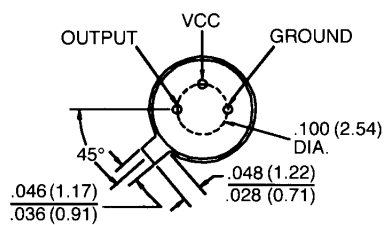
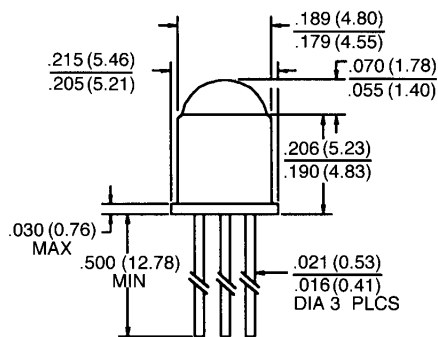


**PACKAGE DIMENSIONS**



ST2139

**DESCRIPTION**

The QSA15X 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 monolithic die is packaged in a narrow angle, hermetically sealed, TO-18 metal can package.

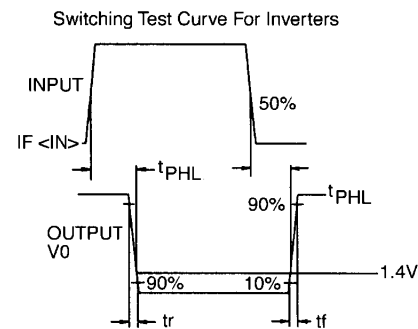
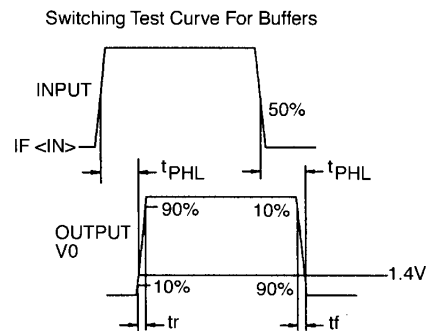
**FEATURES**

- High noise immunity.
- Direct TTL/LSTTL interface.
- Hermetically sealed package.
- Reception angle of  $\pm 12^\circ$ .

<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_A = 25^\circ\text{C}$ Unless Otherwise Specified)	
Supply Voltage, $V_{CC}$	18 volts
Storage Temperature	$-65^\circ\text{C}$ to $+125^\circ\text{C}$
Operating Temperature	$-55^\circ\text{C}$ to $+105^\circ\text{C}$
Soldering:	
Lead Temperature (Iron)	240°C for 5 sec. <sup>(2,3,4,5)</sup>
Lead Temperature (Flow)	260°C for 10 sec. <sup>(2,3,5)</sup>
Power Dissipation	250 mW <sup>(1)</sup>
Duration of Output short to $V_{CC}$	1.00 sec.
Voltage at Output	35 volts
Sinking Current	50 mA
Sourcing Current (QSA156, QSA157)	10 mA
Irradiance	3.0 mW/cm <sup>2</sup>

<b>ELECTRICAL CHARACTERISTICS</b> ( $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ ) ( $V_{CC} = 4.5$ to 16 volts)						
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Operating Supply Voltage	$V_{CC}$	4.5		16.0	V	
Positive Going Threshold Irradiance <sup>(6)</sup>	$E_e (+)$	0.025		0.250	mW/cm <sup>2</sup>	$T_A = 25^\circ\text{C}$
Hysteresis Ratio	$E_e (+)/E_e (-)$	1.10		2.00		
Supply Current	$I_{CC}$	—		12.0	mA	$E_e = 0$ or .3 mW/cm <sup>2</sup> <sup>(6)</sup>
Peak to peak ripple which will cause false triggering		—		2.00	V	$f = \text{DC to } 50 \text{ MHz}$
<b>QSA156 (BUFFER TOTEM POLE)</b>						
High Level Output Voltage	$V_{OH}$	$V_{CC} - 2.1$		—	V	$E_e = .3 \text{ mW/cm}^2$ , $I_{OH} = -1.0 \text{ mA}$ <sup>(6)</sup>
Low Level Output Voltage	$V_{OL}$	—		0.40	V	$E_e = 0$ , $I_{OL} = 16 \text{ mA}$
<b>QSA157 (INVERTER TOTEM POLE)</b>						
High Level Output Voltage	$V_{OH}$	$V_{CC} - 2.1$		—	V	$E_e = 0$ , $I_{OH} = -1.0 \text{ mA}$
Low Level Output Voltage	$V_{OL}$	—		0.40	V	$E_e = .3 \text{ mW/cm}^2$ , $I_{OL} = 16 \text{ mA}$ <sup>(6)</sup>
<b>QSA158 (BUFFER OPEN COLLECTOR)</b>						
High Level Output Current	$I_{OH}$	—		100	$\mu\text{A}$	$E_e = .3 \text{ mW/cm}^2$ , $V_{OH} = 30 \text{ V}$ <sup>(6)</sup>
Low Level Output Voltage	$V_{OL}$	—		0.40	V	$E_e = 0$ , $I_{OL} = 16 \text{ mA}$
<b>QSA159 (INVERTER OPEN COLLECTOR)</b>						
High Level Output Current	$I_{OH}$	—		100	$\mu\text{A}$	$E_e = 0$ , $V_{OH} = 30 \text{ V}$
Low Level Output Voltage	$V_{OL}$	—		0.40	V	$E_e = .3 \text{ mW/cm}^2$ , $I_{OL} = 16 \text{ mA}$ <sup>(6)</sup>

<b>ELECTRICAL CHARACTERISTICS</b> ( $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ ) ( $V_{CC} = 4.5$ to $16$ volts)						
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
QSA156, QSA157						
Output rise, fall times	$t_r, t_f$	—		70	nS	$E_e = 0$ or $.3 \text{ mW/cm}^2$ , $f = 10\text{K HZ}$
Propagation delay	$t_{phl}, t_{plh}$		6.0		$\mu\text{S}$	DC=50%, $R_L = 10 \text{ TTL loads}$
QSA158, QSA159						
Output rise, fall times	$t_r, t_f$	—		100	nS	$E_e = 0$ or $.3 \text{ mW/cm}^2$ , $f = 10\text{K HZ}$
Propagation delay	$t_{phl}, t_{plh}$		6.0		$\mu\text{S}$	DC=50%, $R_L = 300\Omega^{(6)}$

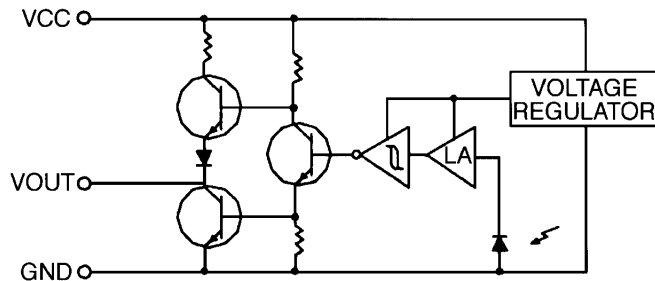


ST2141

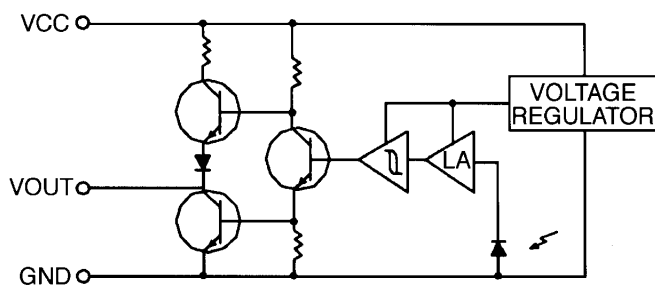
## NOTES

1. Derate power dissipation linearly  $2.50 \text{ mW}/^{\circ}\text{C}$  above  $25^{\circ}\text{C}$ .
2. RMA flux is recommended.
3. Methanol or Isopropyl alcohols are recommended as cleaning agents.
4. Soldering iron tip  $\frac{1}{16}$ " (1.6 mm) minimum from housing.
5. As long as leads are not under any stress or spring tension.
6. Irradiance measurements are made with an AlGaAs LED emitting light at a peak wavelength of 880 nm.

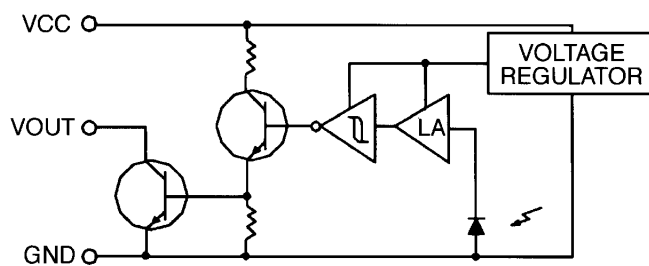
**CIRCUIT SCHEMATICS**



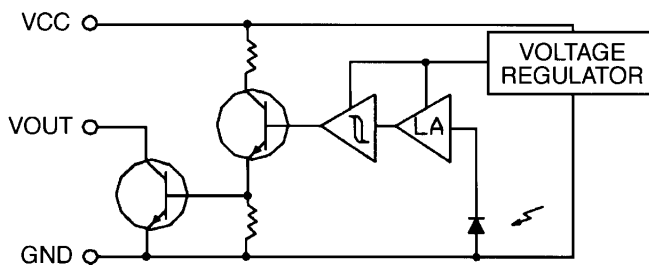
**QSA156**  
Totem-Pole Output Buffer



**QSA157**  
Totem-Pole Output Inverter



**QSA158**  
Open-Collector Output Buffer



**QSA159**  
Open-Collector Output Inverter

ST2140

**DISCLAIMER**

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. 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.

**LIFE SUPPORT POLICY**

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.