

# MC100LVE164

## 3.3V ECL 16:1 Multiplexer

The MC100LVE164 is a 16:1 multiplexer with a differential output. The select inputs (SEL0, 1, 2, 3) control which one of the sixteen data inputs (A0 – A15) is propagated to the output. The device is functionally equivalent to the MC100E164 except it operates from a 3.3 V supply. The device is packaged in the 32-lead LQFP. The LQFP has a 7x7 mm body with a 0.8 mm lead pitch.

Special attention to the design layout results in a typical skew between the 16 inputs of only 50 ps.

### Features

- 850 ps Data Input to Output
- Differential Output
- ESD Protection: Human Body Model; >2 kV,  
Machine Model >200 V
- The 100 Series Contains Temperature Compensation
- PECL Mode Operating Range:  $V_{CC} = 3.0\text{ V}$  to  $3.8\text{ V}$   
with  $V_{EE} = 0\text{ V}$
- NECL Mode Operating Range:  $V_{CC} = 0\text{ V}$   
with  $V_{EE} = -3.0\text{ V}$  to  $-3.8\text{ V}$
- Internal Input Pulldown Resistors
- Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test
- Moisture Sensitivity Level 2  
For Additional Information, see Application Note AND8003/D
- Flammability Rating: UL 94 code V-0 @ 0.125 in,  
Oxygen Index: 28 to 34
- Transistor Count = 307 devices
- Pb-Free Packages are Available\*



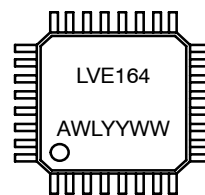
**ON Semiconductor®**

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### MARKING DIAGRAM\*



**32 LQFP  
FA SUFFIX  
CASE 873A**



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

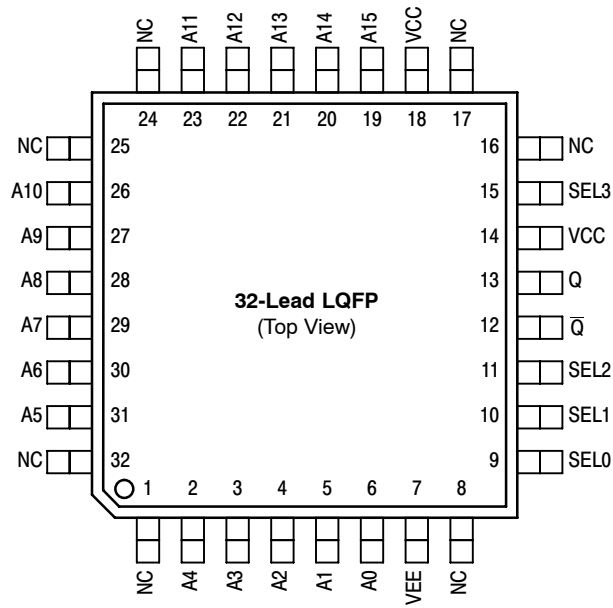
\*For additional marking information, refer to Application Note AND8002/D.

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 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.

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Warning: All V<sub>CC</sub> and V<sub>EE</sub> pins must be externally connected to Power Supply to guarantee proper operation.

Figure 1. Logic Diagram and Pinout Assignment

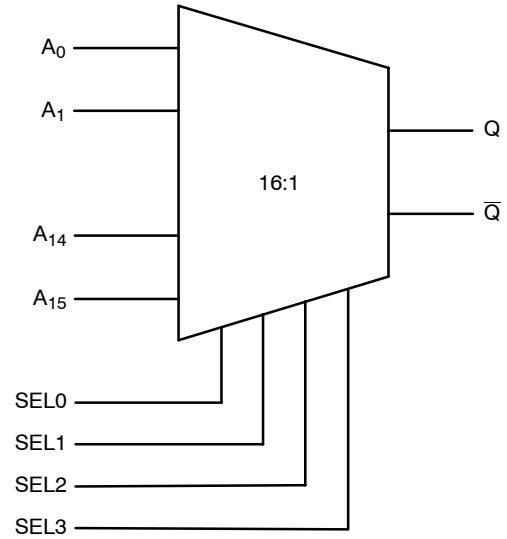


Figure 2. Logic Diagram

Table 1. PIN DESCRIPTION

PIN	FUNCTION
A <sub>0</sub> – A <sub>15</sub>	ECL Data Inputs
SEL[0:3]	ECL Select Inputs
Q, $\bar{Q}$	ECL Differential Outputs
V <sub>CC</sub>	Positive Supply
V <sub>EE</sub>	Negative Supply
NC	No Connect

Table 2. FUNCTION TABLE

SEL3	SEL2	SEL1	SEL0	Data
L	L	L	L	A0
L	L	L	H	A1
L	L	H	L	A2
L	L	H	H	A3
L	H	L	L	A4
L	H	L	H	A5
L	H	H	L	A6
L	H	H	H	A7
H	L	L	L	A8
H	L	L	H	A9
H	L	H	L	A10
H	L	H	H	A11
H	H	L	L	A12
H	H	L	H	A13
H	H	H	L	A14
H	H	H	H	A15

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**Table 3. MAXIMUM RATINGS**

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V <sub>CC</sub>	PECL Mode Power Supply	V <sub>EE</sub> = 0 V		8 to 0	V
V <sub>EE</sub>	NECL Mode Power Supply	V <sub>CC</sub> = 0 V		–8 to 0	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 to 0 –6 to 0	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	32 LQFP 32 LQFP	80 55	°C/W °C/W
θ <sub>JC</sub>	Thermal Resistance (Junction–to–Case)	Standard Board	32 LQFP	12 to 17	°C/W
T <sub>sol</sub>	Wave Solder Pb Pb–Free	<2 to 3 sec @ 248°C <2 to 3 sec @ 260°C		265 265	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

**Table 4. LVPECL DC CHARACTERISTICS** V<sub>CC</sub> = 3.3 V; V<sub>EE</sub> = 0.0 V (Note 1)

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		34	45		34	45		37	45	mA
V <sub>OH</sub>	Output HIGH Voltage (Note 2)	2215	2295	2420	2275	2345	2420	2275	2345	2420	mV
V <sub>OL</sub>	Output LOW Voltage (Note 2)	1470	1605	1745	1490	1595	1680	1490	1595	1680	mV
V <sub>IH</sub>	Input HIGH Voltage (Single–Ended)	2135		2420	2135		2420	2135		2420	mV
V <sub>IL</sub>	Input LOW Voltage (Single–Ended)	1490		1825	1490		1825	1490		1825	mV
I <sub>IH</sub>	Input HIGH Current			150			150			150	μA
I <sub>IL</sub>	Input LOW Current	0.5			0.5			0.5			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.

1. Input and output parameters vary 1:1 with V<sub>CC</sub>. V<sub>EE</sub> can vary ±0.3 V.
2. Outputs are terminated through a 50 Ω resistor to V<sub>CC</sub> – 2.0 V.

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**Table 5. LVNECL DC CHARACTERISTICS**  $V_{CC} = 0.0\text{ V}$ ;  $V_{EE} = -3.3\text{ V}$  (Note 3)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	Power Supply Current		34	45		34	45		37	45	mA
$V_{OH}$	Output HIGH Voltage (Note 4)	-1085	-1005	-880	-1025	-955	-880	-1025	-955	-880	mV
$V_{OL}$	Output LOW Voltage (Note 4)	-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
$I_{IH}$	Input HIGH Current			150			150			150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	0.5			0.5			0.5			$\mu\text{A}$

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 lfm. 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  $\pm 0.3\text{ V}$ .

4. Outputs are terminated through a  $50\ \Omega$  resistor to  $V_{CC} - 2.0\text{ V}$ .

**Table 6. AC CHARACTERISTICS**  $V_{CC} = 3.3\text{ V}$ ;  $V_{EE} = 0.0\text{ V}$  or  $V_{CC} = 0.0\text{ V}$ ;  $V_{EE} = -3.3\text{ V}$  (Note 5)

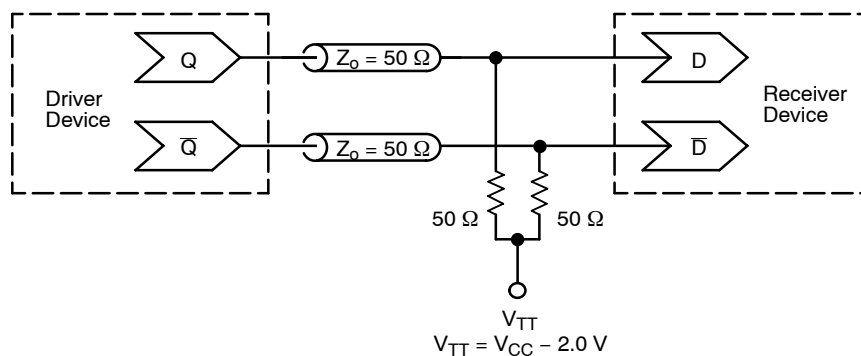
Symbol	Characteristic	-40°C			25°C			85°C			Unit	
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
f <sub>max</sub>	Maximum Toggle Frequency		700			700			700		MHz	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay to Output	A Input SEL0 SEL1 SEL2 SEL3	350 500 400 400 400	600 700 675 675 550	850 900 900 900 700	350 500 400 400 400	600 700 675 675 550	850 900 900 900 700	350 500 400 400 400	600 700 675 675 550	850 900 900 900 700	ps
t <sub>SKEW</sub>	Within Device Skew (Note 6)		75			50			50			ps
t <sub>JITTER</sub>	RMS Random Clock Jitter		<1			<1			<1			ps
t <sub>r</sub> t <sub>f</sub>	Rise/Fall Times (20% – 80%)		275	400	550	275	400	550	275	400	550	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 lfm. 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.

5.  $V_{EE}$  can vary  $\pm 0.3\text{ V}$ .

6. Within Device skew is defined as the difference in the A to Q delay between the 16 different A inputs.

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**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
- AN1642/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

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### ORDERING INFORMATION

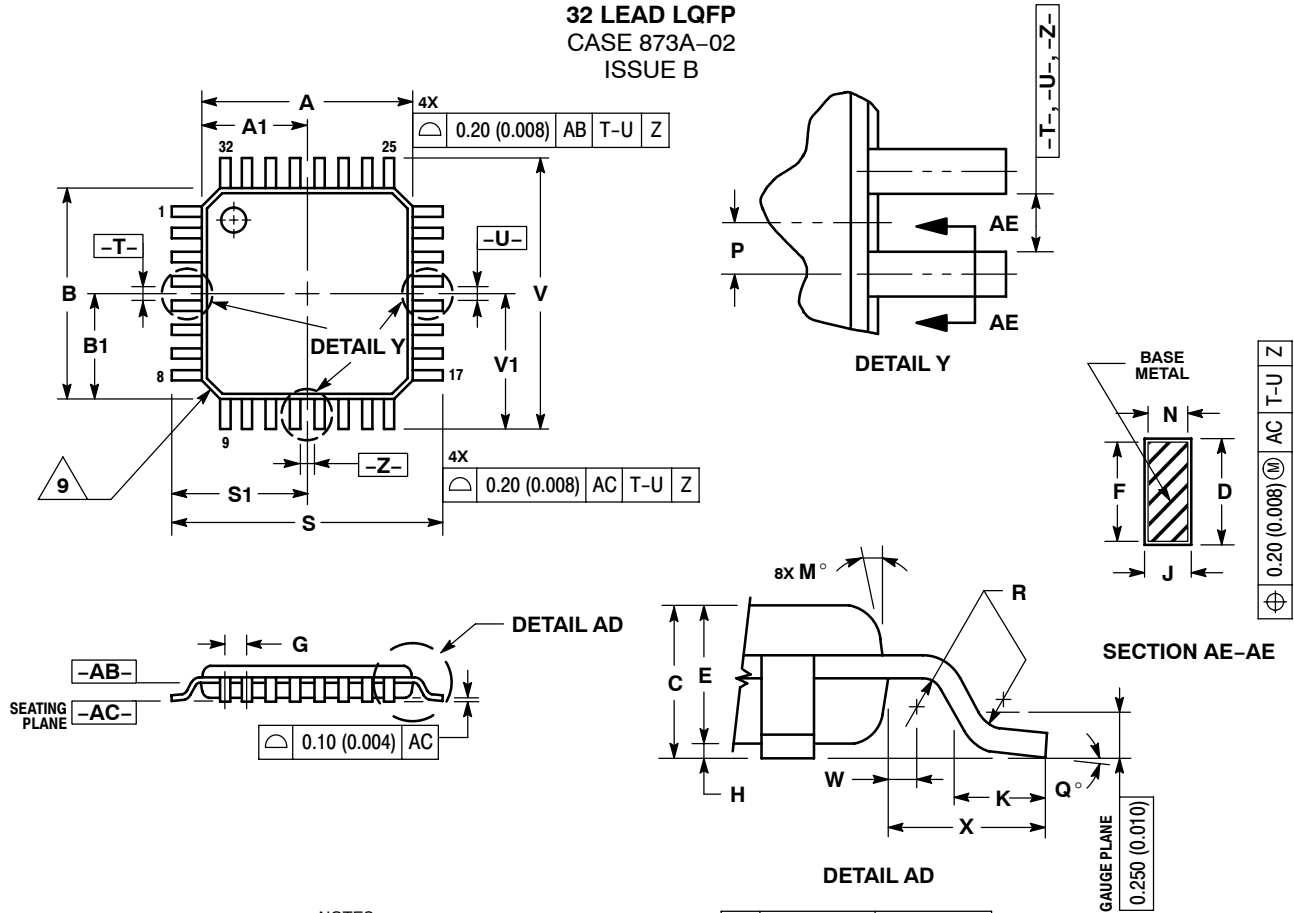
Device	Package	Shipping <sup>†</sup>
MC100LVE164FA	LQFP	250 Units / Rail
MC100LVE164FAG	LQFP (Pb-Free)	250 Units / Rail
MC100LVE164FAR2	LQFP	2000 / Tape & Reel
MC100LVE164FAR2G	LQFP (Pb-Free)	2000 / Tape & Reel

<sup>†</sup>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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## PACKAGE DIMENSIONS

32 LEAD LQFP  
CASE 873A-02  
ISSUE B




### 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.

DIM	MILLIMETERS		INCHES	
	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

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