741061

X-BAND MIXER/DETECTOR DIODE

Silicon Schottky barrier diode in DO-23 outline specially designed for use in Doppler radar systems and intruder alarms where low 1/f noise and high sensitivity are required. May be used for both mixer and detector applications. This device is a direct replacement for the BAV46 and has an all-bonded structure capable of withstanding higher shock levels and wide temperature excursions during operation and storage.

QUICK REFERENCE DATA

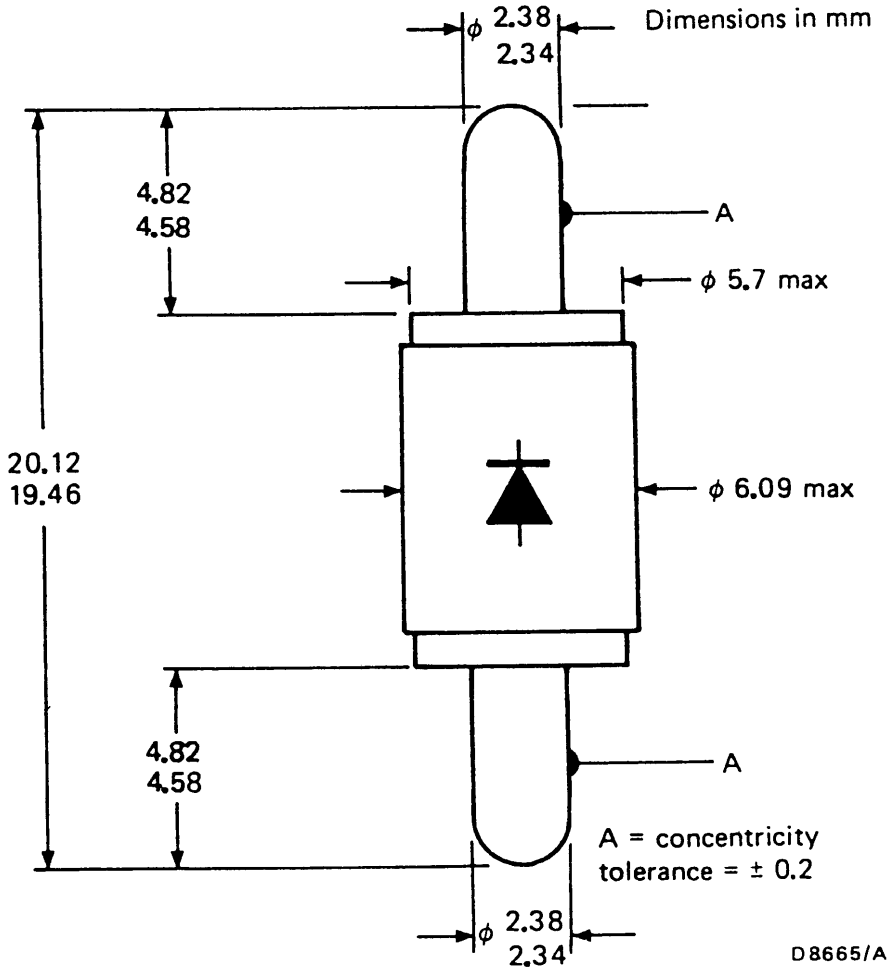
Mixer mode			
Voltage output for −90 dBm input power at X-band	typ.	40	μV
1/f noise in the bandwidth 1 Hz to 1 kHz from carrier	typ.	1.0	μV
Detector mode			
Tangential sensitivity in bandwidth 0 to 2 MHz	typ.	−55	dBm

This data must be read in conjunction with GENERAL SAFETY RECOMMENDATIONS – MICROWAVE SEMICONDUCTORS

MECHANICAL DATA

Conforms to SOD-48

Compatible with JEDEC DO-23



Terminal identification: diode symbol indicates polarity

Accessory: collet type 56321 (see page 4) converts BAS46 to JEDEC DO-22 outline.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Storage temperature range	T_{stg}		−55 to +125	°C
Ambient temperature range for operation	T_{amb}		−55 to +125	°C
Reverse voltage	V_R	max.	2	V
Forward current	I_F	max.	10	mA

CHARACTERISTICS (T_{amb} = 25 °C)

Forward voltage at I_F = 1 mA	V_F	typ.	0.5	V
Reverse current at V_R = 2 V	I_R	max.	2	μA
→ Total capacitance at V_R = 0 V	C_T	typ.	0.3	pF
Mixer mode				
Voltage output at X-band (notes 1 and 2)	V_o	min.	15	μV
	V_o	typ.	40	μV
$1/f$ noise (note 3)	N_f	typ.	1.0	μV
	N_f	max.	2.0	μV
Detector mode				
Tangential sensitivity (note 4)	S_{ts}	min.	−52	dBm
	S_{ts}	typ.	−55	dBm
Video impedance (note 5)	Z_v	typ.	850	Ω

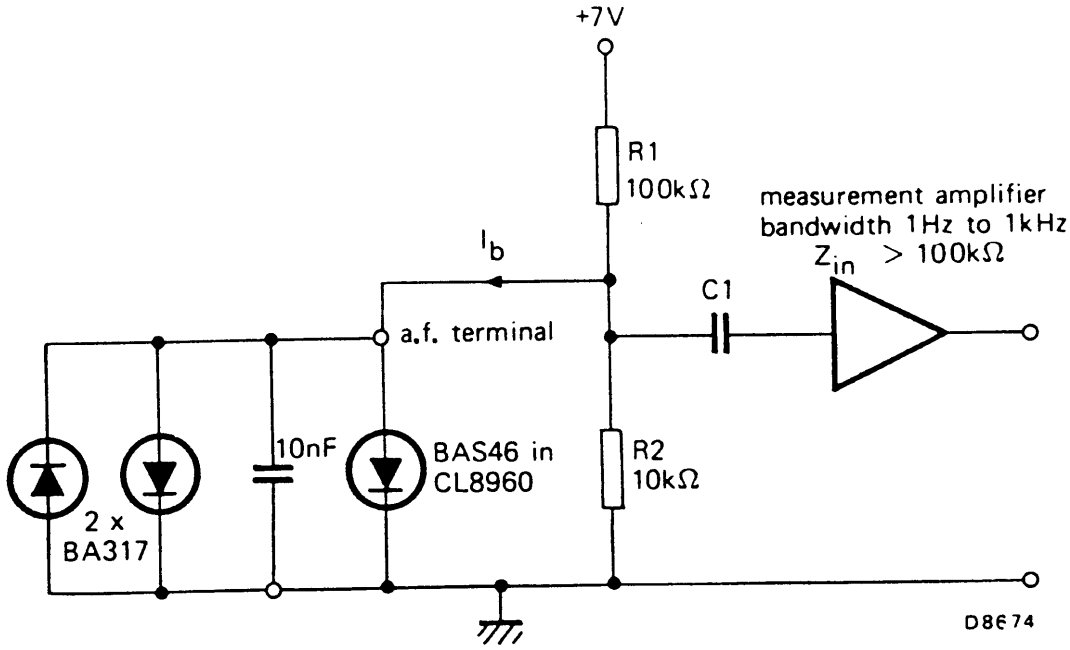
Notes

1. Mixer operated with d.c. bias of 35 μA and r.f. bias of −18 dBm, giving a total bias of 42 μA.
2. Measurement made using CL8960 doppler radar module, output power 10 mW (typ.). The input power to the mixer of −90 dBm is a signal 100 dB down on the output power from a typical CL8960 with $\frac{\text{signal + noise}}{\text{noise}}$ at 18 dB (min.)

   A return signal, 100 dB down on radiated power, is equivalent to that achieved from a man target of radar cross-section 1.0 m^2 at a range of 15 m when operating the CL8960 with a 5 dB antenna.
3. Noise measured in the bandwidth 1 Hz to 1 kHz from carrier with a d.c. bias of 50 μA.
4. Bandwidth 0 to 2 MHz and a forward bias of 50 μA.
5. Measured with a forward bias of 50 μA.

Alternative capacitance versions and packages may be made available to suit customers' specific requirements

Measurement circuit:



N.B. a) The current I_b should be approximately 35 μA with the Gunn device disconnected and approximately 42 μA with the Gunn device operational and the antenna operating into free space, using the mounting recommended in the CL8960 data.

b) The coupling capacitor C_1 should have a small impedance compared with Z_{in}. See measurement circuit above.

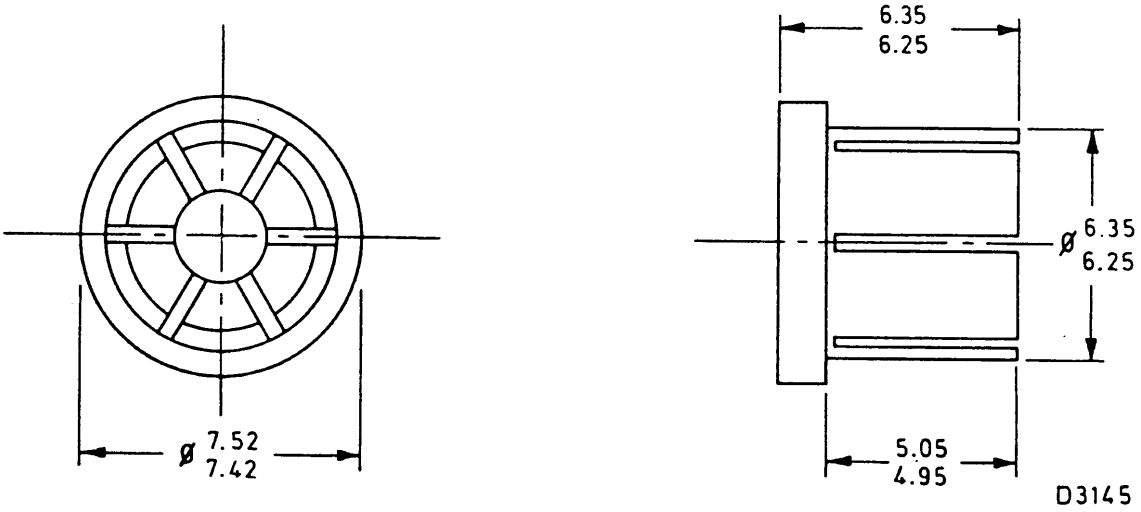
OPERATING PRECAUTIONS

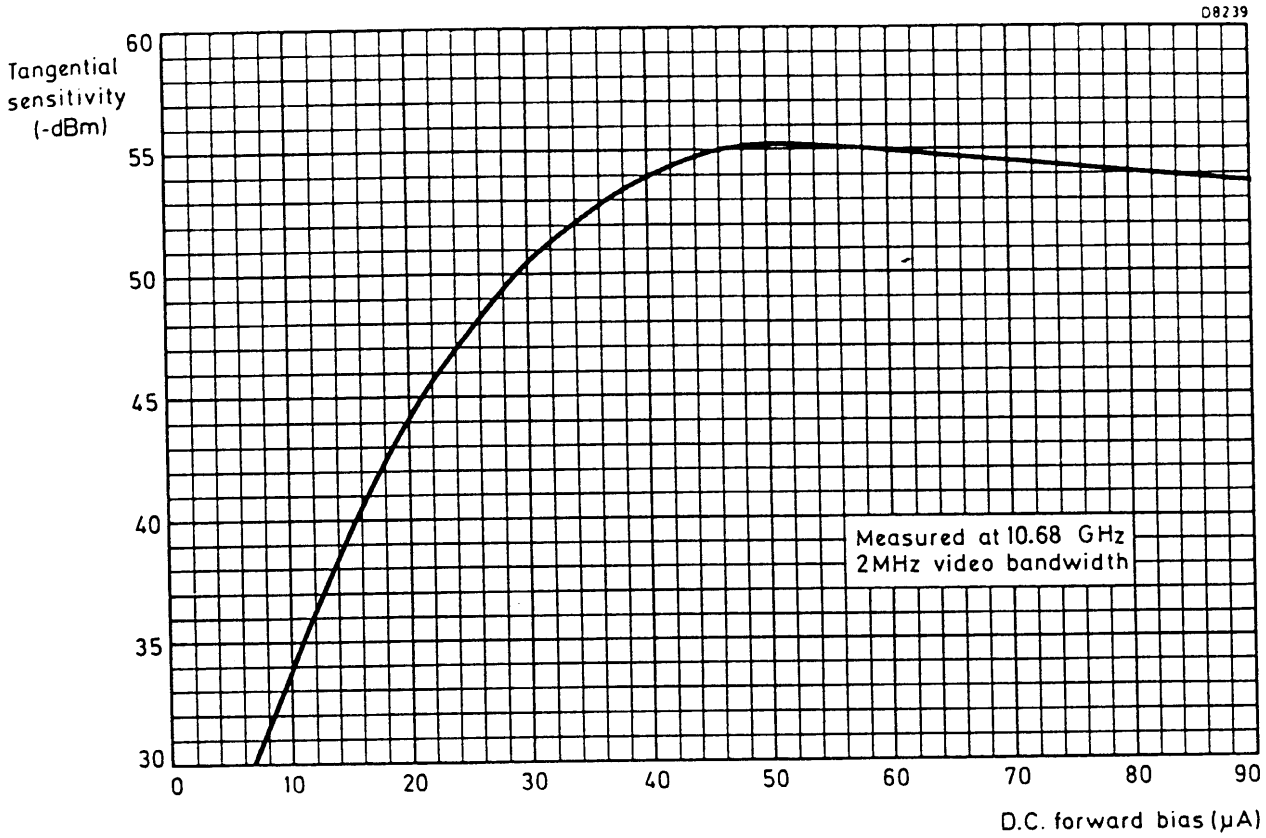
Care must be taken when making measurements that the precautions described in the operating notes are observed and that test equipment does not introduce transients.

1. The diode has a low junction capacitance and may be damaged by transients of very short duration. It is therefore recommended that soldering irons are isolated from the mains supply when making soldered connections to the diode.
2. Precautions similar to those required for CMOS devices are necessary namely:
   (a) Earthed wrist straps should be worn.
   (b) Table tops or other working surfaces should be conductive and earthed.
   (c) Anti-static clothing should be worn.
   (d) To prevent the development of damaging transient voltages, the device should not be inserted or removed from the user's circuit with the d.c. power applied.
3. It is recommended that the user incorporates a diode protection circuit. A suitable circuit consists of two BA317 diodes connected in parallel but with one diode reversed, together with a parallel 10 nF capacitor. This circuit should be connected in close proximity to the diode terminals and has been found to afford a suitable degree of protection.
4. A d.c. bias level of at least 30 μA must be maintained to ensure adequate mixer performance.

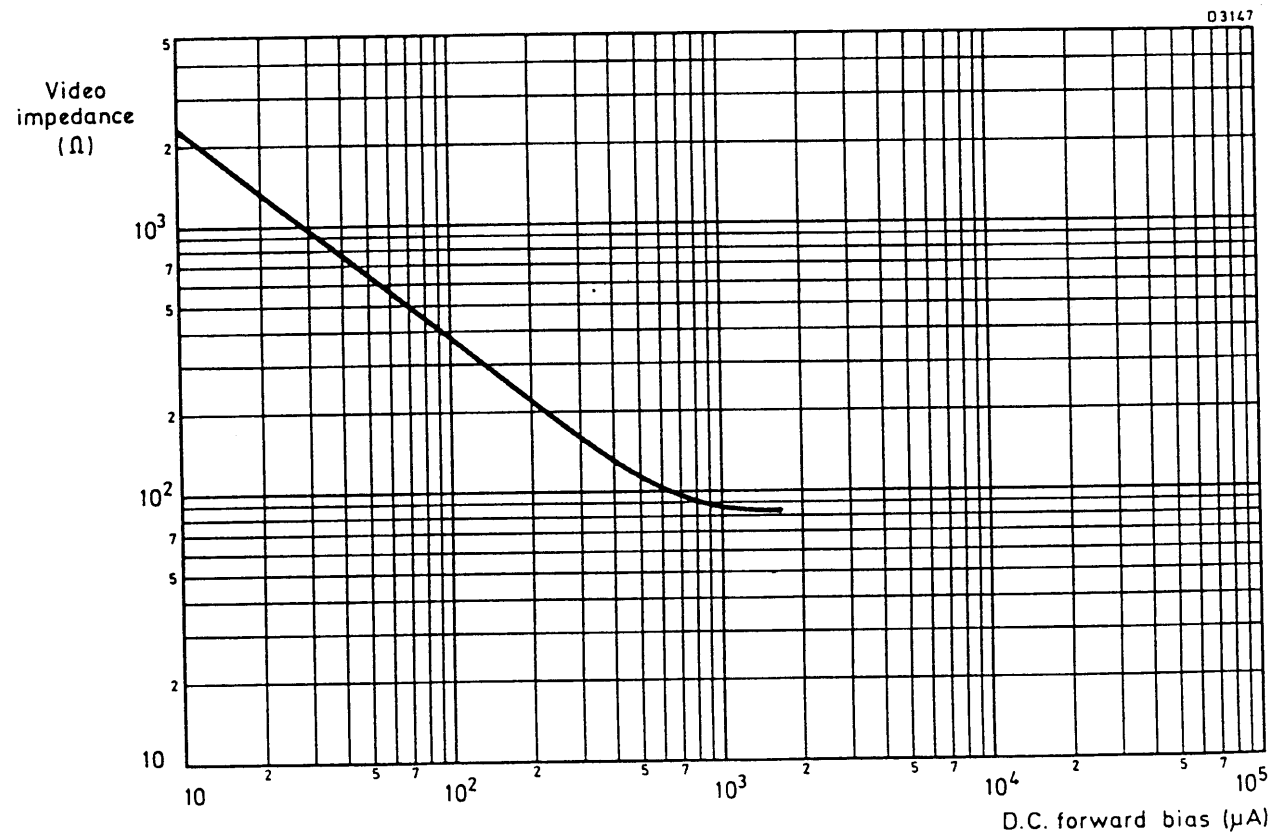
COLLET 56321

Dimensions in mm





Typical tangential sensitivity as a function of d.c. forward bias.



Typical video impedance as a function of d.c. forward bias