

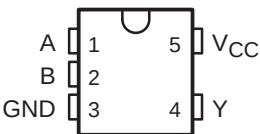
SN74LVC1G08

SINGLE 2-INPUT POSITIVE-AND GATE

SCES217B – APRIL 1999 – REVISED FEBRUARY 2000

- **EPIC™** (Enhanced-Performance Implanted CMOS) Submicron Process
- **I_{off}** Feature Supports Partial-Power-Down Mode Operation
- Supports 5-V V_{CC} Operation
- Package Options Include Plastic Small-Outline Transistor (DBV, DCK) Packages

DBV OR DCK PACKAGE
(TOP VIEW)



description

This single 2-input positive-AND gate is designed for 1.65-V to 5.5-V V_{CC} operation.

The SN74LVC1G08 performs the Boolean function $Y = A \cdot B$ or $Y = \overline{\overline{A} + \overline{B}}$ in positive logic.

This device is fully specified for partial-power-down applications using I_{off}. The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

The SN74LVC1G08 is characterized for operation from –40°C to 85°C.

FUNCTION TABLE

INPUTS		OUTPUT
A	B	Y
H	H	H
L	X	L
X	L	L

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



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PRODUCT PREVIEW

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

Supply voltage range, V_{CC}	–0.5 V to 6.5 V
Input voltage range, V_I (see Note 1)	–0.5 V to 6.5 V
Output voltage range, V_O (see Notes 1 and 2)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$)	–50 mA
Output clamp current, I_{OK} ($V_O < 0$)	–50 mA
Continuous output current, I_O	±50 mA
Continuous current through V_{CC} or GND	±100 mA
Package thermal impedance, θ_{JA} (see Note 3): DBV package	347°C/W
DCK package	389°C/W
Storage temperature range, T_{stg}	–65°C to 150°C

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

- NOTES: 1. The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
 2. The value of V_{CC} is provided in the recommended operating conditions table.
 3. The package thermal impedance is calculated in accordance with JESD 51.

recommended operating conditions (see Note 4)

		MIN	MAX	UNIT
V_{CC} Supply voltage	Operating	1.65	5.5	V
	Data retention only	1.5		
V_{IH} High-level input voltage	$V_{CC} = 1.65$ V to 1.95 V	$0.65 \times V_{CC}$		V
	$V_{CC} = 2.3$ V to 2.7 V	1.7		
	$V_{CC} = 3$ V to 3.6 V	2		
	$V_{CC} = 4.5$ V to 5.5 V	$0.7 \times V_{CC}$		
V_{IL} Low-level input voltage	$V_{CC} = 1.65$ V to 1.95 V		$0.35 \times V_{CC}$	V
	$V_{CC} = 2.3$ V to 2.7 V		0.7	
	$V_{CC} = 3$ V to 3.6 V		0.8	
	$V_{CC} = 4.5$ V to 5.5 V		$0.3 \times V_{CC}$	
V_I Input voltage		0	5.5	V
V_O Output voltage		0	V_{CC}	V
I_{OH} High-level output current	$V_{CC} = 1.65$ V		–4	mA
	$V_{CC} = 2.3$ V		–8	
	$V_{CC} = 3$ V		–16	
	$V_{CC} = 4.5$ V		–24	
I_{OL} Low-level output current	$V_{CC} = 1.65$ V		4	mA
	$V_{CC} = 2.3$ V		8	
	$V_{CC} = 3$ V		16	
	$V_{CC} = 4.5$ V		24	
$\Delta t/\Delta v$ Input transition rise or fall rate	$V_{CC} = 1.8$ V ± 0.15 V, 2.5 V ± 0.2 V		20	ns/V
	$V_{CC} = 3.3$ V ± 0.3 V		10	
	$V_{CC} = 5$ V ± 0.5 V		5	
T_A Operating free-air temperature		–40	85	°C

NOTE 4: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		V _{CC}	MIN	TYP†	MAX	UNIT
V _{OH}		I _{OH} = −100 μA		1.65 V to 5.5 V	V _{CC} −0.1			V
		I _{OH} = −4 mA		1.65 V	1.2			
		I _{OH} = −8 mA		2.3 V	1.9			
		I _{OH} = −16 mA		3 V	2.4			
		I _{OH} = −24 mA			2.3			
		I _{OH} = −32 mA		4.5 V	3.8			
V _{OL}		I _{OL} = 100 μA		1.65 V to 5.5 V			0.1	V
		I _{OL} = 4 mA		1.65 V			0.45	
		I _{OL} = 8 mA		2.3 V			0.3	
		I _{OL} = 16 mA		3 V			0.4	
		I _{OL} = 24 mA					0.55	
		I _{OL} = 32 mA		4.5 V			0.55	
I _I	A or B inputs	V _I = 5.5 V or GND		0 to 5.5 V			±5	μA
I _{off}		V _I or V _O = 5.5 V		0			±10	μA
I _{CC}		V _I = 5.5 V or GND, I _O = 0		1.65 V to 5.5 V			10	μA
ΔI _{CC}		One input at V _{CC} − 0.6 V, Other inputs at V _{CC} or GND		3 V to 5.5 V			500	μA
C _i		V _I = V _{CC} or GND		3.3 V				pF

[†] All typical values are at V_{CC} = 3.3 V, T_A = 25°C.

switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figures 1 through 4)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 1.8 V ± 0.15 V		V _{CC} = 2.5 V ± 0.2 V		V _{CC} = 3.3 V ± 0.3 V		V _{CC} = 5 V ± 0.5 V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A or B	Y									ns

operating characteristics, T_A = 25°C

PARAMETER	TEST CONDITIONS	V _{CC} = 1.8 V	V _{CC} = 2.5 V	V _{CC} = 3.3 V	V _{CC} = 5 V	UNIT
		TYP	TYP	TYP	TYP	
C _{pd} Power dissipation capacitance	f = 10 MHz					pF

PRODUCT PREVIEW



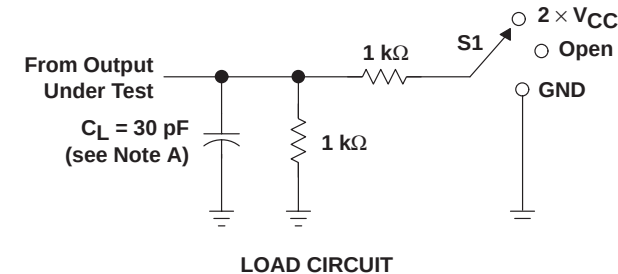
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SINGLE 2-INPUT POSITIVE-AND GATE

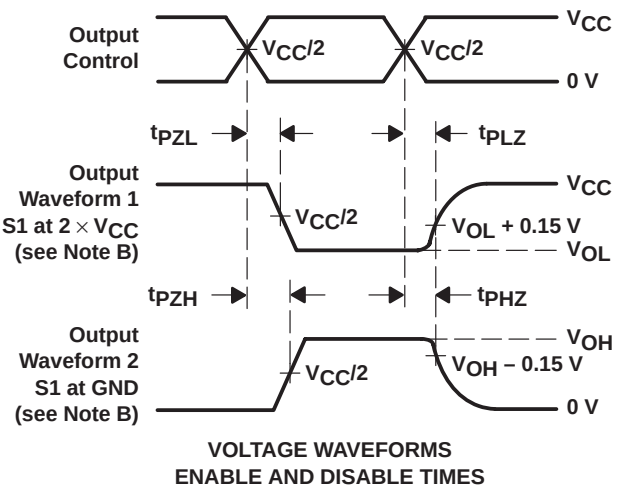
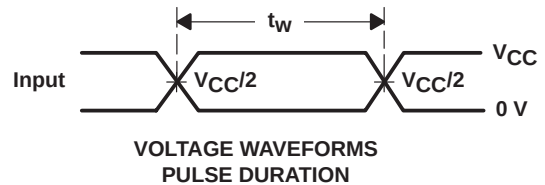
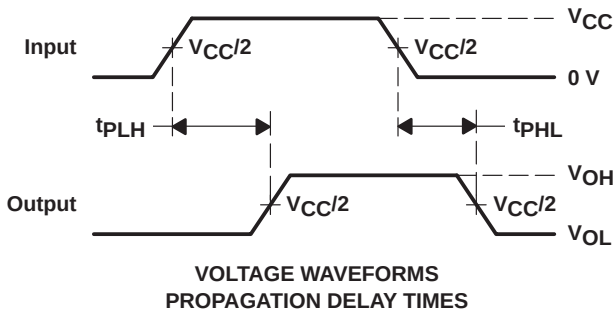
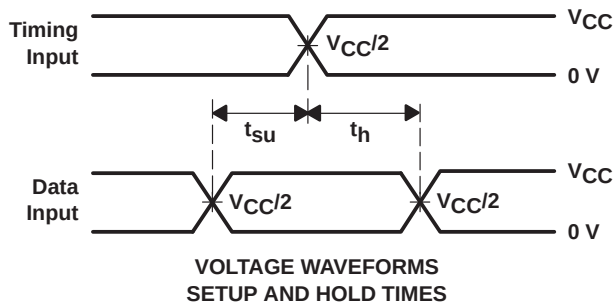
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PARAMETER MEASUREMENT INFORMATION

$$V_{CC} = 1.8 \text{ V} \pm 0.15 \text{ V}$$



TEST	S1
t_{pd}	Open
t_{PLZ}/t_{PZL}	2 $\times V_{CC}$
t_{PHZ}/t_{PHZ}	GND

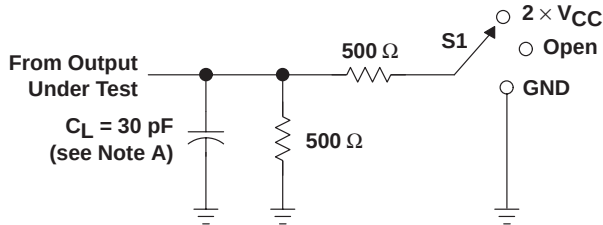


- NOTES:
- C_L includes probe and jig capacitance.
 - Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 - All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2 \text{ ns}$, $t_f \leq 2 \text{ ns}$.
 - The outputs are measured one at a time with one transition per measurement.
 - t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - t_{PZL} and t_{PZH} are the same as t_{en} .
 - t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 1. Load Circuit and Voltage Waveforms

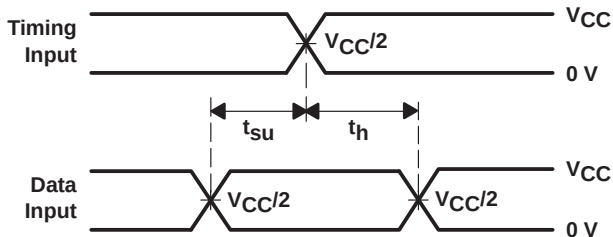
PARAMETER MEASUREMENT INFORMATION

$$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$$

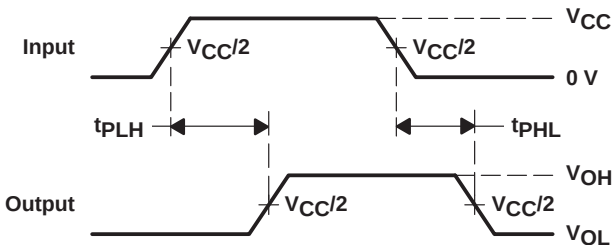


LOAD CIRCUIT

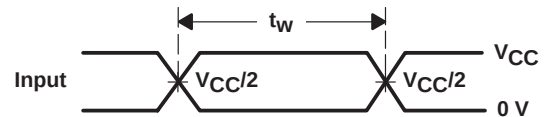
TEST	S1
t_{pd}	Open
t_{PLZ}/t_{PZL}	2 $\times V_{CC}$
t_{PHZ}/t_{PZH}	GND



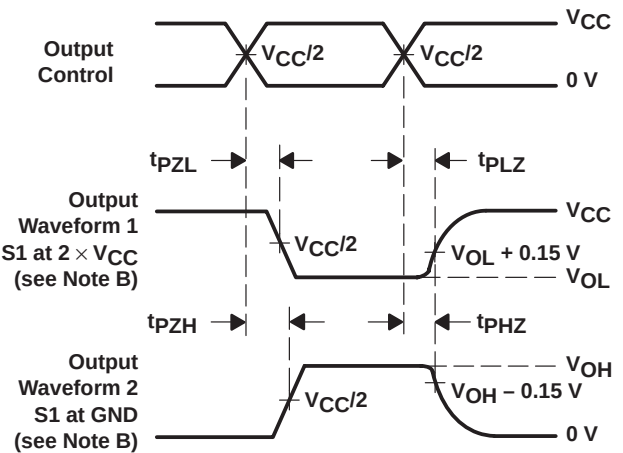
VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES

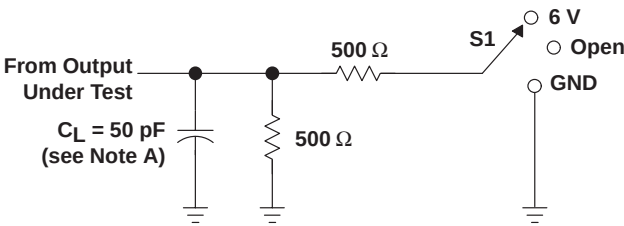
- NOTES: A. C_L includes probe and jig capacitance.
- B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
- C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2 \text{ ns}$, $t_f \leq 2 \text{ ns}$.
- D. The outputs are measured one at a time with one transition per measurement.
- E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
- F. t_{PZL} and t_{PZH} are the same as t_{en} .
- G. t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 2. Load Circuit and Voltage Waveforms

SN74LVC1G08 SINGLE 2-INPUT POSITIVE-AND GATE

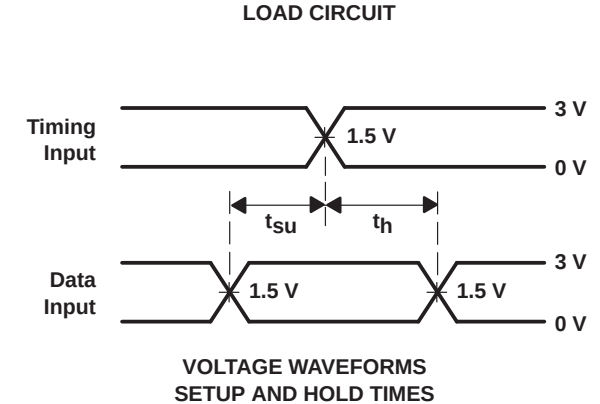
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PARAMETER MEASUREMENT INFORMATION $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$

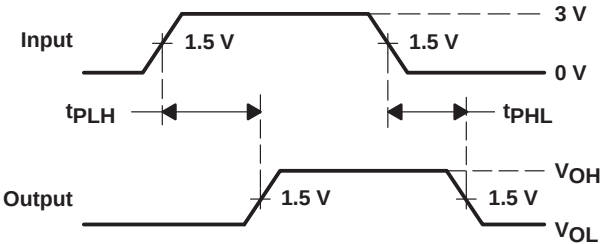


LOAD CIRCUIT

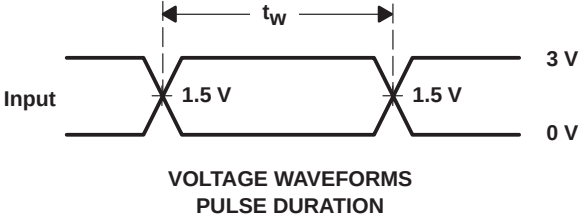
TEST	S1
t_{pd}	Open
t_{PLZ}/t_{PZL}	6 V
t_{PHZ}/t_{PZH}	GND



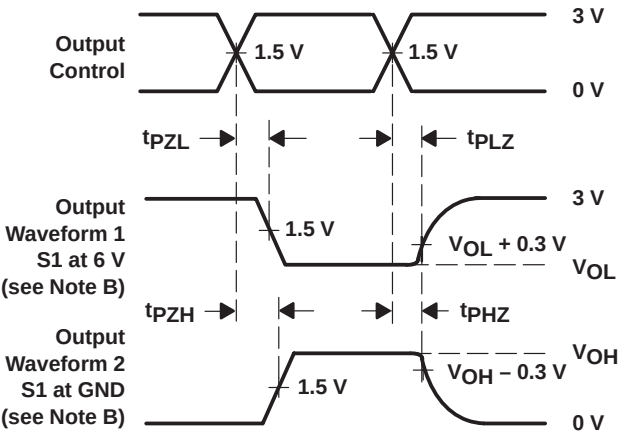
VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
PULSE DURATION



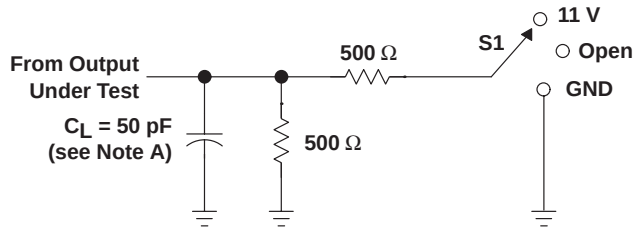
VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES

- NOTES:
- A. C_L includes probe and jig capacitance.
 - B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 - C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 2.5\text{ ns}$, $t_f \leq 2.5\text{ ns}$.
 - D. The outputs are measured one at a time with one transition per measurement.
 - E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - F. t_{PZL} and t_{PZH} are the same as t_{en} .
 - G. t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 3. Load Circuit and Voltage Waveforms

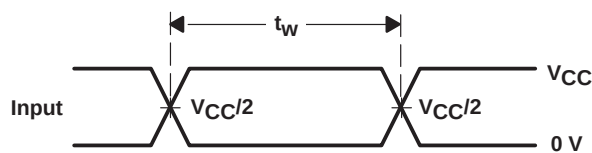
PARAMETER MEASUREMENT INFORMATION

$$V_{CC} = 5\text{ V} \pm 0.5\text{ V}$$

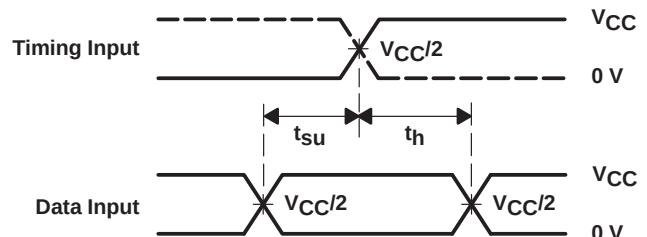


LOAD CIRCUIT

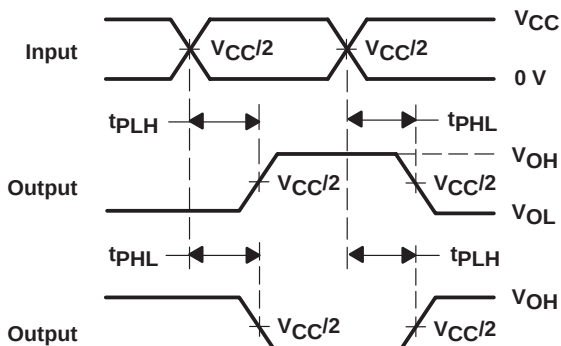
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	11 V
t_{PHZ}/t_{PZH}	GND



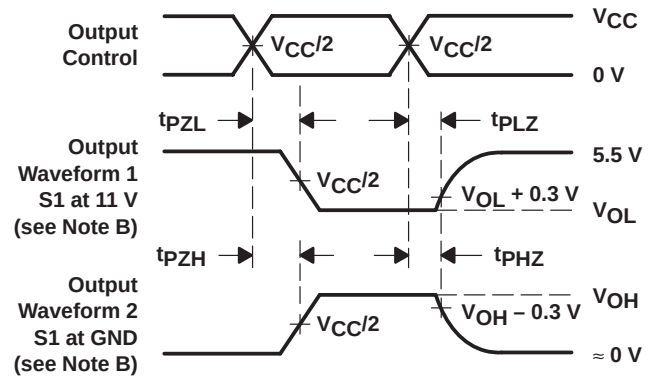
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

- NOTES: A. C_L includes probe and jig capacitance.
- B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
- C. All input pulses are supplied by generators having the following characteristics: PRR $\leq 10\text{ MHz}$, $Z_O = 50\text{ }\Omega$, $t_r \leq 2.5\text{ ns}$, $t_f \leq 2.5\text{ ns}$.
- D. The outputs are measured one at a time with one transition per measurement.
- E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
- F. t_{PZL} and t_{PZH} are the same as t_{en} .
- G. t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 4. Load Circuit and Voltage Waveforms

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