

MOTOROLA

SEMICONDUCTOR TECHNICAL DATA

Order number: MC100ES6130

Rev 1, 5/2004

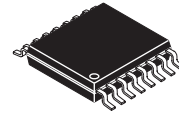
## 2.5/3.3V 1:4 PECL Clock Driver with 2:1 Input MUX

The MC100ES6130 is a 2.5 GHz differential PECL 1:4 fanout buffer. The ES6130 offers a wide operating range of 2.5 V and 3.3 V and also features a 2:1 input MUX which is ideal for redundant clock switchover applications. This device also includes a synchronous enable pin that forces the outputs into a fixed logic state. Enable or disable state is initiated only after the outputs are in a LOW state to eliminate the possibility of a runt clock pulse.

### Features

- 2 GHz maximum output frequency
- 25 ps maximum output-to-output skew
- 150 ps part-to-part skew
- 350 ps typical propagation delay
- 2:1 differential MUX input
- 2.5 / 3.3 V operating range
- LVPECL and HSTL input compatible
- 16-lead TSSOP package
- Temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

## MC100ES6130



**DT SUFFIX**  
16 LEAD TSSOP PACKAGE  
CASE 948F

### ORDERING INFORMATION

Device	Package
MC100ES6130DT	TSSOP-16
MC100ES6130DTR2	TSSOP-16

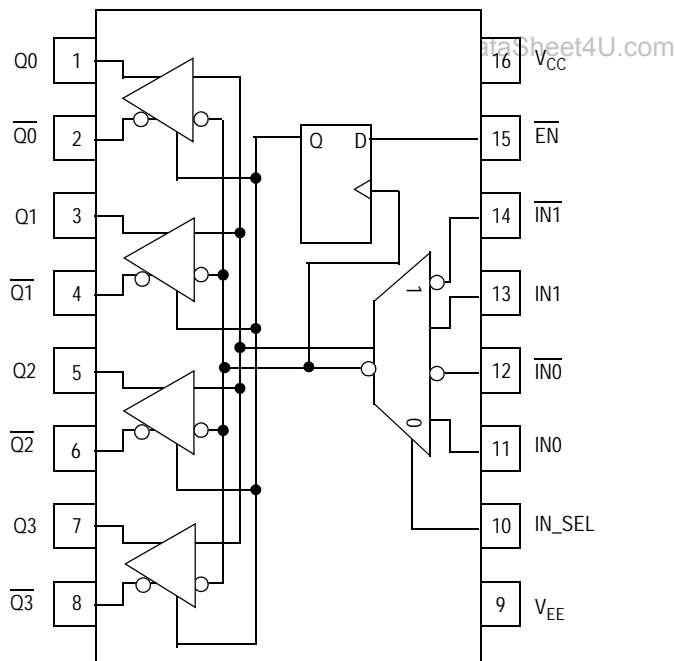


Figure 1. 16-Lead Pinout (Top View) and Logic Diagram

# Freescale Semiconductor, Inc.

## MC100ES6130

**Table 1. Pin Description**

Number	Name	Description
1, 2, 3, 4, 5, 6, 7, 8	$\overline{Q0}$ to $\overline{Q3}$ $\overline{Q0}$ to $\overline{Q3}$	LVPECL differential outputs: Terminate with $50\Omega$ to $V_{CC}-2V$ . For single-ended applications, terminate the unused output with $50\Omega$ to $V_{CC}-2V$ .
9	$V_{EE}$	Negative power supply: For LVPECL applications, connect to GND.
10	IN_SEL	LVPECL compatible 2:1 mux input signal select: When IN_SEL is LOW, the IN0 input pair is selected. When IN_SEL is HIGH, the IN1 input pair is selected. Includes a $75k\Omega$ pulldown. Default state is LOW and IN0 is selected.
11, 12, 13, 14	IN0, $\overline{IN0}$ IN1, $\overline{IN1}$	LVPECL, HSTL clock or data inputs. Internal $75k\Omega$ pulldown resistors on IN0 and IN1. Internal $75k\Omega$ pullup and $75k\Omega$ pulldown resistors on $\overline{IN0}$ , $\overline{IN1}$ . IN0, IN1 default condition is $V_{CC}/2$ when left floating. $\overline{IN0}$ , $\overline{IN1}$ default condition is LOW when left floating.
15	$\overline{EN}$	LVPECL compatible synchronous enable: When $\overline{EN}$ goes HIGH, $Q_{OUT}$ will go LOW and $\overline{Q}_{OUT}$ will go HIGH on the next LOW input clock transition. Includes a $75k\Omega$ pulldown. Default state is LOW when left floating. The internal latch is clocked on the falling edge of the input (IN0, IN1).
16	$V_{CC}$	Positive power supply: Bypass with $0.1\mu F/0.01\mu F$ low ESR capacitors.

**Table 2. Truth Table<sup>1</sup>**

IN0	IN1	IN_SEL	$\overline{EN}$	Q
L	X	L	L	L
H	X	L	L	H
X	L	H	L	L
X	H	H	L	L
Z	X	L	H	L
X	Z	H	H	L

1. Z = HIGH to LOW Transition  
X = Don't Care

**Table 3. General Specifications**

Characteristics		Value
Internal Input Pulldown Resistor		$75\text{ k}\Omega$
Internal Input Pullup Resistor		$75\text{ k}\Omega$
ESD Protection	Human Body Model	$> 2000\text{ V}$
	Machine Model	$> 200\text{ V}$
	Charged Device Model	$> 1500\text{ V}$
$\theta_{JA}$ Thermal Resistance (Junction-to-Ambient)	0 LFPM, 16 TSSOP	$138^\circ\text{C/W}$
	500 LFPM, 16 TSSOP	$108^\circ\text{C/W}$

Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test

Table 4. Absolute Maximum Ratings<sup>1</sup>

Symbol	Rating	Conditions	Rating	Units
V <sub>SUPPLY</sub>	Power Supply Voltage	Difference between V <sub>CC</sub> & V <sub>EE</sub>	3.9	V
V <sub>IN</sub>	Input Voltage	V <sub>CC</sub> - V <sub>EE</sub> ≤ 3.6 V	V <sub>CC</sub> + 0.3 V <sub>EE</sub> - 0.3	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

1. Absolute maximum continuous ratings are those maximum values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation at absolute-maximum-rated conditions is not implied.

Table 5. DC Characteristics (V<sub>CC</sub> = 0 V, V<sub>EE</sub> = -2.5 V ±5% or V<sub>CC</sub> = 2.5 V ±5%, V<sub>EE</sub> = 0 V)

Symbol	Characteristic	-40°C			0°C to 85°C			Unit
		Min	Typ	Max	Min	Typ	Max	
I <sub>EE</sub>	Power Supply Current		45	70		45	70	mA
V <sub>OH</sub>	Output HIGH Voltage <sup>1</sup>	V <sub>CC</sub> - 1250	V <sub>CC</sub> - 990	V <sub>CC</sub> - 800	V <sub>CC</sub> - 1200	V <sub>CC</sub> - 960	V <sub>CC</sub> - 750	mV
V <sub>OL</sub>	Output LOW Voltage <sup>1</sup>	V <sub>CC</sub> - 2000	V <sub>CC</sub> - 1550	V <sub>CC</sub> - 1150	V <sub>CC</sub> - 1925	V <sub>CC</sub> - 1630	V <sub>CC</sub> - 1200	mV
V <sub>outPP</sub>	Output Peak-to-Peak Voltage	200			200			mV
V <sub>IH</sub>	Input HIGH Voltage	V <sub>CC</sub> - 1165		V <sub>CC</sub> - 880	V <sub>CC</sub> - 1165		V <sub>CC</sub> - 880	mV
V <sub>IL</sub>	Input LOW Voltage	V <sub>CC</sub> - 1810		V <sub>CC</sub> - 1475	V <sub>CC</sub> - 1810		V <sub>CC</sub> - 1475	mV
V <sub>PP</sub>	Differential Input Voltage <sup>2</sup>	0.12		1.3	0.12		1.3	V
V <sub>CMR</sub>	Differential Cross Point Voltage <sup>3</sup>	V <sub>EE</sub> + 0.2		V <sub>CC</sub> - 1.0	V <sub>EE</sub> + 0.2		V <sub>CC</sub> - 1.0	V
I <sub>IN</sub>	Input Current			±150			±150	μA

- Output termination voltage V<sub>TT</sub> = 0 V for V<sub>CC</sub> = 2.5 V operation is supported but the power consumption of the device will increase.
- V<sub>PP</sub> (DC) is the minimum differential input voltage swing required to maintain device functionality.
- V<sub>CMR</sub> (DC) is the cross point of the differential input signal. Functional operation is obtained when the cross point is within the V<sub>CMR</sub> (DC) range and the input swing lies within the V<sub>PP</sub> (DC) specification.

Table 6. DC Characteristics (V<sub>CC</sub> = 0 V, V<sub>EE</sub> = -3.8 to 3.135 V or V<sub>CC</sub> = 3.135 to 3.8 V, V<sub>EE</sub> = 0 V)

Symbol	Characteristic	-40°C			0°C to 85°C			Unit
		Min	Typ	Max	Min	Typ	Max	
I <sub>EE</sub>	Power Supply Current		48	70		48	70	mA
V <sub>OH</sub>	Output HIGH Voltage <sup>1</sup>	V <sub>CC</sub> - 1150	V <sub>CC</sub> - 1020	V <sub>CC</sub> - 800	V <sub>CC</sub> - 1200	V <sub>CC</sub> - 970	V <sub>CC</sub> - 750	mV
V <sub>OL</sub>	Output LOW Voltage <sup>1</sup>	V <sub>CC</sub> - 1950	V <sub>CC</sub> - 1620	V <sub>CC</sub> - 1250	V <sub>CC</sub> - 2000	V <sub>CC</sub> - 1680	V <sub>CC</sub> - 1300	mV
V <sub>outPP</sub>	Output Peak-to-Peak Voltage	200			200			mV
V <sub>IH</sub>	Input HIGH Voltage	V <sub>CC</sub> - 1165		V <sub>CC</sub> - 880	V <sub>CC</sub> - 1165		V <sub>CC</sub> - 880	mV
V <sub>IL</sub>	Input LOW Voltage	V <sub>CC</sub> - 1810		V <sub>CC</sub> - 1475	V <sub>CC</sub> - 1810		V <sub>CC</sub> - 1475	mV
V <sub>PP</sub>	Differential Input Voltage <sup>2</sup>	0.12		1.3	0.12		1.3	V
V <sub>CMR</sub>	Differential Cross Point Voltage <sup>3</sup>	V <sub>EE</sub> + 0.2		V <sub>CC</sub> - 1.1	V <sub>EE</sub> + 0.2		V <sub>CC</sub> - 1.1	V
I <sub>IN</sub>	Input Current			±150			±150	μA

- Output termination voltage V<sub>TT</sub> = 0 V for V<sub>CC</sub> = 2.5 V operation is supported but the power consumption of the device will increase.
- V<sub>PP</sub> (DC) is the minimum differential input voltage swing required to maintain device functionality.
- V<sub>CMR</sub> (DC) is the crosspoint of the differential input signal. Functional operation is obtained when the crosspoint is within the V<sub>CMR</sub> (DC) range and the input swing lies within the V<sub>PP</sub> (DC) specification.

## MC100ES6130

Table 7. AC Characteristics ( $V_{CC} = 0\text{ V}$ ,  $V_{EE} = -3.8\text{ V}$  to  $-2.375\text{ V}$ ;  $V_{CC} = 2.375$  to  $3.8\text{ V}$ ,  $V_{EE} = 0\text{ V}$ )<sup>1</sup>

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$f_{\max}$	Maximum Frequency	2			2			2			GHz
$t_{PLH} / t_{PHL}$	Propagation Delay to Output Differential CLK to Q, $\bar{Q}$	300	340	450	300	350	450	300	350	475	ps
$t_{SKEW}$	Skew <sup>2</sup> output-to-output part-to-part		15	25 125		15	25 150		15	25 150	ps ps
$t_{JITTER}$	Cycle-to-Cycle Jitter RMS ( $1\sigma$ )			1			1			1	ps
$V_{PP}$	Minimum Input Swing	200		1200	200		1200	200		1200	mV
$V_{CMR}$	Differential Cross Point Voltage	$V_{EE} + 0.2$		$V_{CC} - 1.2$	$V_{EE} + 0.2$		$V_{CC} - 1.2$	$V_{EE} + 0.2$		$V_{CC} - 1.2$	V
$t_r / t_f$	Output Rise/Fall Times (20% – 80% @ 50 MHz)	70		225	70		250	70		275	ps

1. Measured using a 750 mV source, 50% Duty Cycle clock source. All loading with 50 ohms to  $V_{CC} - 2.0\text{V}$ .
2. Skew is measured between outputs under identical transitions.

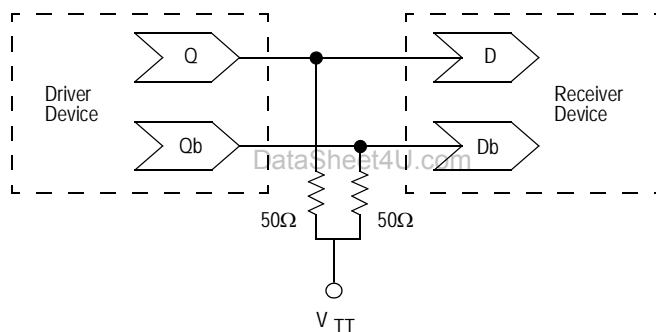
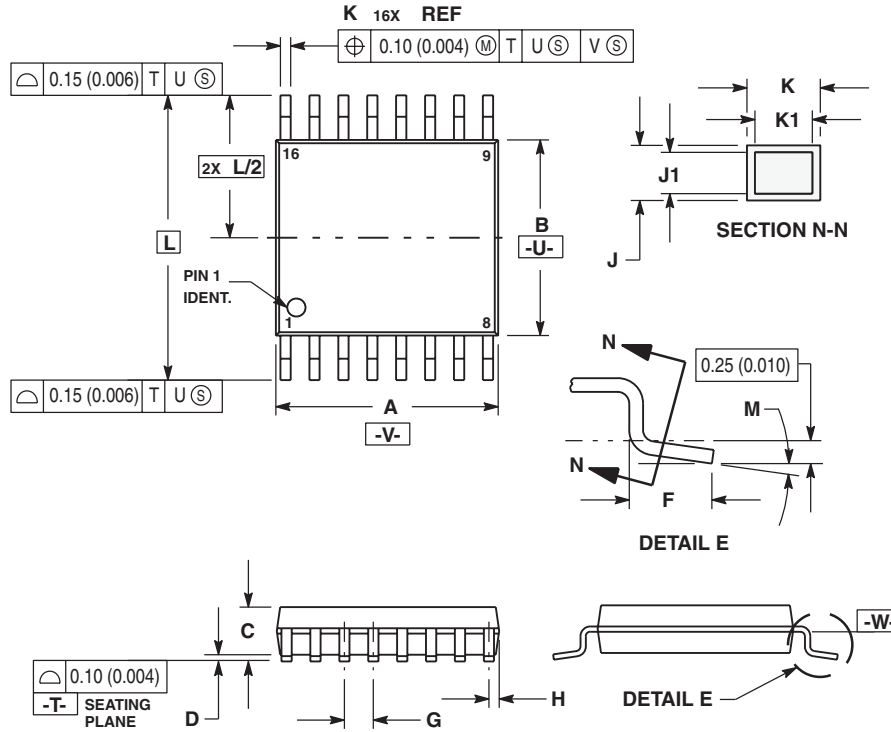


Figure 2. Typical Termination for Output Driver and Device Evaluation

OUTLINE DIMENSIONS

**TSSOP-16**  
**DT SUFFIX**  
 16-LEAD TSSOP PACKAGE  
 CASE 948F-01  
 ISSUE 0



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
  4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
  5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
  6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
  7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.18	0.28	0.007	0.011
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0"	8"	0"	8"

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