LiD3010

Laser integrated Detector

VECTOR TECHNOLOGY LIMITED

Features

* Multifunction Detector
* Video Bandwidth
* Ambient Light Compensated
* 100Hz Flicker Filter
* Asynchronous/Synchronous Detection
* 5KHz-475KHz Tunable Tone Decoder
* Hybrid Reliability

Applications

* Intensity Stability Checks
* Security Beam Break Monitors
* Fog Detectors
* Alignment Devices
* Data Transmission
* Audio & Video Communications

Description

The 3010 Detector is a multifunction hybrid module in an industry standard 0.6" 28 pin package. A variety of pin photodiodes can be used with this module to provide detectors for a wide range of applications.

The module may be configured as a simple intensity level detector, or for detecting modulated light sources. In the latter case the module may be configured to eliminate the affects of varying ambient light level and includes a filter to eliminate the flicker associated with fluorescent lights.

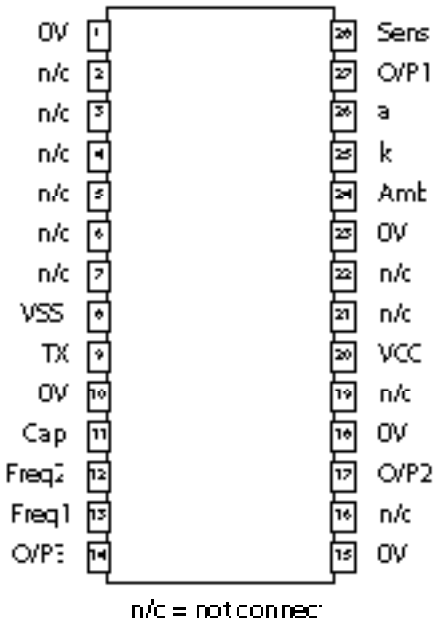
A tone decoder is included in the module which may be tuned to lock onto a particular modulating frequency.

An output capable of driving a Beta TX laser diode is also available which provides a means of developing a synchronous detection system.

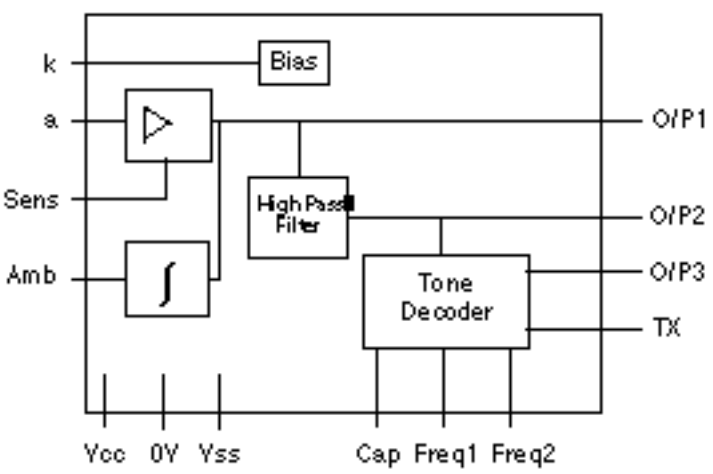
The module requires ±12V supplies and a minimum of external components.

The hybrid is protected from reverse polarity

Pin Configuration



Block Diagram



Absolute Maximum Ratings (over operating free-air temperature range unless otherwise noted) (1)

Supply Voltage.....	±15	V
Internal Power Dissipation.....	1.5	W
Short Circuit Duration O/P1, O/P2, TX.....	Indefinite	
Current Sinking Capability O/P 3.....	100	mA
Operating Temperature.....	0 to +70	˚C
Storage Temperature.....	-40 to +85	˚C

Notes

1. Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Electrical Characteristics (Vcc = +12V, VSS = -12V, Ta = 25C unless otherwise noted)

Parameter	Test Conditions	Min.	Typ.	Max.	Units
INPUT AMPLIFIER					
Transimpedance (1)			100		KΩ
Transimpedance (2)		0.47		50	KΩ
Optical Sensitivity (1) (10)	BPX65 diode, 670nm (O/P1)		8		mV/µW
Sensitivity Range (2) (10)	BPX65 diode, 670nm (O/P1)	5×10^{-2}		3.7	mV/µW
Bandwidth (3dB) (3)	Sinewave (O/P1. 0.05mV/µW)	D.C.		5.5×10^{5}	Hz
Bandwidth (3dB) (3)	Sinewave (O/P1. 0.5mV/µW)	D.C.		1.8×10^{5}	Hz
Bandwidth (3dB) (4)	Sinewave (O/P1. O/P2. 0.5mV/µW)	10^{3}		10^{5}	Hz
Noise Voltage	0.1Hz to 10Hz		10		µV p-p
Slew Rate (5)			12		V/µs
Input Bias Current	Ta = 25˚C			100	pA
Input Offset Current	Ta = 25˚C			50	pA
HIGH PASS FILTER					
Filter Bandwidth (3dB)	Sinewave	10^{3}		10^{5}	Hz
AMBIENT COMPENSATOR					
Output Offset Voltage		0.3	2.0	5.0	mV
TONE DECODER					
Centre Frequency f_o (6)			2.7×10^{4}		Hz
Centre Frequency Range (7)		6×10^{4}		4.75×10^{5}	Hz
Centre Frequency Range (8)		5×10^{3}		6×10^{4}	Hz
Frequency Stability			50 ±200		ppm/˚C
Detection Bandwidth			10		% of f_o
MODULATOR					
Output Voltage	RL=50Ω		±400		mV
Output Impedance			50		Ohms
OUTPUTS					
Output Voltage Swing	O/P1,2 VCC/VSS ±12V RL=1KΩ		10		V p-p
	O/P3 VCC/VSS ±12V RL=1KΩ	0		5	V
GENERAL					
Operating Voltage Range (9)	VCC	+10		+14	V
	VSS	-10		-14	V
Supply Current Quiescent	VCC		30		mA
	VSS		20		mA

Notes

1. External Variable Resistor NOT connected between pins 'a' and 'Sens'
2. 100KΩ Variable Resistor between pins 'a' and 'Sens'
3. Amb NOT connected - Bandwidth decreases with increasing transimpedance.
4. Amb Connected - Lower 3dB point may be compensated with external components.
5. Dependant on Sensitivity setting. Slew rate specified for minimum sensitivity.
6. External Variable Resistor and Capacitor NOT connected.
7. Maximum range possible with a 50KΩ Variable Resistor
8. Maximum range possible with a 50KΩ Variable Resistor and 6n8 Capacitor combination
9. Both supply rails must be decoupled to 0V close to the hybrid using 10µ Tantalum Capacitors.
10. Dependant on Photodiode sensitivity.

Further Details

PHOTODIODES

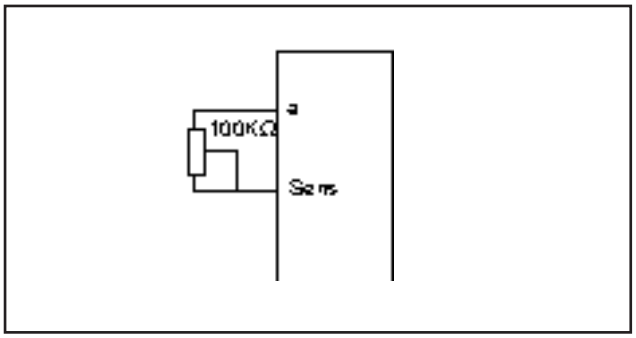
A wide variety of PIN photodiodes can be used with the module. However care must be taken to ensure that the sensitivity of the diode will not cause the input amplifier to saturate when detecting high intensity signals.

Large area photodiodes with high capacitance may limit the potential bandwidth of the detector. Long cables between the photodiode and the detector module will reduce bandwidth and increase noise.

INPUT AMPLIFIER

The transimpedance of the input amplifier is set internally to 100KΩ. This can be reduced by the addition of a variable or fixed resistor between the 'a' and 'Sens' pins.

For example the addition of a 100KΩ cermet potentiometer will provide transimpedance adjustment between 470 and 50KΩ. Keep track lengths short to reduce noise pick up.



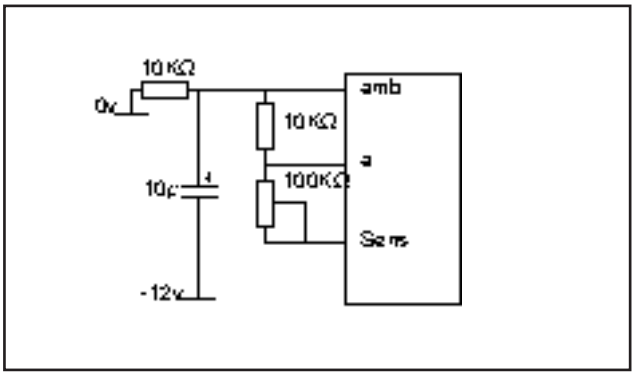
The output of this amplifier is available at O/P1. This output will contain a small amount of capacitatively coupled noise from the tone decoder clock generator. For applications not requiring the use of the tone decoder, the noise may be eliminated by connecting the 'Cap' pin to 0V.

For applications requiring only limited bandwidth, a filter network may be connected between pin 'a' and O/P1, with a possible improvement in output noise. The bandwidth of the input amplifier is determined by the transimpedance setting. Video bandwidths of 5.5MHz may be achieved at low values of transimpedance, but will fall below 1MHz at high transimpedance values.

AMBIENT COMPENSATOR

The ambient compensator integrates the steady state voltage at O/P1 and subtracts a dc current from the input amplifier such that the output is at 0V. This feature is incorporated by connecting the 'amb' pin to pin 'a'. O/P1 will then not respond to steady state signals.

Because low frequency modulation is seen by this circuit as variation in ambient light level, the circuit will try to compensate with a consequent increase in the low frequency 3dB point to around 1KHz. This may be offset by the addition of three external components. The following component values bring the lower 3dB point to around 50Hz.



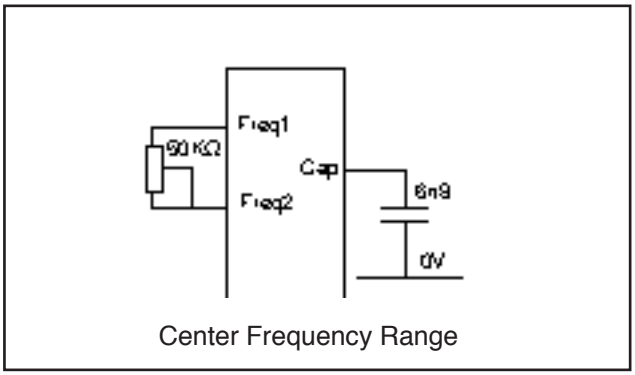
FLICKER FILTER

The flicker filter is a high pass filter designed to eliminate the affects associated with fluorescent lights. The output of this filter is available at O/P2. This output is internally connected to the input of the tone decoder.

Like O/P1, this output will contain a small amount of capacitatively coupled noise from the tone decoder clock generator. For applications not requiring the use of the tone decoder, the noise may be eliminated by connecting the 'Cap' pin to 0V.

TONE DECODER

The tone decoder is set internally to detect a modulation frequency of around 27KHz.
By the addition of an external variable or fixed resistor between pins 'Freq1' and 'Freq2' and/or a capacitor between pins 'Cap' and '0V' other center frequencies may be set.



Center Frequency Range

50KΩ Variable Resistor No Capacitor	6 x 10^4 to 4.75 x 10^5 Hz
50KΩ Variable Resistor	5 x 10^3 to

Keep track lengths short to avoid frequency jitter. Use high quality cermet potentiometers or fixed resistors to reduce temperature related frequency drift. Capacitive loading will limit the highest frequency obtainable.

O/P3 is a logic compatible output. The output can sink currents up to 100mA, but should not be asked to source more than 50μA. When an in-band signal is detected this output goes low (below 1V, typ. 0.6V @ 100mA) and when the signal is lost returns to +5V.

The tone decoder will lock onto signals near $(2n+1)f_o$ and will give an output for signals near $(4n+1)f_o$ where n=0,1,2,etc. Thus signals at these frequencies may cause an unwanted output.

If the input amplifier sensitivity is set too high, the signal at the input to the tone decoder may be too high and in-band sub-harmonic components may be generated. This will cause the decoder to become sensitive to signals at $f_o/3$, $f_o/5$, etc. For applications not requiring the use of the tone decoder, improvement in output noise may be obtained by connecting the 'Cap' pin to 0V.

MODULATOR OUTPUT

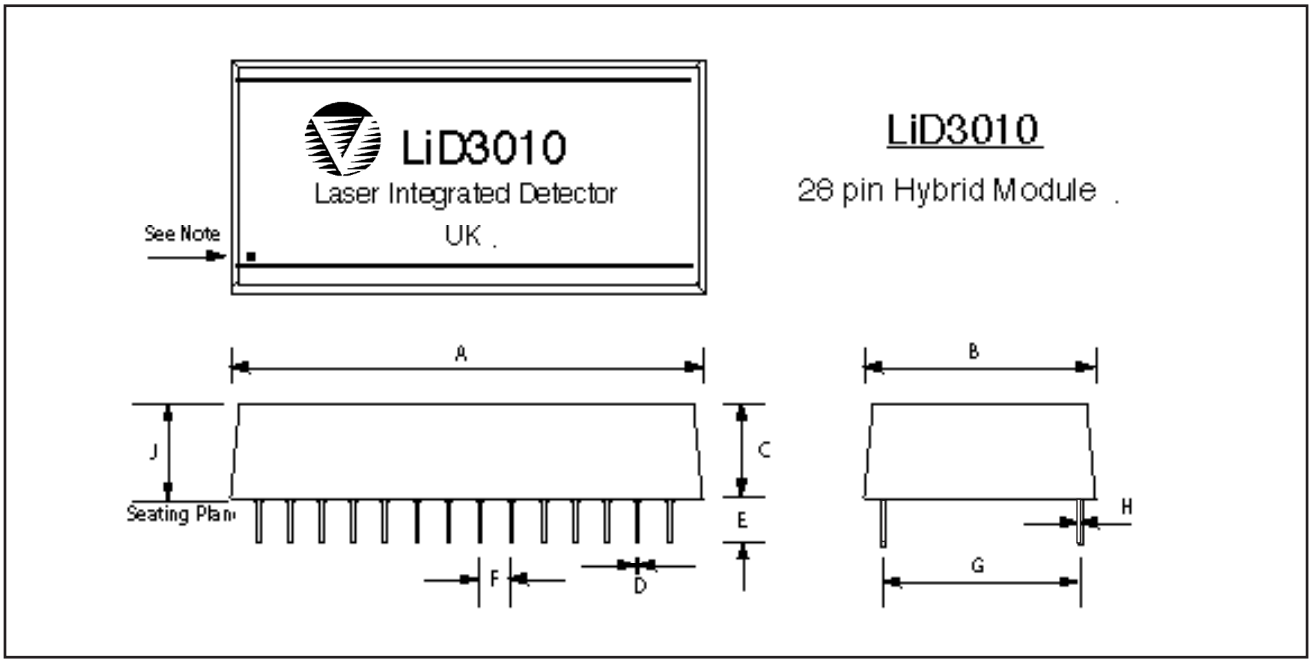
The output pin 'TX' may be connected directly to the modulation input of a Vector Technology Beta TX Laser Diode Module.The laser will then be modulated with a square wave signal at the same frequency as the tone decoder is set to detect. This allows synchronous demodulation to be used with significant improvement in low signal detection due to the bandwidth narrowing. Indeed in many cases the signal can be completely saturated with noise and can still be detected. Long cables between this output and the input to the Laser Diode will cause signal skew and phase delay. This may limit the ability of the tone decoder to lock onto the detected signal.

POWER SUPPLY

It is necessary to decouple both the VCC and the VSS supply rails to 0V using 10μF Tantalum capacitors. These should be close to the hybrid.

The hybrid is designed to work with regulated supply rails from ±10V to ±14V. Reverse polarity connection will not damage the hybrid, but inserting the hybrid into a socket the wrong way round is likely to cause damage.

Mechanical Details

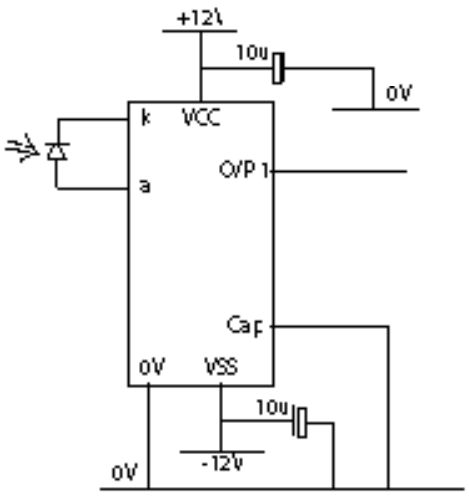


Code	Dimension Inch	mm	Notes
A	1.457	37.0	2
B	0.709	18.0	2
C	0.295	7.5	2
D	0.197	0.5	3
E	0.157	4.0	
F	0.10	2.54	4
G	0.60	15.24	4
H	0.008	0.2	
J	0.315	8.0	5

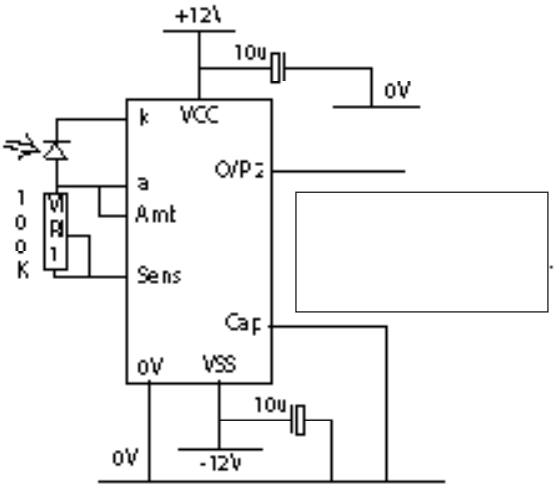
Notes

1. White dot indicates Pin 1 position
2. Plastic moulded container.
3. All pins identical.
4. All pins on 0.1" x 0.6" pitch.
5. Seating plane dependant on lead frame used.
6. Hybrid is potted into container.

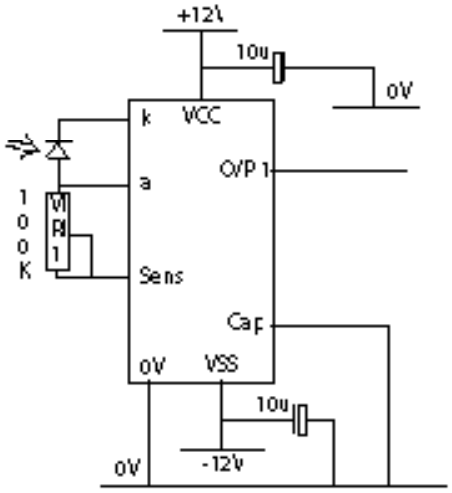
Simple Intensity Monitor



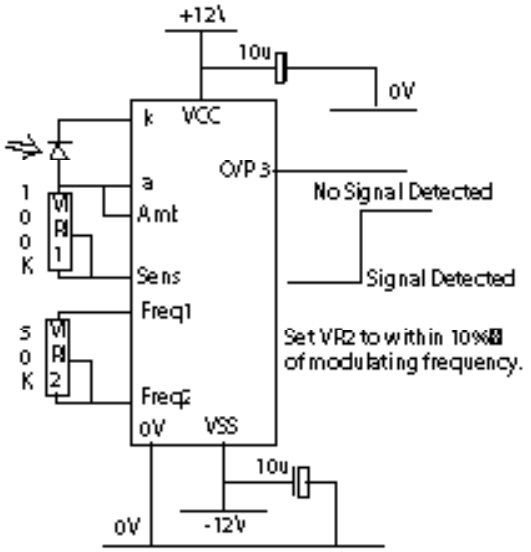
Ambient Light Compensated Modulated Detector



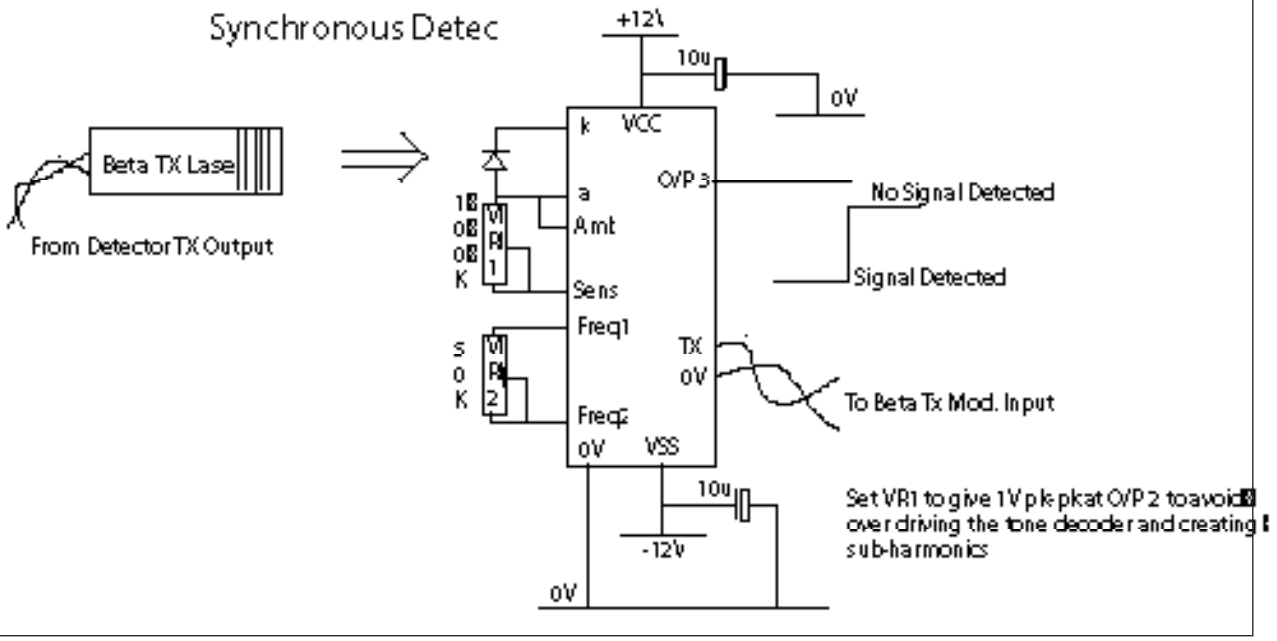
Variable Gain Intensity Monitor



Tone Decod



Synchronous Detec



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