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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

February 2016

QSE158, QSE159
Plastic Silicon OPTOLOGIC® Photosensor

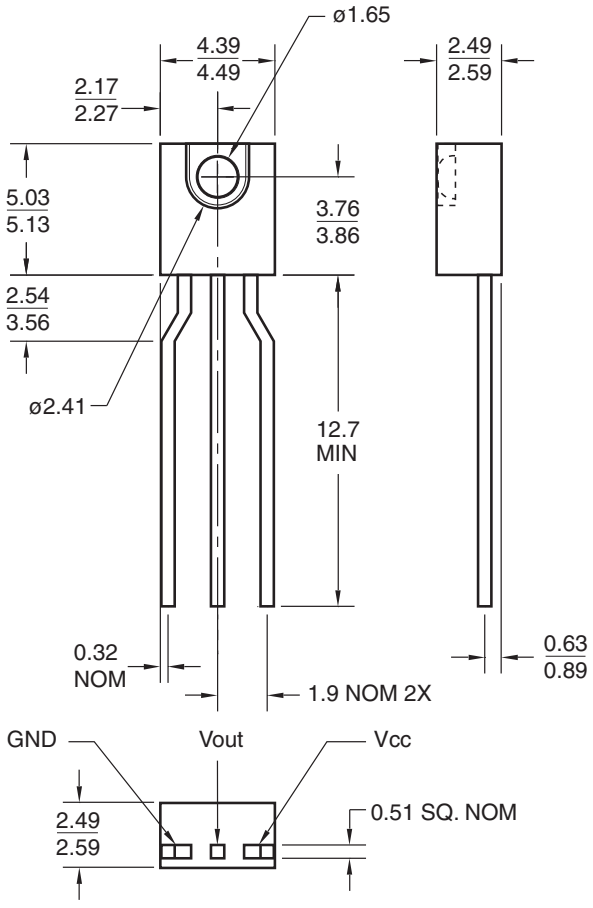
Features

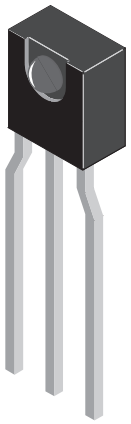
- Bipolar silicon IC
- Package type: Sidelooker
- Medium wide reception angle, 50°
- Package material and color: black epoxy
- Matched emitter: QEE113/QEE123
- Daylight filter
- High sensitivity
- Direct TTL/LSTTL interface

Description

The QSE15X family are OPTOLOGIC® ICs 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.

Package Dimensions



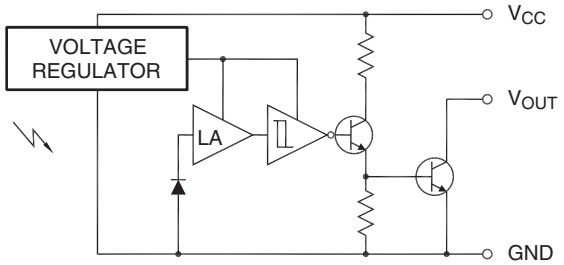


Part Number Definitions		Color Code
QSE158	Open-collector, buffer output	Green
QSE159	Open-collector, inverter output	Blue

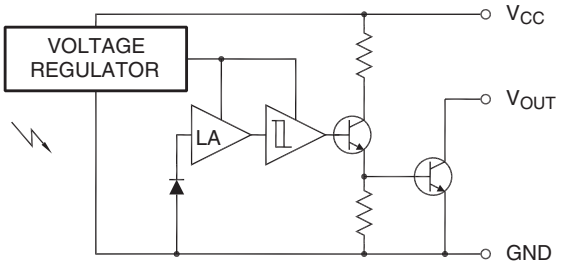
Input/Output Table		
Part Number	**Light**	**Output**
QSE158	On	HIGH
	Off	LOW
QSE159	On	LOW
	Off	HIGH

Note:
1. Dimensions for all drawings are in millimeters.

Block Diagrams



QSE158
Open-Collector Output Buffer



QSE159
Open-Collector Output Inverter

Absolute Maximum Ratings (T_A = 25°C unless otherwise specified)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Rating	Unit
T_{OPR}	Operating Temperature	-40 to +85	°C
T_{STG}	Storage Temperature	-40 to +100	°C
T_{SOL-I}	Soldering Temperature (Iron)[2,3,4]	240 for 5 sec	°C
T_{SOL-F}	Soldering Temperature (Flow)[2,3]	260 for 10 sec	°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[1]	100	mW

Notes:

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

Electrical Characteristics (T_A = -40°C to +85°C, V_{CC} = 4.5V to 16V)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Ee(+)	Positive Going Threshold Irradiance(5)	T_A = 25°C	0.025		0.250	mW/cm^2
Ee(+)/Ee(-)	Hysteresis Ratio		1.10		2.00	
I_{CC}	Supply Current(5)	Ee = 0 or 0.3mW/cm^2			5.0	mA
	Peak to Peak Ripple which will Cause False Triggering	f = DC to 50MHz			2.00	V
QSE158 (Buffer Open Collector)						
I_{OH}	High Level Output Current(5)	Ee = 0.3mW/cm^2, V_{OH} = 30V			100	µA
V_{OL}	Low Level Output Voltage	Ee = 0, I_{OL} = 16mA			0.40	V
QSE159 (Inverter Open Collector)						
I_{OH}	High Level Output Current	Ee = 0, V_{OH} = 30V			100	µA
V_{OL}	Low Level Output Voltage(5)	Ee = 0.3mW/cm^2, I_{OL} = 16mA			0.40	V
QSE158, QSE159						
t_R, t_F	Output Rise, Fall Times	Ee = 0 or 0.3mW/cm^2, f = 10kHz, DC = 50%, R_L = 360Ω(5)			100	nS
t_{PHL}, t_{PLH}	Propagation Delay			6.0		µS

Note:

5. λ = 880nm (AlGaAs).

Typical Performance Curves (Sensor Coupled to QEE113 Emitter)

Fig. 1 Output Voltage vs. Input Current (Inverters)

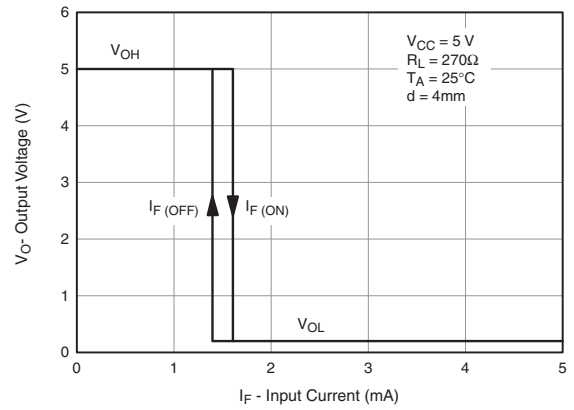


Fig. 2 Output Voltage vs. Input Current (Buffers)

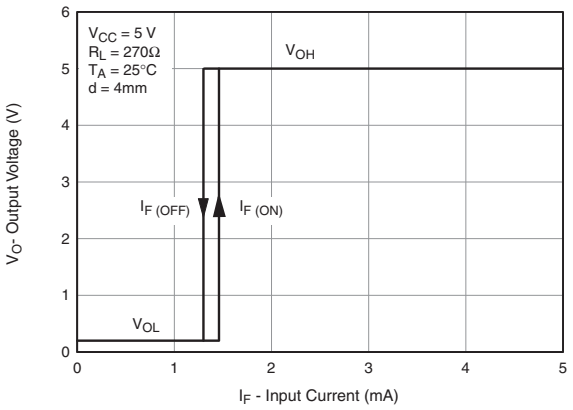


Fig. 3 Threshold Current vs. Distance

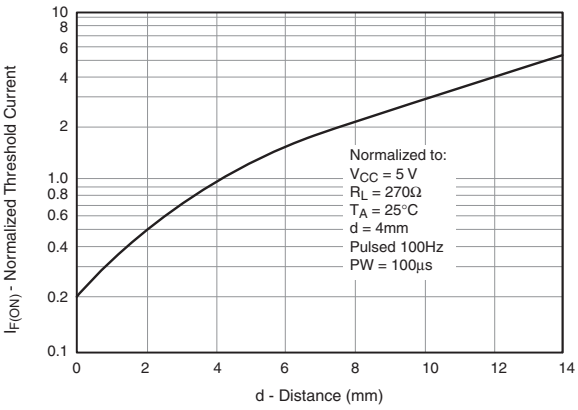
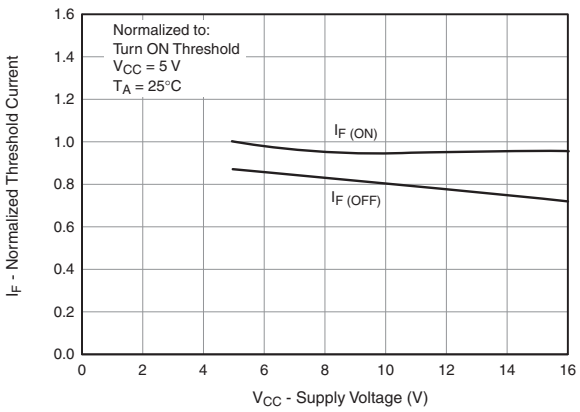


Fig. 4 Normalized Threshold Current vs. Supply Voltage



Typical Performance Curves (Sensor Coupled to QEE113 Emitter) (Continued)

Fig. 5 Normalized Threshold Current vs. Ambient Temperature

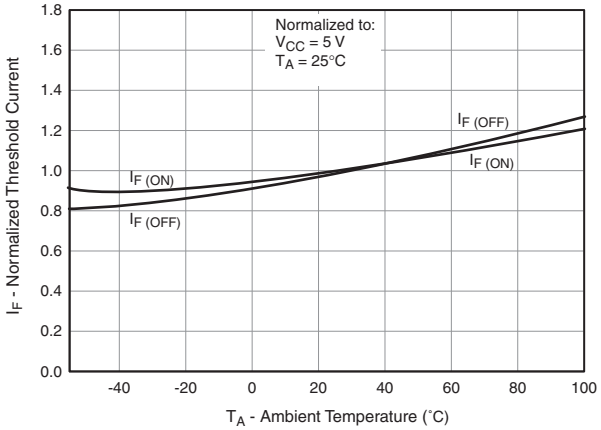


Fig. 6 Low Output Voltage vs. Output Current

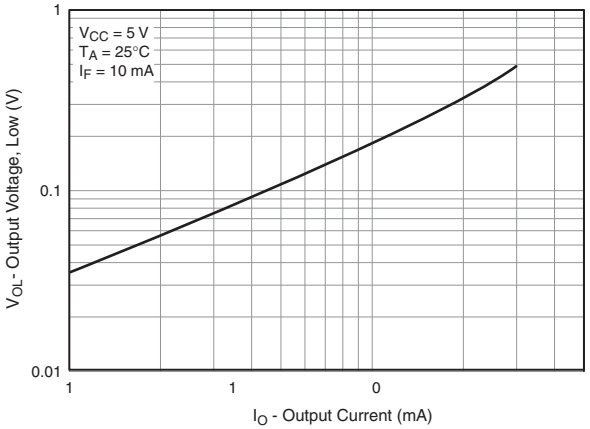


Fig. 7 Response Time vs. Forward Current

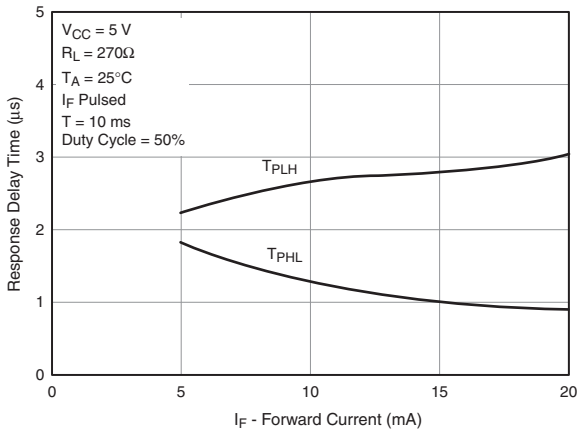
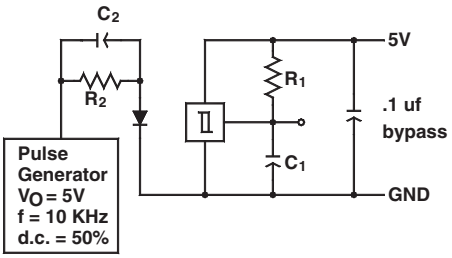


Fig. 8 Switching Speed Test Circuit



$R_1 = 360\Omega$ $C_1 = 15$ pf C_1 and C_2 include probe and
$R_2 = 180\Omega$ $C_2 = 20$ pf stray wire capacitance

Fig. 9 Switching Times Definition for Buffers

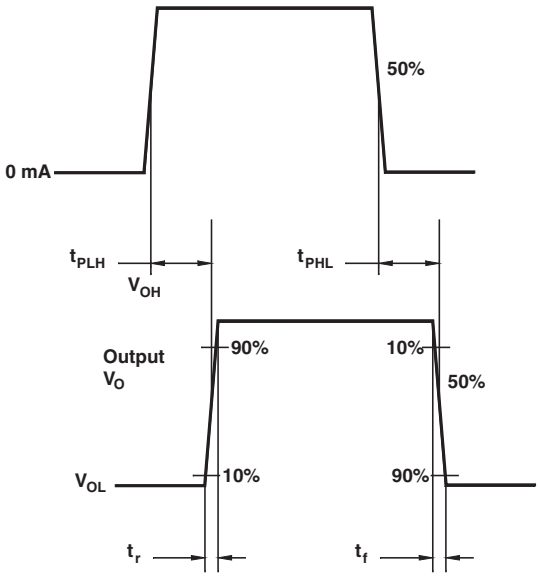
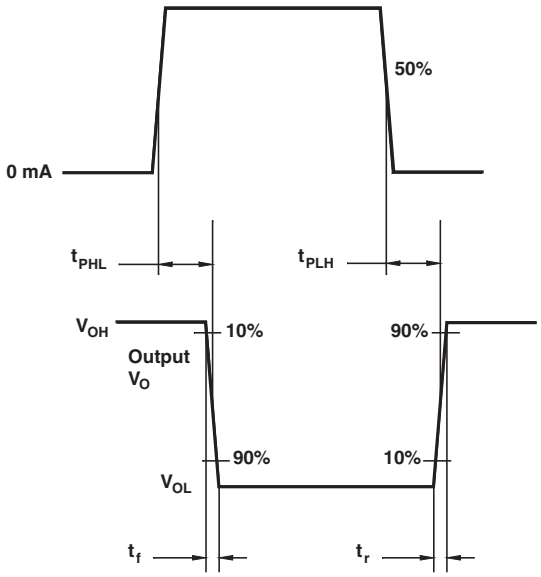


Fig. 10 Switching Times Definition for Inverters



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No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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