# **Quad 4-Input OR/NOR**

The MC10EP101 is a Quad 4-input OR/NOR gate. The device is functionally equivalent to the E101. With AC performance faster than the E101 device, the EP101 is ideal for applications requiring the fastest AC performance available. All V<sub>CC</sub> and V<sub>EE</sub> pins must be externally connected to power supply to guarantee proper operation.

- 250ps Typical Propagation Delay
- High Bandwidth to 3 Ghz Typical
- PECL mode: 3.0V to 5.5V  $V_{CC}$  with  $V_{EE} = 0V$
- ECL mode:  $0V V_{CC}$  with  $V_{EE} = -3.0V$  to -5.5V
- 75kΩ Internal Input Pulldown Resistors
- ESD Protection: >4KV HBM, >100V MM
- Moisture Sensitivity Level 2

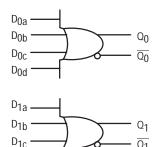
For Additional Information, See Application Note AND8003/D

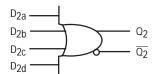
 Flammability Rating: UL-94 code V-0 @ 1/8", Oxygen Index 28 to 34

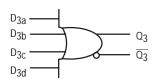
 $D_{1d}$ 

• Transistor Count = 173 devices

### **LOGIC DIAGRAM**









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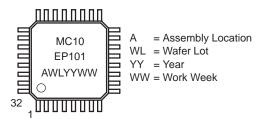
Formerly a Division of Motorola

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32-LEAD TQFP FA SUFFIX CASE 873A

#### MARKING DIAGRAM\*



\*For additional information, see Application Note AND8002/D

PIN DESCRIPTION							
PIN FUNCTION							
D0a-D3d	ECL Data Inputs						
Q0-Q3, Q0-Q3	ECL Data Outputs						
VCC	Positive Supply						
VBB	Reference Voltage Output						
VEE	Negative, 0 Supply						

#### **TRUTH TABLE**

Dna	Dnb	Dnc	Dnd	Qn	Qn
L H X X H	L X H X H	L X H X H	L X X H H		HLLL

### **ORDERING INFORMATION**

Device	Package	Shipping		
MC10EP101FA	TQFP	250 Units/Tray		
MC10EP101FAR2	TQFP	2000 Tape & Reel		

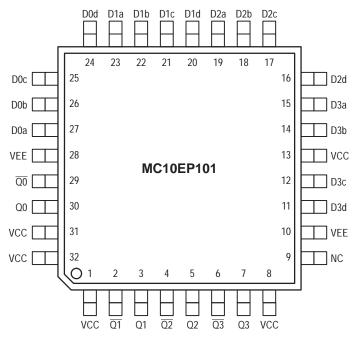


Figure 1. 32–Lead TQFP Pinout (Top View)

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
VEE	Power Supply (V <sub>CC</sub> = 0V)		-6.0 to 0	VDC
V <sub>CC</sub>	Power Supply (V <sub>EE</sub> = 0V)		6.0 to 0	VDC
VI	Input Voltage (V <sub>CC</sub> = 0V, V <sub>I</sub> not more negative that	an V <sub>EE</sub> )	-6.0 to 0	VDC
VI	Input Voltage (VEE = 0V, VI not more positive than	n V <sub>CC</sub> )	6.0 to 0	VDC
l <sub>out</sub>	Output Current	Continuous Surge	50 100	mA
TA	Operating Temperature Range		-40 to +85	°C
T <sub>stg</sub>	Storage Temperature		-65 to +150	°C
θЈА	Thermal Resistance (Junction–to–Ambient)	Still Air 500lfpm	80 55	°C/W
θJC	Thermal Resistance (Junction-to-Case)		12 to 17	°C/W
T <sub>sol</sub>	Solder Temperature (<2 to 3 Seconds: 245°C desi	ired)	265	°C

 $<sup>^{\</sup>star}$  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 3.)

			-40°C 25°C		85°C						
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
IEE	Power Supply Current (Note 1.)	45	57	75	45	58	75	45	59	75	mA
Vон	Output HIGH Voltage (Note 2.)	-1135	-1060	-885	-1070	-945	-820	-1010	-885	-760	mV
VOL	Output LOW Voltage (Note 2.)	-1995	-1810	-1685	-1995	-1745	-1620	-1995	-1685	-1560	mV
VIH	Input HIGH Voltage Single Ended	-1210		-885	-1145		-820	-1085		-760	mV
V <sub>IL</sub>	Input LOW Voltage Single Ended	-1935		-1610	-1870		-1545	-1810		-1485	mV
ΊΗ	Input HIGH Current			150			150			150	μΑ
I <sub>I</sub> L	Input LOW Current	-150			-150			-150			μΑ

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. Input and output parameters vary 1:1 with VCC.

# DC CHARACTERISTICS, LVPECL ( $V_{CC} = 3.3V \pm 0.3V$ , $V_{EE} = 0V$ ) (Note 6.)

		-40°C 25°C		85°C							
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
IEE	Power Supply Current (Note 4.)	45	57	75	45	58	75	45	59	75	mA
VOH	Output HIGH Voltage (Note 5.)	2165	2240	2415	2230	2355	2480	2290	2415	2540	mV
VOL	Output LOW Voltage (Note 5.)	1305	1490	1615	1305	1555	1680	1305	1615	1740	mV
VIH	Input HIGH Voltage Single Ended	2090		2415	2155		2480	2215		2540	mV
V <sub>IL</sub>	Input LOW Voltage Single Ended	1365		1690	1430		1755	1490		1815	mV
ΊΗ	Input HIGH Current			150			150			150	μΑ
I <sub>I</sub> L	Input LOW Current	-150			-150			-150			μΑ

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.

- 4.  $V_{CC}$  = 3.0V,  $V_{EE}$  = 0V, all other pins floating. 5. All loading with 50 ohms to  $V_{CC}$  -2.0 volts.
- 6. Input and output parameters vary 1:1 with V<sub>CC</sub>.

# DC CHARACTERISTICS, PECL ( $V_{CC} = 5.0 \text{V} \pm 0.5 \text{V}$ , $V_{EE} = 0 \text{V}$ ) (Note 9.)

		–40°C		25°C			85°C				
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
IEE	Power Supply Current (Note 7.)	45	57	75	45	58	75	45	59	75	mA
VOH	Output HIGH Voltage (Note 8.)	3865	3940	4115	3930	4055	4180	3990	4115	4240	mV
VOL	Output LOW Voltage (Note 8.)	3005	3190	3315	3005	3255	3380	3005	3315	3440	mV
VIH	Input HIGH Voltage Single Ended	3790		4115	3855		4180	3915		4240	mV
V <sub>IL</sub>	Input LOW Voltage Single Ended	3065		3390	3130		3455	3190		3515	mV
ΊΗ	Input HIGH Current			150			150			150	μΑ
I <sub>IL</sub>	Input LOW Current	-150			-150			-150			μΑ

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.

- 7.  $V_{CC} = 5.0V$ ,  $V_{EE} = 0V$ , all other pins floating. 8. All loading with 50 ohms to  $V_{CC} 2.0$  volts. 9. Input and output parameters vary 1:1 with  $V_{CC}$ .

# AC CHARACTERISTICS ( $V_{CC} = 3.0 \text{V to } 5.5 \text{V}$ ; $V_{EE} = 0 \text{V}$ ) or ( $V_{CC} = 0 \text{V}$ ; $V_{EE} = -3.0 \text{V to } -5.5 \text{V}$ )

			–40°C			25°C			85°C		
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
f <sub>max</sub>	Maximum Toggle Frequency (Note 10.)		3.0			3.0			3.0		GHz
tPLH, tPHL	Propagation $D \rightarrow Q, \overline{Q}$ Delay	125	225	325	150	250	370	170	300	420	ps
tSKEW	Device Skew Q, Q Q Part-to-Part (Note 11.)		TBD TBD			TBD TBD			TBD TBD		ps
<sup>t</sup> JITTER	Cycle-to-Cycle Jitter		TBD			TBD			TBD		ps
t <sub>r</sub>	Output Rise and Fall Times (20% – 80%) Q, $\overline{\mathbb{Q}}$	100	150	200	100	170	250	120	190	270	ps

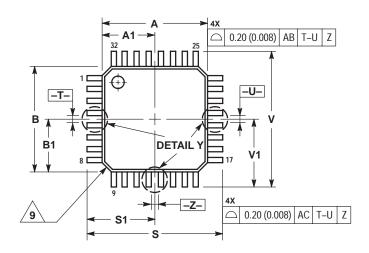
<sup>10.</sup> F<sub>max</sub> guaranteed for functionality only.

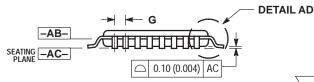
<sup>11.</sup> Skew is measured between outputs under identical transitions.

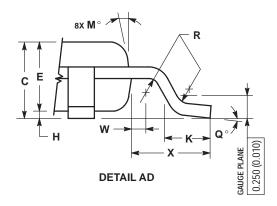
## **PACKAGE DIMENSIONS**

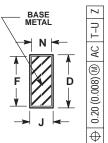
### **TQFP FA SUFFIX**

32-LEAD PLASTIC PACKAGE CASE 873A-02 ISSUE A

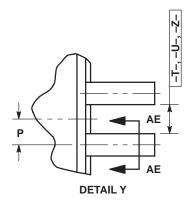








SECTION AE-AE



NOTES:

- 11. 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 Y TO RE DETERMINED AT
  5. DIMENSIONS S AND Y TO RE DETERMINED AT

- DE TERMINED 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-.
  TO DIMENSION D DOES NOT INCLUDE DAMBAR
  PROTRUSION. DAMBAR PROTRUSION SHALL NOT CAUSE THE D DIMENSION TO EXCEED 0.520 (0.020).
- u.520 (J.020).

  8. MINIMUM SOLDER PLATE THICKNESS SHALL BE 0.0076 (0.0003).

  9. EXACT SHAPE OF EACH CORNER MAY VARY FROM DEPICTION.

	MILLIN	METERS	INC	HES		
DIM	MIN	MAX	MIN	MAX		
Α	7.000	BSC	0.276	BSC		
A1	3.500	BSC	0.138	BSC		
В	7.000	BSC	0.276	BSC		
B1	3.500	BSC	0.138	BSC		
С	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			
Н	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		
Р	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		
Х	1.000	REF	0.039	REF		

# **Notes**

# **Notes**

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