

# MC100EL14

## 5V ECL 1:5 Clock Distribution Chip

The MC100EL14 is a low skew 1:5 clock distribution chip designed explicitly for low skew clock distribution applications. 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.

The EL14 features a multiplexed clock input to allow for the distribution of a lower speed scan or test clock along with the high speed system clock. When LOW (or left open and pulled LOW by the input pulldown resistor) the SEL pin will select the differential clock input.

The common enable ( $\overline{\text{EN}}$ ) is synchronous so that the outputs will only be enabled/disabled when they are already in the LOW state. This avoids any chance of generating a runt clock pulse when the device is enabled/disabled as can happen with an asynchronous control. The internal flip flop is clocked on the falling edge of the input clock, therefore all associated specification limits are referenced to the negative edge of the clock input.

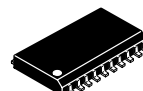
### Features

- 50 ps Output-to-Output Skew
- Synchronous Enable/Disable
- Multiplexed Clock Input
- 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  $-5.7 \text{ V}$
- Q Output will Default LOW with Inputs Open or at  $V_{EE}$
- Internal Input Pull-down Resistors on All Inputs, Pull-up Resistors on Inverted Inputs
- Pb-Free Packages are Available\*



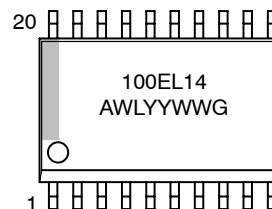
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SOIC-20L  
DW SUFFIX  
CASE 751D

### MARKING DIAGRAM



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

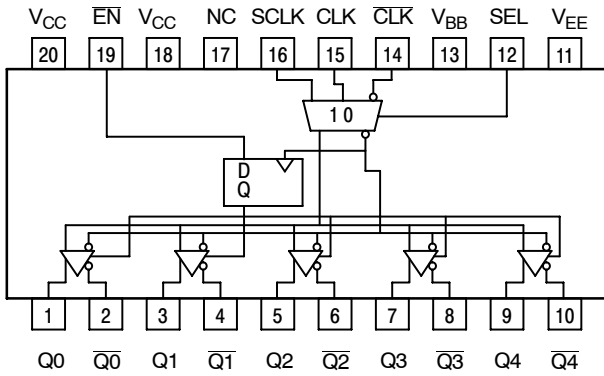
\*For additional marking information, refer to Application Note AND8002/D.

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 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  $V_{CC}$  and  $V_{EE}$  pins must be externally connected to Power Supply to guarantee proper operation.

**Figure 1. Logic Diagram and Pinout Assignment**

**Table 1. PIN DESCRIPTION**

PIN	FUNCTION
CLK, $\overline{\text{CLK}}$	ECL Diff Clock Inputs
SCLK	ECL Scan Clock Input
EN	ECL Sync Enable
SEL	ECL Clock Select Input
$Q_{0-4}, \overline{Q_{0-4}}$	ECL Diff Clock Outputs
$V_{BB}$	Reference Voltage Output
$V_{CC}$	Positive Supply
$V_{EE}$	Negative Supply
NC	No Connect

**Table 2. FUNCTION TABLE**

CLK*	SCLK*	SEL*	$\overline{\text{EN}}^*$	Q
L	X	L	L	L
H	X	L	L	H
X	L	H	L	L
X	H	H	L	H
X	X	X	H	L
(Note )				

1. On next negative transition of CLK or SCLK  
 \*\*Pins will default low when left open.

**Table 3. ATTRIBUTES**

Characteristics	Value
Internal Input Pulldown Resistor	75 k $\Omega$
Internal Input Pullup Resistor	75 k $\Omega$
ESD Protection	Human Body Model > 2 kV Machine Model > 200 V Charge Device Model > 4 kV
Moisture Sensitivity (Note 2)	Level 1
Flammability Rating	Oxygen Index: 28 to 34 UL 94 V-0 @ 0.125 in
Transistor Count	303 Devices
Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test	

2. For additional Moisture Sensitivity information, refer to Application Note AND8003/D.

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**Table 4. MAXIMUM RATINGS**

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
$V_{CC}$	PECL Mode Power Supply	$V_{EE} = 0\text{ V}$		8	V
$V_{EE}$	NECL Mode Power Supply	$V_{CC} = 0\text{ V}$		-8	V
$V_I$	PECL Mode Input Voltage	$V_{EE} = 0\text{ V}$	$V_I \leq V_{CC}$	6	V
	NECL Mode Input Voltage	$V_{CC} = 0\text{ V}$	$V_I \geq V_{EE}$	-6	V
$I_{out}$	Output Current	Continuous Surge		50	mA
				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 lfpm	SOIC-20L	90	$^{\circ}\text{C}/\text{W}$
		500 lfpm	SOIC-20L	60	$^{\circ}\text{C}/\text{W}$
$\theta_{JC}$	Thermal Resistance (Junction-to-Case)	Standard Board	SOIC-20L	30 to 35	$^{\circ}\text{C}/\text{W}$
$T_{sol}$	Wave Solder	Pb		265	$^{\circ}\text{C}$
		Pb-Free		<2 to 3 sec @ 248 $^{\circ}\text{C}$ <2 to 3 sec @ 260 $^{\circ}\text{C}$	

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 5. 100EL SERIES PECL DC CHARACTERISTICS**  $V_{CC} = 5.0\text{ V}$ ;  $V_{EE} = 0.0\text{ V}$  (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		32	40		32	40		34	42	mA
$V_{OH}$	Output HIGH Voltage (Note 4)	3915	3995	4120	3975	4045	4120	3975	4050	4120	mV
$V_{OL}$	Output LOW Voltage (Note 4)	3170	3305	3445	3190	3295	3380	3190	3295	3380	mV
$V_{IH}$	Input HIGH Voltage (Single-Ended)	3835		4120	3835		4120	3835		4120	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	3190		3525	3190		3525	3190		3525	mV
$V_{BB}$	Output Voltage Reference	3.62		3.74	3.62		3.74	3.62		3.74	V
$V_{IHCMR}$	Common Mode Range (Differential Configuration) (Note 5) $V_{PP} < 500\text{ mV}$ $V_{PP} \geq 500\text{ mV}$	1.3 1.5		4.6 4.6	1.2 1.4		4.6 4.6	1.2 1.4		4.6 4.6	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.

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

**Table 6. 100EL SERIES NECL DC CHARACTERISTICS**  $V_{CC} = 0.0\text{ V}$ ;  $V_{EE} = -5.0\text{ V}$  (Note 6)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	Power Supply Current		32	40		32	40		34	42	mA
$V_{OH}$	Output HIGH Voltage (Note 7)	-1085	-1005	-880	-1025	-955	-880	-1025	-955	-880	mV
$V_{OL}$	Output LOW Voltage (Note 7)	-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
$V_{IHCMR}$	Common Mode Range (Differential Configuration) (Note 8) $V_{PP} < 500\text{ mV}$ $V_{PP} \geq 500\text{ mV}$	-3.7 -3.5		-0.4 -0.4	-3.8 -3.6		-0.4 -0.4	-3.8 -3.6		-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.

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

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**Table 7. 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 9)

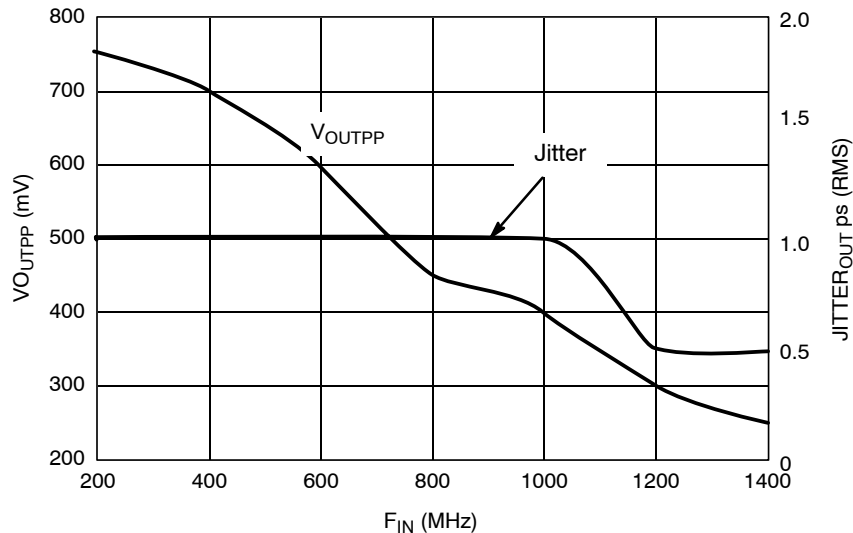
Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$f_{max}$	Maximum Toggle Frequency (See Figure 2, $f_{MAX}/\text{Jitter}$ )		1			1			1		GHz
$t_{PLH}$ $t_{PHL}$	Prop Delay CLK to Q (Diff) CLK to Q (SE) SCLK to Q	520 470 470		720 770 770	580 530 530	680 680 680	780 830 830	630 580 580		830 880 880	ps
$t_{SKEW}$	Part-to-Part Skew Within-Device Skew (Note 10)			200 50			200 50			200 50	ps
$t_{JITTER}$	Random Clock Jitter (RMS) @ 1 GHz (See Figure 2, $f_{MAX}/\text{Jitter}$ )		1			1			1		ps
$t_S$	Setup Time $\overline{EN}$	0			0	-133		0			ps
$t_H$	Hold Time $\overline{EN}$	250			250	140		250			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%)	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 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.

9.  $V_{EE}$  can vary +0.8 V / -0.5 V. Outputs are terminated through a 50  $\Omega$  resistor to  $V_{CC} - 2.0\text{ V}$ .

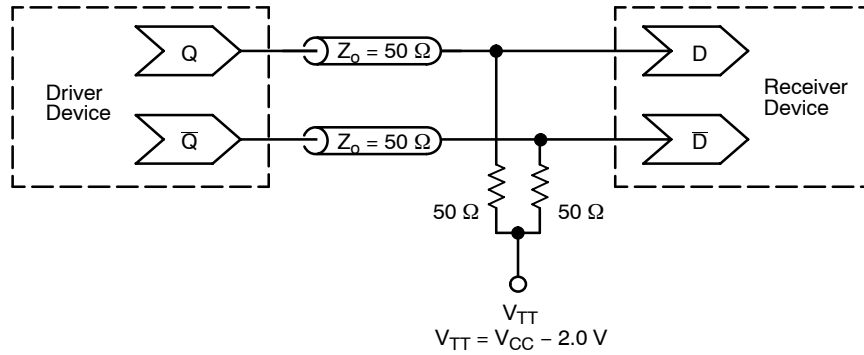
10. Skews are specified for identical LOW-to-HIGH or HIGH-to-LOW transitions.

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



**Figure 2. Output Voltage Amplitude / RMS Jitter vs. Input Frequency at Ambient Temperature (Typical)**

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**Figure 3. Typical Termination for Output Driver and Device Evaluation**  
 (See Application Note AND8020/D – Termination of ECL Logic Devices.)

### ORDERING INFORMATION<sup>4</sup>

Device	Package	Shipping <sup>†</sup>
MC100EL14DW	SOIC-20L	38 Units / Rail
MC100EL14DWG	SOIC-20L (Pb-Free)	38 Units / Rail
MC100EL14DWR2	SOIC-20L	1000 / Tape & Reel
MC100EL14DWR2G	SOIC-20L (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.

## MC100EL14

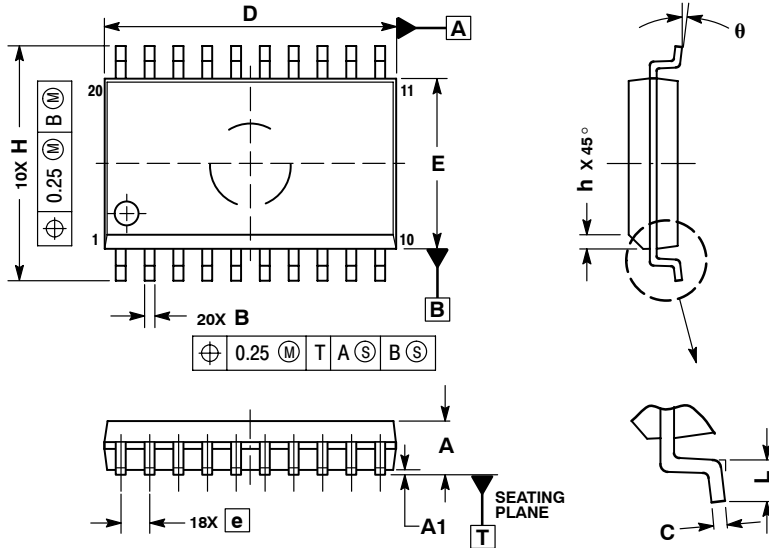
### Resource Reference of Application Notes

- 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  
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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