

ใบงานที่ 9 การอ่านคู่มือไอซีดิจิทัล

จุดประสงค์การเรียนรู้

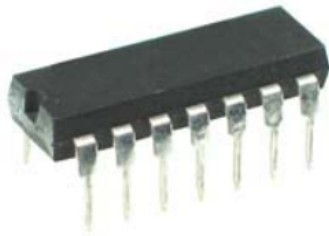
1. บอกวิธีการอ่านคู่มือไอซีดิจิทัล
2. บอกวิธีค้นหาคู่มือไอซีดิจิทัลแบบต่าง ๆ
3. อ่านคู่มือไอซีดิจิทัล
4. ค้นหาคู่มือไอซีดิจิทัลแบบต่าง ๆ

เครื่องมือ/วัสดุอุปกรณ์ในการปฏิบัติงาน

1. คอมพิวเตอร์ที่เชื่อมต่อ internet

ขั้นตอนในการปฏิบัติงาน

1. 74LS00



Features

- Four Independent NAND Gates
- Standard Pin Configuration
- Operating Temperature to 70°C
- Standard TTL Switching Voltages
- Equivalent to SN74LS00N, DM74LS00N, HD74LS00P

Part Summary	
Manufacturer	Various
Manufacturer's Part Number	74LS00
Manufacturer's Web Site	-
Futurlec Part Number	74LS00
Department	Integrated Circuits
Category	74LS Series
RoHS Compliant	-
Package Type	14 Pin DIP
Technical Data	74LS00 Datasheet



August 1986
Revised March 2000

DM74LS00

Quad 2-Input NAND Gate

General Description

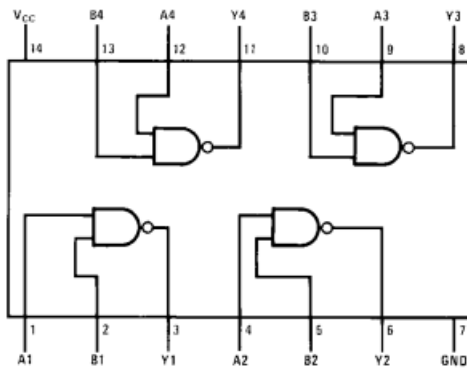
This device contains four independent gates each of which performs the logic NAND function.

Ordering Code:

Order Number	Package Number	Package Description
DM74LS00M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow
DM74LS00SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
DM74LS00N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram



Function Table

$$Y = \overline{AB}$$

Inputs		Output
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

H = HIGH Logic Level
L = LOW Logic Level

Symbol	Parameter	Min	Nom	Max	Units
V _{CC}	Supply Voltage	4.75	5	5.25	V
V _{IH}	HIGH Level Input Voltage	2			V
V _{IL}	LOW Level Input Voltage			0.8	V
I _{OH}	HIGH Level Output Current			-0.4	mA
I _{OL}	LOW Level Output Current			8	mA
T _A	Free Air Operating Temperature	0		70	°C

Absolute Maximum Ratings(Note 1)

Supply Voltage 7V
 Input Voltage 7V
 Operating Free Air Temperature Range 0°C to +70°C
 Storage Temperature Range -65°C to +150°C

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Recommended Operating Conditions

Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = -18 mA			-1.5	V
V _{OH}	HIGH Level Output Voltage	V _{CC} = Min, I _{OH} = Max, V _{IL} = Max	2.7	3.4		V
V _{OL}	LOW Level Output Voltage	V _{CC} = Min, I _{OL} = Max, V _{IH} = Min		0.35	0.5	V
		I _{OL} = 4 mA, V _{CC} = Min		0.25	0.4	
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 7V			0.1	mA
I _{IH}	HIGH Level Input Current	V _{CC} = Max, V _I = 2.7V			20	µA
I _{IL}	LOW Level Input Current	V _{CC} = Max, V _I = 0.4V			-0.36	mA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 3)	-20		-100	mA
I _{CCH}	Supply Current with Outputs HIGH	V _{CC} = Max		0.8	1.6	mA
I _{CCL}	Supply Current with Outputs LOW	V _{CC} = Max		2.4	4.4	mA

Note 2: All typicals are at V_{CC} = 5V, T_A = 25°C.

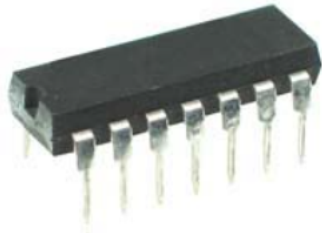
Note 3: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Switching Characteristics
 at V_{CC} = 5V and T_A = 25°C

Symbol	Parameter	R _L = 2 kΩ				Units
		C _L = 15 pF		C _L = 50 pF		
		Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	3	10	4	15	ns
t _{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	3	10	4	15	ns

2. 74LS02

74LS02 - 74LS02 Quad 2-input NOR Gate



Features

- Four Independent NOR Gates
- Standard Pin Configuration
- Operating Temperature to 70°C
- Standard TTL Switching Voltages
- Equivalent to SN74LS02N, DM74LS02N, HD74LS02P

Part Summary	
Manufacturer	Various
Manufacturer's Part Number	74LS02
Manufacturer's Web Site	-
Futurlec Part Number	74LS02
Department	Integrated Circuits
Category	74LS Series
RoHS Compliant	-
Package Type	14 Pin DIP
Technical Data	74LS02 Datasheet

May 1986
Revised March 2000

DM74LS02 Quad 2-Input NOR Gate

General Description
This device contains four independent gates each of which performs the logic NOR function.

Ordering Code:

Order Number	Package Number	Package Description
DM74LS02M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow
DM74LS02SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
DM74LS02N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram

Function Table

$$Y = \overline{A + B}$$

Inputs		Output
A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

H = HIGH Logic Level
L = LOW Logic Level

Recommended Operating Conditions					
Symbol	Parameter	Min	Nom	Max	Units
V _{CC}	Supply Voltage	4.75	5	5.25	V
V _{IH}	HIGH Level Input Voltage	2			V
V _{IL}	LOW Level Input Voltage			0.8	V
I _{OH}	HIGH Level Output Current			-0.4	mA
I _{OL}	LOW Level Output Current			8	mA
T _A	Free Air Operating Temperature	0		70	°C

Electrical Characteristics						
over recommended operating free air temperature range (unless otherwise noted)						
Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = -18 mA			-1.5	V
V _{OH}	HIGH Level Output Voltage	V _{CC} = Min, I _{OH} = Max, V _{IL} = Max	2.7	3.4		V
V _{OL}	LOW Level Output Voltage	V _{CC} = Min, I _{OL} = Max, V _{IH} = Min		0.35	0.5	V
		I _{OL} = 4 mA, V _{CC} = Min		0.25	0.4	
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 7V			0.1	mA
I _{IH}	HIGH Level Input Current	V _{CC} = Max, V _I = 2.7V			20	µA
I _{IL}	LOW Level Input Current	V _{CC} = Max, V _I = 0.4V			-0.40	mA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 3)	-20		-100	mA
I _{CCH}	Supply Current with Outputs HIGH	V _{CC} = Max		1.6	3.2	mA
I _{CCL}	Supply Current with Outputs LOW	V _{CC} = Max		2.8	5.4	mA

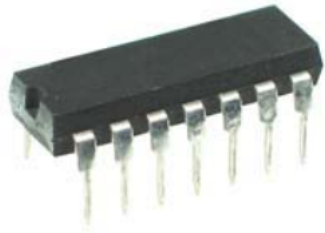
Note 2: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 3: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Switching Characteristics						
at V _{CC} = 5V and T _A = 25°C						
Symbol	Parameter	R _L = 2 kΩ				Units
		C _L = 15 pF		C _L = 50 pF		
		Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time LOW-to-HIGH Level Output		13		18	ns
t _{PHL}	Propagation Delay Time HIGH-to-LOW Level Output		10		15	ns

3. 74LS04

74LS04 - 74LS04 Hex Inverter



Features

- Six Independent Invert Gates
- Standard Pin Configuration
- Operating Temperature to 70°C
- Standard TTL Switching Voltages
- Equivalent to SN74LS04N, DM74LS04N, HD74LS04P

Part Summary	
Manufacturer	Various
Manufacturer's Part Number	74LS04
Manufacturer's Web Site	-
Futurlec Part Number	74LS04
Department	Integrated Circuits
Category	74LS Series
RoHS Compliant	-
Package Type	14 Pin DIP
Technical Data	74LS04 Datasheet

DM74LS04
Hex Inverting Gates

General Description
This device contains six independent gates each of which performs the logic INVERT function.

August 1986
Revised March 2000

Ordering Code:

Order Number	Package Number	Package Description
DM74LS04M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow
DM74LS04SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
DM74LS04N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram

Function Table

$Y = \bar{A}$

Input A	Output Y
L	H
H	L

H = HIGH Logic Level
L = LOW Logic Level

Recommended Operating Conditions						
Symbol	Parameter	Min	Nom	Max	Units	
V _{CC}	Supply Voltage	4.75	5	5.25	V	
V _{HI}	HIGH Level Input Voltage	2			V	
V _{IL}	LOW Level Input Voltage			0.8	V	
I _{OH}	HIGH Level Output Current			-0.4	mA	
I _{OL}	LOW Level Output Current			8	mA	
T _A	Free Air Operating Temperature	0		70	°C	

Electrical Characteristics						
over recommended operating free air temperature range (unless otherwise noted)						
Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = -18 mA			-1.5	V
V _{OH}	HIGH Level Output Voltage	V _{CC} = Min, I _{OH} = Max, V _{IL} = Max	2.7	3.4		V
V _{OL}	LOW Level Output Voltage	V _{CC} = Min, I _{OL} = Max, V _{IH} = Min		0.35	0.5	V
		I _{OL} = 4 mA, V _{CC} = Min		0.25	0.4	
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 7V			0.1	mA
I _{IH}	HIGH Level Input Current	V _{CC} = Max, V _I = 2.7V			20	µA
I _{IL}	LOW Level Input Current	V _{CC} = Max, V _I = 0.4V			-0.36	mA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 3)	-20		-100	mA
I _{CCH}	Supply Current with Outputs HIGH	V _{CC} = Max		1.2	2.4	mA
I _{CCL}	Supply Current with Outputs LOW	V _{CC} = Max		3.6	6.6	mA

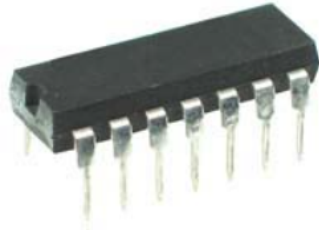
Note 2: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 3: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Switching Characteristics						
at V _{CC} = 5V and T _A = 25°C						
Symbol	Parameter	R _L = 2 kΩ				Units
		C _L = 15 pF		C _L = 50 pF		
		Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	3	10	4	15	ns
t _{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	3	10	4	15	ns

4. 74LS08


74LS08 - 74LS08 Quad 2-Input AND Gates (Open Collector)



Features

- Four Independent AND Gates
- Standard Pin Configuration
- Operating Temperature up to 70°C
- Standard TTL Switching Voltages
- Equivalent to SN74LS08N, DM74LS08N, HD74LS08P

Part Summary	
Manufacturer	Various
Manufacturer's Part Number	74LS08
Manufacturer's Web Site	-
Futurlec Part Number	74LS08
Department	Integrated Circuits
Category	74LS Series
RoHS Compliant	-
Package Type	14 Pin DIP
Technical Data	74LS08 Datasheet



August 1986
Revised March 2000

DM74LS08

Quad 2-Input AND Gates

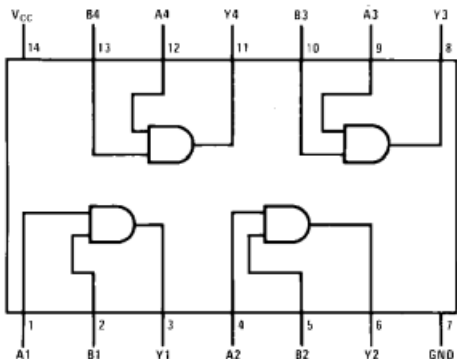
General Description
This device contains four independent gates each of which performs the logic AND function.

Ordering Code:

Order Number	Package Number	Package Description
DM74LS08M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow
DM74LS08SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
DM74LS08N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram



Function Table

$Y = AB$

Inputs		Output
A	B	Y
L	L	L
L	H	L
H	L	L
H	H	H

H = HIGH Logic Level
L = LOW Logic Level

Recommended Operating Conditions						
Symbol	Parameter	Min	Nom	Max	Units	
V _{CC}	Supply Voltage	4.75	5	5.25	V	
V _{IH}	HIGH Level Input Voltage	2			V	
V _{IL}	LOW Level Input Voltage			0.8	V	
I _{OH}	HIGH Level Output Current			-0.4	mA	
I _{OL}	LOW Level Output Current			8	mA	
T _A	Free Air Operating Temperature	0		70	°C	

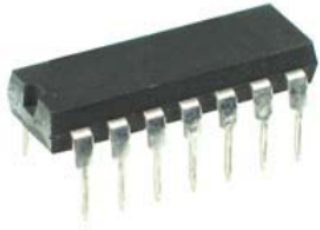
Electrical Characteristics						
over recommended operating free air temperature range (unless otherwise noted)						
Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = -18 mA			-1.5	V
V _{OH}	HIGH Level Output Voltage	V _{CC} = Min, I _{OH} = Max, V _{IH} = Min	2.7	3.4		V
V _{OL}	LOW Level Output Voltage	V _{CC} = Min, I _{OL} = Max, V _{IL} = Max		0.35	0.5	V
		I _{OL} = 4 mA, V _{CC} = Min		0.25	0.4	
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 7V			0.1	mA
I _{IH}	HIGH Level Input Current	V _{CC} = Max, V _I = 2.7V			20	µA
I _{IL}	LOW Level Input Current	V _{CC} = Max, V _I = 0.4V			-0.36	mA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 3)	-20		-100	mA
I _{CCH}	Supply Current with Outputs HIGH	V _{CC} = Max		2.4	4.8	mA
I _{CCL}	Supply Current with Outputs LOW	V _{CC} = Max		4.4	8.8	mA

Switching Characteristics						
at V _{CC} = 5V and T _A = 25°C						
Symbol	Parameter	R _L = 2 kΩ				Units
		C _L = 15 pF		C _L = 50 pF		
		Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	4	13	6	18	ns
t _{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	3	11	5	18	ns

Note 2: All typicals are at V_{CC} = 5V, T_A = 25°C.

5. 74LS10

74LS10 - 74LS10 Triple 3-Input NAND Gates



Features

- Three Independent NAND Gates
- Fast Switching Times
- Operating Temperature up to 70°C
- Standard DIP 74LS10 IC
- Equivalent to SN74LS10N, DM74LS10N, HD74LS10P

Part Summary	
Manufacturer	Various
Manufacturer's Part Number	74LS10
Manufacturer's Web Site	-
Futurlec Part Number	74LS10
Department	Integrated Circuits
Category	74LS Series
RoHS Compliant	-
Package Type	14 Pin DIP
Technical Data	74LS10 Datasheet

August 1986
Revised March 2000

DM74LS10 Triple 3-Input NAND Gate

General Description
This device contains three independent gates each of which performs the logic NAND function.

Ordering Code:

Order Number	Package Number	Package Description
DM74LS10M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow
DM74LS10N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram

Function Table

$Y = \overline{ABC}$

Inputs			Output
A	B	C	Y
X	X	L	H
X	L	X	H
L	X	X	H
H	H	H	L

H = HIGH Logic Level
L = LOW Logic Level
X = Either LOW or HIGH Logic Level

Recommended Operating Conditions						
Symbol	Parameter	Min	Nom	Max	Units	
V _{CC}	Supply Voltage	4.75	5	5.25	V	
V _{IH}	HIGH Level Input Voltage	2			V	
V _{IL}	LOW Level Input Voltage			0.8	V	
I _{OH}	HIGH Level Output Current			-0.4	mA	
I _{OL}	LOW Level Output Current			8	mA	
T _A	Free Air Operating Temperature	0		70	°C	

Electrical Characteristics						
over recommended operating free air temperature range (unless otherwise noted)						
Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = -18 mA			-1.5	V
V _{OH}	HIGH Level Output Voltage	V _{CC} = Min, I _{OH} = Max, V _{IL} = Max	2.7	3.4		V
V _{OL}	LOW Level Output Voltage	V _{CC} = Min, I _{OL} = Max, V _{IH} = Min		0.35	0.5	V
		I _{OL} = 4 mA, V _{CC} = Min		0.25	0.4	
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 7V			0.1	mA
I _{IH}	HIGH Level Input Current	V _{CC} = Max, V _I = 2.7V			20	µA
I _{IL}	LOW Level Input Current	V _{CC} = Max, V _I = 0.4V			-0.36	mA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 3)	-20		-100	mA
I _{CCH}	Supply Current with Outputs High	V _{CC} = Max		0.6	1.2	mA
I _{CCL}	Supply Current with Outputs Low	V _{CC} = Max		1.8	3.3	mA

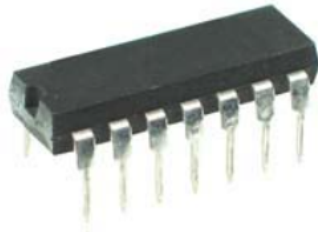
Note 2: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 3: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Switching Characteristics						
at V _{CC} = 5V and T _A = 25°C						
Symbol	Parameter	R _L = 2 kΩ				Units
		C _L = 15 pF		C _L = 50 pF		
		Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	3	10	4	15	ns
t _{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	3	10	4	15	ns

6. 74LS11


74LS11 - 74LS11 Triple 3-input AND Gate



Features

- Three Independent AND Gates
- Standard Pin Configuration
- Fast Switching Times
- Operating Temperature up to 70°C
- Standard TTL Switching Voltages

Part Summary	
Manufacturer	Various
Manufacturer's Part Number	74LS11
Manufacturer's Web Site	-
Futurlec Part Number	74LS11
Department	Integrated Circuits
Category	74LS Series
RoHS Compliant	-
Package Type	14 Pin DIP
Technical Data	74LS11 Datasheet



DM74LS11
Triple 3-Input AND Gate

General Description
This device contains three independent gates each of which performs the logic AND function.

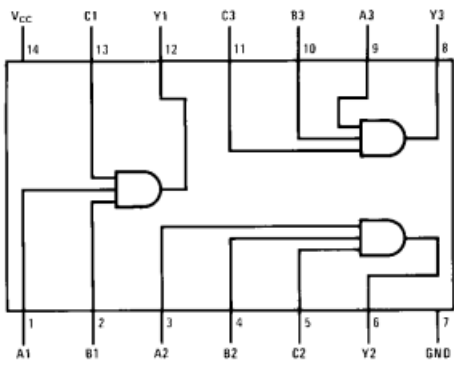
August 1986
Revised March 2000

Ordering Code:

Order Number	Package Number	Package Description
DM74LS11M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow
DM74LS11N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram



Function Table

$Y = ABC$

Inputs			Output
A	B	C	Y
X	X	L	L
X	L	X	L
L	X	X	L
H	H	H	H

H = HIGH Logic Level
L = LOW Logic Level
X = Either LOW or HIGH Logic Level

Recommended Operating Conditions						
Symbol	Parameter	Min	Nom	Max	Units	
V _{CC}	Supply Voltage	4.75	5	5.25	V	
V _{IH}	HIGH Level Input Voltage	2			V	
V _{IL}	LOW Level Input Voltage			0.8	V	
I _{OH}	HIGH Level Output Current			-0.4	mA	
I _{OL}	LOW Level Output Current			8	mA	
T _A	Free Air Operating Temperature	0		70	°C	

Electrical Characteristics						
over recommended operating free air temperature range (unless otherwise noted)						
Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = -18 mA			-1.5	V
V _{OH}	HIGH Level Output Voltage	V _{CC} = Min, I _{OH} = Max V _{IH} = Min	2.7	3.4		V
V _{OL}	LOW Level Output Voltage	V _{CC} = Min, I _{OL} = Max V _{IL} = Max		0.35	0.5	V
		I _{OL} = 4 mA, V _{CC} = Min		0.25	0.4	
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 7V			0.1	mA
I _{IH}	HIGH Level Input Current	V _{CC} = Max, V _I = 2.7V			20	µA
I _{IL}	LOW Level Input Current	V _{CC} = Max, V _I = 0.4V			-0.36	mA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 3)	-20		-100	mA
I _{CCH}	Supply Current with Outputs HIGH	V _{CC} = Max		1.8	3.6	mA
I _{CCL}	Supply Current with Outputs LOW	V _{CC} = Max		3.3	6.6	mA

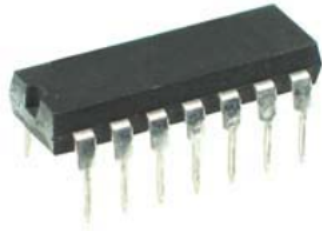
Note 2: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 3: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Switching Characteristics						
at V _{CC} = 5V and T _A = 25°C						
Symbol	Parameter	R _L = 2 kΩ				Units
		C _L = 15 pF		C _L = 50 pF		
		Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	4	13	6	18	ns
t _{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	3	11	5	18	ns

7. 74LS20

74LS20 - 74LS20 Dual 4-input NAND Gate



Features

- Two Independent NAND Gates
- Wide Operating Voltage
- Operating Temperature up to 70°C
- Standard DIP 74LS20 IC
- Equivalent to SN74LS20N, DM74LS20N, HD74LS20P

Part Summary	
Manufacturer	Various
Manufacturer's Part Number	74LS20
Manufacturer's Web Site	-
Futurlec Part Number	74LS20
Department	Integrated Circuits
Category	74LS Series
RoHS Compliant	-
Package Type	14 Pin DIP
Technical Data	74LS20 Datasheet

June 1986
Revised March 2000

DM74LS20 Dual 4-Input NAND Gate

General Description
This device contains two independent gates each of which performs the logic NAND function.

Ordering Code:

Order Number	Package Number	Package Description
DM74LS20M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow
DM74LS20N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram

Function Table

$Y = \overline{ABCD}$

Inputs				Output
A	B	C	D	Y
X	X	X	L	H
X	X	L	X	H
X	L	X	X	H
L	X	X	X	H
H	H	H	H	L

H = HIGH Logic Level
L = LOW Logic Level
X = Either LOW or HIGH Logic Level

Recommended Operating Conditions						
Symbol	Parameter	Min	Nom	Max	Units	
V _{CC}	Supply Voltage	4.75	5	5.25	V	
V _{IH}	HIGH Level Input Voltage	2			V	
V _{IL}	LOW Level Input Voltage			0.8	V	
I _{OH}	HIGH Level Output Current			-0.4	mA	
I _{OL}	LOW Level Output Current			8	mA	
T _A	Free Air Operating Temperature	0		70	°C	

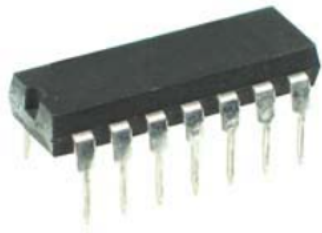
Electrical Characteristics						
over recommended operating free air temperature range (unless otherwise noted)						
Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = -18 mA			-1.5	V
V _{OH}	HIGH Level Output Voltage	V _{CC} = Min, I _{OH} = Max, V _{IL} = Max	2.7	3.4		V
V _{OL}	LOW Level Output Voltage	V _{CC} = Min, I _{OL} = Max, V _{IH} = Min		0.35	0.5	V
		I _{OL} = 4 mA, V _{CC} = Min		0.25	0.4	
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 7V			0.1	mA
I _{IH}	HIGH Level Input Current	V _{CC} = Max, V _I = 2.7V			20	µA
I _{IL}	LOW Level Input Current	V _{CC} = Max, V _I = 0.4V			-0.36	mA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 3)	-20		-100	mA
I _{CC} H	Supply Current with Outputs HIGH	V _{CC} = Max		0.4	0.8	mA
I _{CC} L	Supply Current with Outputs LOW	V _{CC} = Max		1.2	2.2	mA

Note 2: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 3: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Switching Characteristics						
at V _{CC} = 5V and T _A = 25°C						
Symbol	Parameter	R _L = 2 kΩ				Units
		C _L = 15 pF		C _L = 50 pF		
		Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	3	10	4	15	ns
t _{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	3	10	4	15	ns

8. 74LS21

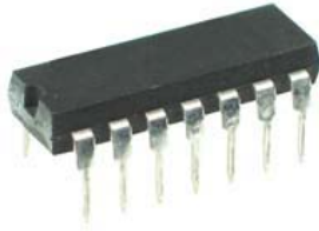
74LS21 - 74LS21 Dual 4-input AND Gate**Features**

- Two Independent AND Gates
- Standard Pin Configuration
- Fast Switching Times
- Operating Temperature up to 70°C
- Standard TTL Switching Voltages

Part Summary	
Manufacturer	Various
Manufacturer's Part Number	74LS21
Manufacturer's Web Site	-
Futurlec Part Number	74LS21
Department	Integrated Circuits
Category	74LS Series
RoHS Compliant	-
Package Type	14 Pin DIP
Technical Data	

9. 74LS32

74LS32 - 74LS32 Quad 2-input OR Gate



Features

- Four Independent OR Gates
- Wide Operating Voltage
- Operating Temperature up to 70°C
- Standard DIP 74LS32 IC
- Equivalent to SN74LS32N, DM74LS32N, HD74LS32P

Part Summary	
Manufacturer	Various
Manufacturer's Part Number	74LS32
Manufacturer's Web Site	-
Futurlec Part Number	74LS32
Department	Integrated Circuits
Category	74LS Series
RoHS Compliant	-
Package Type	14 Pin DIP
Technical Data	74LS32 Datasheet

FAIRCHILD
SEMICONDUCTOR™

June 1986
Revised March 2000

DM74LS32

Quad 2-Input OR Gate

General Description

This device contains four independent gates each of which performs the logic OR function.

Ordering Code:

Order Number	Package Number	Package Description
DM74LS32M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow
DM74LS32SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
DM74LS32N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram

Function Table

$Y = A + B$

Inputs		Output
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	H

H = HIGH Logic Level
L = LOW Logic Level

Recommended Operating Conditions						
Symbol	Parameter	Min	Nom	Max	Units	
V _{CC}	Supply Voltage	4.75	5	5.25	V	
V _{IH}	HIGH Level Input Voltage	2			V	
V _{IL}	LOW Level Input Voltage			0.8	V	
I _{OH}	HIGH Level Output Current			-0.4	mA	
I _{OL}	LOW Level Output Current			8	mA	
T _A	Free Air Operating Temperature	0		70	°C	

Electrical Characteristics						
over recommended operating free air temperature range (unless otherwise noted)						
Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = -18 mA			-1.5	V
V _{OH}	HIGH Level Output Voltage	V _{CC} = Min, I _{OH} = Max V _{IH} = Min	2.7	3.4		V
V _{OL}	LOW Level Output Voltage	V _{CC} = Min, I _{OL} = Max V _{IL} = Max		0.35	0.5	V
		I _{OL} = 4 mA, V _{CC} = Min		0.25	0.4	
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 7V			0.1	mA
I _{IH}	HIGH Level Input Current	V _{CC} = Max, V _I = 2.7V			20	µA
I _{IL}	LOW Level Input Current	V _{CC} = Max, V _I = 0.4V			-0.36	mA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 3)	-20		-100	mA
I _{CCH}	Supply Current with Outputs HIGH	V _{CC} = Max		3.1	6.2	mA
I _{CCL}	Supply Current with Outputs LOW	V _{CC} = Max		4.9	9.8	mA

Note 2: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 3: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Switching Characteristics						
at V _{CC} = 5V and T _A = 25°C						
Symbol	Parameter	R _L = 2 kΩ				Units
		C _L = 15 pF		C _L = 50 pF		
		Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	3	11	4	15	ns
t _{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	3	11	4	15	ns

10. 74LS47

74LS47 - 74LS47 BCD to 7-Segment Decoder/Driver**Features**

- Accepts Four Line of BCD Input and Converts this to Seven Open Collector Outputs
- Open Collector Outputs require Pull-Up Resistors
- Lamp Test Input
- Operating Temperature up to 70°C
- Standard TTL Switching Voltages

Part Summary	
Manufacturer	Various
Manufacturer's Part Number	74LS47
Manufacturer's Web Site	-
Futurlec Part Number	74LS47
Department	Integrated Circuits
Category	74LS Series
RoHS Compliant	-
Package Type	16 Pin DIP
Technical Data	74LS47 Datasheet



October 1988
Revised March 2000

DM74LS47

BCD to 7-Segment Decoder/Driver with Open-Collector Outputs

General Description

The DM74LS47 accepts four lines of BCD (8421) input data, generates their complements internally and decodes the data with seven AND/OR gates having open-collector outputs to drive indicator segments directly. Each segment output is guaranteed to sink 24 mA in the ON (LOW) state and withstand 15V in the OFF (HIGH) state with a maximum leakage current of 250 μ A. Auxiliary inputs provided blanking, lamp test and cascadable zero-suppression functions.

Features

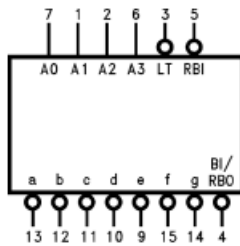
- Open-collector outputs
- Drive indicator segments directly
- Cascadable zero-suppression capability
- Lamp test input

Ordering Code:

Order Number	Package Number	Package Description
DM74LS47M	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
DM74LS47N	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

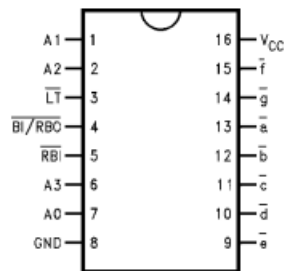
Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Logic Symbol



V_{CC} = Pin 16
GND = Pin 8

Connection Diagram



Recommended Operating Conditions					
Symbol	Parameter	Min	Nom	Max	Units
V_{CC}	Supply Voltage	4.75	5	5.25	V
V_{IH}	HIGH Level Input Voltage	2			V
V_{IL}	LOW Level Input Voltage			0.8	V
I_{OH}	HIGH Level Output Current $\bar{a} - \bar{g}$ @ $15V = V_{OH}$ (Note 7)			-250	μA
I_{OH}	HIGH Level Output Current \bar{BI} / \bar{RBO}			-50	μA
I_{OL}	LOW Level Output Current			24	mA
T_A	Free Air Operating Temperature	0		70	$^{\circ}C$

Note 7: OFF-State at $\bar{a} - \bar{g}$.

Electrical Characteristics						
Over recommended operating free air temperature range (unless otherwise noted)						
Symbol	Parameter	Conditions	Min	Typ (Note 8)	Max	Units
V_I	Input Clamp Voltage	$V_{CC} = \text{Min}, I_I = -18 \text{ mA}$			-1.5	V
V_{OH}	HIGH Level Output Voltage	$V_{CC} = \text{Min}, I_{OH} = \text{Max}, V_{IL} = \text{Max}, \bar{BI} / \bar{RBO}$	2.7	3.4		V
I_{OFF}	Output HIGH Current Segment Outputs	$V_{CC} = 5.5V, V_O = 15V \bar{a} - \bar{g}$			250	μA
V_{OL}	LOW Level Output Voltage	$V_{CC} = \text{Min}, I_{OL} = \text{Max}, V_{IH} = \text{Min}, \bar{a} - \bar{g}$		0.35	0.5	V
		$I_{OL} = 3.2 \text{ mA}, \bar{BI} / \bar{RBO}$			0.5	
		$I_{OL} = 12 \text{ mA}, \bar{a} - \bar{g}$		0.25	0.4	
		$I_{OL} = 1.6 \text{ mA}, \bar{BI} / \bar{RBO}$			0.4	
I_I	Input Current @ Max Input Voltage	$V_{CC} = \text{Max}, V_I = 7V$			100	μA
		$V_{CC} = \text{Max}, V_I = 10V$				
I_{IH}	HIGH Level Input Current	$V_{CC} = \text{Max}, V_I = 2.7V$			20	μA
I_{IL}	LOW Level Input Current	$V_{CC} = \text{Max}, V_I = 0.4V$			-0.4	mA
I_{OS}	Short Circuit Output Current	$V_{CC} = \text{Max}$ (Note 9),				mA
		I_{OS} at \bar{BI} / \bar{RBO}	-0.3		-2.0	
I_{CC}	Supply Current	$V_{CC} = \text{Max}$			13	mA

Note 8: All typicals are at $V_{CC} = 5V, T_A = 25^{\circ}C$.

Note 9: Not more than one output should be shorted at a time, and the duration should not exceed one second.

11. 74LS48


74LS48 - 74LS48 BCD to 7-Segment Decoder/Driver



Features

- Accepts Four Line of BCD Input and Converts this to Seven Open Collector Outputs
- Pull-Up Resistors Included
- Lamp Test Input
- Operating Temperature up to 70°C
- Standard TTL Switching Voltages

Part Summary	
Manufacturer	Various
Manufacturer's Part Number	74LS48
Manufacturer's Web Site	-
Futurlec Part Number	74LS48
Department	Integrated Circuits
Category	74LS Series
RoHS Compliant	-
Package Type	16 Pin DIP
Technical Data	74LS48 Datasheet



National Semiconductor

January 1992

DM74LS48 BCD to 7-Segment Decoder

General Description

The 'LS48 translates four lines of BCD (8421) input data into the 7-segment numeral code and provides seven corresponding outputs having pull-up resistors, as opposed to totem pole pull-ups. These outputs can serve as logic signals, with a HIGH output corresponding to a lighted lamp segment, or can provide a 1.3 mA base current to npn lamp driver transistors. Auxiliary inputs provide lamp test, blanking and cascadable zero-suppression functions. The 'LS48 decodes the input data in the pattern indicated in the Truth Table and the segment identification illustration.

Connection Diagram

Dual-In-Line Package

Order Number **DM74LS48M** or **DM74LS48N**
See NS Package Number **M16A** or **N16E**

TL/F/10172-1

Recommended Operating Conditions						
Symbol	Parameter	DM74LS48			Units	
		Min	Nom	Max		
V_{CC}	Supply Voltage	4.75	5	5.25	V	
V_{IH}	High Level Input Voltage	2			V	
V_{IL}	Low Level Input Voltage			0.8	V	
I_{OH}	High Level Output Current			-50	μ A	
I_{OL}	Low Level Output Current			6.0	mA	
T_A	Free Air Operating Temperature	0		70	$^{\circ}$ C	

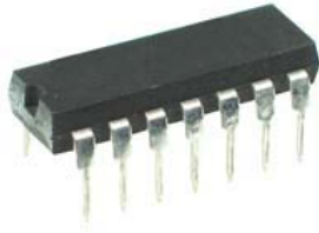
Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)						
Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	$V_{CC} = \text{Min}, I_I = -18 \text{ mA}$			-1.5	V
V_{OH}	High Level Output Voltage	$V_{CC} \text{ Min}, I_{OH} = \text{Max}, V_{IL} = \text{Max}$	2.4			V
I_{OFF}	Output High Current Segment Outputs	$V_{CC} = \text{Min}, V_O = 0.85\text{V}$	-1.3			mA
V_{OL}	Low Level Output Voltage	$V_{CC} = \text{Min}, I_{OL} = \text{Max}, V_{IH} = \text{Min}$			0.5	V
		$I_{OL} = 2.0 \text{ mA}, V_{CC} = \text{Min}$			0.4	
I_I	Input Current @ Max Input Voltage	$V_{CC} = \text{Max}, V_I = 7\text{V}$			0.1	mA
I_{IH}	High Level Input Current	$V_{CC} = \text{Max}, V_I = 2.7\text{V}$			20	μ A
I_{IL}	Low Level Input Current	$V_{CC} = \text{Max}, V_I = 0.4\text{V}$			-0.4	mA
I_{OS}	Short Circuit Output Current	$V_{CC} = \text{Max}, V_O = 0\text{V}$ at $\overline{BI}/\overline{RBO}$ (Note 2)	-0.3		-2	mA
I_{CCH}	Supply Current	$V_{CC} = \text{Max}, V_{IN} = 4.5\text{V}$			38	mA

Note 1: All typicals are at $V_{CC} = 5\text{V}, T_A = 25^{\circ}\text{C}$.

Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

12. 74LS86

74LS86 - 74LS86 Quad EXCLUSIVE-OR Gate



Features

- Four Independent EXCLUSIVE-OR Gates
- Wide Operating Voltage
- Operating Temperature up to 70°C
- Standard DIP 74LS86 IC
- Equivalent to SN74LS86N, DM74LS86N, HD74LS86P

Part Summary	
Manufacturer	Various
Manufacturer's Part Number	74LS86
Manufacturer's Web Site	-
Futurlec Part Number	74LS86
Department	Integrated Circuits
Category	74LS Series
RoHS Compliant	-
Package Type	14 Pin DIP
Technical Data	74LS86 Datasheet

August 1986
Revised March 2000

DM74LS86

Quad 2-Input Exclusive-OR Gate

General Description
This device contains four independent gates each of which performs the logic exclusive-OR function.

Ordering Code:

Order Number	Package Number	Package Description
DM74LS86M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow
DM74LS86SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
DM74LS86N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram

Function Table

$$Y = A \oplus B = \bar{A}B + A\bar{B}$$

Inputs		Output
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

H = HIGH Logic Level
L = LOW Logic Level

Recommended Operating Conditions					
Symbol	Parameter	Min	Nom	Max	Units
V _{CC}	Supply Voltage	4.75	5	5.25	V
V _{IH}	HIGH Level Input Voltage	2			V
V _{IL}	LOW Level Input Voltage			0.8	V
I _{OH}	HIGH Level Output Current			-0.4	mA
I _{OL}	LOW Level Output Current			8	mA
T _A	Free Air Operating Temperature	0		70	°C

Electrical Characteristics						
over recommended operating free air temperature range (unless otherwise noted)						
Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = -18 mA			-1.5	V
V _{OH}	HIGH Level Output Voltage	V _{CC} = Min, I _{OH} = Max, V _{IL} = Max, V _{IH} = Min	2.7	3.4		V
V _{OL}	LOW Level Output Voltage	V _{CC} = Min, I _{OL} = Max, V _{IL} = Max, V _{IH} = Min		0.35	0.5	V
		I _{OL} = 4 mA, V _{CC} = Min		0.25	0.4	
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 7V			0.2	mA
I _{IH}	HIGH Level Input Current	V _{CC} = Max, V _I = 2.7V			40	µA
I _{IL}	LOW Level Input Current	V _{CC} = Max, V _I = 0.4V			-0.6	mA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 3)	-20		-100	mA
I _{CCH}	Supply Current with Outputs HIGH	V _{CC} = Max (Note 4)		6.1	10	mA
I _{CCL}	Supply Current with Outputs LOW	V _{CC} = Max (Note 5)		9	15	mA

Note 2: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 3: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Note 4: I_{CCH} is measured with all outputs OPEN, one input at each gate at 4.5V, and the other inputs grounded.

Note 5: I_{CCL} is measured with all outputs OPEN and all inputs grounded.

สรุปผลการทดลอง

.....

.....

.....

.....

.....

.....