PRODUCT	:	CAMERA MODULE
MODEL NO.	:	CM6116-B300BF-E
SUPPLIER	:	TRULY OPTO-ELECTRONICS LTD.
DATE	:	May 13, 2011

CERT. No. 946535
ISO9001
TL9000

SPECIFICATION

Revision: 1.0

CM6116-B300BF-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
1.0	2011-05-13	First release	

CONTENTS

WRITTEN BY	CHECKED BY	APPROVED BY
HUANG WEI NA	WEI YOU XING	LIU TIE NAN

Key Information

Module No.		CM6116-B300BF-E
Module Size		6.5mm X 6.5mm X4.45mm
Sensor Type		MT9T113
Full resolution		2048 X 1536 pixels(QXGA)
Supply voltage	Digital	1.70-1.95V
	Analog	2.50~3.10V
	I/O	1.70~3.10V
Lens		1/5 INCH 3P+IR
Focus(F.NO)		2.8
View Angle		66.2°
Object distance		80cm-infinity
Responsivity		0.75V/Lux-sec
Pixel size		1.4μm x1.4μm
Sensor Temperature (at junction)		-30° C to 70° C
Output Formats(8-bit)		YUV4:2:2, YUV4:2:0, 565RGB,555RGB,444RGB,JPEG4:2:2, processed Bayer, RAW8- and RAW10-bit
Maximum frame Rate		15 fps at full resolution 30 fps in preview mode
SNR MAX		36dB
Dynamic Range		62.5dB
IC Package		Bare die
Power consumption		TBD mW at 15 fps, full resolution mode
		TBD mW at 30 fps, preview mode
ADC resolution		10 –Bit, on-die
Current consumption		20μW,standby ,at +70℃
Package		Antistatic Plastic

Pin Assignment

No.	Name	Pin type	Description
1	SIOD	I/O	Slave two-wire serial interface date to and from the host processor
2	SIOC	Input	Slave two-wire serial interface clock from the host processor
3	VSYNC	Output	Identifies rows in the active image
4	HSYNC	Output	Identifies pixels in the active line
5	DOVDD	Supply	I/O power supply
6	MCLK	Input	Master input clock.
7	DGND	Supply	Digital ground
8	PCLK	output	Pixel Clock.
9	NC		
10	NC		
11	D0	output	Data out [0]
12	D1	output	Data out [1]
13	DGND	Supply	Digital ground
14	D2	output	Data out [2]
15	D3	output	Data out [3]
16	D4	output	Data out [4]
17	D5	output	Data out [5]
18	D6	output	Data out [6]
19	D7	output	Data out [7]
20	DVDD	Supply	Digital power supply
21	PWDN	Input	Controls sensor's standby mode,ative HIGH
22	AVDD	Supply	Analog power supply
23	RESET	Input	When LOW, the CMOS image sensor asynchronously resets.
24	AGND	Supply	Analog ground.

Electrical Characteristics

1. Absolute Maximum Ratings

Symbol	Parameter	Rating		Unit
		Min	Max	
VDD1V8_MAX	Core digital voltage	TBD	TBD	V
VDD_IO_MAX	I/O digital voltage	TBD	TBD	V
VAA_MAX	Analog voltage	TBD	TBD	V
VAA_PIX_MAX	Pixel supply voltage	TBD	TBD	V
VIH_MAX	Input HIGH voltage	TBD	TBD	V
VIL_MAX	Input LOW voltage	TBD	TBD	V
T_OP	Operating temperature (measured at junction)	TBD	TBD	°C
T_ST	Storage temperature	TBD	TBD	°C

One-Time Programmable Memory Programming Sequence

Figure 43 shows the sequence of signals to be used for OTP memory programming sequence. The supply voltages and EXTCLK to be used are shown in Table 24 on page 64.

2.DC Characteristics

^{f}EXTCLK = 54 MHz; ^{f}PIXCLK = 96 MHz; VDD1V8 = 1.95V; VDD_IO = 3.1V; VAA = 3.1V; VAA_PIX = 3.1V; VDD_PLL1V2 = 1.3V; VDD1V2_TX = NA; T_A = 70°C;

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VDD1V8	Core digital voltage		1.7	–	1.95	V
VDD_IO1	I/O digital voltage		1.7	–	1.95	V
VDD_IO2	I/O digital voltage		2.5	–	3.1	V
VAA	Analog voltage		2.5	–	3.1	V
VAA_PIX	Pixel supply voltage		2.5	–	3.1	V
IDD1V8	Digital operating current	Context A	–	–	TBD	mA
IAA	Analog operating current	Context A	–	–	TBD	mA
IAA_PIX	Pixel supply current	Context A	–	–	TBD	mA
	Total power consumption	Context A	–	–	TBD	mW
IDD1V8	Digital operating current	Context B	–	–	TBD	mA
IAA	Analog operating current	Context B	–	–	TBD	mA
IAA_PIX	Pixel supply current	Context B	–	–	TBD	mA
	Total power consumption	Context B	–	–	TBD	mW
Hard standby	Total standby current when asserting the STANDBY signal	vdd_dis_soft ON R0x0028[0] = 1 (T_A = 70°C)		–	TBD	µA
Soft standby (clock on at 24 MHz)	Total standby current when asserting R0x0018[0] = 1	vdd_dis_soft OFF R0x0028[0] = 0		–	TBD	mA

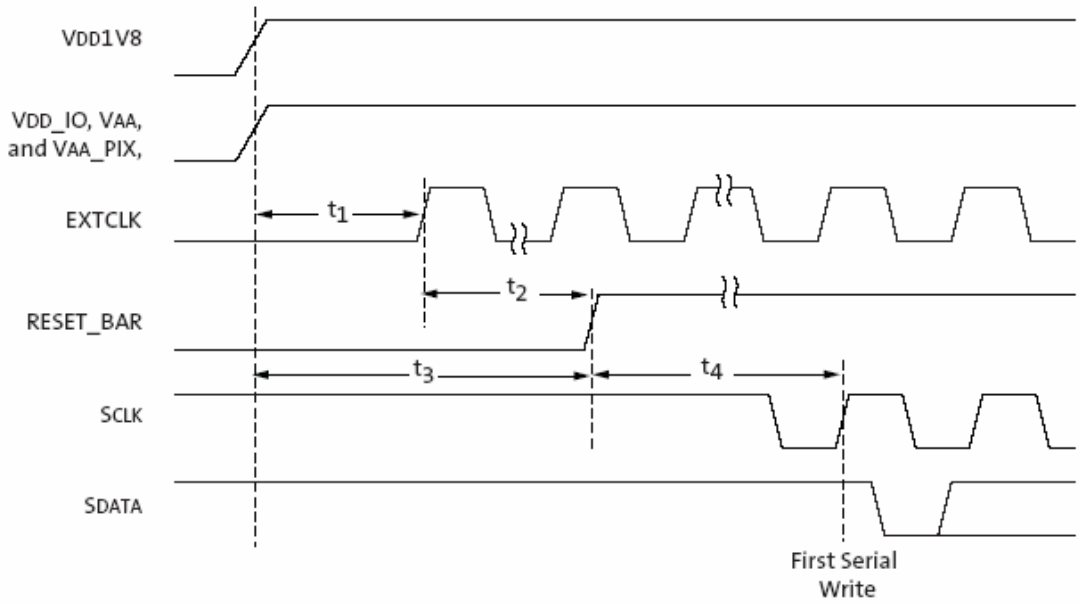
Notes:
1. Context A: Columns = 320, Rows = 240, VCO = 768MHz, Format = CbYCrY8, Pfd = 6MHz, FPS = 30.0
2. Context B: Columns = 2048, Rows = 1536, VCO = 768MHz, Format = JPEG, Pfd = 6MHz, FPS = 15.0

3. Timing Specifications

Power-up Sequence

Powering up the sensor is independent of voltages applied in a particular order, as shown in Figure 36. The timing requirements for other signals are shown in Table 14. It is advised that the user manually assert a hard reset upon power-up.

Power-Up Sequence



Power-Up Signal Timing

Definition	Symbol	Min	Typ	Max	Unit
VDD1V8 to other supplies		–	–	500	ms
VDD1V8 to EXTCLK	t_1	–	50	–	ms
EXTCLK to RESET_BAR	t_2	70	–	–	CLK cycles
VDD1V8 to RESET_BAR	$t_3 = t_1 + t_2$	50	–	–	ms
RST activation time	t_4	100			CLK cycles

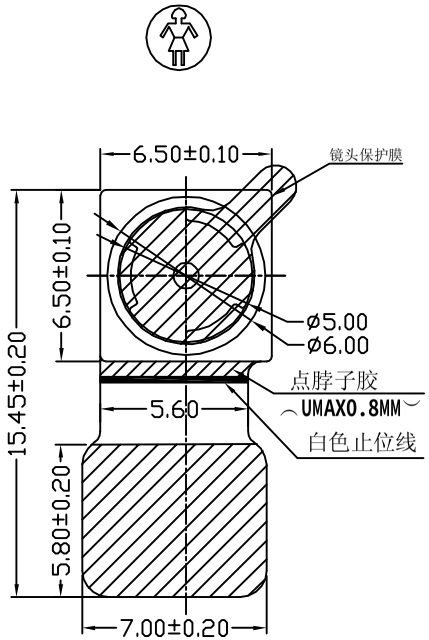
Note: For more information of sensor please refer to the MT9T113 specification.

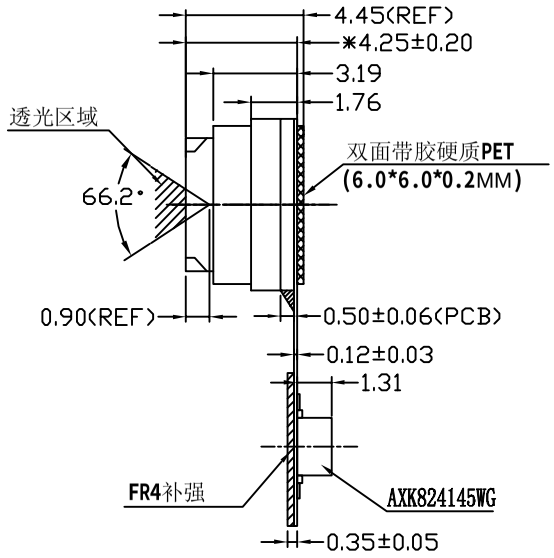
Mechanical Drawing

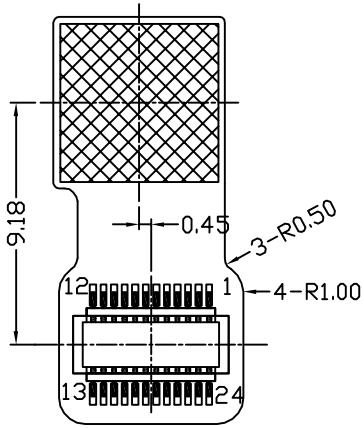
RoHS

Customer No.:

CM6116-B300BF-E Camera Module







24PIN DESCRIPTION

PIN NO	NAME
1	SIOD
2	SIOC
3	VSYNC
4	HSYNC
5	DOVDD(2.8V)
6	MCLK
7	DGND
8	PCLK
9	NC
10	NC
11	D0
12	D1
13	DGND
14	D2
15	D3
16	D4
17	D5
18	D6
19	D7
20	DVDD(1.8V)
21	PWDN
22	AVDD(2.8V)
23	RESET
24	AGND

主要参数(Module Specification)	
焦距(EFL)	2.75mm
光圈(F.NO)	2.8
视场角(View Angle)	66.2°
畸变(Distortion)	<1 %
景深(Focusing Range)	80 cm~Infinity
感光芯片(Chip Type)	MT9T113
象素(Array Size)	3.0M
镜头类型(lens Size)	1/5INCH 3P+IR

备注 ：SADDR拉高处理 ’模组I2C地址为0x7A

CUSTOMER APPROVE		AMEND			手机摄像模组
Mechanical	Electrical	4	修改PET厚度	20110509	TOLERANCE DECIMAL .x ± .30 .xx ± .20 ∠ ± 1/4°
		3	修改连接器型号	20110331	
		2	更改可视区域尺寸和深度。	20110329	
		1	更换连接	20110311	
		NO.	CONTENT	DATE	

TRULY OPTO-ELECTRONICS LTD.

PRODUCT NO.	DRAW NO.	REV
CM6116-B300BF-E	BXMCCM0166	F
DWN 何玉梅 20110223	DSN 何玉梅 20110223	
CHKD 李高阳 20110223	APPD 刘铁楠 20110223	
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

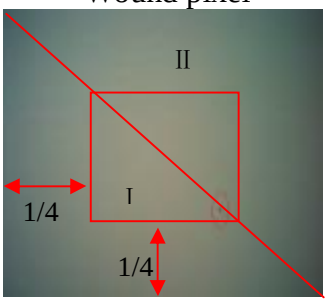
A: The defect can be found in the finished product, or have obvious visual differences from good products, such as crack, defect and dust, or influence image quality, or are appointed by the customer. We will emphasize these items and check all products.

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≥950 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:

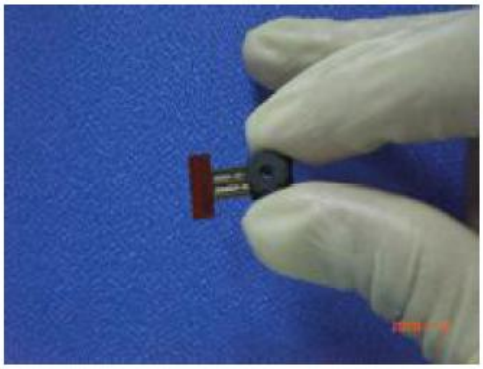
Referenced standard: GB/T 2828.1-2003/ISO 2859-1:1999 and ANSI/ASQC.4-1993 Ⅱ

PRECAUTIONS FOR USING CCM MODULES

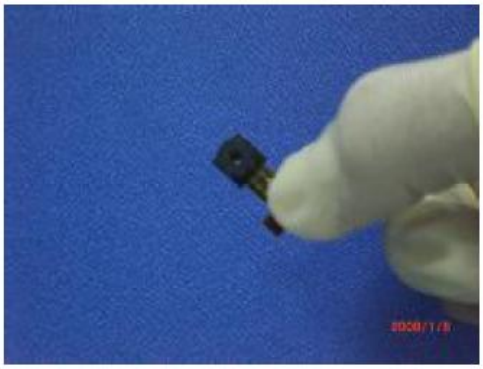
Handing Precautions

—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.

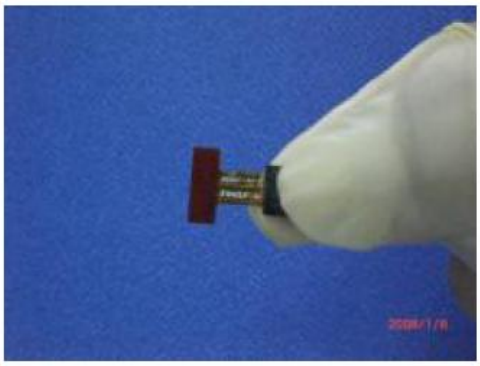
Apply indication



Correct



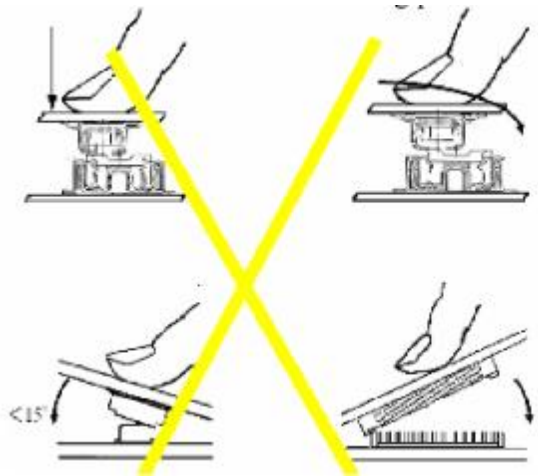
Incorrect

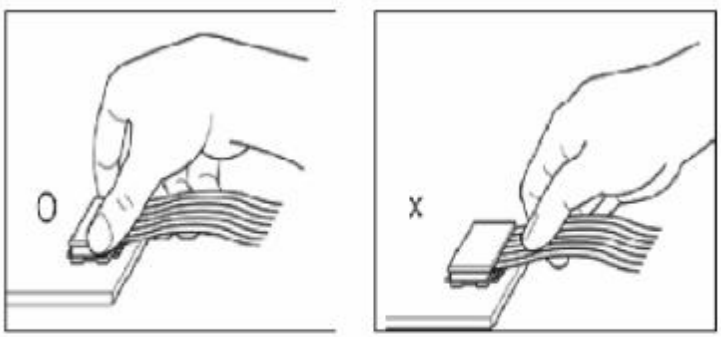


Incorrect

Precaution for assemble the module with BTB connector:

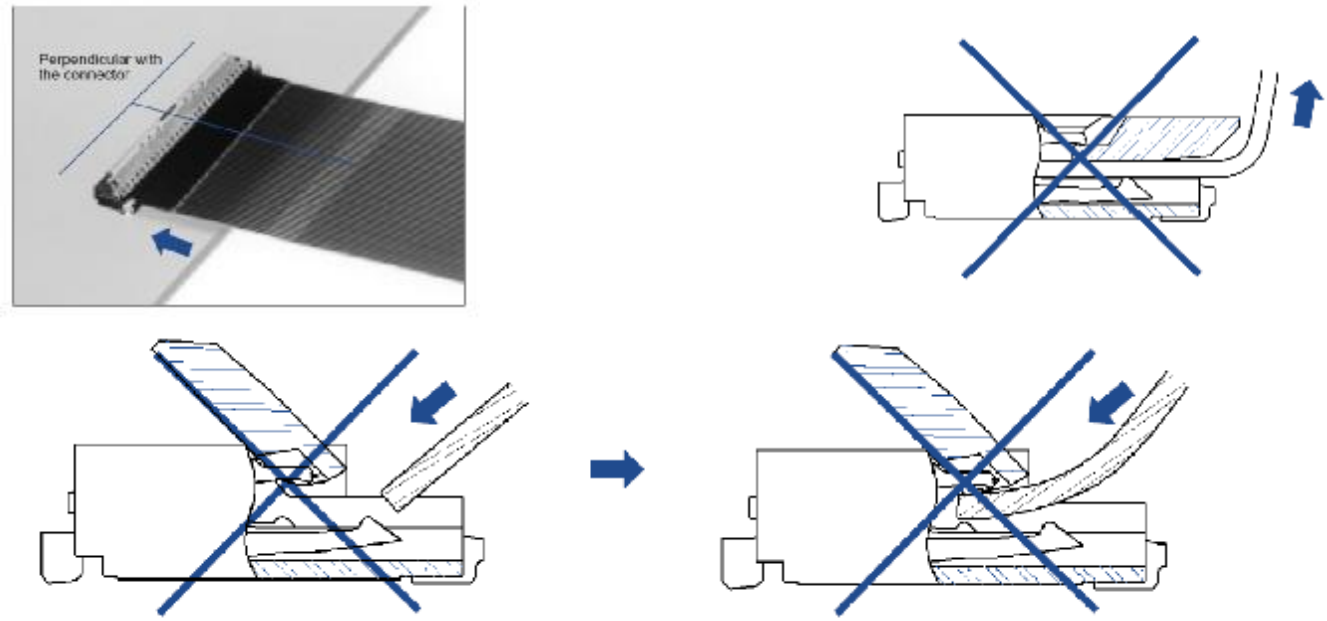
Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows





OK NG

Precaution for assemble the module with ZIF connector:



Precaution for 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.

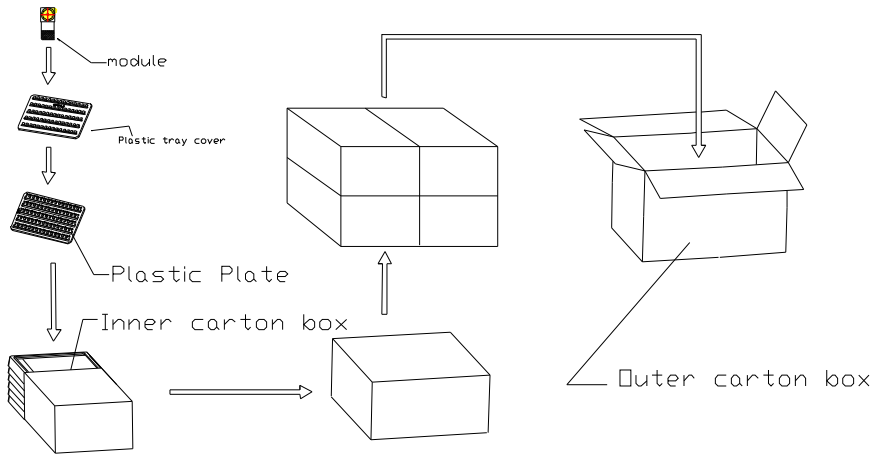
Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet, conductors and terminals.

Package Specification

Packaging Design One

Product No.	CM6116-B300BF-E	Release date			
Product name	Compact Camera Module	Releaser			
Supplier	TRULY OPTO-ELECTRONICS LTD.	Recycle		☐YES	■ NO
Quantity/ each box	TBD	Material for box		■ paper ☐ plastic	
Outer carton box size	405mm*290mm*290mm	Box type		■new	☐update
Quantity / inner box * Quantity / outer box	TBD	Weight	g / pcs Kg / outer box	BOX=TYPE Record of SRF Dept.	TBD Kg(Max)

Packing Standards:



There are TBD modules each plastic plate.

There are TBD modules each inner carton box..

There are TBD modules each outer carton box.

Requirements of outer carton box :

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

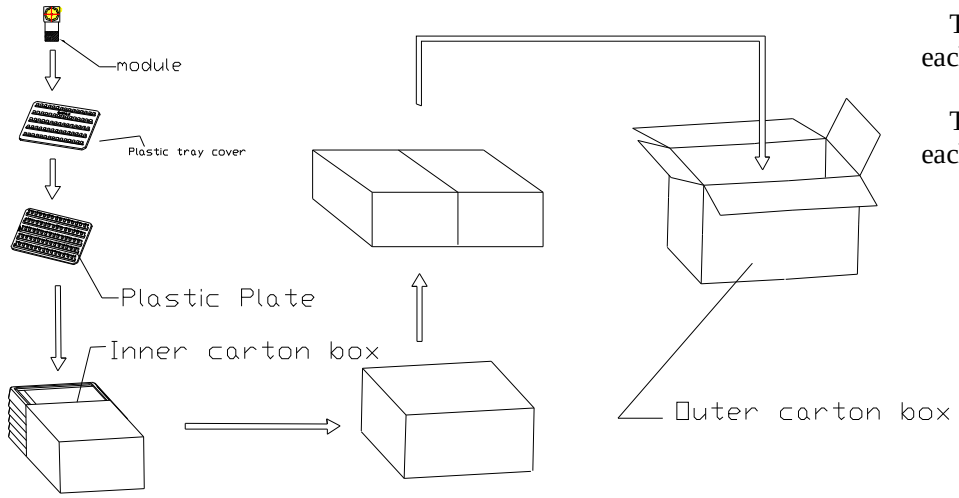
Material for Plastic tray

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

Packaging Design Two

Product No.	CM6116-B300BF-E	Release date			
Product name	Compact Camera Module	Releaser			
Supplier	TRULY OPTO-ELECTRONICS LTD.	Recycle		☐YES	■ NO
Quantity/ each box	TBD	Material for box		■ paper	☐ plastic
Outer carton box size	405 mm *290 mm *170 mm	Box type		■new	☐update
Quantity / inner box * Quantity / outer box	TBD	Weight	g / pcs Kg / outer box	BOX=TYPE Record of SRF Dept.	TBD Kg(Max)

Packing Standards:



There are TBD modules each plastic plate.

There are TBD modules each inner carton box..

There are TBD modules each outer carton box.

Requirements of outer carton box :

4. Weight(Max): TBD 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