MC10EP105

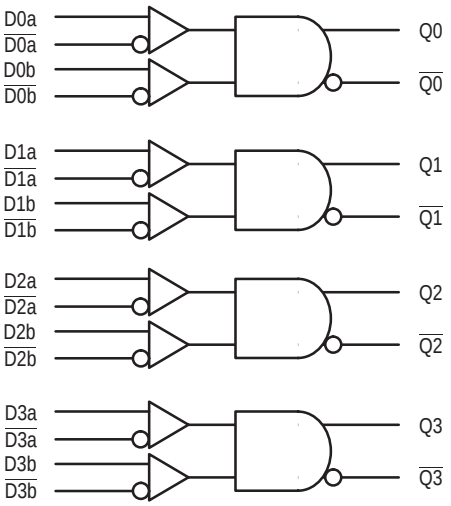
Product Preview

Quad 2-Input Differential AND/NAND

The MC10EP105 is a 2–input differential AND/NAND gate. Each gate is functionally equivalent to a EP05 and LVEL05 devices. With AC performance much faster than the LVEL05 device, the EP105 is ideal for applications requiring the fastest AC performance available. All V_{CC} and V_{EE} pins must be externally connected to power supply to guarantee proper operation.

- 190ps Typical Propagation Delay
- High Bandwidth to 3 Ghz Typical
- ECL mode: 0V V_{CC} with V_{EE} = –3.0V to –5.5V
- PECL mode: 3.0V to 5.5V V_{CC} with V_{EE} = 0V
- Internal Input Pulldown Resistors
- ESD Protection: >2KV HBM, >100V MM
- New Differential Input Common Mode Range
- Moisture Sensitivity Level 2
  For Additional Information, See Application Note AND8003/D
- Flammability Rating: UL–94 code V–0 @ 1/8”,
  Oxygen Index 28 to 34
- Transistor Count = 444 devices

LOGIC DIAGRAM



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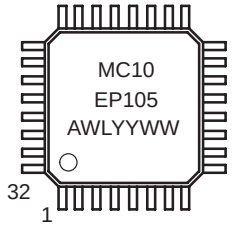
32–LEAD TQFP
FA SUFFIX
CASE 873A

MARKING DIAGRAM*



A = Assembly Location
WL = Wafer Lot
YY = Year
WW = Work Week

*For additional information, see Application Note AND8002/D

PIN DESCRIPTION	
PIN	**FUNCTION**
Dna, Dnb, $\overline{\text{Dna}}$, $\overline{\text{Dnb}}$	ECL Data Inputs
Qn, $\overline{\text{Qn}}$	ECL Data Outputs
VBB	Reference Voltage Output
VCC	Positive Supply
VEE	Negative, 0 Supply

TRUTH TABLE

Dna	Dnb	$\overline{\text{Dna}}$	$\overline{\text{Dnb}}$	Qn	$\overline{\text{Qn}}$
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
MC10EP105FA	TQFP	250 Units/Tray
MC10EP105FAR2	TQFP	2000 Tape & Reel

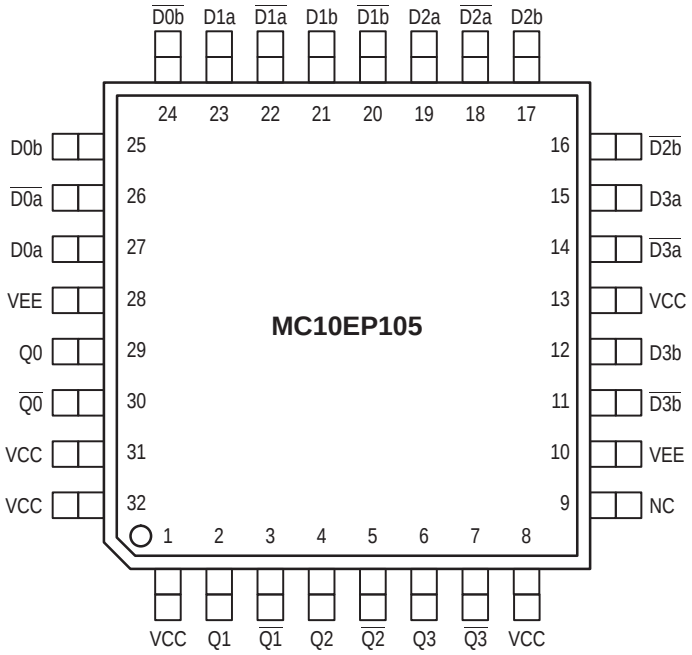


Figure 1. 32–Lead TQFP Pinout
(Top View)

Warning: All V_{CC} and V_{EE} pins must be externally connected to Power Supply to guarantee proper operation.

MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V_{EE}	Power Supply (V_{CC} = 0V)	–6.0 to 0	VDC
V_{CC}	Power Supply (V_{EE} = 0V)	6.0 to 0	VDC
V_I	Input Voltage (V_{CC} = 0V, V_I not more negative than V_{EE})	–6.0 to 0	VDC
V_I	Input Voltage (V_{EE} = 0V, V_I not more positive than V_{CC})	6.0 to 0	VDC
I_{out}	Output Current — Continuous Surge	50 100	mA
T_A	Operating Temperature Range	–40 to +85	°C
T_{stg}	Storage Temperature	–65 to +150	°C
θ_{JA}	Thermal Resistance (Junction–to–Ambient) — Still Air 500lfpm	80 55	°C/W
θ_{JC}	Thermal Resistance (Junction–to–Case)	12 to 17	°C/W
T_{sol}	Solder Temperature (<2 to 3 Seconds: 245°C desired)	265	°C

* Maximum Ratings are those values beyond which damage to the device may occur.

DC CHARACTERISTICS, ECL/LVECL (V_{CC} = 0V; V_{EE} = –5.5V to –3.0V) (Note 4.)

Symbol	Characteristic	–40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
IEE	Power Supply Current (Note 1.)					59					mA
V_{OH}	Output HIGH Voltage (Note 2.)	–1135	–1060	–885	–1070	–945	–820	–1010	–885	–760	mV
V_{OL}	Output LOW Voltage (Note 2.)	–1935	–1810	–1685	–1870	–1745	–1620	–1810	–1685	–1560	mV
V_{IH}	Input HIGH Voltage Single Ended	–1210		–885	–1145		–820	–1085		–760	mV
V_{IL}	Input LOW Voltage Single Ended	–1935		–1610	–1870		–1545	–1810		–1485	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Note 3.)	V_{EE}+2.0		0.0	V_{EE}+2.0		0.0	V_{EE}+2.0		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: 10EP circuits 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 airflow greater than 500lfpm is maintained.

1. V_{CC} = 0V, V_{EE} = V_{EEmin} to V_{EEmax}, all other pins floating.
2. All loading with 50 ohms to V_{CC}–2.0 volts.
3. V_{IHCMR} min varies 1:1 with V_{EE}, max varies 1:1 with V_{CC}.
4. Input and output parameters vary 1:1 with V_{CC}.

DC CHARACTERISTICS, LVPECL (V_{CC} = 3.3V ± 0.3V, V_{EE} = 0V) (Note 8.)

Symbol	Characteristic	–40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
IEE	Power Supply Current (Note 5.)					59					mA
V_{OH}	Output HIGH Voltage (Note 6.)	2165	2240	2415	2230	2355	2480	2290	2415	2540	mV
V_{OL}	Output LOW Voltage (Note 6.)	1365	1490	1615	1430	1555	1680	1490	1615	1740	mV
V_{IH}	Input HIGH Voltage Single Ended	2090		2415	2155		2480	2215		2540	mV
V_{IL}	Input LOW Voltage Single Ended	1365		1690	1430		1755	1490		1815	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Note 7.)	2.0		3.3	2.0		3.3	2.0		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: 10EP circuits 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 airflow greater than 500lfpm is maintained.

5. V_{CC} = 3.3V, V_{EE} = 0V, all other pins floating.
6. All loading with 50 ohms to V_{CC}–2.0 volts.
7. V_{IHCMR} min varies 1:1 with V_{EE}, max varies 1:1 with V_{CC}.
8. Input and output parameters vary 1:1 with V_{CC}.

DC CHARACTERISTICS, PECL (V_{CC} = 5.0V ± 0.5V, V_{EE} = 0V) (Note 12.)

Symbol	Characteristic	–40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
IEE	Power Supply Current (Note 9.)					59					mA
V_{OH}	Output HIGH Voltage (Note 10.)	3865	3940	4115	3930	4055	4180	3990	4115	4240	mV
V_{OL}	Output LOW Voltage (Note 10.)	3065	3190	3315	3130	3255	3380	3190	3315	3440	mV
V_{IH}	Input HIGH Voltage Single Ended	3790		4115	3855		4180	3915		4240	mV
V_{IL}	Input LOW Voltage Single Ended	3065		3390	3130		3455	3190		3515	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Note 11.)	2.0		5.0	2.0		5.0	2.0		5.0	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: 10EP circuits 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 airflow greater than 500lfpm is maintained.

9. V_{CC} = 5.0V, V_{EE} = 0V, all other pins floating.
10. All loading with 50 ohms to V_{CC}–2.0 volts.
11. V_{IHCMR} min varies 1:1 with V_{EE}, max varies 1:1 with V_{CC}.
12. Input and output parameters vary 1:1 with V_{CC}.

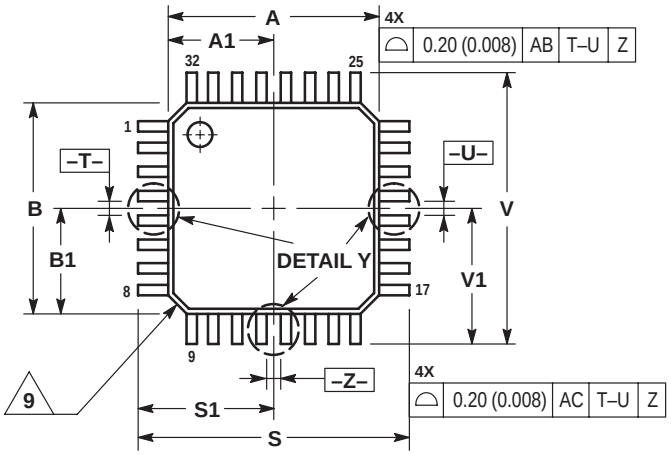
AC CHARACTERISTICS (V_{CC} = 0V; V_{EE} = –3.0V to –5.5V) or (V_{CC} = 3.0V to 5.5V; V_{EE} = 0V)

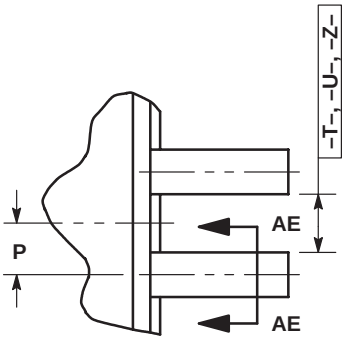
Symbol	Characteristic	–40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
f_{max}	Maximum Toggle Frequency (Note 13.)		3.0			3.0			3.0		GHz
t_{PLH}, t_{PHL}	Propagation Delay to Output Differential					190					ps
t_{SKEW}	Duty Cycle Skew (Note 14.)		5.0			5.0	20		5.0	20	ps
t_{JITTER}	Cycle–to–Cycle Jitter		TBD			TBD			TBD		ps
V_{PP}	Input Voltage Swing (Diff.)	150	800	1200	150	800	1200	150	800	1200	mV
t_r t_f	Output Rise/Fall Times Q (20% – 80%)					120					ps

13. F_{max} guaranteed for functionality only. V_{OL} and V_{OH} levels are guaranteed at DC only.
14. Skew is measured between outputs under identical transitions. Duty cycle skew is defined only for differential operation when the delays are measured from the cross point of the inputs to the cross point of the outputs.

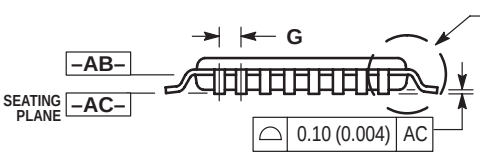
PACKAGE DIMENSIONS

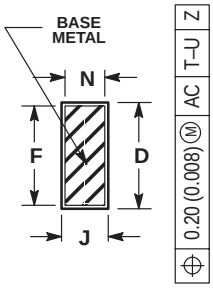
TQFP
FA SUFFIX
32–LEAD PLASTIC PACKAGE
CASE 873A–02
ISSUE A



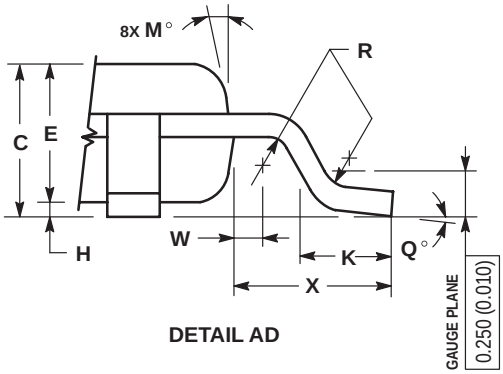


DETAIL Y





SECTION AE–AE



DETAIL AD

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DATUM PLANE –AB– IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
4. DATUMS –T–, –U–, AND –Z– TO BE DETERMINED AT DATUM PLANE –AB–.
5. DIMENSIONS S AND V TO BE DETERMINED AT SEATING PLANE –AC–.
6. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.250 (0.010) PER SIDE. DIMENSIONS A AND B DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE –AB–.
7. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL NOT CAUSE THE D DIMENSION TO EXCEED 0.520 (0.020).
8. MINIMUM SOLDER PLATE THICKNESS SHALL BE 0.0076 (0.0003).
9. EXACT SHAPE OF EACH CORNER MAY VARY FROM DEPICTION.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	7.000 BSC		0.276 BSC	
A1	3.500 BSC		0.138 BSC	
B	7.000 BSC		0.276 BSC	
B1	3.500 BSC		0.138 BSC	
C	1.400	1.600	0.055	0.063
D	0.300	0.450	0.012	0.018
E	1.350	1.450	0.053	0.057
F	0.300	0.400	0.012	0.016
G	0.800 BSC		0.031 BSC	
H	0.050	0.150	0.002	0.006
J	0.090	0.200	0.004	0.008
K	0.500	0.700	0.020	0.028
M	12° REF		12° REF	
N	0.090	0.160	0.004	0.006
P	0.400 BSC		0.016 BSC	
Q	1°	5°	1°	5°
R	0.150	0.250	0.006	0.010
S	9.000 BSC		0.354 BSC	
S1	4.500 BSC		0.177 BSC	
V	9.000 BSC		0.354 BSC	
V1	4.500 BSC		0.177 BSC	
W	0.200 REF		0.008 REF	
X	1.000 REF		0.039 REF	

Notes

Notes

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