

# Reflective Object Sensor

OPB703 through OPB705, OPB703WZ through OPB705WZ, OPB701Wz through OPB70HWZ



## Features:

- Phototransistor output
- High sensitivity
- Low-cost plastic housing
- Available with lenses for dust protection and ambient light filtration
- Focused for maximum sensitivity

## Description:

The **OPB703**, **OPB704** and **OPB705** consist of an Infrared (890nm) Light Emitting Diode (LED) and a NPN silicon Phototransistor, mounted side-by-side on converging optical axes in a black plastic housing and are designed for PCBoard mounting. The **OPB703WZ**, **OPB704WZ**, **OPB705WZ** and **OPB70BWZ** are designed for remote mounting utilizing interconnect wires of UL approved 26 AWG, 24" (61.0cm) minimum length, stripped and tinned.

The **OPB70AWZ** consists of an Infrared (890nm) Light Emitting Diode (LED) and a NPN silicon Photodarlington, mounted side-by-side on converging optical axes in a black plastic housing and is designed for remote mounting utilizing interconnect wires of UL approved 26 AWG, 24" (61.0cm) minimum length, stripped and tinned.

The **OPB70CWZ through OPB70FWZ** consist of a Visible (Red 640nm) Light Emitting Diode (LED) and a NPN silicon Phototransistor or Rbe Phototransistor, mounted side-by-side on converging optical axes in a black plastic housing and are designed for remote mounting utilizing interconnect wires of UL approved 26 AWG, 24" (61.0cm) minimum length, stripped and tinned.

Various lens options are available: No lens for the (**OPB703**, **OPB703WZ**), blue window for dust protection for the (**OPB704**, **OPB704WZ**, **OPB70BWZ**, **OPB70HWZ**) and aperture lens for improved resolution for the (**OPB705**, **OPB705WZ**, **OPB70AWZ**, **OPB70CWZ**, **OPB70DWZ**). The **OPB704G** and **OPB704GWZ** offers excellent protection for dirty environments.

The phototransistor responds to illumination from the emitter when a reflective object passes within the field of view centered typically at 0.15" (3.8 mm).

Custom electrical, wire, cabling and connectors are available. Contact your local representative or OPTEK for more information.

## Applications:

- Non-contact reflective object sensor
- Assembly line automation
- Machine automation
- Machine safety
- End of travel sensor
- Door sensor
- Mark Detection
- Office Equipment



Ordering Information						
Part	LED Peak	Detector	Optical Cover	Lead or Wire		
<b>OPB703</b>	890 nm	Transistor	None	0.160" Leads		
<b>OPB703WZ</b>				24" / 26 AWG Wire		
<b>OPB704</b>			Blue Window	0.160" Leads		
<b>OPB704WZ</b>				24" / 26 AWG Wire		
<b>OPB70HWZ</b>				24" / 26 AWG Wire		
<b>OPB704G</b>				0.160" Leads		
<b>OPB704GWZ</b>			24" / 26 AWG Wire			
<b>OPB705</b>			640 nm	Darlington	Aperture	0.160" Leads
<b>OPB705WZ</b>						24" / 26 AWG Wire
<b>OPB70AWZ</b>				Rbe Transistor	Blue Window	
<b>OPB70BWZ</b>						
<b>OPB70CWZ</b>	Rbe Transistor	Aperture				
<b>OPB70DWZ</b>						
<b>OPB70EWZ</b>	Rbe Transistor	Clear Window				
<b>OPB70FWZ</b>						

General Note  
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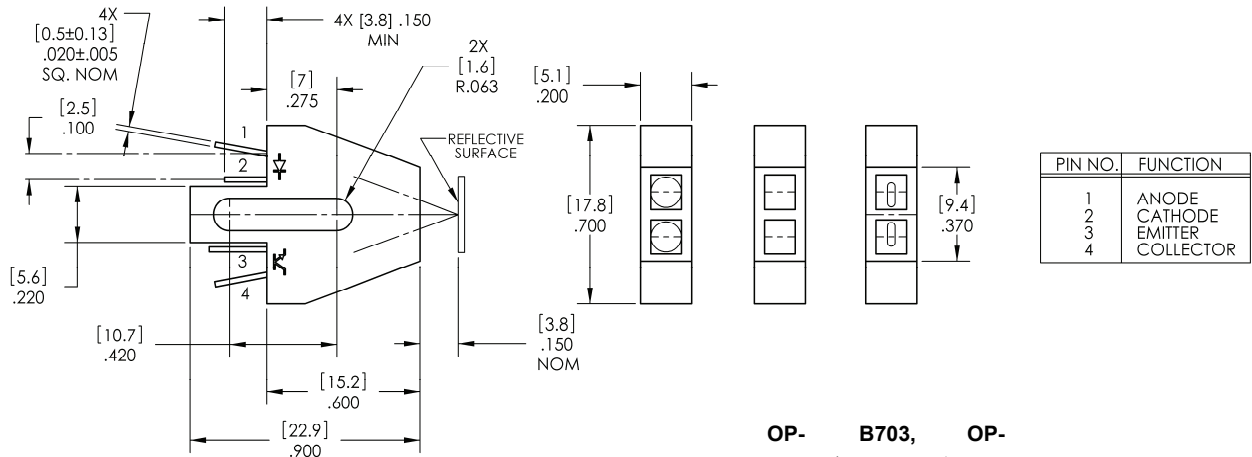
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# Reflective Object Sensor

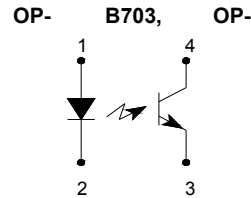


OPB703 through OPB705, OPB&03WZ through OPB705WZ, OPB701Wz through OPB70HWZ

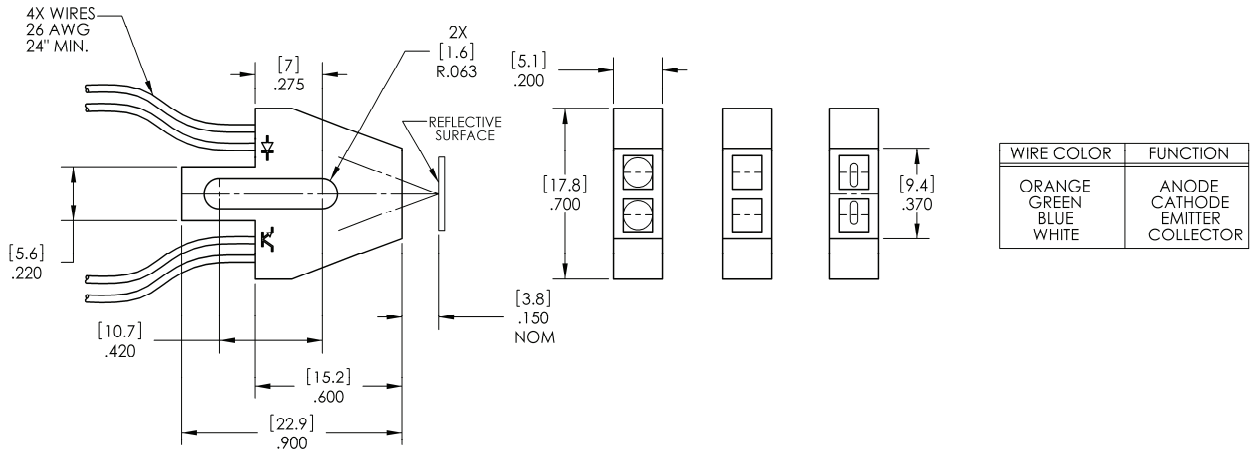
## OPB703, OPB704, OPB705



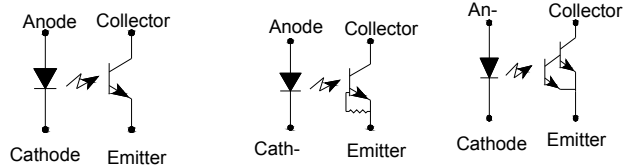
DIMENSIONS ARE IN INCHES [MM]  
TOLERANCES ARE ± .010 UNLESS OTHERWISE SPECIFIED.



## OPB703WZ, OPB704WZ, OPB705WZ, OPB70AWZ, OPB70BWZ, OPB70CWZ, OPB70DWZ



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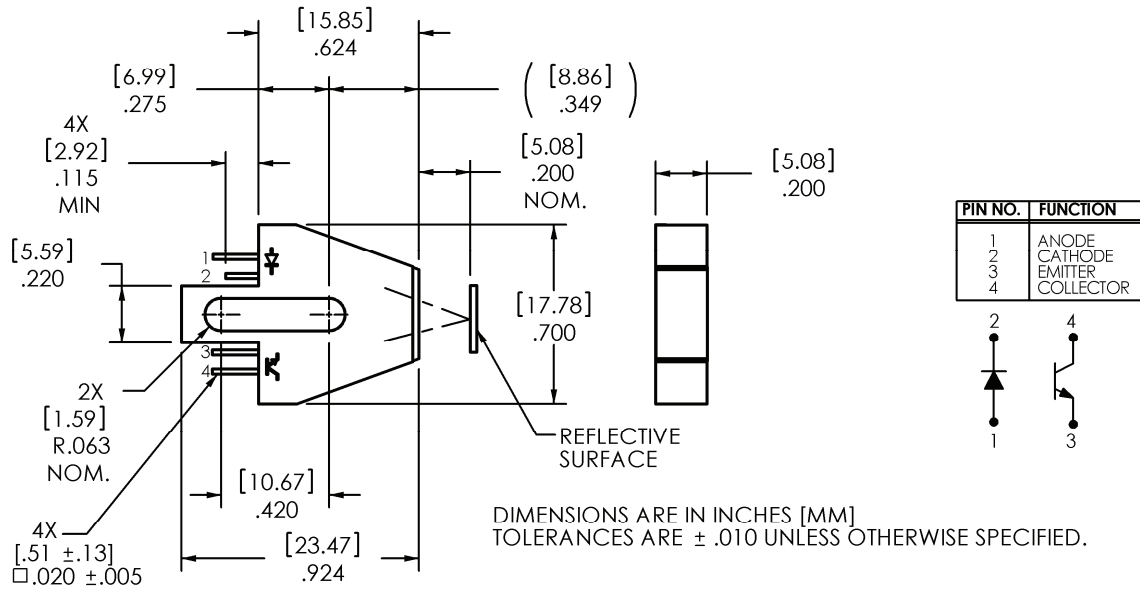
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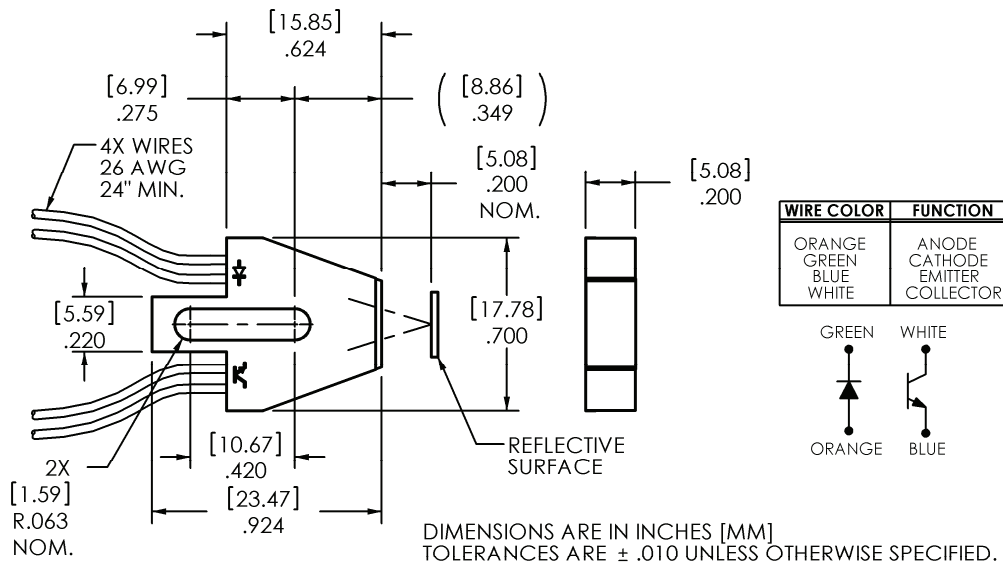


OPB703 through OPB705, OPB&03WZ  
through OPB705WZ, OPB701Wz through  
OPB70HWZ

OPB704G



OPB704GWZ



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OPB703 through OPB705, OPB&03WZ  
through OPB705WZ, OPB701Wz through  
OPB70HWZ



Absolute Maximum Ratings ( $T_A=25^{\circ}\text{C}$ unless otherwise noted)	
Storage Temperature Range	$-40^{\circ}\text{C}$ to $+80^{\circ}\text{C}$
Lead Soldering Temperature [1/16 inch (1.6 mm) from the case for 5 sec. with soldering iron]	$240^{\circ}\text{C}^{(1)}$
Input Diode	
Forward DC Current	40 mA
Reverse DC Voltage	2 V
Power Dissipation	$100\text{ mW}^{(2)}$
Output Photodetector	
Collector-Emitter Voltage Phototransistor	30 V
Photodarlington	15 V
Emitter-Collector Voltage	5 V
Collector DC Current	25 mA
Power Dissipation	$100\text{ mW}^{(2)}$

Notes:

- (1) RMA flux is recommended. Duration can be extended to 10 seconds maximum when flow soldering.
- (2) For OPB703WZ, OPB704WZ, OPB705WZ, OPB70BWZ, OPB704G, OPB704GWZ and OPB70HWZ derate linearly  $1.82\text{ mW}/^{\circ}\text{C}$  above  $25^{\circ}\text{C}$ .

# Reflective Object Sensor

OPB703 through OPB705, OPB703WZ through OPB705WZ, OPB701Wz through OPB70HWZ



**Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)  
**(OPB703, OPB703WZ, OPB704, OPB704WZ, OPB705, OPB705WZ, OPB704G, OPB704GWZ, OPB70HWZ)**

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
<b>Input Diode</b> (See OP265 for additional information — for reference only)						
$V_F$	Forward Voltage	-	-	1.7	V	$I_F = 40\text{mA}$
$I_R$	Reverse Current	-	-	100	$\mu\text{A}$	$V_R = 2\text{V}$
<b>Output Phototransistor</b> (See OP505 for additional information — for reference only)						
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	30	-	-	V	$I_{CE} = 100\ \mu\text{A}$
$V_{(BR)ECO}$	Emitter-Collector Breakdown Voltage	5	-	-	V	$I_{EC} = 100\ \mu\text{A}$
$I_{CEO}$	Collector Dark Current	-	-	250	nA	$V_{CE} = 10\text{V}, I_F = 0, E_E = 0$
<b>Coupled</b>						
$I_{C(ON)}$	On-State Collector Current					
	OPB70HWZ	0.60	-	3.5	mA	$V_{CE} = 5\text{V}, I_F = 40\text{mA}, d = 0.15''^{(4)(6)}$
	OPB703, OPB703WZ	0.30	-	2.5		
OPB704, OPB704WZ	0.20	-	2.5			
	OPB704G, OPB704GWZ	0.50	-	6.0		$V_{CE} = 5\text{V}, I_F = 40\text{mA}, d = 0.20''^{(4)(6)}$
$I_{CX}$	Crosstalk				$\mu\text{A}$	$V_{CE} = 5\text{V}, I_F = 40\text{mA}^{(5)}$
	OPB703, OPB703WZ	-	-	20		
	OPB704, OPB704WZ, OPB70HWZ	-	-	20		

**Notes:**

- (1) RMA flux is recommended. Duration can be extended to 10 seconds maximum when flow soldering.
- (2) For OPB703, OPB704 and OPB705, derate linearly 1.67 mW/ $^\circ\text{C}$  above 25 $^\circ\text{C}$ .
- (3) For OPB703WZ, OPB704WZ, OPB705WZ, OPB70BWZ, OPB704G, OPB704GWZ, OPB70HWZ, OPB70AWZ, OPB70CWZ, OPB70DWZ, OPB70EWZ, and OPB70FWZ derate linearly 1.82 mW/ $^\circ\text{C}$  above 25 $^\circ\text{C}$ .
- (4) The distance from the assembly face to the reflective surface is d.
- (5) Crosstalk ( $I_{CX}$ ) is the collector current measured with the indicated current in the input diode and with no reflecting surface.
- (6) Measured using Eastman Kodak neutral white test card with 90% diffuse reflectance as a reflecting surface. Reference: Eastman Kodak, Catalog # E 152 7795.
- (7) All parameters tested using pulse techniques.

# Reflective Object Sensor

OPB703 through OPB705, OPB&03WZ  
through OPB705WZ, OPB701Wz through  
OPB70HWZ



## Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise noted) (OPB70AWZ)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
<b>Input Diode</b> (See OP265 for additional information — for reference only)						
$V_F$	Forward Voltage	-	-	1.7	V	$I_F = 40\text{mA}$
$I_R$	Reverse Current	-	-	100	$\mu\text{A}$	$V_R = 2\text{V}$
<b>Output PhotoDarlington</b> (See OP535 for additional information — for reference only)						
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	15	-	-	V	$I_{CE} = 1.0\text{mA}$ , $E_E = 0$
$V_{(BR)ECO}$	Emitter-Collector Breakdown Voltage	5	-	-	V	$I_{EC} = 100\mu\text{A}$ , $E_E = 0$
$I_{CEO}$	Collector Dark Current	-	-	250	nA	$V_{CE} = 10\text{V}$ , $I_F = 0$ , $E_E = 0$
<b>Coupled</b>						
$I_{C(ON)}$	On-State Collector Current	5.0	-	26.0	mA	$V_{CE} = 5\text{V}$ , $I_F = 40\text{mA}$ , $d = 0.15''$ <sup>(1)(3)</sup>
$V_{(SAT)}$	Saturation Voltage	-	-	1.15	V	$I_C = 400\mu\text{A}$ , $I_F = 40\text{mA}$ , $d = 0.15''$ <sup>(1)(3)</sup>
$I_{CX}$	Crosstalk	-	-	25	$\mu\text{A}$	$V_{CE} = 5\text{V}$ , $I_F = 40\text{mA}$ <sup>(2)</sup>

### Notes:

- (1) The distance from the assembly face to the reflective surface is  $d$ .
- (2) Crosstalk ( $I_{CX}$ ) is the collector current measured with the indicated current in the input diode and with no reflecting surface.
- (3) Measured using Eastman Kodak neutral white test card with 90% diffuse reflectance as a reflecting surface. Reference: Eastman Kodak, Catalog # E 152 7795.

# Reflective Object Sensor

OPB703 through OPB705, OPB&03WZ  
through OPB705WZ, OPB701Wz through  
OPB70HWZ



## Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise noted) (OPB70BWZ)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
<b>Input Diode</b> (See OP265 for additional information — for reference only)						
$V_F$	Forward Voltage	-	-	1.7	V	$I_F = 40\text{mA}$
$I_R$	Reverse Current	-	-	100	$\mu\text{A}$	$V_R = 2\text{V}$
<b>Output Phototransistor</b> (See OP705 for additional information — for reference only)						
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	30	-	-	V	$I_{CE} = 100\ \mu\text{A}$
$V_{(BR)ECO}$	Emitter-Collector Breakdown Voltage	0.4	-	-	V	$I_{EC} = 100\ \mu\text{A}$
$I_{CEO}$	Collector Dark Current	-	-	100	nA	$V_{CE} = 10\text{V}, I_F = 0, E_E = 0$
<b>Coupled</b>						
$I_{C(ON)}$	On-State Collector Current OPB70BWZ	0.50	-	3.0	mA	$V_{CE} = 5\text{V}, I_F = 40\text{mA}, d = 0.15''^{(1)(3)}$
$I_{CX}$	Crosstalk OPB70BWZ	-	-	5	$\mu\text{A}$	$V_{CE} = 5\text{V}, I_F = 40\text{mA}^{(2)}$

### Notes:

- (1) The distance from the assembly face to the reflective surface is  $d$ .
- (2) Crosstalk ( $I_{CX}$ ) is the collector current measured with the indicated current in the input diode and with no reflecting surface.
- (3) Measured using Eastman Kodak neutral white test card with 90% diffuse reflectance as a reflecting surface. Reference: Eastman Kodak, Catalog # E 152 7795.

# Reflective Object Sensor

OPB703 through OPB705, OPB&03WZ  
through OPB705WZ, OPB701Wz through  
OPB70HWZ



## Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise noted) (OPB70CWZ and OPB70EWZ)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
<b>Input Diode</b> (See OVLAS6CB8 for additional information — for reference only)						
$V_F$	Forward Voltage	-	-	2.6	V	$I_F = 40\text{mA}$
$I_R$	Reverse Current	-	-	100	$\mu\text{A}$	$V_R = 2\text{V}$
<b>Output Phototransistor</b> (See OP505 for additional information — for reference only)						
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	30	-	-	V	$I_{CE} = 100\mu\text{A}, I_F = 0, E_E = 0$
$V_{(BR)ECO}$	Emitter-Collector Breakdown Voltage	0.4	-	-	V	$I_{EC} = 100\mu\text{A}, I_F = 0, E_E = 0$
$I_{CEO}$	Collector Dark Current	-	-	100	nA	$V_{CE} = 10\text{V}, I_F = 0, E_E = 0$

## Coupled

$I_{C(ON)}$	On-State Collector Current	OPB70CWZ	.10	-	1.0	mA	$V_{CE} = 5\text{V}, I_F = 40\text{mA}, d = 0.15''^{(2)(3)}$
		OPB70EWZ	.25	-	2.5		
$V_{(SAT)}$	Saturation Voltage	-	-	0.4	V	$I_C = 100\mu\text{A}, I_F = 40\text{mA}, d = 0.15''^{(1)(3)}$	
$I_{CX}$	Crosstalk	-	-	2	$\mu\text{A}$	$V_{CE} = 5\text{V}, I_F = 40\text{mA}^{(2)}$	

### Notes:

- (1) The distance from the assembly face to the reflective surface is  $d$ .
- (2) Crosstalk ( $I_{CX}$ ) is the collector current measured with the indicated current in the input diode and with no reflecting surface.
- (3) Measured using Eastman Kodak neutral white test card with 90% diffuse reflectance as a reflecting surface. Reference: Eastman Kodak, Catalog # E 152 7795.



# Reflective Object Sensor

OPB703 through OPB705, OPB&03WZ  
through OPB705WZ, OPB701Wz through  
OPB70HWZ



## Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise noted) (OPB70DWZ and OPB70FWZ)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
<b>Input Diode</b> (See OVLAS6CB8 for additional information — for reference only)						
$V_F$	Forward Voltage	-	-	2.6	V	$I_F = 40\text{mA}$
$I_R$	Reverse Current	-	-	100	$\mu\text{A}$	$V_R = 2\text{V}$
<b>Output Phototransistor</b> (See OP505 for additional information — for reference only)						
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	30	-	-	V	$I_{CE} = 100\mu\text{A}, I_F = 0, E_E = 0$
$V_{(BR)ECO}$	Emitter-Collector Breakdown Voltage	5.0	-	-	V	$I_{EC} = 100\mu\text{A}, I_F = 0, E_E = 0$
$I_{CEO}$	Collector Dark Current	-	-	250	nA	$V_{CE} = 10\text{V}, I_F = 0, E_E = 0$

## Coupled

$I_{C(ON)}$	On-State Collector Current	OPB70DWZ	.10	-	1.5	mA	$V_{CE} = 5\text{V}, I_F = 40\text{mA}, d = 0.15''^{(1)(3)}$
		OPB70FWZ	.25	-	3.5		
$V_{(SAT)}$	Saturation Voltage	-	-	0.4	V	$I_{C(ON)} = 100\mu\text{A}, I_F = 40\text{mA}, d = 0.15''^{(1)(3)}$	
$I_{CX}$	Crosstalk	-	-	5.0	$\mu\text{A}$	$V_{CE} = 5\text{V}, I_F = 40\text{mA}^{(2)}$	

### Notes:

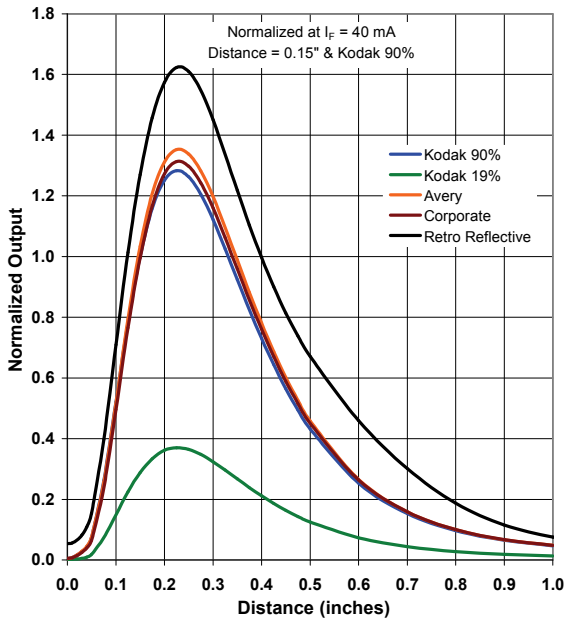
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- (3) Measured using Eastman Kodak neutral white test card with 90% diffuse reflectance as a reflecting surface. Reference: Eastman Kodak, Catalog # E 152 7795.

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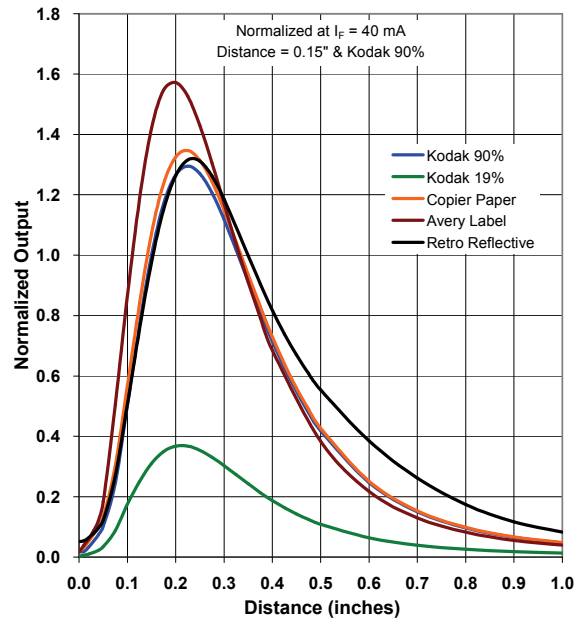
OPB703 through OPB705, OPB&03WZ through OPB705WZ, OPB701Wz through OPB70HWZ



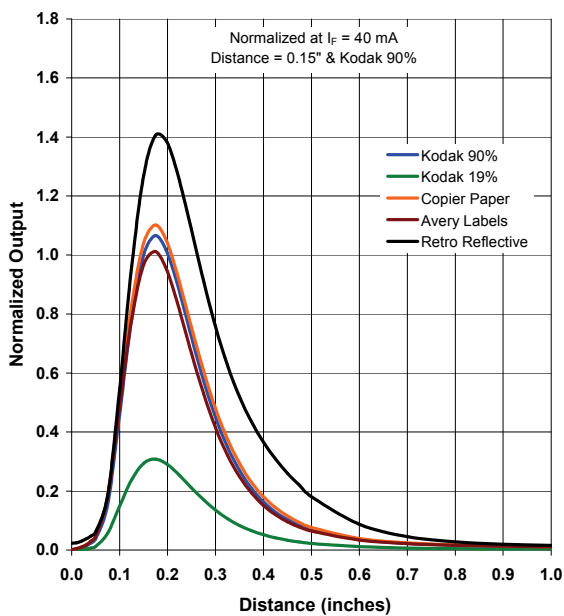
**OPB703 - Output vs Distance**



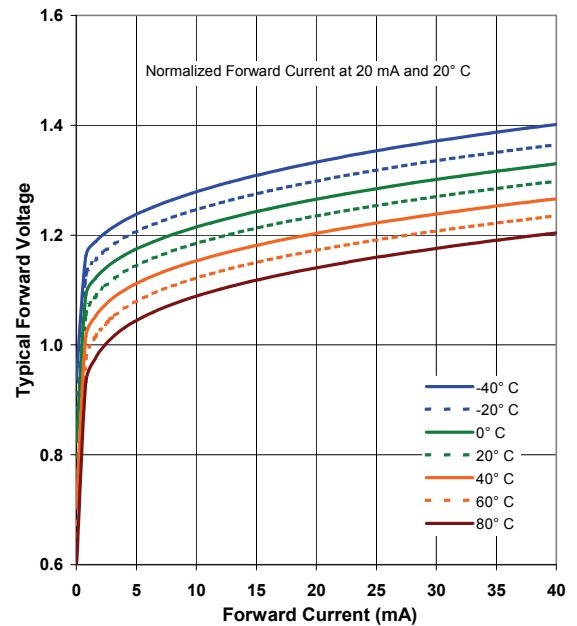
**OPB704 - Output vs Distance**



**OPB705 - Output vs Distance**



**Forward Voltage vs Forward Current vs Temp**

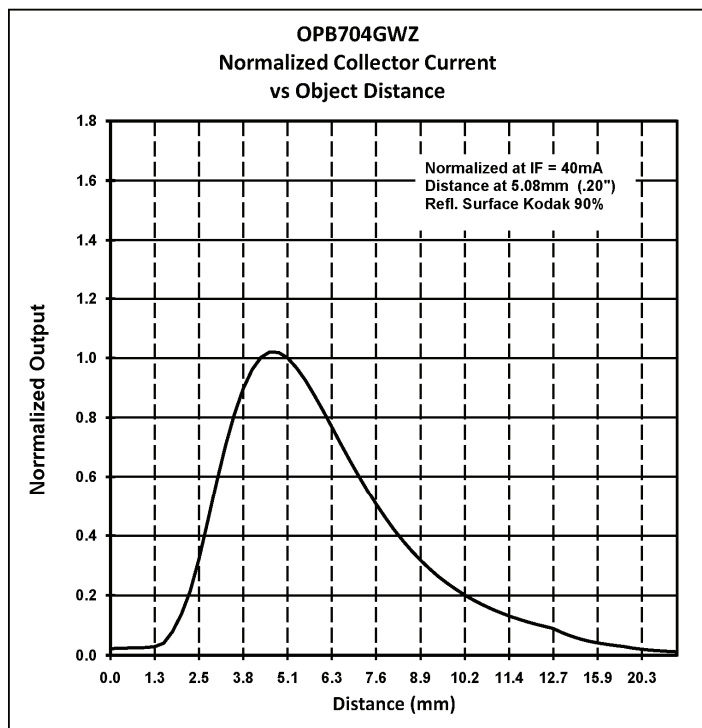


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