100mA LASER Diode Driver

General Description

The EMD2161 is a LASER Diode (LD) driver with up to 100mA driving capability and 10kHz pulsed operation. To prevent driving LD with improper large current, a current limit circuit is designed in. Once the protecting circuit is triggered 3 times, the main driver would be ceased and wake-up it again by re-power on.

Feature

- Up to 100mA driving capability
- With selectable current limit
- With Under Voltage Protection

Typical Application

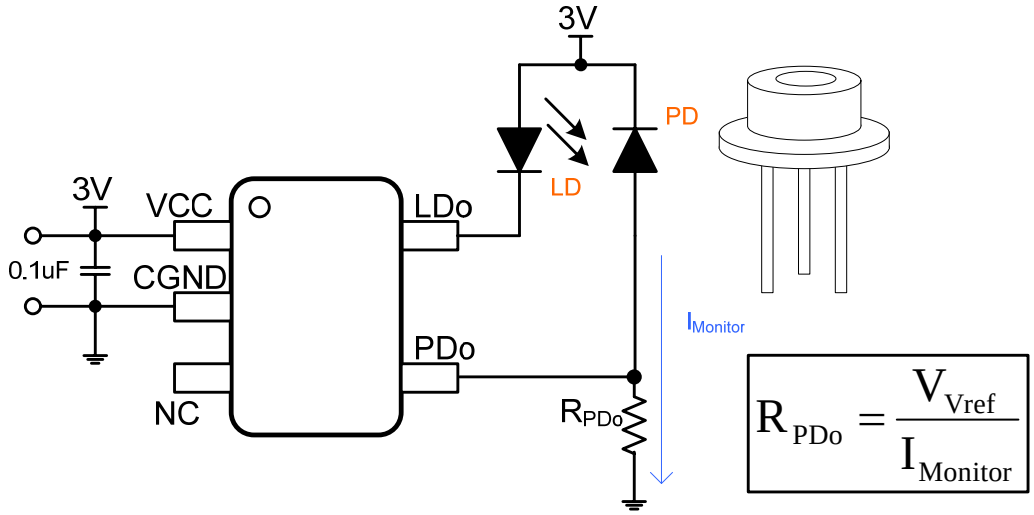
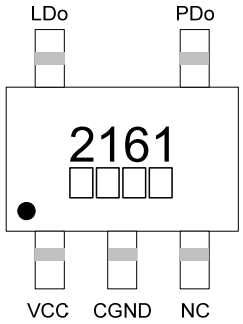


Fig. 1 Typical application circuit

Connection Diagram

SOT-23-5 (Top View)

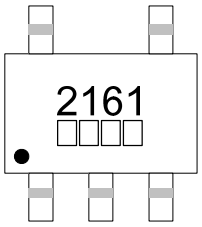


Order Information

EMD2161-00VN05NRR

00	Output Current Adjustable
VN05	SOT-23-5 Package
NRR	RoHS & Halogen free
	Rating: -40 to 85°C
	Tape & Reel

Order, Mark & Packing Information

Package	Product ID	Marking	Packing
SOT-23-5	EMD2161-00VN05NRR		3K units Tape & Reel

Pin Locations & Functions

Pin Name	Pin No.	Description
VCC	**1**	Supply voltage.
CGND	**2**	Ground.
NC	**3**	
PDo	**4**	Feedback node for LASER output power control. Normally, a resistor around 10k between PDo and CGND is recommended.
LDo	**5**	Main LASER diode Driver.

Functional Block Diagram

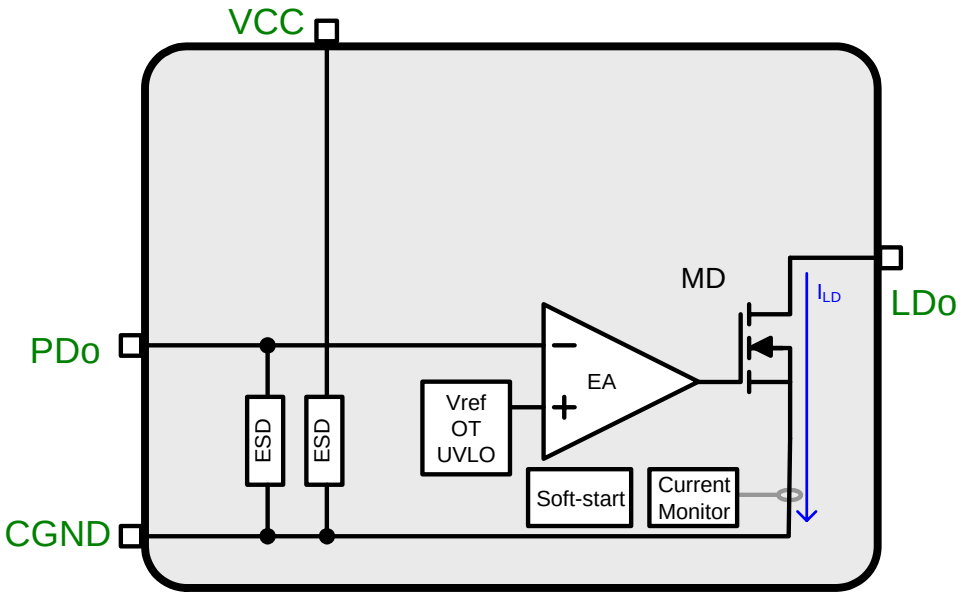


Fig. 2 Functional Block Diagram

Absolute Maximum Ratings (Note1, 2)

Devices are subjected to fail if they stay above absolute maximum ratings.

Supply Voltage (VCC) ---------- – 0.3V to +6.5V
Others (PDo,LDo) ---------- – 0.3V to VCC
Storage Temperature ---------- – 65°C to 150°C
Junction Temperature ---------- 150°C
Lead Temperature (Soldering, 10 sec) --------- 260°C
Latch up ---------- 200mA
HBM ESD ---------- 2000V
MM ESD ---------- 200V

Recommended Operating Rating (Note3, 4 and 5)

Supply Voltage (VCC) ---------- 3.0V to +5.5V Operating Junction Temperature ---- -40℃ to 100℃

Thermal Resistance

Symbol	θ_{JA}(Note 1)	θ_{JC} **(top)**(Note 2)
SOT-23-5	152 (℃/W)	81(℃/W)

Electrical Characteristics

VCC=3V, T_A=+25°C, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
VCC	Supply Voltage		3.0		5.5	V
V_{UVLO}	Under Voltage Lockout Threshold	VCC failing		2.4		V
V_{UVLO_HYS}	Hysteresis of Under Voltage Lockout	VCC rising		0.1		V
V_{Vref}	Reference Voltage	VCC=3V	0.53	0.55	0.57	V
I_{PDo}	PDo pin current	V_{PDo} =1.1V		1		nA
$R_{DS(ON)}$	Main Driver on Resistance	VCC=2.8V,		1	3	
$I_{O,100}$	In regulation Maximum Output Current	VCC=3V;	60	100	150	mA

Note 1: Absolute Maximum ratings indicate limits beyond which damage may occur. Electrical specifications do not apply when operating the device outside of its rated operating conditions.

Note 2: All voltages are with respect to the potential at the ground pin.

Note 3: T_J is a function of the ambient temperature T_A and power dissipation P_D ($T_J = T_A + (P_D) * (\theta_{JA})$).

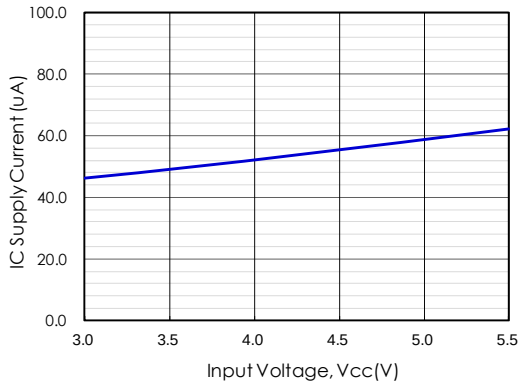
Note 4: θ_{JA} is measured in the natural convection at T_A=25℃ on a high effective thermal conductivity test board (2 layers, 2S0P).

Note 5: $\theta_{JC\ (top)}$ represents the resistance to the heat flows the chip to package top case.

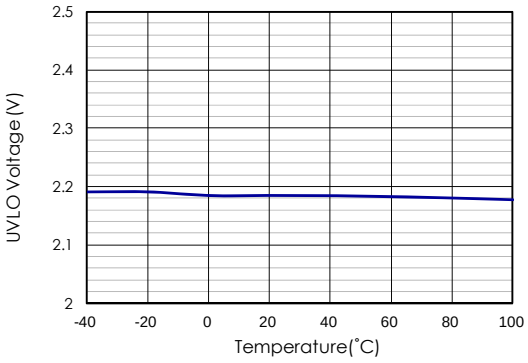
Typical Performance Characteristics

T_A=25℃, unless otherwise specified

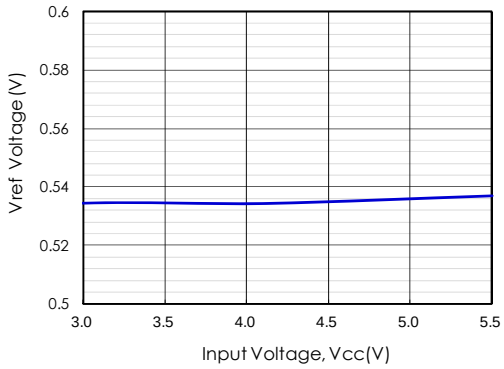
IC Supply Current (I_{IN}) vs. V_{CC}



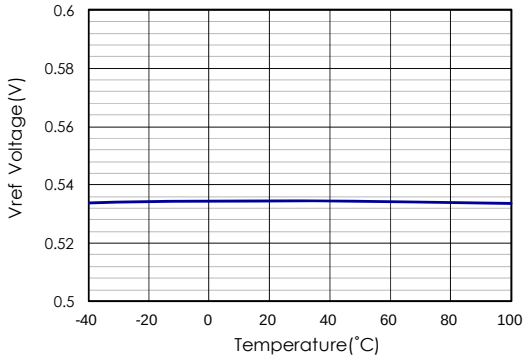
UVLO Voltage vs. Temperature



V_{Vref} vs.V_{CC}



V_{Vref} vs. Temperature



Typical Application Information

Continuous Wave (CW) Mode Power

The EMD2161 can be adapted to CW laser diodes from 2 to 15mW and usable laser module type as Fig.3.

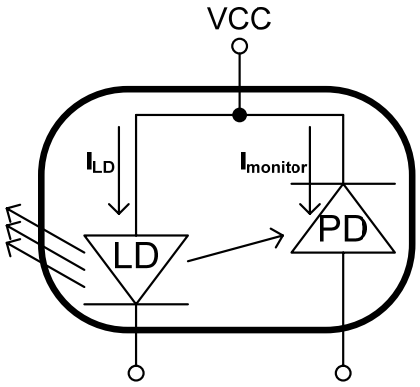


Fig.3 Laser Module type for EMD2161

The pin PDo is used to adjust the sensitivity of the monitor diode and to set a desired power for the optical laser diode.

Example,

A laser diode is with 5mW optical output, monitor diode with 0.033mA/mW. For 2mW optical output, the RPDo can be calculated as following equation:

$$RPDo = \frac{V_{Vref}}{0.033 \times 2} = \frac{0.55}{0.066} \approx 8.3k\Omega$$

#

Pulsed Operation –Structure-1

Fig.4 shows the simplified design for pulsed operation, up to 10kHz pulsed operation could be also provided by EMD2161. Beside, in order to avoid overdriving the laser diode during pulsed operation, the laser rising current with 15us delay is designed for soft-start.

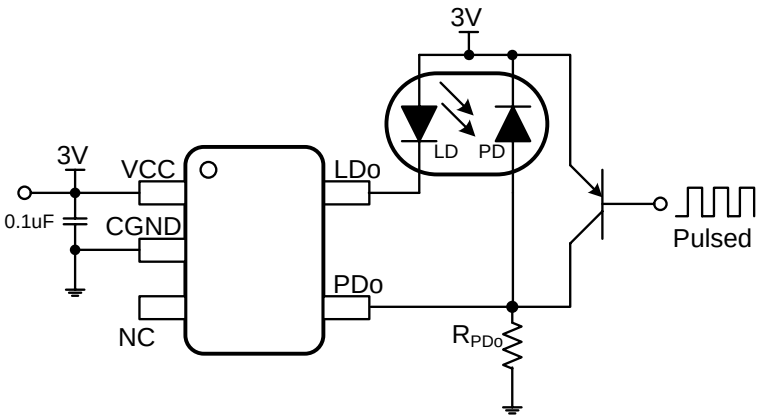
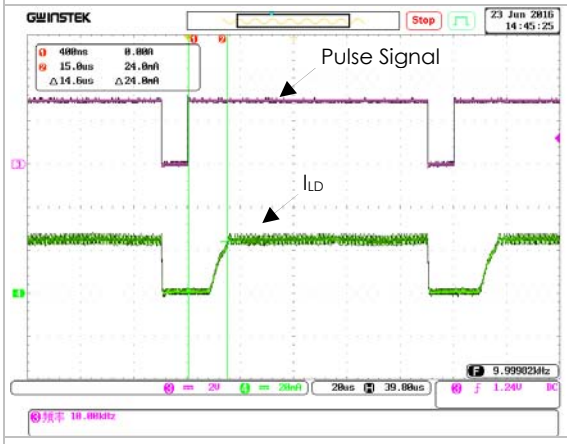


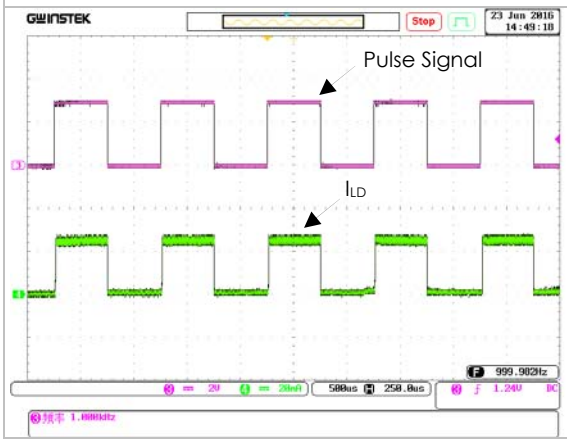
Fig.4 Pulsed operation example on PDo pin

Pulsed Operation with 10kHz/D=90%



Pulsed Operation with 1kHz/D=90%

Pulsed Operation with 1kHz/D=50%



Pulsed Operation with 1kHz/D=10%

Pulsed Operation –Structure-2

In addition, the EMD2161 with pulsed operation is not only applied on PDo pin, but also it is adapted with pulsed operation on VCC pin, as shown in Fig.5. Nevertheless, due to the VCC UVLO, the I_{LD} delay (turn-on delay + rising delay) would be raised above 20us.

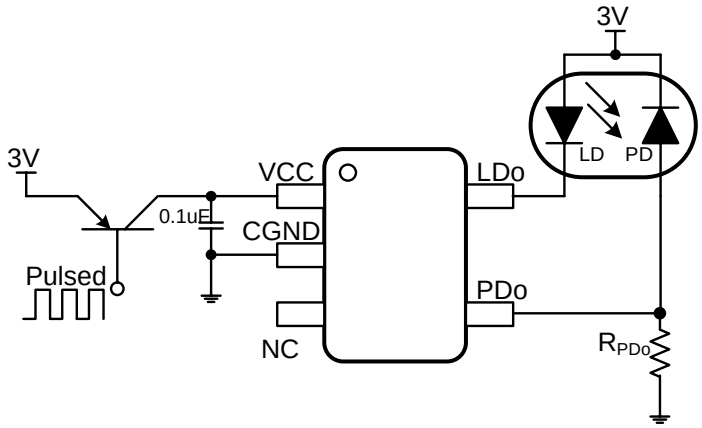
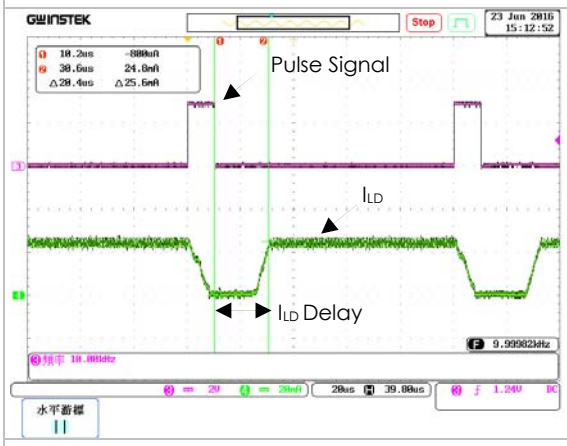


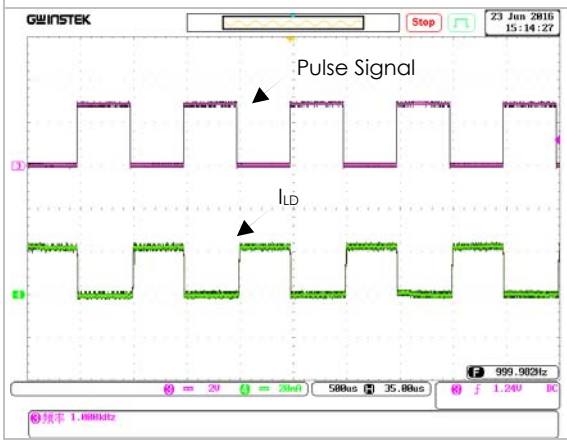
Fig.5 Pulsed operation example on VCC pin

Pulsed Operation with 10kHz/D=90%

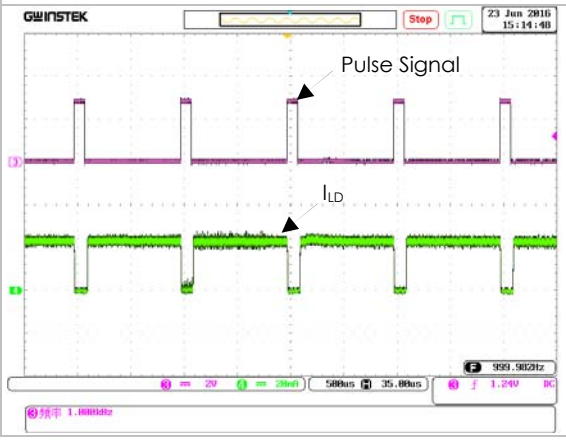


Pulsed Operation with 1kHz/D=90%

Pulsed Operation with 1kHz/D=50%



Pulsed Operation with 1kHz/D=10%



Driving High V_F Laser Diode

Due to the VCC AMR of EMD2161 is 6.5V, an external boost or charge-pump IC could be adapted to supply the laser module, and the application structure as shown in Fig.6.

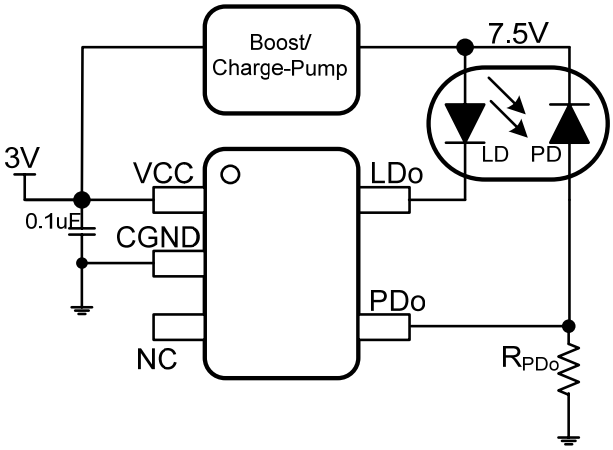
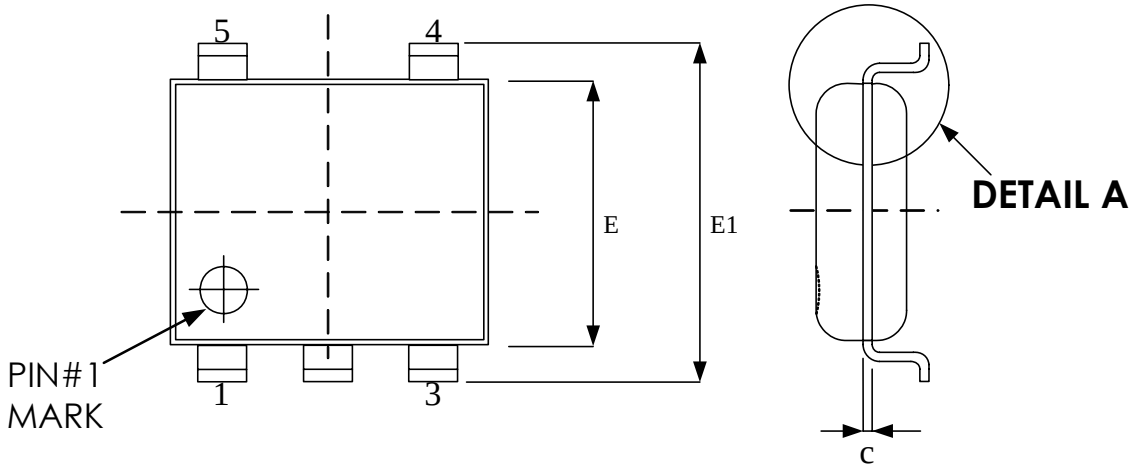
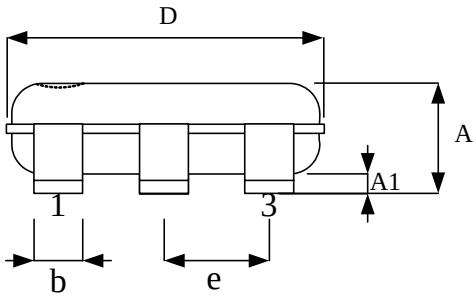


Fig.6 Driving High V_F Laser Diode

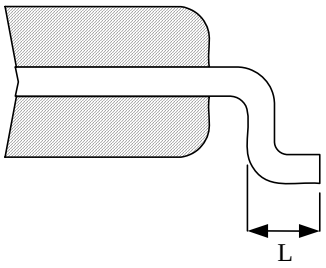
Package Outline Drawing
SOT-23-5



TOP VIEW



SIDE VIEW



DETAIL A

Symbol	Dimension in mm	
	Min.	Max.
A	0.90	1.45
A1	0.00	0.15
b	0.30	0.50
c	0.08	0.25
D	2.70	3.10
E	1.40	1.80
E1	2.60	3.00
e	0.95 BSC	
L	0.30	0.60

Revision History

Revision	Date	Description
0.1	2016.08.12	Initial Version.

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