Test Data Sheet

PM7 - MWIR

(EO-12.5T3-MIR)
S/N: J6716

Resonant electro-optic phase modulator

with
- temperature sensor (NTC)
- thermal crystal mount
- DC port (SMA)

RF properties	Value	Unit
Preset resonance frequency: f_0 [1]	12.5	MHz
Resonance frequency tuning range: Δf_0 [1]	11.0 - 13.8	MHz
RF Bandwidth: $\Delta\nu$_RF	140	kHz
Quality factor: Q	89	
Required RF power for 1rad @ 4500nm [2]	33.7	dBm
max. RF power: RF_{max} [3]	1	W

DC properties	Value	Unit
DC Bandwidth: $\Delta\nu$_DC (-3dB)	~ 9	kHz
Required DC voltage for π rad (PM) @ 4500nm	1.7	kVdc
max. DC voltage: V_{max}	+/- 500	Vdc
Input capacitance (DC)	1.0	nF

Optical properties		
EO crystal	LT	
Aperture	3x3	mm^2
Wavefront distortion (633nm)	< λ/6	nm
recommended max. optical intensity (4500nm)	< 1	W/mm^2
AR coating (R_{avg}<1%)	3.0 - 4.5	um

[1] at 24.3°C [2] with 50Ω termination [3] no damage with RF_{in} < 2W

Measured modulation

Fig. 1: Oscilloscope trace

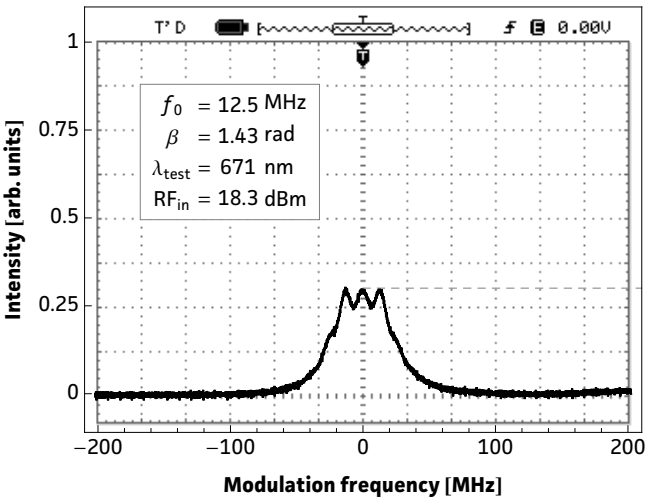


Fig. 2: Carrier/sideband ratio

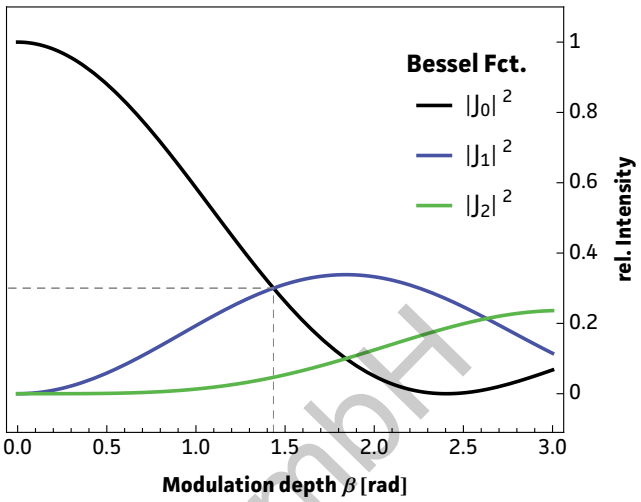


Table 1: Expected modulation

$\beta = 1$ rad	unit	λ_1	λ_2	λ_3
λ	nm	**671**	**3000**	**4500**
P	dBm	15.2	29.3	33.7
P	W	0.03	0.85	2.34
U	V_p	1.8	9.2	15.3
U_π	V_p	5.7	29.	48.
β / U	rad / V	0.55	0.11	0.07

Fig.1: Recorded oscilloscope trace retrieved from a test setup as illustrated below.

Fig.2: Squared absolute values of first-kind Bessel functions vs. modulation depth. Vertical lines reveal the ratio between the carrier $|J_0|^2$ and the i^{th} sideband $|J_i|^2$ at a specific ß.

Fig.3: Dependency between RF amplitude and modulation depth for different wavelengths. Points on the curve allow to retrieve either the required RF amplitude for a specific/desired ß or the max. achievable modulation depth for a given/available RF power.

Table 1: Expected RF-amplitude/-power values and conversion factors for the required wavelength at the reference modulation depth of 1 rad. **Note:** Experimentally recorded modulation depth displayed in Fig.1 might vary from the respective values (ß=1rad) provided in the table.

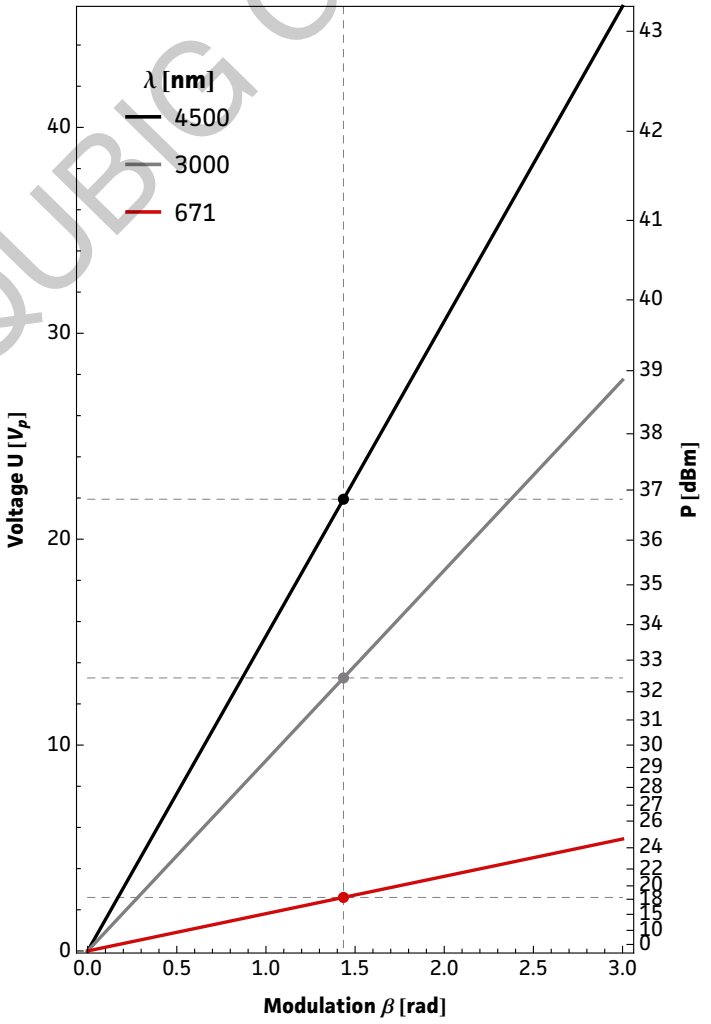
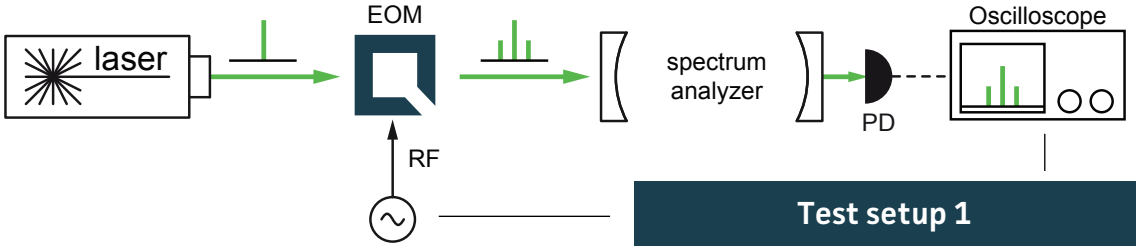
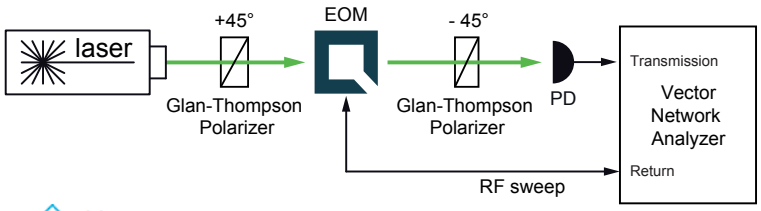
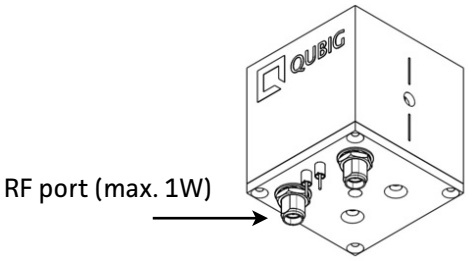


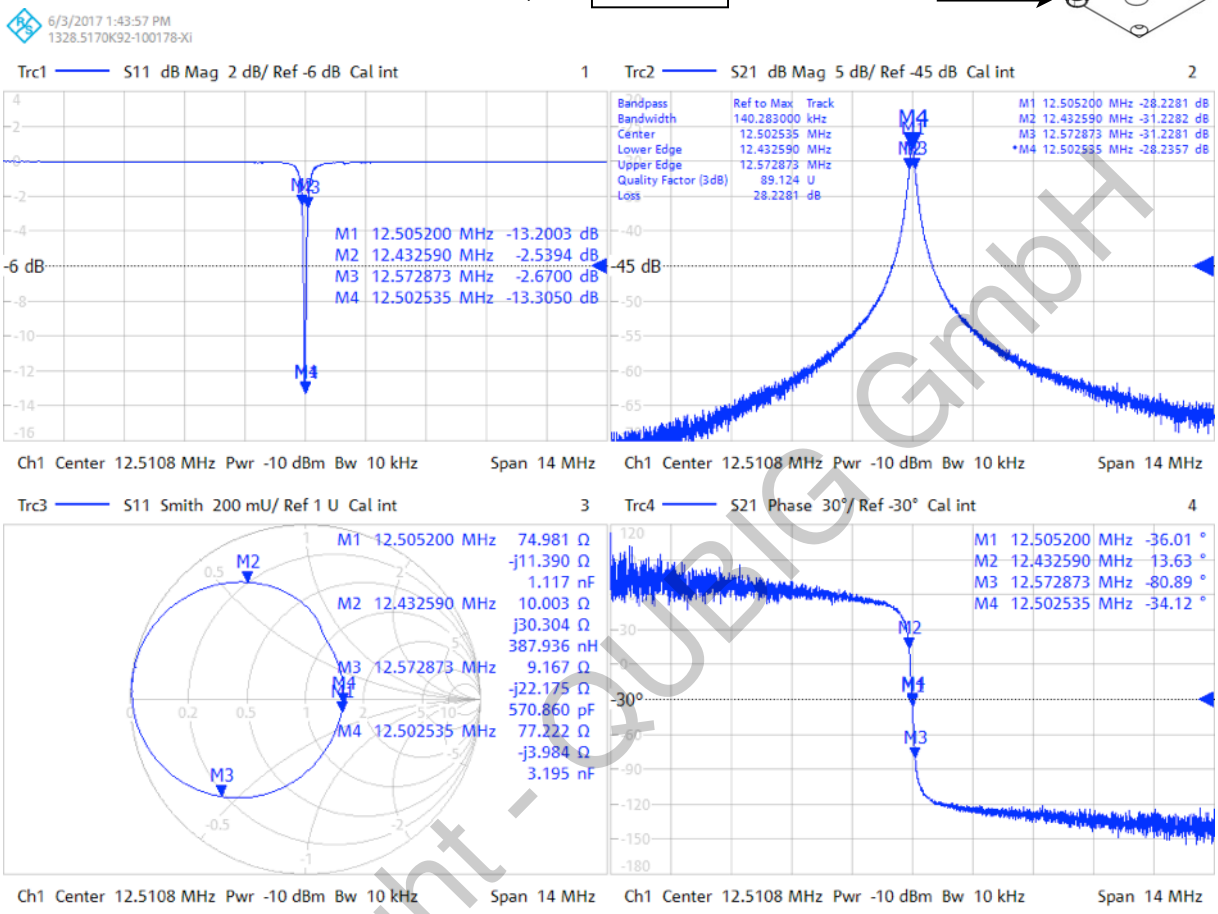
Fig. 3: RF–signal amplitude vs. modulation depth



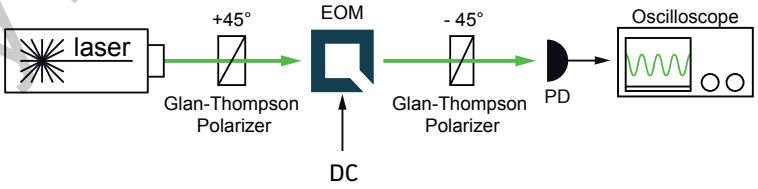
Resonance characteristics

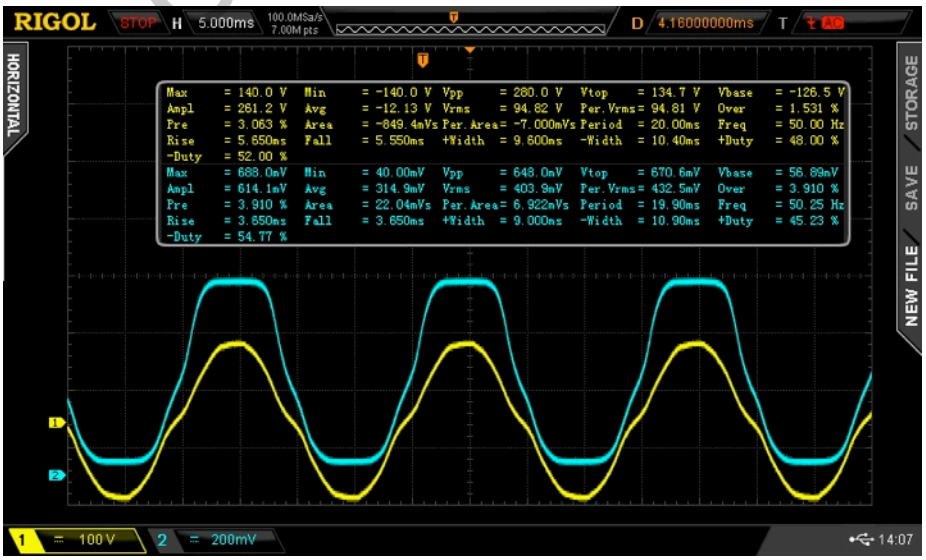


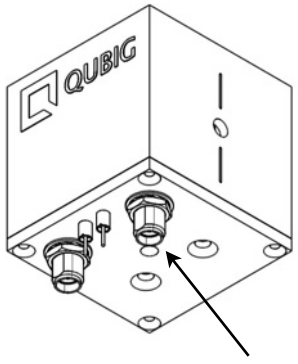




DC characteristics







DC port (max. +/-500V)

yellow:
DC Voltage input signal

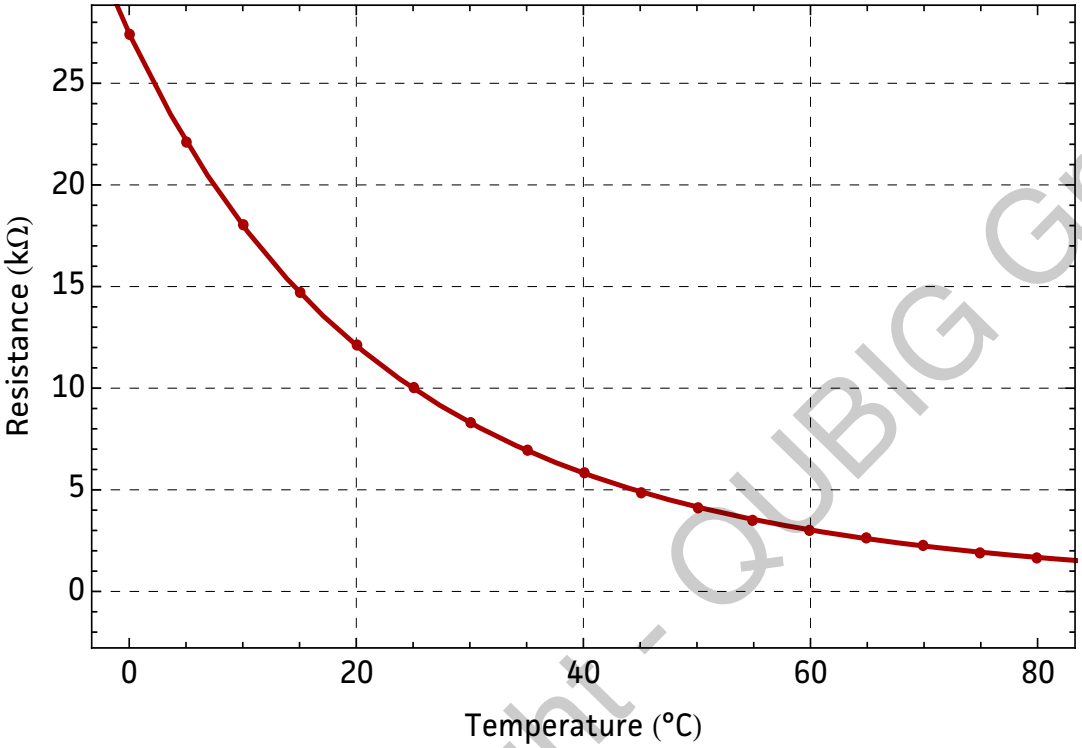
blue:
optical modulation
(achieved modulation depth: π)

TXC-option information

NTC characteristics:

NTC part number	Resistance (25°C) (ohm)	B-Constant (25-50°C) (K)	Operating Current for Sensor (25°C) (mA)	Rated Electric Power (25°C) (mW)	Typical Dissipation Constant (25°C) (mW/°C)	Thermal Time Constant (25°C) (s)
NXFT15XH103FA2B050	10k +/- 1%	3380 +/- 1%	0.12	7.5	1.5	4

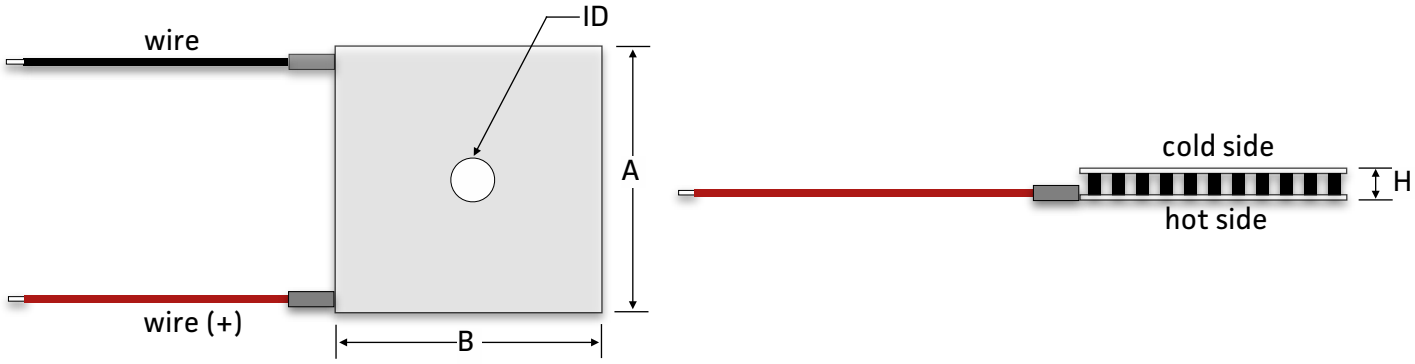
- Operating Current for Sensor rises Thermistor's temperature by 0.1°C
- Rated Electric Power shows the required electric power that causes Thermistors's temperature to rise to 30°C by self heating, at ambient temperature of 25°C.



Part Number	NXFT15XH103
Resistance	10kΩ
B-Constant	3380K
Temp. (°C)	Resistance (kΩ)
-40	197.388
-35	149.395
-30	114.345
-25	88.381
-20	68.915
-15	54.166
-10	42.889
-5	34.196
0	27.445
5	22.165
10	18.010
15	14.720
20	12.099
25	10.000
30	8.309
35	6.939
40	5.824
45	4.911
50	4.160
55	3.539
60	3.024
65	2.593
70	2.233
75	1.929
80	1.673
85	1.455
90	1.270
95	1.112
100	0.976
105	0.860
110	0.759
115	0.673
120	0.598
125	0.532

TEC characteristics:

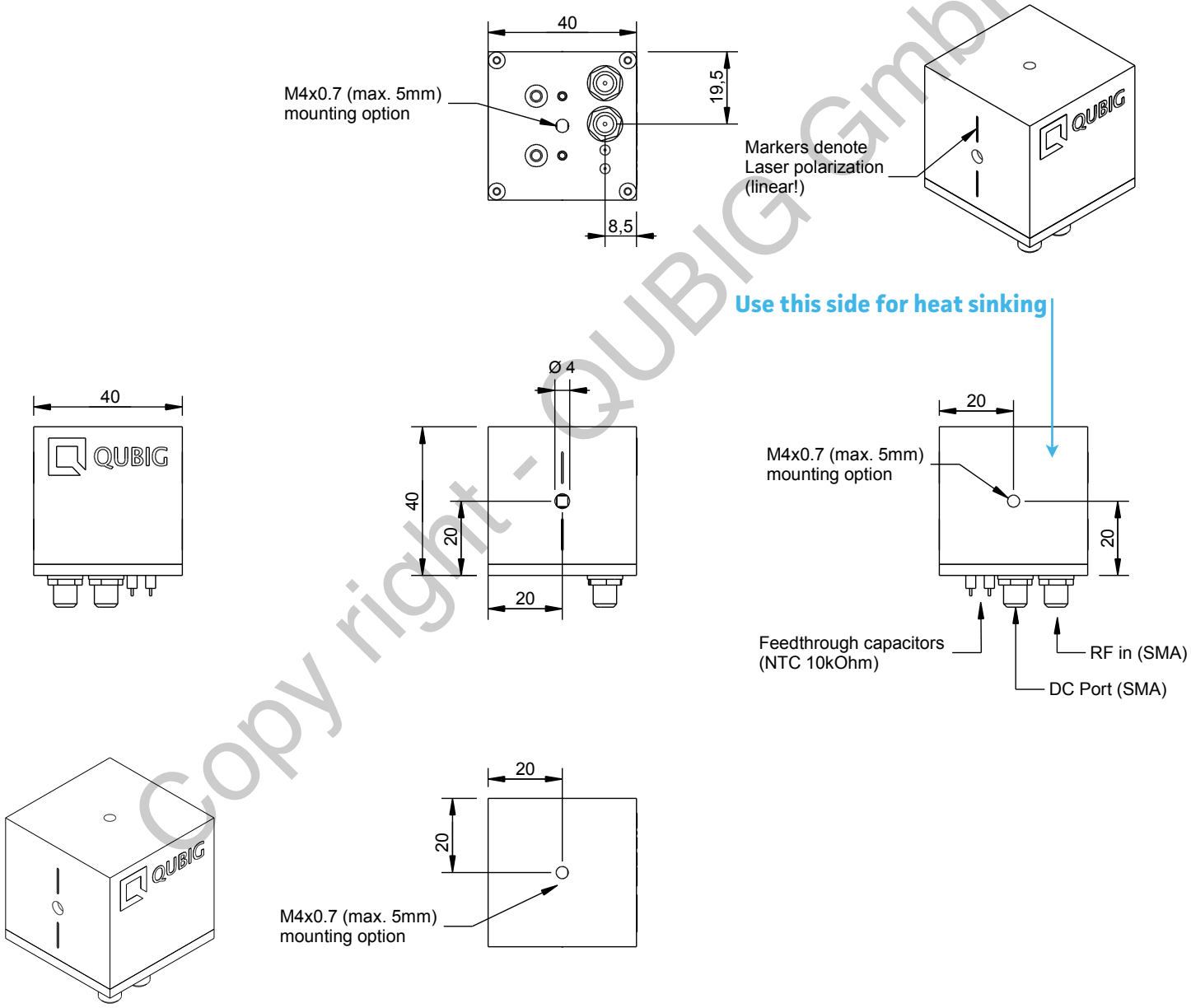
TEC part number	Imax (A)	Umax (V)	Qcmax (W)	ΔTmax (K)	Tmax (°C)	A (mm)	B (mm)	H (mm)	ID (mm)	Sealing
UEPT-440-127-040M12 5S	4.0	15.2	40	67.0	125.0	40.0	40.0	4.6	4.5	Silicon



Handling instructions

- Input laser polarization must be aligned with respect to the white markers on the housing
- Please handle device carefully. Avoid shock. Don't drop.
- After turn on the resonance frequency might drift slightly with applied RF power. Please compensate by tuning the RF drive frequency until steady-state (~min).
- Slight angle adjustment can reduce unwanted residual amplitude modulation (RAM)

Package drawing



Tested by:

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