

# MC100EL90

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

### Description

The MC100EL90 is a triple ECL to PECL 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 standard +5 V differential PECL output signals.

To accomplish the level translation, the EL90 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.

The 100 Series Contains Temperature Compensation

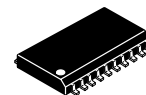
### Features

- 500 ps Propagation Delays
- Operating Range:
  - ◆  $V_{CC}$  = 4.75 V to 5.25 V
  - ◆  $V_{EE}$  = -3.0 V to -5.5 V; GND = 0 V
- Q Output will Default LOW with Inputs Open or at  $V_{EE}$
- Internal Input Pulldown Resistors
- ESD Protection:
  - ◆ > 2 kV Human Body Model
  - ◆ > 200 V Machine Model
- Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test
- Moisture Sensitivity: Level 3 (Pb-Free)  
(For Additional Information, see Application Note [AND8003/D](#))
- Flammability Rating: UL 94 V-0 @ 1.125 in,  
Oxygen Index: 28 to 34
- Transistor Count = 261 Devices
- This Device is Pb-Free, Halogen Free and is RoHS Compliant



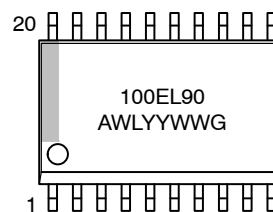
ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)



SOIC-20 WB  
DW SUFFIX  
CASE 751D-05

### MARKING DIAGRAM\*



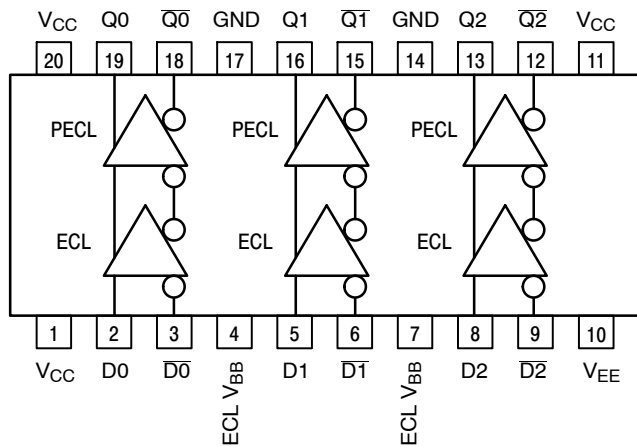
A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week  
G = Pb-Free Package

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

### ORDERING INFORMATION

Device	Package	Shipping
MC100EL90DWG	SOIC-20 WB (Pb-Free)	38 Units/Tube

# MC100EL90



**Table 1. PIN DESCRIPTION**

PIN	FUNCTION
$D_n, \overline{D_n}$	ECL Inputs
$Q_n, \overline{Q_n}$	PECL 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. 20-Lead Pinout and Logic Diagram (Top View)**

**Table 2. MAXIMUM RATINGS**

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
$V_{CC}$	PECL Mode Power Supply	$V_{EE} = 0\text{ V}$		8 to 0	V
$V_{EE}$	NECL Mode Power Supply	$V_{CC} = 0\text{ V}$		-8 to 0	V
$V_I$	PECL Mode Input Voltage NECL Mode Input Voltage	$V_{EE} = 0\text{ V}$ $V_{CC} = 0\text{ V}$	$V_I \leq V_{CC}$ $V_I \geq V_{EE}$	6 to 0 -6 to 0	V
$I_{out}$	Output Current	Continuous Surge		50 100	mA
$I_{BB}$	$V_{BB}$ 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 lfp 500 lfp	SOIC-20 WB SOIC-20 WB	90 60	$^{\circ}\text{C}/\text{W}$
$\theta_{JC}$	Thermal Resistance (Junction-to-Case)	Standard Board	SOIC-20 WB	30 to 35	$^{\circ}\text{C}/\text{W}$
$T_{sol}$	Wave Solder (Pb-Free)			265	$^{\circ}\text{C}$

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 3. PECL DC CHARACTERISTICS** ( $V_{CC} = 5.0\text{ V}$ ;  $V_{EE} = -5\text{ V}$ ; GND = 0 V (Note 1))

Symbol	Characteristic	-40 $^{\circ}\text{C}$			25 $^{\circ}\text{C}$			85 $^{\circ}\text{C}$			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 2)	3915	3995	4120	3975	4045	4120	3975	4050	4120	mV
$V_{OL}$	Output LOW Voltage (Note 2)	3170	3305	3445	3190	3295	3380	3190	3295	3380	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 lfp. 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  $V_{CC}$ .  $V_{CC}$  can vary  $\pm 0.5\text{ V}$ .
- Outputs are terminated through a 50  $\Omega$  resistor to  $V_{CC} - 2.0\text{V}$ .

# MC100EL90

**Table 4. NECL DC CHARACTERISTICS** ( $V_{CC} = 5.0\text{ V}$ ;  $V_{EE} = -5\text{ V}$ ;  $GND = 0\text{ V}$  (Note 1))

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	$V_{EE}$ 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 Configuration) (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
$I_{IH}$	Input HIGH Current			150			150			150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	0.5			0.5			0.5			$\mu\text{A}$

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 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.

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

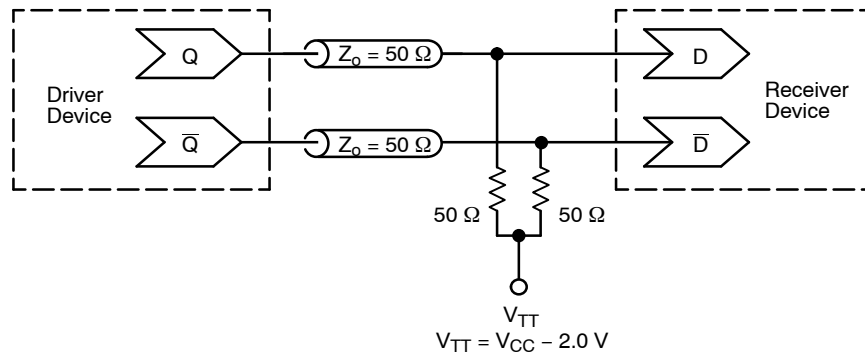
**Table 5. AC CHARACTERISTICS** ( $V_{CC} = 4.5\text{ to }5.5\text{ V}$ ;  $V_{EE} = -3.0\text{ to }-5.5\text{ V}$ ;  $GND = 0\text{ V}$ )

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
fmax	Maximum Toggle Frequency		560			650			700		MHz
$t_{PLH}$ $t_{PHL}$	Propagation Delay D to Q Differential S.E.	390 340		590 640	420 370		620 670	460 410		660 710	ps
$t_{SKEW}$	Skew Output-to-Output (Note 1) Part-to-Part (Differential Configuration) (Note 1) Duty Cycle (Differential Configuration) (Note 2)		20 25	100 200		20 25	100 200		20 25	100 200	ps
$t_{JITTER}$	Cycle-to-Cycle Jitter		TBD			TBD			TBD		ps
$V_{PP}$	Input Swing (Note 3)	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

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.

1. Skews are valid across specified voltage range, part-to-part skew is for a given temperature.
2. Duty cycle skew is the difference between a TPLH and TPHL propagation delay through a device.
3.  $V_{PP}(\text{min})$  is the minimum input swing for which AC parameters are guaranteed. The device has a DC gain of  $\approx 40$ .

## MC100EL90



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

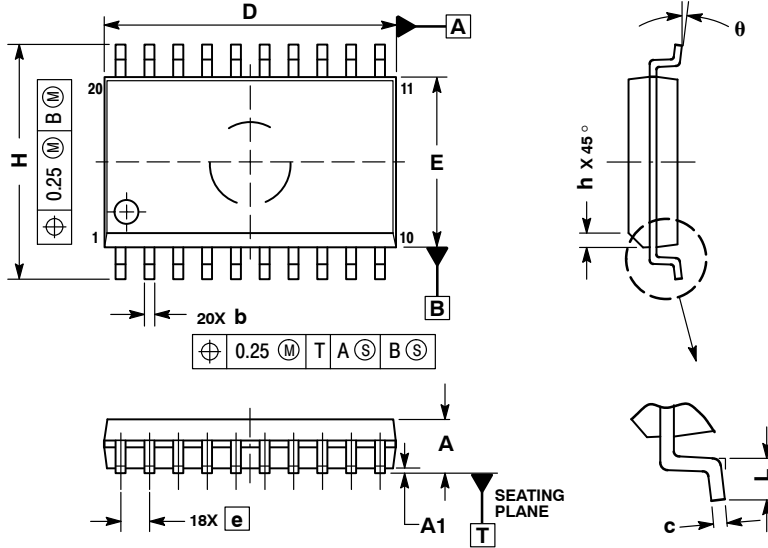
### Resource Reference of Application Notes

- 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

# MC100EL90

## PACKAGE DIMENSIONS

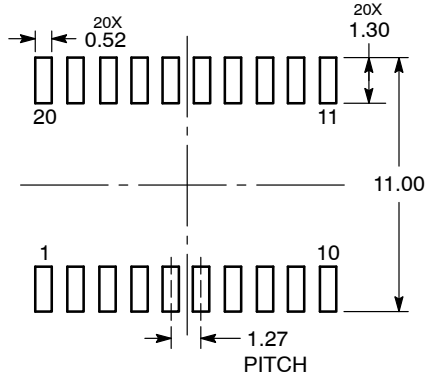
SOIC-20 WB  
DW SUFFIX  
CASE 751D-05  
ISSUE H



- 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.

# MC100EL90

ECLinPS is a trademark of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries.

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
Phone: 81-3-5817-1050

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>  
For additional information, please contact your local  
Sales Representative