Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!


# Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

Is Now Part of

ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

FAIRCHILD

February 2016

# QSE158, QSE159
# Plastic Silicon OPTOLOGIC® Photosensor

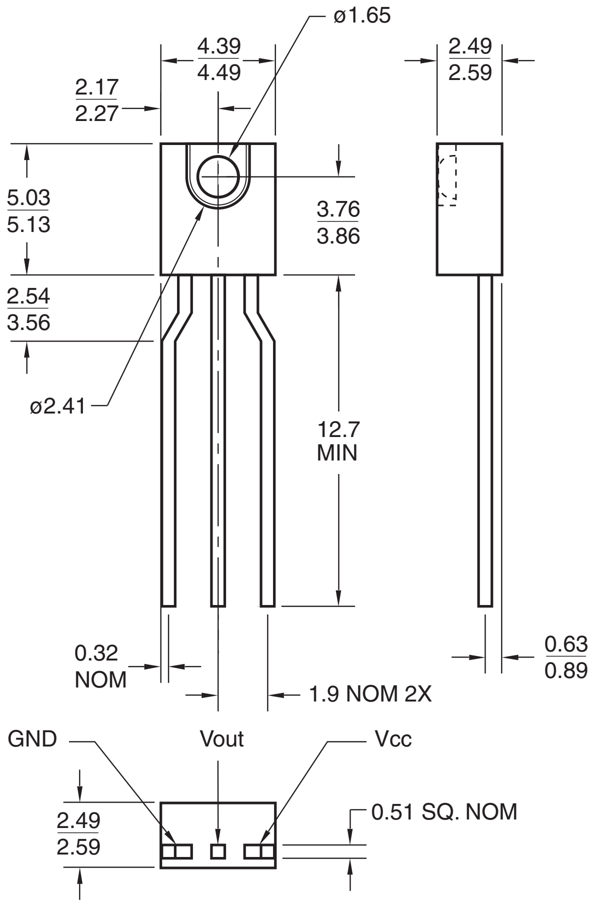
## Features

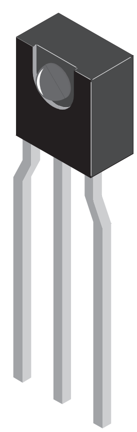
- Bipolar silicon IC
- Package type: Sidelooker
- Medium wide reception angle, 50°
- Package material and color: black epoxy
- Matched emitter: QEE113/QEE123
- Daylight filter
- High sensitivity
- Direct TTL/LSTTL interface

## 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



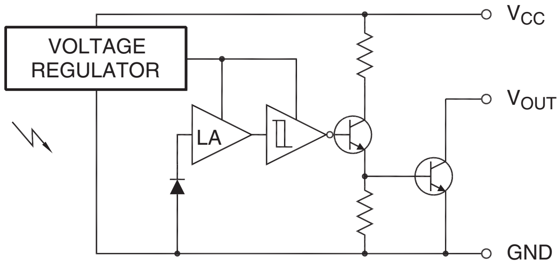
| Part Number Definitions | | Color Code |
|---|---|---|
| QSE158 | Open-collector, buffer output | Green |
| QSE159 | Open-collector, inverter output | Blue |

**Input/Output Table**

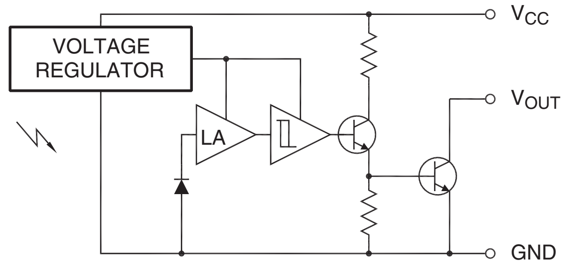
| Part Number | Light | Output |
|---|---|---|
| QSE158 | On | HIGH |
| | Off | LOW |
| QSE159 | On | LOW |
| | Off | HIGH |

**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)**

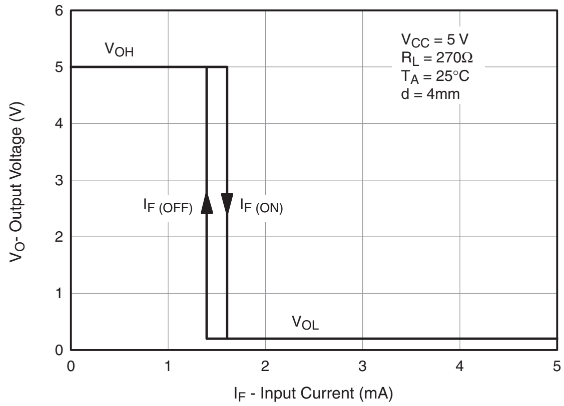



**Fig. 2 Output Voltage vs. Input Current (Buffers)**

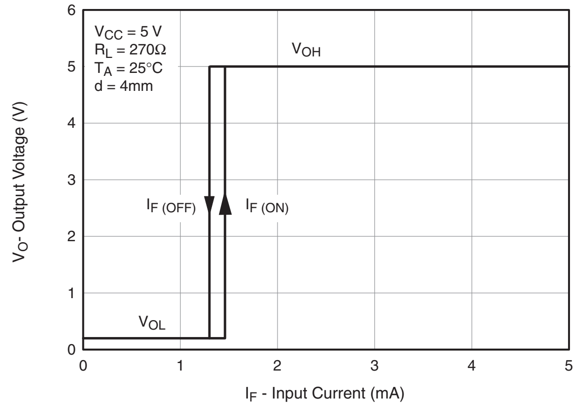



**Fig. 3 Threshold Current vs. Distance**

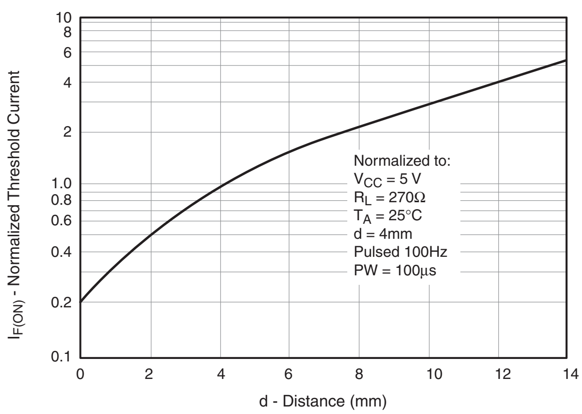
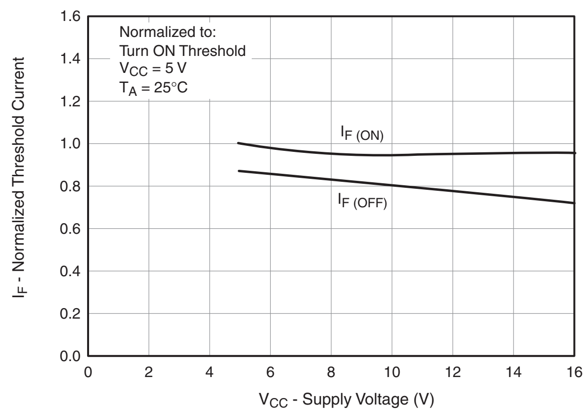



**Fig. 4 Normalized Threshold Current vs. Supply Voltage**



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

**Fig. 5 Normalized Threshold Current vs. Ambient Temperature**

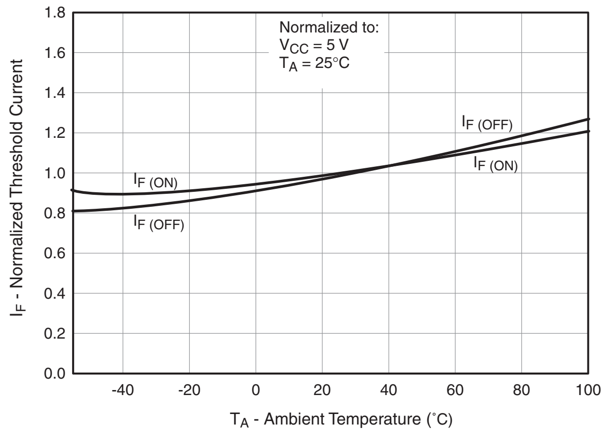



**Fig. 6 Low Output Voltage vs. Output Current**

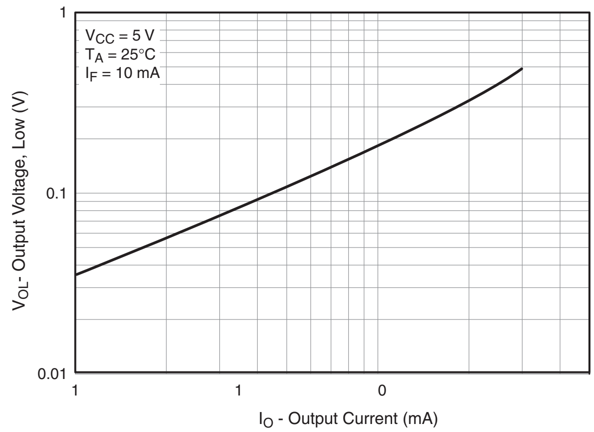



**Fig. 7 Response Time vs. Forward Current**

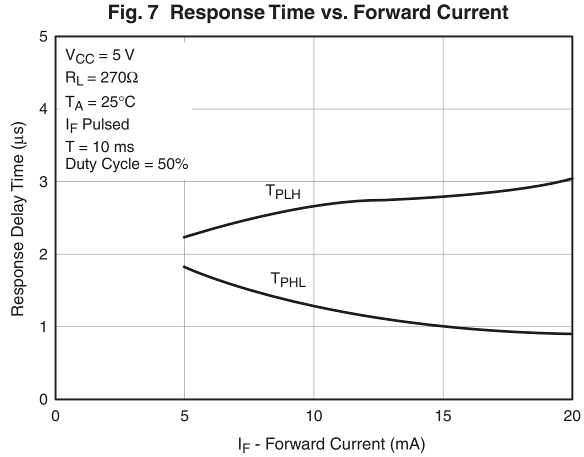
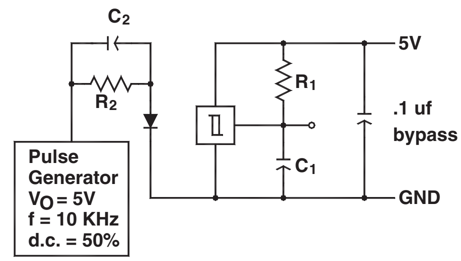


**Fig. 8 Switching Speed Test Circuit**




$R_1 = 360\Omega$ $R_2 = 180\Omega$

$C_1 = 15$ pf $C_2 = 20$ pf

$C_1$ and $C_2$ include probe and stray wire capacitance

**Fig. 9 Switching Times Definition for Buffers**

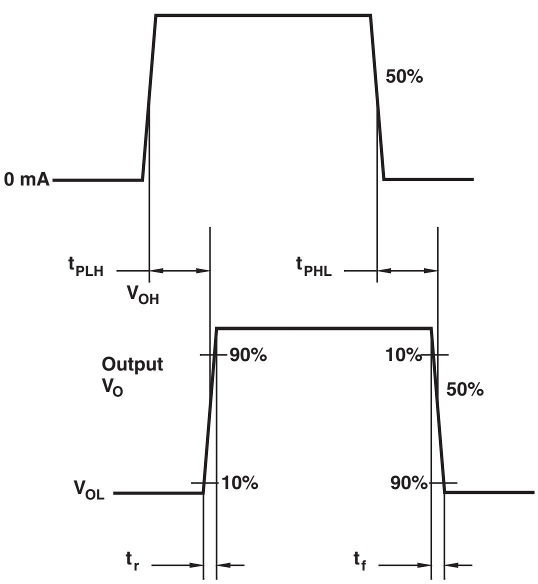
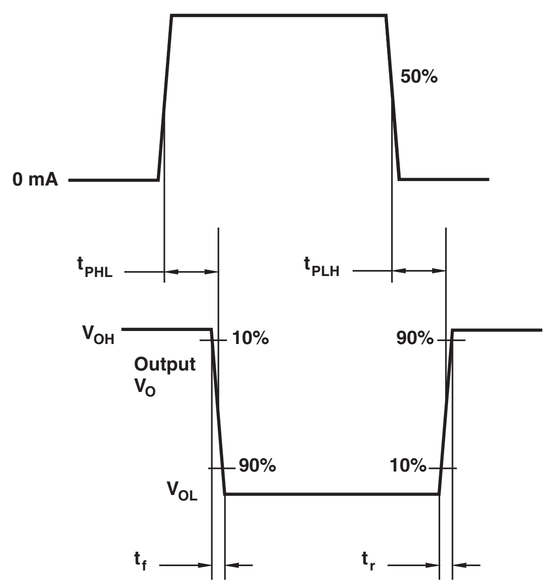



**Fig. 10 Switching Times Definition for Inverters**



## TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™
AttitudeEngine™
Awinda®
AX-CAP®*
BitSiC™
Build it Now™
CorePLUS™
CorePOWER™
*CROSSVOLT*™
CTL™
Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficientMax™
ESBC™
®
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FastvCore™
FETBench™
FPS™
F-PFS™
FRFET®
Global Power Resource℠
GreenBridge™
Green FPS™
Green FPS™ e-Series™
G*max*™
GTO™
IntelliMAX™
ISOPLANAR™
Making Small Speakers Sound Louder and Better™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
MotionGrid®
MTi®
MTx®
MVN®
mWSaver®
OptoHiT™
OPTOLOGIC®
OPTOPLANAR®
®
Power Supply WebDesigner™
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
™
Saving our world, 1mW/W/kW at a time™
SignalWise™
SmartMax™
SMART START™
Solutions for Your Success™
SPM®
STEALTH™
SuperFET®
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS®
SyncFET™
Sync-Lock™
®*
TinyBoost®
TinyBuck®
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TranSiC™
TriFault Detect™
TRUECURRENT®*
µSerDes™
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
VoltagePlus™
XS™
Xsens™
仙童®

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

## DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT HTTP://WWW.FAIRCHILDSEMI.COM. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

## AUTHORIZED USE

Unless otherwise specified in this data sheet, this product is a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability. This product may not be used in the following applications, unless specifically approved in writing by a Fairchild officer: (1) automotive or other transportation, (2) military/aerospace, (3) any safety critical application – including life critical medical equipment – where the failure of the Fairchild product reasonably would be expected to result in personal injury, death or property damage. Customer's use of this product is subject to agreement of this Authorized Use policy. In the event of an unauthorized use of Fairchild's product, Fairchild accepts no liability in the event of product failure. In other respects, this product shall be subject to Fairchild's Worldwide Terms and Conditions of Sale, unless a separate agreement has been signed by both Parties.

## ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Terms of Use

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

## PRODUCT STATUS DEFINITIONS

**Definition of Terms**

| Datasheet Identification | Product Status | Definition |
|---|---|---|
| Advance Information | Formative / In Design | Datasheet contains the design specifications for product development. Specifications may change in any manner without notice. |
| Preliminary | First Production | Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| 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. |
| Obsolete | Not In Production | Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only. |

Rev. I77

## PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT**:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
**Phone**: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
**Fax**: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
**Email**: orderlit@onsemi.com

**N. American Technical Support**: 800−282−9855 Toll Free USA/Canada
**Europe, Middle East and Africa Technical Support:**
Phone: 421 33 790 2910
**Japan Customer Focus Center**
Phone: 81−3−5817−1050

**ON Semiconductor Website**: **www.onsemi.com**

**Order Literature**: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative