



SY88022L

11.3Gbps Laser Diode Driver

Description

The SY88022L is a single 3.3V supply, small form factor driver for telecom/datacom applications using FP/DFB lasers at data rates up to 11.3Gbps. The driver can deliver modulation current up to 60mA and a bias current up to 80mA

All support documentation can be found on Micrel's web site at: www.micrel.com.

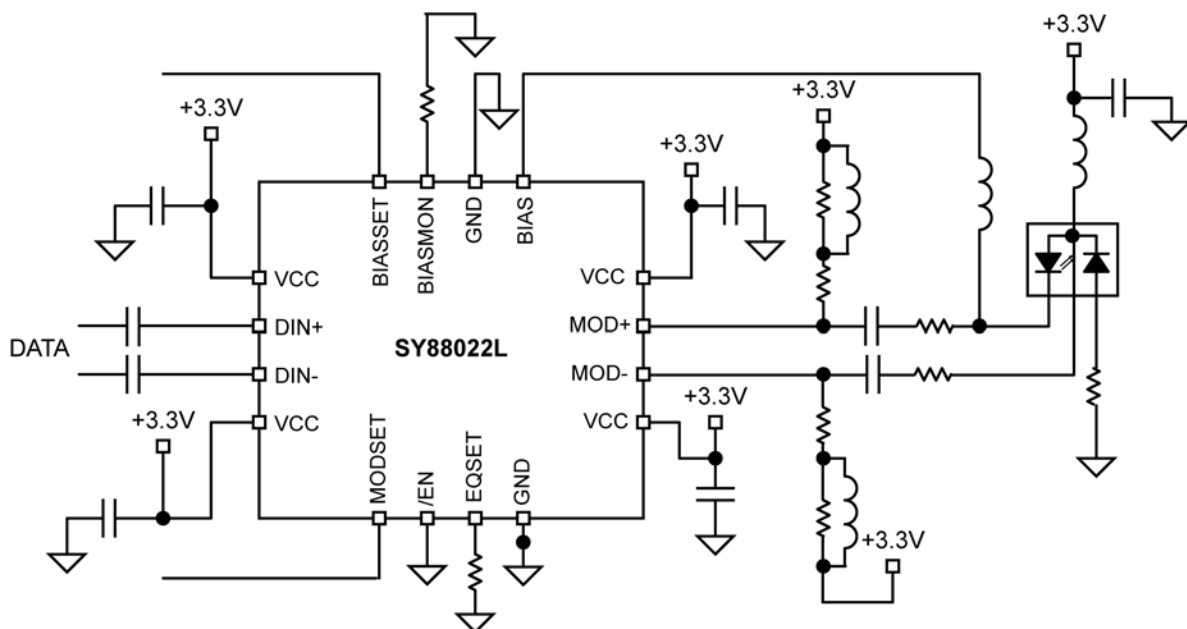
Features

- Operates from a single 3.3V supply
- Operation up to 11.3Gbps
- Modulation current up to 60mA
- Bias current up to 80mA
- Available in a small form factor 3mm x 3mm QFN package

Applications

- Multi-rate LAN, MAN applications up to 11.3Gbps: 8xFC, 10G GbE, SONET OC-192 and SDH STM-64
- SFP+, XFP, XPAK, XENPAK, X2, MSA 300 optical modules

Typical Application



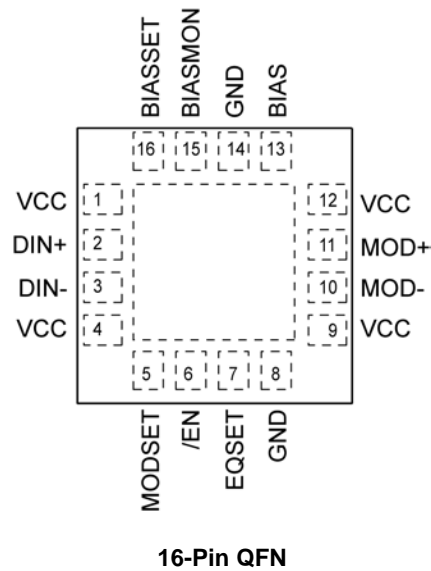
Ordering Information⁽¹⁾

Part Number	Voltage	Temperature Range	Package	Lead Finish
SY88022LMG	3.3V	-40° to +85°C	QFN-16	NiPdAu Pb-Free
SY88022LMGTR ⁽²⁾	3.3V	-40° to +85°C	QFN-16	NiPdAu Pb-Free

Notes:

1. Contact factory for die availability. Dice are guaranteed at T_A = +25°C, DC Electricals only.
2. Tape and Reel.

Pin Configuration



Pin Description

Pin Number	Pin Name	Pin Function
1, 4, 9, 12	VCC	Supply Voltage. Bypass with a 0.1 μ F//0.01 μ F low ESR capacitor as close to the VCC pins as possible.
8, 14	GND	Ground. Ground and exposed pad must be connected to the plane of the most negative potential.
2	DIN+	Non-inverting input data. Internally terminated with 50 Ω to VCC.
3	DIN-	Inverting input data. Internally terminated with 50 Ω to VCC.
5	MODSET	Modulation current setting and control. Apply a voltage within the range 0V to 1.2V to this pin to set the modulation current. Input impedance 25k Ω .
6	/EN	Active Low TTL. Internal 75k Ω pull down to GND. The driver is enabled when this pin is unconnected or /EN is asserted low and disabled when /EN asserted high.
7	EQSET	Install a resistor from this pin to GND to set the desired equalization level. 0 Ω will provide maximum equalization and 2k Ω or higher will provide negligible equalization. Leave open if no equalization is needed.
10	MOD-	Inverted modulation current output. Provides modulation current when input data is negative.
11	MOD+	Non-inverted modulation current output. Provides modulation current when input data is positive.
13	BIAS	BIAS Current Output.
15	BIASMON	Bias Current Monitor. Install an external resistor from this pin to GND to convert the output current to a voltage proportional to the bias current.
16	BIASSET	Bias current setting and control. Apply a voltage within the range 0V to 1.2V to this pin to set the bias current. Input impedance 25k Ω .

Truth Table

DIN+	DIN-	/EN	MOD+ ⁽¹⁾	MOD-	Laser Output ⁽²⁾
L	H	L	H	L	L
H	L	L	L	H	H
X	X	H	H	H	L

Notes:

1. $I_{MOD} = 0$ when MOD+ = H.
2. Assuming that the laser cathode is tied to MOD+.

Absolute Maximum Ratings⁽¹⁾

Supply Voltage (V_{IN})	-0.5V to +4.0V
CML Input Voltage (V_{IN})	$V_{CC}-1.2V$ to $V_{CC}+0.5V$
TTL Control Input Voltage (V_{IN})	0V to V_{CC}
Lead Temperature (soldering, 20sec.)	+260°C
Storage Temperature (T_s)	-65°C to +150°C

Operating Ratings⁽²⁾

Supply Voltage (V_{CC})	+3.0V to +3.6V
Ambient Temperature (T_A)	-40°C to +85°C
Package Thermal Resistance ⁽³⁾	
QFN	
(θ_{JA}) Still-air	60°C/W
(ψ_{JB})	33°C/W

DC Electrical Characteristics

$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ and $V_{CC} = +3.0V$ to $+3.6V$, unless otherwise noted. Typical values are $V_{CC} = +3.3V$, $T_A = 25^\circ\text{C}$, $I_{MOD} = 30\text{mA}$, $I_{BIAS} = 30\text{mA}$.

Symbol	Parameter	Condition	Min	Typ	Max	Units
I_{CC}	Power Supply Current	Modulation and bias currents excluded		65	95 ⁽⁴⁾	mA
V_{MOD_MIN}	Minimum Voltage Required at the Driver Output (headroom) for Proper Operation		1.2			V
V_{BIAS_MIN}	Minimum Voltage Required at the BIAS Output (headroom) for Proper Operation		1.2			V
R_{IN}	Input Resistance, Single Ended		45	50	55	Ω
V_{ID}	Differential Input Voltage Swing		100		1000	mV _{pp}
V_{IL}	/EN Input Low				0.8	V
V_{IH}	/EN Input High		2			V
I_{BIAS}	Bias Current		10		80	mA
I_{Bias_OFF}	Bias OFF Current	Current at BIAS when the device is disabled			150	μA
RMODSET	Input Resistance at MODSET Pin			25		k Ω
VMODSET	Voltage Range at MODSET Pin	IMOD range 10mA to 60mA			1.2	V
RBIASSET	Input Resistance at BIASSET Pin			25		k Ω
VBIASSET	Voltage Range at BIASSET Pin	IBIAS range 10mA to 80mA			1.2	V

Notes:

1. Exceeding the absolute maximum rating may damage the device.
2. The device is not guaranteed to function outside its operating rating.
3. Package Thermal Resistance assumes exposed pad is soldered (or equivalent) to the devices most negative potential on the PCB. θ_{JB} uses a 4-layer and θ_{JA} in still air unless otherwise stated.
4. Maximum I_{CC} measured with $I_{MOD} = 60\text{mA}$ and $I_{BIAS} = 80\text{mA}$ and MOD+/MOD- tied to VCC.

AC Electrical Characteristics

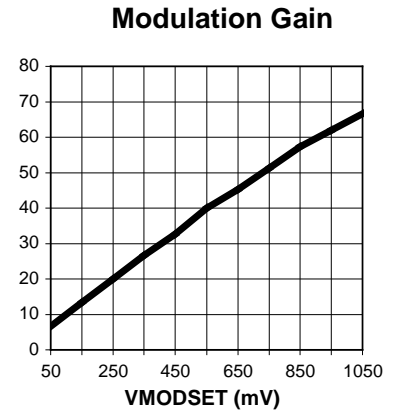
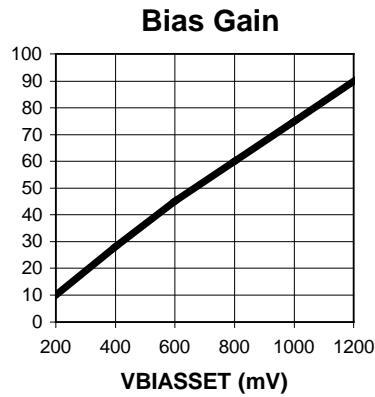
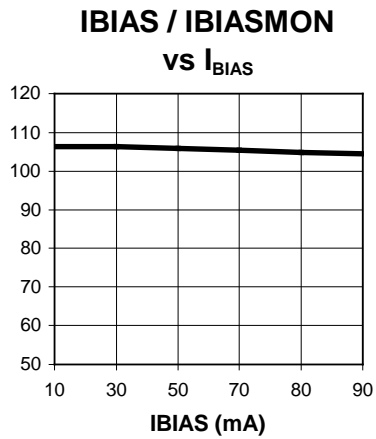
$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ and $V_{CC} = +3.0\text{V}$ to $+3.6\text{V}$, unless otherwise noted. Typical values are $V_{CC} = +3.3\text{V}$, $T_A = 25^\circ\text{C}$, $I_{MOD} = 30\text{mA}$, $I_{BIAS} = 30\text{mA}$.

Symbol	Parameter	Condition	Min	Typ	Max	Units
	Data Rate	NRZ			11.3	Gbps
$I_{MOD}^{(5)}$	Modulation Current	AC-coupled	10		$60^{(6)}$	mA
I_{MOD_OFF}	Modulation OFF Current	Current at MOD+ and MOD- when the device is disabled			150	μA
t_r	Output Current Rise Time	20% to 80%, 25Ω load		25	35	ps
t_f	Output Current Fall Time	20% to 80%, 25Ω load		25	35	ps
DJ	Deterministic Jitter	K25.8 pattern at 11.3Gbps, $V_{IN} = 200\text{mV}_{PP}$		4		pSPP
RJ	Random Jitter	K25.8 pattern at 11.3Gbps, $V_{IN} = 200\text{mV}_{PP}$		0.3		pSPP

Notes:

- I_{MOD} is defined as the current going into the external load, which is equal to the total current of the output device subtracted by the current going into the internal 50Ω pull-up.
- $I_{MOD(MAX)}$ is defined for a 25Ω external load.

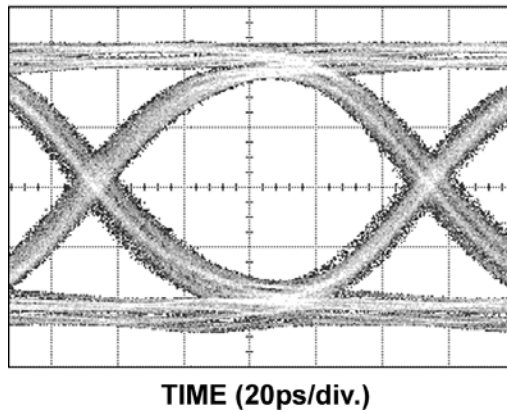
Typical Characteristics



Note:
 I_{MOD} is defined for a 25 Ω external load.

Functional Characteristics

**Electrical Eye Diagram
PRBS 2⁷-1 @10.3125Gbps,
 $R_L = 50\Omega$, $I_{MOD} = 25mA$**



Input and Output Stages

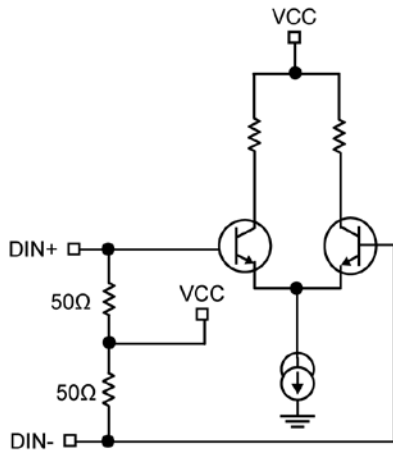


Figure 1a. Simplified Input Stage

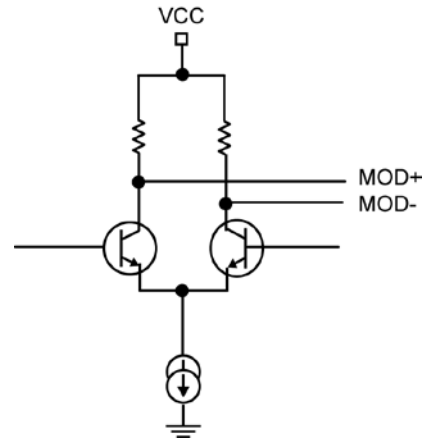
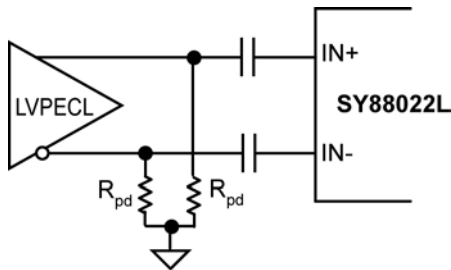


Figure 1b. Simplified Output Stage

Interfacing the Input to Differential Logic Drivers



Note:
R_{pd} = 140Ω to 220Ω

Figure 2a. AC-Coupling to LVPECL Driver

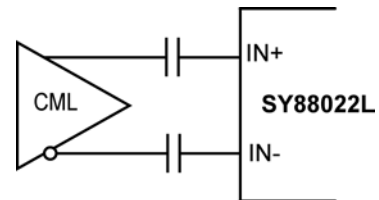
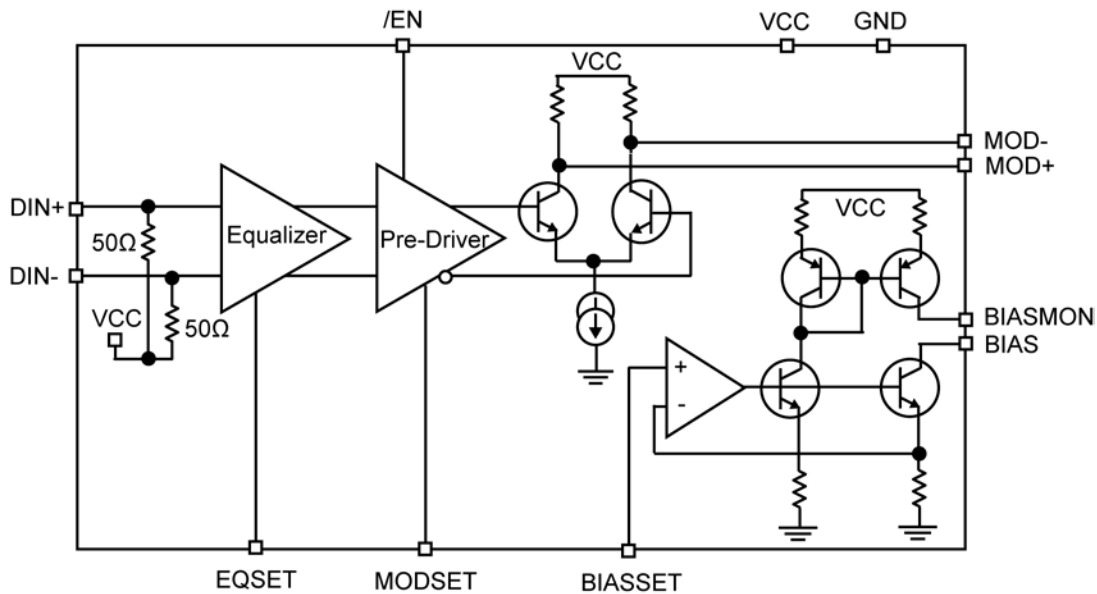


Figure 2b. AC-Coupling to CML Driver

Functional Diagram



Functional Description

As shown on the block diagram above, the driver is composed from an input equalizer, and a modulation block consisting of a pre-driver, and a current source.

Equalizer

The input equalizer allows for compensation of up to 9" of FR4 microstrip trace or equivalent. The equalization restores the losses in high frequency components of the signal caused by its travel on the line card traces and through the connectors between the line card and the module before it reaches the input stage. The amount of equalization is programmable with a resistor from pin 7 to ground.

Modulator

The modulator consists of a pre-driver and a current source. The modulation current is set in the pre-driver by applying a voltage within the range 0V to 1.2V to pin 5 (MODSET). The pre-driver provides the current to the output stage, which consists of a current source

composed from a differential pair which collectors are connected to MOD+/MOD- pins and have 50Ω internal termination to VCC. The Modulation gain curve on page 6 shows modulation current variation versus the applied voltage at MODSET pin.

Bias

The bias is set by applying a voltage within the range 0V to 1.2V to pin 16 (BIASSET). The bias gain curve on page 6 shows bias current variation versus the applied voltage at pin 16.

The SY88022L driver is designed to work with one of the Micrel's MIC300X series of controllers which have built in APC (Automatic Power Control) circuit and a serial interface for programming modulation and bias, temperature compensation tables, setting registers, and monitoring registers read back. Refer to the MIC3001/MIC3002/MIC3003 datasheets for more details. The applications section below shows how to set up the driver to work correctly with the MIC300X controller.

Application Information

Figure 3, below, illustrates a typical optical transceiver using the SY88022L and one of the Micrel's FOM

management IC MIC300X.

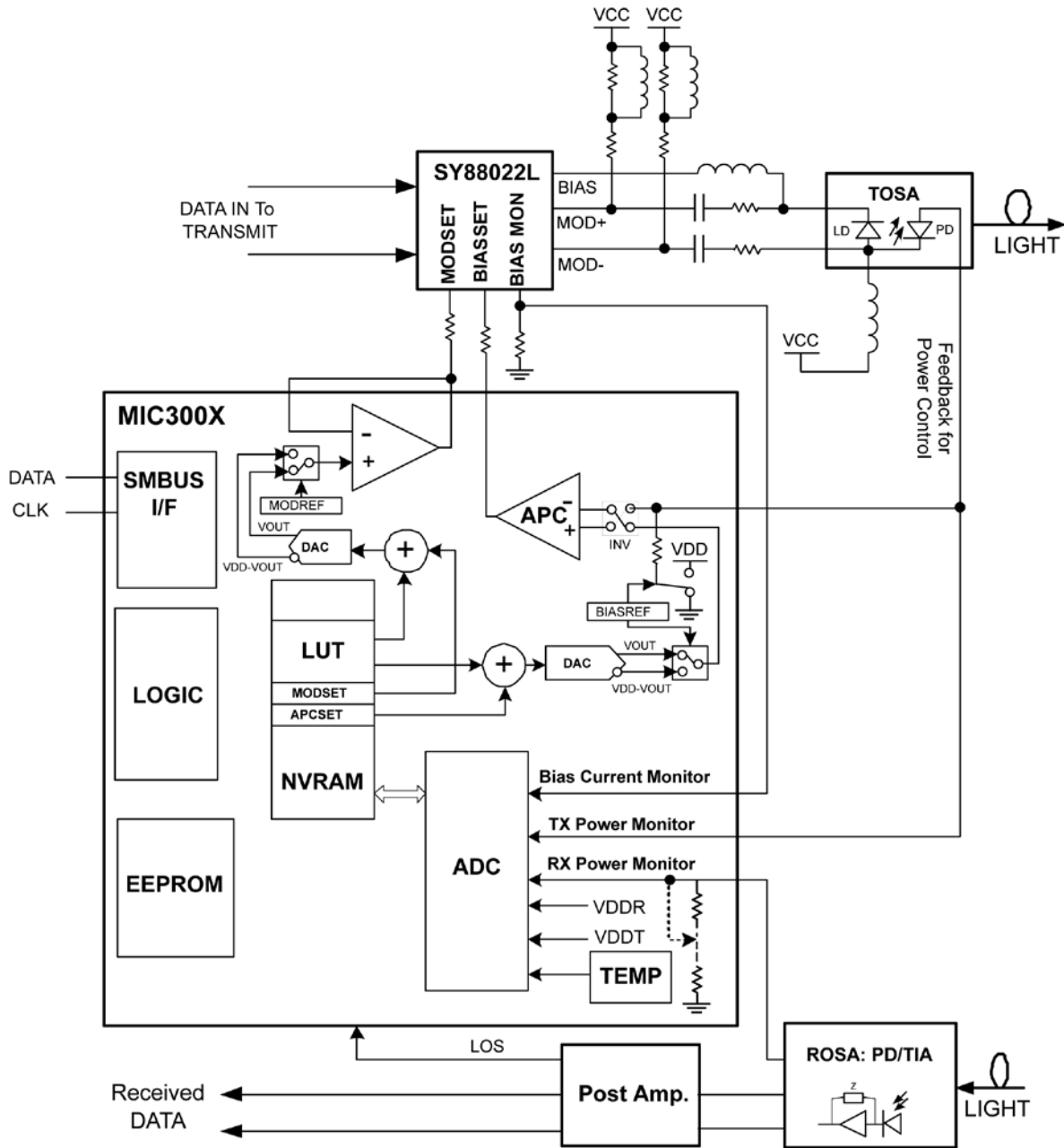
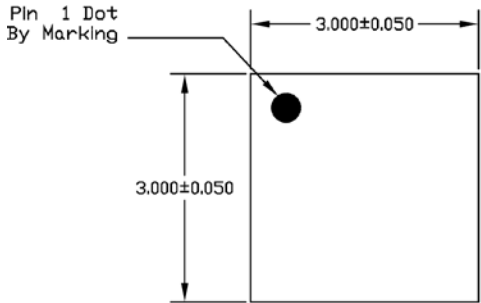
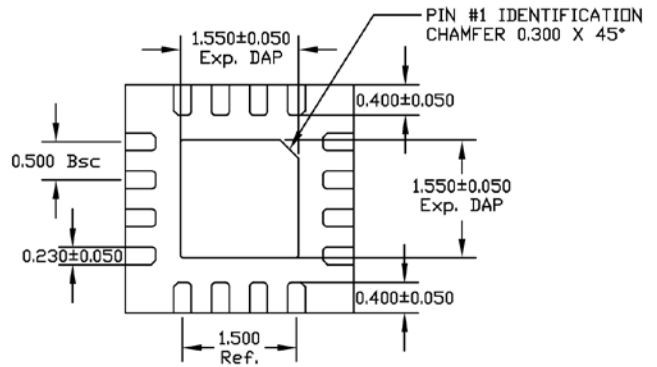


Figure 3. Typical Optical Transceiver

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 (3mm x 3mm) QFN

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>

The information furnished by Micrel in this data sheet is believed to be accurate and reliable. However, no responsibility is assumed by Micrel for its use. Micrel reserves the right to change circuitry and specifications at any time without notification to the customer.

Micrel Products are not designed or authorized for use as components in life support appliances, devices or systems where malfunction of a product can reasonably be expected to result in personal injury. Life support devices or systems are devices or systems that (a) are intended for surgical implant into the body or (b) support or sustain life, and whose failure to perform can be reasonably expected to result in a significant injury to the user. A Purchaser's use or sale of Micrel Products for use in life support appliances, devices or systems is a Purchaser's own risk and Purchaser agrees to fully indemnify Micrel for any damages resulting from such use or sale.

© 2009 Micrel, Incorporated.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Micrel:](#)

[SY88022LMG](#) [SY88022ALMG TR](#) [SY88022ALMG](#) [SY88022LMG TR](#)

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А