

## General Description

The SY88932L is the smallest available laser driver with a programmable modulation current up to 60mA for Fabry-Perot (FP) or distribution feedback (DFB) lasers. The device is suitable for SONET/SDH applications with data rates up to 4.25Gbps. The SY88932L accepts either CML level or AC-coupled PECL inputs, and incorporates an active low TTL /EN function which shuts off the modulation current when HIGH.

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

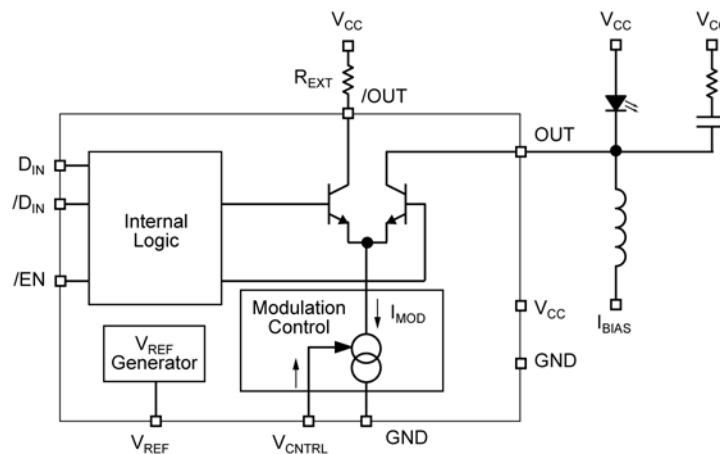
## Features

- Up to 4.25Gbps operation
- Modulation current to 60mA
- Rise/fall times 65ps typical
- Input 50Ω internally terminated to VCC
- TTL /EN with internal 75kΩ pull-down
- Designed for use with MIC3000 optical transceiver management IC
- Voltage programmable laser modulation current
- Single 3.3V power supply
- Operating temperature range of -40°C to +85°C
- Available in tiny 16-pin QFN package

## Applications

- Fiber optical module
- Transponder
- XAUI CWDM
- SONET/ SDH transmission system
- Add-drop MUX
- Metro area network
- 4.25Gbps optical transmitter

## Block Diagram



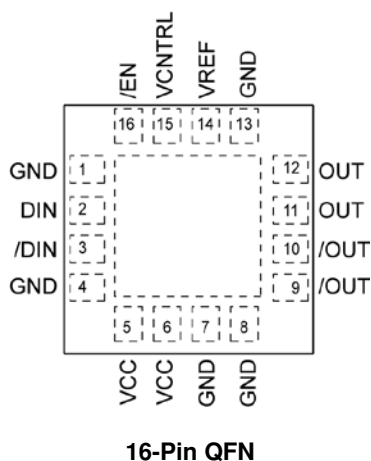
## Ordering Information

| Part Number                 | Package Type | Operating Range | Package Marking                      | Lead Finish    |
|-----------------------------|--------------|-----------------|--------------------------------------|----------------|
| SY88932LMI                  | QFN-16       | Industrial      | 932L                                 | Sn-Pb          |
| SY88932LMITR <sup>(1)</sup> | QFN-16       | Industrial      | 932L                                 | Sn-Pb          |
| SY88932LMG                  | QFN-16       | Industrial      | 932L with Pb-Free bar-line indicator | Pb-Free NiPdAu |
| SY88932LMGTR <sup>(1)</sup> | QFN-16       | Industrial      | 932L with Pb-Free bar-line indicator | Pb-Free NiPdAu |

**Note:**

1. Tape and Reel.

## Pin Configuration



## Pin Description

| Pin Number     | Pin Name  | Pin Function  |
|----------------|-----------|---|
| 2, 3           | DIN, /DIN | NRZ differential data (inputs), CML terminated interface with 50Ω to V <sub>CC</sub> .              |
| 1, 4, 7, 8, 13 | GND       | Ground.   |
| 5, 6           | VCC       | Positive power supply.  |
| 9, 10, 11, 12  | OUT, /OUT | Open collector (outputs) from the modulation driver.  |
| 14             | VREF      | Voltage reference, nominally 1.25V with respect to ground.  |
| 15             | VCNTRL    | Voltage control of I <sub>MOD</sub> . 5kΩ input impedance. See "Typical Operating Characteristics." |
| 16             | /EN       | Enable: TTL-compatible active low input with 75kΩ pull-down resistor.                               |

## Truth Table<sup>(1,2)</sup>

| D | /D | /EN | OUT <sup>(3)</sup> | /OUT |
|---|----|-----|--------------------|------|
| L | H  | L   | H                  | L    |
| H | L  | L   | L                  | H    |
| X | X  | H   | H                  | L    |

### Notes:

1. Truth table parameters are given for voltage rather than optical outputs. Hence, a voltage HIGH and OUT means no modulation current is flowing through OUT, and a voltage LOW on OUT means modulation current is flowing through OUT. A voltage LOW implies an optical HIGH, and vice versa.
2. L = LOW, H = HIGH, X = don't care.
3. I<sub>OUT</sub> ≤ I<sub>MOD\_OFF</sub> when /EN is HIGH.

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

Supply Voltage ( $V_{CC}$ ) ..... -0.5V to +4.0V  
 CML Input Voltage ( $V_{IN}$ ) .....  $V_{CC} - 1.0V$  to  $V_{CC} + 0.5V$   
 TTL Control Input Voltage ( $V_{IN}$ ) ..... 0V to  $V_{CC}$   
 Lead Temperature (soldering, 20sec.) ..... 265°C  
 Storage Temperature ( $T_s$ ) ..... -65°C to +150°C

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

Supply Voltage ( $V_{CC}$ ) ..... +3.0V to +3.6V  
 Ambient Temperature ( $T_A$ ) ..... -40°C to +85°C  
 Junction Temperature ( $T_J$ ) ..... -40°C to +120°C  
 Junction Thermal Resistance<sup>(3)</sup>  
 QFN  
 ( $\theta_{JA}$ ) Still-Air ..... 61°C/W  
 ( $\psi_{JB}$ ) Still-Air ..... 38°C/W

### DC Electrical Characteristics

$V_{CC} = 3.0V$  to  $3.6V$ ;  $GND = 0V$ ;  $T_A = -40^\circ C$  to  $+85^\circ C$ , Typical values at  $V_{CC} = 3.3V$ ,  $T_A = 25^\circ C$ .

| Symbol         | Parameter  | Condition        | Min            | Typ  | Max            | Units            |
|----------------|--|------------------|----------------|------|----------------|------------------|
| $I_{CC}$       | Power Supply Current                                     | Note 4           |                | 57   | 80             | mA               |
| $I_{MOD}$      | Modulation Current Range                                 |                  | 10             |      | 60             | mA               |
| $I_{MOD\_OFF}$ | Modulation Off Current                                   | /EN = $V_{IHEN}$ |                |      | 200            | $\mu A$          |
| $V_{IR}$       | CML Input Voltage Range                                  |                  | $V_{CC} - 0.8$ |      | $V_{CC} + 0.4$ | V                |
| $V_{ID}$       | CML Input Differential Voltage ( $D_{IN}$ , / $D_{IN}$ ) | Note 5           | 400            | 800  | 1600           | mV <sub>PP</sub> |
| $V_{IHEN}$     | TTL Input HIGH Voltage (/EN)                             |                  | 2.0            |      |                | V                |
| $V_{ILEN}$     | TTL Input LOW Voltage (/EN)                              |                  |                |      | 0.8            | V                |
| $V_{OUT}$      | Voltage (OUT, /OUT)                                      | Note 6           | $V_{CC} - 1.5$ |      | $V_{CC}$       | V                |
| $V_{REF}$      | Reference Voltage  | Note 7           | 1.2            | 1.25 | 1.3            | V                |

**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 datasheet. Exposed to Absolute Maximum Ratings conditions for extended periods may affect device reliability.
2. The device is not guaranteed to function outside its operating rating.
3. Thermal resistance numbers are 4-layer PCB. Thermal performance assumes exposed pad is soldered (or equivalent) to the same potential as the ground pins on the PCB.
4. Excluding  $I_{MOD}$ .  $I_{MOD}$  set to 60mA with 25 $\Omega$  load to  $V_{CC}$  on OUT, /OUT. Inputs floating.
5.  $V_{ID}$  is the voltage required to guarantee a stable logic level. For logic "1",  $D_{IN}$  must be  $V_{ID}/2$  above / $D_{IN}$ . For stable logic "0",  $D_{IN}$  must be  $V_{ID}/2$  below / $D_{IN}$ .
6. OUT and /OUT are current outputs. This specification defines the voltage range that the user must guarantee these pins remain within for proper operation.
7.  $V_{REF}$  intended to source/sink  $\leq |5mA|$ .

## AC Electrical Characteristics<sup>(8)</sup>

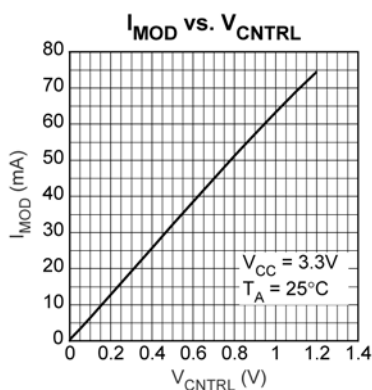
$V_{CC} = 3.0V$  to  $3.6V$ ;  $GND = 0V$ ;  $T_A = -40^{\circ}C$  to  $+85^{\circ}C$ , Typical values at  $V_{CC} = 3.3V$ ,  $T_A = 25^{\circ}C$ .

| Symbol     | Parameter                              | Condition  | Min | Typ | Max | Units |
|------------|--|------------|-----|-----|-----|-------|
| $t_r, t_f$ | Output Rise/Fall Times<br>(20% to 80%) | Note 9     |     | 65  | 100 | ps    |
| DJ         | Deterministic Jitter                   | Note 9, 10 |     | 20  |     | pSPP  |

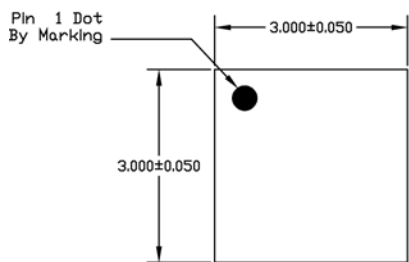
**Notes:**

- 8. AC characteristics are guaranteed by design and characterization.
- 9.  $I_{MOD} = 60mA$ .
- 10. Deterministic jitter measured using K28.5 pattern of 2.486Gbps,  $V_{ID} = 1600mV_{PP}$ .

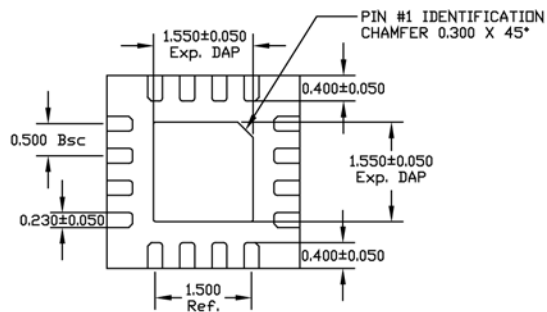
## Typical Operating Characteristics



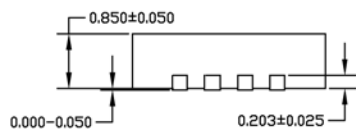
# Package Information



TOP VIEW



BOTTOM VIEW

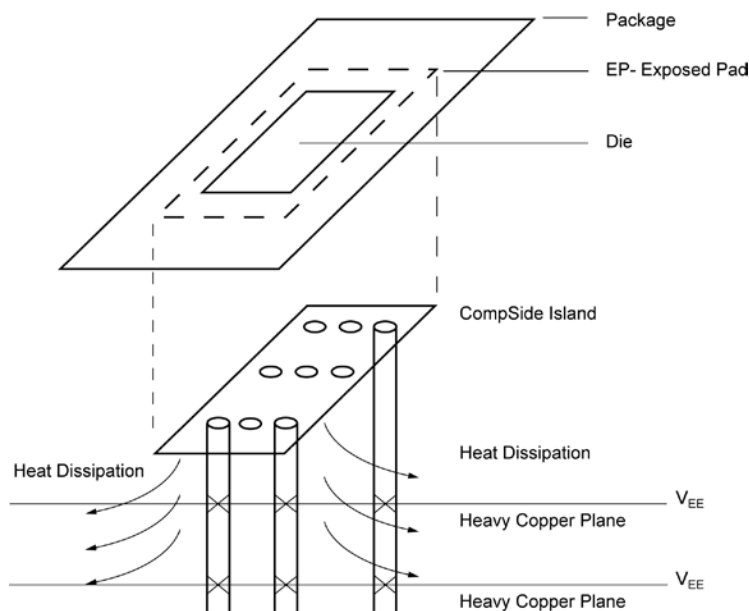


SIDE VIEW

**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.

**16-Pin QFN**



### PCB Thermal Consideration for 16-Pin QFN Package

#### Package Notes:

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

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