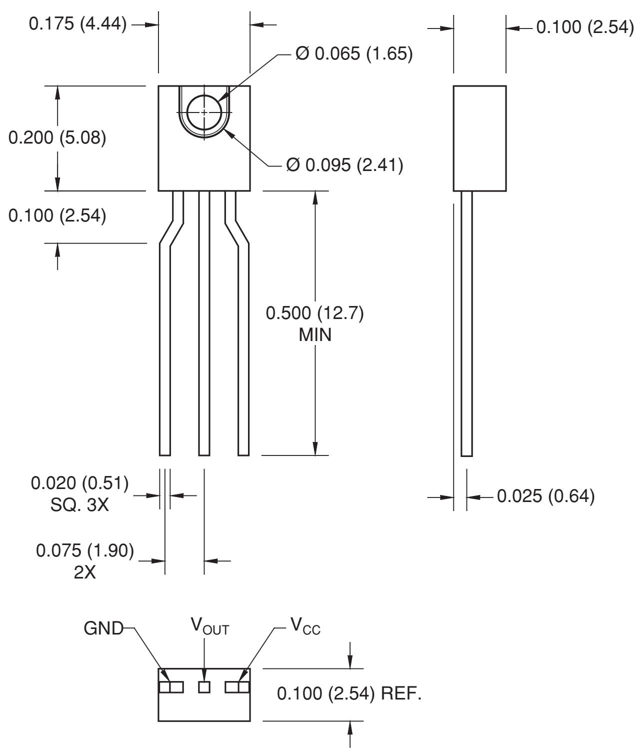
FAIRCHILD
SEMICONDUCTOR®

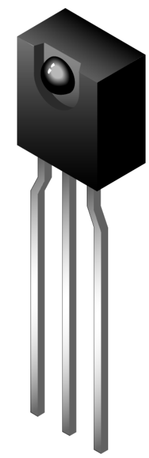
PLASTIC SILICON OPTOLOGIC® PHOTOSENSOR

QSE156 QSE157 QSE158 QSE159

PACKAGE DIMENSIONS



NOTES:
1. Dimensions for all drawings are in inches (mm).
2. Tolerance of ± .010 (.25) on all non-nominal dimensions unless otherwise specified.



Part Number Definitions		Color Code
QSE156	Totem-Pole, buffer output	Red
QSE157	Totem-Pole, inverter output	Yellow
QSE158	Open-collector, buffer output	Green
QSE159	Open-collector, inverter output	Blue

Input/Output Table

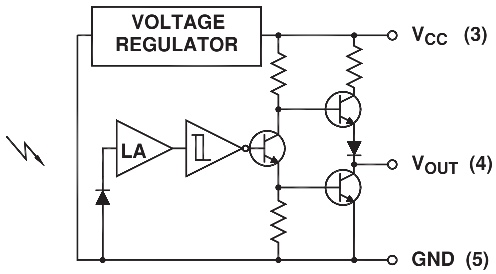
Part Number	Light	Output
QSE156	On	High
	Off	Low
QSE157	On	Low
	Off	High
QSE158	On	High
	Off	Low
QSE159	On	Low
	Off	High

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.

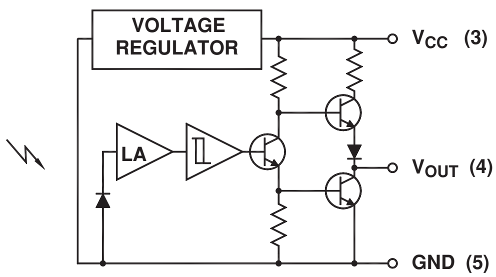
FEATURES

- 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



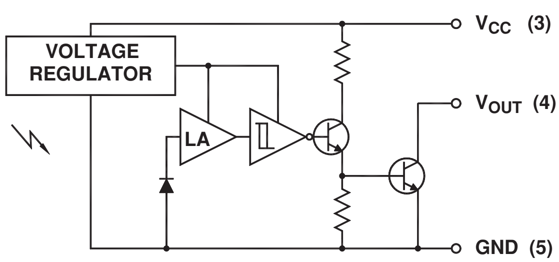
QSE156

Totem-Pole Output Buffer



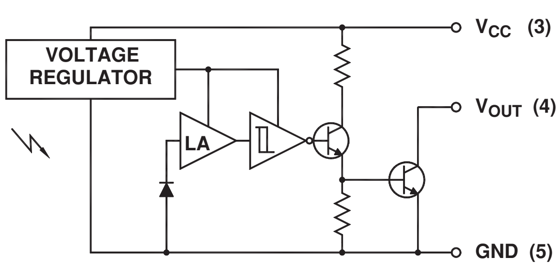
QSE157

Totem-Pole Output inverter



QSE158

Open-Collector Output Buffer



QSE159

Open-Collector Output Inverter

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise specified)			
Parameter	**Symbol**	**Rating**	**Unit**
Operating Temperature	T_{OPR}	-40 to +85	°C
Storage Temperature	T_{STG}	-40 to +100	°C
Soldering Temperature (Iron)(2,3,4)	T_{SOL-I}	240 for 5 sec	°C
Soldering Temperature (Flow)(2,3)	T_{SOL-F}	260 for 10 sec	°C
Output Current	I_O	50	mA
Supply Voltage	V_{CC}	4.0 to 16	V
Output Voltage	V_O	30	V
Power Dissipation(1)	P_D	100	mW

NOTES:
1. Derate power dissipation linearly 2.50 mW/°C above 25°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.
5. λ = 880 nm (AlGaAs).

ELECTRICAL / OPTICAL CHARACTERISTICS (T_A = –40°C to +85°C, V_{CC} = 4.5 to 16 volts)						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Test Conditions**
Positive Going Threshold Irradiance(5)	Ee (+)	0.025		0.250	mW/cm^2	T_A = 25°C
Hysteresis Ratio	Ee (+)/Ee(–)	1.10		2.00		
Supply Current	I_{CC}	—		5.0	mA	Ee = 0 or .3 mW/cm^2(5)
Peak to peak ripple which will cause false triggering		—		2.00	V	f = DC to 50 MHZ
QSE156 (BUFFER TOTEM POLE)						
High Level Output Voltage	V_{OH}	V_{CC}-2.1		—	V	Ee = .3 mW/cm^2, I_{OH} = -1.0mA(5)
Low Level Output Voltage	V_{OL}	—		0.40	V	Ee = 0, I_{OL} = 16 mA
QSE157 (INVERTER TOTEM POLE)						
High Level Output Voltage	V_{OH}	V_{CC}-2.1		—	V	Ee = 0, I_{OH} = -1.0mA
Low Level Output Voltage	V_{OL}	—		0.40	V	Ee = .3 mW/cm^2, I_{OL} = 16mA(5)
QSE158 (BUFFER OPEN COLLECTOR)						
High Level Output Current	I_{OH}	—		100	µA	Ee = .3mW/cm^2, V_{OH} = 30V(5)
Low Level Output Voltage	V_{OL}	—		0.40	V	Ee = 0, I_{OL} = 16mA
QSE159 (INVERTER OPEN COLLECTOR)						
High Level Output Current	I_{OH}	—		100	µA	Ee = 0, V_{OH} = 30V
Low Level Output Voltage	V_{OL}	—		0.40	V	Ee = .3mW/cm^2, I_{OL} = 16mA(5)
QSE156, QSE157						
Output rise, fall times	tr, tf	—		70	nS	Ee = 0 or .3 mW/cm^2, f = 10KHz DC = 50%, R_L=360Ω(5)
Propagation delay	tphl, tplh		6.0		µS	
QSE158, QSE159						
Output rise, fall times	tr, tf	—		100	nS	Ee = 0 or .3 mW/cm^2, f = 10KHz DC = 50%, R_L=360Ω(5)
Propagation delay	tphl, tplh		6.0		µS	

Typical Performance Curves - (Sensor Coupled to QEE113 Emitter)

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

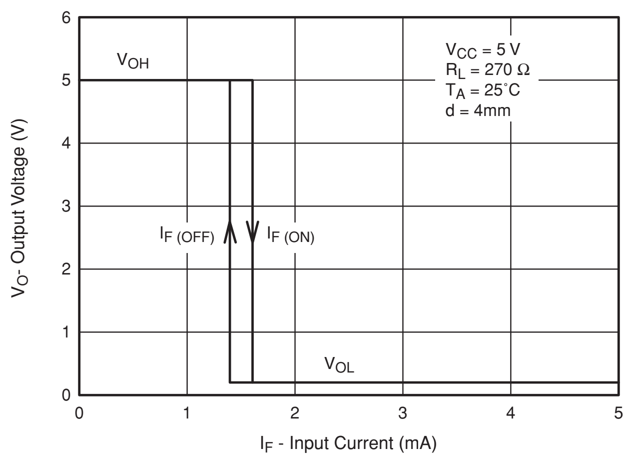


Fig. 2 Output Voltage vs. Input Current (Buffers)

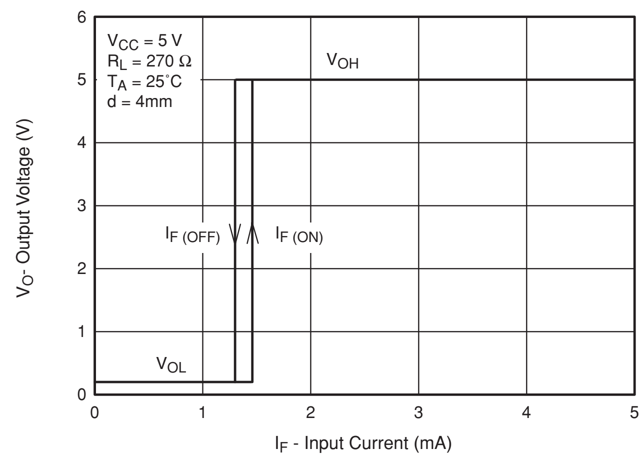


Fig. 3 Threshold Current vs. Distance

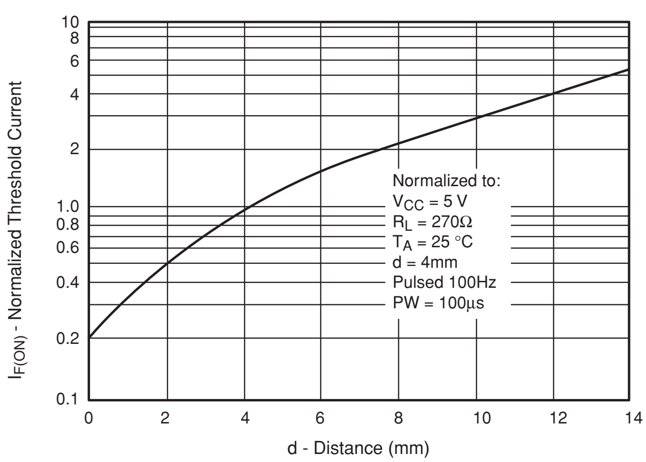


Fig. 4 Normalized Threshold Current vs. Supply Voltage

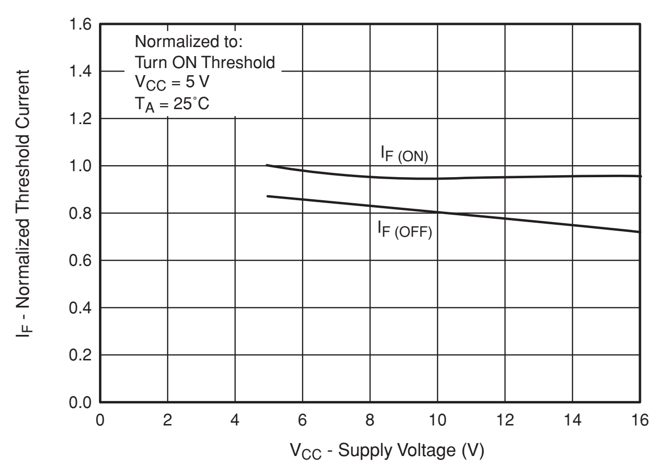


Fig. 5 Normalized Threshold Current vs. Ambient Temperature

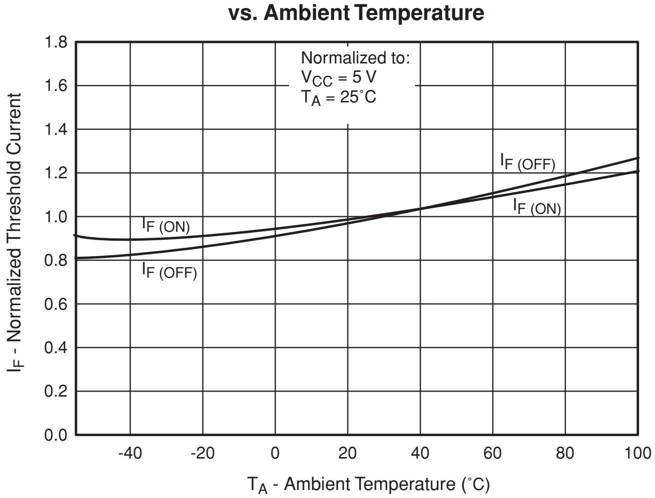


Fig. 6 Low Output Voltage vs. Output Current

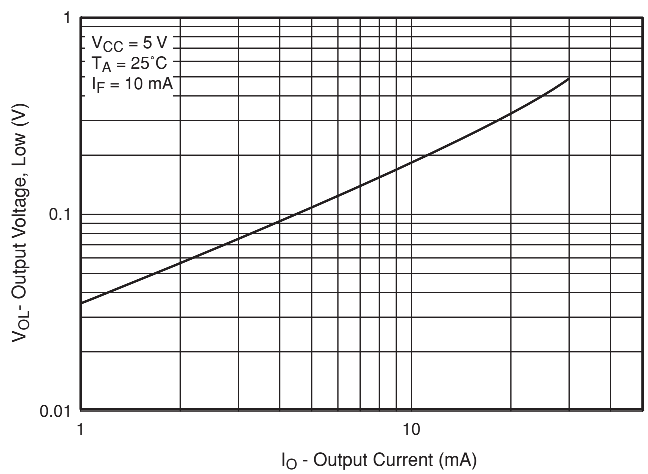


Fig. 7 Response Time vs. Forward Current

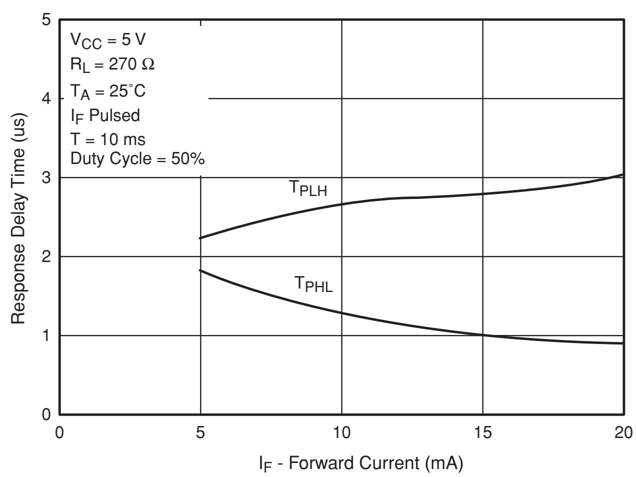
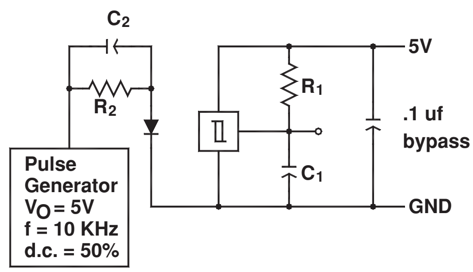


Fig. 8 Switching Speed Test Circuit



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

Fig. 9 Switching Times Definition for Buffers

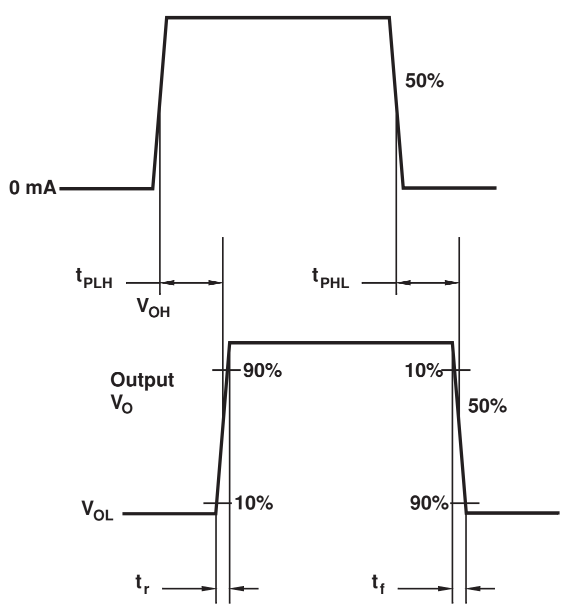
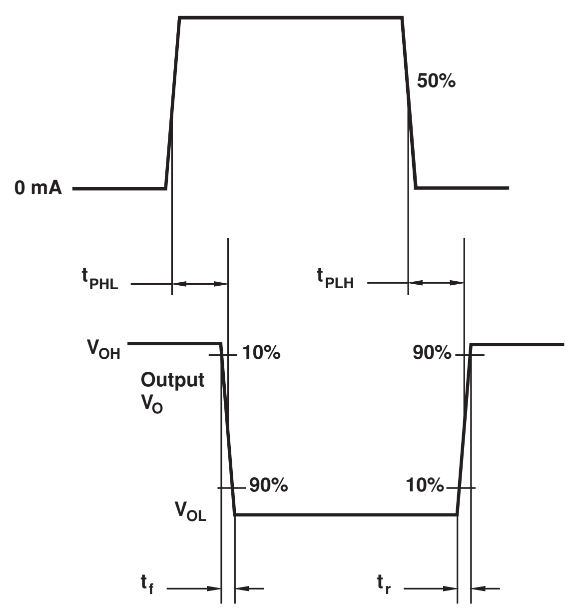


Fig. 10 Switching Times Definition for Inverters



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