tangio®
Printed Electronics

Standard Force Sensor

TPE-500 SERIES DATA SHEET

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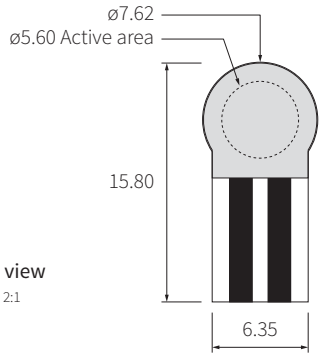
Force Sensing Resistor

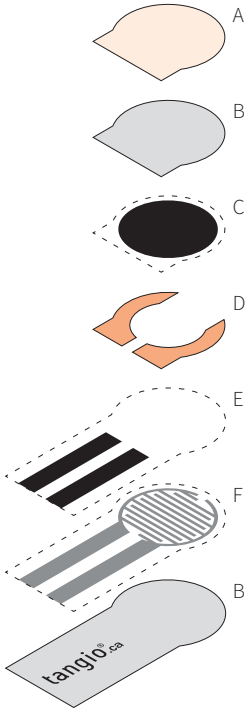
TPE-500 / TPE-500s



Top view
Scale 2:1

Stacked view

A Adhesive
B PET
C FSR
D Spacer
E Tail carbon
F Silver conductive



Mechanical data

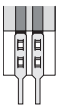
Active area	ø5.60mm	Trace width	0.25mm
Thickness (inc. 0.05mm adhesive)	0.325 / 0.250mm	Trace pitch	0.50mm
Mode	Shunt	Spacer height	0.125 / 0.050mm
Sensor overall width	7.62mm	Tail length	9.00mm
Sensor overall length	15.80mm	Tail width	6.35mm

Interconnect options and part numbers

TPE-500A / TPE-500sA

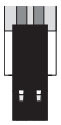
Exposed carbon traces

TPE-500B / TPE-500sB



YIDA. bronze/tin plated solder tab
P/N# YD-1-254-10

TPE-500C / TPE-500sC



CNT female phos. bronze/tin plated termination pins
P/N# 3043-001-00
w/HX standard housing
P/N# HX-25406-2Y

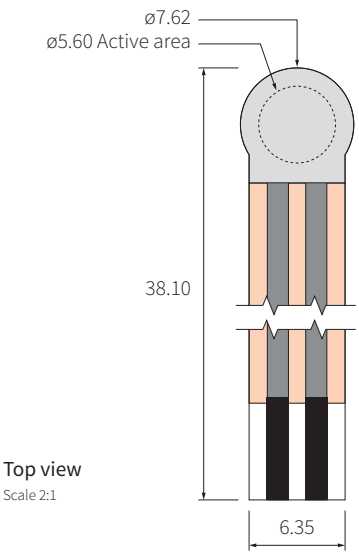
Device characteristics

Characteristic	Description	Value	Notes
Actuation force	Force to reach 10MΩ	< 30g / < 10g	Average of 100 samples
Force range	linear region of log/log	Up to 5kg	Higher forces can be achieved with custom sensor and actuation methods
Long term drift	1kg for 48hrs	< 2%	Per log time
Single part repeatability	100 actuations of 1kg	2%	1 standard deviation/mean
Part to part repeatability	100 sensors same batch	+/– 4%	1 standard deviation/mean
Low temp. storage	–20°C for 250hrs	8%	Avg. change in resistance of 5 sensors
High temp. storage	+85°C for 250hrs	4%	Avg. change in resistance of 5 sensors
High humidity storage	+85°C/85%RH for 250hrs	8%	Avg. change in resistance of 5 sensors
Lifecycle durability (10M)	1kg force at 3Hz	7%	Avg. change in resistance of 4 sensors
Hysteresis	100 actuations of 1kg	5%	Avg. change in resistance of 100 samples
Operational temp. range	100 cycles at 0.5kg	–20 to +85°C	

Device characteristics and mechanical data stated in orange text refer to TPE-500s.
All values typical, and quoted at 10N applied force unless otherwise stated. Force dependent on actuation interface, mechanics, and measurement electronics.

Force Sensing Resistor

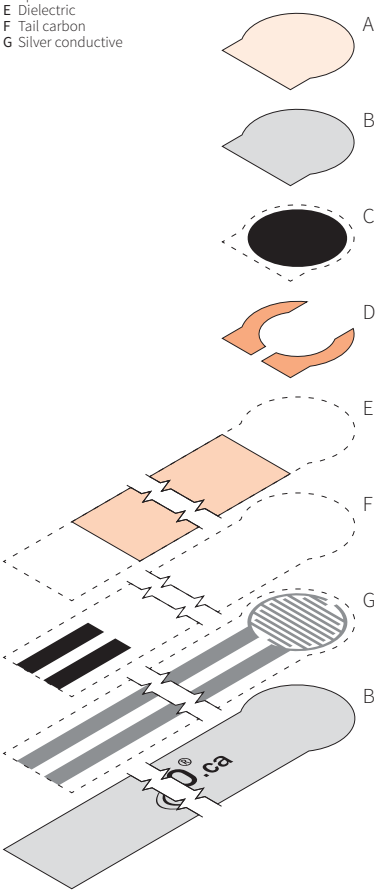
TPE-501 / TPE-501s



Top view
Scale 2:1

Stacked view

A Adhesive
B PET
C FSR
D Spacer
E Dielectric
F Tail carbon
G Silver conductive



Mechanical data

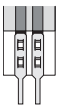
Active area	ø5.60mm	Trace width	0.25mm
Thickness (inc. 0.050mm adhesive)	0.325 / 0.250mm	Trace pitch	0.50mm
Mode	Shunt	Spacer height	0.125 / 0.050mm
Sensor overall width	7.62mm	Tail length	30.00mm
Sensor overall length	38.10mm	Tail width	6.35mm

Interconnect options and part numbers

TPE-501A / TPE-501sA

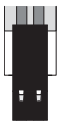
Exposed carbon traces

TPE-501B / TPE-501sB



YIDA. bronze/tin plated solder tab
P/N# YD-1-254-10

TPE-501C / TPE-501sC



CNT female phos. bronze/tin plated termination pins
P/N# 3043-001-00
w/HX standard housing
P/N# HX-25406-2Y

Device characteristics

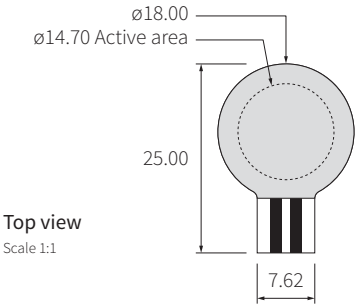
Characteristic	Description	Value	Notes
Actuation force	Force to reach 10MΩ	< 30g / < 10g	Average of 100 samples
Force range	linear region of log/log	Up to 5kg	Higher forces can be achieved with custom sensor and actuation methods
Long term drift	1kg for 48hrs	< 2%	Per log time
Single part repeatability	100 actuations of 1kg	2%	1 standard deviation/mean
Part to part repeatability	100 sensors same batch	+/– 4%	1 standard deviation/mean
Low temp. storage	–20°C for 250hrs	8%	Avg. change in resistance of 5 sensors
High temp. storage	+85°C for 250hrs	4%	Avg. change in resistance of 5 sensors
High humidity storage	+85°C/85%RH for 250hrs	8%	Avg. change in resistance of 5 sensors
Lifecycle durability (10M)	1kg force at 3Hz	7%	Avg. change in resistance of 4 sensors
Hysteresis	100 actuations of 1kg	5%	Avg. change in resistance of 100 samples
Operational temp. range	100 cycles at 0.5kg	–20 to +85°C	

Device characteristics and mechanical data stated in orange text refer to TPE-501s.
Note: All values typical, and quoted at 10N applied force unless otherwise stated. Force dependent on actuation interface, mechanics, and measurement electronics.

Force Sensing Resistor

TPE-502

Mechanical data

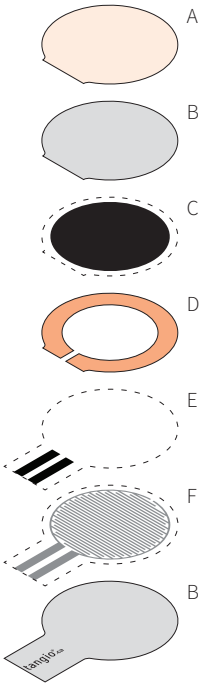


Top view
Scale 1:1

Active area	ø14.70mm	Trace width	0.25mm
Thickness (inc. 0.05mm adhesive)	0.375mm	Trace pitch	0.50mm
Mode	Shunt	Spacer height	0.125mm
Sensor overall width	18.00mm	Tail length	9.00mm
Sensor overall length	25.00mm	Tail width	7.62mm

Stacked view

A Adhesive
B PET
C FSR
D Spacer
E Tail carbon
F Silver conductive

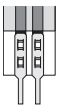


Interconnect options and part numbers

TPE-502A

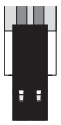
Exposed carbon traces

TPE-502B



YIDA. bronze/tin plated solder tab
P/N# YD-1-254-10

TPE-502C



CNT female phos. bronze/tin plated termination pins
P/N# 3043-001-00
w/HX standard housing
P/N# HX-25406-2Y

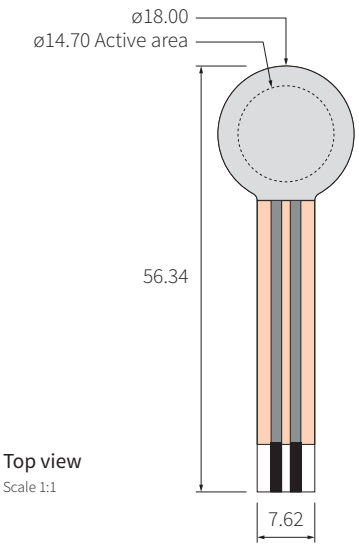
Device characteristics

Characteristic	Description	Value	Notes
Actuation force	Force to reach 10MΩ	< 15g	Average of 100 samples
Force range	linear region of log/log	Up to 5kg	Higher forces can be achieved with custom sensor and actuation methods
Long term drift	1kg for 48hrs	< 1%	Per log time
Single part repeatability	100 actuations of 1kg	2%	1 standard deviation/mean
Part to part repeatability	100 sensors same batch	+/– 4%	1 standard deviation/mean
Low temp. storage	–20°C for 250hrs	7%	Avg. change in resistance of 5 sensors
High temp. storage	+85°C for 250hrs	3%	Avg. change in resistance of 5 sensors
High humidity storage	+85°C/85%RH for 250hrs	12%	Avg. change in resistance of 5 sensors
Lifecycle durability (10M)	1kg force at 3Hz	3%	Avg. change in resistance of 4 sensors
Hysteresis	100 actuations of 1kg	5%	Avg. change in resistance of 100 samples
Operational temp. range	100 cycles at 0.5kg	–20 to +85°C	

Note: All values typical, and quoted at 10N applied force unless otherwise stated. Force dependent on actuation interface, mechanics, and measurement electronics.

Force Sensing Resistor

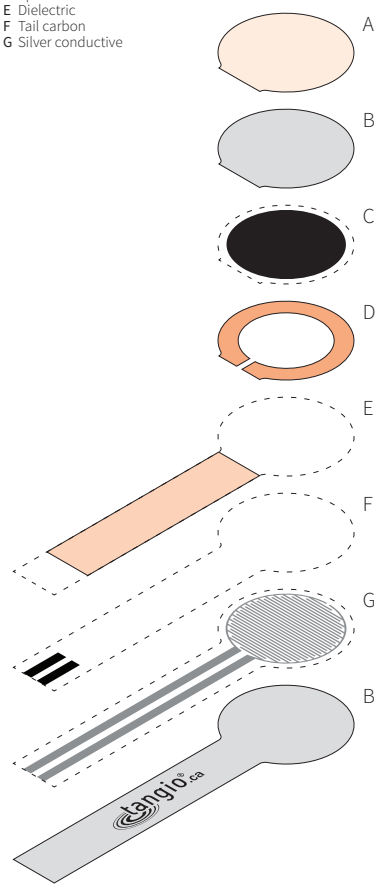
TPE-503



Top view
Scale 1:1

Stacked view

A Adhesive
B PET
C FSR
D Spacer
E Dielectric
F Tail carbon
G Silver conductive



Mechanical data

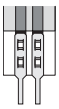
Active area	ø14.70mm	Trace width	0.25mm
Thickness (inc. 0.05mm adhesive)	0.375mm	Trace pitch	0.50mm
Mode	Shunt	Spacer height	0.125mm
Sensor overall width	18.00mm	Tail length	38.00mm
Sensor overall length	56.34mm	Tail width	7.62mm

Interconnect options and part numbers

TPE-503A

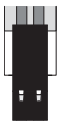
Exposed carbon traces

TPE-503B



YIDA. bronze/tin plated solder tab
P/N# YD-1-254-10

TPE-503C



CNT female phos. bronze/tin plated termination pins
P/N# 3043-001-00
w/HX standard housing
P/N# HX-25406-2Y

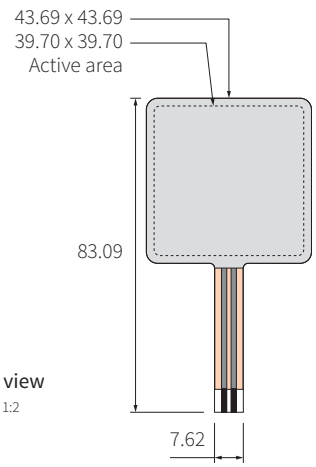
Device characteristics

Characteristic	Description	Value	Notes
Actuation force	Force to reach 10MΩ	< 15g	Average of 100 samples
Force range	linear region of log/log	Up to 5kg	Higher forces can be achieved with custom sensor and actuation methods
Long term drift	1kg for 48hrs	< 1%	Per log time
Single part repeatability	100 actuations of 1kg	2%	1 standard deviation/mean
Part to part repeatability	100 sensors same batch	+/– 4%	1 standard deviation/mean
Low temp. storage	–20°C for 250hrs	7%	Avg. change in resistance of 5 sensors
High temp. storage	+85°C for 250hrs	3%	Avg. change in resistance of 5 sensors
High humidity storage	+85°C/85%RH for 250hrs	12%	Avg. change in resistance of 5 sensors
Lifecycle durability (10M)	1kg force at 3Hz	3%	Avg. change in resistance of 4 sensors
Hysteresis	100 actuations of 1kg	5%	Avg. change in resistance of 100 samples
Operational temp. range	100 cycles at 0.5kg	–20 to +85°C	

Note: All values typical, and quoted at 10N applied force unless otherwise stated. Force dependent on actuation interface, mechanics, and measurement electronics.

Force Sensing Resistor

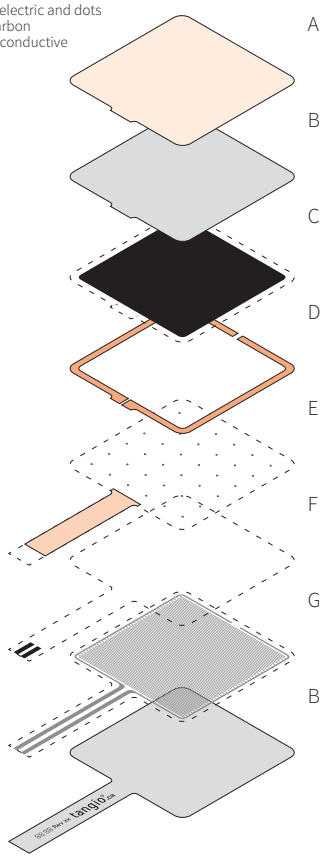
TPE-506



Top view
Scale 1:2

Stacked view

A Adhesive
B PET
C FSR
D Spacer
E Tail dielectric and dots
F Tail carbon
G Silver conductive



Mechanical data

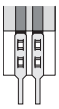
Active area	39.70 x 39.70mm	Trace width	0.25mm
Thickness (inc. 0.05mm adhesive)	0.375mm	Trace pitch	0.50mm
Mode	Shunt	Spacer height	0.125mm
Sensor overall width	43.69mm	Tail length	39.40mm
Sensor overall length	83.09mm	Tail width	7.62mm

Interconnect options and part numbers

TPE-506A

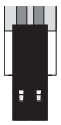
Exposed carbon traces

TPE-506B



YIDA. bronze/tin plated solder tab
P/N# YD-1-254-10

TPE-506C



CNT female phos. bronze/tin plated termination pins
P/N# 3043-001-00
w/HX standard housing
P/N# HX-25406-2Y

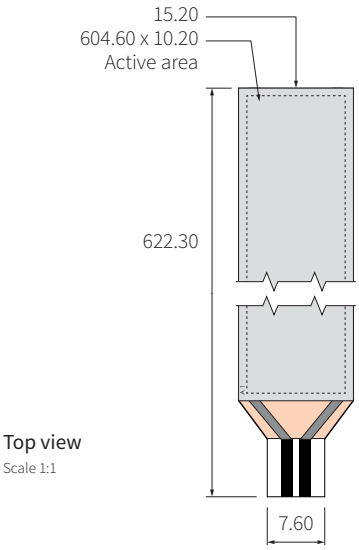
Device characteristics

Characteristic	Description	Value	Notes
Actuation force	Force to reach 10MΩ	< 20g	Average of 100 samples
Force range	linear region of log/log	Up to 5kg	Higher forces can be achieved with custom sensor and actuation methods
Long term drift	1kg for 48hrs	< 2%	Per log time
Single part repeatability	100 actuations of 1kg	2%	1 standard deviation/mean
Part to part repeatability	100 sensors same batch	+/– 4%	1 standard deviation/mean
Low temp. storage	–20°C for 250hrs	8%	Avg. change in resistance of 5 sensors
High temp. storage	+85°C for 250hrs	4%	Avg. change in resistance of 5 sensors
High humidity storage	+85°C/85%RH for 250hrs	8%	Avg. change in resistance of 5 sensors
Lifecycle durability (10M)	1kg force at 3Hz	7%	Avg. change in resistance of 4 sensors
Hysteresis	100 actuations of 1kg	5%	Avg. change in resistance of 100 samples
Operational temp. range	100 cycles at 0.5kg	–20 to +85°C	

Note: All values typical, and quoted at 10N applied force unless otherwise stated. Force dependant on actuation interface, mechanics, touch location, and measurement electronics.

Force Sensing Resistor

TPE-508

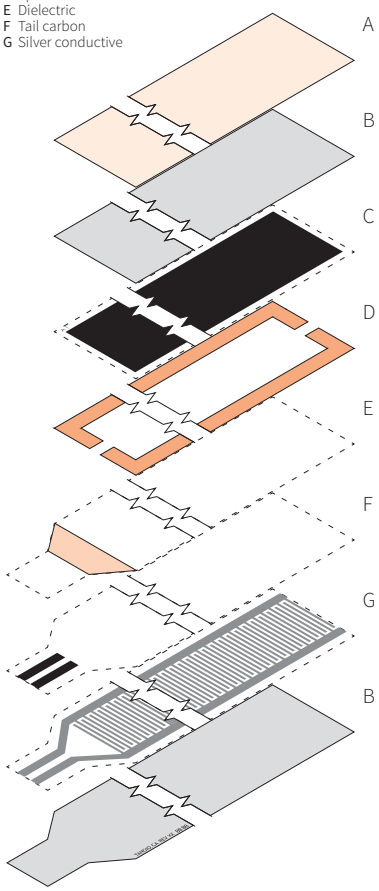


Top view

Scale 1:1

Stacked view

A Adhesive
B PET
C FSR
D Spacer
E Dielectric
F Tail carbon
G Silver conductive



Mechanical data

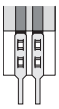
Active area	604.60 x 10.20mm	Trace width	0.25mm
Thickness (inc. 0.05mm adhesive)	0.375mm	Trace pitch	0.50mm
Mode	Shunt	Spacer height	0.125mm
Sensor overall width	15.20mm	Tail length	12.70mm
Sensor overall length	622.30mm	Tail width	7.60mm

Interconnect options and part numbers

TPE-508A

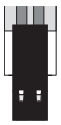
Exposed carbon traces

TPE-508B



YIDA. bronze/tin plated solder tab
P/N# YD-1-254-10

TPE-508C



CNT female phos. bronze/tin plated termination pins
P/N# 3043-001-00
w/HX standard housing
P/N# HX-25406-2Y

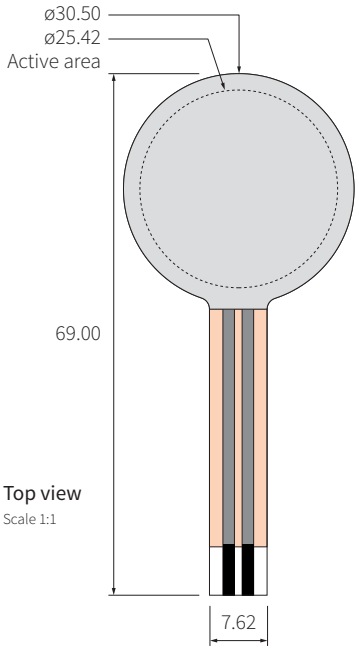
Device characteristics

Characteristic	Description	Value	Notes
Actuation force	Force to reach 10MΩ	< 20g	Average of 100 samples
Force range	linear region of log/log	Up to 5kg	Higher forces can be achieved with custom sensor and actuation methods
Long term drift	1kg for 48hrs	< 1%	Per log time
Single part repeatability	100 actuations of 1kg	2%	1 standard deviation/mean
Part to part repeatability	100 sensors same batch	+/– 4%	1 standard deviation/mean
Low temp. storage	–20°C for 250hrs	7%	Avg. change in resistance of 5 sensors
High temp. storage	+85°C for 250hrs	3%	Avg. change in resistance of 5 sensors
High humidity storage	+85°C/85%RH for 250hrs	12%	Avg. change in resistance of 5 sensors
Lifecycle durability (10M)	1kg force at 3Hz	12%	Avg. change in resistance of 4 sensors
Hysteresis	100 actuations of 1kg	5%	Avg. change in resistance of 100 samples
Operational temp. range	100 cycles at 0.5kg	–20 to +85°C	

Note: All values typical, and quoted at 10N applied force unless otherwise stated. Force dependent on actuation interface, mechanics, and measurement electronics.

Force Sensing Resistor

TPE-510

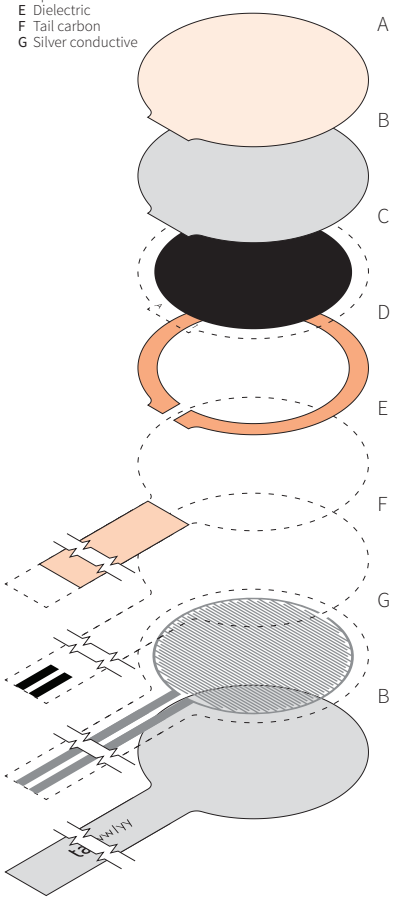


Top view

Scale 1:1

Stacked view

A Adhesive
B PET
C FSR
D Spacer
E Dielectric
F Tail carbon
G Silver conductive



Mechanical data

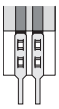
Active area	ø25.42mm	Trace width	0.25mm
Thickness (inc. 0.05mm adhesive)	0.425mm	Trace pitch	0.50mm
Mode	Shunt	Spacer height	0.125mm
Sensor overall width	30.50mm	Tail length	38.00mm
Sensor overall length	69.00mm	Tail width	7.62mm

Interconnect options and part numbers

TPE-510A

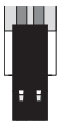
Exposed carbon traces

TPE-510B



YIDA. bronze/tin plated solder tab
P/N# YD-1-254-10

TPE-510C



CNT female phos. bronze/tin plated termination pins
P/N# 3043-001-00
w/HX standard housing
P/N# HX-25406-2Y

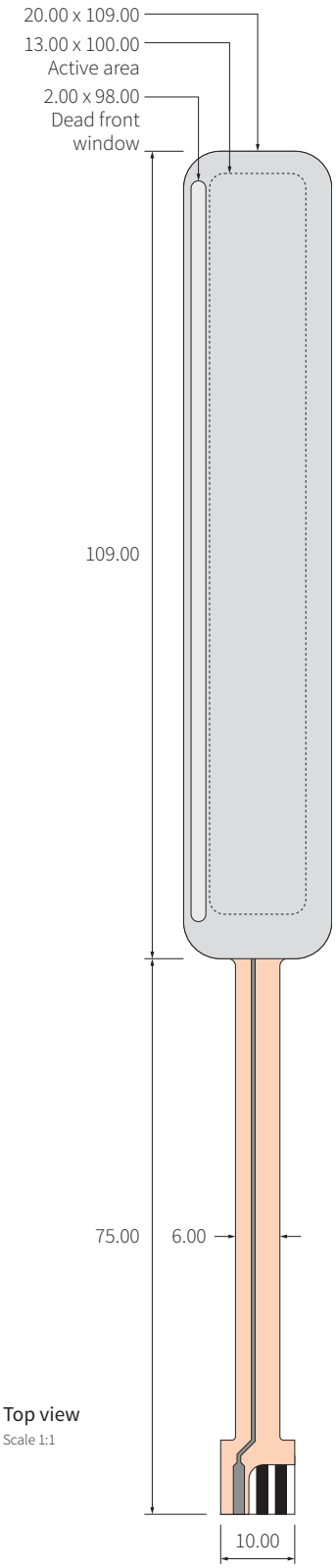
Device characteristics

Characteristic	Description	Value	Notes
Actuation force	Force to reach 10MΩ	< 10g	Average of 100 samples
Force range	linear region of log/log	Up to 5kg	Higher forces can be achieved with custom sensor and actuation methods
Long term drift	1kg for 48hrs	< 1%	Per log time
Single part repeatability	100 actuations of 1kg	2%	1 standard deviation/mean
Part to part repeatability	100 sensors same batch	+/– 4%	1 standard deviation/mean
Low temp. storage	–20°C for 250hrs	7%	Avg. change in resistance of 5 sensors
High temp. storage	+85°C for 250hrs	3%	Avg. change in resistance of 5 sensors
High humidity storage	+85°C/85%RH for 250hrs	8%	Avg. change in resistance of 5 sensors
Lifecycle durability (10M)	1kg force at 3Hz	3%	Avg. change in resistance of 4 sensors
Hysteresis	100 actuations of 1kg	5%	Avg. change in resistance of 100 samples
Operational temp. range	100 cycles at 0.5kg	–20 to +85°C	

Note: All values typical, and quoted at 10N applied force unless otherwise stated. Force dependent on actuation interface, mechanics, and measurement electronics.

Force Sensing Potentiometer

TPE-520



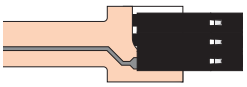
Top view
Scale 1:1

Mechanical data

Active area	13.00 x 100.00mm	Trace width	0.25mm
Thickness (inc. 0.05mm adhesive)	0.375mm	Trace pitch	0.50mm
Mode	Thru	Spacer height	0.125mm
Sensor overall width	20.00mm	Tail length	75.00mm
Sensor overall length	184.00mm	Tail width	10.00mm

Interconnect option and part number

TPE-520C



Nicomatic crimp P/N# 14106-12
with Nicomatic housing P/N# OF03

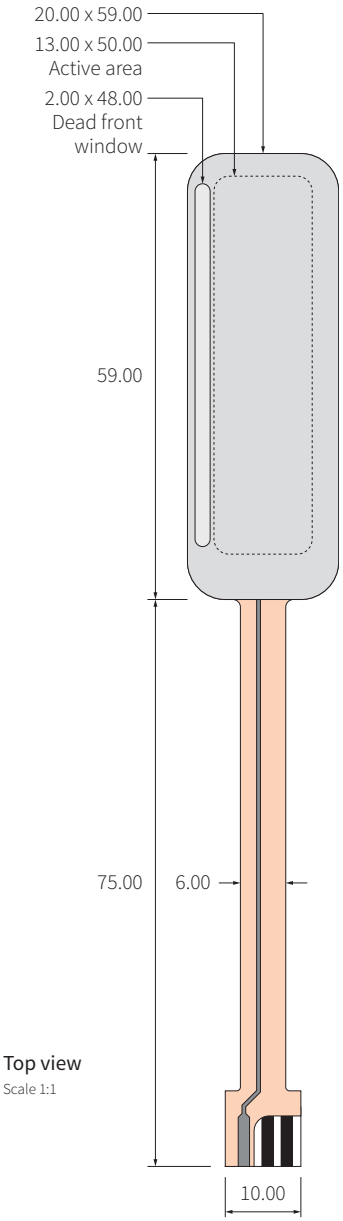
Device characteristics

Characteristic	Description	Value	Notes
Actuation force	Force to reach 10MΩ	< 20g	Average of 100 samples
Force range	linear region of log/log	Up to 1kg	Higher forces can be achieved with custom sensor and actuation methods
Long term drift	1kg for 48hrs	< 2%	Per log time
Single part repeatability	100 actuations of 1kg	5%	1 standard deviation/mean
Part to part repeatability	100 sensors same batch	+/– 10%	1 standard deviation/mean
Low temp. storage	–20°C for 250hrs	2%	Avg. change in resistance of 5 sensors
High temp. storage	+85°C for 250hrs	9%	Avg. change in resistance of 5 sensors
High humidity storage	+85°C/85%RH for 250hrs	10%	Avg. change in resistance of 5 sensors
Lifecycle durability (1M)	1kg force at 3Hz	4%	Avg. change in resistance of 4 sensors
Hysteresis	100 actuations of 1kg	5%	Avg. change in resistance of 100 samples
Operational temp. range	100 cycles at 0.5kg	–20 to +60°C	
Linear resistance	Resistance between pins 1 and 2	1.25k +/– 15%	Average of 100 parts same batch

Note: All values typical, and quoted at 10N applied force unless otherwise stated. Force dependant on actuation interface, mechanics, touch location, and measurement electronics.

Force Sensing Potentiometer

TPE-521



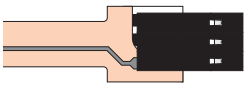
Top view
Scale 1:1

Mechanical data

Active area	13.00 x 50.00mm	Trace width	0.25mm
Thickness (inc. 0.05mm adhesive)	0.375mm	Trace pitch	0.50mm
Mode	Thru	Spacer height	0.125mm
Sensor overall width	20.00mm	Tail length	75.00mm
Sensor overall length	134.00mm	Tail width	10.00mm

Interconnect option and part number

TPE-521C



Nicomatic crimp P/N# 14106-12
with Nicomatic housing P/N# OF03

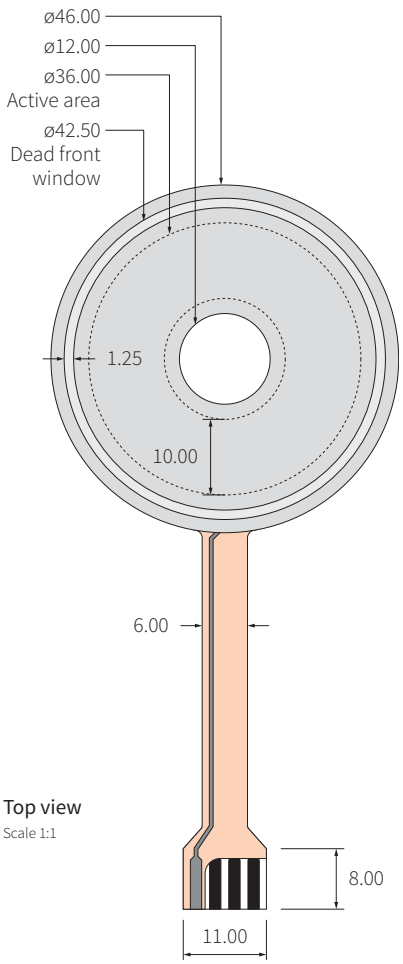
Device characteristics

Characteristic	Description	Value	Notes
Actuation force	Force to reach 10MΩ	< 20g	Average of 100 samples
Force range	linear region of log/log	Up to 1kg	Higher forces can be achieved with custom sensor and actuation methods
Long term drift	1kg for 48hrs	< 2%	Per log time
Single part repeatability	100 actuations of 1kg	5%	1 standard deviation/mean
Part to part repeatability	100 sensors same batch	+/– 10%	1 standard deviation/mean
Low temp. storage	–20°C for 250hrs	2%	Avg. change in resistance of 5 sensors
High temp. storage	+85°C for 250hrs	9%	Avg. change in resistance of 5 sensors
High humidity storage	+85°C/85%RH for 250hrs	10%	Avg. change in resistance of 5 sensors
Lifecycle durability (1M)	1kg force at 3Hz	4%	Avg. change in resistance of 4 sensors
Hysteresis	100 actuations of 1kg	5%	Avg. change in resistance of 100 samples
Operational temp. range	100 cycles at 0.5kg	–20 to +60°C	
Linear resistance	Resistance between pins 1 and 2	0.76k +/– 15%	Average of 100 parts same batch

Note: All values typical, and quoted at 10N applied force unless otherwise stated. Force dependant on actuation interface, mechanics, touch location, and measurement electronics.

Force Sensing Potentiometer

TPE-530



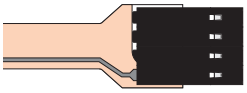
Top view
Scale 1:1

Mechanical data

Active area (inner / outer)	ø16.00 / ø36.00mm	Trace width	0.25mm
Thickness (inc. 0.05mm adhesive)	0.375mm	Trace pitch	0.50mm
Mode	Thru	Spacer height	0.125mm
Sensor overall width	46.00mm	Tail length	49.80mm
Sensor overall length	95.80mm	Tail width	11.00mm

Interconnect option and part number

TPE-530C



Nicomatic crimp P/N# 14106-12
with Nicomatic housing P/N# OF04

Device characteristics

Characteristic	Description	Value	Notes
Actuation force	Force to reach 10MΩ	< 20g	Average of 100 samples
Force range	linear region of log/log	Up to 1kg	Higher forces can be achieved with custom sensor and actuation methods
Long term drift	1kg for 48hrs	< 2%	Per log time
Single part repeatability	100 actuations of 1kg	5%	1 standard deviation/mean
Part to part repeatability	100 sensors same batch	+/– 10%	1 standard deviation/mean
Low temp. storage	–20°C for 250hrs	2%	Avg. change in resistance of 5 sensors
High temp. storage	+85°C for 250hrs	9%	Avg. change in resistance of 5 sensors
High humidity storage	+85°C/85%RH for 250hrs	10%	Avg. change in resistance of 5 sensors
Lifecycle durability (1M)	1kg force at 3Hz	4%	Avg. change in resistance of 4 sensors
Hysteresis	100 actuations of 1kg	5%	Avg. change in resistance of 100 samples
Operational temp. range	100 cycles at 0.5kg	–20 to +60°C	
Linear resistance	Resistance between pins 1 and 2	+/– 15%	Average of 100 parts same batch

Note: All values typical, and quoted at 10N applied force unless otherwise stated. Force dependant on actuation interface, mechanics, touch location, and measurement electronics.

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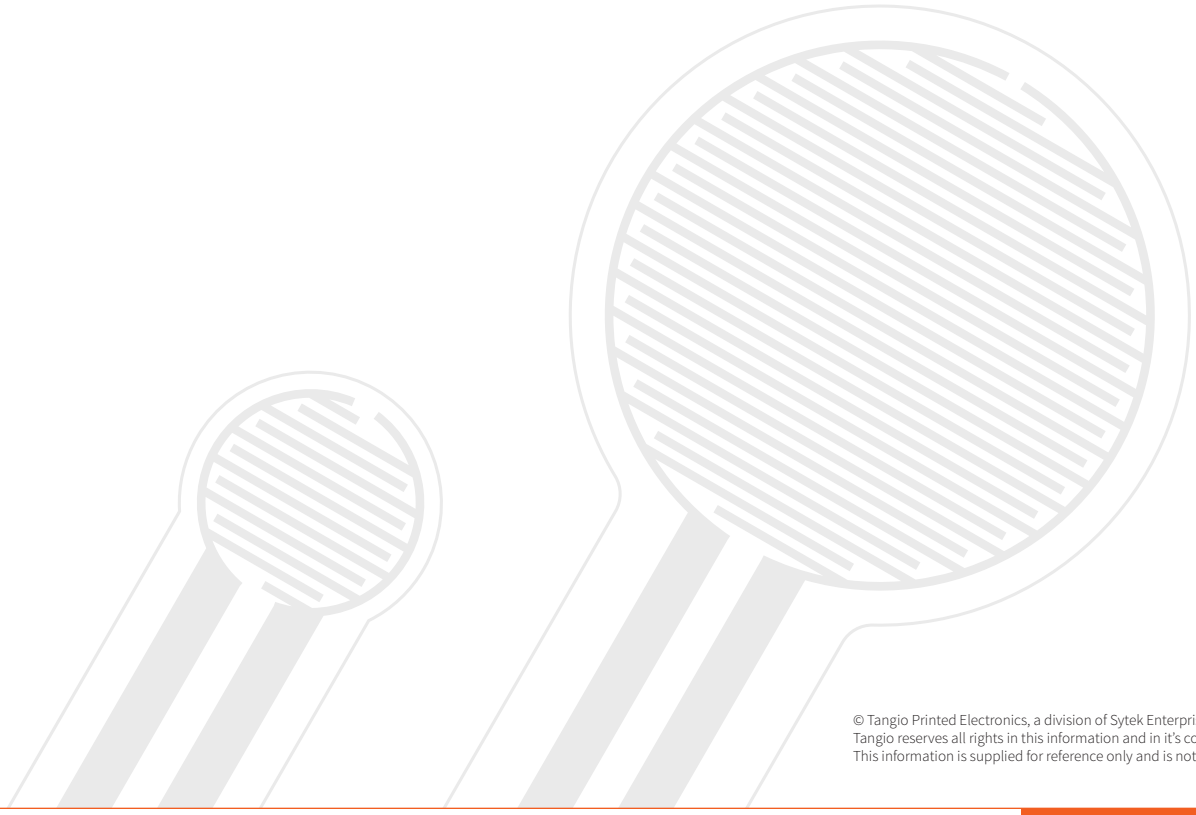

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