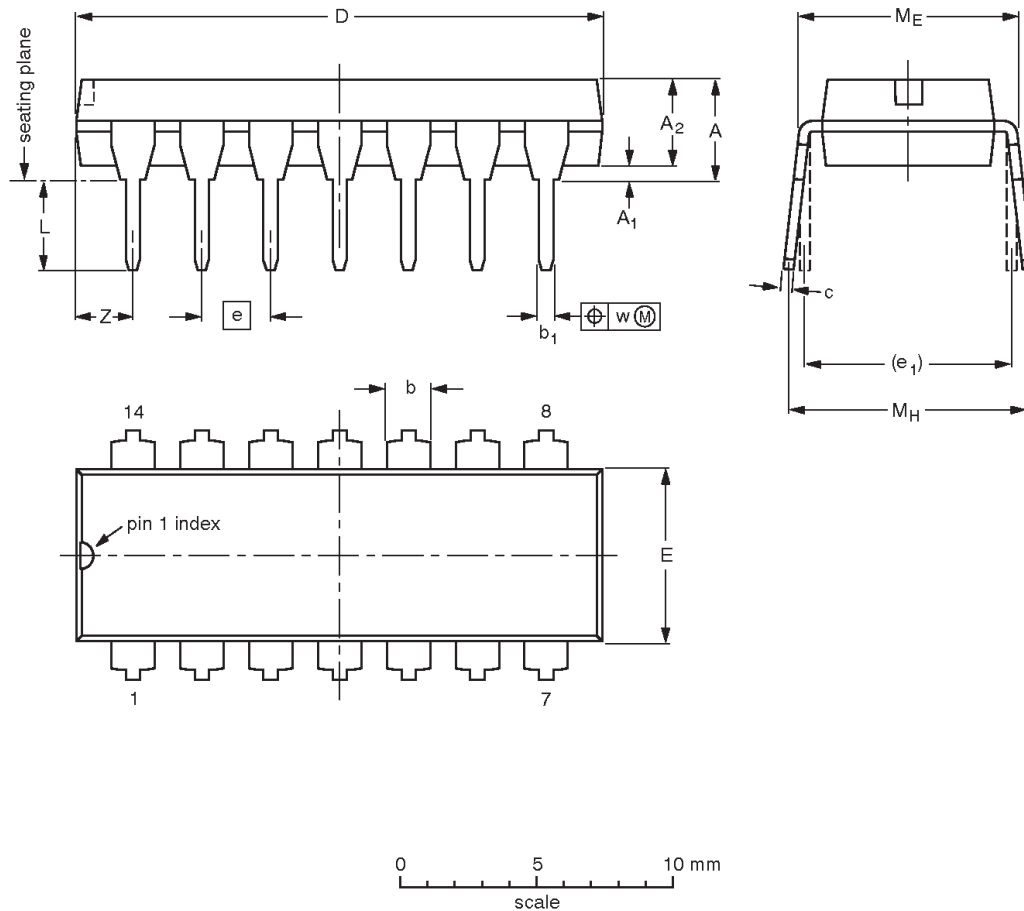
Figure 4. Typical Performance Characteristics

# High-speed dual-differential comparator/sense amp

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DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1




**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

UNIT	A max.	A <sub>1</sub> min.	A <sub>2</sub> max.	b	b <sub>1</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	e <sub>1</sub>	L	M <sub>E</sub>	M <sub>H</sub>	w	Z <sup>(1)</sup> max.
mm	4.2	0.51	3.2	1.73 1.13	0.53 0.38	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2.2
inches	0.17	0.020	0.13	0.068 0.044	0.021 0.015	0.014 0.009	0.77 0.73	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.087

**Note**

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

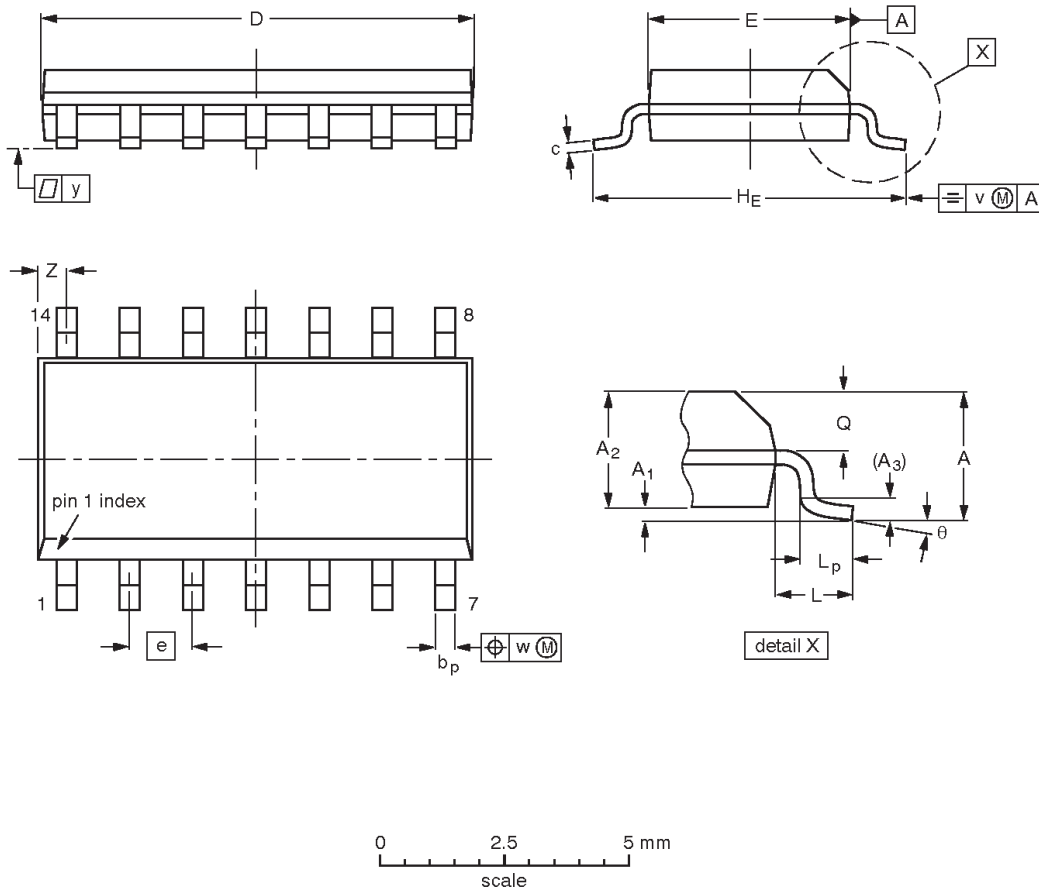
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT27-1	050G04	MO-001	SC-501-14			95-03-11 99-12-27

# High-speed dual-differential comparator/sense amp

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SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1



**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	8.75 8.55	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.35 0.34	0.16 0.15	0.050	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

**Note**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT108-1	076E06	MS-012				97-05-22 99-12-27

## High-speed dual-differential comparator/sense amp

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Data sheet status <sup>[1]</sup>	Product status <sup>[2]</sup>	Definitions
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