

OvationONS™ 1L - Laser Navigation Sensor

Features

- Laser Sensor
 - New OptiCheck™ technology
 - Selectable resolution 400, 800, and 1200 cpi
 - High speed motion detection (20 in/s Typ; 8G Typ)
 - Wide operating voltage: 2.7V to 3.6V
 - Self adjusting power saving modes
 - Self adjusting frame rate for optimum performance
 - Motion detect pin output
 - Internal oscillator — no crystal required
 - 4-Wire SPI port
 - Fault tolerant laser drive circuitry on chip for eye safety compliance
 - Minimum number of passive components
- Vertical Cavity Surface Emitting Laser (VCSEL)
 - Integrated within the sensor package
 - Optical power: Typ 0.520 mW at room temperature*
 - Wavelength: 850 nm Typ. (840 nm min., 870 nm max.)*
 - * Class-1 Laser products per IEC60825-1/A2: 2001 and EN 60825-1/A1: 2002, with optical output power < 0.743 mW over all specified operating temperatures and supply voltages, and with emission wavelength between 840 and 870 nm
- Molded Optic
 - 12.78 mm distance from PCB to tracking surface

Applications

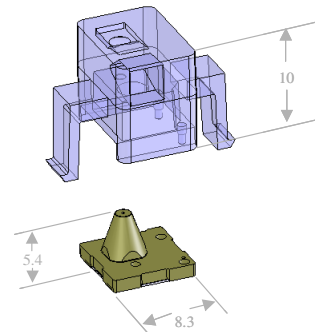
- Laser mice
- Optical trackballs
- Motion sensing applications

Functional Description

The CYONS1001L is a two piece kit containing:

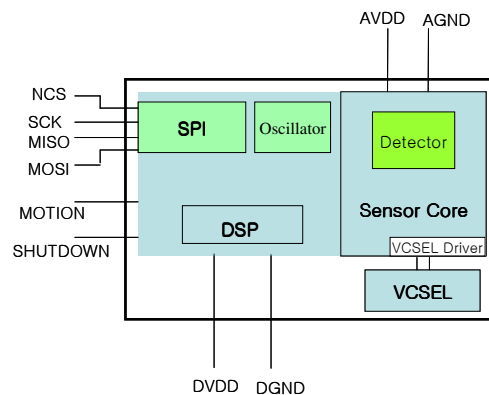
1. An IC package (with 2 kV ESD) that integrates:
 - a. Laser Detector analog and digital circuitry
 - b. VCSEL
 - c. Optical aperture
2. A molded plastic piece containing a lens for collimation of the VCSEL beam and for imaging of the light scattered from the tracking surface onto the sensor portion of the laser detector. The molded optic has features for registration to the package and attachment to the PC board.

Figure 1. CYONS1001L (Two Piece System)



Block Diagram

Figure 2. CYONS1001L Chip



Functional Overview

The CYONS1001L is a complete laser navigation sensor. It resides on a printed circuit board within an optical solution. The CYONS1001L supplies all illumination and optical navigation functions to provide position change data. The CYONS1001L tracks on wide range of surfaces. The device also provides these functions:

- SPI interface to USB microcontroller or wireless transmitter
- Internal system clock
- Fault tolerant laser power control meeting IEC 60825 class 1 eye safety requirements

When operated within the recommended operating conditions, (25°C; 3.3V) the sensor has this tracking performance:

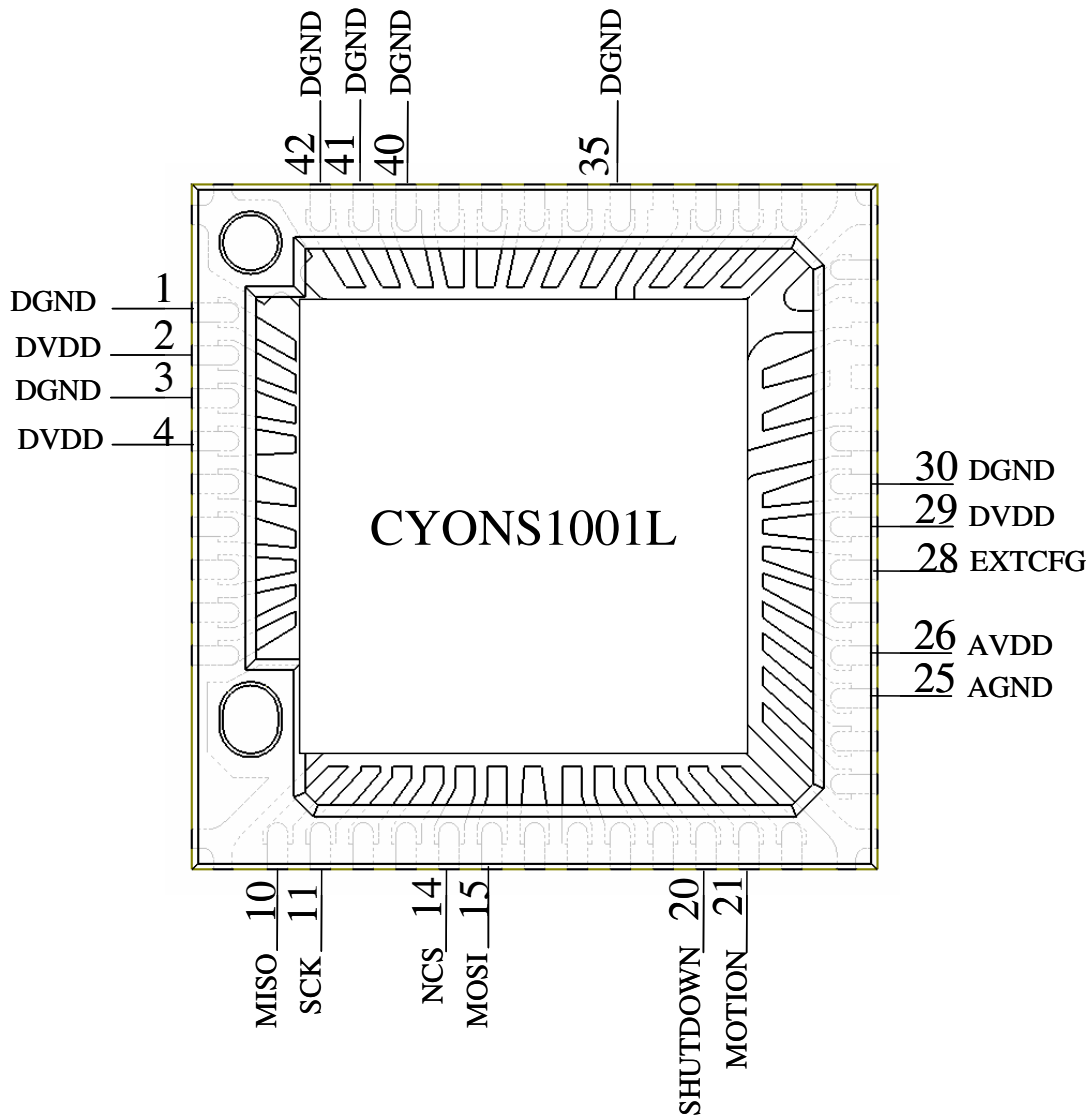
Parameter	Min.	Typ.	Max.	Unit
Resolution	400	800	1200	cpi
Speed		20		in/s
Acceleration		8		G
Lift sense height			2.8	mm
Tracking error			5	%
Zero motion			1	count

Pin Descriptions^[1, 2]

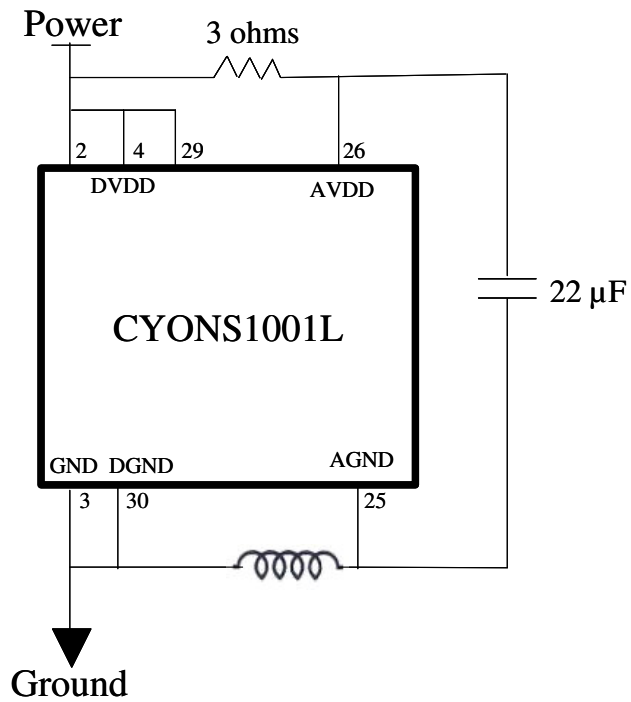
Pin QFN	Signal Name	Type	# Of Pins	Function
14	NCS (Chip Select)	I	1	SPI chip select
11	SCK (Serial Clock)	I	1	SPI clock input
10	MISO (Master In/Slave Out)	O	1	SPI output
15	MOSI (Master Out/Slave In)	I	1	SPI input
20	SHUTDOWN	I	1	Enter Hibernate mode
21	MOTION	O	1	Motion detect; active LOW output
28	EXTCFG	I	1	External configuration for factory test
26	AVDD	Power	1	Analog supply voltage
2, 4, 9	DVDD (Regulator Power)	Power	3	Digital supply voltage
25	AGND	Ground	1	Analog ground
3, 30, Case bottom	GND	Ground	1	Digital ground
5, 6, 7, 8, 9, 12, 13, 16, 17, 18, 19, 22, 23, 24, 27, 31, 32, 33, 34, 36, 37, 38, 39	NC		23	No connect
1, 35, 40, 41, 42	Tie to DGND		5	Tie to GND

Notes

1. SPI pin assignment assumes CYONS1001L is in SPI slave mode.
2. See "Power Supply Connections" on page 4" for power and ground pin configurations.



Power Supply Connections



Note

Additional power supply connections, setups, and specifications are documented in the *CYONS1001L User Guide*.

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit	Notes
Storage Temperature	-40		85	°C	Case temperature
Operating Temperature	-15		55	°C	Case temperature
Lead Solder Temperature			260	°C	10 seconds
Supply Voltage	-0.5 (tbd)		3.7 (tbd)	V	
ESD			2	kV	All pins, HBM MIL 883 method 3015
Input Voltage	-0.5		$V_{dd} + 0.5$	V	
Latch Up Current			100	mA	

Operating Conditions

Parameter	Min	Typ	Max	Unit	Notes
Operating Temperature	5		45	°C	
Power Supply Voltage	2.7		3.6	V	
Power Supply Rise Time	100			μs	
Supply Noise—AVDD (sinusoidal)			25	mV p-p	10 kHz–50 MHz
Supply Noise—VDD, DVDD (sinusoidal)			100	mV p-p	10 kHz–50 MHz
Serial Port Clock Frequency			2.0	MHz	Active drive, 50% duty cycle
Distance from Lens to Surface Plane	12.53	2.78	13.03	mm	Deviation from nominal will adversely impact lift detection.
Distance from PCB to Tracking Surface	12.55	12.8	13.05	mm	
Load Capacitance			100	pF	MOTION, MISO

DC Electrical Characteristics

Parameter	Min	Typ	Max	Unit	Notes
DC Supply Current (track mode)		12.4	15.5	mA	
DC Supply Current (nap1 mode)		5.4	7.7	mA	
DC Supply Current (nap2 mode)		1.9	3.9	mA	
DC Supply Current (sleep mode)		250	380	μA	
Hibernate Supply Current		45	100	μA	
Input Low Voltage			0.8	V	
Input High Voltage	$0.7V_{dd}$			V	
Input Hysteresis		100		mV	
Input Leakage Current		±1	±10	μA	MOSI, NCS
Output Low Voltage			0.7	V	MISO, MOTION
Output High Voltage	$V_{dd} - 0.7$			V	
Input Capacitance			10	pF	MOSI, NCS

AC Electrical Characteristics

Parameter	Min	Typ	Max	Unit	Notes
Motion Delay after Reset			100	ms	
Hibernate			50	ms	From command to low current
Wake from Hibernate			100	ms	
MISO Rise Time		150	300	ns	100 pF load
MISO Fall Time		150	300	ns	100 pF load
MISO Delay after SCLK			120	ns	
MISO Hold Time	0.5			μs	
MOSI Hold Time	200			ns	
MOSI Setup Time	120			ns	
SPI Time between Write to Register	30			μs	
SPI Time between Write to and Read from Registers	20			μs	
SPI Time between Read and Subsequent Reads	400			μs	
SPI Delay from Last Address Bit to First Data Bit Out	4			μs	
NCS Inactive after Burst Register Access	500			ns	
NCS to SCLK Active	120			ns	
SCLK to NCS Inactive (for read)	120			ns	
SCLK to NCS Inactive (for write)	20			μs	
NCS to MISO High Z			500	ns	5 pF load, Thevenin load
MOTION Rise Time		150	300	ns	100 pF load
MOTION Fall Time		150	300	ns	100 pF load
Transient Current Supply			tbd	mA	Max supply current during input voltage ramp

Ordering Information

Part Number	Description	Package Type	Operating Range
CYONS1001L-LBXC	Sensor in PQFN Package	PQFN = Plastic Quad Flat (No Lead)	5–45°C

Part Number	Description	Package Type	Operating Range
CYONSLENS1001-C	Lens		5–45°C

Package Diagrams

Figure 3. Mechanical and LAND Pads Dimensions

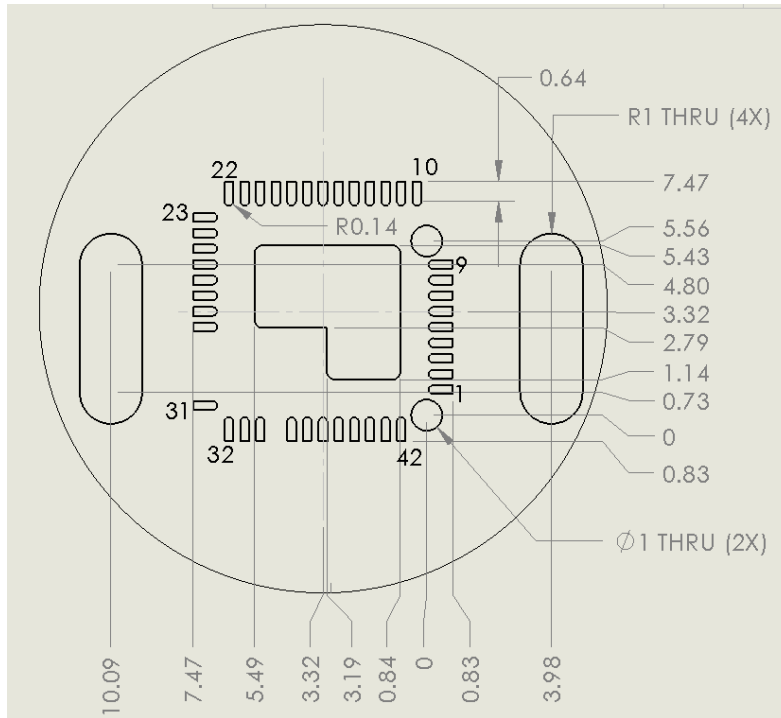
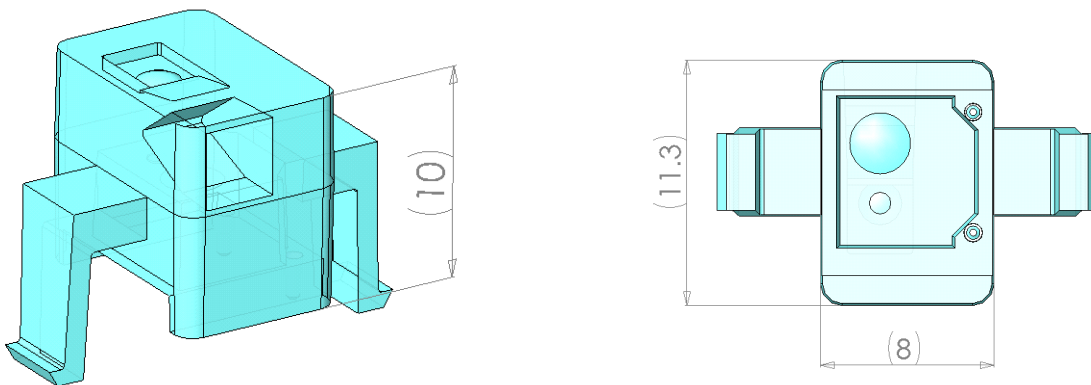
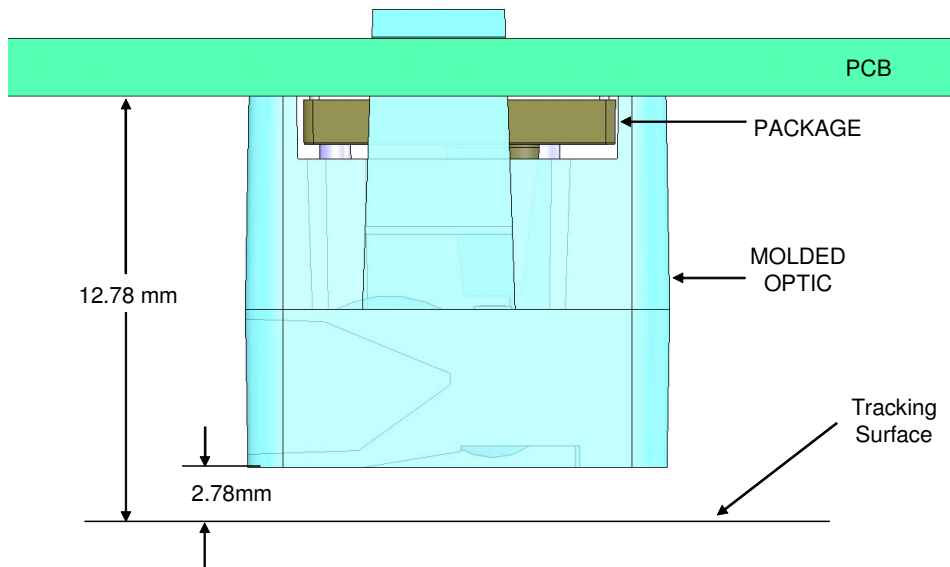


Figure 4. Molded Optic



Package Diagrams (continued)

Figure 5. PCB Mounting Height (Side View)



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Document History Page

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REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	498388	07/21/2006	XSJ	New Data Sheet
*A	906600	04/03/2007	XSJ	Updated DC Characteristics Table Removed 1000 dpi resolution option