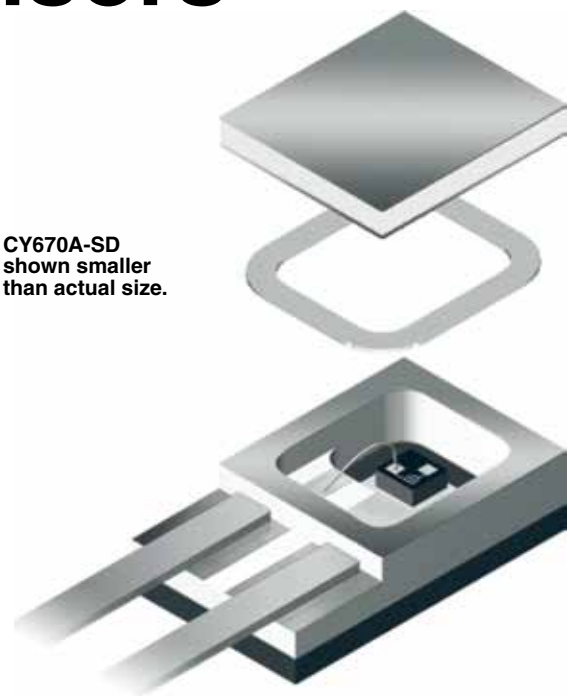
Cryogenic Temperature Sensors
Silicon Diodes

CY670 Series



CY670A-SD shown smaller than actual size.

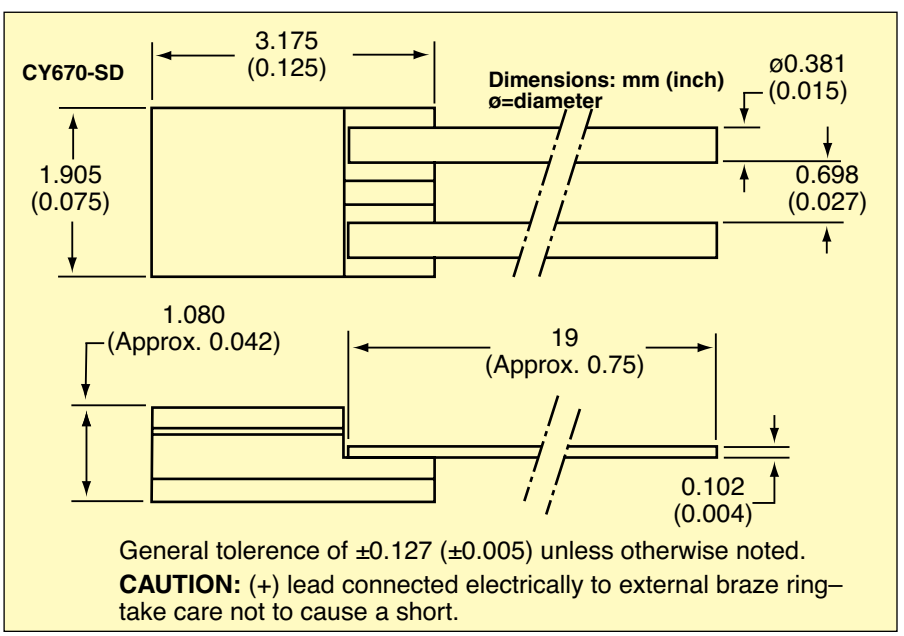
- **Best Accuracy Across the Widest Useful Temperature Range, 1.4 to 500 K**
- **Tightest Tolerances for Applications from 30 to 500 K**
- **Rugged, Reliable SD Package (Designed to Withstand Repeated Thermal Cycling and Minimize Sensor Self-Heating)**
- **Conformance to Standard Curve CY670 (Temperature Response Curve Variety of Packaging Options)**
- **Bare Die Sensors with the Smallest Size and Fastest Thermal Response Time**
- **Non-Magnetic Sensor**

The CY670 Series silicon diodes offer a more accurate reading of temperature ranges compared to previously marketed silicone diodes. Conforming to the curve CY670 standard voltage vs. temperature response curve, sensors within the CY670 Series are interchangeable, and for many applications they do not require individual calibration. CY670 Series sensors in the SD package are available in 5 tolerance bands—3 for general cryogenic use across the 1.4 to 500 K temperature range, and 1 that offers superior accuracy for applications from 30 K to room temperature. The CY670 Series sensors also come in a tolerance band (E), which is available only as a bare die. For applications requiring greater accuracy, CY670-SD diodes are available with calibration across the full 1.4 to 500 K temperature range.

The CY670E bare die sensor provides the smallest physical size and fastest thermal response time of any silicon diode on the market today. This is an important advantage for applications where size and thermal response time are critical, including focal plane arrays and high temperature superconducting filters for cellular communication.

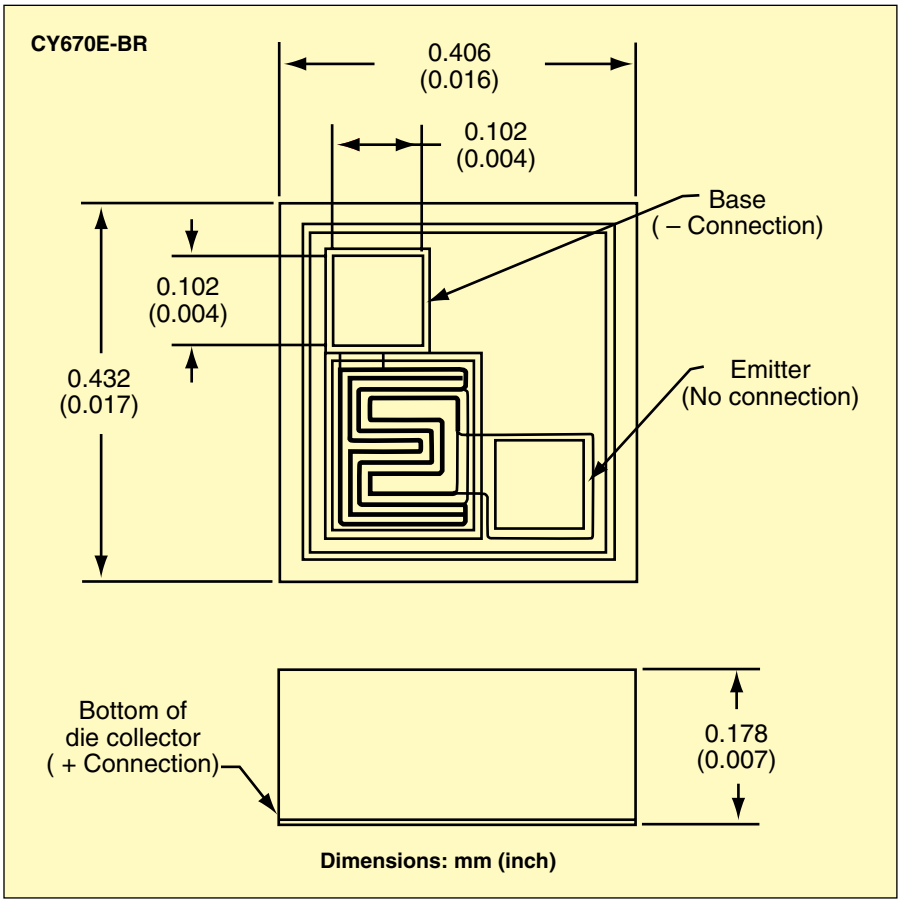
Specifications

Standard Curve: Curve CY670, see chart next page
Recommended Excitation: 10 µA, ±0.1%
Max Reverse Voltage: 60V
Max Current Before Damage: 1 mA, continuous or 100 mA, pulsed
Dissipation at Recommended Excitation: 16 µW @ 4.2 K; 10 µW @ 77 K; 5 µW @ 300 K



General tolerence of ±0.127 (±0.005) unless otherwise noted.

CAUTION: (+) lead connected electrically to external braze ring–take care not to cause a short.



Thermal Response Time:
SD Model: Typical <10 ms @ 4.2 K, 100 ms @ 77 K, 200 ms @ 305 K
BR Model: 1 ms @ 4.2 K, 13 ms @ 77 K, 20 ms @ 305 K
Use in Radiation: Recommended for use only in low level radiation
Use in Magnetic Field: Not recommended for use in magnetic field applications below 60 K; low magnetic field dependence when used in fields up to 5 tesla above 60 K
Reproducibility(*): ±10 mK @ 4.2 K
(*) *Short-term reproducibility data is obtained by subjecting sensor to repeated thermal shocks from 305 to 4.2 K.*

Range of Use	Limit Min	Limit Max
CY670-SD	1.4 K	500 K
CY670E-BR	1.4 K	500 K

Calibrated Accuracy

Temperature	Typical Accuracy	Long Term Accuracy (*)
1.4 K	±12 mK	—
4.2 K	±12 mK	10 mK
10 K	±12 mK	—
77 K	±22 mK	40 mK
300 K	±32 mK	25 mK
500 K	±50 mK	—

(*) *Long term stability data is obtained by subjecting sensor to 200 thermal shocks from 305 to 77 K.*

Temperature Response Data Table (Typical for CY670)

Temperature	Volts	dV/dT (mV/K)
1.4 K	1.64	-12.5
4.2 K	1.58	- 31.6
10 K	1.38	-26.8
77 K	1.03	-1.73
305 K	0.560	-2.30

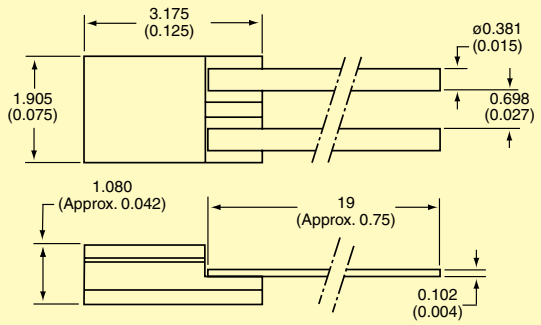
Tolerance Bands for the CY670 Series Diode Thermometer

Band	Temperature Tolerance at Temperature Range			
	2 to 30 K	30 to 100 K	100 to 305 K	305 to 500 K
A (1)	±0.25 K	±0.25 K	±0.50 K	±0.50 K
B (2)	±0.50 K	±0.50 K	±0.50 K	±0.33% of T (1.01 to 1.65 K)
C (3)	±1.0 K	±1.0 K	±1.0 K	±0.5% of T (1.53 to 2.50 K)
D (4) (PRT Band)	±1.5 K	±0.25 K	±0.30 K	±0.1% of T (0.305 to 0.500 K)
E (Bare Chip Band)	±1.0 K	±0.25 K	±0.25% of T (0.25 to 0.76 K)	±0.25% of T (0.76 to 1.25 K)

CY670-SD

Accuracy Band Availability				
1	2	3	4	—

Dimensions: mm (in)



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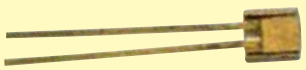
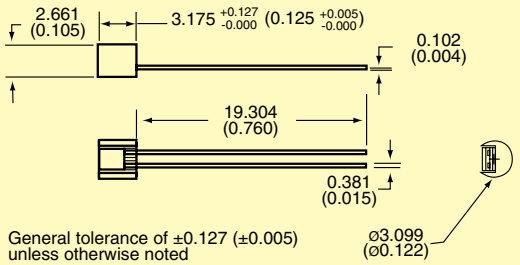
CY670-LR



Accuracy Band Availability				
1	2	3	4	—

Dimensions: mm (in)

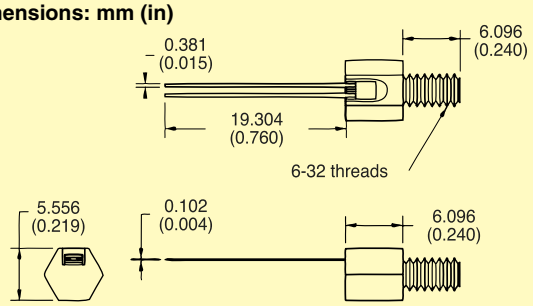


General tolerance of ±0.127 (±0.005) unless otherwise noted

CY670-ET

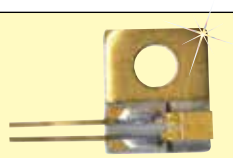
Accuracy Band Availability				
1	2	3	4	—

Dimensions: mm (in)



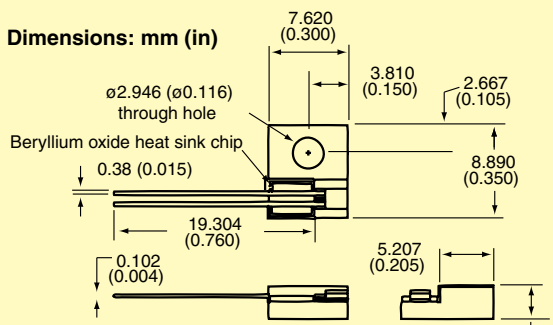
General tolerance of ±0.127 (±0.005) unless otherwise noted

CY670-BO



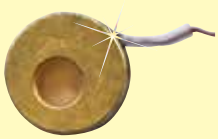
Accuracy Band Availability				
1	2	3	4	—

Dimensions: mm (in)



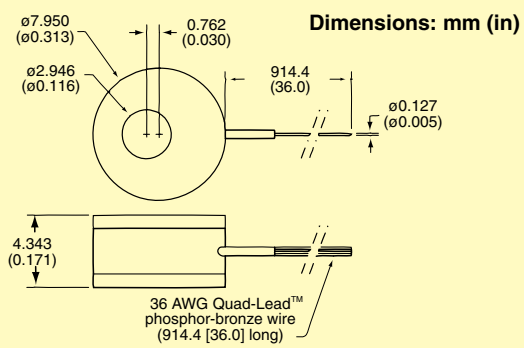
General tolerance of ±0.127 (±0.005) unless otherwise noted

CY670-CU *4-leads*



Accuracy Band Availability				
1	2	3	4	—

Dimensions: mm (in)

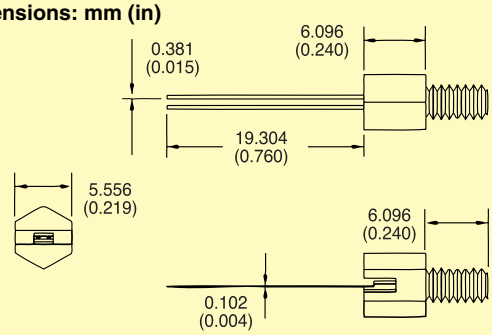


General tolerance of ±0.127 (±0.005) unless otherwise noted

CY670-MT

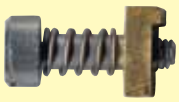
Accuracy Band Availability				
1	2	3	4	—

Dimensions: mm (in)



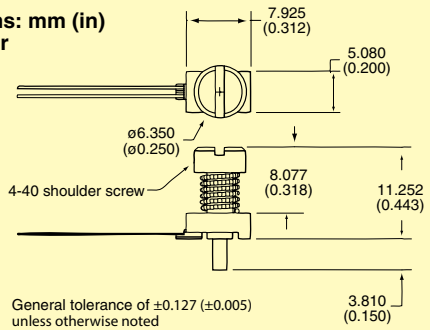
General tolerance of ±0.127 (±0.005) unless otherwise noted

CY670-CO



Accuracy Band Availability				
1	2	3	4	—

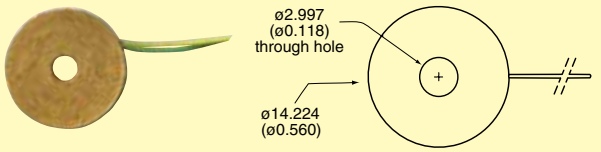
Dimensions: mm (in)
ø=diameter



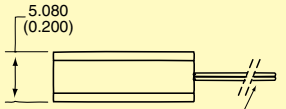
General tolerance of ±0.127 (±0.005)
unless otherwise noted

CY670-CY

Accuracy Band Availability				
—	2	3	4	—



Dimensions: mm (in)
ø=diameter



2-30 AWG PFA coated stranded copper wire
(914.4 [36] long)

General tolerance of ±0.127 (±0.005) unless otherwise noted

To Order

Model No.	Description
CY670A-SD	Cryogenic sensor, flat sensor, band A
CY670B-SD	Cryogenic sensor, flat sensor, band B
CY670C-SD	Cryogenic sensor, flat sensor, band C
CY670D-SD	Cryogenic sensor, flat sensor, band D
CY670A-CU	Cryogenic sensor, small copper bobbin, band A
CY670B-CU	Cryogenic sensor, small copper bobbin, band B
CY670C-CU	Cryogenic sensor, small copper bobbin, band C
CY670D-CU	Cryogenic sensor, small copper bobbin, band D
CY670A-CO	Cryogenic sensor, clamp style, band A
CY670B-CO	Cryogenic sensor, clamp style, band B
CY670C-CO	Cryogenic sensor, clamp style, band C
CY670D-CO	Cryogenic sensor, clamp style, band D
CY670A-LR	Cryogenic sensor, half rounded cylinder, band A
CY670B-LR	Cryogenic sensor, half rounded cylinder, band B
CY670C-LR	Cryogenic sensor, half rounded cylinder, band C
CY670D-LR	Cryogenic sensor, half rounded cylinder, band D
CY670A-CY	Cryogenic sensor, large copper bobbin, band A
CY670B-CY	Cryogenic sensor, large copper bobbin, band B
CY670C-CY	Cryogenic sensor, large copper bobbin, band C
CY670D-CY	Cryogenic sensor, large copper bobbin, band D
CY670A-ET	Cryogenic sensor, screw in, band A
CY670B-ET	Cryogenic sensor, screw in, band B
CY670C-ET	Cryogenic sensor, screw in, band C
CY670D-ET	Cryogenic sensor, screw in, band D
CY670A-MT	Cryogenic sensor, metric screw in, band A
CY670B-MT	Cryogenic sensor, metric screw in, band B
CY670C-MT	Cryogenic sensor, metric screw in, band C
CY670D-MT	Cryogenic sensor, metric screw in, band D
CY670A-BO	Beryllium oxide heat sink block, band A
CY670B-BO	Beryllium oxide heat sink block, band B
CY670C-BO	Beryllium oxide heat sink block, band C
CY670D-BO	Beryllium oxide heat sink block, band D
CYC670E-BR-10	Cryogenic sensor, bare ship, package of 10

Ordering Examples: CY670A-SD, *cryogenic sensor.*
CY670B-CU, *cyrogenic sensor, small copper bobbin, band B.*