



Precision Edge®

- **Guaranteed AC performance over temp and voltage:**  
DC-to >1.5Gbps data rate throughput  
>750MHz clock  $f_{MAX}$   
<50ps within-device skew
- **Ultra-low jitter design:**  
RMS random jitter  
PP deterministic jitter  
RMS cycle-to-cycle jitter  
PP total jitter (clock)
- **Accepts CML, PECL, LVPECL inputs**
- **350mV LVDS output swing**
- **Power supply 3.3V ±10% or 5.0V ±10%**
- **°C to +85°C temperature range**
- **Available in ultra-small (2mm × 2mm) 8-pin MLF®**

## DESCRIPTION

The SY89325V is a fully differential, CML/PECL/LVPECL-to-LVDS translator. It achieves LVDS signaling up to 1.5Gbps and clock rates of 750MHz, depending of the distance and the characteristics of the media and noise coupling sources. LVDS is intended to drive 50Ω impedance transmission line media such as PCB traces, backplanes, or cables.

SY89325V inputs can be terminated with a single resistor between the true and complement pins of the input.

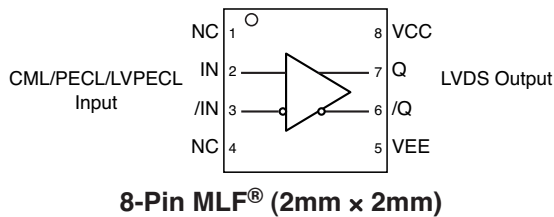
The SY89325V is a member of Micrel's Precision Edge® family of high-speed logic devices. This family features ultra-small packaging, high signal integrity, and operation at many different supply voltages. For applications that require dual translators, consider the SY55855V.

All support documentation can be found on Micrel's web site at [www.micrel.com](http://www.micrel.com).

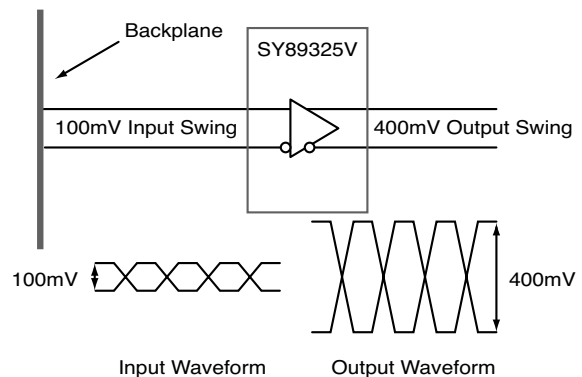
## APPLICATIONS

- High-speed logic
- Data communications systems
- Wireless communications systems
- Telecom systems

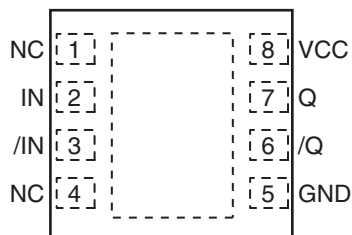
## FUNCTIONAL BLOCK DIAGRAM



## TYPICAL APPLICATIONS CIRCUIT



## PACKAGE/ORDERING INFORMATION



**8-Pin MLF<sup>®</sup> (MLF-8)**

## Ordering Information

Part Number	Package Type	Operating Range	Package Marking	Lead Finish
SY89325VMITR	MLF-8	Industrial	325	Sn-Pb
SY89325VMGTR <sup>(1)</sup>	MLF-8	Industrial	325 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	Pin Function
	IN, /IN	Differential Inputs: These input pairs are the differential signal inputs to the device. These inputs accept AC- or DC-coupled signals as small as 100mV. External termination is required.
	VCC	Positive power supply. Bypass with 0.1 $\mu$ F   0.01 $\mu$ F low ESR capacitors.
	Q, /Q	Differential LVDS Output: This output is the output of the device. Terminate with 100 $\Omega$ across the pair. See "Output Interface Applications" section.
	GND, Exposed	Ground. Ground pin and exposed pad must be connected to the same ground plane.
	NC	No connect.

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

Supply Voltage ( $V_{CC}$ ) ..... -0.5V to + 6.0V  
 Input Voltage ( $V_{IN}$ ) ..... -0.5V to  $V_{CC} + 0.5V$

Source or sink current on IN, /IN ..... ±50mA  
 CML Output Voltage ( $V_{OUT}$ ) .....  $V_{CC} - 1.0V$  to  $V_{CC} + 0.5V$   
 Lead Temperature (soldering, 20 sec.) ..... +260°C  
 Storage Temperature ( $T_S$ ) ..... -65°C to +150°C

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

Supply Voltage ( $V_{CC}$ ) ..... +3.0V to +3.6V  
 ..... +4.5V to +5.0V  
 Ambient Temperature ( $T_A$ ) ..... -40°C to +85°C  
 Package Thermal Resistance<sup>(3)</sup>  
 MLF® ( $\theta_{JA}$ )  
 Still-Air ..... 93°C/W  
 MLF® ( $\Psi_{JB}$ )  
 Junction-to-board ..... 60°C/W

### DC ELECTRICAL CHARACTERISTICS<sup>(4)</sup>

°C to +85°C; unless stated.

Parameter	Condition	Min	Typ	Max	Units
Power Supply		3.0	3.3	3.6	V
		4.5	5.0	5.7	V
Power Supply Current	$V_{CC} \leq 3.6V$			50	mA
	$3.6V \leq V_{CC} \leq 5.7V$			80	mA

### INPUT DC ELECTRICAL CHARACTERISTICS<sup>(4)</sup>

±10% or 5.0V ±10%;  $T_A = -40^\circ\text{C}$  to +85°C.

Parameter	Condition	Min	Typ	Max	Units
Input HIGH Voltage (IN, /IN)		1.6		$V_{CC}$	V
Input LOW Voltage (IN, /IN)		1.5		$V_{CC} - 0.1$	V
Input Voltage Swing (IN, /IN)	See Figure 1a.	100			mV
Differential Input Voltage Swing IIN - /INI	See Figure 1b.	200			mV

### LVDS OUTPUT DC ELECTRICAL CHARACTERISTICS<sup>(4)</sup>

±10% or 5.0V ±10%;  $T_A = -40^\circ\text{C}$  to +85°C;  $R_L = 100\Omega$  across output pair, or equivalent, unless otherwise stated.

Parameter	Condition	Min	Typ	Max	Units
Output HIGH Voltage	$I_{OH} = -4.0\text{mA}$			1.474	V
Output LOW Voltage	$I_{OL} = 4.0\text{mA}$	0.925			V
Output Common Mode Voltage		1.125		1.375	V
$\Delta$ Change in Common Mode Voltage		-50		+50	mV
Output Voltage Swing		250	350		mV
DIFF-OUT Differential Output Voltage Swing		500	700		mV

Permanent device damage may occur if ratings in the "Absolute Maximum Ratings" section are exceeded. This is a stress rating only and functional operation is not implied for conditions other than those detailed in the operational sections of this data sheet. Exposure to absolute maximum ratings conditions for extended periods may affect device reliability.

The data sheet limits are not guaranteed if the device is operated beyond the operating ratings.

Package thermal resistance assumes exposed pad is soldered (or equivalent) to the device's most negative potential on the PCB.  $\Psi_{JB}$  uses 4-layer  $\theta$  in still-air unless otherwise stated.

The circuit is designed to meet the DC specifications shown in the above table after thermal equilibrium has been established.

## AC ELECTRICAL CHARACTERISTICS<sup>(5)</sup>

±10% or 5.0V ±10%;  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ; output loaded with  $100\Omega$  across the output pair, or equivalent unless otherwise stated.

Parameter	Condition	Min	Typ	Max	Units
Maximum Operating Frequency	$V_{OUT} \geq 200\text{mV}$ NRZ Data Clock	1.5			Gbps
			750		MHz
Propagation Delay IN-to-Q	$V_{IN} \geq 100\text{mV}$	300		700	ps
Random Jitter (RJ)	<b>Note 6</b>			1	ps <sub>RMS</sub>
Deterministic Jitter (DJ)	<b>Note 7</b>			10	ps <sub>PP</sub>
Cycle-to-Cycle Jitter	<b>Note 8</b>			1	ps <sub>RMS</sub>
Total Jitter (TJ)	<b>Note 9</b>			10	ps <sub>PP</sub>
Rise / Fall Time (20% to 80%) Q, /Q	At full output swing.	100		300	ps

Measured with 100mV input swing. See “Timing Diagrams” section for definition of parameters. High-frequency AC-parameters are guaranteed by design and characterization.

Random jitter is measured with a K28.7 comma detect character pattern, measured at 1.5Gbps.

Deterministic jitter is measured at  $f_{MAX}$ , with both K28.5 and  $2^{23}-1$  PRBS pattern

Cycle-to-cycle jitter definition: the variation of periods between adjacent cycles,  $T_n - T_{n-1}$  where T is the time between rising edges of the output

Total jitter definition: with an ideal clock input of frequency  $\leq f_{MAX}$ , no more than one output edge in  $10^{12}$  output edges will deviate by more than the specified peak-to-peak jitter value.

## SINGLE-ENDED AND DIFFERENTIAL SWINGS

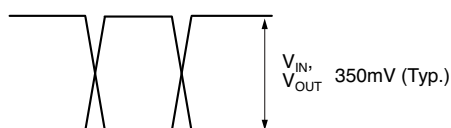


Figure 1a. Single-Ended Voltage Swing

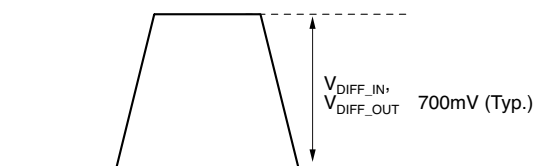


Figure 1b. Differential Voltage Swing

## TIMING DIAGRAM

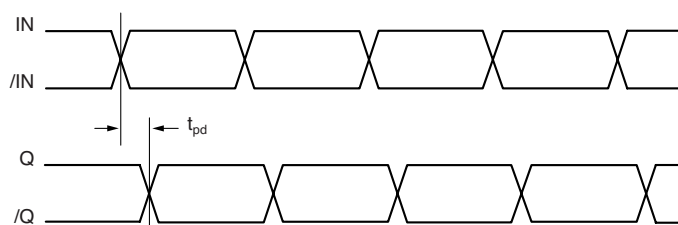
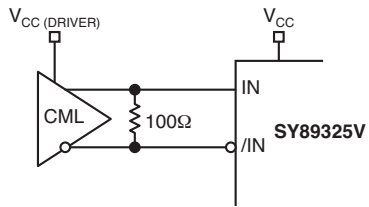


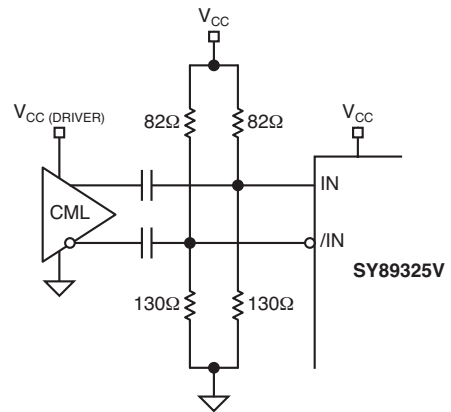
Figure 2. Timing Diagram

**INPUT INTERFACE APPLICATIONS**

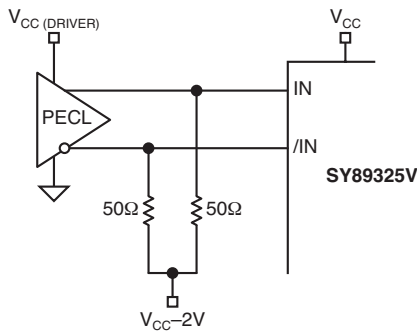


Note:  $V_{CC}$  of SY89325V must be  $\geq V_{CC(DRIVER)}$

**Figure 3. CML-DC Coupled**

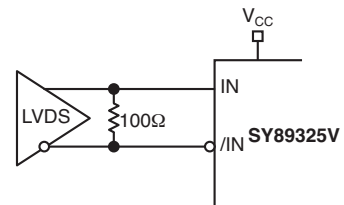


**Figure 5. CML-AC Coupled**



Note:  $V_{CC}$  of SY89325V must be  $\geq V_{CC(DRIVER)}$

**Figure 4. PECL-DC Coupled**



**Figure 6. LVDS**

## OUTPUT INTERFACE APPLICATIONS

LVDS specifies a small swing of 350mV typical, on a nominal 1.25V common mode above ground. The common mode voltage has tight limits to permit large variations in

ground between an LVDS driver and receiver. Also, change in common mode voltage, as a function of data input, is kept to a minimum, to keep EMI low.

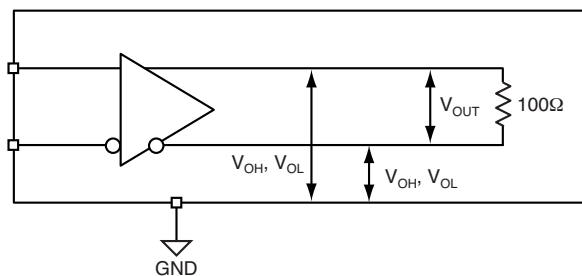


Figure 8a. LVDS Differential Measurement

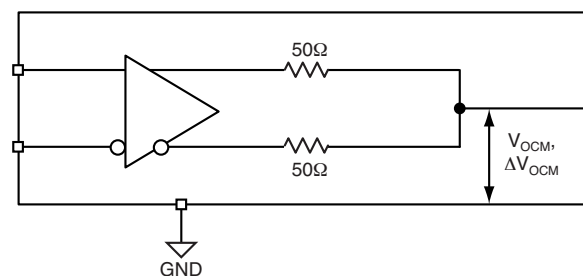
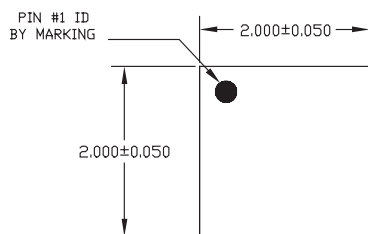


Figure 8b. LVDS Common Mode Measurement

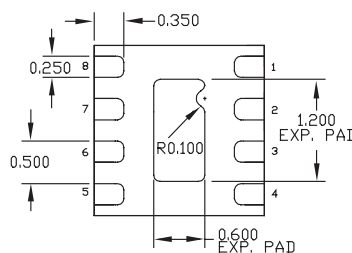
## RELATED PRODUCT AND SUPPORT DOCUMENTATION

Part Number	Function	Data Sheet Link
	Dual CML/PECL/LVPECL-to-LVDS Translator	<a href="http://www.micrel.com/product-info/products/sy55855v.shtml">www.micrel.com/product-info/products/sy55855v.shtml</a>
	MLF® Application Note	<a href="http://www.amkor.com/products/notes_papers/MLF_AppNote_0902.pdf">www.amkor.com/products/notes_papers/MLF_AppNote_0902.pdf</a>
HBW Solutions	New Products and Applications	<a href="http://www.micrel.com/product-info/products/solutions.shtml">www.micrel.com/product-info/products/solutions.shtml</a>

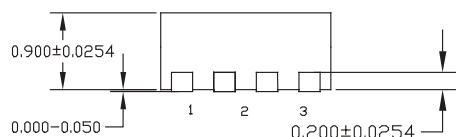
## LeadFrame® (MLF-8)



TOP VIEW

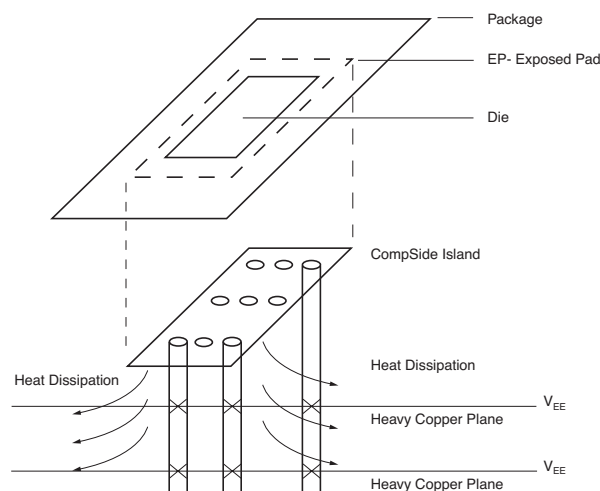


BOTTOM VIEW



SIDE VIEW

- NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
  2. MAX. PACKAGE WARPAGE IS 0.05 mm.
  3. MAXIMUM ALLOWABLE BURRS IS 0.076 mm IN ALL DIRECTIONS.
  4. PIN #1 ID ON TOP WILL BE LASER/INK MARKED.



### PCB Thermal Consideration for 8-Pin MLF® Package

#### Package Notes:

1. Package meets Level 2 qualification.
2. All parts are dry-packaged before shipment.
3. Exposed pads must be soldered to a ground for proper thermal management.

**MICREL, INC. 2180 FORTUNE DRIVE SAN JOSE, CA 95131 USA**

TEL + 1 (408) 944-0800 FAX + 1 (408) 474-1000 WEB <http://www.micrel.com>

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