SY88782L

3.3V, 1.25Gbps High Current, Low Power Laser Driver for Datacom Telecom Applications

General Description

The SY88782L is a single supply 3.3V low power consumption, small form factor, driver for telecom/datacom applications using FP/DFB lasers at data rates up to 1.25Gbps. The driver can deliver modulation current up to 90mA, and the high compliance voltage it offers makes the part suitable for high-current operation (with the laser AC- or DC-coupled to it.) This device is intended to be used with Micrel MIC3000/1 Optical Transceiver Management IC which allows for modulation and bias currents control and monitoring, automatic power Control, and temperature compensation.

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

Features

- 2.3V minimum laser compliance voltage
- 44mA power supply current typical
- Operation up to 1.25Gbps
- Modulation current up to 90mA
- Designed for use with the MIC3000/1
- Small form factor 3mm x 3mm MLF™ package

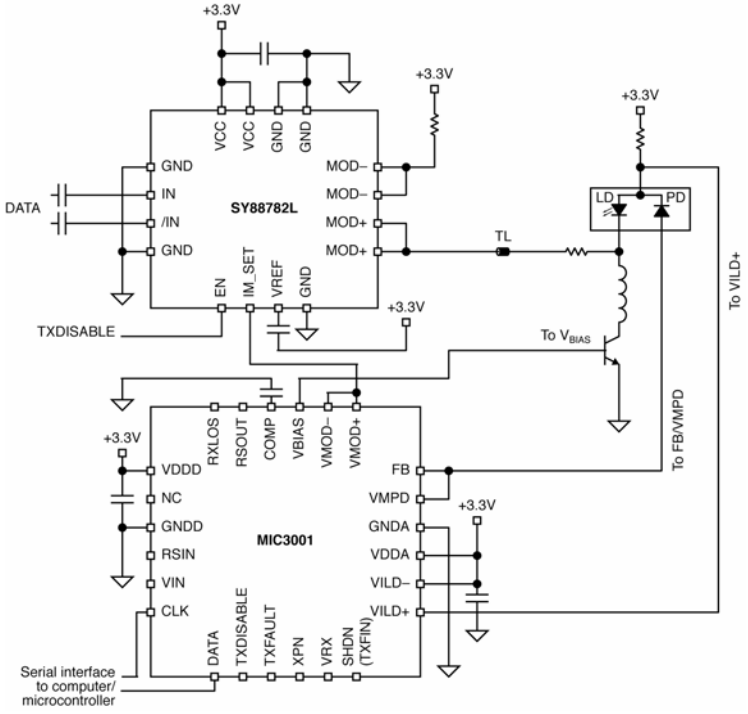
Applications

- Multi-rate LAN, MAN applications up to 1.25Gbps: Ethernet, SONET OC3/12/24 and SDH STM1/4/8
- SFF, SFP Modules

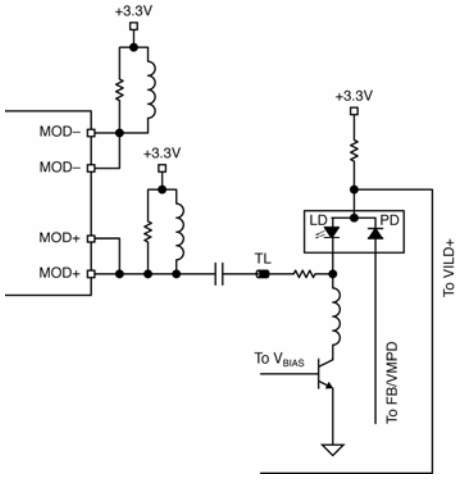
Markets

- Telecom, Datacom

Typical Application



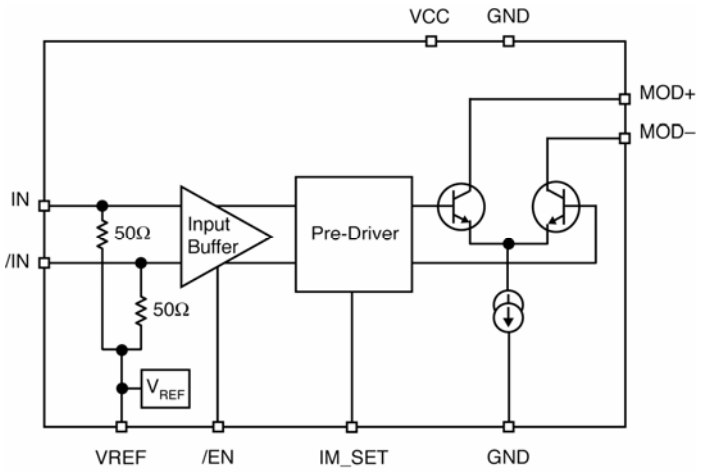
Laser DC-Coupled to the Driver



Laser AC-Coupled to the Driver

*Micro*LeadFrame is a trademark of Amkor Technology, Inc.

Functional Block Diagram



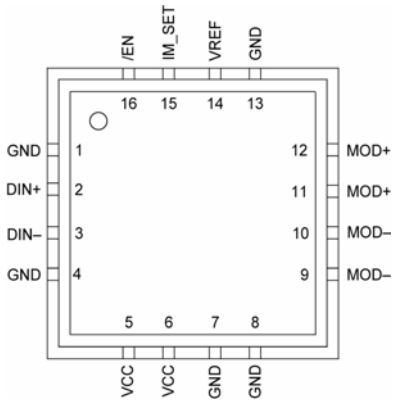
Ordering Information[1]

Part Number	Package Type	Operating Range	Package Marking	Lead Finish
SY88782LMG	MLF-16	Industrial	782L with Pb-Free bar-line indicator	NiPdAu Pb-Free
SY88782LMGTR[2]	MLF-16	Industrial	782L with Pb-Free bar-line indicator	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



16-Pin MLF™ (MLF-16)

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Pin Description

Pin Name	Pin Number	Pin Function
1, 4, 7, 8, 13	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 50Ω to a reference voltage.
3	DIN–	Inverting input data. Internally terminated with 50Ω to a reference voltage.
5, 6	VCC	Supply Voltage. Bypass with a 0.1µF//0.01µF low ESR capacitor as close to VCC pin as possible.
9, 10	MOD–	Inverted modulation current output. Outputs modulation current when input data is negative.
11, 12	MOD+	Non-inverted modulation current output. Outputs modulation current when input data is positive.
14	VREF	Reference Voltage. Install a 0.1µF capacitor between VREF and VCC.
15	IM_SET	Modulation current setting and control. The voltage applied to this pin will set the modulation current. To be connected to the MIC3000/1 pin 24 (VMOD+). Input impedance 25KΩ.
16	/EN	A low level signal on this pin will enable the output stage of the driver. Internally pulled down with 75KΩ.

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	L	L

Notes:

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

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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]
MLF™
(θ_{JA}) Still-air ..... 60°C/W
(ψ_{JB})..... 33°C/W

DC Electrical Characteristics

T_A = –40°C to +85°C and V_{CC} = +3.0V to +3.6V, unless otherwise noted. Typical values are V_{CC} = +3.3V, T_A = 25°C, I_{MOD} = 60mA.

Symbol	Parameter	Condition	Min	Typ	Max	Units
I_{CC}	Power Supply Current	Modulation currents excluded		44	60[4]	mA
V_{MOD_MIN}	Minimum Voltage Required at the Driver Output (headroom) for Proper Operation		0.7			V
$R_{IN(DATA)}$	Input Resistance (DIN+, DIN-)		45	50	55	Ω
V_{ID}	Differential Input Voltage Swing		200		2400	mV_{pp}
/EN Low					0.8	V
/EN High			2			V
$R_{IN\ (IMOD\_SET)}$	I_{M_SET} Input Resistance			25		kΩ
V_{IM_SET}	Voltage Range on I_{M_SET} Pin	I_{MOD} range 10mA to 90mA			1.2	V

AC Electrical Characteristics

T_A = –40°C to +85°C and V_{CC} = +3.0V to +3.6V, unless otherwise noted. Typical values are V_{CC} = +3.3V, T_A = 25°C, I_{MOD} = 60mA.

Symbol	Parameter	Condition	Min	Typ	Max	Units
	Data Rate	NRZ	0.05		1.25	Gbps
I_{MOD}	Modulation Current[5]	AC-coupled	10		90	mA
		DC-coupled	10		70[6]	mA
I_{MOD_OFF}	Modulation OFF Current	Current at MOD+ when the device is disabled			750	µA
t_r	Output Current Rise Time	20% to 80%, I_{MOD} = 60mA		80		ps
t_f	Output Current Fall Time	20% to 80%, I_{MOD} = 60mA		80		ps
	Total Jitter	@1.25Gbps data rate			20	ps_{PP}
	Pulse-Width Distortion				20	ps

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 data sheet. Exposure to absolute maximum ratings conditions for extended periods may affect device reliability.
2. The data sheet limits are not guaranteed if the device is operated beyond the operating ratings.
3. Package Thermal Resistance assumes exposed pad is soldered (or equivalent) to the devices most negative potential on the PCB. ψ_{JB} uses a 4-layer and θ_{JA} in still air unless otherwise stated.
4. I_{CC} = 60mA for worst-case conditions with I_{MOD} = 90mA, T_A = +85°C, V_{CC} = 3.6V.
5. Load = 15Ω.
6. Assuming V_{CC} = 3.0V, Laser bandgap voltage = 1V, laser package inductance = 1nH, laser equivalent series resistor = 5Ω, and damping resistor = 10Ω.

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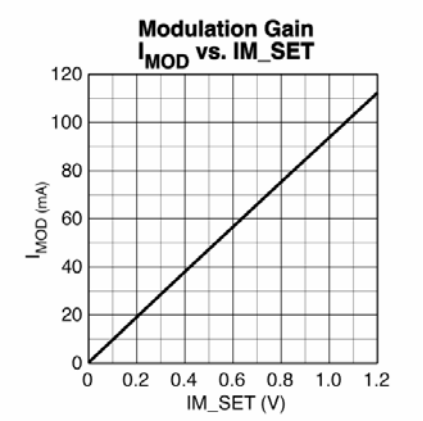
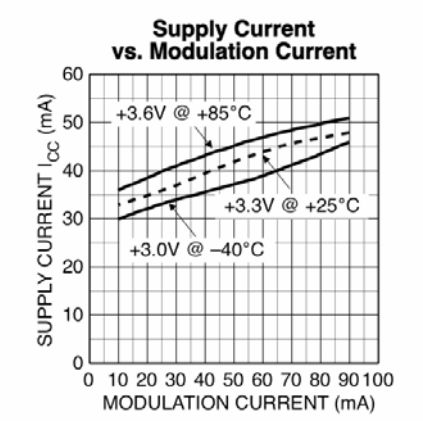
Typical Operating Characteristics





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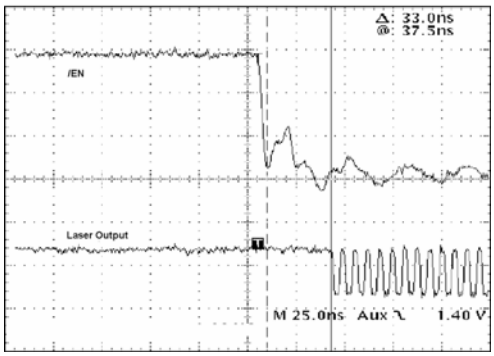
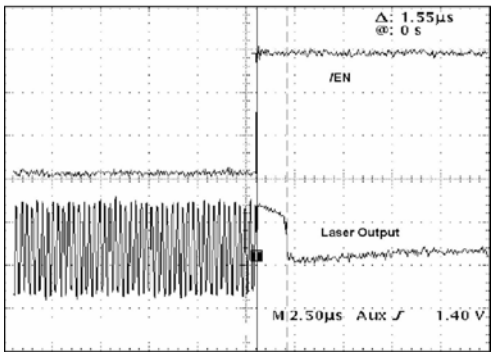
Functional Characteristics

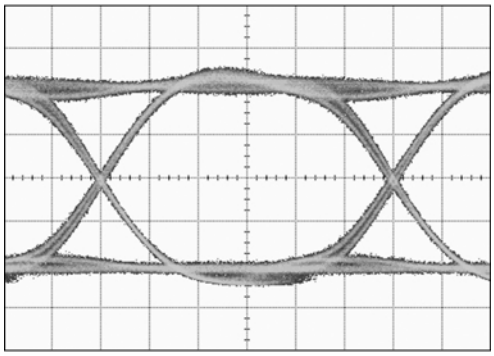
Transmitter Enable Time



Transmitter Disable Time

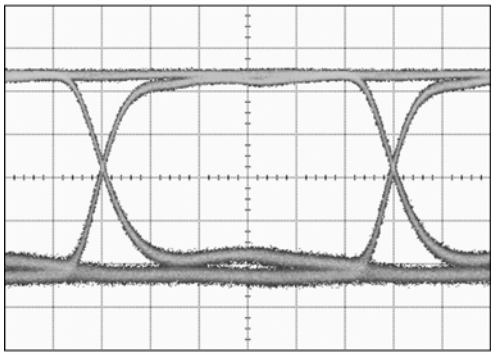


Optical Eye Diagram
1.25Gbps PRBS 2^{23}–1, ER = 14dB, OC-48 Filter



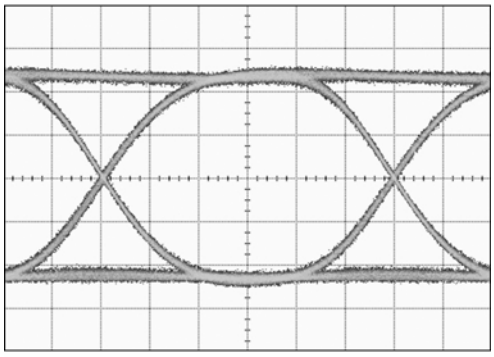
TIME (133ps/div.)

Electrical Eye Diagram
1.25Gbps PRBS 2^{23}–1, Load = 15Ω



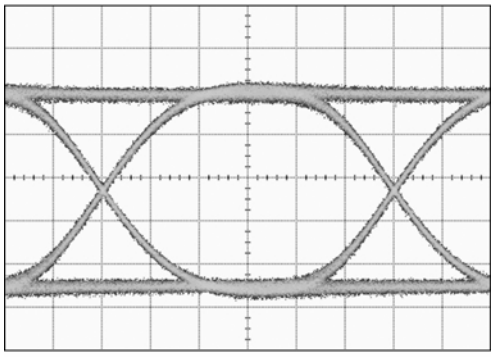
TIME (133ps/div.)

Optical Eye Diagram
622Mbps PRBS 2^{23}–1, ER = 13dB, OC-12 Filter



TIME (270ps/div.)

Electrical Eye Diagram
155Mbps PRBS 2^{23}–1, ER = 14dB, OC-3 Filter



TIME (1ns/div.)

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Input and Output Stages

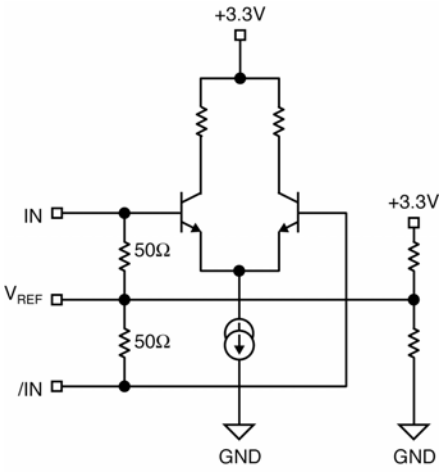

Figure 1a. Simplified Input Stage

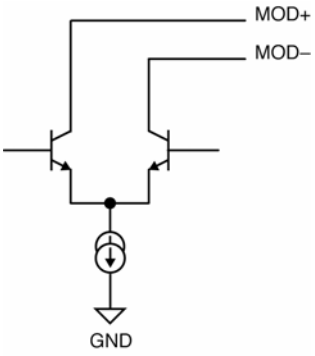

Figure 1b. Simplified Output Stage

Interface the Input to Different Logic Drivers

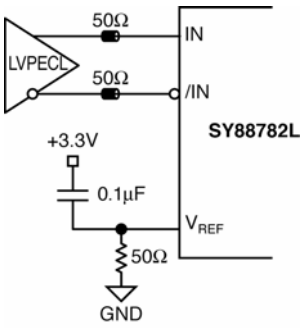

Figure 2a. DC-Coupling to LVPECL Driver

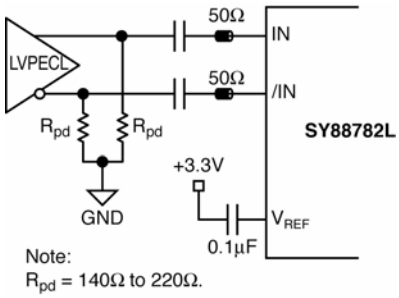

Figure 2b. AC-Coupling to LVPECL Driver

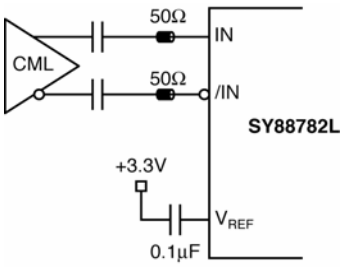

Figure 2c. AC-Coupling to CML Driver

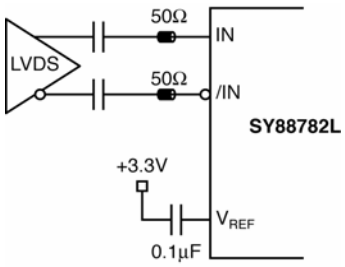

Figure 2d. AC-Coupling to LVDS Driver

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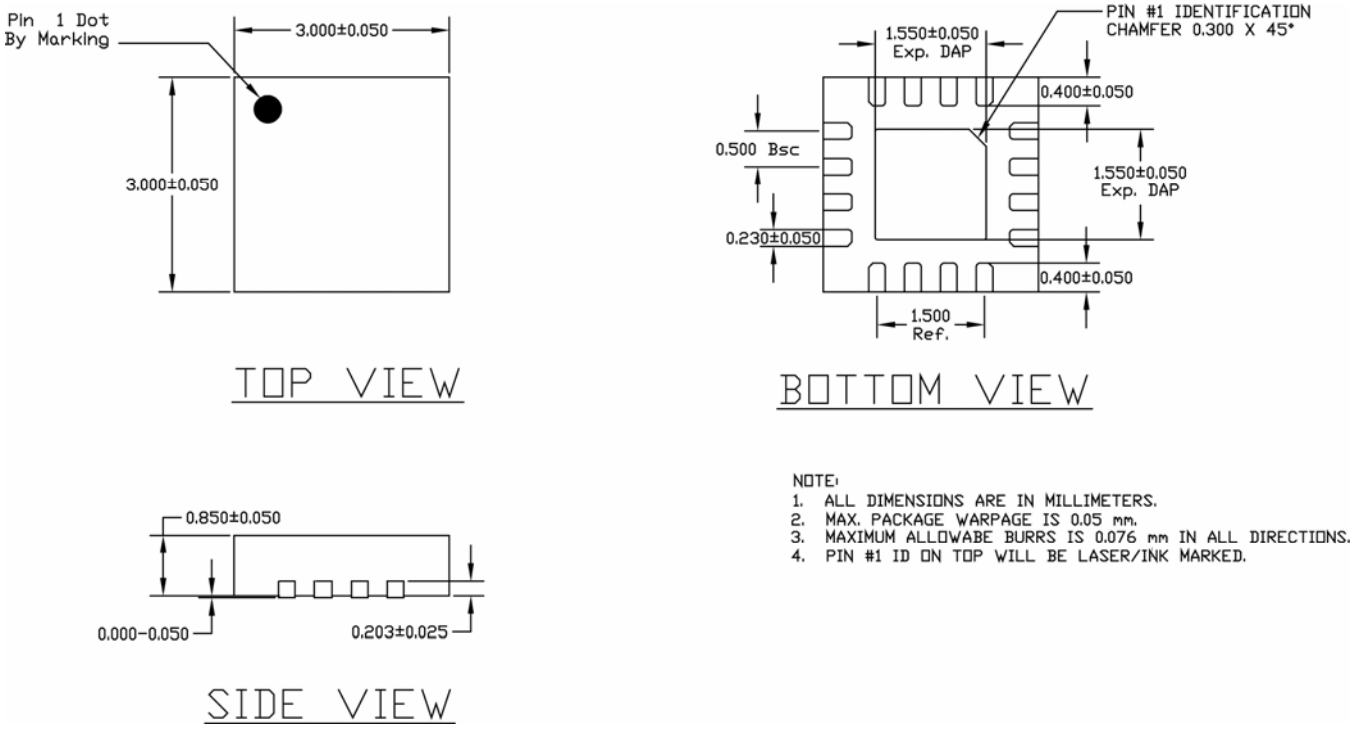
16 LEAD (3mmx3mm) *Micro*LEADFRAME™ (MLF-16)



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