

### FEATURES

- Up to 1.25Gb/s operation
- 75mA peak drive current
- Separate modulation control
- Separate master reset for laser safety
- Differential inputs for data and clock
- 75K $\Omega$  input pulldown resistor
- Single power supply
- Available in 16-pin SOIC package

### DESCRIPTION

The SY100EL1001 is a high speed current source for driving a semiconductor laser diode in optical transmission applications. The output current modulation is DC – voltage controlled. The integrated circuit contains the following functional blocks:

- Input Line Receiver
- D Flip-Flop
- Bias Control Circuitry
- Output Current Switch

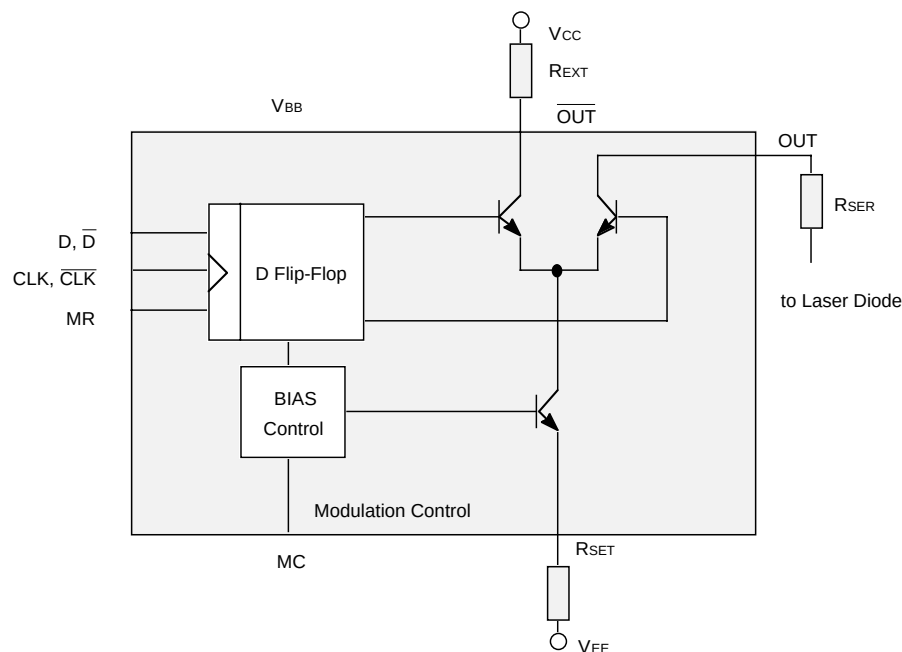
A logic HIGH level at the data input results in the modulation current flowing through the OUT pin on the next rising edge of the clock. A logic HIGH level at the master reset input will disable the modulation current.

The device incorporates complementary open collector outputs with a capability of driving peak current of 75 mA.

The laser driver current is adjustable by selection of RSET. The resistor REXT must be placed between /OUT and VCC to dissipate the worst case power. RSET is recommended to fix laser diode matching issues.

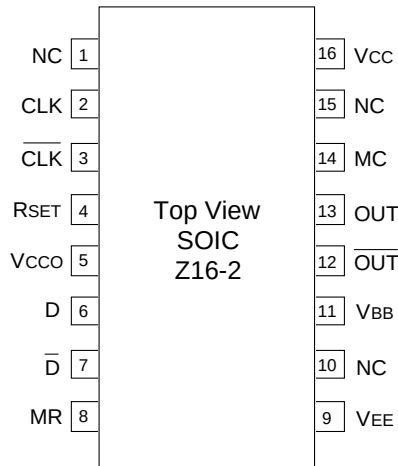
The SY100EL1001 utilizes the high performance bipolar ASSET™ technology.

### BLOCK DIAGRAM



## PACKAGE/ORDERING INFORMATION

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



16-Pin Narrow SOIC (Z16-2)

| Part Number                       | Package Type | Operating Range | Package Marking                               | Lead Finish    |
|-----------------------------------|--------------|-----------------|-----------------------------------------------|----------------|
| SY100EL1001ZC                     | Z16-2        | Commercial      | SY100EL1001ZC                                 | Sn-Pb          |
| SY100EL1001ZCTR <sup>(2)</sup>    | Z16-2        | Commercial      | SY100EL1001ZC                                 | Sn-Pb          |
| SY100EL1001ZI                     | Z16-2        | Industrial      | SY100EL1001ZI                                 | Sn-Pb          |
| SY100EL1001ZITR <sup>(2)</sup>    | Z16-2        | Industrial      | SY100EL1001ZI                                 | Sn-Pb          |
| SY100EL1001ZG <sup>(3)</sup>      | Z16-2        | Industrial      | SY100EL1001ZG with Pb-Free bar-line indicator | Pb-Free NiPdAu |
| SY100EL1001ZGTR <sup>(2, 3)</sup> | Z16-2        | Industrial      | SY100EL1001ZG with Pb-Free bar-line indicator | Pb-Free NiPdAu |

**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.

## PIN NAMES

| Pin               | Function                                                                                                                                                            |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $V_{CC}, V_{CCO}$ | Most positive power supply pins separation helps to isolate sensitive circuitry from noise generating function. +5V for PECL operation or ground for ECL operation. |
| $V_{EE}$          | Most negative power supply input. Ground for PECL operation or -5V for ECL operation.                                                                               |
| $V_{BB}$          | This pin provides a reference voltage for use in single ended applications or when the input signal is AC coupled into the device.                                  |
| D, /D             | These differential ECL/PECL 100K compatible inputs receive NRZ data.                                                                                                |
| CLK, /CLK         | These differential clock inputs                                                                                                                                     |
| MR                | This ECL/PECL 100K compatible input resets the Laser Driver Logic - modulation current transitions to zero when asserted high.                                      |
| OUT, /OUT         | Open collector outputs from the modulation buffer drive these differential current outputs.                                                                         |
| MC                | An external voltage sets the main value of modulation current $I_O$ .                                                                                               |
| $R_{SET}$         | An external resistor sets the source current for modulation $I_{mod}$ .                                                                                             |
| NC                | These pins are not connected.                                                                                                                                       |

## TRUTH TABLE<sup>(1)</sup>

| D | /D | CLK | /CLK | MR | OUT | /OUT |
|---|----|-----|------|----|-----|------|
| L | H  | Z   | ZZ   | L  | H   | L    |
| H | L  | Z   | ZZ   | L  | L   | H    |
| X | X  | X   | X    | H  | H   | L    |

**Note:**

1. L = LOW, H = HIGH, Z = LOW-to-HIGH transition, ZZ = HIGH-to-LOW transition, X = don't care.

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

| Symbol     | Rating                                 | Value      | Unit |
|------------|----------------------------------------|------------|------|
| $V_{CC}$   | Power Supply Voltage ( $V_{CC} = 0V$ ) | 0 to -7.0  | V    |
| $V_{IN}$   | Input Voltage ( $V_{CC} = 0V$ )        | 0 to -6.0  | V    |
| $I_{OUT}$  | Output Current                         | 75         | mA   |
| $T_{LEAD}$ | Lead Temperature (soldering, 20sec.)   | +260       | °C   |
| $T_A$      | Operating Temperature Range            | -40 to +85 | °C   |
| $P_D$      | Power Dissipation                      | 500        | mW   |

**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.

**OPERATIONING CONDITIONS<sup>(1)</sup>**

| Symbol    | Rating                      | Value          | Unit     |
|-----------|-----------------------------|----------------|----------|
| $V_{EE}$  | Power Supply Voltage        | -4.75 to -5.25 | V        |
| $R_{SET}$ | Resistor to Adjust Current  | 10 to 100      | $\Omega$ |
| $R_{EXT}$ | Resistor to Dissipate Power | 10 to 50       | $\Omega$ |
| $R_{SER}$ | Laser Diode Serial Resistor | 0 to 50        | $\Omega$ |

**Note:**

1. The voltage drop across  $R_{EXT}$  and  $R_{SER}$  should not be greater than 2V.

**DC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>**
 $V_{CC} = V_{CCO} = 0V$ ;  $V_{EE} = -5.0V \pm 5\%$ 

| Symbol     | Parameter                                                     | $T_A = -40^\circ C$ |      |          | $T_A = 0^\circ C$ |      |          | $T_A = +25^\circ C$ |      |          | $T_A = +85^\circ C$ |      |          | Unit    |
|------------|---------------------------------------------------------------|---------------------|------|----------|-------------------|------|----------|---------------------|------|----------|---------------------|------|----------|---------|
|            |                                                               | Min.                | Typ. | Max.     | Min.              | Typ. | Max.     | Min.                | Typ. | Max.     | Min.                | Typ. | Max.     |         |
| $V_{IH}$   | Input HIGH Voltage<br>(D, CLK, MR)                            | -1165               | —    | -880     | -1165             | —    | -880     | -1165               | —    | -880     | -1165               | —    | -880     | mV      |
| $V_{IL}$   | Input LOW Voltage<br>(D, CLK, MR)                             | -1810               | —    | -1475    | -1810             | —    | -1475    | -1810               | —    | -1475    | -1810               | —    | -1475    | mV      |
| $V_{Imod}$ | Input Voltage<br>(Modulation Control)                         | $V_{EE}$            | —    | $V_{CC}$ | $V_{EE}$          | —    | $V_{CC}$ | $V_{EE}$            | —    | $V_{CC}$ | $V_{EE}$            | —    | $V_{CC}$ | V       |
| $V_{BB}$   | Output Reference<br>Voltage                                   | -1380               | —    | -1260    | -1380             | —    | -1260    | -1380               | —    | -1260    | -1380               | —    | -1260    | mV      |
| $I_{IH}$   | Input HIGH Current<br>(D, CLK, MR)                            | —                   | —    | 150      | —                 | —    | 150      | —                   | —    | 150      | —                   | —    | 150      | $\mu A$ |
| $I_{Imod}$ | Input Current<br>(Modulation Control)                         | —                   | —    | 150      | —                 | —    | 150      | —                   | —    | 150      | —                   | —    | 150      | $\mu A$ |
| $I_{IL}$   | Input LOW Current <sup>(2)</sup><br>(D, CLK, MR)              | 0.5                 | —    | —        | 0.5               | —    | —        | 0.5                 | —    | —        | 0.5                 | —    | —        | $\mu A$ |
| $I_{CC}$   | Supply Current <sup>(3)</sup>                                 | 8                   | 14   | 25       | 8                 | 14   | 25       | 8                   | 14   | 25       | 8                   | 14   | 25       | mA      |
| $I_{OH}$   | Output HIGH Current <sup>(4)</sup><br>(MR LOW) <sup>(5)</sup> | 60                  | 64   | 68       | 60                | 64   | 68       | 60                  | 64   | 68       | 60                  | 64   | 68       | mA<br>5 |
| $I_{OL}$   | Output LOW Current<br>(MR HIGH)                               | —                   | —    | 500      | —                 | —    | 500      | —                   | —    | 500      | —                   | —    | 500      | $\mu A$ |
| $I_{OR}$   | Output Current Ringing <sup>(6)</sup>                         | —                   | —    | 10       | —                 | —    | 10       | —                   | —    | 10       | —                   | —    | 10       | %       |
| $I_{Omod}$ | Laser Diode Modulation<br>Current Range                       | 5                   | —    | 60       | 5                 | —    | 60       | 5                   | —    | 60       | 5                   | —    | 60       | mA      |

**Notes:**

- $R_{SET} = 10\Omega \pm 1\%$
- $V_I = V_{IL}$  (Min.)
- $V_{Imod} = V_{CC}$
- $V_{Imod} = -3.5V$
- $V_{Lmod} = -0.8V$
- $I_{OH} = 5$  to  $60mA$

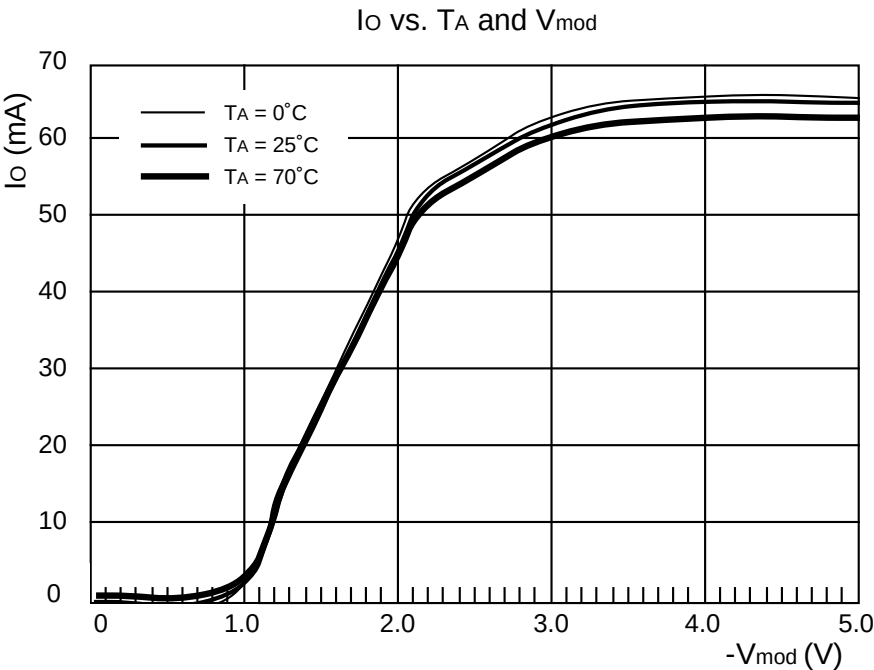
**AC ELECTRICAL CHARACTERISTICS<sup>(1)</sup>**

| Symbol         | Parameter                        | $T_A = -40^\circ C$ |      |      | $T_A = 0^\circ C$ |      |      | $T_A = +25^\circ C$ |      |      | $T_A = +85^\circ C$ |      |      | Unit |
|----------------|----------------------------------|---------------------|------|------|-------------------|------|------|---------------------|------|------|---------------------|------|------|------|
|                |                                  | Min.                | Typ. | Max. | Min.              | Typ. | Max. | Min.                | Typ. | Max. | Min.                | Typ. | Max. |      |
| $t_{pd}$ CLK   | Propagation Delay<br>CLK - OUT   | —                   | —    | 1000 | —                 | —    | 1000 | —                   | —    | 1000 | —                   | —    | 1000 | ps   |
| $t_{pd}$ MR    | Propagation Delay<br>MR - OUT    | —                   | —    | 1000 | —                 | —    | 1000 | —                   | —    | 1000 | —                   | —    | 1000 | ps   |
| $t_r$<br>$t_f$ | Rise/Fall Time<br>(20% to 80%)   | —                   | —    | 400  | —                 | —    | 400  | —                   | —    | 400  | —                   | —    | 400  | ps   |
| $t_S$          | Set-up Time                      | 100                 | —    | —    | 100               | —    | —    | 100                 | —    | —    | 100                 | —    | —    | ps   |
| $t_H$          | Hold Time                        | 200                 | —    | —    | 200               | —    | —    | 200                 | —    | —    | 200                 | —    | —    | ps   |
| $t_{PW}$       | Minimum Pulse Width<br>(CLK, MR) | 400                 | —    | —    | 400               | —    | —    | 400                 | —    | —    | 400                 | —    | —    | ps   |

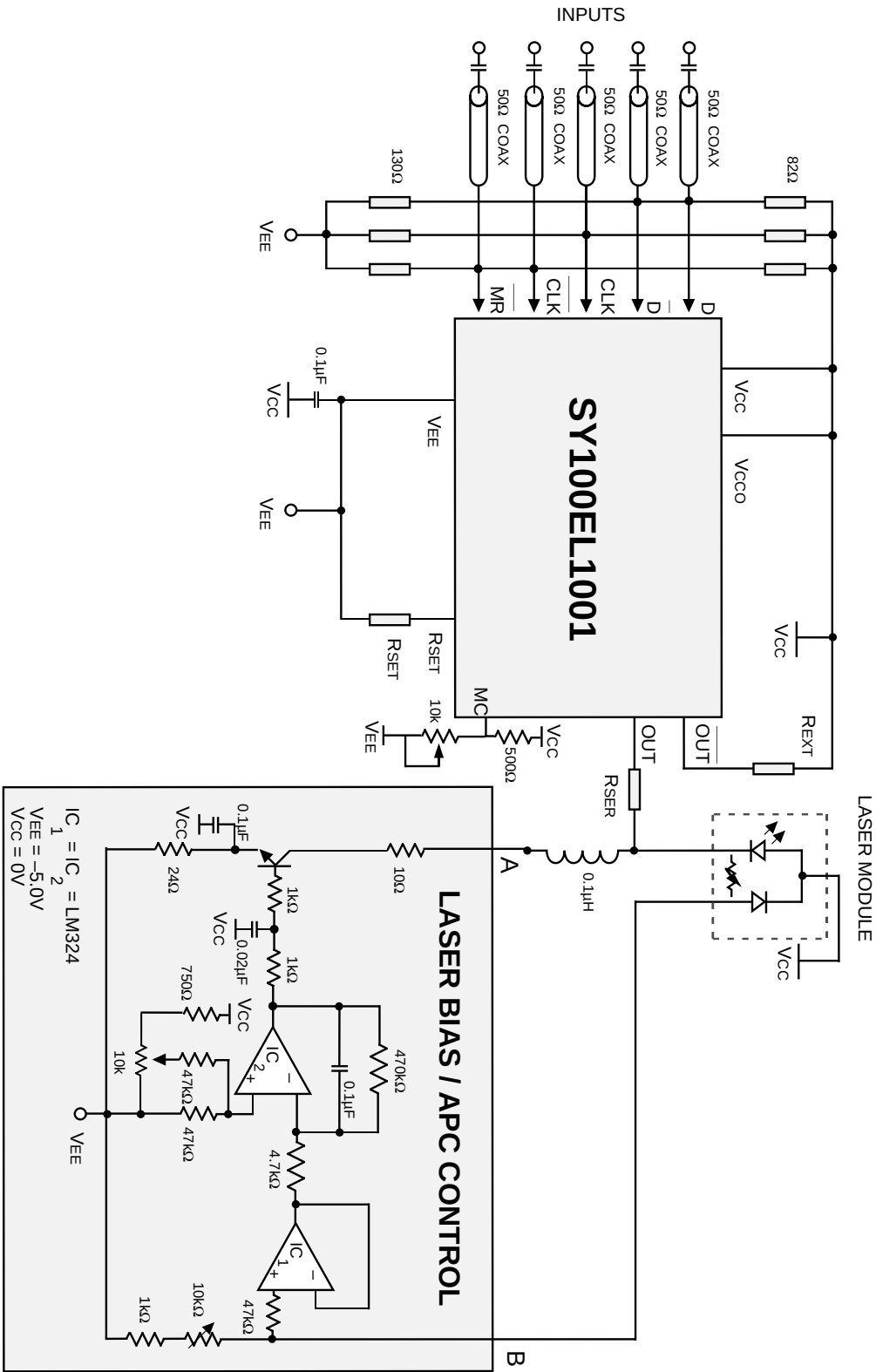
**Note:**

- $R_{SET} = 10\Omega \pm 1\%$ ,  $R_{EXT} = R_{SER} = 50\Omega \pm 1\%$

PERFORMANCE CURVES

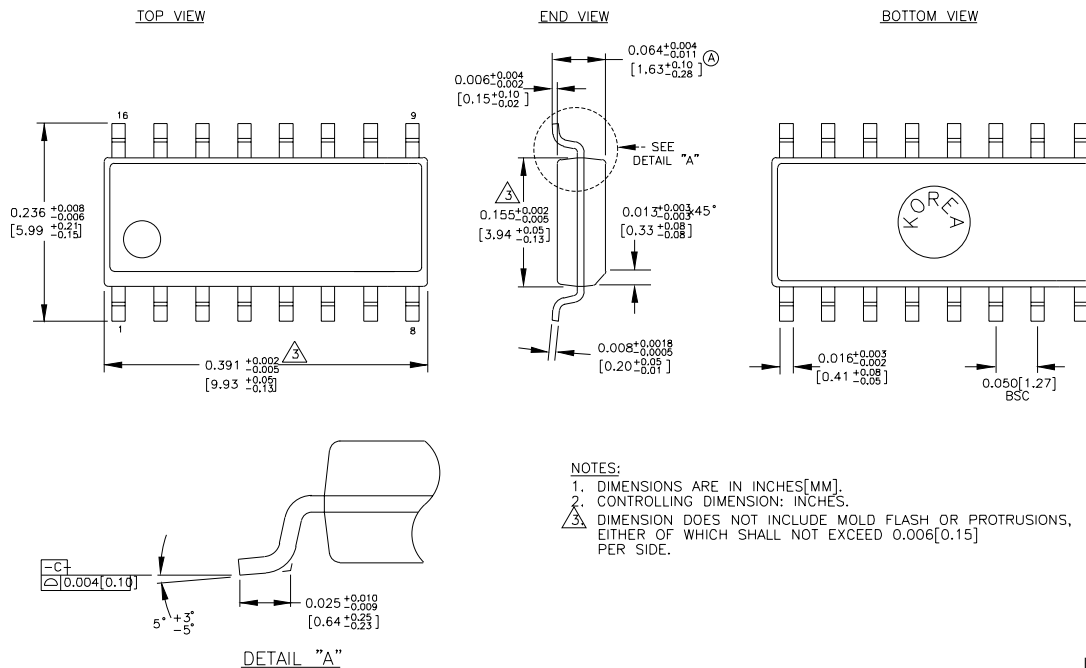


APPLICATION EXAMPLE



- NOTES:
1. Split 100k ECL terminations are 82Ω and 130Ω to VCC and VEE respectively.
  2. Recommended power supply bypass capacitors are 0.1μF with optional 10μF Tantalum in parallel.
  3. High frequency design techniques are required for board layout. A double sided or multilayer board is recommended in conjunction with a low impedance ground plane and properly terminated transmission lines for all signal paths.
  4. V<sub>ss</sub> voltage pin may be used as reference for single ended input applications.

# 16-PIN SOIC .150" WIDE (Z16-2)



Rev. 02

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