MC10EL15, MC100EL15

5V ECL 1:4 Clock Distribution Chip

The MC10EL/100EL15 is a low skew 1:4 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 EL15 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 ($\overline{EN}$) 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.

The 100 series contains temperature compensation.

Features

- 50 ps Output-to-Output Skew
- Synchronous Enable/Disable
- Multiplexed Clock Input
- 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 CLKs, SCLK, SEL, and $\overline{EN}$.
- Pb−Free Packages are Available*

*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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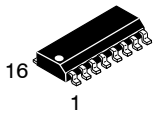


SO−16
D SUFFIX
CASE 751B

MARKING DIAGRAMS*

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.

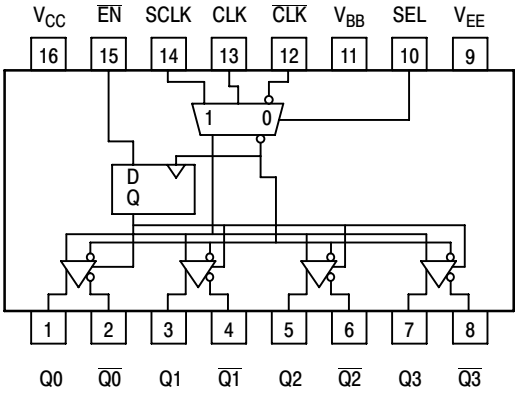


Figure 1. Logic Diagram and Pinout Assignment

Table 1. 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_{0-3}, $\overline{Q_{0-3}}$	ECL Diff Clock Outputs
V_{BB}	Reference Voltage Output
V_{CC}	Positive Supply
V_{EE}	Negative Supply

Table 2. 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)

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

Table 3. ATTRIBUTES

Characteristics		Value
Internal Input Pulldown Resistor		75 KΩ
Internal Input Pullup Resistor		N/A
ESD Protection	Human Body Model Machine Model Charged Device Model	> 1 kV > 100 V 2 kV
Moisture Sensitivity, Indefinite Time Out of Drypack (Note 2)		Level 1
Flammability Rating	Oxygen Index: 28 to 34	UL 94 V−0 @ 0.125 in
Transistor Count		103
Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test		

2. For additional information, see Application Note AND8003/D.

Table 4. MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
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	$V_I \leq V_{CC}$ $V_I \geq V_{EE}$	6 −6	V V
I_{out}	Output Current	Continuous Surge		50 100	mA mA
I_{BB}	V_{BB} Sink/Source			± 0.5	mA
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	SO−16 SO−16	130 75	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction−to−Case)	Standard Board	SO−16	33 to 36	°C/W
T_{sol}	Wave Solder Pb Pb−Free	<2 to 3 sec @ 248°C <2 to 3 sec @ 260°C		265 265	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

Table 5. 10EL SERIES PECL DC CHARACTERISTICS V_{CC} = 5.0 V; V_{EE} = 0.0 V (Note 3)

		−40°C			25°C			85°C			
Symbol	**Characteristic**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**
I_{EE}	Power Supply Current		25	35		25	35		25	35	mA
V_{OH}	Output HIGH Voltage (Note 4)	3920	4010	4110	4020	4105	4190	4090	4185	4280	mV
V_{OL}	Output LOW Voltage (Note 4)	3050	3200	3350	3050	3210	3370	3050	3227	3405	mV
V_{IH}	Input HIGH Voltage (Single−Ended)	3770		4110	3870		4190	3940		4280	mV
V_{IL}	Input LOW Voltage (Single−Ended)	3050		3500	3050		3520	3050		3555	mV
V_{BB}	Output Voltage Reference	3.57		3.7	3.65		3.75	3.69		3.81	V
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 5)	2.5		4.6	2.5		4.6	2.5		4.6	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5			0.5			0.3			μA

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 lfpm. 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 +0.06 V / −0.5 V.
4. Outputs are terminated through a 50 Ω resistor to V_{CC} − 2.0 V.
5. 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.

Table 6. 10EL SERIES NECL DC CHARACTERISTICS V_{CC} = 0 V; V_{EE} = −5.0 V (Note 6)

		−40°C			25°C			85°C			
Symbol	**Characteristic**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**
I_{EE}	Power Supply Current		25	35		25	35		25	35	mA
V_{OH}	Output HIGH Voltage (Note 7)	−1080	−990	−890	−980	−895	−810	−910	−815	−720	mV
V_{OL}	Output LOW Voltage (Note 7)	−1950	−1800	−1650	−1950	−1790	−1630	−1950	−1773	−1595	mV
V_{IH}	Input HIGH Voltage (Single−Ended)	−1230		−890	−1130		−810	−1060		−720	mV
V_{IL}	Input LOW Voltage (Single−Ended)	−1950		−1500	−1950		−1480	−1950		−1445	mV
V_{BB}	Output Voltage Reference	−1.43		−1.30	−1.35		−1.25	−1.31		−1.19	V
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 8)	−2.5		−0.4	−2.5		−0.4	−2.5		−0.4	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5			0.5			0.3			μA

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 lfpm. 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.

6. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.06 V / −0.5 V.
7. Outputs are terminated through a 50 Ω resistor to V_{CC} − 2.0 V.
8. 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.

Table 7. 100EL SERIES PECL DC CHARACTERISTICS V_{CC} = 5.0 V; V_{EE} = 0.0 V (Note 9)

		−40°C			25°C			85°C			
Symbol	**Characteristic**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**
I_{EE}	Power Supply Current		25	35		25	35		25	38	mA
V_{OH}	Output HIGH Voltage (Note 10)	3915	3995	4120	3975	4045	4120	3975	4050	4120	mV
V_{OL}	Output LOW Voltage (Note 10)	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}	Input HIGH Voltage Common Mode Range (Differential) (Note 11)	2.5		4.6	2.5		4.6	2.5		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: 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 lfpm. 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. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.8 V / −0.5 V.
10. Outputs are terminated through a 50 Ω resistor to V_{CC} − 2.0 V.
11. 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.

Table 8. 100EL SERIES NECL DC CHARACTERISTICS V_{CC} = 0 V; V_{EE} = −5.0 V (Note 12)

		−40°C			25°C			85°C			
Symbol	**Characteristic**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**
I_{EE}	Power Supply Current		25	35		25	35		25	38	mA
V_{OH}	Output HIGH Voltage (Note 13)	−1085	−1005	−880	−1025	−955	−880	−1025	−955	−880	mV
V_{OL}	Output LOW Voltage (Note 13)	−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 14)	−2.5		−0.4	−2.5		−0.4	−2.5		−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: 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 lfpm. 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.

12. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.8 V / −0.5 V.
13. Outputs are terminated through a 50 Ω resistor to V_{CC} − 2.0 V.
14. 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.

Table 9. AC CHARACTERISTICS V_{CC} = 5.0 V; V_{EE} = 0.0 V or V_{CC}= 0 V; V_{EE} = −5.0 V (Note 15)

		−40°C			25°C			85°C			
Symbol	**Characteristic**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**
f_{MAX}	Maximum Toggle Frequency					1.25					GHz
t_{PLH} t_{PHL}	Propagation Delay CLK to Q (Diff) CLK to Q (SE) SCLK to Q	 460 410 410		 660 710 710	 470 420 420		 670 720 720	 500 450 470		 700 750 750	ps
t_{SKEW}	Part-to-Part Skew Within-Device Skew (Note 16)			200 50			200 50			200 50	ps
t_{JITTER}	Random Clock Jitter (RMS)					2.6					ps
t_S	Setup Time $\overline{EN}$	150			150			150			ps
t_H	Hold Time $\overline{EN}$	400			400			400			ps
V_{PP}	Input Swing (Note 17)	150		1000	150		1000	150		1000	mV
t_r t_f	Output Rise/Fall Times Q (20% − 80%)	325		575	325		575	325		575	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 lfpm. 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.

15. 10 Series: V_{EE} can vary +0.06 V / −0.5 V.
    100 Series: V_{EE} can vary +0.8 V / −0.5 V.
16. Skews are specified for identical LOW−to−HIGH or HIGH−to−LOW transitions.
17. V_{PP}(min) is minimum input swing for which AC parameters guaranteed. The device has a DC gain of ≈ 40.

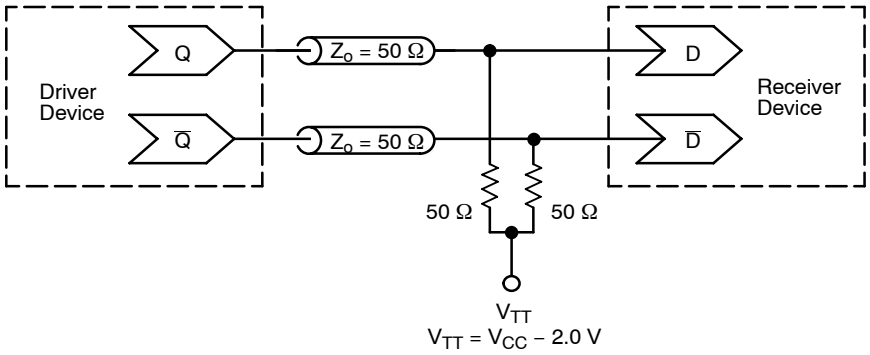


Figure 2. Typical Termination for Output Driver and Device Evaluation (See Application Note AND8020/D – Termination of ECL Logic Devices.)

ORDERING INFORMATION

Device	Package	Shipping†
MC10EL15D	SOIC−16	48 Units / Rail
MC10EL15DG	SOIC−16 (Pb−Free)	48 Units / Rail
MC10EL15DR2	SOIC−16	2500 / Tape & Reel
MC10EL15DR2G	SOIC−16 (Pb−Free)	2500 / Tape & Reel
MC100EL15D	SOIC−16	48 Units / Rail
MC100EL15DG	SOIC−16 (Pb−Free)	48 Units / Rail
MC100EL15DR2	SOIC−16	2500 / Tape & Reel
MC100EL15DR2G	SOIC−16 (Pb−Free)	2500 / Tape & Reel

†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

AN1642/D – The ECL Translator Guide

AND8001/D – Odd Number Counters Design

AND8002/D – Marking and Date Codes

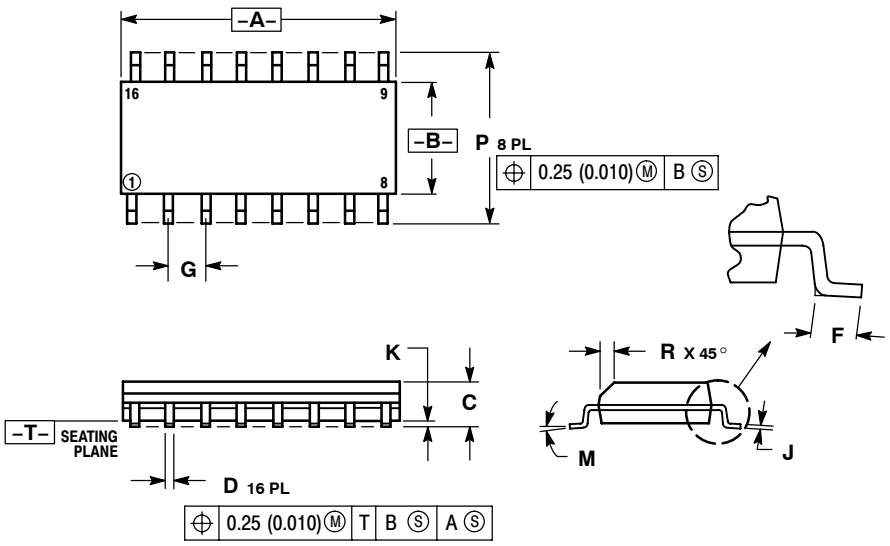
AND8020/D – Termination of ECL Logic Devices

AND8066/D – Interfacing with ECLinPS

AND8090/D – AC Characteristics of ECL Devices

PACKAGE DIMENSIONS

SOIC
CASE 751B–05
ISSUE J



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS 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.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

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PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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For additional information, please contact your local Sales Representative.

MC10EL15/D