

D-Robotics RDK™ Stereo Camera GS130W



1. Scope

This approval sheet contains the general information of V1TT02D-202+D-Robotics RDK™ Stereo Camera GS130W dual camera module designed for D-Robotics. It contains the key features of the module as well as the information for the quality inspection and reliability test purposes.

2. Features

- ◆ Global shutter
- ◆ High sensitivity
- ◆ High dynamic range (HDR)
- ◆ High signal to noise ratio
- ◆ 850nm/940nm near infrared enhancement
- ◆ External triggering and multiple sensors synchronization
- ◆ AEC/AGC, minimum exposure time less than 1 line
- ◆ LED strobe
- ◆ Horizontal/vertical windowing
- ◆ 28× analog gain, 32× digital gain
- ◆ Programmable registers through I²C
- ◆ Low power consumption
- ◆ Build-in temperature sensor

Applications

- ◆ Machine vision
- ◆ Automotive
- ◆ Security surveillance systems
- ◆ Motion monitoring

3. General Description

3.1 Camera Module Specification

No.	Item	Specification
1	Sensor	SC132GS (Global shutter)
2	sensor amount	2pcs
3	Baseline	80mm
4	Sensor Lens Size	1/4 inch
5	Sensor Pixel array number	1080 (H) × 1280 (V)
6	Sensor pixel size	2.7 μm (H) × 2.7 μm (V)
7	Sensor power supply	Digital = 1.14V–1.26V (1.2V nominal); Analog = 2.4V–2.6V (2.5V nominal); I/O = 1.7V–1.9V (1.8V nominal)
8	Sensor output formats	12/10/8-bit RAW
9	Sensor maximum image transfer rate	1080 (H) × 1280 (V) @ 120fps
10	SNR	40dB
11	Sensor image area	Diagonal 4.522 mm

3.2 Camera Lens Specification

No.	Item	Specification
1	Lens Size	1/4 inch
2	Focal Length	1.75mm
3	F/NO.	2
4	Field of View Angle (Diagonal)	157.2° (D) / 96.8° (H) / 115.6° (V) ± 3°
5	OP Distortion	< -74%
6	Image Quality	0F ≥ 600 LW/PH; 0.6F ≥ 500 LW/PH
7	IR Filter	650nm
8	Focusing Range	20cm - ∞ (AT=70cm)

4. Sensor Electrical Specification

4.1 Absolute Maximum Ratings

Table 3- 1 Absolute maximum ratings

Item	Symbol	Absolute Maximum Ratings	Unit
Analog supply voltage	V_{AVDD}	-0.3~3.0	V
I/O supply voltage	V_{DOVDD}	-0.3~2.2	V
Digital supply voltage	V_{DVDD}	-0.3~1.4	V
I/O input voltage	V_I	-0.3~ $V_{DOVDD}+0.3$	V
I/O output voltage	V_O	-0.3~ $V_{DOVDD}+0.3$	V
Operating temperature	T_{OPR}	-30~+85	°C
Best operating temperature	T_{SPEC}	-20~+60	°C
Storage temperature	T_{STG}	-40~+85	°C

4.2 Sensor DC Characteristics

Table 3-2 DC electrical characteristics (MIPI mode: AVDD = 2.5V, DOVDD = 1.8V)

Item	Symbol	Min	Typical	Max	Unit
Power Supply					
Analog supply voltage	V_{AVDD}	2.4	2.5	2.6	V
I/O supply voltage	V_{DOVDD}	1.7	1.8	1.9	V
Digital supply voltage	V_{DVDD}	1.14	1.2	1.26	V
Current (Operating current, linear mode, MIPI 4-lane output)					
Analog supply current	I_{AVDD}	-	24	24.9	mA
Digital supply current	I_{DVDD}	-	57.4	62	mA
I/O supply current	I_{DOVDD}	-	0.5	0.6	mA
Current (Standby current)					
Analog supply current	I_{AVDD}	-	7800	-	μA
Digital supply current	I_{DVDD}	-	2300	-	μA
I/O supply current	I_{DOVDD}	-	200	-	μA
Total power consumption	Power	-	22620	-	μW
Digital Input					
Input low level	V_{IL}	-	-	$0.3 \times DOVDD$	V
Input high level	V_{IH}	$0.7 \times DOVDD$	-	-	V
Input capacitor	C_{IN}	-	-	10	pF
Digital Output (25 pF standard load)					
Output high level	V_{OH}	$0.9 \times DOVDD$	-	-	V
Output low level	V_{OL}	-	-	$0.1 \times DOVDD$	V
Serial Interface Input (SCL and SDA)					
Input low level	V_{IL}	-0.5	0	$0.3 \times DOVDD$	V
Input high level	V_{IH}	$0.7 \times DOVDD$	DOVDD	DOVDD + 0.5	V

Notes:

- 1) Operating current & Standby current (Typ.): Supply voltage 2.5V/1.8V/1.2V, $T_j=25^\circ\text{C}$; max. analogue gain; test condition: 100 LSB
- 2) Operating current (Max.): Supply voltage 2.6V/1.9V/1.26V, $T_j=80^\circ\text{C}$; max. analogue gain; test condition: 100 LSB

4.3 Sensor AC Characteristics

Table 3- 3 AC characteristics (TA = 25°C, AVDD = 2.5V, DOVDD = 1.8V)

Item	Symbol	Min	Typical	Max	Unit
AC Parameters					
DC differential linearity deviation	DLE	-	< 1	-	LSB
DC integral linearity deviation	ILE	-	< 2	-	LSB
Crystal and Clock Input					
Input clock frequency	f_{EXTCLK}	6	-	27	MHz
Input clock high pulse width	t_{WH}	5	-	-	ns
Input clock low pulse width	t_{WL}	5	-	-	ns
Input clock duty cycle	-	45	50	55	%

Note: Package thermal resistance $\theta_{ja} = 40^{\circ}\text{C/W}$.

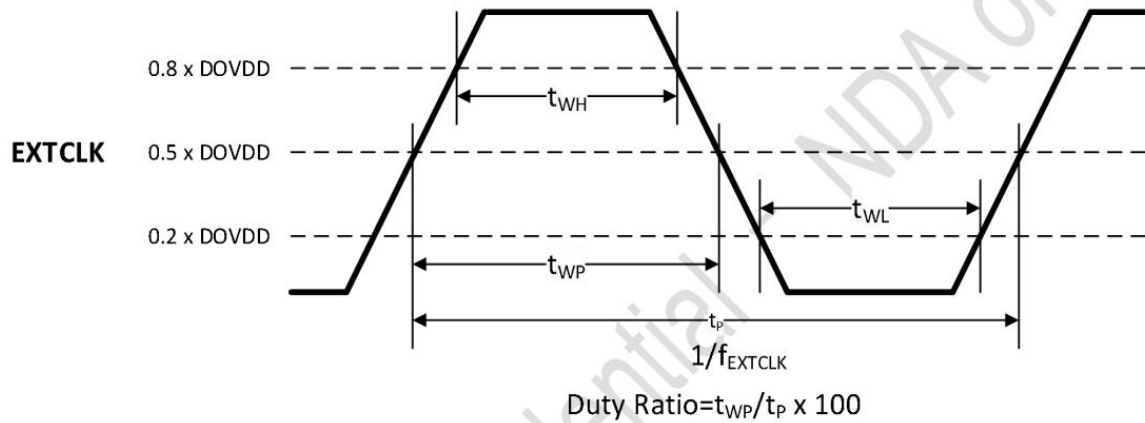
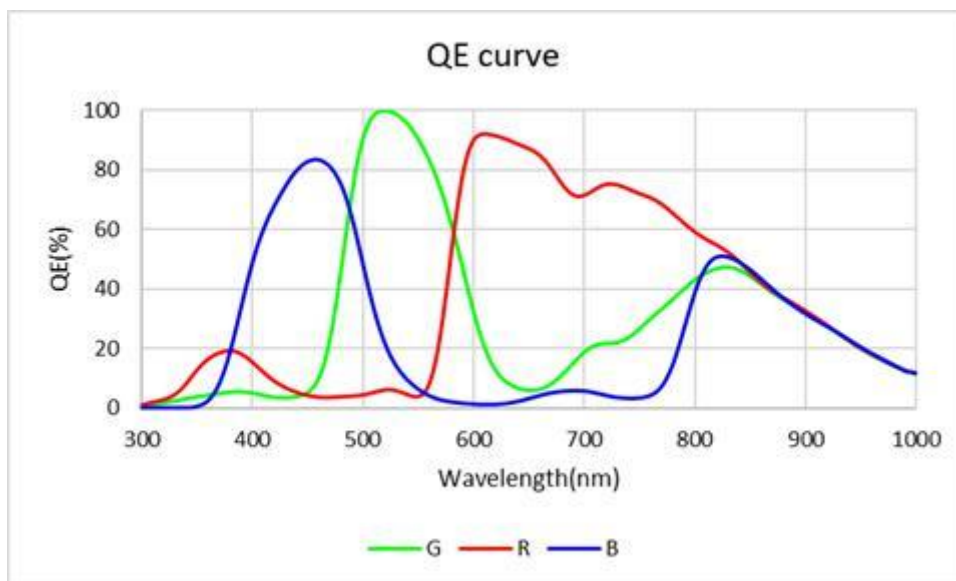


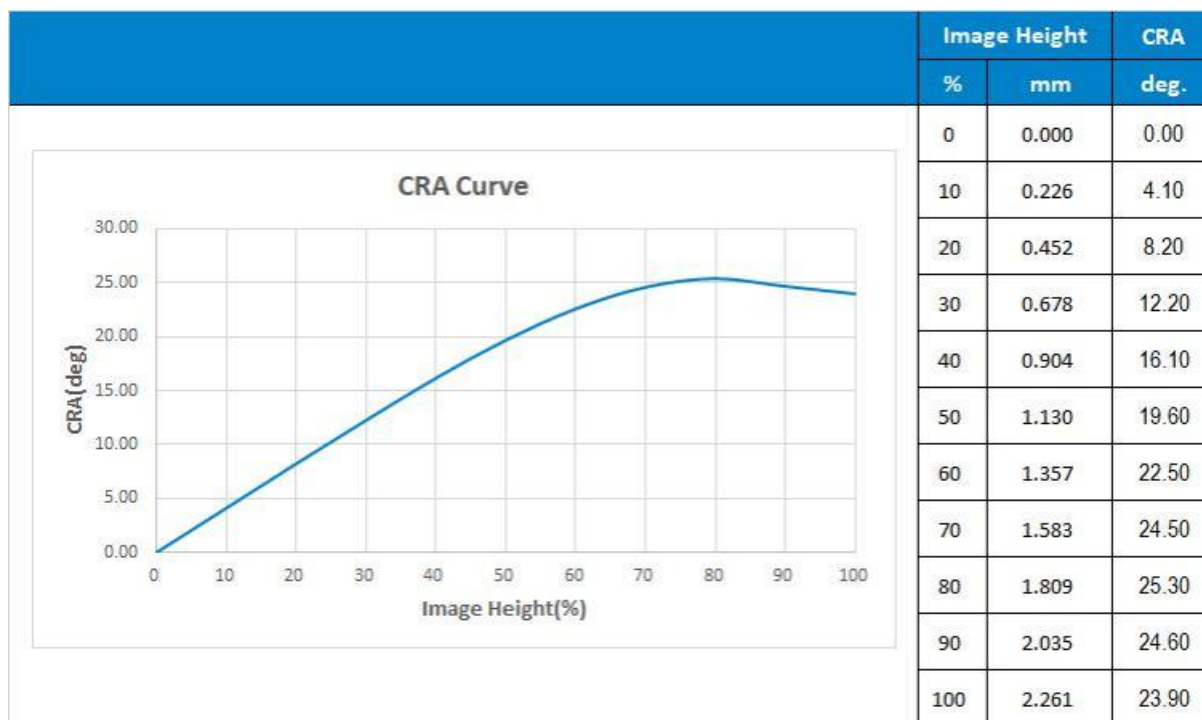
Figure 3- 1 Input clock waveform

4.4 Optical Characteristic

4.4.1 Chief ray angle (CRA)



4.4.2 Chief ray angle (CRA)



For more information of sensor please refer to the SC132GS spec.

5.2 V1TT02D-202 Camera Module PIN Description (sensor part)

Pin	Number	Name	Pin type	Function/Description
Pin	1#	DGND	GND	Digital GND
Pin	2#	AVDD	POWER	2.5V power supply(Analog)
Pin	3#	DVDD	POWER	1.2V power supply(core)
Pin	4#	DOVDD	POWER	1.8V power supply(I/O)
Pin	5#	DGND	GND	Digital GND
Pin	6#	FSYNC	I/O	Frame sync input/output
Pin	7#	DGND	GND	Digital GND
Pin	8#	RESET	I	RESET Signal Input
Pin	9#	STROBE	O	LED strobe signal
Pin	10#	SID0	I	I ² C Device ID 0
Pin	11#	SIO_D	I/O	Serial communication data
Pin	12#	SIO_C	I	Serial communication clock input
Pin	13#	DGND	GND	Digital GND
Pin	14#	MCLK	I	System input clock
Pin	15#	DGND	GND	Digital GND
Pin	16#	MDOP	O	MIPI TX data positive output(lane1)
Pin	17#	MDON	O	MIPI TX data negative output(lane1)
Pin	18#	DGND	DGND	Digital GND
Pin	19#	MD1P	O	MIPI TX data positive output(lane2)
Pin	20#	MD1N	O	MIPI TX data negative output(lane2)
Pin	21#	DGND	DGND	Digital GND
Pin	22#	MCP	O	MIPI TX clock positive output
Pin	23#	MCN	O	MIPI TX clock negative output
Pin	24#	DGND	DGND	Digital GND



5.4 D-Robotics RDK™ Stereo Camera GS130W Module Configuration Specification (ZJB part)

J1/J3 Pin	Number	Name	Pin type	Function/Description
Pin	1#	DGND	GND	Digital GND
Pin	2#	AVDD	POWER	2.5V power supply(Analog)
Pin	3#	DVDD	POWER	1.2V power supply(core)
Pin	4#	DOVDD	POWER	1.8V power supply(I/O)
Pin	5#	DGND	GND	Digital GND
Pin	6#	FSYNC	I/O	Frame sync input/output
Pin	7#	DGND	GND	Digital GND
Pin	8#	RESET	I	RESET Signal Input
Pin	9#	STROBE	O	LED strobe signal
Pin	10#	SID0	I	I ² C Device ID 0
Pin	11#	SIO_D	I/O	Serial communication data
Pin	12#	SIO_C	I	Serial communication clock input
Pin	13#	DGND	GND	Digital GND
Pin	14#	MCLK	I	System input clock
Pin	15#	DGND	GND	Digital GND
Pin	16#	MDOP	O	MIPI TX data positive output(lane1)
Pin	17#	MDON	O	MIPI TX data negative output(lane1)
Pin	18#	DGND	DGND	Digital GND
Pin	19#	MD1P	O	MIPI TX data positive output(lane2)
Pin	20#	MD1N	O	MIPI TX data negative output(lane2)
Pin	21#	DGND	DGND	Digital GND
Pin	22#	MCP	O	MIPI TX clock positive output
Pin	23#	MCN	O	MIPI TX clock negative output
Pin	24#	DGND	DGND	Digital GND

J2/J4 Pin	Number	Name	Pin type	Function/Description
Pin	1#	DGND	GND	Digital GND
Pin	2#	MDON	0	MIPI TX data negative output (lane1)
Pin	3#	MDOP	0	MIPI TX data positive output (lane1)
Pin	4#	DGND	GND	Digital GND
Pin	5#	MD1N	0	MIPI TX data negative output (lane2)
Pin	6#	MD1P	0	MIPI TX data positive output (lane2)
Pin	7#	DGND	GND	Digital GND
Pin	8#	MCN	0	MIPI TX clock negative output
Pin	9#	MCP	0	MIPI TX clock positive output
Pin	10#	DGND	GND	Digital GND
Pin	11#	NC	–	NC
Pin	12#	NC	–	NC
Pin	13#	NC	–	NC
Pin	14#	NC	–	NC
Pin	15#	NC	–	NC
Pin	16#	NC	–	NC
Pin	17#	EN	I	RESET Signal Input
Pin	18#	FSYNC	I/O	Frame sync input/output
Pin	19#	DGND	GND	Digital GND
Pin	20#	SIO_C	I	Serial communication clock input
Pin	21#	SIO_D	I/O	Serial communication data
Pin	22#	VDD_3V3	POWER	Power supply 3.3V for Optical Sensor

6. Reliability Test

No.	Test Item	Test Conditions	Judge Standard
1	Constant Temperate and Humidity Storage Test	Temperate: $60\pm3^{\circ}\text{C}$; Humidity: $90\pm3\%\text{RH}$; Test duration: 96H	No image distort and good color rendition.
2	High Temperate Storage Test	Temperate: $80\pm3^{\circ}\text{C}$; Test duration: 96H	No image distort and good color rendition.
3	Low Temperate Storage Test	Temperate: $-40\pm3^{\circ}\text{C}$; Test duration: 96H	No image distort and good color rendition.
4	High and Low Temperate Shock Test	High Temp.: $80 \pm 3^{\circ}\text{C}$; Low Temp.: $-40 \pm 3^{\circ}\text{C}$; Each Place Time: 30min; Number of Cycles: 30	No image distort and good color rendition.
5	High Temperate Function Test	Temperate: $60\pm3^{\circ}\text{C}$; Test Duration: 24H; Max Work Voltage	No image distort and good color rendition.
6	Low Temperate Function Test	Temperate: $-20\pm3^{\circ}\text{C}$; Test Duration: 24H; Max Work Voltage	No image distort and good color rendition.
7	Constant Temperate and Humidity Function Test	Temperate: $55\pm3^{\circ}\text{C}$; Humidity: 85%RH; Test Duration: 24H; Max Work Voltage	No image distort and good color rendition.
8	Vibration Test	Frequency Range: 10-55-10Hz; Amplitude: 2mm; Test All 3 Axes (X, Y, Z); Duration 30min for Each Axis	No image distort and good color rendition.
9	Drop Test	Floor: Concrete; Height: 150cm; Clamp Weight: 100g; Positions: 6 Surface; Each Surface Drop 3 Times	No image distort and good color rendition.
10	ESD TEST	8KV Contact Discharge 12KV Air Discharge 10 Times for Second	No image distort and good color rendition.

7. Shipping inspection items and standards

7.1 Sampling methods

1. Sampling plan :

Sampling Plan: Refer to the Chinese National Standard GB/T 2828.1-2003 for single normal sampling procedures. The general inspection level is $IL = II$, and the Acceptance Quality Limit (AQL) is based on the standards $MA = 0.4$ and $MI = 0.65$.

2. Method:

- 1) Environmental requirements: 5W light bulb, illuminance: 500-1100 lux, distance between the light bulb and the table: $60 \pm 10\text{cm}$;
- 2) The distance between the eyes and the object to be tested is $40 \pm 10\text{CM}$, with single-point visual inspection time of 3 to 5 seconds, and overall visual inspection time around 10 seconds;
- 3) The angle between the line of sight and the surface of the object being inspected should be within $\pm 45^\circ$;
- 4) Vision must be above 1.0, with no color blindness;
- 5) For general appearance dimensions, appropriate measuring tools should be used for measurement;
- 6) The accuracy level of the caliper should be no less than 0.02mm, and the accuracy level of the micrometer should be no less than 0.01mm; the microscope magnification is 10X. Items 9-15 in the visual inspection are the inspection of the connector under the microscope, while the other visual inspection items are conducted by direct visual inspection;
- 7) The other or custom-made tooling and devices must meet the measurement requirements specified in the relevant process, inspection documents, or technical drawings.

8. Packaging

8.1 Packaging Process

1. Every module is placed into a tray until all empty slots of a tray are filled. Each tray contains no more than TBD modules.
2. Each tray uses an anti-static bag to prevent the module from moisture by partially sucking out the air from the stack.
3. A stack has TBD trays.
4. Insert three stacks into a outside box. Then attach the label onto the outside box.

9. Precautions

9.1 Storage and Operating Conditions

To keep the product and packaging material in good condition, care must be taken to control temperature and humidity in the storage area.

Recommended conditions:

Ambient temperature: 0~+40℃

Humidity: 30~70%RH

No rapid change on temperature and humidity.

The products listed in this catalog are not designed for use under the following conditions. Storage and/or usage under following conditions is prohibited.

1. Exposure to corrosive gas such as chlorine, hydrogen sulfide, ammonia, sulfur dioxide, nitrogen oxide, etc.
2. Exposure to direct sunlight.
3. Exposure to dust.
4. Exposure to excessive moisture or wet locations.
5. Exposure to salt water or sea breezes.
6. Exposure to strong static electricity or electromagnetic waves.

9.2 Transportation and Handling

1. Minimize any mechanical vibration or shock and avoid dropping of the product during transportation or dropping the product that contains the substrate.
2. Since the application of static electricity or over voltage may cause defect in the product or deterioration of its reliability, caution must be taken against exposure to any static electricity generated by electrified items such as workbenches, soldering irons, tools, carrying containers, etc.
3. Caution shall be taken to avoid overstress to the product.