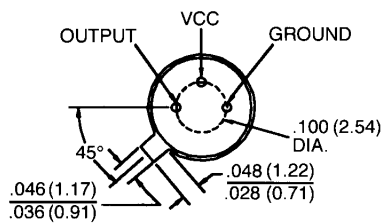
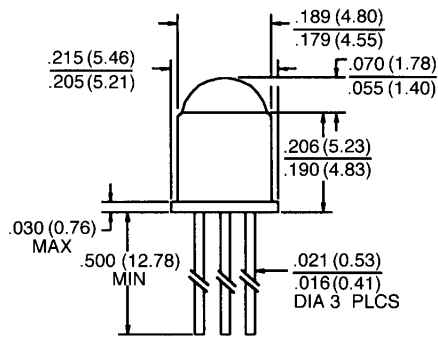


**QSA156/157/158/159**

**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.

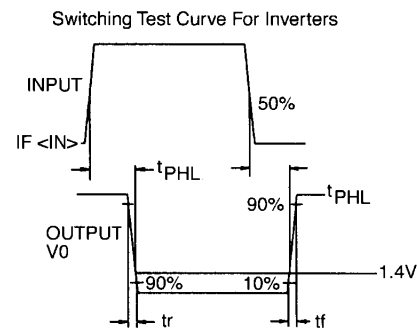
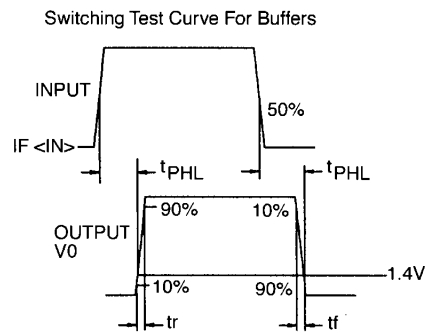
**FEATURES**

- 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) .....	$240^\circ\text{C}$ for 5 sec. <sup>(2,3,4,5)</sup>
Lead Temperature (Flow) .....	$260^\circ\text{C}$ 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 .....	$3.0 \text{ mW/cm}^2$

<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>	Ee (+)	0.025		0.250	$\text{mW/cm}^2$	$T_A = 25^\circ\text{C}$
Hysteresis Ratio	Ee(+)/Ee(-)	1.10		2.00		
Supply Current	$I_{CC}$	—		12.0	mA	Ee = 0 or $.3 \text{ mW/cm}^2$ <sup>(6)</sup>
Peak to peak ripple which will cause false triggering		—		2.00	V	f = DC to 50 MHz
<b>QSA156 (BUFFER TOTEM POLE)</b>						
High Level Output Voltage	$V_{OH}$	$V_{CC} - 2.1$		—	V	Ee = $.3 \text{ mW/cm}^2$ , $I_{OH} = -1.0 \text{ mA}$ <sup>(6)</sup>
Low Level Output Voltage	$V_{OL}$	—		0.40	V	Ee = 0, $I_{OL} = 16 \text{ mA}$
<b>QSA157 (INVERTER TOTEM POLE)</b>						
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 = $.3 \text{ mW/cm}^2$ , $I_{OL} = 16 \text{ mA}$ <sup>(6)</sup>
<b>QSA158 (BUFFER OPEN COLLECTOR)</b>						
High Level Output Current	$I_{OH}$	—		100	$\mu\text{A}$	Ee = $.3 \text{ mW/cm}^2$ , $V_{OH} = 30 \text{ V}$ <sup>(6)</sup>
Low Level Output Voltage	$V_{OL}$	—		0.40	V	Ee = 0, $I_{OL} = 16 \text{ mA}$
<b>QSA159 (INVERTER OPEN COLLECTOR)</b>						
High Level Output Current	$I_{OH}$	—		100	$\mu\text{A}$	Ee = 0, $V_{OH} = 30 \text{ V}$
Low Level Output Voltage	$V_{OL}$	—		0.40	V	Ee = $.3 \text{ mW/cm}^2$ , $I_{OL} = 16 \text{ mA}$ <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%, $R_L = 300\Omega^{(6)}$

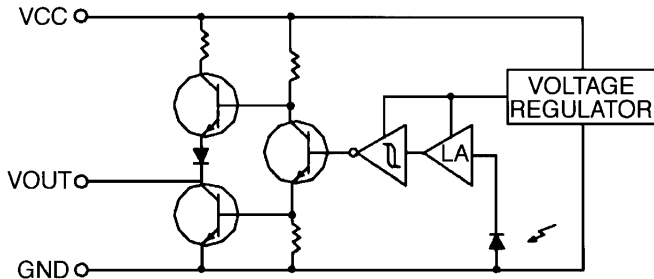


ST2141

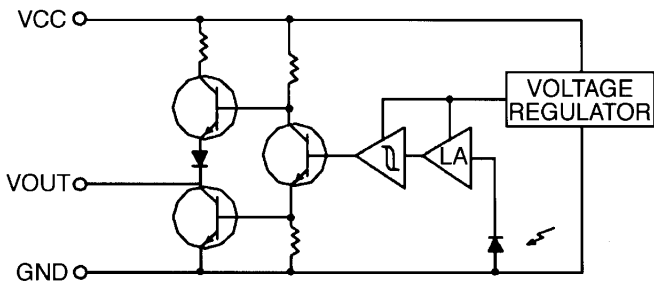
**NOTES**

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  $1/16"$  (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.

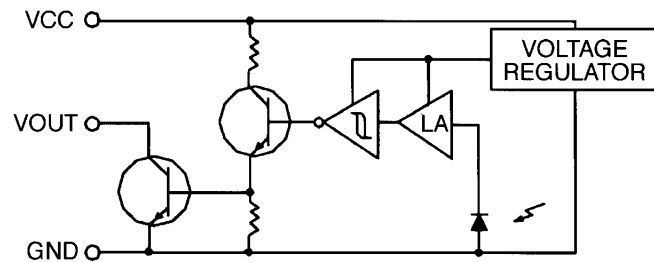
**CIRCUIT SCHEMATICS**



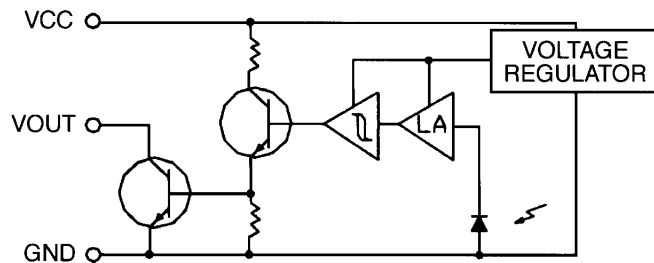
**QSA156**  
Totem-Pole Output Buffer



**QSA157**  
Totem-Pole Output Inverter



**QSA158**  
Open-Collector Output Buffer



**QSA159**  
Open-Collector Output Inverter

ST2140

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