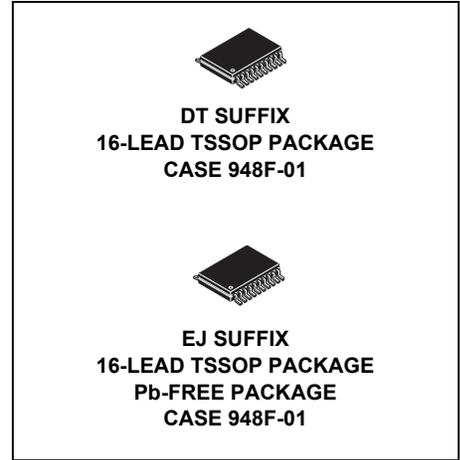


The MC100ES6130 is a 2.5 GHz differential PECL 1:4 fanout buffer. The ES6130 offers a wide operating range of 2.5 V and 3.3 V and also features a 2:1 input MUX which is ideal for redundant clock switchover applications. This device also includes a synchronous enable pin that forces the outputs into a 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°C to +85°C
- 16-lead Pb-free package available



ORDERING INFORMATION	
Device	Package
MC100ES6130DT	TSSOP-16
MC100ES6130DTR2	TSSOP-16
MC100ES6130EJ	TSSOP-16 (Pb-Free)
MC100ES6130EJR2	TSSOP-16 (Pb-Free)

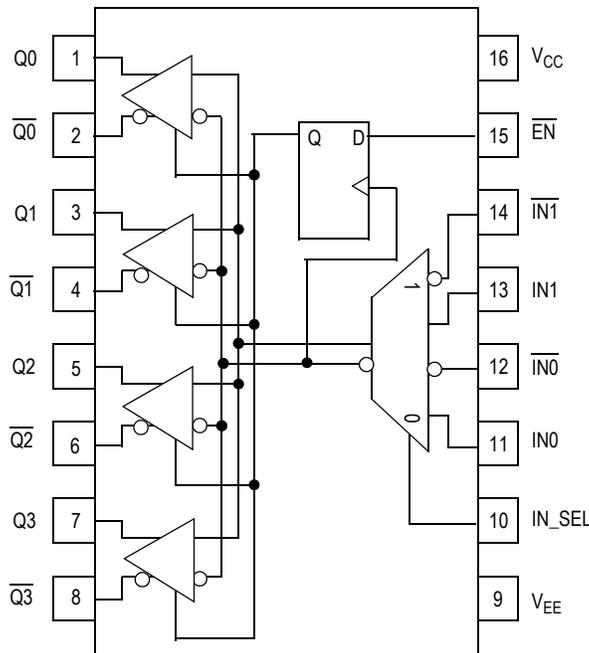


Figure 1. 16-Lead Pinout (Top View) and Logic Diagram

**Table 1. Pin Description**

Number	Name	Description
1, 2, 3, 4, 5, 6, 7, 8	$\overline{Q0}$ to $\overline{Q3}$ $Q0$ to $Q3$	LVPECL differential outputs: Terminate with $50\Omega$ to $V_{CC} - 2\text{ V}$ . For single-ended applications, terminate the unused output with $50\Omega$ to $V_{CC} - 2\text{ V}$ .
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 $75\text{ k}\Omega$ 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 $75\text{ k}\Omega$ pulldown resistors on IN0 and IN1. Internal $75\text{ k}\Omega$ pullup and $75\text{ k}\Omega$ pulldown resistors on $\overline{IN0}$ , $\overline{IN1}$ . $\overline{IN0}$ , $\overline{IN1}$ default condition is $V_{CC}/2$ when left floating. IN0, 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 $75\text{ k}\Omega$ 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 $0.1\text{ }\mu\text{F}/0.01\text{ }\mu\text{F}$ 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	H
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

1. 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.
2. V<sub>PP</sub> (DC) is the minimum differential input voltage swing required to maintain device functionality.
3. 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)**

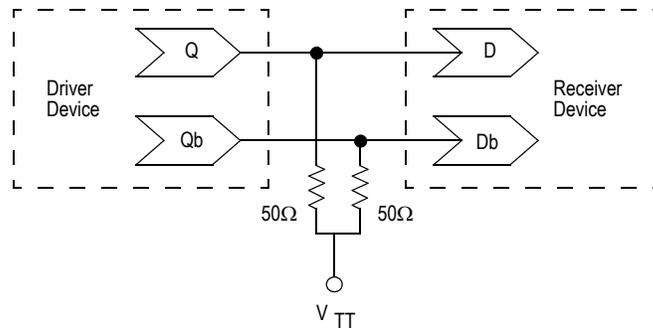
Symbol	Characteristic	-40°C			0°C to 85°C			Unit
		Min	Typ	Max	Min	Typ	Max	
I <sub>EE</sub>	Power Supply Current		48	70		48	70	mA
V <sub>OH</sub>	Output HIGH Voltage <sup>(1)</sup>	V <sub>CC</sub> - 1150	V <sub>CC</sub> - 1020	V <sub>CC</sub> - 800	V <sub>CC</sub> - 1200	V <sub>CC</sub> - 970	V <sub>CC</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

1. 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.
2. V<sub>PP</sub> (DC) is the minimum differential input voltage swing required to maintain device functionality.
3. 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.

**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

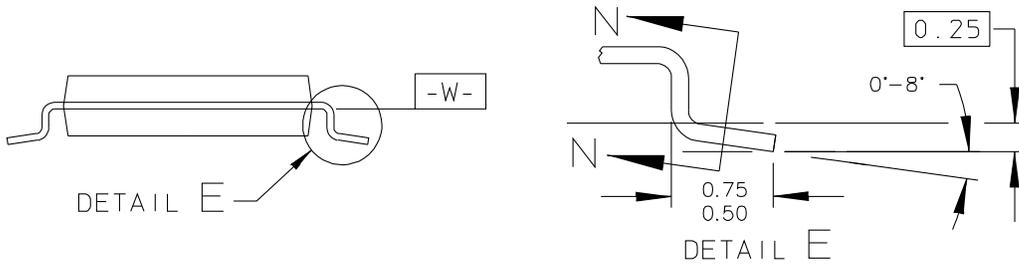
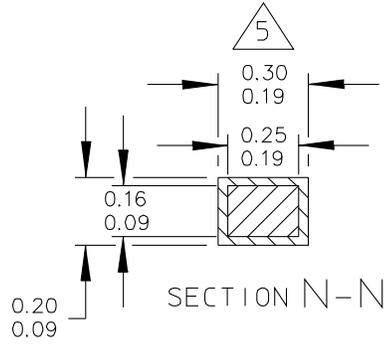
1. Measured using a 750 mV source, 50% Duty Cycle clock source. All loading with 50 ohms to  $V_{CC} - 2.0\text{ V}$ .
2. Skew is measured between outputs under identical transitions.



**Figure 2. Typical Termination for Output Driver and Device Evaluation**



PACKAGE DIMENSIONS



© FREESCALE SEMICONDUCTOR, INC. ALL RIGHTS RESERVED.	MECHANICAL OUTLINE	PRINT VERSION NOT TO SCALE	
TITLE:  16 LD TSSOP, PITCH 0.65MM	DOCUMENT NO: 98ASH70247A	REV: B	
	CASE NUMBER: 948F-01	19 MAY 2005	
	STANDARD: JEDEC		

**CASE 948F-01  
ISSUE B  
16-LEAD TSSOP PACKAGE**

**PACKAGE DIMENSIONS**

NOTES:

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

© FREESCALE SEMICONDUCTOR, INC. ALL RIGHTS RESERVED.	MECHANICAL OUTLINE	PRINT VERSION NOT TO SCALE
TITLE:  16 LD TSSOP, PITCH 0.65MM	DOCUMENT NO: 98ASH70247A	REV: B
	CASE NUMBER: 948F-01	19 MAY 2005
	STANDARD: JEDEC	

**CASE 948F-01  
ISSUE B  
16-LEAD TSSOP PACKAGE**

**Revision History Sheet**

<b>Rev</b>	<b>Table</b>	<b>Page</b>	<b>Description of Change</b>	<b>Date</b>
4		1	Product Discontinuance Notice – Last Time Buy Expires on (12/7/2013)	12/19/12



## IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD-PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers who are designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only to develop an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third-party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising from your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Disclaimer Rev.1.01 Jan 2024)

### Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

### Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

### Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit [www.renesas.com/contact-us/](http://www.renesas.com/contact-us/).