61120	**PROGRAMMABLE LIGHT-TO-FREQUENCY CONVERTER**	**Mii** **OPTOELECTRONIC PRODUCTS DIVISION**

Features:

- High resolution Conversion of Light Intensity to Frequency With No External Components
- Programmable Sensitivity and Full-Scale Output Frequency
- Advanced LinCMOS™ Technology
- Single-Supply Operation Down to 2.7V, with Power-Down Feature

Applications:

- Incorporates wide dynamic range, high-resolution light measurement functions into a system using a single-component solution
- Communicates directly With a Microcontrollers eliminating the need for A/D converters
- Determines the clarity of the liquid

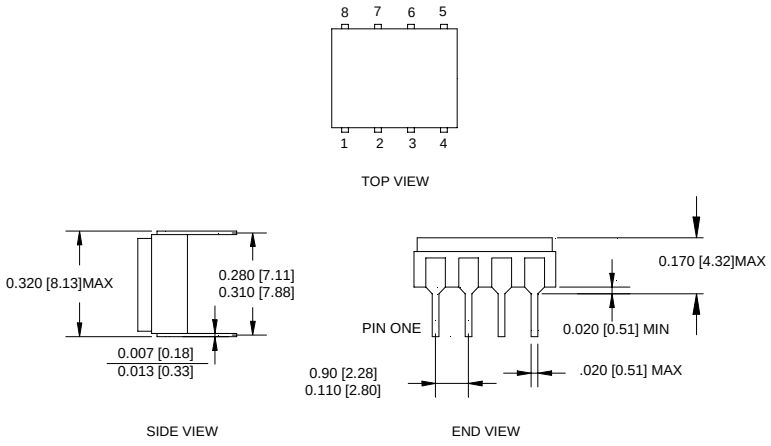
DESCRIPTION

The 61120 programmable light-to-frequency converter combines a configurable silicon photodiode and a current-to-frequency converter on sigil monolithic CMOS integrated circuits. The output can be either a pulse train or a square wave (50% duty cycle) with frequency directly proportional to light intensity. The sensitivity of the device is selectable in three ranges, providing two decades of adjustment. The full-scale output frequency can be scaled by one of four preset values. All inputs and the output are TTL compatible, allowing direct two-way communication with a microcontroller for programming and output interface. An output enable /(OE) is provided that places the output in the high-impedance state for multiple-unit sharing of a microcontroller input line. The device is available with absolute-output-frequency tolerance of ±20%. Its circuit has been temperature compensated for the ultraviolet-to-visible-light range of 300nm to 700nm. The device is characterized for operation over the temperature range of -25°C to 70°C. Glass lens inhibits UV degradation.

ABSOLUTE MAXIMUM RATINGS

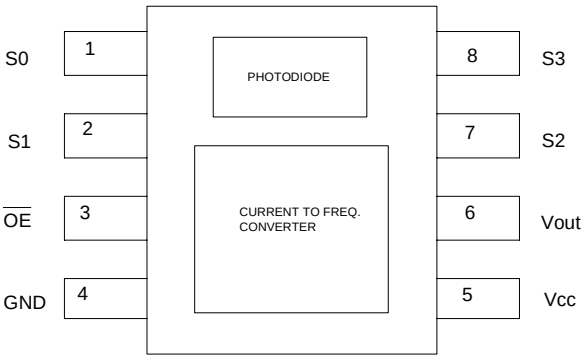
Storage Temperature ..... -25°C to +85°C
Operating Free-Air Temperature Range ..... -25°C to +70°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds..... +260°C
Input Voltage Range, all inputs, V_I ..... -0.3 V to V_{DD} +0.3 V
Supply Voltage – V_{DD} 6.5V

Package Dimensions



ALL DIMENSIONS ARE IN INCHES [MILLIMETERS]

Schematic Diagram



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ELECTRICAL CHARACTERISTICS

T_a = -25°C, V_{DD} = 5V unless otherwise specified.

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	TEST CONDITIONS	NOTE
High-Level Output Voltage	VOH	4	4.3		V	IOH = -4 mA	
Low-Level Output Voltage	VOL		0.17	0.26	V	IOL = 4 mA	
High-Level Input Current	I_{IH}			1uA	uA		
Low-Level Input Current	I_{IL}			1uA	uA		
Supply Current						Power-on mode Power-down mode	
Full-Scale Frequency		1.1			MHz		1
Temperature Coef. Output Freq.			±100		ppm/°C	$\lambda \leq 700nm$, $-25°C \leq T_A \leq 70°C$	
Supply Voltage Sensitivity	k_{SVS}		0.5		%/V	VDD = 5V ±10%	

OPERATING CHARACTERISTICS

T_a = 25°C, V_{dd} = 5V

PARAMETER	SYMBOL	TSL230			TSL230A			TSL230B			UNITS	TEST CONDITIONS	NOTE
		min	typ	max	Min	typ	max	Min	typ	Max			
Output Frequency	f_O	0.8	1	1.2	0.9	1	1.1	0.95			MHz	S0 = H, S1 = S2 = S3 = L, E_e = 130 mW/cm^2, λ_p= 670 nm	
			0.1	10		0.1	10		0.1	10	Hz	Ee = 0, S0 = H, S1 = S2 =S3 = L	
		0.8	1	1.2	0.9	1	1.1	0.95			MHz	S1 = H, S0 = S2 = S3 = L, E_e = 13 mW/cm^2, λ_p= 670 nm	
			0.13	10		0.13	10		0.13	10	Hz	Ee = 0, S1 = H, S0 = S2 =S3 = L	
		0.8	1	1.2	0.9	1	1.1	0.95			MHz	S0 = S1 = H, S2 = S3 = L, E_e = 1.3 mW/cm^2, λ_p= 670 nm	
			0.5	10		0.5	10		0.5	10	Hz	Ee = 0, S0 = S1 = H, S2 =S3 = L	
Output Pulse Duration	t_W	125		550	125		550	125		550		S2 = S3 = H	
			.5f_o			.5f_o			.5f_o			S2 or S3 = H	
Nonlinearity			±.1%			±.1%			±.1%		%F.S.	f_O = 0 Hz to 10 kHz	2
			±.1%			±.1%			±.1%			f_O = 0 Hz to 100 kHz	
			±.1%			±.1%			±.1%			f_O = 0 Hz to 1 MHz	
Recovery from power down				100			100			100			us
Step response to full-scale input		1 pulse of new frequency plus 1 us											
Response Time to programming change		2 periods of new principal frequency plus 1 us											3
Response Time to Output Enable /(OE)			50	150		50	150		50	150	ns		

Note: 1. Full-scale frequency is the maximum operating of the device without saturation.
2. Nonlinearity is defined as the deviation of fO from a straight line between zero and full scale, expressed as a percent of full scale.
3. Principal frequency is the internal oscillator frequency, equivalent to divide-by-1 output selection.

RECOMMENDED OPERATING CONDITIONS

PARAMETER		SYMBOL	MIN	MAX	UNITS
Supply Voltage		V_{DD}	2.7	6	V
High-Level Input Voltage	V_{DD} = 4.5 V to 5.5 V	V_{IH}	2	V_{DD}	V
Low-Level Input Voltage	V_{DD} = 4.5 V to 5.5 V	V_{IL}	0	0.8	V
Operating free-air temperature range		T_A	-25	70	°C

OPERATION INFORMATION

Terminal Functions			
TERMINAL NAME	NO.	I/O	DESCRIPTION
GND	4		Ground
/OE	3	I	Enable for f_O (active low)
OUT	6	0	Scaled-Frequency (f_O) output
S0, S1	1, 2	I	Sensitivity-select inputs
S2, S3	7, 8	I	f_O scaling-select inputs
VDD	5		Supply Voltage

Selectable Options					
S1	S2	Sensitivity	S3	S2	f_O Scaling (divide-by)
L	L	Power down	L	L	1
L	H	1x	L	H	2
H	L	10x	H	L	10
H	H	100x	H	H	100

TYPICAL CHARACTERISTICS

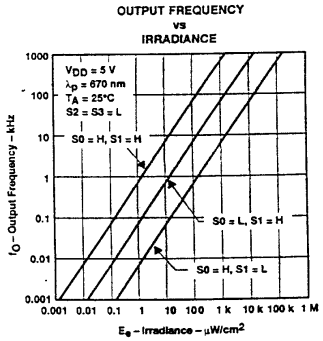

Figure 1

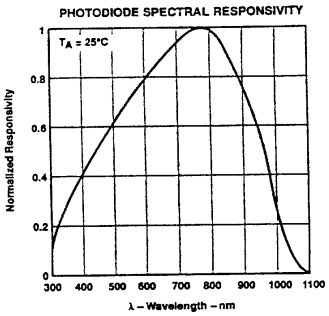

Figure 2

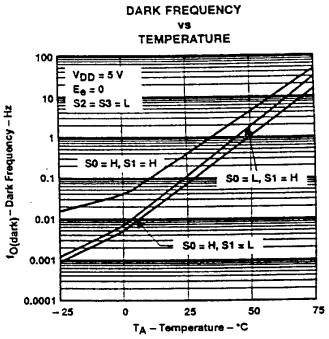

Figure 3

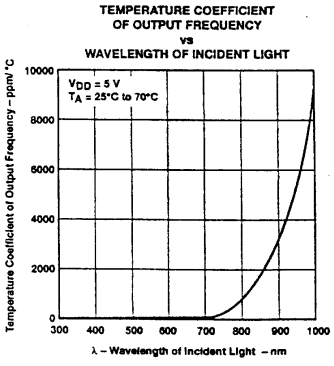

Figure 4

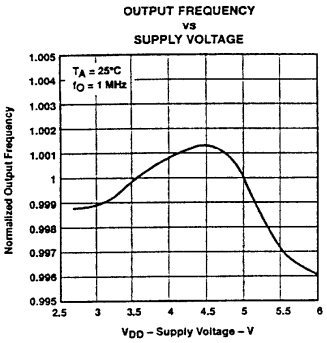

Figure 5