Sense Amplifiers

LM5520/LM7520 series
dual core memory sense amplifiers
general description

The devices in this series of dual core sense amplifiers convert bipolar millivolt-level memory sense signals to saturated logic levels. The design employs a common reference input which allows the input threshold voltage level of both amplifiers to be adjusted. Separate strobe inputs provide time discrimination for each channel. Logic inputs and outputs are DTL/TTL compatible. All devices of the series have identical preamplifier configurations, while various logic connections are provided to suit the specific application.

The LM5520/LM7520 has output latch capability and provides sense, strobe, and memory function for two sense lines. The LM5522/LM7522 contains a single open collector output which may be used to expand the number of inputs of the LM5520/LM7520, or to drive an external Memory Data Register (MDR). Intended for small memories, the two channels of the LM5524/LM7524 are independent with two separate outputs. The LM5534/LM7534 is similar to the LM5524/LM7524 but has uncommitted, wire-ORable outputs. The LM5528/LM7528 has the same logic configuration of the LM5524/LM7524 and in addition provides separate low impedance Test Points at each preamplifier output. A similar device having uncommitted, wire-ORable outputs is the LM5538/LM7538.

features

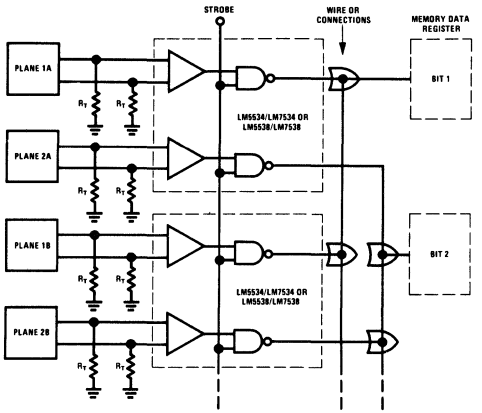
- High speed
- Guaranteed narrow threshold uncertainty over temperature
- Adjustable input threshold voltage
- Fast overload recovery times
- Two amplifiers per package
- Molded or cavity dual-in-line package
- Six logic configurations

The part number ending with an even number (e.g., LM5520) designates a tighter guaranteed input threshold uncertainty than the subsequent odd number ending (e.g., LM5521). The remaining specifications for the two are identical. All devices meet or exceed the specifications for the corresponding device (where applicable) in the SN5520/SN7520 series and are pin-for-pin replacements.

absolute maximum ratings

Supply Voltage	±7V
Differential or Reference Input Voltage	±5V
Logic Input Voltage	+5.5V
Operating Temperature Range	
LM55XX	−55°C to +125°C
LM75XX	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

typical application



Expanded Small Memory System

LM5520/LM7520 and LM5521/LM7521 electrical characteristics

LM5520/LM5521: The following apply for $-55°C \leq T_A \leq 125°C$

PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS (EACH AMPLIFIER) DIFF. INPUT	REF. INPUT	STROBE INPUT	GATE Q INPUT	GATE $\bar{Q}$ INPUT	LOGIC OUTPUT (NOTE 3)	SUPPLY VOLT.	COMMENTS
Differential Input Threshold Voltage (V_{TH}) (Note 2)	10(8)	15		mV	$\pm V_{TH}$	15 mV	+5V	+5V		+16 mA(Q)	±5V	Logic Output <0 4V
		15	20(22)	mV	$\pm V_{TH}$	15 mV	+5V	+5V		−400 μA(Q)	±5V	Logic Output >2.4V
	35(33)	40		mV	$\pm V_{TH}$	40 mV	+5V	+5V		+16 mA(Q)	±5V	Logic Output <0 4V
		40	45(47)	mV	$\pm V_{TH}$	40 mV	+5V	+5V		−400 μA(Q)	±5V	Logic Output >2 4V
Differential & Reference Input Bias Current		30	100	μA	0V	0V	+5 25V	+5 25V	+5 25V		±5.25V	
LM7520/LM7521: The following apply for $0°C \leq T_A \leq 70°C$												
Differential Input Threshold Voltage (V_{TH}) (Note 4)	11(8)	15		mV	$\pm V_{TH}$	15 mV	+5V	+5V		+16 mA(Q)	±5V	Logic Output <0 4V
		15	19(22)	mV	$\pm V_{TH}$	15 mV	+5V	+5V		−400 μA(Q)	±5V	Logic Output >2 4V
	36(33)	40		mV	$\pm V_{TH}$	40 mV	+5V	+5V		+16 mA(Q)	±5V	Logic Output <0.4V
		40	44(47)	mV	$\pm V_{TH}$	40 mV	+5V	+5V		−400 μA(Q)	±5V	Logic Output >2 4V
Differential & Reference Input Bias Current		30	75	μA	0V	0V	+5 25V	+5 25V	+5 25V		±5 25V	
LM5520/LM5521: The following apply for $-55°C \leq T_A \leq 125°C$ LM7520/LM7521: The following apply for $0°C \leq T_A \leq 70°C$												
Differential Input Offset Current		0 5		μA	0V	0V	+5 25V	+5 25V	+5 25V		±5 25V	
Logic "1" Input Voltage												
(Strobes)	2			V	40 mV	20 mV	+2V	+4 75V		−400 μA(Q)	±5V	Logic Output >2 4V
(Gate Q)	2			V	40 mV	20 mV	0V	+2V		+16 mA(Q)	±5V	Logic Output <0.4V
(Gate $\bar{Q}$)	2			V	40 mV	20 mV	0V	0V	+2V	+16 mA($\bar{Q}$)	±5V	Logic Output <0 4V
Logic "0" Input Voltage												
(Strobes)			0 8	V	40 mV	20 mV	+0 8V	+4.75V		+16 mA(Q)	±5V	Logic Output <0.4V
(Gate Q)			0 8	V	40 mV	20 mV	0V	+0.8V		−400 μA(Q)	±5V	Logic Output >2 4V
(Gate $\bar{Q}$)			0 8	V	40 mV	20 mV	0V	0V	+0 8V	−400 μA($\bar{Q}$)	±5V	Logic Output >2 4V
Logic "0" Input Current		-1	-1 6	mA	40 mV	20 mV	+0 4V	+0 4V	+0 4V		±5 25V	Each Input
Logic "1" Input Current		5	40	μA	0V	20 mV	+2 4V	+5 25V	+2 4V		±5 25V	Each Input
(Strobe & Gate $\bar{Q}$)		02	1	mA	0V	20 mV	+5 25V	+5 25V	+5 25V		±5 25V	Each Input
(Gate Q)		5	40	μA	40 mV	20 mV	+5 25V	+2 4V			±5 25V	
		02	1	mA	40 mV	20 mV	+5 25V	+5 25V			±5 25V	
Logic "1" Output Voltage												
(Strobe)	2 4	3 9		V	40 mV	20 mV	+2 0V	+5 25V		−400 μA(Q)	±4 75V	
(Gate Q)	2 4	3 9		V	40 mV	20 mV	0V	+0 8V		−400 μA(Q)	±4 75V	
(Gate $\bar{Q}$)	2 4	3 9		V	40 mV	20 mV	+4.75V	0V	+0 8V	−400 μA($\bar{Q}$)	±4 75V	
Logic "0" Output Voltage												
(Strobe)		0 25	0 40	V	40 mV	20 mV	+0.8V	+4 75V		+16 mA(Q)	±4 75V	
(Gate Q)		0 25	0 40	V	0V	20 mV	0V	+2V		+16 mA(Q)	±4 75V	
(Gate $\bar{Q}$)		0 25	0 40	V	0V	20 mV	0V	0V	+2V	+16 mA($\bar{Q}$)	±4 75V	
Q Output Short Circuit Current	-3	-4	-5	mA	0V	20 mV	0V	0V		0 V(Q)	±5 25V	
$\bar{Q}$ Output Short Circuit Current	-2 1	-2 8	-3 5	mA	0V	20 mV	0V	0V	0V	0 V($\bar{Q}$)	±5 25V	
V+ Supply Current		21	35	mA	0V	20 mV	0V	0V	0V		±5 25V	
V− Supply Current		-13	-18	mA	0V	20 mV	0V	0V	0V		±5 25V	

Note 1: For $0°C \leq T_A \leq 70°C$ operation, electrical characteristics for LM5520 and LM5521 are guaranteed the same as LM7520 and LM7521, respectively.

Note 2: Limits in parentheses pertain to LM5521, other limits pertain to LM5520.

Note 3: Q or $\bar{Q}$ in parentheses indicate Q or $\bar{Q}$ logic output, respectively.

Note 4: Limits in parentheses pertain to LM7521, other limits pertain to LM7520.

Note 5: Positive current is defined as current into the referenced pin.

Note 6: Pin 1 to have $\geq$100 pF capacitor connected to ground.

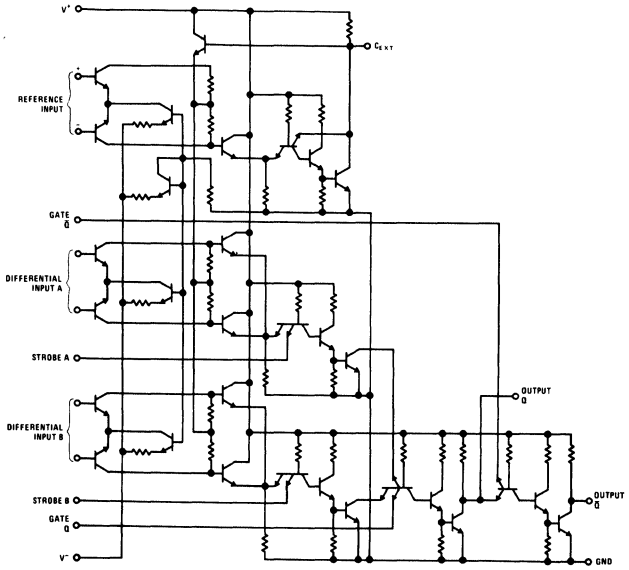
LM5520/LM7520 and LM5521/LM7521
electrical characteristics

LM5520/LM5521 and LM7520/LM7521: The following apply for $T_A = 25°C$, $V^+ = 5V$, $V^- = -5V$

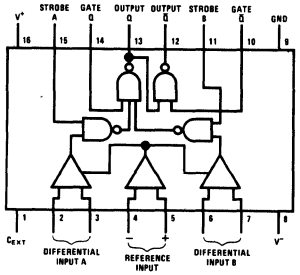
PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS				
					DIFF. INPUT	REF. INPUT	STROBE AND GATE INPUTS	Q LOGIC OUTPUT	AC TEST CIRCUIT
AC Common-Mode Input Firing Voltage		±2 5		V	PULSE	20 mV	+5V	SCOPE	
Propagation Delays									
Differential Input to Logical "1" Q Output		20	40	ns		20 mV			1
Differential Input to Logical "0" Q Output		28		ns		20 mV			1
Differential Input to Logical "1" $\overline{Q}$ Output		36		ns		20 mV			1
Differential Input to Logical "0" $\overline{Q}$ Output		28	55	ns		20 mV			1
Strobe Input to Logical "1" Q Output		10	30	ns		20 mV			1
Strobe Input to Logical "0" Q Output		20		ns		20 mV			1
Strobe Input to Logical "1" $\overline{Q}$ Output		33		ns		20 mV			1
Strobe Input to Logical "0" $\overline{Q}$ Output		16	55	ns		20 mV			1
Gate Q Input to Logical "1" Q Output		12	20	ns		20 mV			2
Gate Q Input to Logical "0" Q Output		6		ns		20 mV			2
Gate Q Input to Logical "1" $\overline{Q}$ Output		17		ns		20 mV			2
Gate Q Input to Logical "0" $\overline{Q}$ Output		19	30	ns		20 mV			2
Gate $\overline{Q}$ Input to Logical "1" $\overline{Q}$ Output		12		ns		20 mV			2
Gate $\overline{Q}$ Input to Logical "0" $\overline{Q}$ Output		6	20	ns		20 mV			2
Diff Input Overload Recovery Time		10		ns					
Common-Mode Input Overload Recovery Time		5		ns					
Min Cycle Time		200		ns					

LM5520/LM7520 and LM5521/LM7521

schematic diagram



connection diagram

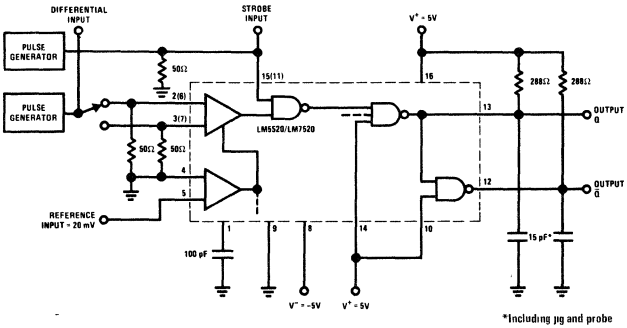


TOP VIEW

Order Number LM5520J or LM7520J
See Package 17
Order Number LM7520N
See Package 23
Order Number LM5521J or LM7521J
See Package 17
Order Number LM7521N
See Package 23

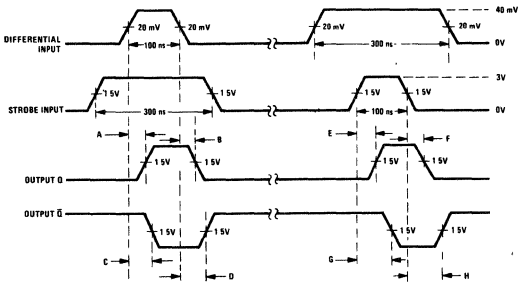
LM5520/LM7520 and LM5521/LM7521

AC test circuit (1)



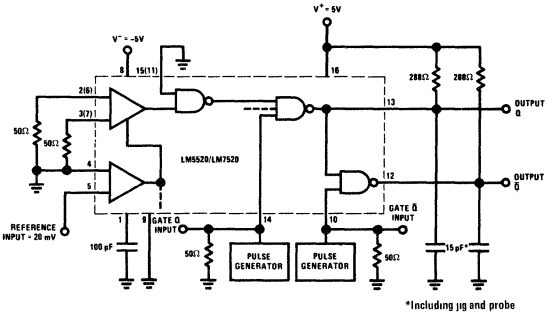
*Including jig and probe

voltage waveforms (1)



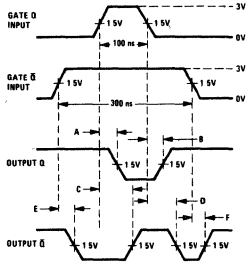
1 Pulse generator characteristics
Z_{OUT} = 50Ω, t_r = t_f = 15 ±5 ns, PRR = 1 MHz
2 Propagation delays
A = Differential input to logical "1" output Q
B = Differential input to logical "0" output Q
C = Differential input to logical "0" output Q̄
D = Differential input to logical "1" output Q̄
E = Strobe input to logical "1" output Q
F = Strobe input to logical "0" output Q
G = Strobe input to logical "0" output Q̄
H = Strobe input to logical "1" output Q̄

AC test circuit (2)



*Including jig and probe

voltage waveforms (2)



1 Pulse generator characteristics
Z_{OUT} = 50Ω, t_r = t_f = 15 ±5 ns, PRR = 1 MHz
2 Propagation delays.
A = Gate Q input to logical "0" output Q
B = Gate Q input to logical "1" output Q
C = Gate Q input to logical "1" output Q̄
D = Gate Q̄ input to logical "0" output Q̄
E = Gate Q̄ input to logical "0" output Q̄
F = Gate Q̄ input to logical "1" output Q̄

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LM5522/LM7522 and LM5523/LM7523 electrical characteristics

LM5522/LM5523: The following apply for $-55^{\circ}C \leq T_A \leq 125^{\circ}C$ (Note 1)

PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS (EACH AMPLIFIER) DIFF. INPUT	REF. INPUT	STROBE INPUT	GATE INPUT	LOGIC OUTPUT	SUPPLY VOLT.	COMMENTS
Differential Input Threshold Voltage (V_{TH}) (Note 2)	10(8)	15		mV	$\pm V_{TH}$	15 mV	+5V	+5V	−400 μA	±5V	Logic Output >2 4V
		15	20(22)	mV	$\pm V_{TH}$	15 mV	+5V	+5V	+16 mA	±5V	Logic Output <0 4V
	35(33)	40		mV	$\pm V_{TH}$	40 mV	+5V	+5V	−400 μA	±5V	Logic Output >2 4V
		40	45(47)	mV	$\pm V_{TH}$	40 mV	+5V	+5V	+16 mA	±5V	Logic Output <0 4V
Differential & Reference Input Bias Current		30	100	μA	0V	0V	+5 25V	+5 25V		±5.25V	
LM7522/LM7523: The following apply for $0^{\circ}C \leq T_A \leq 70^{\circ}C$											
Differential Input Threshold Voltage (V_{TH}) (Note 3)	11(8)	15		mV	$\pm V_{TH}$	15 mV	+5V	+5V	−400 μA	±5V	Logic Output >2.4V
		15	19(22)	mV	$\pm V_{TH}$	15 mV	+5V	+5V	+16 mA	±5V	Logic Output <0.4V
	36(33)	40		mV	$\pm V_{TH}$	40 mV	+5V	+5V	−400 μA	±5V	Logic Output >2.4V
		40	44(47)	mV	$\pm V_{TH}$	40 mV	+5V	+5V	+16 mA	±5V	Logic Output <0 4V
Differential & Reference Input Bias Current		30	75	μA	0V	0V	+5 25V	+5.25V		±5 25V	
LM5522/LM5523: The following apply for $-55^{\circ}C \leq T_A \leq 125^{\circ}C$ LM7522/LM7523: The following apply for $0^{\circ}C \leq T_A \leq 70^{\circ}C$											
Diff Input Offset Current		0 5		μA	0V	0V	+5.25V	+5 25V		±5 25V	
Logic "1" Input Voltage (Strobes)	2			V	40 mV	20 mV	+2V	+4 75V	+16 mA	±5V	Logic Output <0 4V
(Gate)	2			V	40 mV	20 mV	0V	+2V	−400 μA	±5V	Logic Output >2 4V
Logic "0" Input Voltage (Strobes)			0 8	V	40 mV	20 mV	+0 8V	+4.75V	−400 μA	±5V	Logic Output >2.4V
(Gate)			0.8	V	40 mV	20 mV	0V	+0.8V	+16 mA	±5V	Logic Output <0.4V
Logic "0" Input Current		−1	−1 6	mA	40 mV	20 mV	+0 4V	+0 4V		±5.25V	Each Input
Logic "1" Input Current (Strobes)			40	μA	0V	20 mV	+2.4V	+5.25V		±5.25V	
			1	mA	0V	20 mV	+5 25V	+5 25V		±5.25V	
(Gate)			40	μA	40 mV	20 mV	+5 25V	+2.4V		±5.25V	
			1	mA	40 mV	20 mV	+5 25V	+5.25V		±5 25V	
Logic "1" Output Voltage	2.4	3 9		V	40 mV	20 mV	+0 8V	+2V	−400 μA	±4.75V	
Logic "0" Output Voltage (Strobes)		0 25	0.40	V	40 mV	20 mV	+2V	+4.75V	+16 mA	±4.75V	Tie Pins 10 and 12
(Gate)		0 25	0.40	V	40 mV	20 mV	0V	+0.8V	+16 mA	±4.75V	Tie Pins 10 and 12
Output Short Circuit Current	−2 1	−2 8	−3.5	mA	40 mV	20 mV	0V	+5.25V	0V	±5.25V	Tie Pins 10 and 12
Output Leakage Current		0.01	250	μA	0V	20 mV	0V	+2V	+5.25V	±4 75V	
V^+ Supply Current		23	36	mA	0V	20 mV	0V	0V		±5.25V	
V^- Supply Current		−13	−18	mA	0V	20 mV	0V	0V		±5.25V	
LM5522/LM5523 and LM7522/LM7523: The following apply for $T_A = 25^{\circ}C$, $V^+ = 5V$, $V^- = -5V$											
AC Common Mode Input Firing Voltage		±2 5		V	PULSE	20 mV	+5V	+5V	SCOPE		
Propagation Delays Differential Input to Logical "1" Output		26		ns		20 mV					AC Test Circuit
Differential Input to Logical "0" Output		21	45	ns		20 mV					AC Test Circuit
Strobe Input to Logical "1" Output		22		ns		20 mV					AC Test Circuit
Strobe Input to Logical "0" Output		12	40	ns		20 mV					AC Test Circuit
Gate Input to Logical "1" Output		4		ns		20 mV					AC Test Circuit
Gate Input to Logical "0" Output		15	25	ns		20 mV					AC Test Circuit
Differential Input Overload Recovery Time		10		ns							
Common Mode Input Overload Recovery Time		5		ns							
Min Cycle Time		200		ns							

Note 1. For $0^{\circ}C \leq T_A \leq 70^{\circ}C$ operation, electrical characteristics for LM5522 and LM5523 are guaranteed the same as LM7522 and LM7523, respectively

Note 2: Limits in parentheses pertain to LM5523, other limits pertain to LM5522

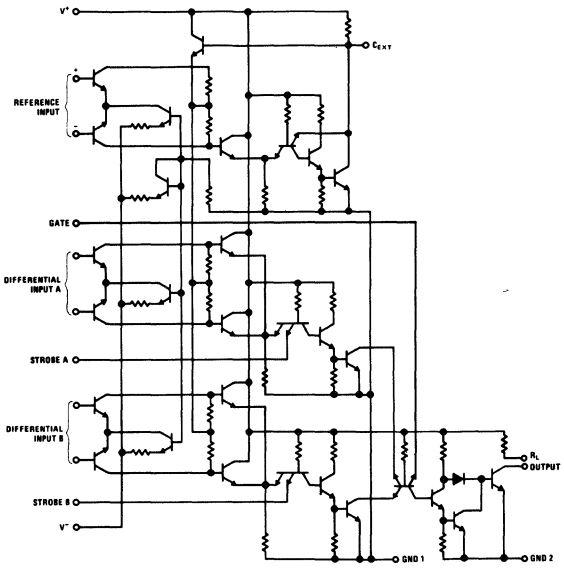
Note 3. Limits in parentheses pertain to LM7523, other limits pertain to LM7522

Note.4 Positive current is defined as current into the referenced pin

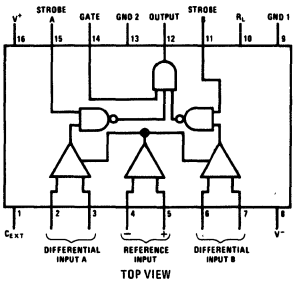
Note 5: Pin 1 to have $\geq$ 100 pF capacitor connected to ground

LM5522/LM7522 and LM5523/LM7523

schematic diagram



connection diagram



TOP VIEW

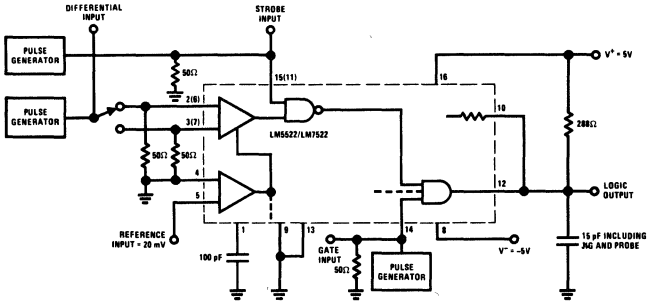
Order Number LM5522J or LM7522J
See Package 17

Order Number LM7522N
See Package 23

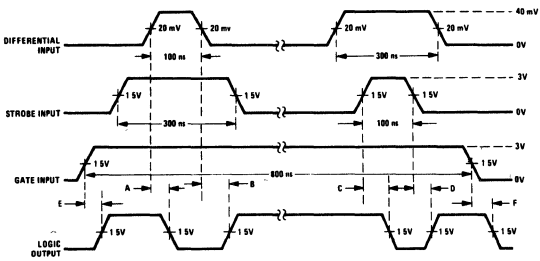
Order Number LM5523J or LM7523J
See Package 17

Order Number LM7523N
See Package 23

AC test circuit



voltage waveforms



1. One strobe is grounded when the other side is being tested
2. Pulse generator characteristics.
   $Z_{OUT} = 50\Omega$, $t_r = t_f = 15 \pm 5$ ns, PRR = 1 MHz
3. Propagation delays:
   A = Differential input to logical "0" output
   B = Differential input to logical "1" output
   C = Strobe input to logical "0" output
   D = Strobe input to logical "1" output
   E = Gate input to logical "1" output
   F = Gate input to logical "0" output

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LM5524/LM7524 and LM5525/LM7525 electrical characteristics

LM5524/LM5525: The following apply for $-55°C \leq T_A \leq 125°C$ (Note 1)

PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS (EACH AMPLIFIER) DIFF. INPUT	REF. INPUT	STROBE INPUT	LOGIC OUTPUT	SUPPLY VOLT.	COMMENTS
Differential Input Threshold Voltage (V_{TH}) (Note 2)	10(8)	15		mV	$\pm V_{TH}$	15 mV	+5V	+16 mA	±5V	Logic Output <0 4V
		15	20(22)	mV	$\pm V_{TH}$	15 mV	+5V	−400 μA	±5V	Logic Output >2 4V
	35(33)	40		mV	$\pm V_{TH}$	40 mV	+5V	+16 mA	±5V	Logic Output <0 4V
		40	45(47)	mV	$\pm V_{TH}$	40 mV	+5V	−400 μA	±5V	Logic Output >2 4V
Differential & Reference Input Bias Current		30	100	μA	0V	0V	+5 25V		±5 25V	
LM7524/LM7525: The following apply for $0°C \leq T_A \leq 70°C$										
Differential Input Threshold Voltage (V_{TH}) (Note 3)	11(8)	15		mV	$\pm V_{TH}$	15 mV	+5V	+16 mA	±5V ±5%	Logic Output <0 4V
		15	19(22)	mV	$\pm V_{TH}$	15 mV	+5V	−400 μA	±5V ±5%	Logic Output >2 4V
	36(33)	40		mV	$\pm V_{TH}$	40 mV	+5V	+16 mA	±5V ±5%	Logic Output <0 4V
		40	44(47)	mV	$\pm V_{TH}$	40 mV	+5V	−400 μA	±5V ±5%	Logic Output >2 4V
Differential & Reference Input Bias Current		30	75	μA	0V	0V	+5 25V		±5 25V	
LM5524/LM5525: The following apply for $-55°C \leq T_A \leq 125°C$ LM7524/LM7525: The following apply for $0°C \leq T_A \leq 70°C$										
Diff Input Offset Current		0.5		μA	0V	0V	+5 25V		±5 25V	
Logic "1" Input Voltage	2			V	40 mV	20 mV	+2V	−400 μA	±5V	Logic Output >2 4V
Logic "0" Input Voltage			0 8	V	40 mV	20 mV	+0.8V	+16 mA	±5V	Logic Output <0.4V
Logic "0" Input Current		−1	−1 6	mA	40 mV	20 mV	+0.4V		±5 25V	
Logic "1" Input Current		5	40	μA	0V	20 mV	+2 4V		±5 25V	
		0.02	1	mA	0V	20 mV	+5.25V		±5.25V	
Logic "1" Output Voltage	2.4	3.9		V	40 mV	20 mV	+2 0V	−400 μA	±4 75V	
Logic "0" Output Voltage		0 25	0.40	V	40 mV	20 mV	+0.8V	+16 mA	±4 75V	
Output Short Circuit Current	−2 1	−2 8	−3.5	mA	40 mV	20 mV	+5 25V	0V	±5.25V	
V^+ Supply Current		29	40	mA	0V	20 mV	0V		±5 25V	
V^- Supply Current		−13	−18	mA	0V	20 mV	0V		±5 25V	
LM5524/LM5525 and LM7524/LM7525: The following apply for $T_A = 25°C$, $V^+ = 5V$, $V^- = -5V$										
AC Common-Mode Input Firing Voltage		±2.5		V	PULSE	20 mV	+5V	SCOPE		
Propagation Delays										
Differential Input to Logical "1" Output		20	40	ns		20 mV				AC Test Circuit
Differential Input to Logical "0" Output		28		ns		20 mV				AC Test Circuit
Strobe Input to Logical "1" Output		10	30	ns		20 mV				AC Test Circuit
Strobe Input to Logical "0" Output		20		ns		20 mV				AC Test Circuit
Differential Input Overload Recovery Time		10		ns						
Common-Mode Input Overload Recovery Time		5		ns						
Min Cycle Time		200		ns						

Note 1: For $0°C \leq T_A \leq 70°C$ operation, electrical characteristics for LM5524 and LM5525 are guaranteed the same as LM7524 and LM7525 respectively.

Note 2: Limits in parentheses pertain to LM5525, other limits pertain to LM5524.

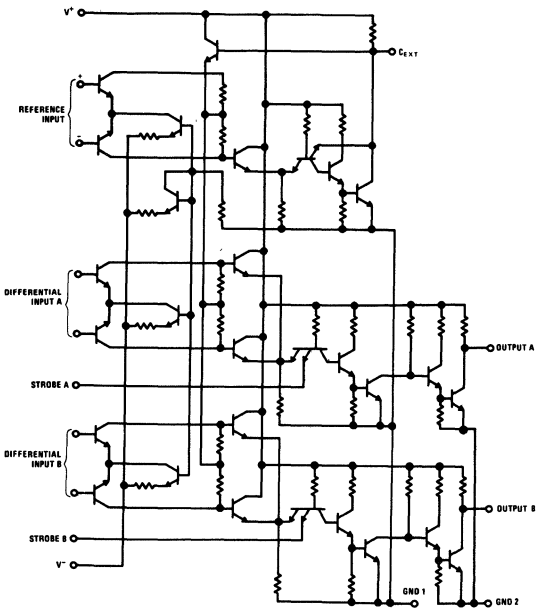
Note 3: Limits in parentheses pertain to LM7525, other limits pertain to LM7524.

Note 4: Positive current is defined as current into the referenced pin.

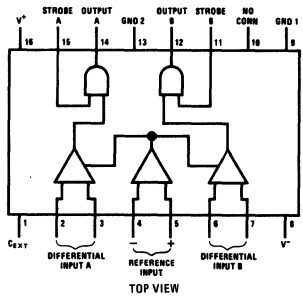
Note 5: Pin 1 to have $\geq$100 pF capacitor connected to ground.

LM5524/LM7524 and LM5525/LM7525

schematic diagram



connection diagram



TOP VIEW

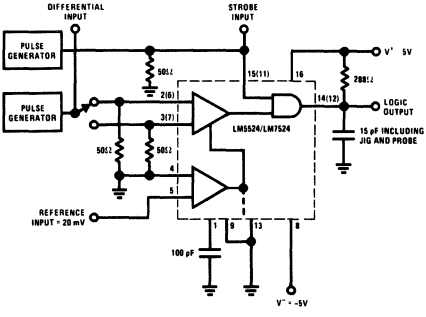
Order Number LM5524J or LM7524J
See Package 17

Order Number LM7524N
See Package 23

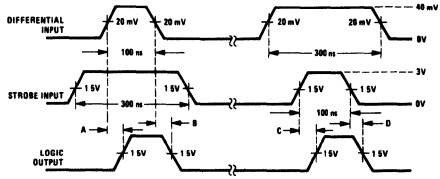
Order Number LM5525J or LM7525J
See Package 17

Order Number LM7525N
See Package 23

AC test circuit



voltage waveforms



1. Pulse generator characteristics:
   Z_{OUT} = 50Ω, t_r = t_f = 15 ±5 ns, PRR = 1 MHz
2. Propagation delays:
   A = Differential input to logical "1" output
   B = Differential input to logical "0" output
   C = Strobe input to logical "1" output
   D = Strobe input to logical "0" output

7

LM5528/LM7528 and LM5529/LM7529 electrical characteristics

LM5528/LM5529: The following apply for $-55°C \leq T_A \leq 125°C$ (Note 1)

PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS (EACH AMPLIFIER) DIFF. INPUT	REF. INPUT	STROBE INPUT	LOGIC OUTPUT	SUPPLY VOLT.	COMMENTS
Differential Input Threshold Voltage (V_{TH}) (Note 2)	10(8)	15		mV	$\pm V_{TH}$	15 mV	+5V	+16 mA	±5V	Logic Output <0 4V
		15	20(22)	mV	$\pm V_{TH}$	15 mV	+5V	-400 μA	±5V	Logic Output >2 4V
	35(33)	40		mV	$\pm V_{TH}$	40 mV	+5V	+16 mA	±5V	Logic Output <0 4V
		40	45(47)	mV	$\pm V_{TH}$	40 mV	+5V	-400 μA	±5V	Logic Output >2 4V
Differential & Reference Input Bias Current		30	100	μA	0V	0V	+5.25V		±5 25V	
LM7528/LM7529: The following apply for $0°C \leq T_A \leq 70°C$										
Differential Input Threshold Voltage (V_{TH}) (Note 3)	11(8)	15		mV	$\pm V_{TH}$	15 mV	+5V	+16 mA	±5V	Logic Output <0 4V
		15	19(22)	mV	$\pm V_{TH}$	15 mV	+5V	-400 μA	±5V	Logic Output >2 4V
	36(33)	40		mV	$\pm V_{TH}$	40 mV	+5V	+16 mA	±5V	Logic Output <0 4V
		40	44(47)	mV	$\pm V_{TH}$	40 mV	+5V	-400 μA	±5V	Logic Output >2 4V
Differential & Reference Input Bias Current		30	75	μA	0V	0V	+5 25V		±5 25V	
LM5528/LM5529: The following apply for $-55°C \leq T_A \leq 125°C$ LM7528/LM7529: The following apply for $0°C \leq T_A \leq 70°C$										
Diff Input Offset Current		0 5		μA	0V	0V	+5 25V		±5 25V	
Logic "1" Input Voltage	2			V	40 mV	20 mV	+2V	-400 μA	±5V	Logic Output >2 4V
Logic "0" Input Voltage			0 8	V	40 mV	20 mV	+0 8V	+16 mA	±5V	Logic Output <0 4V
Logic "0" Input Current		-1	-1.6	mA	40 mV	20 mV	+0 4V		±5 25V	
Logic "1" Input Current		5 0.02	40 1	μA mA	0V 0V	20 mV 20 mV	+2 4V +5.25V		±5.25V ±5 25V	
Logic "1" Output Voltage	2.4	3.9		V	40 mV	20 mV	+2 0V	-400 μA	±4 75V	
Logic "0" Output Voltage		0.25	0 40	V	40 mV	20 mV	+0 8V	+16 mA	±4 75V	
Output Short Circuit Current	-2 1	-2 8	-3 5	mA	40 mV	20 mV	+5 25V	0V	±5 25V	
V^+ Supply Current		29	40	mA	0V	20 mV	0V		±5 25V	
V^- Supply Current		-13	-18	mA	0V	20 mV	0V		±5.25V	
LM5528/LM5529 and LM7528/LM7529: The following apply for $T_A = 25°C$, $V^+ = 5V$, $V^- = -5V$										
AC Common-Mode Input Firing Voltage		±2 5		V	PULSE	20 mV	+5V	SCOPE		
Propagation Delays										
Differential Input to Logical "1" Output		20	40	ns		20 mV				AC Test Circuit
Differential Input to Logical "0" Output		28		ns		20 mV				AC Test Circuit
Strobe Input to Logical "1" Output		10	30	ns		20 mV				AC Test Circuit
Strobe Input to Logical "0" Output		20		ns		20 mV				AC Test Circuit
Differential Input Overload Recovery Time		10		ns						
Common-Mode Input Overload Recovery Time		5		ns						
Min. Cycle Time		200		ns						

Note 1: For $0°C \leq T_A \leq 70°C$ operation, electrical characteristics for LM5528 and LM5529 are guaranteed the same as LM7528 and LM7529 respectively.

Note 2: Limits in parentheses pertain to LM5529, other limits pertain to LM5528.

Note 3: Limits in parentheses pertain to LM7529, other limits pertain to LM7528.

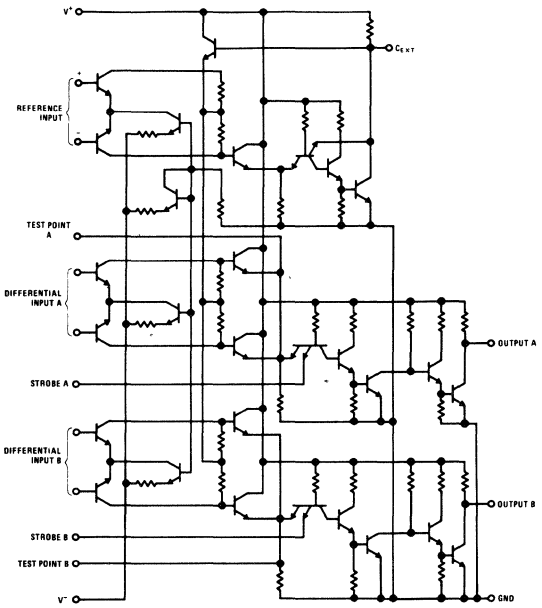
Note 4: Positive current is defined as current into the referenced pin.

Note 5: Pin 1 to have $\geq$100 pF capacitor connected to ground.

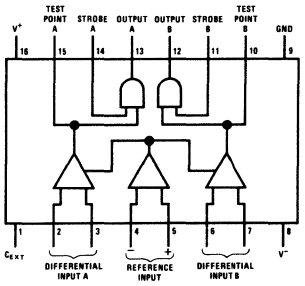
Note 6: Each test point to have $\leq$15 pF capacitive load to ground.

LM5528/LM7528 and LM5529/LM7529

schematic diagram



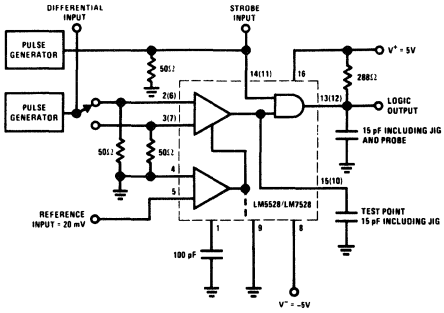
connection diagram



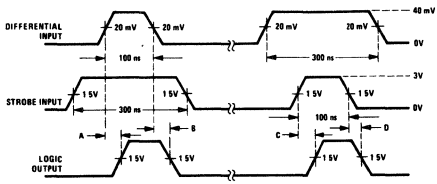
TOP VIEW

Order Number LM5528J or LM7528J
See Package 17
Order Number LM7528N
See Package 23
Order Number LM5529J or LM7529J
See Package 17
Order Number LM7529N
See Package 23

AC test circuit



voltage waveforms



1 Pulse generator characteristics
$Z_{OUT} = 50\Omega$, $t_r = t_f = 15 \pm 5$ ns, PRR = 1 MHz
2 Propagation delays
A = Differential input to logical "1" output
B = Differential input to logical "0" output
C = Strobe input to logical "1" output
D = Strobe input to logical "0" output

7

LM5534/LM7534 and LM5535/LM7535 electrical characteristics

LM5534/LM5535: The following apply for $-55°C \leq T_A \leq 125°C$ (Note 1)

PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS (EACH AMPLIFIER) DIFF. INPUT	REF. INPUT	STROBE INPUT	LOGIC OUTPUT	SUPPLY VOLT.	COMMENTS
Differential Input Threshold Voltage (V_{TH}) (Note 2)	10(8)	15		mV	$\pm V_{TH}$	15 mV	+5V	+5 25V	±5V	Logic Output <250 μA
		15	20(22)	mV	$\pm V_{TH}$	15 mV	+5V	+20 mA	±5V	Logic Output <0 4V
	35(33)	40		mV	$\pm V_{TH}$	40 mV	+5V	+5 25V	±5V	Logic Output <250 μA
		40	45(47)	mV	$\pm V_{TH}$	40 mV	+5V	+20 mA	±5V	Logic Output <0 4V
Differential & Reference Input Bias Current		30	100	μA	0V	0V	+5 25V		±5 25V	
LM7534/LM7535: The following apply for $0°C \leq T_A \leq 70°C$										
Differential Input Threshold Voltage (V_{TH}) (Note 3)	11(8)	15		mV	$\pm V_{TH}$	15 mV	+5V	+5.25V	±5V	Logic Output <250 μA
		15	19(22)	mV	$\pm V_{TH}$	15 mV	+5V	+20 mA	±5V	Logic Output <0 4V
	36(33)	40		mV	$\pm V_{TH}$	40 mV	+5V	+5 25V	±5V	Logic Output <250 μA
		40	44(47)	mV	$\pm V_{TH}$	40 mV	+5V	+20 mA	±5V	Logic Output <0 4V
Differential & Reference Input Bias Current		30	75	μA	0V	0V	+5 25V		±5 25V	
LM5534/LM5535: The following apply for $-55°C \leq T_A \leq 125°C$ **LM7534/LM7535: The following apply for $0°C \leq T_A \leq 70°C$**										
Diff Input Offset Current		0 5		μA	0V	0V	+5 25V		±5 25V	
Logic "0" Input Voltage			0.8	V	40 mV	20 mV	+0 8V	+5.25V	±5V	Logic Output <250 μA
Logic "1" Input Voltage	2.0			V	40 mV	20 mV	+2.0V	+20 mA	±5V	Logic Output <0.4V
Logic "0" Input Current		-1	-1.6	mA	40 mV	20 mV	+0.4V		±5.25V	
Logic "1" Input Current		5	40	μA	0V	20 mV	+2.4V		±5 25V	
		0.02	1	mA	0V	20 mV	+5 25V		±5 25V	
Logic "0" Output Voltage		0.25	0.40	V	40 mV	20 mV	+2V	+20 mA	±4.75V	
Output Leakage Current		0.01	250	μA	40 mV	20 mV	+0.8V	+5 25V	±4 75V	
V^+ Supply Current		28	38	mA	0V	20 mV	0V		±5 25V	
V^- Supply Current		-13	-18	mA	0V	20 mV	0V		±5 25V	
LM5534/LM5535 and LM7534/LM7535: The following apply for $T_A = 25°C$, $V^+ = 5V$, $V^- = -5V$										
AC Common-Mode Input Firing Voltage		±2.5		V	PULSE	20 mV	+5V	SCOPE		
Propagation Delays										
Differential Input to Logical "1" Output		24		ns		20 mV				AC Test Circuit
Differential Input to Logical "0" Output		20	40	ns		20 mV				AC Test Circuit
Strobe Input to Logical "1" Output		16		ns		20 mV				AC Test Circuit
Strobe Input to Logical "0" Output		10	30	ns		20 mV				AC Test Circuit
Differential Input Overload Recovery Time		10		ns						
Common-Mode Input Overload Recovery Time		5		ns						
Min. Cycle Time		200		ns						

Note 1: For $0°C \leq T_A \leq 70°C$ operation, electrical characteristics for LM5534 and LM5535 are guaranteed the same as LM7534 and LM7535 respectively

Note 2: Limits in parentheses pertain to LM5535, other limits pertain to LM5534.

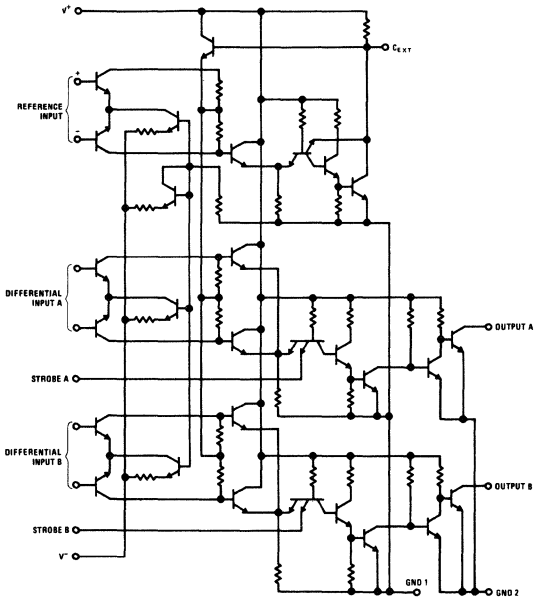
Note 3: Limits in parentheses pertain to LM7535, other limits pertain to LM7534.

Note 4: Positive current is defined as current into the referenced pin.

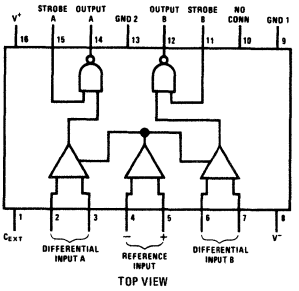
Note 5: Pin 1 to have $\geq$ 100 pF capacitor connected to ground.

LM5534/LM7534 and LM5535/LM7535

schematic diagram



connection diagram



TOP VIEW

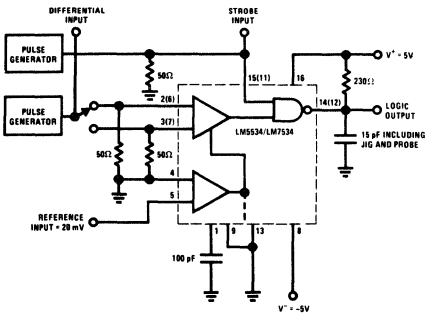
Order Number LM5534J or LM7534J
See Package 17

Order Number LM7534N
See Package 23

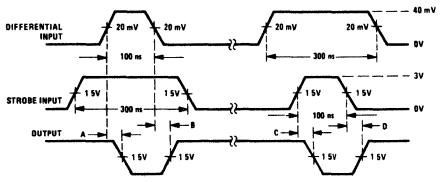
Order Number LM5535J or LM5535J
See Package 17

Order Number LM7535N
See Package 23

AC test circuit



voltage waveforms



1. Pulse generator characteristics
   Z_{OUT} = 50Ω, t_r = t_f = 15 ±5 ns, PRR = 1 MHz
2. Propagation delays.
   A = Differential input to logical "0" output
   B = Differential input to logical "1" output
   C = Strobe input to logical "0" output
   D = Strobe input to logical "1" output

7

LM5538/LM7538 and LM5539/LM7539 electrical characteristics

LM5538/LM5539: The following apply for $-55°C \leq T_A \leq 125°C$ (Note 1)

PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS (EACH AMPLIFIER) DIFF. INPUT	REF. INPUT	STROBE INPUT	LOGIC OUTPUT	SUPPLY VOLT.	COMMENTS
Differential Input Threshold Voltage (V_{TH}) (Note 2)	10(8)	15		mV	$\pm V_{TH}$	15 mV	+5V	+5 25V	±5V	Logic Output <250 μA
		15	20(22)	mV	$\pm V_{TH}$	15 mV	+5V	+20 mA	±5V	Logic Output <0 4V
	35(33)	40		mV	$\pm V_{TH}$	40 mV	+5V	+5 25V	±5V	Logic Output <250 μA
		40	45(47)	mV	$\pm V_{TH}$	40 mV	+5V	+20 mA	±5V	Logic Output <0 4V
Differential & Reference Input Bias Current		30	100	μA	0V	0V	+5 25V		±5.25V	
LM7538/LM7539: The following apply for $0°C \leq T_A \leq 70°C$										
Differential Input Threshold Voltage (V_{TH}) (Note 3)	11(8)	15		mV	$\pm V_{TH}$	15 mV	+5V	+5.25V	±5V	Logic Output <250 μA
		15	19(22)	mV	$\pm V_{TH}$	15 mV	+5V	+20 mA	±5V	Logic Output <0.4V
	36(33)	40		mV	$\pm V_{TH}$	40 mV	+5V	+5.25V	±5V	Logic Output <250 μA
		40	44(47)	mV	$\pm V_{TH}$	40 mV	+5V	+20 mA	±5V	Logic Output <0.4V
Differential & Reference Input Bias Current		30	75	μA	0V	0V	+5.25V		±5 25V	
LM5538/LM5539: The following apply for $-55°C \leq T_A \leq 125°C$ LM7538/LM7539: The following apply for $0°C \leq T_A \leq 70°C$										
Diff. Input Offset Current		0.5		μA	0V	0V	+5.25V		±5 25V	
Logic "1" Input Voltage	2			V	40 mV	20 mV	+2V	+20 mA	±5V	Logic Output <0 4V
Logic "0" Input Voltage			0.8	V	40 mV	20 mV	+0.8V	+5 25V	±5V	Logic Output <250 μA
Logic "0" Input Current		-1	-1.6	mA	40 mV	20 mV	+0.4V		±5 25V	
Logic "1" Input Current		5	40	μA	0V	20 mV	+2.4V		±5.25V	
		0.02	1	mA	0V	20 mV	+5.25V		±5.25V	
Logic "0" Output Voltage		0.25	0.40	V	40 mV	20 mV	+2.0V	+20 mA	±4 75V	
Output Leakage Current		0.01	250	μA	40 mV	20 mV	+0.8V	+5.25V	±4.75V	
V^+ Supply Current		28	38	mA	0V	20 mV	0V		±5.25V	
V^- Supply Current		-13	-18	mA	0V	20 mV	0V		±5.25V	
LM5538/LM5539 and LM7538/LM7539: The following apply for $T_A = 25°C$, $V^+ = 5V$, $V^- = -5V$										
AC Common-Mode Input Firing Voltage		±2.5		V	PULSE	20 mV	+5V	SCOPE		
Propagation Delays										
Differential Input to Logical "1" Output		24		ns		20 mV				AC Test Circuit
Differential Input to Logical "0" Output		20	40	ns		20 mV				AC Test Circuit
Strobe Input to Logical "1" Output		16		ns		20 mV				AC Test Circuit
Strobe Input to Logical "0" Output		10	30	ns		20 mV				AC Test Circuit
Differential Input Overload Recovery Time		10		ns						
Common-Mode Input Overload Recovery Time		5		ns						
Min. Cycle Time		200		ns						

Note 1: For $0°C \leq T_A \leq 70°C$ operation, electrical characteristics for LM5538 and LM5539 are guaranteed the same as LM7538 and LM7539 respectively.

Note 2: Limits in parentheses pertain to LM5539, other limits pertain to LM5538.

Note 3: Limits in parentheses pertain to LM7539, other limits pertain to LM7538.

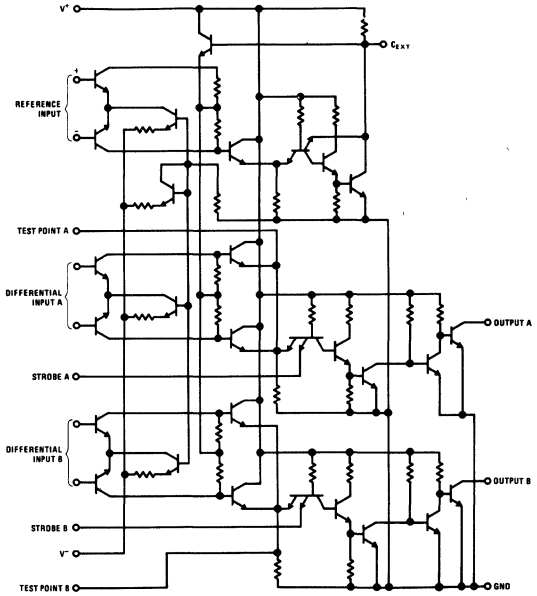
Note 4: Positive current is defined as current into the referenced pin.

Note 5: Pin 1 to have $\geq$100 pF capacitor connected to ground.

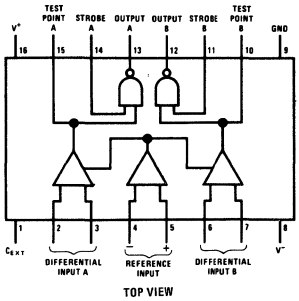
Note 6: Each test point to have $\leq$15 pF capacitive load to ground.

LM5538/LM7538 and LM5539/LM7539

schematic diagram



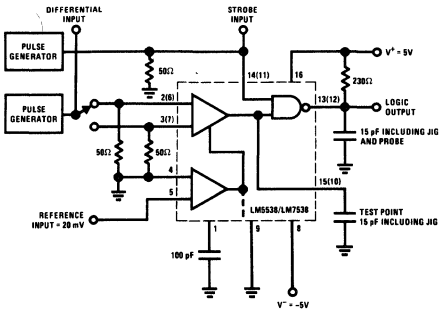
connection diagram



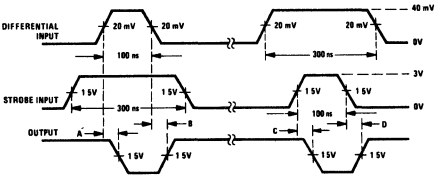
TOP VIEW

Order Number LM5538J or LM5538J
See Package 17
Order Number LM7538N
See Package 23
Order Number LM5539J or LM7539J
See Package 17
Order Number LM7539N
See Package 23

AC test circuit



voltage waveforms

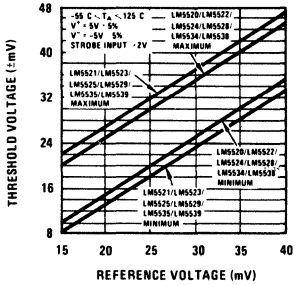


1 Pulse generator characteristics
$Z_{OUT} = 50\Omega$, $t_r = t_f = 15 \pm 5$ ns, PRR = 1 MHz
2 Propagation delays
A = Differential input to logical "0" output
B = Differential input to logical "1" output
C = Strobe input to logical "0" output
D = Strobe input to logical "1" output

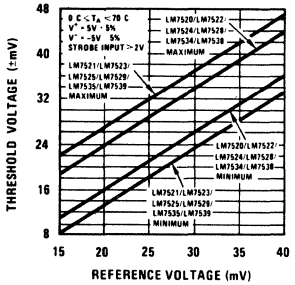
7

guaranteed performance characteristics

Differential Input Threshold Voltage

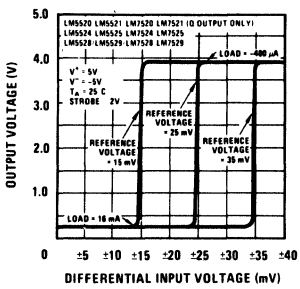


Differential Input Threshold Voltage

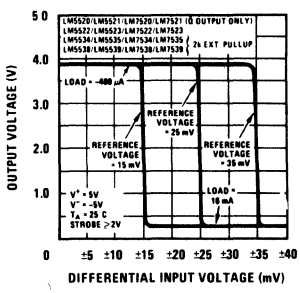


typical performance characteristics

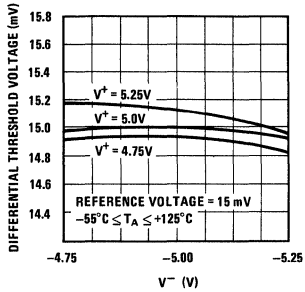
Transfer Characteristics



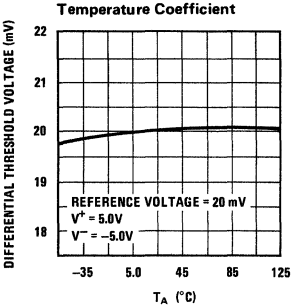
Transfer Characteristics



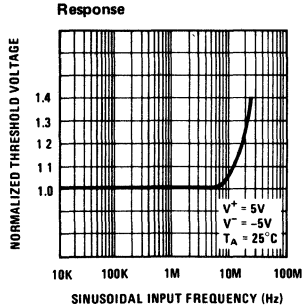
Power Supply Rejection



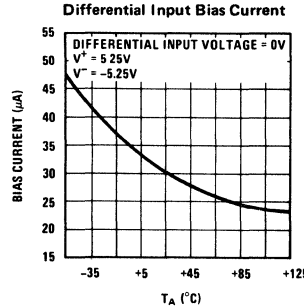
Temperature Coefficient



Differential Input Frequency Response

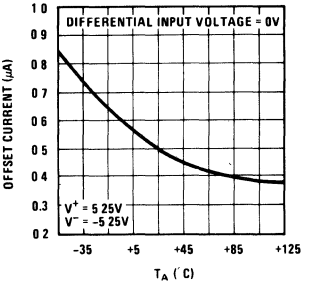


Differential Input Bias Current

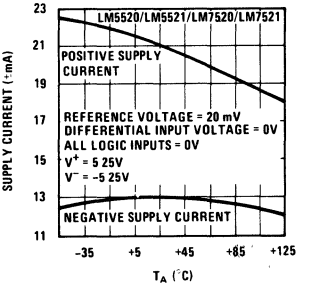


typical performance characteristics (cont.)

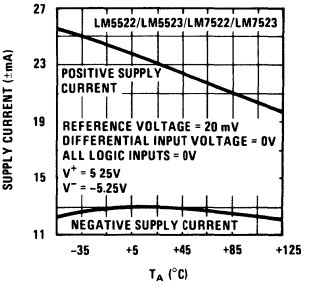
Differential Input Offset Current



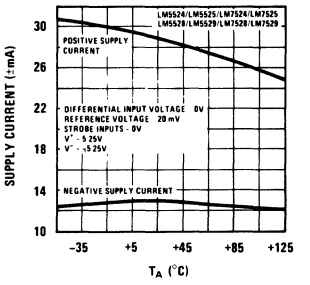
Power Supply Currents



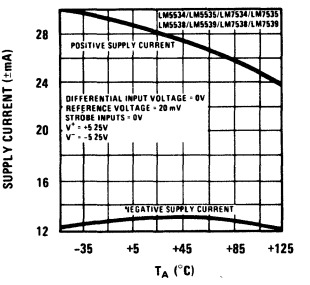
Power Supply Currents



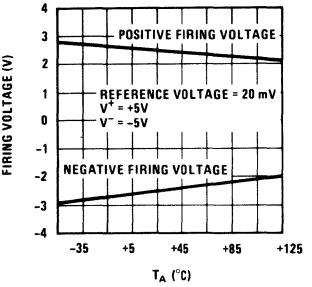
Power Supply Currents



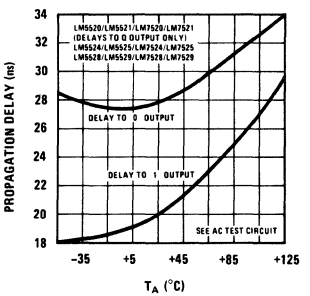
Power Supply Currents



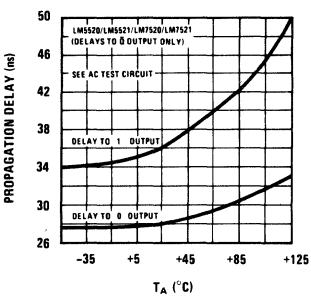
AC Common-Mode Firing Voltage



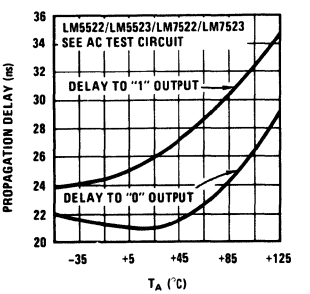
Differential Input to Output Propagation Delays



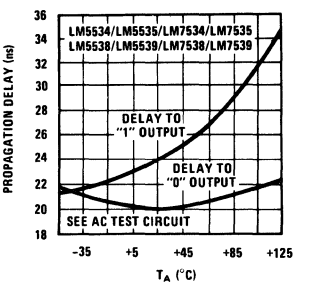
Differential Input to Output Propagation Delays



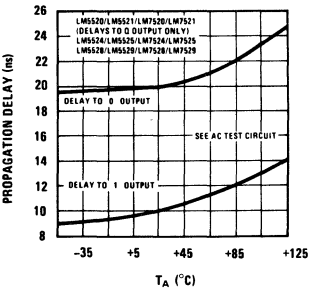
Differential Input to Output Propagation Delays



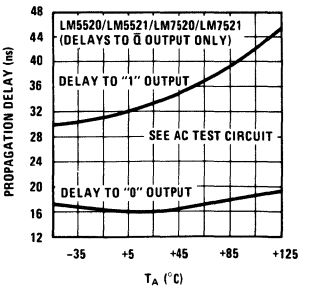
Differential Input to Output Propagation Delays



Strobe to Output Propagation Delays



Strobe to Output Propagation Delays



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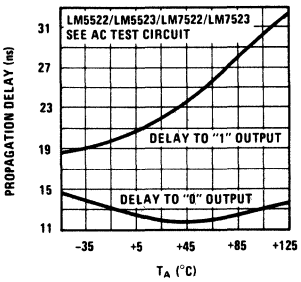
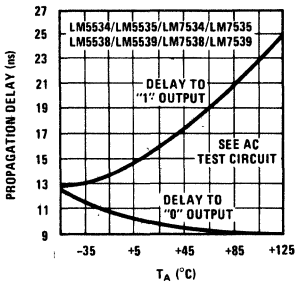
typical performance characteristics (cont.)

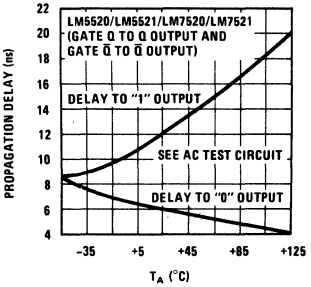
Strobe to Output Propagation Delays



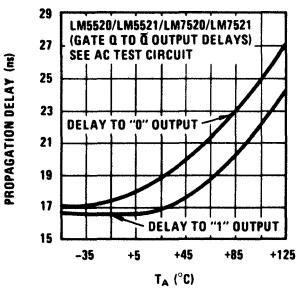
Strobe to Output Propagation Delays



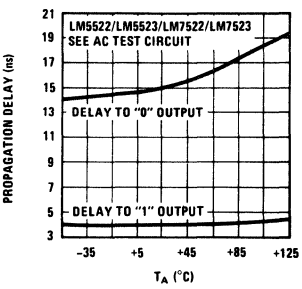
Gate to Output Propagation Delays



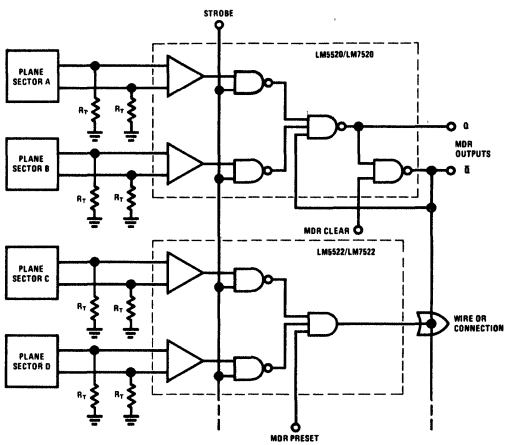
Gate to Output Propagation Delays



Gate to Output Propagation Delays

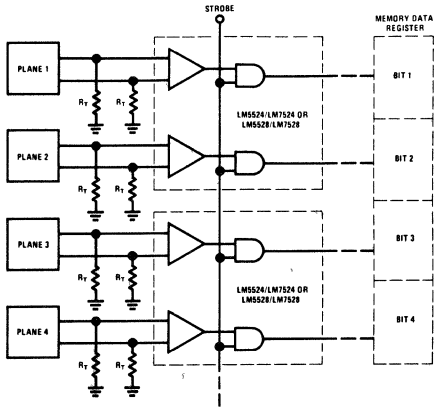


typical applications

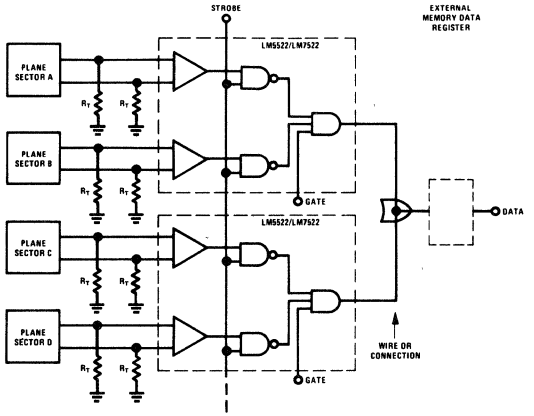


Large Memory System with Sectored Core Planes

typical applications (cont.)



Small Memory System



Large Memory System