# -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 VEE 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  $\overline{D}$  input will be biased at VEE/2 and the D input will be pulled to VEE. 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<sub>CC</sub>= 3.0 V to 3.8 V;
   V<sub>EE</sub>= -3.0 V to -5.5 V; GND= 0 V
- Internal Input Pulldown Resistors
- Q Output will Default LOW with Inputs Open or at VEE
- 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 code V-0 @ 1/8", Oxygen Index 28 to 34
- Transistor Count = 261 devices



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#### MARKING DIAGRAM\*





= Assembly Location

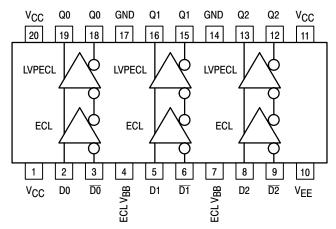
WL = Wafer Lot YY = Year

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 Units/Reel



#### **PIN DESCRIPTION**

PIN	FUNCTION
Dn, Dn Qn, Qn ECL V <sub>BB</sub> VCC VEE GND	ECL Inputs LVPECL Outputs ECL Reference Voltage Output Positive Supply Negative Supply Ground

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
VCC	PECL Power Supply	GND = 0 V		8 to 0	V
VEE	NECL Power Supply	GND = 0 V		-8 to 0	V
VI	NECL Mode Input Voltage	GND = 0 V	V <sub>I</sub> ≥ V <sub>EE</sub>	-6 to 0	V
l <sub>out</sub>	Output Current	Continuous Surge		50 100	mA mA
I <sub>BB</sub>	ECL V <sub>BB</sub> Sink/Source			± 0.5	mA
TA	Operating Temperature Range			-40 to +85	°C
T <sub>stg</sub>	Storage Temperature Range			-65 to +150	°C
θЈА	Thermal Resistance (Junction-to-Ambient)	0 LFPM 500 LFPM	20 SOIC 20 SOIC	90 60	°C/W
θJC	Thermal Resistance (Junction-to-Case)	std bd	20 SOIC	30 to 35	°C/W
T <sub>sol</sub>	Wave Solder			265	°C

<sup>1.</sup> Maximum Ratings are those values beyond which device damage may occur.

 $<sup>^{\</sup>ast}$  All VCC pins are tied together on the die.

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

		−40°C		25°C			85°C				
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
IEE	VEE Power Supply Current			8.0		6.0	8.0			8.0	mA
V <sub>IH</sub>	Input HIGH Voltage (Single-Ended)	-1165		-880	-1165		-880	-1165		-880	mV
V <sub>IL</sub>	Input LOW Voltage (Single–Ended)	-1810		-1475	-1810		-1475	-1810		-1475	mV
ECL V <sub>BB</sub>	Output Voltage Reference	-1.38		-1.26	-1.38		-1.26	-1.38		-1.26	V
VIHCMR	Input HIGH Voltage Common Mode Range (Differential) (Note 3) Vpp < 500 mV Vpp ≧ 500 mV	V <sub>EE</sub> +1.3 VEE+1.5		-0.4 -0.4	V <sub>EE</sub> +1.2 VEE+1.4		-0.4 -0.4	V <sub>EE</sub> +1.2 VEE+1.4		-0.4 -0.4	V V
lН	Input HIGH Current			150			150			150	μΑ
IIL	Input LOW Current DDD	0.5 -600			0.5 -600			0.5 -600			μΑ

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 lfpm is maintained.

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

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

		–40°C		25°C			85°C				
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
ICC	V <sub>CC</sub> Power Supply Current			24		20	24			26	mA
Vон	Output HIGH Voltage (Note 5)	2215	2295	2420	2275	2345	2420	2275	2345	2420	mV
V <sub>OL</sub>	Output LOW Voltage (Note 5)	1470	1605	1745	1490	1595	1380	1490	1595	1680	mV

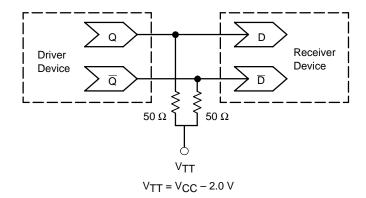
NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfpm is maintained.

- 4. Output parameters vary 1:1 with V<sub>CC</sub>. V<sub>CC</sub> can vary +0.5 V / -0.3 V. V<sub>EE</sub> can vary -3.0 V to -5.5 V. 5. Outputs are terminated through a 50  $\Omega$  resistor to V<sub>CC</sub>-2 volts.

#### AC CHARACTERISTICS $\mbox{V}_{CC}\mbox{=}\ 3.0\mbox{ V to }3.8\mbox{ V; V}_{EE}\mbox{=}\mbox{-}3.0\mbox{ V to }-5.5\mbox{ V; GND= }0\mbox{ V}$

			-40°C 25°C								
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
f <sub>max</sub>	Maximum Toggle Frequency		560			650			700		MHz
<sup>t</sup> PLH <sup>t</sup> PHL	Propagation Delay Diff D to Q S.E.	390 340		590 640	420 370		620 670	460 410		660 710	ps
<sup>t</sup> SKEW	Skew Output-to-Output (Note 6) Part-to-Part (Diff) (Note 6) Duty Cycle (Diff) (Note 7)		20 25	100 200		20 25	100 200		20 25	100 200	ps
<sup>t</sup> JITTER	Cycle-to-Cycle Jitter		TBD			TBD			TBD		ps
VPP	Input Swing (Note 8)	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

- 6. Skews are valid across specified voltage range, part-to-part skew is for a given temperature.7. Duty cycle skew is the difference between a TPLH and TPHL propagation delay through a device.
- 8. Vpp(min) is the minimum input swing for which AC parameters guaranteed. The device has a DC gain of ≈40.



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 VIH 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

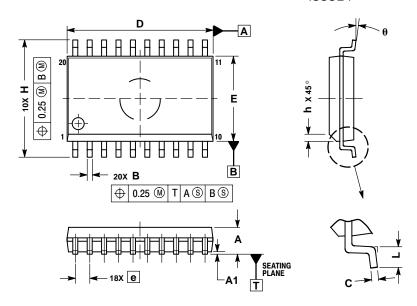
AND8001 - Odd Number Counters Design

AND8002 - Marking and Date Codes

AND8020 - Termination of ECL Logic Devices

#### **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.

	MILLIMETERS								
DIM	MIN	MAX							
Α	2.35	2.65							
A1	0.10	0.25							
В	0.35	0.49							
С	0.23	0.32							
D	12.65	12.95							
E	7.40	7.60							
е	1.27	BSC							
Н	10.05	10.55							
h	0.25	0.75							
L	0.50	0.90							
A	0 °	7 °							

## **Notes**

## **Notes**

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