

# Infrared Products Selection Guide

July 2002

## Light Emitting Diodes

## Transmissive Opto Sensors

## Reflective Opto Sensors

## Photosensors

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- Absolute Maximum Ratings
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- Ordering Information
- Glossary of Terms
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## Frequently Asked Questions

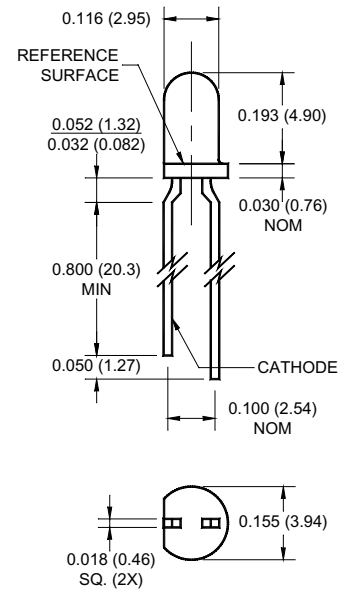
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# Plastic Light Emitting Diodes

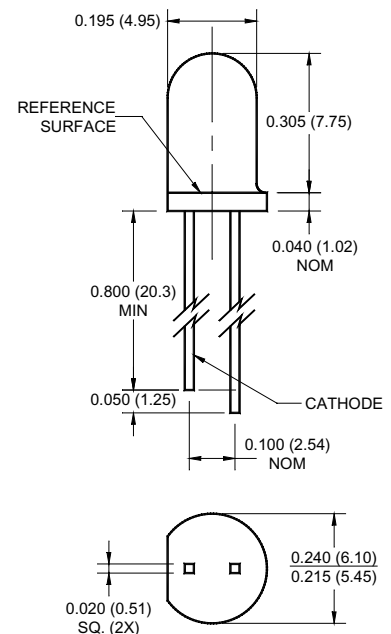
## T-1 (3 mm) Diode Package



All dimensions are in inches (millimeters)

Part Number	$I_e @ 100 \text{ mA } I_F$ (mW/sr)		$V_F @ 100 \text{ mA } I_F$ (V) max	$I_R @ 5 \text{ V } V_R$ ( $\mu\text{A}$ ) max	Emission Angle in Degrees ( $^\circ$ ) @ 1/2 Power	Wavelength (nm) $\lambda_p$
	min	max				
QEC112	6	30	1.7	10	24	940
QEC113	14	-	1.7	10	24	940
QEC121	14	-	1.9	10	16	880
QEC122	27	80	1.9	10	16	880
QEC123	39	-	1.9	10	16	880

## T-1 3/4 (5 mm) Diode Package

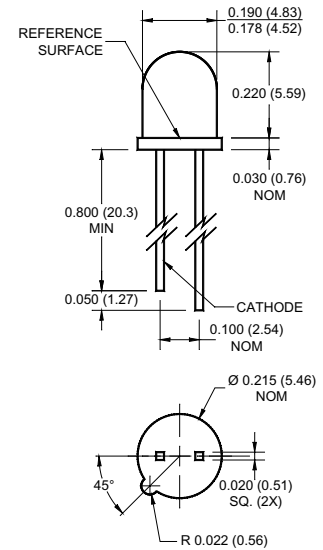


All dimensions are in inches (millimeters)

Part Number	$I_e @ 100 \text{ mA } I_F$ (mW/sr)		$V_F @ 100 \text{ mA } I_F$ (V) max	$I_R @ 5 \text{ V } V_R$ ( $\mu\text{A}$ ) max	Emission Angle in Degrees ( $^\circ$ ) @ 1/2 Power	Wavelength (nm) $\lambda_p$
	min	max				
QED233	10	50	1.6	10	40	940
QED234	27	-	1.6	10	40	940
QED633	15	-	1.6	10	55	940
QED634	20	-	1.6	10	55	940
QED121	16	40	1.9	10	18	880
QED122	32	100	1.9	10	18	880
QED123	50	-	1.9	10	18	880
QED221	10	20	1.9	10	40	880
QED222	16	32	1.9	10	40	880
QED223	25	-	1.9	10	40	880

# Plastic Light Emitting Diodes

## TO-46 (Plastic) Diode Package



Part Number	$I_e$ @ 100 mA $I_F$ (mW/sr)		$V_F$ @ 100 mA $I_F$ (V) max	$I_R$ @ 5 V $V_R$ ( $\mu$ A) max	Emission Angle in Degrees ( $^\circ$ ) @ 1/2 Power	Wavelength (nm) $\lambda_p$
	min	max				
QED422	10	40	1.9	10	30	880
QED423	20	-	1.9	10	30	880
QED522	20	80	1.9	10	20	880
QED523	40	-	1.9	10	20	880

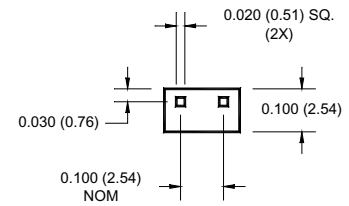
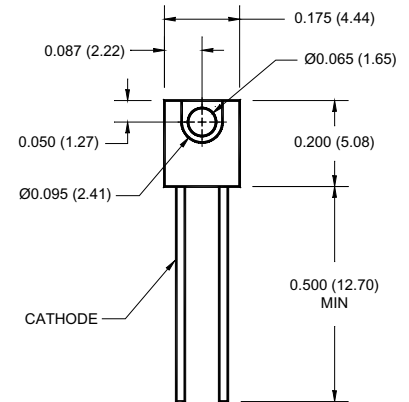
All dimensions are in inches (millimeters)

Absolute Maximum Ratings

PARAMETER	QEC	QED
<b>Temperature</b>		
$T_{OPR}$	-40 to +100 $^\circ$ C	-40 to +100 $^\circ$ C
$T_{STG}$	-40 to +100 $^\circ$ C	-40 to +100 $^\circ$ C
$T_{SOL-I}$	240 $^\circ$ C for 5 sec	240 $^\circ$ C for 5 sec
$T_{SOL-F}$	260 $^\circ$ C for 10 sec	260 $^\circ$ C for 10 sec
<b>LED</b>		
$I_F$	50 mA	100 mA
$V_R$	5.0 V	5.0 V
$P_D$	100 mW	200 mW

# Plastic Light Emitting Diodes

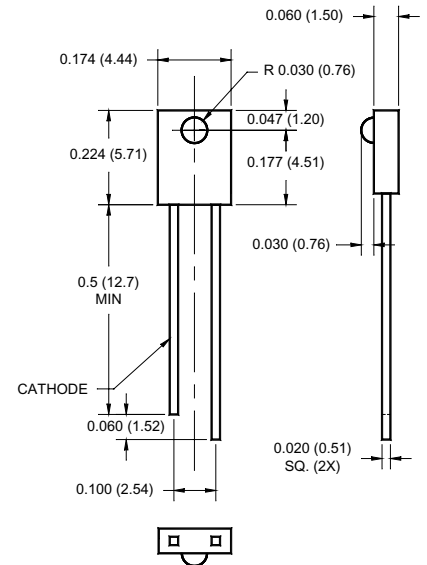
## Sidelooker Diode Package



All dimensions are in inches (millimeters)

Part Number	$I_e @ 100 \text{ mA } I_F$ (mW/sr)		$V_F @ 100 \text{ mA } I_F$ (V)	$I_R @ 5 \text{ V } V_R$ ( $\mu\text{A}$ )	Emission Angle in Degrees ( $^\circ$ ) @ 1/2 Power	Wavelength (nm) $\lambda_p$
	min	max	max	max		
QEE113	3	12	1.7	10	50	940
QEE122	4	16	1.9	10	50	880
QEE123	8	-	1.9	10	50	880

## Thin Sidelooker Diode Package

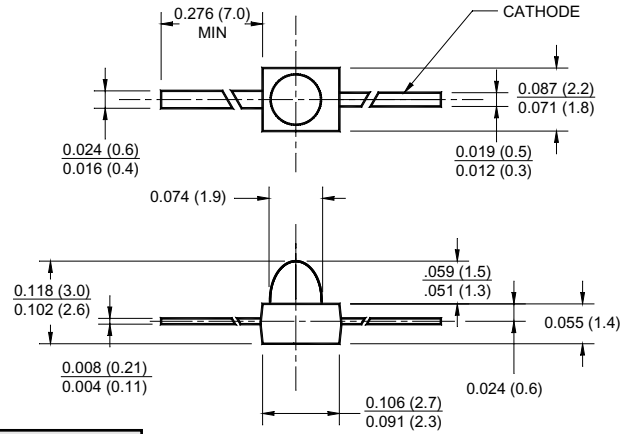
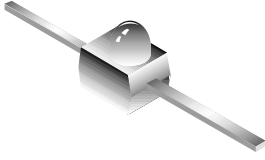


All dimensions are in inches (millimeters)

Part Number	$I_e @ 100 \text{ mA } I_F$ (mW/sr)		$V_F @ 100 \text{ mA } I_F$ (V)	$I_R @ 5 \text{ V } V_R$ ( $\mu\text{A}$ )	Emission Angle in Degrees ( $^\circ$ ) @ 1/2 Power	Wavelength (nm) $\lambda_p$
	min	max	max	max		
QEE213	2	-	1.7	10	50	940

# Surface Mount Light Emitting Diodes

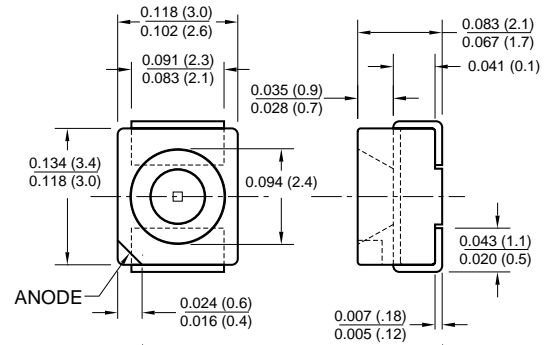
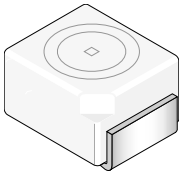
## T-3/4 (2 mm) Diode Package



Part Number	$I_e$ @ 100 mA $I_F$ (mW/sr)		$V_F$ @ 100 mA $I_F$ (V)	$I_R$ @ 5 V $V_R$ ( $\mu$ A)	Emission Angle in Degrees ( $^\circ$ ) @ 1/2 Power	Wavelength (nm) $\lambda_p$
	min	max	max	max		
QEB363	8	-	1.7	100	24	940
QEB373	16	-	1.9	100	24	880

All dimensions are in inches (millimeters)

## PLCC-2 Diode Package



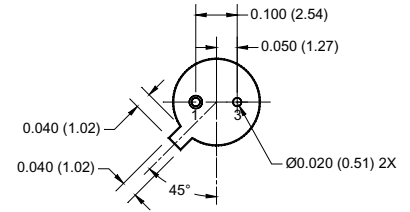
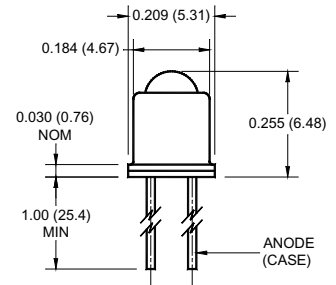
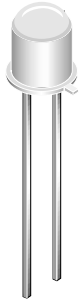
Part Number	$I_e$ @ 100 mA $I_F$ (mW/sr)		$V_F$ @ 100 mA $I_F$ (V)		$I_R$ @ 5 V $V_R$ ( $\mu$ A)	Emission Angle in Degrees ( $^\circ$ ) @ 1/2 Power	Wavelength (nm) $\lambda_p$
	min	max	typ	max	max		
QEB421	4	8	1.5	1.8	1.0	120	880
QEB441	2	6	2.1	-	10.0	120	730

All dimensions are in inches (millimeters)

PARAMETER	QEB3XX	QEB4XX	QEE
	<b>Temperature</b>		
$T_{OPR}$	-40 to +85 $^\circ$ C	-55 to +100 $^\circ$ C	-40 to +100 $^\circ$ C
$T_{STG}$	-40 to +85 $^\circ$ C	-55 to +100 $^\circ$ C	-40 to +100 $^\circ$ C
$T_{SOL-I}$	240 $^\circ$ C for 5 sec	NA	240 $^\circ$ C for 5 sec
$T_{SOL-F}$	260 $^\circ$ C for 10 sec	260 $^\circ$ C for 10 sec	260 $^\circ$ C for 10 sec
<b>LED</b>			
$I_F$	50 mA	100 mA	50 mA
$V_R$	5.0 V	5.0 V	5.0 V
$P_D$	100 mW	180 mW	100 mW

# Hermetic Light Emitting Diodes

## TO-46 Diode Package (Convex Lens)

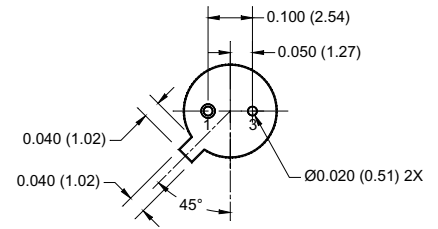
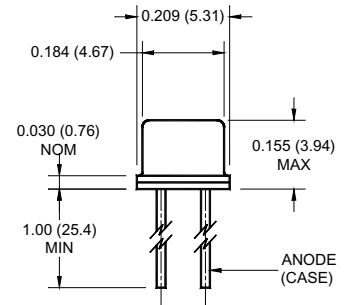
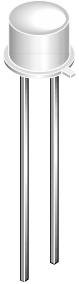


Part Number	$P_O @ 100 \text{ mA } I_F$ (mW)		$V_F @ 100 \text{ mA } I_F$ (V)	$I_R @ 3 \text{ V } V_R$ ( $\mu\text{A}$ )	Emission Angle in Degrees ( $^\circ$ ) @ 1/2 Power	Wavelength (nm) $\lambda_p$
	min	max	max	max		
1N6264	6.00	-	1.7	10	16	940
CGX14	5.40	-	1.7	10	16	940
CGX16	1.50	-	1.7	10	16	940
LED55B	3.50	-	1.7	10	16	940
LED55C	5.40	-	1.7	10	16	940
LED56	1.50	-	1.7	10	16	940
F5D1	12.00	-	1.8	10	16	880
F5D2	9.00	-	1.8	10	16	880
F5D3	10.50	-	1.8	10	16	880

All dimensions are in inches (millimeters)

# Hermetic Light Emitting Diodes

## TO-46 Diode Package (Flat Lens)



Part Number	$P_O @ 100 \text{ mA } I_F$ (mW)		$V_F @ 100 \text{ mA } I_F$ (V)	$I_R @ 3 \text{ V } V_R$ ( $\mu\text{A}$ )	Emission Angle in Degrees ( $^\circ$ ) @ 1/2 Power	Wavelength (nm) $\lambda_p$
	min	max	max	max		
1N6265	6.00	-	1.7	10	80	940
CQX15	5.40	-	1.7	10	80	940
CQX17	1.50	-	1.7	10	80	940
LED55BF	3.50	-	1.7	10	80	940
LED55CF	5.40	-	1.7	10	80	940
LED56F	1.50	-	1.7	10	80	940
F5E1	12.00	-	1.8	10	80	880
F5E2	9.00	-	1.8	10	80	880
F5E3	10.50	-	1.8	10	80	880

All dimensions are in inches (millimeters)

Absolute Maximum Ratings

### PARAMETER 1N, CQX, LED, F5

#### Temperature

$T_{OPR}$	-65 to +125 $^\circ\text{C}$
$T_{STG}$	-65 to +150 $^\circ\text{C}$
$T_{SOL-L}$	240 $^\circ\text{C}$ for 5 sec
$T_{SOL-F}$	260 $^\circ\text{C}$ for 10 sec

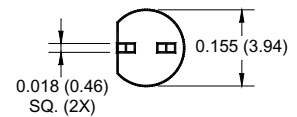
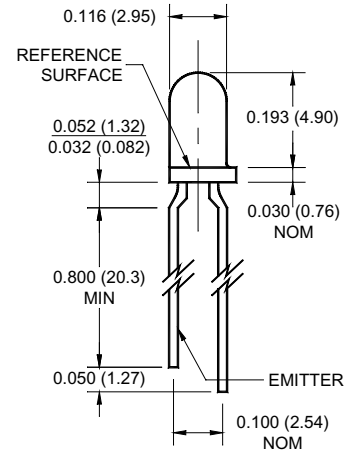
#### LED

$I_F$	100 mA
$I_R$	3.0 V
$P_D$	170 mW



# Plastic Silicon Photosensors

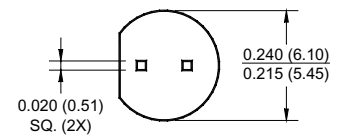
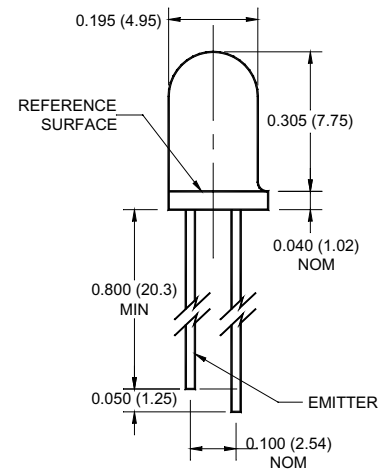
## T-1 (3 mm) Detector Package



All dimensions are in inches (millimeters)

Part Number	V <sub>CE</sub> (V)	Test Conditions		I <sub>C</sub> (ON) (mA)		BV <sub>CEO</sub> (V) max	I <sub>CEO</sub> @ 10 V V <sub>CE</sub> (nA) max	Sensor Type
		E <sub>e</sub> (mW/cm <sup>2</sup> )	λ <sub>p</sub> (nm)	min	max			
QSC112	5	0.5	880 AlGaAs	1.00	4.00	30	100	Phototransistor
QSC113	5	0.5	880 AlGaAs	2.40	9.60	30	100	Phototransistor
QSC114	5	0.5	880 AlGaAs	4.00	–	30	100	Phototransistor
QSC133	5	0.25	880 AlGaAs	8.00	–	30	100	Photodarlington

## T-1 3/4 (5 mm) Detector Package

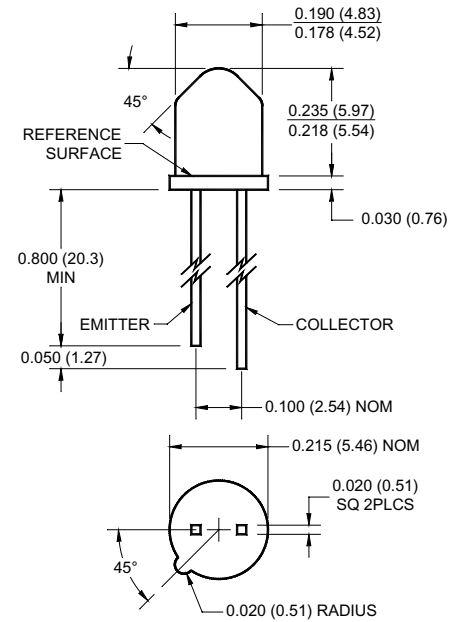


All dimensions are in inches (millimeters)

Part Number	V <sub>CE</sub> (V)	Test Conditions		I <sub>C</sub> (ON) (mA)		BV <sub>CEO</sub> (V) max	I <sub>CEO</sub> @ 10 V V <sub>CE</sub> (nA) max	Sensor Type
		E <sub>e</sub> (mW/cm <sup>2</sup> )	λ <sub>p</sub> (nm)	min	max			
QSD122	5	0.5	880 AlGaAs	1.00	6.00	30	100	Phototransistor
QSD123	5	0.5	880 AlGaAs	4.00	16.00	30	100	Phototransistor
QSD124	5	0.5	880 AlGaAs	6.00	–	30	100	Phototransistor

# Plastic Silicon Photosensors

## TO-18 Detector (Plastic Package)



All dimensions are in inches (millimeters)

Part Number	V <sub>CE</sub> (V)	Test Conditions		I <sub>c</sub> (ON) (mA)		BV <sub>CEO</sub> (V) max	I <sub>CEO</sub> @ 10 V V <sub>CE</sub> (nA) max	Sensor Type
		E <sub>e</sub> (mW/cm <sup>2</sup> )	λ <sub>p</sub> (nm)	min	max			
QSD722	5	0.5	880 AlGaAs	0.60	3.80	30	100	Phototransistor
QSD723	5	0.5	880 AlGaAs	2.50	10.00	30	100	Phototransistor
QSD724	5	0.5	880 AlGaAs	3.50	–	30	100	Phototransistor
QSD733	5	0.25	880 AlGaAs	10.00	–	30	100	Photodarlington

Absolute Maximum Ratings

### PARAMETER QSC, QSD

#### Temperature

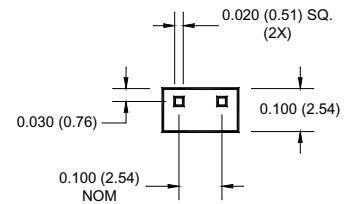
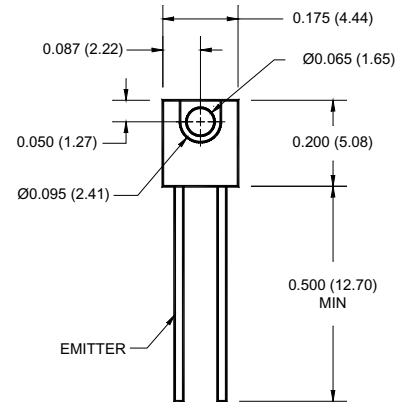
T <sub>OPR</sub>	–40 to +100°C
T <sub>STG</sub>	–40 to +100°C
T <sub>SOL-I</sub>	240°C for 5 sec
T <sub>SOL-F</sub>	260°C for 10 sec

#### Sensor

V <sub>CEO</sub>	30 V
V <sub>ECC</sub>	5.0 V
P <sub>D</sub>	100 mW

# Plastic Silicon Photosensors

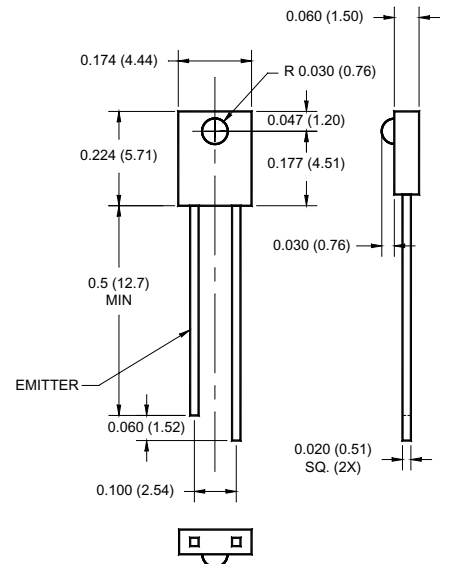
## Sidelooker Detector Package



All dimensions are in inches (millimeters)

Part Number	Test Conditions			$I_C$ (ON) (mA)		$BV_{CEO}$ (V)	$I_{CEO}$ @ 10 V $V_{CE}$ (nA)	Sensor Type
	$V_{CE}$ (V)	$E_e$ (mW/cm <sup>2</sup> )	$\lambda_p$ (nm)	min	max	max	max	
QSE113	5	0.5	880 AlGaAs	0.25	1.50	30	100	Phototransistor
QSE114	5	0.5	880 AlGaAs	1.00	–	30	100	Phototransistor
QSE122	5	0.5	880 AlGaAs	3.00	12.00	30	100	Phototransistor
QSE133	5	0.25	880 AlGaAs	9.00	–	30	100	Photodarlington

## Thin Sidelooker Detector Package

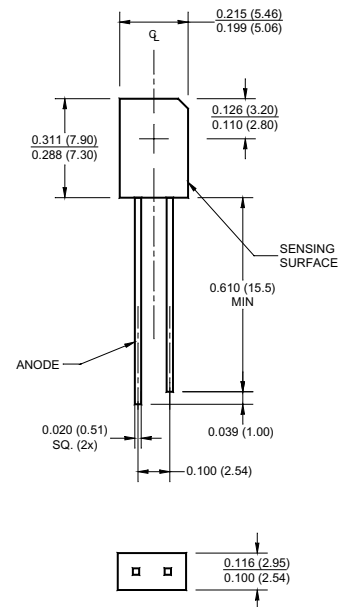


All dimensions are in inches (millimeters)

Part Number	Test Conditions			$I_C$ (ON) (mA)		$BV_{CEO}$ (V)	$I_{CEO}$ @ 25 V $V_{CE}$ (nA)	Sensor Type
	$V_{CE}$ (V)	$E_e$ (mW/cm <sup>2</sup> )	$\lambda_p$ (nm)	min	max	max	max	
QSE213	5	0.5	950 GaAs	0.2	1.50	30	100	Phototransistor
QSE214	5	0.5	950 GaAs	1.0	–	30	100	Phototransistor

# Plastic Silicon Photosensors

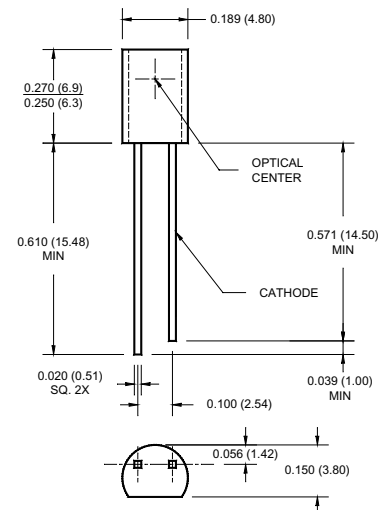
## Sidelooker Detector Package (No Lens)



All dimensions are in inches (millimeters)

Part Number	Test Conditions			$I_L$ ( $\mu A$ )		$I_{RD}$ @ 10 V $V_R$ (nA) max	Radiant Sensitive Area ( $mm^2$ )	Sensor Type
	$V_R$ (V)	$E_e$ ( $mW/cm^2$ )	$\lambda_p$ (nm)	min	max			
QSE773	5	1.0	940 GaAs	30.0	-	30	2.71 x 2.71	Photodiode

## TO-92 Detector Package



All dimensions are in inches (millimeters)

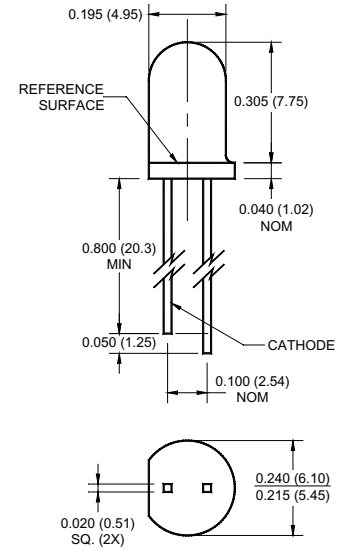
Part Number	Test Conditions			$I_L$ ( $\mu A$ )		$I_{RD}$ @ 10 V $V_R$ (nA) max	Radiant Sensitive Area ( $mm^2$ )	Sensor Type
	$V_R$ (V)	$E_e$ ( $mW/cm^2$ )	$\lambda_p$ (nm)	min	max			
QSE973	5	1.0	940 GaAs	30.0	-	30	2.71 x 2.71	Photodiode

Absolute Maximum Ratings	PARAMETER	QSE11X, 21X	
	<b>Temperature</b>		
	$T_{OPR}$	-40 to +100°C	
	$T_{STG}$	-40 to +100°C	
	$T_{SOL-H}$	240°C for 5 sec	
	$T_{SOL-F}$	260°C for 10 sec	
	<b>Sensor</b>		
$V_{CEO}$	30 V		
$V_{ECO}$	5.0 V		
$P_D$	100 mW		

Absolute Maximum Ratings	PARAMETER	QSE773, 993	
	<b>Temperature</b>		
	$T_{OPR}$	-40 to +85°C	
	$T_{STG}$	-40 to +85°C	
	$T_{SOL-H}$	240°C for 5 sec	
	$T_{SOL-F}$	260°C for 10 sec	
	<b>Diode</b>		
$I_F$	NA		
$V_R$	30 V		
$P_D$	150 mW		

# Plastic Silicon Photosensors

## T-1<sup>3</sup>/<sub>4</sub> (5 mm) Diode Package



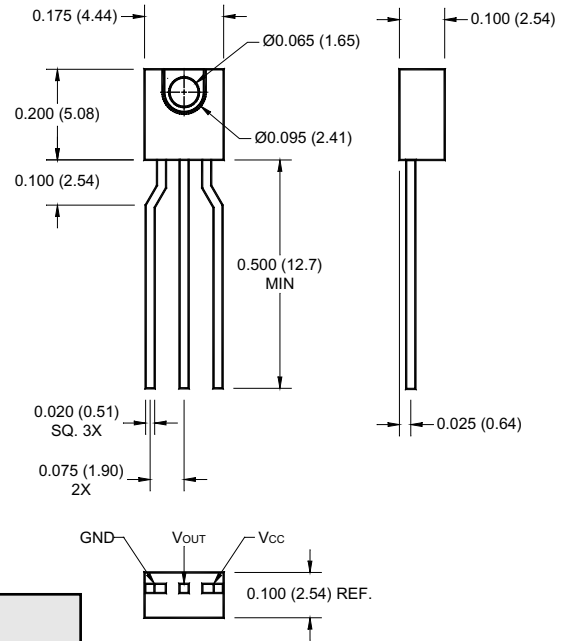
Part Number	Test Conditions			$I_L$ ( $\mu A$ )		$I_{RD}$ @ 20 V $V_R$ (nA) max	Radiant Sensitive Area ( $mm^2$ )	Sensor Type
	$V_R$ (V)	$E_e$ ( $mW/cm^2$ )	$\lambda_p$ (nm)	min	max			
QSD2030	5	0.5	950 GaAs	15.0	—	5	1.0 x 1.0	Photodiode

All dimensions are in inches (millimeters)

Absolute Maximum Ratings	PARAMETER	QSD	
	<b>Temperature</b>		
	$T_{OPR}$	-40 to +100°C	
	$T_{STG}$	-40 to +100°C	
	$T_{SOLH}$	240°C for 5 sec	
	$T_{SOLF}$	260°C for 10 sec	
	<b>Diode</b>		
	$I_F$	NA	
	$V_R$	50 V	
	$P_D$	100 mW	

# Plastic Silicon OPTOLOGIC® Photosensors

## Sidelooker OPTOLOGIC® Package



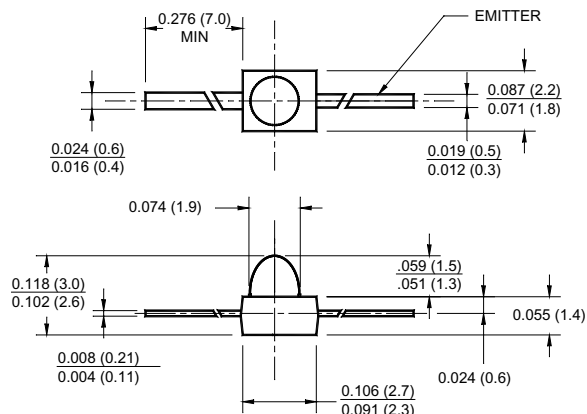
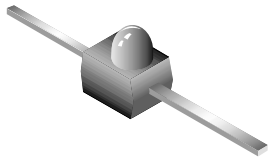
Part Number	Test Conditions (nm) $\lambda_p$	$E_{e+}$ (mW/cm <sup>2</sup> ) max	$E_{e+}/E_{e-}$ typ	$V_{OL}$ (V) max	$I_{CC}$ (mA) max	Sensor Type
QSE156	880 AlGaAs	0.250	1.2	0.40	5	Buffer Totem Pole
QSE157	880 AlGaAs	0.250	1.2	0.40	5	Inverter Totem Pole
QSE158	880 AlGaAs	0.250	1.2	0.40	5	Buffer Open Collector
QSE159	880 AlGaAs	0.250	1.2	0.40	5	Inverter Open Collector

All dimensions are in inches (millimeters)

Absolute Maximum Ratings	PARAMETER	QSE	
	<b>Temperature</b>		
	$T_{OPR}$	-40 to +85°C	
	$T_{STG}$	-40 to +100°C	
	$T_{SOLH}$	240°C for 5 sec	
	$T_{SOLF}$	260°C for 10 sec	
	<b>Sensor</b>		
	$I_O$	50 mA	
	$V_{CC}$	16 V	
	$P_D$	100 mW	

# Surface Mount Silicon Photosensors

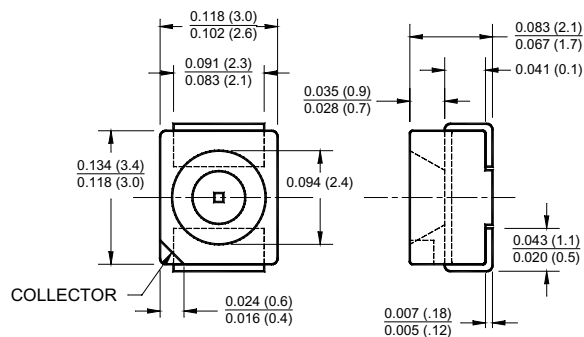
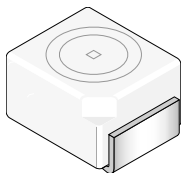
## T-3/4 (2 mm) Detector Package



All dimensions are in inches (millimeters)

Part Number	Test Conditions			$I_C$ (ON)		$BV_{CEO}$	$I_{CEO}$ @ 10 V $V_{CE}$	Sensor Type
	$V_{CE}$ (V)	$E_e$ (mW/cm <sup>2</sup> )	$\lambda_p$ (nm)	min	max	max	max	
QSB363	5	0.5	880 AlGaAs	0.7	-	30	100	Phototransistor

## PLCC-2 Detector Package



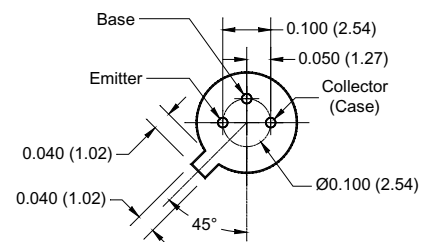
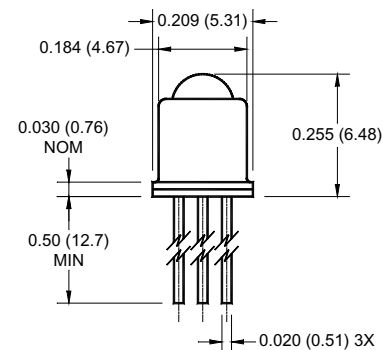
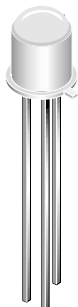
All dimensions are in inches (millimeters)

Part Number	Test Conditions			$I_C$ (ON)		$BV_{CEO}$	$I_{CEO}$ @ 25 V $V_{CE}$	Sensor Type
	$V_{CE}$ (V)	$E_e$ (mW/cm <sup>2</sup> )	$\lambda_p$ (nm)	min	max	max	max	
QSB320	5	0.1	880 AlGaAs	16	-	30	200	Phototransistor

Absolute Maximum Ratings	PARAMETER	QSB320	QSB363	
	<b>Temperature</b>			
	$T_{OPR}$	-55 to +100°C	-40 to +85°C	
	$T_{STG}$	-55 to +100°C	-40 to +85°C	
	$T_{SOL-I}$	NA	240°C for 5 sec	
	$T_{SOL-F}$	260°C for 10 sec	260°C for 10 sec	
	<b>Sensor</b>			
	$V_{CEO}$	35 V	30 V	
	$V_{ECO}$	5.0 V	5.0 V	
	$P_D$	165 mW	100 mW	

# Hermetic Silicon Photosensors

## TO-18 Detector Package (Convex Lens)



Part Number	V <sub>CE</sub> (V)	Test Conditions		I <sub>C</sub> (ON) (mA)		BV <sub>CEO</sub> (V) max	I <sub>CEO</sub> @ 10 V V <sub>CE</sub> (nA) max	Sensor Type
		E <sub>o</sub> (mW/cm <sup>2</sup> )	λ <sub>p</sub> (nm)	min	max			
BPW36	5	0.5	940 GaAs	1.00	-	30	100	Phototransistor
BPW37	5	0.5	940 GaAs	0.50	-	30	100	Phototransistor
L14G1	5	0.5	940 GaAs	1.00	-	30	100	Phototransistor
L14G2	5	0.5	940 GaAs	0.50	-	30	100	Phototransistor
L14G3	5	0.5	940 GaAs	2.00	-	30	100	Phototransistor
L14P1	5	0.5	940 GaAs	6.50	-	30	100	Phototransistor
L14P2	5	0.5	940 GaAs	13.0	-	30	100	Phototransistor

Part Number	V <sub>CE</sub> (V)	Test Conditions		I <sub>C</sub> (ON) (mA)		BV <sub>CEO</sub> (V) max	I <sub>CEO</sub> @ 12 V V <sub>CE</sub> (nA) max	Sensor Type
		E <sub>o</sub> (mW/cm <sup>2</sup> )	λ <sub>p</sub> (nm)	min	max			
BPW38	5	0.05	940 GaAs	3.00	-	25	100	Photodarlington
L14F1	5	0.05	940 GaAs	3.00	-	25	100	Photodarlington
L14F2	5	0.05	940 GaAs	1.00	-	25	100	Photodarlington

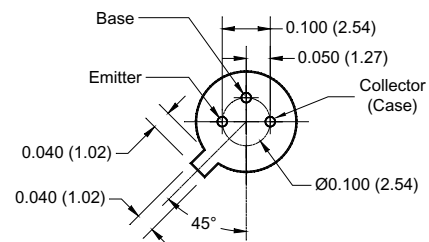
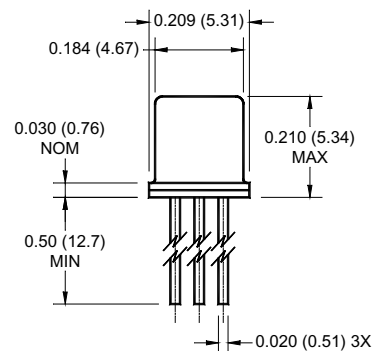
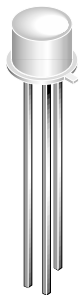
All dimensions are in inches (millimeters)

PARAMETER	BPW38, L14F	L14G/P, BPW36/7
	<b>Absolute Maximum Ratings</b>	
<b>Temperature</b>		
T <sub>OPR</sub>	-65 to +125°C	-65 to +125°C
T <sub>STG</sub>	-65 to +150°C	-65 to +150°C
T <sub>SOL-H</sub>	240°C for 5 sec	240°C for 5 sec
T <sub>SOL-F</sub>	260°C for 10 sec	260°C for 10 sec
<b>Sensor</b>		
V <sub>CEO</sub>	25 V	30 V
V <sub>CBO</sub>	25 V	40 V
V <sub>EBO</sub>	12.0 V	5.0 V
P <sub>D</sub>	300 mW	300 mW



# Hermetic Silicon Photosensors

## TO-18 Detector Package (Flat Lens)



Part Number	V <sub>CE</sub> (V)	Test Conditions		I <sub>C(ON)</sub> (mA)		BV <sub>CEO</sub> (V) max	I <sub>CEO</sub> @ 20 V V <sub>CE</sub> (nA) max	Sensor Type
		E <sub>e</sub> (mW/cm <sup>2</sup> )	λ <sub>p</sub> (nm)	min	max			
L14C1	5	0.5	940 GaAs	0.16	-	30	100	Phototransistor
L14C2	5	0.5	940 GaAs	0.08	-	30	100	Phototransistor

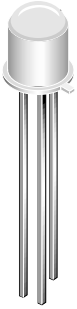
Part Number	V <sub>CE</sub> (V)	Test Conditions		I <sub>C(ON)</sub> (mA)		BV <sub>CEO</sub> (V) max	I <sub>CEO</sub> @ 20 V V <sub>CE</sub> (nA) max	Sensor Type
		E <sub>e</sub> (mW/cm <sup>2</sup> )	λ <sub>p</sub> (nm)	min	max			
L14N1	5	0.5	940 GaAs	1.00	-	30	100	Phototransistor
L14N2	5	0.5	940 GaAs	2.00	-	30	100	Phototransistor

All dimensions are in inches (millimeters)

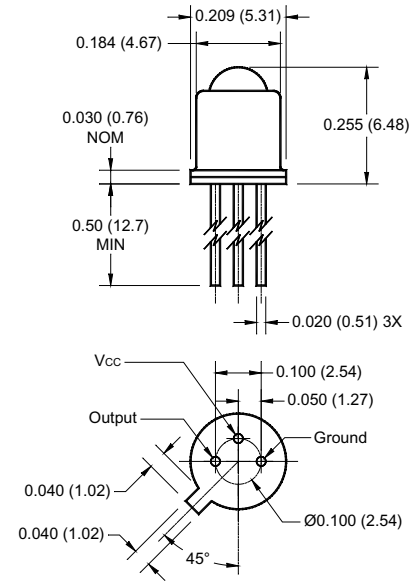
Absolute Maximum Ratings	PARAMETER	L14C/N	
	<b>Temperature</b>		
	T <sub>OPR</sub>	-65 to +125°C	
	T <sub>STG</sub>	-65 to +150°C	
	T <sub>SOLH</sub>	240°C for 5 sec	
	T <sub>SOLF</sub>	260°C for 10 sec	
	<b>Sensor</b>		
	V <sub>CEO</sub>	30 V	
	V <sub>CBO</sub>	40 V	
	V <sub>EBO</sub>	5.0 V	
P <sub>D</sub>	300 mW		

# Hermetic Silicon Photosensors

## TO-18 OPTOLOGIC® Package



Part Number	Test Conditions (nm) $\lambda_p$	$E_{e+}$ (mW/cm <sup>2</sup> ) max	$E_{e+}/E_{e-}$ typ	$V_{OL}$ (V) max	$I_{CC}$ (mA) max	Sensor Type
QSA156	880 AlGaAs	0.250	1.2	0.40	5	Buffer Totem Pole
QSA157	880 AlGaAs	0.250	1.2	0.40	5	Inverter Totem Pole
QSA158	880 AlGaAs	0.250	1.2	0.40	5	Buffer Open Collector
QSA159	880 AlGaAs	0.250	1.2	0.40	5	Inverter Open Collector

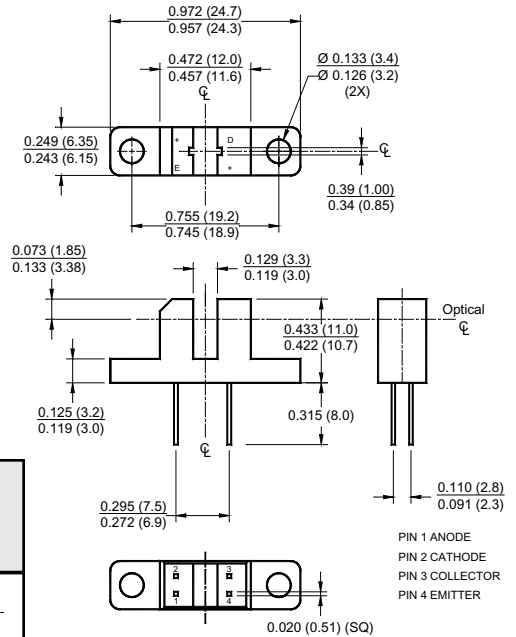
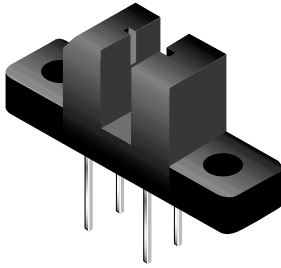


All dimensions are in inches (millimeters)

Absolute Maximum Ratings	PARAMETER	QSA	
	<b>Temperature</b>		
	$T_{OPR}$	-55 to +105°C	
	$T_{STG}$	-65 to +125°C	
	$T_{SOL-H}$	240°C for 5 sec	
	$T_{SOL-F}$	260°C for 10 sec	
	<b>Sensor</b>		
	$I_D$	50 mA	
	$V_{CC}$	16 V	
	$P_D$	250 mW	

# Transmissive Opto Sensors

## Slotted Switch H21 (Analog – Standard Resolution)



Part Number	Test Conditions		$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Aperture Width (mm)		Gap Width (mm)
	$I_F$ (mA)	$V_{CE}$ (V)				Emitter	Sensor	
CNY28	20	10	0.2	30	Phototransistor	0.94	0.94	3.15
CNY29	20	10	2.50	25	Photodarlington	0.94	0.94	3.15
H21A1	20	5	1.00	30	Phototransistor	0.94	0.94	3.15
H21A2	20	5	2.00	30	Phototransistor	0.94	0.94	3.15
H21A3	20	5	4.00	30	Phototransistor	0.94	0.94	3.15
H21A4	20	5	1.00	55	Phototransistor	0.94	0.94	3.15
H21A5	20	5	2.00	55	Phototransistor	0.94	0.94	3.15
H21A6	20	5	4.00	55	Phototransistor	0.94	0.94	3.15
H21B1	10	1.5	7.50	30	Photodarlington	0.94	0.94	3.15
H21B2	10	1.5	14.00	30	Photodarlington	0.94	0.94	3.15
H21B3	10	1.5	25.00	30	Photodarlington	0.94	0.94	3.15
H21B4	10	1.5	7.50	55	Photodarlington	0.94	0.94	3.15
H21B5	10	1.5	14.00	55	Photodarlington	0.94	0.94	3.15
H21B6	10	1.5	25.00	55	Photodarlington	0.94	0.94	3.15

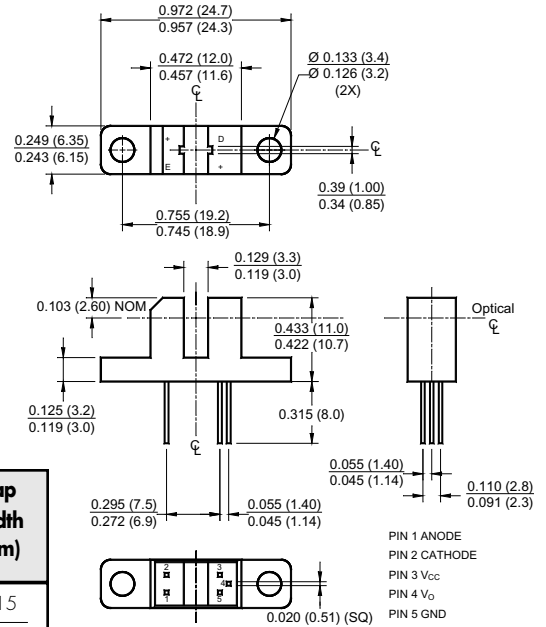
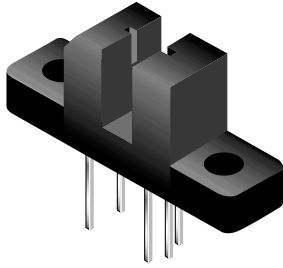
All dimensions are in inches (millimeters)

PARAMETER	CNY28	CNY29	H21A1-A3	H21A4-A6	H21B1-B3	H21B4-B6
	<b>Temperature</b>					
$T_{OPR}$	-55 to +85°C	-55 to +85°C	-55 to +100°C	-55 to +100°C	-55 to +100°C	-55 to +100°C
$T_{STG}$	-55 to +85°C	-55 to +85°C	-55 to +100°C	-55 to +100°C	-55 to +100°C	-55 to +100°C
$T_{SOL-H}$	240°C for 5 sec for all devices					
$T_{SOL-F}$	260°C for 10 sec for all devices					
<b>Input Diode</b>						
$I_F$	60 mA	60 mA	60 mA	60 mA	60 mA	60 mA
$V_R$	3.0 V	3.0 V	6.0 V	6.0 V	6.0 V	6.0 V
$P_D$	100 mW	100 mW	100 mW	100 mW	100 mW	100 mW
<b>Output Transistor</b>						
$V_{CEO}$	30 V	30 V	30 V	55 V	30 V	55 V
$V_{ECO}$	4.5 V	6.0 V	4.5 V	4.5 V	6.0 V	6.0 V
$I_C$	20 mA	40 mA	20 mA	20 mA	40 mA	40 mA
$P_D$	150 mW	150 mW	150 mW	150 mW	150 mW	150 mW

Absolute Maximum Ratings

# Transmissive Opto Sensors

## Slotted Switch Logic H21 (OPTOLOGIC® – Standard Resolution)



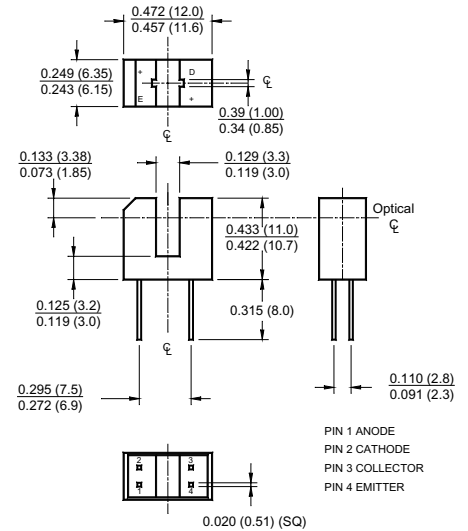
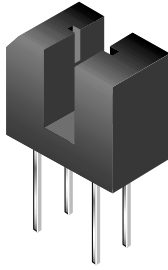
Part Number	Test Conditions V <sub>CC</sub> (V)	I <sub>F+</sub> (mA) max	I <sub>CC</sub> (mA) max	Output	Aperture Width (mm)		Gap Width (mm)
					Emitter	Sensor	
H21LTB	5	15	5.0	Buffer Totem Pole	0.94	0.94	3.15
H21LTI	5	15	5.0	Inverter Totem Pole	0.94	0.94	3.15
H21LOB	5	15	5.0	Buffer Open Collector	0.94	0.94	3.15
H21LOI	5	15	5.0	Inverter Open Collector	0.94	0.94	3.15

All dimensions are in inches (millimeters)

Absolute Maximum Ratings	PARAMETER	H21L	
	<b>Temperature</b>		
	T <sub>OPR</sub>	-40 to +85°C	
	T <sub>STG</sub>	-40 to +85°C	
	T <sub>SOL-I</sub>	240°C for 5 sec	
	T <sub>SOL-F</sub>	260°C for 10 sec	
	<b>Input Diode</b>		
	I <sub>F</sub>	50 mA	
	V <sub>R</sub>	6.0 V	
	P <sub>D</sub>	100 mW	
	<b>Output Optologic®</b>		
	I <sub>O</sub>	50 mA	
V <sub>CC</sub>	4.0 – 16 V		
V <sub>O</sub>	30 V		
P <sub>D</sub>	150 mW		

# Transmissive Opto Sensors

## Slotted Switch H22 (Analog – Standard Resolution)



Part Number	Test Conditions		I <sub>C</sub> (ON) (mA) min	BV <sub>CEO</sub> (V) min	Output	Aperture Width (mm)		Gap Width (mm)
	I <sub>F</sub> (mA)	V <sub>CE</sub> (V)				Emitter	Sensor	
CNY36	20	10	0.2	30	Phototransistor	0.94	0.94	3.15
H22A1	20	5	1.00	30	Phototransistor	0.94	0.94	3.15
H22A2	20	5	2.00	30	Phototransistor	0.94	0.94	3.15
H22A3	20	5	4.00	30	Phototransistor	0.94	0.94	3.15
H22A4	20	5	1.00	55	Phototransistor	0.94	0.94	3.15
H22A5	20	5	2.00	55	Phototransistor	0.94	0.94	3.15
H22A6	20	5	4.00	55	Phototransistor	0.94	0.94	3.15
H22B1	10	1.5	7.50	30	Photodarlington	0.94	0.94	3.15
H22B2	10	1.5	14.00	30	Photodarlington	0.94	0.94	3.15
H22B3	10	1.5	25.00	30	Photodarlington	0.94	0.94	3.15
H22B4	10	1.5	7.50	55	Photodarlington	0.94	0.94	3.15
H22B5	10	1.5	14.00	55	Photodarlington	0.94	0.94	3.15
H22B6	10	1.5	25.00	55	Photodarlington	0.94	0.94	3.15

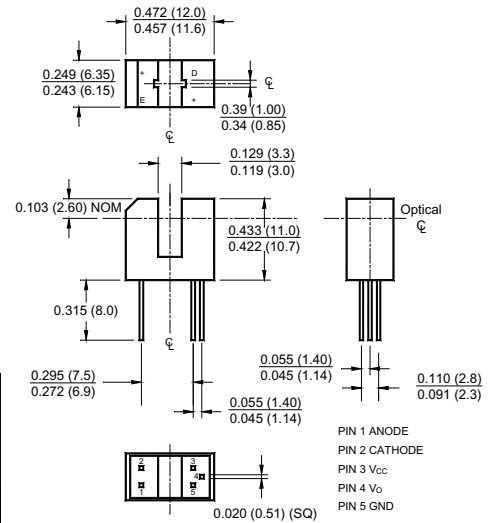
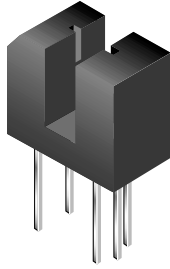
All dimensions are in inches (millimeters)

PARAMETER	CNY	H22A1-A3	H22A4-A6	H21B1-B3	H22B4-B6
	<b>Temperature</b>				
T <sub>OPR</sub>	-55 to +85°C	-55 to +100°C	-55 to +100°C	-55 to +100°C	-55 to +100°C
T <sub>STG</sub>	-55 to +85°C	-55 to +100°C	-55 to +100°C	-55 to +100°C	-55 to +100°C
T <sub>SOL-H</sub>	240°C for 5 sec for all devices				
T <sub>SOL-F</sub>	260°C for 10 sec for all devices				
<b>Input Diode</b>					
I <sub>F</sub>	60 mA	60 mA	60 mA	60 mA	60 mA
V <sub>R</sub>	3.0 V	6.0 V	6.0 V	6.0 V	6.0 V
P <sub>D</sub>	100 mW	100 mW	100 mW	100 mW	100 mW
<b>Output Transistor</b>					
V <sub>CEO</sub>	30 V	30 V	55 V	30 V	55 V
V <sub>ECC</sub>	4.5 V	4.5 V	4.5 V	6.0 V	6.0 V
I <sub>C</sub>	20 mA	20 mA	20 mA	40 mA	40 mA
P <sub>D</sub>	150 mW	150 mW	150 mW	150 mW	150 mW

Absolute Maximum Ratings

# Transmissive Opto Sensors

## Slotted Switch Logic H22 (OPTOLOGIC® – Standard Resolution)



All dimensions are in inches (millimeters)

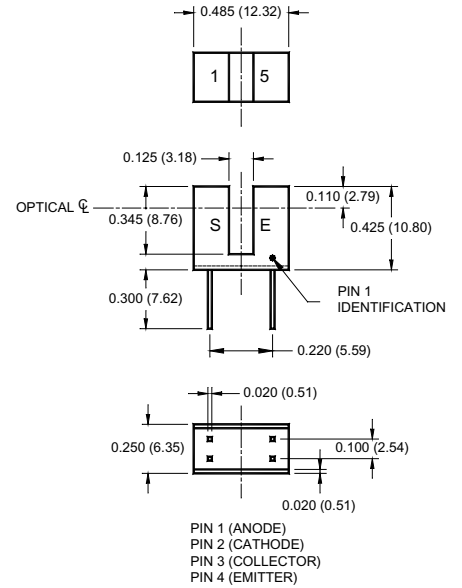
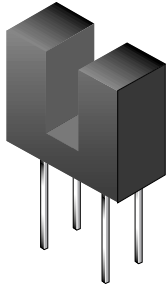
Part Number	Test Conditions V <sub>CC</sub> (V)	I <sub>F+</sub> (mA) max	I <sub>CC</sub> (mA) max	Output	Aperture Width (mm)		Gap Width (mm)
					Emitter	Sensor	
H22LTB	5	15	5.0	Buffer Totem Pole	0.94	0.94	3.15
H22LTI	5	15	5.0	Inverter Totem Pole	0.94	0.94	3.15
H22LOB	5	15	5.0	Buffer Open Collector	0.94	0.94	3.15
H22LOI	5	15	5.0	Inverter Open Collector	0.94	0.94	3.15

Absolute Maximum Ratings

PARAMETER	H22L
<b>Temperature</b>	
T <sub>OPR</sub>	-40 to +85°C
T <sub>STG</sub>	-40 to +85°C
T <sub>SOL-H</sub>	240°C for 5 sec
T <sub>SOL-F</sub>	260°C for 10 sec
<b>Input Diode</b>	
I <sub>F</sub>	50 mA
V <sub>R</sub>	6.0 V
P <sub>D</sub>	100 mW
<b>Output Optologic®</b>	
I <sub>O</sub>	50 mA
V <sub>CC</sub>	4.0 – 16 V
V <sub>O</sub>	30 V
P <sub>D</sub>	150 mW

# Transmissive Opto Sensors

## Slotted Switch QVA (Analog)



### (Standard Resolution)

Part Number	Test Conditions		$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Aperture Width (mm)		Gap Width (mm)
	$I_F$ (mA)	$V_{CE}$ (V)				Emitter	Sensor	
QVA11134	20	5	1.00	30	Phototransistor	1.27	1.27	3.18

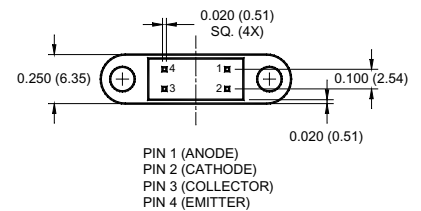
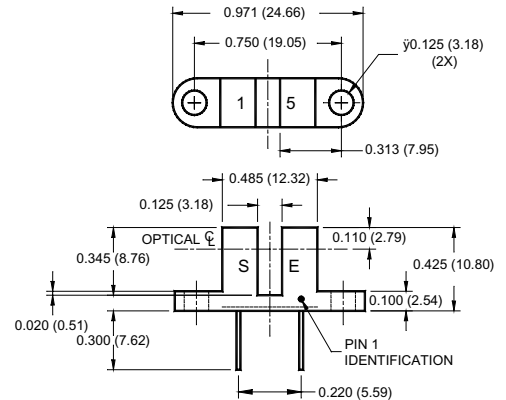
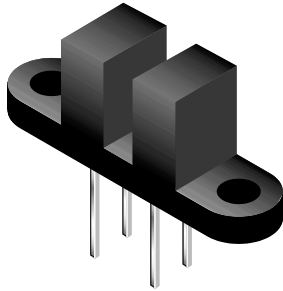
### (High Resolution)

Part Number	Test Conditions		$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Aperture Width (mm)		Gap Width (mm)
	$I_F$ (mA)	$V_{CE}$ (V)				Emitter	Sensor	
QVA21114	20	5	0.20	30	Phototransistor	0.25	0.25	3.18

All dimensions are in inches (millimeters)

# Transmissive Opto Sensors

## Slotted Switch QVB (Analog)



### (Standard Resolution)

Part Number	Test Conditions		$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Wavelength $\lambda_p$ (nm)	Aperture Width (mm)		Gap Width (mm)
	$I_F$ (mA)	$V_{CE}$ (V)				Emitter	Sensor	
QVB11134	20	5	1.00	30	Phototransistor	1.27	1.27	3.18

### (High Resolution)

Part Number	Test Conditions		$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Aperture Width (mm)		Gap Width (mm)
	$I_F$ (mA)	$V_{CE}$ (V)				Emitter	Sensor	
QVB21114	20	5	0.20	30	Phototransistor	0.25	0.25	3.18

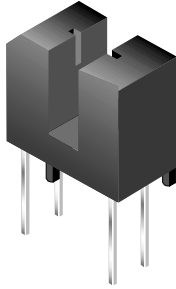
All dimensions are in inches (millimeters)

Absolute Maximum Ratings	PARAMETER	QVA, QVB	
	<b>Temperature</b>		
	$T_{OPR}$	-40 to +85°C	
	$T_{STG}$	-40 to +85°C	
	$T_{SOL-H}$	240°C for 5 sec	
	$T_{SOL-F}$	260°C for 10 sec	
	<b>Input Diode</b>		
	$I_F$	5 mA	
	$V_R$	6.0 V	
	$P_D$	100 mW	
<b>Output Transistor</b>			
$V_{CEO}$	30.0 V		
$V_{ECO}$	4.5 V		
$I_C$	20 mA		
$P_D$	150 mW		

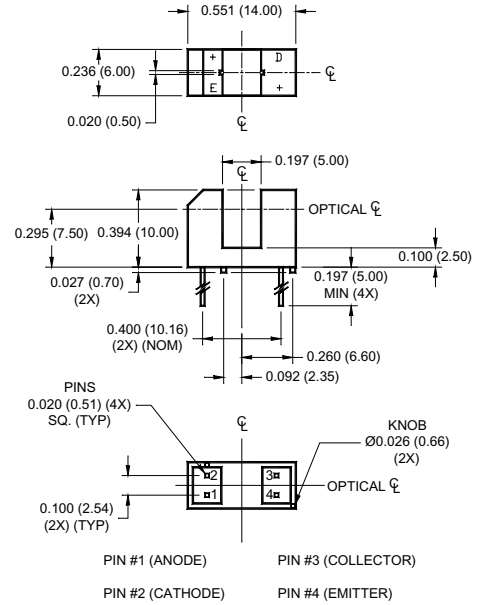


# Transmissive Opto Sensors

## Slotted Switch 5 mm Gap, 10 mm lead spacing (Analog – High Resolution)

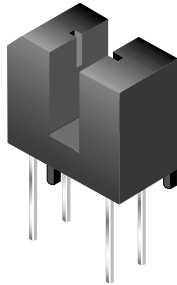


Part Number	Test Conditions		I <sub>C</sub> (ON) (mA) min	BV <sub>CEO</sub> (V) min	Output	Aperture Width (mm)		Gap Width (mm)
	I <sub>F</sub> (mA)	V <sub>CE</sub> (V)				Emitter	Sensor	
QVE00832	20	10	0.50	30	Phototransistor	0.50	0.50	5.00

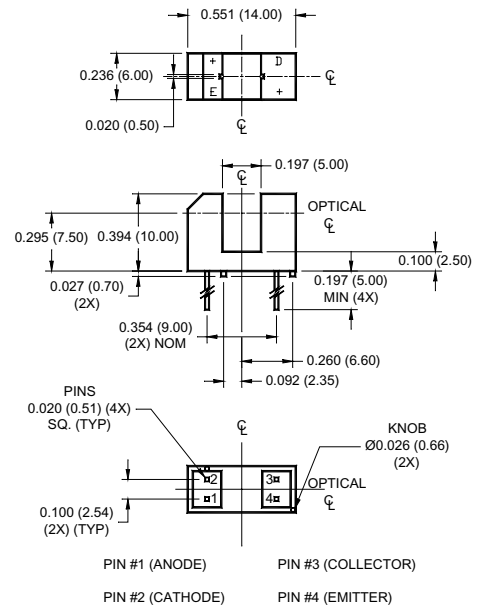


All dimensions are in inches (millimeters)

## Slotted Switch 5 mm Gap, 9 mm lead spacing (Analog – High Resolution)



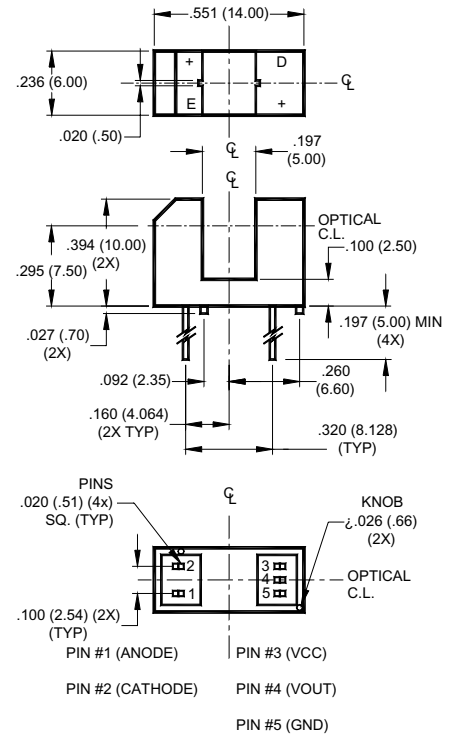
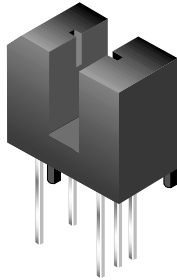
Part Number	Test Conditions		I <sub>C</sub> (ON) (mA) min	BV <sub>CEO</sub> (V) min	Output	Aperture Width (mm)		Gap Width (mm)
	I <sub>F</sub> (mA)	V <sub>CE</sub> (V)				Emitter	Sensor	
QVE00118	20	10	0.50	30	Phototransistor	0.50	0.50	5.00



All dimensions are in inches (millimeters)

# Transmissive Opto Sensors

## Slotted Switch Logic 5 mm (OPTOLOGIC® – High Resolution)



Part Number	Test Conditions V <sub>CC</sub> (V)	I <sub>CC</sub> (mA) max	Output	Aperture Width (mm)		Gap Width (mm)
				Emitter	Sensor	
QVE00120	5	5.0	Buffer Open Collector	0.50	0.50	5.00

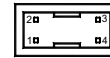
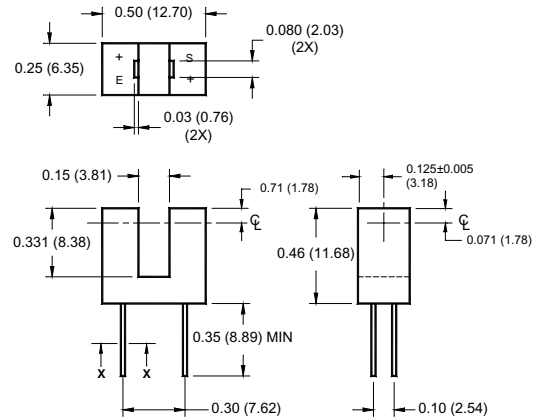
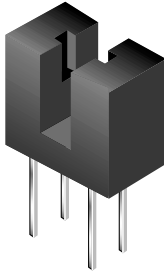
All dimensions are in inches (millimeters)

Absolute Maximum Ratings	PARAMETER	QVE	
	<b>Temperature</b>		
	T <sub>OPR</sub>	-55 to +100°C	
	T <sub>STG</sub>	-55 to +100°C	
	T <sub>SOL-H</sub>	240°C for 5 sec	
	T <sub>SOL-F</sub>	260°C for 10 sec	
	<b>Input Diode</b>		
	I <sub>F</sub>	5 mA	
	V <sub>R</sub>	6.0 V	
	P <sub>D</sub>	100 mW	
<b>Output Transistor</b>			
V <sub>CEO</sub>	30.0 V		
V <sub>ECC</sub>	4.5 V		
I <sub>C</sub>	20 mA		
P <sub>D</sub>	150 mW		

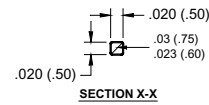
Absolute Maximum Ratings	PARAMETER	QVE00120	
	<b>Temperature</b>		
	T <sub>OPR</sub>	-40 to +85°C	
	T <sub>STG</sub>	-40 to +85°C	
	T <sub>SOL-H</sub>	240°C for 5 sec	
	T <sub>SOL-F</sub>	260°C for 10 sec	
	<b>Input Diode</b>		
	I <sub>F</sub>	50 mA	
	V <sub>R</sub>	6.0 V	
	P <sub>D</sub>	100 mW	
<b>Output Optologic®</b>			
I <sub>O</sub>	50 mA		
V <sub>CC</sub>	4.5 – 16 V		
V <sub>O</sub>	30 V		
P <sub>D</sub>	150 mW		

# Transmissive Opto Sensors

## Slotted Switch High Profile (Analog – Low Resolution)



PIN 1 ANODE  
PIN 2 CATHODE  
PIN 3 COLLECTOR  
PIN 4 EMITTER



Part Number	Test Conditions		$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Aperture Width (mm)		Gap Width (mm)
	$I_F$ (mA)	$V_{CE}$ (V)				Emitter	Sensor	
QVE11233	20	5	0.50	30	Phototransistor	2.0	2.0	3.81

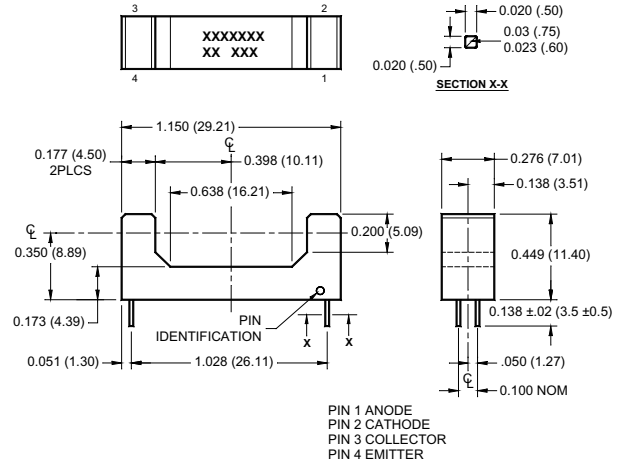
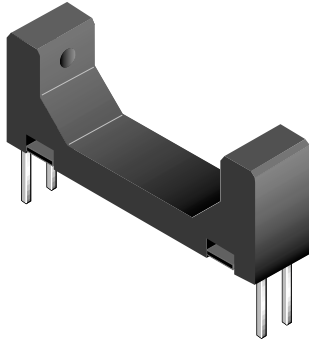
All dimensions are in inches (millimeters)

Absolute Maximum Ratings

PARAMETER	QVE
<b>Temperature</b>	
$T_{OPR}$	-40 to +85°C
$T_{STG}$	-40 to +85°C
$T_{SOL-H}$	240°C for 5 sec
$T_{SOL-F}$	260°C for 10 sec
<b>Input Diode</b>	
$I_F$	50 mA
$V_R$	6.0 V
$P_D$	100 mW
<b>Output Transistor</b>	
$V_{CEO}$	30.0 V
$V_{ECO}$	4.5 V
$I_C$	20 mA
$P_D$	150 mW

# Transmissive Opto Sensors

## Slotted Switch Wide Gap (Analog – Low Resolution)



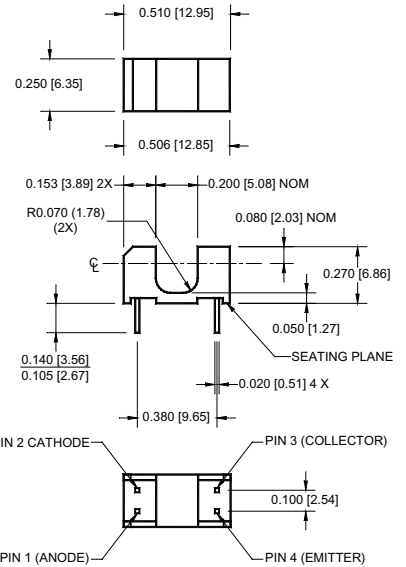
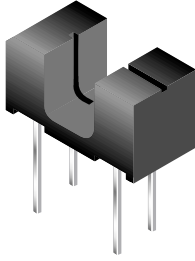
Part Number	Test Conditions		I <sub>C</sub> (ON) (mA) min	BV <sub>CEO</sub> (V) min	Output	Aperture Width (mm)		Gap Width (mm)
	I <sub>F</sub> (mA)	V <sub>CE</sub> (V)				Emitter	Sensor	
QVL21653	20	5	0.10	30	Phototransistor	1.5	1.5	20.22
QVL25335	10	5	5.0	30	Photodarlington	1.5	1.5	20.22

All dimensions are in inches (millimeters)

Absolute Maximum Ratings	PARAMETER	QVL21653	QVL25335	
	<b>Temperature</b>			
	T <sub>OPR</sub>	-40 to +85°C	-40 to +85°C	
	T <sub>STG</sub>	-40 to +85°C	-40 to +85°C	
	T <sub>SOL-H</sub>	240°C for 5 sec	240°C for 5 sec	
	T <sub>SOL-F</sub>	260°C for 10 sec	260°C for 10 sec	
	<b>Input Diode</b>			
	I <sub>F</sub>	50 mA	50 mA	
	V <sub>R</sub>	6.0 V	6.0 V	
	P <sub>D</sub>	100 mW	100 mW	
<b>Output Transistor</b>				
V <sub>CEO</sub>	30.0 V	30.0 V		
V <sub>ECC</sub>	4.5 V	6.0 V		
I <sub>C</sub>	20 mA	40 mA		
P <sub>D</sub>	150 mW	150 mW		

# Transmissive Opto Sensors

## Slotted Switch MOC (Analog – Standard Resolution)



Part Number	Test Conditions		$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Aperture Width (mm)		Gap Width (mm)
	$I_F$ (mA)	$V_{CE}$ (V)				Emitter	Sensor	
MOC70P1	20	10	1.0	30	Phototransistor	1.0	1.0	5.08
MOC70P2	20	10	2.0	30	Phototransistor	1.0	1.0	5.08
MOC70P3	20	10	4.0	30	Phototransistor	1.0	1.0	5.08

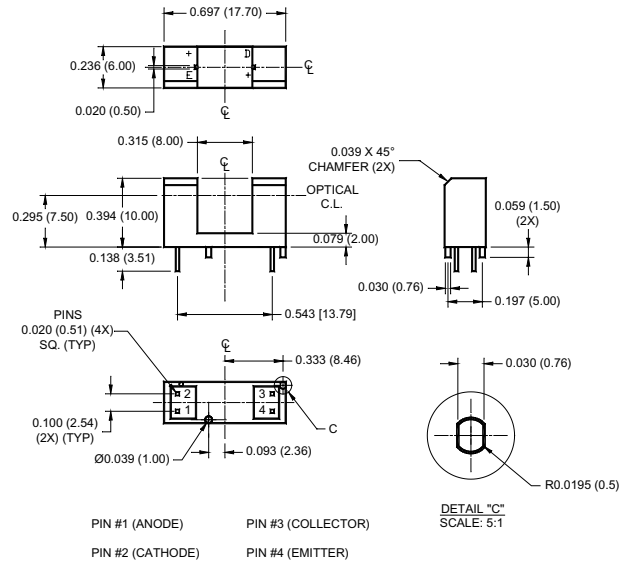
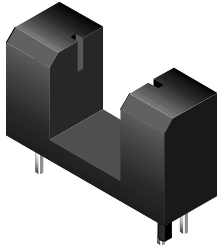
All dimensions are in inches (millimeters)

Absolute Maximum Ratings

PARAMETER	MOC
<b>Temperature</b>	
$T_{OPR}$	-55 to +85°C
$T_{STG}$	-55 to +85°C
$T_{SOL-I}$	240°C for 5 sec
$T_{SOL-F}$	260°C for 10 sec
<b>Input Diode</b>	
$I_F$	60 mA
$V_R$	6.0 V
$P_D$	150 mW
<b>Output Transistor</b>	
$V_{CEO}$	30.0 V
$V_{ECO}$	4.5 V
$I_C$	20 mA
$P_D$	150 mW

# Transmissive Opto Sensors

## Slotted Switch 8 mm Gap (Analog – High Resolution)



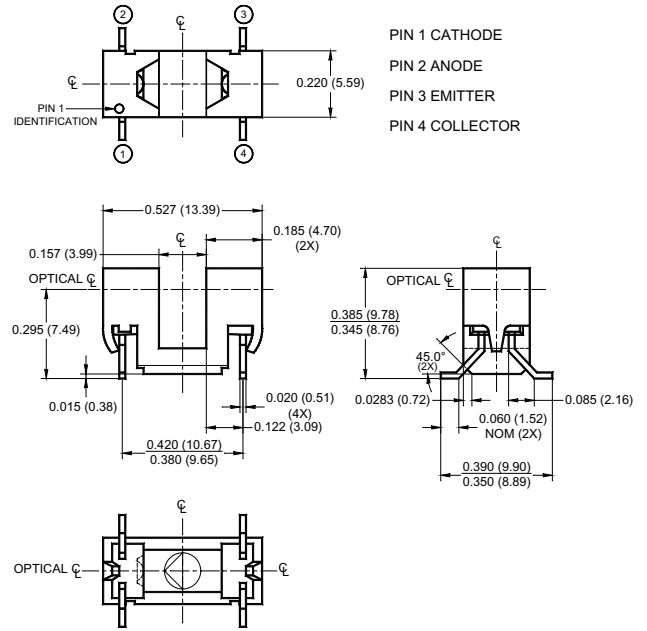
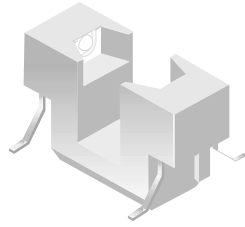
Part Number	Test Conditions		$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Aperture Width (mm)		Gap Width (mm)
	$I_F$ (mA)	$V_{CE}$ (V)				Emitter	Sensor	
QVE00034	20	10	0.50	30	Phototransistor	0.50	0.50	8.00

All dimensions are in inches (millimeters)

Absolute Maximum Ratings	PARAMETER	QVE	
	<b>Temperature</b>		
	$T_{OPR}$	-55 to +100°C	
	$T_{STG}$	-55 to +100°C	
	$T_{SOL-H}$	240°C for 5 sec	
	$T_{SOL-F}$	260°C for 10 sec	
	<b>Input Diode</b>		
	$I_F$	50 mA	
	$V_R$	6.0 V	
	$P_D$	100 mW	
	<b>Output Transistor</b>		
	$V_{CEO}$	30.0 V	
$V_{ECO}$	4.5 V		
$I_C$	20 mA		
$P_D$	150 mW		

# Transmissive Opto Sensors

## Surface Mount Opto Interrupter QCK (Analog – Low Resolution)



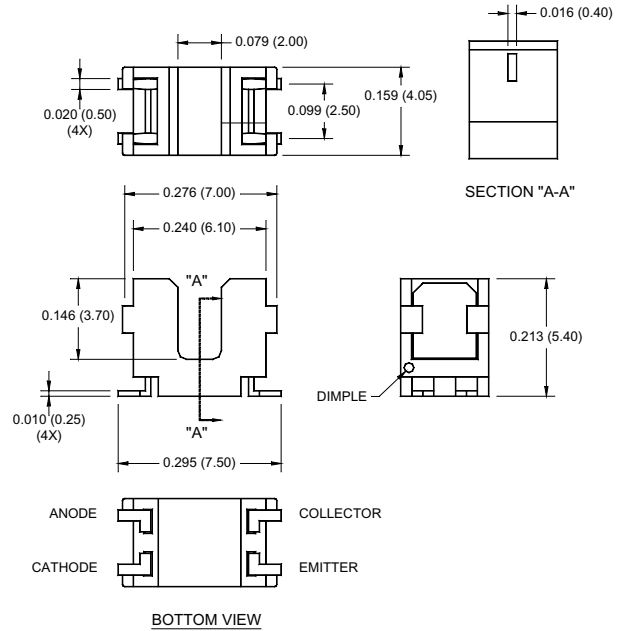
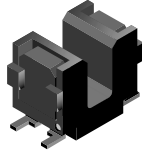
Part Number	Test Conditions		$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Aperture Width (mm)		Gap Width (mm)
	$I_f$ (mA)	$V_{CE}$ (V)				Emitter	Sensor	
QCK3	5	1.5	1.0	30	Photodarlington	NA	NA	3.99
QCK4	5	1.5	10.0	30	Photodarlington	NA	NA	3.99
QCK5	20	5	2.00	30	Phototransistor	NA	NA	3.99

All dimensions are in inches (millimeters)

Absolute Maximum Ratings	PARAMETER	QCK3, 4	QCK5	
	<b>Temperature</b>			
	$T_{OPR}$	-40 to +100°C	-40 to +100°C	
	$T_{STG}$	-40 to +100°C	-40 to +100°C	
	$T_{SOLH}$	183°C for 60 sec (pre-heating stage)	183°C for 60 sec (pre-heating stage)	
	$T_{SOLF}$	230°C for 5 sec (reflow stage)	230°C for 5 sec (reflow stage)	
	<b>Input Diode</b>			
	$I_f$	50 mA	5 mA	
	$V_R$	6.0 V	6.0 V	
	$P_D$	100 mW	100 mW	
<b>Output Transistor</b>				
$V_{CEO}$	30.0 V	30.0 V		
$V_{ECO}$	6.0 V	6.0 V		
$I_C$	40 mA	20 mA		
$P_D$	150 mW	150 mW		

# Transmissive Opto Sensors

## Surface Mount Switch 2 mm Gap (Analog – High Resolution)



Part Number	Test Conditions		$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Aperture Width (mm)		Gap Width (mm)
	$I_F$ (mA)	$V_{CE}$ (V)				Emitter	Sensor	
QVE00033	5	5	0.10	30	Phototransistor	0.4	0.4	2.00

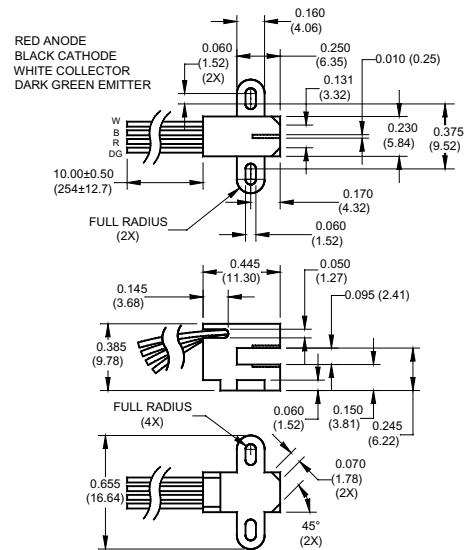
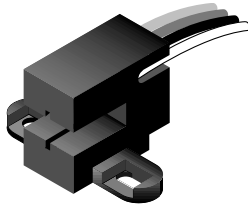
All dimensions are in inches (millimeters)

Absolute Maximum Ratings	PARAMETER	QVE	
	<b>Temperature</b>		
	$T_{OPR}$	-55 to +100°C	
	$T_{STG}$	-55 to +100°C	
	$T_{SOLH}$	160°C for 120 sec (pre-heating stage)	
	$T_{SOLF}$	200°C for 60 sec (reflow stage)	
	<b>Input Diode</b>		
	$I_F$	50 mA	
	$V_R$	6.0 V	
	$P_D$	75 mW	
	<b>Output Transistor</b>		
	$V_{CEO}$	300 V	
	$V_{ECO}$	4.5 V	
$I_C$	20 mA		
$P_D$	75 mW		



# Transmissive Opto Sensors

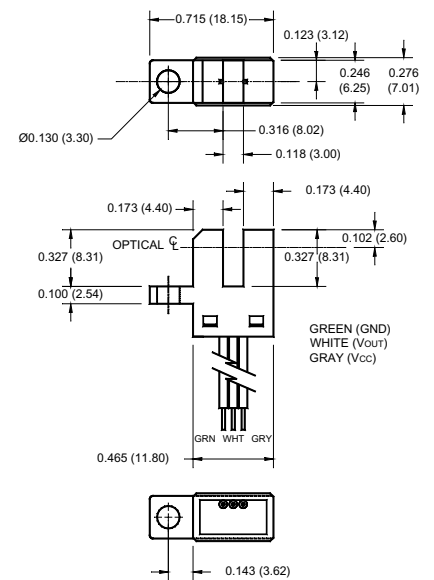
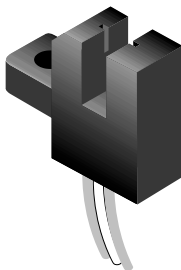
## Slotted Switch Horizontal with Wires (Analog – High Resolution)



All dimensions are in inches (millimeters)

Part Number	Test Conditions		$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Aperture Width (mm)		Gap Width (mm)
	$I_F$ (mA)	$V_{CE}$ (V)				Emitter	Sensor	
QVE00039	20	10	0.50	30	Phototransistor	0.25	0.25	2.41

## Slotted Switch Logic with Wires (OPTOLOGIC® – High Resolution)



All dimensions are in inches (millimeters)

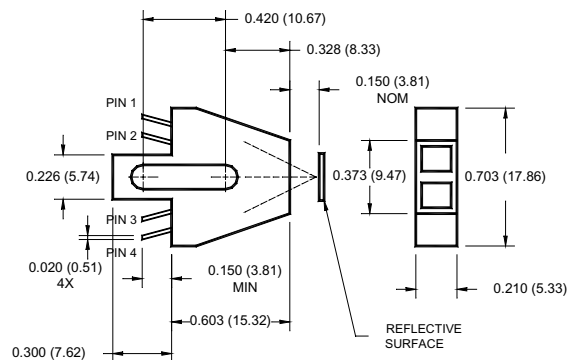
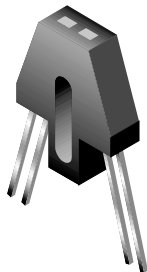
Part Number	Test Conditions $V_{CC}$ (V)	$I_{CC}$ (mA) max	Output	Aperture Width (mm)		Gap Width (mm)
				Emitter	Sensor	
QVE00112	5	20.0	Inverter Open Collector	0.35	0.35	4.40

Absolute Maximum Ratings	PARAMETER QVE00039	
	<b>Temperature</b>	
	$T_{OPR}$	-40 to +85°C
	$T_{STG}$	-40 to +85°C
	<b>Input Diode</b>	
	$I_F$	50 mA
	$V_R$	6.0 V
	$P_D$	100 mW
	<b>Output Transistor</b>	
	$V_{CEO}$	30.0 V
$V_{ECO}$	4.5 V	
$I_C$	20 mA	
$P_D$	150 mW	

Absolute Maximum Ratings	PARAMETER QVE00112	
	<b>Temperature</b>	
	$T_{OPR}$	-40 to +85°C
	$T_{STG}$	-40 to +85°C
	<b>Input Diode</b>	
	$I_F$	NA
	$V_R$	NA
	$P_D$	NA
	<b>Output Optologic®</b>	
	$I_O$	50 mA
$V_{CC}$	4.5 – 16 V	
$V_O$	30 V	
$P_D$	150 mW	

# Reflective Opto Sensors

## Reflective Arrowhead with Dust Cover (Focused)

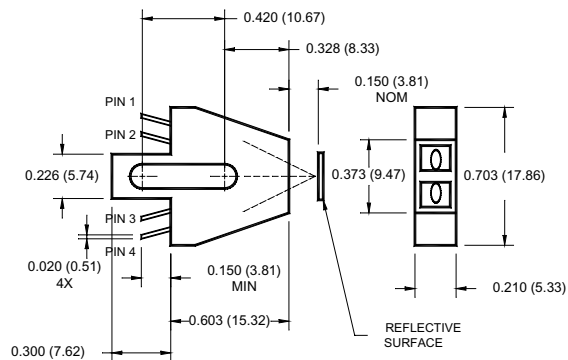
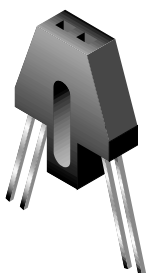


PIN1 ANODE  
PIN2 CATHODE  
PIN3 COLLECTOR  
PIN4 EMITTER

All dimensions are in inches (millimeters)

Part Number	Test Conditions		Sensor to Surface Distance (inch)	$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Wavelength $\lambda_p$ (nm)
	$I_F$ (mA)	$V_{CE}$ (V)					
QRB1113	40	5	0.150	0.20	30	Phototransistor	940
QRB1114	40	5	0.150	0.60	30	Phototransistor	940

## Reflective Arrowhead without Dust Cover (Focused)



PIN1 ANODE  
PIN2 CATHODE  
PIN3 COLLECTOR  
PIN4 EMITTER

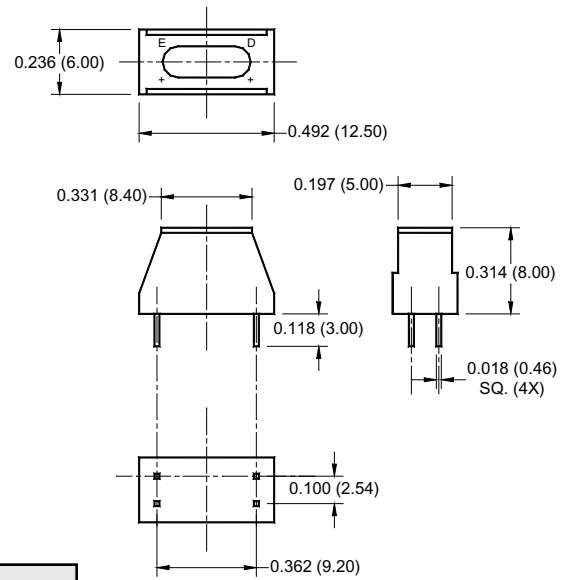
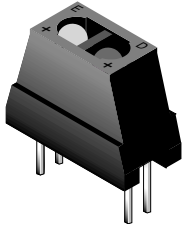
All dimensions are in inches (millimeters)

Part Number	Test Conditions		Sensor to Surface Distance (inch)	$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Wavelength $\lambda_p$ (nm)
	$I_F$ (mA)	$V_{CE}$ (V)					
QRC1113	40	5	0.150	0.20	30	Phototransistor	940

Absolute Maximum Ratings	PARAMETER	QRB, QRC	
	<b>Temperature</b>		
	$T_{OPR}$	-40 to +85°C	
	$T_{STG}$	-40 to +85°C	
	$T_{SOL-I}$	240°C for 5 sec	
	$T_{SOL-F}$	260°C for 10 sec	
	<b>Input Diode</b>		
	$I_F$	50 mA	
	$V_R$	5.0 V	
	$P_D$	100 mW	
	<b>Output Transistor</b>		
	$V_{CEO}$	30.0 V	
$V_{ECO}$	4.5 V		
$I_C$	20 mA		
$P_D$	100 mW		

# Reflective Opto Sensors

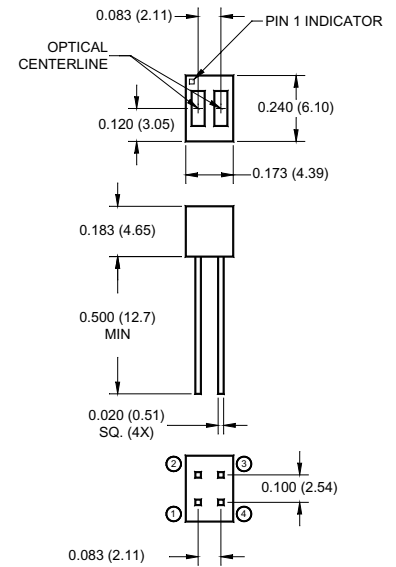
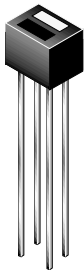
## Reflective Focusing Sensor PCB Mount



Part Number	Test Conditions			$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Wavelength $\lambda_p$ (nm)
	$I_f$ (mA)	$V_{CE}$ (V)	Sensor to Surface Distance (inch)				
QRE00034	20	10	0.160	0.16	30	Phototransistor	940

All dimensions are in inches (millimeters)

## Reflective Non-focusing Sensor PCB Mount



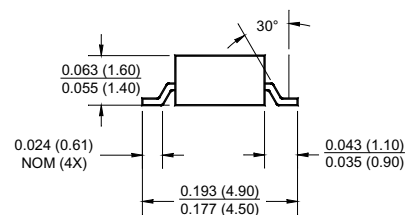
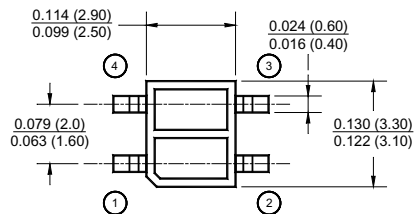
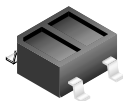
PIN 1 COLLECTOR      PIN 3 ANODE  
PIN 2 EMITTER      PIN 4 CATHODE

Part Number	Test Conditions			$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Wavelength $\lambda_p$ (nm)
	$I_f$ (mA)	$V_{CE}$ (V)	Sensor to Surface Distance (inch)				
QRD1113	20	5	0.050	0.30	30	Phototransistor	880
QRD1114	20	5	0.050	1.00	30	Phototransistor	880
QRD1313	20	5	0.050	10	15	Photodarlington	880

All dimensions are in inches (millimeters)

# Reflective Opto Sensors

## Reflective Surface Mount (Unfocused)



PIN 1 ANODE      PIN 3 COLLECTOR  
 PIN 2 CATHODE    PIN 4 EMITTER

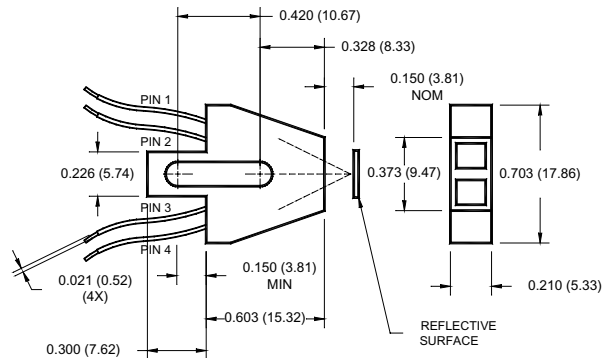
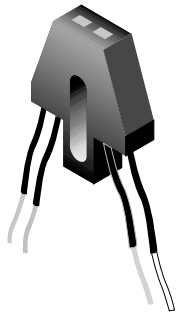
All dimensions are in inches (millimeters)

Part Number	Test Conditions		Sensor to Surface Distance (inch)	I <sub>C (ON)</sub> (mA) min	BV <sub>CEO</sub> (V) min	Output	Wavelength λ <sub>p</sub> (nm)
	I <sub>f</sub> (mA)	V <sub>CE</sub> (V)					
QRE1113GR	20	5	0.040	0.15	30	Phototransistor	940

Absolute Maximum Ratings	PARAMETER	QRD1113, 4	QRD1313	QRE1113GR	QRE00034	
	<b>Temperature</b>					
	T <sub>OPR</sub>	-40 to +85°C	-40 to +85°C	-25 to +85°C	-40 to +85°C	
	T <sub>STG</sub>	-40 to +85°C	-40 to +85°C	-30 to +100°C	-40 to +85°C	
	T <sub>SOLH</sub>	240°C for 5 sec	240°C for 5 sec	240°C for 5 sec	240°C for 5 sec	
	T <sub>SOLF</sub>	260°C for 10 sec	260°C for 10 sec	260°C for 10 sec	260°C for 10 sec	
	<b>Input Diode</b>					
	I <sub>f</sub>	50 mA	50 mA	50 mA	50 mA	
	V <sub>R</sub>	6.0 V	6.0 V	6.0 V	6.0 V	
	P <sub>D</sub>	100 mW	100 mW	75 mW	100 mW	
	<b>Output Transistor</b>					
	V <sub>CEO</sub>	30.0 V	15.0 V	30.0 V	30.0 V	
V <sub>ECC</sub>	4.5 V	6.0 V	5.0 V	6.0 V		
I <sub>C</sub>	20 mA	40 mA	20 mA	20 mA		
P <sub>D</sub>	100 mW	100 mW	50 mW	100 mW		

# Reflective Opto Sensors

## Reflective Arrowhead with Dust Cover, Wires (Focused)

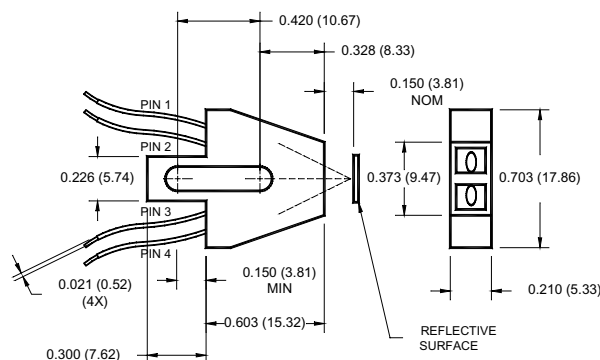
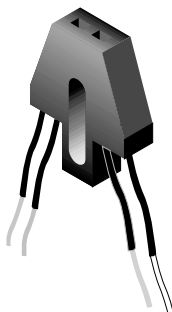


PIN1 ANODE  
 PIN2 CATHODE  
 PIN3 COLLECTOR  
 PIN4 EMITTER

All dimensions are in inches (millimeters)

Part Number	Test Conditions		Sensor to Surface Distance (inch)	$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Wavelength $\lambda_p$ (nm)
	$I_f$ (mA)	$V_{CE}$ (V)					
QRB1133	40	5	0.150	0.20	30	Phototransistor	940
QRB1134	40	5	0.150	0.60	30	Phototransistor	940

## Reflective Arrowhead without Dust Cover, Wires (Focused)



PIN1 ANODE  
 PIN2 CATHODE  
 PIN3 COLLECTOR  
 PIN4 EMITTER

All dimensions are in inches (millimeters)

Part Number	Test Conditions		Sensor to Surface Distance (inch)	$I_C$ (ON) (mA) min	$BV_{CEO}$ (V) min	Output	Wavelength $\lambda_p$ (nm)
	$I_f$ (mA)	$V_{CE}$ (V)					
QRC1133	40	5	0.150	0.20	30	Phototransistor	940

Absolute Maximum Ratings	PARAMETER	QRB, QRC	
	<b>Temperature</b>		
	$T_{OPR}$	-40 to +85°C	
	$T_{STG}$	-40 to +85°C	
	<b>Input Diode</b>		
	$I_f$	50 mA	
	$V_R$	5.0 V	
	$P_D$	100 mW	
	<b>Output Transistor</b>		
	$V_{CEO}$	30.0 V	
	$V_{ECO}$	4.5 V	
	$I_C$	20 mA	
$P_D$	100 mW		

# Ordering Information

Package Description <sup>1</sup> (Alphanumeric)	Packaging Options			
	Bag (Quantity)	Tube (Quantity)	Tape on Ammopack	Tape on Reel
PLCC-2 Detector	1000			■
PLCC-2 Diode	1000			■
Reflective Arrowhead with Dust Cover	50			
Reflective Arrowhead with Dust Cover, Wires	20			
Reflective Arrowhead without Dust Cover	50			
Reflective Arrowhead without Dust Cover, Wires	20			
Reflective Focusing Sensor PCB Mount		50		
Reflective Non-focusing Sensor PCB Mount	100			
Reflective Surface Mount Package				■
Sidelooker Detector	500			■
Sidelooker Detector (No Lens)	1000			■
Sidelooker Diode	500			■
Sidelooker OPTOLOGIC®	500			■
Slotted Switch 5 mm Gap, 9 mm Lead Spacing		50		
Slotted Switch 5 mm Gap, 10 mm Lead Spacing		50		
Slotted Switch 8 mm Gap		50		
Slotted Switch H21		50		
Slotted Switch H22		50		
Slotted Switch High Profile		50		
Slotted Switch Horizontal with Wires	50			
Slotted Switch Logic 5 mm		50		
Slotted Switch Logic H21		50		
Slotted Switch Logic H22		50		
Slotted Switch Logic with Wires	50			
Slotted Switch MOC		50		
Slotted Switch QVA		50		
Slotted Switch QVB		50		
Slotted Switch Wide Gap		50		
Surface Mount Opto Interrupter QCK		25		■
Surface Mount Switch 2 mm Gap				■
Thin Sidelooker Detector	500			■
Thin Sidelooker Diode	500			■
T- <sup>3</sup> / <sub>4</sub> (2 mm) Detector	1000			■
T- <sup>3</sup> / <sub>4</sub> (2 mm) Diode	1000			■
T-1 (3 mm) Detector	250		■	■
T-1 (3 mm) Diode	250		■	■
T-1 <sup>3</sup> / <sub>4</sub> (5 mm) Detector	250		■	■
T-1 <sup>3</sup> / <sub>4</sub> (5 mm) Diode	250		■	■
TO-18 Detector (Convex Lens)	500			
TO-18 Detector (Flat Lens)	500			
TO-18 Detector (Plastic)	250		■	■
TO-18 OPTOLOGIC®	500			
TO-46 Package (Convex Lens)	500			
TO-46 Package (Flat Lens)	500			
TO-46 (Plastic) Diode	250		■	■
TO-92 Detector Package	1000			■

<sup>1</sup> Package descriptions match the titles of packages on the tables of specifications pages.

# Infrared Glossary of Terms

Terms	Definitions	Symbol	Unit
Breakdown Voltage	Collector to base breakdown voltage with the emitter open.	$BV_{CBO}$	V
	Collector to emitter breakdown voltage with the base open.	$BV_{CEO}$	V
	Emitter to collector breakdown voltage with the base open.	$BV_{ECO}$	V
Collector-Emitter Leakage	Collector to emitter current with base open and without radiant incidence.	$I_{CEO}$	nA
Collector-Emitter Voltage	Collector to emitter voltage with base open.	$V_{CEO}$	V
Collector Current	Collector current.	$I_C$	mA
Dark Current	Reverse dark current at a given reverse voltage.	$I_{RD}$	nA
Emitter-Collector Voltage	Emitter to collector voltage with base open.	$V_{ECO}$	V
Forward Voltage	Voltage between anode and cathode at a specified forward current.	$V_F$	V
Forward Current	The current flowing through a diode from anode to cathode.	$I_F$	mA
Light Current	Current flowing through a device due to radiant incidence.	$I_L$	mA
On-State Collector Current	Current flowing from collector due to radiant incidence.	$I_{C(ON)}$	mA
Operating Temperature Range	Temperature range for which operating specifications are valid.	$T_{OPR}$	°C
Output Current	Output current.	$I_O$	mA
	Logic high output voltage.	$V_{OH}$	V
	Logic low output voltage.	$V_{OL}$	V
Power Dissipation	Power dissipation.	$P_D$	mW
Radiant Intensity	The radiant flux generated per unit solid angle on the axis.	$I_E$	mW/sr
Reception Angle	The angle of the cone where the sensitivity is half of that on the optical axis.	$2 \theta_{1/2}$	°
Reverse Current	Current flowing through a diode from cathode and anode.	$I_R$	μA
Reverse Voltage	Voltage between cathode and anode at a specified reverse current.	$V_F$	V
Saturation Voltage	Collector to emitter saturation voltage.	$V_{CE SAT}$	V
Soldering Temperature	Temperature for lead soldering.	$T_{SOL}$	°C
	Temperature for lead soldering with iron.	$T_{SOL-I}$	°C
	Temperature for wave soldering.	$T_{SOL-F}$	°C
Storage Temperature Range	Temperature range for storage while not in operation.	$T_{STR}$	°C
Supply Current	Current drawn from the supply at a given voltage.	$I_{CC}$	mA
Supply Voltage	Operating supply voltage.	$V_{CC}$	V
Threshold	Amount of incident light required to turn a device on.	$E_{\theta+}$	mW/cm <sup>2</sup>
	Amount of incident light required to turn a device off.	$E_{\theta-}$	mW/cm <sup>2</sup>
	Forward current required to turn a device on.	$I_{F+}$	mA
	Forward current required to turn a device off.	$I_{F-}$	mA
Total Output Power	The total optical output power.	$P_O$	mW
Viewing Angle	The angle of the cone where the luminous intensity is half of that on the optical axis.	$2 \theta_{1/2}$	°

# Frequently Asked Questions

## What is the greatest distance at which an infrared solution will still work?

There is no absolute answer to this question, rather it depends on the application. In most cases, by pulsing the emitter with a high drive current and using a sensitive photosensor, such as a photodarlington, one can expand the range.

- The range for detecting an object by reflection can be from less than 1 mm up to 400 mm. The factors involved are the configuration and reflectivity of the reflective surface, the drive current of the emitter, and the photosensor output. Dust, however, can impair the reflectivity and decrease the range.
- Object sensing by transmissivity (ie. breaking a beam of light between two points with an object) has a range from less than 1 mm up to 12 m. The determining factors are the size of the object used to break the beam, the drive current of the emitter, the output type of the photosensor, and the electrical timing techniques used, such as synchronous detection.
- For pure data transmission, the range is from less than 1 mm up to 15 m. The determining factors are the data rate, the coding and modulation technique, and the expected signal to noise ratio or bit error rate. A high emitter drive current can increase the range of the system.

## Can IR photosensors detect visible light?

Yes. All of the Fairchild photosensors are constructed using silicon chips. Silicon has a relatively flat sensitivity range and can detect the entire visible spectrum. The sensitivity, however, decreases from red wavelengths (660 nm) to blue wavelengths (450 nm). Most Fairchild photosensors, however, are sold with a daylight filter on the lens which blocks most visible light from reaching the sensing area of the chip. Depending on the need a customer can usually purchase photosensors without the daylight filter. Curves are available showing the output response of the photosensor with and without a daylight filter.

## Can ambient light cause photosensors to false trigger?

The photosensors, as discussed above, are typically built with a daylight filter that prevents most visible light in the environment from reaching the detector chip. Curves are available showing the output response with and without a daylight filter. The response to light sources like fluorescent tubes, phosphorescent sources, or other artificial light sources depends on their spectral characteristics and may be noticeable.

## What is the most efficient emitter?

The brightest emitter we offer, in terms of on-axis intensity, is the QED123. This emitter has a narrow emission angle. If a wider emission angle is preferred, the QED223 or QED234 are recommended.

## What is the response time of emitters and photosensors?

Each component type has a different response time, which is specified as rise time or fall time. The typical rise times for each product family are given below.

- 940 nm emitters: 1  $\mu$ s
- 880 nm emitters: 0.8  $\mu$ s
- Phototransistors: 10  $\mu$ s
- Photodarlingtons: 100  $\mu$ s
- Photodiodes: 0.01 – 0.05  $\mu$ s
- OPTOLOGIC® Photosensors: 0.1  $\mu$ s

## What is the maximum driving current of emitters?

The answer to this question depends on the type of emitter and the forward current conditions. Driving conditions can be either continuous or pulsed. The continuous maximum current is specified in the data sheet of the product. The maximum pulsed current depends on the pulse width and the duty cycle. The duty cycle is determined by dividing the pulse width by the period of the pulse. The pulsed current can range as high as two amps (2 A) if the pulses are very short and the duty cycle is very low.



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