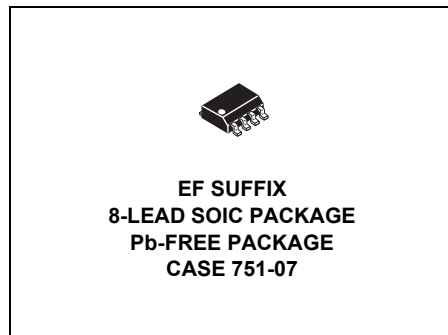


3.3 V Dual Differential LVPECL to LVTTTL Translator

The MC100ES60T23 is a dual differential LVPECL-to-LVTTTL translator. The low voltage PECL levels, small package, and dual gate design is ideal for clock translation applications.

Features

- Maximum Frequency 500 MHz
- Differential LVPECL Inputs
- LVPECL Operating Range: $V_{CC} = 3.0\text{ V to }3.6\text{ V}$
- Additive Phase Jitter, RMS: 0.18ps (typical)
- 24 mA LVTTTL Compatible Outputs
- 8-Lead SOIC Package
- Ambient Temperature Range: $-40^{\circ}\text{C to }+85^{\circ}\text{C}$
- 8-Lead Pb-Free Package
- **Use replacement part: ICS83023I**



ORDERING INFORMATION	
Device	Package
MC100ES60T23EF	SO-8 (Pb-Free)
MC100ES60T23EFR2	SO-8 (Pb-Free)

PIN DESCRIPTION	
Pin	Function
Q_n	LVTTTL Outputs
D_n, \bar{D}_n	LVPECL Differential Inputs
V_{CC}	Positive Supply
GND	Negative Supply

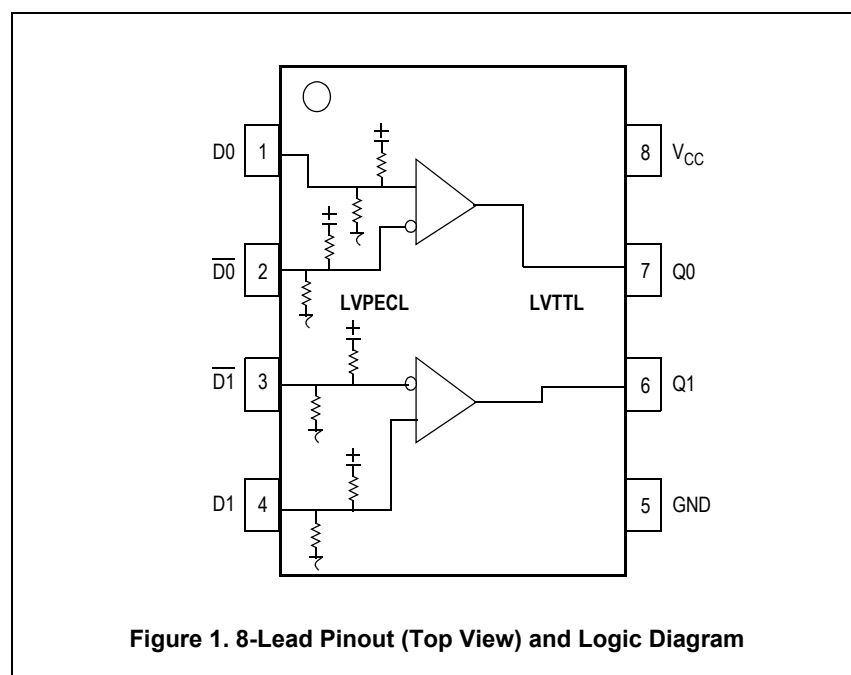


Table 1. General Specifications

Characteristics		Value
Internal Input Pulldown Resistor	D	75 k Ω
	\overline{D}	112.5 k Ω
Internal Input Pullup Resistors		75 k Ω
ESD Protection	Human Body Model	> 2000 V
	Machine Model	> 200 V
θ_{JA} Thermal Resistance (Junction to Ambient)	0 LFPM, 8 SOIC	190°C/W
	500 LFPM, 8 SOIC	130°C/W

Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test

Table 2. Absolute Maximum Ratings⁽¹⁾

Symbol	Parameter	Conditions	Rating	Unit
V_{SUPPLY}	Power Supply Voltage	Difference between V_{CC} and V_{EE}	3.9	V
V_{IN}	Input Voltage	$V_{CC} - V_{EE} \leq 3.6$ V	$V_{CC} + 0.3$	V
			$V_{EE} - 0.3$	V
I_{OUT}	Output Current	Continuous Surge	50	mA
			100	mA
T_A	Operating Temperature Range		-40 to +85	°C
T_{STG}	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. LVPECL Input DC Characteristics ($V_{CC} = 3.0$ to 3.6 V; $V_{EE} = 0$ V); $T_A = 40^\circ\text{C}$ to 85°C

Symbol	Characteristic	Min	Typ	Max	Unit
I_{CCH}	Power Supply Current (Outputs set to HIGH)		19	25	mA
I_{CCL}	Power Supply Current (Outputs set to LOW)		6.0	33	mA
V_{IH}	Input HIGH Voltage	$V_{CC} - 1165$		$V_{CC} - 880$	mV
V_{IL}	Input LOW Voltage	$V_{CC} - 1810$		$V_{CC} - 1475$	mV
V_{PP}	Differential Input Voltage ⁽¹⁾	0.15		1.3	V
V_{CMR}	Differential Cross Point Voltage ⁽²⁾	$V_{EE} + 1.1$		$V_{CC} - 0.65$	V
I_{IH}	Input HIGH Current			150	μA
I_{IL}	Input LOW Current	-150			μA

1. V_{PP} (DC) is the minimum differential input voltage swing required to maintain device functionality.
 2. V_{CMR} (DC) is the crosspoint of the differential input signal. Functional operation is obtained when the crosspoint is within the V_{CMR} (DC) range and the input swing lies within the V_{PP} (DC) specification.

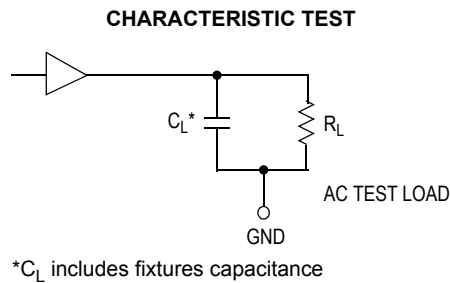
Table 4. LVTTTL / LVCMOS Output DC Characteristics ($V_{CC} = 3.0$ to 3.6 V; $T_A = 40^\circ\text{C}$ to 85°C)

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
V_{OH}	Output HIGH Voltage	$I_{OH} = -24$ mA	2.4			V
V_{OL}	Output LOW Voltage	$I_{OL} = 24$ mA			0.5	V
I_{OS}	Output Short Circuit Current		-140	-185	-275	mA

Table 5. AC Characteristics ($V_{CC} = 3.0$ to 3.6 V; $V_{EE} = 0$ V)⁽¹⁾; $T_A = 40^\circ\text{C}$ to 85°C)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
f_{OUT}	Output Toggle Frequency ⁽²⁾				500	MHz
t_{PD}	Propagation Delay		0.95		1.75	ns
t_{SK++} t_{SK--} t_{SKPP} t_{SKP}	Data Path Skew ⁽³⁾ Data Path Skew ⁽³⁾ Part-to-Part Skew ⁽³⁾ Pulse Skew ⁽³⁾				120 140 500 250	ps ps ps ps
t_{JIT}	Buffer Additive Phase Jitter, RMS; refer to Additive Phase Jitter Section	CLK0/Q0 CLK0/Q0 CLK1/Q1 CLK1/Q1	125MHz, 12kHz - 20MHz 156.25MHz, 12kHz - 20MHz 125MHz, 12kHz - 20MHz 156.25MHz, 12kHz - 20MHz	0.40 0.18 0.38 0.21		ps ps ps ps
V_{PP}	Input Voltage Swing (Differential) ⁽⁴⁾		200		1300	mV
V_{CMR}	Differential Cross Point Voltage		$V_{EE}+1.2$		$V_{CC}-0.3$	V
t_r / t_f	Output Rise/Fall Times (0.8 V – 2.0 V)		50		250	ps

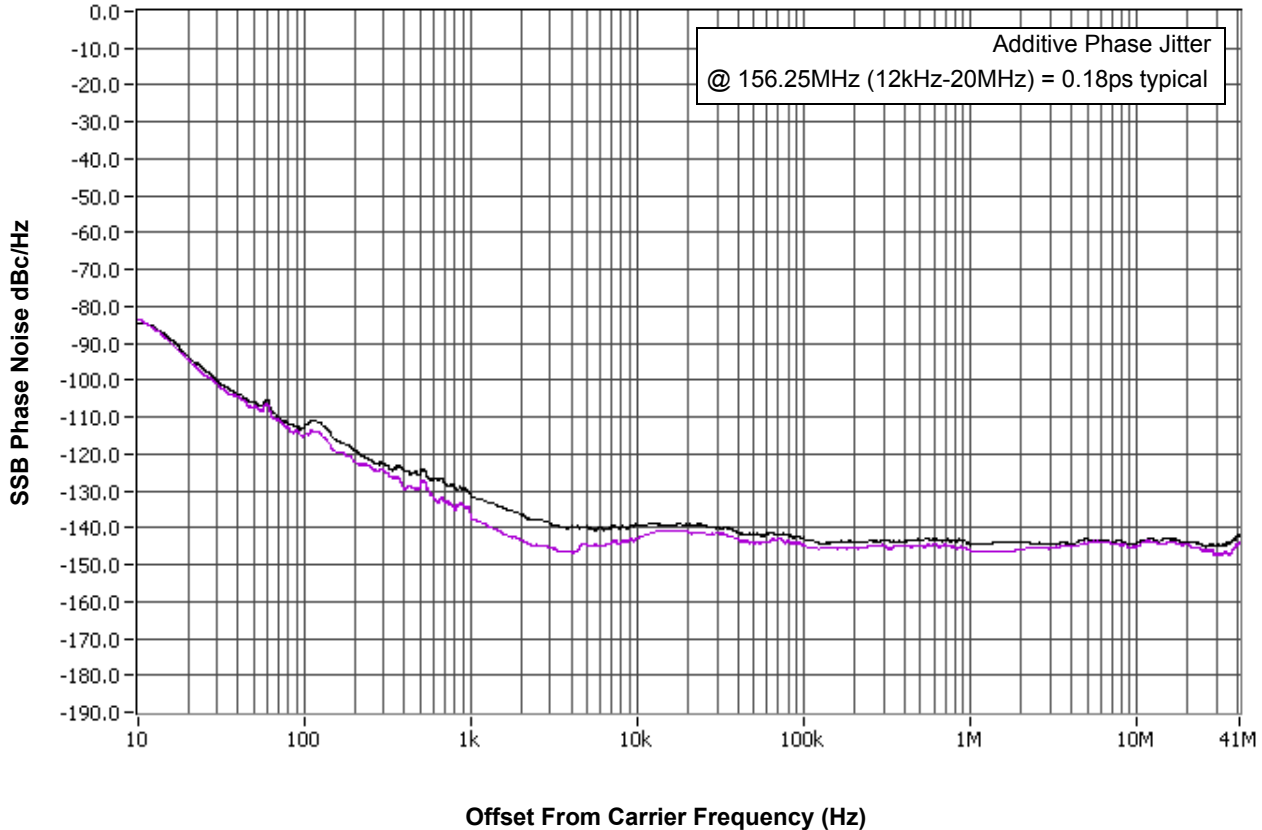
1. LVTTTL output $R_L = 500 \Omega$ to GND and $C_L = 20$ pF to GND. Refer to [Figure 2](#).
2. f_{max} guaranteed for functionality only. V_{OL} and V_{OH} levels are guaranteed at DC only.
3. Skews are measured between outputs under identical conditions.
4. 200 mV input guarantees AC Characteristics.

**Figure 2. TTL Output Loading Used for Device Evaluation**

ADDITIVE PHASE JITTER

The spectral purity in a band at a specific offset from the fundamental compared to the power of the fundamental is called the dBc Phase Noise. This value is normally expressed using a Phase noise plot and is most often the specified plot in many applications. Phase noise is defined as the ratio of the noise power present in a 1Hz band at a specified offset from the fundamental frequency to the power value of the fundamental. This ratio is expressed in decibels (dBm) or a ratio of the power in the 1Hz band to the power in the

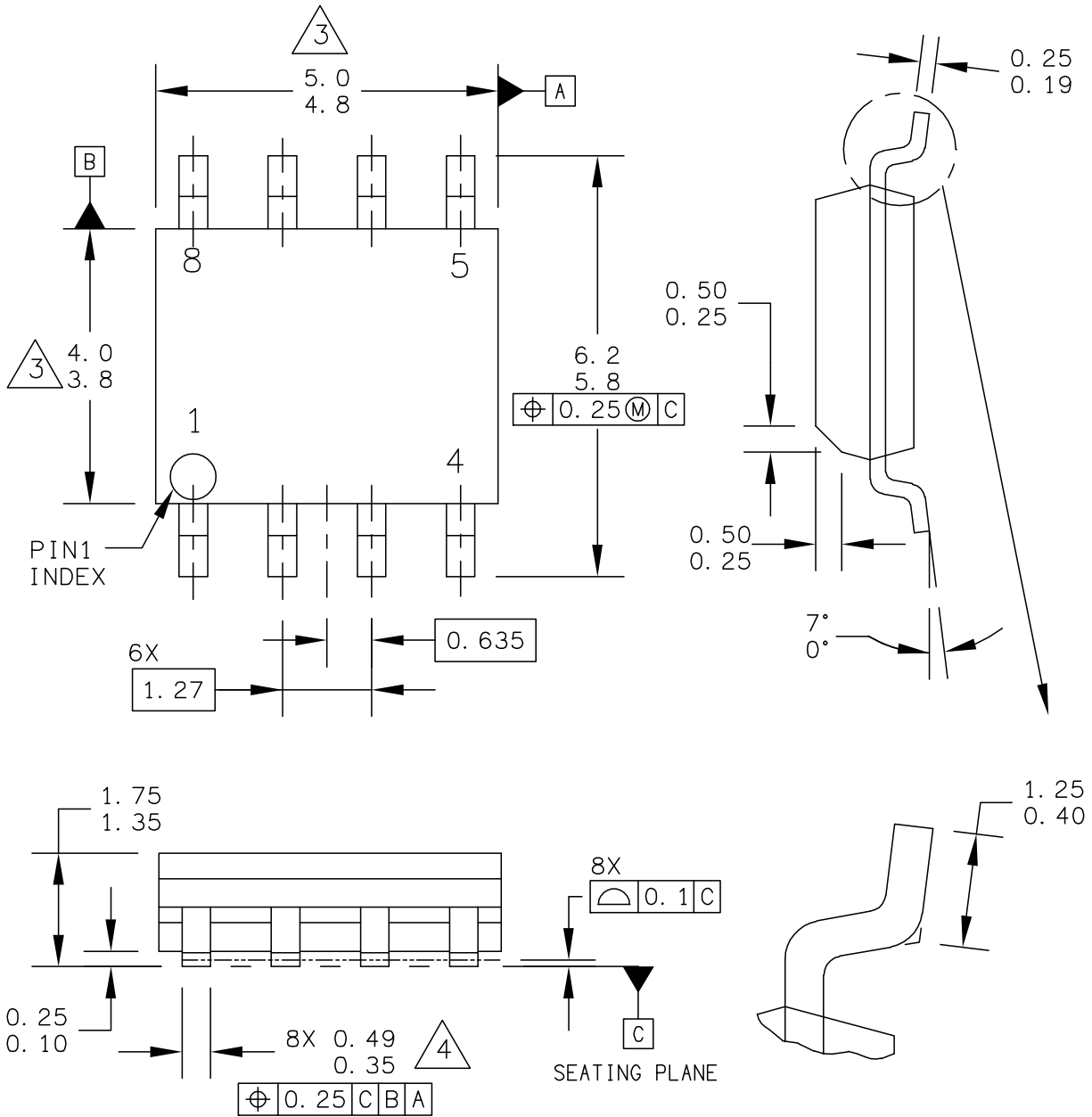
fundamental. When the required offset is specified, the phase noise is called a dBc value, which simply means dBm at a specified offset from the fundamental. By investigating jitter in the frequency domain, we get a better understanding of its effects on the desired application over the entire time record of the signal. It is mathematically possible to calculate an expected bit error rate given a phase noise plot.



As with most timing specifications, phase noise measurements have issues. The primary issue relates to the limitations of the equipment. Often the noise floor of the equipment is higher than the noise floor of the device. This is

illustrated above. The device meets the noise floor of what is shown, but can actually be lower. The phase noise is dependant on the input source and measurement equipment.

PACKAGE DIMENSIONS





© FREESCALE SEMICONDUCTOR, INC. ALL RIGHTS RESERVED.	MECHANICAL OUTLINE	PRINT VERSION NOT TO SCALE	
TITLE: 8LD SOIC NARROW BODY	DOCUMENT NO: 98ASB42564B	REV: U	
	CASE NUMBER: 751-07	07 APR 2005	
	STANDARD: JEDEC MS-012AA		

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

Revision History Sheet

NOTES:

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

© FREESCALE SEMICONDUCTOR, INC. ALL RIGHTS RESERVED.	MECHANICAL OUTLINE	PRINT VERSION NOT TO SCALE	
TITLE: 8LD SOIC NARROW BODY	DOCUMENT NO: 98ASB42564B	REV: U	
	CASE NUMBER: 751-07	07 APR 2005	
	STANDARD: JEDEC MS-012AA		

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

PAGE 2 OF 2

Rev	Table	Page	Description of Change	Date
10		1	Product Discontinuance Notice - Last Time Buy Expires on (2/3/13) Use replacement part: ICS83023I	12/14/12

We've Got Your Timing Solution



6024 Silver Creek Valley Road
San Jose, California 95138

Sales

800-345-7015 (inside USA)
+408-284-8200 (outside USA)
Fax: 408-284-2775
www.IDT.com/go/contactIDT

Technical Support

netcom@idt.com
+480-763-2056

DISCLAIMER Integrated Device Technology, Inc. (IDT) and its subsidiaries reserve the right to modify the products and/or specifications described herein at any time and at IDT's sole discretion. All information in this document, including descriptions of product features and performance, is subject to change without notice. Performance specifications and the operating parameters of the described products are determined in the independent state and are not guaranteed to perform the same way when installed in customer products. The information contained herein is provided without representation or warranty of any kind, whether express or implied, including, but not limited to, the suitability of IDT's products for any particular purpose, an implied warranty of merchantability, or non-infringement of the intellectual property rights of others. This document is presented only as a guide and does not convey any license under intellectual property rights of IDT or any third parties.

IDT's products are not intended for use in applications involving extreme environmental conditions or in life support systems or similar devices where the failure or malfunction of an IDT product can be reasonably expected to significantly affect the health or safety of users. Anyone using an IDT product in such a manner does so at their own risk, absent an express, written agreement by IDT.

Integrated Device Technology, IDT and the IDT logo are registered trademarks of IDT. Other trademarks and service marks used herein, including protected names, logos and designs, are the property of IDT or their respective third party owners.