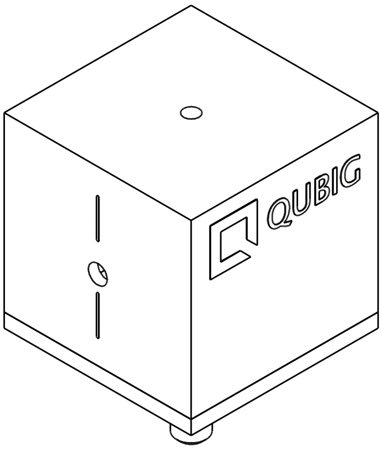
QUBIG

Empowering Laser Technologies

Test Data Sheet

EO-T1055M3-TXC
S/N:

Resonant electro-optic phase modulator
with
- thermal crytsal mount
- temperature sensor (NTC)
- tunable resonance frequency



RF properties	Value	Unit
Resonance frequency: f_0 1)	984 - 1099	MHz
Preset frequency: f_{set} 1)	1055	MHz
Bandwidth: Δν	4.3	MHz
Quality factor: Q	244	
Required RF power for 1rad @ 739nm 2)	25.5	dBm
max. RF power: RF_{max} 3)	4	W

Optical properties		
EO crystal	MLN	
Aperture	3x2.6	mm^2
Wavefront distortion (633nm)	λ/4	nm
recommended max. optical intensity (739nm)	<10	W/mm^2
AR coating (R<0.5%)	500 - 900	nm

1) at 24.3°C 2) with 50Ω termination 3) no damage with RF_{in} < 10W

Measured modulation

Fig. 1: Oscilloscope trace

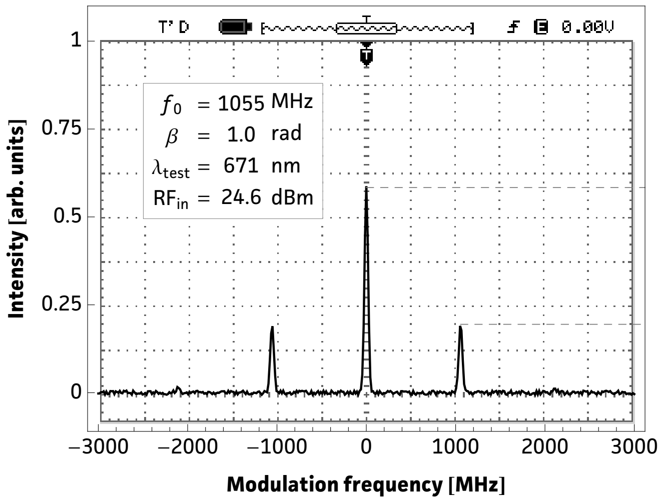


Fig. 2: Carrier/sideband ratio

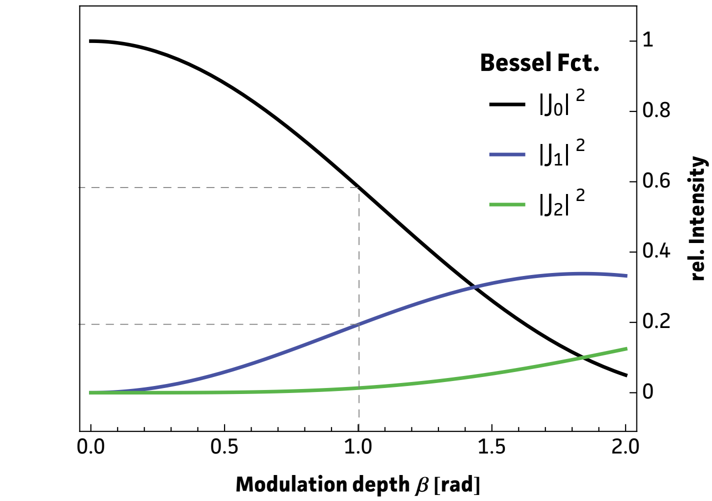


Table 1: Expected modulation

$\beta = 1$ rad	unit	λ_1	λ_2
λ	nm	**671**	**739**
P	dBm	24.6	25.5
P	mW	286	359
U	V_p	5.4	6.
U_π	V_p	16.8	18.8
β / U	rad / V	0.19	0.17

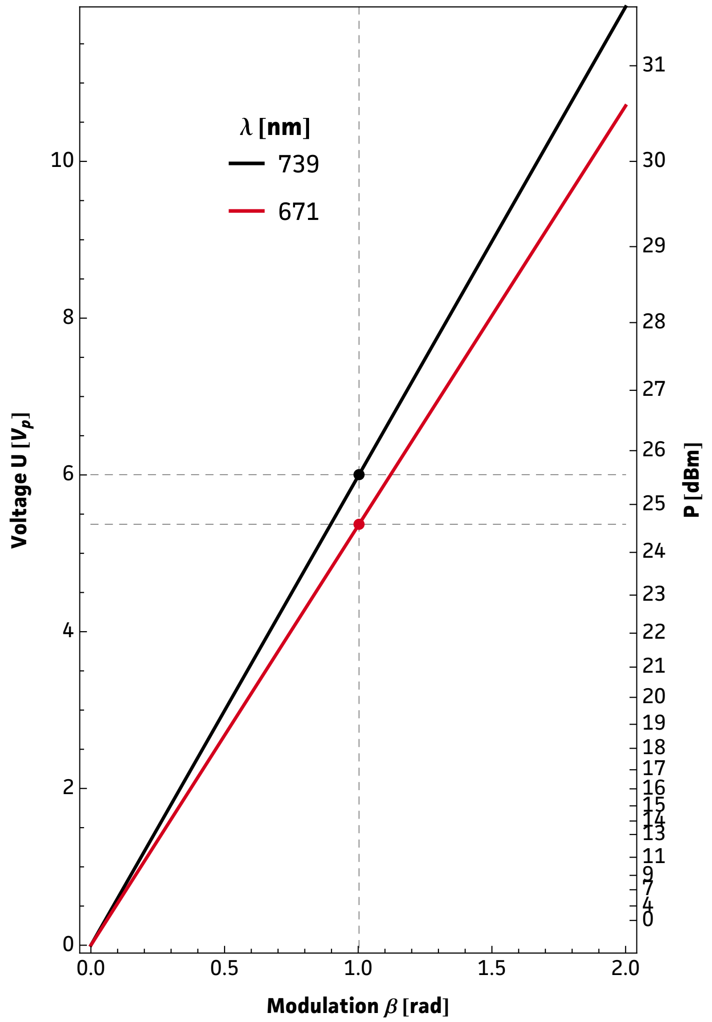


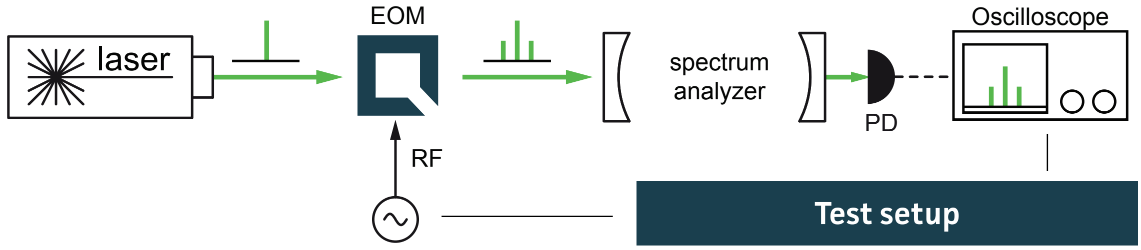
Fig. 3: RF–signal amplitude vs. modulation depth

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

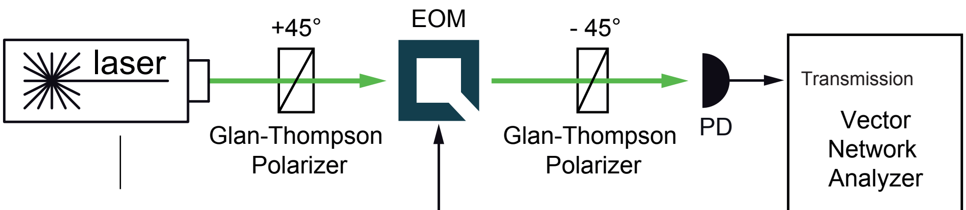
Fig.2: Squared absolute values of first-kind Bessel functions vs. modulation depth. Vertical lines reveal the ratio between the carrier $|J_0|^2$ and the i^{th} sideband $|J_i|^2$ at a specific ß.

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.

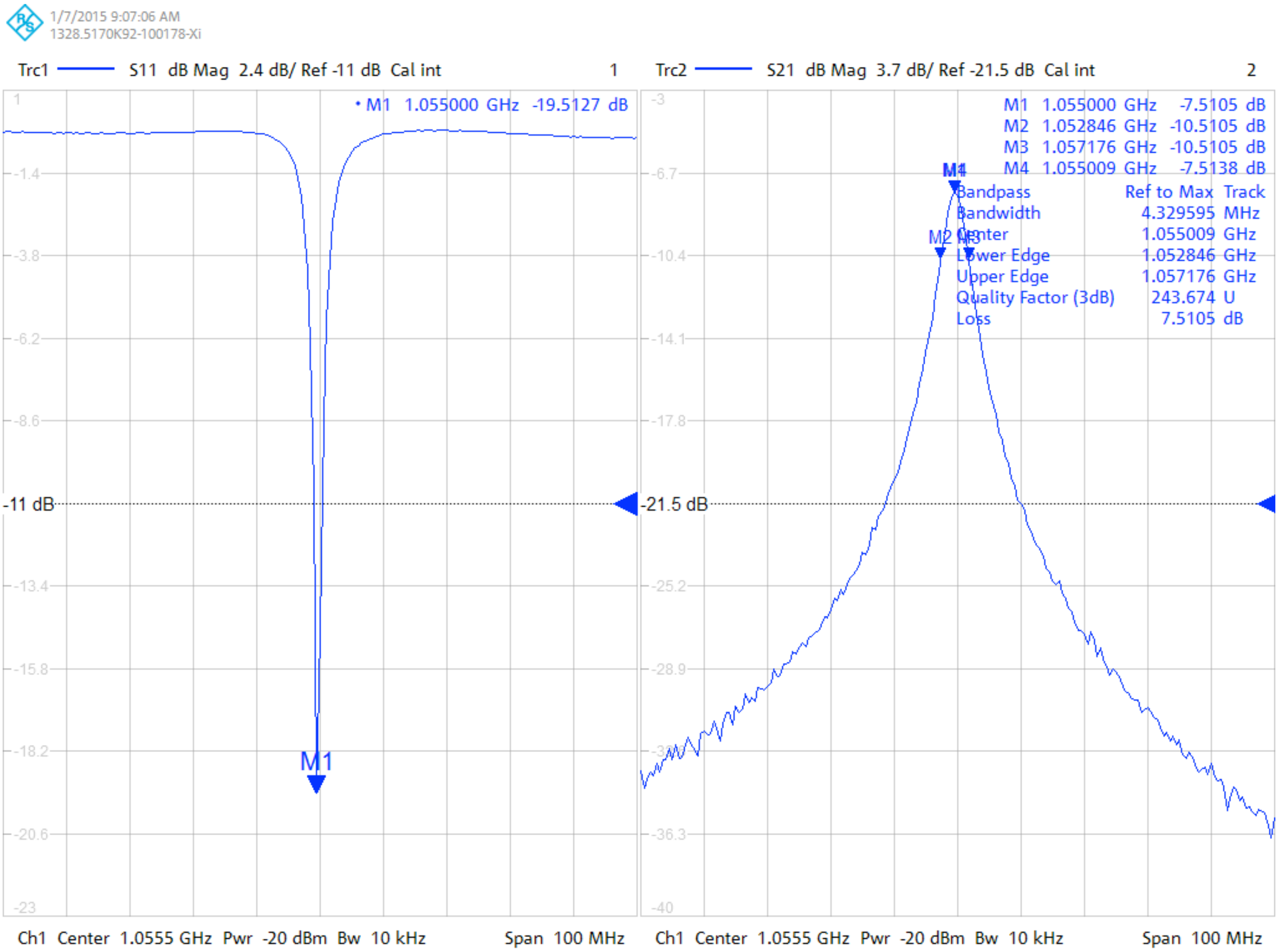
Table 1: Expected RF-amplitude/-power values and conversion factors for the required wavelength at the reference modulation depth of 1 rad. **Note:** Experimentally recorded modulation depth displayed in Fig.1 might vary from the respective values (ß=1rad) provided in the table.



Resonance characteristics

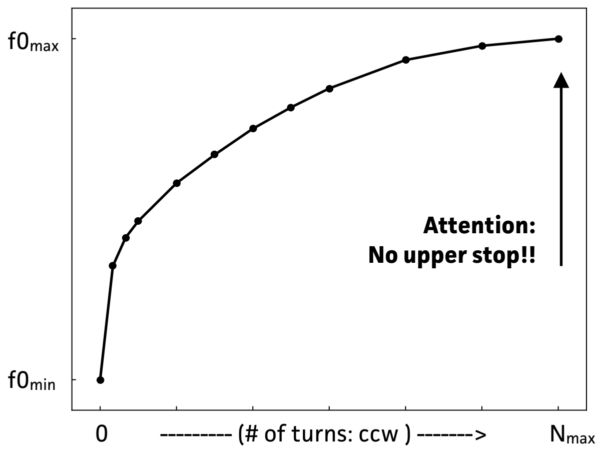


Test setup



Tuning performance

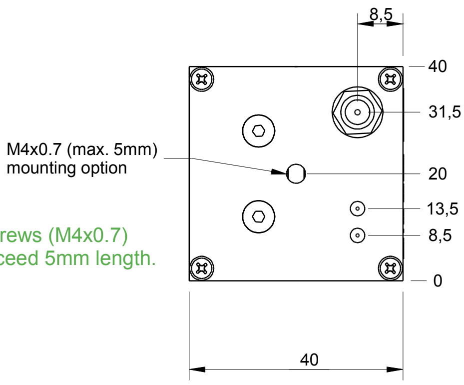
MAX resonance frequency	f_0 max	1099	MHz
MIN resonance frequency	f_0 min	984	MHz
number of turns	N_{max}	6	
counter clock-wise turns ⤴	higher f_0 ↑		
clock-wise turns ⤵	lower f_0 ↓		



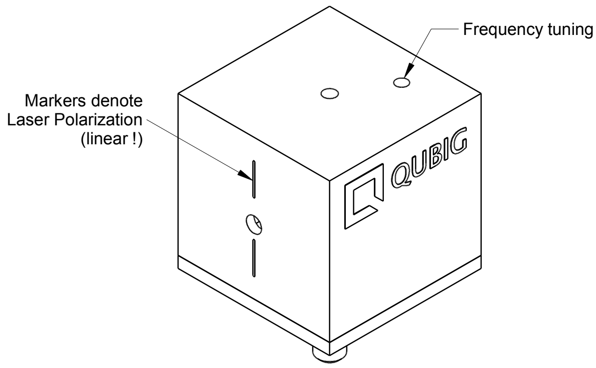
Handling instructions

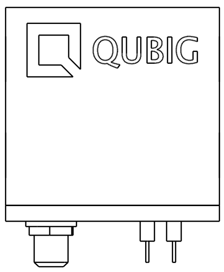
- Housing is hermetically sealed. There are no user serviceable parts inside. None of the screws must not be loosened at any time! Crystal will be damaged otherwise.
- Input laser polarisation must be orthogonally aligned with respect to the cooling fins
- Please handle device carefully. Avoid shock. 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).

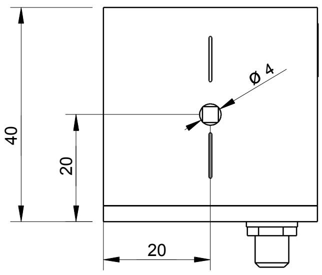
Package drawing



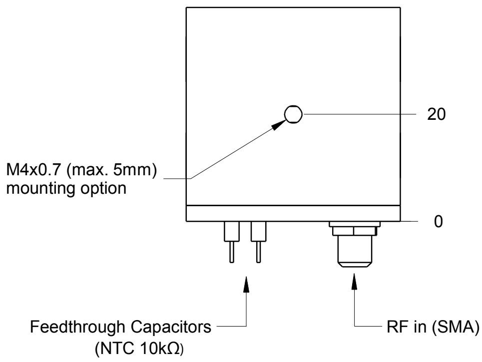
Note 1: mounting screws (M4x0.7) must not exceed 5mm length.

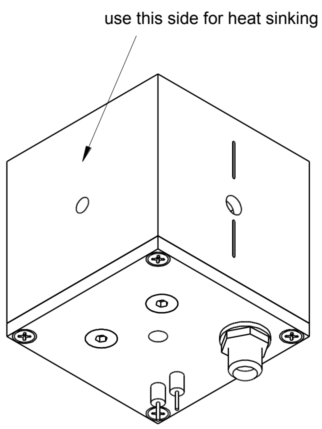


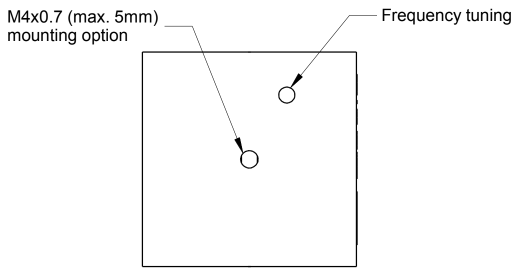




Note 2: crystal aperture is 3x3mm.







Attention!!!

Housing is hermetically sealed.
No use serviceable parts inside.
Screws must not be loosened!
Crystal will be damaged otherwise.

Tested by:

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TXC-option information

Mounting hardware:

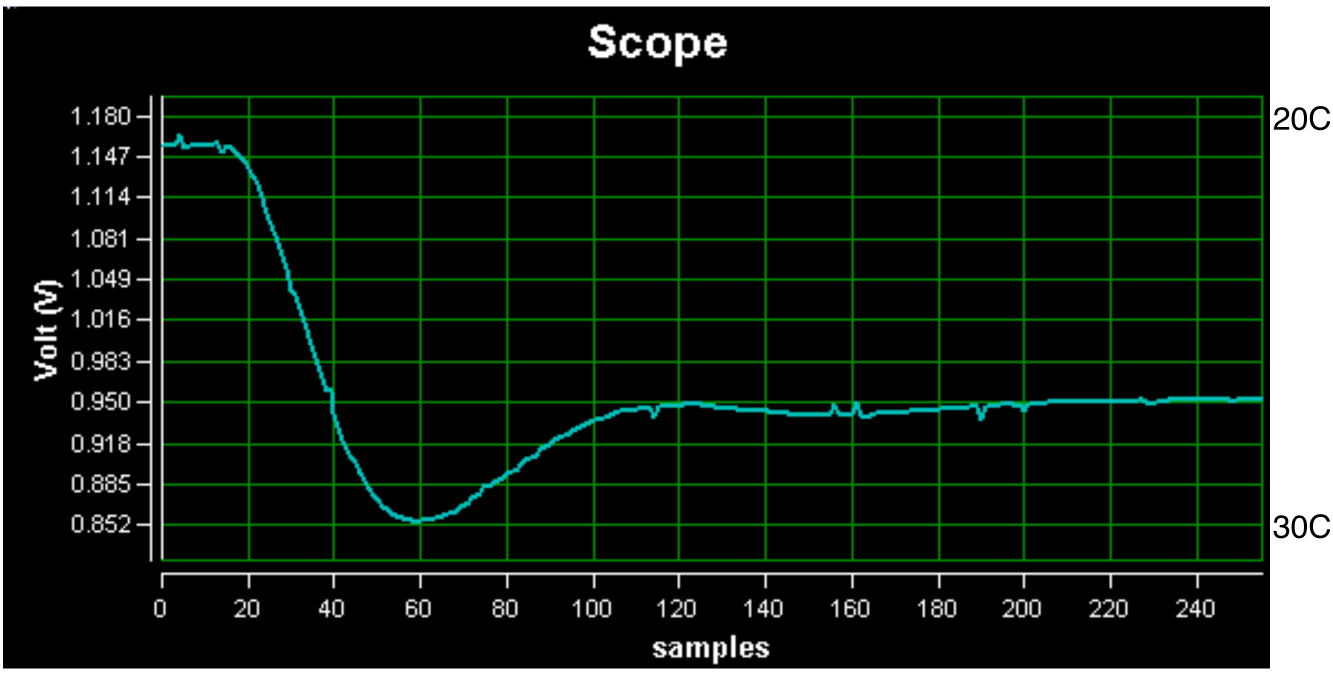
- SMD capacitor: 1x 47µF - C1210C476M4PACTU
- TEC: 2xUwe Elektronik UEPT-42168
- Thermal pads: 2x, double sided adhesive (40x40mm²)
- Thermally insulating screw (PEEK): 2x M4, socket head

Temperature Controller Settings:

(tested with modified T-controller: Wavelength Electronics PTC2.5-CH)

P-Gain	12
Enable Jumper	internal enable (IEN)
Voltage Setpoint Jumper	external voltage stepping (EVS)
Sensor Bias Select	100µA
Sensor Type Select	Other
Current Limit	2.5A
Integrator Time Constant	**47µF**
Time Constant	~60s

Temperature Controller Measurement:



actual temperature in R(T) = V(T)/100uA vs. time (1 sample = 1s)

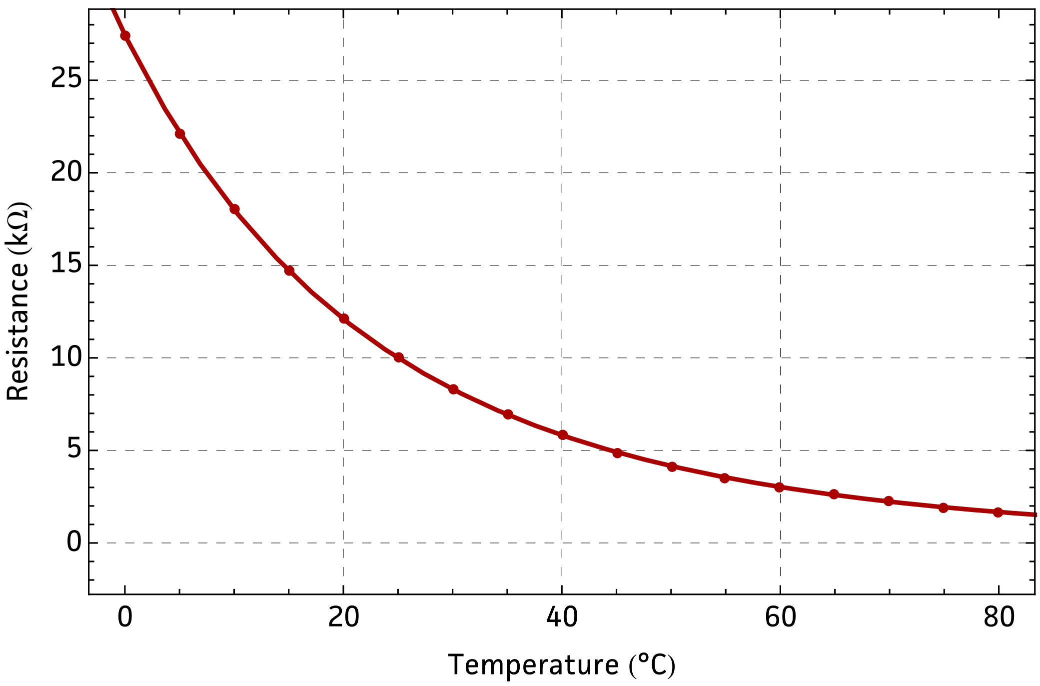
Temperature sensor characteristics:

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

Characteristic Line



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-42168	4,0	15,2	40,1	67,0	125,0	40,0	40,0	4,6	4,5	Silicon