

MC100EPT23

3.3V Dual Differential LVPECL/LVDS/CML to LVTTTL/LVCMOS Translator

The MC100EPT23 is a dual differential LVPECL/LVDS/CML to LVTTTL/LVCMOS translator. Because LVPECL (Positive ECL), LVDS, and positive CML input levels and LVTTTL/LVCMOS output levels are used, only +3.3 V and ground are required. The small outline 8-lead SOIC package and the dual gate design of the EPT23 makes it ideal for applications which require the translation of a clock or data signal.

The EPT23 is available in only the ECL 100K standard. Since there are no LVPECL outputs or an external V_{BB} reference, the EPT23 does not require both ECL standard versions. The LVPECL/LVDS inputs are differential. Therefore, the MC100EPT23 can accept any standard differential LVPECL/LVDS input referenced from a V_{CC} of +3.3 V.

Features

- 1.5 ns Typical Propagation Delay
- Maximum Operating Frequency > 275 MHz
- LVPECL/LVDS/CML Inputs, LVTTTL/LVCMOS Outputs
- 24 mA LVTTTL Outputs
- Operating Range: $V_{CC} = 3.0$ V to 3.6 V with $GND = 0$ V
- Pb-Free Packages are Available



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MARKING DIAGRAMS*



- A = Assembly Location
- L = Wafer Lot
- Y = Year
- W = Work Week
- \bar{M} = Date Code
- = Pb-Free Package

(Note: Microdot may be in either location)

*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 5 of this data sheet.

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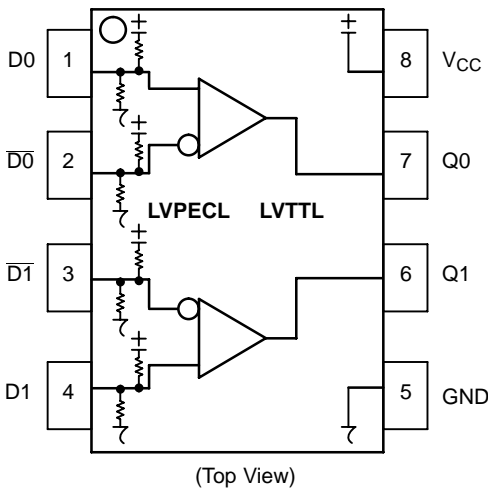


Figure 1. Logic Diagram and 8-Lead Pinout

Table 1. PIN DESCRIPTION

Pin	Function
Q0, Q1	LVTTTL/LVCMOS Outputs
D0**, D1** D0**, D1**	Differential LVPECL/LVDS/CML Inputs
V _{CC}	Positive Supply
GND	Ground
EP	Exposed pad must be connected to a sufficient thermal conduit. Electrically connect to the most negative supply or leave floating open.

** Pins will default to $V_{CC}/2$ when left open.

Table 2. ATTRIBUTES

Characteristics	Value
Internal Input Pulldown Resistor	50 k Ω
Internal Input Pullup Resistor	50 k Ω
ESD Protection	Human Body Model > 1500 V Machine Model > 100 V Charged Device Model > 2 kV
Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1)	Level 1
Flammability Rating	Oxygen Index: 28 to 34 UL 94 V-0 @ 0.125 in
Transistor Count	91 Devices
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test	

1. For additional information, see Application Note AND8003/D.

Table 3. MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V _{CC}	Power Supply	GND = 0 V		3.8	V
V _I	Input Voltage	GND = 0 V	$V_I \leq V_{CC}$	3.8	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	SOIC-8 SOIC-8	190 130	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction-to-Case)	Standard Board	SOIC-8	41 to 44	°C/W
θ_{JA}	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	TSSOP-8 TSSOP-8	185 140	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction-to-Case)	Standard Board	TSSOP-8	41 to 44	°C/W
θ_{JA}	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	DFN8 DFN8	129 84	°C/W °C/W
T _{sol}	Wave Solder	Pb <2 to 3 sec @ 248°C Pb-Free <2 to 3 sec @ 260°C		265 265	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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Table 4. PECL DC CHARACTERISTICS $V_{CC} = 3.3\text{ V}$, $GND = 0\text{ V}$ (Note 2)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{CCH}	Power Supply Current (Outputs set to HIGH)	10	18	25	10	18	25	10	18	25	mA
I_{CCL}	Power Supply Current (Outputs set to LOW)	15	26	36	15	26	36	15	26	36	mA
V_{IH}	Input HIGH Voltage	2075		2420	2075		2420	2075		2420	mV
V_{IL}	Input LOW Voltage	1355		1675	1355		1675	1355		1675	mV
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Note 3)	1.2		3.3	1.2		3.3	1.2		3.3	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	D D	-150 -150		-150 -150			-150 -150		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 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.

2. All values vary 1:1 with V_{CC} .

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.

Table 5. LVTTTL/LVC MOS OUTPUT DC CHARACTERISTICS $V_{CC} = 3.3\text{ V}$, $GND = 0.0\text{ V}$, $T_A = -40^\circ\text{C}$ to 85°C

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
V_{OH}	Output HIGH Voltage	$I_{OH} = -3.0\text{ mA}$	2.4			V
V_{OL}	Output LOW Voltage	$I_{OL} = 24\text{ mA}$			0.5	V
I_{OS}	Output Short Circuit Current		-180		-50	mA

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.

Table 6. AC CHARACTERISTICS $V_{CC} = 3.0\text{ V}$ to 3.6 V , $GND = 0.0\text{ V}$ (Note 4)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
f_{max}	Maximum Frequency (Figure 2)	275	350		275	350		275	350		MHz
t_{PLH} , t_{PHL}	Propagation Delay to Output Differential (Note 5)	1.2	1.5	1.8	1.2	1.5	1.8	1.3	1.7	2.4	ns
t_{SK++} , t_{SK--} , t_{SKPP}	Output-to-Output Skew++ Output-to-Output Skew-- Part-to-Part Skew (Note 6)		15	60		15	70		30	125	ps
			35	80		40	80		40	80	
			70	500		70	500		140	500	
t_{JITTER}	Random Clock Jitter (RMS) (Figure 2)		5	10		5	10		5	10	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 (0.8 V – 2.0 V) Q, \bar{Q}	330	600	900	330	600	900	330	650	900	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.

4. Measured with a 750 mV 50% duty-cycle clock source. $R_L = 500\ \Omega$ to GND and $C_L = 20\text{ pF}$ to GND. Refer to Figure 3.

5. Reference ($V_{CC} = 3.3\text{ V} \pm 5\%$; $GND = 0\text{ V}$)

6. Skews are measured between outputs under identical conditions.

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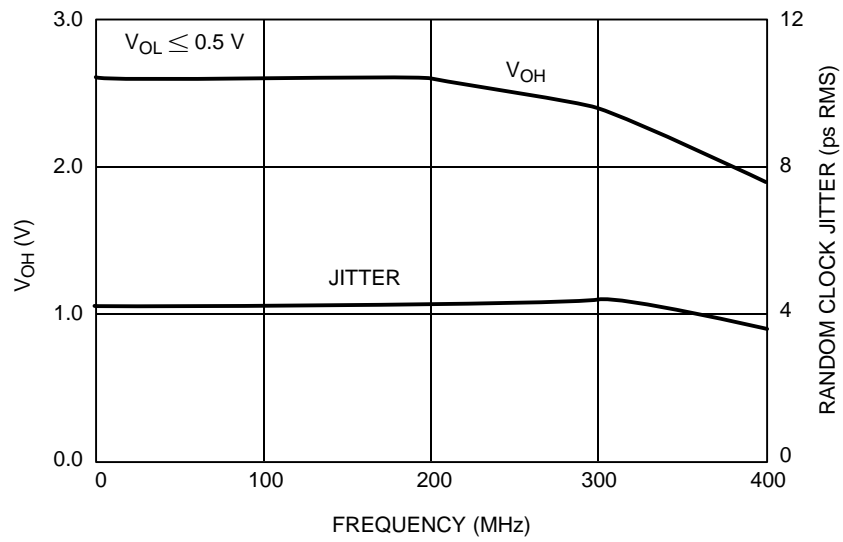


Figure 2. Typical V_{OH} / Jitter versus Frequency (25°C)

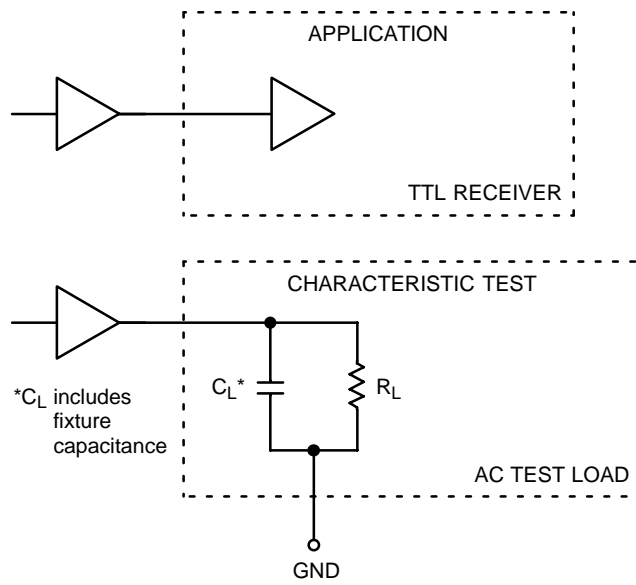


Figure 3. TTL Output Loading Used for Device Evaluation

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ORDERING INFORMATION

Device	Package	Shipping†
MC100EPT23D	SOIC-8	98 Units / Rail
MC100EPT23DG	SOIC-8 (Pb-Free)	98 Units / Rail
MC100EPT23DR2	SOIC-8	2500 / Tape & Reel
MC100EPT23DR2G	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC100EPT23DT	TSSOP-8	100 Units / Rail
MC100EPT23DTG	TSSOP-8 (Pb-Free)	100 Units / Rail
MC100EPT23DTR2	TSSOP-8	2500 / Tape & Reel
MC100EPT23DTR2G	TSSOP-8 (Pb-Free)	2500 / Tape & Reel
MC100EPT23MNR4	DFN8	1000 / Tape & Reel
MC100EPT23MNR4G	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.

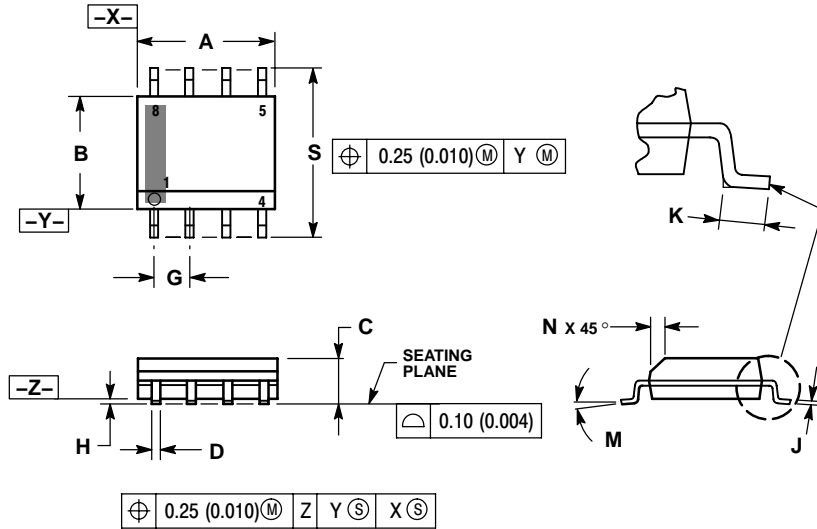
Resource Reference of Application Notes

- 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

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PACKAGE DIMENSIONS

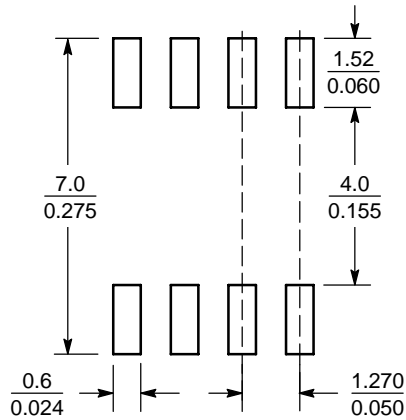
SOIC-8 NB
CASE 751-07
ISSUE AH



- 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.
 6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

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

SOLDERING FOOTPRINT*



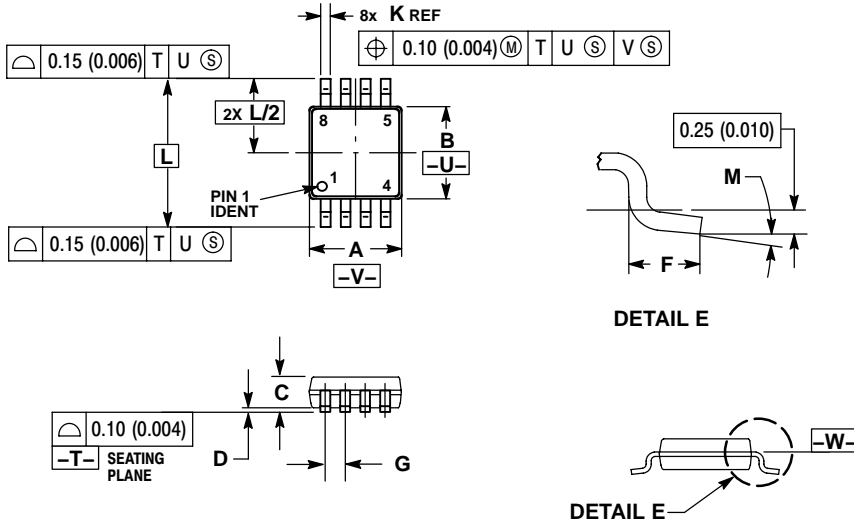
SCALE 6:1 ($\frac{\text{mm}}{\text{inches}}$)

*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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PACKAGE DIMENSIONS

TSSOP-8
DT SUFFIX
PLASTIC TSSOP PACKAGE
CASE 948R-02
ISSUE A



NOTES:

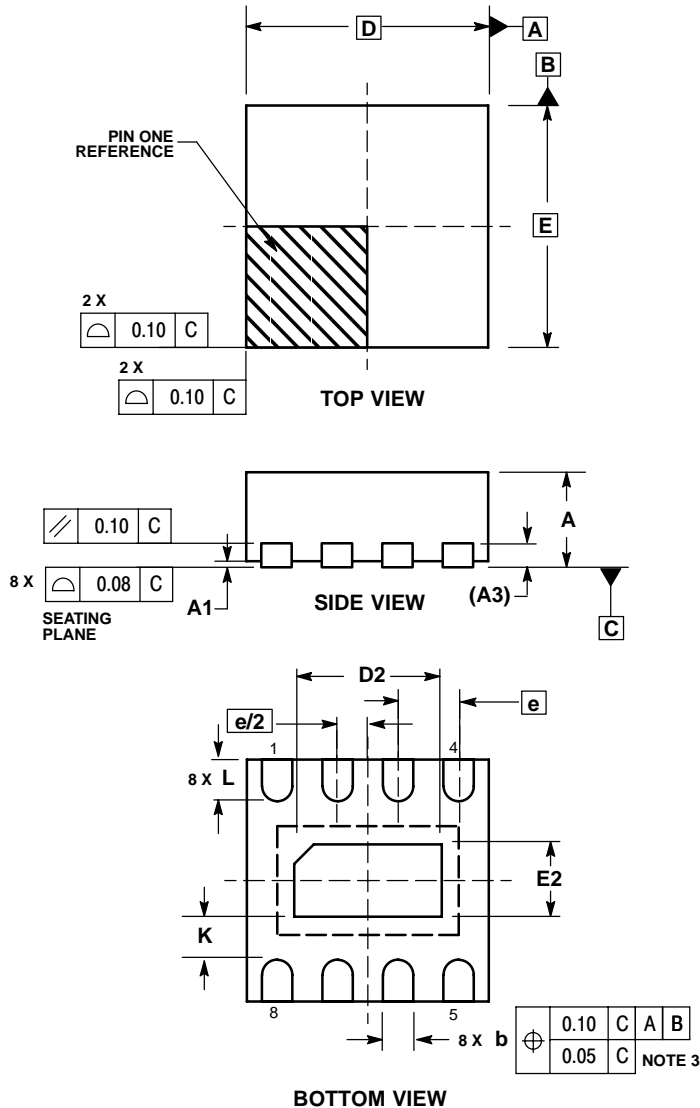
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD 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 -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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PACKAGE DIMENSIONS

DFN8
CASE 506AA-01
ISSUE D



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 0.25 AND 0.30 MM FROM TERMINAL.
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	0.20	---
L	0.25	0.35

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