

# MC100EL30

## 5V ECL Triple D Flip-Flop with Set and Reset

The MC100EL30 is a triple master-slave D flip-flop with differential outputs. Data enters the master latch when the clock input is LOW and transfers to the slave upon a positive transition on the clock input.

In addition to a common Set input individual Reset inputs are provided for each flip flop. Both the Set and Reset inputs function asynchronous and overriding with respect to the clock inputs.

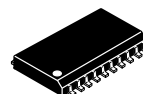
### Features

- 1200 MHz Minimum Toggle Frequency
  - 450 ps Typical Propagation Delays
  - ESD Protection: >2 kV Human Body Model
  - The 100 Series Contains Temperature Compensation.
  - PECL Mode Operating Range:  
 $V_{CC} = 4.2\text{ V to }5.7\text{ V}$  with  $V_{EE} = 0\text{ V}$
  - NECL Mode Operating Range:  
 $V_{CC} = 0\text{ V}$  with  $V_{EE} = -4.2\text{ V to }-5.7\text{ V}$
  - Internal Input 75 k $\Omega$  Pulldown Resistors
  - Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test
  - Moisture Sensitivity: Pb = Level 1  
Pb-Free = Level 3
- For Additional Information, see Application Note AND8003/D
- Flammability Rating: UL 94 V-0 @ 0.125 in, Oxygen Index: 28 to 34
  - Transistor Count = 347 devices
  - Pb-Free Packages are Available\*



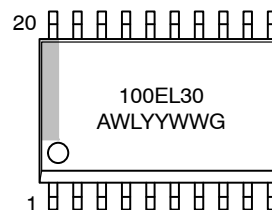
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SO-20 WB  
DW SUFFIX  
CASE 751D

### MARKING DIAGRAM\*



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

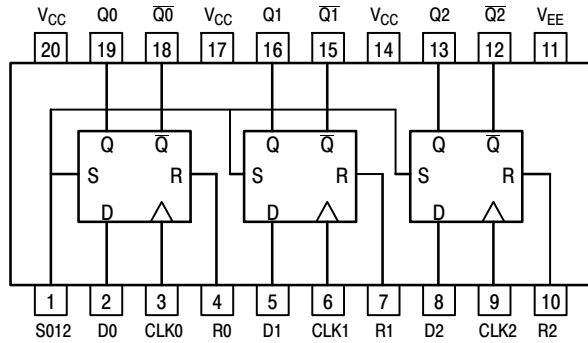
\*For additional marking information, refer to Application Note AND8002/D.

### 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.

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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: 20-Lead SOIC (Top View)**

**Table 1. PIN DESCRIPTION**

Pin	Function
D0–D2	ECL Data Inputs
R0–R2	ECL Reset Inputs
CLK0–CLK2	ECL Clock Inputs
S012	ECL Common Set Input
Q0–Q2; $\overline{Q0-Q2}$	ECL Differential Data Outputs
V <sub>CC</sub>	Positive Supply
V <sub>EE</sub>	Negative Supply

**Table 2. FUNCTION 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

\*Pin will default low when left open.

**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
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	SOIC-20 SOIC-20	90 60	°C/W °C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	SOIC-20	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.

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**Table 4. PECL DC CHARACTERISTICS**  $V_{CC}= 5.0\text{ V}$ ;  $V_{EE}= 0.0\text{ V}$  (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		55	62		55	62		55	64	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
$V_{IH}$	Input HIGH Voltage	3835		4120	3835		4120	3835		4120	mV
$V_{IL}$	Input LOW Voltage	3190		3525	3190		3525	3190		3525	mV
$I_{IH}$	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 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.

1. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +0.8 V / -0.5 V.
2. Outputs are terminated through a 50  $\Omega$  resistor to  $V_{CC} - 2.0\text{ V}$ .

**Table 5. NECL DC CHARACTERISTICS**  $V_{CC}= 0.0\text{ V}$ ;  $V_{EE}= -5.0\text{ V}$  (Note 3)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	Power Supply Current		55	62		55	62		55	64	mA
$V_{OH}$	Output HIGH Voltage (Note 4)	-1085	-1005	-880	-1025	-955	-880	-1025	-955	-880	mV
$V_{OL}$	Output LOW Voltage (Note 4)	-1830	-1695	-1555	-1810	-1705	-1620	-1810	-1705	-1620	mV
$V_{IH}$	Input HIGH Voltage	-1165		-880	-1165		-880	-1165		-880	mV
$V_{IL}$	Input LOW Voltage	-1810		-1475	-1810		-1475	-1810		-1475	mV
$I_{IH}$	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 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.

3. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +0.8 V / -0.5 V.
4. Outputs are terminated through a 50  $\Omega$  resistor to  $V_{CC} - 2.0\text{ V}$ .

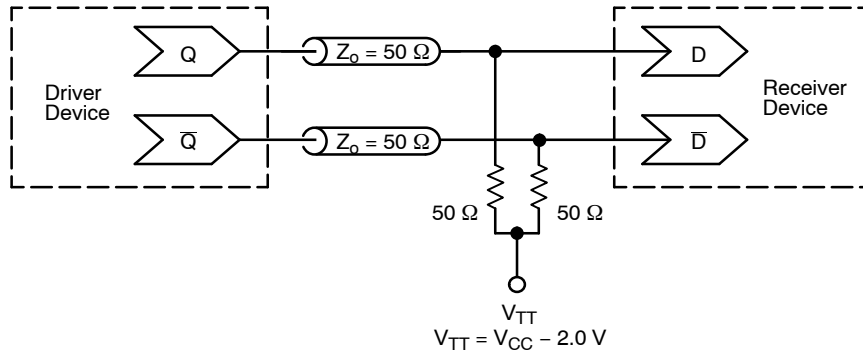
# MC100EL30

**Table 6. AC CHARACTERISTICS**  $V_{CC}= 5.0\text{ V}; V_{EE}= 0.0\text{ V}$  or  $V_{CC}= 0.0\text{ V}; V_{EE}= -5.0\text{ V}$  (Note 5)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$f_{\max}$	Maximum Toggle Frequency	1.0			1.2			1.2			GHz
$t_{PLH}$ $t_{PHL}$	Propagation Delay to Output CLK, S, R	550		800	570		820	590		840	ps
$t_S$ $t_H$	Setup Time Hold Time	150 200	0 100		150 200	0 100		150 200	0 100		ps
$t_{RR}$	Set/Reset Recovery	400	200		400	200		400	200		ps
$t_{PW}$	Minimum Pulse Width CLK Set, Reset	400 650			400 650			400 650			ps
$t_{JITTER}$	Cycle-to-Cycle Jitter		TBD			TBD			TBD		ps
$t_r$ $t_f$	Output Rise/Fall Times Q (20% - 80%)	280		550	280	450	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.

5.  $V_{EE}$  can vary +0.8 V / -0.5 V.



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

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## ORDERING INFORMATION

Device	Package	Package <sup>†</sup>
MC100EL30DW	SOIC-20	38 Units / Rail
MC100EL30DWG	SOIC-20 (Pb-Free)	38 Units / Rail
MC100EL30DWR2	SOIC-20	1000 / Tape & Reel
MC100EL30DWR2G	SOIC-20 (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.

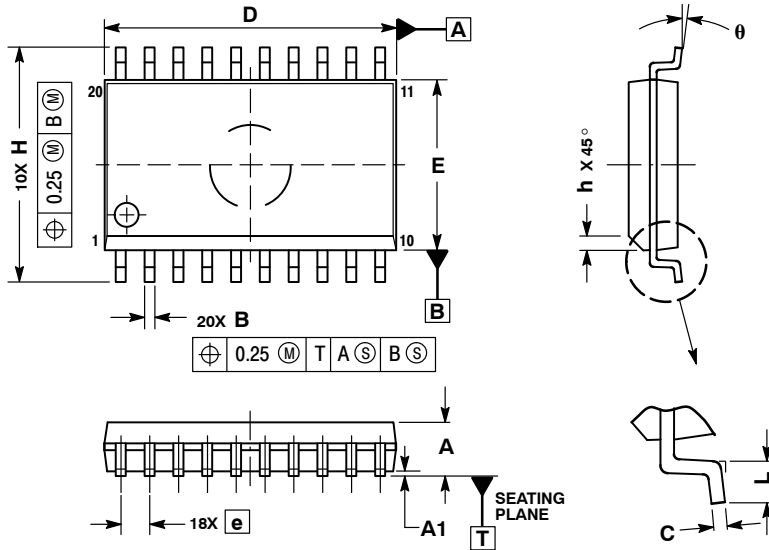
### Resource Reference of Application Notes

- 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

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## 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
θ	0°	7°

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