Data sheet microchip MCT-1064-90ps

Microchip in transmission for pulsed laser emission
(Data sheet rev. 1.3 2015-01-02)

MCT-1064-90ps - Microchip with 1064 nm laser emission and 90 ps pulse duration

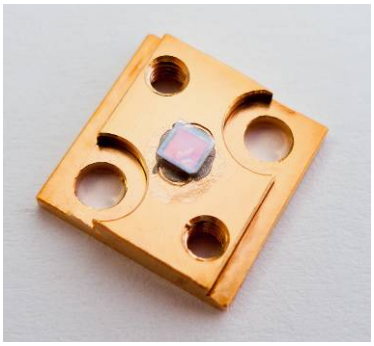
Table of contents:

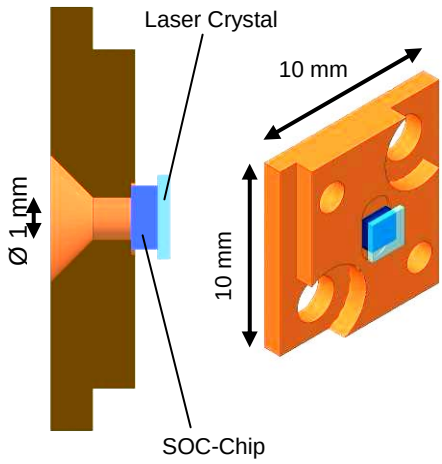
1. Microchip description and applications

The Microchip (MC) consists of a saturable absorber mirror bonded with a Nd:YVO_4 laser crystal. The MC can be used to generate pulsed laser radiation at 1064 nm wavelength if pumped with a pump diode at 808 nm. Possible application areas of this laser radiation are:

- micromachining
- light detection and ranging (LIDAR)
- precision measurements
- frequency conversion

The main advantage of a laser build with this microchip is the pump power dependent repetition rate with fixed pulse duration and pulse energy. By simply increasing the pump power at 808 nm the repetition rate - and consequently the average output power - will be increased proportionally starting from the laser threshold.





2. Microchip parameters

MCT-1064-90ps

Optical Pump Parameters

Parameter at T=25°C	***Min.***	***Typ.***	***Max.***
Wavelength	806 nm	808 nm	810 nm
Optical Pump Power P_p	70 mW	150 mW-200 mW	300 mW
Pump Spot Diameter	25 µm	40 µm	100 µm
Fluorescent Lifetime		35 µs (3%)	
Pump Absorption @ 808nm	85%	90%	97,5%
Pump Power Density	5.5 KW/cm^2		24 KW/cm^2*

Lasing performance with 40µm pump spot size at 25°C

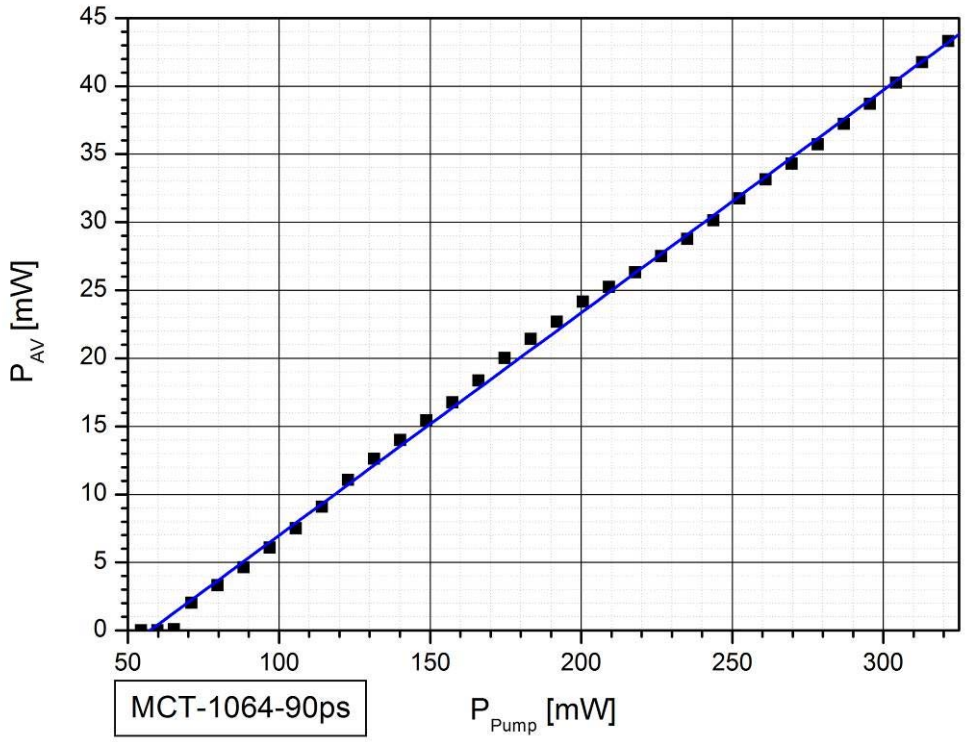
Parameter at T=25°C	***Min.***	***Typ.***	***Max.***
Laser Emission Wavelength	1064.0nm	1064.3nm	1064.6nm
Laser Wavelength Drift		45 pm/100mW**	
Beam Waist Diameter	40 µm		100 µm
M^2	1.1	1.3	1.5
Pulse Energy	80 nJ	95 nJ	110 nJ
Pulse Duration	80 ps	90 ps	110 ps
Differential Efficiency	10%	20%	25%
Lasing Threshold	70 mW	85 mW	100 mW
Polarization Extinction Ratio		30	
f_{rep}	20 kHz		400 kHz
P_p (150mW)	10 mW	12 mW	14 mW
P_p (200mW)	17 mW	20 mW	23 mW

The average output power P and the repetition frequency f_R are a function of the optical pump power. These dependencies are nearly linear above the laser threshold. The jitter of the repetition frequency decreases with increasing pump power.

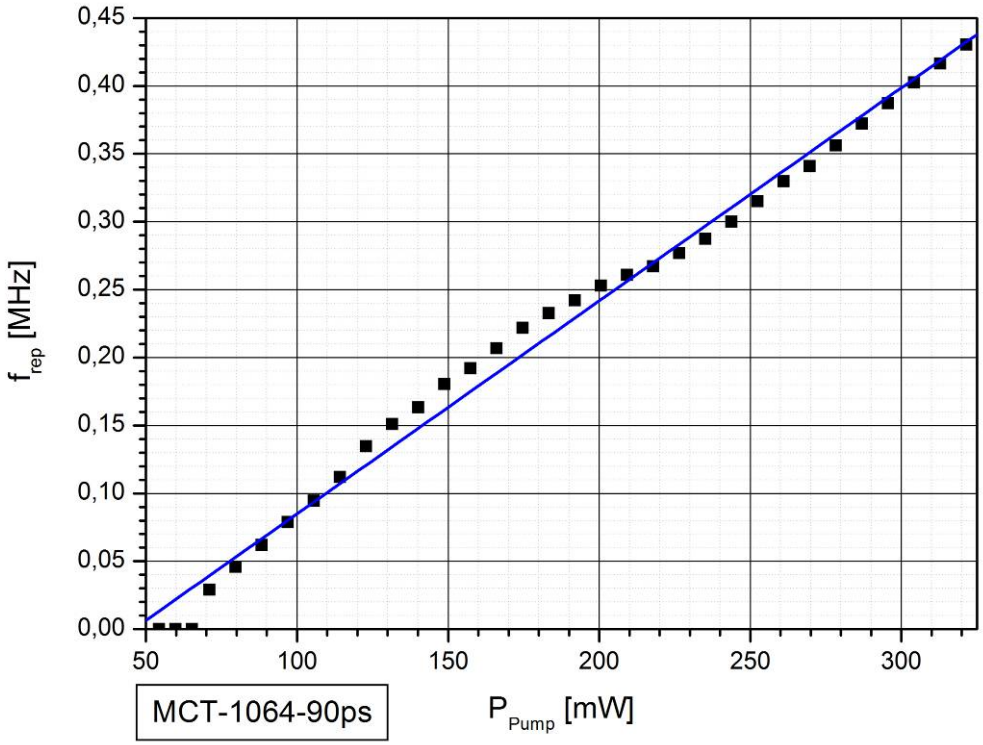
* Pump Power Density at 40 µm pump spot diameter and 300 mW pump power

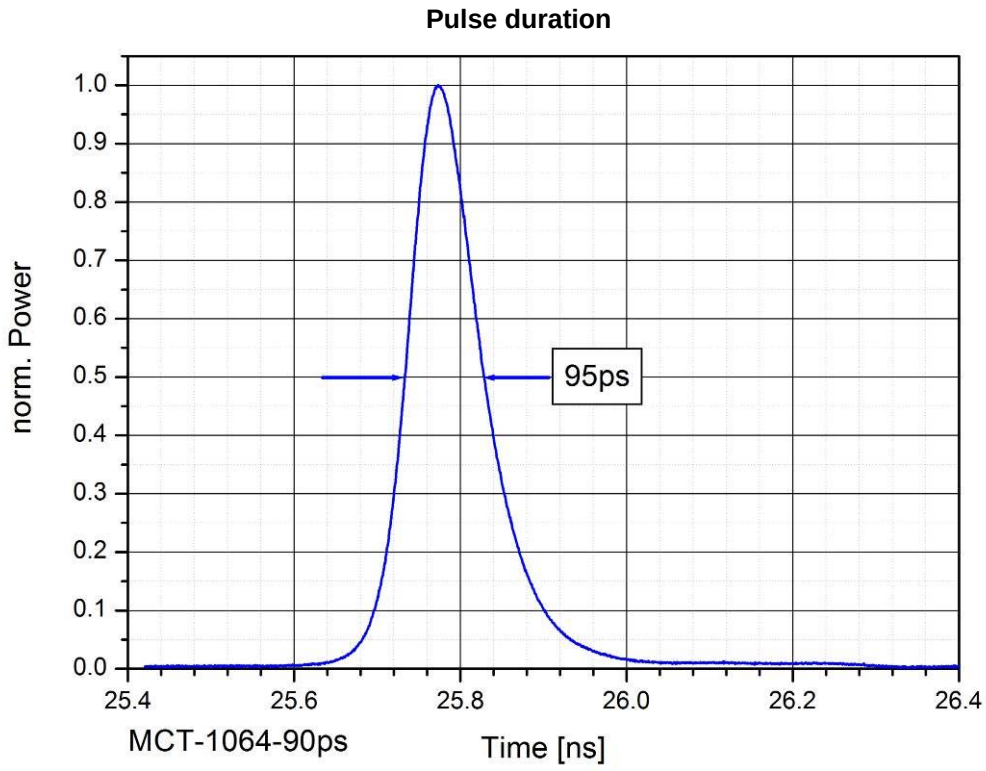
** Laser wavelength drift for 40µm pump spot diameter

Dependency of the average output power P on the pump power at 808 nm



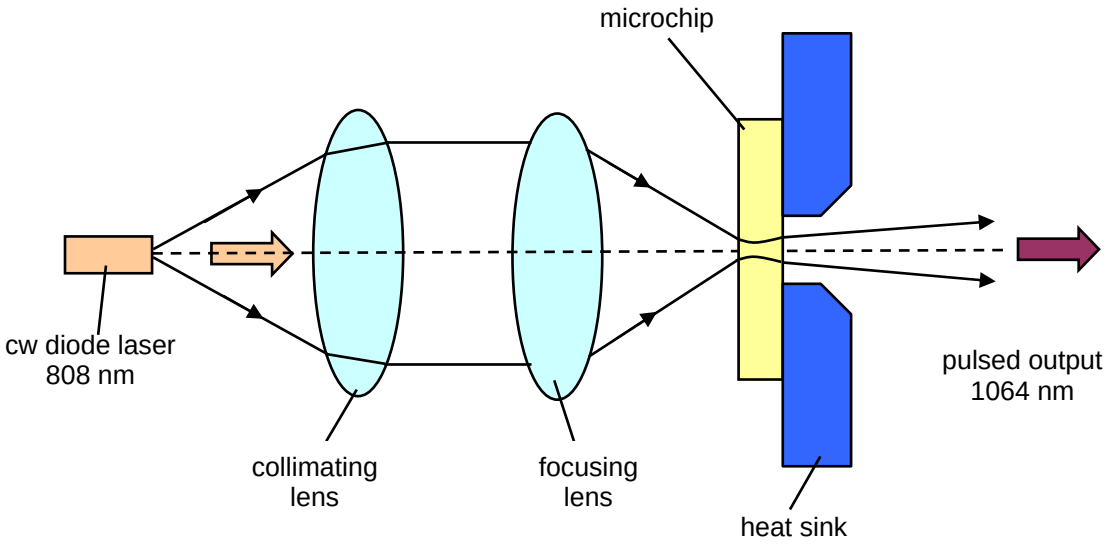
Dependency of the repetition rate f_{rep} on the pump power at 808 nm



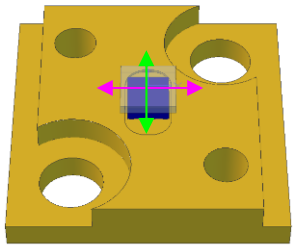


3. Microchip laser setup

The microchip consists of a saturable absorber mirror (SAM) and a Nd:YVO_4 laser crystal. Because the SOC is transparent, the laser setup must be in transmission mode. For optical pumping a multi-mode laser diode with about 500 mW cw output power at 808 nm wavelength is sufficient. The proposed laser setup using two lenses is shown below.



The laser output is not collimated. Typical pump spot diameter values are between 40 µm and 80 µm.



The arrow shows the polarization direction of the emitted light (parallel to c-axis)

The green arrow shows the recommended polarization direction of the pump light (perpendicular to the c-axis). The wrong pump light polarization leads to worse output parameters of the laser.

4. Mount Dimensions