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QSE256, QSE257, QSE258, QSE259
Plastic Silicon OPTOLOGIC® Photosensor

Features

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

Description

The QSE25x 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
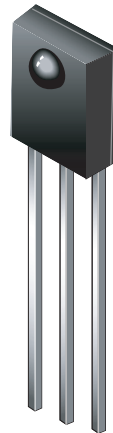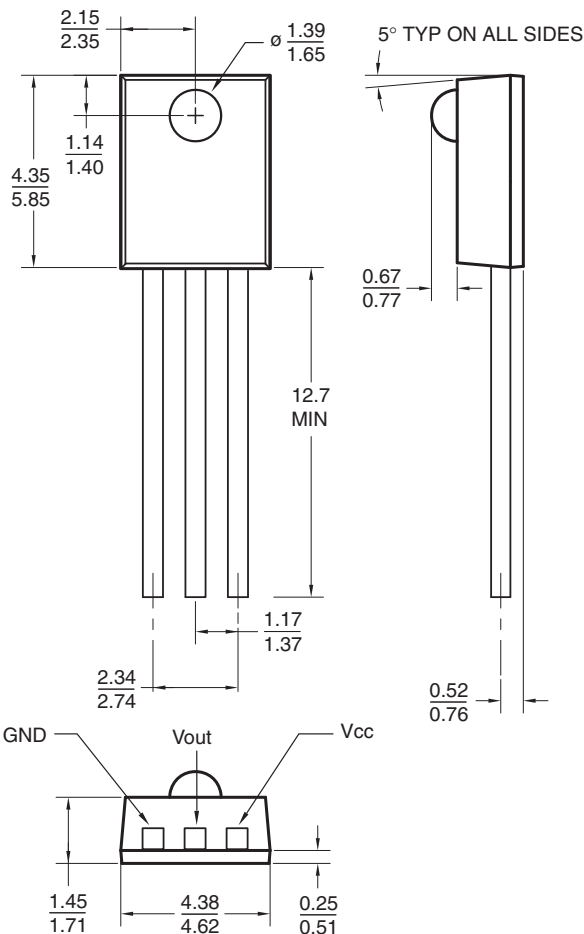
Part Number Definitions		Color Code
QSE256	Totem-Pole, buffer output	Red
QSE257	Totem-Pole, inverter output	Yellow
QSE258	Open-collector, buffer output	Green
QSE259	Open-collector, inverter output	Blue

Input/Output Table		
Part Number	Light	Output
QSE256	On	HIGH
	Off	LOW
QSE257	On	LOW
	Off	HIGH
QSE258	On	HIGH
	Off	LOW
QSE259	On	LOW
	Off	HIGH

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

Block Diagrams
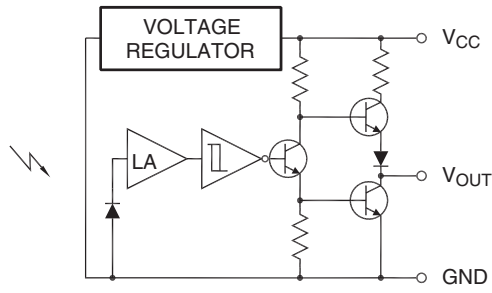
QSE256
Totem-Pole Output Buffer
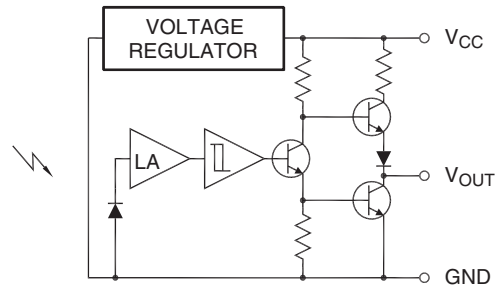
QSE257
Totem-Pole Output Inverter
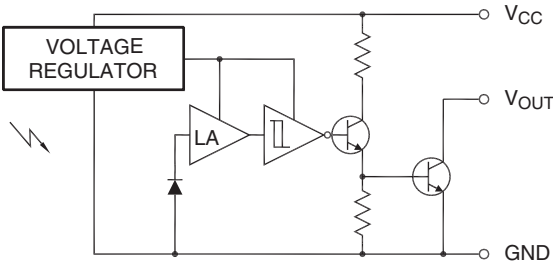
QSE258
Open-Collector Output Buffer
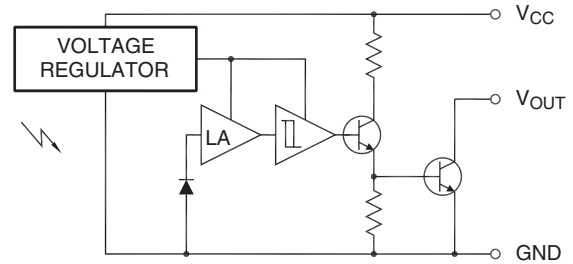
QSE259
Open-Collector Output Inverter

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 $5.5V)$

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
QSE256 (Buffer Totem Pole)						
V_{OH}	High Level Output Voltage[5]	Ee = 0.3mW/cm^2, I_{OH} = -10mA	2.4			V
V_{OL}	Low Level Output Voltage	Ee = 0, I_{OL} = 16mA			0.40	V
QSE257 (Inverter Totem Pole)						
V_{OH}	High Level Output Voltage	Ee = 0, I_{OH} = -10mA	2.4			V
V_{OL}	Low Level Output Voltage[5]	Ee = 0.3mW/cm^2, I_{OL} = 16mA			0.40	V
QSE258 (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
QSE259 (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
QSE256, QSE257						
t_R, t_F	Output Rise, Fall Times	Ee = 0 or 0.3mW/cm^2, f = 10kHz, DC = 50%, $R_L = 360\Omega$[5]			70	nS
t_{PHL}, t_{PLH}	Propagation Delay			6.0		µS
QSE258, QSE259						
t_R, t_F	Output Rise, Fall Times	Ee = 0 or 0.3mW/cm^2, f = 10kHz, DC = 50%, $R_L = 360\Omega$[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)

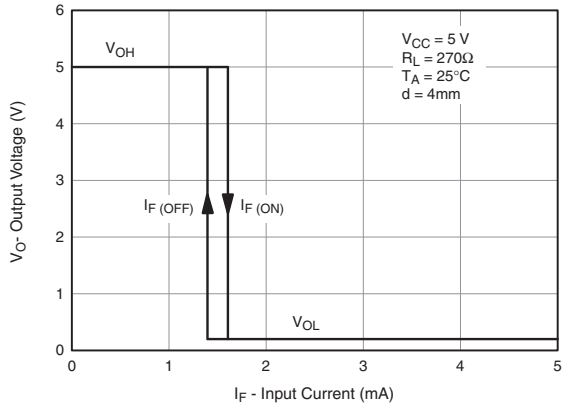### Fig. 1 Output Voltage vs. Input Current (Inverters)

V_{OH}

V_{CC} = 5 V
R_L = 270Ω
T_A = 25°C
d = 4mm

$I_{F (OFF)}$ $I_{F (ON)}$

V_{OL}

V_O- Output Voltage (V)

I_F - Input Current (mA)

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

V_{CC} = 5 V
R_L = 270Ω
T_A = 25°C
d = 4mm

V_{OH}

$I_{F (OFF)}$ $I_{F (ON)}$

V_{OL}

V_O- Output Voltage (V)

I_F - Input Current (mA)
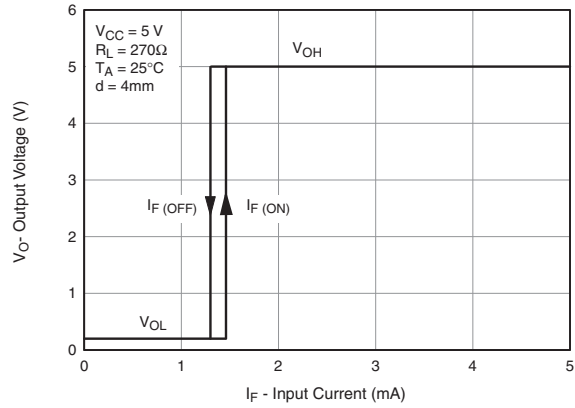
Fig. 3 Threshold Current vs. Distance

Normalized to:
V_{CC} = 5 V
R_L = 270Ω
T_A = 25°C
d = 4mm
Pulsed 100Hz
PW = 100µs

$I_{F(ON)}$ - Normalized Threshold Current

d - Distance (mm)

Fig. 4 Normalized Threshold Current vs. Supply Voltage

Normalized to:
Turn ON Threshold
V_{CC} = 5 V
T_A = 25°C

$I_{F (ON)}$
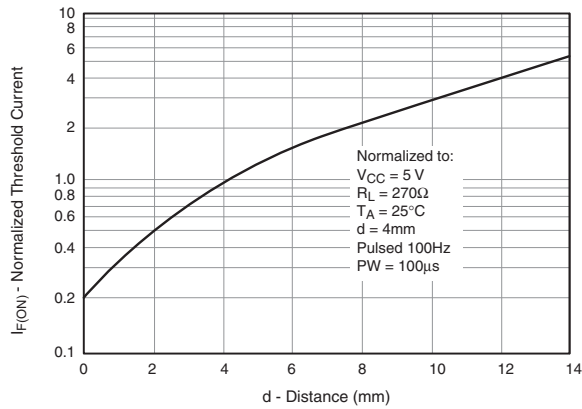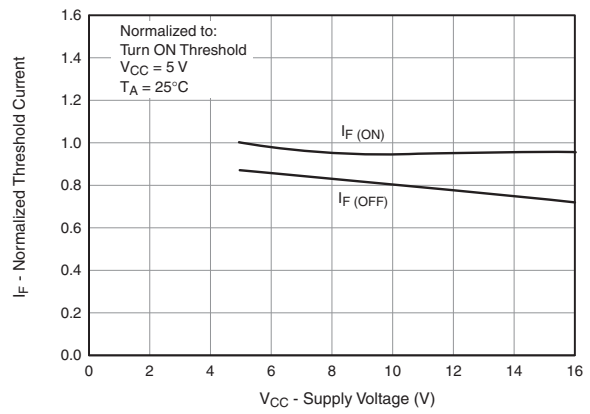
$I_{F (OFF)}$

I_F - Normalized Threshold Current

V_{CC} - Supply Voltage (V)

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

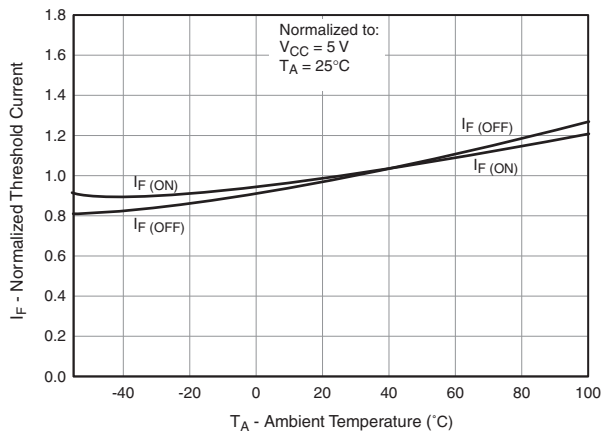**Fig. 5 Normalized Threshold Current vs. Ambient Temperature**

Normalized to:
V_{CC} = 5 V
T_A = 25°C

I_F - Normalized Threshold Current

$I_{F (OFF)}$
$I_{F (ON)}$
$I_{F (ON)}$
$I_{F (OFF)}$

T_A - Ambient Temperature (°C)

Fig. 6 Low Output Voltage vs. Output Current

V_{CC} = 5 V
T_A = 25°C
I_F = 10 mA

V_{OL} - Output Voltage, Low (V)

I_O - Output Current (mA)
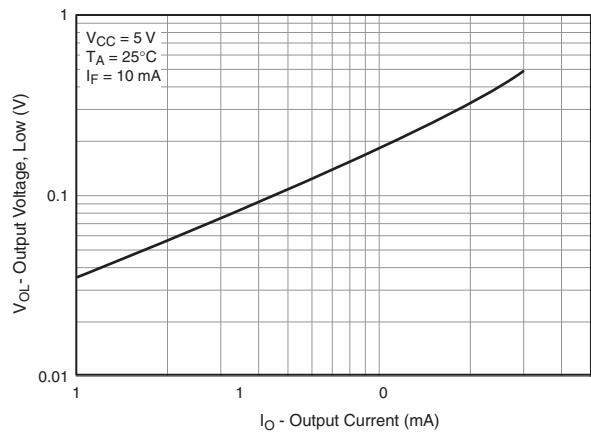
Fig. 7 Response Time vs. Forward Current

V_{CC} = 5 V
R_L = 270Ω
T_A = 25°C
I_F Pulsed
T = 10 ms
Duty Cycle = 50%

Response Delay Time (µs)

T_{PLH}
T_{PHL}

I_F - Forward Current (mA)
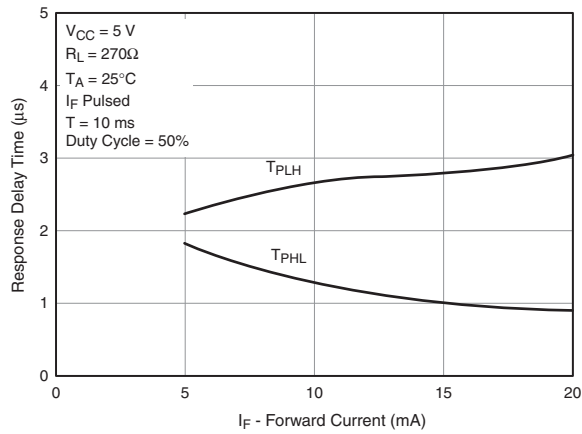
Fig. 8 Switching Speed Test Circuit
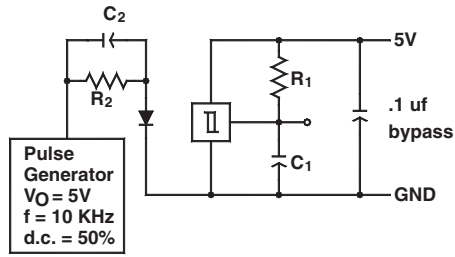
R₁ = 360Ω   C₁ = 15 pf   C₁ and C₂ include probe and
R₂ = 180Ω   C₂ = 20 pf   stray wire capacitance

Fig. 9 Switching Times Definition for Buffers
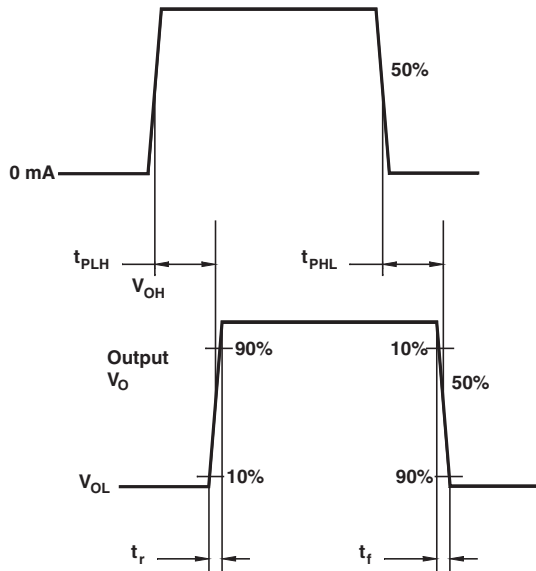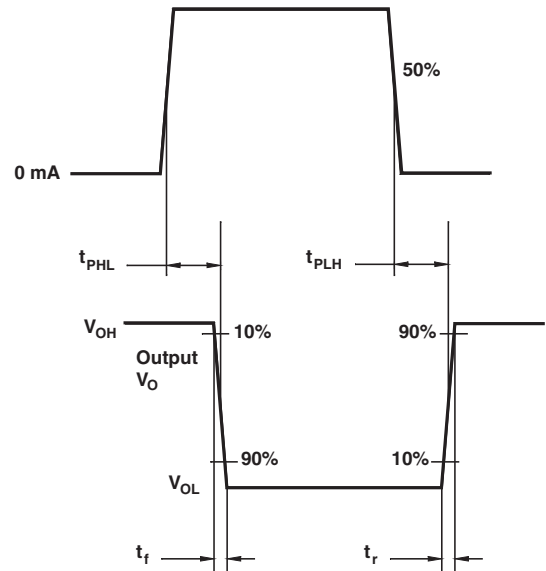

Fig. 10 Switching Times Definition for Inverters

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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.
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Rev. I62

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