74HC165-Q100; 74HCT165-Q100

8-bit parallel-in/serial out shift register

Rev. 3 — 23 April 2020 Product data sheet

1. General description

The 74HC165-Q100; 74HCT165-Q100 are 8-bit serial or parallel-in/serial-out shift registers. The device features a serial data input (DS), eight parallel data inputs (D0 to D7) and two complementary serial outputs (Q7 and $\overline{Q7}$). When the parallel load input ($\overline{PL}$) is LOW the data from D0 to D7 is loaded into the shift register asynchronously. When $\overline{PL}$ is HIGH data enters the register serially at DS. When the clock enable input ($\overline{CE}$) is LOW data is shifted on the LOW-to-HIGH transitions of the CP input. A HIGH on $\overline{CE}$ will disable the CP input. Inputs are overvoltage tolerant to 15 V. This enables the device to be used in HIGH-to-LOW level shifting applications.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Asynchronous 8-bit parallel load
- Synchronous serial input
- Complies with JEDEC standard no. 7A
- Input levels:
  - For 74HC165-Q100: CMOS level
  - For 74HCT165-Q100: TTL level
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)
- DHVQFN package with Side-Wettable Flanks enabling Automatic Optical Inspection (AOI) of solder joints

3. Applications

- Parallel-to-serial data conversion

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4. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74HC165D-Q100	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74HCT165D-Q100				
74HC165PW-Q100	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
74HCT165PW-Q100				
74HC165BQ-Q100	-40 °C to +125 °C	DHVQFN16	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm	SOT763-1
74HCT165BQ-Q100				

5. Functional diagram

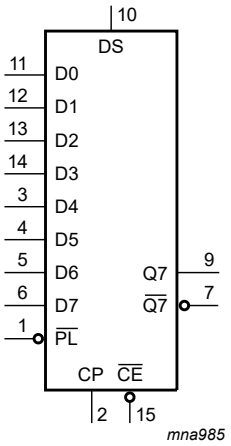

Fig. 1. Logic symbol

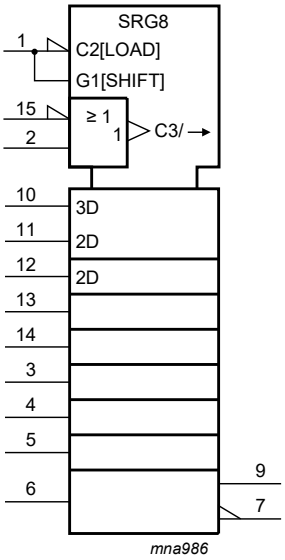

Fig. 2. IEC logic symbol

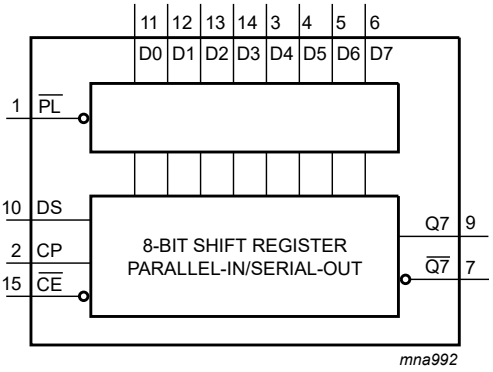

Fig. 3. Functional diagram

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6. Pinning information

6.1. Pinning

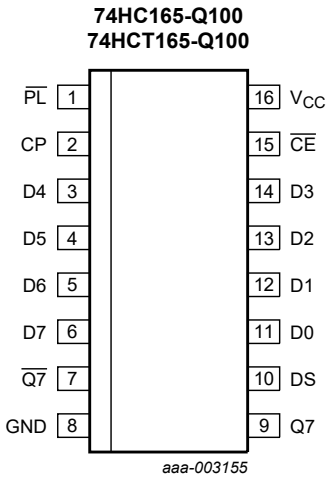
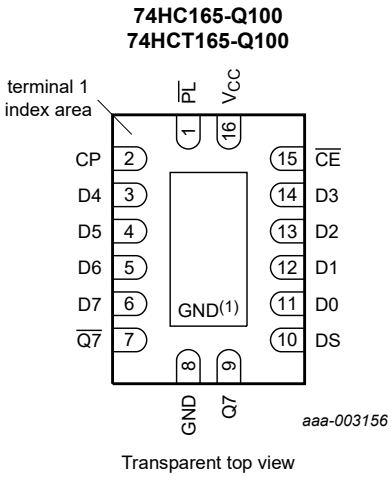


Fig. 4. Pin configuration SOT109-1 (SO16) and SOT403-1 (TSSOP16)



Transparent top view

(1) This is not a ground pin. There is no electrical or mechanical requirement to solder the pad. In case soldered, the solder land should remain floating or connected to GND.

Fig. 5. Pin configuration SOT763-1 (DHVQFN16)

6.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
$\overline{PL}$	1	asynchronous parallel load input (active LOW)
CP	2	clock input (LOW-to-HIGH edge-triggered)
$\overline{Q7}$	7	complementary output from the last stage
GND	8	ground (0 V)
Q7	9	serial output from the last stage
DS	10	serial data input
D0 to D7	11, 12, 13, 14, 3, 4, 5, 6	parallel data inputs (also referred to as Dn)
$\overline{CE}$	15	clock enable input (active LOW)
V_{CC}	16	positive supply voltage

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7. Functional description

Table 3. Function table

H = HIGH voltage level; h = HIGH voltage level one set-up time prior to the LOW-to-HIGH clock transition;
L = LOW voltage level; l = LOW voltage level one set-up time prior to the LOW-to-HIGH clock transition;
q = state of the referenced output one set-up time prior to the LOW-to-HIGH clock transition;
X = don't care; ↑ = LOW-to-HIGH clock transition.

Operating modes	Inputs					Qn registers		Outputs	
	$\overline{PL}$	$\overline{CE}$	CP	DS	D0 to D7	Q0	Q1 to Q6	Q7	$\overline{Q7}$
parallel load	L	X	X	X	L	L	L to L	L	H
	L	X	X	X	H	H	H to H	H	L
serial shift	H	L	↑	l	X	L	q0 to q5	q6	$\overline{q6}$
	H	L	↑	h	X	H	q0 to q5	q6	$\overline{q6}$
	H	↑	L	l	X	L	q0 to q5	q6	$\overline{q6}$
	H	↑	L	h	X	H	q0 to q5	q6	$\overline{q6}$
hold "do nothing"	H	H	X	X	X	q0	q1 to q6	q7	$\overline{q7}$
	H	X	H	X	X	q0	q1 to q6	q7	$\overline{q7}$

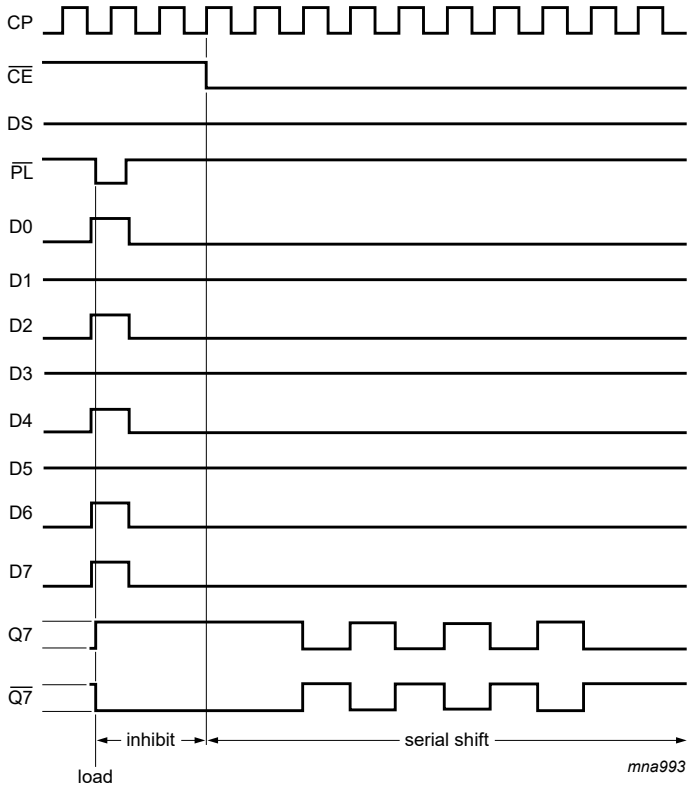

Fig. 6. Timing diagram

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8. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V)

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CC}	supply voltage			-0.5	+7	V
I_{IK}	input clamping current	$V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V	[1]	-	±20	mA
I_{OK}	output clamping current	$V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V	[1]	-	±20	mA
I_O	output current	-0.5 V $< V_O < V_{CC} + 0.5$ V		-	±25	mA
I_{CC}	supply current			-	50	mA
I_{GND}	ground current			-50	-	mA
T_{stg}	storage temperature			-65	+150	°C
P_{tot}	total power dissipation	T_{amb} = -40 °C to +125 °C	[2]	-	500	mW

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
[2] For SOT109-1 (SO16) package: P_{tot} derates linearly with 12.4 mW/K above 110 °C.
For SOT403-1 (TSSOP16) package: P_{tot} derates linearly with 8.5 mW/K above 91 °C.
For SOT763-1 (DHVQFN16) package: P_{tot} derates linearly with 11.2 mW/K above 106 °C.

9. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol	Parameter	Conditions	74HC165-Q100			74HCT165-Q100			Unit
			Min	Typ	Max	Min	Typ	Max	
V_{CC}	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
V_I	input voltage		0	-	V_{CC}	0	-	V_{CC}	V
V_O	output voltage		0	-	V_{CC}	0	-	V_{CC}	V
T_{amb}	ambient temperature		-40	-	+125	-40	-	+125	°C
Δt/ΔV	input transition rise and fall rate	V_{CC} = 2.0 V	-	-	625	-	-	-	ns/V
		V_{CC} = 4.5 V	-	1.67	139	-	1.67	139	ns/V
		V_{CC} = 6.0 V	-	-	83	-	-	-	ns/V

10. Static characteristics

Table 6. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC165-Q100										
V_{IH}	HIGH-level input voltage	V_{CC} = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
		V_{CC} = 4.5 V	3.15	2.4	-	3.15	-	3.15	-	V
		V_{CC} = 6.0 V	4.2	3.2	-	4.2	-	4.2	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
		V_{CC} = 4.5 V	-	2.1	1.35	-	1.35	-	1.35	V
		V_{CC} = 6.0 V	-	2.8	1.8	-	1.8	-	1.8	V

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Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}								
		I_O = -20 μA; V_{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I_O = -20 μA; V_{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I_O = -20 μA; V_{CC} = 6.0 V	5.9	6.0	-	5.9	-	5.9	-	V
		I_O = -4.0 mA; V_{CC} = 4.5 V	3.98	4.32	-	3.84	-	3.7	-	V
		I_O = -5.2 mA; V_{CC} = 6.0 V	5.48	5.81	-	5.34	-	5.2	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}								
		I_O = 20 μA; V_{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 20 μA; V_{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 20 μA; V_{CC} = 6.0 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 4.0 mA; V_{CC} = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		I_O = 5.2 mA; V_{CC} = 6.0 V	-	0.16	0.26	-	0.33	-	0.4	V
I_I	input leakage current	$V_I = V_{CC}$ or GND; V_{CC} = 6.0 V	-	-	±0.1	-	±1	-	±1	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; I_O = 0 A; V_{CC} = 6.0 V	-	-	8.0	-	80	-	160	μA
C_I	input capacitance		-	3.5	-	-	-	-	-	pF
74HCT165-Q100										
V_{IH}	HIGH-level input voltage	V_{CC} = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	2.0	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	-	0.8	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}; V_{CC} = 4.5 V								
		I_O = -20 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I_O = -4.0 mA	3.98	4.32	-	3.84	-	3.7	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}								
		I_O = 20 μA; V_{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 5.2 mA; V_{CC} = 6.0 V	-	0.16	0.26	-	0.33	-	0.4	V
I_I	input leakage current	$V_I = V_{CC}$ or GND; V_{CC} = 6.0 V	-	-	±0.1	-	±1	-	±1	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; I_O = 0 A; V_{CC} = 6.0 V	-	-	8.0	-	80	-	160	μA
ΔI_{CC}	additional supply current	per input pin; $V_I = V_{CC}$ - 2.1 V; other inputs at V_{CC} or GND; V_{CC} = 4.5 V to 5.5 V								
		Dn and DS inputs	-	35	126	-	157.5	-	171.5	μA
		CP, $\overline{CE}$, and $\overline{PL}$ inputs	-	65	234	-	292.5	-	318.5	μA
C_I	input capacitance		-	3.5	-	-	-	-	-	pF

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11. Dynamic characteristics

Table 7. Dynamic characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V);
C_L = 50 pF unless otherwise specified; for test circuit, see Fig. 12

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC165-Q100										
t_{pd}	propagation delay	CP or $\overline{CE}$ to Q7, $\overline{Q7}$; see Fig. 7 [1]								
		V_{CC} = 2.0 V	-	52	165	-	205	-	250	ns
		V_{CC} = 4.5 V	-	19	33	-	41	-	50	ns
		V_{CC} = 6.0 V	-	15	28	-	35	-	43	ns
		V_{CC} = 5.0 V; C_L = 15 pF	-	16	-	-	-	-	-	ns
		$\overline{PL}$ to Q7, $\overline{Q7}$; see Fig. 8								
		V_{CC} = 2.0 V	-	50	165	-	205	-	250	ns
		V_{CC} = 4.5 V	-	18	33	-	41	-	50	ns
		V_{CC} = 6.0 V	-	14	28	-	35	-	43	ns
		V_{CC} = 5.0 V; C_L = 15 pF	-	15	-	-	-	-	-	ns
		D7 to Q7, $\overline{Q7}$; see Fig. 9								
		V_{CC} = 2.0 V	-	36	120	-	150	-	180	ns
		V_{CC} = 4.5 V	-	13	24	-	30	-	36	ns
		V_{CC} = 6.0 V	-	10	20	-	26	-	31	ns
		V_{CC} = 5.0 V; C_L = 15 pF	-	11	-	-	-	-	-	ns
t_t	transition time	Q7, $\overline{Q7}$ output; see Fig. 7 [2]								
		V_{CC} = 2.0 V	-	19	75	-	95	-	110	ns
		V_{CC} = 4.5 V	-	7	15	-	19	-	22	ns
		V_{CC} = 6.0 V	-	6	13	-	16	-	19	ns
t_W	pulse width	CP input HIGH or LOW; see Fig. 7								
		V_{CC} = 2.0 V	80	17	-	100	-	120	-	ns
		V_{CC} = 4.5 V	16	6	-	20	-	24	-	ns
		V_{CC} = 6.0 V	14	5	-	17	-	20	-	ns
		$\overline{PL}$ input LOW; see Fig. 8								
		V_{CC} = 2.0 V	80	14	-	100	-	120	-	ns
		V_{CC} = 4.5 V	16	5	-	20	-	24	-	ns
		V_{CC} = 6.0 V	14	4	-	17	-	20	-	ns
t_{rec}	recovery time	$\overline{PL}$ to CP, $\overline{CE}$; see Fig. 8								
		V_{CC} = 2.0 V	100	22	-	125	-	150	-	ns
		V_{CC} = 4.5 V	20	8	-	25	-	30	-	ns
		V_{CC} = 6.0 V	17	6	-	21	-	26	-	ns

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Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
t_{su}	set-up time	DS to CP, $\overline{CE}$; see Fig. 10								
		V_{CC} = 2.0 V	80	11	-	100	-	120	-	ns
		V_{CC} = 4.5 V	16	4	-	20	-	24	-	ns
		V_{CC} = 6.0 V	14	3	-	17	-	20	-	ns
		$\overline{CE}$ to CP and CP to $\overline{CE}$; see Fig. 10								
		V_{CC} = 2.0 V	80	17	-	100	-	120	-	ns
		V_{CC} = 4.5 V	16	6	-	20	-	24	-	ns
		V_{CC} = 6.0 V	14	5	-	17	-	20	-	ns
		Dn to $\overline{PL}$; see Fig. 11								
		V_{CC} = 2.0 V	80	22	-	100	-	120	-	ns
		V_{CC} = 4.5 V	16	8	-	20	-	24	-	ns
		V_{CC} = 6.0 V	14	6	-	17	-	20	-	ns
t_h	hold time	DS to CP, $\overline{CE}$ and Dn to $\overline{PL}$; see Fig. 10								
		V_{CC} = 2.0 V	5	2	-	5	-	5	-	ns
		V_{CC} = 4.5 V	5	2	-	5	-	5	-	ns
		V_{CC} = 6.0 V	5	2	-	5	-	5	-	ns
		$\overline{CE}$ to CP and CP to $\overline{CE}$; see Fig. 10								
		V_{CC} = 2.0 V	5	-17	-	5	-	5	-	ns
		V_{CC} = 4.5 V	5	-6	-	5	-	5	-	ns
		V_{CC} = 6.0 V	5	-5	-	5	-	5	-	ns
f_{max}	maximum frequency	CP input; see Fig. 7								
		V_{CC} = 2.0 V	6	17	-	5	-	4	-	MHz
		V_{CC} = 4.5 V	30	51	-	24	-	20	-	MHz
		V_{CC} = 6.0 V	35	61	-	28	-	24	-	MHz
		V_{CC} = 5.0 V; C_L = 15 pF	-	56	-	-	-	-	-	MHz
C_{PD}	power dissipation capacitance	per package; V_I = GND to V_{CC} [3]	-	35	-	-	-	-	-	pF
74HCT165-Q100										
t_{pd}	propagation delay	$\overline{CE}$, CP to Q7, $\overline{Q7}$; see Fig. 7 [1]								
		V_{CC} = 4.5 V	-	17	34	-	43	-	51	ns
		V_{CC} = 5.0 V; C_L = 15 pF	-	14	-	-	-	-	-	ns
		$\overline{PL}$ to Q7, $\overline{Q7}$; see Fig. 8								
		V_{CC} = 4.5 V	-	20	40	-	50	-	60	ns
		V_{CC} = 5.0 V; C_L = 15 pF	-	17	-	-	-	-	-	ns
		D7 to Q7, $\overline{Q7}$; see Fig. 9								
		V_{CC} = 4.5 V	-	14	28	-	35	-	42	ns
		V_{CC} = 5.0 V; C_L = 15 pF	-	11	-	-	-	-	-	ns

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Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
t_t	transition time	Q7, $\overline{Q7}$ output; see Fig. 7 [2]								
		V_{CC} = 4.5 V	-	7	15	-	19	-	22	ns
t_W	pulse width	CP input; see Fig. 7								
		V_{CC} = 4.5 V	16	6	-	20	-	24	-	ns
		$\overline{PL}$ input; see Fig. 8								
		V_{CC} = 4.5 V	20	9	-	25	-	30	-	ns
t_{rec}	recovery time	$\overline{PL}$ to CP, $\overline{CE}$; see Fig. 8								
		V_{CC} = 4.5 V	20	8	-	25	-	30	-	ns
t_{su}	set-up time	DS to CP, $\overline{CE}$; see Fig. 10								
		V_{CC} = 4.5 V	20	2	-	25	-	30	-	ns
		$\overline{CE}$ to CP and CP to $\overline{CE}$; see Fig. 10								
		V_{CC} = 4.5 V	20	7	-	25	-	30	-	ns
		Dn to $\overline{PL}$; see Fig. 11								
		V_{CC} = 4.5 V	20	10	-	25	-	30	-	ns
t_h	hold time	DS to CP, $\overline{CE}$ and Dn to $\overline{PL}$; see Fig. 10								
		V_{CC} = 4.5 V	7	-1	-	9	-	11	-	ns
		$\overline{CE}$ to CP and CP to $\overline{CE}$; see Fig. 10								
		V_{CC} = 4.5 V	0	-7	-	0	-	0	-	ns
f_{max}	maximum frequency	CP input; see Fig. 7								
		V_{CC} = 4.5 V	26	44	-	21	-	17	-	MHz
		V_{CC} = 5.0 V; C_L = 15 pF	-	48	-	-	-	-	-	MHz
C_{PD}	power dissipation capacitance	per package; V_I = GND to V_{CC} - 1.5 V [3]	-	35	-	-	-	-	-	pF

[1] t_{pd} is the same as t_{PHL} and t_{PLH}.
[2] t_t is the same as t_{THL} and t_{TLH}.
[3] C_{PD} is used to determine the dynamic power dissipation (P_D in µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where:
f_i = input frequency in MHz;
f_o = output frequency in MHz;
$\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs;
C_L = output load capacitance in pF;
V_{CC} = supply voltage in V.

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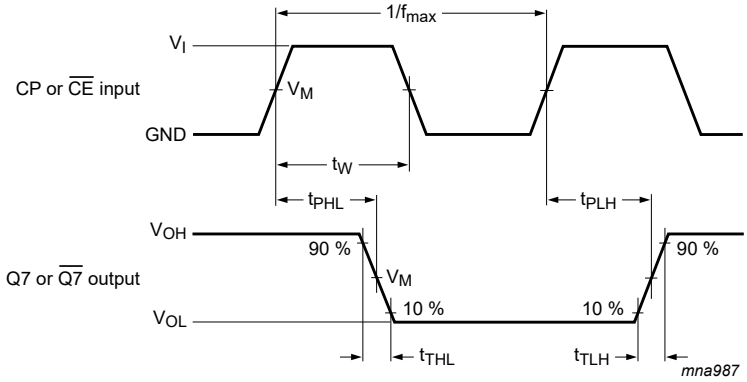
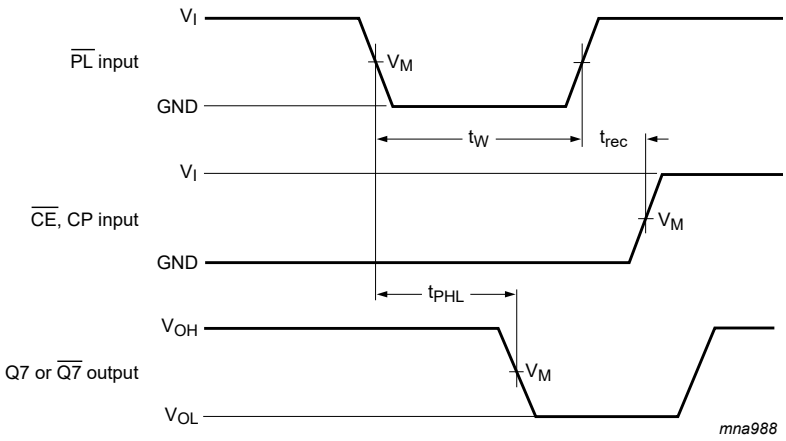
11.1. Waveforms and test circuit



Measurement points are given in Table 8.

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

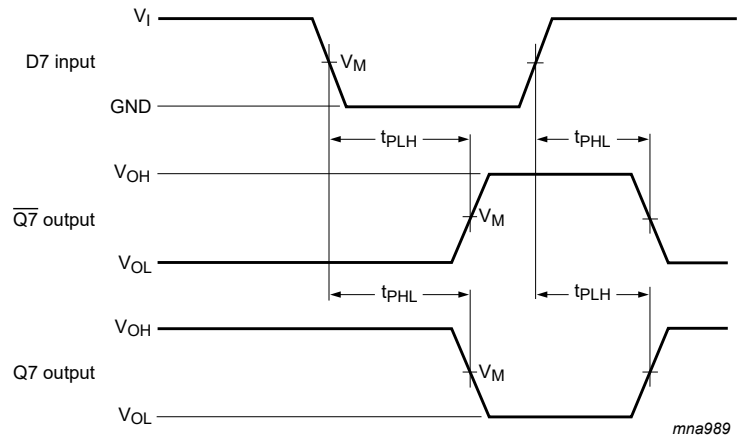
Fig. 7. The clock (CP) or clock enable ($\overline{CE}$) to output (Q7 or $\overline{Q7}$) propagation delays, the clock pulse width, the maximum clock frequency and the output transition times



Measurement points are given in Table 8.

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig. 8. The parallel load ($\overline{PL}$) pulse width, the parallel load to output (Q7 or $\overline{Q7}$) propagation delays, the parallel load to clock (CP) and clock enable ($\overline{CE}$) recovery time



Measurement points are given in Table 8.

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig. 9. The data input (D7) to output (Q7 or $\overline{Q7}$) propagation delays when $\overline{PL}$ is LOW

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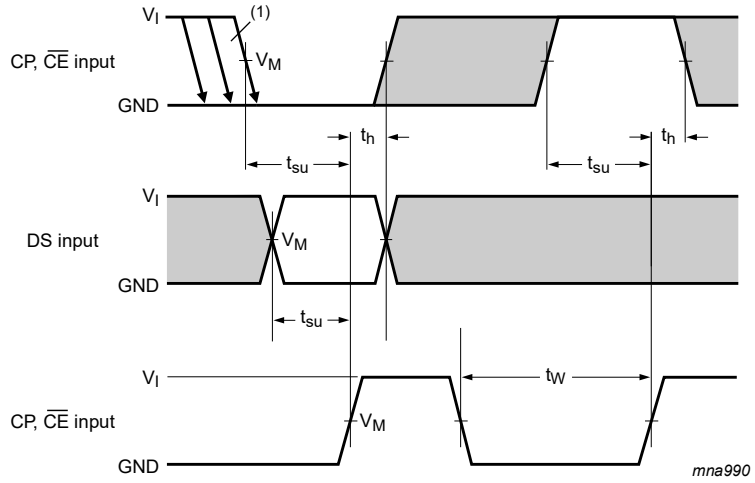


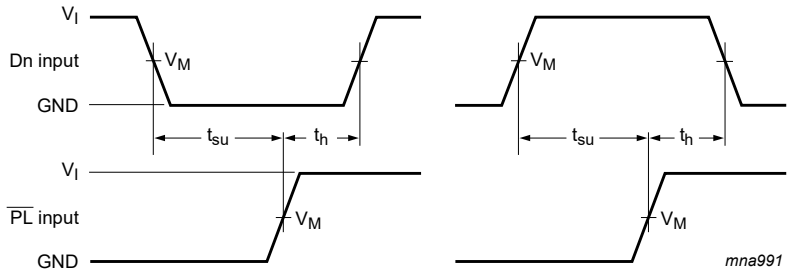
(1) $\overline{CE}$ may change only from HIGH-to-LOW while CP is LOW.

The shaded areas indicate when the input is permitted to change for predictable output performance

Measurement points are given in Table 8.

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig. 10. The set-up and hold times from the serial data input (DS) to the clock (CP) and clock enable ($\overline{CE}$) inputs, from the clock enable input ($\overline{CE}$) to the clock input (CP) and from the clock input (CP) to the clock enable input ($\overline{CE}$)



Measurement points are given in Table 8.

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig. 11. The set-up and hold times from the data inputs (Dn) to the parallel load input ($\overline{PL}$)

Table 8. Measurement points

Type	Input		Output
	V_I	V_M	V_M
74HC165-Q100	V_{CC}	$0.5V_{CC}$	$0.5V_{CC}$
74HCT165-Q100	3 V	1.3 V	1.3 V

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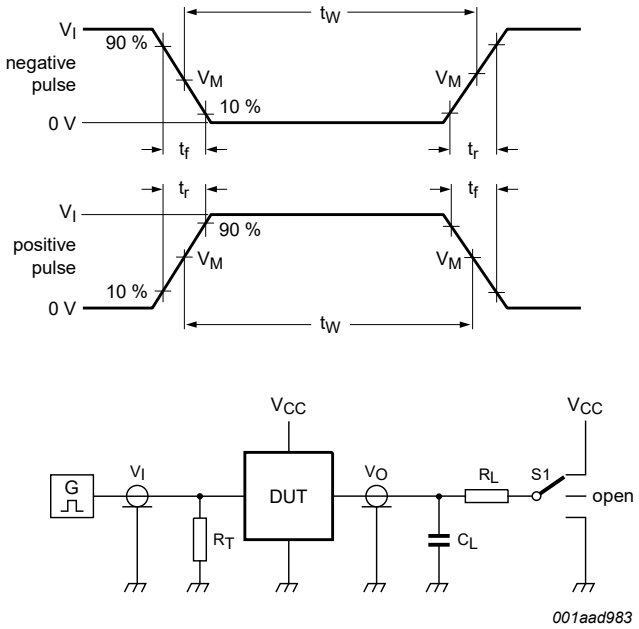

Test data is given in Table 9.

Definitions for test circuit:

R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator.

C_L = Load capacitance including jig and probe capacitance.

R_L = Load resistance.

S1 = Test selection switch

Fig. 12. Test circuit for measuring switching times

Table 9. Test data

Type	Input		Load		S1 position
	V_I	t_r, t_f	C_L	R_L	t_{PHL}, t_{PLH}
74HC165-Q100	V_{CC}	6 ns	15 pF, 50 pF	1 kΩ	open
74HCT165-Q100	3 V	6 ns	15 pF, 50 pF	1 kΩ	open

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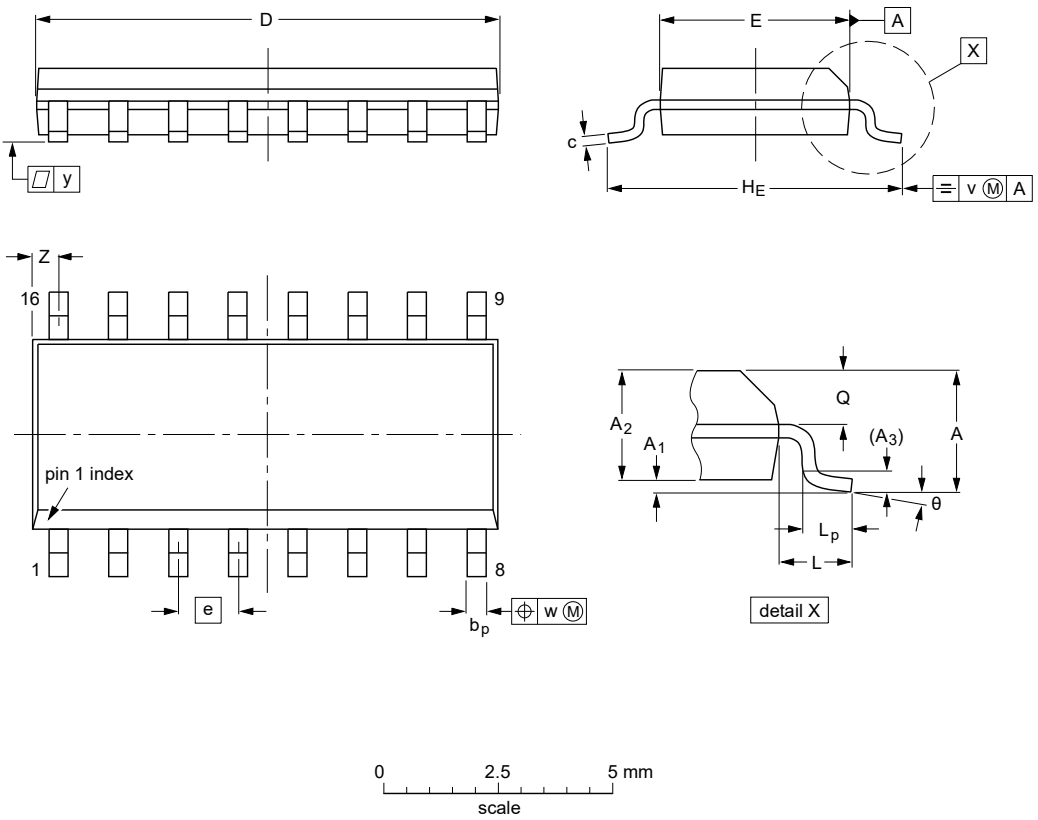
12. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm **SOT109-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	10.0 9.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.39 0.38	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.020	0.01	0.01	0.004	0.028 0.012	

Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT109-1	076E07	MS-012				~~99-12-27~~ 03-02-19

Fig. 13. Package outline SOT109-1 (SO16)

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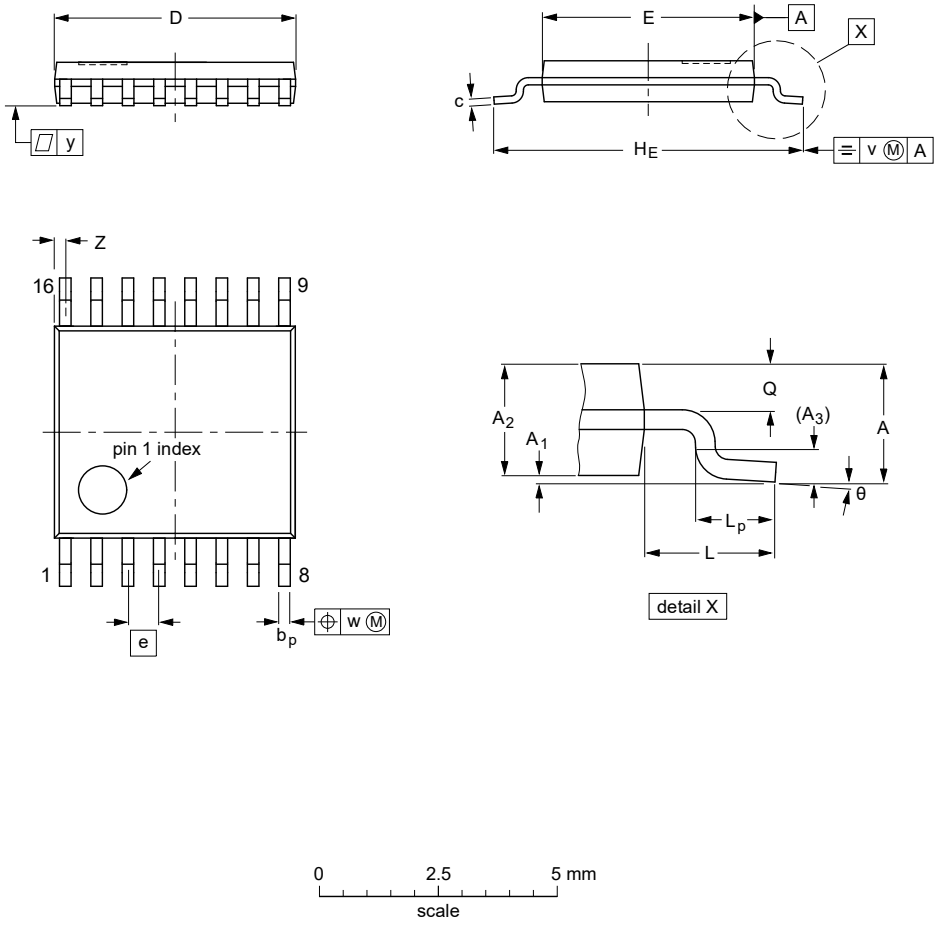
TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm **SOT403-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (2)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.40 0.06	8° 0°

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT403-1		MO-153				~~99-12-27~~ 03-02-18

Fig. 14. Package outline SOT403-1 (TSSOP16)

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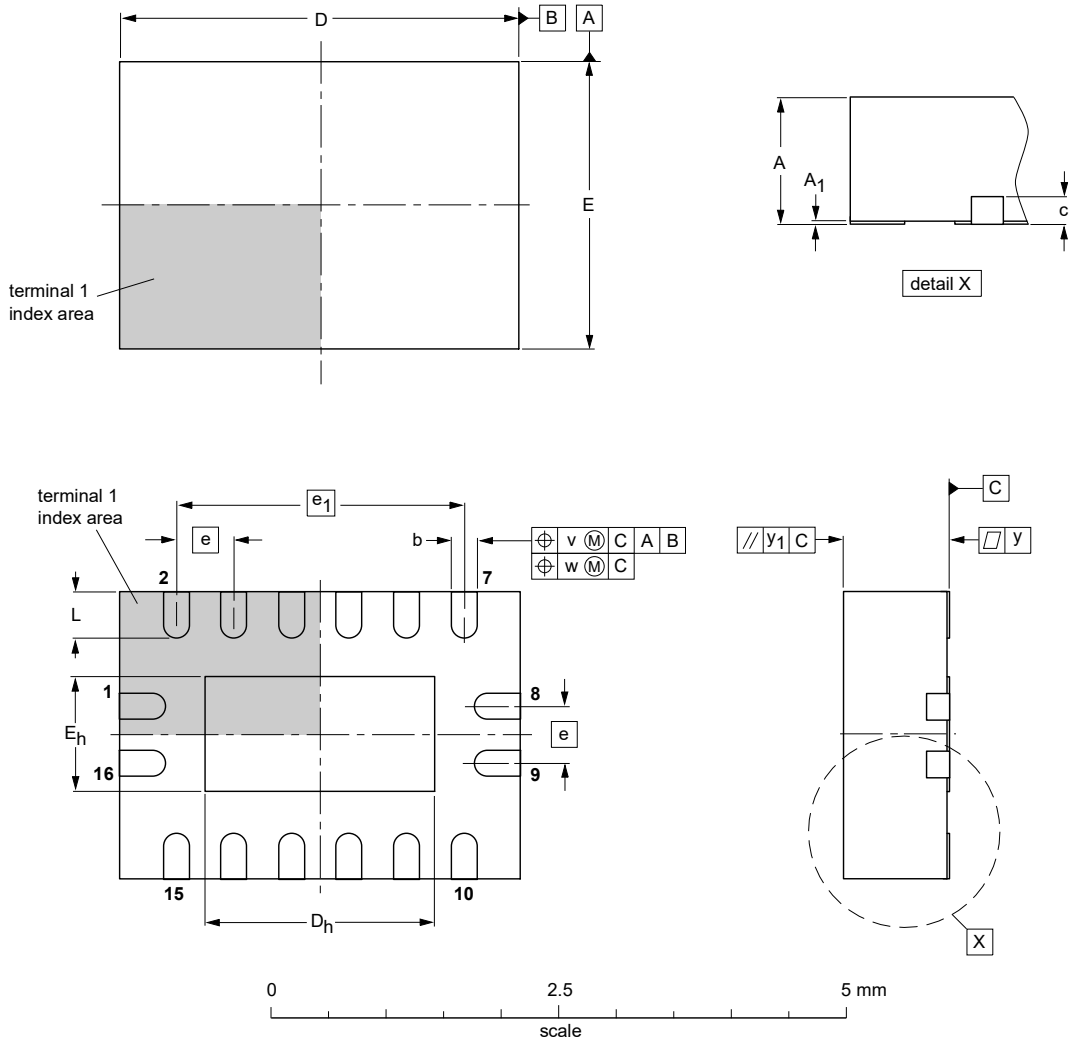
DHVQFN16: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm **SOT763-1**



DIMENSIONS (mm are the original dimensions)

UNIT	$A^{(1)}$ max.	A_1	b	c	$D^{(1)}$	D_h	$E^{(1)}$	E_h	e	e_1	L	v	w	y	y_1
mm	1	0.05 0.00	0.30 0.18	0.2	3.6 3.4	2.15 1.85	2.6 2.4	1.15 0.85	0.5	2.5	0.5 0.3	0.1	0.05	0.05	0.1

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT763-1	- - -	MO-241	- - -			~~02-10-17~~ 03-01-27

Fig. 15. Package outline SOT763-1 (DHVQFN16)

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13. Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MIL	Military
MM	Machine Model
TTL	Transistor-Transistor Logic

14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT165_Q100 v.3	20200423	Product data sheet	-	74HC_HCT165_Q100 v.2
Modifications:	• Section 2 updated. • Table 4: Derating values for P_{tot} total power dissipation updated.			
74HC_HCT165_Q100 v.2	20170821	Product data sheet	-	74HC_HCT165_Q100 v.1
Modifications:	• Section 1 updated. • Table 7: Hold time for 74HC165 has been updated. • The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate.			
74HC_HCT165_Q100 v.1	20120717	Product data sheet	-	-

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Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at https://www.nexperia.com.

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