

# MC100LVEL17

## 3.3V ECL Quad Differential Receiver

### Description

The MC100LVEL17 is a 3.3 V ECL, quad differential receiver. The device is functionally equivalent to the E116 device with the capability of operation from either a  $-3.3$  V or  $+3.3$  V supply voltage.

Under open input conditions, the  $\bar{D}$  input will be biased at  $V_{CC}/2$  and the D input will be pulled down to  $V_{EE}$ . This operation will force the Q output LOW and ensure 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  $0.01 \mu\text{F}$  capacitor and limit current sourcing or sinking to  $0.5$  mA. When not used,  $V_{BB}$  should be left open.

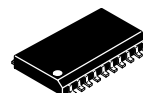
### Features

- 325 ps Propagation Delay
- High Bandwidth Output Transitions
- The 100 Series Contains Temperature Compensation
- PECL Mode Operating Range:  $V_{CC} = 3.0$  V to  $3.8$  V with  $V_{EE} = 0$  V
- NECL Mode Operating Range:  $V_{CC} = 0$  V with  $V_{EE} = -3.0$  V to  $-3.8$  V
- Internal Input Pulldown Resistors D Inputs; Pullup and Pulldown on  $\bar{D}$  Inputs
- Q Output will Default LOW with Inputs Open or at  $V_{EE}$
- Pb-Free Packages are Available\*



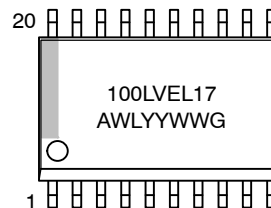
ON Semiconductor®

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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

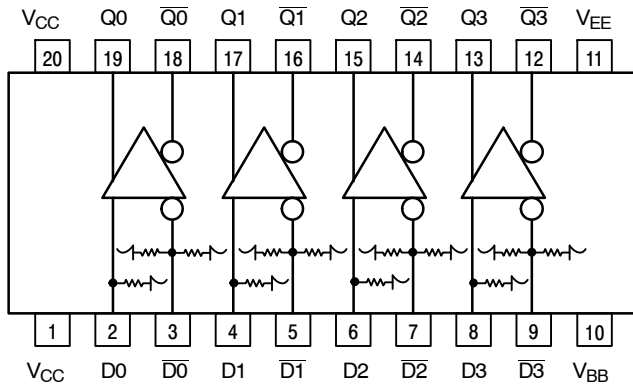
\*For additional marking information, refer to Application Note AND8002/D.

### 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.

# MC100LVEL17



**Table 1. PIN DESCRIPTION**

PIN	FUNCTION
Dn, $\bar{D}n$	ECL Differential Data Inputs
Qn, $\bar{Q}n$	ECL Differential Data Outputs
V <sub>BB</sub>	Reference Voltage Output
V <sub>CC</sub>	Positive Supply
V <sub>EE</sub>	Negative Supply

\* All V<sub>CC</sub> pins are tied together on the die.

Warning: All V<sub>CC</sub> and V<sub>EE</sub> pins must be externally connected to Power Supply to guarantee proper operation.

**Figure 1. Logic Diagram and Pinout: (Top View)**

**Table 2. ATTRIBUTES**

Characteristics	Value
Internal Input Pulldown Resistor	75 k $\Omega$
Internal Input Pullup Resistor	75 k $\Omega$
ESD Protection	Human Body Model Machine Model Charged Device Model
	> 2 kV > 200 V > 4 kV
Moisture Sensitivity, (Note 1)	
	Pb (Indefinite Time Out of Drypack) Pb-Free
	Level 1 Level 3
Flammability Rating	Oxygen Index: 28 to 34
	UL 94 V-0 @ 0.125 in
Transistor Count	141
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test	

1. For additional information, see Application Note AND8003/D.

# MC100LVEL17

**Table 3. MAXIMUM RATINGS**

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V <sub>CC</sub>	PECL Mode Power Supply	V <sub>EE</sub> = 0 V		8 to 0	V
V <sub>EE</sub>	NECL Mode Power Supply	V <sub>CC</sub> = 0 V		-8 to 0	V
V <sub>I</sub>	PECL Mode Input Voltage NECL Mode Input Voltage	V <sub>EE</sub> = 0 V V <sub>CC</sub> = 0 V	V <sub>I</sub> ≤ V <sub>CC</sub> V <sub>I</sub> ≥ V <sub>EE</sub>	6 to 0 -6 to 0	V V
I <sub>out</sub>	Output Current	Continuous Surge		50 100	mA mA
I <sub>BB</sub>	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	SO-20L SO-20L	90 60	°C/W °C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	SO-20L	30 to 35	°C/W
T <sub>sol</sub>	Wave Solder Pb Pb-Free	<2 to 3 sec @ 248°C <2 to 3 sec @ 260°C		265 265	°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.

**Table 4. LVPECL DC CHARACTERISTICS** V<sub>CC</sub> = 3.3 V; V<sub>EE</sub> = 0.0 V (Note 2)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I <sub>EE</sub>	Power Supply Current		26	31		26	31		27	33	mA
V <sub>OH</sub>	Output HIGH Voltage (Note 3)	2215	2295	2420	2275	2345	2420	2275	2345	2420	mV
V <sub>OL</sub>	Output LOW Voltage (Note 3)	1470	1605	1745	1490	1595	1680	1490	1595	1680	mV
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
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) (Note 4)										
	V <sub>pp</sub> < 500 mV	1.3		2.9	1.2		2.9	1.2		2.9	V
	V <sub>pp</sub> ≥ 500 mV	1.5		2.9	1.4		2.9	1.4		2.9	V
I <sub>IH</sub>	Input HIGH Current			150			150			150	μA
I <sub>IL</sub>	Input LOW Current	D <sub>n</sub>	0.5		0.5			0.5			μA
		$\overline{D}_n$	-300		-300			-300			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.

- Input and output parameters vary 1:1 with V<sub>CC</sub>. V<sub>EE</sub> can vary ±0.3 V.
- Outputs are terminated through a 50 Ω resistor to V<sub>CC</sub> - 2.0 V.
- V<sub>IHCMR</sub> min varies 1:1 with V<sub>EE</sub>, max varies 1:1 with V<sub>CC</sub>. The V<sub>IHCMR</sub> range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between V<sub>ppmin</sub> and 1 V.

# MC100LEVEL17

**Table 5. LVNECL DC CHARACTERISTICS**  $V_{CC} = 0.0\text{ V}$ ;  $V_{EE} = -3.3\text{ V}$  (Note 5)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	Power Supply Current		26	31		26	31		27	33	mA
$V_{OH}$	Output HIGH Voltage (Note 6)	-1085	-1005	-880	-1025	-955	-880	-1025	-955	-880	mV
$V_{OL}$	Output LOW Voltage (Note 6)	-1830	-1695	-1555	-1810	-1705	-1620	-1810	-1705	-1620	mV
$V_{IH}$	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
$V_{BB}$	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 7)										
	$V_{pp} < 500\text{ mV}$	-2.0		-0.4	-2.1		-0.4	-2.1		-0.4	V
	$V_{pp} \geq 500\text{ mV}$	-1.8		-0.4	-1.9		-0.4	-1.9		-0.4	V
$I_{IH}$	Input HIGH Current			150			150			150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	$D_n$	0.5		0.5		0.5				$\mu\text{A}$
		$\overline{D_n}$	-300		-300		-300				$\mu\text{A}$

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.

5. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary  $\pm 0.3\text{ V}$ .

6. Outputs are terminated through a  $50\ \Omega$  resistor to  $V_{CC} - 2.0\text{ V}$ .

7.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ , max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between  $V_{ppmin}$  and  $1\text{ V}$ .

**Table 6. AC CHARACTERISTICS**  $V_{CC} = 3.3\text{ V}$ ;  $V_{EE} = 0.0\text{ V}$  or  $V_{CC} = 0.0\text{ V}$ ;  $V_{EE} = -3.3\text{ V}$  (Note 8)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$f_{max}$	Maximum Toggle Frequency					1.75					GHz
$t_{PLH}$ $t_{PHL}$	Propagation Delay D to Q	Diff S.E.	330 280	530 580	350 300		550 600	360 310		560 610	ps
$t_{SKEW}$	Skew	Output-to-Output (Note 9) Part-to-Part (Diff) (Note 9) Duty Cycle (Diff) (Note 10)		75 200 25			75 200 25			75 200 25	ps
$t_{JITTER}$	Random Clock Jitter (RMS)					0.7					ps
$V_{PP}$	Input Swing (Note 11)		150	1000	150		1000	150		1000	mV
$t_r$ $t_f$	Output Rise/Fall Times Q (20% - 80%)		280	550	280		550	280		550	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.

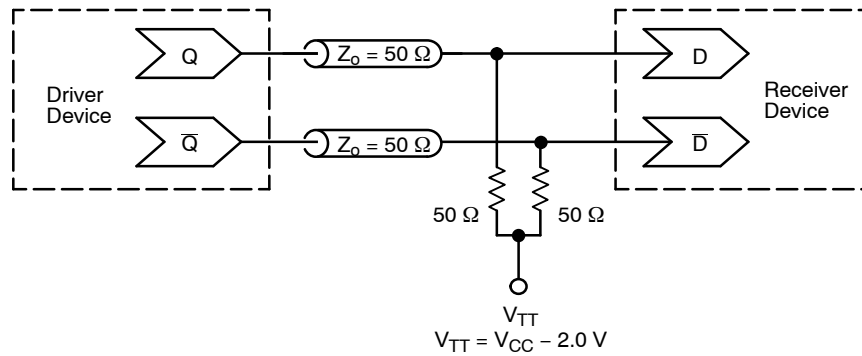
8.  $V_{EE}$  can vary  $\pm 0.3\text{ V}$ .

9. Skews are valid across specified voltage range, part-to-part skew is for a given temperature.

10. Duty cycle skew is the difference between a  $t_{PLH}$  and  $t_{PHL}$  propagation delay through a device.

11.  $V_{pp(min)}$  is minimum input swing for which AC parameters guaranteed. The device has a DC gain of  $\approx 40$ .

## MC100LVEL17



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

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
MC100LVEL17DW	SO-20 WB	38 Units / Rail
MC100LVEL17DWG	SO-20 WB (Pb-Free)	38 Units / Rail
MC100LVEL17DWR2	SO-20 WB	1000 / Tape & Reel
MC100LVEL17DWR2G	SO-20 WB (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.

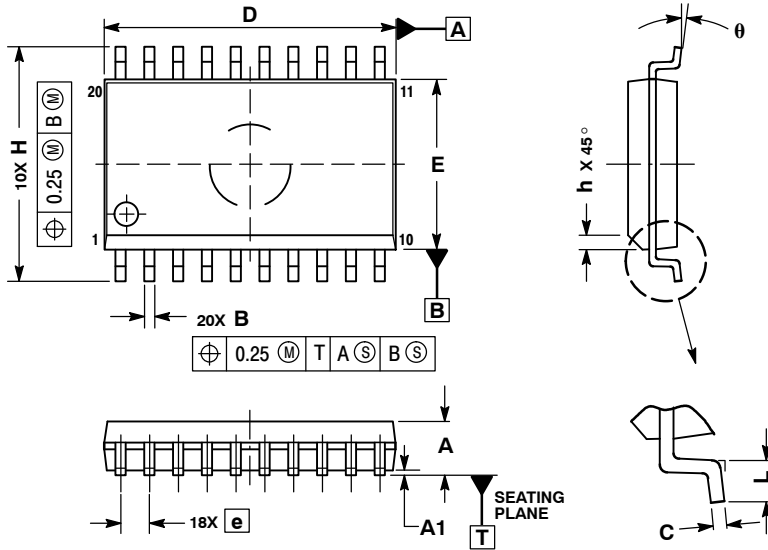
### Resource Reference of Application Notes

- 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

# MC100LEVEL17

## 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
theta	0°	7°

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