

iC-WK, iC-WKL Application Notes

2.4V CW LASER DIODE DRIVER



Release 19.11.02, Page 1/3

CONTENTS

1. Application Notes page 1
2. Dimensioning page 3

1. APPLICATION NOTES

Figure 1 to 3 show the standard configurations of iC-WK/L for N/P/M-type laser diodes respectively. Due to the rapid soft start iC-WK/L can be pulsed up to approximately 1 kHz by simply switching the supply voltage on and off.

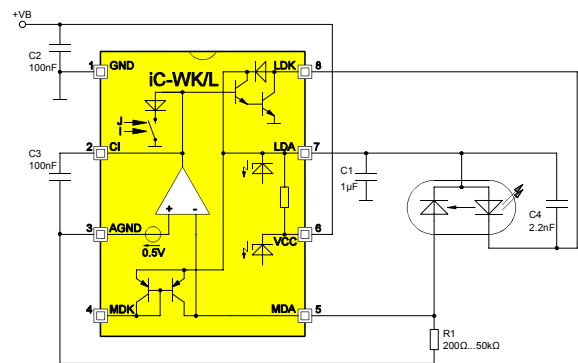


Fig. 1: Configuration for N-type laser diodes (cathode MD at anode LD)

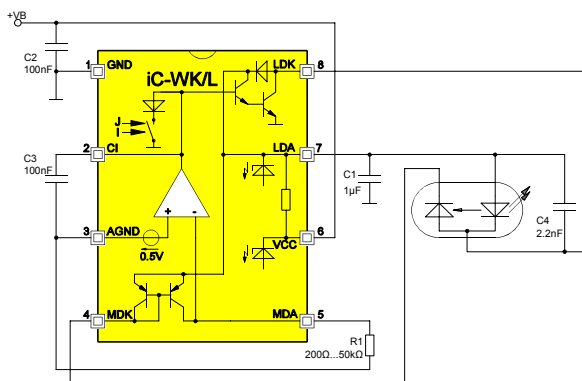


Fig. 2: Configuration for P-type laser diodes (anode MD at cathode LD)

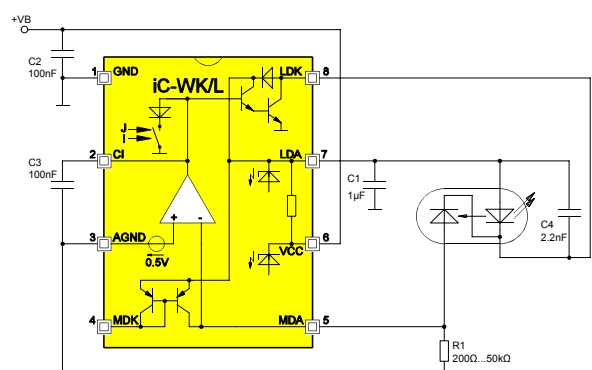


Fig. 3: Configuration for M-type laser diodes (common cathode of LD and MD)

In Figure 4 the internal current mirror for P-type laser diodes is used for analog modulation. Thus the laser power can be dimmed by drawing current from pin MDK. For this task a controlled current source is best suited. If a voltage source is used (eg. a D/A converter) plus resistor (R_{mod}), the modulation current results from the voltage drop across R_{mod} divided by R_{mod} . The voltage at MDK calculates to $V_B - 2 \cdot V_{BE}$.

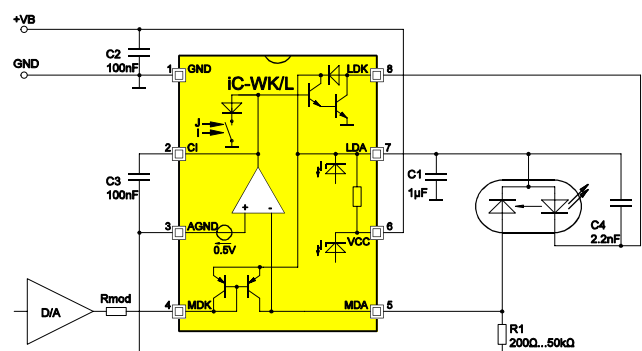


Fig. 4: Using the second monitor input for analog modulation (N-type laser)

iC-WK, iC-WKL Application Notes

2.4V CW LASER DIODE DRIVER



Release 19.11.02, Page 2/3

As shown in Figure 5, analog modulation is also possible with a P-type laser diode via pin MDA. Again the modulation current results from the voltage drop across R_{mod} divided by R_{mod} . The voltage at MDA is 0.5 V. With iC-WK an additional blocking capacitor across R_1 might be necessary (see also Figure 8). **Caution**, in contrast to the circuit given in Figure 4 a laser power increase is possible!

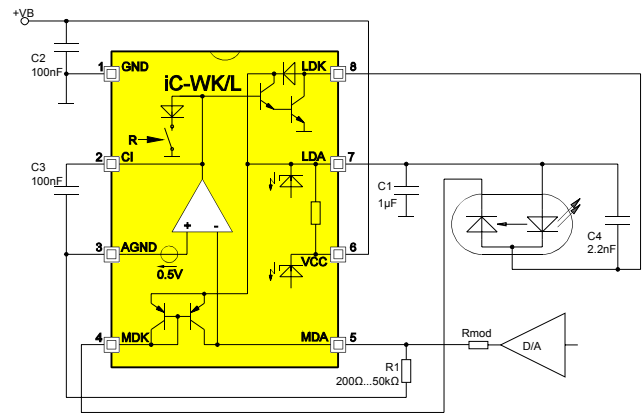


Fig. 5: Analog modulation with a P-type laser

Figure 6 shows a circuit for higher laser currents. R_2 sets the amount of current iC-WK/L handles. With $R_2 = 16 \Omega$ and $V_{BE}(Q1) = 0.7 \text{ V}$ this gives approximately 44 mA (45 mA is ideal). R_{GND} sets the overcurrent shutdown threshold. With $R_{GND} = 3.3 \Omega$ and $V_{BE}(Q2) = 0.65 \text{ V}$ it results to 200 mA. These values have to be adapted according to the transistors used and the desired shutdown threshold. Q_2 may be a general purpose small signal transistor like a BC237. Q_1 must be chosen according to the required laser current eg. a BD139. With CMOS signals at pin ENA the circuit can be switched on and off.

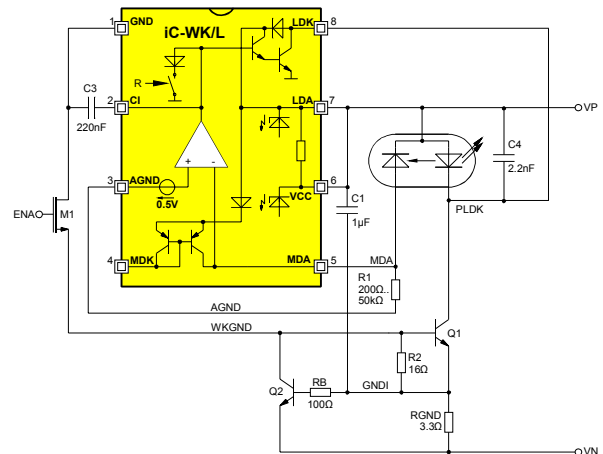


Fig. 6: N-type circuit for higher laser currents

Figure 7 shows a different circuit for higher laser currents, in particular for P-type lasers. Although the circuit shown in Fig. 6 is also suited for P-type lasers, this circuit allows to connect the laser diode case (= common terminal) to the circuit ground.

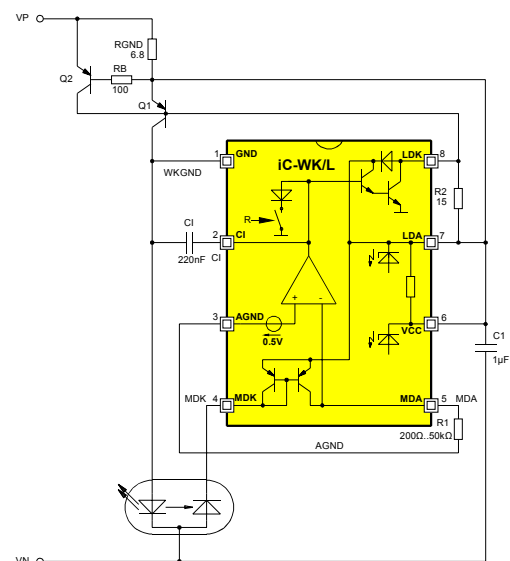


Fig. 7: P-type circuit for higher laser currents

iC-WK, iC-WKL Application Notes

2.4V CW LASER DIODE DRIVER



Release 19.11.02, Page 3/3

In a noisy environment the integrated safety power-down circuit (MDA monitor, iC-WK only) may be triggered unintentionally. Usually the noise finds its way into the system via the power supply or the leads from the driver to the laser diode. Therefore the power supply should be blocked accurately and the leads to the laser diode should be kept as short as possible. Should such a shutdown occur all the same, C5 can effectively suppress this. Since C5 slows down the feedback path of the regulator and thus might lead to oscillation, C5 must not exceed 47 pF and R1 25 kΩ. C3 must be increased to at least 220 nF. C1 should be chosen to 2.2..4.7 μF and must not be a tantalum type.

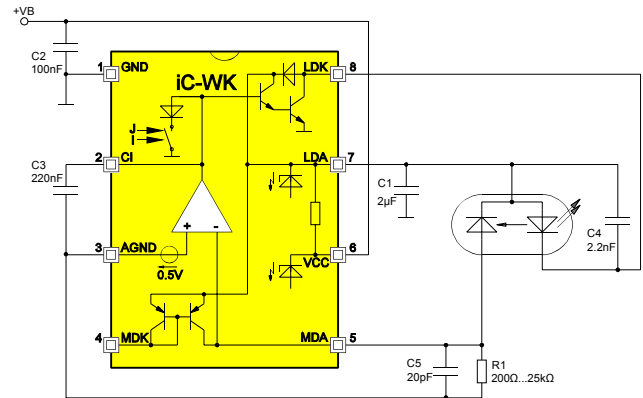


Fig. 8: N-type circuit with filtering for noisy environments

2. DIMENSIONING

Device	Range	Note
R1	200 Ω..50 kΩ	Sets the laser power; select according to the laser diode. Example: $R1 = V(MDA) / I(MD) @ I(LD)_{nom} = 0.5 \text{ V} / 0.25 \text{ mA} = 2 \text{ k}\Omega$
R2		Sets the bias, select according to Q1. Example: $R2 = V_{BE}(Q1) @ I(LD)_{nom} / 45 \text{ mA} = 0.7 \text{ V} / 45 \text{ mA} = 15.56 \Omega$
RGND		Sets the overcurrent shutdown threshold; select according to Q2 and the desired threshold $I(LD)_{off}$. Example: $RGND = V_{BE}(Q2) @ I(LD)_{off} / I(LD)_{off} = 0.65 \text{ V} / 200 \text{ mA} = 3.25 \Omega$
C1	100 nF..1 μF..	Ceramic filtering capacitor for the laser diode power supply
C2	(0)..100 nF	Optional, may be omitted with satisfactory filtering by C1.
C3	22 nF..	Select according to laser diode and value of R1. Example: for a typical laser diode with $I(LDK) = 35 \text{ mA}$ and $I(MD) = 0.25 \text{ mA}$ 100 nF are sufficient.
C4	1 nF..10 nF	Optional, ceramic ESD protection capacitor
C5	(0)..47 pF	Optional, ceramic filtering capacitor
M1		Optional, switching transistor
Q1		Optional, small-signal or power transistor
Q2		Optional, small-signal transistor