

MC100LVEL29

3.3V ECL Dual Differential Data and Clock D Flip-Flop With Set and Reset

The MC100LVEL29 is a dual master-slave flip flop. The device features fully differential Data and Clock inputs as well as outputs. The MC100LVEL29 is pin and functionally equivalent to the MC100EL29. Data enters the master latch when the clock is LOW and transfers to the slave upon a positive transition on the clock input.

The differential inputs have special circuitry which ensures device stability under open input conditions. When both differential inputs are left open the D input will pull down to V_{EE} and the \bar{D} input will bias around $V_{CC}/2$. The outputs will go to a defined state, however the state will be random based on how the flip flop powers up.

Both flip flops feature asynchronous, overriding Set and Reset inputs. Note that the Set and Reset inputs cannot both be HIGH simultaneously.

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 μ F capacitor and limit current sourcing or sinking to 0.5 mA. When not used, V_{BB} should be left open.

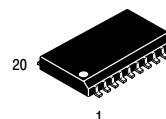
- 1100 MHz Flip-Flop Toggle Frequency
- ESD Protection: >2 KV HBM
- 580 ps Typical Propagation Delays
- The 100 Series Contains Temperature Compensation
- PECL Mode Operating Range: $V_{CC}= 3.0$ V to 3.8 V with $V_{EE}= 0$ V
- NECL Mode Operating Range: $V_{CC}= 0$ V with $V_{EE}= -3.0$ V to -3.8 V
- Internal Input Pulldown Resistors
- 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 = 313 devices



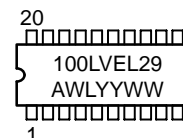
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MARKING DIAGRAM*



SOIC-20
DW SUFFIX
CASE 751D



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

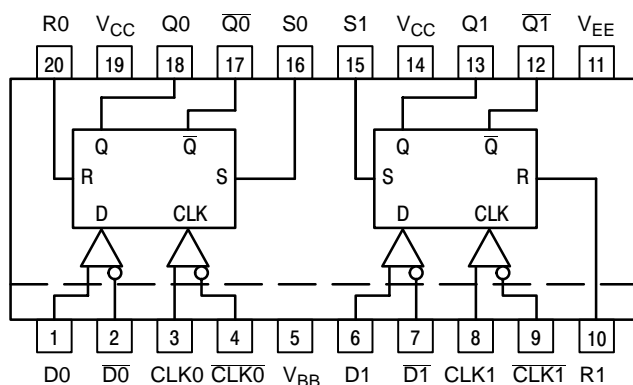
*For additional information, see Application Note AND8002/D

ORDERING INFORMATION

Device	Package	Shipping
MC100LVEL29DW	SOIC-20	38 Units/Rail
MC100LVEL29DWR2	SOIC-20	1000 Units/Reel

MC100LVEL29

Logic Diagram and Pinout: 20-Lead SOIC (Top View)



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

PIN DESCRIPTION

PIN	FUNCTION
D0, $\overline{D0}$; D1, $\overline{D1}$	ECL Differential Data Inputs
R0, R1	ECL Reset Inputs
CLK0, $\overline{CLK0}$	ECL Differential Clock Inputs
CLK1, $\overline{CLK1}$	ECL Differential Clock Inputs
S0, S1	ECL Set Inputs
Q0, $\overline{Q0}$; Q1, $\overline{Q1}$	ECL Differential Data Outputs
V_{BB}	Reference Voltage Output
V_{CC}	Positive Supply
V_{EE}	Negative Supply

TRUTH TABLE

R	S	D	CLK	Q	\overline{Q}
L	L	L	Z	L	H
L	L	H	Z	H	L
H	L	X	X	L	H
L	H	X	X	H	L
H	H	X	X	Undef	Undef

Z = LOW to HIGH Transition
X = Don't Care

MAXIMUM RATINGS (Note 1.)

Symbol	Parameter	Condition 1	Condition 2	Rating	Units
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 mA
I_{BB}	V_{BB} Sink/Source			± 0.5	mA
TA	Operating Temperature Range			-40 to +85	$^{\circ}\text{C}$
T_{stg}	Storage Temperature Range			-65 to +150	$^{\circ}\text{C}$
θ_{JA}	Thermal Resistance (Junction to Ambient)	0 LFPM 500 LFPM	20 SOIC 20 SOIC	90 60	$^{\circ}\text{C}/\text{W}$ $^{\circ}\text{C}/\text{W}$
θ_{JC}	Thermal Resistance (Junction to Case)	std bd	20 SOIC	30 to 35	$^{\circ}\text{C}/\text{W}$
T_{sol}	Wave Solder	<2 to 3 sec @ 248 $^{\circ}\text{C}$		265	$^{\circ}\text{C}$

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

MC100LEVEL29

LVPECL DC CHARACTERISTICS $V_{CC}=3.3\text{ V}$; $V_{EE}=0.0\text{ V}$ (Note 1.)

Symbol	Characteristic	-40°C			25°C			85°C			Unit	
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
I_{EE}	Power Supply Current		35	50		35	50		35	50	mA	
V_{OH}	Output HIGH Voltage (Note 2.)	2215	2295	2420	2275	2345	2420	2275	2345	2420	mV	
V_{OL}	Output LOW Voltage (Note 2.)	1470	1605	1745	1490	1595	1680	1490	1595	1680	mV	
V_{IH}	Input HIGH Voltage (Single Ended)	2135		2420	2135		2420	2135		2420	mV	
V_{IL}	Input LOW Voltage (Single Ended)	1490		1825	1490		1825	1490		1825	mV	
V_{BB}	Output Voltage Reference	1.92		2.04	1.92		2.04	1.92		2.04	V	
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 3.)											
		$V_{pp} < 500\text{ mV}$	1.3		2.9	1.2		2.9	1.2		2.9	V
		$V_{pp} \geq 500\text{ mV}$	1.5		2.9	1.4		2.9	1.4		2.9	V
I_{IH}	Input HIGH Current			150			150			150	μA	
I_{IL}	Input LOW Current	D_n	0.5		0.5		0.5		0.5		μA	
		$\overline{D_n}$	-300		-300		-300		-300		μA	

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.

1. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary $\pm 0.3\text{ V}$.
2. Outputs are terminated through a 50 ohm resistor to $V_{CC}-2$ volts.
3. 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 V.

LVNECL DC CHARACTERISTICS $V_{CC}=0.0\text{ V}$; $V_{EE}=-3.3\text{ V}$ (Note 1.)

Symbol	Characteristic	-40°C			25°C			85°C			Unit	
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
I_{EE}	Power Supply Current		35	50		35	50		35	50	mA	
V_{OH}	Output HIGH Voltage (Note 2.)	-1085	-1005	-880	-1025	-955	-880	-1025	-955	-880	mV	
V_{OL}	Output LOW Voltage (Note 2.)	-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 3.)											
		$V_{pp} < 500\text{ mV}$	-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	μA	
I_{IL}	Input LOW Current	D_n	0.5		0.5		0.5		0.5		μA	
		$\overline{D_n}$	-300		-300		-300		-300		μA	

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.

1. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary $\pm 0.3\text{ V}$.
2. Outputs are terminated through a 50 ohm resistor to $V_{CC}-2$ volts.
3. 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 V.

MC100LVEL29

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 1.)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
f_{\max}	Maximum Toggle Frequency	1.1			1.1			1.1			GHz
t_{PLH} t_{PHL}	Propagation Delay to Output CLK S, R	480 480		680 700	500 500	580 720	700 720	520 520		720 740	ps
t_S t_H	Setup Time Hold Time	0 100			0 100			0 100			ps
t_{RR}	Set/Reset Recovery	100			100			100			ps
t_{PW}	Minimum Pulse Width CLK, Set, Reset	400			400			400			ps
t_{JITTER}	Cycle-to-Cycle Jitter		TBD			TBD			TBD		ps
V_{PP}	Input Swing (Note 2.)	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

- V_{EE} can vary $\pm 0.3\text{ V}$.
- $V_{PP}(\min)$ is the minimum input swing for which AC parameters guaranteed.

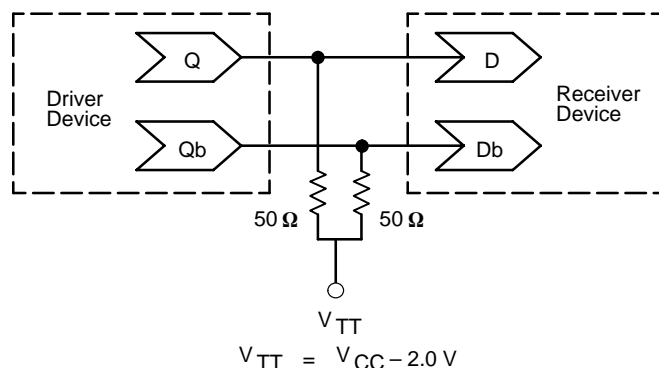


Figure 1. Typical Termination for Output Driver and Device Evaluation (See Application Note AND8020 – Termination of ECL Logic Devices.)

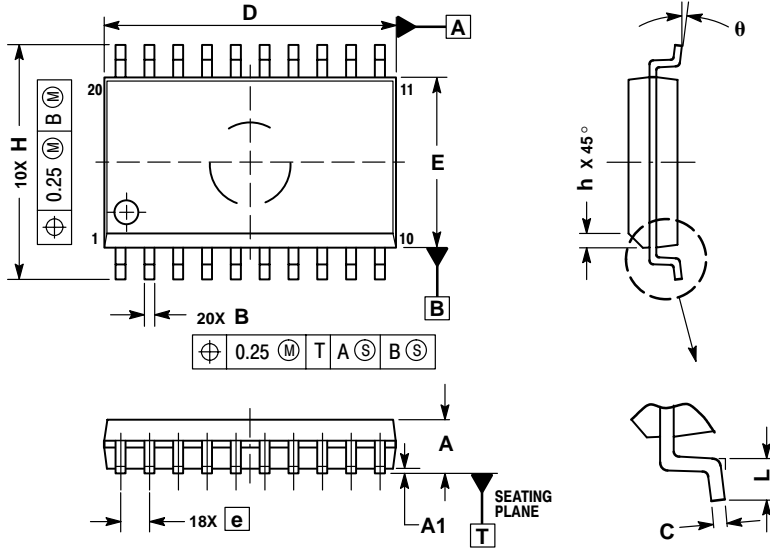
Resource Reference of Application Notes

- AN1404** – ECLinPS Circuit Performance at Non-Standard V_{IH} 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

MC100LVEL29

PACKAGE DIMENSIONS

SOIC-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°

Notes

Notes

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