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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



## 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.

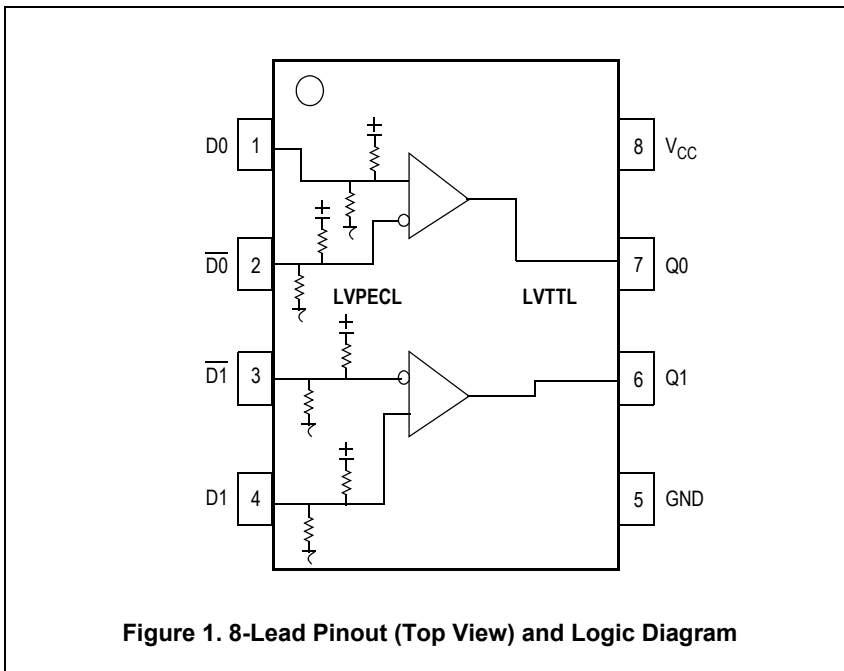
### Features

- 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 $\Omega$
	$\overline{D}$	112.5 k $\Omega$
Internal Input Pullup Resistors		75 k $\Omega$
ESD Protection	Human Body Model	> 2000 V
	Machine Model	> 200 V
$\theta_{JA}$ 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<sup>(1)</sup>**

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  $85^\circ\text{C}$** 

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 <sup>(1)</sup>	0.15		1.3	V
$V_{CMR}$	Differential Cross Point Voltage <sup>(2)</sup>	$V_{EE} + 1.1$		$V_{CC} - 0.65$	V
$I_{IH}$	Input HIGH Current			150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	-150			$\mu\text{A}$

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.

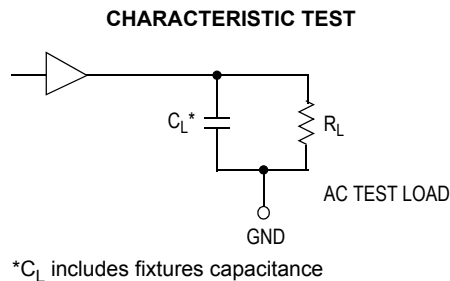
**Table 4. LVTTTL / LVCMOS Output DC Characteristics** ( $V_{CC} = 3.0$  to  $3.6$  V;  $T_A = 40^\circ\text{C}$  to  $85^\circ\text{C}$ )

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)<sup>(1)</sup>;  $T_A = 40^\circ\text{C}$  to  $85^\circ\text{C}$ )

Symbol	Characteristic		Test Conditions	Min	Typ	Max	Unit
$f_{OUT}$	Output Toggle Frequency <sup>(2)</sup>					500	MHz
$t_{PD}$	Propagation Delay			0.95		1.75	ns
$t_{SK++}$ $t_{SK--}$ $t_{SKPP}$ $t_{SKP}$	Data Path Skew <sup>(3)</sup> Data Path Skew <sup>(3)</sup> Part-to-Part Skew <sup>(3)</sup> Pulse Skew <sup>(3)</sup>					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) <sup>(4)</sup>			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

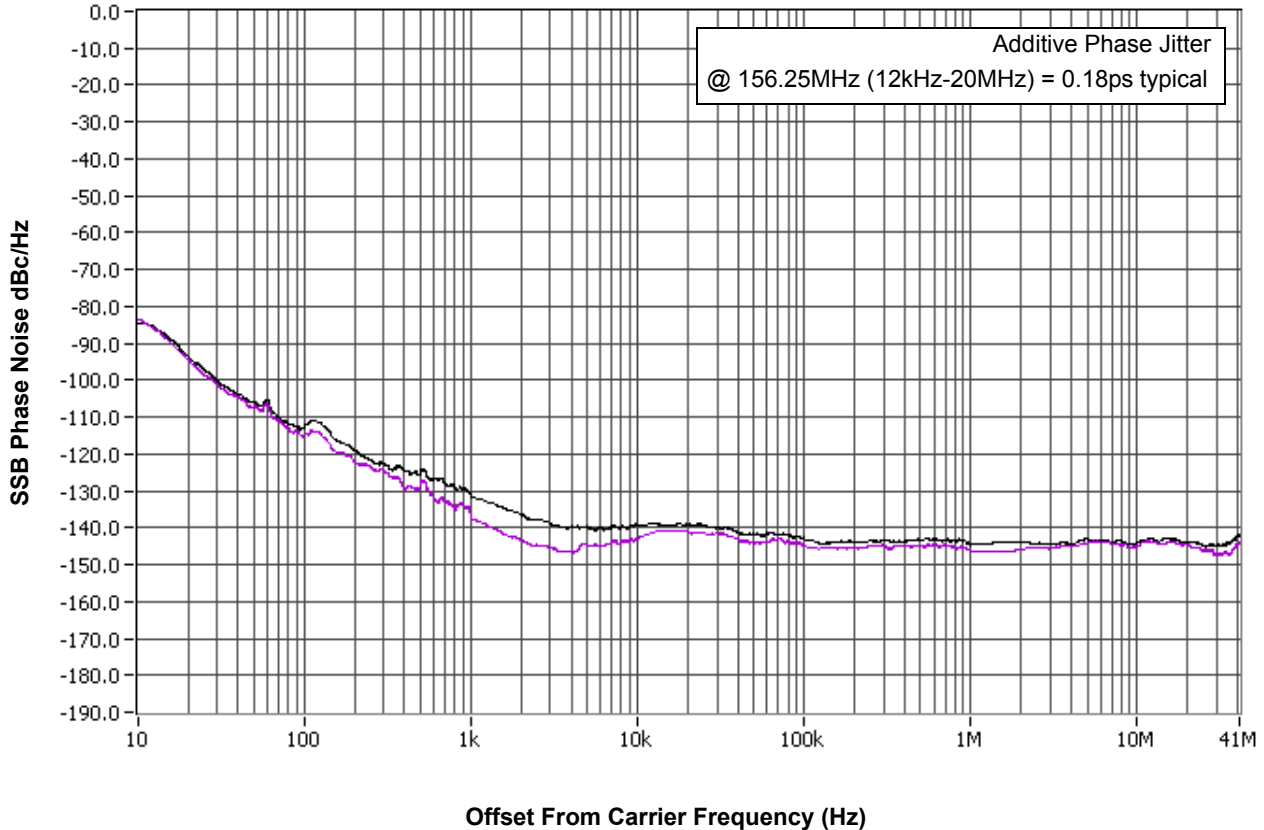
1. LVTTTL output  $R_L = 500 \Omega$  to GND and  $C_L = 20$  pF to GND. Refer to [Figure 2](#).
2.  $f_{max}$  guaranteed for functionality only.  $V_{OL}$  and  $V_{OH}$  levels are guaranteed at DC only.
3. Skews are measured between outputs under identical conditions.
4. 200 mV input guarantees AC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

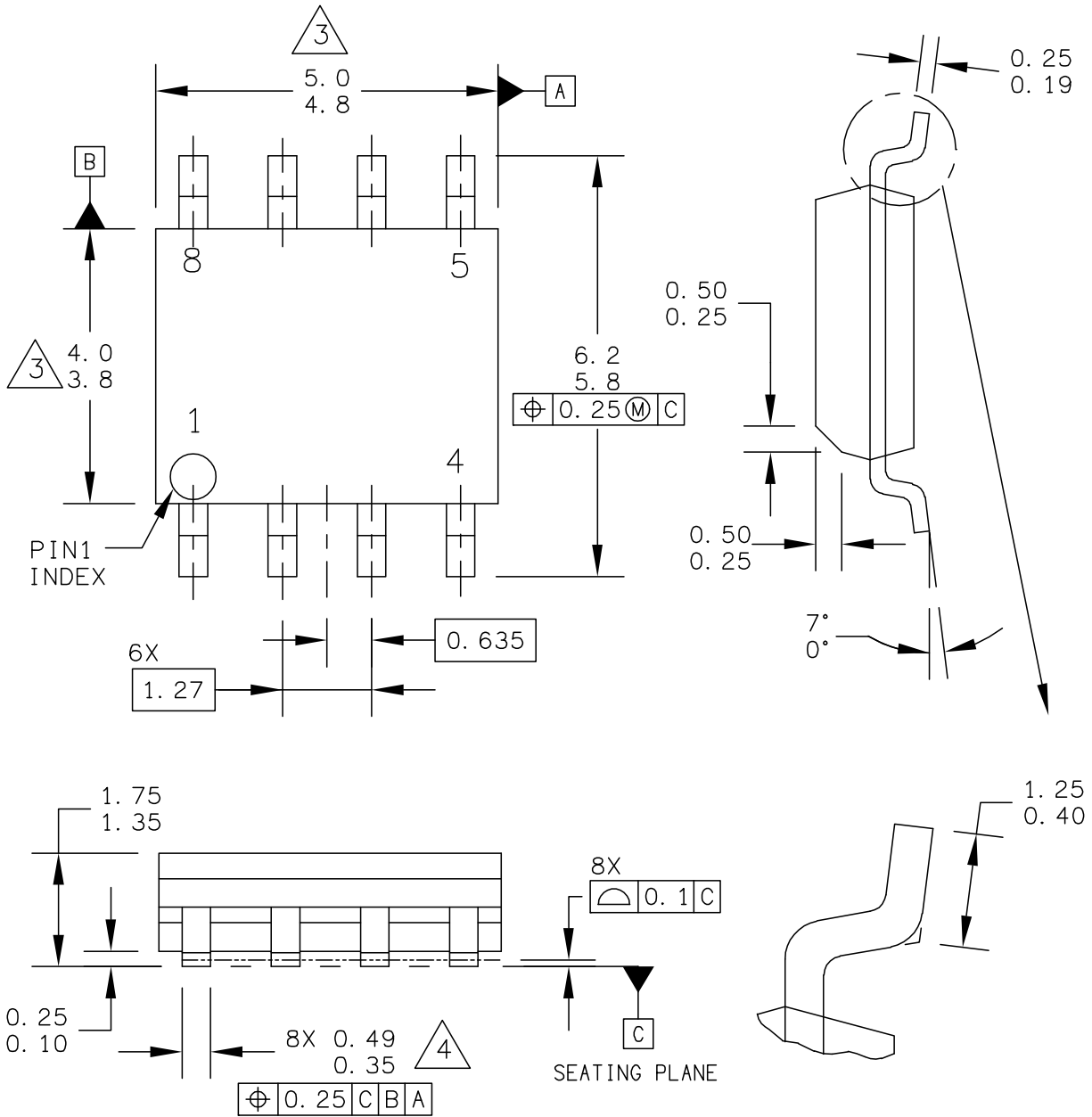
fundamental. When the required offset is specified, the phase noise is called a dBc value, which simply means dBm at a specified offset from the fundamental. By investigating jitter in the frequency domain, we get a better understanding of its effects on the desired application over the entire time record 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**





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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.

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



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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](http://www.IDT.com/go/contactIDT)

### Technical Support

[netcom@idt.com](mailto:netcom@idt.com)  
+480-763-2056

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