74AHC08Q
Quad 2-Input AND Gate

GENERAL DESCRIPTION

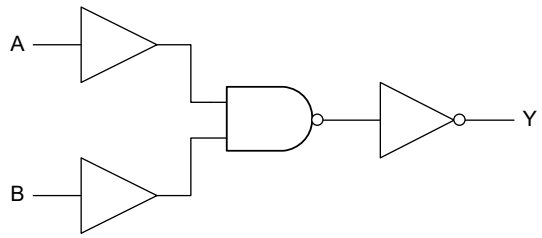
The 74AHC08Q is a quad 2-input AND gate with high-speed CMOS inputs. It has a wide supply voltage range from 2.0V to 5.5V. The over-voltage tolerant inputs are up to 5.5V. Due to this feature, the device can be used as a translator in mixed voltage environment.

This device is AEC-Q100 qualified (Automotive Electronics Council Standard Q100 Grade 1) and the use of this device is suitable for automotive applications.

FEATURES

- **AEC-Q100 Qualified for Automotive Applications**
  Device Temperature Grade 1
  T_A = -40℃ to +125℃
- **Supply Voltage Range: 2.0V to 5.5V**
- **Over-Voltage Tolerant Inputs up to 5.5V**
- **CMOS Low Power Dissipation**
- **Balanced Propagation Delays**
- **All Inputs with Schmitt-Trigger Action**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in a Green TSSOP-14 Package**

LOGIC DIAGRAM



FUNCTION TABLE

INPUT		OUTPUT
nA	nB	nY
H	H	H
L	*X*	L
X	L	L

$Y = A \cdot B$ or $Y = \overline{\overline{A} + \overline{B}}$.

H = High Voltage Level

L = Low Voltage Level

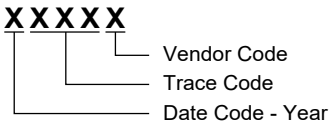
X = Don't Care

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE TOP MARKING	PACKING OPTION
74AHC08Q	TSSOP-14	-40℃ to +125℃	74AHC08QTS14G/TR	04C TS14 XXXXX	Tape and Reel, 4000

MARKING INFORMATION

NOTE: XXXXX = Date Code, Trace Code and Vendor Code.



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS (1)

Supply Voltage, V_{CC} ..... -0.5V to 7.0V
Input Voltage, V_I (2) ..... -0.5V to 7.0V
Output Voltage, V_O (2) ..... -0.5V to MIN (7.0V, V_{CC} +0.5V)
Input Clamp Current, I_{IK} (V_I < -0.5V) .....-20mA
Output Clamp Current, I_{OK} (V_O < -0.5V or V_O > V_{CC} + 0.5V)
.....±20mA
Output Current, I_O (V_O = -0.5V to V_{CC} + 0.5V) .....±25mA
Supply Current, I_{CC} 75mA
Ground Current, I_{GND}.....-75mA
Junction Temperature (3) .....+150℃
Storage Temperature Range .....-65℃ to +150℃
Lead Temperature (Soldering, 10s).....+260℃
ESD Susceptibility
HBM.....4000V
CDM.....1000V

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range, V_{CC} .....2.0V to 5.5V
Input Voltage Range, V_I .....0V to 5.5V
Output Voltage Range, V_O ..... 0V to V_{CC}
Input Transition Rise and Fall Rate, Δt/ΔV
V_{CC} = 3.3V ± 0.3V ..... 100ns/V (MAX)
V_{CC} = 5.0V ± 0.5V .....20ns/V (MAX)
Operating Temperature Range .....-40℃ to +125℃

OVERSTRESS CAUTION

1. Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

3. The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability.

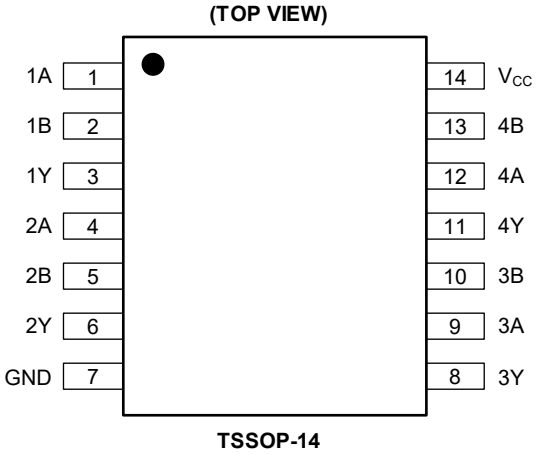
ESD SENSITIVITY CAUTION

This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

PIN CONFIGURATION



PIN DESCRIPTION

PIN	NAME	FUNCTION
1, 4, 9, 12	1A, 2A, 3A, 4A	Data Inputs.
2, 5, 10, 13	1B, 2B, 3B, 4B	Data Inputs.
3, 6, 8, 11	1Y, 2Y, 3Y, 4Y	Data Outputs.
7	GND	Ground.
14	V_{CC}	Supply Voltage.

ELECTRICAL CHARACTERISTICS

(Full = -40℃ to +125℃, all typical values are measured at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
High-Level Input Voltage	V_{IH}	V_{CC} = 2.0V		Full	1.5			V
		V_{CC} = 3.0V		Full	2.1			V
		V_{CC} = 5.5V		Full	3.85			V
Low-Level Input Voltage	V_{IL}	V_{CC} = 2.0V		Full			0.5	V
		V_{CC} = 3.0V		Full			0.9	V
		V_{CC} = 5.5V		Full			1.65	V
High-Level Output Voltage	V_{OH}	$V_I = V_{IH}$	I_O = -50μA, V_{CC} = 2.0V	Full	1.9	1.995		V
			I_O = -50μA, V_{CC} = 3.0V	Full	2.9	2.995		V
			I_O = -50μA, V_{CC} = 4.5V	Full	4.4	4.495		V
			I_O = -4.0mA, V_{CC} = 3.0V	Full	2.6	2.8		V
			I_O = -8.0mA, V_{CC} = 4.5V	Full	4.0	4.25		V
Low-Level Output Voltage	V_{OL}	$V_I = V_{IL}$	I_O = 50μA, V_{CC} = 2.0V	Full		0.005	0.1	V
			I_O = 50μA, V_{CC} = 3.0V	Full		0.005	0.1	V
			I_O = 50μA, V_{CC} = 4.5V	Full		0.005	0.1	V
			I_O = 4.0mA, V_{CC} = 3.0V	Full		0.15	0.4	V
			I_O = 8.0mA, V_{CC} = 4.5V	Full		0.25	0.5	V
Input Leakage Current	I_I	V_I = 5.5V or GND, V_{CC} = 0V to 5.5V		Full		0.02	2	μA
Supply Current	I_{CC}	$V_I = V_{CC}$ or GND, I_O = 0A, V_{CC} = 5.5V		Full		0.02	10	μA
Input Capacitance	C_I			+25℃		5		pF

DYNAMIC CHARACTERISTICS

(See Figure 1 for test circuit, see Figure 2 for waveforms. Full = -40℃ to +125℃, all typical values are measured at V_{CC} = 3.3V and V_{CC} = 5.0V, T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN (1)	TYP	MAX (1)	UNITS
Propagation Delay (2)	t_{PD}	nA, nB to nY, V_{CC} = 3.0V to 3.6V	C_L = 15pF	Full	0.5	4.5	9	ns
			C_L = 50pF	Full	0.5	5.5	14	ns
		nA, nB to nY, V_{CC} = 4.5V to 5.5V	C_L = 15pF	Full	0.5	3	6	ns
			C_L = 50pF	Full	0.5	4.5	9	ns
Power Dissipation Capacitance (3)	C_{PD}	C_L = 50pF, f_i = 1MHz, V_I = GND to V_{CC}		+25℃		10		pF

NOTES:

1. Specified by design and characterization, not production tested.
2. t_{PD} is the same as t_{PLH} and t_{PHL}.
3. C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

   $P_D = (C_{PD} \times V_{CC}^2 \times f_i \times N) + \Sigma(C_L \times V_{CC}^2 \times f_o)$

   where:

   f_i = Input frequency in MHz.

   f_o = Output frequency in MHz.

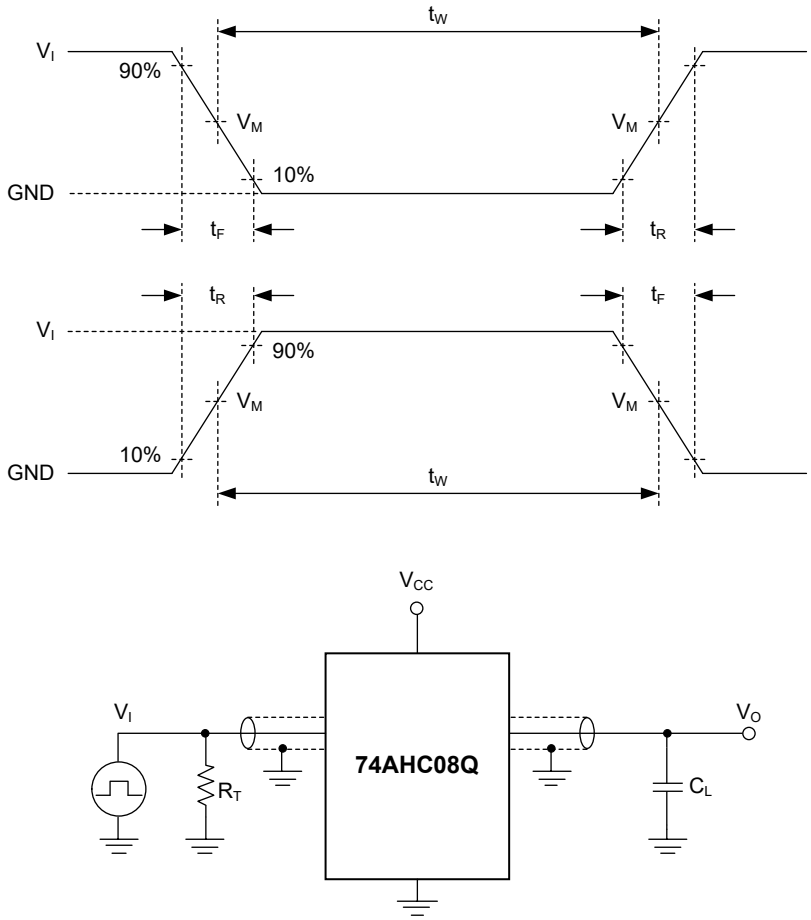
   C_L = Output load Capacitance in pF.

   V_{CC} = Supply voltage in Volts.

   N = Number of inputs Switching.

   $\Sigma (C_L \times V_{CC}^2 \times f_o)$ = Sum of the Outputs.

TEST CIRCUIT



Test conditions are given in Table 1.

Definitions for test circuit:

C_L: Load capacitance (includes jig and probe).

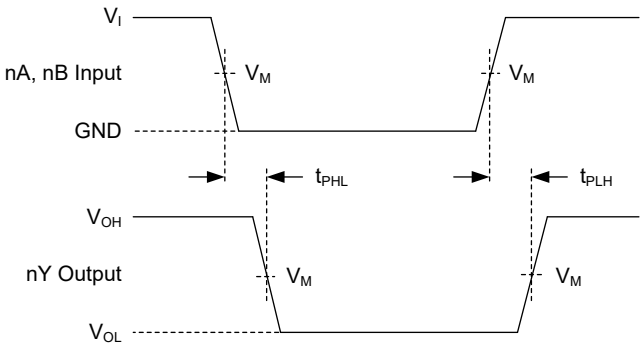
R_T: Termination resistance (equals to output impedance Z_O of the pulse generator).

Figure 1. Test Circuit for Measuring Switching Times

Table 1. Test Conditions

SUPPLY VOLTAGE	INPUT		LOAD	TEST
V_{CC}	V_I	t_R, t_F	C_L	
2.0V to 5.5V	V_{CC}	≤ 3.0ns	15pF, 50pF	t_{PHL}, t_{PLH}

WAVEFORMS



Test conditions are given in Table 1.
Measurement points are given in Table 2.
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Figure 2. Input (nA, nB) to Output (nY) Propagation Delay Times

Table 2. Measurement Points

SUPPLY VOLTAGE	INPUT		OUTPUT
V_{CC}	V_I	V_M (1)	V_M
2.0V to 5.5V	V_{CC}	0.5 × V_{CC}	0.5 × V_{CC}

NOTE:
1. The measurement points should be V_{IH} or V_{IL} when the input rising or falling time exceeds 3.0ns.

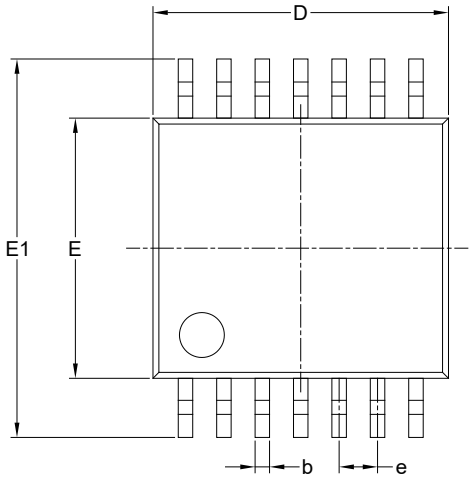
REVISION HISTORY

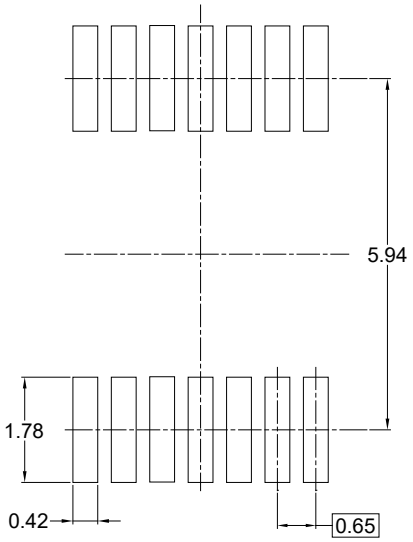
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (DECEMBER 2022) to REV.A	Page
Changed from product preview to production data	All

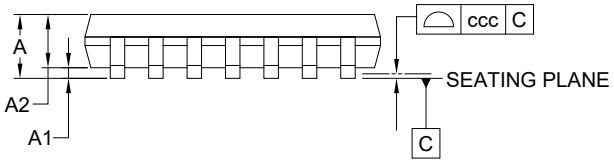
PACKAGE OUTLINE DIMENSIONS

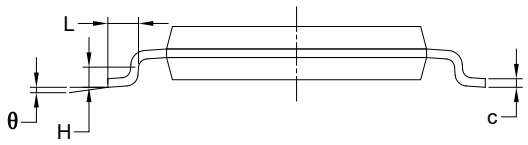
TSSOP-14





RECOMMENDED LAND PATTERN (Unit: mm)



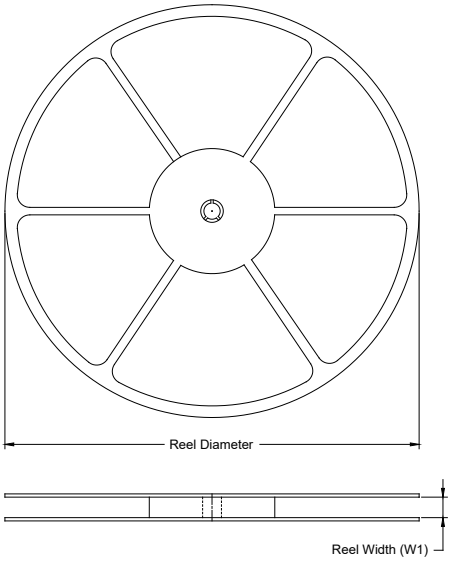


Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	-	-	1.200
A1	0.050	-	0.150
A2	0.800	-	1.050
b	0.190	-	0.300
c	0.090	-	0.200
D	4.860	-	5.100
E	4.300	-	4.500
E1	6.200	-	6.600
e	0.650 BSC		
L	0.450	-	0.750
H	0.250 TYP		
θ	0°	-	8°
ccc	0.100		

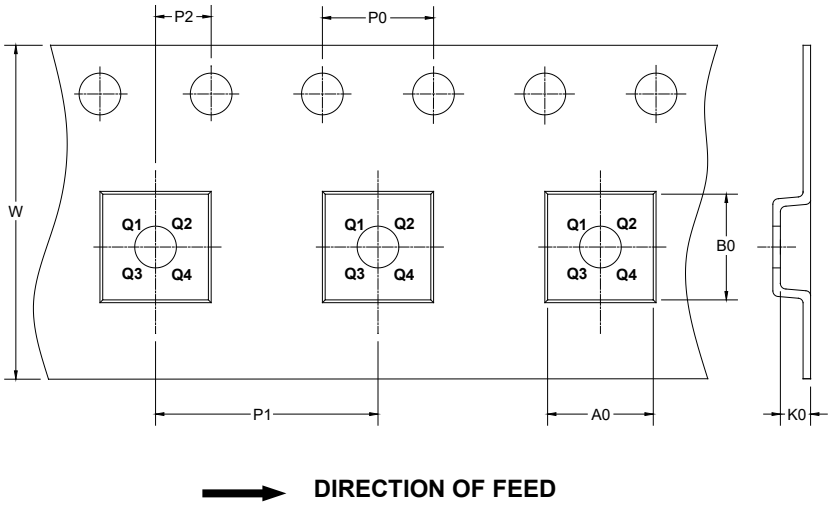
NOTES:
1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MO-153.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



DIRECTION OF FEED

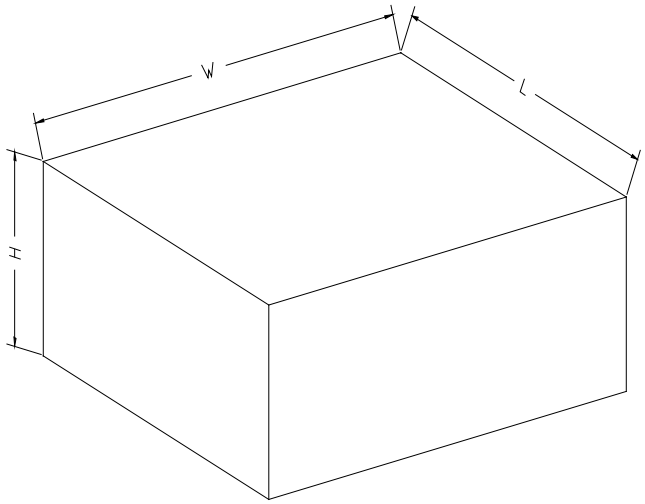
NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
TSSOP-14	13″	12.4	6.80	5.40	1.50	4.0	8.0	2.0	12.0	Q1

DD0001

CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
13″	386	280	370	5

DD0002