



# 5V/3.3V 2.5Gbps VARIABLE OUTPUT SWING DIFFERENTIAL RECEIVER

ECL Pro™  
SY100EP16VS

## FEATURES

- 3.3V and 5V power supply options
- Fast output transitions  $<160\text{ps } t_r / t_f$
- Guaranteed operation over  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$  temperature range
- Functionally equivalent to SY88927V and SY10EP16V
- Variable output swing from 100mV to 700mV
- Available in 8-pin (3mm) EPAD-MSOP package

## APPLICATIONS

- Multimode optical transceiver
- VCSEL driver
- Backplane receiver



ECL Pro™

## DESCRIPTION

The SY100EP16VS are differential receivers with variable output swing. The devices are functionally equivalent to the EP16V devices with an input that controls the amplitude of the outputs. EP16VS is commonly used as VCSEL laser driver.

The operational range of the EP16VS control input is from  $V_{BB}$  (max. swing) to  $V_{CC}$  (min. swing). Simple control of the output swing can be obtained by a variable resistor between the  $V_{BB}$  pin and  $V_{CC}$  with the wiper driving  $V_{CTRL}$ .

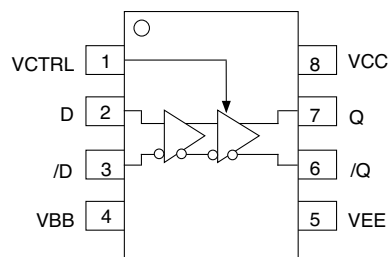
The EP16VS provides a  $V_{BB}$  output for either single-ended use or as a DC bias for AC coupling to the device. The  $V_{BB}$  pin should be used only as a bias for the EP16VS as its current sink/source capability is limited. Whenever used, the  $V_{BB}$  pin should be bypassed with a  $0.01\mu\text{F}$  capacitor to  $V_{CC}$  (in PECL mode).

Under open input conditions (pulled to  $V_{EE}$ ), internal input clamps will force the Q output LOW.

## PIN NAMES

| Pin        | Function                         |
|------------|----------------------------------|
| D, /D      | PECL Data Inputs                 |
| Q, /Q      | Data Outputs                     |
| $V_{BB}$   | Reference Voltage Output         |
| $V_{CTRL}$ | Output Swing Control             |
| $V_{CC}$   | Most Positive Power Supply Input |
| $V_{EE}$   | Most Negative Power Supply Input |

## PACKAGE/ORDERING INFORMATION



8-Pin EPAD-MSOP

Ordering Information<sup>(1)</sup>

| Part Number                       | Package Type | Operating Range | Package Marking                      | Lead Finish      |
|-----------------------------------|--------------|-----------------|--------------------------------------|------------------|
| SY100EP16VSKC                     | K8-2         | Commercial      | P16S                                 | Sn-Pb            |
| SY100EP16VSKCTR <sup>(2)</sup>    | K8-2         | Commercial      | P16S                                 | Sn-Pb            |
| SY100EP16VSKI                     | K8-2         | Industrial      | P16S                                 | Sn-Pb            |
| SY100EP16VSKITR <sup>(2)</sup>    | K8-2         | Industrial      | P16S                                 | Sn-Pb            |
| SY100EP16VSKY <sup>(3)</sup>      | K8-2         | Industrial      | P16S with Pb-Free bar-line indicator | Pb-Free Matte-Sn |
| SY100EP16VSKYTR <sup>(2, 3)</sup> | K8-2         | Industrial      | P16S with Pb-Free bar-line indicator | Pb-Free Matte-Sn |

## Notes:

1. Contact factory for die availability. Dice are guaranteed at  $T_A = 25^\circ\text{C}$ , DC Electricals only.
2. Tape and Reel.
3. Pb-Free package is recommended for new designs.

**ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>**

| Symbol             | Rating                                                                                                                                                                                         | Value                  | Unit   |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------|
| V <sub>EE</sub>    | Power Supply Voltage (V <sub>CC</sub> = 0)                                                                                                                                                     | –6.0 to 0              | V      |
| V <sub>CC</sub>    | Power Supply Voltage (V <sub>EE</sub> = 0)                                                                                                                                                     | +6.0 to 0              | V      |
| V <sub>IN</sub>    | Input Voltage (V <sub>CC</sub> = 0V, V <sub>IN</sub> not more negative than V <sub>EE</sub> )<br>Input Voltage (V <sub>EE</sub> = 0V, V <sub>IN</sub> not more negative than V <sub>CC</sub> ) | –6.0 to 0<br>+6.0 to 0 | V<br>V |
| I <sub>OUT</sub>   | Output Current<br>–Continuous<br>–Surge                                                                                                                                                        | 50<br>100              | mA     |
| I <sub>BB</sub>    | V <sub>BB</sub> Sink/Source Current <sup>(2)</sup>                                                                                                                                             | ±0.5                   | mA     |
| T <sub>A</sub>     | Operating Temperature Range                                                                                                                                                                    | –40 to +85             | °C     |
| T <sub>store</sub> | Storage Temperature Range                                                                                                                                                                      | –65 to +150            | °C     |
| T <sub>LEAD</sub>  | Lead Temperature (soldering, 20sec.)                                                                                                                                                           | 260                    | °C     |
| θ <sub>JA</sub>    | Package Thermal Resistance<br>(Junction-to-Ambient)<br>–Still-Air                                                                                                                              | 38                     | °C/W   |

**Note 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.

**DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>**

V<sub>CC</sub> = +5V ±10% or +3.3V ±10%; R<sub>LOAD</sub> = 50Ω to V<sub>CC</sub> –2V<sup>(2)</sup>

| Symbol          | Parameter                                                                                                       | T <sub>A</sub> = –40°C |                       | T <sub>A</sub> = +25°C |                       |                       | T <sub>A</sub> = +85°C |                       | Unit |
|-----------------|-----------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|------------------------|-----------------------|-----------------------|------------------------|-----------------------|------|
|                 |                                                                                                                 | Min.                   | Max.                  | Min.                   | Typ.                  | Max.                  | Min.                   | Max.                  |      |
| I <sub>EE</sub> | Power Supply Current                                                                                            | —                      | 51                    | —                      | —                     | 51                    | —                      | 51                    | mA   |
| V <sub>BB</sub> | Output Reference Voltage                                                                                        | V <sub>CC</sub> –1.38  | V <sub>CC</sub> –1.26 | V <sub>CC</sub> –1.38  | —                     | V <sub>CC</sub> –1.26 | V <sub>CC</sub> –1.38  | V <sub>CC</sub> –1.26 | V    |
| V <sub>OH</sub> | Output HIGH Voltage <sup>(3)</sup>                                                                              | V <sub>CC</sub> –1085  | V <sub>CC</sub> –880  | V <sub>CC</sub> –1025  | V <sub>CC</sub> –0955 | V <sub>CC</sub> –880  | V <sub>CC</sub> –1025  | V <sub>CC</sub> –880  | mV   |
| V <sub>OL</sub> | Output LOW Voltage <sup>(3)</sup><br>V <sub>CTRL</sub> = V <sub>BB</sub><br>V <sub>CTRL</sub> = V <sub>CC</sub> | V <sub>CC</sub> –1900  | V <sub>CC</sub> –1650 | V <sub>CC</sub> –1900  | —                     | V <sub>CC</sub> –1650 | V <sub>CC</sub> –1900  | V <sub>CC</sub> –1650 | mV   |
|                 |                                                                                                                 | V <sub>CC</sub> –1125  | V <sub>CC</sub> –975  | V <sub>CC</sub> –1125  | —                     | V <sub>CC</sub> –975  | V <sub>CC</sub> –1125  | V <sub>CC</sub> –975  | mV   |
| V <sub>IH</sub> | Input HIGH Voltage                                                                                              | V <sub>CC</sub> –1165  | V <sub>CC</sub> –880  | 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                                                                                               | V <sub>CC</sub> –1810  | V <sub>CC</sub> –1475 | V <sub>CC</sub> –1810  | —                     | V <sub>CC</sub> –1475 | V <sub>CC</sub> –1810  | V <sub>CC</sub> –1475 | mV   |
| I <sub>IH</sub> | Input HIGH Current D, /D<br>V <sub>CTRL</sub> <sup>(4)</sup>                                                    | —                      | 150                   | —                      | —                     | 150                   | —                      | 150                   | μA   |
|                 |                                                                                                                 | —                      | 80                    | —                      | —                     | 80                    | —                      | 80                    | μA   |
| I <sub>IL</sub> | Input LOW Current                                                                                               | 0.5                    | —                     | 0.5                    | —                     | —                     | 0.5                    | —                     | μA   |

**Note 1.** 100EP 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 traverse airflow greater than 500lfpm is maintained.

**Note 2.** Input and output parameters vary 1:1 with V<sub>CC</sub>.

**Note 3.** All loading with 50Ω to V<sub>CC</sub> – 2.0V.

**Note 4.** V<sub>CTRL</sub> = V<sub>CC</sub> –0.88V.

**AC ELECTRICAL CHARACTERISTICS**
 $V_{CC} = +5V \pm 10\%$  or  $+3.3V \pm 10\%$ ;  $R_{LOAD} = 50\Omega$  to  $V_{CC} - 2V$ 

| Symbol                 | Parameter                                             | $T_A = -40^\circ C$ |          |                | $T_A = +25^\circ C$ |          |                | $T_A = +85^\circ C$ |          |                | Unit |
|------------------------|-------------------------------------------------------|---------------------|----------|----------------|---------------------|----------|----------------|---------------------|----------|----------------|------|
|                        |                                                       | Min.                | Typ.     | Max.           | Min.                | Typ.     | Max.           | Min.                | Typ.     | Max.           |      |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>to Output<br>D (Diff)<br>D (SE)  | 100<br>100          | —<br>250 | 250<br>350     | 100<br>100          | —<br>250 | 250<br>350     | 120<br>120          | —<br>280 | 300<br>400     | ps   |
| $V_{PP}$               | Minimum Input Swing <sup>(1)</sup>                    | 150                 | —        | —              | 150                 | —        | —              | 150                 | —        | —              | mV   |
| $V_{CMR}$              | Common Mode Range <sup>(2)</sup>                      | $V_{CC} - 1.3$      | —        | $V_{CC} - 0.4$ | $V_{CC} - 1.3$      | —        | $V_{CC} - 0.4$ | $V_{CC} - 1.3$      | —        | $V_{CC} - 0.4$ | V    |
| $t_r, t_f$             | Output Rise/Fall Times <sup>(3)</sup><br>(20% to 80%) | —                   | —        | 160            | —                   | 95       | 160            | —                   | —        | 160            | ps   |

**Note 1.** Minimum input swing for which AC parameters are guaranteed. The device has a DC gain of  $\approx 40$  when output has a full swing.

**Note 2.** The CMR range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between  $V_{PP}$  (min.) and 1V. The lower end of the CMR range varies 1:1 with  $V_{EE}$ . The numbers in the spec table assume a nominal  $V_{EE} = -3.3V$  and  $V_{CC} = 0V$ . Note for PECL operation, the  $V_{CMR}$  (min.) will be fixed at  $3.3V - 4V_{CMR}$  (min.).

**Note 3.** Output at full swing.

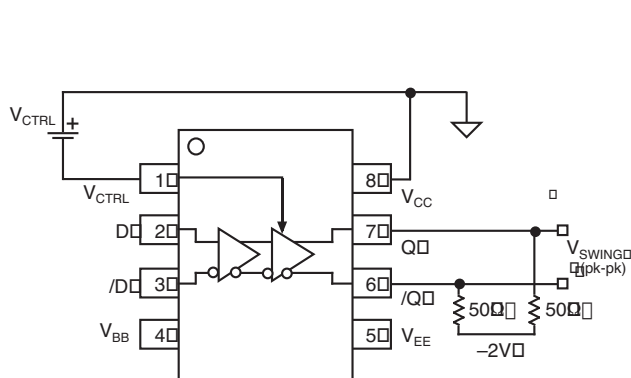
**APPLICATION IMPLEMENTATION**

Figure 1. Voltage Source Implementation

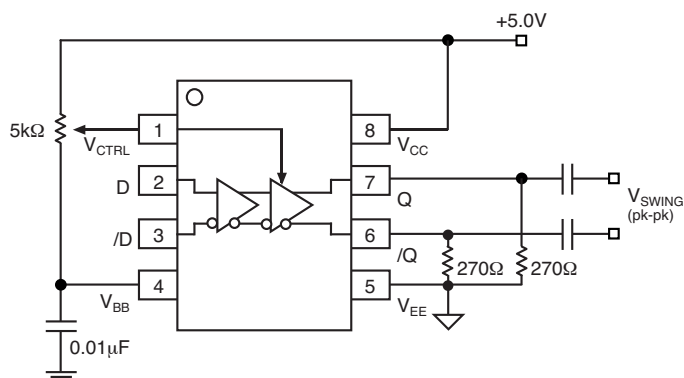
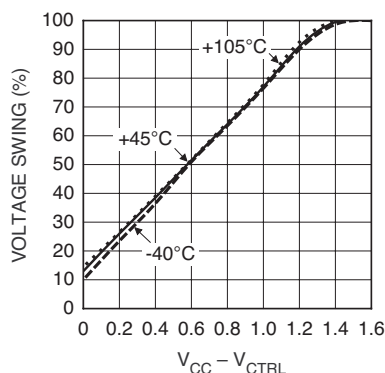
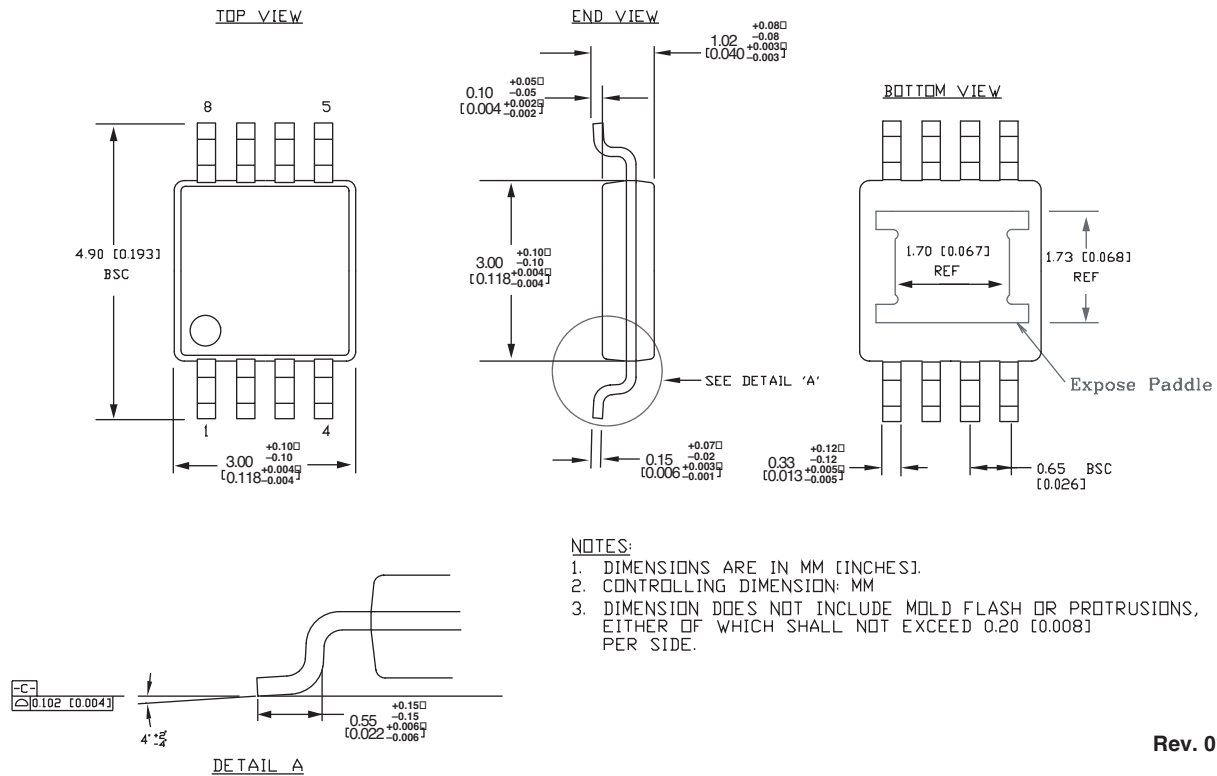


Figure 2. Alternative Implementation

**TYPICAL VOLTAGE OUTPUT SWING**Figure 3. Typical Voltage Output Swing  
 $V_{CC} = 3.3V$  or  $5V$

## 8-PIN EPAD-MSOP (K8-2)



Rev. 01

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