

# NB100ELT23L

## 3.3V Dual Differential LVPECL/LVDS to LVTTTL Translator

The NB100ELT23L is a dual differential LVPECL/LVDS to LVTTTL translator. Because LVPECL (Positive ECL) or LVDS levels are used, only +3.3 V and ground are required. The small outline 8-lead package and the dual gate design of the ELT23L makes it ideal for applications which require the translation of a clock and a data signal.

The ELT23L is available in only the ECL 100K standard. Since there are no LVPECL outputs or an external  $V_{BB}$  reference, the ELT23L does not require both ECL standard versions. The LVPECL inputs are differential. Therefore, the NB100ELT23L can accept any standard differential LVPECL/LVDS input referenced from a  $V_{CC}$  of +3.3 V.

### Features

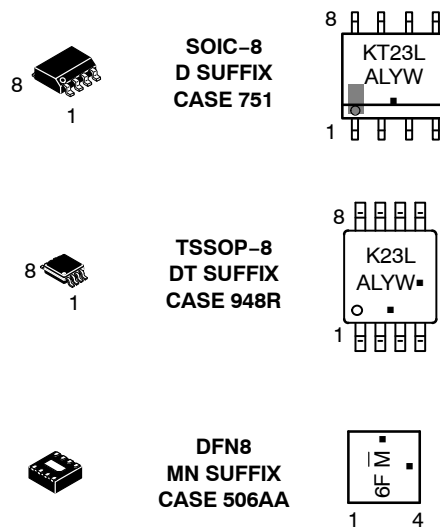
- 2.1 ns Typical Propagation Delay
- Maximum Operating Frequency > 160 MHz
- 24 mA LVTTTL Outputs
- Operating Range:  $V_{CC} = 3.0\text{ V}$  to  $3.6\text{ V}$  with  $GND = 0\text{ V}$
- Pb-Free Packages are Available



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### MARKING DIAGRAMS\*



- A = Assembly Location
- L = Wafer Lot
- Y = Year
- W = Work Week
- M̄ = Date Code
- = Pb-Free Package

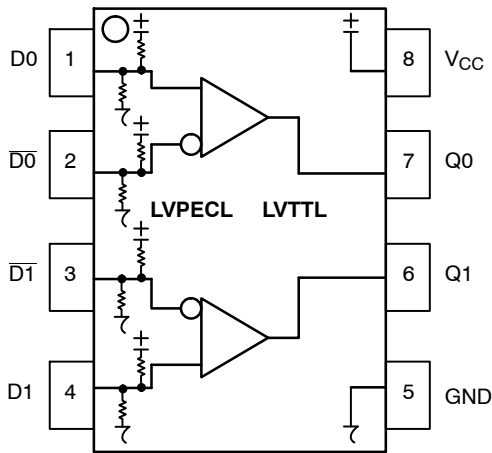
(Note: Microdot may be in either location)

\*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. 8-Lead Pinout (Top View) and Logic Diagram**

**Table 1. PIN DESCRIPTION**

PIN	FUNCTION
Q0, Q1	LVTTTL Outputs
D0*, D1* D0**, D1**	Differential LVPECL Inputs
V <sub>CC</sub>	Positive Supply
GND	Ground
EP	(DFN8 only) Thermal exposed pad must be connected to a sufficient thermal conduit. Electrically connect to the most negative supply (GND) or leave unconnected, floating open.

\*Pins will default to  $V_{CC}/2$  when left open. If connected to a common termination voltage under no signal conditions, then the device will be susceptible to self-oscillation.

\*\*Pins will default to  $2/3 V_{CC}$  when left open. If connected to a common termination voltage under no signal conditions, then the device will be susceptible to self-oscillation. See AND8020, Section 6 for options.

**Table 2. ATTRIBUTES**

Characteristics		Value
Internal Input Pulldown Resistor	D	50 k $\Omega$
	D	75 k $\Omega$
Internal Input Pullup Resistor		50 k $\Omega$
ESD Protection	Human Body Model	> 1.5 kV
	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 @ 1.25 in
Transistor Count		91 Devices
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test		

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

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**Table 3. MAXIMUM RATINGS**

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V <sub>CC</sub>	Power Supply	GND = 0 V		3.8	V
V <sub>I</sub>	Input Voltage	GND = 0 V	V <sub>I</sub> ≤ V <sub>CC</sub>	3.8	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	SO-8 SO-8	190 130	°C/W °C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	SO-8	41 to 44	°C/W
θ <sub>JA</sub>	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	TSSOP-8 TSSOP-8	185 140	°C/W °C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	TSSOP-8	41 to 44	°C/W
θ <sub>JA</sub>	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	DFN8 DFN8	129 84	°C/W °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
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	(Note 2)	DFN8	35 to 40	°C/W

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.

2. JEDEC standard multilayer board – 2S2P (2 signal, 2 power)

**Table 4. PECL DC CHARACTERISTICS** V<sub>CC</sub> = 3.3 V, GND = 0 V (Note 3)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I <sub>CCH</sub>	Power Supply Current (Outputs set to HIGH)	10	14	20	10	15	20	10	15	20	mA
I <sub>CCL</sub>	Power Supply Current (Outputs set to LOW)	15	19	25	15	19	25	15	20	25	mA
V <sub>IH</sub>	Input HIGH Voltage	2075		2420	2075		2420	2075		2420	mV
V <sub>IL</sub>	Input LOW Voltage	1355		1675	1355		1675	1355		1675	mV
V <sub>IHCMR</sub>	Input HIGH Voltage Common Mode Range (Note 4)	1.2		3.3	1.2		3.3	1.2		3.3	V
I <sub>IH</sub>	Input HIGH Current			150			150			150	μA
I <sub>IL</sub>	Input LOW Current	-150			-150			-150			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.

3. All values vary 1:1 with V<sub>CC</sub>.

4. V<sub>IHCMR</sub> minimum varies 1:1 with V<sub>EE</sub>. V<sub>IHCMR</sub> max varies 1:1 with V<sub>CC</sub>. The V<sub>IHCMR</sub> range is referenced to the most positive side of the differential input signal.

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**Table 5. TTL DC CHARACTERISTICS**  $V_{CC} = 3.3\text{ V}$ ,  $GND = 0.0\text{ V}$ ,  $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$

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

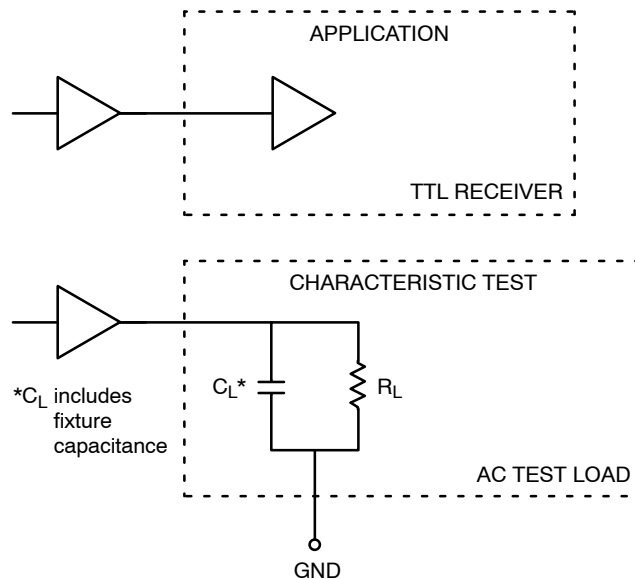
NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional 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**  $V_{CC} = 3.3\text{ V} \pm 5\%$ ,  $GND = 0.0\text{ V}$  (Note 5)

Symbol	Characteristic	$-40^\circ\text{C}$			$25^\circ\text{C}$			$85^\circ\text{C}$			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$f_{max}$	Maximum Frequency	160			160			160			MHz
$t_{PLH}$ , $t_{PHL}$	Propagation Delay to Output Differential (Note 6) $C_L = 20\text{ pF}$	1.95	2.5	2.95	1.95	2.5	2.95	1.95	2.6	3.25	ns
$t_{SK++}$ , $t_{SK--}$ , $t_{SKPP}$	Output-to-Output Skew++ Output-to-Output Skew-- Part-to-Part Skew (Note 7)			60 25 500			60 25 500			60 25 500	ps
$t_{JITTER}$	Random Clock Jitter (RMS)		6.0	20		6.0	20		6.0	20	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 $C_L = 20\text{ pF}$ (0.8 V to 2.0 V)	700 300	900	1650 1000	700 300	900	1650 1000	700 300	900	1650 1000	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. Measured using a 750 mV source, 50% duty cycle clock source. All loading with  $500\ \Omega$  to GND,  $C_L = 20\text{ pF}$ .
6. Reference ( $V_{CC} = 3.3\text{ V} \pm 5\%$ ;  $GND = 0\text{ V}$ ).
7. Skews are measured between outputs under identical conditions.



**Figure 2. TTL Output Loading Used for Device Evaluation**

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## ORDERING INFORMATION

Device	Package	Shipping†
NB100ELT23LD	SO-8	98 Units / Rail
NB100ELT23LDG	SO-8 (Pb-Free)	98 Units / Rail
NB100ELT23LDR2	SO-8	2500 / Tape & Reel
NB100ELT23LDR2G	SO-8 (Pb-Free)	2500 / Tape & Reel
NB100ELT23LDT	TSSOP-8	100 Units / Rail
NB100ELT23LDTG	TSSOP-8 (Pb-Free)	100 Units / Rail
NB100ELT23LDTR2	TSSOP-8	2500 / Tape & Reel
NB100ELT23LDTR2G	TSSOP-8 (Pb-Free)	2500 / Tape & Reel
NB100ELT23LMNR4	DFN8	1000 / Tape & Reel
NB100ELT23LMNR4G	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.

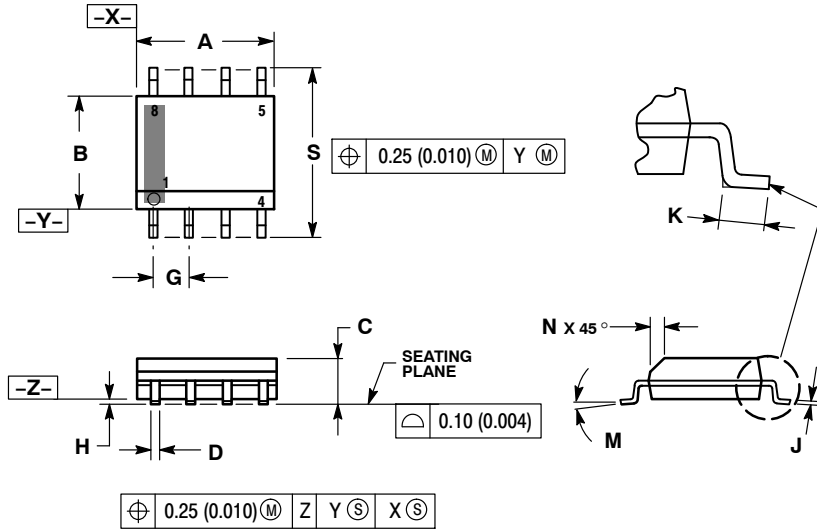
### Resource Reference of Application Notes

- 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

# NB100ELT23L

## PACKAGE DIMENSIONS

SOIC-8 NB  
CASE 751-07  
ISSUE AH

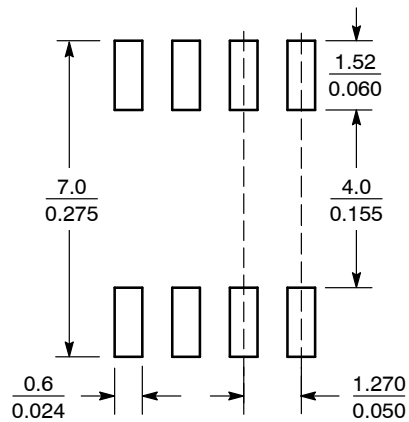


### NOTES:

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\*



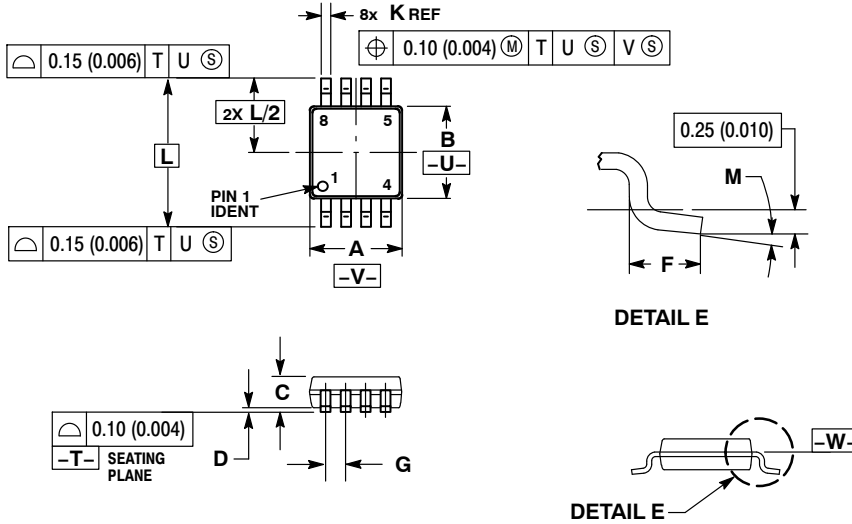
SCALE 6:1  $\left( \frac{\text{mm}}{\text{inches}} \right)$

\*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:

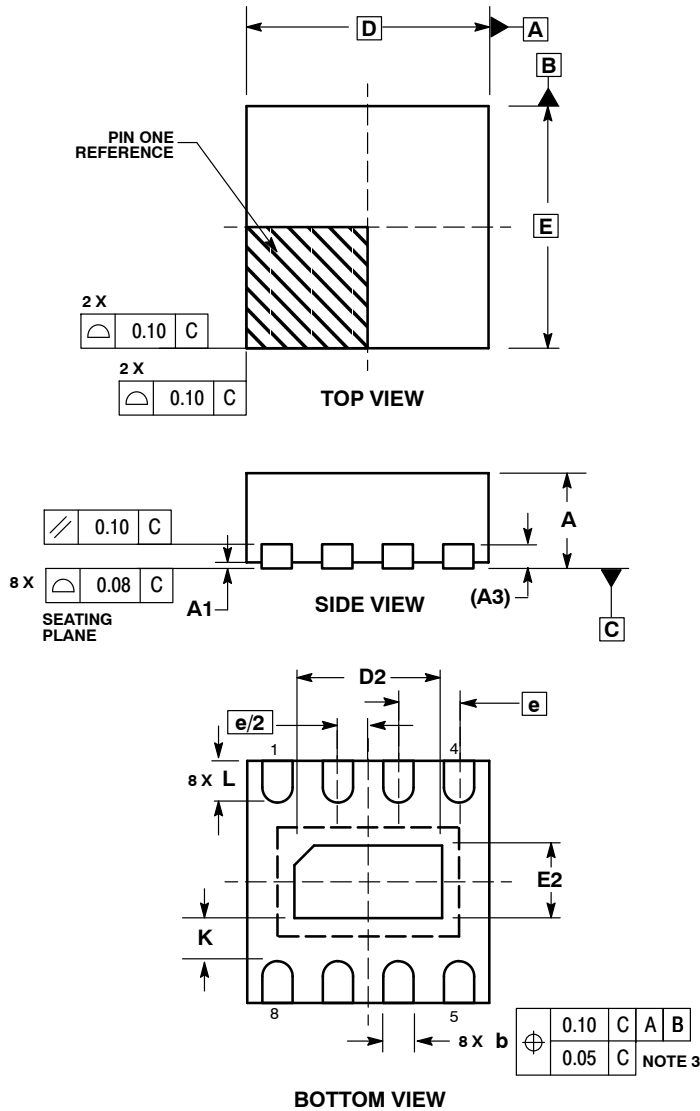
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL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

MILLIMETERS		
DIM	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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