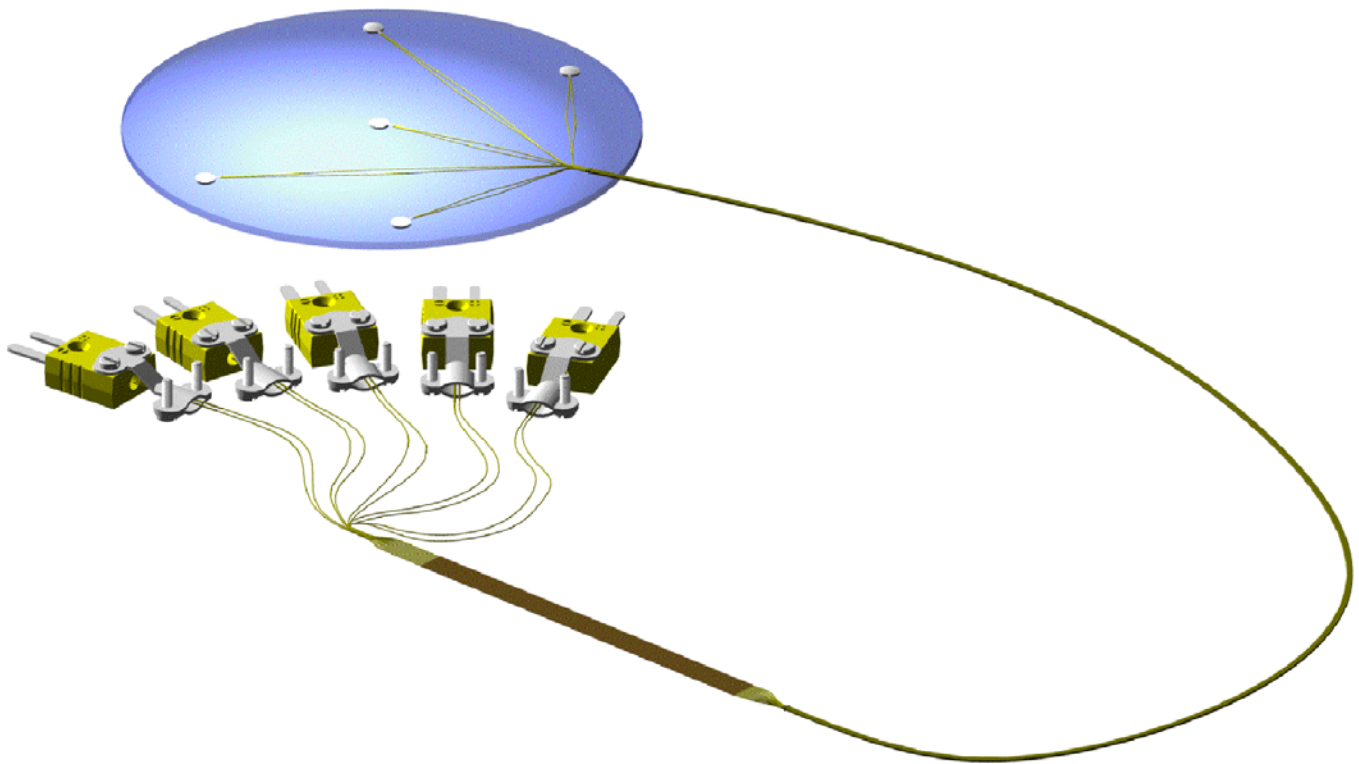




**THERMO ELECTRIC**

# **WAFER TEMPERATURE SENSORS**

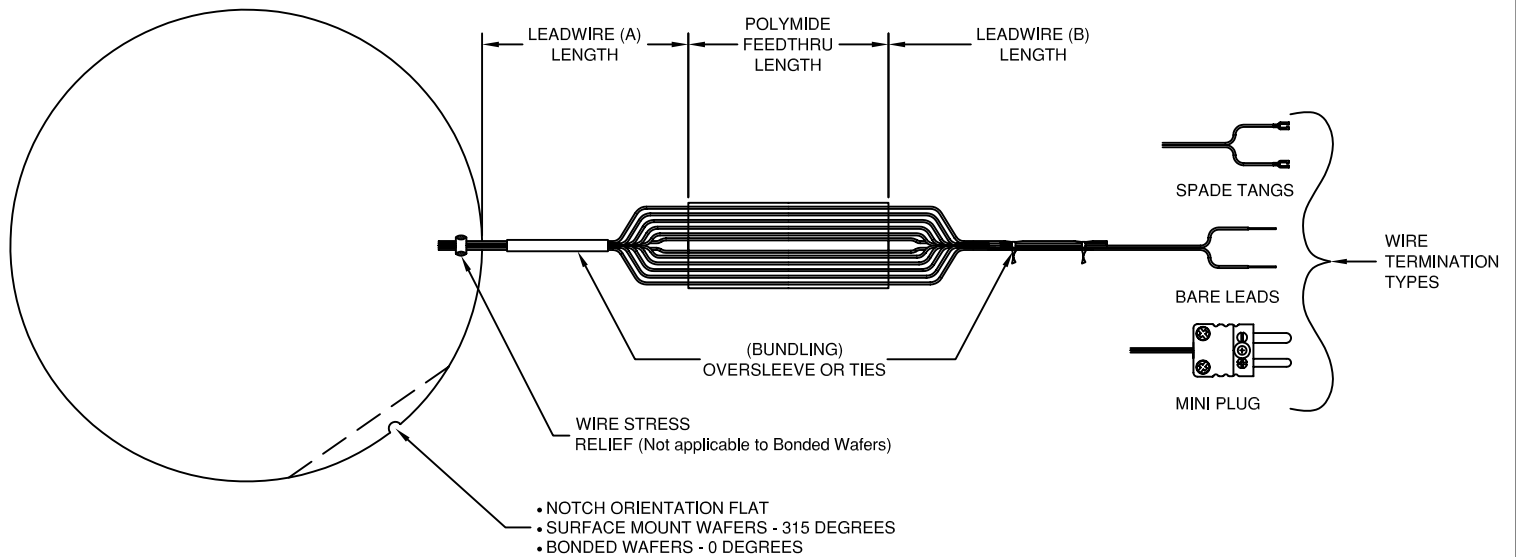
## **Section SEMI**



The "Instrumented Wafer" typically finds application in semiconductor processing equipment where knowing and controlling the temperature at the surface of a silicon wafer is critical. While these products are typically used throughout the semiconductor industry, this technology can also be used to measure the temperature uniformity of any two dimensional surface.

Most common applications: Solder Reflow, Rapid Thermal Processing (RTP), Rapid Thermal Annealing (RTA), Post Exposure Bake (PEB), Chemical Vapor Deposition (CVD), Physical Vapor Deposition (PVD), ION Implantation, Solar Cell, and many other thermally driven processes.

## WAFER TEMPERATURE SENSORS



Please see page SEMI-090 for ordering information.

### TC-350H - High Performance - Temperature Range (-40°C to 350°C)

The TC-350H uses the smallest possible sensing elements to reduce thermal mass and increase the response time of each sensor. The material used to fabricate the sensors is carefully chosen for the highest possible accuracy and greatest sensor to sensor uniformity.

This design finds application where knowing and controlling the temperature at the surface of a silicon wafer is critical. Most manufacturers embed their sensors within the wafer's core. This product focuses its measurement at the wafer's surface where the most vital processes occur. In using this product you can expect faster and more accurate response times resulting from the most accurate placement of the sensing elements.

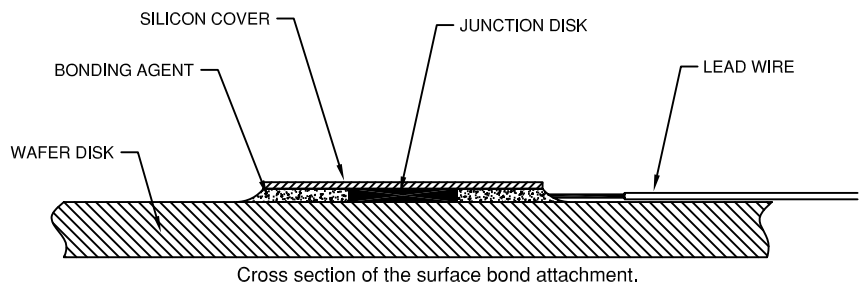
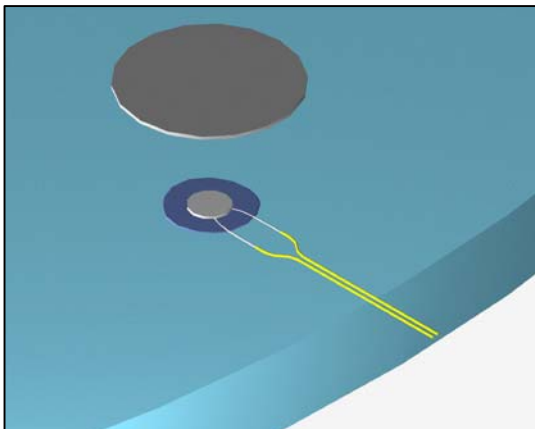
While these products are typically used throughout the semiconductor industry, this technology can also be used to measure the temperature uniformity of any other two dimensional surface.

The TC-350 wafer products employ Thermocouple technology to produce the most accurate and reliable readings.

### Recommended Sensors:

**Type K Thermocouple (Chromel/Alumel)** - The most popular sensor for use in this design. The Type K thermocouple offers the best balance of range, accuracy, and reliability.

**Type T Thermocouple (Copper/Constantan)** - Higher accuracy at the cost of a narrow temperature range. Finds use in high accuracy, low temperature applications.



The unique surface bond attachment securely fixes the sensor to the substrate. The planar sensing element offers the highest possible response times.



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## SECTION SEMI

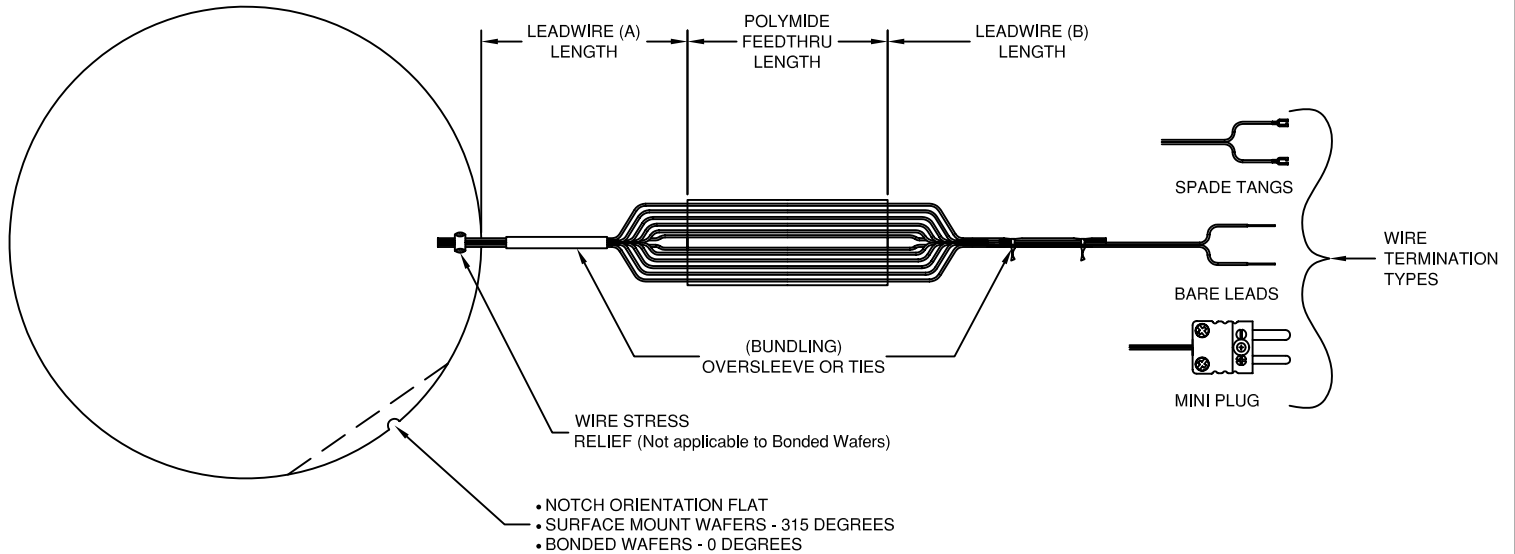
### TC-350H

### HIGH PERFORMANCE

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Doc. No.: TE-CO010109-SEMI-010

## WAFER TEMPERATURE SENSORS



Please see page SEMI-090 for ordering information.

### TC-350D - Heavy Duty - Temperature Range (-40°C to 350°C)

The TC-350D uses the most rugged components to increase the lifespan of these often fragile products. The material used to fabricate the sensors is carefully chosen for the highest possible accuracy and greatest sensor to sensor uniformity.

This design finds application where knowing and controlling the temperature at the surface of a silicon wafer is critical. Most manufacturers embed their sensors within the wafer's core. This product focuses its measurement at the wafer's surface where the most vital processes occur. IN using this product you can expect faster and more accurate response times resulting from the most accurate placement of the sensing elements.

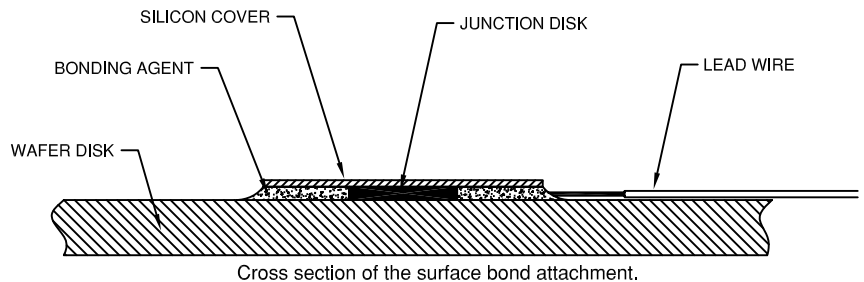
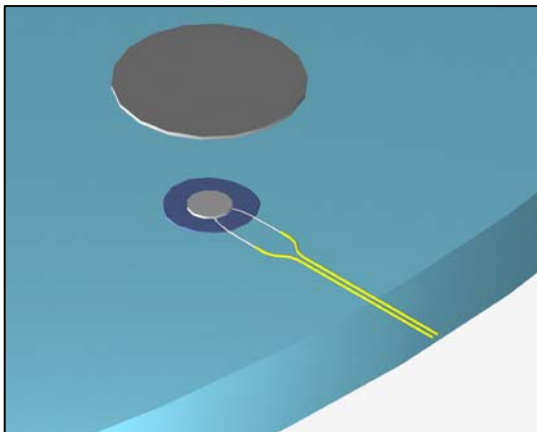
While these products are typically used throughout the semiconductor industry, this technology can also be used to measure the temperature uniformity of any other two dimensional surface.

The TC-350 wafer products employ Thermocouple technology to produce the most accurate and reliable readings.

### Recommended Sensors:

**Type K Thermocouple (Chromel/Alumel)** - The most popular sensor for use in this design. The Type K thermocouple offers the best balance of range, accuracy, and reliability.

**Type T Thermocouple (Copper/Constantan)** - Higher accuracy at the cost of a narrow temperature range. Finds use in high accuracy, low temperature applications.



The unique surface bond attachment securely fixes the sensor to the substrate. The planar sensing element offers the highest possible response times.



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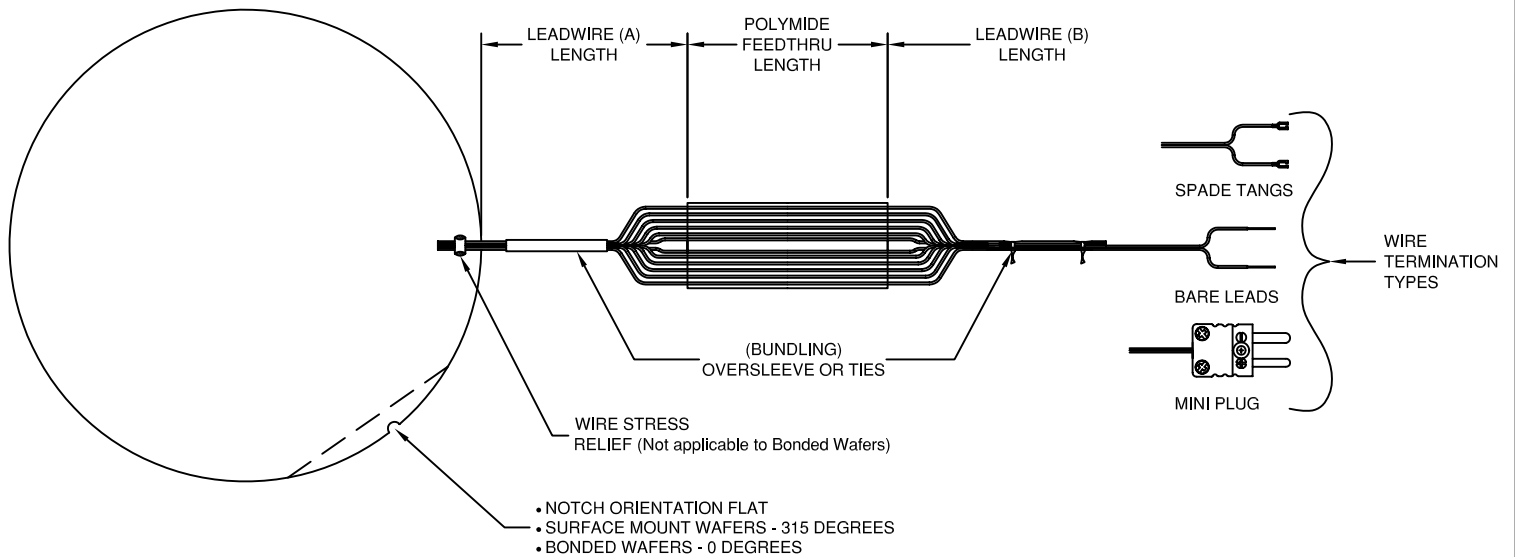
## SECTION SEMI

### TC-350D HEAVY DUTY

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## WAFER TEMPERATURE SENSORS



Please see page SEMI-090 for ordering information.

### TC-700H - High Performance - Temperature Range (-40°C to 700°C)

The TC-700H uses the smallest possible sensing elements to reduce thermal mass and increase the response time of each sensor. The material used to fabricate the sensors is carefully chosen for the highest possible accuracy and greatest sensor to sensor uniformity.

This design finds application where knowing and controlling the temperature at the surface of a silicon wafer is critical. Most manufacturers embed their sensors within the wafer's core. This product focuses its measurement at the wafer's surface where the most vital processes occur. IN using this product you can expect faster and more accurate response times resulting from the most accurate placement of the sensing elements.

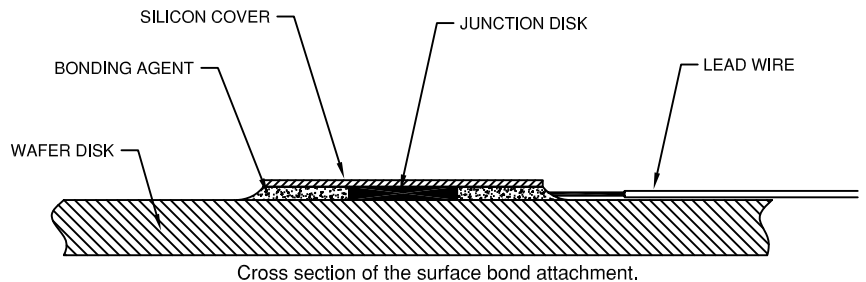
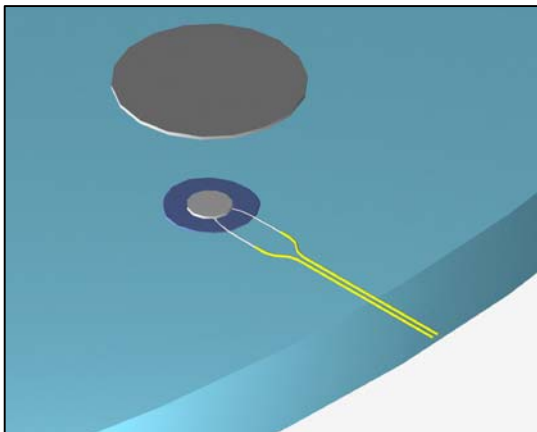
While these products are typically used throughout the semiconductor industry, this technology can also be used to measure the temperature uniformity of any other two dimensional surface.

The TC-700 wafer products employ Thermocouple technology to produce the most accurate and reliable readings.

#### Recommended Sensors:

**Type K Thermocouple (Chromel/Alumel)** - The most popular sensor for use in this design. The Type K thermocouple offers the best balance of range, accuracy, and reliability.

**Type N Thermocouple (Nicrosil/Nisil)** - Less popular than Type K, but slightly more resistant to high temperature oxidation and corrosion.



The unique surface bond attachment securely fixes the sensor to the substrate. The planar sensing element offers the highest possible response times.



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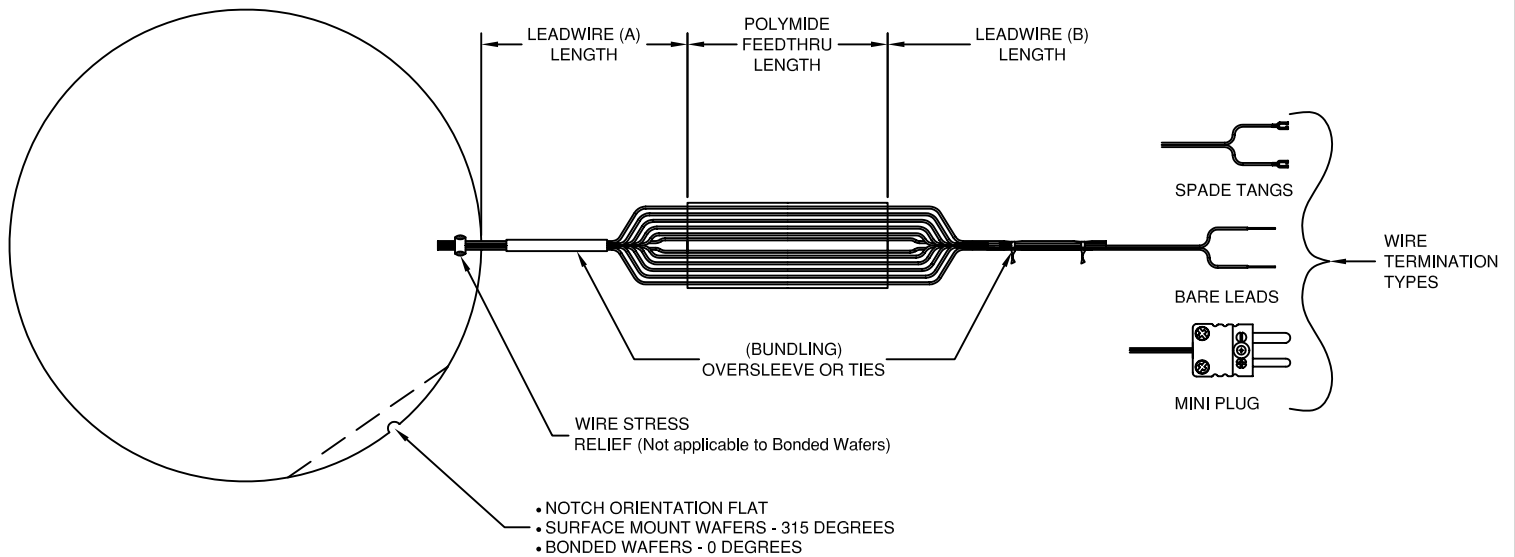
## SECTION SEMI

### TC-700H HIGH PERFORMANCE

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## WAFER TEMPERATURE SENSORS



Please see page SEMI-090 for ordering information.

### TC-700D - Heavy Duty - Temperature Range (-40°C to 700°C)

**The TC-700D uses the most rugged components to increase the lifespan of these often fragile products. The material used to fabricate the sensors is carefully chosen for the highest possible accuracy and greatest sensor to sensor uniformity.**

This design finds application where knowing and controlling the temperature at the surface of a silicon wafer is critical. Most manufacturers embed their sensors within the wafer's core. This product focuses its measurement at the wafer's surface where the most vital processes occur. IN using this product you can expect faster and more accurate response times resulting from the most accurate placement of the sensing elements.

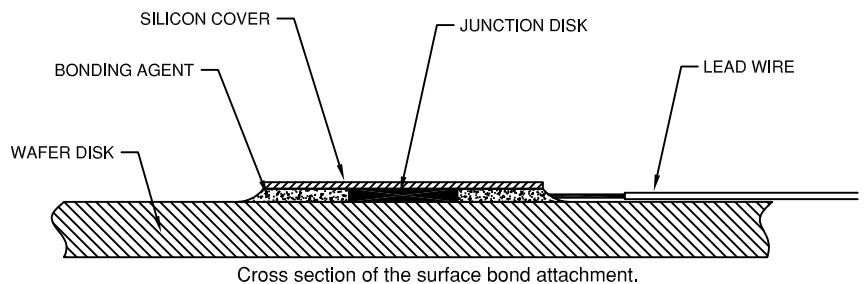
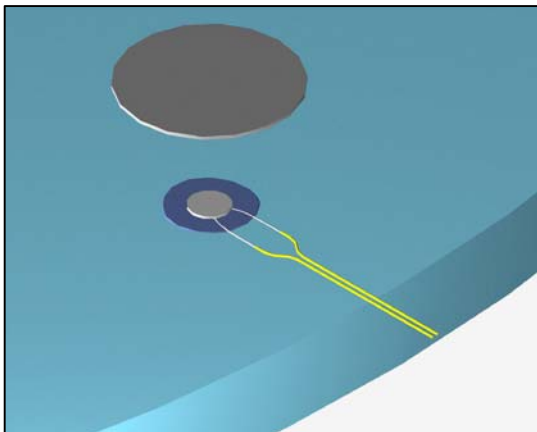
While these products are typically used throughout the semiconductor industry, this technology can also be used to measure the temperature uniformity of any other two dimensional surface.

The TC-700 wafer products employ Thermocouple technology to produce the most accurate and reliable readings.

### Recommended Sensors:

**Type K Thermocouple (Chromel/Alumel)** - The most popular sensor for use in this design. The Type K thermocouple offers the best balance of range, accuracy, and reliability.

**Type N Thermocouple (Nicrosil/Nisil)** - Less popular than Type K, but slightly more resistant to high temperature oxidation and corrosion.



The unique surface bond attachment securely fixes the sensor to the substrate. The planar sensing element offers the highest possible response times.



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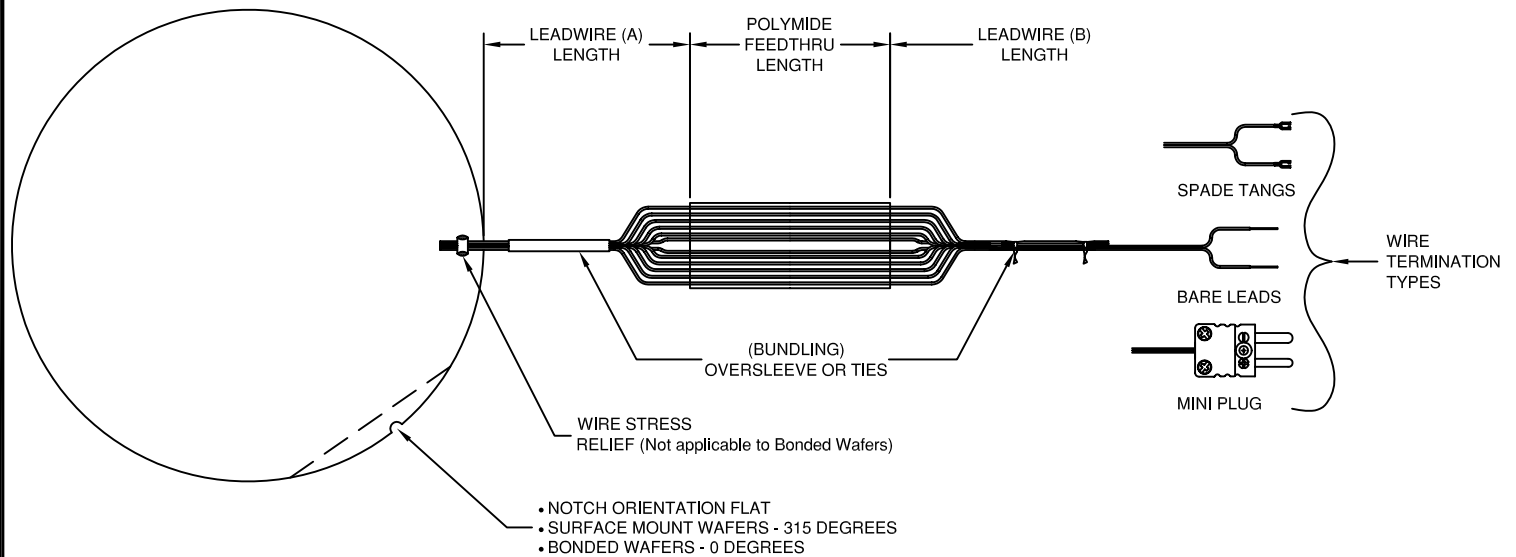
## SECTION SEMI

### TC-700D HEAVY DUTY

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## WAFER TEMPERATURE SENSORS



Please see page SEMI-090 for ordering information.

### TC-1200 - High Temperature / High Purity - Temperature Range (-40°C to 1200°C)

The TC-1200 takes advantage of a very unique attachment method to allow for extremely high temperature operation. This method does not employ the use of bonding agent. Instead, the silicon is laser welded to hold the sensor in place.

Not only does this allow for high temperature operation, but it also creates one of the "cleanest" designs available. By eliminating the bonding agents there is no possibility of "out gassing" or other undesirable conditions.

This design finds application where knowing and controlling the temperature at the surface of a silicon wafer is critical. Most manufacturers embed their sensors within the wafer's core. This product focuses its measurement at the wafer's surface where the most vital processes occur. In using this product you can expect faster and more accurate response times resulting from the most accurate placement of the sensing elements.

While these products are typically used throughout the semiconductor industry, this technology can also be used to measure the temperature uniformity of any other two dimensional surface.

The TC-1200 wafer products employ Thermocouple technology to produce the most accurate and reliable readings.

### Recommended Sensors:

**Type K Thermocouple (Chromel/Alumel)** - The Type K thermocouple offers the best balance of range, accuracy, and reliability.

**Type N Thermocouple (Nicrosil/Nisil)** - Less popular than Type K, but slightly more resistant to high temperature oxidation and corrosion.

**Type R Thermocouple (Platinum/Rhodlum)** - Recommended for high temperature applications. This sensor offers the highest possible accuracy and uniformity. (Note: cannot be used in oxygen reducing atmospheres. Also available in type S or B.)



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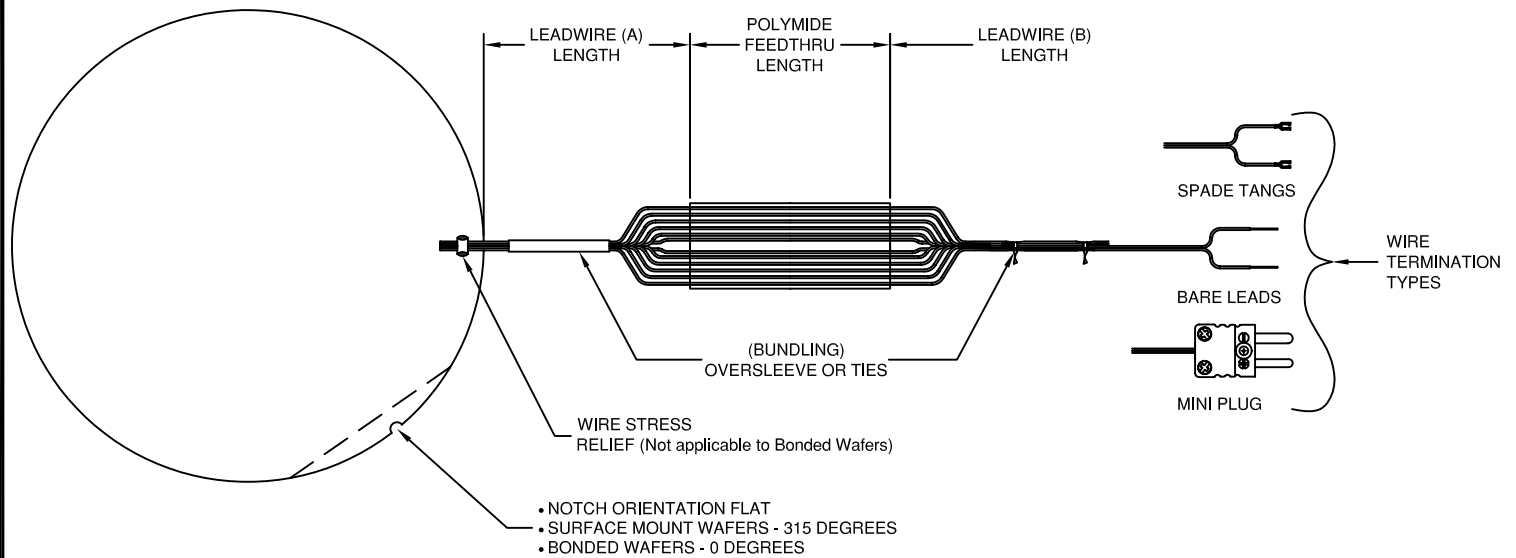
### TC-1200

### HIGH TEMPERATURE/HIGH PURITY

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## WAFER TEMPERATURE SENSORS



Please see page SEMI-090 for ordering information.

### BTC700H - Low Profile / High Response - Instrumented Wafer Pair - Max Temp 700 C

The BTC-700H offers a low profile and exact vertical alignment of a mated wafer pair to assure quick and accurate response. This product will respond to the static and dynamic temperature changes occurring in typical wafer bonding processes.

The BTC700 finds application in wafer bonding equipment where knowing and controlling temperature uniformity across mating silicon wafer surfaces is required. MEMS, MOEMS, silicon-on-insulator (SOI), wafer level packaging, and 3 dimensional chip stacking are the main technical categories where wafer bonding is employed.

Bonded Wafers can be fabricated from any wafer diameter so that a specific bonding process can be followed as close as technically possible. As a user of this product, you can expect rapid, accurate, and reliable response to temperature changes that occur during the wafer bonding processes.

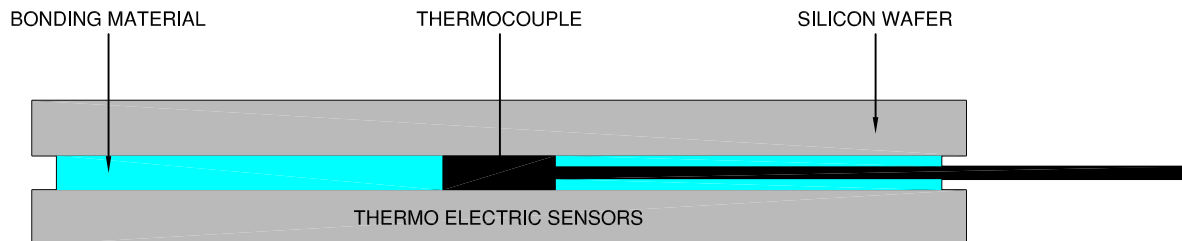
**Type K Thermocouple (Chromel/Alumel)** - The most popular sensor for use in this design. The Type K thermocouple offers the best balance of range, accuracy, and reliability.

### Specifications:

Standard Gap:	0.150mm
Planarity:	+/- 1% Standard Gap

### Pair Thickness:

100mm	1.050mm +/- 0.050
125mm	1.250mm +/- 0.050
150mm	1.350mm +/- 0.050
200mm	1.450mm +/- 0.050
300mm	1.550mm +/- 0.050



Cross section of the bonded instrumented wafer pair



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### SECTION SEMI

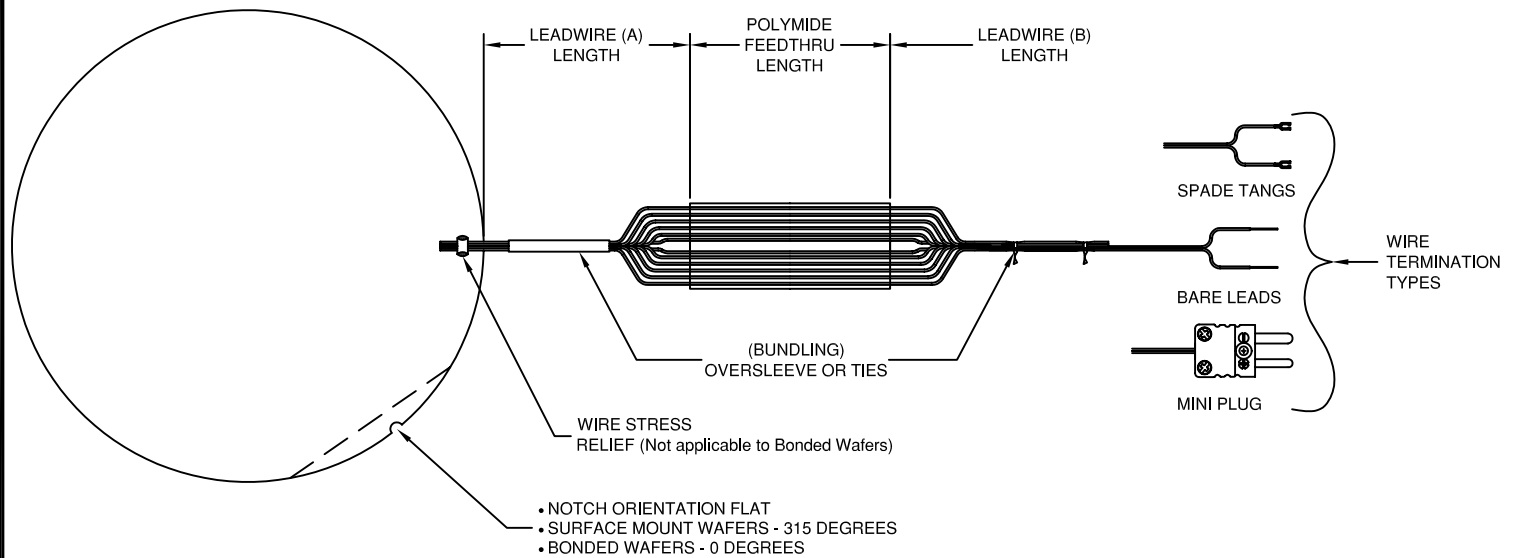
### BTC700H LOW PROFILE/HIGH RESPONSE

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## WAFER TEMPERATURE SENSORS



Please see page SEMI-090 for ordering information.

### BTC700D - High Durability - Instrumented Wafer Pair - Max Temp 700 C

The BTC-700D uses the most rugged components possible to increase the lifespan of these fragile products. This assembly will respond to the static and dynamic temperature changes occurring in typical wafer bonding processes.

The BTC700 finds application in wafer bonding equipment where knowing and controlling temperature uniformity across mating silicon wafer surfaces is required. MEMS, MOEMS, silicon-on-insulator (SOI), wafer level packaging, and 3 dimensional chip stacking are the main technical categories where wafer bonding is employed.

Bonded Wafers can be fabricated from any wafer diameter so that a specific bonding process can be followed as close as technically possible. As a user of this product, you can expect rapid, accurate, and reliable response to temperature changes that occur during the wafer bonding processes.

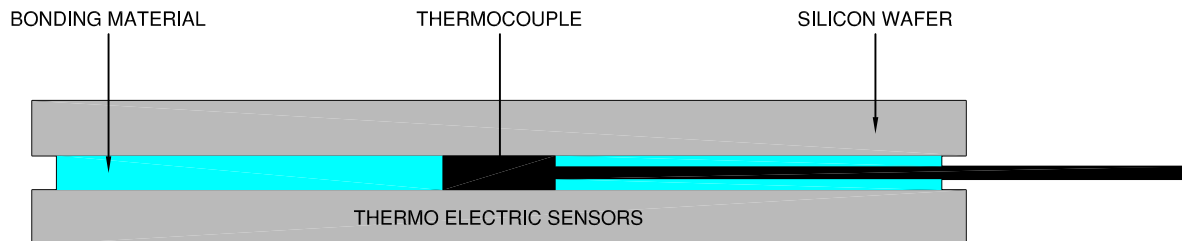
**Type K Thermocouple (Chromel/Alumel)** - The most popular sensor for use in this design. The Type K thermocouple offers the best balance of range, accuracy, and reliability.

### Specifications:

Standard Gap:	0.300mm
Planarity:	+/- 1% Standard Gap

### Pair Thickness:

100mm	2.85mm +/- 0.075
125mm	3.05mm +/- 0.075
150mm	3.15mm +/- 0.075
200mm	3.25mm +/- 0.075
300mm	3.35mm +/- 0.075



Cross section of the bonded instrumented wafer pair



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### SECTION SEMI

### BTC700D HIGH DURABILITY

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## WAFER TEMPERATURE SENSORS

### Type K Thermocouple Specification Detail:

Accuracy:	+/- 0.4% or 1.1°C Whichever is Greater
Sensor to Sensor Uniformity:	+/- 0.1°C
Operational Range:	-270 - 1372°C
Wire Diameter:	0.254mm, 0.127mm
Sensor Size:	6mm, 3mm

### Type T Thermocouple Specification Detail:

Accuracy:	+/- 0.4% or 0.5°C Whichever is Greater
Sensor to Sensor Uniformity:	+/- 0.1°C
Operational Range:	-270 - 400°C
Wire Diameter:	0.254mm, 0.127mm
Sensor Size:	6mm, 3mm

### Type N Thermocouple Specification Detail:

Accuracy:	+/- 0.4% or 1.1°C Whichever is Greater
Sensor to Sensor Uniformity:	+/- 0.1°C
Operational Range:	-270 - 1300°C
Wire Diameter:	0.254mm, 0.127mm
Sensor Size:	6mm, 3mm

### Type E Thermocouple Specification Detail:

Accuracy:	+/- 0.4% or 1.1°C Whichever is Greater
Sensor to Sensor Uniformity:	+/- 0.1°C
Operational Range:	-270 - 1000°C
Wire Diameter:	0.254mm, 0.127mm
Sensor Size:	6mm, 3mm

### Type J Thermocouple Specification Detail:

Accuracy:	+/- 0.4% or 1.1°C Whichever is Greater
Sensor to Sensor Uniformity:	+/- 0.1°C
Operational Range:	-270 - 1200°C
Wire Diameter:	0.254mm, 0.127mm
Sensor Size:	6mm, 3mm

### Type R Thermocouple Specification Detail:

Accuracy:	+/- 0.1% or 0.6°C Whichever is Greater
Sensor to Sensor Uniformity:	+/- 0.1°C
Operational Range:	-50 - 1768°C
Wire Diameter:	0.254mm, 0.127mm
Sensor Size:	6mm, 3mm

### Type S Thermocouple Specification Detail:

Accuracy:	+/- 0.1% or 0.6°C Whichever is Greater
Sensor to Sensor Uniformity:	+/- 0.1°C
Operational Range:	-50 - 1768°C
Wire Diameter:	0.254mm, 0.127mm
Sensor Size:	6mm, 3mm



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SECTION SEMI

SPECIFICATION DETAILS

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# WAFER TEMPERATURE SENSORS

## CONFIGURATION CODE

S	100	8	1	K	36	S	100	4	T	300	M	MP	A
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CODE	INTERNAL CODE
	LEAVE BLANK IF UNKNOWN

CODE	WIRE TERMINATION
MP	MINI PLUG
BW	BARE WIRE
CM	CERAMIC MINI PLUG
DP	D-PIN

CODE	CONNECTOR
M	MALE
F	FEMALE

CODE	LEAD LENGTH "B"
	SPECIFY IN mm

CODE	"B" LEADWIRE SLEEVING MATERIAL
T	TEFLON
S	SILICA
P	POLYIMIDE
C	BRAIDED CERAMIC
Q	QUARTZ

CODE	VACUUM FEED THROUGH LENGTH
2	2 INCHES
4	4 INCHES
6	6 INCHES
8	8 INCHES
10	10 INCHES
12	12 INCHES
18	18 INCHES

CODE	LEAD LENGTH "A"
	SPECIFY IN mm

CODE	"A" LEADWIRE SLEEVING MATERIAL
T	TEFLON
S	SILICA
P	POLYIMIDE
C	BRAIDED CERAMIC
Q	QUARTZ

CODE	WIRE GAUGE
	(ALWAYS 36 Awg UNLESS SPECIFIED OTHERWISE)

CODE	CALIBRATION
J	IRON(+) vs CONSTANTAN(-)
K	CHROMEL(+) vs ALUMEL(-)
T	COPPER(+) vs CONSTANTAN(-)
E	CHROMEL(+) vs CONSTANTAN(-)
N	NICROSIL(+) vs NISIL(-)
R	PLATINUM 13% RHODIUM(+) vs PLATINUM(-)
S	PLATINUM 10% RHODIUM(+) vs PLATINUM(-)
B	PLATINUM 30% RHODIUM(+) vs PLATINUM 6% RHODIUM(-)

CODE	QUANTITY of THERMOCOUPLES
	(TOTAL)

CODE	PRODUCT TEMPERATURE CODE
4	400° C
8	800° C
12	1200° C

CODE	WAFER SIZE
	(IN mm)

CODE	PRODUCT CODE
B	BONDED
S	SURFACE MOUNT



## INTRODUCTION

# THERMO ELECTRIC COMPANY INC.

**CORPORATE OFFICES**  
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**Fax: 905-451-4606**  
**E-Mail: [tecasales@te-direct.com](mailto:tecasales@te-direct.com)**



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**E-Mail: [sales@thermo-electric.be](mailto:sales@thermo-electric.be)**

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SECTION INTR

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