

# MC100LVEL90

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

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.

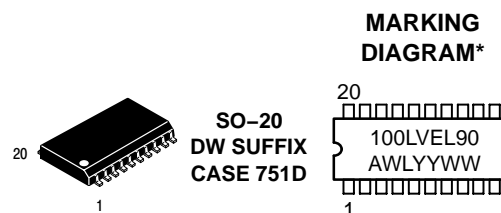
The  $V_{BB}$  pin, an internally generated voltage supply, is available to this device only. For single-ended input conditions, the unused differential input is connected to  $V_{BB}$  as a switching reference voltage.  $V_{BB}$  may also rebias AC coupled inputs. When used, decouple  $V_{BB}$  and  $V_{CC}$  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.

- 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 Level 1  
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



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A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week

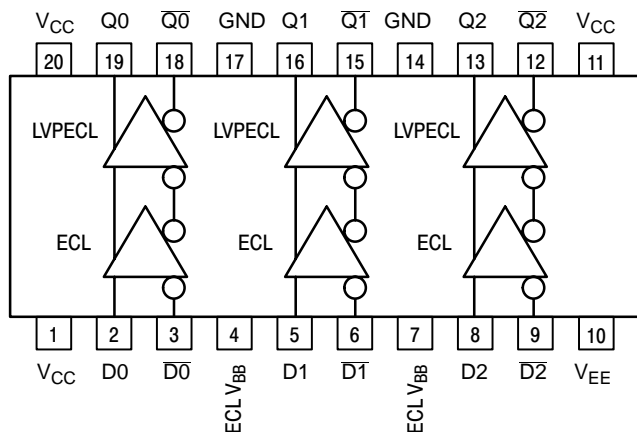
\*For additional information, see Application Note AND8002/D

### ORDERING INFORMATION

Device	Package	Shipping†
MC100LVEL90DW	SO-20	38 Units/Rail
MC100LVEL90DWR2	SO-20	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.

# MC100LEVEL90



## 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)

## MAXIMUM RATINGS (Note 1)

Symbol	Parameter	Condition 1	Condition 2	Rating	Units
$V_{CC}$	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)	std bd	20 SOIC	30 to 35	$^{\circ}\text{C}/\text{W}$
$T_{sol}$	Wave Solder			265	$^{\circ}\text{C}$

1. Maximum Ratings are those values beyond which device damage may occur.

# MC100LVEL90

## NECL INPUT DC CHARACTERISTICS $V_{CC}=3.3\text{ V}$ ; $V_{EE}=-3.3\text{ V}$ ; $GND=0\text{ V}$ (Note 2)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	$V_{EE}$ 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 3) $V_{pp} < 500\text{ mV}$ $V_{pp} \geq 500\text{ mV}$	$V_{EE}+1.3$		-0.4	$V_{EE}+1.2$		-0.4	$V_{EE}+1.2$		-0.4	V
		$V_{EE}+1.5$		-0.4	$V_{EE}+1.4$		-0.4	$V_{EE}+1.4$		-0.4	V
$I_{IH}$	Input HIGH Current			150			150			150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	$\frac{D}{D}$		0.5	$\frac{D}{D}$		0.5	$\frac{D}{D}$		0.5	$\mu\text{A}$
		$\frac{D}{D}$		-600	$\frac{D}{D}$		-600	$\frac{D}{D}$		-600	$\mu\text{A}$

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfm is maintained.

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

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

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 5)	2215	2295	2420	2275	2345	2420	2275	2345	2420	mV
$V_{OL}$	Output LOW Voltage (Note 5)	1470	1605	1745	1490	1600	1680	1490	1595	1680	mV

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfm is maintained.

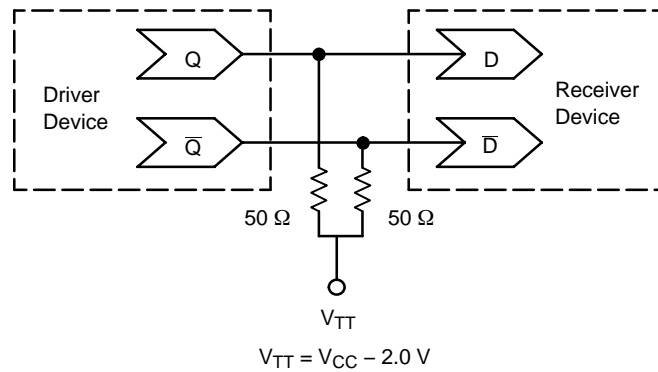
- Output parameters vary 1:1 with  $V_{CC}$ .  $V_{CC}$  can vary +0.5 V / -0.3 V.  $V_{EE}$  can vary -3.0 V to -5.5 V.
- Outputs are terminated through a 50  $\Omega$  resistor to  $V_{CC}-2$  volts.

## 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	
$f_{max}$	Maximum Toggle Frequency		560			650			700		MHz
$t_{PLH}$ $t_{PHL}$	Propagation Delay D to Q Diff S.E.	390		590	420		620	460		660	ps
		340		640	370		670	410		710	
$t_{SKEW}$	Skew Output-to-Output (Note 6) Part-to-Part (Diff) (Note 6) Duty Cycle (Diff) (Note 7)		20	100		20	100		20	100	ps
			25	200		25	200		25	200	
$t_{JITTER}$	Random Clock Jitter		TBD			TBD			TBD		ps
$V_{PP}$	Input Voltage Swing (Differential Configuration) (Note 8)	150		1000	150		1000	150		1000	mV
$t_r$ $t_f$	Output Rise/Fall Times Q (20% - 80%)	230		500	230		500	230		500	ps

- Skews are valid across specified voltage range, part-to-part skew is for a given temperature.
- Duty cycle skew is the difference between a TPLH and TPHL propagation delay through a device.
- $V_{PP}(\text{min})$  is swing measured single-ended on each input in differential configuration. The device has a DC gain of  $\approx 40$ .

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

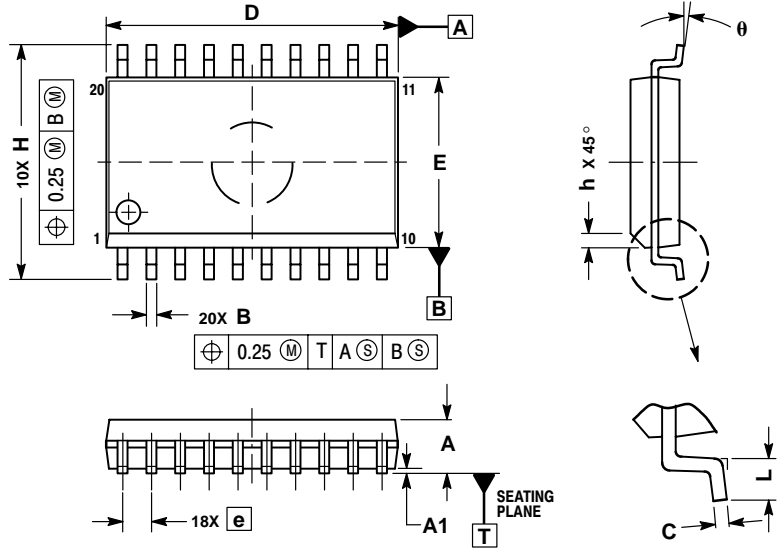
## Resource Reference of Application Notes

- AN1404** – ECLinPS Circuit Performance at Non-Standard V<sub>IH</sub> Levels
- AN1405** – ECL Clock Distribution Techniques
- AN1406** – Designing with PECL (ECL at +5.0 V)
- AN1503** – ECLinPS I/O SPICE Modeling Kit
- AN1504** – Metastability and the ECLinPS Family
- AN1560** – Low Voltage ECLinPS SPICE Modeling Kit
- AN1568** – Interfacing Between LVDS and ECL
- AN1596** – ECLinPS Lite Translator ELT Family SPICE I/O Model Kit
- AN1650** – Using Wire-OR Ties in ECLinPS Designs
- AN1672** – The ECL Translator Guide
- AND8001** – Odd Number Counters Design
- AND8002** – Marking and Date Codes
- AND8020** – Termination of ECL Logic Devices

# MC100LVEL90

## PACKAGE DIMENSIONS

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



- 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°

# MC100LVEL90

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