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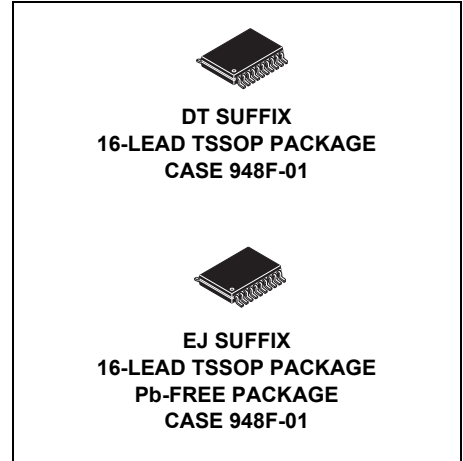
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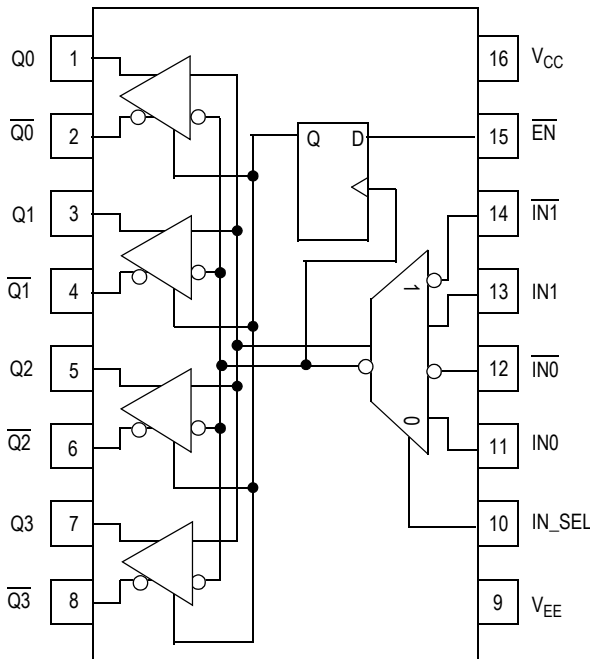
The MC100ES6130 is a 2.5 GHz differential PECL 1:4 fanout buffer. The ES6130 offers a wide operating range of 2.5 V and 3.3 V and also features a 2:1 input MUX which is ideal for redundant clock switchover applications. This device also includes a synchronous enable pin that forces the outputs into a 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  $+85^{\circ}\text{C}$
- 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,<br>7, 8 | $\overline{Q0}$ to $\overline{Q3}$<br>$Q0$ 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, $\overline{IN0}$<br>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<br>V <sub>EE</sub> - 0.3 | V<br>V   |
| I <sub>out</sub>    | Output Current              | Continuous<br>Surge                                  | 50<br>100                                      | mA<br>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)

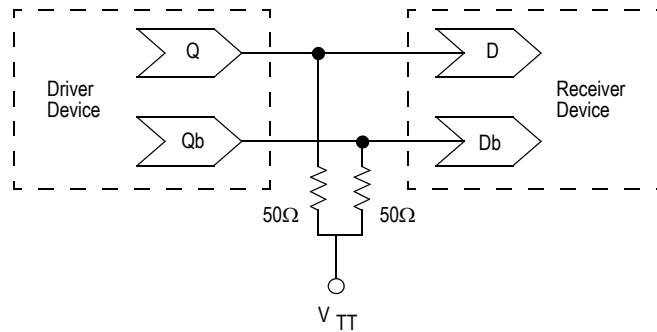
| Symbol             | Characteristic                                  | -40°C                  |                        |                        | 0°C to 85°C            |                        |                        | Unit |
|--------------------|---|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------|
|                    |   | 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.

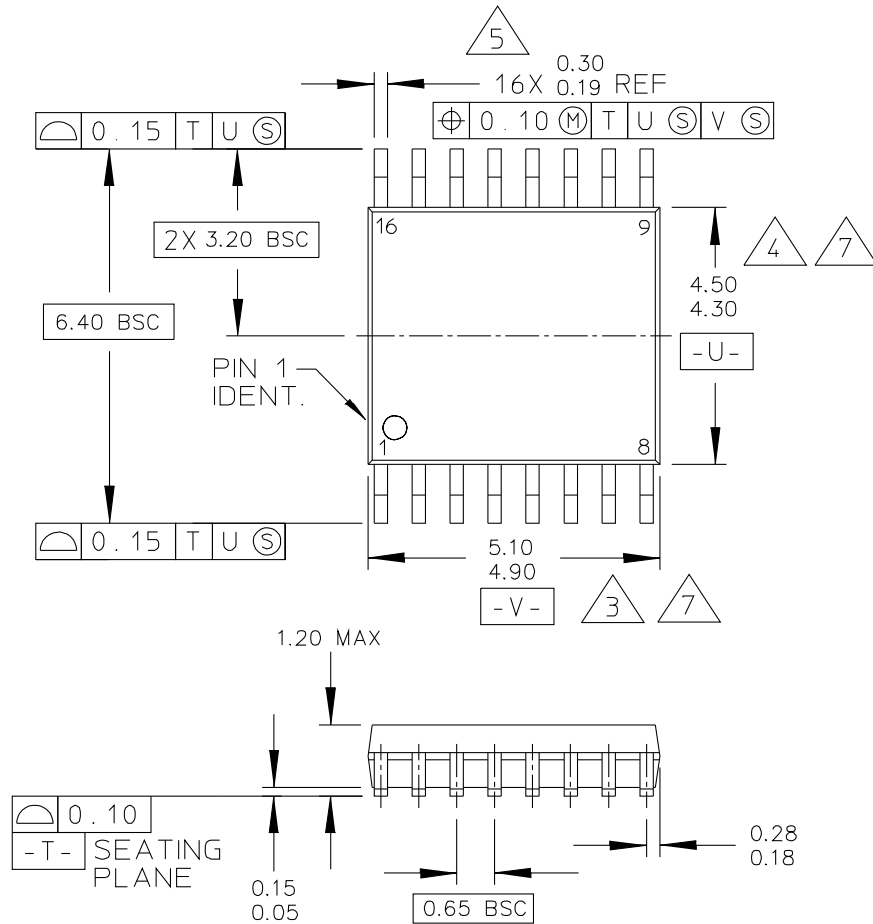
**Table 7. AC Characteristics** ( $V_{CC} = 0\text{ V}$ ,  $V_{EE} = -3.8\text{ V}$  to  $-2.375\text{ V}$ ;  $V_{CC} = 2.375$  to  $3.8\text{ V}$ ,  $V_{EE} = 0\text{ V}$ )<sup>(1)</sup>

| 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      |
| $t_{\text{PLH}} / t_{\text{PHL}}$ | Propagation Delay to Output<br>Differential<br>CLK to Q, $\bar{Q}$ | 300                   | 340 | 450                   | 300                   | 350 | 450                   | 300                   | 350 | 475                   | ps       |
| $t_{\text{SKEW}}$                 | Skew <sup>(2)</sup><br>output-to-output<br>part-to-part            |                       | 15  | 25<br>125             |                       | 15  | 25<br>150             |                       | 15  | 25<br>150             | ps<br>ps |
| $t_{\text{JITTER}}$               | Cycle-to-Cycle Jitter<br>RMS ( $1\sigma$ )                         |                       |     | 1                     |                       |     | 1                     |                       |     | 1                     | ps       |
| $V_{\text{PP}}$                   | Minimum Input Swing  | 200                   |     | 1200                  | 200                   |     | 1200                  | 200                   |     | 1200                  | mV       |
| $V_{\text{CMR}}$                  | Differential Cross Point Voltage                                   | $V_{\text{EE}} + 0.2$ |     | $V_{\text{CC}} - 1.2$ | $V_{\text{EE}} + 0.2$ |     | $V_{\text{CC}} - 1.2$ | $V_{\text{EE}} + 0.2$ |     | $V_{\text{CC}} - 1.2$ | V        |
| $t_r / t_f$                       | Output Rise/Fall Times<br>(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  $V_{\text{CC}} - 2.0\text{ V}$ .
2. Skew is measured between outputs under identical transitions.

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

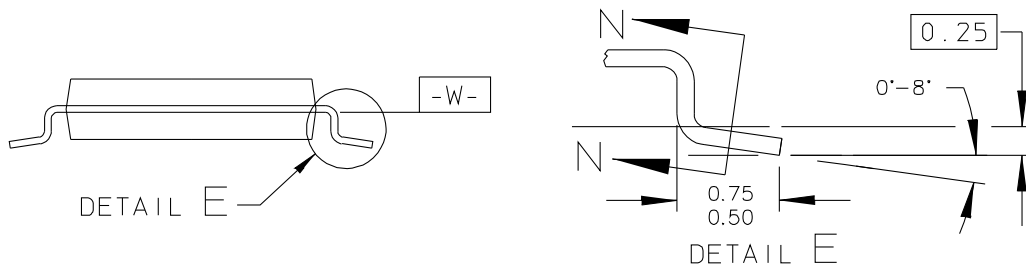
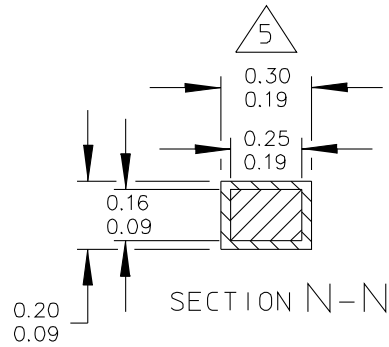
**PACKAGE DIMENSIONS**



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|   | CASE NUMBER: 948F-01     | 19 MAY 2005                |  |
|   | STANDARD: JEDEC          |                            |  |

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

**PACKAGE DIMENSIONS**



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**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-.

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PAGE 3 OF 3

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



## Revision History Sheet

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