

# 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.

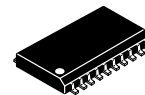
### Features

- 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
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant



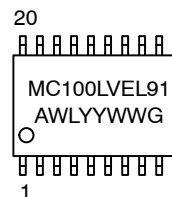
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SOIC-20 WB  
DW SUFFIX  
CASE 751D

### MARKING DIAGRAM\*



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

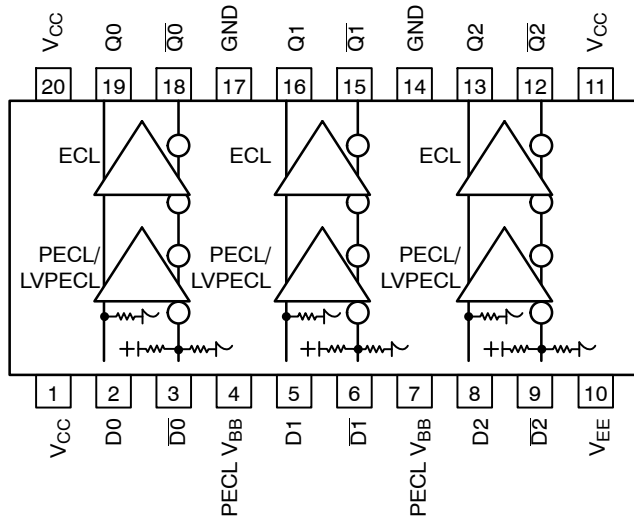
\*For additional marking information, refer to Application Note [AND8002/D](#).

### ORDERING INFORMATION

Device	Package	Shipping†
MC100LVEL91DWG	SOIC-20 WB (Pb-Free)	38 Units/Tube
MC100LVEL91DWR2G	SOIC-20 WB (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](#).

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**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 1. PIN DESCRIPTION**

Pin	Function
D <sub>n</sub> , D <sub>n</sub> <sup>̄</sup>	PECL/LVPECL Inputs
Q <sub>n</sub> , Q <sub>n</sub> <sup>̄</sup>	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

**Table 2. ATTRIBUTES**

Characteristics	Value
Internal Input Pulldown Resistor	75 kΩ
Internal Input Pullup Resistor	75 kΩ
ESD Protection Human Body Model Machine Model Charged Device Model	> 2 kV > 100 V > 2 kV
Moisture Sensitivity, (Note 1): Pb-Free	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
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 WB	90 60	°C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	SOIC-20 WB	30 to 35	°C/W
T <sub>sol</sub>	Wave Solder (Pb-Free)			265	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

**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 1))

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 2) V <sub>PP</sub> < 500 mV V <sub>PP</sub> ≥ 500 mV	1.0 1.2		2.9 2.9	0.9 1.1		2.9 2.9	0.9 1.1		2.9 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.

1. Input parameters vary 1:1 with V<sub>CC</sub>. V<sub>CC</sub> can vary +0.5 / -0.3 V.
2. 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 1))

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 2)	-1085	-1005	-880	-1025	-955	-880	-1025	-955	-880	mV
V <sub>OL</sub>	Output LOW Voltage (Note 2)	-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.

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

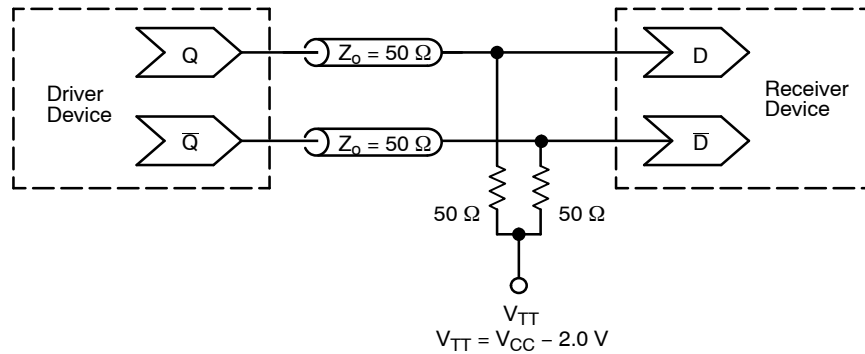
# MC100LEVEL91

**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 1))

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
$T_{PLH}$	Propagation Delay Differential Configuration	490	590	690	520	620	720	560	660	760	ps
$t_{PHL}$	D to Q Select-Ended	440	590	740	470	620	770	510	660	810	
$t_{SKEW}$	Skew Output-to-Output (Note 2) Part-to-Part (Differential Configuration) (Note 2) Duty Cycle (Differential Configuration) (Note 3)		40 25	100 200		40 25	100 200		40 25	100 200	ps
$V_{PP}$	Input Swing (Note 4)	200		1000	200		1000	200		1000	
$t_r$ $t_f$	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.

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



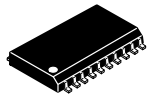
**Figure 2. Typical Termination for Output Driver and Device Evaluation**  
(See Application Note [AND8020/D](#) – Termination of ECL Logic Devices.)

# MC100LVEL91

## 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

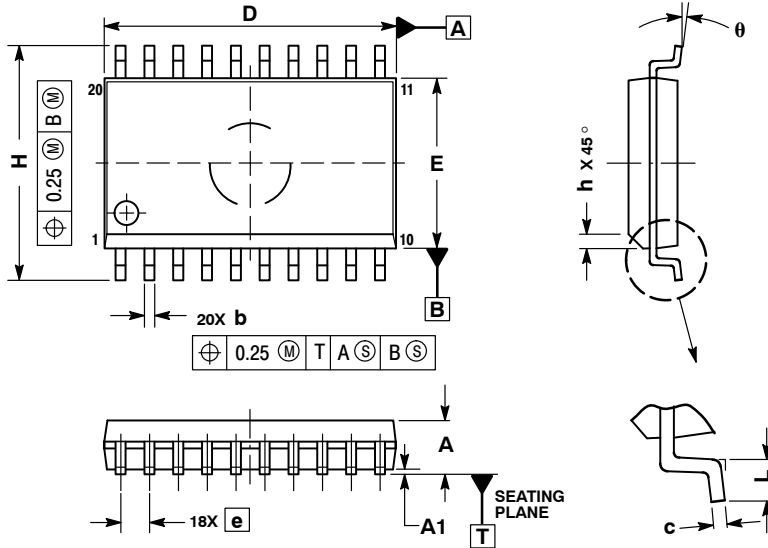
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 1:1

SOIC-20 WB  
CASE 751D-05  
ISSUE H

DATE 22 APR 2015



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.

DIM	MILLIMETERS	
	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°

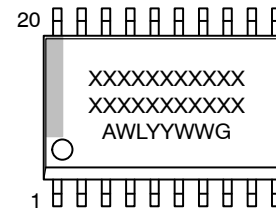
RECOMMENDED  
SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

GENERIC  
MARKING DIAGRAM\*



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

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

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