

MC100LVEL51

3.3V ECL Differential Clock D Flip-Flop

The MC100LVEL51 is a differential clock D flip-flop with reset. The device is functionally equivalent to the EL51 device, but operates from a 3.3 V supply. With propagation delays and output transition times essentially equal to the EL51, the LVEL51 is ideally suited for those applications which require the ultimate in AC performance at 3.3 V V_{CC} .

The reset input is an asynchronous, level triggered signal. Data enters the master portion of the flip-flop when the clock is LOW and is transferred to the slave, and thus the outputs, upon a positive transition of the clock. The differential clock inputs of the LVEL51 allow the device to be used as a negative edge triggered flip-flop.

The differential input employs clamp circuitry to maintain stability under open input conditions. When left open, the CLK input will be pulled down to V_{EE} and the $\overline{CLK}$ input will be biased at $V_{CC}/2$.

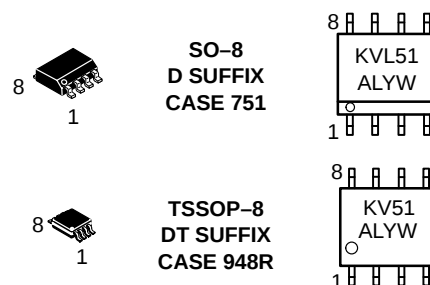
- 475 ps Propagation Delay
- 2.8 GHz Toggle Frequency
- ESD Protection: >4 KV HBM, >200 V MM
- The 100 Series Contains Temperature Compensation
- PECL Mode Operating Range: V_{CC} = 3.0 V to 3.8 V with V_{EE} = 0 V
- NECL Mode Operating Range: V_{CC} = 0 V with V_{EE} = -3.0 V to -3.8 V
- Internal Input 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 = 114 devices



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MARKING DIAGRAMS*



A = Assembly Location

L = Wafer Lot

Y = Year

W = Work Week

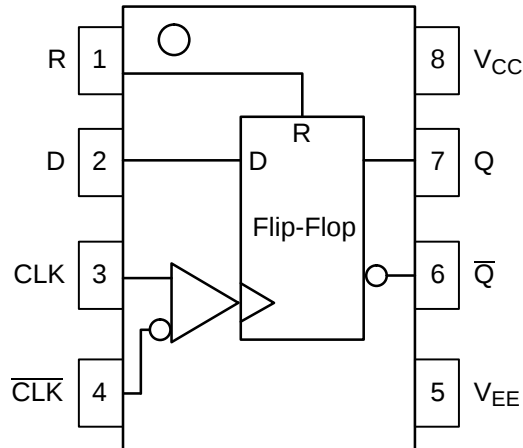
*For additional information, see Application Note AND8002/D

ORDERING INFORMATION

Device	Package	Shipping
MC100LVEL51D	SO-8	98 Units / Rail
MC100LVEL51DR2	SO-8	2500 / Reel
MC100LVEL51DT	TSSOP-8	98 Units / Rail
MC100LVEL51DTR2	TSSOP-8	2500 / Reel

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LOGIC DIAGRAM AND PINOUT ASSIGNMENT



PIN DESCRIPTION

PIN	FUNCTION
CLK, $\overline{\text{CLK}}$	ECL Differential Clock Input
Q, $\overline{\text{Q}}$	ECL Differential Output
D	ECL D Input
R	ECL Reset Input
V_{CC}	Positive Supply
V_{EE}	Negative Supply

TRUTH TABLE

D	R	CLK	Q
L	L	Z	L
H	L	Z	H
X	H	X	L

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	$V_{EE} = 0 \text{ V}$	$V_I \leq V_{CC}$	6 to 0	V
	NECL Mode Input Voltage	$V_{CC} = 0 \text{ V}$	$V_I \geq V_{EE}$	-6 to 0	V
I_{out}	Output Current	Continuous Surge		50 100	mA mA
T_A	Operating Temperature Range			-40 to +85	°C
T_{stg}	Storage Temperature Range			-65 to +150	°C
θ_{JA}	Thermal Resistance (Junction to Ambient)	0 LFPM 500 LFPM	8 SOIC 8 SOIC	190 130	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction to Case)	std bd	8 SOIC	41 to 44 $\pm$ 5%	°C/W
θ_{JA}	Thermal Resistance (Junction to Ambient)	0 LFPM 500 LFPM	8 TSSOP 8 TSSOP	185 140	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction to Case)	std bd	8 TSSOP	41 to 44 $\pm$ 5%	°C/W
T_{sol}	Wave Solder	<2 to 3 sec @ 248°C		265	°C

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

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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		30	35		30	35		32	37	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_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 3.)										
	$V_{pp} < 500\text{ mV}$	1.2		3.0	1.1		3.0	1.1		3.0	V
	$V_{pp} \geq 500\text{ mV}$	1.4		3.0	1.3		3.0	1.3		3.0	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	Others CLK	0.5 -600		0.5 -600			0.5 -600			μA 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 lfpm 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 $V_{CC}-2\text{ volts}$.
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		30	35		30	35		32	37	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_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 3.)										
	$V_{pp} < 500\text{ mV}$	-2.1		-0.3	-2.2		-0.3	-2.2		-0.3	V
	$V_{pp} \geq 500\text{ mV}$	-1.9		-0.3	-2.0		-0.3	-2.0		-0.3	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	Others CLK	0.5 -600		0.5 -600			0.5 -600			μA 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 lfpm 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 $V_{CC}-2\text{ volts}$.
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.

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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	2.7			2.8			2.9			GHz
t_{PLH} t_{PHL}	Propagation Delay to Output CLK R	330 340	465 455	510 540	340 350	475 765	520 550	370 390	530 510	550 590	ps
t_S	Setup Time	150	0		150	0		150	0		ps
t_H	Hold Time	200	100		200	100		200	100		ps
t_{RR}	Reset Recovery	350	200		350	200		350	200		ps
t_{PW}	Minimum Pulse Width CLK Reset	400 500			400 500			400 500			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%)	120		320	120		320	120		320	ps

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

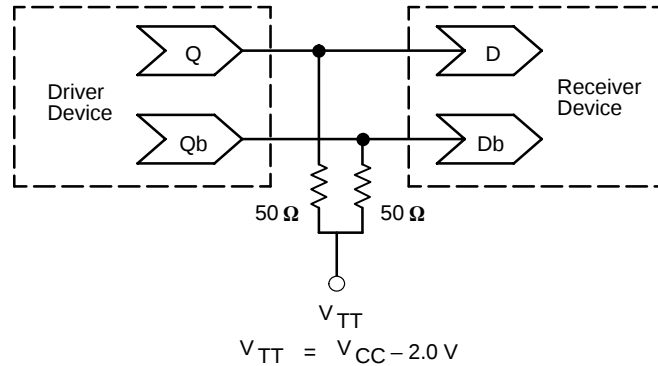


Figure 1. Typical Termination for Output Driver and Device Evaluation
(See Application Note AND8020 – Termination of ECL Logic Devices.)

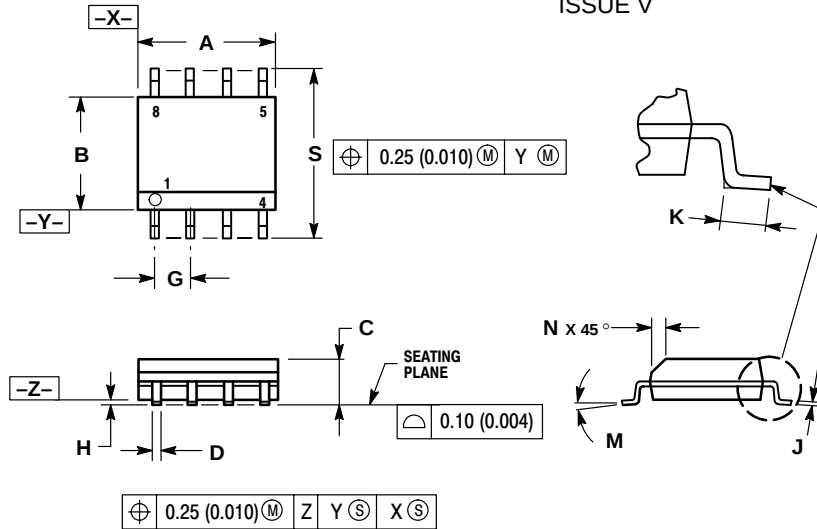
Resource Reference of Application Notes

- 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

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PACKAGE DIMENSIONS

SO-8
D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751-07
ISSUE V



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

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