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 μF 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 $\overline{SEL}$ pin will select the differential clock input.

The common enable ($\overline{EN}$) 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.

- 50 ps Output-to-Output Skew
- Synchronous Enable/Disable
- Multiplexed Clock Input
- ESD Protection: > 2 KV HBM, > 200 V MM
- The 100 Series Contains Temperature Compensation
- PECL Mode Operating Range: V_{CC} = 4.2 V to 5.7 V with V_{EE} = 0 V
- NECL Mode Operating Range: V_{CC} = 0 V with V_{EE} = –4.2 V to –5.7 V
- Internal Input Pulldown Resistors on CLK, SCLK, SEL, and $\overline{EN}$.
- Q Output will Default LOW with Inputs Open or at V_{EE}
- 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 = 303 devices

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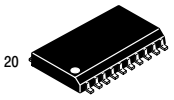
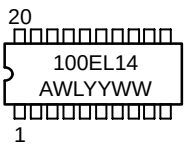


SO–20
DW SUFFIX
CASE 751D

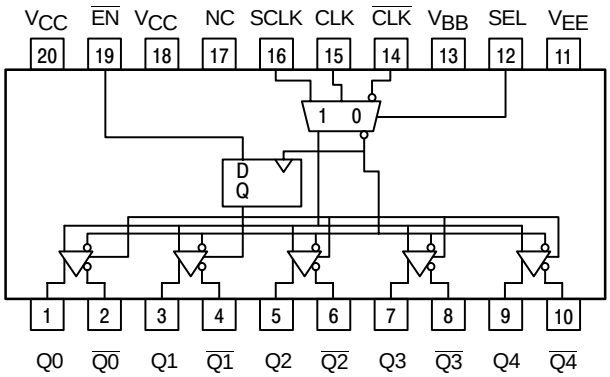
MARKING DIAGRAM



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

ORDERING INFORMATION

Device	Package	Shipping
MC100EL14DW	SO–20	38 Units/Rail
MC100EL14DWR2	SO–20	1000 Units/Reel



* All V_{CC} pins are tied together on the die.

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

PIN DESCRIPTION

PIN	FUNCTION
CLK, $\overline{CLK}$	ECL Diff Clock Inputs
SCLK	ECL Scan Clock Input
$\overline{EN}$	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

FUNCTION TABLE

CLK*	SCLK*	SEL*	$\overline{EN}$*	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 (1)

1. On next negative transition of CLK or SCLK

* Pins will default low when left open.

MAXIMUM RATINGS (Note 1)

Symbol	Parameter	Condition 1	Condition 2	Rating	Units
V_{CC}	PECL Mode Power Supply	V_{EE} = 0 V		8	V
V_{EE}	NECL Mode Power Supply	V_{CC} = 0 V		–8	V
V_I	PECL Mode Input Voltage NECL Mode Input Voltage	V_{EE} = 0 V V_{CC} = 0 V	$V_I \le V_{CC}$ $V_I \ge V_{EE}$	6 –6	V 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	°C
T_{stg}	Storage Temperature Range			–65 to +150	°C
θ_{JA}	Thermal Resistance (Junction–to–Ambient)	0 LFPM 500 LFPM	20 SOIC 20 SOIC	90 60	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction–to–Case)	std bd	20 SOIC	30 to 35	°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.

100EL SERIES PECL DC CHARACTERISTICS V_{CC} = 5.0 V; V_{EE} = 0.0 V (Note 2)

		–40°C			25°C			85°C			
Symbol	**Characteristic**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**
I_{EE}	Power Supply Current		32	40		32	40		34	42	mA
V_{OH}	Output HIGH Voltage (Note 3)	3915	3995	4120	3975	4045	4120	3975	4050	4120	mV
V_{OL}	Output LOW Voltage (Note 3)	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) (Note 4) V_{PP} < 500 mV V_{PP} ≥ 500 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	μA
I_{IL}	Input LOW Current	0.5			0.5			0.5			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.

2. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.8 V / –0.5 V.
3. Outputs are terminated through a 50 Ω resistor to V_{CC} – 2.0 V.
4. 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}min and 1 V.

100EL SERIES NECL DC CHARACTERISTICS V_{CC} = 0.0 V; V_{EE} = –5.0 V (Note 5)

		–40°C			25°C			85°C			
Symbol	**Characteristic**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**
I_{EE}	Power Supply Current		32	40		32	40		34	42	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}	Common Mode Range (Differential) (Note 7) V_{PP} < 500 mV V_{PP} ≥ 500 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	μA
I_{IL}	Input LOW Current	0.5			0.5			0.5			μA

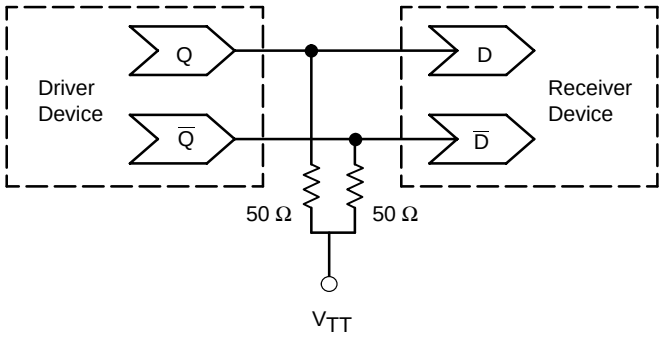
NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfpm is maintained.

5. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.8 V / –0.5 V.
6. Outputs are terminated through a 50 Ω resistor to V_{CC} – 2.0 V.
7. 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}min and 1 V.

AC CHARACTERISTICS V_{CC} = 5.0 V; V_{EE} = 0.0 V or V_{CC} = 0.0 V; V_{EE} = –5.0 V (Note 8)

		–40°C			25°C			85°C			
Symbol	**Characteristic**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**
f_{max}	Maximum Toggle Frequency		TBD			TBD			TBD		GHz
t_{PLH} t_{PHL}	Prop CLK to Q (Diff) Delay 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 9)			200 50			200 50			200 50	ps
t_{JITTER}	Cycle–to–Cycle Jitter		TBD			TBD			TBD		ps
t_S	Setup Time $\overline{EN}$	0			0			0			ps
t_H	Hold Time $\overline{EN}$	0			0			0			ps
V_{PP}	Input Swing (Note 10)	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

8. V_{EE} can vary +0.8 V / –0.5 V.
9. Skews are specified for identical LOW-to-HIGH or HIGH-to-LOW transitions.
10. $V_{PP(}$min) is the minimum input swing for which AC parameters guaranteed. The device has a DC gain of ≈40.



$V_{TT} = V_{CC} – 2.0$ V

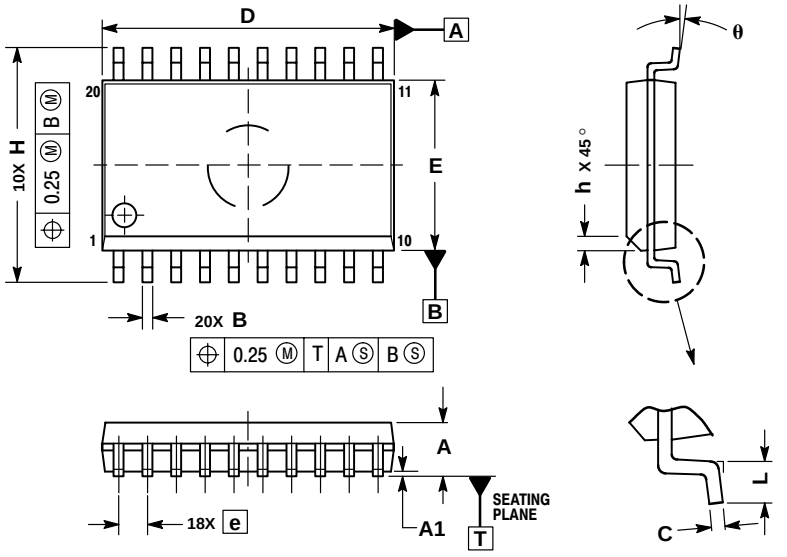
Typical Termination for Output Driver and Device Evaluation
(See Application Note AND8020 – Termination of ECL Logic Devices.)

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

PACKAGE DIMENSIONS

SO–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.

	MILLIMETERS	
DIM	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

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