



U74HC165

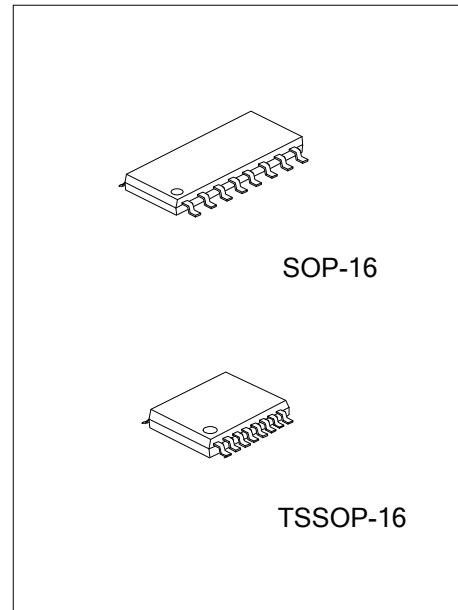
CMOS IC

8-BIT PARALLEL-LOAD SHIFT REGISTER

DESCRIPTION

The **U74HC165** is an 8-bit parallel-load shift register that, when clocked, shifts the data toward a serial (Q_H) output. Parallel-in access to each stage is provided by eight individual direct data (A-H) inputs that are enabled by a low level at shift/load (SH/\overline{LD}) input. The U74HC165 also features a clock-inhibit ($CLK\ INH$) function and a complementary serial (\overline{Q}_H) output.

Clocking is accomplished by a low-to-high transition of the clock (CLK) input while SH/\overline{LD} is held high and $CLK\ INH$ is held low. The functions of CLK and $CLK\ INH$ are interchangeable. Since a low CLK and a low-to-high transition of $CLK\ INH$ also accomplish clocking, $CLK\ INH$ should be changed to the high level only while CLK is high. Parallel loading is inhibited when SH/\overline{LD} is held high. While SH/\overline{LD} is low, the parallel inputs to the register are enabled independently of the levels of the CLK , $CLK\ INH$, or serial (SER) inputs.



FEATURES

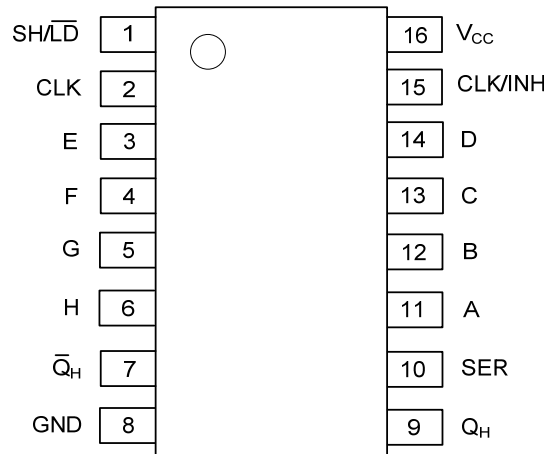
- * Complementary Outputs
- * Direct Overriding Load (Data) Inputs
- * Gated Clock Inputs
- * Parallel-to-Serial Data Conversion

ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74HC165L-S16-T	U74HC165G-S16-T	SOP-16	Tube
U74HC165L-S16-R	U74HC165G-S16-R	SOP-16	Tape Reel
U74HC165L-P16-T	U74HC165G-P16-T	TSSOP-16	Tube
U74HC165L-P16-R	U74HC165G-P16-R	TSSOP-16	Tape Reel

<p>U74HC165L-S16-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Lead Free</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) S16: SOP-16, P16: TSSOP-16</p> <p>(3) L: Lead Free, G: Halogen Free</p>
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■ PIN CONFIGURATION

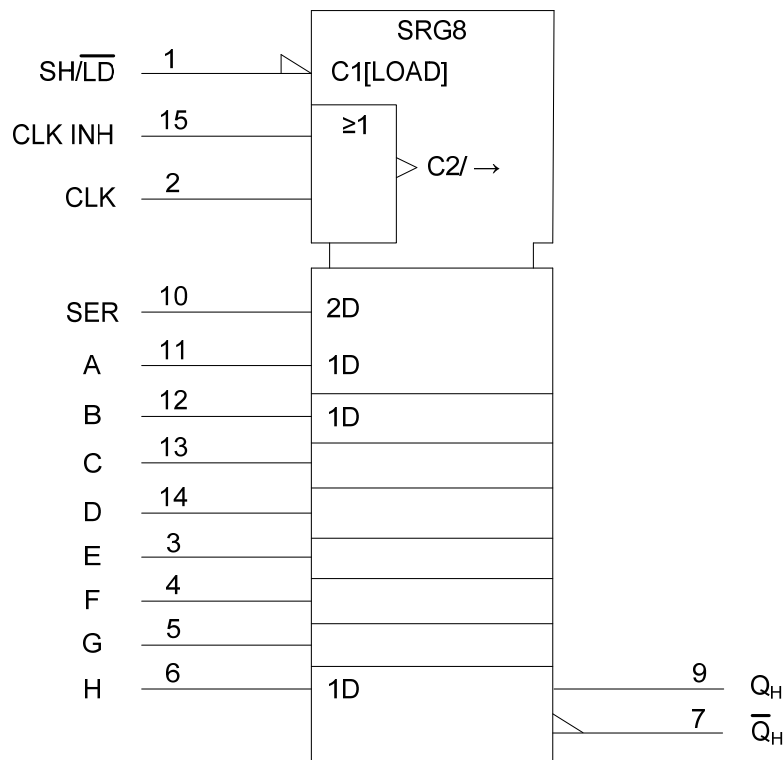


■ FUNCTION TABLE

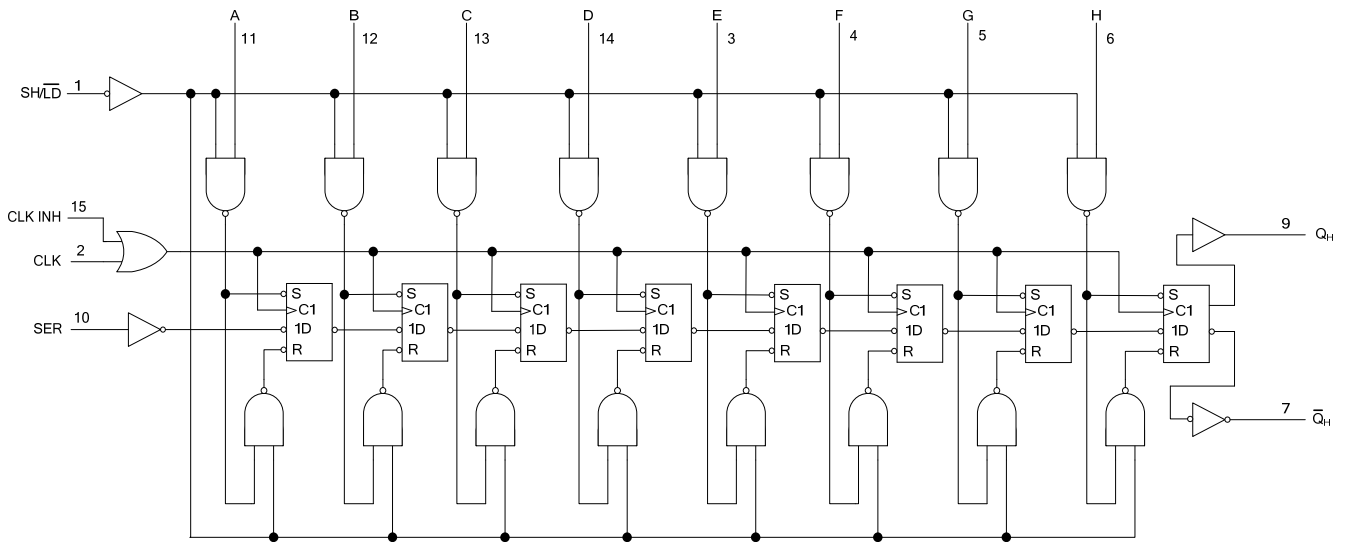
INPUTS			FUNCTION
SH/LD	CLK	CLK INH	
L	X	X	Parallel load
H	H	X	No change
H	X	H	No change
H	L	↑	Shift↑
H	↑	L	Shift↑

↑ Shift=content of each internal register shifts toward serial output Q_H. Data at SER is shifted into the first register.

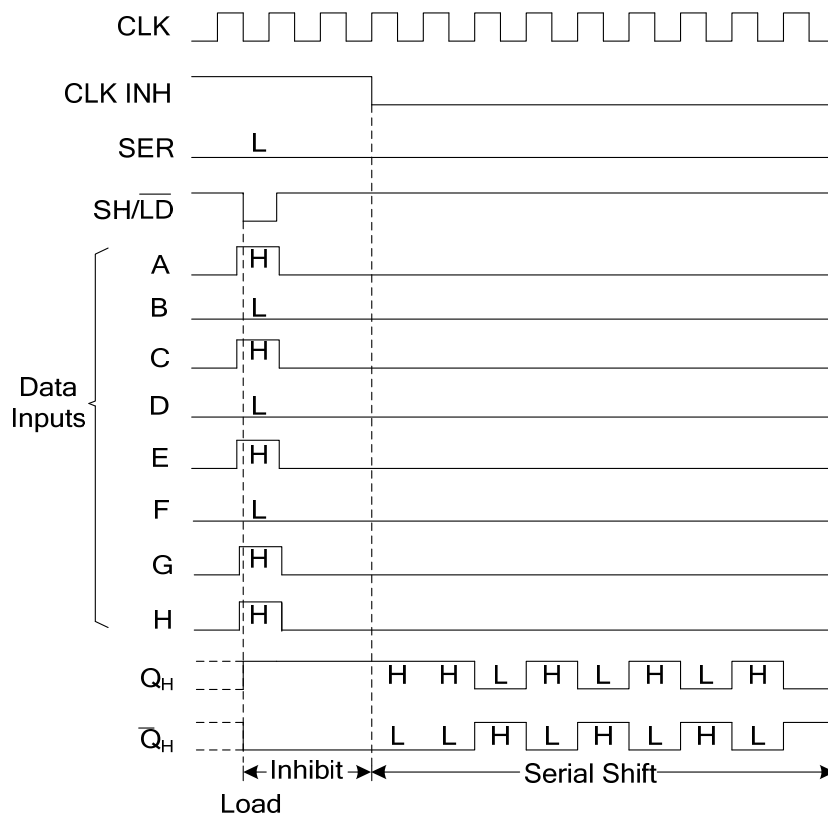
■ LOGIC SYMBOL



■ LOGIC DIAGRAM (positive logic)



■ TYPICAL SHIFT, LOAD, AND INHIBIT SEQUENCE



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	-0.5 ~ 7	V
V_{CC} or GND Current	I_{CC}	±50	mA
Output Current	I_{OUT}	±25	mA
Input Clamp Current	I_{IK}	±20	mA
Output Clamp Current	I_{OK}	±20	mA
Storage Temperature	T_{STG}	-65 ~ + 150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.
 Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ THERMAL RESISTANCES

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	73	°C/W
		110	

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{CC}		2	5	6	V
High-level Input Voltage	V_{IH}	$V_{CC}=2V$	1.5			V
		$V_{CC}=4.5V$	3.15			
		$V_{CC}=6V$	4.2			
Low-level Input Voltage	V_{IL}	$V_{CC}=2V$			0.5	V
		$V_{CC}=4.5V$			1.35	
		$V_{CC}=6V$			1.8	
Input Voltage	V_{IN}		0		V_{CC}	V
Output Voltage	V_{OUT}		0		V_{CC}	V
Input Transition (Rise and Fall) Time	t_t	$V_{CC}=2V$			1000	ns
		$V_{CC}=4.5V$			500	
		$V_{CC}=6V$			400	
Operating Free-air Temperature	T_A		-40		+85	°C

■ ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ C$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage High-Level	V_{OH}	$V_{CC}=2V, I_{OH}=-20\mu A$	1.9	1.998		V
		$V_{CC}=4.5V, I_{OH}=-20\mu A$	4.4	4.499		
		$V_{CC}=6V, I_{OH}=-20\mu A$	5.9	5.999		
		$V_{CC}=4.5V, I_{OH}=-4mA$	3.98	4.3		
		$V_{CC}=6V, I_{OH}=-5.2mA$	5.48	5.8		
Output Voltage Low-Level	V_{OL}	$V_{CC}=2V, I_{OL}=20\mu A$		0.002	0.1	V
		$V_{CC}=4.5V, I_{OL}=20\mu A$		0.001	0.1	
		$V_{CC}=6V, I_{OL}=20\mu A$		0.001	0.1	
		$V_{CC}=4.5V, I_{OL}=4mA$		0.17	0.26	
		$V_{CC}=6V, I_{OL}=5.2mA$		0.15	0.26	
Input Leakage Current	$I_{I(LEAK)}$	$V_{CC}=6V, V_{IN}=V_{CC}$ or GND		±0.1	±100	nA
Quiescent Supply Current	I_{CC}	$V_{CC}=6V, V_{IN}=V_{CC}$ or GND, $I_{OUT}=0$			8	µA
Input Capacitance	C_I	$V_{CC}=2V$ to 6V		3	10	pF

■ TIMING REQUIREMENTS ($T_A = 25^\circ C$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Clock frequency	f_{clock}	$V_{CC}=2V$	0		6	MHz
		$V_{CC}=4.5V$	0		31	
		$V_{CC}=6V$	0		36	

■ TIMING REQUIREMENTS(Cont.)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Pulse duration	SH/ $\overline{\text{LD}}$ low	t_w	$V_{CC}=2V$	80			ns
			$V_{CC}=4.5V$	16			
			$V_{CC}=6V$	14			
	CLK high or low		$V_{CC}=2V$	80			
			$V_{CC}=4.5V$	16			
			$V_{CC}=6V$	14			
Setup time	SH/ $\overline{\text{LD}}$ high before CLK \uparrow	t_{su}	$V_{CC}=2V$	80			ns
			$V_{CC}=4.5V$	16			
			$V_{CC}=6V$	14			
	SER before CLK \uparrow		$V_{CC}=2V$	40			
			$V_{CC}=4.5V$	8			
			$V_{CC}=6V$	7			
	CLK INH low before CLK \uparrow		$V_{CC}=2V$	100			
			$V_{CC}=4.5V$	20			
			$V_{CC}=6V$	17			
	CLK INH high before CLK \uparrow		$V_{CC}=2V$	40			
			$V_{CC}=4.5V$	8			
			$V_{CC}=6V$	7			
Data before SH/ $\overline{\text{LD}}$ \downarrow	$V_{CC}=2V$	100					
	$V_{CC}=4.5V$	20					
	$V_{CC}=6V$	17					
Hold time	SER data after CLK \uparrow	t_h	$V_{CC}=2V$	5			ns
			$V_{CC}=4.5V$	5			
			$V_{CC}=6V$	5			
	PAR data after SH/ $\overline{\text{LD}}$ \downarrow		$V_{CC}=2V$	5			
			$V_{CC}=4.5V$	5			
			$V_{CC}=6V$	5			

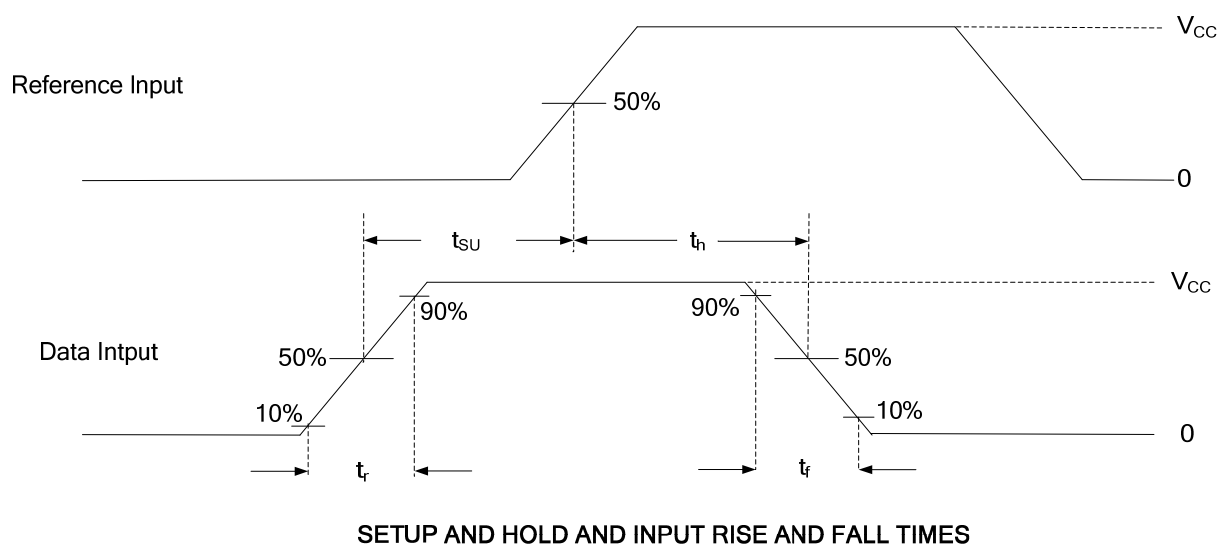
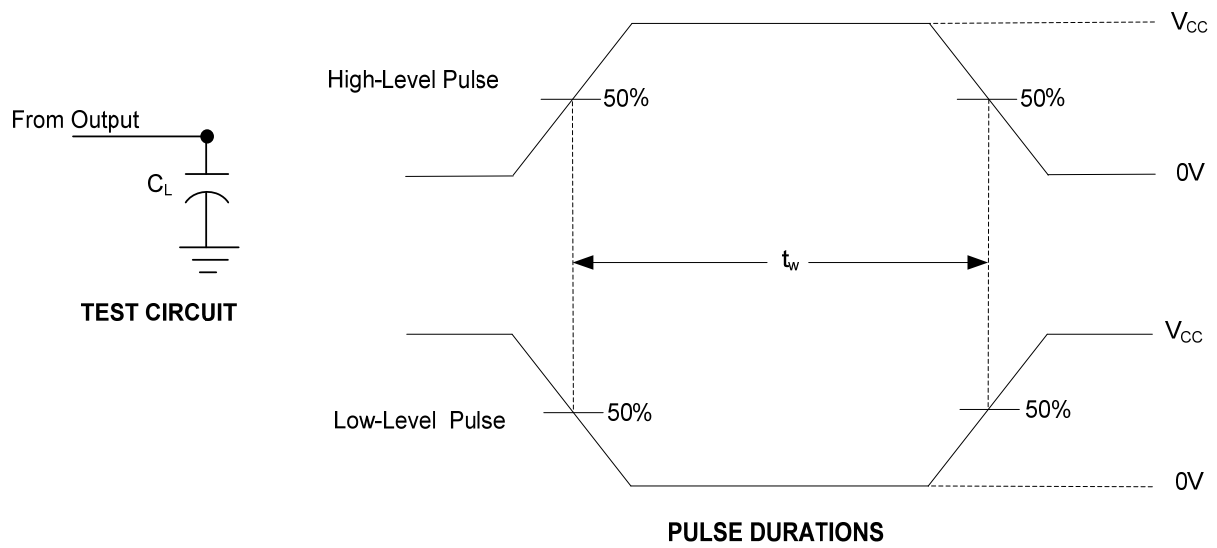
■ SWITCHING CHARACTERISTICS ($t_r = t_f = 6\text{ns}$, $C_L = 50\text{pF}$, $T_A = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	V_{CC}	MIN	TYP	MAX	UNIT
Minimum Frequency Response	f_{max}	$V_{CC}=2V$	6	13		ns
		$V_{CC}=4.5V$	31	50		
		$V_{CC}=6V$	36	62		
Propagation delay from input (SH/ $\overline{\text{LD}}$) to output(QH or $\overline{\text{Q}}_H$)	t_{PD}	$V_{CC}=2V$		80	150	ns
		$V_{CC}=4.5V$		20	30	
		$V_{CC}=6V$		16	26	
Propagation delay from input (CLK) to output(QH or $\overline{\text{Q}}_H$)		$V_{CC}=2V$		75	150	
		$V_{CC}=4.5V$		15	30	
		$V_{CC}=6V$		13	26	
Propagation delay from input (H) to output(QH or $\overline{\text{Q}}_H$)		$V_{CC}=2V$		75	150	
		$V_{CC}=4.5V$		15	30	
		$V_{CC}=6V$		13	26	
To Output(Any)	t_t	$V_{CC}=2V$		38	75	ns
		$V_{CC}=4.5V$		8	15	
		$V_{CC}=6V$		6	13	

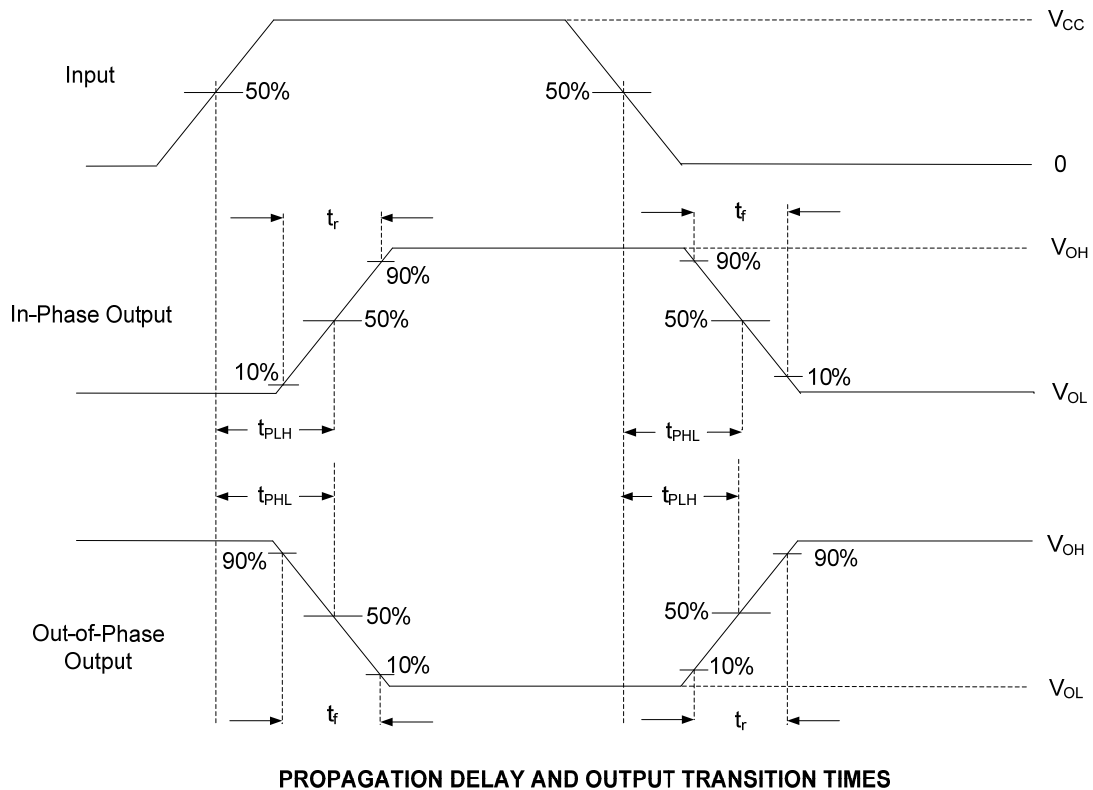
■ OPERATING CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	C_{PD}	No load		75		pF

■ TEST CIRCUIT AND WAVEFORMS



■ TEST CIRCUIT AND WAVEFORMS(Cont.)



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