MC100LVEP05

2.5V / 3.3V ECL 2-Input Differential AND/NAND

ON Semiconductor®

http://onsemi.com

Description

The MC100LVEP05 is a 2−input differential AND/NAND gate. The MC100LVEP05 is the low voltage version of the MC100EP05 and is functionally equivalent to the EL05 and LVEL05 devices. With AC performance much faster than the LVEL05 device, the MC100LVEP05 is ideal for low voltage applications requiring the fastest AC performance available.

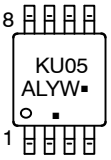
The 100 Series contains temperature compensation.

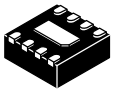
Features

- 220 ps Typical Propagation Delay
- Input Clock Frequency > 3 GHz
- 0.2 ps Typical RMS Random Clock Period Jitter
- LVPECL Mode Operating Range: V_{CC} = 2.375 V to 3.6 V with V_{EE} = 0 V
- NECL Mode Operating Range: V_{CC} = 0 V with V_{EE} = −2.375 V to −3.6 V
- Open Input Default State
- Q Output Will Default LOW with Inputs Open
- These are Pb−Free Devices*

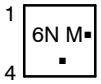
MARKING DIAGRAMS*

TSSOP−8
DT SUFFIX
CASE 948R





DFN8
MN SUFFIX
CASE 506AA



K = MC100
M = Date Code
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*For additional marking information, refer to Application Note AND8002/D.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 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.

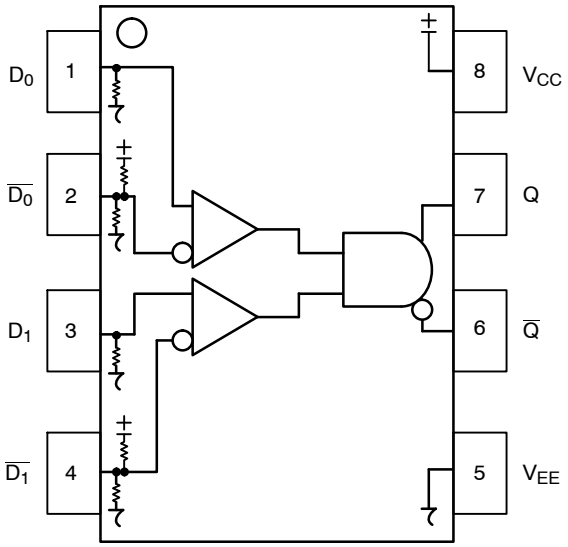


Figure 1. 8−Lead Pinout (Top View) **and Logic Diagram**

Table 1. PIN DESCRIPTION

Pin	Function
D0*, D1*, $\overline{D0}$**, $\overline{D1}$**	ECL Data Inputs
Q, $\overline{Q}$	ECL Data Outputs
V_{CC}	Positive Supply
V_{EE}	Negative Supply
EP	(DFN8 only) Thermal exposed pad must be connected to a sufficient thermal conduit. Electrically connect to the most negative supply (GND) or leave unconnected, floating open.

* Pins will default LOW when left open.
** Pins will default to V_{CC}/2when left open.

Table 2. TRUTH TABLE

D0	D1	$\overline{D0}$	$\overline{D1}$	Q	$\overline{Q}$
L	L	H	H	L	H
L	H	H	L	L	H
H	L	L	H	L	H
H	H	L	L	H	L

Table 3. ATTRIBUTES

Characteristics	Value	
Internal Input Pulldown Resistor	75 kΩ	
Internal Input Pullup Resistor	37.5 kΩ	
ESD Protection Human Body Model Machine Model Charged Device Model	 > 4 kV > 200 V > 2 kV	
Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1) TSSOP−8 DFN8	Pb Pkg Level 1 Level 1	Pb−Free Pkg Level 3 Level 1
Flammability Rating Oxygen Index: 28 to 34	UL 94 V−0 @ 0.125 in	
Transistor Count	167 Devices	
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test		

1. For additional information, see Application Note AND8003/D.

Table 4. MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V_{CC}	PECL Mode Power Supply	V_{EE} = 0 V		6	V
V_{EE}	NECL Mode Power Supply	V_{CC} = 0 V		−6	V
V_I	PECL Mode Input Voltage NECL Mode Input Voltage	V_{EE} = 0 V V_{CC} = 0 V	$V_I \le V_{CC}$ $V_I \ge V_{EE}$	6 −6	V V
I_{out}	Output Current	Continuous Surge		50 100	mA mA
T_A	Operating Temperature Range			−40 to +85	°C
T_{stg}	Storage Temperature Range			−65 to +150	°C
θ_{JA}	Thermal Resistance (Junction−to−Ambient)	0 lfpm 500 lfpm	TSSOP−8 TSSOP−8	185 140	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction−to−Case)	Standard Board	TSSOP−8	41 to 44	°C/W
θ_{JA}	Thermal Resistance (Junction−to−Ambient)	0 lfpm 500 lfpm	DFN8 DFN8	129 84	°C/W °C/W
T_{sol}	Wave Solder	3 sec @ 260°C		265	°C
θ_{JC}	Thermal Resistance (Junction−to−Case)	(Note 2)	DFN8	35 to 40	°C/W

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.

2. JEDEC standard multilayer board − 2S2P (2 signal, 2 power)

Table 5. 100EP DC CHARACTERISTICS, PECL V_{CC} = 2.5 V, V_{EE} = 0 V (Note 3)

		−40°C			25°C			85°C			
Symbol	Characteristic	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Unit
I_{EE}	Power Supply Current	15	25	32	17	27	36	19	28	38	mA
V_{OH}	Output HIGH Voltage (Note 4)	1355	1480	1605	1355	1480	1605	1355	1480	1605	mV
V_{OL}	Output LOW Voltage (Note 4)	555	730	900	555	730	900	555	730	900	mV
V_{IH}	Input HIGH Voltage (Single−Ended)	1355		1620	1355		1620	1355		1620	mV
V_{IL}	Input LOW Voltage (Single−Ended)	555		900	555		900	555		900	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential Configuration) (Notes 5, 6)	1.2		2.5	1.2		2.5	1.2		2.5	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current D Input LOW Current $\overline{D}$	0.5 −150			0.5 −150			0.5 −150			μA

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

3. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.125 V to −1.3 V.
4. All loading with 50 Ω to V_{CC} − 2.0 V.
5. Single−ended input CLK pin operation is limited to $V_{CC} \ge 3.0$ V in PECL mode.
6. V_{IHCMR} min varies 1:1 with V_{EE}, V_{IHCMR} max varies 1:1 with V_{CC}. The V_{IHCMR} range is referenced to the most positive side of the differential input signal.

Table 6. 100EP DC CHARACTERISTICS, PECL V_{CC} = 3.3 V, V_{EE} = 0 V (Note 7)

Symbol	Characteristic	−40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current	15	25	32	17	27	36	19	28	38	mA
V_{OH}	Output HIGH Voltage (Note 8)	2155	2280	2405	2155	2280	2405	2155	2280	2405	mV
V_{OL}	Output LOW Voltage (Note 8)	1355	1530	1700	1355	1530	1700	1355	1530	1700	mV
V_{IH}	Input HIGH Voltage (Single−Ended)	2075		2420	2075		2420	2075		2420	mV
V_{IL}	Input LOW Voltage (Single−Ended)	1355		1675	1355		1675	1355		1675	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 9)	1.2		3.3	1.2		3.3	1.2		3.3	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current D $\overline{D}$	0.5 −150			0.5 −150			0.5 −150			μA

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

7. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.3 V to −2.2 V.
8. All loading with 50 Ω to V_{CC} − 2.0 V.
9. V_{IHCMR} min varies 1:1 with V_{EE}, V_{IHCMR} max varies 1:1 with V_{CC}. The V_{IHCMR} range is referenced to the most positive side of the differential input signal.

Table 7. 100EP DC CHARACTERISTICS, NECL V_{CC} = 0 V, V_{EE} = −2.375 V to −3.6 V (Note 10)

Symbol	Characteristic	−40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current	15	25	32	17	27	36	19	28	38	mA
V_{OH}	Output HIGH Voltage (Note 11)	−1145	−1020	−895	−1145	−1020	−895	−1145	−1020	−895	mV
V_{OL}	Output LOW Voltage (Note 11)	−1945	−1770	−1600	−1945	−1770	−1600	−1945	−1770	−1600	mV
V_{IH}	Input HIGH Voltage (Single−Ended)	−1165		−880	−1165		−880	−1165		−880	mV
V_{IL}	Input LOW Voltage (Single−Ended)	−1945		−1600	−1945		−1600	−1945		−1600	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 12)	V_{EE}+1.2		0.0	V_{EE}+1.2		0.0	V_{EE}+1.2		0.0	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current D $\overline{D}$	0.5 −150			0.5 −150			0.5 −150			μA

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

10. Input and output parameters vary 1:1 with V_{CC}.
11. All loading with 50 Ω to V_{CC} − 2.0 V.
12. V_{IHCMR} min varies 1:1 with V_{EE}, V_{IHCMR} max varies 1:1 with V_{CC}. The V_{IHCMR} range is referenced to the most positive side of the differential input signal.

Table 8. AC CHARACTERISTICS V_{CC} = 0 V; V_{EE} = −2.375 V to −3.6 V or V_{CC} = 2.375 V to 3.6 V; V_{EE} = 0 V (Note 13)

Symbol	Characteristic	−40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
f_{max}	Maximum Frequency (Figure 2)	3.0			3.0			3.0			GHz
t_{PLH}, t_{PHL}	Propagation Delay to Output Differential	160	210	260	170	220	270	210	260	320	ps
t_{JITTER}	RMS Random Clock Jitter $f_{in} \leq$ 3.0 GHz (Figure 2)		0.2	1		0.2	1		0.2	1.5	ps
V_{PP}	Input Voltage Swing (Differential Configuration)	150	800	1200	150	800	1200	150	800	1200	mV
t_r t_f	Output Rise/Fall Times Q (20% − 80%)	70	120	170	80	130	180	100	150	200	ps

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

13. Measured using a 750 mV source, 50% duty cycle clock source. All loading with 50 Ω to V_{CC} − 2.0 V.

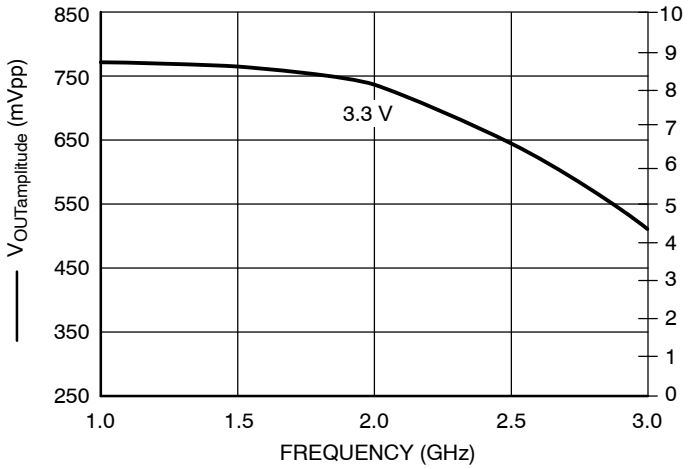


Figure 2. F_{max} @ 25°C

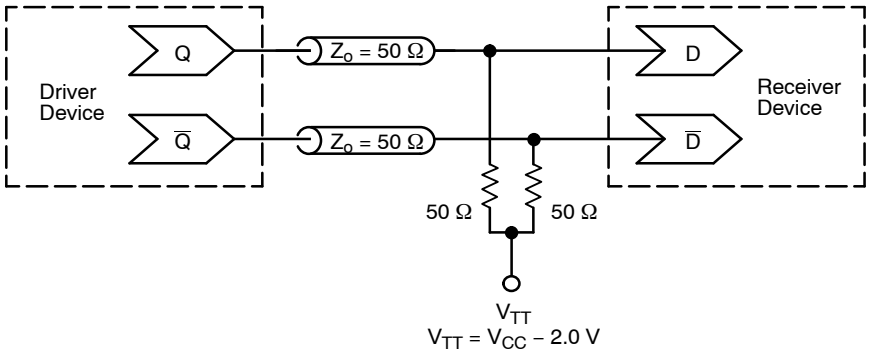


Figure 3. Typical Termination for Output Driver and Device Evaluation (See Application Note AND8020/D – Termination of ECL Logic Devices.)

ORDERING INFORMATION

Device	Package	Shipping†
MC100LVEP05DTG	TSSOP−8 (Pb−Free)	100 Units / Rail
MC100LVEP05DTR2G	TSSOP−8 (Pb−Free)	2500 / Tape & Reel
MC100LVEP05MNTXG	DFN8 (Pb−Free)	1000 / 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.

Resource Reference of Application Notes

AN1405/D – ECL Clock Distribution Techniques

AN1406/D – Designing with PECL (ECL at +5.0 V)

AN1503/D – ECLinPS™ I/O SPiCE Modeling Kit

AN1504/D – Metastability and the ECLinPS Family

AN1568/D – Interfacing Between LVDS and ECL

AN1672/D – The ECL Translator Guide

AND8001/D – Odd Number Counters Design

AND8002/D – Marking and Date Codes

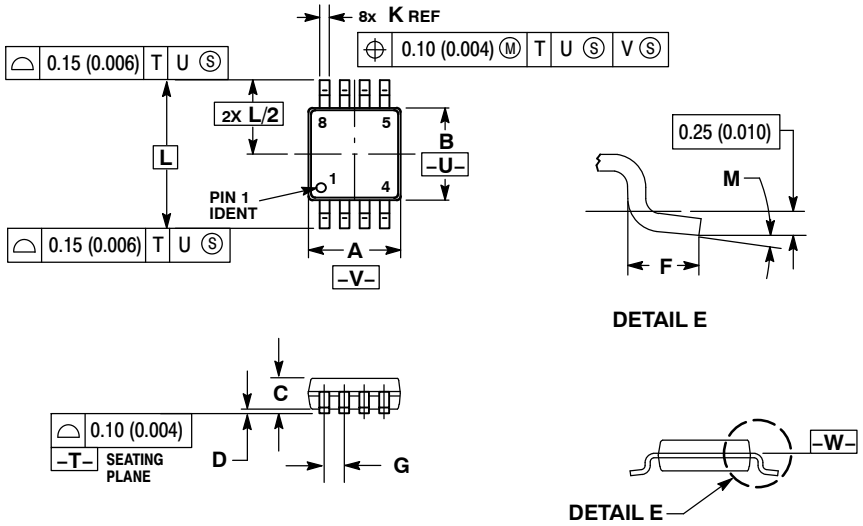
AND8020/D – Termination of ECL Logic Devices

AND8066/D – Interfacing with ECLinPS

AND8090/D – AC Characteristics of ECL Devices

PACKAGE DIMENSIONS

TSSOP−8
DT SUFFIX
PLASTIC TSSOP PACKAGE
CASE 948R−02
ISSUE A

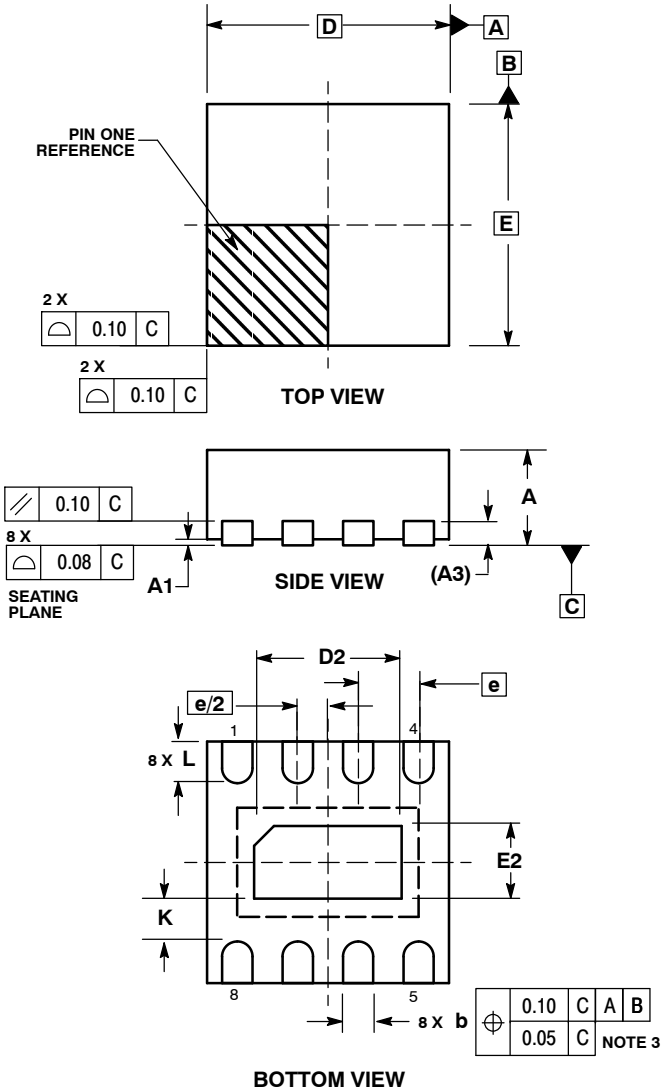


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
6. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE −W−.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	2.90	3.10	0.114	0.122
B	2.90	3.10	0.114	0.122
C	0.80	1.10	0.031	0.043
D	0.05	0.15	0.002	0.006
F	0.40	0.70	0.016	0.028
G	0.65 BSC		0.026 BSC	
K	0.25	0.40	0.010	0.016
L	4.90 BSC		0.193 BSC	
M	0°	6°	0°	6°

PACKAGE DIMENSIONS

DFN8
CASE 506AA−01
ISSUE D



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994 .
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.80	1.00
A1	0.00	0.05
A3	0.20 REF	
b	0.20	0.30
D	2.00 BSC	
D2	1.10	1.30
E	2.00 BSC	
E2	0.70	0.90
e	0.50 BSC	
K	0.20	−−−
L	0.25	0.35

ECLinPS is a trademark of Semiconductor Components Industries, LLC (SCILLC).

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5773−3850

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative