Elektronika cyfrowa

Moduł 3

Dr inż.
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v2022/1

Moduł 3

- Karty charakterystyki
- Przykładowe czujniki

Czytanie kart charakterystyki

LED: 334-15/T1C1-4WYA

Absolute Maximum Ratings (Ta=25℃)

Parameter	Symbol	Rating	Unit
Continuous Forward Current	I_F	30	mA
Peak Forward Current(Duty /10 @ 1KHZ)	I_{FP}	100	mA
Reverse Voltage	V_R	5	V
Operating Temperature	T_{opr}	-40 ~ +85	℃
Storage Temperature	T_{stg}	-40 ~ +100	℃
Soldering Temperature (T=5 sec)	T_{sol}	260 ± 5	℃
Power Dissipation	P_d	100	mW
Zener Reverse Current	Iz	100	mA
Electrostatic Discharge	ESD	4K	V

Electro-Optical Characteristics (Ta=25℃)

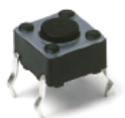
Parameter	Symbol	Condition	Min.	Typ.	Max.	Units
Forward Voltage	V_F	I_F=20mA	3.0	----	3.6	V
Zener Reverse Voltage	Vz	Iz=5mA	5.2	----	----	V
Reverse Current	I_R	V_R=5V	----	----	50	uA
Luminous Intensity	I_V	I_F=20mA	14250	----	28500	mcd
Viewing Angle	2θ 1/2	I_F=20mA	----	15	----	deg
Chromaticity Coordinates	x	I_F=20mA	----	0.30	----	
	y		----	0.29	----	

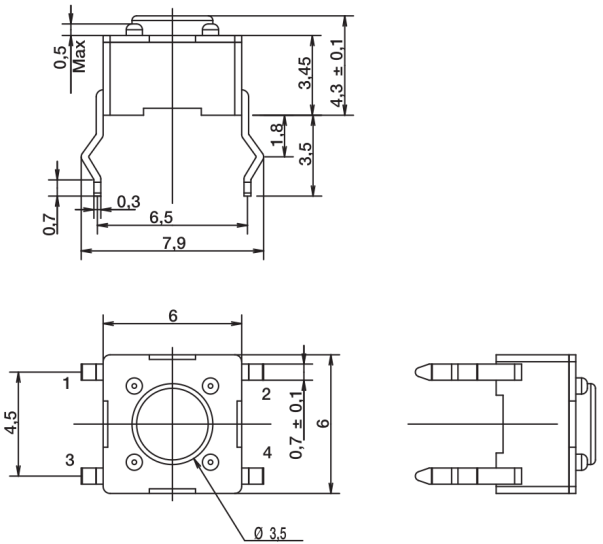
Źródło: Everlight: Technical Data Sheet 5 mm Round White LED (T-1 3/4) [334-15/T1C1-4WYA]

Czytanie kart charakterystyki

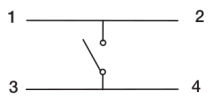
Przycisk: PTS645-S

S STRAIGHT

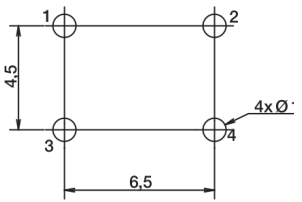




SCHEMATIC



PCB LAYOUT



Tactile Switches

Specification

FUNCTION: Momentary action
CONTACT ARRANGEMENT: SPST, N.O.
TERMINALS: PC pins

Mechanical

ACTUATION FORCE: 130 grams, 160 grams, 200 grams, 260 grams
LIFE EXPECTANCY: 100,000 operations.

Electrical

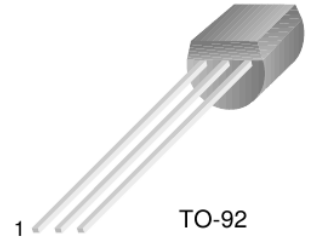
CONTACT RATING: 50 mA @ 12 V DC.
DIELECTRIC STRENGTH: 250 V AC min.
CONTACT RESISTANCE: 100 mΩ max. initial.
INSULATION RESISTANCE: 10^{11} Ω min.

Environmental

OPERATING TEMPERATURE: -20°C to 60°C

Źródło: C&K: PTS645 Series 6 mm Tact Switches

Czytanie kart charakterystyki



1. Collector 2. Base 3. Emitter

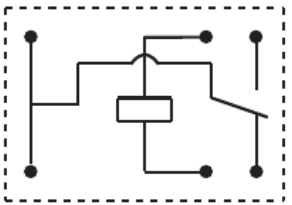
Tranzystor: BC546

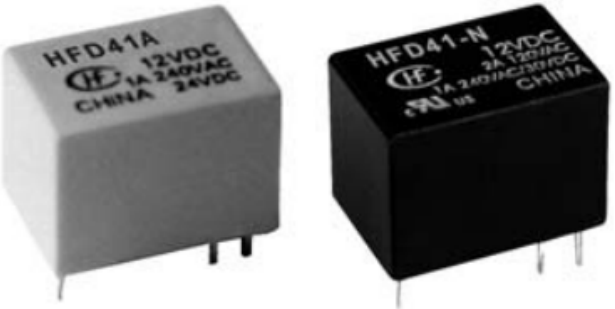
Absolute Maximum Ratings T_a=25◦C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CBO}	Collector-Base Voltage : BC546	80	V
	: BC547/550	50	V
	: BC548/549	30	V
V_{CEO}	Collector-Emitter Voltage : BC546	65	V
	: BC547/550	45	V
	: BC548/549	30	V
V_{EBO}	Emitter-Base Voltage : BC546/547	6	V
	: BC548/549/550	5	V
I_C	Collector Current (DC)	100	mA
P_C	Collector Power Dissipation	500	mW
T_J	Junction Temperature	150	◦C
T_{STG}	Storage Temperature	-65 ~ 150	◦C

Źródło: FAIRCHILD: BC546/547/548/549/550

Czytanie kart charakterystyk





Przekaźnik: HFD41

CONTACT DATA

Concat arrangement	1C
Contact resistance	100mΩ max. (at 1A 6VDC)
Contact material	AgNi, AgCdO
Contact rating (Res. load)	1A 120VAC, 1A 240VAC / 30VDC 3A 120VAC 2A 120VAC, 5A 120VAC
Max. switching voltage	240VAC / 30VDC
Max. switching current	5A
Max. switching power	600VA / 30W
Mechanical endurance	1 x 10^7OPS
Electrical endurance	9.9 x 10^4OPS (1A 120VAC, 1A 30VDC, Resistive load, Room temp., 1s on 9s off)

COIL DATA

at 23˚C

Nominal Voltage VDC	Pick-up Voltage VDC max.	Drop-out Voltage VDC min.	Max. Voltage VDC	Coil Resistance x (1±10%) Ω		
				H	N	B
3	2.3	0.3	3.9	45	25	20
5	3.8	0.5	6.5	120	70	56
6	4.5	0.6	7.8	180	100	80
9	6.8	0.9	11.7	400	220	180
12	9.0	1.2	15.6	700	400	320
24	18.0	2.4	31.2	2800	1600	1280

Źródło: Hongfa Relay: HFD41/D41A

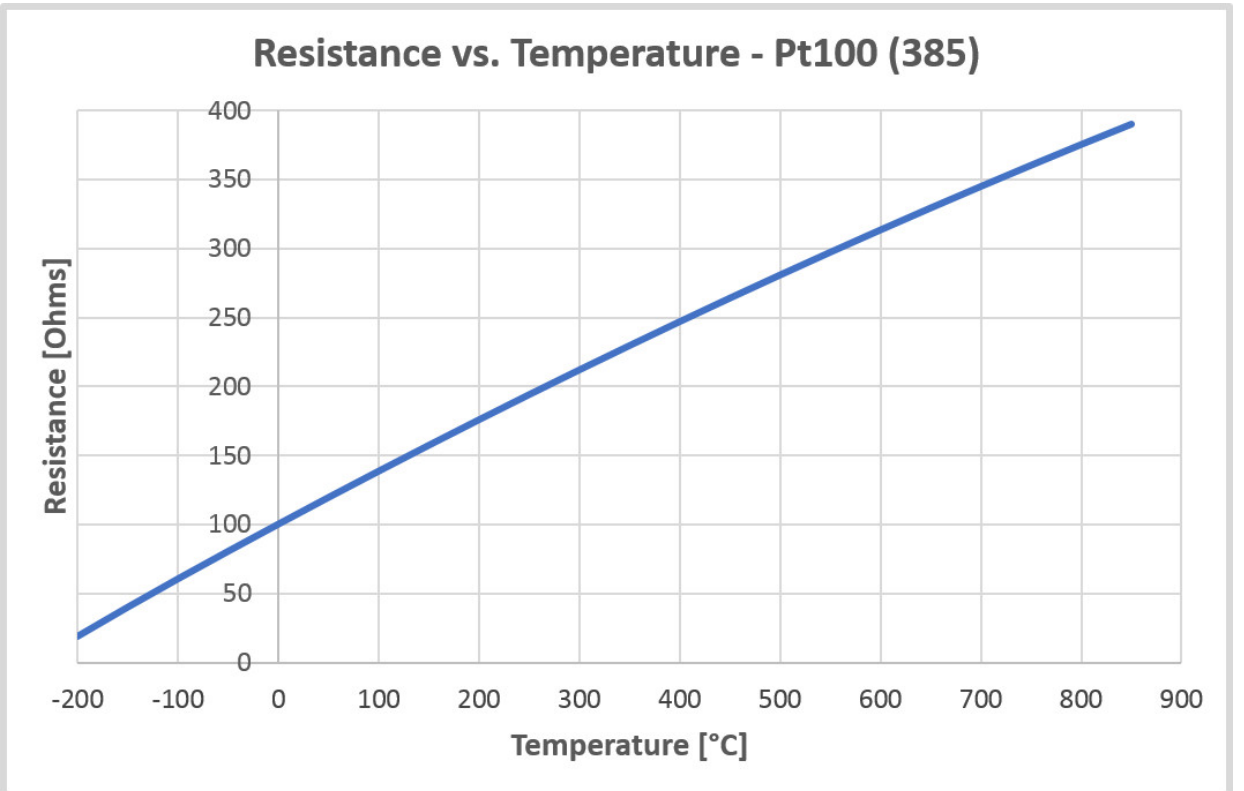
Czujniki

Parametryczne
- rezystancyjne,
- indukcyjne,
- pojemnościowe.

Generacyjne
- dynamiczne,
- termoelektryczne
- piezoelektryczne,
- elektrochemiczne,
- fotoelektryczne.

Źródła:
https://sklepautomatyka.com.pl/produkt/czujnik-indukcyjny-ims18-08bpsnc0s-sick/
http://www.hvac4u.pl/81,ls-cap-czujnik-poziomu-cieczy-pojemnosciowy.html
http://seneca.energoelektronika.pl/produkt/urzadzenia-pomiarowe-i-sterujace/czujniki-temperatury/czujniki-temperatury-czujniki-temperatury/sonda-temperatury-czujnik-temperatury-pt100/

Termometr rezystancyjny PT100



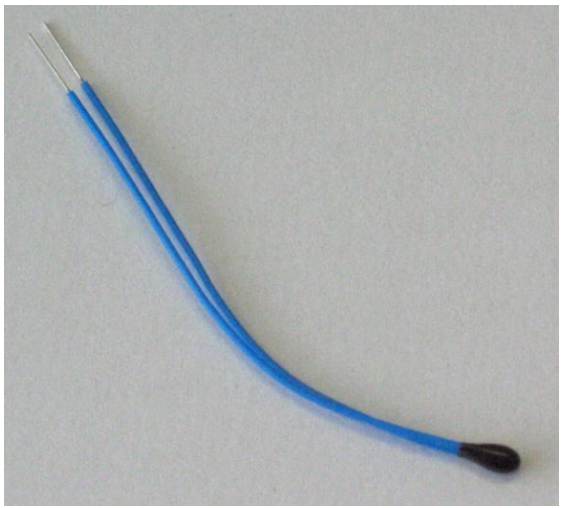
Źródło: https://blog.beamex.com/pt100-temperature-sensor

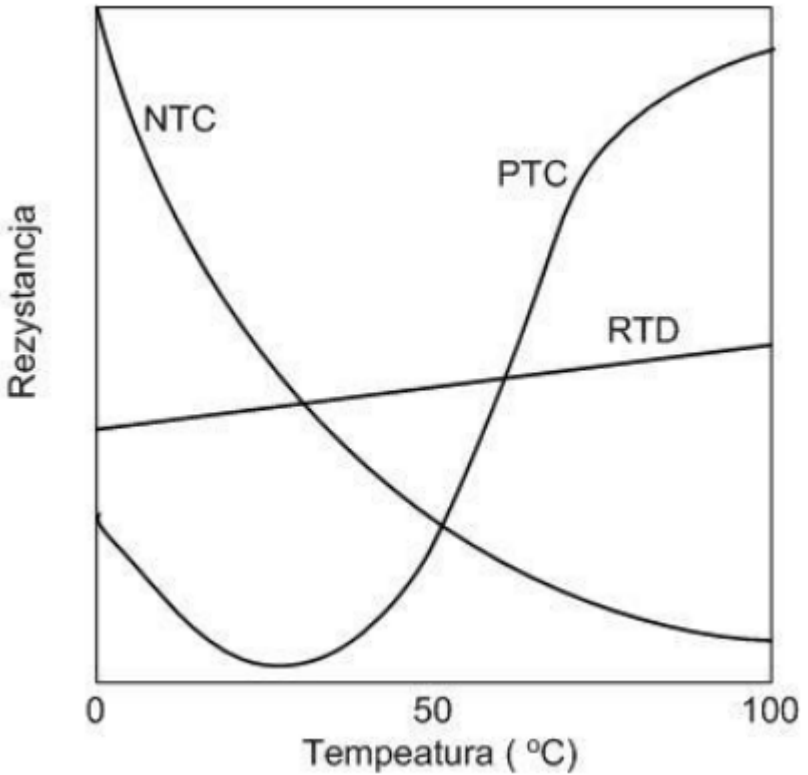
Termistory (termometry półprzewodnikowe)

NTC – negative temp. coefficient

$$R_T = A \exp [\beta / T]$$

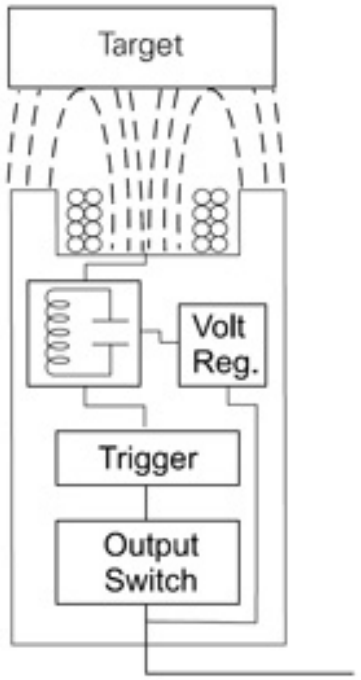
A – wsp. Rozmiaru próbki
β – stała materiałowa

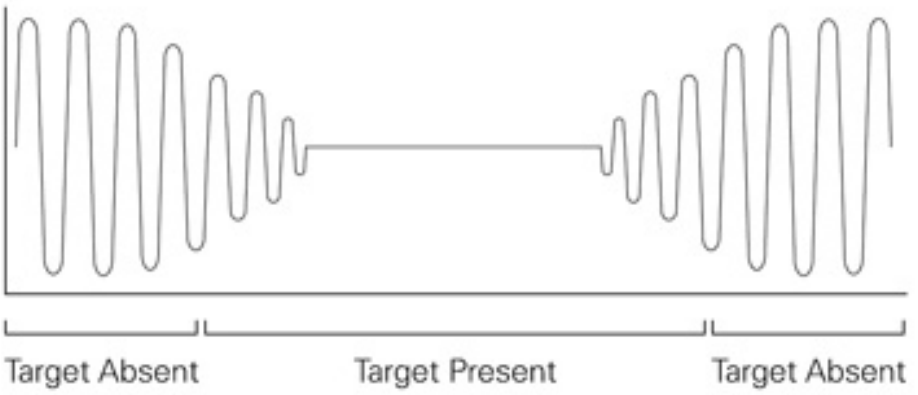




Źródła: https://en.wikipedia.org/wiki/Thermistor, http://home.agh.edu.pl/~maziarz/userfiles/downloads/TS-9-cz.temperatury.pdf

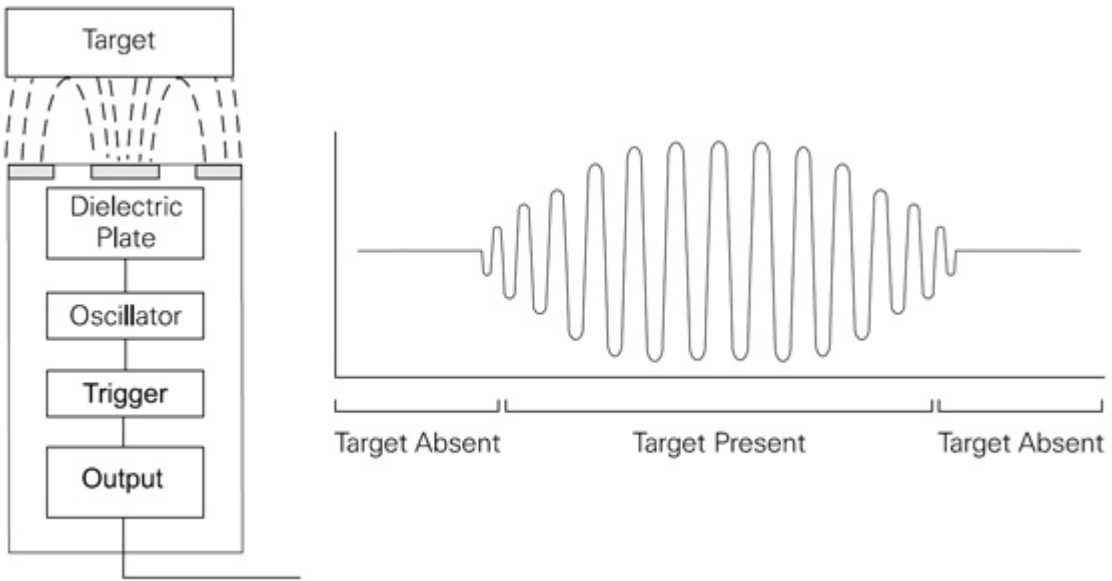
Czujnik indukcyjny





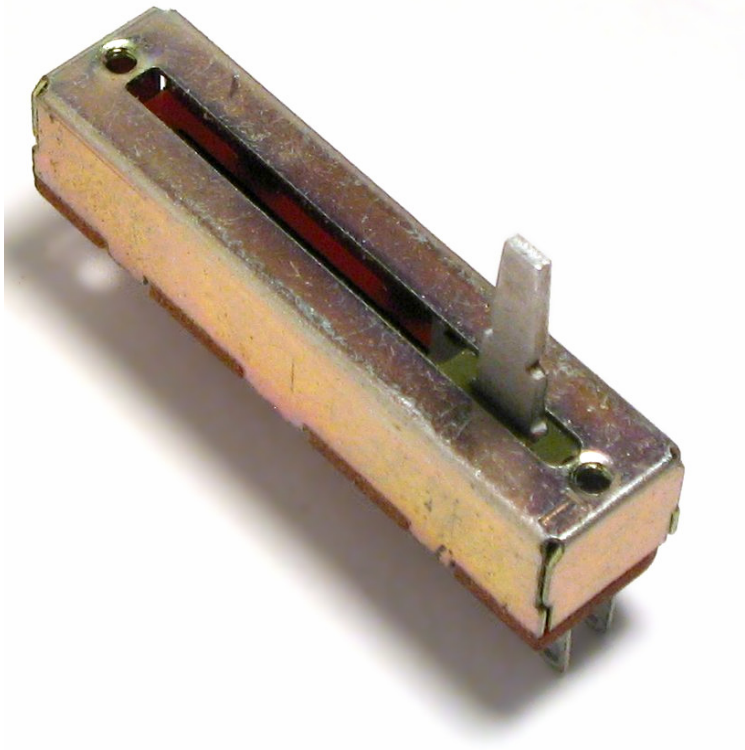
Źródła:
https://pl.wikipedia.org/wiki/Czujnik_indukcyjny
http://www.krc2u.co.kr/product/cg/carlogavazzi_inductive.html

Czujnik pojemnościowy

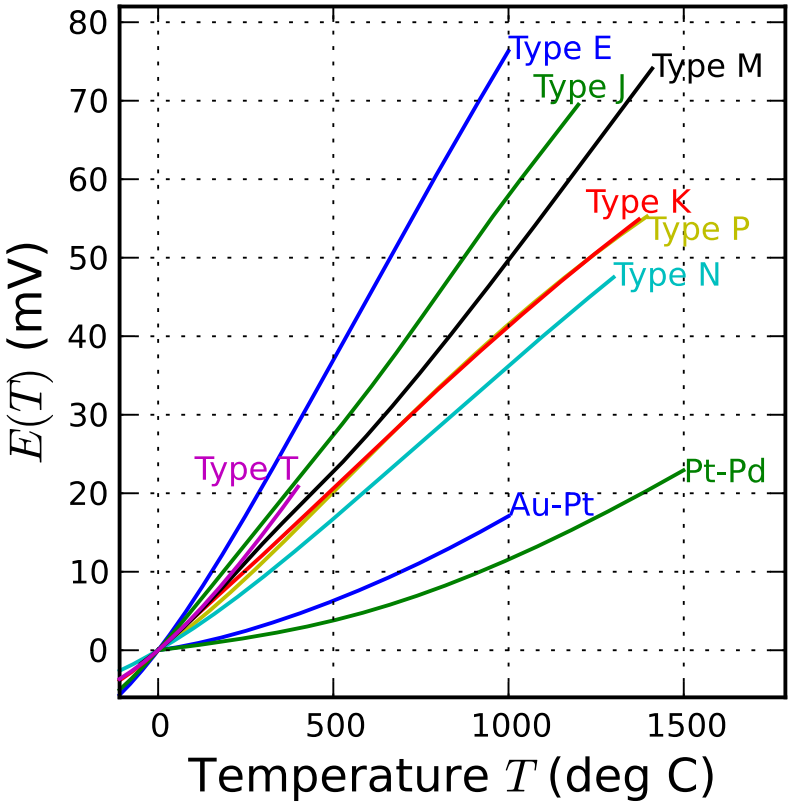


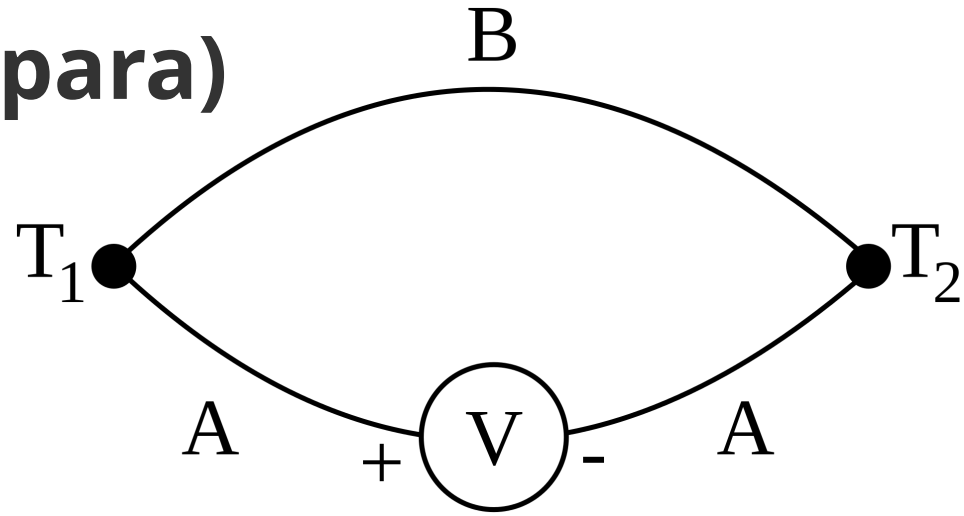
Źródło: http://www.krc2u.co.kr/product/cg/carlogavazzi_capacitive.html

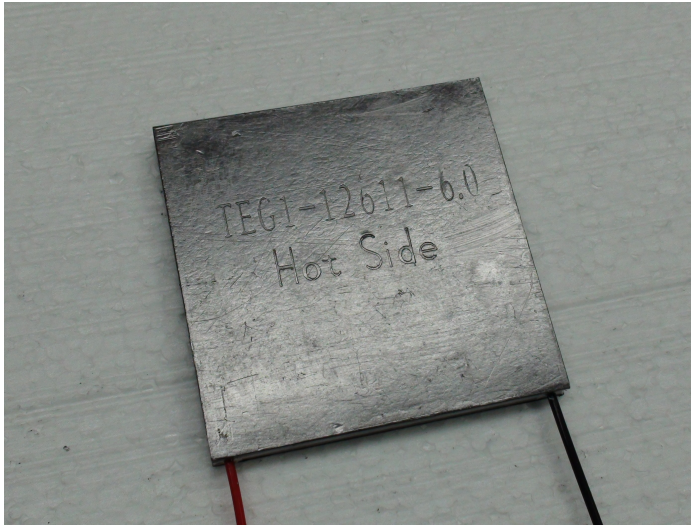
Kąt obrotu/przesunięcie



Termoelement (termopara)

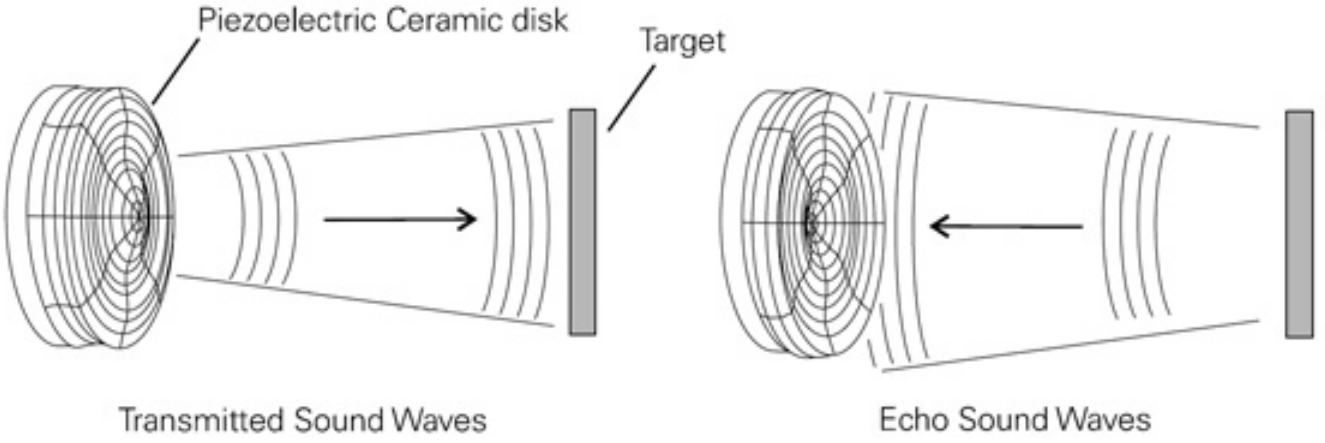






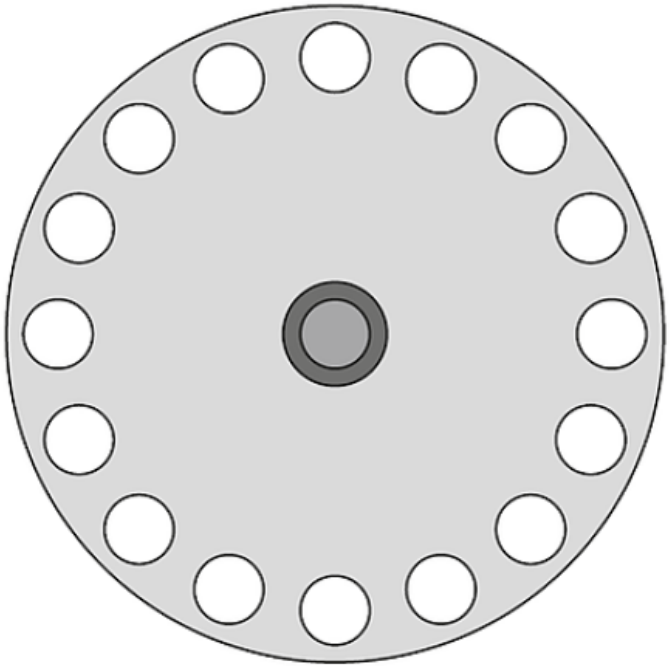
Źródła:
https://pl.wikipedia.org/wiki/Termopara
https://en.wikipedia.org/wiki/Thermocouple

Czujnik ultradźwiękowy

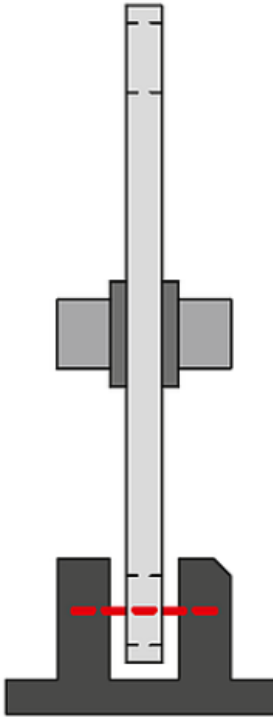


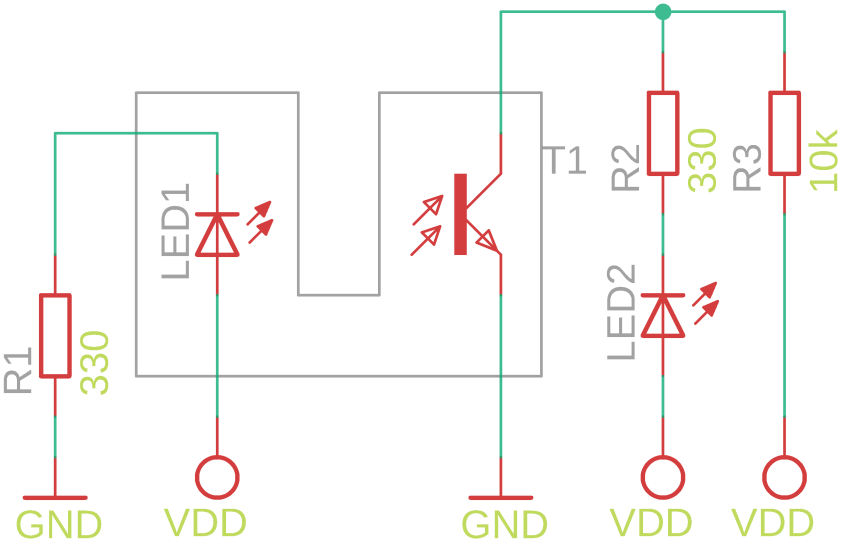
Źródło: http://www.krc2u.co.kr/product/cg/carlogavazzi_ultrasonic.html

Czujnik szczelinowy



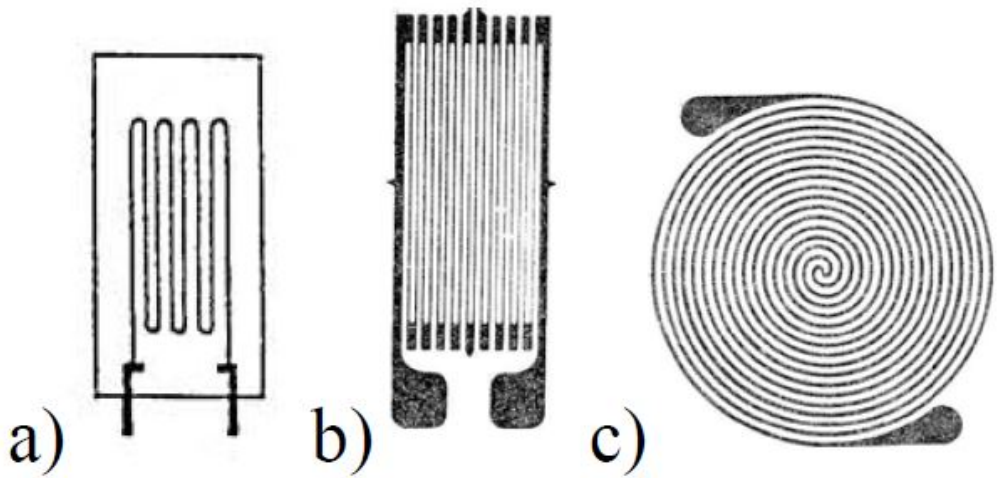
TARCZA

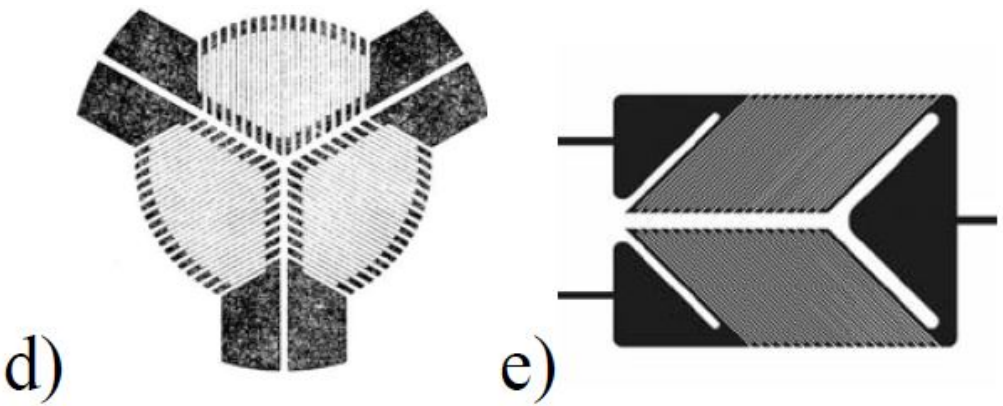




Źródło:
https://elektroniksc.com.pl/transoptory/czujnik-transoptor-szczelinowy-70v-ctr-if-20-10ma-szer-szczeliny-3-1mm-vishay-tcst2103-rohs/
https://ep.com.pl/projekty/miniprojekty/11167-krancowka-ze-szczelinowym-czujnikiem-optycznym

Tensometry oporowe



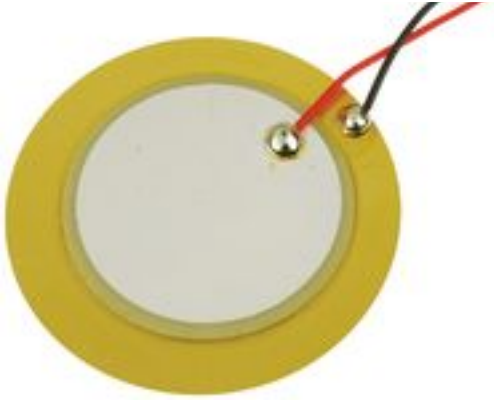


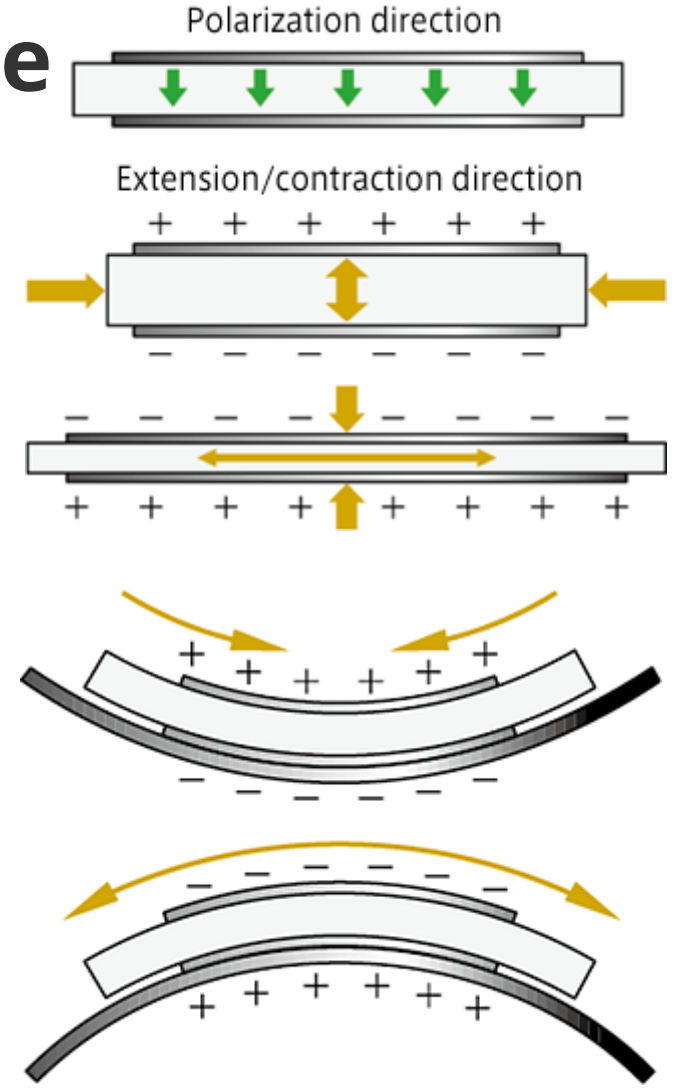
$$\sigma = \frac{lG}{S}\left[\frac{siemens}{metr}\right]$$

σ - Przewodnictwo właściwe materiału
G – przewodnictwo elektryczne
S – pole przekroju poprzecznego elementu
l – długość bloku

Źródło:
https://en.wikipedia.org/wiki/Strain_gauge
https://pl.wikipedia.org/wiki/Tensometr

Czujniki piezoelektryczne





Źródło:
https://sklep.phu-szczepan.pl/product-pol-3132-Czujnik-piezoelektryczny-W250.html
Piezo Element MCFT-27T-4.2AL-127 Datasheet
https://product.tdk.com/info/en/products/sensor/level/powder-level/technote/tpo/index.html