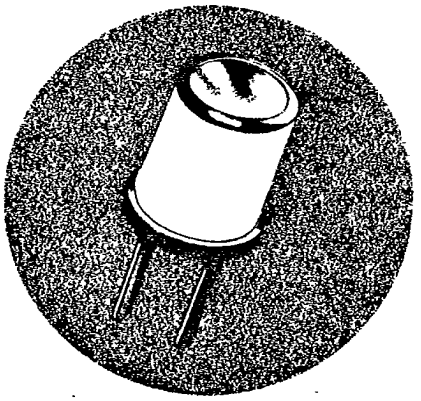
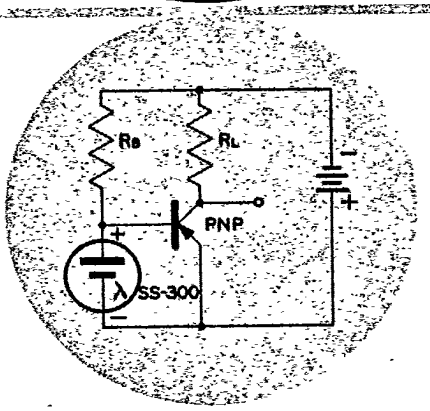


SILICON PHOTOELECTRIC CONTROL CELLS



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SILICON SENSORS, INC.

ELECTRICAL EQUIVALENT CIRCUIT FOR SS-300

SS-300
EQUIVALENT CIRCUIT

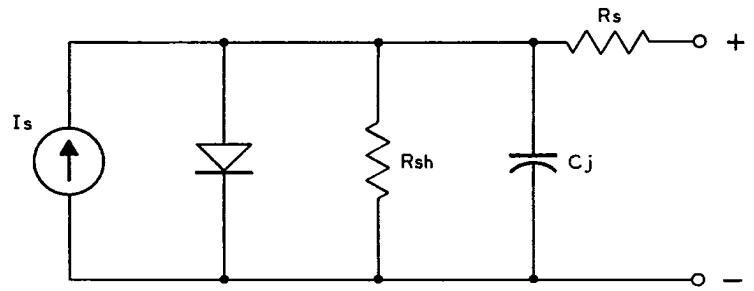


FIG. 1

Is = 1.5μa/FC
Rsh = 25KΩ
Cj = 2500μμfd
Rs = 200 ohms

DESCRIPTION OF OPERATION

The Silicon Sensors Silicon Photoelectric Control Cell is a P-N junction that offers the advantages of both a photovoltaic and a photoresistive device. This property allows the design engineer to select one device to fulfill his photoelectric requirements.

Operation of the cell can be seen from the equivalent circuit and the current voltage relationships (Fig. 2). Holes and electrons are generated by photon absorption. These charge carriers are then separated by an electric field built into the device in the process of manufacture. This phenomena is represented by the current generator and is essentially independent of ambient temperature. The current generated is shunted by an ideal diode, a shunt leakage resistance and an equivalent junction capacity. The diode has the normal temperature dependence of a silicon diode.

By operating the cell with reverse voltage, the diode in the equivalent circuit is essentially backed biased and eliminated from the circuit. When operated under these conditions the Silicon Sensors silicon photoelectric cell is extremely temperature stable.

Faster response cells or cells with lower minimum reverse leakages are available.

DESIGN DATA

TEMPERATURE — The useful operating temperature range is −65°C to + 175°C.

SPEED OF RESPONSE—The response time is 20 microseconds or less dependent upon the load resistance.

REVERSE VOLTAGE — The Silicon Sensors photoelectric control cell is designed for operation with reverse voltage. Bias voltage should not exceed — 0.7 volt d.c. Special cells can be supplied to operate at higher reverse voltages.

CONFIGURATION — Standard TO-5 or TO-11 transistor can with glass end window.

PIN CONNECTIONS — Two rigid pins for plug in designs or standard transistor base for solder connection.

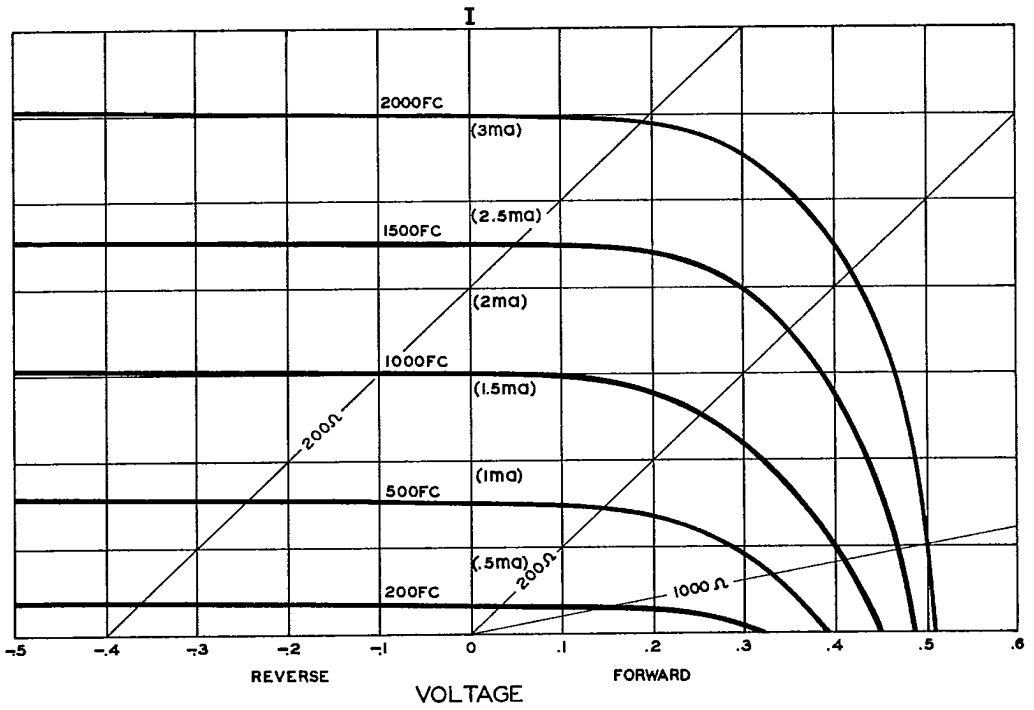
LIFE — Life expectancy of the cell is essentially unlimited when operated within recommended specifications and properly protected against mechanical forces and corrosive environments.

HUMIDITY — Cells are coated and sealed against moisture before insertion in can. Can is further sealed against moisture after the cells are inserted.

SPECTRAL RESPONSE — The Silicon Sensors Photoelectric Control Cell responds to illumination from 0.4 to 1.15 micron. See Fig. 4.

Please feel free to contact our Engineering Department for assistance in the application and use of Silicon Photoelectric Control Cells.

CURRENT-VOLTAGE CHARACTERISTICS
(TYPICAL)



Operational characteristics can be determined by the use of the load line. If the cell is used in the photovoltaic mode, the load line will pass through the origin. If the cell is used in the photoresistive mode (reverse biased condition) the load line will intercept the negative voltage axis and current axis away from the origin. The slope of the load line is determined by the load impedance. Forward biasing of the cell can be used in special cases.

By proper selection of the load impedance, the cell may be made to reverse its polarity at any specific level within its range of operation.

ELECTRICAL SPECIFICATIONS

FORWARD CHARACTERISTICS:

a) Load Current:

Typical	410μa
Minimum	370μa

b) Load Voltage:

Typical	410mv
Minimum	370mv

c) Open Circuit Voltage:

Typical	450mv
Minimum	400mv

d) Short Circuit Current:

Typical	1,500μa
Minimum	1,100μa

REVERSE CHARACTERISTICS:

a) Dark Current:
—0.5vdc

Typical	10μa
Maximum	20μa

b) At 1000 FC:

Typical	1,500μa
Minimum	1,100μa

TEST CONDITIONS:

Light Level:	1,000 FC Tungsten
Temperature:	25°C
Load Resistance:	1,000 ohms

3

Cells may be supplied with tighter specifications upon special request.

MECHANICAL SPECIFICATIONS

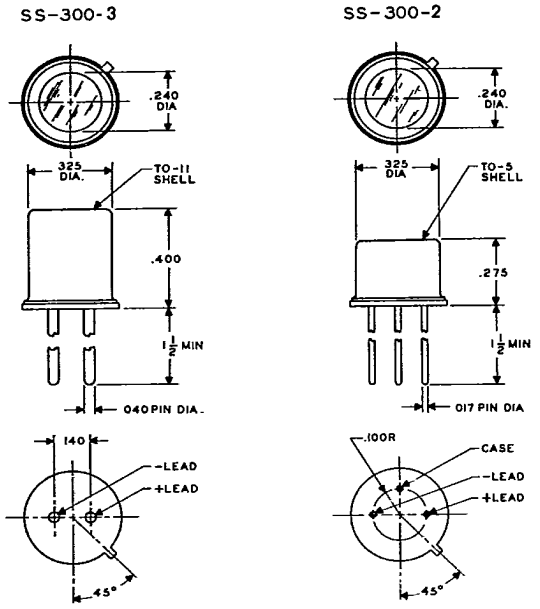


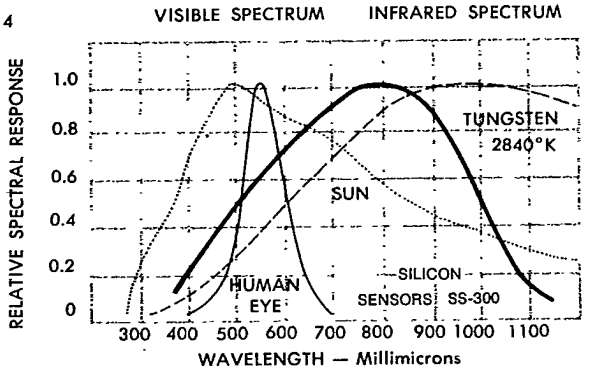
FIG. 3

	Can	Base
SS-300-1	TO-5	2 pin
SS-300-2	TO-5	3 pin
SS-300-3	TO-11	2 pin
SS-300-4	TO-11	3 pin

Appropriate sockets are provided with units.

RELATIVE SPECTRAL RESPONSE OF SILICON SENSORS SILICON PHOTOELECTRIC CELLS AND ILLUMINATION SOURCES

FIG. 4

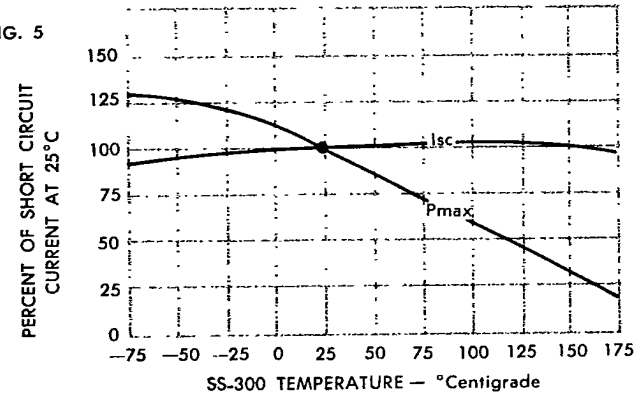


SPECTRAL RESPONSE — The curve in Figure 4, shows the response of the Silicon Sensors Photoelectric cells in the visible and near infra-red range. This characteristic allows for the cell use in photographic and infra-red detector applications.

ILLUMINATION SOURCES — A light source should have a spectral energy distribution which is similar to the control cell response. Fig. 4 shows that both sunlight and tungsten light are suitable for use with Silicon Sensors Photoelectric Control cells.

TYPICAL VARIATION OF MAXIMUM POWER OUTPUT AND SHORT CIRCUIT CURRENT WITH TEMPERATURE

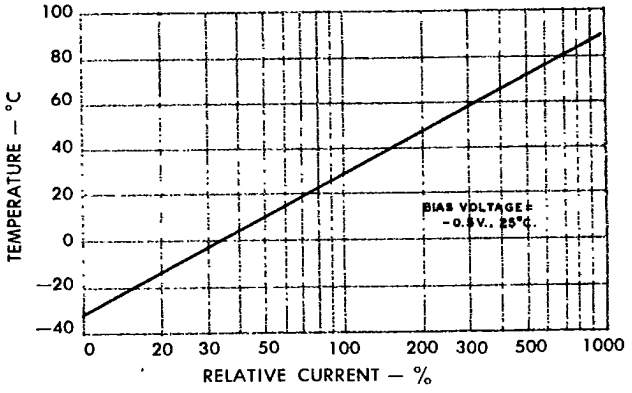
FIG. 5



TEMPERATURE CHARACTERISTICS — The short-circuit current and the output current for maximum power are essentially constant over the operating temperature range of the control cell. The open-circuit voltage and output voltage for maximum power decrease linearly with increasing temperature. Fig. 5 shows the variation of short-circuit current and maximum available power over the operating temperature range.

TYPICAL DARK CURRENT VERSUS TEMPERATURE

FIG. 6



DARK CURRENT CHARACTERISTIC — The dark reverse current characteristics varies logarithmically with temperature as seen in Figure 6. The dark current can be of importance when signal to noise ratios are being considered.