

# MC100LVEL91

## 3.3 V Triple LVPECL Input to -3.3 V to -5.0 V ECL Output Translator

### Description

The MC100LVEL91 is a triple LVPECL input to ECL output translator. The device receives low voltage differential PECL signals, determined by the  $V_{CC}$  supply level, and translates them to differential -3.3 V to -5.0 V ECL output signals.

To accomplish the level translation the LVEL91 requires three power rails. The  $V_{CC}$  supply should be connected to the positive supply, and the  $V_{EE}$  pin should be connected to the negative power supply. The GND pins are connected to the system ground plane. Both  $V_{EE}$  and  $V_{CC}$  should be bypassed to ground via 0.01  $\mu$ F capacitors.

Under open input conditions, the  $\bar{D}$  input will be biased at  $V_{CC}/2$  and the D input will be pulled to GND. This condition will force the Q output to a low, ensuring stability.

The  $V_{BB}$  pin, an internally generated voltage supply, is available to this device only. For single-ended input conditions, the unused differential input is connected to  $V_{BB}$  as a switching reference voltage.  $V_{BB}$  may also rebias AC coupled inputs. When used, decouple  $V_{BB}$  and  $V_{CC}$  via a 0.01  $\mu$ F capacitor and limit current sourcing or sinking to 0.5 mA. When not used,  $V_{BB}$  should be left open.

### Features

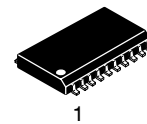
- 620 ps Typical Propagation Delay
- The 100 Series Contains Temperature Compensation
- Operating Range:  $V_{CC} = 3.8$  V to 3.0 V;  
 $V_{EE} = -3.0$  V to -5.5 V; GND = 0 V
- Q Output will Default LOW with Inputs Open or at GND
- Pb-Free Packages are Available\*



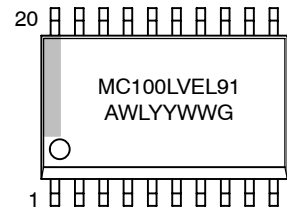
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### MARKING DIAGRAM\*



1  
SO-20  
DW SUFFIX  
CASE 751D



A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week  
G = Pb-Free Package

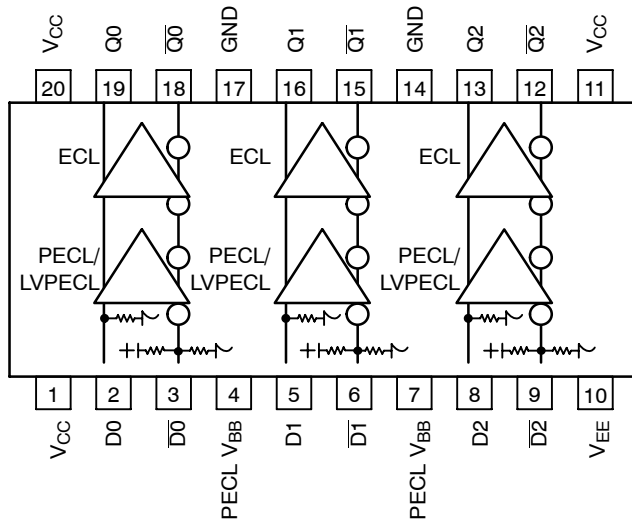
\*For additional marking information, refer to Application Note AND8002/D.

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 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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**Table 1. PIN DESCRIPTION**

Pin	Function
Dn, Dn̄	PECL/LVPECL Inputs
Qn, Qn̄	ECL Outputs
PECL V <sub>BB</sub>	PECL Reference Voltage Output
V <sub>CC</sub>	Positive Supply
V <sub>EE</sub>	Negative Supply
GND	Ground

**Figure 1. SO-20 Pinout (Top View) and Logic Diagram**

\* All V<sub>CC</sub> pins are tied together on the die.

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

**Table 2. ATTRIBUTES**

Characteristics	Value	
Internal Input Pulldown Resistor	75 kΩ	
Internal Input Pullup Resistor	75 kΩ	
ESD Protection	Human Body Model	> 2 kV
	Machine Model	> 100 V
	Charged Device Model	> 2 kV
Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1)	Pb Pkg	Pb-Free Pkg
	Level 1	Level 3
Flammability Rating	Oxygen Index: 28 to 34 UL 94 V-0 @ 0.125 in	
Transistor Count	282 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>	PECL Power Supply	GND = 0 V		3.8	V
V <sub>EE</sub>	NECL Power Supply	GND = 0 V		-6.0	V
V <sub>I</sub>	PECL 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
I <sub>BB</sub>	PECL V <sub>BB</sub> Sink/Source			± 0.5	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	SOIC-20 SOIC-20	90 60	°C/W °C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	SOIC-20	30 to 35	°C/W
T <sub>sol</sub>	Wave Solder	Pb Pb-Free		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.

**Table 4. LVPECL INPUT DC CHARACTERISTICS** V<sub>CC</sub> = 3.3 V; V<sub>EE</sub> = -3.3 V to -5.0 V; GND = 0 V (Note 2)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I <sub>CC</sub>	V <sub>CC</sub> Power Supply Current			11		6	11			11	mA
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
LVPECL V <sub>BB</sub>	Output Voltage Reference	1.92		2.04	1.92		2.04	1.92		2.04	V
V <sub>IHCMR</sub>	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 3)										
	V <sub>PP</sub> < 500 mV	1.0		2.9	0.9		2.9	0.9		2.9	V
	V <sub>PP</sub> ≥ 500 mV	1.2		2.9	1.1		2.9	1.1		2.9	V
I <sub>IH</sub>	Input HIGH Current			150			150			150	μA
I <sub>IL</sub>	Input LOW Current	D D̄	0.5 -600		0.5 -600			0.5 -600			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.

- Input parameters vary 1:1 with V<sub>CC</sub>. V<sub>CC</sub> can vary +0.5 / -0.3 V.
- V<sub>IHCMR</sub> min varies 1:1 with GND. V<sub>IHCMR</sub> max varies 1:1 with V<sub>CC</sub>.

**Table 5. NECL OUTPUT DC CHARACTERISTICS** V<sub>CC</sub> = 3.3 V; V<sub>EE</sub> = -3.3 V to -5.0 V; GND = 0 V (Note 4)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I <sub>EE</sub>	V <sub>EE</sub> Power Supply Current			27		21	27			29	mA
V <sub>OH</sub>	Output HIGH Voltage (Note 5)	-1085	-1005	-880	-1025	-955	-880	-1025	-955	-880	mV
V <sub>OL</sub>	Output LOW Voltage (Note 5)	-1830	-1695	-1555	-1810	-1705	-1620	-1810	-1705	-1620	mV

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.

- Output parameters vary 1:1 with GND. V<sub>CC</sub> can vary +0.3 V / -0.5 V.
- All loading with 50 Ω resistor to GND - 2.0 V.

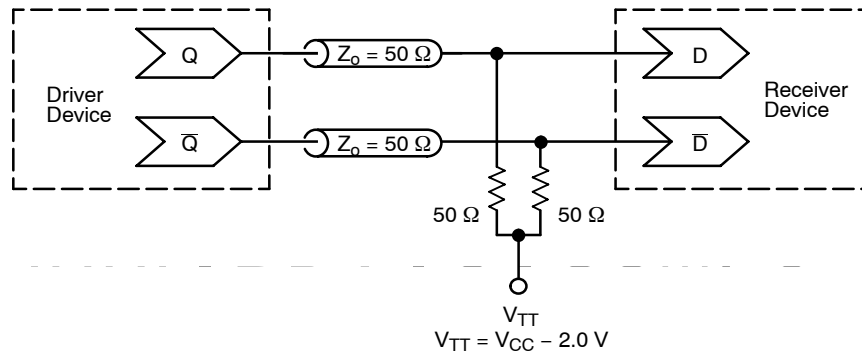
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**Table 6. AC CHARACTERISTICS**  $V_{CC} = 3.3\text{ V}$ ;  $V_{EE} = -3.0\text{ V}$  to  $-5.5\text{ V}$ ;  $GND = 0\text{ V}$  (Note 6)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$f_{max}$	Maximum Toggle Frequency		600			600			600		MHz
$t_{PLH}$ $t_{PHL}$	Propagation Delay D to Q Differential Configuration Select-Ended	490 440	590 590	690 740	520 470	620 620	720 770	560 510	660 660	760 810	ps
$t_{SKEW}$	Skew Output-to-Output (Note 7) Part-to-Part (Differential Configuration) (Note 7) Duty Cycle (Differential Configuration) (Note 8)		40 25	100 200		40 25	100 200		40 25	100 200	ps
$V_{PP}$	Input Swing (Note 9)	200		1000	200		1000	200		1000	mV
$t_r$ $t_f$	Output Rise/Fall Times Q (20% - 80%)	320	400	580	320	400	580	320	400	580	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 lpm. 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.

6.  $V_{CC}$  can vary  $+0.5\text{ V}$  /  $-0.3\text{ V}$ .
7. Skews are valid across specified voltage range, part-to-part skew is for a given temperature.
8. Duty cycle skew is the difference between a  $T_{PLH}$  and  $T_{PHL}$  propagation delay through a device.
9.  $V_{PP}(\min)$  is the minimum input swing for which AC parameters are guaranteed. The device has a DC gain of  $\approx 40$ .



**Figure 2. Typical Termination for Output Driver and Device Evaluation**  
(See Application Note AND8020/D – Termination of ECL Logic Devices.)

## ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
MC100LVEL91DW	SO-20	38 Units / Rail
MC100LVEL91DWG	SO-20 (Pb-Free)	38 Units / Rail
MC100LVEL91DWR2	SO-20	1000 / Tape & Reel
MC100LVEL91DWR2G	SO-20 (Pb-Free)	1000 / 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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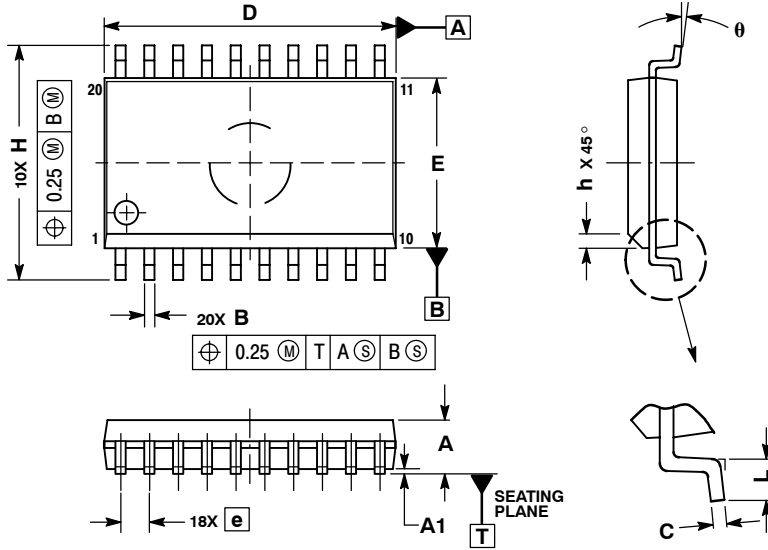
### Resource Reference of Application Notes

- 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

# MC100LEVEL91

## PACKAGE DIMENSIONS

SO-20 WB  
DW SUFFIX  
PLASTIC SOIC PACKAGE  
CASE 751D-05  
ISSUE G



**NOTES:**

1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

MILLIMETERS		
DIM	MIN	MAX
A	2.35	2.65
A1	0.10	0.25
B	0.35	0.49
C	0.23	0.32
D	12.65	12.95
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.25	0.75
L	0.50	0.90
θ	0°	7°

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