

## 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

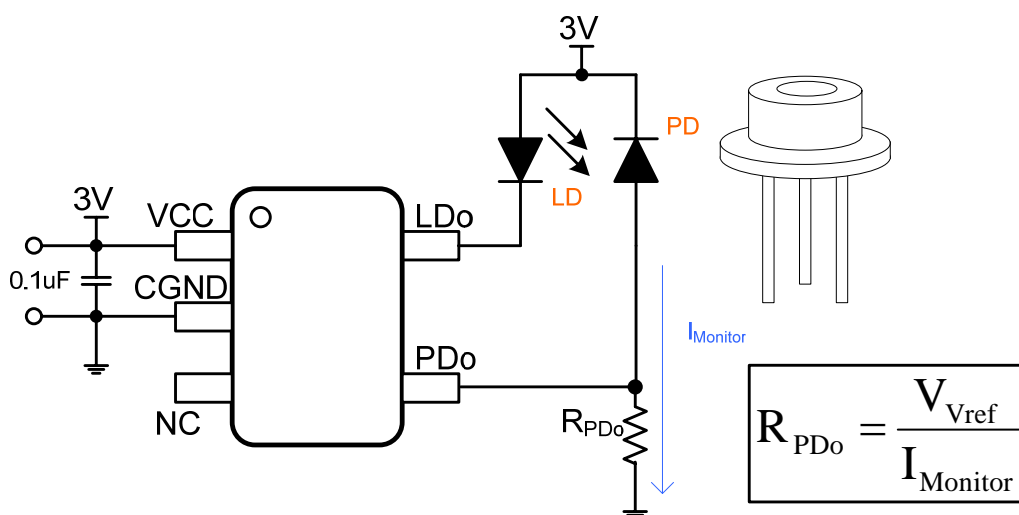
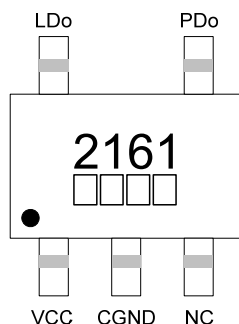


Fig. 1 Typical application circuit

### Connection Diagram

#### SOT-23-5 (Top View)

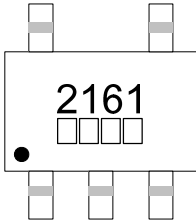


### Order Information

EMD2161-00VN05NRR

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

## Order, Mark &amp; Packing Information

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

## Pin Locations &amp; 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

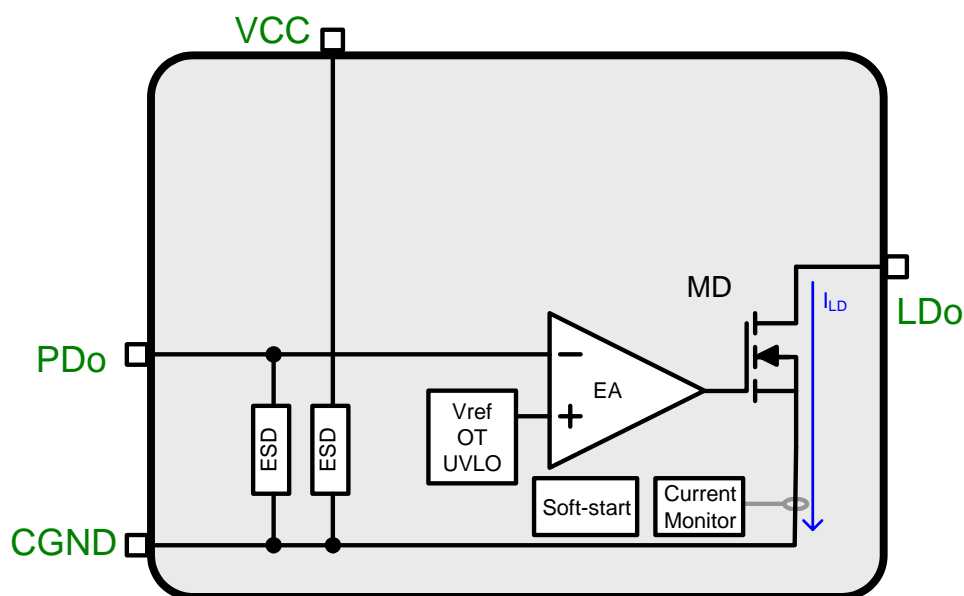


Fig. 2 Functional Block Diagram

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

**Recommended Operating Rating** (Note3, 4 and 5)

Supply Voltage (VCC)	----- 3.0V to +5.5V	Operating Junction Temperature	---- -40°C to 100°C
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**Thermal Resistance**

Symbol	$\theta_{JA}$ (Note 1)	$\theta_{JC}$ (top)(Note 2)
SOT-23-5	152 (°C/W)	81 (°C/W)

**Electrical Characteristics**

VCC=3V, T<sub>A</sub>=+25°C, unless otherwise specified.

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

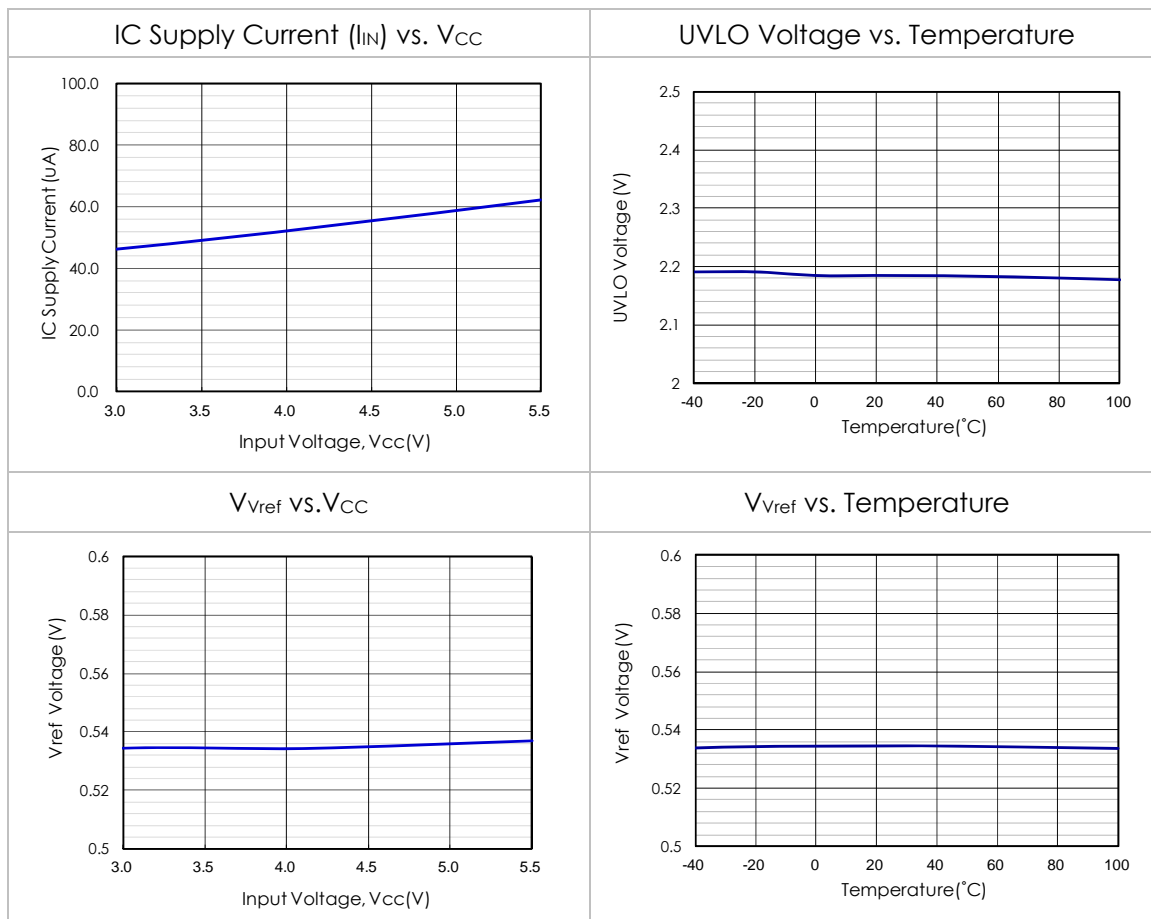
**Note 1:** Absolute Maximum ratings indicate limits beyond which damage may occur. Electrical specifications do not apply when operating the device outside of its rated operating conditions.

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

**Note 3:** T<sub>J</sub> is a function of the ambient temperature T<sub>A</sub> and power dissipation P<sub>D</sub> (T<sub>J</sub> = T<sub>A</sub> + (P<sub>D</sub>) \* (θ<sub>JA</sub>)).

**Note 4:** θ<sub>JA</sub> is measured in the natural convection at T<sub>A</sub>=25°C on a high effective thermal conductivity test board (2 layers, 2SOP).

**Note 5:** θ<sub>JC (top)</sub> represents the resistance to the heat flows the chip to package top case.

**Typical Performance Characteristics** $T_A=25^{\circ}\text{C}$ , unless otherwise specified

## 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.

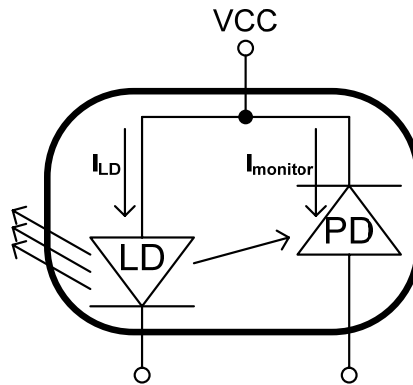


Fig.3 Laser Module type for EMD2161

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 RPD0 can be calculated as following equation:

$$RPD0 = \frac{V_{Vref}}{0.033 \times 2} = \frac{0.55}{0.066} \approx 8.3k\Omega$$

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**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.

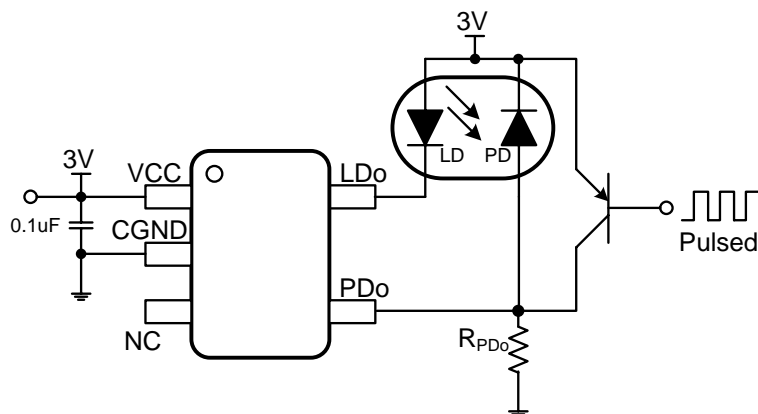
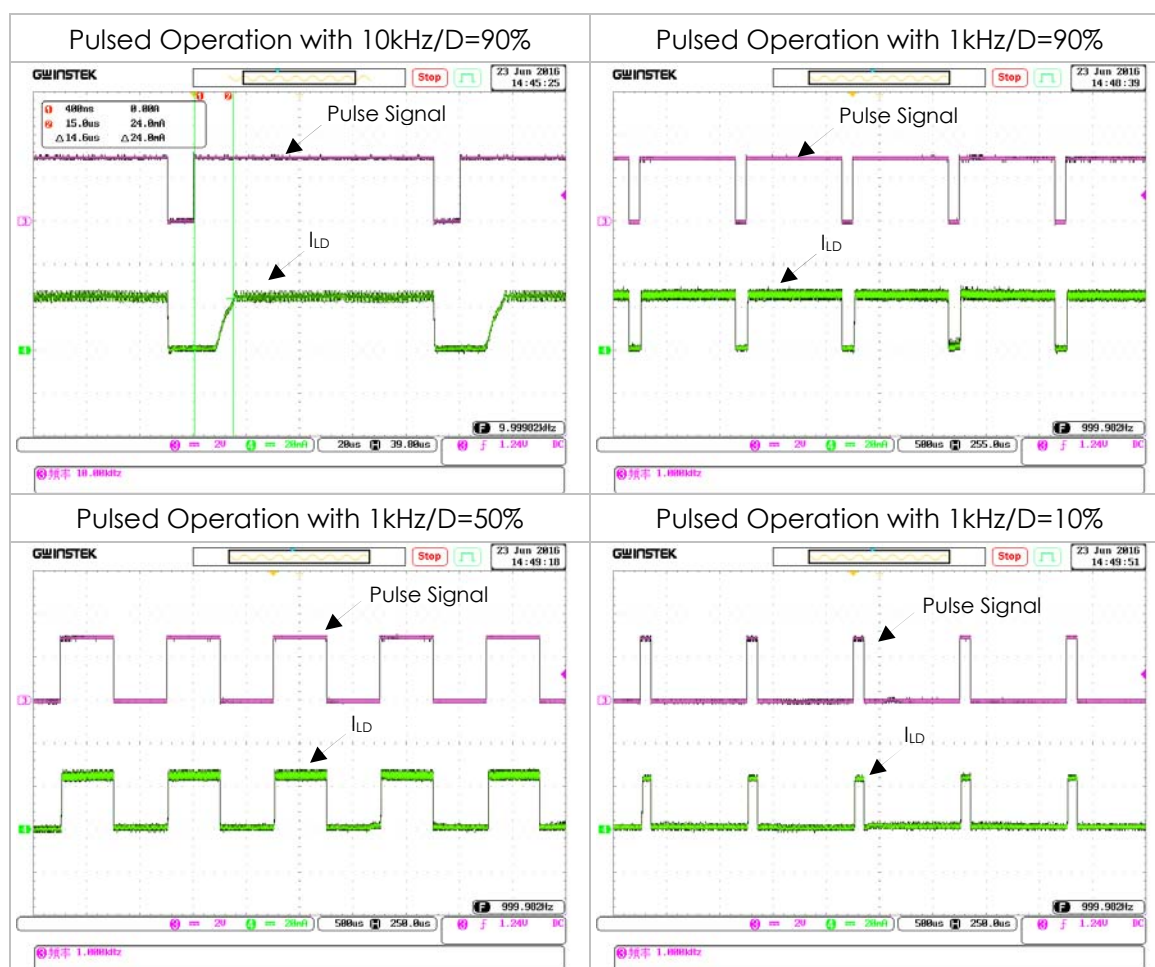


Fig.4 Pulsed operation example on PDo pin



### Pulsed Operation –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 20 $\mu$ s.

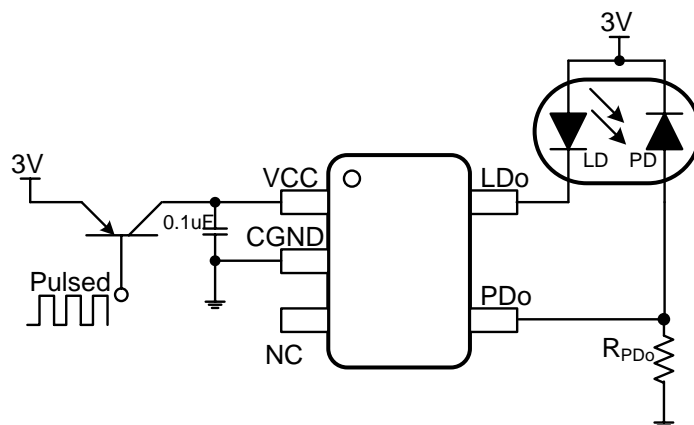
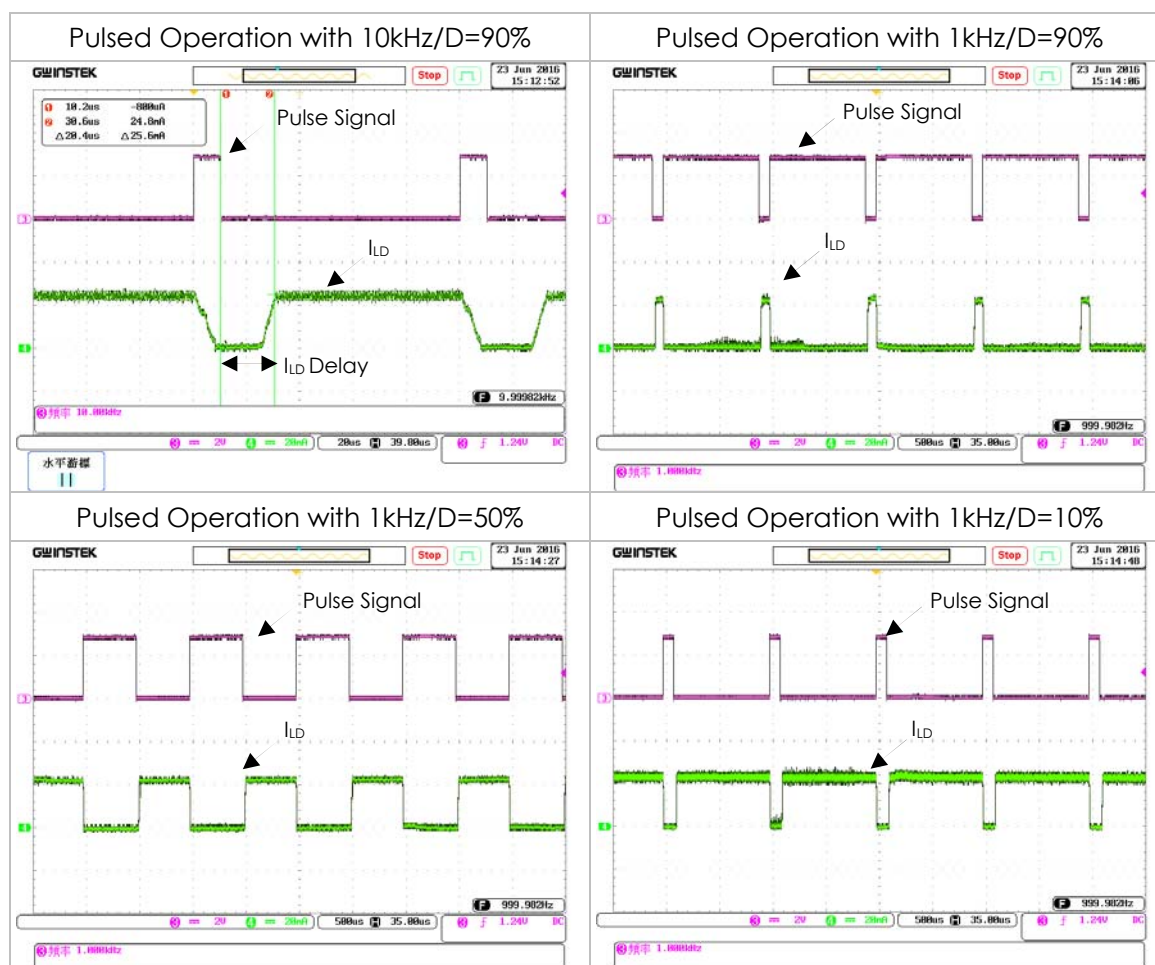


Fig.5 Pulsed operation example on VCC pin



**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.

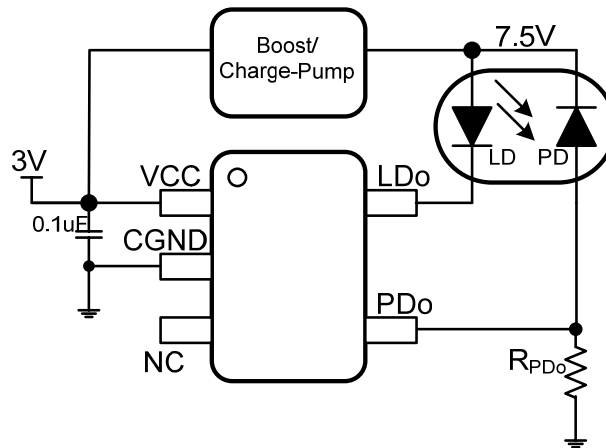
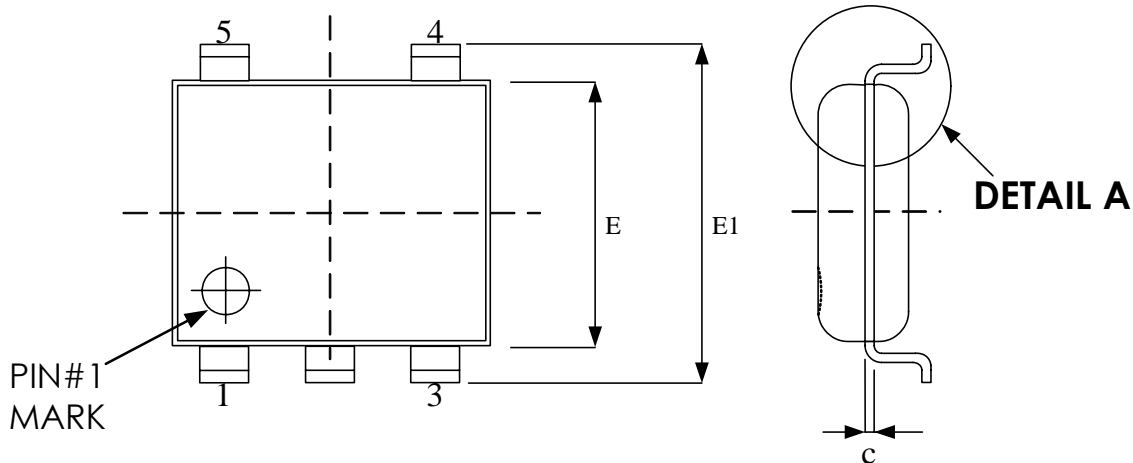
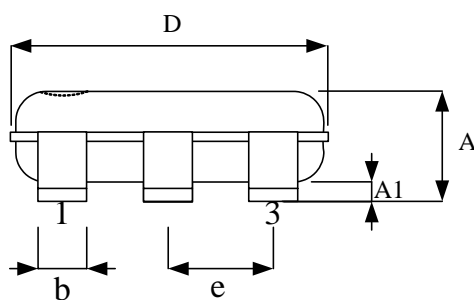


Fig.6 Driving High  $V_F$  Laser Diode

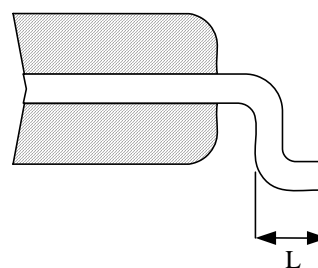
**Package Outline Drawing**  
**SOT-23-5**



**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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