

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

## MC100LVEP05

### 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:  $V_{CC} = 2.375\text{ V to }3.6\text{ V}$  with  $V_{EE} = 0\text{ V}$
- NECL Mode Operating Range:  $V_{CC} = 0\text{ V}$  with  $V_{EE} = -2.375\text{ V to }-3.6\text{ V}$
- Open Input Default State
- Q Output Will Default LOW with Inputs Open
- These Device are Pb-Free, Halogen Free and are RoHS Compliant

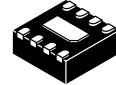


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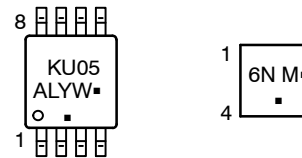


**TSSOP-8  
DT SUFFIX  
CASE 948R**



**DFN8  
MN SUFFIX  
CASE 506AA**

### MARKING DIAGRAMS\*



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)

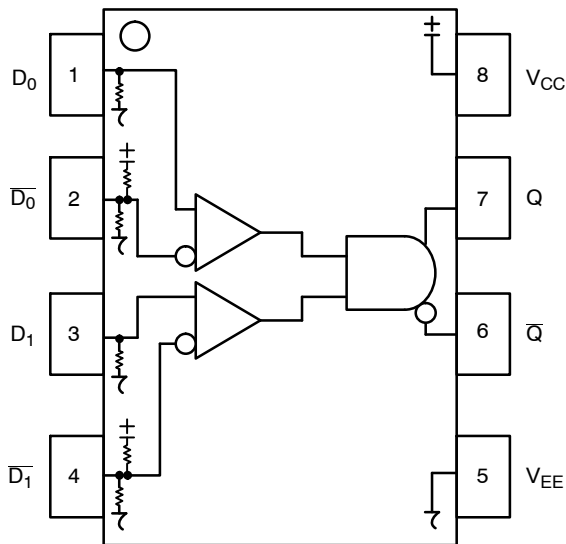
\*For additional marking information, refer to Application Note [AND8002/D](#).

### ORDERING INFORMATION

Device	Package	Shipping†
MC100LVEP05DTG	TSSOP-8 (Pb-Free)	100 Units / Tube
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.

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**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 <sub>CC</sub>	Positive Supply
V <sub>EE</sub>	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  $V_{CC}/2$  when 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 k $\Omega$
Internal Input Pullup Resistor	37.5 k $\Omega$
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-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](#).

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**Table 4. MAXIMUM RATINGS**

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V <sub>CC</sub>	PECL Mode Power Supply	V <sub>EE</sub> = 0 V		6	V
V <sub>EE</sub>	NECL Mode Power Supply	V <sub>CC</sub> = 0 V		-6	V
V <sub>I</sub>	PECL Mode Input Voltage NECL Mode Input Voltage	V <sub>EE</sub> = 0 V V <sub>CC</sub> = 0 V	V <sub>I</sub> ≤ V <sub>CC</sub> V <sub>I</sub> ≥ V <sub>EE</sub>	6 -6	V V
I <sub>out</sub>	Output Current	Continuous Surge		50 100	mA mA
T <sub>A</sub>	Operating Temperature Range			-40 to +85	°C
T <sub>stg</sub>	Storage Temperature Range			-65 to +150	°C
θ <sub>JA</sub>	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	TSSOP-8 TSSOP-8	185 140	°C/W °C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	TSSOP-8	41 to 44	°C/W
θ <sub>JA</sub>	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	DFN8 DFN8	129 84	°C/W °C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	(Note 2)	DFN8	35 to 40	°C/W
T <sub>sol</sub>	Wave Solder	3 sec @ 260°C		265	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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

**Table 5. 100EP DC CHARACTERISTICS, PECL V<sub>CC</sub> = 2.5 V, V<sub>EE</sub> = 0 V (Note 3)**

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I <sub>EE</sub>	Power Supply Current	15	25	32	17	27	36	19	28	38	mA
V <sub>OH</sub>	Output HIGH Voltage (Note 4)	1355	1480	1605	1355	1480	1605	1355	1480	1605	mV
V <sub>OL</sub>	Output LOW Voltage (Note 4)	555	730	900	555	730	900	555	730	900	mV
V <sub>IH</sub>	Input HIGH Voltage (Single-Ended)	1355		1620	1355		1620	1355		1620	mV
V <sub>IL</sub>	Input LOW Voltage (Single-Ended)	555		900	555		900	555		900	mV
V <sub>IHCMR</sub>	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 <sub>IH</sub>	Input HIGH Current			150			150			150	μA
I <sub>IL</sub>	Input LOW Current	$\frac{D}{D}$	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.

- Input and output parameters vary 1:1 with V<sub>CC</sub>. V<sub>EE</sub> can vary +0.125 V to -1.3 V.
- All loading with 50 Ω to V<sub>CC</sub> - 2.0 V.
- Single-ended input CLK pin operation is limited to V<sub>CC</sub> ≥ 3.0 V in PECL mode.
- V<sub>IHCMR</sub> min varies 1:1 with V<sub>EE</sub>. V<sub>IHCMR</sub> max varies 1:1 with V<sub>CC</sub>. The V<sub>IHCMR</sub> range is referenced to the most positive side of the differential input signal.

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**Table 6. 100EP DC CHARACTERISTICS, PECL**  $V_{CC} = 3.3\text{ V}$ ,  $V_{EE} = 0\text{ V}$  (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	$\mu\text{A}$
$I_{IL}$	Input LOW Current	D D	0.5 -150		0.5 -150			0.5 -150			$\mu\text{A}$

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 lpm.

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  $\Omega$  to  $V_{CC} - 2.0\text{ V}$ .

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**  $V_{CC} = 0\text{ V}$ ,  $V_{EE} = -2.375\text{ V}$  to  $-3.6\text{ V}$  (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	$\mu\text{A}$
$I_{IL}$	Input LOW Current	D D	0.5 -150		0.5 -150			0.5 -150			$\mu\text{A}$

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 lpm.

10. Input and output parameters vary 1:1 with  $V_{CC}$ .

11. All loading with 50  $\Omega$  to  $V_{CC} - 2.0\text{ V}$ .

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.

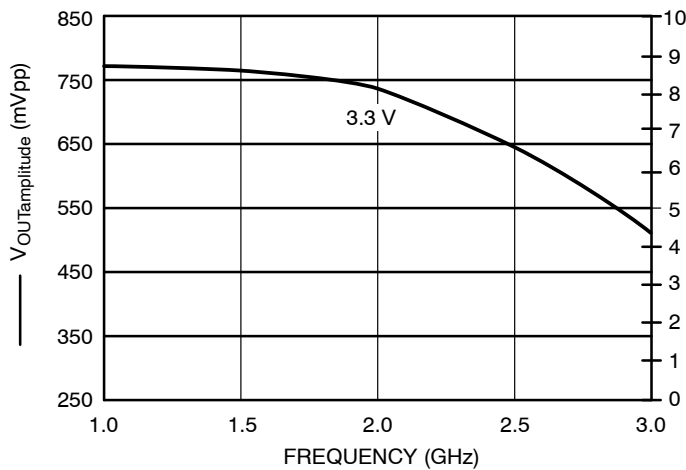
# MC100LVEP05

**Table 8. AC CHARACTERISTICS**  $V_{CC} = 0\text{ V}$ ;  $V_{EE} = -2.375\text{ V}$  to  $-3.6\text{ V}$  or  $V_{CC} = 2.375\text{ V}$  to  $3.6\text{ V}$ ;  $V_{EE} = 0\text{ V}$  (Note 13)

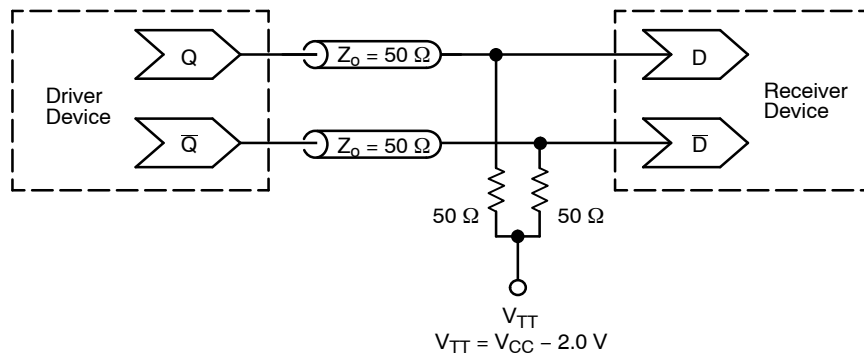
Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$f_{\max}$	Maximum Frequency (Figure 2)	3.0			3.0			3.0			GHz
$t_{PLH}$ , $t_{PHL}$	Propagation Delay to Output Differential	160	210	260	170	220	270	210	260	320	ps
$t_{\text{JITTER}}$	RMS Random Clock Jitter $f_{in} \leq 3.0\text{ GHz}$ (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 (20% – 80%) Q	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 lpm.

13. Measured using a 750 mV source, 50% duty cycle clock source. All loading with  $50\ \Omega$  to  $V_{CC} - 2.0\text{ V}$ .



**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.)

## 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

# MECHANICAL CASE OUTLINE

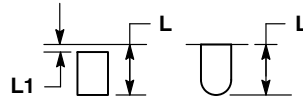
## PACKAGE DIMENSIONS



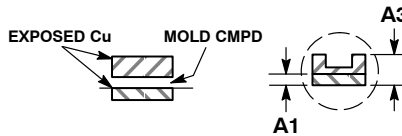
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DFN8 2x2, 0.5P  
CASE 506AA  
ISSUE F

DATE 04 MAY 2016



DETAIL A  
OPTIONAL  
CONSTRUCTIONS



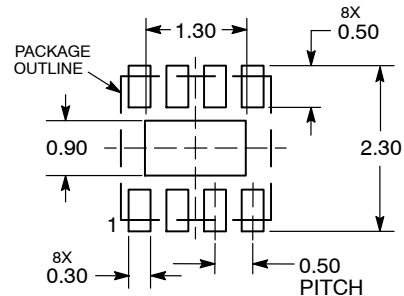
DETAIL B  
ALTERNATE  
CONSTRUCTIONS

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 0.15 AND 0.20 MM FROM TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

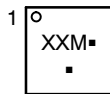
DIM	MILLIMETERS	
	MIN	MAX
A	0.80	1.00
A1	0.00	0.05
A3	0.20	REF
b	0.20	0.30
D	2.00	BSC
D2	1.10	1.30
E	2.00	BSC
E2	0.70	0.90
e	0.50	BSC
K	0.30	REF
L	0.25	0.35
L1	---	0.10

### RECOMMENDED SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

### GENERIC MARKING DIAGRAM\*



- XX = Specific Device Code
- M = Date Code
- = Pb-Free Device

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

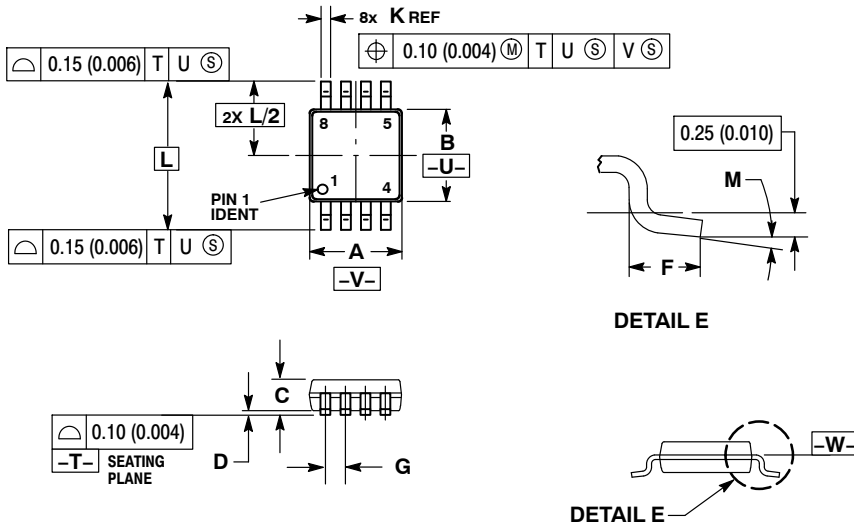
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SCALE 2:1

### TSSOP 8 CASE 948R-02 ISSUE A

DATE 04/07/2000



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-.

DIM	MILLIMETERS		INCHES	
	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°

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