

Data sheet acquired from Harris Semiconductor SCHS273E

August 1997 - Revised September 2003

High-Speed CMOS Logic Triple 3-Input AND Gate

Features

- · Buffered Inputs
- Typical Propagation Delay: 8ns at V_{CC} = 5V,
 C_L = 15pF, T_A = 25°C
- Fanout (Over Temperature Range)
- Wide Operating Temperature Range ... -55°C to 125°C
- Balanced Propagation Delay and Transition Times
- Significant Power Reduction Compared to LSTTL Logic ICs
- HC Types
 - 2V to 6V Operation
 - High Noise Immunity: N_{IL} = 30%, N_{IH} = 30% of V_{CC} at V_{CC} = 5V
- HCT Types
 - 4.5V to 5.5V Operation
 - Direct LSTTL Input Logic Compatibility,
 V_{IL}= 0.8V (Max), V_{IH} = 2V (Min)
 - CMOS Input Compatibility, I_I \leq 1 μ A at V_{OL}, V_{OH}

Description

The 'HC11 and 'HCT11 logic gates utilize silicon gate CMOS technology to achieve operating speeds similar to LSTTL gates with the low power consumption of standard CMOS integrated circuits. All devices have the ability to drive 10 LSTTL loads. The HCT logic family is functionally pin compatible with the standard LS logic family.

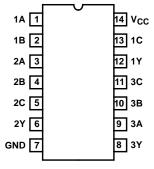
Ordering Information

PART NUMBER	TEMP. RANGE (°C)	PACKAGE
CD54HC11F3A	-55 to 125	14 Ld CERDIP
CD54HCT11F3A	-55 to 125	14 Ld CERDIP
CD74HC11E	-55 to 125	14 Ld PDIP
CD74HC11M	-55 to 125	14 Ld SOIC
CD74HC11MT	-55 to 125	14 Ld SOIC
CD74HC11M96	-55 to 125	14 Ld SOIC
CD74HCT11E	-55 to 125	14 Ld PDIP
CD74HCT11M	-55 to 125	14 Ld SOIC
CD74HCT11MT	-55 to 125	14 Ld SOIC
CD74HCT11M96	-55 to 125	14 Ld SOIC

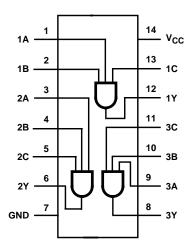
NOTE: When ordering, use the entire part number. The suffix 96 denotes tape and reel. The suffix T denotes a small-quantity reel of 250.

Pinout

CD54HC11, CD54HCT11 (CERDIP) CD74HC11, CD74HCT11 (PDIP, SOIC) TOP VIEW



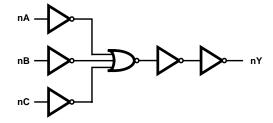
Functional Diagram



TRUTH TABLE

INP	UTS		OUTPUT
nA	nB	nC	nY
L	L	L	L
L	L	Н	L
L	Н	L	L
L	Н	Н	L
Н	L	L	L
Н	L	Н	L
Н	Н	L	L
Н	Н	Н	Н

Logic Symbol



Absolute Maximum Ratings

Thermal Information

Thermal Resistance (Typical, Note 1)	θ _{JA} (°C/W)
E (PDIP) Package	80
M (SOIC) Package	86
Maximum Junction Temperature (Hermetic Package or Di	e) 175 ^o C
Maximum Junction Temperature (Plastic Package)	150 ^o C
Maximum Storage Temperature Range65	^o C to 150 ^o C
Maximum Lead Temperature (Soldering 10s)	300°C
(SOIC - Lead Tips Only)	

Operating Conditions

Temperature Range (T _A)55°C to 125°C
Supply Voltage Range, V _{CC}
HC Types2V to 6V
HCT Types
DC Input or Output Voltage, V _I , V _O 0V to V _{CC}
Input Rise and Fall Time
2V
4.5V 500ns (Max)
6V

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

1. The package thermal impedance is calculated in accordance with JESD 51-7.

DC Electrical Specifications

			ST ITIONS		25°C			-40°C T	O 85°C	-55°C TO 125°C			
PARAMETER	SYMBOL	V _I (V)	I _O (mA)	V _{CC} (V)	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNITS	
HC TYPES													
High Level Input	V _{IH}	-	-	2	1.5	-	-	1.5	-	1.5	-	V	
Voltage				4.5	3.15	-	-	3.15	-	3.15	-	V	
				6	4.2	-	-	4.2	-	4.2	-	V	
Low Level Input	V _{IL}	-	-	2	ı	-	0.5	-	0.5	-	0.5	V	
Voltage				4.5	ı	-	1.35	ı	1.35	-	1.35	V	
				6	ı	-	1.8	1	1.8	-	1.8	V	
High Level Output Voltage CMOS Loads	V _{OH}	V _{IH} or	-0.02	2	1.9	-	-	1.9	-	1.9	-	V	
			-0.02	4.5	4.4	-	-	4.4	-	4.4	-	V	
			-0.02	6	5.9	-	-	5.9	-	5.9	-	V	
High Level Output				-	-	ı	-	-	-	-	-	-	V
Voltage TTL Loads			-4	4.5	3.98	-	-	3.84	-	3.7	-	V	
			-5.2	6	5.48	-	-	5.34	-	5.2	-	V	
Low Level Output	V _{OL}	V _{IH} or	0.02	2	ı	-	0.1	-	0.1	-	0.1	V	
Voltage		V_{IL}	0.02	4.5	ı	-	0.1	ı	0.1	-	0.1	V	
			0.02	6	ı	-	0.1	1	0.1	-	0.1	V	
Low Level Output			-	-	1	-	-	-	-	-	-	V	
Voltage TTL Loads			4	4.5	-	-	0.26	-	0.33	-	0.4	V	
			5.2	6	1	-	0.26	-	0.33	-	0.4	V	
Input Leakage Current	II	V _{CC} or GND	-	6	-	-	±0.1	-	±1	-	±1	μА	

DC Electrical Specifications (Continued)

			ST ITIONS			25°C		-40°C T	O 85°C	-55°C T	-55°C TO 125°C	
PARAMETER	SYMBOL	V _I (V)	I _O (mA)	V _{CC} (V)	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNITS
Quiescent Device Current	Icc	V _{CC} or GND	0	6	-	-	2	-	20	-	40	μА
HCT TYPES												
High Level Input Voltage	V _{IH}	-	-	4.5 to 5.5	2	-	-	2	-	2	-	V
Low Level Input Voltage	V _{IL}	-	-	4.5 to 5.5	-	-	0.8	-	0.8	-	0.8	V
High Level Output Voltage CMOS Loads	V _{OH}	V _{IH} or V _{IL}	-0.02	4.5	4.4	-	-	4.4	-	4.4	-	V
High Level Output Voltage TTL Loads			-4	4.5	3.98	-	-	3.84	-	3.7	-	V
Low Level Output Voltage CMOS Loads	V _{OL}	V _{IH} or V _{IL}	0.02	4.5	-	-	0.1	-	0.1	-	0.1	V
Low Level Output Voltage TTL Loads			4	4.5	-	-	0.26	-	0.33	-	0.4	V
Input Leakage Current	II	V _{CC} and GND	-	5.5	-		±0.1	-	±1	-	±1	μА
Quiescent Device Current	Icc	V _{CC} or GND	-	5.5	-	-	2	-	20	-	40	μА
Additional Quiescent Device Current Per Input Pin: 1 Unit Load	ΔI _{CC} (Note 2)	V _{CC} - 2.1	-	4.5 to 5.5	-	100	360	-	450	-	490	μА

NOTE:

HCT Input Loading Table

INPUT	UNIT LOADS
All	0.5

NOTE: Unit Load is ΔI_{CC} limit specified in DC Electrical Specifications table, e.g. 360 μA max at 25 $^{o}C.$

Switching Specifications Input t_r , $t_f = 6ns$

		TEST	TEST V _{CC}		25°C			-40°C TO 85°C		-55°C TO 125°C		
PARAMETER	SYMBOL	CONDITIONS	(V)	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNITS	
HC TYPES												
Propagation Delay, Input to Output (Figure 1)	t _{PLH} , t _{PHL}	C _L = 50pF	2	-	-	100	-	125	-	150	ns	
			4.5	-	-	20	-	25	-	30	ns	
			6	-	-	17	-	21	-	26	ns	
Propagation Delay, Data Input to Output Y	t _{PLH} , t _{PHL}	C _L = 15pF	5	-	8	-	-	-	-	-	ns	

^{2.} For dual-supply systems theoretical worst case (V $_{I}$ = 2.4V, V $_{CC}$ = 5.5V) specification is 1.8mA.

Switching Specifications Input $t_{f},\,t_{f}=6\text{ns}$ (Continued)

		TEST	v _{cc}		25°C		-40°C T	O 85°C	-55°C T	O 125 ⁰ C	
PARAMETER	SYMBOL	CONDITIONS	(V)	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNITS
Transition Times (Figure 1)	t _{TLH} , t _{THL}	C _L = 50pF	2	-	-	75	-	95	-	110	ns
			4.5	-	-	15	-	19	-	22	ns
			6	-	-	13	-	16	-	19	ns
Input Capacitance	C _I	C _L = 50pF	-	-	-	10	-	10	-	10	pF
Power Dissipation Capacitance (Notes 3, 4)	C _{PD}	C _L = 15pF	5	-	26	-	-	-	-	-	pF
HCT TYPES											
Propagation Delay, Input to Output (Figure 2)	t _{PLH} , t _{PHL}	C _L = 50pF	4.5	-	-	28	-	35	-	42	ns
Propagation Delay, Data Input to Output Y	t _{PLH} , t _{PHL}	C _L = 15pF	5	-	11	-	-	-	-	-	ns
Transition Times (Figure 2)	t _{TLH} , t _{THL}	C _L = 50pF	4.5	-	-	15	-	19	-	22	ns
Input Capacitance	CI	C _L = 50pF	-	-	-	10	-	10	-	10	pF
Power Dissipation Capacitance (Notes 3, 4)	C _{PD}	-	5	-	28	i	-	-	-	-	pF

NOTES:

- 3. $C_{\mbox{\scriptsize PD}}$ is used to determine the dynamic power consumption, per gate.
- 4. $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$ where f_i = input frequency, C_L = output load capacitance, V_{CC} = supply voltage.

Test Circuits and Waveforms

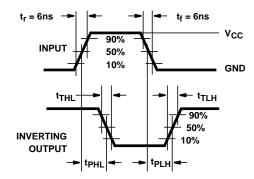


FIGURE 1. HC TRANSITION TIMES AND PROPAGATION DELAY TIMES, COMBINATION LOGIC

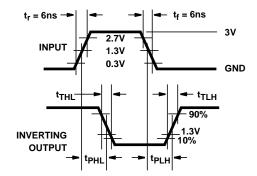


FIGURE 2. HCT TRANSITION TIMES AND PROPAGATION DELAY TIMES, COMBINATION LOGIC



PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
5962-8970901CA	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
CD54HC11F	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
CD54HC11F3A	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
CD54HCT11F	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
CD54HCT11F3A	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
CD74HC11E	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
CD74HC11EE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
CD74HC11M	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HC11M96	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HC11M96E4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HC11M96G4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HC11ME4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HC11MG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HC11MT	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HC11MTE4	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HC11MTG4	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT11E	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
CD74HCT11EE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
CD74HCT11M	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT11M96	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT11M96E4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT11M96G4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT11ME4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT11MG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT11MT	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT11MTE4	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD74HCT11MTG4	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM



PACKAGE OPTION ADDENDUM

18-Sep-2008

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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TAPE AND REEL INFORMATION





A0	Dimension designed to accommodate the component width
В0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing			Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
CD74HC11M96	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
CD74HCT11M96	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1





*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CD74HC11M96	SOIC	D	14	2500	346.0	346.0	33.0
CD74HCT11M96	SOIC	D	14	2500	346.0	346.0	33.0

14 LEADS SHOWN

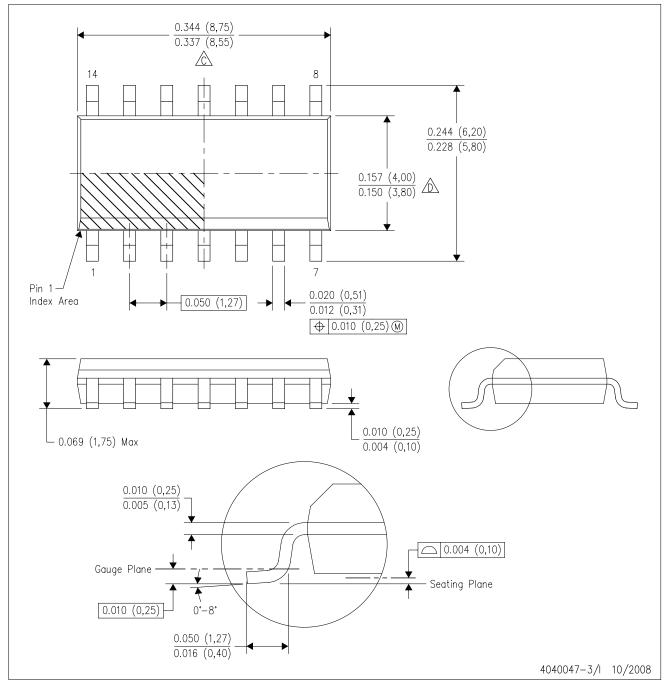


NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package is hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
- E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE



NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
- Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AB.



N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
- The 20 pin end lead shoulder width is a vendor option, either half or full width.



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