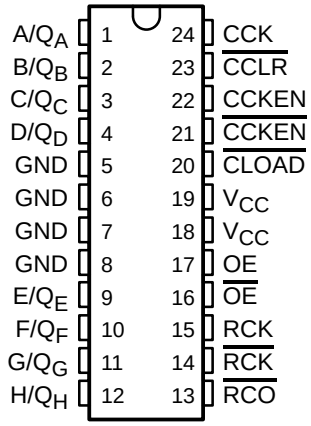
- **Inputs Are TTL-Voltage Compatible**
- **Parallel Register Inputs/Binary Counter/3-State Outputs**
- **Counter Has Direct Overriding Load and Clear**
- **Flow-Through Architecture Optimizes PCB Layout**
- **Center-Pin V_{CC} and GND Configurations Minimize High-Speed Switching Noise**
- ***EPIC*™ (Enhanced-Performance Implanted CMOS) 1-μm Process**
- **500-mA Typical Latch-Up Immunity at 125°C**
- **Package Options Include Plastic Small-Outline Packages and Standard Plastic 300-mil DIPs**

DW OR NT PACKAGE
(TOP VIEW)



description

The 74ACT11593 contains eight multiplexed parallel I/Os with 3-state output capability and an 8-bit storage register that feeds an 8-bit binary counter. Both the register and the counter have individual positive-edge triggered clocks.

The function tables show the operation of the counter clock-enable (CCKEN, $\overline{\text{CCKEN}}$) and output-enable (OE, $\overline{\text{OE}}$) inputs.

The counter input has direct load and clear functions. A low-going $\overline{\text{RCO}}$ pulse is obtained when the counter reaches the hex word FF.

Expansion is easily accomplished for two stages by connecting $\overline{\text{RCO}}$ of the first stage to $\overline{\text{CCKEN}}$ of the second stage. Cascading for larger count chains is accomplished by connecting $\overline{\text{RCO}}$ of each stage to CCK of the following stage.

The 74ACT11593 is characterized for operation from –40°C to 85°C.

Function Tables

COUNTER CLOCK ENABLE

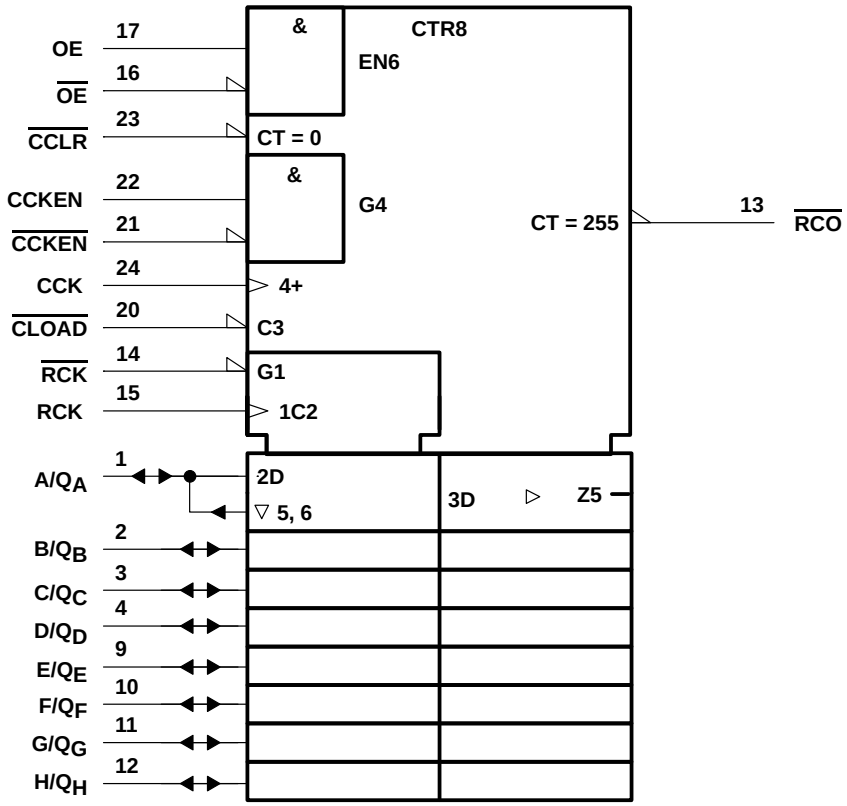
INPUTS		OUTPUTS
CCKEN	$\overline{\text{CCKEN}}$	A/Q_A THRU H/Q_H
L	L	Disable
L	H	Disable
H	L	Enable
H	H	Disable

OUTPUT ENABLE

INPUTS		OUTPUTS
OE	$\overline{\text{OE}}$	A/Q_A THRU H/Q_H
L	L	Input mode
L	H	Input mode
H	L	Output mode
H	H	Input mode

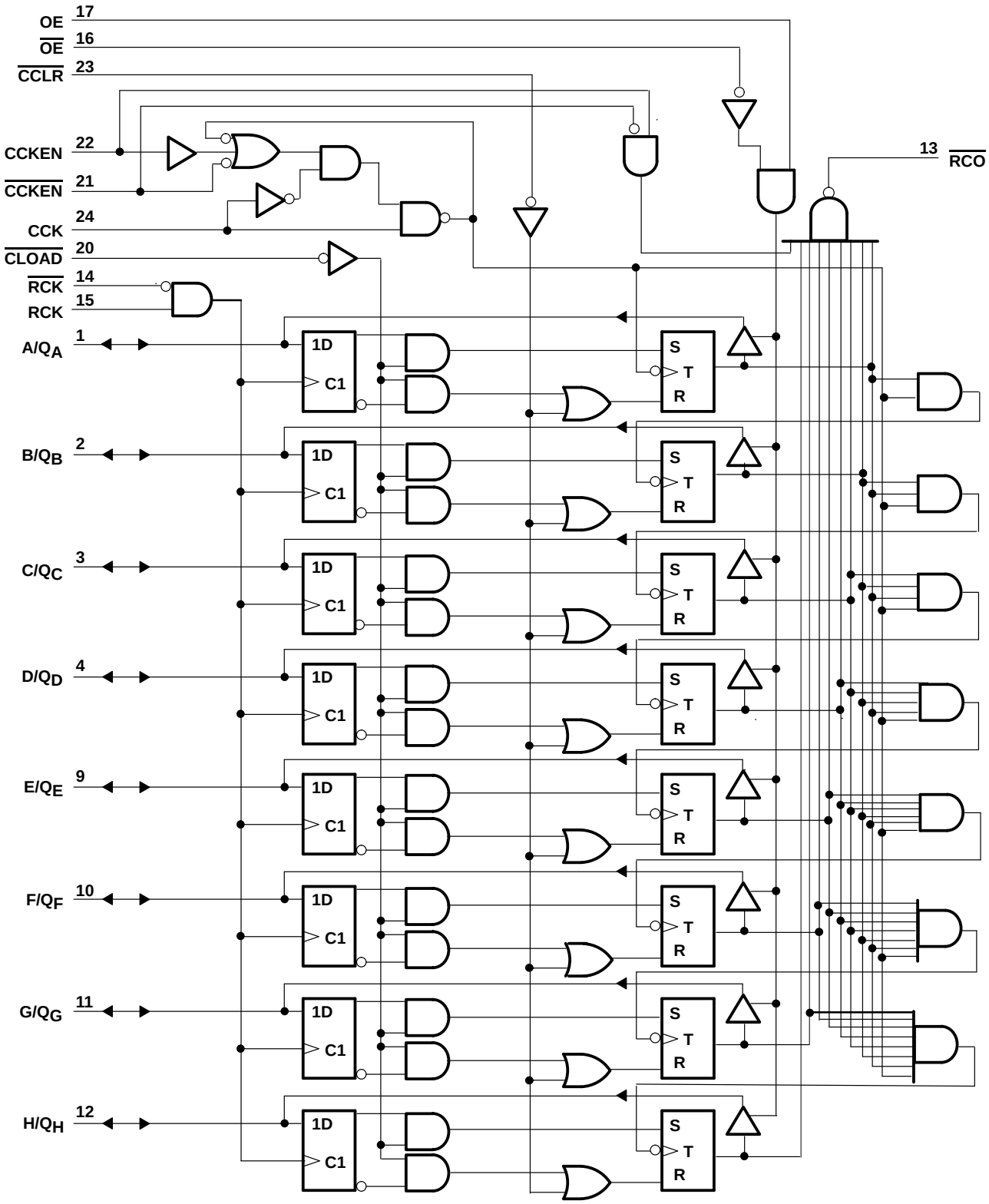
EPIC is a trademark of Texas Instruments Incorporated.

logic symbol†

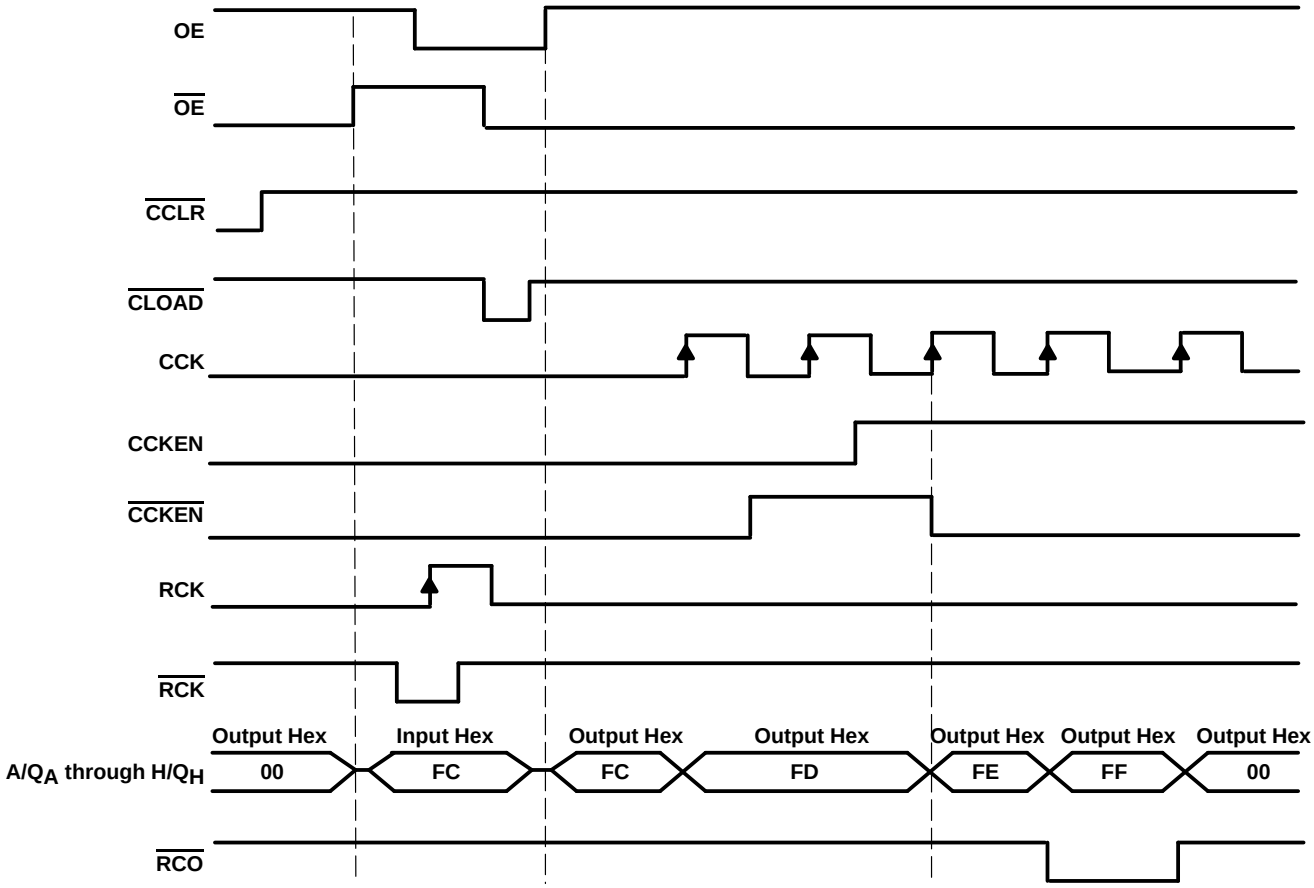


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



typical operating sequence



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

Supply voltage range, V_{CC} . . . . . –0.5 V to 7 V
Input voltage range, V_I (see Note 1) . . . . . –0.5 V to V_{CC} + 0.5 V
Output voltage range, V_O (see Note 1) . . . . . –0.5 V to V_{CC} + 0.5 V
Input clamp current, I_{IK} (V_I < 0 or V_I > V_{CC}) . . . . . ±20 mA
Output clamp current, I_{OK} (V_O < 0 or V_O > V_{CC}) . . . . . ±50 mA
Continuous output current, I_O (V_O = 0 to V_{CC}) . . . . . ±50 mA
Continuous current through V_{CC} or GND . . . . . ±225 mA
Storage temperature range . . . . . –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.

NOTE 1: The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

recommended operating conditions (see Note 2)

		MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage	4.5	5	5.5	V
V_{IH}	High-level input voltage	2			V
V_{IL}	Low-level input voltage			0.8	V
V_I	Input voltage	0		V_{CC}	V
V_O	Output voltage	0		V_{CC}	V
I_{OH}	High-level output current			–24	mA
I_{OL}	Low-level output current			24	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	0		10	ns/V
T_A	Operating free-air temperature	–40		85	°C

NOTE 2: Unused or floating inputs must be held high or low.

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

PARAMETER	TEST CONDITIONS		V_{CC}	T_A = 25°C			MIN	MAX	UNIT
				MIN	TYP	MAX			
V_{OH}	I_{OH} = –50 µA		4.5 V	4.4			4.4		V
			5.5 V	5.4			5.4		
	I_{OH} = –24 mA		4.5 V	3.94			3.8		
			5.5 V	4.94			4.8		
	I_{OH} = –75 mA†		5.5 V				3.85		
V_{OL}	I_{OL} = 50 µA		4.5 V			0.1		0.1	V
			5.5 V			0.1		0.1	
	I_{OL} = 24 mA		4.5 V			0.36		0.44	
			5.5 V			0.36		0.44	
	I_{OL} = 75 mA†		5.5 V					1.65	
I_I	$V_I = V_{CC}$ or GND		5.5 V			±0.1		±1	µA
I_{OZ}	$V_O = V_{CC}$ or GND		5.5 V			±0.5		±5	µA
I_{CC}	$V_I = V_{CC}$ or GND,	I_O = 0	5.5 V			8		80	µA
ΔI_{CC}‡	One input at 3.4 V,	Other inputs at V_{CC} or GND	5.5 V			0.9		1	mA
C_i	$V_I = V_{CC}$ or GND		5 V		3.5				pF
C_{io}	$V_O = V_{CC}$ or GND		5 V		12.5				pF

† Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.
‡ This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0 V or V_{CC}.

timing requirements over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)

			T_A = 25°C		MIN	MAX	UNIT
			MIN	MAX			
f_{clock}	Clock frequency, CCK or RCK			52		52	MHz
t_w	Pulse duration	CCK high or low	9.6		9.6		ns
		RCK high or low	5.8		5.8		
		$\overline{\text{CCLR}}$ low	7.6		7.6		
		$\overline{\text{CLOAD}}$ low	6.2		6.2		
t_{su}	Setup time	$\overline{\text{CCKEN}}$ low before CCK↑	3.6		3.6		ns
		CCKEN high before CCK↑	4		4		
		$\overline{\text{CCLR}}$ high before CCK↑	1.2		1.2		
		$\overline{\text{CLOAD}}$ high before CCK↑	5.1		5.1		
		RCK↑ before $\overline{\text{CLOAD}}$↑†	7.4		7.4		
		Data A thru H before RCK↑	2.4		2.4		
t_h	Hold time	Data A thru H after RCK↑	1.2		1.2		ns
		All others	0.8		0.8		

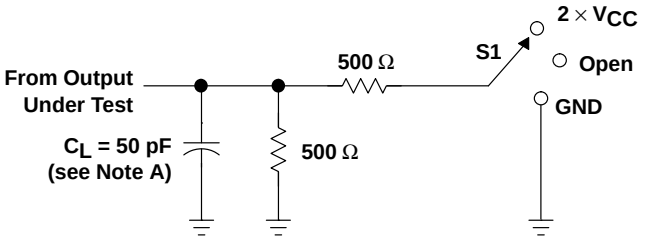
switching characteristics over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	T_A = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
f_{max}			52			52		MHz
t_{PLH}	CCK	Q	5.6	10.2	13.3	5.6	15.1	ns
t_{PHL}			5.8	10.3	13.3	5.8	15	
t_{PLH}	$\overline{\text{CLOAD}}$	Q	5.5	12	16.9	5.5	19.1	ns
t_{PHL}			5.8	13.5	19.4	5.8	21.7	
t_{PHL}	$\overline{\text{CCLR}}$	Q	5	10.4	14.3	5	16	ns
t_{PZH}	OE	Q	5.9	10.9	14.3	5.9	16.3	ns
t_{PZL}			5.9	11.1	14.8	5.9	16.9	
t_{PZH}	$\overline{\text{OE}}$	Q	4.9	10.4	14.4	4.9	16.5	ns
t_{PZL}			5.1	10.7	15	5.1	17	
t_{PHZ}	OE	Q	5.3	9	11.8	5.3	12.9	ns
t_{PLZ}			6.2	10.2	13.1	6.2	14.4	
t_{PHZ}	$\overline{\text{OE}}$	Q	5.6	8.6	10.7	5.6	11.6	ns
t_{PLZ}			6.4	9.9	12	6.4	13.3	
t_{PLH}	CCK	$\overline{\text{RCO}}$	4.9	9.2	12.1	4.9	13.7	ns
t_{PHL}			5.8	10.9	14.3	5.8	16.3	
t_{PLH}	$\overline{\text{CLOAD}}$	$\overline{\text{RCO}}$	4.6	9.6	13.3	4.6	15	ns
t_{PHL}			7.1	13.6	18.5	7.1	21	
t_{PLH}	$\overline{\text{CCLR}}$	$\overline{\text{RCO}}$	5.1	10.3	14.5	5.1	16.2	ns
t_{PLH}	RCK	$\overline{\text{RCO}}$	6.7	12	15.6	6.7	17.7	ns
t_{PHL}			7.5	13.6	17.8	7.5	20.2	

operating characteristics, V_{CC} = 5 V, T_A = 25°C

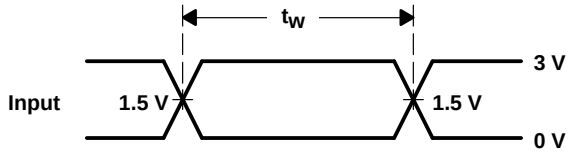
PARAMETER			TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance	Outputs enabled	C_L = 50 pF, f = 1 MHz	61	pF
		Outputs disabled		15	

PARAMETER MEASUREMENT INFORMATION

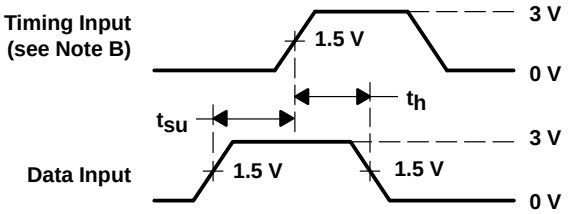


LOAD CIRCUIT

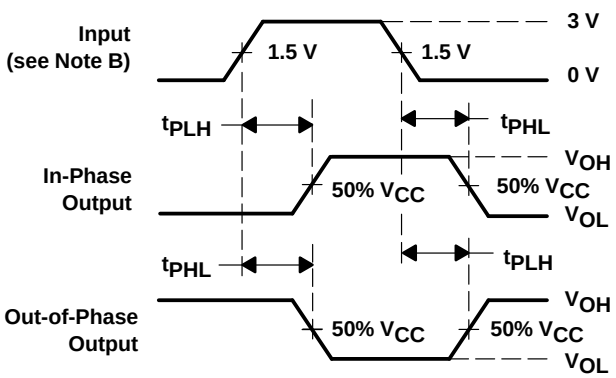
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	2 × V_{CC}
t_{PHZ}/t_{PZH}	GND



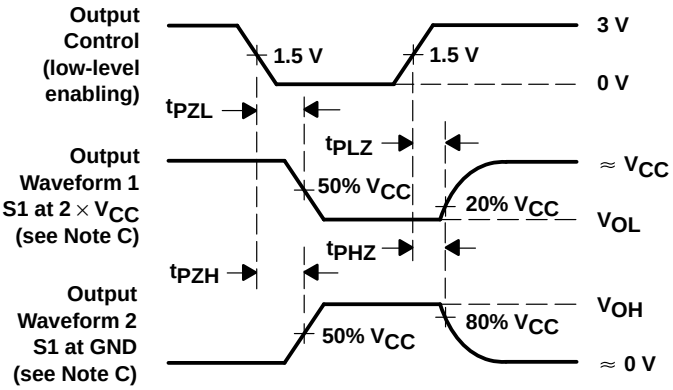
VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS

NOTES: A. C_L includes probe and jig capacitance.
B. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50 Ω, t_r = 3 ns, t_f = 3 ns.
C. 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.
D. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

IMPORTANT NOTICE

Texas Instruments (TI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

TI warrants performance of its semiconductor products and related software to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Certain applications using semiconductor products may involve potential risks of death, personal injury, or severe property or environmental damage ("Critical Applications").

TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS.

Inclusion of TI products in such applications is understood to be fully at the risk of the customer. Use of TI products in such applications requires the written approval of an appropriate TI officer. Questions concerning potential risk applications should be directed to TI through a local SC sales office.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards should be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor does TI warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used.