PRODUCT	:	CAMERA MODULE
MODEL NO.	:	CM6098-B500SA-E
SUPPLIER	:	TRULY OPTO-ELECTRONICS LTD.
DATE	:	May 26, 2011

CERT. No. 946535
ISO9001
TL9000

SPECIFICATION

Revision: 1.0

CM6098-B500SA-E

If there is no special request from customer, TRULY OPTO-ELECTRONICS LTD. will not reserve the tooling of the product under the following conditions:
1.There is no response from customer in two years after TRULY OPTO-ELECTRONICS LTD. submit the samples;
2.There is no order in two years after the latest mass production.
And correlated data (include quality record) will be reserved one year more after tooling was discarded.

TRULY OPTO-ELECTRONICS LTD.: CUSTOMER:

Quality Assurance Department:_____ Approved by: Technical Department:_____	Approved by:

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
0.1	2011-03-18	First release	
1.0	2011-5-26	Change drawing	

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- FACTORY CONTACT INFORMATION

WRITTEN BY	CHECKED BY	APPROVED BY
TANG JING	WEI YOU XING	LIU TIE NAN

Auto-Focus Specification

NO.	Item	Specification
1	Auto-Focus Type	VCM (Voice Coil Motor)
3	Power Supply	2.6~3.3 V
4	Rated Current	≤100mA
5	Resistance	28±10%Ω
6	Settling Time	TBD
7	Hysteresis	≤10μm
8	Focusing Range	10cm to infinity
9	Life Time	TBD

Key Information

Module No.		CM6098-B500SA-E
Module Size		8.5mm X 8.5mm X 5.15mm
Sensor Type		OV5640_CSP
Array Size	QSXGA	2592 X 1944
Power supply	core	1.5V +/- 5%
	Analog	2.6 ~ 3.0V (2.8V typical)
	I/O	1.8V/2.8V
	AF_VDD	2.6~3.3V
Lens		1/4 inch 4Plastic+ IR
Focus(F.NO)		2.8
View Angle		70.0°
Image Area		3673.6 μm x 2738.4 μm
Object distance		10cm-infinity
Sensitivity		600 mV/Lux-sec
Pixel size		1.4μm x 1.4μm
IR Cutter		650+/-10nm
Sensor Temperature Range	Operating	-30° C to 70° C
	Stable Image	0° C to 50° C
Output Formats		RAW RGB, RGB565/555/444, YUV422/420, YCbCr422, and compression
Maximum Image Transfer Rate	QSXGA	15 fps
	VGA	90 fps
	QVGA	120 fps
max S/N ratio:		36 dB (maximum)
Dynamic Range		68 dB @ 8x gain
substrate		FPC
IC Package		CSP
Sensor Power requirement	Active	140 mA
	Standby	20 μA
Dark current		8 mV/s @ 60° C junction temperature
Package		Antistatic Plastic

Pin Assignment

No.	Name	Pin type	Description
1	D0	I/O	Video port output bit[0]
2	AVDD	Power	power for analog circuit
3	D1	I/O	Video port output bit[1]
4	AGND	Ground	Ground for analog circuit
5	D2	I/O	Video port output bit[2]
6	DVDD	Power	power for digital circuit
7	D3	I/O	Video port output bit[3]
8	RESET	Input	reset (active low with internal pull-up resistor)
9	D4	I/O	Video port output bit[4]
10	DOVDD	Power	Power for I/O circuit
11	D5	I/O	Video port output bit[5]
12	PWDN	Input	Power down, active high with internal pull-down resistor
13	D6	I/O	Video port output bit[6]
14	SIOC	Input	SCCB input clock
15	D7	I/O	Video port output bit[7]
16	SIOD	I/O	SCCB data
17	D8	I/O	Video port output bit[8]
18	GND	Ground	Ground
19	D9	I/O	Video port output bit[9]
20	VSYNC	I/O	DVP VSYNC output
21	GND	Ground	Ground
22	HSYNC	I/O	DVP HREF output
23	MCLK	Input	System input clock
24	PCLK	I/O	DVP PCLK output
25	GND	Ground	Ground
26	GND	Ground	Ground
27	AF_ GND	Ground	Ground for VCM
28	STROBE	output	I/O strobe output
29	GND	Ground	Ground
30	AF_VDD	Power	Power for VCM

Electrical Characteristics

1. Absolute Maximum Ratings

parameter		absolute maximum rating[a]
supply voltage (with respect to ground)[b]	V_{DD-A}	4.5V
	V_{DD-D}	3V
	V_{DD-IO}	4.5V
electro-static discharge (ESD)	human body model	2000V
	machine model	200V
all input/output voltages (with respect to ground)		-0.3V to V_{DD-IO} + 1V
I/O current on any input or output pin		±200 mA

a. exceeding the absolute maximum ratings shown above invalidates all AC and DC electrical specifications and may result in permanent damage to the device. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

b. for negative voltage with respect to ground, V_{DD-A} (-4.5V), V_{DD-C} (-3V), V_{DD-IO} (-4.5V)

2.DC Characteristics (-20℃<Ta<70℃)

symbol	parameter	min	typ	max	unit
power supply					
V_{DD-A}	supply voltage (analog)	2.6	2.8	3.0	V
V_{DD-D}[a]	supply voltage (digital core)	1.425	1.5	1.575	V
V_{DD-IO}	supply voltage (digital I/O)	1.71	1.8	3.0	V
internal DVDD short to DVDD, DVP output, AVDD = 2.8V, DOVDD = 2.8V					
I_{DD-A}	operating current 2592 x 1944 @ 15 fps JPG		30	40	mA
I_{DD-DO}			110	140	mA
I_{DD-A}	operating current 1080p @ 30 fps JPG		30	40	mA
I_{DD-DO}			100	130	mA
I_{DD-A}	operating current 720p @ 60 fps		32	42	mA
I_{DD-DO}			100	42	mA
I_{DD-A}	operating current 720 @ 30 fps YUV		32	40	mA
I_{DD-DO}			58	72	mA
I_{DD-A}	operating current VGA @ 30 fps		30	40	mA
I_{DD-DO}			58	72	mA
internal DVDD, EVDD short to DVDD, MIPI output, AVDD = 2.8V, DOVDD = 1.8V					
I_{DD-A}	operating current 2592 x 1944 @ 15 fps JPG		30	40	mA
I_{DD-DO}			110	140	mA
I_{DD-A}	operating current 2592 x 1944 @ 15 fps YUV		30	40	mA
I_{DD-DO}			100	130	mA
I_{DD-A}	operating current 1080p @ 30 fps JPG		30	40	mA
I_{DD-DO}			100	130	mA
I_{DD-A}	operating current 1080p @ 30 fps YUV		30	40	mA
I_{DD-DO}			90	115	mA
I_{DD-A}	operating current 720 @ 30 fps YUV		32	42	mA
I_{DD-DO}			54	70	mA
external DVDD, EVDD short to DVDD, DVP output, AVDD = 2.8V, DOVDD = 2.8V					
I_{DD-A}	operating current 2592 x 1944 @ 15 fps JPG		30	40	mA
I_{DD-D}			98	125	mA
I_{DD-DO}			9	12	mA

3. AC Characteristics (T_A=25℃, V_{DD-A}=2.8V)

symbol	parameter	min	typ	max	unit
ADC parameters					
B	analog bandwidth		30		MHz
DLE	DC differential linearity error		0.5		LSB
ILE	DC integral linearity error		1		LSB
	settling time for hardware reset			<1	ms
	settling time for software reset			<1	ms
	settling time for resolution mode change			<1	ms
	settling time for register setting			<300	ms

4. Timing Characteristics

symbol	parameter	min	typ	max	unit
oscillator and clock input					
f_{OSC}	frequency (XVCLK)[a]	6	24	54	MHz
t_r, t_f	clock input rise/fall time[b]			5 (10[c])	ns
f_{PCLK}	parallel port output pixel clock		48[d]	96[e]	MHz

a. for input clock range 6~27MHz, the OV5640 can tolerate input clock jitter up to 1ns, for input clock range to 54MHz, the OV5640 can tolerate input clock jitter up to 500ps

b. if the PLL is bypassed, the delay from input clock to output clock is approximately 4~5ns

c. if using the internal PLL

d. typical PCLK is 48 MHz when sensor output is smaller size (VGA YUV or below) or full size compression

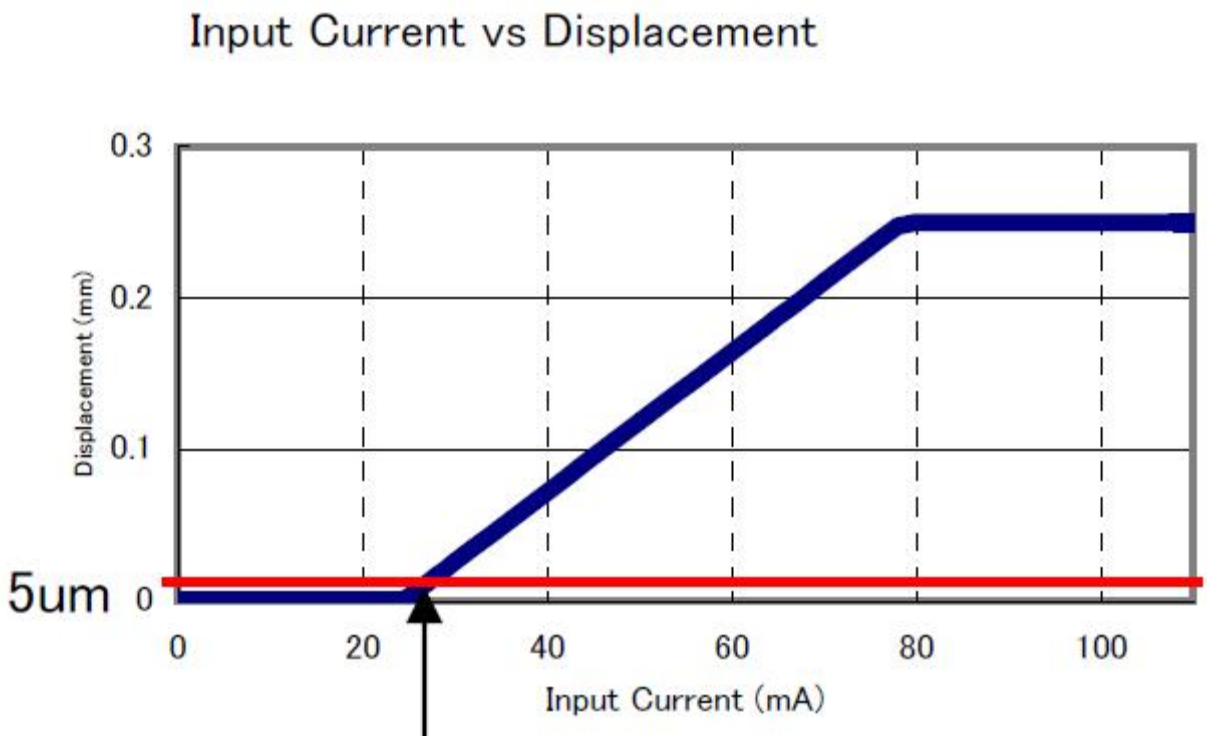
e. 96 MHz is for sensor RAW data output at 15fps or YUV output at 7.5fps. For higher speeds such as 5 megapixel YUV @ 15fps, OmniVision recommends using the MIPI two-lane interface.

Note: For more information of sensor please refer to the OV5640_CSP specification.

5. VCM Specification

NO.	Item	Condition	Specification
1	Motor Size	Without terminal	8.5*8.5*3.45 mm
2	Absolute Max Current		≤100mA
3	Moving Tilt	∞→10cm	＜30′
4	Starting Current	Moving direction is upward	≥15mA
5	Hysteresis	At stroke range:0.005 ~ 0.15mm	≤10μm
6	Sensitivity		3.5 ~ 7.0μm/mA
7	Motion Range	Driving Current 100mA	0~0.19 mm with lens
8	Terminal Resistance	20±5℃	28±10%Ω
9	Lens Unit Mass		≤0.15g

Performance Diagram

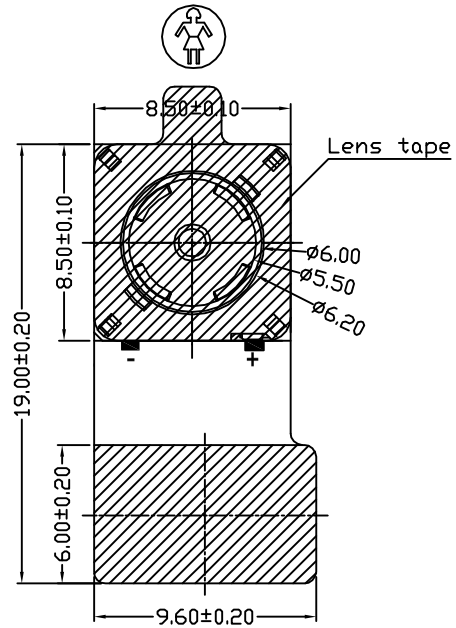


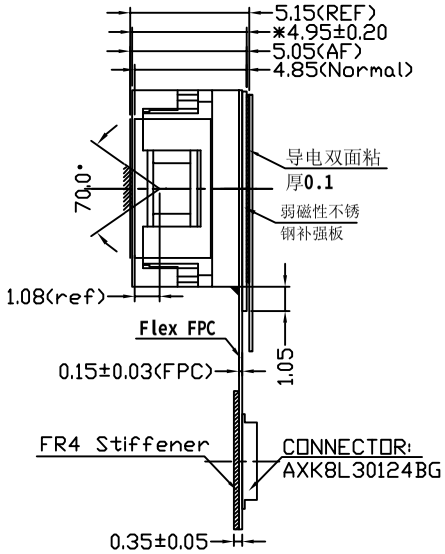
Mechanical Drawing

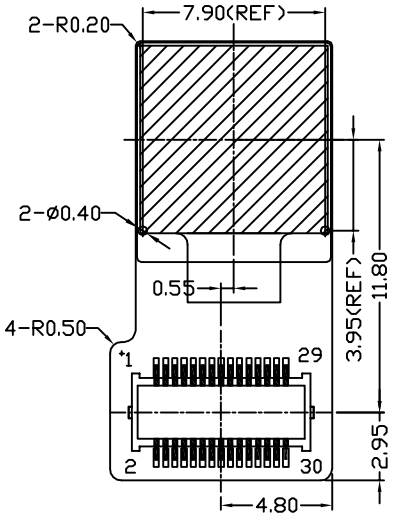
RoHS

Customer No.:

CM6098-B500SA-E Camera Module







30PIN DESCRIPTION

PIN NO.	SIGNAL
1	DO
2	AVDD_2.8V
3	D1
4	AGND
5	D2
6	DVDD_1.5V
7	D3
8	RESET
9	D4
10	DOVDD_2.8V
11	D5
12	PWDN
13	D6
14	SIOC
15	D7
16	SIOD
17	D8
18	GND
19	D9
20	VSYNC
21	GND
22	HSYNC
23	MCLK
24	PCLK
25	GND
26	GND
27	AF_GND
28	STROBE
29	GND
30	AF_VDD

主要参数(Module Specification)	
焦距(EFL)	3.42
光圈(F.NO)	2.8
视场角(View Angle)	70.0°
畸变(Distortion)	< 1 %
景深(Focusing Range)	10 cm~Infinity
感光芯片(Chip Type)	OV5640_CSP
象素(Array Size)	5.0M
镜头类型(lens Size)	1/4INCH 4P+IR

Actuator Specification	
Type	VCM Parameter
Control Mode	IIC
Supply Voltage	2.8V~3.3 V
Coil Resistance	28±10% ohm
Rated Current	≤100mA
Lens Movement	0.30mm(Max)

DVDD(1.5V+/-5%)
AVDD(2.6V~3.0V)
DOVDD(1.8V/2.8V)

CUSTOMER APPROVE		AMEND			手机摄像模组
Mechanical	Electrical	△			TOLERANCE: DECIMAL .x ± .30 .xx ± .20 ∠ ± 1/4
		△			
		△			
		△			
		NO.	CONTENT	DATE	

TRULY OPTO-ELECTRONICS LTD.

PRODUCT NO.	DRAW NO.	REV
CM6098-B500SA-E		A

DWN	李高阳 20110103	DSN	韦有兴 20110103
CHKD	刘铁楠 20110103	APPD	刘铁楠 20110103
NOT IN SCALE		UNIT mm	SHEET:

Appearance Specification

NO.	Item	Standard	Importance Class
1	Top side of Lens	No obvious impurity and oil impurity on the front of lens within the half area; The defect(unfeeling) limitation: width≤1mm, length≤2mm, the defect number≤2; No feeling defect; The width of defects and gaps on the outside of Lens≤0.3mm. Others are unlimited.	A
2	Screw glue	Normally screw glue shall be symmetrical distributed around lens circle side. Particular circs, glue distribution must not disturb customer's assembly operation.	A
3	L1 Glass	No defect and dust check from 45° angle under the reflexing light and from 0° under the highlight	A
4	Holder	No obvious impurity and distortion of outline. The width and length of defect is unlimited, the depth≤0.1mm and ≤1/4 of the thickness of Holder.	B
5	Sealed glue	Sealed glue distributing between holder and FPC must be symmetrical and smooth. Not allow glue leakage and asymmetric thickness. After holder assembly, the thickness distance between one side and its opposite side shall be less than 0.2mm. Excess glue over the holder shall not make the outside dimension be out of control.	A
6	FPC/PCB	Edge defect limitation: width≤1/2H (H is minimum.)、length≤1mm、defect numbers per edge≤2(No tearing gap inby edge for FPC); Edge outshoot limitation (width≤0.3mm, length≤1mm). No obvious impurity and crease on the surface. If there was shield film on the surface, the spot size of the film shall be less than 0.3mm×1mm and no line is exposed. If it was not be cleaned and did not influence the total thickness, it would be permitted. Label and mark shall be clear enough to be discerned.	A
7	Connector	No dust, fingerprint, and not allows to turning colors, distortion; Solder must be well; No open circuit or short circuit	A

8	Gold finger	No dust, fingerprint, and not allows to turning colors, burned, unsmoothed and peeled; No open circuit or short circuit; The defect width shall be smaller than 20% of gold finger's width. No copper/nickel exposed in defect. Numbers of defected pin shall be less than 3. The defect limitation:width≤0.08mm,length≤5mm.	A
9	Stiffener	Holder anchor pole length overtopping the steel plate shall be less than 0.2mm. No dust, rust and deep scratch on the steel surface without Double coated tapes.	B
10	Double coated tapes	Adhered direction shall be right. Not allows to excess steel plate edge. No alveoli and stick. Not allows to peel glue and rip protective paper when tear the protective paper.	B
11	Protective film	No dust in the glue side. Not allows to float or drop. Adhered direction shall be right.	B

Remark:

1. The definition of the appearance importance class

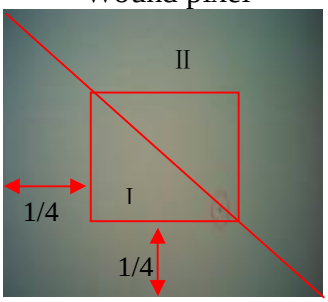
A: The defect can be found in the finished product, or have obvious visual differences from good products, such as crack, defect and dust, or influence image quality, or are appointed by the customer. We will emphasize these items and check all products.

B: The defect can be found in the finished product and has visual difference from the good one, but will not affect customer's aesthetic judgement. Or the defect can not be found in the finished product and will not generate functional problem, but will slightly influence sequential manufacture process or condition. We will supervise these items in the manufacturing process and check products selectively.

2. Sampling standard

Referenced standard: GB/T 2828.1-2003/ISO 2859-1:1999 and ANSI/ASQC.4-1993 Ⅱ

Image Specification

NO.	Item	Standard	Important Class
1	TV Line	Center≥1000 8 point of 0.7 viewing field ≥800	A
2	Shading	The lighteness of 90% viewing area ≥ 40% of center lighteness(Lens correction Shading [Turn off]); The lighteness of 90% viewing area ≥ 60% of center lighteness(Lens correction Shading [Turn on])	A
3	Dust	No dust in the center viewing area; Border area according to the limit samples	A
4	Dead pixel	No in the viewing area.	A
5	Wound pixel 	Ⅰ area：Blemish number≤1 Ⅱ area：Blemish number≤4	B
6	Color	Color distortion ratio of center±15%	B
7	Gray Scale	Margin of two near scales' brightness≥6	B
8	Distortion	＜1%	B
9	Flare	No flare in 45° viewing angle; No ghost in full viewing angle	B

QA Plan

NO.	Item	Sampling frequency	Measure	Remark
Image and reliability item				
1	TV Line	AQL 0.65 Ⅱ Class	Same as production	100% Inspection
2	Shading	AQL 0.65 Ⅱ Class	Same as production	100% Inspection
3	Dust	AQL 0.65 Ⅱ Class	Same as production	100% Inspection
4	Dead pixel	AQL 0.65 Ⅱ Class	Same as production	100% Inspection
5	Wound pixel	AQL 1.5 Ⅱ Class	Same as production	100% Inspection
6	Color	AQL 1.5 Ⅱ Class	Same as production	100% Inspection
7	Gray Scale	AQL 1.5 Ⅱ Class	Same as production	100% Inspection
8	Distortion	N=5,c=0 per batch	Same as production	Sampling by QA
9	Flare	N=5,c=0 per batch	Same as production	Sampling by QA
Appearance Check Items				
1	Top side of Lens	AQL 1.0 Ⅱ Class	Same as production	100% Inspection
2	Screw glue	AQL 1.0 Ⅱ Class	Same as production	100% Inspection
3	L1 Glass	AQL 1.0 Ⅱ Class	Same as production	100% Inspection
4	Holder	AQL 1.5 Ⅱ Class	Same as production	100% Inspection
5	Sealed glue	AQL 1.0 Ⅱ Class	Same as production	100% Inspection
6	FPC/PCB	AQL 1.0 Ⅱ Class	Same as production	100% Inspection
7	Connector	AQL 1.0 Ⅱ Class	Same as production	100% Inspection
8	Gold finger	AQL 1.0 Ⅱ Class	Same as production	100% Inspection
9	Stiffener	AQL 1.5 Ⅱ Class	Same as production	100% Inspection
10	Double coated tapes	AQL 1.5 Ⅱ Class	Same as production	100% Inspection
11	Protective film	AQL 1.5 Ⅱ Class	Same as production	100% Inspection

Sample:

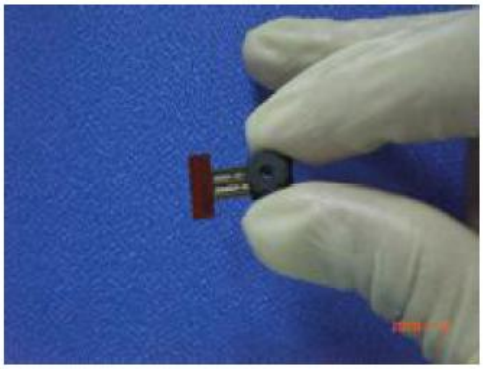
Referenced standard: GB/T 2828.1-2003/ISO 2859-1:1999 and ANSI/ASQC.4-1993 Ⅱ

PRECAUTIONS FOR USING CCM MODULES

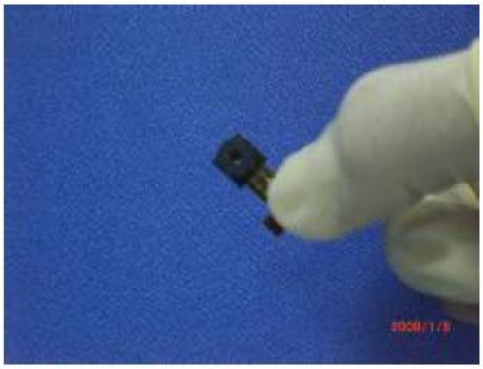
Handing Precautions

—DO NOT try to open the unit enclosure as there is no user-serviceable component inside. To prevent damage to the camera module by electrostatic discharge, handling the camera module only after discharging all static electricity from yourself and ensuring a static-free environment for the camera module.
—DO NOT touch the top surface of the lens.
—DO NOT press down on the lens.
—DO NOT try to focus the lens.
—DO NOT put the camera module in a dusty environment.
—To reduce the risk of electrical shock and damage to the camera module, turn off the power before connect and disconnect the camera module.
—DO NOT drop the camera module more than 60 cm onto any hard surface.
—DO NOT expose camera module to rain or moisture.
—DO NOT expose camera module to direct sunlight.
—DO NOT put camera in a high temperature environment.
—DO NOT use liquid or aerosol cleaners to clean the lens.
—DO NOT make any charges or modifications to camera module.
—DO NOT subject camera module to strong electromagnetic field.
—DO NOT subject the camera module to excessive vibration or shock.
—DO NOT Impact or nip CCM module with spiculate things
—DO NOT alter, modify or change the shape of the tab on the metal frame.
—DO NOT make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
—DO NOT damage or modify the pattern writing on the printed circuit board.
—Absolutely DO NOT modify the zebra rubber strip (conductive rubber) or heat seal connector
—Except for soldering the interface, DO NOT make any alterations or modifications with a soldering iron.
—DO NOT twist FPC of CCM.

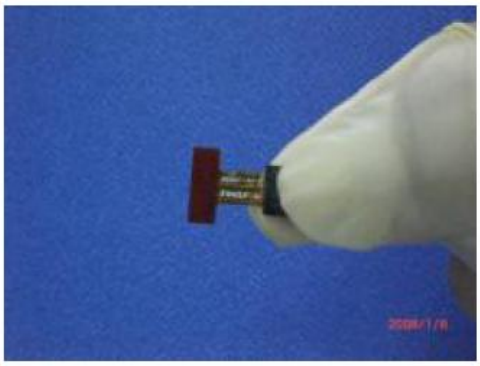
Apply indication



Correct



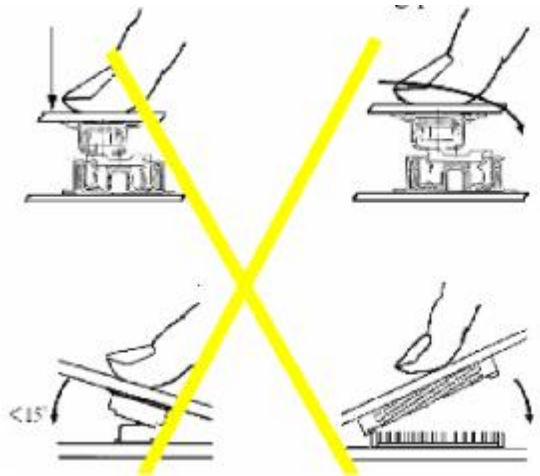
Incorrect

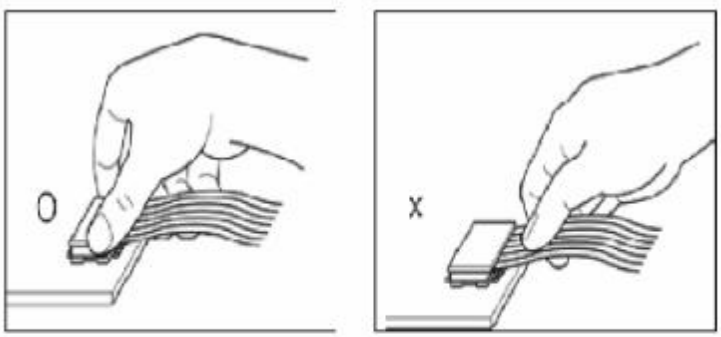


Incorrect

Precaution for assemble the module with BTB connector:

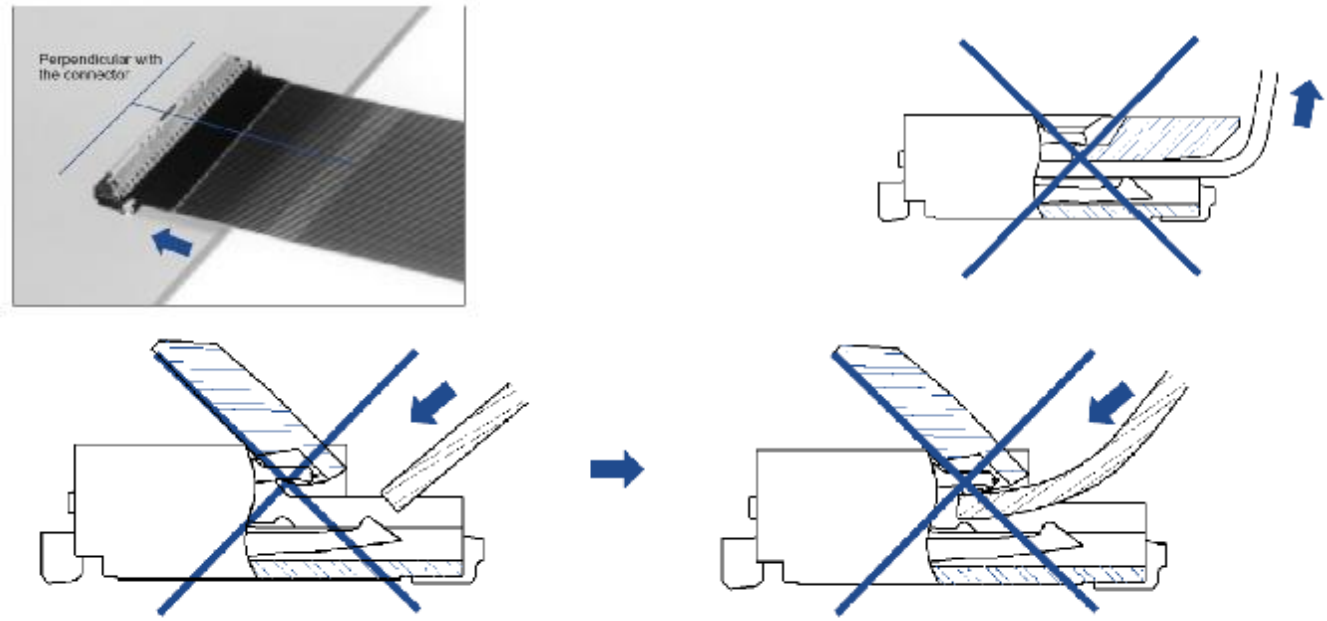
Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows





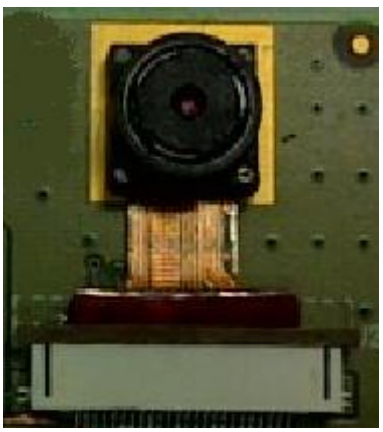
OK NG

Precaution for assemble the module with ZIF connector:



Precaution for assembling the module to terminal unit

The temperature of running module is high base on the high-integrated sensor. In order to enhance the heat dissipation and reduce the noise infection from high temperature, TRULY recommend that the module's backside should be touched with rigid material directly, like as PCB or metal. If necessary, it's recommended the module backside is affixed with the materials which can transfer heat, like as electric-fabric, electric-adhesive, or electric-sponge.



Precaution for soldering the CCM:

	Manual soldering	Machine drag soldering	Machine press soldering
No ROHS product	290˚C ~350˚C. Time: 3-5S.	330˚C ~350˚C. Speed: 4-8 mm/s.	300˚C ~330˚C. Time: 3-6S. Press: 0.8~1.2Mpa
ROHS product	340˚C ~370˚C. Time: 3-5S.	350˚C ~370˚C. Speed: 4-8 mm/s.	330˚C ~360˚C. Time: 3-6S. Press: 0.8~1.2Mpa

(1) If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the lens surface with a cover during soldering to prevent any damage due to flux spatters.
(2) The CCM module and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.

Other precautions

For correct using please refer to the relative criterions of electronic products.

Limited Warranty

Unless agreed between TRULY and customer, TRULY will replace or repair any of its CCM modules which are found to be functionally defective when inspected in accordance with TRULY CCM acceptance standards for a period of one year from date of shipments. Cosmetic/visual defects must be returned to TRULY within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of TRULY limited to repair and/or replacement on the terms set forth above. TRULY will not be responsible for any subsequent or consequential events.

Return CCM under warranty

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are:

-Holder is apart from module.
-Holder or Connector is anamorphic.
-Connector is turnup.
-FPC is lacerated or discon-nexion, and so on.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet, conductors and terminals.

Package Specification

Packaging Design One

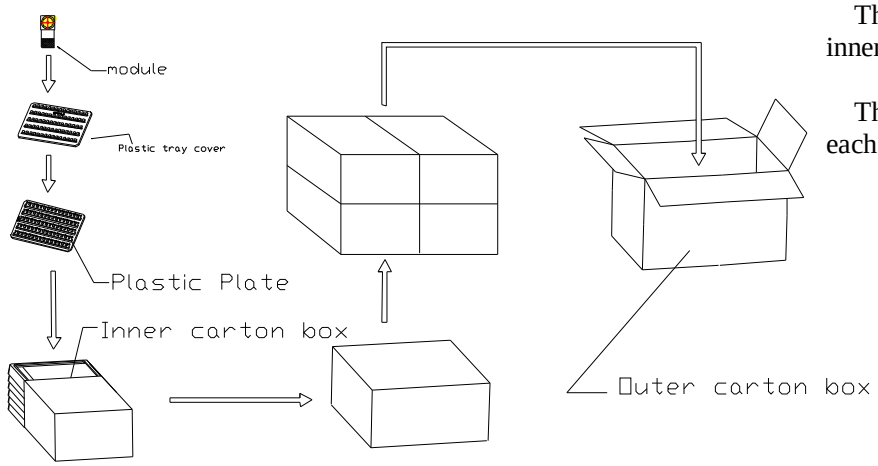
Product No.	CM6098-B500SA-E	Release date			
Product name	Compact Camera Module	Releaser			
Supplier	TRULY OPTO-ELECTRONICS LTD.	Recycle		☐YES	■ NO
Quantity/ each box	3000PCS	Material for box		■ paper	☐ plastic
Outer carton box size	405mm*290mm*290mm	Box type		■new	☐update
Quantity / inner box * Quantity / outer box	750PCS*4=3000PCS	Weight	g / pcs Kg / outer box	BOX=TYPE Record of SRF Dept.	TBD Kg(Max)

Packing Standards:

There are 75PCS modules each plastic plate.

There are 750PCS modules each inner carton box..

There are 3000PCS modules each outer carton box.



Requirements of outer carton box :

1. Weight(Max): 0.75 Kg
2. Height (Max): 0.29 M
3. Prohibition: Box made by log

Material for Plastic tray

It is made of antistatic polystyrene which has no chemical pollution. Surface resistivity : 10^6 ohm/sq

Packaging Design Two

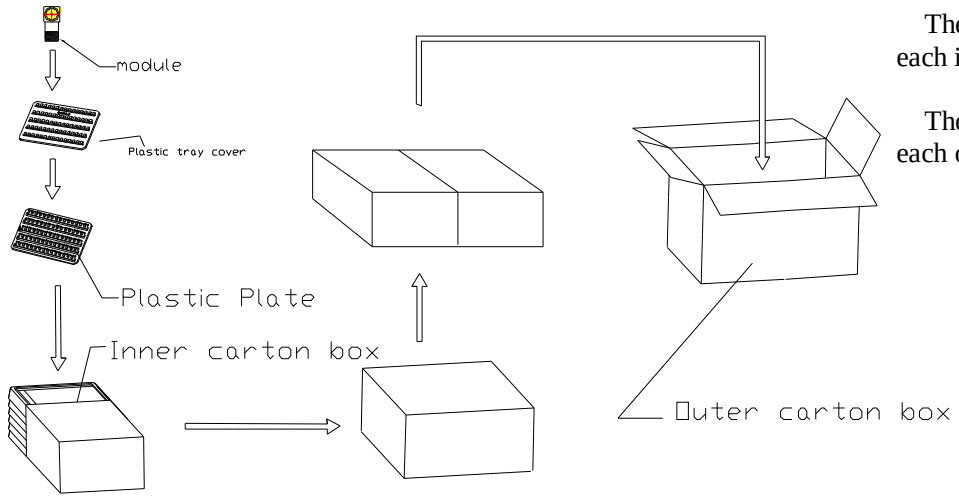
Product No.	CM6098-B500SA-E	Release date			
Product name	Compact Camera Module	Releaser			
Supplier	TRULY OPTO-ELECTRONICS LTD.	Recycle		☐YES ■ NO	
Quantity/ each box	1500PCS	Material for box		■ paper ☐ plastic	
Outer carton box size	405 mm *280 mm *170 mm	Box type		■new ☐update	
Quantity / inner box * Quantity / outer box	750PCS*2=1500PCS	Weight	g / pcs Kg / outer box	BOX=TYPE Record of SRF Dept.	TBD Kg(Max)

Packing Standards:

There are 75PCS modules each plastic plate.

There are 750PCS modules each inner carton box..

There are 1500PCS modules each outer carton box.



Requirements of outer carton box :

4. Weight(Max): 0.65 Kg
5. Height (Max): 0.17 M
6. Prohibition: Box made by log

Material for Plastic tray

It is made of antistatic polystyrene which has no chemical pollution. Surface resistivity : 10^6 ohm/sq

PRIOR CONSULT MATTER

1.①For Truly standard products, we keep the right to change material, process for improving the product property without notice on our customer.
②For OEM products, if any change needed which may affect the product property, we will consult with our customer in advance.
2. If you have special requirement about reliability condition, please let us know before you start the test on our samples.

FACTORY CONTACT INFORMATION

FACTORY NAME: TRULY OPTO-ELECTRONICS LTD.
FACTORY ADDRESS: Truly Industrial Area, ShanWei City, GuangDong, China
FACTORY PHONE: 86-0660-3380061 FAX: 86-0660-3371772