

ABSOLUTE MAXIMUM RATINGS

V_{DD}	-0.3 to 6 V_{DC}
SNK/SRC (Output Compliance Voltage).....	-0.3 to $V_{DD} + 0.3V_{DC}$
SNK/SRC (Maximum Output Current).....	Internally Limited
Operating Temperature Range	-40 to +85°C
Storage Temperature Range.....	-40 to +100°C
RoHS / Pb-free Peak Package Solder Reflow Temperature (40 seconds maximum exposure).....	260° (+0, -5)

Notes: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of specified terminal.

THERMAL DATA
DR Plastic MSOP 8-Pin Reverse Form

THERMAL RESISTANCE-JUNCTION TO CASE, θ_{JC}	39°C/W
THERMAL RESISTANCE-JUNCTION TO AMBIENT, θ_{JA}	206°C/W

DU Plastic MSOP 8-Pin

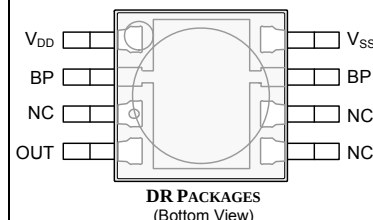
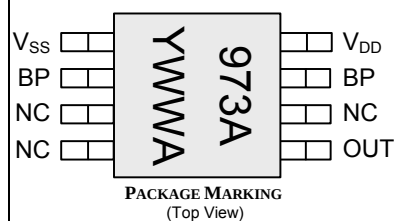
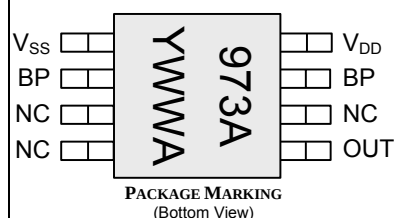
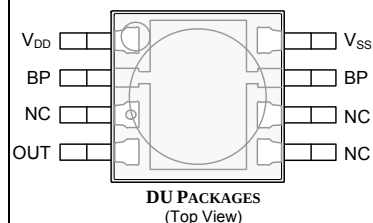
THERMAL RESISTANCE-JUNCTION TO CASE, θ_{JC}	39°C/W
THERMAL RESISTANCE-JUNCTION TO AMBIENT, θ_{JA}	206°C/W

Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$.

The θ_{JA} numbers are guidelines for the thermal performance of the device/pc-board system. All of the above assume no ambient airflow.

FUNCTIONAL PIN DESCRIPTION

Name	Description
V_{DD}	Power Supply Voltage
V_{SS}	Ground Reference for Power and Signal Output
OUT	Current Output
BP	Internally Connected to Bonding Pad. This Pin Can Be Left Open or Connected to V_{SS}
NC	No Connection Pin

PACKAGE PIN OUT


RoHS / Pb-free NiPdAu Finish
MSL 2/260°C/1 Year

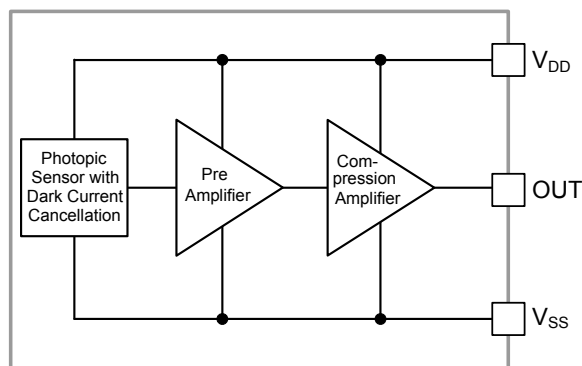
SIMPLIFIED BLOCK DIAGRAM


Figure 1 – Simplified Block Diagram

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, the following specifications apply over the operating ambient temperature $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ except where otherwise noted and the following test conditions: See Note 1, $V_{DD} = 5\text{V}$.

Parameter	Symbol	Test Conditions	LX1973A			Units
			Min	Typ	Max	
Operational Voltage	V _{DD}		4.5		5.5	V
Supply Current	I _{DD}	E _V = 1.0 lux		0.2	0.25	mA
Power Supply Rejection Ratio	PSRR	V _{RIPPLE} = 100mV _{P-P} , f = 10kHz; C _{OUT} = 0.1μF	30	35		dB
Peak Spectral Response	λ _{PR}			580		nm
Infrared Response	$\frac{I_{DD}(\lambda)}{I_{DD}(\lambda_{PR})}$	E _{V(white)} = 100 lux, E _{V(810nm)} = 14.6μW/cm ² , Note 3	-5	1	5	%
Light to Current Gain	G _L	See application section for equation				
Saturation Current	I _{SAT}		570			μA
Radiant Sensitive Area				0.20		mm ²
Flat Top Package (note 5)						
Output Current	I _{OUT(0.01)}	E _V = 0.01 lux @ 25°C, Note 1,2	32	36	40	μA
Output Current	I _{OUT(1.0)}	E _V = 1.0 lux, Note 1,2	103	114	125	μA
Output Current	I _{OUT(10)}	E _V = 10 lux, Note 1,2	183	203	223	
Output Current	I _{OUT(100)}	E _V = 100 lux, Note 1,2	320	360	400	μA
Dark Current (equivalent lux)	I _{OUT (DARK)}	E _V = 0 lux, T _A = 20°C, Note 4		450	900	μLux
		E _V = 0 lux, T _A = 50°C, Note 4		2100	5000	
Dynamic Response Time (to 10% settling error point)	T _{DR}	1.0 lux to 0.01 lux		1.5	3	sec
		0.01 lux to 1.0 lux		0.2	0.5	sec
Reverse Form Package (note 6)						
Output Current	I _{OUT(0.01)}	E _V = 0.01 lux @ 25°C, Note 1,2	32	36	40	μA
Output Current	I _{OUT(1.0)}	E _V = 1.0 lux, Note 1,2	105	117	128	μA
Output Current	I _{OUT(10)}	E _V = 10 lux, Note 1,2,	187	208	229	
Output Current	I _{OUT(100)}	E _V = 100 lux, Note 1,2	333	370	407	μA
Dark Current (equivalent lux)	I _{OUT (DARK)}	E _V = 0 lux, T _A = 20°C, Note 4		450	900	μLux
		E _V = 0 lux, T _A = 50°C, Note 4		2100	5000	
Dynamic Response Time (to 10% settling error point)	T _{DR}	1.0 lux to 0.01 lux		1.5	3	sec
		0.01 lux to 1.0 lux		0.2	0.5	sec

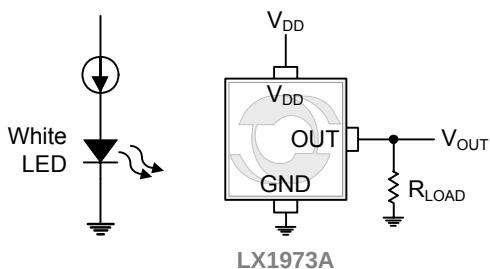
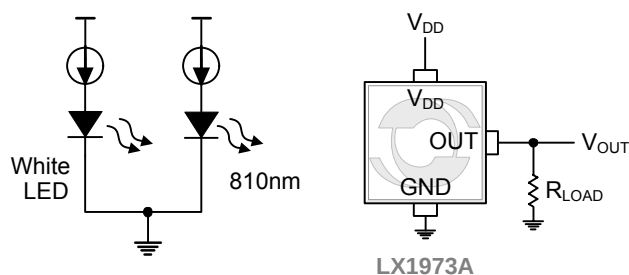
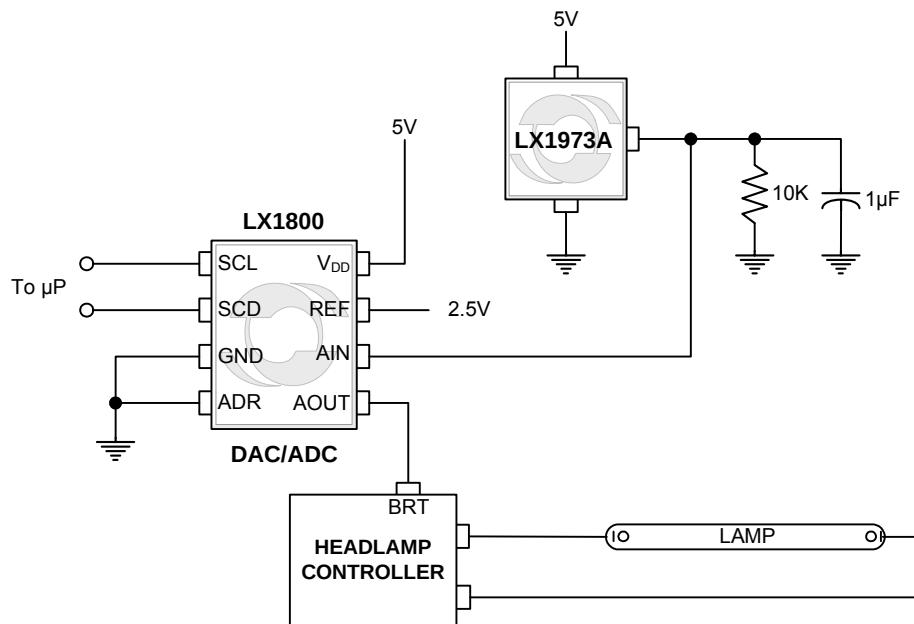
Notes:

1. The input irradiance is supplied from a point source which is a white light emitting diode (LED); Fairchild Semiconductor part number MV8W00.
2. See Figure 2.
3. See Figure 3.

$$4. \text{ Dark Current equivalent lux at 0 lux: } EL = \left[\frac{I_{\text{OUT}}}{I_{\text{REF}}} \right]^4 \div (146 \times 10^{-9})$$

5. For Flat Top (DU Package), $I_{\text{REF}} = 5824\mu\text{A}$.

6. For Reverse Form (DR Package): $I_{\text{REF}} = 5985\mu\text{A}$

TEST CIRCUITS

Figure 2 – Operational Voltage Measurement Circuit

Figure 3 – IR Sensitivity Measurement Circuit
APPLICATION CIRCUITS

Figure 4 – Typical Application

APPLICATIONS**GENERAL DESCRIPTION**

The LX1973A produces an output current that is sensitive to the level of ambient light that falls onto the photosensitive area of the IC package. The sensitivity is amplified and compressed to provide ratio metric accuracy across several decades. The sensitivity function is:

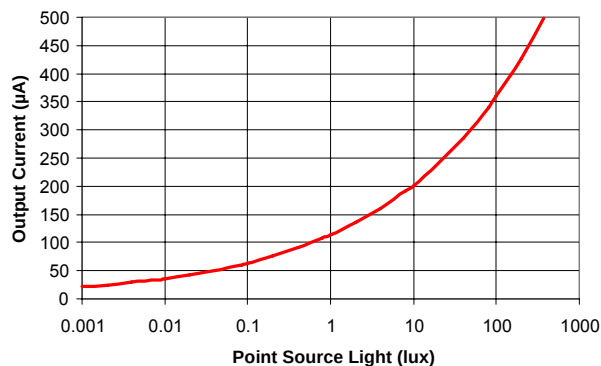
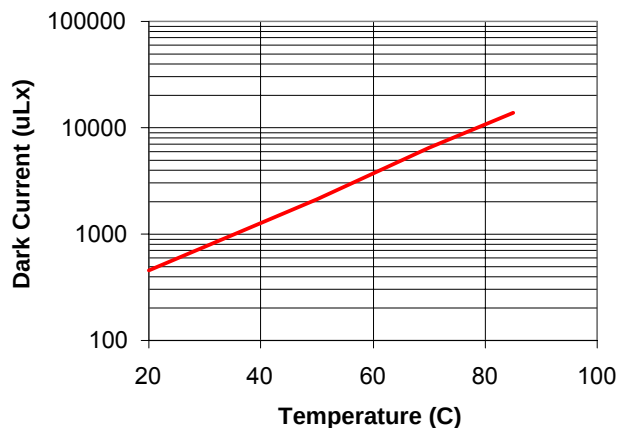
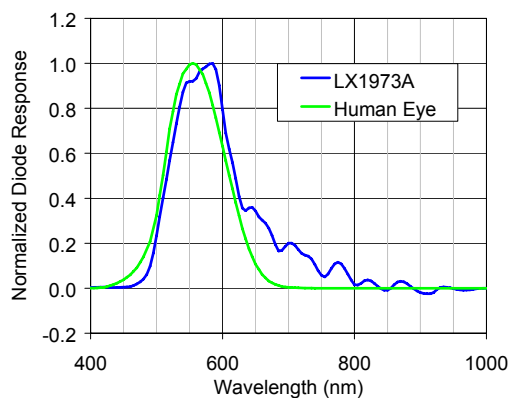
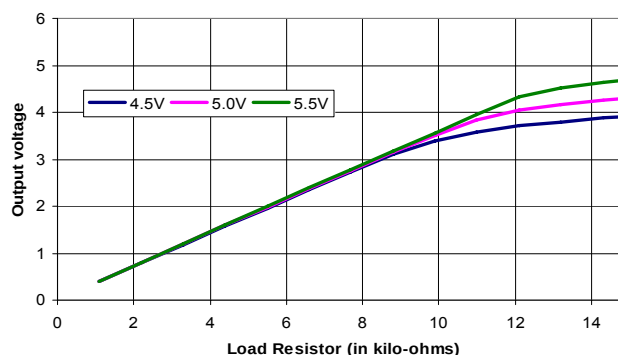
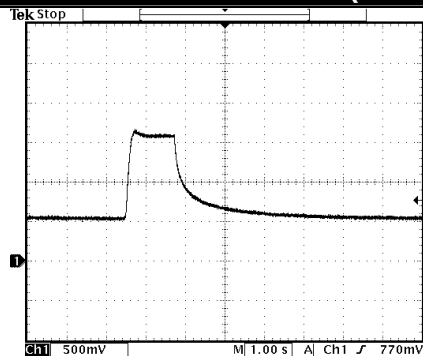
$$I_{OUT}(P) = \frac{I_{ref}}{lux^{0.25}} \times (E_{DARK} + E_{AMBIENT})^{0.25}$$

I_{ref} = 113.8μA for the Flat Top package

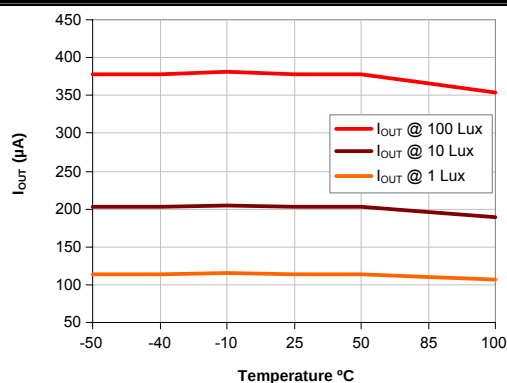
I_{ref} = 117μA for the Reverse Flat Top package

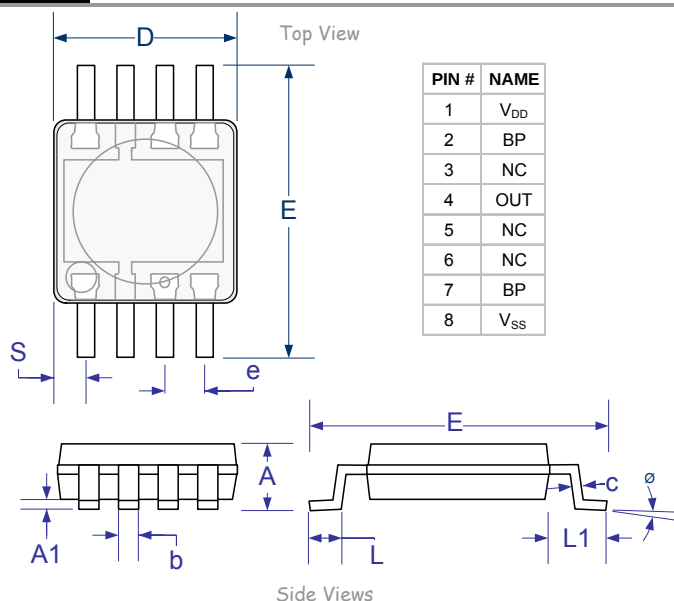
E_{DARK} = dark current equivalent lux expressed in lux from a white LED point source.

$E_{AMBIENT}$ = ambient illumination expressed in lux from a white LED point source.

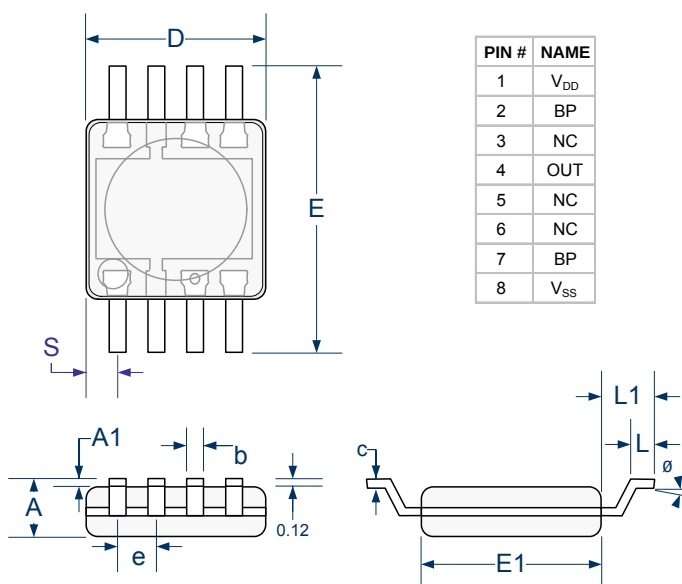
Automotive Light Sensor
PRODUCTION DATA SHEET
SENSITIVITY

DARK CURRENT VS TEMP

NORMALIZED (PRE COMPRESSION)

100 LUX OUTPUT VOLTAGE (FLAT TOP)

I_{OUT} STEP RESPONSE (FLAT TOP)


Load = 10kΩ and 0µF; Photo Step = Direct Light Input of 1 lux to 0.01 lux.

I_{OUT} OVER TEMP @ 100 LUX, 10 LUX, 1 LUX


PACKAGE DIMENSIONS
DU 8-Pin Miniature Shrink Outline Package (MSOP)


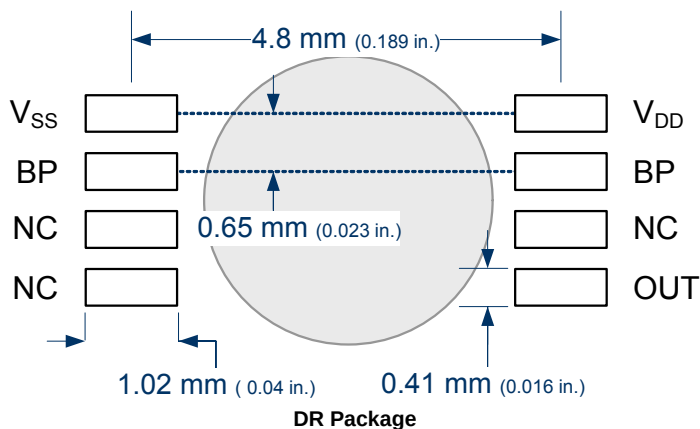
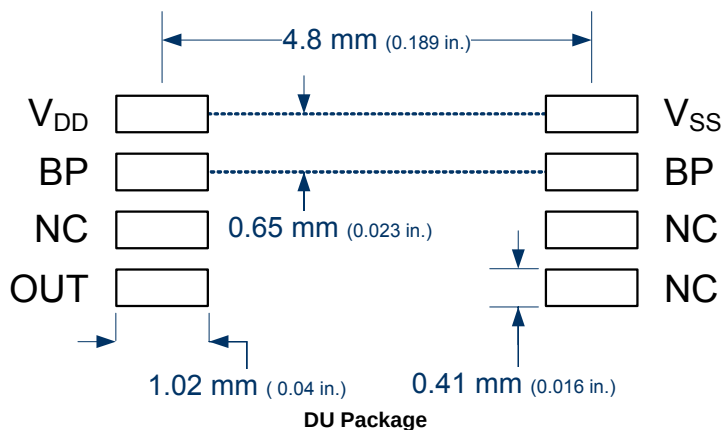
Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	—	1.10	—	0.043
A1	0.05	0.15	0.002	0.006
b	0.26	0.41	0.010	0.016
c	0.13	0.23	0.005	0.009
D	2.90	3.10	0.114	0.122
e	0.65 BSC		0.025 BSC	
E	4.75	5.05	0.187	0.198
E1	2.90	3.10	0.114	0.122
L	0.41	0.71	0.016	0.028
L1	0.95 BSC		0.037 BSC	
S	0.525 BSC		0.021 BSC	
Ø	3°		3°	

DR 8-Pin Miniature Shrink Outline Package (MSOP) Reversed Form


Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	—	1.10	—	0.043
A1	0.05	0.15	0.002	0.006
b	0.26	0.41	0.010	0.016
c	0.13	0.23	0.005	0.009
D	2.90	3.10	0.114	0.122
e	0.65 BSC		0.025 BSC	
E	4.75	5.05	0.187	0.198
E1	2.90	3.10	0.114	0.122
L	0.41	0.71	0.016	0.028
L1	0.95 BSC		0.037 BSC	
S	0.525 BSC		0.021 BSC	
Ø	3°		3°	

Note:

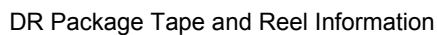
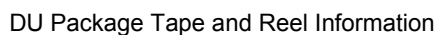
Dimensions do not include mold flash or protrusions; these shall not exceed 0.155mm(.006") on any side. Lead dimension shall not include solder coverage.

PACKAGE INFORMATION
Package Land Pattern




PRODUCTION DATA SHEET

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LX1973A

Automotive Light Sensor

PRODUCTION DATA SHEET

NOTES

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