

# MC100LVEL90

## -3.3V / -5V Triple ECL Input to LVPECL Output Translator

### Description

The MC100LVEL90 is a triple ECL to LVPECL translator. The device receives either -3.3 V or -5 V differential ECL signals, determined by the  $V_{EE}$  supply level, and translates them to +3.3 V differential LVPECL output signals.

To accomplish the level translation, the LVEL90 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, as expected, 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  $V_{EE}/2$  and the D input will be pulled to  $V_{EE}$ . 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

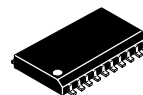
- 500 ps Propagation Delays
- ESD Protection: >2 kV HBM, >200 V MM
- The 100 Series Contains Temperature Compensation
- Operating Range:  $V_{CC} = 3.0$  V to 3.8 V;  
 $V_{EE} = -3.0$  V to -5.5 V; GND = 0 V
- Internal Input Pulldown Resistors
- Q Output will Default LOW with Inputs Open or at  $V_{EE}$
- Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test
- Moisture Sensitivity;  
Pb Pkg Level 1,  
Pb-Free Pkg Level 3  
For Additional Information, see Application Note AND8003/D
- Flammability Rating: UL 94 V-0 @ 0.125 in,  
Oxygen Index: 28 to 34
- Transistor Count = 261 devices
- Pb-Free Packages are Available\*

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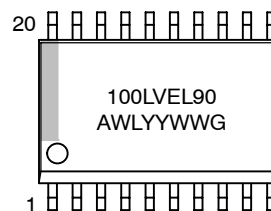
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SO-20 WB  
DW SUFFIX  
CASE 751D

### MARKING DIAGRAM\*



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

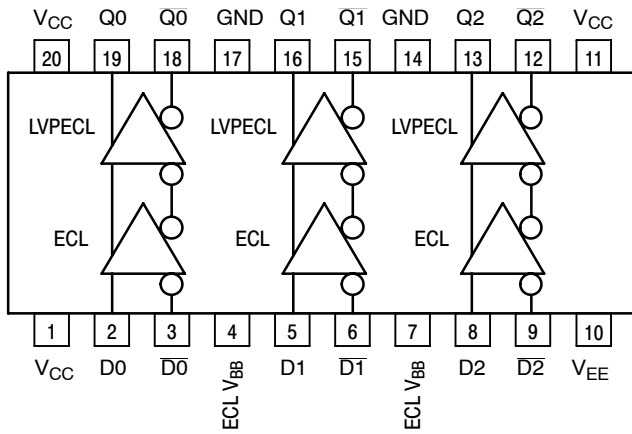
\*For additional marking information, refer to Application Note AND8002/D.

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 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, $\overline{Dn}$	ECL Inputs
Qn, $\overline{Qn}$	LVPECL Outputs
ECL $V_{BB}$	ECL Reference Voltage Output
$V_{CC}$	Positive Supply
$V_{EE}$	Negative Supply
GND	Ground

\* All  $V_{CC}$  pins are tied together on the die.

Warning: All  $V_{CC}$ ,  $V_{EE}$ , and GND pins must be externally connected to Power Supply to guarantee proper operation.

**Figure 1. Logic Diagram and Pinout: 20-Lead SOIC (Top View)**

**Table 2. MAXIMUM RATINGS**

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
$V_{CC}$	PECL Power Supply	GND = 0 V		8 to 0	V
$V_{EE}$	NECL Power Supply	GND = 0 V		-8 to 0	V
$V_I$	NECL Mode Input Voltage	GND = 0 V	$V_I \geq V_{EE}$	-6 to 0	V
$I_{out}$	Output Current	Continuous		50	mA
		Surge		100	mA
$I_{BB}$	ECL $V_{BB}$ Sink/Source			$\pm 0.5$	mA
$T_A$	Operating Temperature Range			-40 to +85	$^{\circ}\text{C}$
$T_{stg}$	Storage Temperature Range			-65 to +150	$^{\circ}\text{C}$
$\theta_{JA}$	Thermal Resistance (Junction-to-Ambient)	0 lfpm	20 SOIC	90	$^{\circ}\text{C}/\text{W}$
		500 lfpm	20 SOIC	60	$^{\circ}\text{C}/\text{W}$
$\theta_{JC}$	Thermal Resistance (Junction-to-Case)	Standard Board	20 SOIC	30 to 35	$^{\circ}\text{C}/\text{W}$
$T_{sol}$	Wave Solder			265	$^{\circ}\text{C}$

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 3. NECL INPUT DC CHARACTERISTICS**  $V_{CC}= 3.3\text{ V}$ ;  $V_{EE}= -3.3\text{ V}$ ;  $GND= 0\text{ V}$  (Note 1)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	$V_{EE}$ Power Supply Current			8.0		6.0	8.0			8.0	mA
$V_{IH}$	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
ECL $V_{BB}$	Output Voltage Reference	-1.38		-1.26	-1.38		-1.26	-1.38		-1.26	V
$V_{IHCMR}$	Input HIGH Voltage Common Mode Range (Differential) (Note 2) $V_{pp} < 500\text{ mV}$ $V_{pp} \geq 500\text{ mV}$	$V_{EE}+1.3$ $V_{EE}+1.5$		-0.4 -0.4	$V_{EE}+1.2$ $V_{EE}+1.4$		-0.4 -0.4	$V_{EE}+1.2$ $V_{EE}+1.4$		-0.4 -0.4	V V
$I_{IH}$	Input HIGH Current			150			150			150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	$\frac{D}{\bar{D}}$	0.5 -600		0.5 -600			0.5 -600			$\mu\text{A}$

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.

1. Input parameters vary 1:1 with GND.  $V_{EE}$  can vary -3.0 V to -5.5 V.
2.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ .  $V_{IHCMR}$  max varies 1:1 with GND.

**Table 4. LVPECL OUTPUT DC CHARACTERISTICS**  $V_{CC}= 3.3\text{ V}$ ;  $V_{EE}= -3.3\text{ V}$ ;  $GND= 0\text{ V}$  (Note 3)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{CC}$	$V_{CC}$ Power Supply Current			24		20	24			26	mA
$V_{OH}$	Output HIGH Voltage (Note 4)	2215	2295	2420	2275	2345	2420	2275	2345	2420	mV
$V_{OL}$	Output LOW Voltage (Note 4)	1470	1605	1745	1490	1600	1680	1490	1595	1680	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 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. Output parameters vary 1:1 with  $V_{CC}$ .  $V_{CC}$  can vary +0.5 V / -0.3 V.  $V_{EE}$  can vary -3.0 V to -5.5 V.
4. Outputs are terminated through a 50  $\Omega$  resistor to  $V_{CC}-2$  volts.

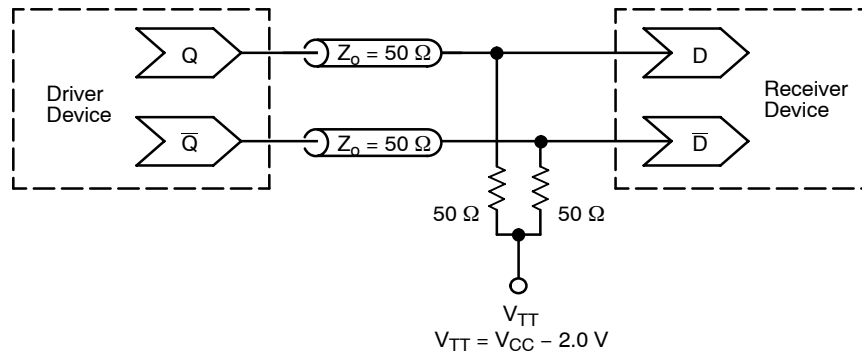
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**Table 5. AC CHARACTERISTICS**  $V_{CC} = 3.0\text{ V to }3.8\text{ V}$ ;  $V_{EE} = -3.0\text{ V to }-5.5\text{ V}$ ;  $GND = 0\text{ V}$

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		560			650			700		MHz
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay D to Q Diff S.E.	390 340		590 640	420 370		620 670	460 410		660 710	ps
t <sub>SKEW</sub>	Skew Output-to-Output (Note 5) Part-to-Part (Diff) (Note 5) Duty Cycle (Diff) (Note 6)		20 25	100 200		20 25	100 200		20 25	100 200	ps
t <sub>JITTER</sub>	Random Clock Jitter		TBD			TBD			TBD		ps
V <sub>PP</sub>	Input Voltage Swing (Differential Configuration) (Note 7)	150		1000	150		1000	150		1000	mV
t <sub>r</sub> t <sub>f</sub>	Output Rise/Fall Times Q (20% - 80%)	230		500	230		500	230		500	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. Skews are valid across specified voltage range, part-to-part skew is for a given temperature.
6. Duty cycle skew is the difference between a TPLH and TPHL propagation delay through a device.
7. V<sub>PP</sub>(min) is swing measured single-ended on each input in differential configuration. The device has a DC gain of ≈40.



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

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## ORDERING INFORMATION

Device	Package	Package <sup>†</sup>
MC100LVEL90DW	SOIC-20	38 Units / Rail
MC100LVEL90DWG	SOIC-20 (Pb-Free)	38 Units / Rail
MC100LVEL90DWR2	SOIC-20	1000 / Tape & Reel
MC100LVEL90DWR2G	SOIC-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.

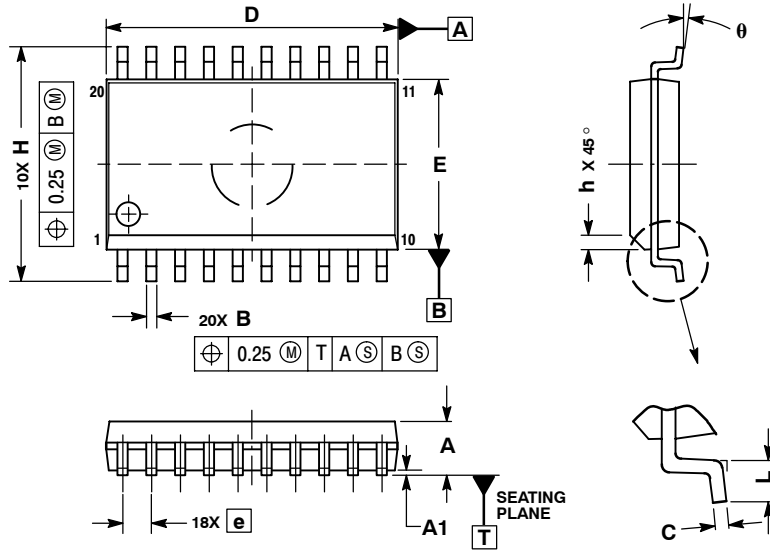
### Resource Reference of Application Notes

- 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

SO-20 WB  
DW SUFFIX  
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.

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°

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