

signetics DUAL CORE MEMORY SENSE AMPLIFIERS

SN7520
SN7521
SN7522
SN7523
SN7524
SN7525

LINEAR INTEGRATED CIRCUITS

DESCRIPTION

The 7520 Series Dual Core Memory Sense Amplifiers are designed for use in high speed core memory systems. Three separate logic configurations allow flexibility of system design.

The 7520 and 7521 can be used to perform the function of a flip-flop or a data register which responds to the sense and strobe-input conditions.

The 7522 and 7523 features an open collector stage which may be used to perform the wired-OR function.

The 7524 and 7525 features two independent sense channels with separate outputs.

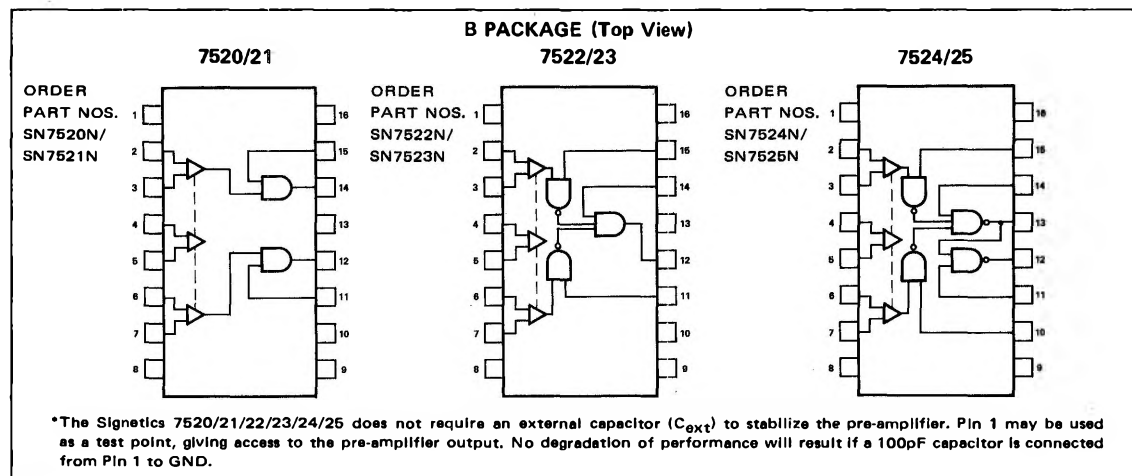
FEATURES

- DUAL SENSE AMPS
- $\pm 4\text{mV}$ THRESHOLD UNCERTAINTY
- DESIGN VERSATILITY
- 25ns PROPAGATION DELAY

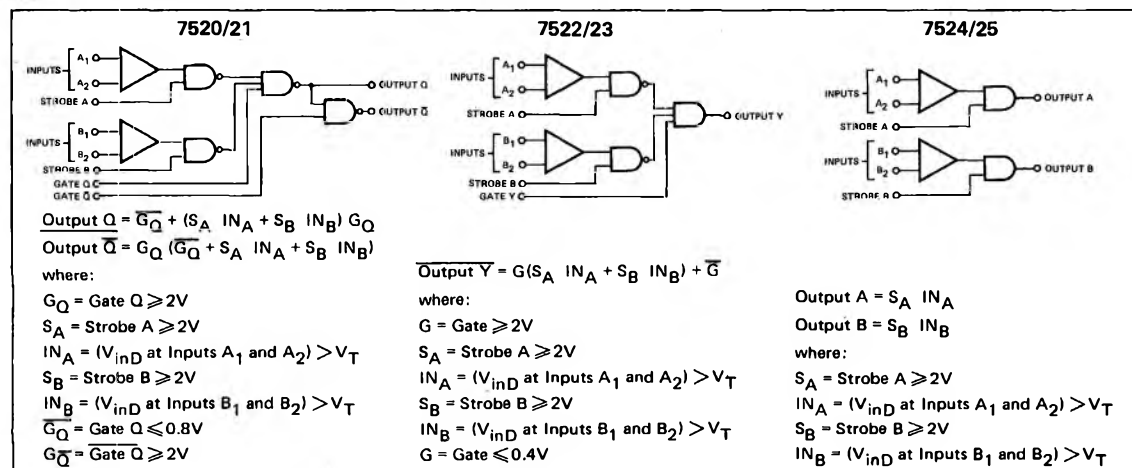
ABSOLUTE MAXIMUM RATINGS

Differential Input Voltage	$\pm 5\text{V}$
V_{CC}	$\pm 7\text{V}$
Strobe & Gain Input Voltages	$+5.5\text{V}$
Storage Temperature	-65°C to $+150^\circ\text{C}$
Operating Temperature	0°C to $+70^\circ\text{C}$
Power Dissipation	500mW

PIN CONFIGURATIONS



LOGIC DIAGRAMS



ELECTRICAL CHARACTERISTICS ($V_{cc1} = 5V$, $V_{cc2} = -5V$, $T_A = 0^\circ C$ to $+70^\circ C$, unless otherwise specified)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNITS	
V _T	Differential-Input Threshold Voltage (See Note 1)	V _{ref} = 15mV	7520	11	15	18	mV	
			7521	8	15	22	mV	
		V _{ref} = 40mV	7520	36	40	44	mV	
			7521	33	40	47	mV	
V _{CMF}	Common-Mode Input Firing Voltage (See Note 2)	Strobe Input: V _{inS} = V _{in(1)} Common-Mode Input Pulse : t _r = t _f ≤ 15ns, t _{p(in)} = 50ns T _A = 25°C			±3		V	
I _{in}	Differential-Input Bias Current	V _{cc1} = 5.25V, V _{cc2} = -5.25V V _{inD} = 0mV			30	75	μA	
I _{DI}	Differential-Input Offset Current	V _{cc1} = 5.25V, V _{cc2} = -5.25V			0.5		μA	
z _{inD}	Differential-Input Impedance	f = 1 kHz			2		kΩ	
V _{in(1)}	Logical 1 Input Voltage (gate and strobe inputs)	V _{cc1} = 4.75V, V _{cc2} = -4.75V V _{in(0)} = 0.8V			2		V	
V _{in(0)}	Logical 0 Input Voltage (gate and strobe inputs)	V _{cc1} = 4.75V, V _{cc2} = -4.75V V _{in(1)} = 2V				0.8	V	
I _{in(0)}	Logical 0 Level Input Current (gate and strobe inputs)	V _{cc1} = 5.25V, V _{cc2} = -5.25V V _{in(0)} = 0.4V				-1.6	mA	
I _{in(1)}	Logical 1 Level Input Current (gate and strobe inputs)	V _{cc1} = 5.25V, V _{cc2} = -5.25V V _{in(1)} = 2.4V				40	μA	
		V _{cc1} = 5.25V, V _{cc2} = -5.25V V _{in(1)} = V _{cc1}				1	mA	
V _{out(1)}	Logical 1 Output Voltage	V _{cc1} = 4.75V, V _{cc2} = -4.75V I _{load} = -400μA			2.4	3.9	V	
V _{out(0)}	Logical 0 Output Voltage	V _{cc1} = 4.75V, V _{cc2} = -4.75V I _{sink} = 16mA				0.25	0.4	V
I _{OS(Q)}	Q Output Short-Circuit Current	V _{cc1} = 5.25V, V _{cc2} = -5.25V			3.3		5	mA
I _{OS(Q)}	Q Output Short-Circuit Current	V _{cc1} = 5.25V, V _{cc2} = -5.25V			2.1		3.5	mA
I _{cc1}	V _{cc1} Supply Current	T _A = 25°C				28	mA	
I _{cc2}	V _{cc2} Supply Current	T _A = 25°C				-14	mA	
t _{or D}	Differential-Input Overload Recovery Time (See Note 3)	V _{inD} = 2V, t _r = t _f = 20ns				20	ns	
t _{or CM}	Common-Mode Input Overload Recovery Time (See Note 4)	V _{inCM} = 2V, t _r = t _f = 20ns				20	ns	
t _{cyc(min)}	Minimum cycle time					200	ns	

PROPAGATION DELAY TIMES			MIN	TYP	MAX	UNIT
SYMBOL	FROM INPUT	TO OUTPUT				
$t_{pd(1)DQ}$, $t_{pd(0)DQ}$	$A_1 - A_2$ or $B_1 - B_2$	Q		20	40	ns
$t_{pd(1)D\bar{Q}}$, $t_{pd(0)D\bar{Q}}$	$A_1 - A_2$ or $B_1 - B_2$	$\bar{Q}$		30		ns
$t_{pd(1)SQ}$, $t_{pd(0)SQ}$	Strobe A or B	Q		25	55	ns
$t_{pd(1)S\bar{Q}}$, $t_{pd(0)S\bar{Q}}$	Strobe A or B	$\bar{Q}$		35		ns
$t_{pd(1)G_QQ}$, $t_{pd(0)G_QQ}$	Gate Q	Q		15	30	ns
$t_{pd(1)G_Q\bar{Q}}$, $t_{pd(0)G_Q\bar{Q}}$	Gate Q	$\bar{Q}$		25		ns
$t_{pd(1)G_{\bar{Q}}Q}$, $t_{pd(0)G_{\bar{Q}}Q}$	Gate $\bar{Q}$	Q		15	55	ns
$t_{pd(1)G_{\bar{Q}}\bar{Q}}$, $t_{pd(0)G_{\bar{Q}}\bar{Q}}$	Gate $\bar{Q}$	$\bar{Q}$		35		ns
				10	20	ns
				15		ns
				20	30	ns
				15		ns
				10	20	ns

(SEE NOTES PAGE 128)

ELECTRICAL CHARACTERISTICS ($V_{cc1} = 5V$, $V_{cc2} = -5V$, $T_A = 0^\circ C$ to $+70^\circ C$, unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_T	Differential Input Threshold Voltage (See Note 1)	$V_{ref} = 15mV$	7522	11	15	mV
			7523	8	15	mV
		$V_{ref} = 40mV$	7522	36	40	mV
			7523	33	40	mV
V_{CMF}	Common Mode Input Firing Voltage (See Note 2)	Strobe Input: $V_{inS} = V_{in(1)}$ Common Mode Input Pulse: $t_r = t_f \geq 15ns$, $t_{p(in)} = 50ns$ $T_A = 25^\circ C$		± 3		V
I_{in}	Differential Input Bias Current	$V_{cc1} = 5.25V$, $V_{cc2} = -5.25V$ $V_{inD} = 0mV$		30	75	μA
I_{DI}	Differential Input Offset Current	$V_{cc1} = 5.25V$, $V_{cc2} = -5.25V$		0.5		μA
z_{inD}	Differential Input Impedance	$f = 1 kHz$		2		k Ω
$V_{in(1)}$	Logical 1 Input Voltage (gate and strobe inputs)	$V_{cc1} = 4.75V$, $V_{cc2} = -4.75V$ $V_{in(0)} = 0.8V$	2			V
$V_{in(0)}$	Logical 0 Input Voltage (gate and strobe inputs)	$V_{cc1} = 4.75V$, $V_{cc2} = -4.75V$ $V_{in(1)} = 2V$			0.8	V
$I_{in(0)}$	Logical 0 Level Input Current (gate and strobe inputs)	$V_{cc1} = 5.25V$, $V_{cc2} = -5.25V$ $V_{in(0)} = 0.4V$		-1	-1.6	mA
$I_{in(1)}$	Logical 1 Level Input Current (gate and strobe inputs)	$V_{cc1} = 5.25V$, $V_{cc2} = -5.25V$ $V_{in(1)} = 2.4V$			40	μA
		$V_{cc1} = 5.25V$, $V_{cc2} = -5.25V$ $V_{in(1)} = V_{cc1}$			1	mA
		$V_{cc1} = 4.75V$, $V_{cc2} = -4.75V$ $I_{load} = -400\mu A$, $V_{in} = 2V$	2.4	3.9		V
$V_{out(0)}$	Logical 0 Output Voltage	$V_{cc1} = 4.75V$, $V_{cc2} = -4.75V$ $I_{sink} = 16mA$, $V_{in} = 0.8V$		0.2	0.4	V
$I_{out(1)}$	Output Reverse Current	$V_{cc1} = 4.75V$, $V_{cc2} = -4.75V$ $V_{out} = 5.25V$, $V_{in} = 2V$			250	μA
I_{OS}	Output Short Circuit Current	$V_{cc1} = 5.25V$, $V_{cc2} = -5.25V$	2.1		3.5	mA
I_{cc1}	V_{cc1} Supply Current	$T_A = 25^\circ C$		27		mA
I_{cc2}	V_{cc2} Supply Current	$T_A = 25^\circ C$		15		mA
$t_{or D}$	Differential Input Overload Recovery Time (See Note 3)	$V_{inD} = 2V$, $t_r = t_f = 20ns$		20		ns
$t_{or CM}$	Common Mode Input Overload Recovery Time (See Note 4)	$V_{inCM} = \pm 2V$, $t_r = t_f = 20ns$		20		ns
$t_{cyc(min)}$	Minimum Cycle Time			200		ns

PROPAGATION DELAY TIMES			MIN	TYP	MAX	UNIT
SYMBOL	FROM INPUT	TO OUTPUT				
$t_{pd(1)D}$	$A_1 - A_2$ or $B_1 - B_2$	Y		20		ns
$t_{pd(0)D}$				30	45	ns
$t_{pd(1)S}$	Strobe A or B	Y		15		ns
$t_{pd(0)S}$				25	40	ns
$t_{pd(1)G}$	Gate	Y		10		ns
$t_{pd(0)G}$				15	25	ns

(SEE NOTES PAGE 128)

ELECTRICAL CHARACTERISTICS ($V_{cc1} = 5V$, $V_{cc2} = -5V$, $T_A = 0^\circ C$ to $+70^\circ C$, unless otherwise specified)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
V _T	Differential Input Threshold Voltage (See Note 1)	V _{ref} = 15mV	7524	11	15	19	mV
			7525	8	15	22	mV
		V _{ref} = 40mV	7524	36	40	44	mV
			7525	33	40	47	mV
V _{CMF}	Common Mode Input Firing Voltage (See Note 2)	Strobe Input: V _{inS} = V _{in(1)} Common Mode Input Pulse: t _r = t _f ≤ 15ns, t _{p(in)} = 50ns T _A = 25°C			±3		V
I _{in}	Differential Input Bias Current	V _{cc1} = 5.25V, V _{cc2} = -5.25V V _{inD} = 0mV			30	75	μA
I _{DI}	Differential Input Offset Current	V _{cc1} = 5.25V, V _{cc2} = -5.25V			0.5		μA
z _{inD}	Differential Input Impedance	f = 1 kHz			2		kΩ
V _{in(1)}	Logical 1 Input Voltage (strobe inputs)	V _{cc1} = 4.75V, V _{cc2} = -4.75V V _{in(0)} = 0.8V			2		V
V _{in(0)}	Logical 0 Input Voltage (strobe inputs)	V _{cc1} = 4.75V, V _{cc2} = -4.75V V _{in(1)} = 2V				0.8	V
I _{in(0)}	Logical 0 Level Input Current (strobe inputs)	V _{cc1} = 5.25V, V _{cc2} = -5.25V V _{in(0)} = 0.4V			-1	-1.6	mA
I _{in(1)}	Logical 1 Level Input Current (strobe inputs)	V _{cc1} = 5.25V, V _{cc2} = -5.25V V _{in(1)} = 2.4V				40	μA
		V _{cc1} = 5.25V, V _{cc2} = -5.25V V _{in(1)} = V _{cc1}				1	mA
		V _{cc1} = 4.75V, V _{cc2} = -4.75V I _{load} = -400μA, V _{in(1)} = 2V			2.4	3.9	V
V _{out(1)}	Logical 1 Output Voltage	V _{in(0)} = 0.8V					V
V _{out(0)}	Logical 0 Output Voltage	V _{cc1} = 4.75V, V _{cc2} = -4.75V I _{sink} = 16mA, V _{in(0)} = 0.8V			0.25	0.4	V
I _{OS}	Output Short Circuit Current	V _{cc1} = 5.25V, V _{cc2} = -5.25V			2.1	3.5	mA
I _{cc1}	V _{cc1} Supply Current	T _A = 25°C				25	mA
I _{cc2}	V _{cc2} Supply Current	T _A = 25°C				-15	mA
t _{or D}	Differential Input Overload Recovery Time (See Note 3)	V _{inD} = 2V, t _r = t _f = 20ns				20	ns
t _{or CM}	Common Mode Input Overload Recovery Time (See Note 4)	V _{inCM} = ±2V, t _r = t _f = 20ns				20	ns
t _{cyc(min)}	Minimum Cycle Time					200	ns

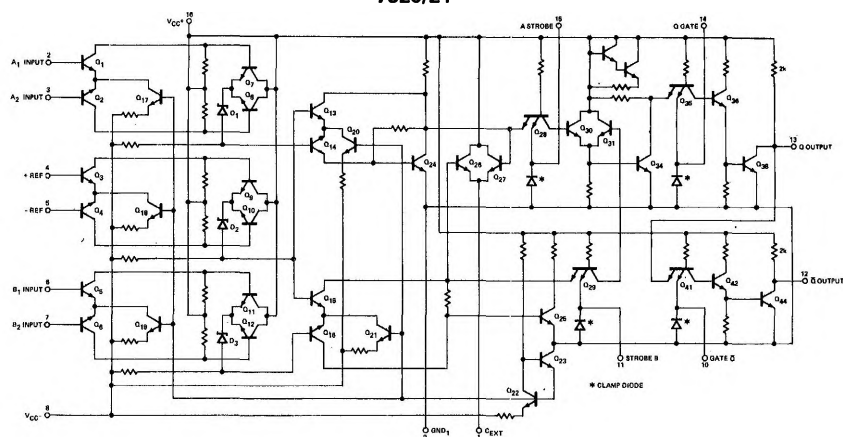
PROPAGATION DELAY TIMES			MIN	TYP	MAX	UNIT
SYMBOL	FROM INPUT	TO OUTPUT				
$t_{pd(1)D}$	$A_1 - A_2$ or $B_1 - B_2$	A or B		25	40	ns
$t_{pd(0)D}$				20		ns
$t_{pd(1)S}$	Strobe A or B	A or B		15	30	ns
$t_{pd(0)S}$				20		ns

NOTES:

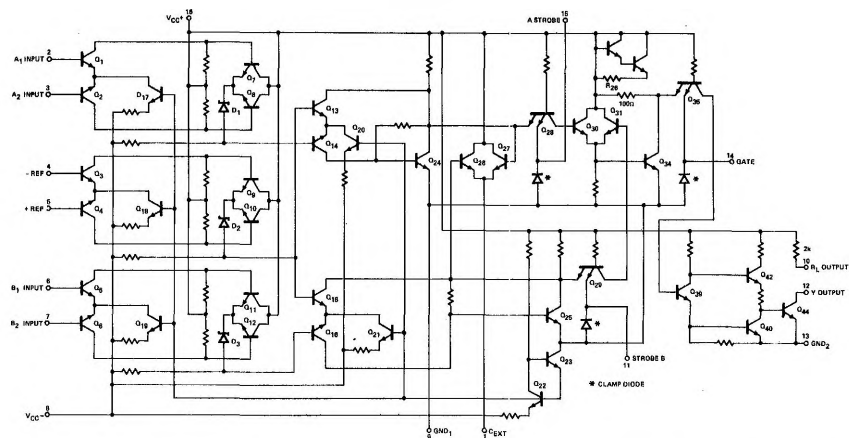
- The differential input threshold voltage (V_T) is defined as the DC input voltage (V_{in}) required to force the output of the sense amplifier to the logic gate threshold voltage level.
- Common mode input firing voltage is the common mode voltage that will exceed the dynamic range of the input at the specified conditions and cause the logic output to switch. The specified common mode input signal is applied with a strobe enable signal present.
- Differential input overload recovery time is the time necessary for the device to recover from the specified differential input overload signal prior to the strobe enable signal.
- Common mode input overload recovery time is the time necessary for the device to recover from the specified common mode input overload signal prior to the strobe enable signal.

SCHEMATIC DIAGRAMS

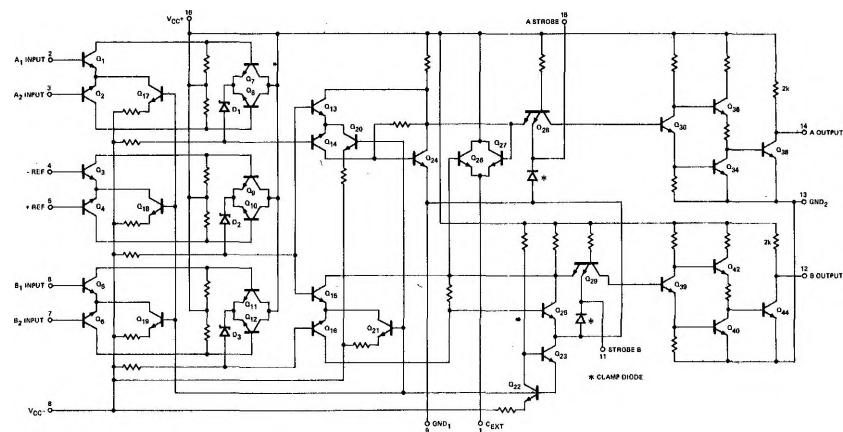
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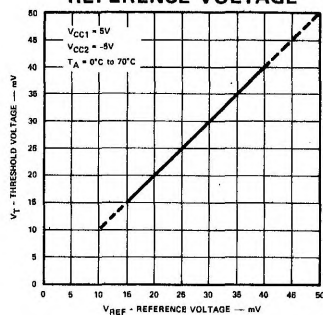


7524/25

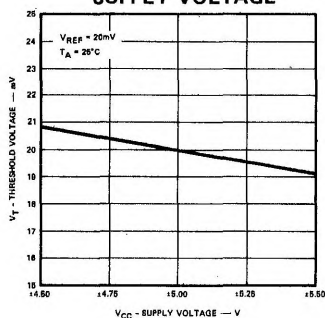


TYPICAL CHARACTERISTIC CURVES

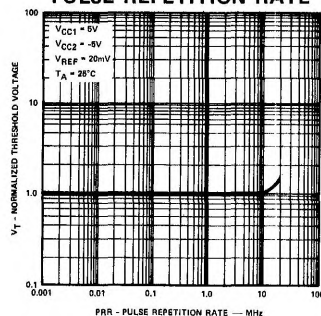
THRESHOLD VOLTAGE
VERSUS
REFERENCE VOLTAGE



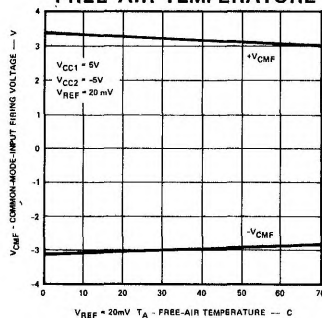
THRESHOLD VOLTAGE
VERSUS
SUPPLY VOLTAGE



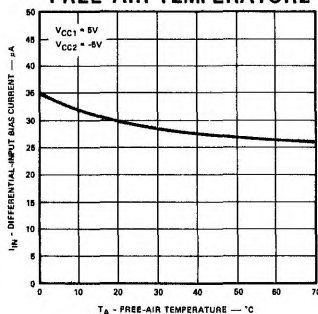
NORMALIZED THRESHOLD
VOLTAGE VERSUS
PULSE REPETITION RATE



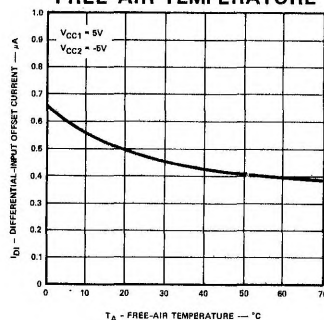
COMMON-MODE FIRING
VOLTAGE VERSUS
FREE-AIR TEMPERATURE



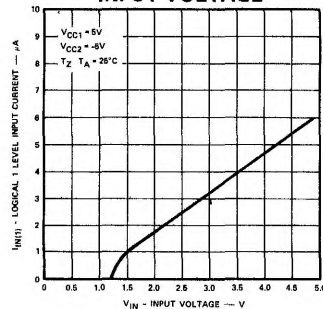
DIFFERENTIAL-INPUT BIAS
CURRENT VERSUS
FREE-AIR TEMPERATURE



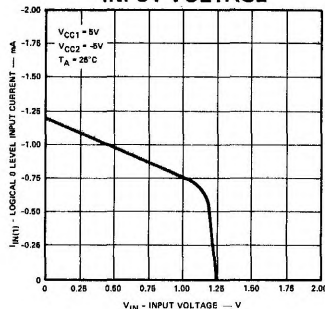
DIFFERENTIAL-INPUT
OFFSET CURRENT VS
FREE-AIR TEMPERATURE



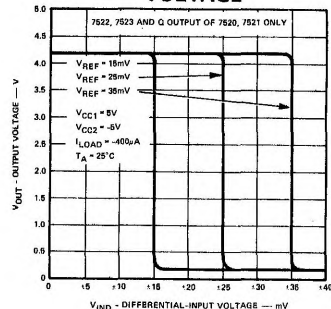
LOGICAL 1 LEVEL INPUT
CURRENT VERSUS
INPUT VOLTAGE



LOGICAL 0 LEVEL INPUT
CURRENT VERSUS
INPUT VOLTAGE

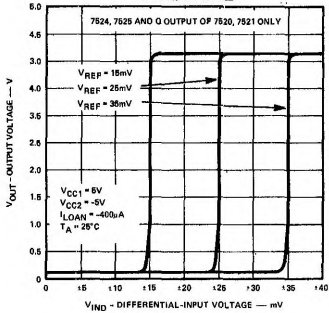


OUTPUT VOLTAGE VERSUS
DIFFERENTIAL-INPUT
VOLTAGE

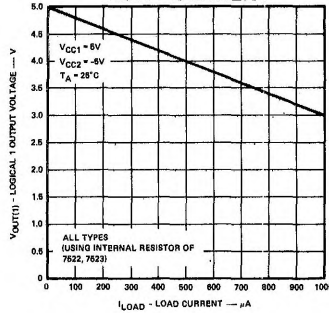


Typical Characteristic Curves (Cont'd.)

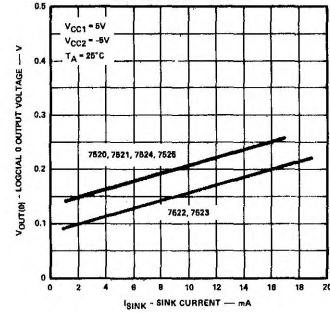
OUTPUT VOLTAGE VERSUS DIFFERENTIAL-INPUT VOLTAGE



LOGICAL 1 OUTPUT VOLTAGE VERSUS LOAD CURRENT



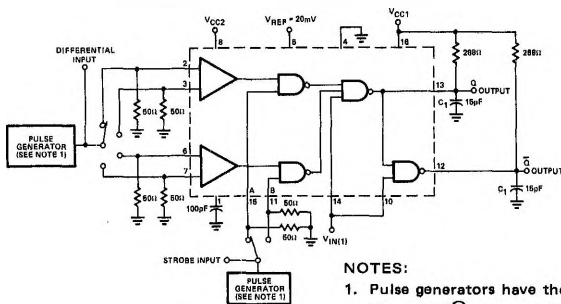
LOGICAL 0 OUTPUT VOLTAGE VERSUS SINK CURRENT



Switching Characteristics (Propagation Delay Times)

TEST CIRCUIT – DIFFERENTIAL AND STROBE INPUTS TO OUTPUTS

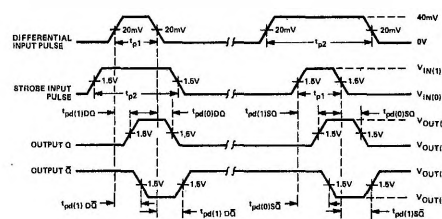
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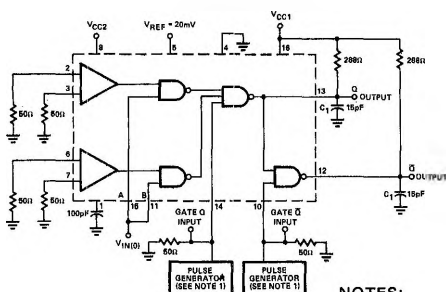
NOTES:

1. Pulse generators have the following characteristics:
 $Z_{OUT} = 50\Omega$, $t_r = t_f = 15(\pm 5)ns$, $t_{p1} = 100ns$,
 $t_{p2} = 300ns$, and $PRR = 1 MHz$.
2. C_1 includes probe and jig capacitance.

VOLTAGE WAVEFORMS – DIFFERENTIAL AND STROBE INPUTS TO OUTPUTS



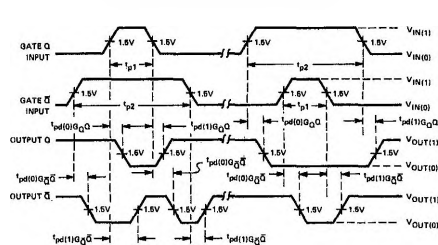
TEST CIRCUIT



NOTES:

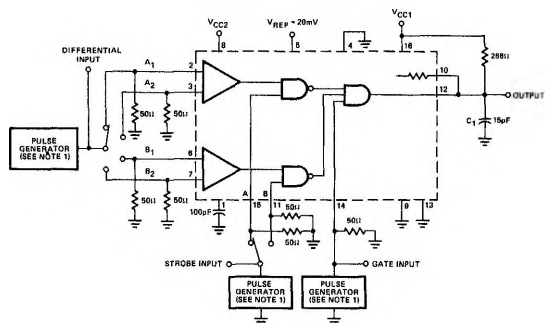
1. Pulse generators have the following characteristics:
 $Z_{OUT} = 50\Omega$, $t_r = t_f = 15(\pm 5)ns$, $t_{p1} = 100ns$,
 $t_{p2} = 300ns$, and $PRR = 1 MHz$.
2. C_1 includes probe and jig capacitance.

VOLTAGE WAVEFORMS

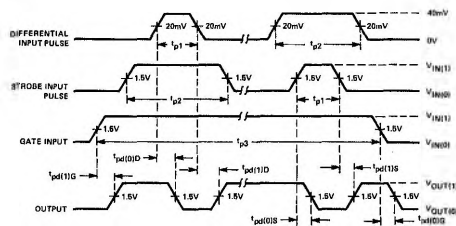


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TEST CIRCUIT



VOLTAGE WAVEFORMS

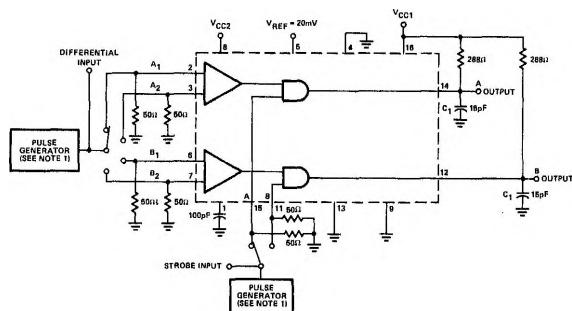


NOTES:

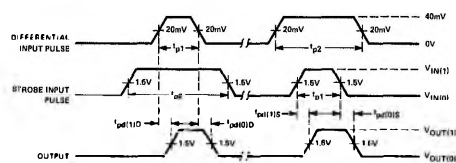
1. Pulse generators have the following characteristics:
 $Z_{out} = 50\Omega$, $t_r = t_f = 15(\pm 5)ns$, $t_{p1} = 100ns$,
 $t_{p2} = 300ns$, $PRR = 1 MHz$.
2. Strobe input pulse is applied to Strobe A when inputs $A_1 - A_2$ are being tested and to Strobe B when inputs $B_1 - B_2$ are being tested.
3. C_1 includes probe and jig capacitance.

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TEST CIRCUIT



VOLTAGE WAVEFORMS



NOTES:

1. Pulse generators have the following characteristics:
 $Z_{out} = 50\Omega$, $t_r = t_f = 15(\pm 5)ns$, $t_{p1} = 100ns$,
 $t_{p2} = 300ns$, $PRR = 1 MHz$.
2. Strobe input pulse is applied to Strobe A when inputs $A_1 - A_2$ are being tested and to Strobe B when inputs $B_1 - B_2$ are being tested.
3. C_1 includes probe and jig capacitance.