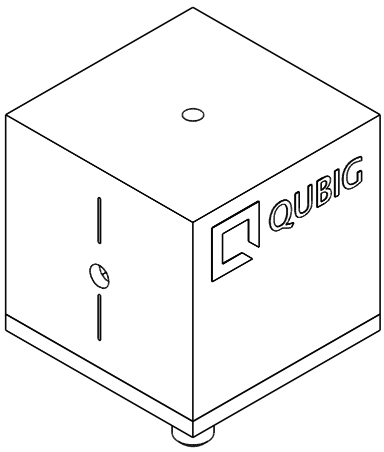
QUBIG

Empowering Laser Technologies

Test Data Sheet

EO-F20L3-TXC
S/N:

Resonant electro-optic phase modulator
with
- temperature sensor (NTC)
- thermal crystal mount



RF properties	Value	Unit
Resonance frequency: f_0 [1]	19.9	MHz
Preset frequency: f_{set} [1]	19.9	MHz
Bandwidth: $\Delta\nu$	238	kHz
Quality factor: Q	83	
Required RF power for 1rad @ 1062.5nm [2]	15.7	dBm
max. RF power: RF_{max} [3]	1	W

Optical properties		
EO crystal	LN	
Aperture	3x3	mm^2
Wavefront distortion (633nm)	< $\lambda/6$	nm
recommended max. optical intensity (1064nm)	< 20	W/mm^2
AR coating (R_{avg}<0.5%)	630 - 1070	nm

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

Measured modulation

Fig. 1: Oscilloscope trace

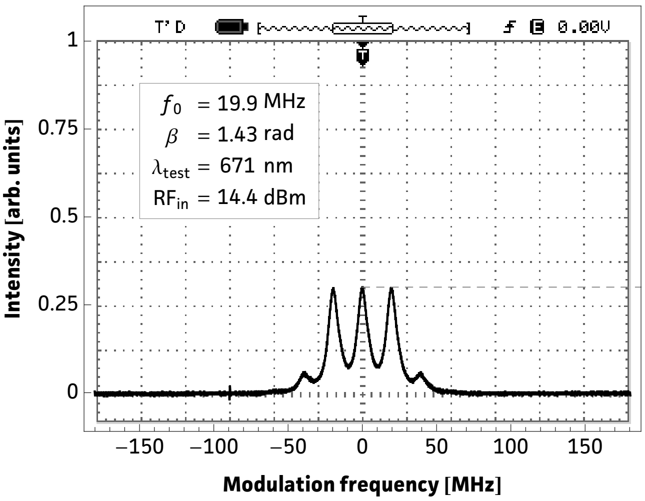


Fig. 2: Carrier/sideband ratio

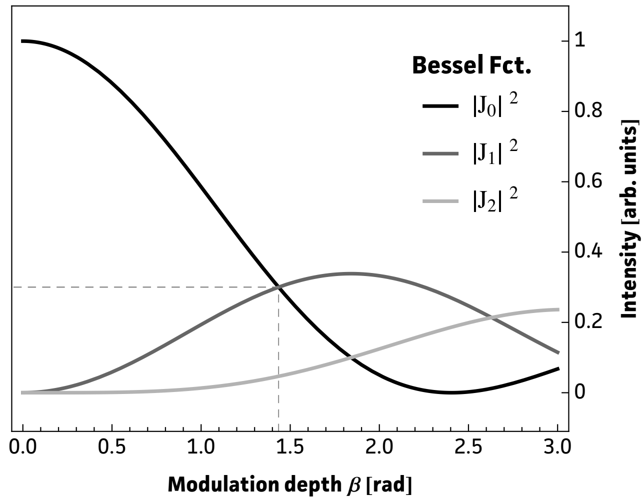


Table 1: Expected modulation

$\beta = 1$ rad	unit	λ_1	λ_2
λ	nm	**671**	**1062.5**
P	dBm	11.3	15.7
P	mW	13	37
U	V_p	1.2	1.9
U_π	V_p	3.6	6.1
β / U	rad / V	0.86	0.52

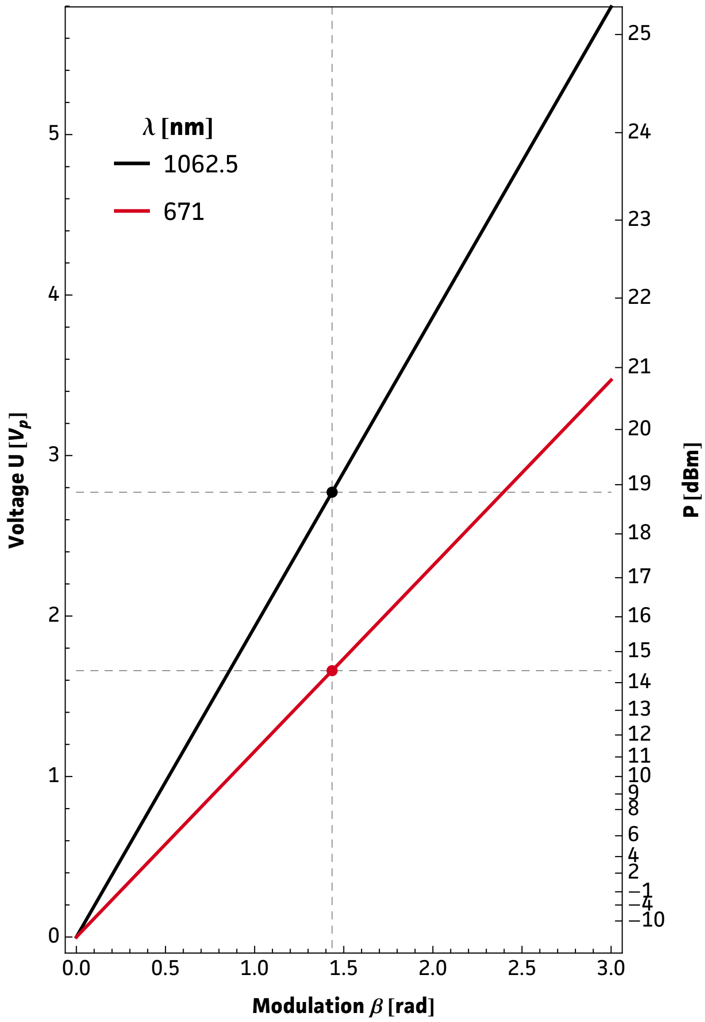


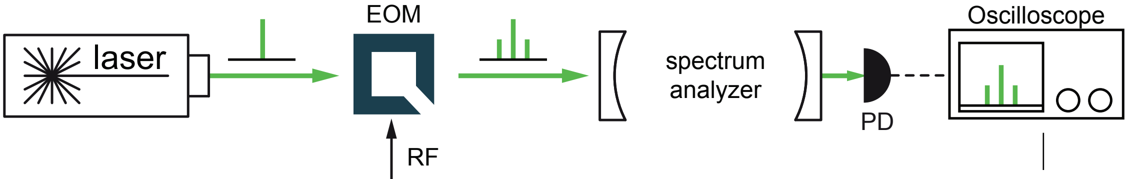
Fig. 3: RF–signal amplitude vs. modulation depth

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.

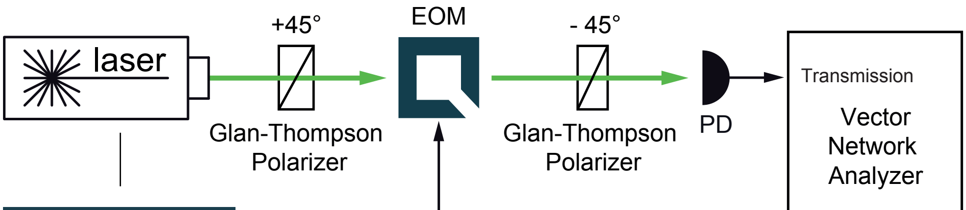
Fig.3: Dependency between RF amplitude and modulation depth for different wavelengths. Points on the curve allow to retrieve either the required RF amplitude for a specific/desired ß or the max. achievable modulation depth for a given/available RF power.

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.

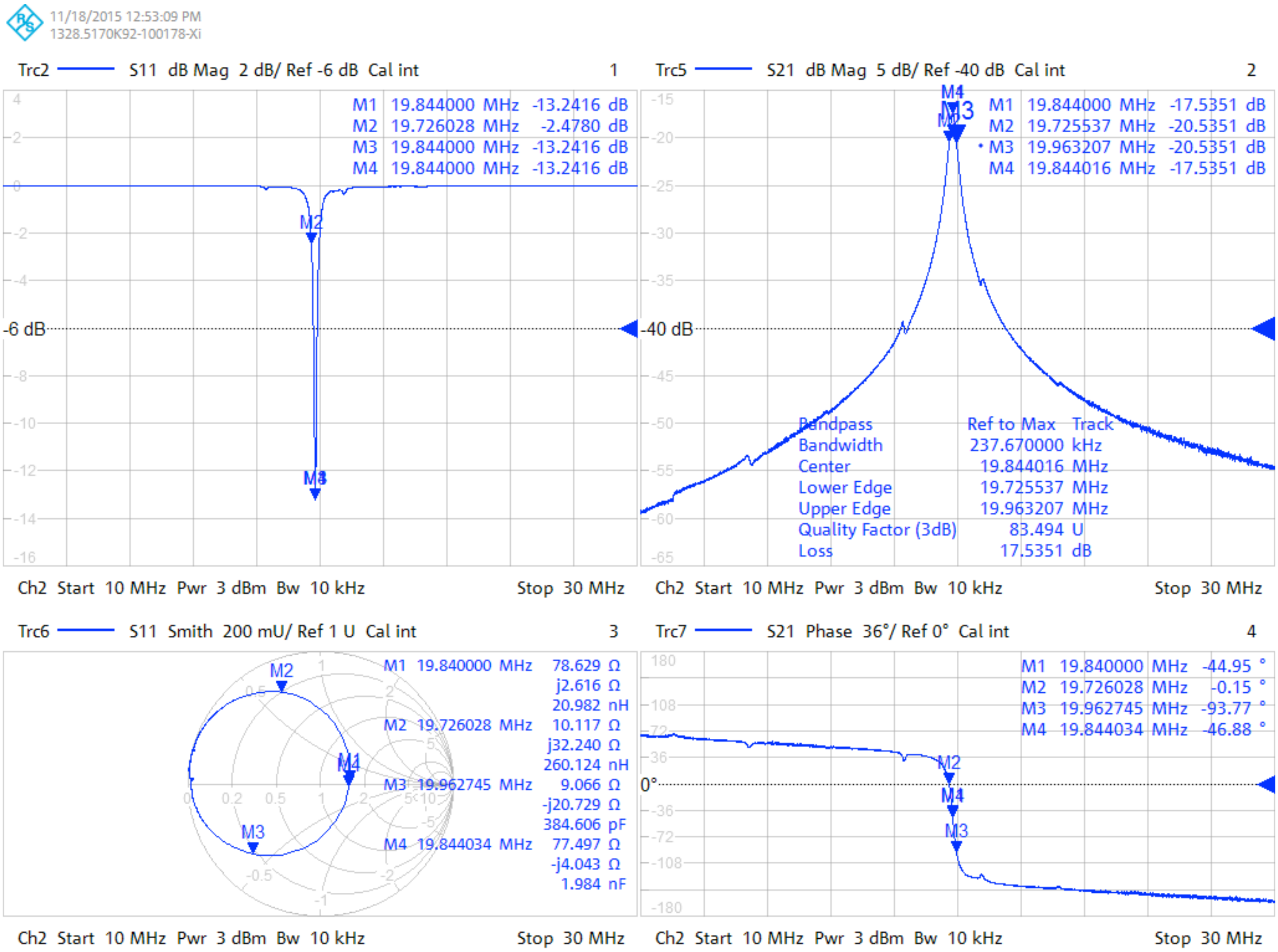


Test setup

Resonance characteristics



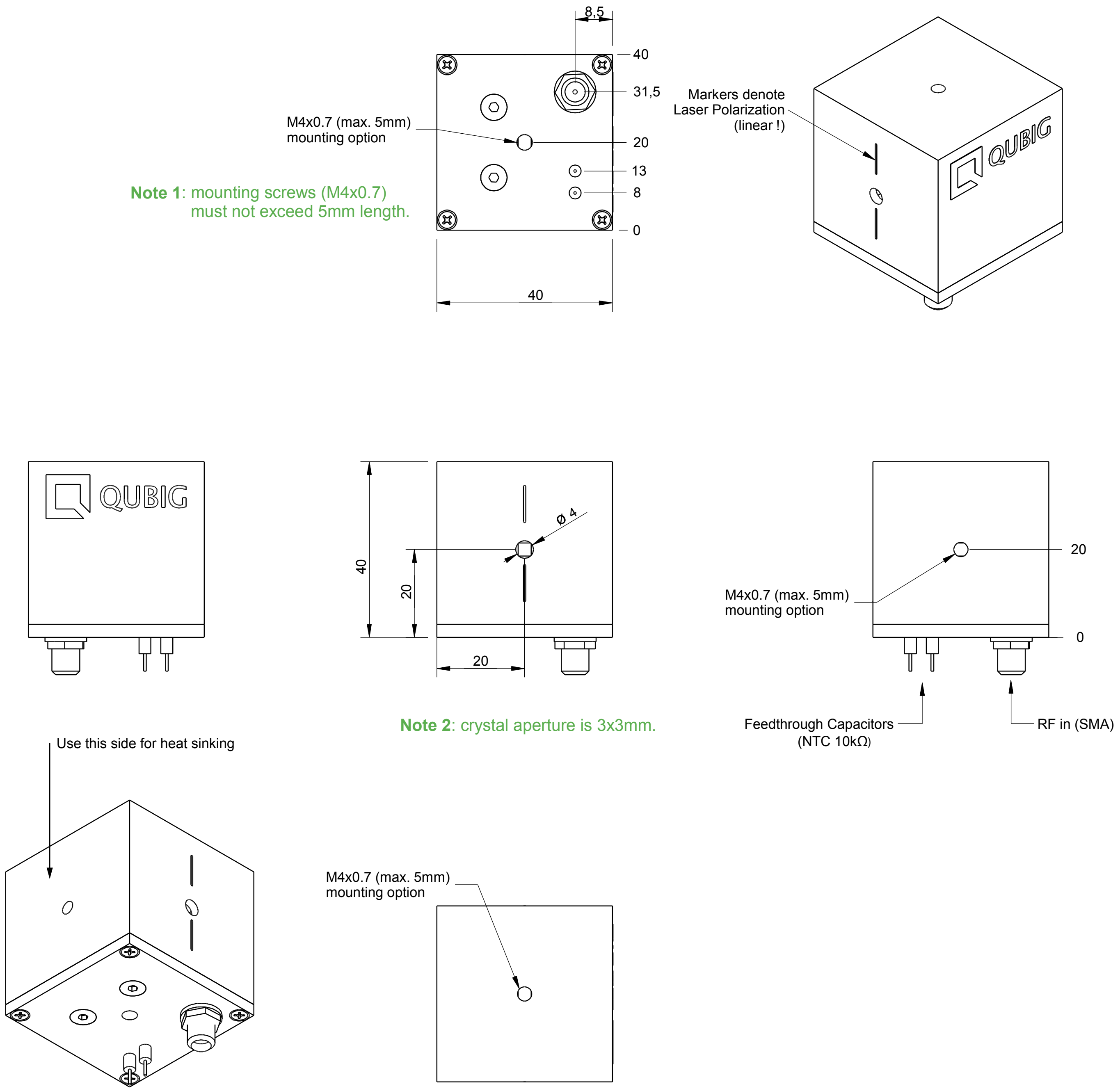
Test setup



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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TXC-option information

Mounting hardware:

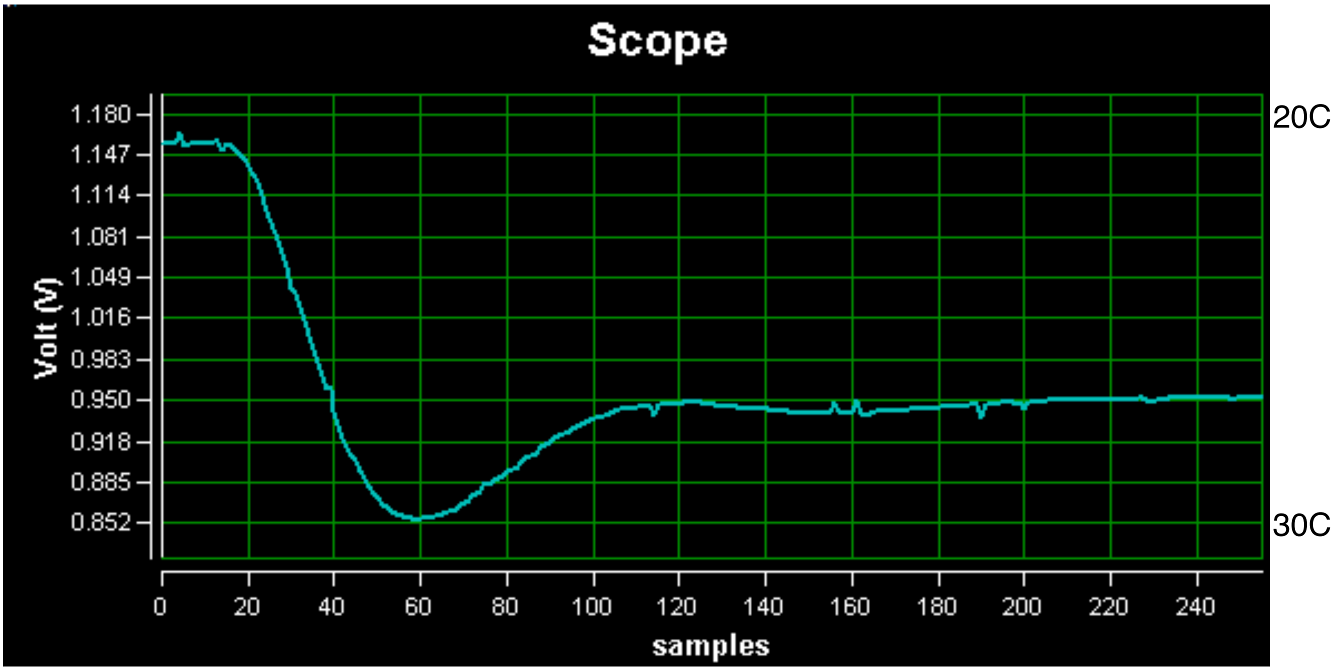
- SMD capacitor: 1x 47µF - C1210C476M4PACTU
- TEC: 2xUwe Elektronik UEPT-42168
- Thermal pads: 2x, double sided adhesive (40x40mm^2)
- Thermally insulating screw (PEEK): 2x M4, socket head

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)

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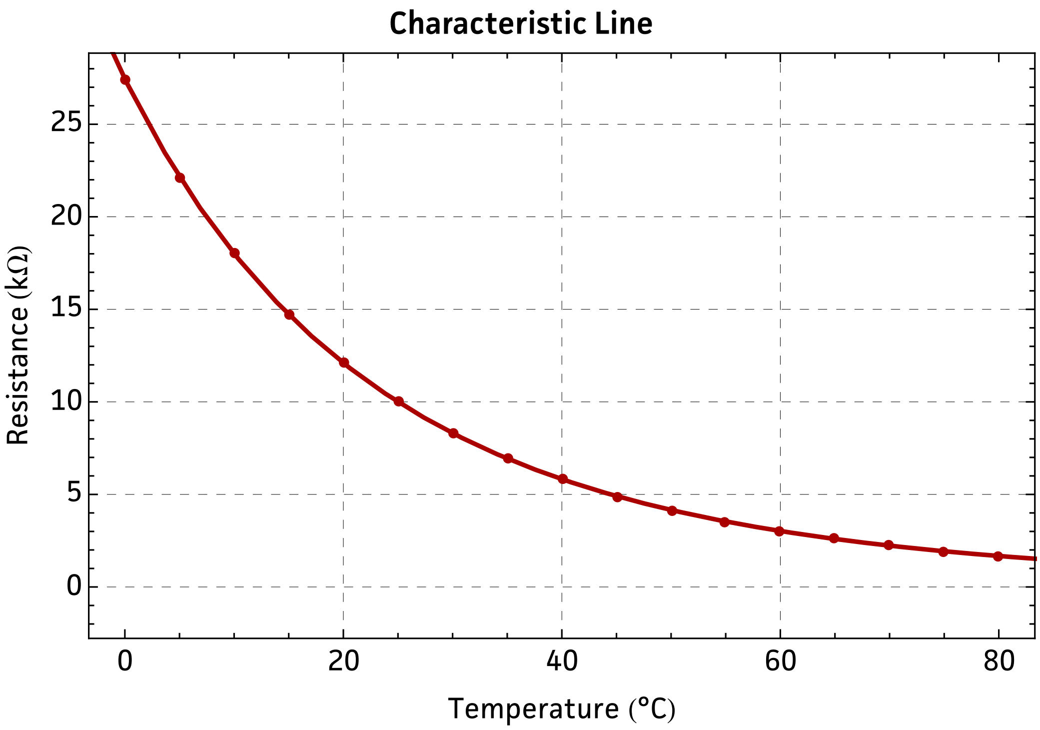
Temperature sensor characteristics:

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



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