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### Freescale Semiconductor Technical Data

MC100ES6011 Rev 5, 08/2005

# 2.5 V/3.3 V ECL 1:2 Differential Fanout Buffer

The MC100ES6011 is a differential 1:2 fanout buffer. The ES6011 is ideal for applications requiring lower voltage.

The 100ES Series contains temperature compensation.

#### Features

- 270 ps Typical Propagation Delay
- Maximum Frequency > 3 GHz Typical
- PECL Mode Operating Range:  $V_{CC}$  = 2.375 V to 3.8 V with  $V_{EE}$  = 0 V
- + ECL Mode Operating Range: V<sub>CC</sub> = 0 V with V<sub>EE</sub> = -2.375 V to -3.8 V
- Open Input Default State
- Q Output Will Default LOW with Inputs Open or at V<sub>EE</sub>
- LVDS Input Compatible
- 8-Lead SOIC and TSSOP Pb-Free Packages Available





CASE 1640-01

ORDERING INFORMATION						
Device	Package					
MC100ES6011D	SO-8					
MC100ES6011DR2	SO-8					
MC100ES6011EF	SO-8 (Pb-Free)					
MC100ES6011EFR2	SO-8 (Pb-Free)					
MC100ES6011DT	TSSOP-8					
MC100ES6011DTR2	TSSOP-8					
MC100ES6011EJ	TSSOP-8 (Pb-Free)					
MC100ES6011EJR2	TSSOP-8 (Pb-Free)					

PIN DESCRIPTION				
Pin	Function			
$D^{(1)}, \overline{D}^{(2)}$	ECL Data Inputs			
Q0, <u>Q0</u> Q1, <u>Q1</u>	ECL Data Outputs			
V <sub>CC</sub>	Positive Supply			
V <sub>EE</sub>	Negative Supply			

1. Pins will default LOW when left open.

 Pins will default to 0.572 V<sub>CC</sub>/2 when left open.



#### Table 1. Attributes

Characteri	Value	
Internal Input Pulldown Resistor	75 kΩ	
Internal Input Pullup Resistor	56 kΩ	
ESD Protection	Human Body Model Machine Model Charged Device Model	> 4000 V > 200 V > 1500 V
$\theta_{JA}$ Thermal Resistance (Junction to Ambient)	0 LFPM, 8 SOIC 500 LFPM, 8 SOIC	190°C/W 130°C/W

Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test

#### Table 2. Maximum Ratings<sup>(1)</sup>

Symbol	Parameter	Conditions	Rating	Units
V <sub>SUPPLY</sub>	Power Supply Voltage	Difference between $V_{CC} \& V_{EE}$	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
TA	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 3. DC Characteristics	$(V_{CC} = 0 V; V_{FF} = -2.5 V \pm$	: 5% or V <sub>CC</sub> = 2.5 V ± 5	%; $V_{FF} = 0 V$ ) <sup>(1)</sup>
		00	, LL ,

Symbol	Characteristic	_40°C			0°C to 85°C			
Symbol	Characteristic	Min	Тур	Max	Min	Тур	Max	Unit
I <sub>EE</sub>	Power Supply Current		12	25		12	25	mA
V <sub>OH</sub>	Output HIGH Voltage <sup>(2)</sup>	V <sub>CC</sub> -1135		V <sub>CC</sub> -760	V <sub>CC</sub> -1070		V <sub>CC</sub> -760	mV
V <sub>OL</sub>	Output LOW Voltage <sup>(2)</sup>	V <sub>CC</sub> -1950		V <sub>CC</sub> -1350	V <sub>CC</sub> -1950		V <sub>CC</sub> -1520	mV
V <sub>OUTPP</sub>	Output Peak-to-Peak Voltage	200			200			mV
V <sub>IH</sub>	Input HIGH Voltage (Single Ended)	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 (Single Ended)	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>(3)</sup>	0.12		1.3	0.12		1.3	V
V <sub>CMR</sub>	Differential Cross Point Voltage <sup>(4)</sup>	V <sub>EE</sub> +1.0		V <sub>CC</sub> –0.8	V <sub>EE</sub> +1.0		V <sub>CC</sub> -0.8	V
I <sub>IN</sub>	Input Current			±150			±150	μA

1. ES6011 circuits 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 airflow > 500 LFPM is maintained.

2. Output termination voltage  $V_{TT}$  = 0 V for  $V_{CC}$  = 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  $V_{PP}$  (DC) specification.

Symbol	Characteristic		-40°C			Unit		
Cymbol	Characteristic	Min	Тур	Max	Min	Тур	Мах	Unit
I <sub>EE</sub>	Power Supply Current		12	25		12	25	mA
V <sub>OH</sub>	Output HIGH Voltage <sup>(2)</sup>	V <sub>CC</sub> –1135		V <sub>CC</sub> -760	V <sub>CC</sub> -1070		V <sub>CC</sub> -760	mV
V <sub>OL</sub>	Output LOW Voltage <sup>(2)</sup>	V <sub>CC</sub> –1950		V <sub>CC</sub> -1500	V <sub>CC</sub> –1950		V <sub>CC</sub> -1520	mV
V <sub>OUTPP</sub>	Output Peak-to-Peak Voltage	200			200			mV
V <sub>IH</sub>	Input HIGH Voltage (Single Ended)	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 (Single Ended)	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>(3)</sup>	0.12		1.3	0.12		1.3	V
V <sub>CMR</sub>	Differential Cross Point Voltage <sup>(4)</sup>	V <sub>EE</sub> +1.0		V <sub>CC</sub> -0.8	V <sub>EE</sub> +1.0		V <sub>CC</sub> –0.8	V
I <sub>IN</sub>	Input Current			±150			±150	μA

## Table 4. DC Characteristics (V<sub>CC</sub> = 0 V; V<sub>EE</sub> = -3.8 to -3.135 or V<sub>CC</sub> = 3.8 to 3.135 V; V<sub>EE</sub> = 0 V)<sup>(1)</sup>

1. ES6011 circuits 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 airflow > 500 LFPM is maintained.

2. Output termination voltage  $V_{TT}$  = 0 V for  $V_{CC}$  = 2.5 V operation is supported but the power consumption of the device will increase.

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

4. 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 5. AC Characteristics (V<sub>CC</sub> = 0 V; V<sub>EE</sub> = -3.8 to -2.375 or V<sub>CC</sub> = 2.375 to 3.8 V; V<sub>EE</sub> = 0 V)<sup>(1)</sup>

Symbol	Charactoristic	–40°C		25°C			0°C to 85°C			Unit	
Symbol	Glaracteristic	Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	Unit
f <sub>MAX</sub>	Maximum Frequency		> 3			> 3			> 3		GHz
t <sub>PLH,</sub> t <sub>PHL</sub>	Propagation Delay (Differential) CLK to Q, $\overline{Q}$	170	260	300	180	270	310	210	285	360	ps
t <sub>SKEW</sub>	Within Device Skew Q, $\overline{Q}$ Device-to-Device Skew <sup>(2)</sup>		9	20 130		9	20 130		9	20 150	ps
t <sub>JITTER</sub>	Cycle-to-Cycle Jitter RMS (1 $\sigma$ )			1			1			1	ps
V <sub>PP</sub>	Input Voltage Swing (Differential)	150		1200	150		1200	150		1200	mV
V <sub>CMR</sub>	Differential Cross Point Voltage	V <sub>EE</sub> +1.2		V <sub>CC</sub> -1.1	V <sub>EE</sub> +1.2		V <sub>CC</sub> -1.1	V <sub>EE</sub> +1.2		V <sub>CC</sub> -1.1	V
t <sub>r</sub> t <sub>f</sub>	Output Rise/Fall Times (20% – 80%)	70		220	70		220	70		220	ps

1. Measured using a 750 mV source 50% Duty Cycle clock source. All loading with 50  $\Omega$  to V<sub>CC</sub>–2.0 V.

2. Skew is measured between outputs under identical transitions.



Figure 2. V<sub>OUTPP</sub> versus Frequency





### PACKAGE DIMENSIONS





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8LD SOIC NARROW	BODY	CASE NUMBER	R: 751–07	07 APR 2005
		STANDARD: JE	EDEC MS-012AA	

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#### CASE 751-07 ISSUE U 8-LEAD SOIC PACKAGE

#### MC100ES6011

NOTES:

- 1. DIMENSIONS ARE IN MILLIMETERS.
- 2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
- <u>Z</u> DIMENSION DOES NOT INCLUDE MOLD PROTRUSION. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
- A. DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS OF THE DIMENSION AT MAXIMUM MATERIAL CONDITION.

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TITLE:		DOCUMENT NO	: 98ASB42564B	REV: U
8LD SOIC NARROV	N BODY	CASE NUMBER	2: 751-07	07 APR 2005
		STANDARD: JE	DEC MS-012AA	

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#### CASE 751-07 ISSUE U 8-LEAD SOIC PACKAGE

#### Advanced Clock Drivers Device Data Freescale Semiconductor

#### MC100ES6011

#### PACKAGE DIMENSIONS









VIEW C



VIEW A-A







- NOTES: DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  DIMENSIONS ARE IN MILLIMETERS.

  - THIS DIMENSION DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT DATUM H, MOLD FLASH OR PROTRUSIONS, SHALL NOT EXCEED 0.15mm PER SIDE.
  - A DIMENSION IS THE LENGTH OF TERMINAL FOR SOLDERING TO A
  - SUBSTRATE. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08mm TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE LEAD FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.14mm SEE DETAIL "B" AND SECTION B-B.
  - 6 SECTION B-B TO BE DETERMINED AT 0.10 TO 0.25mm FROM THE LEAD TIP. 7. THIS PART IS COMPLIANT WITH JEDEC REGISTRATION MO-187 AA. 8. DATUMS A AND B TO BE DETERMINED DATUM PLANE H.

CASE 1640-01 **ISSUE O 8-LEAD TSSOP PACKAGE** 

# NOTES

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