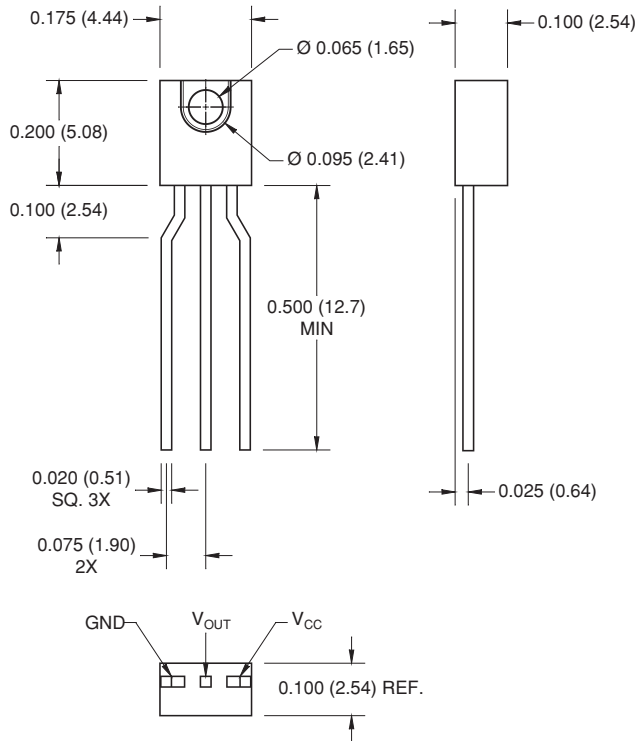


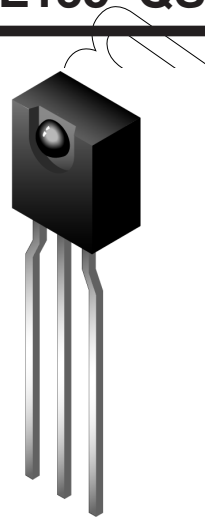
QSE156 QSE157 QSE158 QSE159

PACKAGE DIMENSIONS



NOTES:

1. Dimensions for all drawings are in inches (mm).
2. Tolerance of $\pm .010 (.25)$ 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 |

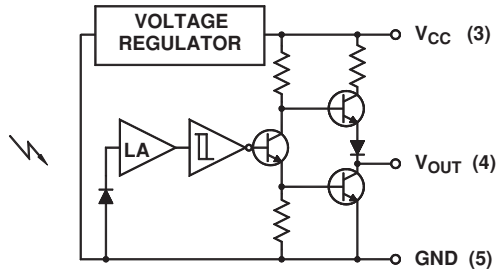
DESCRIPTION

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.

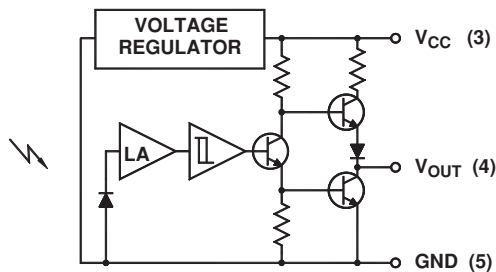
FEATURES

- 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

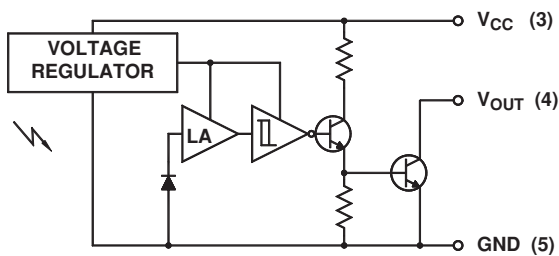
QSE156 QSE157 QSE158 QSE159



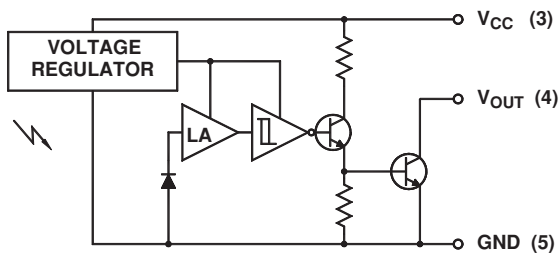
QSE156
Totem-Pole Output Buffer



QSE157
Totem-Pole Output inverter



QSE158
Open-Collector Output Buffer



QSE159
Open-Collector Output Inverter

QSE156 QSE157 QSE158 QSE159

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

| Parameter | Symbol | Rating | Unit |
|---|-------------|----------------|------------------|
| Operating Temperature | T_{OPR} | -40 to +85 | $^\circ\text{C}$ |
| Storage Temperature | T_{STG} | -40 to +100 | $^\circ\text{C}$ |
| Soldering Temperature (Iron) ^(2,3,4) | T_{SOL-I} | 240 for 5 sec | $^\circ\text{C}$ |
| Soldering Temperature (Flow) ^(2,3) | T_{SOL-F} | 260 for 10 sec | $^\circ\text{C}$ |
| 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/ $^\circ\text{C}$ 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.
5. $\lambda = 880 \text{ nm}$ (AlGaAs).

ELECTRICAL / OPTICAL CHARACTERISTICS ($T_A = -40^\circ\text{C}$ to +85 $^\circ\text{C}$, $V_{CC} = 4.5$ to 16 volts)

| Parameter | Symbol | Min | Typ | Max | Units | Test Conditions |
|---|---------------|--------------|-----|-------|--------------------|--|
| Positive Going Threshold Irradiance ⁽⁵⁾ | Ee (+) | 0.025 | | 0.250 | mW/cm ² | $T_A = 25^\circ\text{C}$ |
| 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 , $I_{OH} = -1.0\text{mA}$ (⁵) |
| Low Level Output Voltage | V_{OL} | — | | 0.40 | V | Ee = 0, $I_{OL} = 16 \text{ mA}$ |
| QSE157 (INVERTER TOTEM POLE) | | | | | | |
| High Level Output Voltage | V_{OH} | $V_{CC}-2.1$ | | — | V | Ee = 0, $I_{OH} = -1.0\text{mA}$ |
| Low Level Output Voltage | V_{OL} | — | | 0.40 | V | Ee = .3 mW/cm ² , $I_{OL} = 16\text{mA}$ (⁵) |
| QSE158 (BUFFER OPEN COLLECTOR) | | | | | | |
| High Level Output Current | I_{OH} | — | | 100 | μA | Ee = .3mW/cm ² , $V_{OH} = 30\text{V}$ (⁵) |
| Low Level Output Voltage | V_{OL} | — | | 0.40 | V | Ee = 0, $I_{OL} = 16\text{mA}$ |
| QSE159 (INVERTER OPEN COLLECTOR) | | | | | | |
| High Level Output Current | I_{OH} | — | | 100 | μA | Ee = 0, $V_{OH} = 30\text{V}$ |
| Low Level Output Voltage | V_{OL} | — | | 0.40 | V | Ee = .3mW/cm ² , $I_{OL} = 16\text{mA}$ (⁵) |
| QSE156, QSE157 | | | | | | |
| Output rise, fall times | tr, tf | — | | 70 | nS | Ee = 0 or .3 mW/cm ² , f = 10KHz |
| Propagation delay | tphl, tplh | | 6.0 | | μS | DC = 50%, $R_L = 360\Omega$ (⁵) |
| QSE158, QSE159 | | | | | | |
| Output rise, fall times | tr, tf | — | | 100 | nS | Ee = 0 or .3 mW/cm ² , f = 10KHz |
| Propagation delay | tphl, tplh | | 6.0 | | μS | DC = 50%, $R_L = 360\Omega$ (⁵) |

QSE156 QSE157 QSE158 QSE159

Typical Performance Curves - (Sensor Coupled to QEE113 Emitter)

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

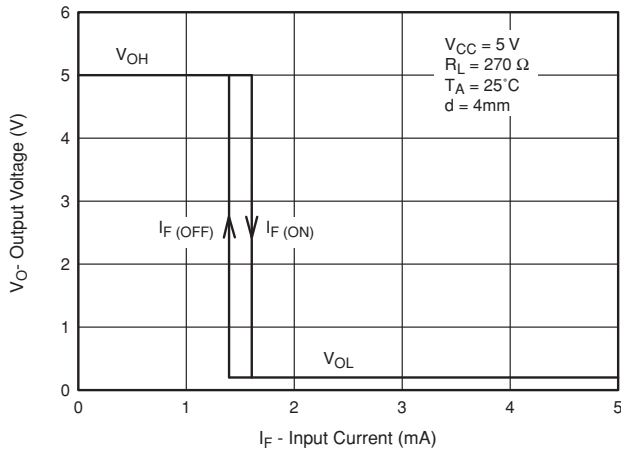


Fig. 2 Output Voltage vs. Input Current (Buffers)

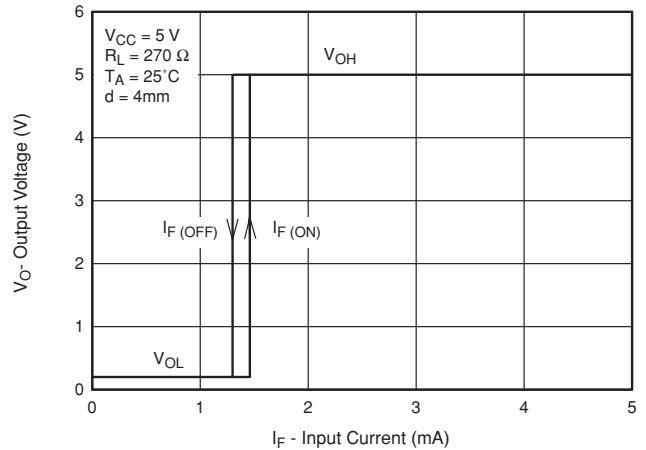


Fig. 3 Threshold Current vs. Distance

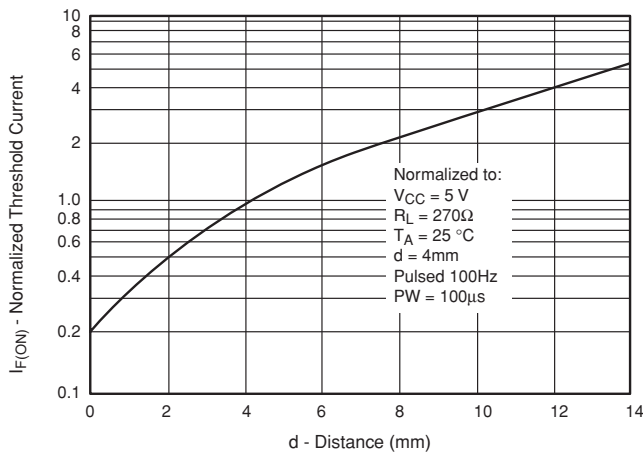
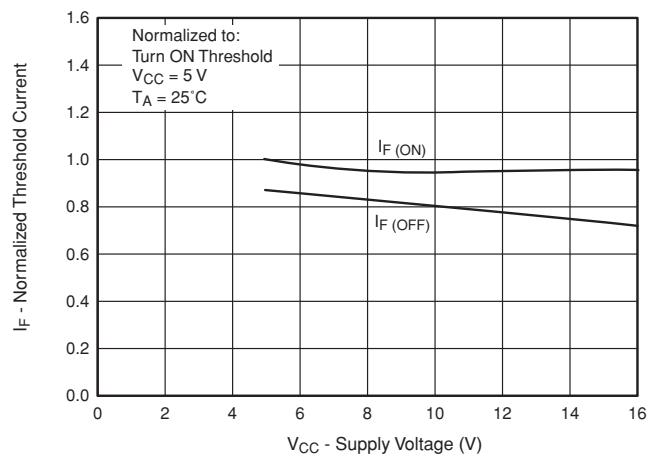


Fig. 4 Normalized Threshold Current vs. Supply Voltage



QSE156 QSE157 QSE158 QSE159

Fig. 5 Normalized Threshold Current vs. Ambient Temperature

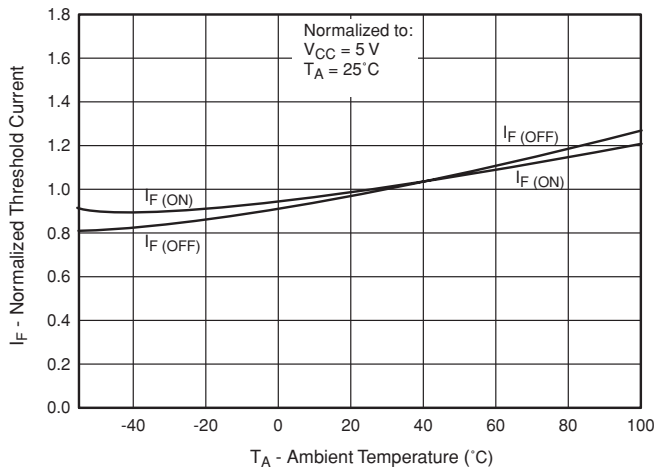


Fig. 6 Low Output Voltage vs. Output Current

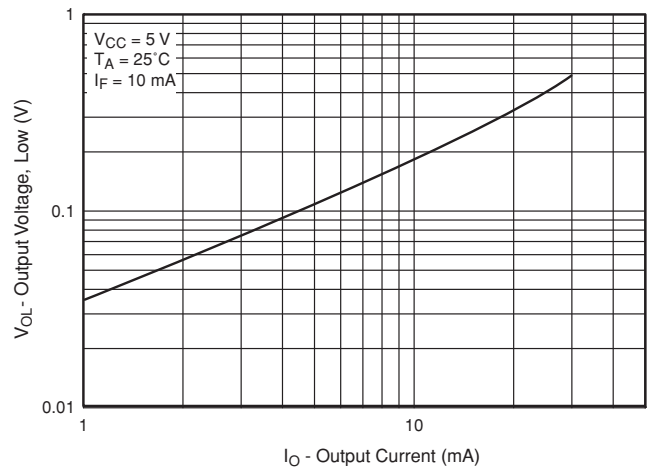
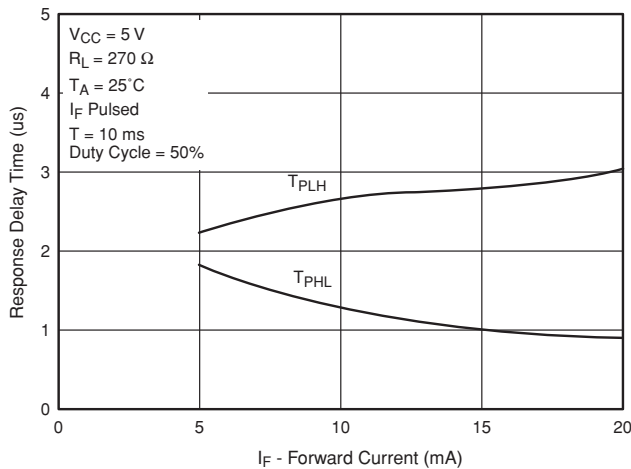
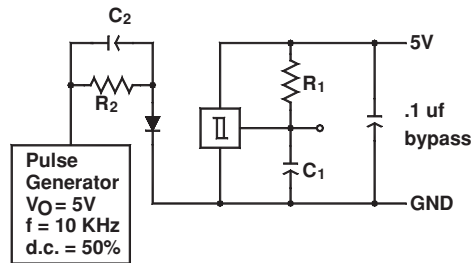


Fig. 7 Response Time vs. Forward Current



QSE156 QSE157 QSE158 QSE159

Fig. 8 Switching Speed Test Circuit



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

$C_1 = 15 \text{ pf}$
 $C_2 = 20 \text{ pf}$

C_1 and C_2 include probe and
stray wire capacitance

Fig. 9 Switching Times Definition for Buffers

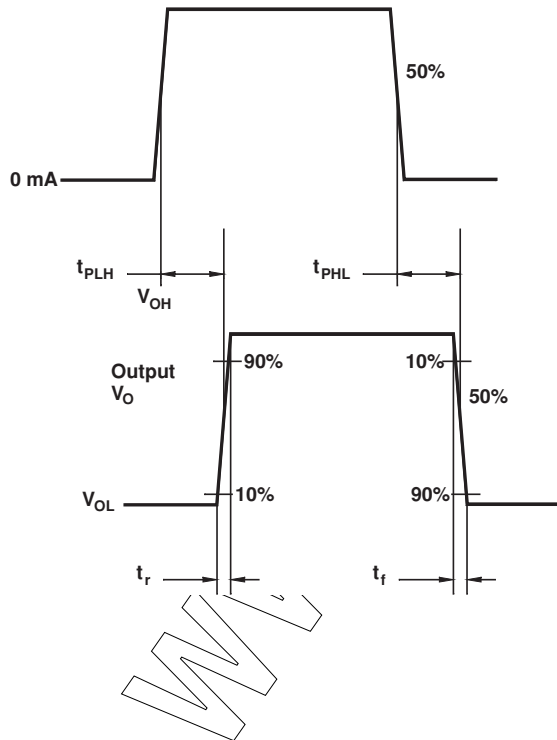
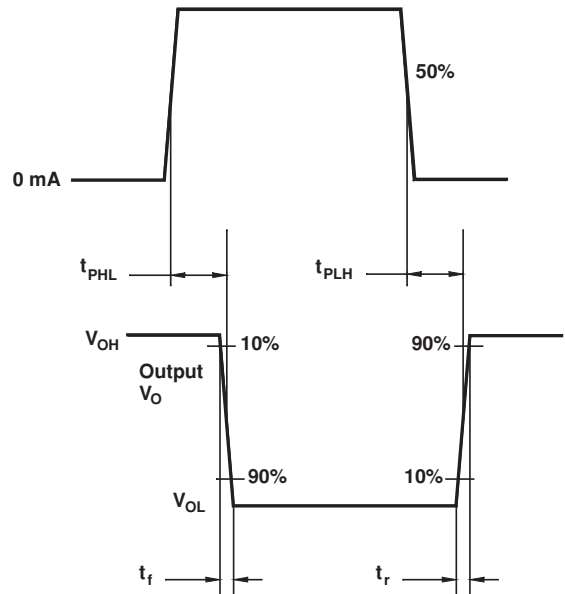


Fig. 10 Switching Times Definition for Inverters



QSE156 QSE157 QSE158 QSE159

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