

MC74HCT595A

8-Bit Serial-Input/Serial or Parallel-Output Shift Register with Latched 3-State Outputs and LSTTL Compatible Inputs

High-Performance Silicon-Gate CMOS

The MC74HCT595A consists of an 8-bit shift register and an 8-bit D-type latch with three-state parallel outputs. The shift register accepts serial data and provides a serial output. The shift register also provides parallel data to the 8-bit latch. The shift register and latch have independent clock inputs. This device also has an asynchronous reset for the shift register.

The HCT595A directly interfaces with the SPI serial data port on CMOS MPUs and MCUs. The device inputs are compatible with standard CMOS or LSTTL outputs.

Features

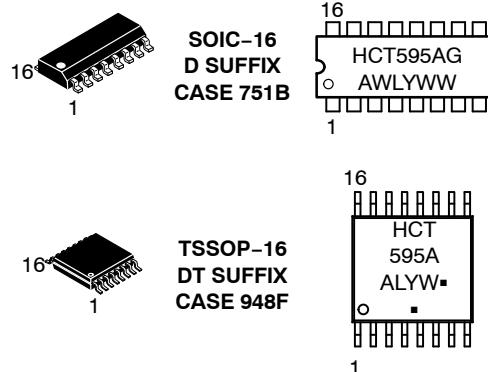
- Output Drive Capability: 15 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 4.5 to 5.5 V
- Low Input Current: 1.0 μ A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance with the Requirements Defined by JEDEC Standard No. 7A
- Chip Complexity: 328 FETs or 82 Equivalent Gates
- Improvements over HC595 / HCT595
 - Improved Propagation Delays
 - 50% Lower Quiescent Power
 - Improved Input Noise and Latchup Immunity
- Pb-Free Packages are Available*



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MARKING DIAGRAMS



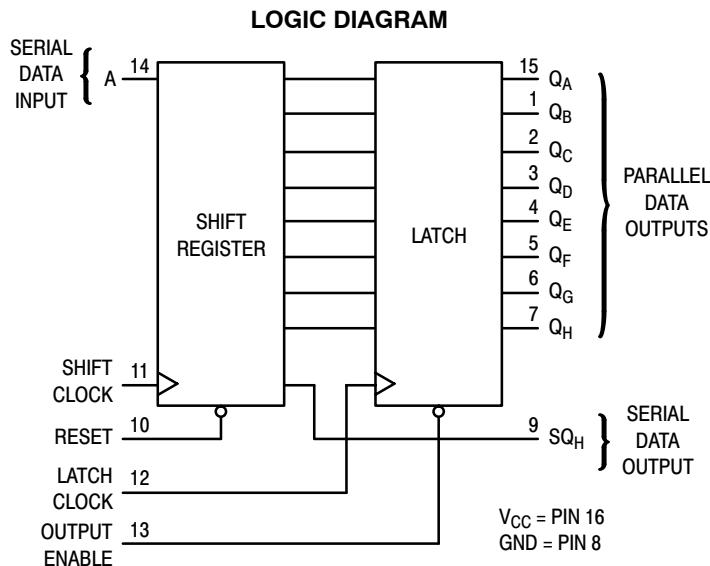
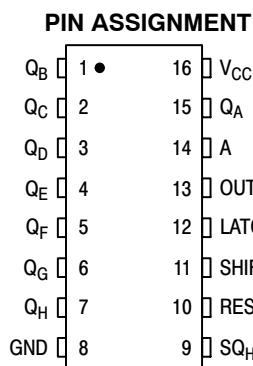
A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week
G, ■ = Pb-Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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ORDERING INFORMATION

Device	Package	Shipping [†]
MC74HCT595ADG	SOIC-16 (Pb-Free)	48 Units / Rail
MC74HCT595ADR2G	SOIC-16 (Pb-Free)	2500 Tape & Reel
MC74HCT595ADTG	TSSOP-16*	96 Units / Rail
MC74HCT595ADTR2G	TSSOP-16* (Pb-Free)	2500 Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*This package is inherently Pb-Free.

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MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	– 0.5 to + 7.0	V
V_{in}	DC Input Voltage (Referenced to GND)	– 0.5 to V_{CC} + 0.5	V
V_{out}	DC Output Voltage (Referenced to GND)	– 0.5 to V_{CC} + 0.5	V
I_{in}	DC Input Current, per Pin	± 20	mA
I_{out}	DC Output Current, per Pin	± 35	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	± 75	mA
P_D	Power Dissipation in Still Air, SOIC Package† TSSOP Package†	500 450	mW
T_{stg}	Storage Temperature	– 65 to + 150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds (Plastic DIP, SOIC or TSSOP Package)	260	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

†Derating — SOIC Package: – 7 mW/°C from 65° to 125°C
TSSOP Package: – 6.1 mW/°C from 65° to 125°C

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range $GND \leq (V_{in} \text{ or } V_{out}) \leq V_{CC}$. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	4.5	5.5	V
V_{in}, V_{out}	DC Input Voltage, Output Voltage (Referenced to GND)	0	V_{CC}	V
T_A	Operating Temperature Range, All Package Types	– 55	+ 125	°C
t_r, t_f	Input Rise/Fall Time (Figure 1)	0	500	ns

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DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V_{CC} V	Guaranteed Limit			Unit
				-55 to 25°C	≤ 85°C	≤ 125°C	
V_{IH}	Minimum High-Level Input Voltage	$V_{out} = 0.1 \text{ V or } V_{CC} - 0.1 \text{ V}$ $ I_{out} \leq 20 \mu\text{A}$	4.5 to 5.5	2.0	2.0	2.0	V
V_{IL}	Maximum Low-Level Input Voltage	$V_{out} = 0.1 \text{ V or } V_{CC} - 0.1 \text{ V}$ $ I_{out} \leq 20 \mu\text{A}$	4.5 to 5.5	0.8	0.8	0.8	V
V_{OH}	Minimum High-Level Output Voltage, $Q_A - Q_H$	$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out} \leq 20 \mu\text{A}$	4.5	4.4	4.4	4.4	V
		$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out} \leq 6.0 \text{ mA}$	4.5	3.98	3.84	3.7	
V_{OL}	Maximum Low-Level Output Voltage, $Q_A - Q_H$	$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out} \leq 20 \mu\text{A}$	4.5	0.1	0.1	0.1	V
		$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out} \leq 6.0 \text{ mA}$	4.5	0.26	0.33	0.4	
V_{OH}	Minimum High-Level Output Voltage, SQ_H	$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out} \leq 20 \mu\text{A}$	4.5	4.4	4.4	4.4	V
		$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out} \leq 4.0 \text{ mA}$	4.5	3.98	3.84	3.7	
V_{OL}	Maximum Low-Level Output Voltage, SQ_H	$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out} \leq 20 \mu\text{A}$	4.5	0.1	0.1	0.1	V
		$V_{in} = V_{IH} \text{ or } V_{IL}$ $ I_{out} \leq 4.0 \text{ mA}$	4.5	0.26	0.33	0.4	
I_{in}	Maximum Input Leakage Current	$V_{in} = V_{CC} \text{ or GND}$	5.5	± 0.1	± 1.0	± 1.0	μA
I_{OZ}	Maximum Three-State Leakage Current, $Q_A - Q_H$	Output in High-Impedance State $V_{in} = V_{IL} \text{ or } V_{IH}$ $V_{out} = V_{CC} \text{ or GND}$	5.5	± 0.5	± 5.0	± 10	μA
I_{CC}	Maximum Quiescent Supply Current (per Package)	$V_{in} = V_{CC} \text{ or GND}$ $I_{out} = 0 \mu\text{A}$	5.5	4.0	40	160	μA
ΔI_{CC}	Additional Quiescent Supply Current	$V_{in} = 2.4 \text{ V, Any One Input}$ $V_{in} = V_{CC} \text{ or GND, Other Inputs}$ $I_{out} = 0 \mu\text{A}$	5.5	$\geq -55^\circ\text{C}$	$25 \text{ to } 125^\circ\text{C}$		mA
				2.9	2.4		

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AC ELECTRICAL CHARACTERISTICS (C_L = 50 pF, Input t_r = t_f = 6.0 ns)

Symbol	Parameter	V _{CC} V	Guaranteed Limit			Unit
			-55 to 25°C	≤ 85°C	≤ 125°C	
f _{max}	Maximum Clock Frequency (50% Duty Cycle) (Figures 1 and 7)	4.5 to 5.5	30	24	20	MHz
t _{PLH} , t _{PHL}	Maximum Propagation Delay, Shift Clock to SQ _H (Figures 1 and 7)	4.5 to 5.5	28	35	42	ns
t _{PHL}	Maximum Propagation Delay, Reset to SQ _H (Figures 2 and 7)	4.5 to 5.5	29	36	44	ns
t _{PLH} , t _{PHL}	Maximum Propagation Delay, Latch Clock to Q _A – Q _H (Figures 3 and 7)	4.5 to 5.5	28	35	42	ns
t _{PLZ} , t _{PZH}	Maximum Propagation Delay, Output Enable to Q _A – Q _H (Figures 4 and 8)	4.5 to 5.5	30	38	45	ns
t _{PZL} , t _{PZH}	Maximum Propagation Delay, Output Enable to Q _A – Q _H (Figures 4 and 8)	4.5 to 5.5	27	34	41	ns
t _{TLH} , t _{THL}	Maximum Output Transition Time, Q _A – Q _H (Figures 3 and 7)	4.5 to 5.5	12	15	18	ns
t _{TLH} , t _{THL}	Maximum Output Transition Time, SQ _H (Figures 1 and 7)	4.5 to 5.5	15	19	22	ns
C _{in}	Maximum Input Capacitance	—	10	10	10	pF
C _{out}	Maximum Three-State Output Capacitance (Output in High-Impedance State), Q _A – Q _H	—	15	15	15	pF
C _{PD}	Power Dissipation Capacitance (Per Package)*	Typical @ 25°C, V _{CC} = 5.0 V			pF	
		300				

* Used to determine the no-load dynamic power consumption: P_D = C_{PD} V_{CC}²f + I_{CC} V_{CC}.

TIMING REQUIREMENTS (Input t_r = t_f = 6.0 ns)

Symbol	Parameter	V _{CC} V	Guaranteed Limit			Unit
			25°C to -55°C	≤ 85°C	≤ 125°C	
t _{su}	Minimum Setup Time, Serial Data Input A to Shift Clock (Figure 5)	4.5 to 5.5	10	13	15	ns
t _{su}	Minimum Setup Time, Shift Clock to Latch Clock (Figure 6)	4.5 to 5.5	15	19	22	ns
t _h	Minimum Hold Time, Shift Clock to Serial Data Input A (Figure 5)	4.5 to 5.5	5.0	5.0	5.0	ns
t _{rec}	Minimum Recovery Time, Reset Inactive to Shift Clock (Figure 2)	4.5 to 5.5	10	13	15	ns
t _w	Minimum Pulse Width, Reset (Figure 2)	4.5 to 5.5	12	15	18	ns
t _w	Minimum Pulse Width, Shift Clock (Figure 1)	4.5 to 5.5	10	13	15	ns
t _w	Minimum Pulse Width, Latch Clock (Figure 6)	4.5 to 5.5	10	13	15	ns
t _r , t _f	Maximum Input Rise and Fall Times (Figure 1)	4.5 to 5.5	500	500	500	ns

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FUNCTION TABLE

Operation	Inputs					Resulting Function			
	Reset	Serial Input A	Shift Clock	Latch Clock	Output Enable	Shift Register Contents	Latch Register Contents	Serial Output SQ_H	Parallel Outputs $Q_A - Q_H$
Reset shift register	L	X	X	L, H, ↓	L	L	U	L	U
Shift data into shift register	H	D	↑	L, H, ↓	L	$D \rightarrow SR_A$; $SR_N \rightarrow SR_{N+1}$	U	$SR_G \rightarrow SR_H$	U
Shift register remains unchanged	H	X	L, H, ↓	L, H, ↓	L	U	U	U	U
Transfer shift register contents to latch register	H	X	L, H, ↓	↑	L	U	$SR_N \rightarrow LR_N$	U	SR_N
Latch register remains unchanged	X	X	X	L, H, ↓	L	*	U	*	U
Enable parallel outputs	X	X	X	X	L	*	**	*	Enabled
Force outputs into high impedance state	X	X	X	X	H	*	**	*	Z

SR = shift register contents

D = data (L, H) logic level

↑ = Low-to-High

* = depends on Reset and Shift Clock inputs

LR = latch register contents

U = remains unchanged

↓ = High-to-Low

** = depends on Latch Clock input

PIN DESCRIPTIONS

INPUTS

A (Pin 14)

Serial Data Input. The data on this pin is shifted into the 8-bit serial shift register.

CONTROL INPUTS

Shift Clock (Pin 11)

Shift Register Clock Input. A low-to-high transition on this input causes the data at the Serial Input pin to be shifted into the 8-bit shift register.

Reset (Pin 10)

Active-low, Asynchronous, Shift Register Reset Input. A low on this pin resets the shift register portion of this device only. The 8-bit latch is not affected.

Latch Clock (Pin 12)

Storage Latch Clock Input. A low-to-high transition on this input latches the shift register data.

Output Enable (Pin 13)

Active-low Output Enable. A low on this input allows the data from the latches to be presented at the outputs. A high on this input forces the outputs ($Q_A - Q_H$) into the high-impedance state. The serial output is not affected by this control unit.

OUTPUTS

$Q_A - Q_H$ (Pins 15, 1, 2, 3, 4, 5, 6, 7)

Noninverted, 3-state, latch outputs.

SQ_H (Pin 9)

Noninverted, Serial Data Output. This is the output of the eighth stage of the 8-bit shift register. This output does not have three-state capability.

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SWITCHING WAVEFORMS

($V_I = 0$ to 3 V, $V_M = 1.3$ V)

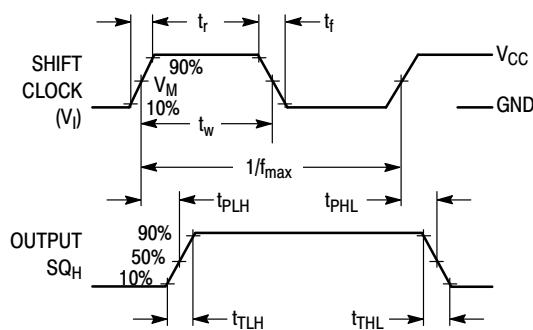


Figure 1.

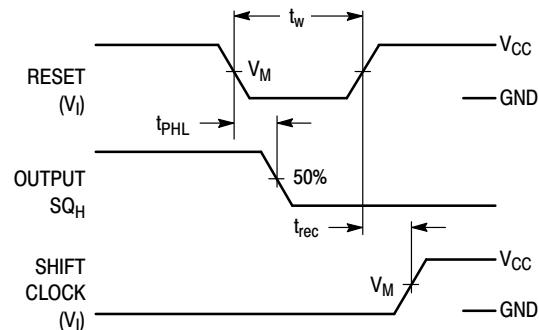


Figure 2.

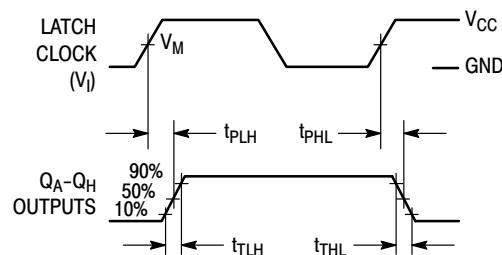


Figure 3.

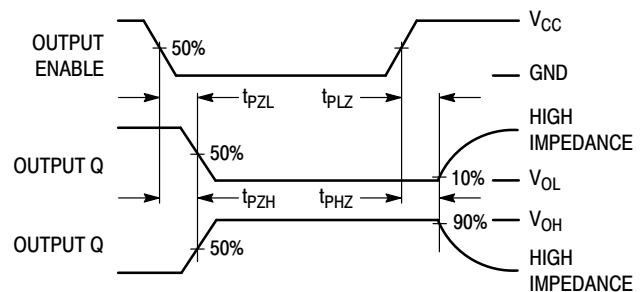


Figure 4.

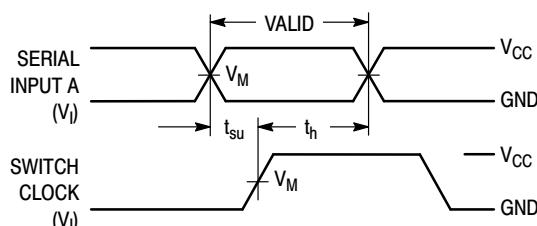


Figure 5.

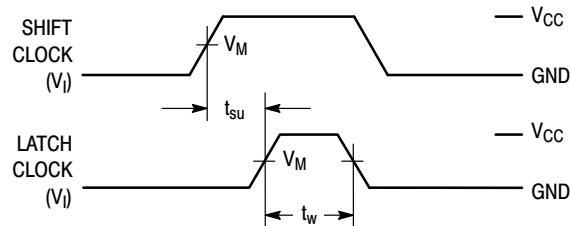
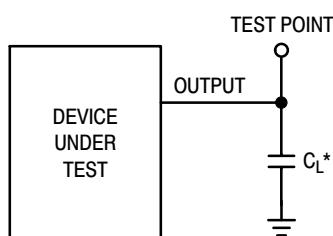


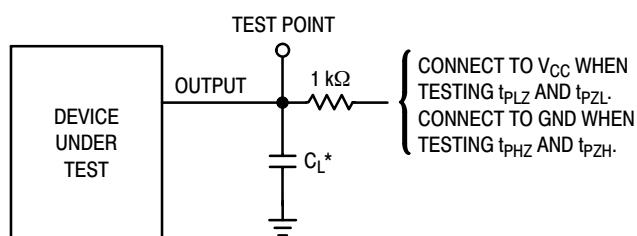
Figure 6.

TEST CIRCUITS



*Includes all probe and jig capacitance

Figure 7.

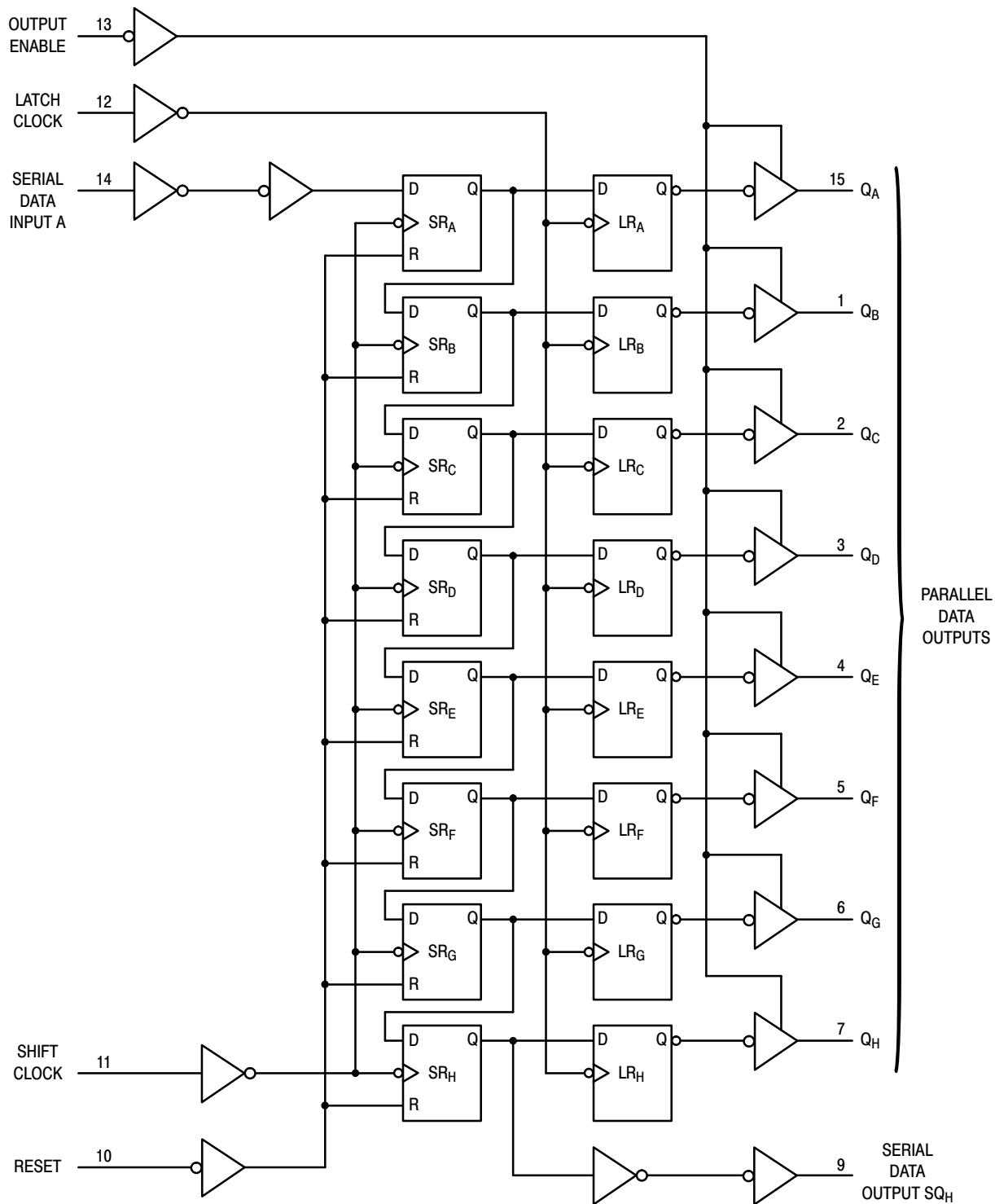


*Includes all probe and jig capacitance

Figure 8.

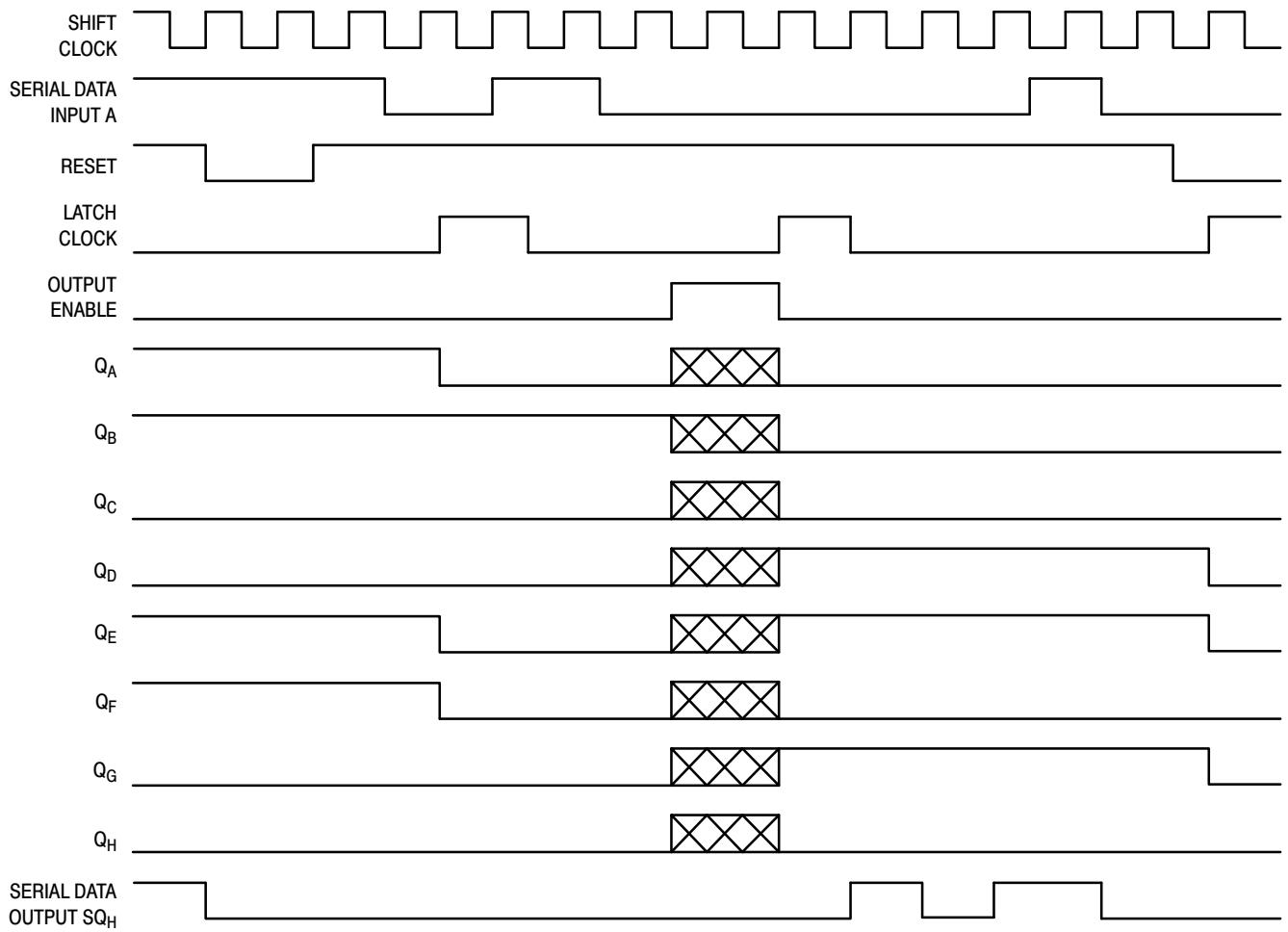
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EXPANDED LOGIC DIAGRAM



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TIMING DIAGRAM

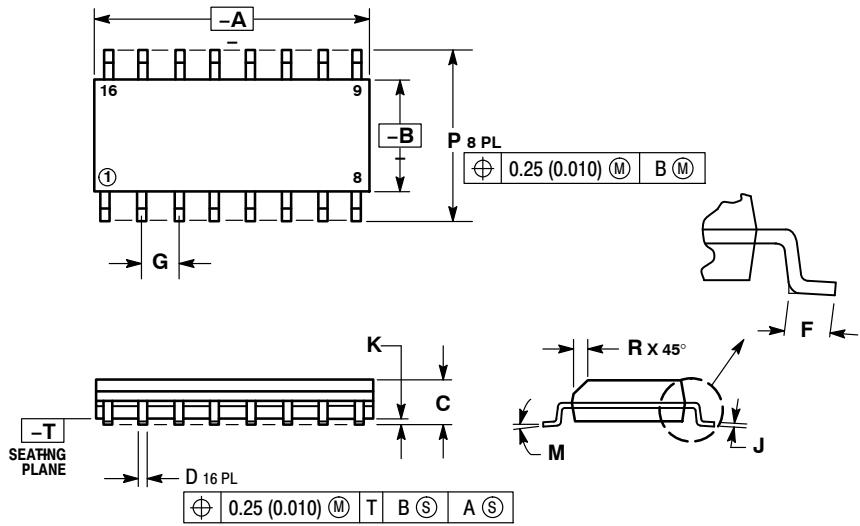


NOTE: implies that the output is in a high-impedance state.

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PACKAGE DIMENSIONS

**SOIC-16
D SUFFIX
CASE 751B-05
ISSUE J**

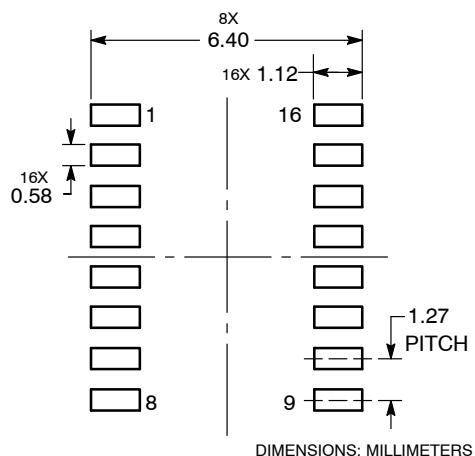


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

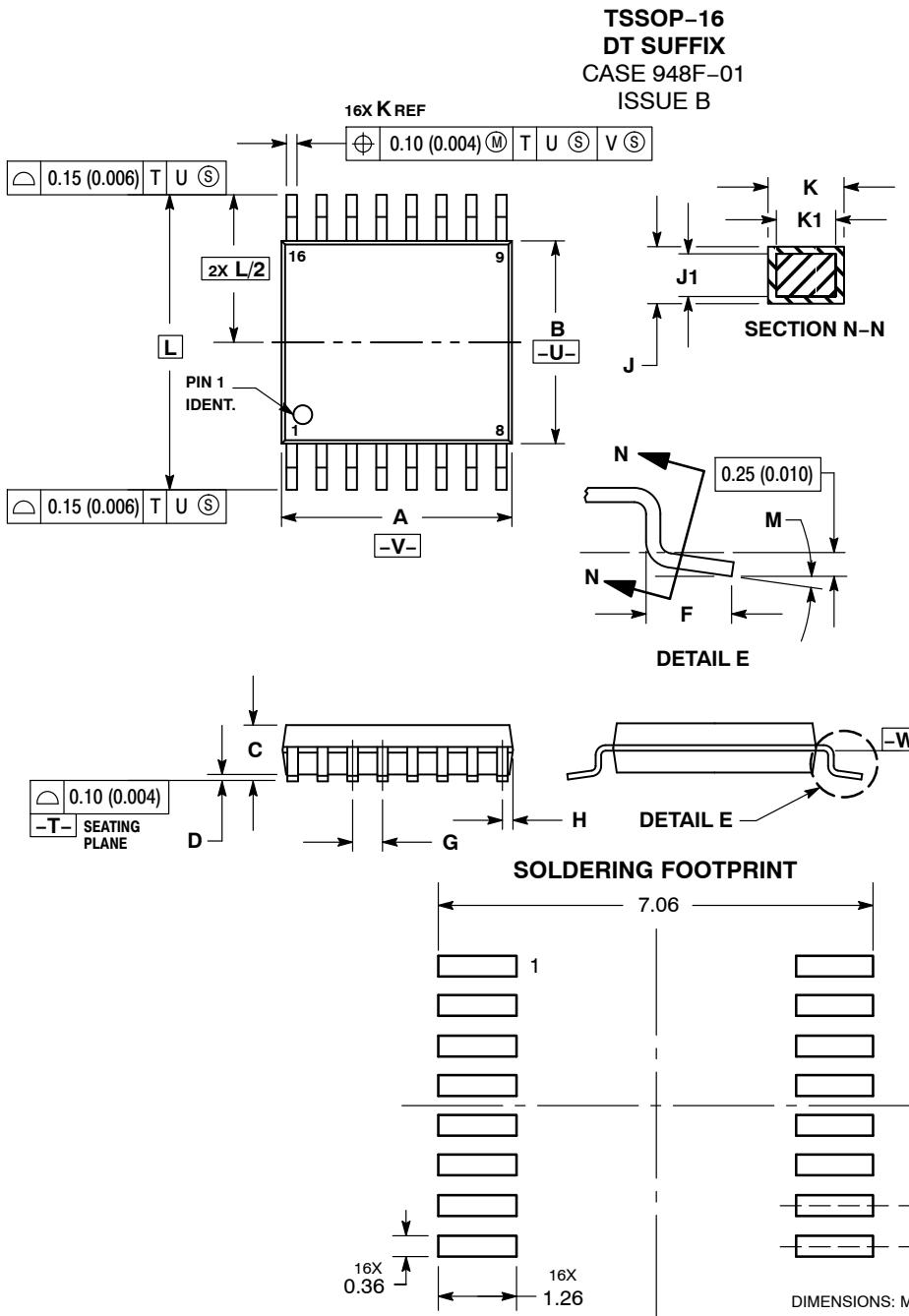
SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

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PACKAGE DIMENSIONS



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ООО "ЛайфЭлектроникс"

"LifeElectronics" LLC

ИНН 7805602321 КПП 780501001 Р/С 40702810122510004610 ФАКБ "АБСОЛЮТ БАНК" (ЗАО) в г.Санкт-Петербурге К/С 30101810900000000703 БИК 044030703

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибуторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибуторских договоров

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- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
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- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помочь разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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