## **PACKAGE/ORDERING INFORMATION**



TOP VIEW 8-Pin MLF®

Ultra-Small Outline (2mm x 2mm)

# **Ordering Information**

Part Number	Package Type	Operating Range	Package Marking	Lead Finish
SY89313VMITR	MLF-8	Industrial	313	Sn-Pb
SY89313VMGTR <sup>(1)</sup>	MLF-8	Industrial	313 with Pb-Free bar-line indicator	Pb-Free NiPdAu

Note:

1. Pb-Free package is recommended for new designs.

#### **PIN DESCRIPTION**

Pin Number	Pin Name	Туре	Pin Function
2, 3	CLK, /CLK	100K ECL/PECL Input	Differential PECL/ECL Input: Internal $75k\Omega$ pull-down resistor. If left open, pin defaults LOW. See "Input Interface Applications" section for single-ended inputs.
7, 6	Q, /Q	100K Output	Differential PECL/ECL Output: Output CLK input divided by 4. See "Output Interface Applications" section for recommendations on terminations.
8	VCC	Positive Power Supply	Positive Power Supply: Bypass with $0.1\mu F//0.01\mu F$ low ESR capacitors.
5	VEE, Exposed Pad	Negative Power Supply	Negative Power Supply: V <sub>EE</sub> and Exposed pad must be tied to most negative supply. For PECL/LVPECL connect to ground.
4	VBB	Reference Voltage Output	Bias Reference Voltage: $V_{CC}$ -1.4V. Used as reference voltage for single- ended input or AC-coupling to the CLK, /CLK inputs. Max sink/source is ±0.5mA. See "Input Interface Applications" section.
1	Reset	100EP Input	Single-ended Input: PECL/ECL Asynchronous reset.

## Absolute Maximum Ratings<sup>(1)</sup>

Supply Voltage (V <sub>CC</sub> )	0.5V to +6.0V
Input Voltage (V <sub>IN</sub> )	–0.5V to V <sub>CC</sub>
LVPECL Output Current (I <sub>OUT</sub> )	
Continuous	50mA
Surge	100mA
Current (V <sub>BB</sub> )	
Source or sink current on V <sub>BB</sub> , Note 3	±1.5mA
Lead Temperature (soldering, 20 sec.)	+260°C
Storage Temperature (T <sub>S</sub> )	. –65°C to +150°C

# Operating Ratings<sup>(2)</sup>

Supply Voltage (V <sub>CC</sub> )	3.0V to 3.6V
	4.5V to 5.5V
Ambient Temperature (T <sub>A</sub> )	40°C to +85°C
Package Thermal Resistance <sup>(4)</sup>	
$MLF^{(R)}(\theta_{1A})$	
Still-Air	93°C/W
500lfpm	~87°C/W
$MLF^{\mathbb{R}}(\Psi_{IB})$	
Junction-to-Board	60°C/W

#### PECL/ECL (100K) DC ELECTRICAL CHARACTERISTICS

 $V_{CC}$  = +3.3V ±10% or +5V ±10% and  $V_{EE}$  = 0V;  $V_{CC}$  = 0V and  $V_{EE}$  = -3.3V ±10% or -5V ±10%;  $R_L$  = 50 $\Omega$  to  $V_{CC}$ -2V;  $T_A$  = -40°C to +85°C unless otherwise noted.

Symbol	Parameter	Condition		Min	Тур	Max	Units
I <sub>EE</sub>	Power Supply Current	Max V <sub>CC</sub> , No Load			30	40	mA
V <sub>OH</sub>	Output HIGH Voltage		Vc	<sub>CC</sub> -1.145	—	V <sub>CC</sub> -0.895	V
V <sub>OL</sub>	Output LOW Voltage		Vc	<sub>CC</sub> -1.945	—	V <sub>CC</sub> -1.695	V
V <sub>IH</sub>	Input HIGH Voltage		Vc	<sub>CC</sub> -1.225	—	V <sub>CC</sub> -0.88	V
V <sub>IL</sub>	Input LOW Voltage		Vc	<sub>CC</sub> –1.945	—	V <sub>CC</sub> -1.625	V
V <sub>IHCMR</sub>	Input HIGH Voltage Common Mode Range	Note 5	V	/ <sub>EE</sub> +2.0	—	V <sub>CC</sub>	V
V <sub>BB</sub>	Bias Voltage		Vc	<sub>CC</sub> -1.525	V <sub>CC</sub> -1.425	V <sub>CC</sub> -1.325	V
I <sub>IH</sub>	Input HIGH Current			_	—	150	μA
I <sub>IL</sub>	Input LOW Current CLK, RESET			0.5	—	_	μA
	Input LOW Current /CLK			-150	_	_	μA

Notes:

- 1. Permanent device damage may occur if absolute maximum ratings are exceeded. This is a stress rating only and functional operation is not implied at conditions other than those detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
- 2. The data sheet limits are not guaranteed if the device is operated beyond the operating ratings.
- 3. Due to the limited drive capability use for input of the same package only.
- 4. Package thermal resistance assumes exposed pad is soldered (or equivalent) to the devices most negative potential on the PCB.
- 5.  $V_{IHCMR}$  (min) varies 1:1 with  $V_{EE}$ , (max) varies 1:1 with  $V_{CC}$ .

# AC ELECTRICAL CHARACTERISTICS<sup>(6)</sup>

 $V_{CC}$  = +3.3V ±10% or +5V ±10% and  $V_{EE}$  = 0V;  $V_{CC}$  = 0V and  $V_{EE}$  = -3.3V ±10% or -5V ±10%;  $R_L$  = 50 $\Omega$  to  $V_{CC}$ -2V;  $T_A$  = -40°C to +85°C unless otherwise noted.

Symbol	Parameter	Condition	Min	Тур	Max	Units
f <sub>MAX</sub>	Maximum Input Frequency		4	—	_	GHz
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay to Output CLK → Q (SY10EP33V) RESET→ Q (SY100EP33V) RESET→ Q		300 300 310	380 420 420	460 500 500	ps
t <sub>RR</sub>	Set/Reset Recovery		200	100	_	ps
t <sub>PW</sub>	Minimum Pulse Width RESET		550	200	_	ps
t <sub>JITTER</sub>	Cycle-to-Cycle RMS Jitter		—	—	1	ps <sub>RMS</sub>
V <sub>PP</sub>	Input Voltage Swing (Differential)		150	800	1200	mV
t <sub>r</sub> t <sub>f</sub>	Output Rise/Fall Times Q, /Q (20% to 80%)		90	180	240	ps

Note:

6. Measured using a 750mV source, 50% duty cycle clock source. All loading with 50 $\Omega$  to V  $_{CC}$  –2.0V.

**TIMING DIAGRAM** 



### INPUT INTERFACE APPLICATIONS



#### Figure 1. Single-Ended LVPECL Input (Terminating Unused Input)

#### LVPECL OUTPUT INTERFACE APPLICATIONS











# 8 LEAD ULTRA-SMALL EPAD-*Micro*LeadFrame<sup>®</sup> (MLF-8)



PCB Thermal Consideration for 8-Pin MLF® Package

#### Package Notes:

- 1. Package meets Level 2 moisture sensitivity classification, and is shipped in dry-pack form.
- Exposed pads must be soldered to plane equivalent to device V<sub>EE</sub> pin's potential for proper thermal management.

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