Cadmium-Sulfide and Cadmium-Sulfo-Selenide Broad-Area Types

Photoconductive cells are also known as light dependent resistors or photoresistors

RCA polycrystalline cadmium-sulfide and cadmium-sulfo-selenide photoconductive cells are designed for use in a variety of light-operated control applications. Maximum response for the cadmium-sulfide photocell types occurs at approximately 5100 angstroms and for the cadmium sulfo-selenide photocells at approximately 6150 angstroms. Typical spectral response characteristics are shown in *Fig.1*.

The 5100-angstrom cadmium-sulfide cells are intended for general purpose use while the 6150-angstrom cadmium-sulfo-selenide cells are designed for applications where faster time response characteristics are required. The 6150-angstrom photocells are about three times faster than their 5100-angstrom counterparts.

TYPICAL SPECTRAL RESPONSE CHARACTERISTICS

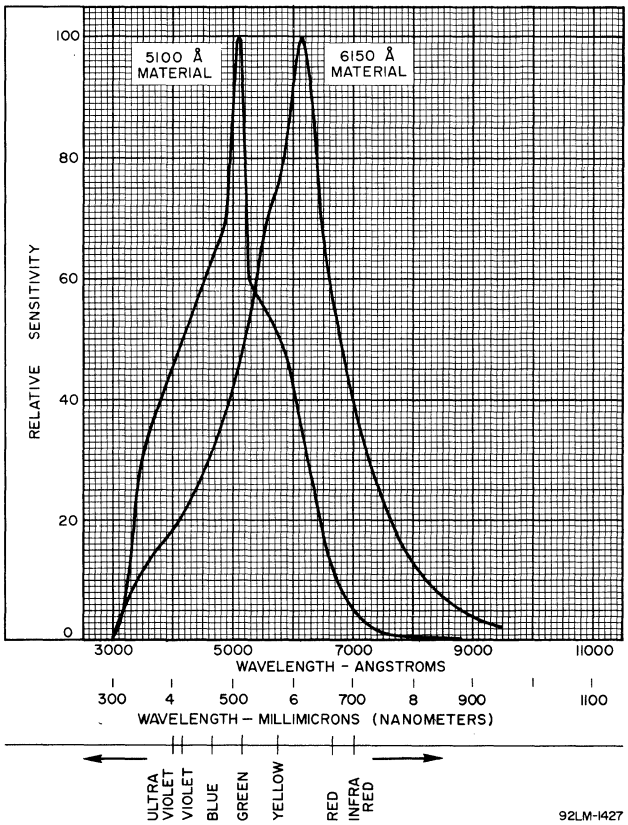

Fig. 1

RCA photoconductive cells are available in three basic package designs; glass-metal, all-glass, and flat plastic-coated designs. The glass-metal and all-glass types are hermetically sealed and may be subjected continuously to environmental conditions of high humidity and high temperature. The plastic-coated types, on the other hand, are designed for applications where prolonged exposure to extremes in humidity are not encountered.

Typical Photocurrent Rise Characteristics for both types of cells are shown in *Fig.2*. These curves show the time in milliseconds required for the photocurrent to rise to 63.5 per cent of its steady-state value as a function of incident illumination levels. The solid curves show rise times after the cell has been stored in the dark, with voltage applied across the cell terminals, for a period of 5 seconds prior to application of illumination. The dashed curves are taken under similar conditions except the cells are stored in the dark for 5 minutes prior to application of illumination. The sensitive surface of the cell is fully illuminated.

TYPICAL PHOTOCURRENT RISE CHARACTERISTICS

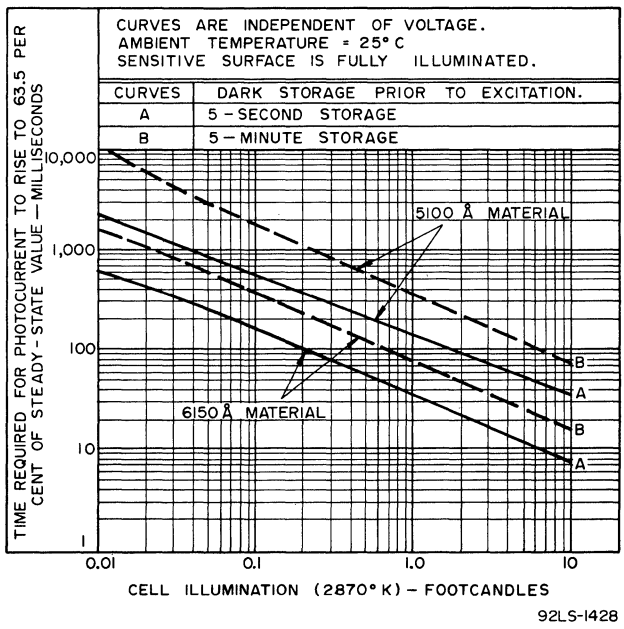

Fig. 2

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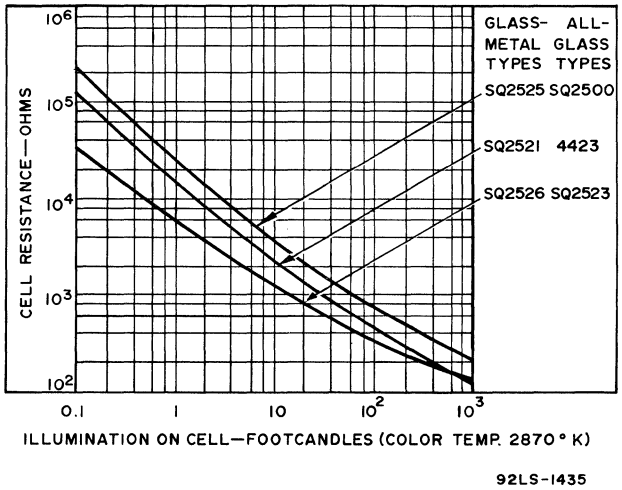
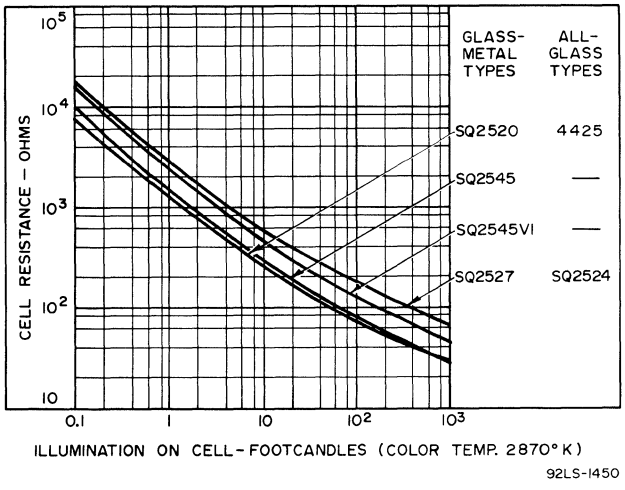
CSS-801A 6/66
Reprinted from CSS-801A 4/66

1/2"-DIAMETER BROAD-AREA TYPES





1/2"-DIAMETER BROAD-AREA TYPES

RCA TYPES			MAXIMUM RATINGS			CHARACTERISTICS AT 25° C				
Glass-Metal Types[a]	All-Glass Types[a]	Wavelength of Peak Response	Voltage Between Terminals DC or Peak AC	Power Dissipation[b]	Photocurrent	Voltage Between Terminals	Illumination[c]	Photocurrent[d] mA		Max. Decay Current[e]
								Min.	Max.	
		angstroms	volts	watt	mA	volts	foot-candles			μA
SQ2525	SQ2500	5100	250	0.2	20	12 (dc)	1	0.24	0.8	6
SQ2521	4423	5100	250	0.2	20	50 (ac)	1[f]	1.5[g]	4[g]	40
SQ2526	SQ2523	5100	110	0.2	50	12 (dc)	1	1	3	80
SQ2527	SQ2524	5100	110	0.2	50	12 (dc)	1	2	6	80
SQ2520	4425	5100	110	0.2	50	12 (dc)	1	3.6	14.5	80
SQ2545	–	6150	75	0.2	50	12 (dc)	1	4	12	15
SQ2545V1	–	6150	110	0.2	50	12 (dc)	1	2.5	7.5	7.5

[a] The maximum ambient operating temperature range for these cells is −40° C to +60° C.

[b] In continuous service with sensitive surface of cell fully illuminated. The power dissipation rating applies up to the maximum rated ambient operating temperature.

[c] For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K.

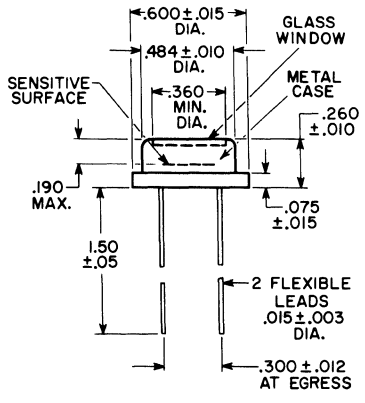
[d] This characteristic is determined after the cell has been exposed for a period of 16 to 24 hours to 50 to 100 footcandle illumination (white fluorescent light).

[e] Measured 10 seconds after removal of incident-illumination level.

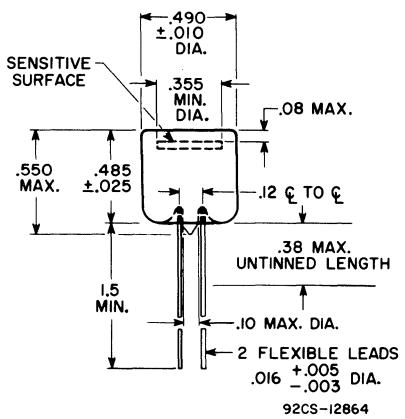
[f] For conditions where light flux from a tungsten-filament lamp operated at a color temperature of 2870° K is transmitted through a filter (Corning C.S. No.1-62 which has an effective transmission of luminous flux of 13.3%) onto the sensitive surface. The value of illumination incident on the sensitive surface is 7.5 footcandles measured before positioning the filter between the lamp and the cell. The sensitive surface of the cell is fully illuminated.

[g] This characteristic is determined after the cell has been exposed for a period of 16 to 24 hours to 500 footcandle illumination (white fluorescent light).

GLASS-METAL TYPES MODIFIED TO-8 CASE



ALL-GLASS TYPES



DIMENSIONS IN INCHES

Typical Photocurrent Decay Characteristics for both types of cells are shown in *Fig.3*. These curves show the time in milliseconds for photocurrent to decrease to 36.5 per cent of its initial steady-state value after illumination is removed. The sensitive surface of the cell is fully illuminated prior to removal of excitation.

TYPICAL PHOTOCURRENT DECAY CHARACTERISTICS

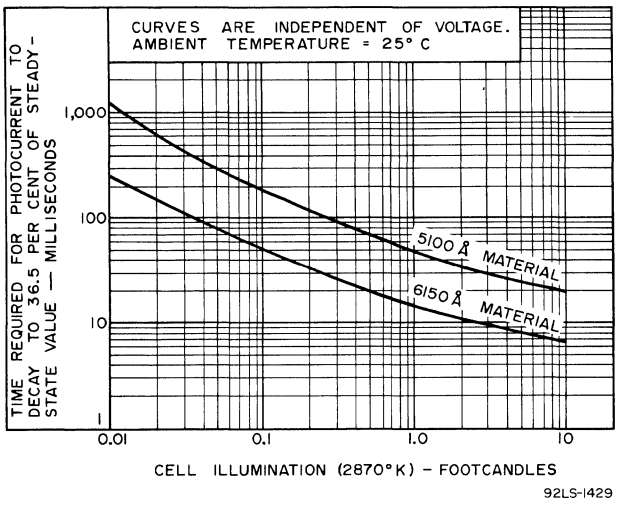


Fig. 3

Typical Photocell Response to Pulsed Light is shown in *Fig.4*. These curves indicate the number of light pulses per second for which a peak-to-valley ratio of 50 per cent will be obtained as a function of cell illumination. The "on-time" of the light pulses equals the "off-time".

TYPICAL RESPONSE CHARACTERISTICS TO PULSED LIGHT

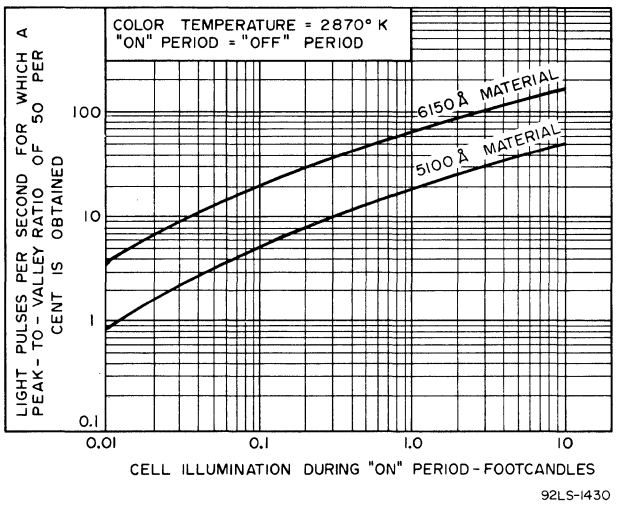


Fig. 4

The effect of *ambient temperature* on cell sensitivity is shown in *Fig.5* for 5100 Å material and in *Fig.6* for 6150 Å material.

The angle of view of the cell may be narrowed by use of a hood of the desired length placed in front of the sensitive surface.

TYPICAL TEMPERATURE CHARACTERISTICS
For 5100 Å Material

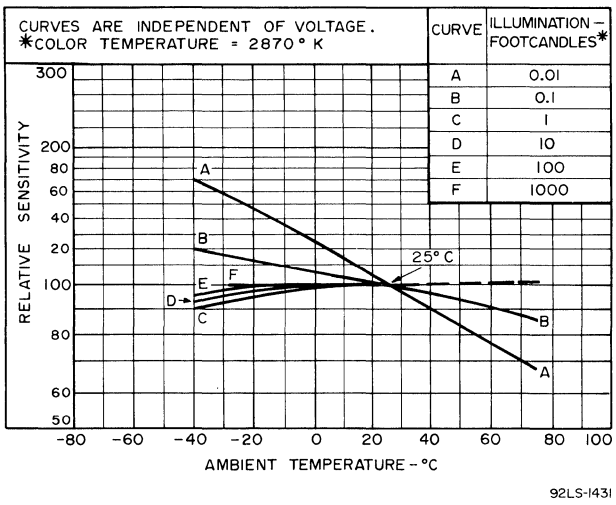


Fig. 5

If the source of radiation is some distance from the cell, the use of a light-collecting lens system may be desirable to utilize more effectively the available radiation. However, when such a system is used the radiation should not be focused onto such a small area that localized overheating of the sensitive surface may

TYPICAL TEMPERATURE CHARACTERISTICS
For 6150 Å Material

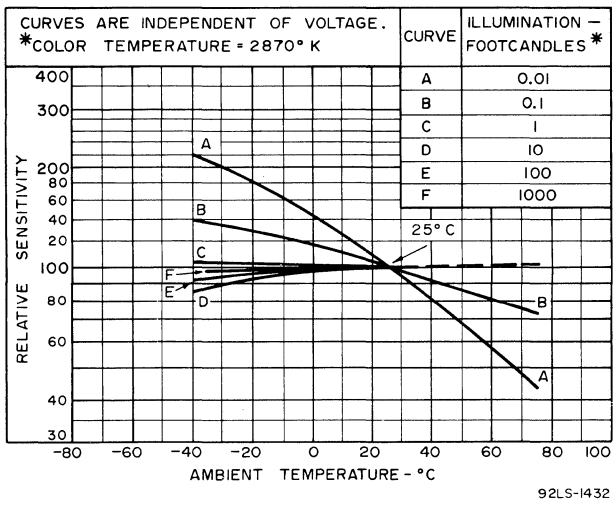
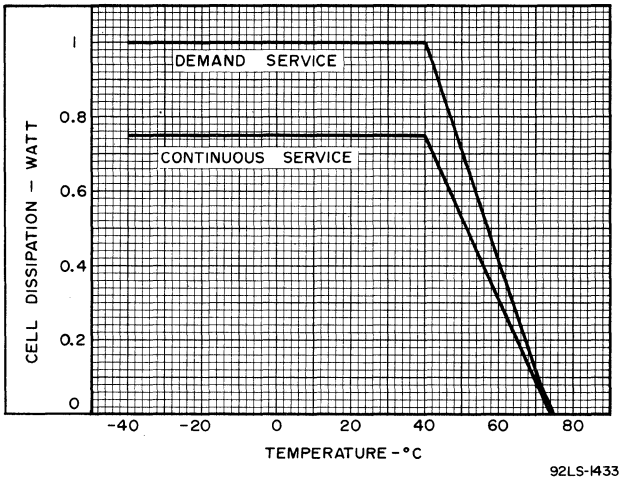
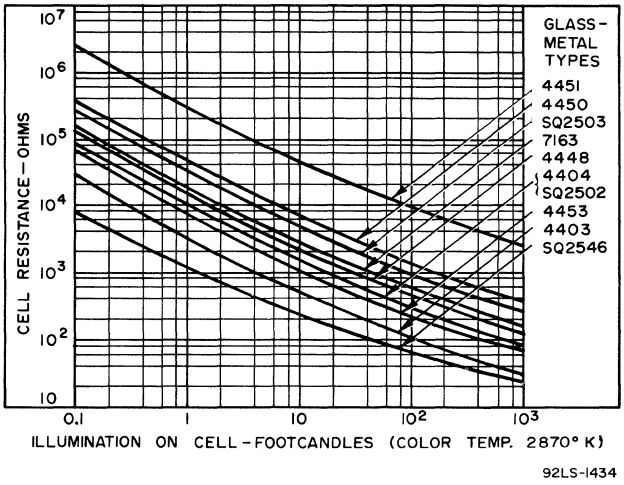


Fig. 6

1"-DIAMETER BROAD-AREA TYPES





1"-DIAMETER BROAD-AREA TYPES

RCA TYPES		MAXIMUM RATINGS				CHARACTERISTICS AT 25° C				
Glass-Metal Types[a]	Wavelength of Peak Response angstroms	Voltage Between Terminals DC or Peak AC volts	Power Dissipation[b] watt: Continuous Service	Power Dissipation[b] watt: Demand Service[c]	Photo-current mA	Voltage Between Terminals ac volts	Illumi-nation[d] foot-candles	Photocurrent[e] mA: Min.	Photocurrent[e] mA: Max.	Max. Decay Current[f] µA
4451	5100	600	0.75	1.0	50	50	35	2	3.5	40
4450	5100	600	0.75	1.0	50	50	3.5	2	3.5	40
SQ2503	5100	600	0.75	1.0	50	50	1	0.8	1.7	40
7163	5100	600	0.75	1.0	50	50	1	1	3	40
4448	5100	600	0.75	1.0	50	50	1	1.5	4	40
4404 SQ2502[g]	5100	600	0.75	1.0	50	50	1	2.5	5	40
4453	5100	600	0.75	1.0	50	50	1	3	7	40
4403	5100	250	0.75	1.0	50	50	1	8	16	78
SQ2546	6150	110	0.75	1.0	50	12 (dc)	1[h]	5	15	5

[a] The maximum ambient operating temperature range for these cells is –40° C to +75° C.

[b] With sensitive surface of cell fully illuminated. These dissipation ratings apply up to a temperature of +40° C from which point the cells are derated linearly to 0 watts at +75° C.

[c] The demand rating is a dissipation rating to which the cell may be exposed in outdoor applications. The rating may be utilized twice every 24 hours for a period of 20 minutes each time provided the interval between demand periods is not less than 4 hours.

[d] For conditions where light flux from a tungsten-filament lamp operated at a color temperature of 2870° K is transmitted through a filter (Corning C.S. No.1-62 which an effective transmission of luminous flux of 13.3%) onto the sensitive surface. The value of illumination incident on the sensitive surface is 7.5 footcandles measured before positioning the filter between the lamp and the cell. The sensitive surface of the cell is fully illuminated.

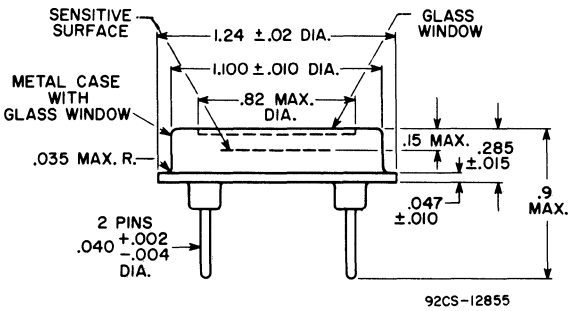
[e] This characteristic is determined after the cell has been exposed for a period of 16 to 24 hours to 500 footcandle illumination (white fluorescent light).

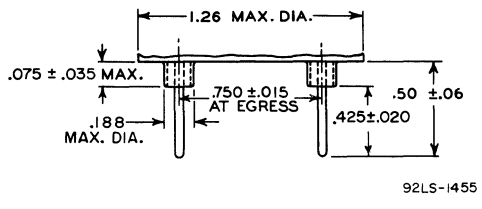
[f] Measured 10 seconds after removal of incident-illumination level.

[g] Type SQ2502 is not recommended for new equipment design. It is identical with type 4404 except it is supplied with attached Intermediate-Shell Octal 5-pin base (JEDEC No.B5-10).

[h] For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K.

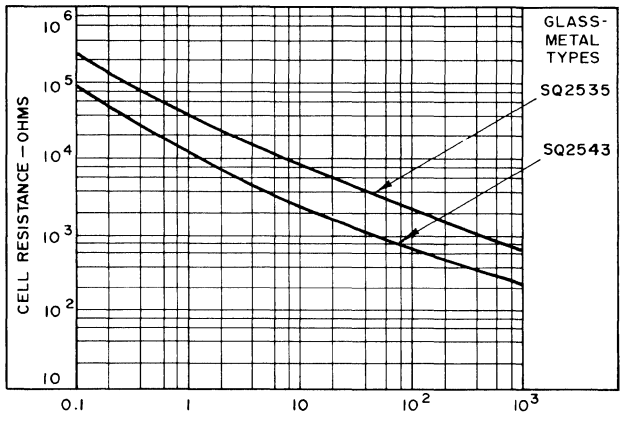
GLASS-METAL TYPES

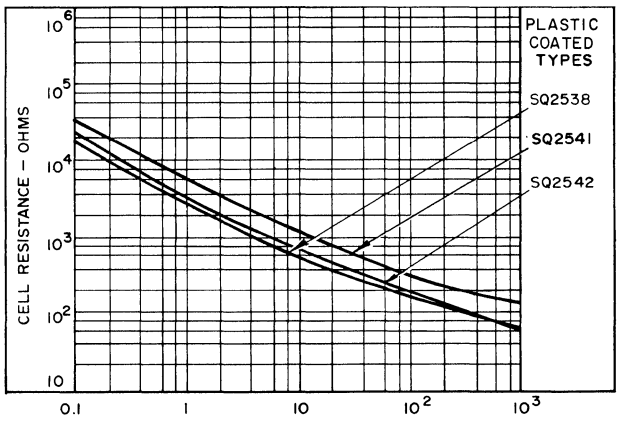




DIMENSIONS IN INCHES

1/5"-DIAMETER BROAD-AREA TYPES and 3/4" x 1/2" FLAT PLASTIC-COATED TYPES





1/5"-DIAMETER BROAD-AREA TYPES

RCA TYPES		MAXIMUM RATINGS			CHARACTERISTICS AT 25° C				
Glass-Metal Types[a]	Wavelength of Peak Response angstroms	Voltage Between Terminals DC or Peak AC volts	Power Dissipation[b] watt	Photocurrent mA	Voltage Between Terminals dc volts	Illumination[c] foot-candles	Photocurrent[d] mA Min.	Photocurrent[d] mA Max.	Max. Decay Current[e] µA
SQ2535[f]	5100	50	0.02[g]	5	12	10	0.8	2.5	12
SQ2543	6150	75	0.02	5	12	1	0.45	1.35	0.5

3/4" x 1/2" FLAT PLASTIC-COATED TYPES

SQ2538	5100	300	0.75	50	50 (ac)	1[h]	8[i]	16[i]	78
SQ2541	5100	300	0.75	50	50 (ac)	1[h]	3[i]	9[i]	40
SQ2542	6150	300	0.5	50	12	1	1.75[i]	5.25[i]	10

[a] The maximum ambient operating temperature range for these cells is –40° C to +75° C.

[b] With sensitive surface of cell fully illuminated. These dissipation ratings apply up to a temperature of +40° C from which point the cells are derated linearly to 0 watts at +75°C.

[c] For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K.

[d] This characteristic is determined after the cell has been exposed for a period of 16 to 24 hours to 50 to 100 footcandle illumination (white fluorescent light).

[e] Measured 10 seconds after removal of incident-illumination level.

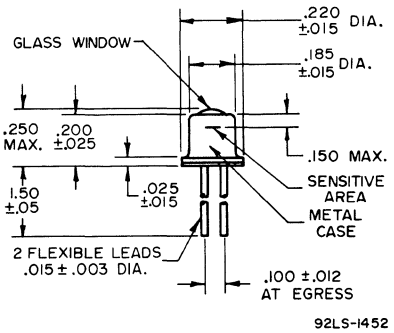
[f] The maximum ambient operating temperature range for these cells is –40° C to +60° C.

[g] In continuous service with sensitive surface of cell fully illuminated. The dissipation rating applies up to the maximum ambient operating temperature.

[h] For conditions where light flux from a tungsten-filament lamp operated at a color temperature of 2870° K is transmitted through a filter (Corning C.S. No.1-62 which has an effective transmission of luminous flux of 13.3%) onto the sensitive surface. The value of illumination incident on the sensitive surface is 7.5 footcandles measured before positioning the filter between the lamp and the cell. The sensitive surface of the cell is fully illuminated.

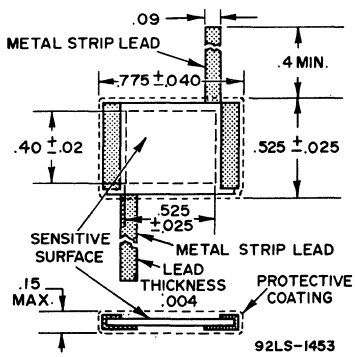
[i] This characteristic is determined after the cell has been exposed for a period of 16 to 24 hours to 500 footcandle illumination (white fluorescent light).

GLASS-METAL TYPES
Modified TO-18



NOTE 1: Tab may protrude from base.

PLASTIC-COATED TYPES

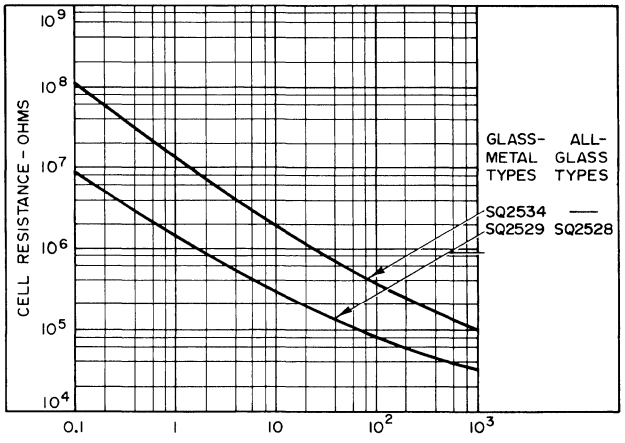


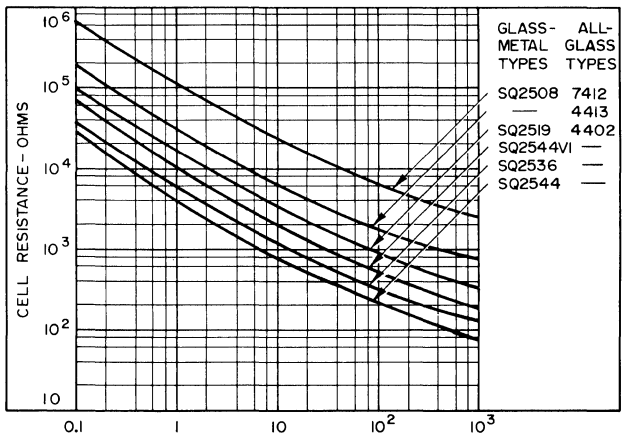
DIMENSIONS IN INCHES

result with consequent adverse effects on its characteristics. Exposure of these cells to radiation (even without voltage applied) so intense as to cause excessive heating of the cells may permanently damage them.

For a given illumination, the output current will have its highest value when the incident illumination is normal (angle of incidence is 0^{o}) to the face of the cell. For greater angles of incidence, the output current decreases. The decrease depends upon several factors including the angle of incidence of the illumination, the amount of illumination, and the area of sensitive surface illuminated.

1/4"-DIAMETER BROAD-AREA TYPES





1/4"-DIAMETER BROAD-AREA TYPES

RCA TYPES			MAXIMUM RATINGS			CHARACTERISTICS AT 25° C				
Glass-Metal Types[a]	All-Glass Types[a]	Wavelength of Peak Response angstroms	Voltage Between Terminals DC or Peak AC volts	Power Dissipation[b] watt	Photocurrent mA	Voltage Between Terminals dc volts	Illumination[c] foot-candles	Photocurrent[d] mA Min.	Photocurrent[d] mA Max.	Max. Decay Current[e] µA
SQ2534	–	5100	150	0.03	5	90	30	0.057	0.65	0.1
SQ2529	SQ2528	5100	300	0.05	5	12	1	0.004	0.012	0.1
SQ2508	7412	5100	200	0.05	5	12	1	0.065	0.275	1
–	4413	5100	110	0.05	5	12	10	1.4	2.75	12
SQ2519	4402	5100	300	0.05	5	12	10	1.6[f]	–	12
SQ2536	–	5100	110	0.05	7	12	1	1	3	15
SQ2544	–	6150	60	0.05	7	12	1	1.5	4.5	2
SQ2544V1	–	6150	110	0.05	7	12	1	0.6	1.8	2

[a] The maximum ambient operating temperature range for these cells is −40° C to +60° C.

[b] In continuous service with sensitive surface of cell fully illuminated. The dissipation rating applies up to the maximum ambient operating temperature.

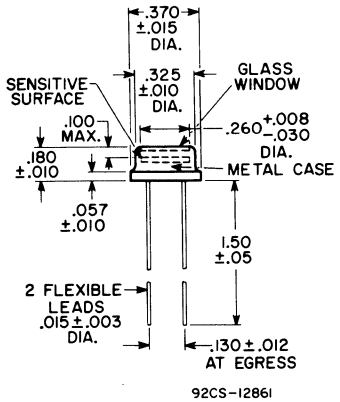
[c] For conditions where the light source is a tungsten-filament lamp operated at a color temperature of 2870° K.

[d] This characteristic is determined after the cell has been exposed for a period of 16 to 24 hours to 500 footcandle illumination (white fluorescent light).

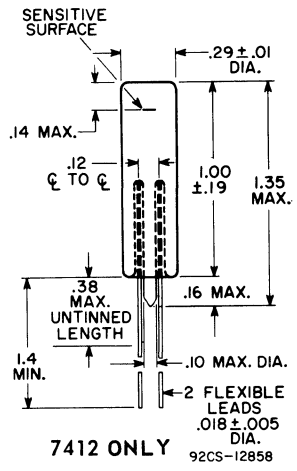
[e] Measured 10 seconds after removal of incident-illumination level.

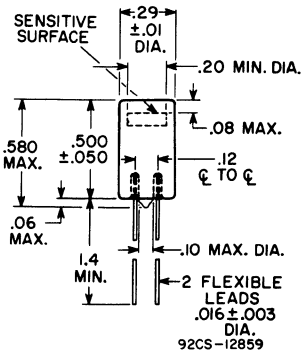
[f] This characteristic is determined after the cell has been exposed for a period of 16 to 24 hours to 50 to 100 footcandle illumination (white fluorescent light).

GLASS-METAL TYPES MODIFIED TO-5 CASE



ALL-GLASS TYPES





DIMENSIONS IN INCHES

RCA PHOTOCONDUCTIVE CELLS