

8-BIT PIPO SHIFT REGISTER WITH ASYNCHRONOUS CLEAR

The TC74ACT299 is an advanced high speed CMOS 8-BIT PIPO SHIFT REGISTER fabricated with silicon gate and double-layer metal wiring C²MOS technology.

It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

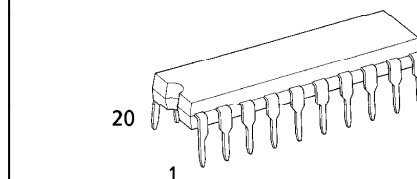
This device may be used as a level converter for interfacing TTL or NMOS to High Speed CMOS. The inputs are compatible with TTL, NMOS and CMOS output voltage levels.

It has a four modes (HOLD, SHIFT LEFT, SHIFT RIGHT and LOAD DATA) controlled by the two selection inputs (S0, S1).

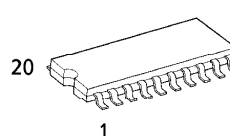
When one or both enable (G1, G2) are high, the eight I/O outputs are forced to the high-impedance state; however, sequential operation or clearing of the register is not affected. All inputs are equipped with protection circuits against static discharge or transient excess voltage.

FEATURES:

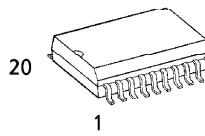
- High Speed..... $f_{MAX} = 130\text{MHz}$ (typ.)
at $V_{CC} = 5\text{V}$
- Low Power Dissipation..... $I_{CC} = 8\mu\text{A}$ (Max.) at $T_a = 25^\circ\text{C}$
- Compatible with TTL outputs $V_{IL} = 0.8\text{V}$ (Max.)
 $V_{IH} = 2.0\text{V}$ (Min.)
- Symmetrical Output Impedance... $|I_{OH}| = I_{OL} = 24\text{mA}$ (Min.)
Capability of driving 50 Ω transmission lines.
- Balanced Propagation Delays..... $t_{PLH} \approx t_{PHL}$
- Pin and Function Compatible with 74F299



P (DIP20—P—300A)
Weight : 1.30g (TYP.)



F (SOP20—P—300)
Weight : 0.22g (TYP.)



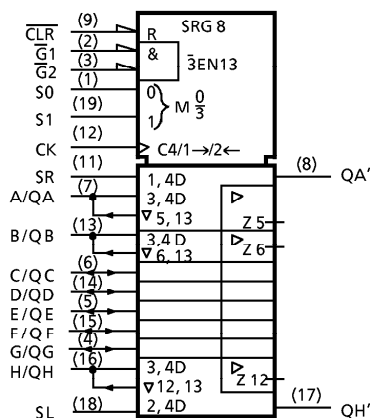
FW (SOL20—P—300)
Weight : 0.46g (TYP.)

PIN ASSIGNMENT

S0	1	20	V _{CC}
$\overline{G1}$	2	19	S1
$\overline{G2}$	3	18	SL
G/QG	4	17	QH'
E/QE	5	16	H/QH
C/QC	6	15	F/QF
A/QA	7	14	D/QD
QA'	8	13	B/QB
$\overline{CLR}$	9	12	CK
GND	10	11	SR

(TOP VIEW)

IEC LOGIC SYMBOL



APPLICATION NOTES

- 1) Do not apply a signal to any bus terminal when it is in the output mode. Damage may result.
- 2) All floating (high impedance) bus terminals must have their input levels fixed by means of pull up or pull down resistors.

TRUTH TABLE

MODE	INPUTS								INPUTS/ OUTPUTS		OUTPUTS	
	$\overline{\text{CLR}}$	FUNCTION SELECT		OUTPUT CONTROL		CK	SERIAL		A/QA	H/QH	QA'	QH'
		S1	S0	$\overline{\text{G1}}^*$	$\overline{\text{G2}}^*$		SL	SR				
Z	L	H	H	X	X	X	X	X	Z	Z	L	L
CLEAR	L	L	X	L	L	X	X	X	L	L	L	L
	L	X	L	L	L	X	X	X	L	L	L	L
HOLD	H	L	L	L	L	X	X	X	QA0	QH0	QA0	QH0
SHIFT	H	L	H	L	L	$\uparrow$	X	H	H	QGn	H	QGn
RIGHT	H	L	H	L	L	$\uparrow$	X	L	L	QGn	L	QGn
SHIFT	H	H	L	L	L	$\uparrow$	H	X	QBn	H	QBn	H
LEFT	H	H	L	L	L	$\uparrow$	L	X	QBn	L	QBn	L
LOAD	H	H	H	X	X	$\uparrow$	X	X	a	h	a	h

* When one or both output controls are high, the eight input/output terminals are in the high-impedance state; however sequential or clearing of the register is not affected.

Z : High Impedance

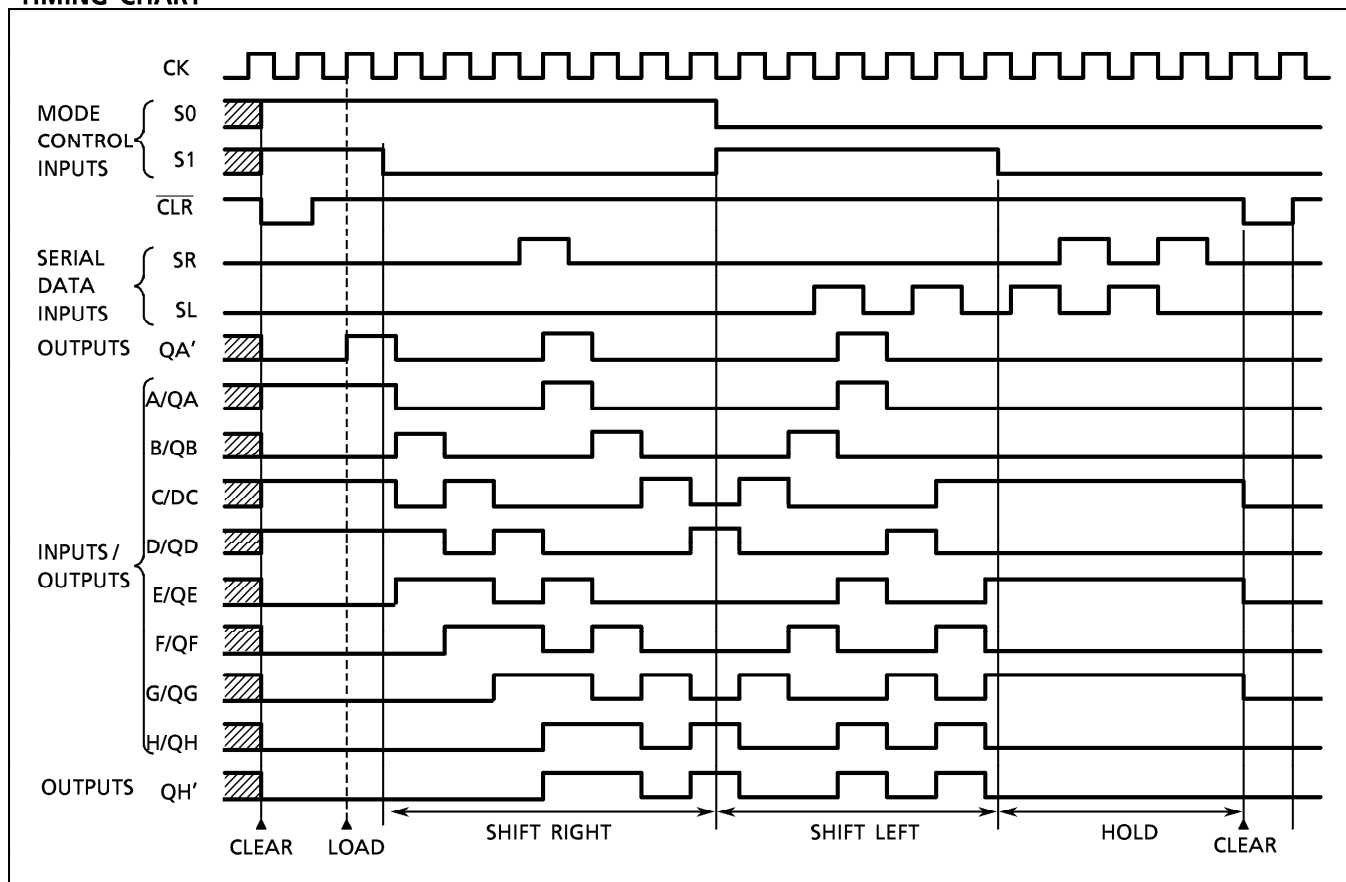
Qn0 : The level of Qn before the indicated steady - state input conditions were established.

Qnn : The level of Qn before the most recent active transition indicated by $\downarrow$ or $\uparrow$.

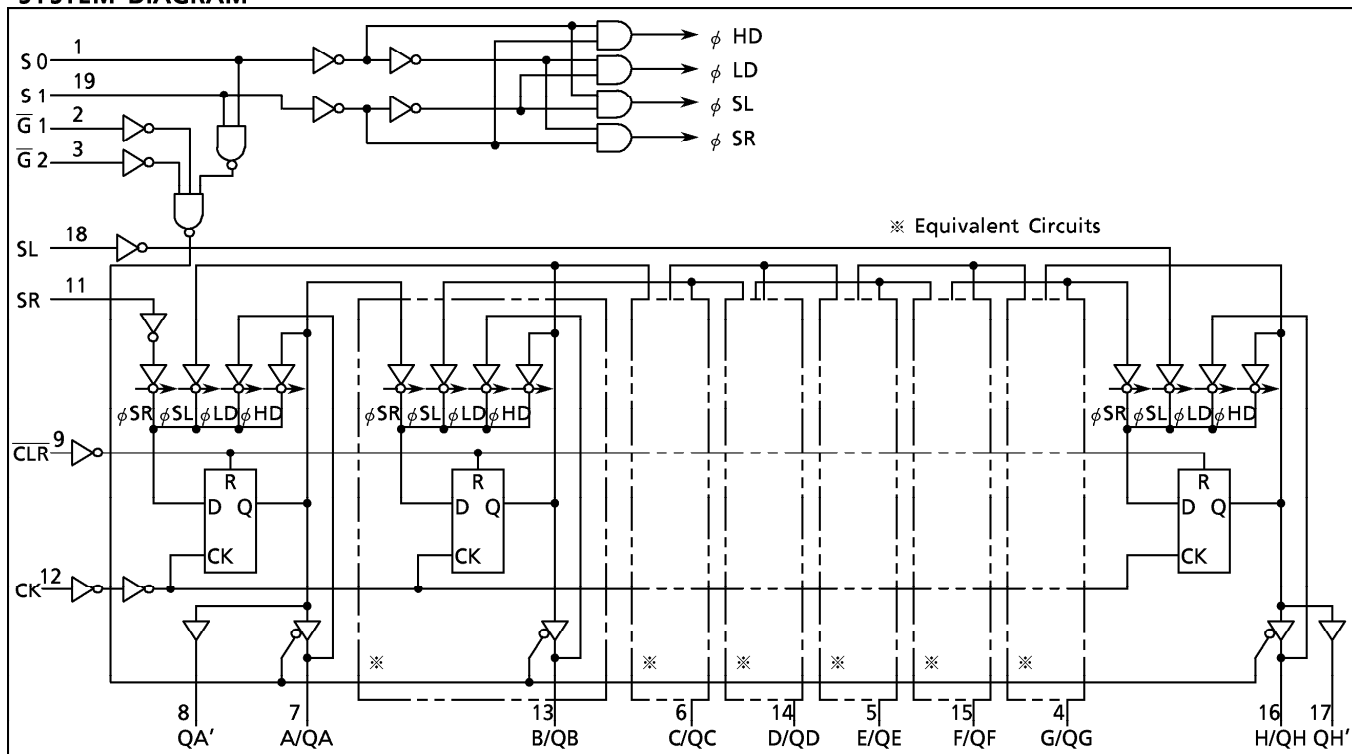
a, h : The level of the steady - state inputs A, H, respectively.

X : Don't Care.

TIMING CHART



SYSTEM DIAGRAM



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	$-0.5 \sim 7.0$	V
DC Input Voltage	V_{IN}	$-0.5 \sim V_{CC} + 0.5$	V
DC Output Voltage	V_{OUT}	$-0.5 \sim V_{CC} + 0.5$	V
Input Diode Current	I_{IK}	± 20	mA
Output Diode Current	I_{OK}	± 50	mA
DC Output Current	I_{OUT}	± 50	mA
DC V_{CC} /Ground Current	I_{CC}	± 250	mA
Power Dissipation	P_D	500 (DIP)* / 180 (SOP)	mW
Storage Temperature	T_{stg}	$-65 \sim 150$	$^{\circ}\text{C}$

*500mW in the range of $T_a = -40^{\circ}\text{C} \sim 65^{\circ}\text{C}$. From $T_a = 65^{\circ}\text{C}$ to 85°C a derating factor of $-10\text{mW}/^{\circ}\text{C}$ should be applied up to 300mW.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V_{CC}	4.5~5.5	V
Input Voltage	V_{IN}	0~ V_{CC}	V
Output Voltage	V_{OUT}	0~ V_{CC}	V
Operating Temperature	T_{opr}	$-40 \sim 85$	$^{\circ}\text{C}$
Input Rise and Fall Time	dt/dV	0~10	ns/V

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		V _{CC} (V)	Ta = 25°C			Ta = -40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
High - Level Input Voltage	V _{IH}			4.5 5.5	2.0	—	—	2.0	—	V
Low - Level Input Voltage	V _{IL}			4.5 5.5	—	—	0.8	—	0.8	V
High - Level Output Voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -50μA I _{OH} = -24mA I _{OH} = -75mA*	4.5 4.5 5.5	4.4 3.94 —	4.5 — —	— — —	4.4 3.80 3.85	— — —	V
Low - Level Output Voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 50μA I _{OL} = 24mA I _{OL} = 75mA*	4.5 4.5 5.5	— — —	0.0 — —	0.1 0.36 —	— — —	0.1 0.44 1.65	V
3 - State Output Off - State Current	I _{OZ}	V _{IN} = V _{IH} or V _{IL} V _{OUT} = V _{CC} or GND		5.5	—	—	± 0.5	—	± 5.0	μA
Input Leakage Current	I _{IN}	V _{IN} = V _{CC} or GND		5.5	—	—	± 0.1	—	± 1.0	
Quiescent Supply Current	I _{CC}	V _{IN} = V _{CC} or GND		5.5	—	—	8.0	—	80.0	
	I _C	PER INPUT: V _{IN} = 3.4V OTHER INPUT: V _{CC} or GND		5.5	—	—	1.35	—	1.5	mA

* : This spec indicates the capability of driving 50Ω transmission lines.

One output should be tested at a time for a 10ms maximum duration.

TIMING REQUIREMENTS (Input t_r = t_f = 3ns)

PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C	Ta = -40~85°C	UNIT
			V _{CC} (V)	LIMIT	LIMIT	
Minimum Pulse Width (CK)	t _W (L) t _W (H)		5.0 ± 0.5	5.0	5.0	ns
Minimum Pulse Width (CLR)	t _W (L)		5.0 ± 0.5	5.0	5.0	
Minimum Set - up Time (SL, SR, A~H)	t _s		5.0 ± 0.5	3.5	3.5	
Minimum Set - up Time (S0, S1)	t _s		5.0 ± 0.5	6.0	6.5	
Minimum Hold Time (SL, SR, A~H)	t _h		5.0 ± 0.5	2.0	2.0	
Minimum Hold Time (S0, S1)	t _h		5.0 ± 0.5	0.0	0.0	
Minimum Removal Time (CLR)	t _{rem}		5.0 ± 0.5	2.0	2.0	

AC ELECTRICAL CHARACTERISTICS ($C_L = 50\text{pF}$, $R_L = 500\Omega$, $t_r = t_f = 3\text{ns}$)

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C			Ta = -40~85°C		UNIT
			V _{CC} (V)	MIN.	TYP.	MAX.	MIN.	MAX.
Propagation Delay Time (CK-QA', QH')	t_{pLH} t_{pHL}		5.0 ± 0.5	—	7.2	10.5	1.0	12.0
Propagation Delay Time (CLR-QA', QH')	t_{pHL}		5.0 ± 0.5	—	6.0	10.0	1.0	11.5
Propagation Delay Time (CK-QA~QH)	t_{pLH} t_{pHL}		5.0 ± 0.5	—	7.4	11.4	1.0	13.0
Propagation Delay Time (CLR-QA~QH)	t_{pHL}		5.0 ± 0.5	—	6.3	10.5	1.0	12.0
Output Enable Time	t_{pZL} t_{pZH}		5.0 ± 0.5	—	7.4	11.4	1.0	13.0
Output Disable Time	t_{pLZ} t_{pHZ}		5.0 ± 0.5	—	7.2	9.6	1.0	11.0
Maximum Clock Frequency	f _{MAX}		5.0 ± 0.5	80	120	—	80	—
Input Capacitance	C _{IN}			—	5	10	—	10
Bus Input Capacitance	C _{I/O}			—	13	—	—	—
Power Dissipation Capacitance	C _{PD} (1)			—	160	—	—	—

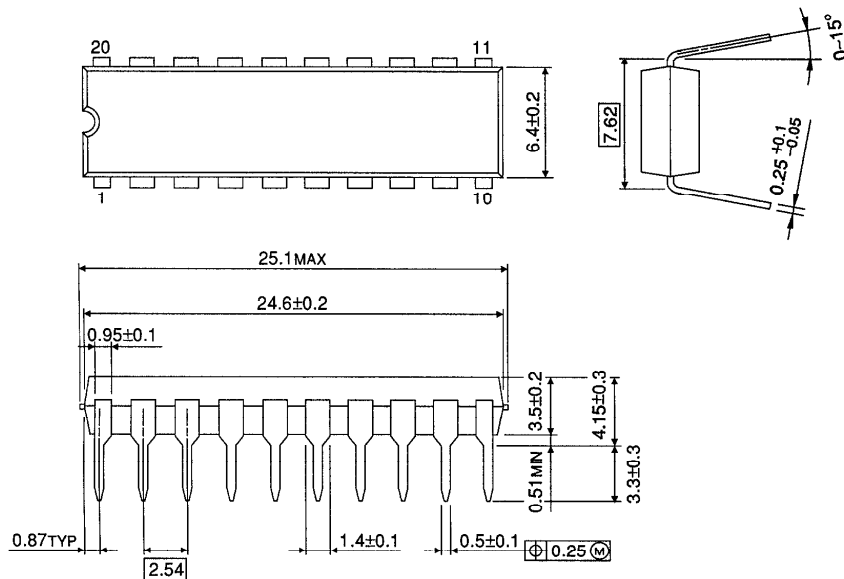
Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

DIP 20PIN OUTLINE DRAWING (DIP20—P—300A)

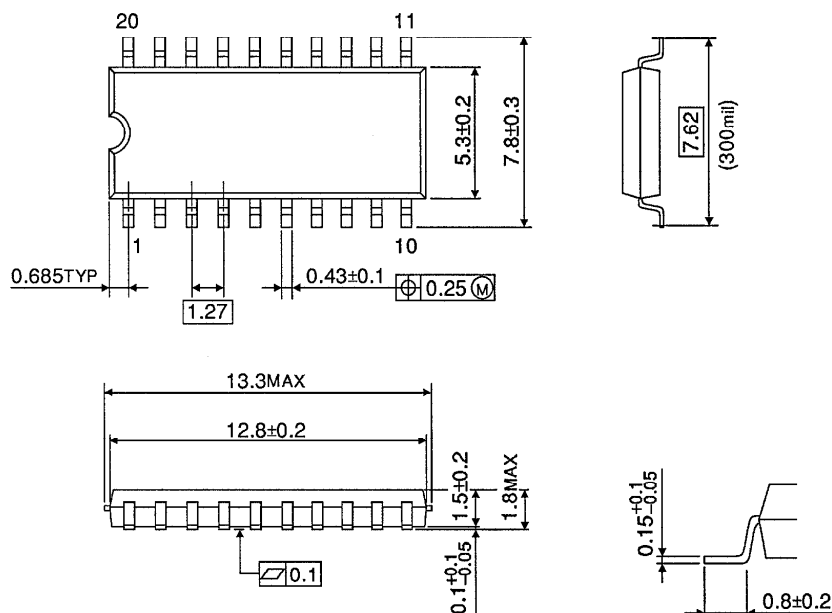
Unit in mm



Weight : 1.30g (TYP.)

SOP 20PIN (200mil BODY) OUTLINE DRAWING (SOP20—P—300)

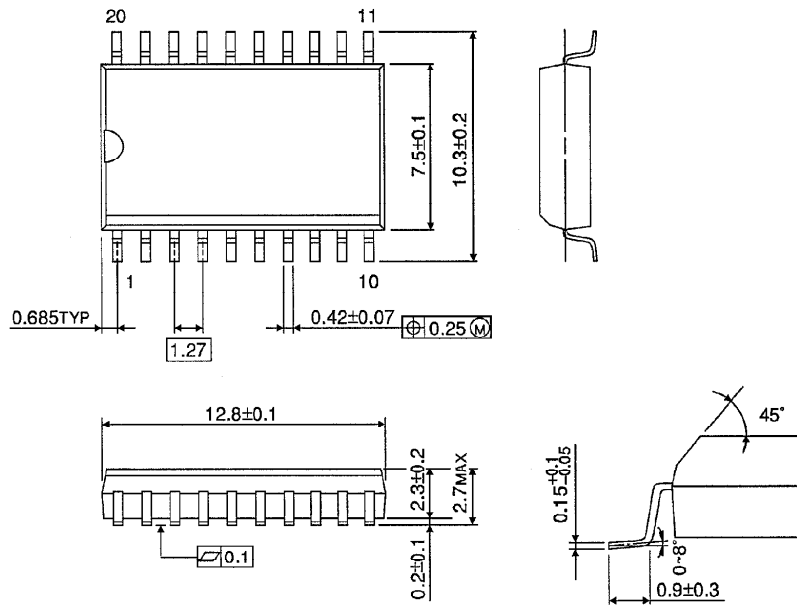
Unit in mm



Weight : 0.22g (TYP.)

SOP 20PIN (300mil BODY) OUTLINE DRAWING (SOL20-P-300)

Unit in mm



Weight : 0.46g (TYP.)