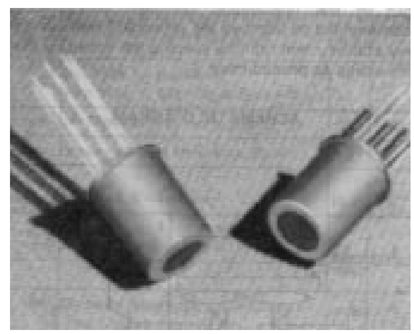
Agilent Technologies

Optical Reflective Sensors

Technical Data

HBCC-1570
HBCC-1580



Features

- **Focused Emitter and Detector in a Single Package**
- **TO-5 Miniature Sealed Package**
- **Photodiode Output**
- **Choice of Resolutions**

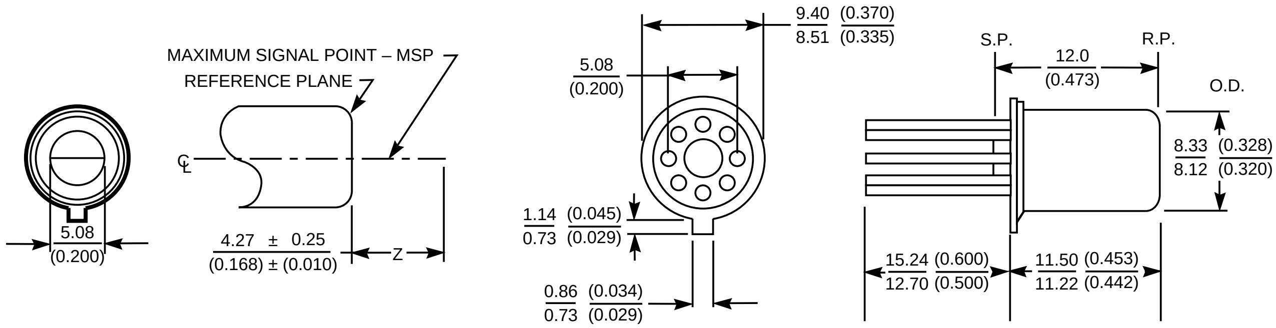
Description

The HBCC-15XX series sensors are fully integrated modules designed for applications requiring optical reflective sensing. The modules contain a 655 nm LED emitter and a photodiode. A bifurcated aspheric lens is used to image the active areas of the emitter and detector to a single spot 4.27 mm (0.168 in.) in front of the package. The output signal is a current generated by the photodiode.

Selection Guide

Sensor Part Number	HBCC-1570	HBCC-1580
LED Resolution	0.33 mm (0.013 in.)	0.185 mm (0.007 in.)
LED Wavelength	655 nm	655 nm

Package Dimensions



NOTES:
A. ALL DIMENSIONS IN MILLIMETERS AND (INCHES).
B. ALL UNTOLERANCED DIMENSIONS ARE FOR REFERENCE ONLY.
C. THE REFERENCE PLANE (R.P.) IS THE TOP SURFACE OF THE PACKAGE.
D. NICKEL CAN AND GOLD PLATED LEADS.
E. S.P. = SEATING PLANE.
F. THE LEAD DIAMETER IS 0.45 mm (0.018 in.) TYP.
G. O.D. = OUTSIDE DIAMETER OF CAN MEASURED IN REGION ABOVE WELD FLANGE TO MIDWAY OF CAN LENGTH.

Mechanical Considerations

The HBCC-15XX series are packaged in a high profile 8 pin TO-5 metal can with a glass window. The LED and photodiode are mounted on a header at the base of the package. Positioned above these active elements is a bifurcated aspheric acrylic lens that focuses them to the same point.

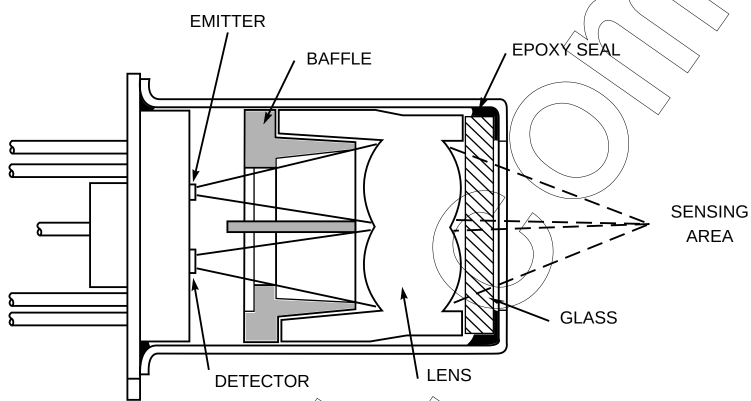
The sensor can be rigidly secured by commercially available TO-5 style heat sinks or 8 pin 0.200 inch diameter pin circle sockets. These fixtures provide a stable reference platform for affixing the HBCC-15XX sensors to a circuit board.

In applications requiring contact scanning (such as bar code reading), protective focusing tips are available. Focusing tips are available in either metal or polycarbonate packages using a sapphire ball as the contact surface. The part numbers are HBCS-2999, HBCS-4999, HBCS-A998, and HBCS-A999.

Electrical Operation

The sensor detector is a pn photodiode. The LED cathode is physically and electrically connected to the case-substrate of the sensor.

HBCC-1570, 1580 Optical System



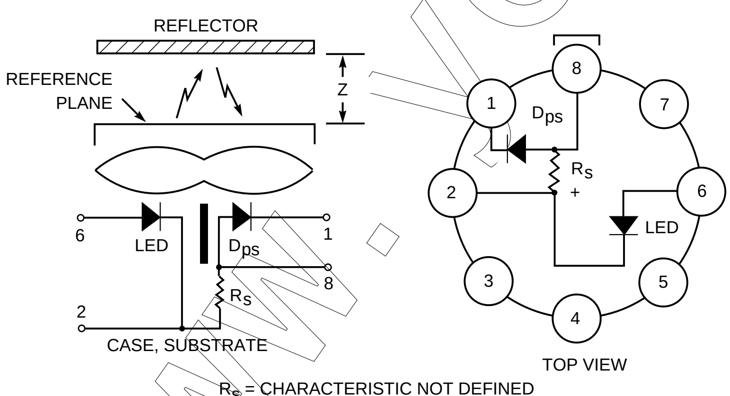
Absolute Maximum Ratings

T_A = 25°C unless specified otherwise (unless specified separately, data applies to all sensors)

Parameter	Symbol	Min.	Max.	Units	Notes
Storage Temperature	T_S	-40	+75	°C	
Operating Temperature	T_A	-20	+75	°C	
Lead Soldering Temperature (1.6 mm from Seating Plane)			260 (for 10 seconds)	°C	1
Average LED Forward Current	I_f				2
Peak LED Forward Current	I_{fp}		125 100	mA mA	3 (HBCC-1570) 3 (HBCC-1580)
Reverse LED Input Voltage	V_r		5.0	V	
Photodiode Bias	V_d	-0.3	6.0	V	4

Notes:

1. CAUTION: The thermal constraints of the acrylic lens will not permit conventional wave soldering procedures. The typical preheat and post-soldering cleaning procedures and dwell times can subject lens to thermal stresses beyond the absolute maximum ratings and can cause it to defocus.
2. These sensors are specified for use with the drive conditions provided by the HBCC-0500 and HBCC-0600 Digitizer IC ONLY.
3. When used with HBCC-0500 or HBCC-0600 digitizer ICs.
4. Voltage differential between Pin 1 and Pin 8 with Pin 8 taken as reference. Exceeding maximum conditions may cause permanent damage to photodiode or to chip metallization.



SCHEMATIC DIAGRAM

CONNECTION DIAGRAM

PIN#	FUNCTION
1	PHOTODIODE CATHODE
2	HEADER GROUND
6	LED ANODE
8	PHOTODIODE ANODE

HBCC-1570 and HBCC-1580: Electrical and Optical Characteristics

$T_A = 25°C$

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions	Note	Figure
Reflected Photocurrent	I_{pr}	(see Bin Table)			nA	I_f = 70 mA peak	5,6	1,2, 4A, 4B, 5
Quality Factor	<Q>	0.82	0.95	1.0	–	I_f = 70 mA peak	5,7	
Maximum Signal Point (MSP)	Z	4.11 (0.162)	4.27 (0.168)	4.42 (0.174)	mm (in.)	I_f = 70 mA peak	5,8	1, 4A, 4B
LED Forward Voltage	V_f	1.5	1.75	2.0	V	I_f = 70 mA		3
LED Reverse Breakdown Voltage	BVR	5.0	–	–	V	I_r = 100 µA		
Photodiode Dark Current	I_d	–	60	1000	pA	V_d = 5 V		
Photodiode Capacitance	C_d	–	100 60	– –	pF pF	V_d = 0 V V_d = 1 V		
LED Peak Wavelength	λ	–	650	670	nm	I_f = 35 mA DC		6
Ipr Temperature Coefficient	K_e	–	-0.006	–	1/°C	I_f = 35 mA DC	9	
System Optical Step Response (OSR) HBCC-1570	d	–	0.268 (0.0106)	–	mm (in.)	4.27 mm (Target from sensor)	10	7A
(OSR) HBCC-1580	d	–	0.154 (0.0061)	–	mm (in.)	4.27 mm (Target from sensor)	10	7B

Notes:

5. Measured from a reflector coated with 99% diffuse reflective white paint (Kodak 6080) positioned 4.27 mm (0.168 in.) from the reference plane. Measured physically is the total photocurrent, Ipt, which consists of a signal (reflected from target) component, Ipr, and a component induced by reflections internal to the sensor (stray), Ips. Ipt = Ipr + Ips. Specified is the reflected signal component, Ipr.
6. See Bin Table
7. <Q> = Ipr/Ipt
8. Measured from reference plane (R.P.) of sensor.
9. Photocurrent variation with temperature varies with LED output which follows a natural exponential law: $I_p(T) = I_p(T_o)*\exp[K_e(T-T_o)]$
10. OSR is defined as the distance for a 10%-90% "step" response of Ipr as the sensor moves over an abrupt black-white edge, or from opaque white to free space (no reflection).

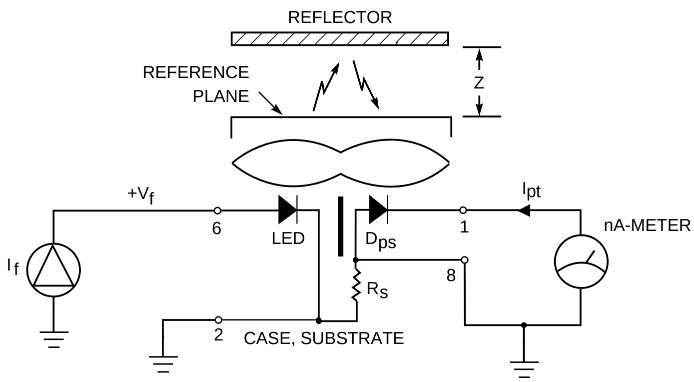


Figure 1. Photocurrent Test Circuit.

Bin Table

Bin#	Ipr Limits (nA) Min.	Max.
1	160	225
2	215	270
3	255	313
4	300	375
5	360	440
6	430	555

Product Marking

The photocurrent binning of the sensor is incorporated as part of the product marking format. The Bin # is represented as the last number (N) on the last line of marking.

A
HBCC-15XX
XXXXXXXN

N = bin number

Bin Availability

The entire available distribution of parts, appropriately marked, will be shipped. Requests for individual bin selections cannot be honored.

Binning and Temperature Effects

Test algorithm bins units to the lower bin number if a unit is in the bin overlap region. Such units can cross bin boundaries as temperature changes. (Ambient temperature affects LED efficiency slightly and may cause several percentage changes in Ipr.) Bin numbers are for “reference only” and do not constitute an absolute guarantee. The output of all LEDs degrades with time, depending on drive conditions and temperature.

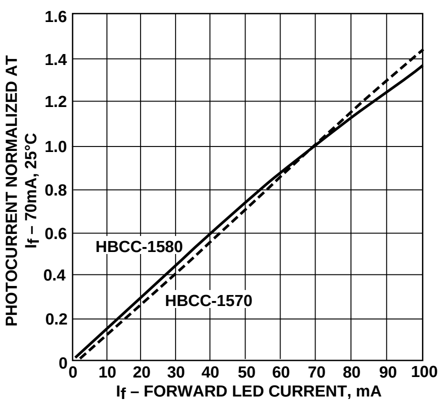


Figure 2. Typical Reflected Photocurrent.

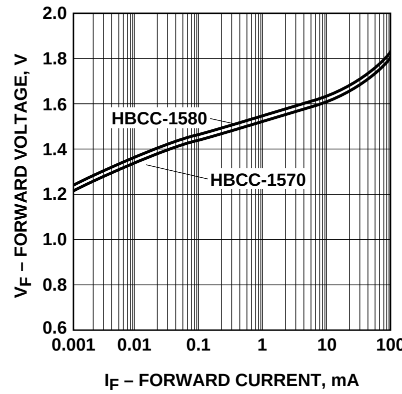


Figure 3. Typical LED Forward Voltage vs. Forward Current.

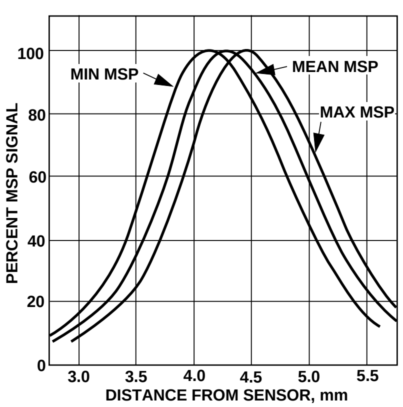


Figure 4A. HBCC-1570 Signal vs. Distance from Sensor.

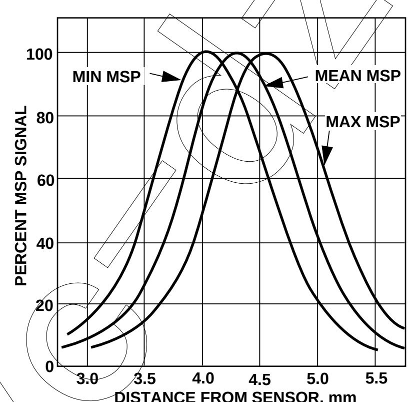


Figure 4B. HBCC-1580 Signal vs. Distance from Sensor.

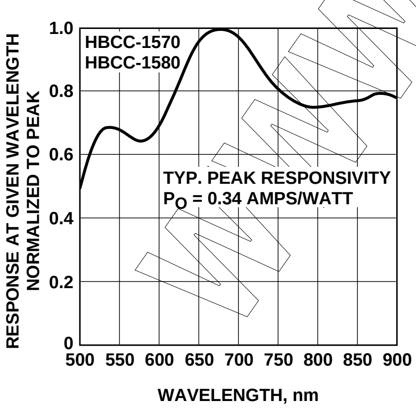


Figure 5. Relative Spectral Response of Sensors.

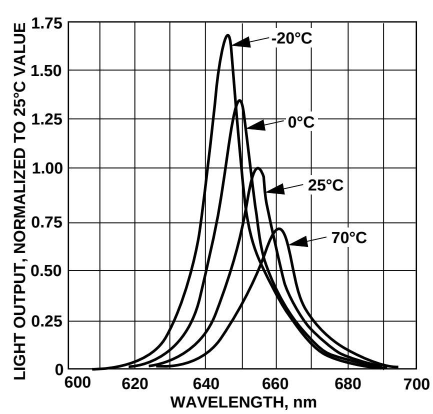


Figure 6. Typical Spectral Distribution of 655 nm LED.

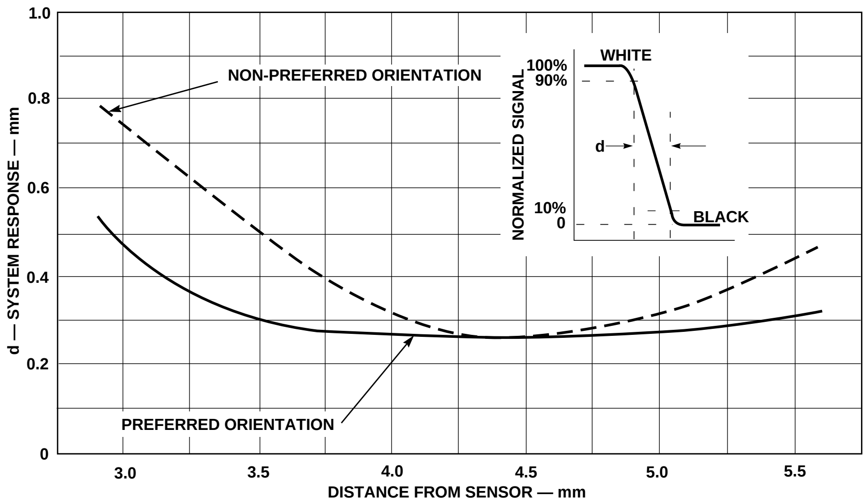


Figure 7A. HBCC-1570, System Optical Step Response Variation with Distance.

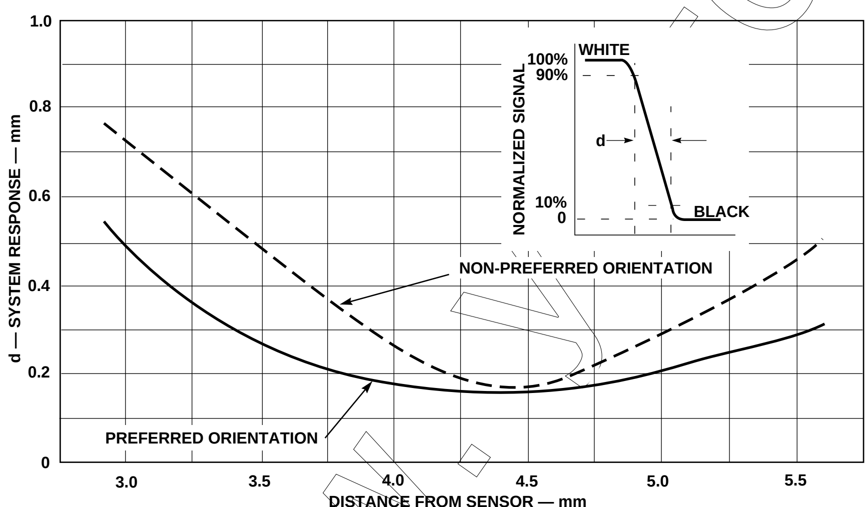
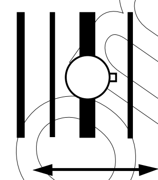


Figure 7B. HBCC-1580, System Optical Step Response Variation with Distance.

Preferred Orientation



At maximum signal point (MSP) when the sensor is in focus, the orientation of the sensor is unimportant. However, as one moves away from MSP (either by distance or angle), the preferred orientation indicated above is recommended to maintain a higher resolution spot size.

www.agilent.com/semiconductors

For product information and a complete list of distributors, please go to our web site.

For technical assistance call:

Americas/Canada: +1 (800) 235-0312 or (408) 654-8675

Europe: +49 (0) 6441 92460

China: 10800 650 0017

Hong Kong: (+65) 271 2451

India, Australia, New Zealand: (+65) 271 2394

Japan: (+81 3) 3335-8152(Domestic/International), or 0120-61-1280(Domestic Only)

Korea: (+65) 271 2194

Malaysia, Singapore: (+65) 271 2054

Taiwan: (+65) 271 2654

Data subject to change.

Obsoletes 5965-5942E (11/99)
January 22, 2002
5988-4571EN

Agilent Technologies