

## 5V/3.3V ECL Differential Receiver

### Features

- 3.3V and 5V Power Supply Options
- 250 ps Propagation Delay (Typical)
- High Bandwidth Output Transitions
- Internal 75 k $\Omega$  Input Pull-Down Resistors
- Available in 8-pin (3 mm x 3 mm) MSOP and SOIC Packages

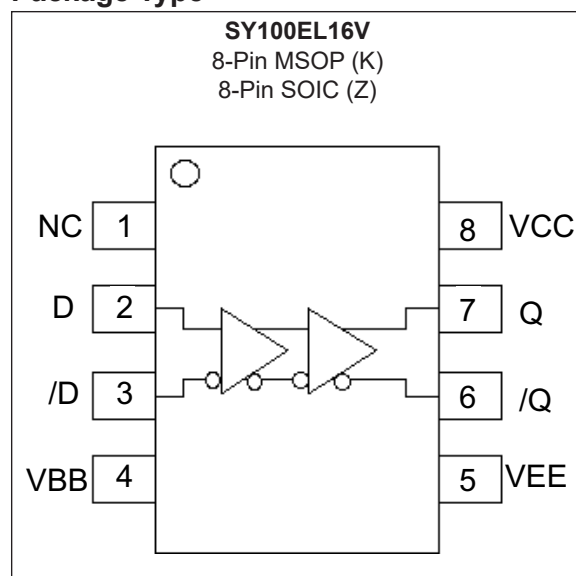
### General Description

The SY100EL16V is a differential receiver. With fast output transition times, the SY100EL16V is ideally suited for interfacing with high-frequency sources.

The SY100EL16V provides a VBB output for either single-ended use or as a DC bias for AC coupling to the device. The VBB pin should be used only as a bias for the SY100EL16V as its current sink/source capability is limited. Whenever used, the VBB pin should be bypassed to ground via a 0.01  $\mu$ F capacitor.

Under open input conditions (pulled to VEE), internal input clamps will force the Q output low.

### Package Type



# SY100EL16V

## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings †

|                                                 |        |
|-------------------------------------------------|--------|
| PECL Power Supply Voltage ( $V_{CC}$ ) (Note 1) | +8V    |
| NECL Power Supply Voltage ( $V_{EE}$ ) (Note 2) | –8V    |
| PECL Mode Input Voltage ( $V_{IN}$ ) (Note 3)   | +6V    |
| NECL Mode Input Voltage ( $V_{IN}$ ) (Note 4)   | –6V    |
| Continuous Output Current ( $I_{OUT}$ )         | 50 mA  |
| Surge Output Current ( $I_{OUT}$ )              | 100 mA |
| ESD Rating (Note 5)                             | >2 kV  |

† **Notice:** Stresses above those listed under “Absolute Maximum ratings” may cause permanent damage to the device. Exposure to maximum rating conditions for extended periods may affect device reliability.

**Note 1:**  $V_{EE} = 0V$

**2:**  $V_{CC} = 0V$

**3:**  $V_{EE} = 0V$ ,  $V_{IN} \leq V_{CC}$

**4:**  $V_{CC} = 0V$ ,  $V_{IN} \geq V_{EE}$

**5:** Mil Std. 883 Human Body Model, all pins

### PECL DC ELECTRICAL CHARACTERISTICS

**Electrical Specifications PECL:**  $V_{CC} = 3.0V$  to  $5.5V$ ;  $V_{EE} = 0V$ ;  $T_A = -40^{\circ}C$  to  $+85^{\circ}C$ , unless otherwise stated (Note 1)

| Parameter                            | Symbol      | Min.             | Typ.             | Max.             | Units   | Conditions                             |
|--------------------------------------|-------------|------------------|------------------|------------------|---------|----------------------------------------|
| Power Supply Current                 | $I_{EE}$    | —                | 18               | 22               | mA      | $T_A = -40^{\circ}C$ to $+25^{\circ}C$ |
|                                      |             | —                | 21               | 26               |         | $T_A = +85^{\circ}C$                   |
| Output High Voltage<br>(Note 2)      | $V_{OH}$    | $V_{CC} - 1.085$ | $V_{CC} - 1.005$ | $V_{CC} - 0.88$  | V       | $T_A = -40^{\circ}C$                   |
|                                      |             | $V_{CC} - 1.025$ | $V_{CC} - 0.955$ | $V_{CC} - 0.88$  |         | $T_A = 0^{\circ}C$ to $+85^{\circ}C$   |
| Output Low Voltage<br>(Note 2)       | $V_{OL}$    | $V_{CC} - 1.830$ | $V_{CC} - 1.695$ | $V_{CC} - 1.555$ | V       | $T_A = -40^{\circ}C$                   |
|                                      |             | $V_{CC} - 1.810$ | $V_{CC} - 1.705$ | $V_{CC} - 1.620$ |         | $T_A = 0^{\circ}C$ to $+85^{\circ}C$   |
| Input High Voltage<br>(Single-Ended) | $V_{IH}$    | $V_{CC} - 1.165$ | —                | $V_{CC} - 0.880$ | V       | —                                      |
| Input Low Voltage<br>(Single-Ended)  | $V_{IL}$    | $V_{CC} - 1.810$ | —                | $V_{CC} - 1.475$ | V       | —                                      |
| Output Reference<br>Voltage          | $V_{BB}$    | $V_{CC} - 1.38$  | —                | $V_{CC} - 1.26$  | V       | —                                      |
| Common Mode Range<br>(Note 3)        | $V_{IHCMR}$ | 2.0              | —                | $V_{CC} - 0.4$   | V       | $T_A = -40^{\circ}C$                   |
|                                      |             | 1.9              | —                | $V_{CC} - 0.4$   |         | $T_A = 0^{\circ}C$ to $+85^{\circ}C$   |
| Input High Current                   | $I_{IH}$    | —                | —                | 150              | $\mu A$ | —                                      |
| Input Low Current                    | $I_{IL}$    | 0.5              | —                | —                | $\mu A$ | $V_{IN} = V_{IL(MIN)}$                 |

**Note 1:** Devices are designed to meet the DC specifications shown in the above table after thermal equilibration has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow greater than 500 lfpm is maintained.

**2:** Outputs are terminated through a  $50\Omega$  resistor to  $V_{CC} - 2.0V$ .

**3:** The CMR range is referenced to the most positive side of the differential input voltage. Normal operation is obtained if the high level falls within the specified range and the peak-to-peak voltage lies between 150 mV and 1V.

## NECL DC ELECTRICAL CHARACTERISTICS

**Electrical Specifications NECL:**  $V_{EE} = -5.5V$  to  $-3.0V$ ;  $V_{CC} = 0V$ ;  $T_A = -40^{\circ}C$  to  $+85^{\circ}C$ , unless otherwise stated (Note 1)

| Parameter                         | Symbol      | Min.           | Typ.   | Max.   | Units   | Conditions                             |
|-----------------------------------|-------------|----------------|--------|--------|---------|----------------------------------------|
| Power Supply Current              | $I_{EE}$    | —              | 18     | 22     | mA      | $T_A = -40^{\circ}C$ to $+25^{\circ}C$ |
|                                   |             | —              | 21     | 26     |         | $T_A = +85^{\circ}C$                   |
| Output High Voltage (Note 2)      | $V_{OH}$    | -1.085         | -1.005 | -0.88  | V       | $T_A = -40^{\circ}C$                   |
|                                   |             | -1.025         | -0.955 | -0.88  |         | $T_A = 0^{\circ}C$ to $+85^{\circ}C$   |
| Output Low Voltage (Note 2)       | $V_{OL}$    | -1.830         | -1.695 | -1.555 | V       | $T_A = -40^{\circ}C$                   |
|                                   |             | -1.810         | -1.705 | -1.620 |         | $T_A = 0^{\circ}C$ to $+85^{\circ}C$   |
| Input High Voltage (Single-Ended) | $V_{IH}$    | -1.165         | —      | -0.880 | V       | —                                      |
| Input Low Voltage (Single-Ended)  | $V_{IL}$    | -1.810         | —      | -1.475 | V       | —                                      |
| Output Reference Voltage          | $V_{BB}$    | -1.38          | —      | -1.26  | V       | —                                      |
| Common Mode Range (Note 3)        | $V_{IHCMR}$ | $V_{EE} + 2.0$ | —      | -0.4   | V       | $T_A = -40^{\circ}C$                   |
|                                   |             | $V_{EE} + 1.9$ | —      | -0.4   |         | $T_A = 0^{\circ}C$ to $+85^{\circ}C$   |
| Input High Current                | $I_{IH}$    | —              | —      | 150    | $\mu A$ | —                                      |
| Input Low Current                 | $I_{IL}$    | 0.5            | —      | —      | $\mu A$ | $V_{IN} = V_{IL(MIN)}$                 |

- Note 1:** Devices are designed to meet the DC specifications shown in the above table after thermal equilibration has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow greater than 500 lfm is maintained.
- 2:** Outputs are terminated through a  $50\Omega$  resistor to  $V_{CC}-2.0V$ .
- 3:** The CMR range is referenced to the most positive side of the differential input voltage. Normal operation is obtained if the high level falls within the specified range and the peak-to-peak voltage lies between 150 mV and 1V.

## AC ELECTRICAL CHARACTERISTICS

**Electrical Characteristics:**  $V_{CC} = 3.0V$  to  $5.5V$ ;  $V_{EE} = 0V$  or  $V_{EE} = -5.5V$  to  $-3.0V$ ;  $V_{CC} = 0V$ ;  $T_A = -40^{\circ}C$  to  $+85^{\circ}C$ , unless otherwise stated, (Note 1)

| Parameter                                    | Symbol                 | Min. | Typ. | Max. | Units | Conditions                           |
|----------------------------------------------|------------------------|------|------|------|-------|--------------------------------------|
| Propagation Delay D to Q<br>D (Differential) | $t_{PLH}$<br>$t_{PHL}$ | 125  | 250  | 375  | ps    | $T_A = -40^{\circ}C$                 |
|                                              |                        | 175  | 250  | 325  |       | $T_A = 0^{\circ}C, +25^{\circ}C$     |
|                                              |                        | 205  | 280  | 355  |       | $T_A = +85^{\circ}C$                 |
| Propagation Delay D to Q<br>(Single-Ended)   | $t_{PLH}$<br>$t_{PHL}$ | 75   | 250  | 425  | ps    | $T_A = -40^{\circ}C$                 |
|                                              |                        | 125  | 250  | 375  |       | $T_A = 0^{\circ}C, +25^{\circ}C$     |
|                                              |                        | 155  | 280  | 405  |       | $T_A = +85^{\circ}C$                 |
| Duty Cycle Skew (Note 2)                     | $t_{SKEW}$             | —    | 5    | —    | ps    | $T_A = -40^{\circ}C$                 |
|                                              |                        | —    | 5    | 20   |       | $T_A = 0^{\circ}C$ to $+85^{\circ}C$ |
| Input Swing (Note 3)                         | $V_{PP}$               | 150  | —    | 1000 | mV    | —                                    |
| Output Rise/Fall Time Q<br>(20% to 80%)      | $t_r/t_f$              | 100  | 225  | 350  | ps    | —                                    |

- Note 1:** Specification for packaged product only.
- 2:** Duty cycle skew is the difference between a  $t_{PLH}$  and  $t_{PHL}$  propagation delay through a device.
- 3:** Input swing for which AC parameters are ensured. The device has a DC gain of  $\approx 40$ .

# SY100EL16V

## TEMPERATURE SPECIFICATIONS

| Parameters                            | Sym.          | Min. | Typ. | Max. | Units | Conditions         |
|---------------------------------------|---------------|------|------|------|-------|--------------------|
| <b>Temperature Ranges</b>             |               |      |      |      |       |                    |
| Operating Temperature Range           | $T_A$         | -40  | —    | +85  | °C    | —                  |
| Storage Temperature Range             | $T_S$         | -65  | —    | +150 | °C    | —                  |
| Lead Temperature                      | $T_{LEAD}$    | —    | —    | +260 | °C    | Soldering, 20 sec. |
| <b>Thermal Resistance</b>             |               |      |      |      |       |                    |
| Package Thermal Resistance, SOIC 8-Ld | $\theta_{JA}$ | —    | 160  | —    | °C/W  | Still-Air          |
|                                       |               | —    | 109  | —    |       | 500 lfpm           |
|                                       | $\theta_{JC}$ | —    | 39   | —    | °C/W  | —                  |
| Package Thermal Resistance, MSOP 8-Ld | $\theta_{JA}$ | —    | 206  | —    | °C/W  | Still-Air          |
|                                       |               | —    | 155  | —    |       | 500 lfpm           |
|                                       | $\theta_{JC}$ | —    | 39   | —    | °C/W  | —                  |

## 2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in [Table 2-1](#).

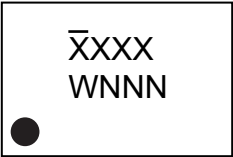
**TABLE 2-1: PIN FUNCTION TABLE**

| Pin Name | Description              |
|----------|--------------------------|
| D        | Data Input               |
| Q        | Data Output              |
| VBB      | Reference Voltage Output |
| NC       | Not Connected            |
| VCC      | Positive Power Supply    |
| VEE      | Negative Power Supply    |

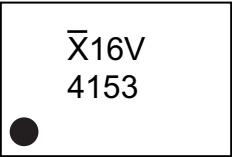
## 3.0 PACKAGING INFORMATION

### 3.1 Package Marking Information

8-Lead MSOP\*



Example



8-Lead SOIC\*



Example



**Legend:** XX...X Product code or customer-specific information  
Y Year code (last digit of calendar year)  
YY Year code (last 2 digits of calendar year)  
WW Week code (week of January 1 is week '01')  
NNN Alphanumeric traceability code  
 Pb-free JEDEC® designator for Matte Tin (Sn)  
\* This package is Pb-free. The Pb-free JEDEC designator () can be found on the outer packaging for this package.  
  
●, ▲, ▼ Pin one index is identified by a dot, delta up, or delta down (triangle mark).

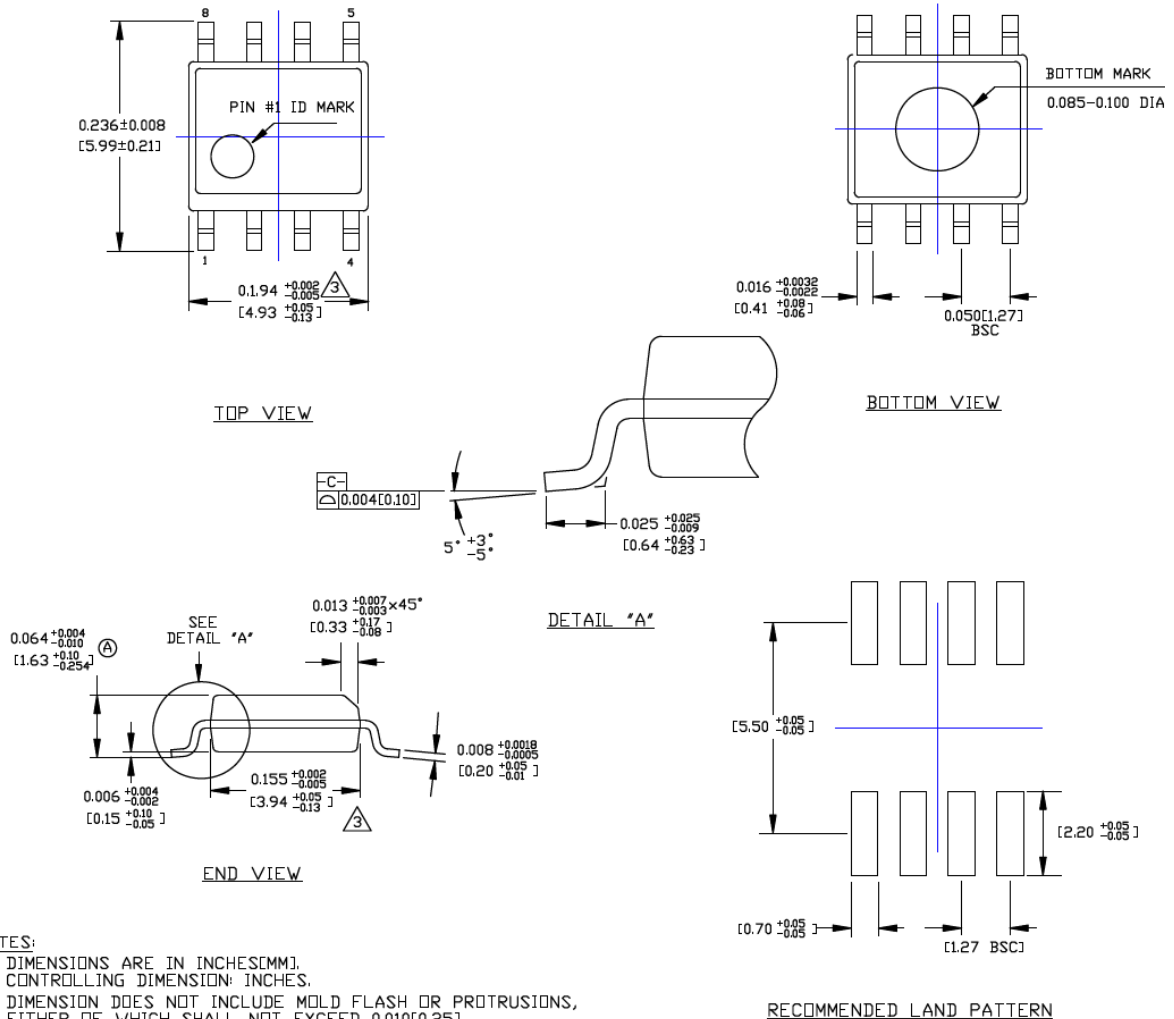
**Note:** In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information. Package may or may not include the corporate logo.  
  
Underbar (  $\bar{\phantom{x}}$  ) and/or Overbar (  $\overline{\phantom{x}}$  ) symbol may not be to scale.

## 8-Lead SOIC Package Outline and Recommended Land Pattern

### TITLE

8 LEAD SOICN PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

| DRAWING # | SOICN-8LD-PL-1 | UNIT | INCH [MM] |
|-----------|----------------|------|-----------|
|-----------|----------------|------|-----------|



### NOTES:

1. DIMENSIONS ARE IN INCHES[MM].
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSION DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS, EITHER OF WHICH SHALL NOT EXCEED 0.010[0.25] PER SIDE.

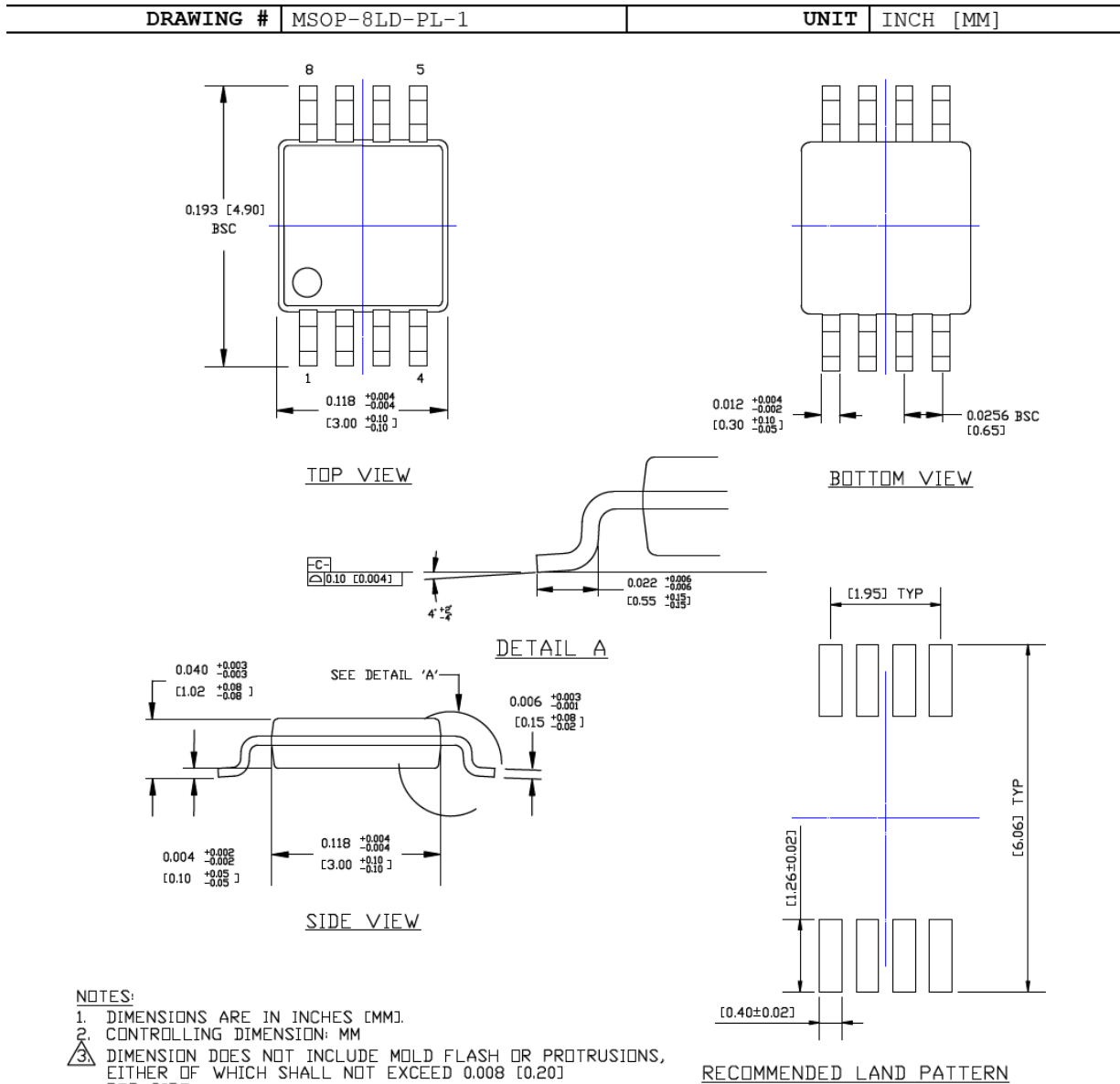
Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>.

# SY100EL16V

## 8-Lead MSOP Package Outline and Recommended Land Pattern

### TITLE

8 LEAD MSOP PACKAGE OUTLINE & RECOMMENDED LAND PATTERN



Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>.

## APPENDIX A: REVISION HISTORY

### Revision A (November 2018)

- Converted Micrel document SY100EL16V to Microchip data sheet template DS20006115A.
- Made minor text changes throughout the document.
- Removed all reference to the EOL SY10EL16V version.

### Revision B (January 2020)

- Updated minimum values for Common Mode Range voltage in [PECL DC Electrical Characteristics](#) table and [NECL DC Electrical Characteristics](#) table.
- Minor stylistic updates to align data sheet with current style.
- Added Marking Spec for MSOP Package Option in **Section 3.1 “Package Marking Information”**.
- Added MSOP examples to the [Product Identification System](#) section.

# SY100EL16V

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NOTES:

## PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

| <u>PART NO.</u>              | <u>X</u>                                                             | <u>X</u> | <u>X</u>          | <u>-XX</u>         |
|------------------------------|----------------------------------------------------------------------|----------|-------------------|--------------------|
| Device                       | Supply Voltage                                                       | Package  | Temperature Range | Special Processing |
| <b>Device:</b>               | SY100EL16: 5V/3.3V ECL Differential Receiver                         |          |                   |                    |
| <b>Supply Voltage Range:</b> | V = 3.3V/5V                                                          |          |                   |                    |
| <b>Package:</b>              | Z = 8-Lead SOIC (Pb-Free NiPdAu)<br>K = 8-Lead MSOP (Pb-Free NiPdAu) |          |                   |                    |
| <b>Temperature Range:</b>    | G = -40°C to +85°C                                                   |          |                   |                    |
| <b>Special Processing:</b>   | <blank>= 95/Tube<br>TR = 1,000/Reel                                  |          |                   |                    |

**Examples:**

a) SY100EL16VZG: SY100EL16, 3.3V/5V, 8-Lead SOIC (Pb-Free NiPdAu), -40°C to +85°C, 95/Tube

b) SY100EL16VZG-TR: SY100EL16, 3.3V/5V, 8-Lead SOIC (Pb-Free NiPdAu), -40°C to +85°C, 1,000/Reel

c) SY100EL16VKG: SY100EL16, 3.3V/5V, 8-Lead MSOP (Pb-Free NiPdAu), -40°C to +85°C, 95/Tube

d) SY100EL16VKG-TR: SY100EL16, 3.3V/5V, 8-Lead MSOP (Pb-Free NiPdAu), -40°C to +85°C, 1,000/Reel

**Note 1:** Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.

# SY100EL16V

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NOTES:

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