

# Plastic Silicon OPTOLOGIC Photosensor

## QSE159

### Description

The QSE159 is OPTOLOGIC IC which feature a Schmitt trigger at output which provides hysteresis for noise immunity and pulse shaping. The basic building block of this IC consists of a photodiode, a linear amplifier, voltage regulator, Schmitt trigger and four output options. The TTL/LSTTL compatible output can drive up to ten TTL loads over supply currents from 4.5 to 16.0 Volts. The devices are marked with a color stripe for easy identification.

### Features

- Bipolar Silicon IC
- Package Type: Sidelooker
- Medium Wide Reception Angle, 50°
- Package Material and Color: Black Epoxy
- Matched emitter: QEE113/QEE123
- Daylight Filter
- High Sensitivity
- Direct TTL/LSTTL Interface
- This is a Pb-Free Device

### Block Diagram

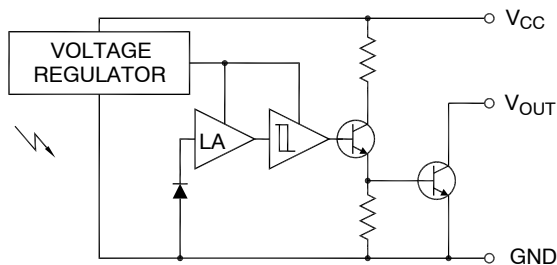
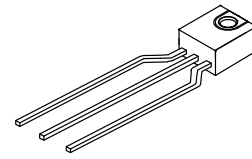


Figure 1. QSE159 Open-Collector Output Inverter



SIDELOOKER OPTOLOGIC  
CASE 100CM

### INPUT/OUTPUT TABLE

Part Number	Light	Output
QSE159	On	LOW
	Off	HIGH

### ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

# QSE159

## MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Rating	Unit
$T_{OPR}$	Operating Temperature	-40 to +85	$^\circ\text{C}$
$T_{STG}$	Storage Temperature	-40 to +100	$^\circ\text{C}$
$T_{SOL-I}$	Soldering Temperature (Iron) (Notes 2, 3, 4)	240 for 5 s	$^\circ\text{C}$
$T_{SOL-F}$	Soldering Temperature (Flow) (Notes 2, 3)	260 for 10 s	$^\circ\text{C}$
$I_O$	Output Current	50	mA
$V_{CC}$	Supply Voltage	4.0 to 16	V
$V_O$	Output Voltage	35	V
$P_D$	Power Dissipation (Note 1)	100	mW

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Derate power dissipation linearly 2.50 mW/ $^\circ\text{C}$  above 25 $^\circ\text{C}$ .
2. RMA flux is recommended.
3. Methanol or isopropyl alcohols are recommended as cleaning agents.
4. Soldering iron 1/16" (1.6 mm) minimum from housing.

## ELECTRICAL CHARACTERISTICS ( $T_A = -40^\circ\text{C}$ to +85 $^\circ\text{C}$ , $V_{CC} = 4.5\text{ V}$ to 5.5 V)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
$E_e(+)$	Positive Going Threshold Irradiance (Note 5)	$T_A = 25^\circ\text{C}$	0.025	-	0.250	mW/cm <sup>2</sup>
$E_e(+)/E_e(-)$	Hysteresis Ratio		1.10	-	2.00	
$I_{CC}$	Supply Current (Note 5)	$E_e = 0$ or 0.3 mW/cm <sup>2</sup>	-	-	5.0	mA
	Peak to Peak Ripple which will Cause False Triggering	$f = \text{DC to } 50\text{ MHz}$	-	-	2.00	V

### QSE159 (INVERTER OPEN COLLECTOR)

$I_{OH}$	High Level Output Voltage	$E_e = 0$ , $V_{OH} = 30\text{ V}$	-	-	100	$\mu\text{A}$
$V_{OL}$	Low Level Output Voltage (Note 5)	$E_e = 0.3\text{ mW/cm}^2$ , $I_{OL} = 16\text{ mA}$	-	-	0.40	V

### QSE159

$t_R, t_F$	Output Rise, Fall Times	$E_e = 0$ or 0.3 mW/cm <sup>2</sup> , $f = 10\text{ kHz}$ , DC = 50%, $R_L = 360\ \Omega$ (Note 5)	-	-	100	ns
$t_{PHL}, t_{PLH}$	Propagation Delay		-	6.0	-	$\mu\text{s}$

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

5.  $\lambda = 880\text{ nm}$  (AlGaAs).

# QSE159

## TYPICAL PERFORMANCE CURVES

(Sensor Coupled to QEE113 Emitter)

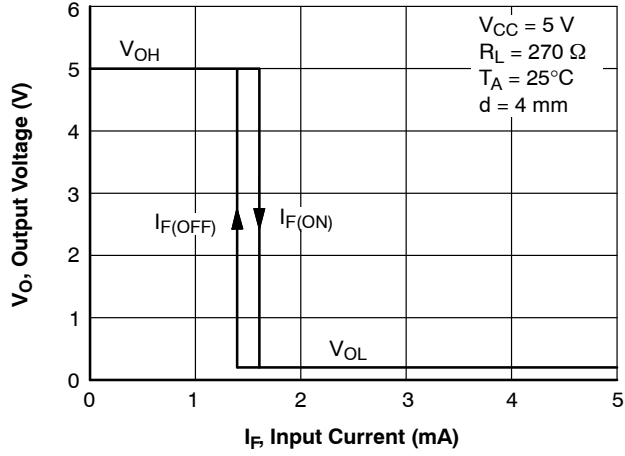


Figure 2. Output Voltage vs. Input Current

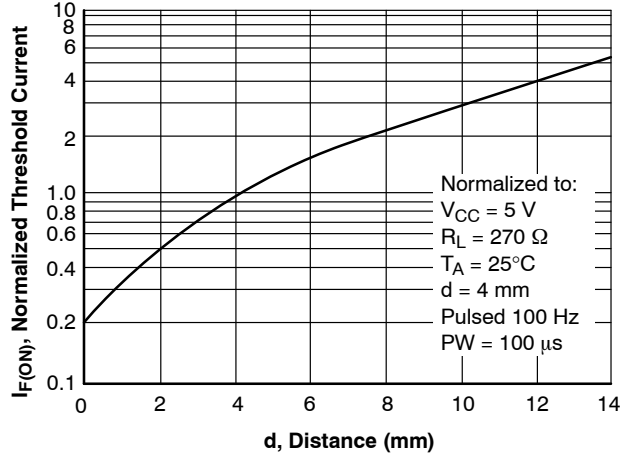


Figure 3. Threshold Current vs. Distance

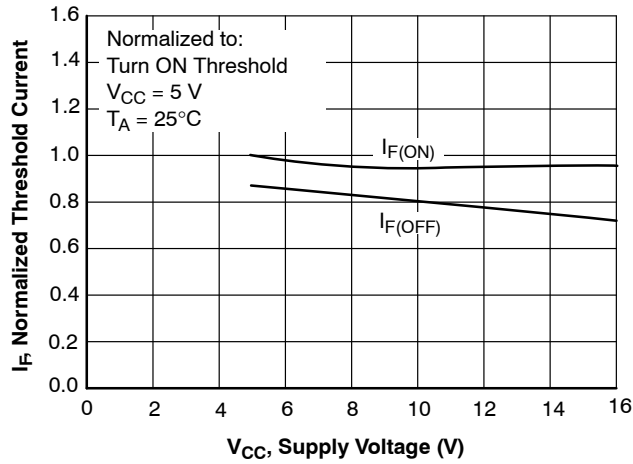


Figure 4. Normalized Threshold Current vs. Supply Voltage

TYPICAL PERFORMANCE CURVES (continued)  
 (Sensor Coupled to QEE113 Emitter)

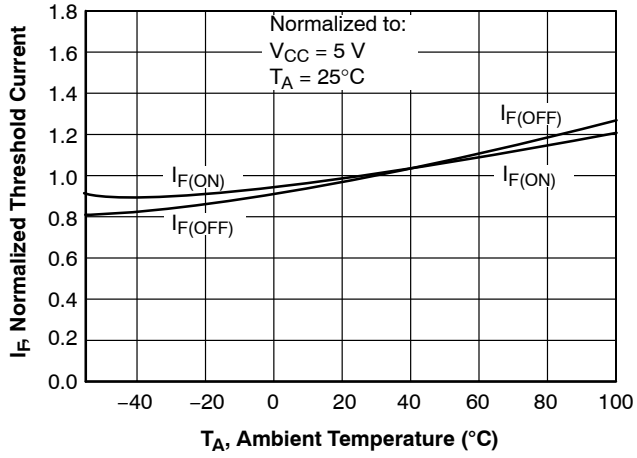


Figure 5. Normalized Threshold Current vs. Ambient Temperature

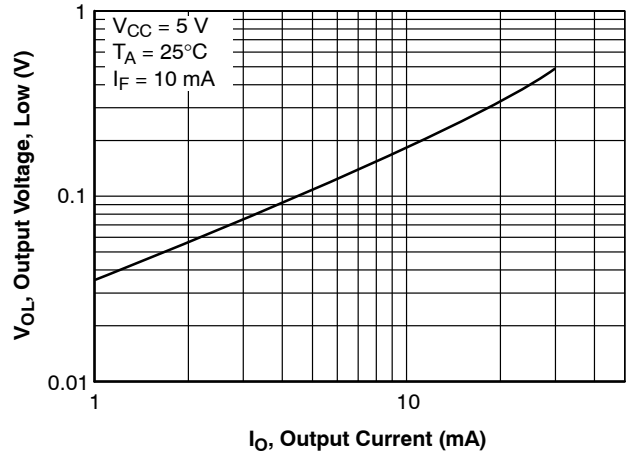


Figure 6. Low Output Voltage vs. Output Current

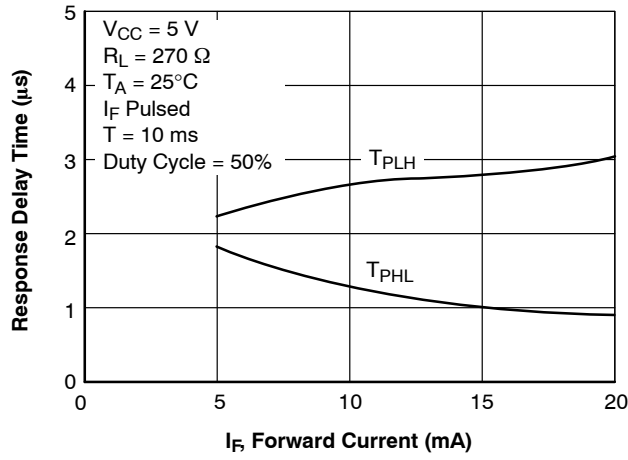
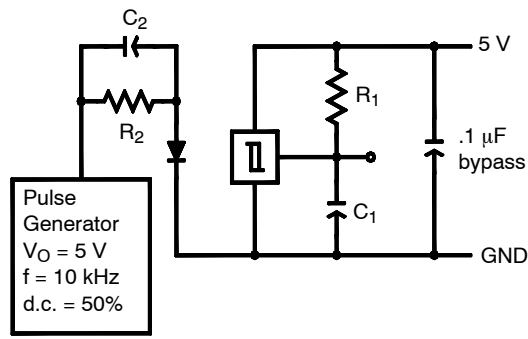


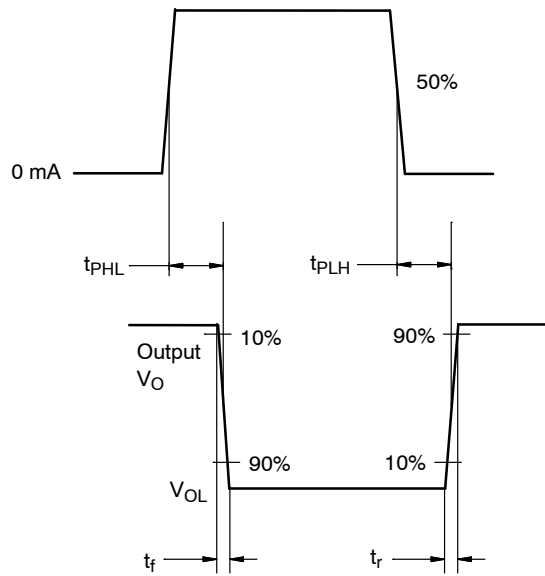
Figure 7. Response Time vs. Forward Current

## QSE159



$R_1 = 360 \Omega$        $C_1 = 15 \text{ pF}$        $C_1$  and  $C_2$  include probe and  
 $R_2 = 180 \Omega$        $C_2 = 20 \text{ pF}$       stray wire capacitance

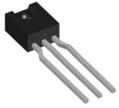
**Figure 8. Switching Speed Test Circuit**



**Figure 9. Switching Times Definitions**

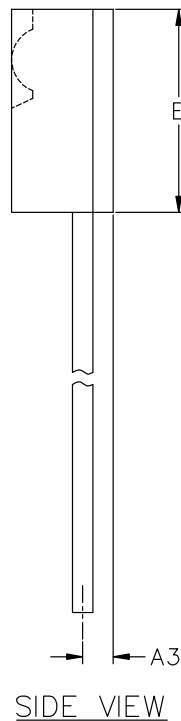
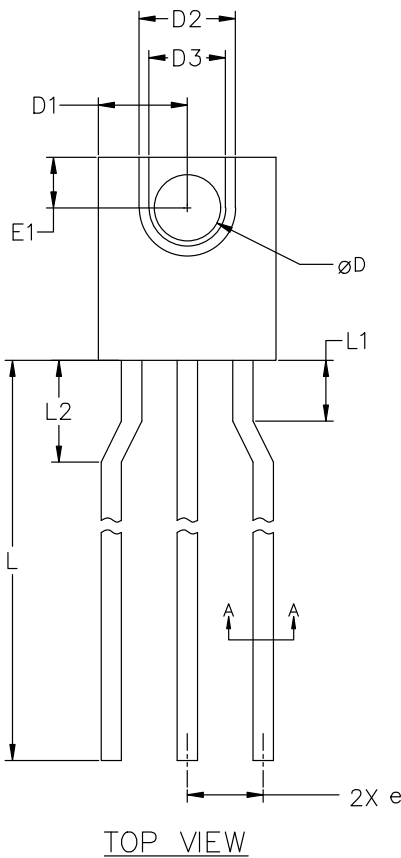
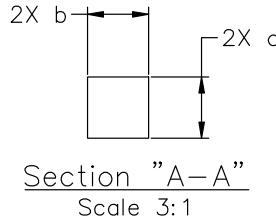
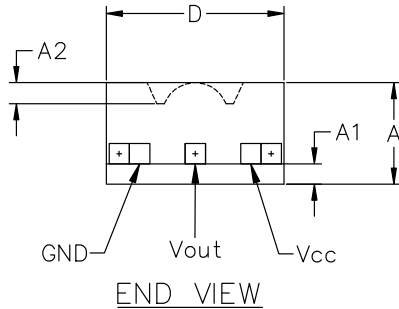
### ORDERING INFORMATION

Part Number	Package	Part Number Definitions	Color Code	Shipping
QSE159	SIDELOOKER OPTOLOGIC (Pb-Free)	Open-collector, inverter output	Blue	500 Units / Bulk



**SIDELOOKER OPTOLOGIC 4.44x5.08x2.54, 1.90P**  
CASE 100CM  
ISSUE A

DATE 05 MAR 2024



NOTES:

1. DIMENSIONING AND TOLERANCING AS PER ASMEY14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.

DIMENSION (MILLIMETERS)			
	MIN	NOM	MAX
A	2.41	2.54	2.67
A1	0.38	0.51	0.64
A2	0.48	0.53	0.58
A3	0.64	0.76	0.89
b	0.51	0.57	0.61
c	0.51	0.57	0.61
D	4.32	4.44	4.57
D1	2.16	2.21	2.29
D2	2.29	2.41	2.54
D3	1.78	1.91	2.03
E	4.83	5.08	5.33
E1	1.14	1.27	1.40
e	1.65	1.90	2.15
øD	1.52	1.65	1.78
L	12.70	13.46	---
L1	1.27	1.52	1.78
L2	2.29	2.54	2.79

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