

## Document information

Info	Content
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Abstract	uWand Calypso 01/02 datasheet

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## 1 Introduction

The uWand® acts as a universal remote control, giving users true pointing control over all devices in the room. Since the uWand is optical-based, you can use 3D gestures to navigate a graphical user interface on the TV screen or a picture frame in an intuitive and lean-back manner.



Fig 1. uWand remote

Figure 1 shows the remote in its reference design casing. Figure 2 shows the uWand reference design bar that needs to be connected over USB to the host system (PC system, or embedded device such as a set-top-box).



Fig 2. uWand bar

The system uses an IR (Infra Red) camera in the remote to do a trigonometric position calculation on two IR beacons placed in a bar. A 2.4 GHz proprietary RF link is used for a, under all circumstances, reliable bidirectional connection to the receiver located in the bar. The link conveys the pointer coordinates ( $x$ ,  $y$ ,  $z$  and rotation round  $z$ -axis), key events and control data. The receiver exposes an USB interface that implements a HID mouse, HID keyboard and HID MCE interface. Four GPIO channels are available for optional sensors

and/or actuators in the remote, par example force feedback (vibration) and analogue 3-axis accelerometers et cetera. For systems without USB the device can also interface over UART using a proprietary protocol.

## 1.1 Key features

- Direct pointing delivers most intuitive usage
  - Cursor appears where pointed at.
  - No drift effects as experienced with accelerometer & gyro solutions
- Most preferred way of pointing; consistently ranked highest in consumer tests
  - Comparable to a multi-touch screen experienced from a distance
- Philips proprietary and patented algorithms deliver:
  - Smoothest cursor movement, adjustable
  - Tremor cancellation algorithms
- Robust methods to handle optical disturbances
- High resolution for precise and well controlled movements
- Extended pointer coordinates like the zoom along the z-axis and rotation around the z-axis are reported for a true 3D experience
- Meets operating range specs of traditional remote control
- Uses robust Radio Frequency (RF) communication link
- Delivers Windows® 7 Touch compatible native Human Interface Device (HID) messages for zoom and rotation

## 1.2 Application area

- TV remote control
- 3D mouse
- Game controller
- Media center controller
- Virtual reality input device

## 2 System diagram

The system is derived from the uWand Calypso platform. This platform is based upon TI's CC2430 RF transceiver. This datasheet describes the 01 and the 02 version, the 01 version uses a 8kB flash USB transceiver, the other a 32kB offering more options (see section 3 for details) . The diagram below, figure 3, shows the key components in the system for both the remote system and the receiver part containing the LED beacons.

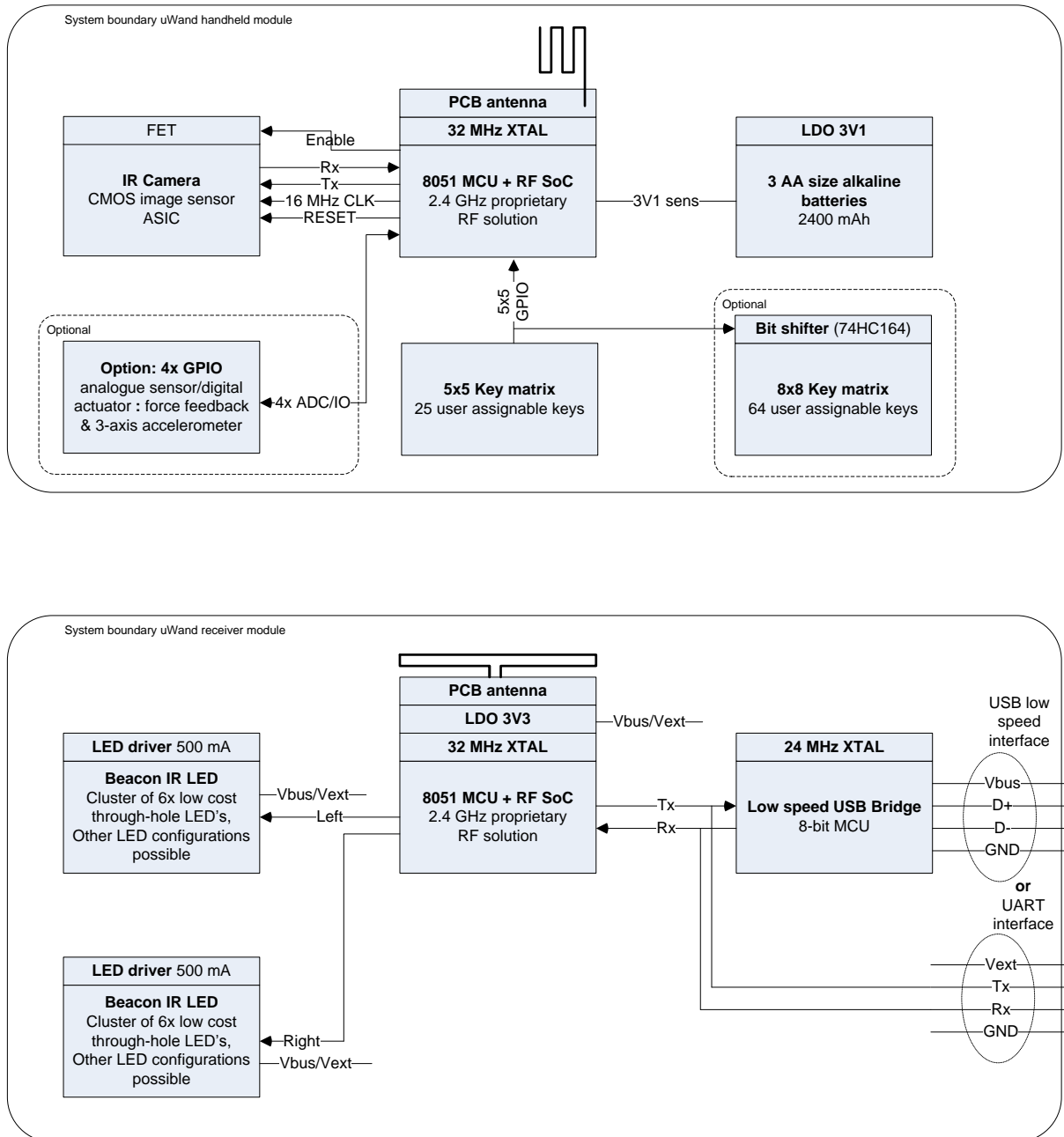


Fig 3. uWand system

## 3 Key specifications

The table below summarizes the key characteristics of the uWand system being comprised of the Pointer (the handheld or remote) and the receiver (the module connected to the host system over the USB link).

Pointer				
Optical range	Angle from center of LED receiver bar	In a straight line	+/- 30 deg	+/-45 deg
	Distance from screen	5 m	4m	3m
Pointing resolution	x-, y-axis are mapped to a plane 1024 * 576, actual precision is scaled up in the API; z-axis, has a resolution of 5 cm; rotation round the z-axis or <i>tilt</i> has a resolution of 2° degrees			
Current consumption	Pointing 25 <sup>1</sup> mA			
	Standby 10 µA			
Power supply	3 AA size alkaline batteries			
Standby time	2.5 years			
Pointing time	90 hours continuous use			
Keyboard/buttons	3 mouse buttons <sup>2</sup>	Left, middle and right button	63 additional keys	User assignable <sup>3</sup>
		Interface		
4 configurable GPIO channels that are either used as digital input or output or analogue input (10 bit). The data can be accessed via the HID USB interface				

For the receiver there are two configurations for the USB transceiver, either the Calypso 01 with a reduced set of features on USB or the Calypso 02 with the full set of features.

Receiver	
Interface	Low speed USB, Miniature USB-B connector or UART full duplex. Implementing the HID mouse, HID keyboard and HID MCE interface. In addition the HID interface offers the z-axis (distance between beacons and remote) and the tilt (the rotation of the remote round its z-axis) which can be used in the UI of the host system for advanced UI interaction.
Calypso 01	Absolute pointing coordinates: x,y in HID mouse API; z axis and tilt in HID feature reports
Calypso 02	Absolute pointing coordinates: x,y in HID mouse API; z axis and tilt in HID feature reports, HID MCE control, Windows® 7 Touch compatible native HID messages for zoom and rotation, relative pointing coordinates for game applications in HID mouse API and raw GPIO data: 4 channels@60Hz
Data rate	1.5 Mbit/s
Power supply	Powered over USB connector
Current consumption	450 mA @ 5V

<sup>1</sup> Using the next generation camera module. 45 mA using the current module.

<sup>2</sup> I.e. mapped on the HID mouse interface, left, middle and right mouse button. This is the default setting for the reference kit. The Calypso platform supports different types of key matrixes like 5x5, bit shift register 8 x 6 and a proprietary SPI bus protocol to offer up to 64 keys per device.

uWand system		
RF link	2.4 GHz proprietary RF link using IEEE 802.15.4 PHY and MAC in combination with a proprietary protocol stack	
RF Range	0 – 15 m indoors	
Frequency agility	A policy is implemented using RSSI monitoring in combination with channel hopping. This provides robustness against disturbance sources as other RF devices, microwaves, Wi-Fi (802.11) sources et cetera. The number of channels used is configurable as are the channel frequencies used.	
Pairing	Devices are paired 1:1. Devices may be unpaired using a switch on the receiver or key combination on the handheld device or a USB HID message from the host system	
Latency	RF	< 10 ms
	System latency <sup>3</sup>	< 40 ms

<sup>3</sup> As measured from the optical input on the camera toward availability as a USB HID report.

## 4 Contact information

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## 5 Legal information

### 5.1 Definitions

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### 5.3 Patents

Notice is herewith given that the subject device uses one or more of the following patents and that each of these patents may have corresponding patents in other jurisdictions.

Philips has been awarded a number of patents on the technology used in the uWand offering in Europe, Asia and the United States. These patents cover the position calculations using IR sources and a handheld IR camera, the robustness improvements using modulated IR beacons and the smoothing methods a.o.

### 5.4 Trademarks

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