

MC10EL05, MC100EL05

5V ECL 2-Input Differential AND/NAND

The MC10EL/100EL05 is a 2-input differential AND/NAND gate. The device is functionally equivalent to the E404 device with higher performance capabilities. With propagation delays and output transition times significantly faster than the E404, the EL05 is ideally suited for those applications which require the ultimate in AC performance.

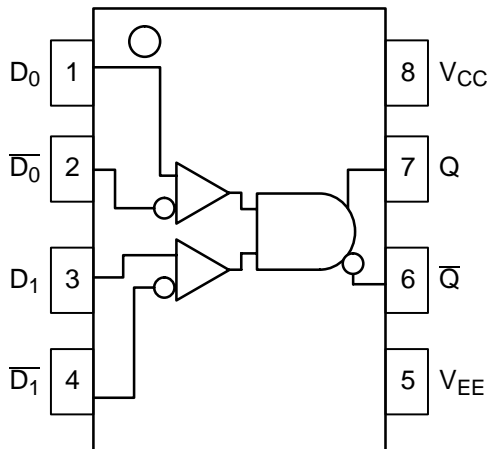
Because a negative 2-input NAND is equivalent to a 2-input OR function, the differential inputs and outputs of the device allows the EL05 to also be used as a 2-input differential OR/NOR gate.

The differential inputs employ clamp circuitry so that under open input conditions (pulled down to V_{EE}) the input to the AND gate will be HIGH. In this way, if one set of inputs is open, the gate will remain active to the other input.

The 100 Series contains temperature compensation.

- 275 ps Propagation Delay
- ESD Protection: > 1 KV HBM, > 100 V MM
- PECL Mode Operating Range: V_{CC} = 4.2 V to 5.7 V with V_{EE} = 0 V
- NECL Mode Operating Range: V_{CC} = 0 V with V_{EE} = -4.2 V to -5.7 V
- Internal Input Pulldown Resistors
- Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test
- Moisture Sensitivity Level 1
- For Additional Information, see Application Note AND8003/D
- Flammability Rating: UL-94 code V-0 @ 1/8", Oxygen Index 28 to 34
- Transistor Count = 44 devices

LOGIC DIAGRAM AND PINOUT ASSIGNMENT



PIN DESCRIPTION

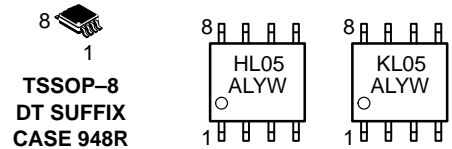
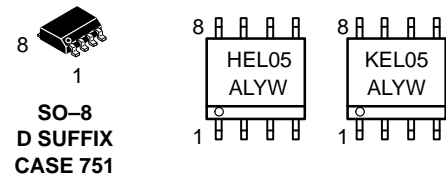
PIN	FUNCTION
D0, D0-bar; D1, D1-bar	ECL Data Inputs
Q, Q-bar	ECL Data Outputs
VCC	Positive Supply
VEE	Negative Supply



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MARKING DIAGRAMS*



H = MC10 L = Wafer Lot
 K = MC100 Y = Year
 A = Assembly Location W = Work Week

*For additional information, see Application Note AND8002/D

TRUTH TABLE

D0	D1	D0-bar	D1-bar	Q	Q-bar
L	L	H	H	L	H
L	H	H	L	L	H
H	L	L	H	L	H
H	H	L	L	H	L

ORDERING INFORMATION

Device	Package	Shipping
MC10EL05D	SO-8	98 Units/Rail
MC10EL05DR2	SO-8	2500 Tape & Reel
MC100EL05D	SO-8	98 Units/Rail
MC100EL05DR2	SO-8	2500 Tape & Reel
MC10EL05DT	TSSOP-8	98 Units/Rail
MC10EL05DTR2	TSSOP-8	2500 Tape & Reel
MC100EL05DT	TSSOP-8	98 Units/Rail
MC100EL05DTR2	TSSOP-8	2500 Tape & Reel

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MAXIMUM RATINGS (Note 1.)

Symbol	Parameter	Condition 1	Condition 2	Rating	Units
V _{CC}	PECL Mode Power Supply	V _{EE} = 0 V		8	V
V _{EE}	NECL Mode Power Supply	V _{CC} = 0 V		-8	V
V _I	PECL Mode Input Voltage NECL Mode Input Voltage	V _{EE} = 0 V V _{CC} = 0 V	V _I ≤ V _{CC} V _I ≥ 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	8 SOIC 8 SOIC	190 130	°C/W °C/W
θ _{JC}	Thermal Resistance (Junction to Case)	std bd	8 SOIC	41 to 44	°C/W
θ _{JA}	Thermal Resistance (Junction to Ambient)	0 LFPM 500 LFPM	8 TSSOP 8 TSSOP	185 140	°C/W °C/W
θ _{JC}	Thermal Resistance (Junction to Case)	std bd	8 TSSOP	41 to 44 ± 5%	°C/W
T _{sol}	Wave Solder	<2 to 3 sec @ 248°C		265	°C

1. Maximum Ratings are those values beyond which device damage may occur.

10EL SERIES PECL DC CHARACTERISTICS V_{CC}= 5.0 V; V_{EE}= 0.0 V (Note 1.)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I _{EE}	Power Supply Current		18	22		18	22		18	22	mA
V _{OH}	Output HIGH Voltage (Note 2.)	3920	4010	4110	4020	4105	4190	4090	4185	4280	mV
V _{OL}	Output LOW Voltage (Note 2.)	3050	3200	3350	3050	3210	3370	3050	3227	3405	mV
V _{IH}	Input HIGH Voltage (Single Ended)	3770		4110	3870		4190	3940		4280	mV
V _{IL}	Input LOW Voltage (Single Ended)	3050		3500	3050		3520	3050		3555	mV
V _{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 3.)	3.0		4.6	3.0		4.6	3.0		4.6	V
I _{IH}	Input HIGH Current			150			150			150	μA
I _{IL}	Input LOW Current	0.5			0.5			0.3			μA

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfpm is maintained.

- Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.25 V / -0.5 V.
- Outputs are terminated through a 50 ohm resistor to V_{CC}-2 volts.
- 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. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between V_{ppmin} and 1 V.

10EL SERIES NECL DC CHARACTERISTICS V_{CC}= 0.0 V; V_{EE}= -5.0 V (Note 1.)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I _{EE}	Power Supply Current		18	22		18	22		18	22	mA
V _{OH}	Output HIGH Voltage (Note 2.)	-1080	-990	-890	-980	-895	-810	-910	-815	-720	mV
V _{OL}	Output LOW Voltage (Note 2.)	-1950	-1800	-1650	-1950	-1790	-1630	-1950	-1773	-1595	mV
V _{IH}	Input HIGH Voltage (Single Ended)	-1230		-890	-1130		-810	-1060		-720	mV
V _{IL}	Input LOW Voltage (Single Ended)	-1950		-1500	-1950		-1480	-1950		-1445	mV
V _{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 3.)	-2.0		-0.4	-2.0		-0.4	-2.0		-0.4	V
I _{IH}	Input HIGH Current			150			150			150	μA
I _{IL}	Input LOW Current	0.5			0.5			0.3			μA

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfpm is maintained.

- Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.25 V / -0.5 V.
- Outputs are terminated through a 50 ohm resistor to V_{CC}-2 volts.
- 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. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between V_{ppmin} and 1 V.

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100EL SERIES PECL DC CHARACTERISTICS $V_{CC}=5.0\text{ V}; V_{EE}=0.0\text{ V}$ (Note 1.)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current		18	22		18	22		21	25	mA
V_{OH}	Output HIGH Voltage (Note 2.)	3915	3995	4120	3975	4045	4120	3975	4050	4120	mV
V_{OL}	Output LOW Voltage (Note 2.)	3170	3305	3445	3190	3295	3380	3190	3295	3380	mV
V_{IH}	Input HIGH Voltage (Single Ended)	3835		4120	3835		4120	3835		4120	mV
V_{IL}	Input LOW Voltage (Single Ended)	3190		3525	3190		3525	3190		3525	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 3.)	3.0		4.6	3.0		4.6	3.0		4.6	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5			0.5			0.5			μA

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfm is maintained.

1. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary +0.8 V / -0.5 V.
2. Outputs are terminated through a 50 ohm resistor to $V_{CC}-2$ volts.
3. 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. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between V_{PPmin} and 1 V.

100EL SERIES NECL DC CHARACTERISTICS $V_{CC}=0.0\text{ V}; V_{EE}=-5.0\text{ V}$ (Note 1.)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current		18	22		18	22		21	25	mA
V_{OH}	Output HIGH Voltage (Note 2.)	-1085	-1005	-880	-1025	-955	-880	-1025	-955	-880	mV
V_{OL}	Output LOW Voltage (Note 2.)	-1830	-1695	-1555	-1810	-1705	-1620	-1810	-1705	-1620	mV
V_{IH}	Input HIGH Voltage (Single Ended)	-1165		-880	-1165		-880	-1165		-880	mV
V_{IL}	Input LOW Voltage (Single Ended)	-1810		-1475	-1810		-1475	-1810		-1475	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 3.)	-2.0		-0.4	-2.0		-0.4	-2.0		-0.4	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5			0.5			0.5			μA

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfm is maintained.

1. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary +0.8 V / -0.5 V.
2. Outputs are terminated through a 50 ohm resistor to $V_{CC}-2$ volts.
3. 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. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between V_{PPmin} and 1 V.

AC CHARACTERISTICS $V_{CC}=5.0\text{ V}; V_{EE}=0.0\text{ V}$ or $V_{CC}=0.0\text{ V}; V_{EE}=-5.0\text{ V}$ (Note 1.)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
f_{max}	Maximum Toggle Frequency		TBD			TBD			TBD		GHz
t_{PLH} t_{PHL}	Propagation Delay to Output	135	260	440	185	275	390	215	305	420	ps
V_{PP}	Input Swing (Note 2.)	150		1000	150		1000	150		1000	mV
t_{JITTER}	Cycle-to-Cycle Jitter		TBD			TBD			TBD		ps
t_r t_f	Output Rise/Fall Times Q (20% - 80%)	100	225	350	100	225	350	100	225	350	ps

1. 10 Series: V_{EE} can vary +0.25 V / -0.5 V.
100 Series: V_{EE} can vary +0.8 V / -0.5 V.
2. $V_{PP(min)}$ is minimum input swing for which AC parameters guaranteed. The device has a DC gain of ≈ 40 .

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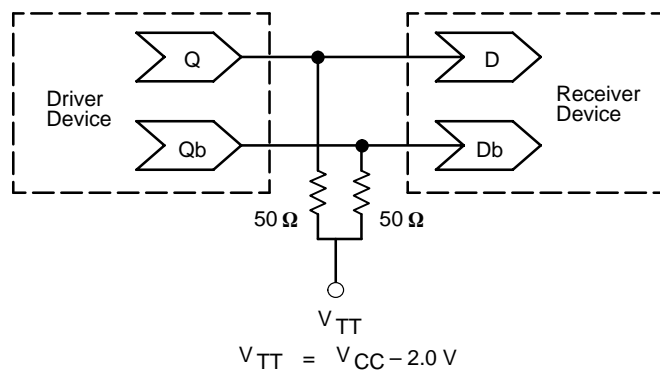


Figure 1. Typical Termination for Output Driver and Device Evaluation
(See Application Note AND8020 – Termination of ECL Logic Devices.)

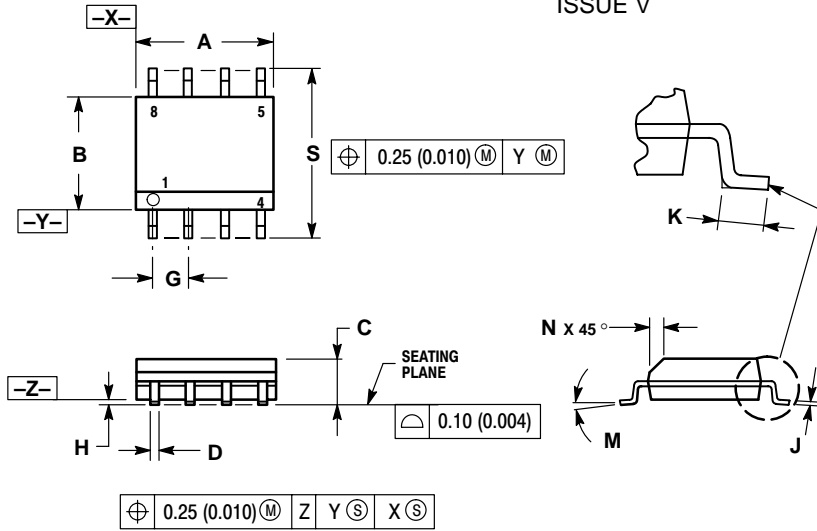
Resource Reference of Application Notes

- AN1404** – ECLinPS Circuit Performance at Non-Standard V_{IH} Levels
- AN1405** – ECL Clock Distribution Techniques
- AN1406** – Designing with PECL (ECL at +5.0 V)
- AN1503** – ECLinPS I/O SPICE Modeling Kit
- AN1504** – Metastability and the ECLinPS Family
- AN1560** – Low Voltage ECLinPS SPICE Modeling Kit
- AN1568** – Interfacing Between LVDS and ECL
- AN1596** – ECLinPS Lite Translator ELT Family SPICE I/O Model Kit
- AN1650** – Using Wire-OR Ties in ECLinPS Designs
- AN1672** – The ECL Translator Guide
- AND8001** – Odd Number Counters Design
- AND8002** – Marking and Date Codes
- AND8020** – Termination of ECL Logic Devices

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PACKAGE DIMENSIONS

SO-8
D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751-07
ISSUE V



NOTES:

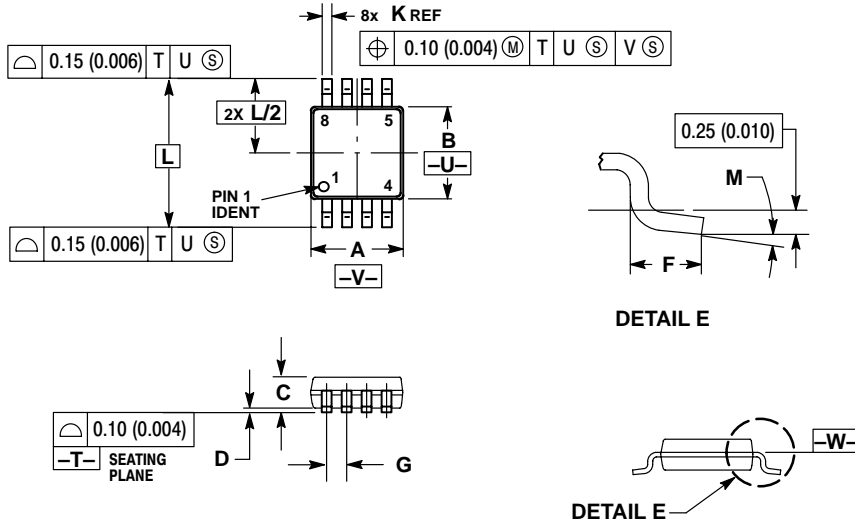
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

MC10EL05, MC100EL05

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 -V-.

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°

Notes

MC10EL05, MC100EL05

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