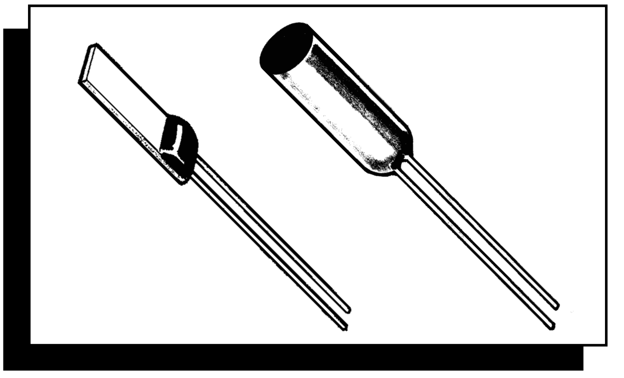
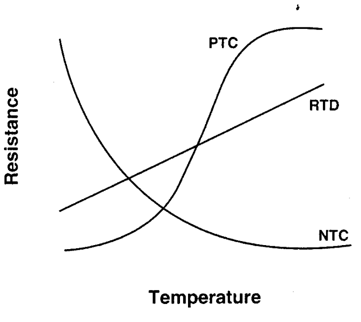
MEGGITT SENSORS

HUMIDITY, POSITION
TEMPERATURE
LIQUID LEVEL
SURFACE MOUNT DEVICES
WIRE LEADS, PC PINS

Thin Film Platinum Precision Temperature Sensor

TYPE SA/SB/SC/SD SERIES





This High Precision Thin Film Platinum Resistance Temperature Detector (Pt-RTD) consists of a thin film deposited Pt plus a less expensive metal wire (e.g.. Pd). This sensing element has a dramatic cost advantage against conventional Pt Sensors yet giving the same performance. The Pt-RTD Sensors can withstand temperatures ranging from -250°C to 800°C while normal operating temperature is between -50°C to 650°C, depending upon the customer's application. Meggitt, a thin film specialist, has extensively provided Pt-RTD with various resistance values (100, 500 and 1000 ohms @ 0°C) and TCR's (3750, 3850ppm/°C).

MEGGITT SENSORS KEY FEATURES

- **NEAR LINEAR RELATIONSHIP (TEMP. & RESISTANCE**
- **EXTREMELY STABLE UP TO 800°C**
- **VERY PRECISE ACCURACY (±0.05% & ±0.15°C)**
- **MEETS IEC751 CLASS "A"**
- **EXCELLENT RELIABILITY**
- **PLATINUM ELEMENT**
- **SUITED TO TEMPERATURES -50°C TO +600°C**
- **MASS AIRFLOW SENSING POSSIBLE**

MEGGITT
ELECTRONIC
COMPONENTS

SALES ACTION DESK
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LOG No FO739 ISSUE 3 09-98

TYPE SA/SC SERIES

ELECTRICAL

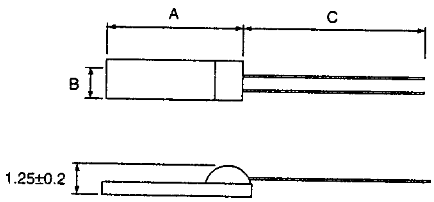
Type	-50°C ~ 500°C	-50°C ~ 600°C	Nominal Value at 0°C	T.C.R. ppm/°C	Tolerance at 0°C	Response Time 90% AIR 1m/sec.	Self Heating AIR 1m/sec.
0 (Glass Coated)	SA101	SC101	100R	3850	Class A ±0.06%	10 seconds	2.5mW/°C
	SA501	SC501	500R	3850	Class B ±0.12%	15 seconds	2.0mW/°C
	SA102	SC102	1K0	3850	Class C ±0.24%	15 seconds	2.0mW/°C
1 (Ceramic Tube)	SA101	SC101	100R	3850	Class A ±0.06%	15 seconds	5.0mW/°C
				3850	Class B ±0.12%		
				3850	Class C ±0.24%		

N.B. Tolerance class A (±0.06% at 0°C) cannot be offered in all packages - please enquire

DIMENSIONS

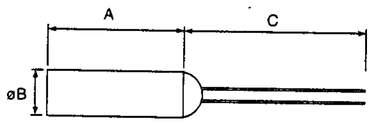
GLASS COATED

A±0.15	B±0.15	C±0.20	
2.40	1.70	10.0	Standard
3.00	2.00	10.0	Special



CERAMIC TUBE

A±1.0	B±0.20	C±0.20
6.00	3.00	8.00



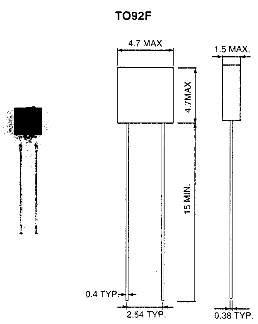
All Dimensions are nominal and in mm unless othrwise shown.Do Not Scale.

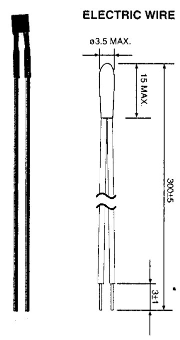
TYPE SB SERIES

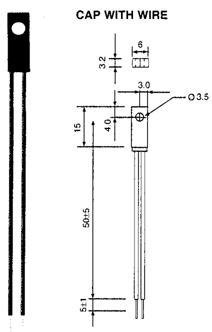
ELECTRICAL

Nominal Resistance at 0°C:		1000 ohms ±1.2 ohms
Temperature Coefficient of Resistance:		3850, 3750
Resistance Tolerance at 0°C -	Class B:	±0.12%
	Class C:	±0.24%
	Class D:	±0.48%
Maximum Applied Current:		1mA
Insulation Resistance:		>100 Meg ohms
Thermal Response Time (90%, Air, 1m/second) -	TO92F:	20 seconds maximum
	Electric Wire:	50 seconds maximum
	Cap with Wire	60 seconds maximum
Self-heating (Air, 1m/second) -	TO92F:	5mW/°C
	Electric Wire:	6mW/°C
	Cap with Wire	7mW/°C
Operating Temperature Range -	TO92F:	-50°C to +105°C
	Electric Wire:	-20°C to +105°C
	Cap with Wire	-20°C to +105°C

DIMENSIONS







TYPE SD SERIES

The SD series is a packaged probe specially designed for range/oven temperature control application. Meggitt Electronic Components can provide various probes upon customers' request with superior manufacturing and design capabilities. To assure quality and reliability of probes, 100% of the products undergo reliability test prior to delivery. Product quality is recognised by CSA (Certificate No: LR 102736-1), UL (File No: E 158992) and AGA (Report No: 135-Z2123). In addition the SD series probes are approved by worldwide leading manufacturers of ovens. Please contact us for more detailed information.

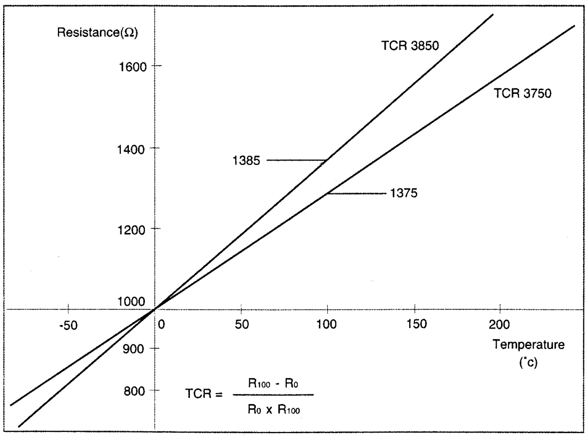
DIMENSIONS

The SD series is normally custom designed and can be offered with a variety of leads and packages to suit ever user requirement.

GENERAL CHARACTERISTICS OF S TYPE TEMPERATURE SENSORS

RESISTANCE/TEMPERATURE TABLES

Resistance at 0°C	100R	500R	1K0	1K0
Temperature Coefficient	3850	3850	3850	3750
Temperature (°C)	Resistance in Ohms			
-50	80.30	401.53	803.07	807.88
0	100.00	500.00	1000.00	1000.00
50	119.40	596.98	1193.95	1189.00
100	138.50	692.50	1385.00	1375.00
150	157.31	786.57	1573.15	1557.96
200	175.84	879.20	1758.40	1737.96
250	194.07	970.37	1940.40	1914.88
300	212.02	1060.09	2120.19	2088.89
350	229.67	1148.37	2296.73	2259.77
400	247.04	1235.19	2470.38	2427.78
450	264.11	1320.56	2641.12	2592.62
500	280.90	1404.48	2808.96	2754.63
550	297.30	1486.95	2973.90	2913.42
600	313.59	1567.97	3135.94	3069.32
650	329.51	1647.54	3295.08	3222.20



Complete Tables in 1°C or 1°F are available from our Technical Sales department

RESISTANCE CHARACTERISTICS

The principle of temperature measurement of Pt-RTD Sensor is based on the measurement of electrical resistance. The resistance of Pt-RTD sensors vary with temperature almost linear in a precisely predetermined relationship. The relationship between temperature and resistance can be expressed exactly by a mathematical equation by which the principle values of the Pt-RTD resistors can be calculated as:

$$R_T = R_O (1+aT-bT^2-cT^3(T-100)$$

where, R_T = Resistance at temperature T
R_O = Resistance at temperature 0°C
T = Ambient temperature (°C)
a,b,c = Temperature coefficient

For Resistance/Temperature Table see above

Pt-RTD TCR = 3750ppm/°C					Pt-RTD TCR = 3850ppm/°C			
Temperature	R_0()	a	b	c	R_0()	a	b	c
T<0°C	1000	$3.81x10^{-3}$	$6.019x10^{-7}$	$6.145x10^{-12}$	100, 500, 1000	$3.90802x10^{-3}$	$5.80195x10^{-7}$	$4.2735x10^{-12}$
T 0°C	1000	$3.81x10^{-3}$	$6.019x10^{-7}$	0.000	100, 500, 1000	$3.90802x10^{-3}$	$5.80195x10^{-7}$	0.000

TEMPERATURE COEFFICIENT OF RESISTANCE

TCR is a characteristic of resistance varying with temperature. It indicates the medium relative resistance change according to temperature change. The average resistance change per degree can be expressed as following:

$$TCR = \frac{R_{100} - R_0}{R_0 \times 100} \ (1/°C)$$

where, R_0 = resistance at 0°C
R_{100} = resistance at 100°C

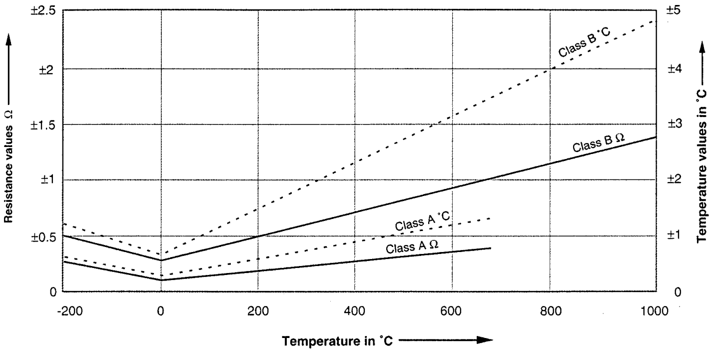
We offer both TCR = 3850 ppm/°C and 3750 ppm/°C for DIN 43760 and IEC 750 standards.

GENERAL CHARACTERISTICS OF S TYPE TEMPERATURE SENSORS

DEVIATION OF TEMPERATURE & RESISTANCE

Pt-RTD Sensor can be categorised as class A, B and C based on resistance tolerance. The limit deviation of Pt-RTD Sensor is accordingly determined by temperature and resistance tolerance shown in the following Table and Figure (in accordance with DIN 43760 and IEC750).

Class	Resistance Tolerance	Limit Deviation (°C)
A	±0.06%	±(0.15+0.002ITI)
B	±0.12%	±(0.30+0.005ITI)
C	±0.24%	±(0.60+0.007ITI)



Limit values and deviations for measuring resistors
(TCR = 3850 ppm/°C)

T (°C)	Principle Value Pt-100 (ohm)	Limit Deviations Pt-100 Class A Ohm	Class A °C	ClassB Ohm	ClassB °C
-50	80.31	±0.10	±0.25	±0.22	±0.60
0	100.00	±0.06	±0.15	±0.12	±0.20
100	138.50	±0.13	±0.35	±0.30	±0.80
200	175.84	±0.20	±0.55	±0.48	±1.30
300	212.02	±0.27	±0.75	±0.64	±1.80
400	247.04	±0.33	±0.95	±0.79	±2.30
500	280.90	±0.38	±1.15	±0.93	±2.80
600	313.59	±0.43	±1.35	±1.06	±3.30

SELF-HEATING EFFECT

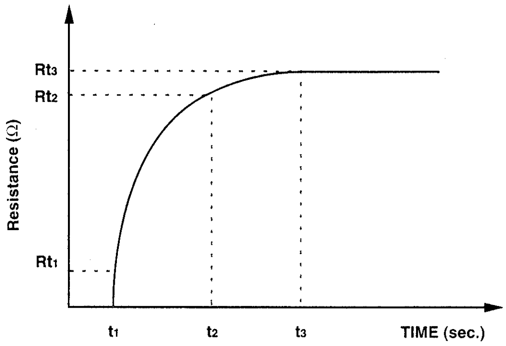
Heat energy is generated when an electric current (1) is applied through the Pt-RTD resistor. This effect might result in errors of temperature measurement. The effect can be minimised by keeping the test current as low as possible (~1mA).
Self-heating effect is expressed as milliwatts per Centigrade as following:

$$mW/°C = \frac{S(P_2-P_1)}{R_2-R_1}$$

where, R_1 = resistance at the lower power dissipation
R_2 = resistance at the higher power dissipation
S = thermometer Sensitivity (dR/dT), at the respective temperature, /°C
P_1 = lower power dissipation, mW
P_2 = higher power dissipation, mW

THERMAL RESPONSE TIME

The thermal response time (t_{90}) if the time Pt Sensors required to respond to 90% the change of temperature. The response time is the time period, t_2-t_1, based against the following formula:



HOW TO ORDER

SC	102	6	0
COMMON PART	**RESISTANCE VALUE**	**TCR/TOLERANCE**	**PACKAGING**
SA - -50° to +500°C SC - -50° to +600°C SB - See Relevant Table SD - Probe Assembly	The first digits are significant figures of resistance value and the third one denotes the number of zeros following Example 1K0 : 102 10K : 103 100K : 104	6 : 3850/A 7 : 3750/A 0 : 3850/B 3 : 3750/B 1 : 3850/C 4 : 3750/C 2 : 3850/D 5 : 3750/D	0 - Glass Coated 1 - Ceramic Tube 2 - TO92F 3 - Electric Wire

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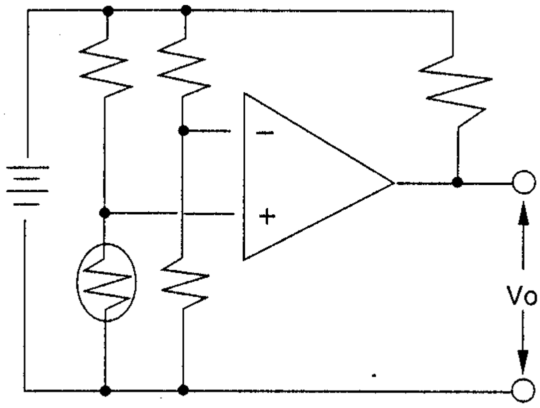
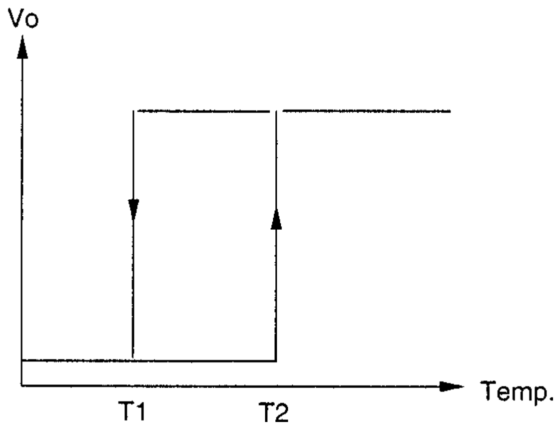
OVER TEMPERATURE PROTECTION SIGNAL CIRCUITS

The deviation across input and output of an electronic circuit results from the tolerance of its components. To eliminate such deviation, a full series of Over-Temperature Protection (OTP) signal circuits exists. The OTP signal circuits are produced with hybrid technology that eliminates the component deviation to meet high precision requirement.
There are two basic circuits for OTP application.

(1) Fixed Temperature Enabled Circuit

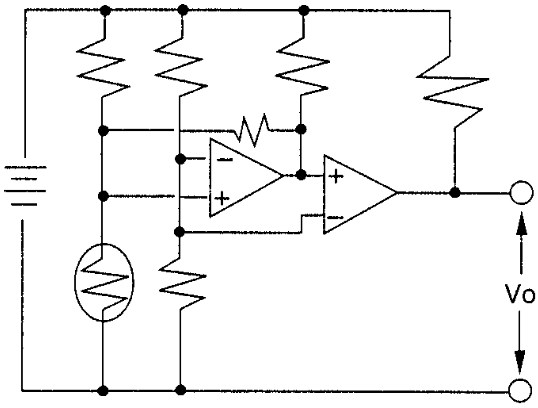
The Fixed Temperature Enabled Circuit is shown here. This integrates a precise voltage dividing resistor network, Pt-RTD and competitor. The output is open-collector type for more flexible application.

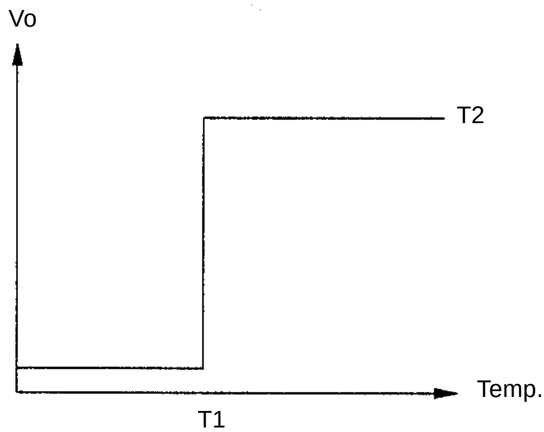




(2) Fixed Temperature Enabled/Low-Temperature Disabled Circuit

The following figure shows the Fixed-Temperature Enabled/Low-Temperature Disabled Circuit. This circuit is basically the Fixed-Temperature Enabled Circuit with a positive feedback resistor whose resistance is taken into account in the circuit calculation. Therefore, the output voltage is enabled at temperature T2 but will not be disabled until temperature drops to T1.
Although named a "OTP Circuits", the above two circuits can be used not only in over-temperature protection but also in other applications depending on the products the customer requirements.





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