eAP87606D100 (EX8036) Datasheet Depthmap Camera Module of eSP876U

(Non-NDA Version)

Revision 1.0

October 30, 2018

Disclaimer

eYs3D makes no representations or warranties with respect to the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and product descriptions without prior notice.

Except as set forth in the written supply agreement signed between your company and eYs3D, eYs3D assumes no liability whatsoever, and disclaims any express or implied warranty, relating to its products including, but not limited to, the implied warranty of merchantability, fitness for a particular purpose, or non-infringement.

eYs3D requests that your company shall abide by and adhere to all international, regional, national, federal, state, and local laws, regulations, codes, governmental or judicial orders, and international conventions, including but not limited to civil codes, copyright laws and regulations, laws protecting the reputation, credit, privacy or portrait right of an individual or entity, that are applicable to any use or application of eYs3D's products or any use, application, promotion, marketing or otherwise dispose of the devices, products, apparatus, instruments, equipments or machines containing or incorporating eYs3D's products.

US Export Control Classification Number (ECCN) & Harmonized Tariff Schedule (HTS):

Classification	Number	Descriptions
US - ECCN	**EAR99**	eYs3D camera processor chips and modules are for commercial use only, NOT under any US Export Control Classification List (CCL).
US- HTS	**8542.31.0001**	eYs3D camera processor chips are classified as "Electronic integrated circuits; parts thereof: Processors and controllers, whether or not combined with memories, converters, logic circuits, amplifiers, clock and timing circuits, or other circuits."
US - HTS	**8525.80.4000**	eYs3D camera modules are classified as "Digital still image video cameras"

EU Product Classification System:

Classification	Number	Descriptions
EU-PCS	**8542 31 0000**	eYs3D camera processor chips are classified as "Electronic integrated circuits - Processors and controllers, whether or not combined with memories, converters, logic circuits, amplifiers, clock and timing circuits, or other circuits"
EU - PCS	**8525 80 3000**	eYs3D camera modules are classified as "Digital camera"

Revision History

Rev	Date	Comments
1.0	October 30, 2018	Initial public release

Table of Contents

1 Introduction

This document contains technical information of the dual sensor camera module with eYs3D eSP876 depth-map camera processor. The module can provide either or both color video and/or depthmap video streams. The eSP876 depthmap controller is compliant to UVC1.5 and USB3.0/2.0 standards. Therefore, the module requires no specific drivers and provides high bandwidth for video transmission. The camera module can be integrated into the following applications AR/VR, People/Thing Counting, Robot/Drone, and Object scanning. The camera module is also a demonstration of the eSP876 reference design for its compact size and the collaboration on IR dot patterned illuminator for a textureless object.

Table 1. Key Parameters

Parameter	Description
Processor	eSP876U
Base Line	6.0cm
Image Sensor	1/3-inch 1.2Mp CMOS Digital Image Sensor with Global Shutter
Image Sensor Resolution	1280 x 960
Lens	Optical Lens F:2.0 with HFOV: 111.3º & VFOV: 85.7º
IR Cut Filter	Visible and 850nm dual band filter
Output Video Resolution	Please refer to Chapter 3 Video Output
Illumination	Wavelength : 850 +- 10 nm IR adaptor board (optional) Number of Features : > 6,700 Peak Output Power : 2 x 250 mW FOI Diagonal : 80^0
Effective Depthmap FOV	HFOV: 100^0 & VFOV: 67.5^0
Depth Working Range	20cm – 350cm
Depth Accuracy	Refer to Chapter 2 Depth Accuracy Chart
Maxima Depth-Map Resolution and Frame Rate	720P @ 60Hz
Color and Depth Sync	Yes
PC Interface Connection	USB3.0 or USB2.0 Type-MicroB
Power Source	USB bus power (5V/800mA by USB3.0; 5V/500mA by USB2.0) via USB connector
Operating Current	Typ. 350~900mA (1.75W~4.5W) in 720P at 60 FPS depend on IR intensity 0~6
Suspend Current	2.52mA (12.6mW)
VID (Vender ID)	0x1E4E
PID (Product ID)	0x0120
Weight	Net Weight 111g, Gross Weight: TBD
Operating Ambient Temperature	0~50 °c

Note: Operating current is measured as shown in the criteria below

1. The output image is delivered by YUV format with USB 3.0.

2. Depthmap resolution: 720P at 60fps with a Black Side Band

3. The default value of IR intensity in eAP87606D100 is 0 stand for turn-off and 1~6 are monotonically increased for the intensity controlled via the FW register, recommend value is 2 (typical 500mA, 2.5W for reference)

Figure 1. eAP87606D100 - 6cm baseline with IR illumination

1.1 Pin Information for the USB 3.0 Connector

Pin assignments and pin descriptions for the USB 3.0 micro B type connector are listed below.

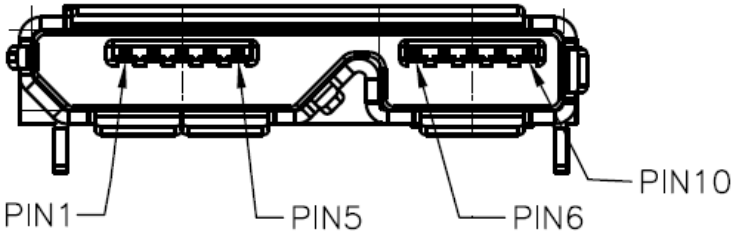

Figure 2. USB 3.0 Micro B Type Connector Drawing

Table 2. Pin Descriptions

Pin No.	Signal	Description	Mating Sequence
1	VBUS	Power	Second
2	D-	USB differential pair	Third
3	D+		
4	ID(GND)	Slave device ID	Second
5	GND	Ground for signal return	Second
6	StdA_SSRX-	SuperSpeed receiver differential pair	Last
7	StdA_SSR+		
8	GND_DRAIN	Ground for signal return	
9	StdA_SST-	SuperSpeed receiver differential pair	
10	StdA_SST+		
Shell	Shield	Connector metal shell	First

1.2 Ordering Information

Table 3. Available Part Number

Part Number	Description
eAP87606D100	EX8036D-6cm-HD-4xIR-USB-uB-Metal-Case

2 Depth Accuracy

Depth accuracy is the minimum distance difference of the same target that can be distinguished and leads to at least 1 pixel difference of disparity on the sensor plane depth accuracy is the minimum distance difference of the same target that can be distinguished and leads to at least 1 pixel difference of disparity on the sensor plane.

Here are the common notes for the three consecutive figures below.

1. Delta Distance is the absolute value of difference between two locations of a measured object while it moves away or towards the camera module Delta Distance is the absolute value of difference between two locations of a measured object while it moves away or towards the camera module.
2. The accuracy shown above is a theoretical calculation based on perfect lighting conditions and component specifications. It is subject to change and would be downgraded in a real scenario.
3. The chart is generated based on the configuration below below:
   - Lens: Optical Lens F:2.0 with HFOV: 111.3º & VFOV: 85.7º
   - Sensor: 1/3-inch 1.2Mp CMOS Digital Image Sensor with Global Shutter

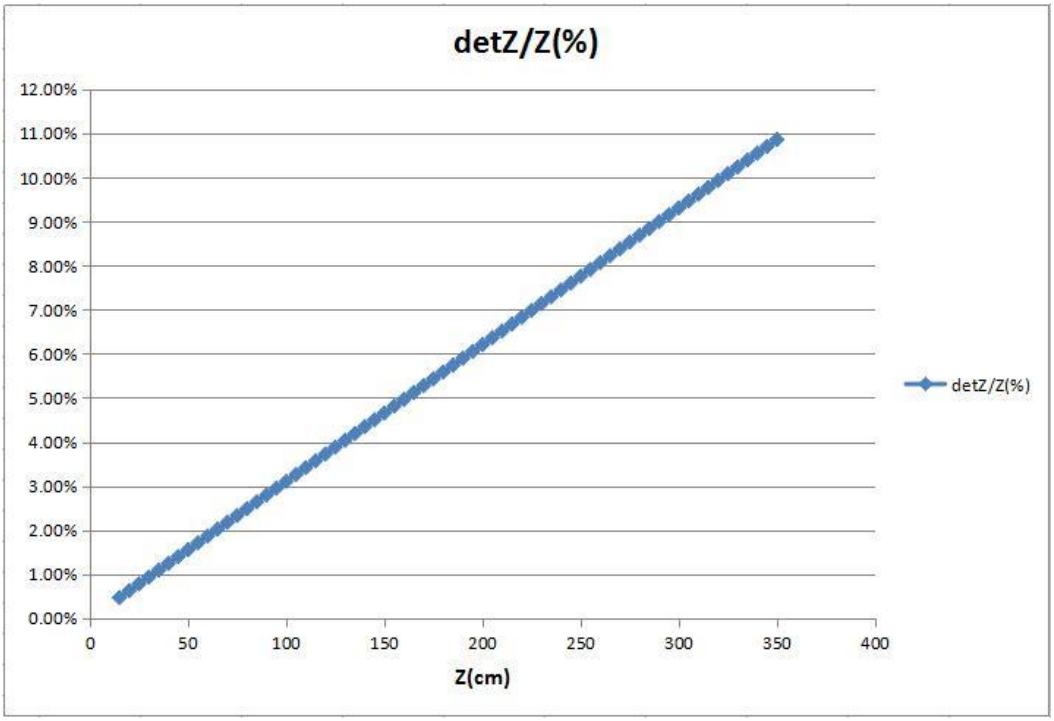

Figure 3. Depth Accuracy Chart of 6cm Baseline (Depth resolution: 1280x720 with FOV 100°)

3 Video Output Modes

Table 4-. Video & Depthmap Resolution

Video			*EP1 Color (2D or 3D)*		*EP2 (Depth-map)*			
L': Rectified Left, D: Depth, R: Right			*Video Resolution*	*YUV (fps)*	*Video Resolution*	*Bitmap Frame Rate*	*Support*	*Comment*
Mode 1	*L'+D*	USB 3.0	1280x720	60/30	1280x720	60/30	Yes	
Mode 2	*L'+D*	USB 3.0	640x480	90/60/30	640x480	90/60/30	Yes	Binning
Mode 3	*L'+R'+D*	USB 3.0	2560x720	30	1280x720	30	Yes	Calibration
Mode 4	*L'+R'+D*	USB 3.0	1280x480	90/60/30	640x480	90/60/30	Yes	Calibration
Mode 5	*L+D*	USB 3.0	1280x720	60/30	1280x720	60/30	Yes	
Mode 6	*L+R+D*	USB 3.0	2560x720	30	1280x720	30	Yes	
Mode 7	*L+R+D*	USB 3.0	1280x480	90/60/30	640x480	90/60/30	Yes	Binning
Mode 8	*L+R*	USB 3.0	2560x960	54	-	-	Yes	
Mode 9	*L+R*	USB 3.0	2560x720	60/30	-	-	Yes	
Mode 10	*L'+R'*	USB 3.0	2560x720	60/30	-	-	Yes	
Mode 11	*L(R)*	USB 3.0	1280x720	60/30	-	-	Yes	Default
Mode 12	*D*	USB 3.0	-	-	1280x720	60/30	Yes	
Mode 13	*D*	USB 3.0	-	-	640x480	90/60/30	Yes	Binning
Mode 14	*L'+D*	USB 2.0	1280x720	5	1280x720	5	Yes	
Mode 15	*L'+D*	USB 2.0	640x480	15	640x480	15	Yes	
Mode 16	*L'+R'+D*	USB 2.0	2560x720	5	1280x720	5	Yes	
Mode 17	*L'+R'+D*	USB 2.0	1280x480	15	640x480	15	Yes	
Mode 18	*L+D*	USB 2.0	1280x720	5	1280x720	5	Yes	
Mode 19	*L+R+D*	USB 2.0	2560x720	5	1280x720	5	Yes	
Mode 20	*L+R+D*	USB 2.0	1280x480	15	640x480	15	Yes	
Mode 21	*L+R*	USB 2.0	2560x960	4	-	-	Yes	
Mode 22	*L+R*	USB 2.0	2560x720	5	-	-	Yes	
Mode 23	*L'+R'*	USB 2.0	2560x720	5	-	-	Yes	
Mode 24	*L(R)*	USB 2.0	1280x720	10	-	-	Yes	Default
Mode 25	*D*	USB 2.0	-	-	1280x720	5	Yes	
Mode 26	*D*	USB 2.0	-	-	640x480	30	Yes	
Mode 27	*L'+D*	USB 2.0 /MJPEG	1280x720	10	1280x720	10	Yes	
Mode 28	*L'+D*	USB 2.0 /MJPEG	640x480	30	640x480	30	Yes	
Mode 29	*L'+R'+D*	USB 2.0 /MJPEG	2560x720	10	1280x720	10	Yes	
Mode 30	*L+D*	USB 2.0 /MJPEG	1280x720	30	640x480	30	Yes	

Video			*EP1 Color (2D or 3D)*		*EP2 (Depth-map)*			
L': Rectified Left, D: Depth, R: Right			*Video Resolution*	*YUV (fps)*	*Video Resolution*	*Bitmap Frame Rate*	*Support*	*Comment*
Mode 31	*L+R+D*	USB 2.0 /MJPEG	2560x720	30	640x480	30	Yes	
Mode 32	*L+R*	USB 2.0 /MJPEG	2560x960	24	-	-	Yes	
Mode 33	*L+R*	USB 2.0 /MJPEG	2560x720	30	-	-	Yes	
Mode 34	*L'+R'*	USB 2.0 /MJPEG	1280x480	30	-	-	Yes	
Mode 35	*L(R)*	USB 2.0 /MJPEG	1280x720	30		-	Yes	

1. Mode 11/24/35 are default in preview mode

4 Module Dimensions

Figure 4. eAP87606D100 Top View

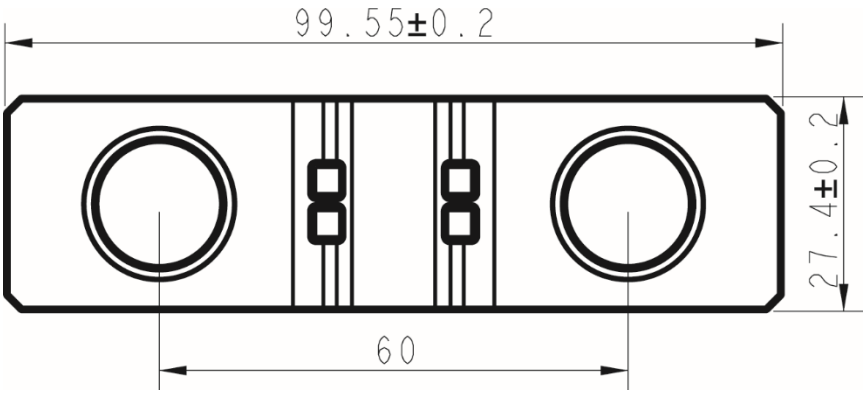

Figure 5. eAP87606D100 Side View

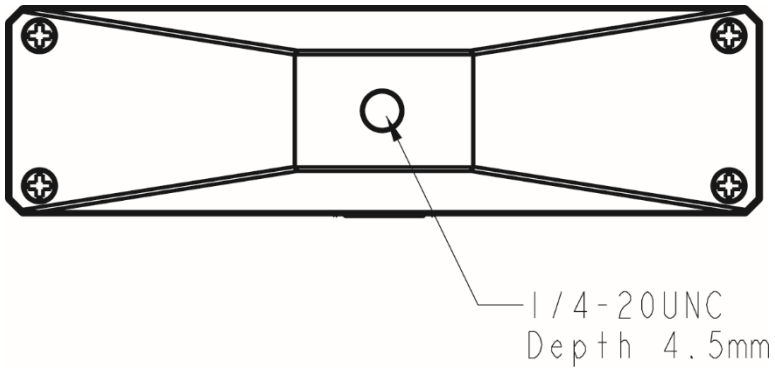

Figure 6. eAP87606D100 Bottom View