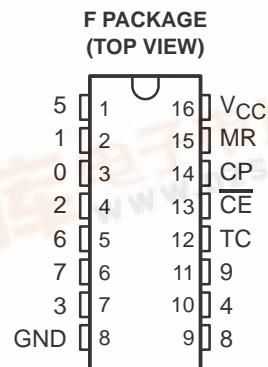


CD54HC4017

DECADE COUNTER/DIVIDER WITH TEN DECODED OUTPUTS

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- 2-V to 6-V Operation
- Fully Static Operation
- Buffered Inputs
- Common Reset
- Positive-Edge Clocking
- Balanced Propagation Delay and Transition Times
- High Noise Immunity: $N_{IL} = 30\%$, $N_{IH} = 30\%$ of V_{CC} at $V_{CC} = 5$ V
- Packaged in Ceramic (F) DIP Package and Also Available in Chip Form (H)



description

The CD54HC4017 is a high-speed silicon-gate CMOS 5-stage Johnson counter with ten decoded outputs. Each decoded output normally is low and sequentially goes high on the low-to-high transition of the clock (CP) input. Each output stays high for one clock period of the ten-clock-period cycle. The terminal count (TC) output transitions low to high after output ten (9) goes low, and can be used in conjunction with the clock enable (\overline{CE}) input to cascade several stages. \overline{CE} disables counting when in the high state. The master reset (MR) input, when taken high, sets all the decoded outputs, except 0, to low.

The CD54HC4017 is characterized for operation over the full military temperature range of -55°C to 125°C .

FUNCTION TABLE

INPUTS			OUTPUT STATE [†]
CP	\overline{CE}	MR	
L	X	L	No change
X	H	L	No change
X	X	H	0 = H 1–9 = L
↑	L	L	Increments counter
↓	X	L	No change
X	↑	L	No change
H	↓	L	Increments counter

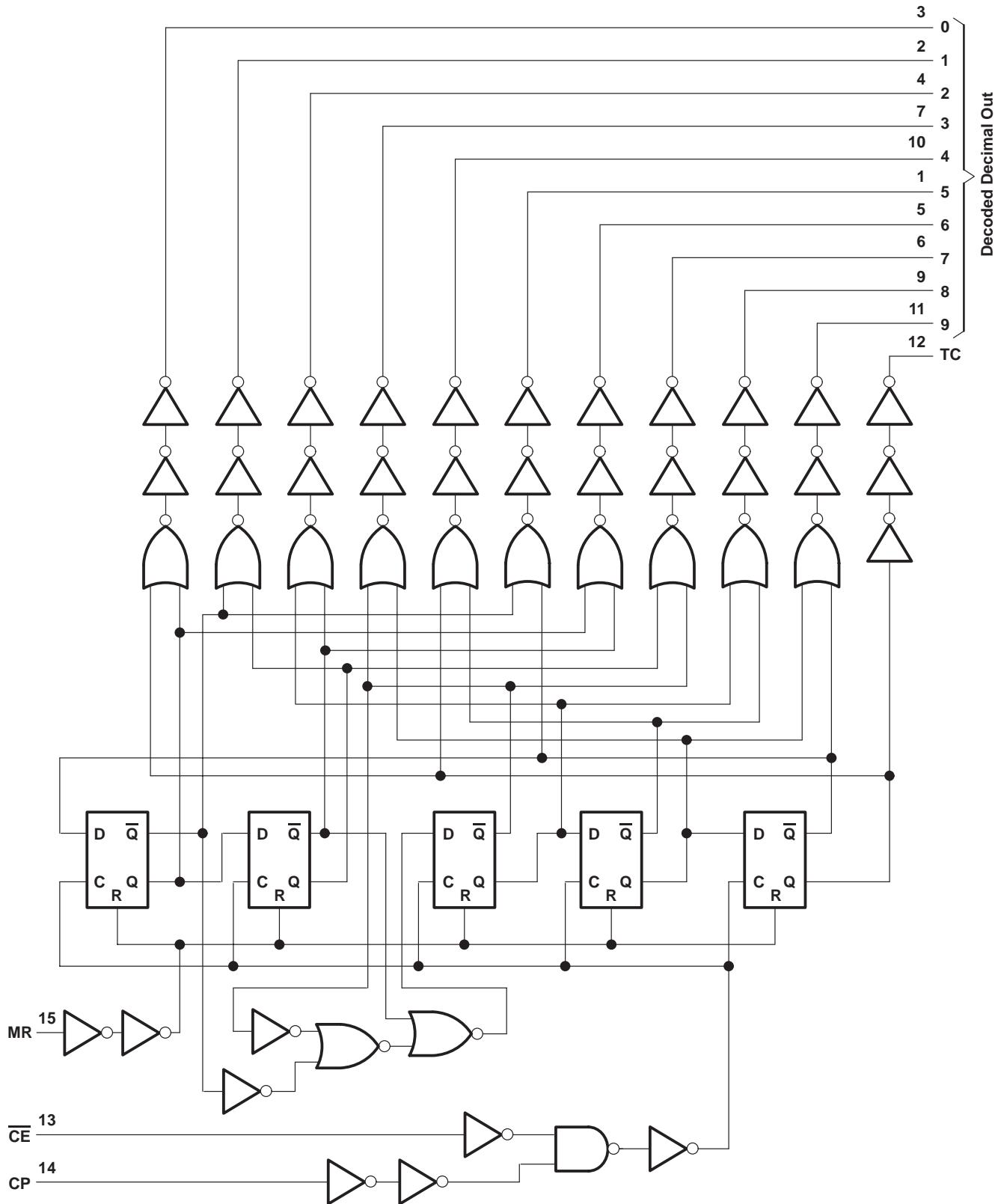
[†] If $n < 5$, $TC = H$; otherwise, $TC = L$.

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logic diagram (positive logic)



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

Supply voltage range, V_{CC}	–0.5 V to 7 V
Input clamp current, I_{IK} ($V_I < 0$ V or $V_I > V_{CC}$)	±20 mA
Output clamp current, I_{OK} ($V_O < 0$ V or $V_O > V_{CC}$)	±20 mA
Continuous output current, each output pin, I_O ($V_O > -0.5$ V or $V_O < V_{CC} + 0.5$ V)	±25 mA
V_{CC} or ground current, I_{CC}	±50 mA
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.

recommended operating (see Note 1)

			MIN	MAX	UNIT
V_{CC}	Supply voltage		2	6	V
V_{IH}	High-level input voltage	$V_{CC} = 2$ V	1.5		V
		$V_{CC} = 4.5$ V	3.15		
		$V_{CC} = 6$ V	4.2		
V_{IL}	Low-level input voltage	$V_{CC} = 2$ V	0	0.5	V
		$V_{CC} = 4.5$ V	0	1.35	
		$V_{CC} = 6$ V	0	1.8	
V_I	Input voltage		0	V_{CC}	V
V_O	Output voltage		0	V_{CC}	V
t_t	Input transition (rise and fall) time	$V_{CC} = 2$ V	0	1000	ns
		$V_{CC} = 4.5$ V	0	500	
		$V_{CC} = 6$ V	0	400	
T_A	Operating free-air temperature		–55	125	°C

NOTE 1: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to TI application report *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

PARAMETER	TEST CONDITIONS	V_{CC}	$T_A = 25^\circ C$		MIN	MAX	UNIT
			MIN	MAX			
V_{OH}	CMOS loads	$V_I = V_{IH}$ or V_{IL} , $I_{OH} = -0.02$ mA	2 V	1.9	1.9		V
			4.5 V	4.4	4.4		
			6 V	5.9	5.9		
	TTL loads	$V_I = V_{IH}$ or V_{IL}	$I_{OH} = -4$ mA	4.5 V	3.98	3.7	V
			$I_{OH} = -5.2$ mA	6 V	5.48	5.2	
V_{OL}	CMOS loads	$V_I = V_{IH}$ or V_{IL} , $I_{OL} = 0.02$ mA	2 V	0.1	0.1		V
			4.5 V	0.1	0.1		
			6 V	0.1	0.1		
	TTL loads	$V_I = V_{IH}$ or V_{IL}	$I_{OL} = 4$ mA	4.5 V	0.26	0.4	V
			$I_{OL} = 5.2$ mA	6 V	0.26	0.4	
I_I	$V_I = V_{CC}$ or 0		6 V	±100	±1000	nA	
I_{CC}	$V_I = V_{CC}$ or 0, $I_O = 0$		6 V	8	160	µA	
C_i			2 V to 6 V	10	10	pF	

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WITH TEN DECODED OUTPUTS

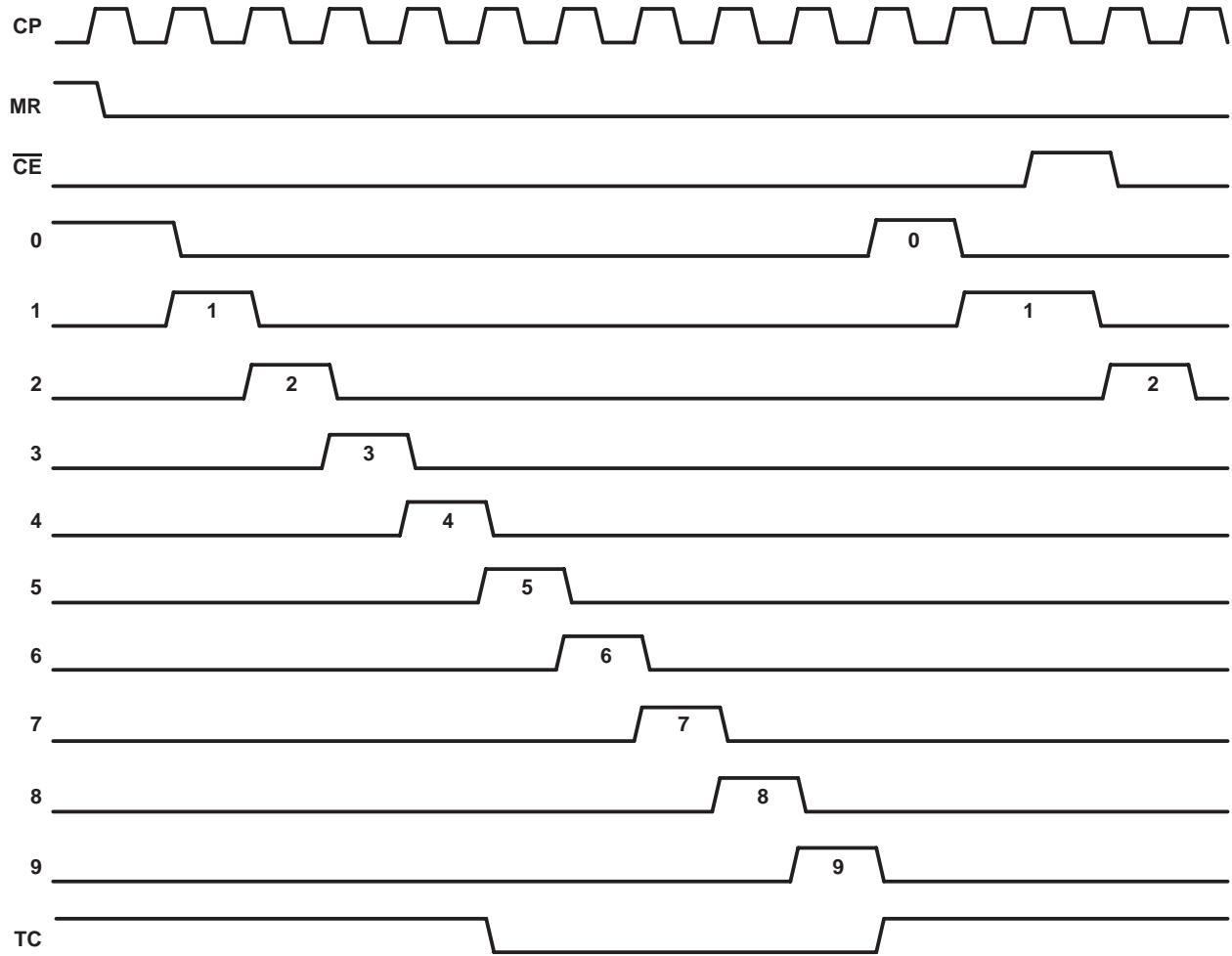
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timing requirements over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		V _{CC}	T _A = 25°C		MIN	MAX	UNIT
			MIN	MAX			
f _{clock}	Maximum clock frequency	2 V	6	4			MHz
		4.5 V	30	20			
		6 V	35	23			
t _w	Pulse duration	CP	2 V	80	120	ns	
			4.5 V	16	24		
			6 V	14	20		
		MR	2 V	80	120		
			4.5 V	16	24		
			6 V	14	20		
t _{su}	Setup time, \overline{CE} to CP	2 V	75	110		ns	
		4.5 V	15	22			
		6 V	13	19			
t _h	Hold time, \overline{CE} to CP	2 V	0	0		ns	
		4.5 V	0	0			
		6 V	0	0			
t _{rem}	Removal time, MR	2 V	5	5		ns	
		4.5 V	5	5			
		6 V	5	5			

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timing requirements



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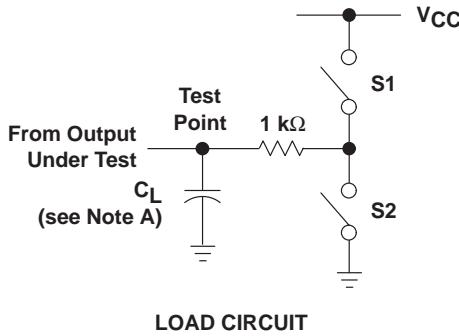
switching characteristics, $C_L = 50 \text{ pF}$, $T_A = 25^\circ\text{C}$ (see Figures 1 and 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	T _A = 25°C		T _A = -55°C TO 125°C		UNIT
				MIN	MAX	MIN	MAX	
f _{max}				2 V	6	4		MHz
				4.5 V	20	20		
				6 V	35	23		
t _{pd}	CP	Any output		2 V	230	345		ns
				4.5 V	46	69		
				6 V	39	59		
t _{pd}	TC			2 V	230	345		ns
				4.5 V	46	69		
				6 V	39	59		
t _{pd}	CE	Any output		2 V	250	375		ns
				4.5 V	50	75		
				6 V	43	64		
t _{pd}	TC			2 V	250	375		ns
				4.5 V	50	75		
				6 V	43	64		
t _{pd}	MR	Any output		2 V	230	345		ns
				4.5 V	46	69		
				6 V	39	59		
t _{pd}	TC			2 V	230	345		ns
				4.5 V	46	69		
				6 V	39	59		

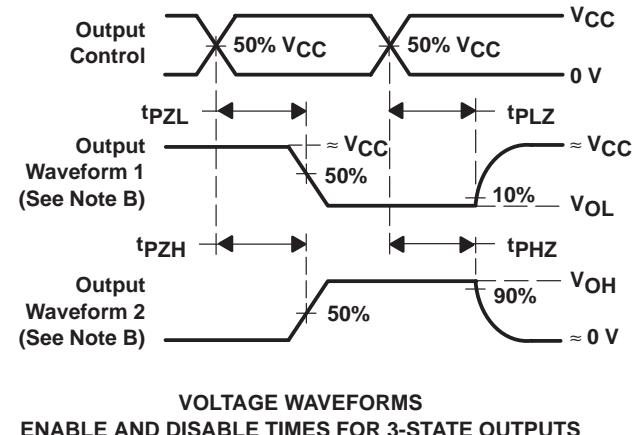
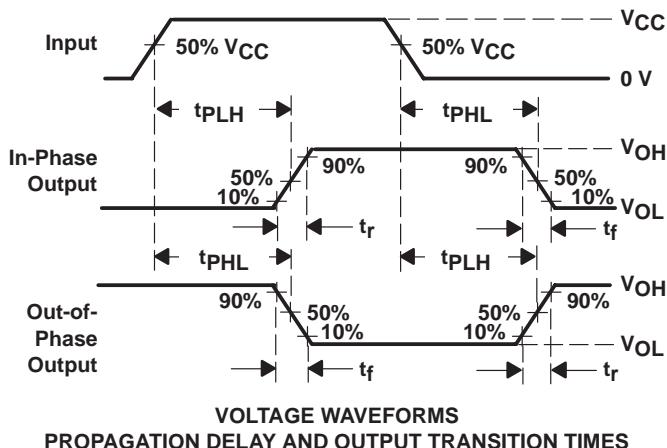
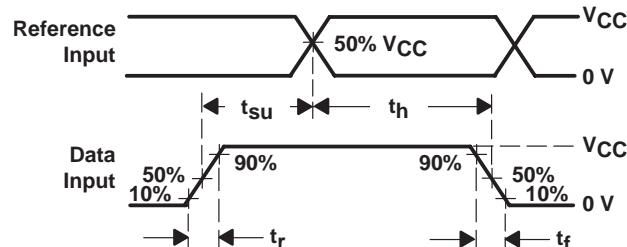
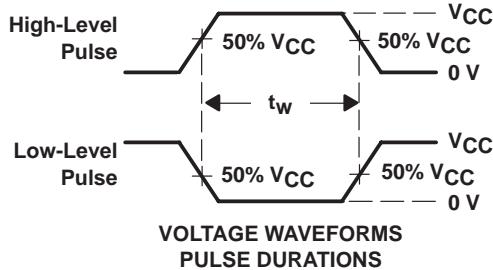
operating characteristics

PARAMETER		TEST CONDITIONS	TYP	UNIT
C _{pd}	Power dissipation capacitance	No load	39	pF

PARAMETER MEASUREMENT INFORMATION



PARAMETER	S1	S2
t_{en}	t_{PZH}	Open
	t_{PZL}	Closed
t_{dis}	t_{PHZ}	Open
	t_{PLZ}	Closed
t_{pd} or t_t	Open	Open



NOTES: A. C_L includes probe and test-fixture 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. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r = 6 \text{ ns}$, $t_f = 6 \text{ ns}$.
 D. The outputs are measured one at a time with one input 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 1. Load Circuit and Voltage Waveforms

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PARAMETER MEASUREMENT INFORMATION

INPUT LEVEL	V_{CC}
V_S	0.5 V_{CC}

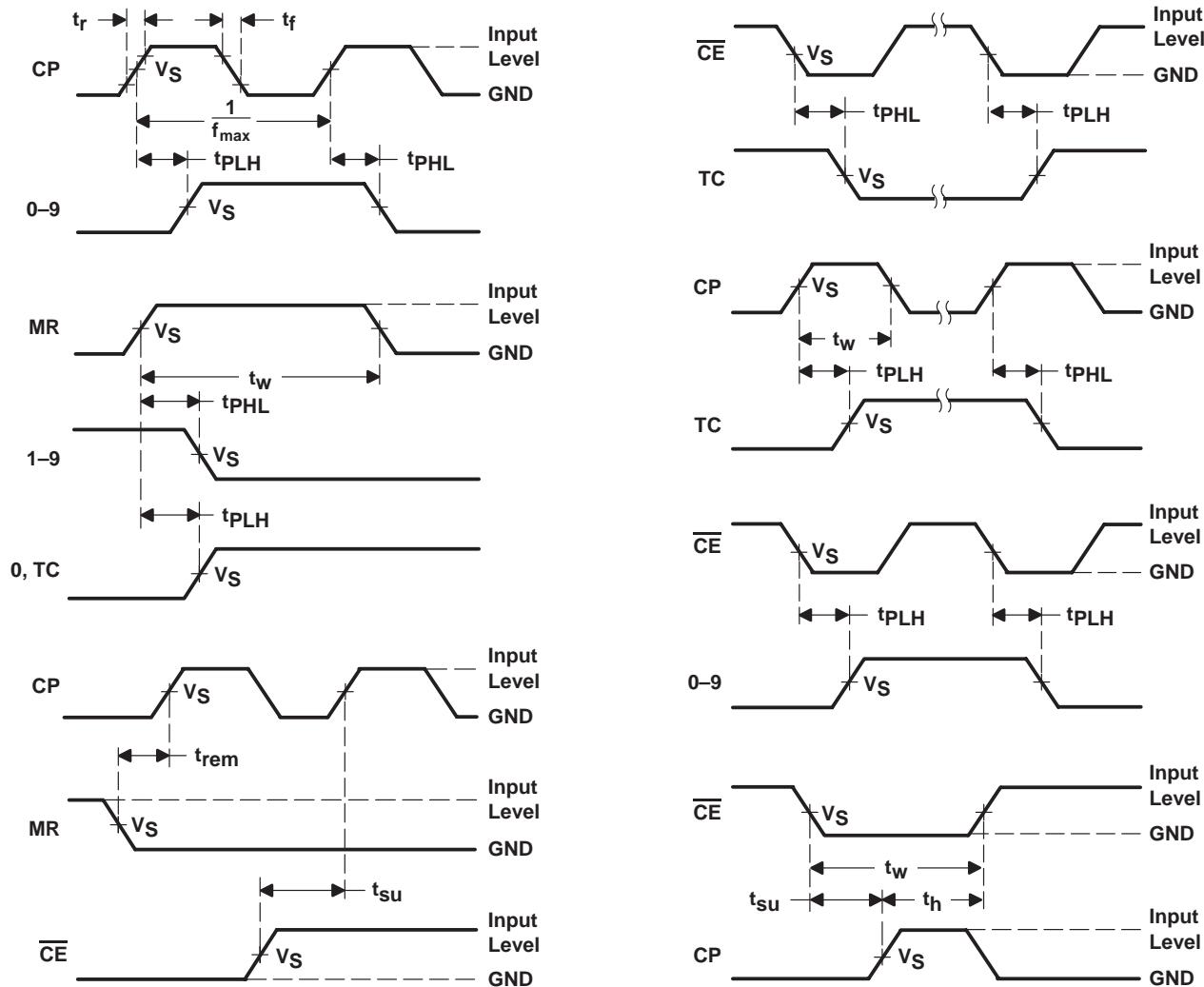


Figure 2. Voltage Waveforms

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