PRODUCT	:	CAMERA MODULE
MODEL NO.	:	CM5594-B200SF-E
SUPPLIER	:	TRULY OPTO-ELECTRONICS LTD.
DATE	:	December 17, 2010

CERT. No. 946535
ISO9001
TL9000

SPECIFICATION

Revision: 1.0

CM5594-B200SF-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	2010-12-17	First release	Full

CONTENTS

WRITTEN BY	CHECKED BY	APPROVED BY
LU CHU MAN	WEI YOU XING	LIU TIE NAN

Key Information

Module No.		CM5594-B200SF-E
Module Size		6.5mm X 6.5mm X 4.70mm
Sensor Type		MT9D115
Array Size	QXGA	1600 X 1200
Supply voltage	Digital	1.8V
	Analog	2.8V
	I/O	1.8-2.8V
Lens		1/5 INCH 3P+IR
Focus(F.NO)		2.8
View Angle		67°
Image Area		2.8mm X2.1mm:3.5mm diagonal (4:3 aspect ratio)
CRA		25° (MAX at 90% image height)
Object distance		60 cm-infinity
Pixel size		Symmetric 1.75μm pixel
IR Cutter		650+/-10nm
Operating temperature range		-30° C to 70° C(at junction)
Frame rate	QXGA	15 fps
	VGA	30 fps
Responsivity		0.82 V/Lux-sec (550nm)
Signal-to-noise ratio		38.4 dB (MAX)
Dynamic Range		64.9 dB
substrate		Flex FPC
IC Package		CSP
Scan Mode		Progressive
Package		Antistatic Plastic

Pin Assignment

No.	Name	Pin type	Description
1	PWDN	Input	Hardware standby
2	HREF	Output	Parallel pixel bus line valid
3	VSYNC	Output	Parallel pixel bus frame valid
4	RESET	Input	Hardware reset.
5	DVDD	Supply	Digital power supply
6	DOVDD	Supply	I/O power supply
7	AVDD	Supply	Analog power supply
8	AGND	Ground	Analog ground
9	PCLK	Output	Parallel pixel bus pixel clock
10	DGND	Ground	Digital Ground
11	XCLK	Input	System clock input
12	DGND	Ground	Digital Ground
13	SIOD	I/O	Two-wire interface Serial data
14	SIOC	Input	Two–wire interface Serial clock
15	Y7	I/O	Video port output bit[7]
16	Y6	I/O	Video port output bit[6]
17	Y5	I/O	Video port output bit[5]
18	Y4	I/O	Video port output bit[4]
19	Y3	I/O	Video port output bit[3]
20	Y2	I/O	Video port output bit[2]
21	Y1	I/O	Video port output bit[1]
22	Y0	I/O	Video port output bit[0]
23	NC		
24	NC		

Electrical Characteristics

1. Absolute Maximum Ratings

Symbol	Parameter	Rating		Unit
		Min	Max	
VDD_MAX	Core digital voltage	–0.3	2.4	V
VDD_IO_MAX	I/O digital voltage	–0.3	4.0	V
VAA_MAX	Analog voltage	–0.3	4.0	V
VAA_PIX_MAX	Pixel supply voltage	–0.3	4.0	V
VDD_PLL_MAX	PLL supply voltage	–0.3	4.0	V
VIH_MAX	Input HIGH voltage	–0.3	VDD_IO + 0.3	V
VIL_MAX	Input LOW voltage	–0.3	–	V
T_OP	Operating temperature (measured at junction)	–30	75	°C
T_ST	Storage temperature	–40	85	°C

2.DC Characteristics

Setup Conditions: ^{f}EXTCLK = 6-54MHz, VDD = VDD_IO_TX = VDD_IO = 1.8V; VAA = VAA_PIX = VDD_PLL = 2.8V; T_j = 25°C, unless stated otherwise

Symbol	Parameter	Condition		Min	Typ	Max	Unit	Notes
VDD	Digital core supply voltage			1.7	1.8	1.95	V	
VDD_PLL	PLL supply voltage			2.5	2.8	3.1	V	
VAA	Analog supply voltage			2.5	2.8	3.1	V	
VAA_PIX	Pixel supply voltage			2.5	2.8	3.1	V	
VDD_IO	Digital IO supply voltage	For VDD_IO = 1.8V		1.7	1.8	1.95	V	
		For VDD_IO = 2.8V		2.5	2.8	3.1	V	
VDDIO_TX	MIPI supply voltage			1.7	1.8	1.95	V	
VPP	OTPM supply voltage			-	8	-	V	
IDD_IO	Digital IO supply current	Context A	VDD_IO =1.8V	-	10	-	mA	1
			VDD_IO = 2.8V	-	15	-	mA	
		Context B	VDD_IO = 1.8V	-	12	-	mA	
			VDD_IO = 2.8V	-	20	-	mA	
IDD_PLL	PLL supply current	PLL is OFF		-	N/A	-	mA	
		PLL is ON		-	13	18	mA	2
IDD	Digital core supply current	Operating in Parallel mode	Context A	-	15	30	mA	
IAA	Analog supply current			-	40	50	mA	
IAA_PIX	Pixel supply current			-	1.5	3	mA	
IDDIO_TX	MIPI supply current			-	N/A	-	mA	3
IDD	Digital core supply current		Context B	-	25	52	mA	
IAA	Analog supply current			-	40	52	mA	
IAA_PIX	Pixel supply current			-	0.8	3	mA	
IDDIO_TX	MIPI supply current			-	N/A	-	mA	3

3. AC Characteristics

^{f}EXTCLK = 6–54 MHz, V_{DD} = V_{DDIO_TX} = V_{DD_IO} = 1.8V; V_{AA} = V_{AA_PIX} = V_{DD_PLL} = 2.8V; T_j = 25°

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	Note
fEXTCLK	External input clock frequency		6	-	54	MHz	2
tr	External input clock rise time	From10% to 90% of Vp-p	-	2	5	ns	1
tf	External input clock fall time	From10% to 90% of Vp-p	-	2	5	ns	1
DCEXTCLK	External input clock duty cycle		40	50	60	%	
tJITTER	External input clock jitter	Peak-to-peak	-	-	500	ps	
tCP	EXTCLK to PIXCLK propagation delay		5	-	45	ns	3
fPIXCLK	Pixel clock frequency		6	-	85	MHz	
tRPIXCLK	Pixel clock rise time	Cload = 15pF	-	2	5	ns	
tFPIXCLK	Pixel clock fall time	Cload = 15pF	-	2	5	ns	
tPD	Pixel clock to data valid		-	-	0.6*PIXCLK	ns	4
tPFH	Pixel clock to frame valid high		-	-	0.6*PIXCLK	ns	
tPLH	Pixel clock to frame valid low		-	-	0.6*PIXCLK	ns	
tPFL	Pixel clock to line valid high		-	-	0.6*PIXCLK	ns	
tPLL	Pixel clock to line valid low		-	-	0.6*PIXCLK	ns	
PIXCLK pin slew rate	Programmable slew = 7	V_{DD_IO} = 2.8V, Cload = 45pF	-	1.2	-	V/ns	5
		V_{DD_IO} = 1.8V, Cload = 45pF	-	0.6	-	V/ns	
	Programmable slew = 4	V_{DD_IO} = 2.8V, Cload = 45pF	-	1	-	V/ns	
		V_{DD_IO} = 1.8V, Cload = 45pF	-	0.5	-	V/ns	
	Programmable slew = 0	V_{DD_IO} = 2.8V, Cload = 45pF	-	0.3	-	V/ns	
		V_{DD_IO} = 1.8V, Cload = 45pF	-	0.15	-	V/ns	
Output pin slew rate	Programmable slew = 7	V_{DD_IO} = 2.8V, Cload = 45pF	-	1.6	-	V/ns	5
		V_{DD_IO} = 1.8V, Cload = 45pF	-	0.8	-	V/ns	
	Programmable slew = 4	V_{DD_IO} = 2.8V, Cload = 45pF	-	1.25	-	V/ns	
		V_{DD_IO} = 1.8V, Cload = 45pF	-	0.55	-	V/ns	
	Programmable slew = 0	V_{DD_IO} = 2.8V, Cload = 45pF	-	0.3	-	V/ns	
		V_{DD_IO} = 1.8V, Cload = 45pF	-	0.15	-	V/ns	

Notes:
1. Measured when the PLL is off. Specification not applicable when PLL is on, but input HIGH/LOW voltage should be within specification.
2. VIH and VIL specifications apply to the over- and undershoot (ringing) present in the MCLK.
3. Measurement done with PLL off.
4. Valid for Cload<20pF on PIXCLK, D_{OUT}[9:0], LINE_VALID, and FRAME_VALID pads. Loads must be matched as closely as possible.
5. PLL is off and EXTCLK is 24MHz.

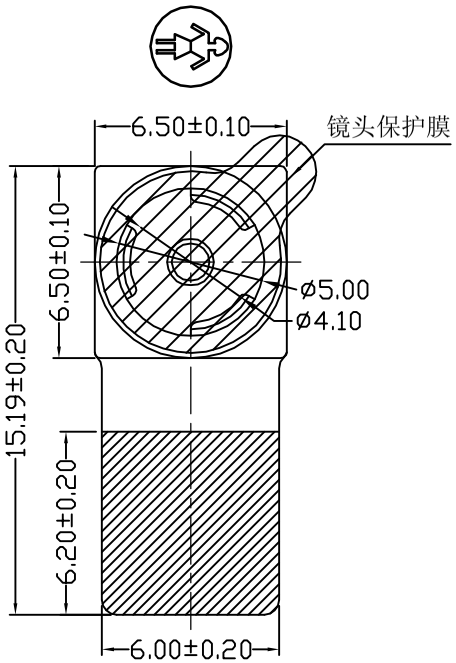
Note: For more information of sensor please refer to the MT9D115 specification.

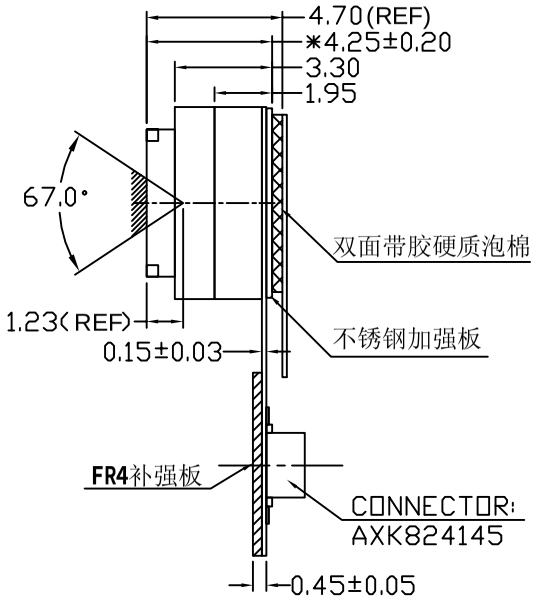
Mechanical Drawing

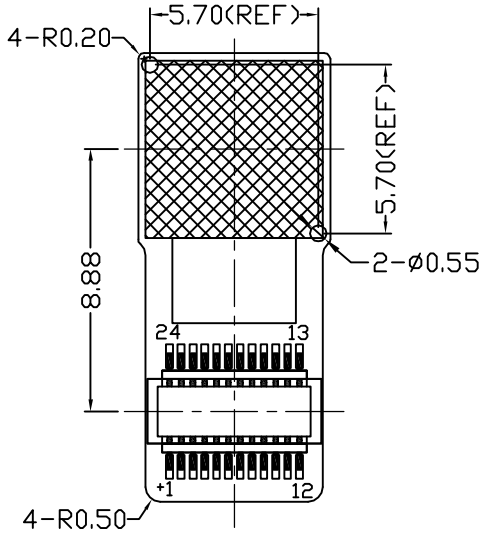
RoHS

Customer No.:

CM5594-B200SF-E Camera Module







24PIN DESCRIPTION

PIN NO	NAME
1	PWDN
2	HREF
3	VSYNC
4	RESET
5	DVDD_1.8V
6	DOVDD_2.8V
7	AVDD_2.8V
8	AGND
9	PCLK
10	DGND
11	XCLK
12	DGND
13	SIOD
14	SIOC
15	Y7
16	Y6
17	Y5
18	Y4
19	Y3
20	Y2
21	Y1
22	Y0
23	NC
24	NC

主要参数(Module Specification)	
焦距(EFL)	2.93 mm
光圈(F.NO)	2.8
视场角(View Angle)	67°
畸变(Distortion)	< 1 %
景深(Focusing Range)	60 cm~Infinity
感光芯片(Chip Type)	MT9D115
象素(Array Size)	2.0M
镜头类型(lens Size)	1/5INCH 3P+IR

备注

1.未注圆角**R0.2** ；

2.带*号为重点尺寸 ；

3.**SADDR**作拉低处理

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
CM5594-B200SF-E		A

DWN 林华苗 20100830	DSN 林华苗 20100830
CHKD 杨永超 20100830	APPD 刘铁楠 20100830

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

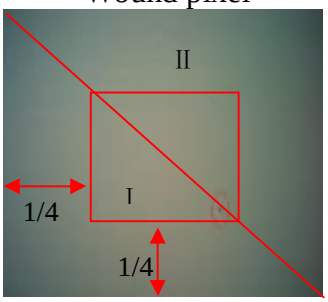
A: The defect can be found in the finished product, or have obvious visual differences from good products, such as crack, defect and dust, or influence image quality, or are appointed by the customer. We will emphasize these items and check all products.

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≥700 8 point of 0.7 viewing field ≥550	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:

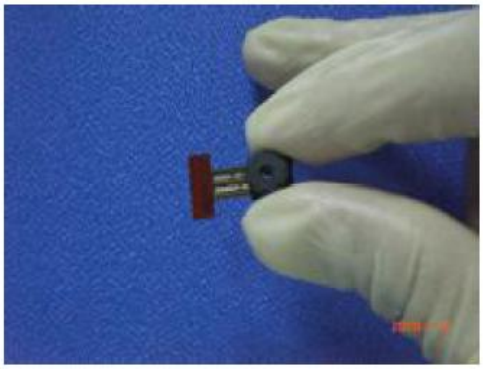
Referenced standard: GB/T 2828.1-2003/ISO 2859-1:1999 and ANSI/ASQC.4-1993 Ⅱ

PRECAUTIONS FOR USING CCM MODULES

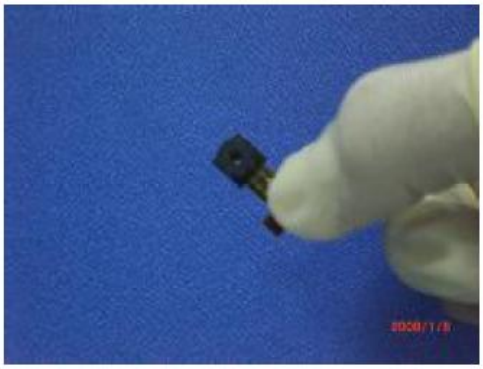
Handing Precautions

—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.

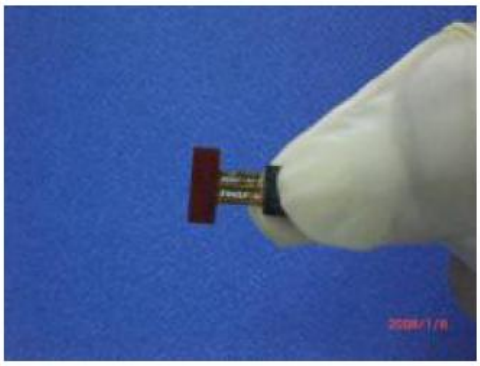
Apply indication



Correct



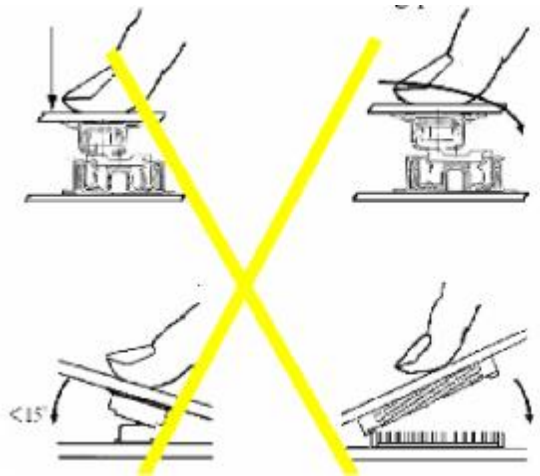
Incorrect

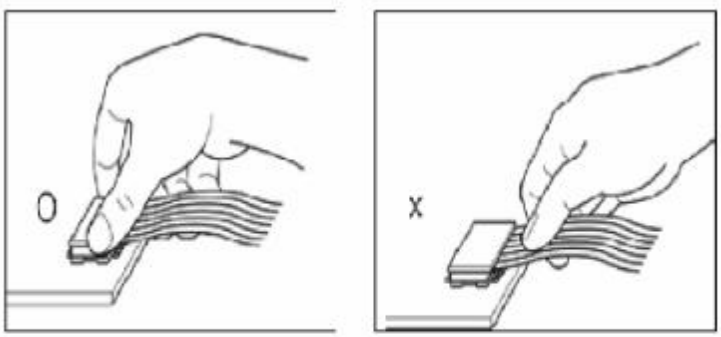


Incorrect

Precaution for assemble the module with BTB connector:

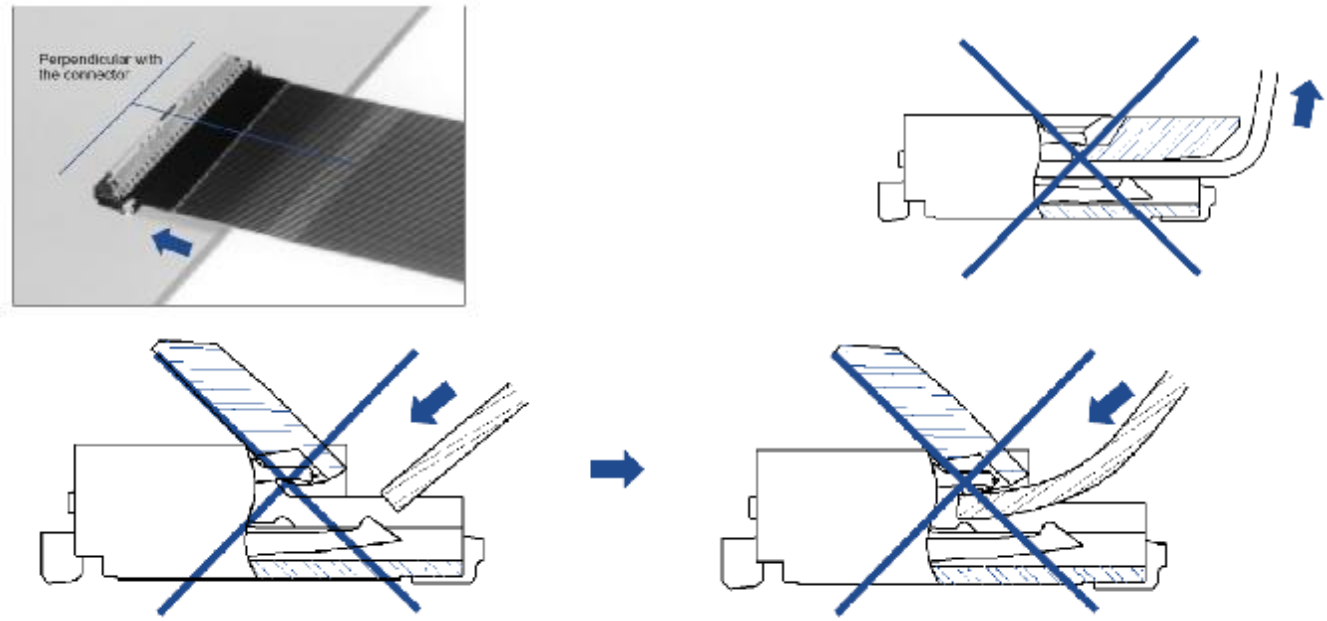
Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows





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.

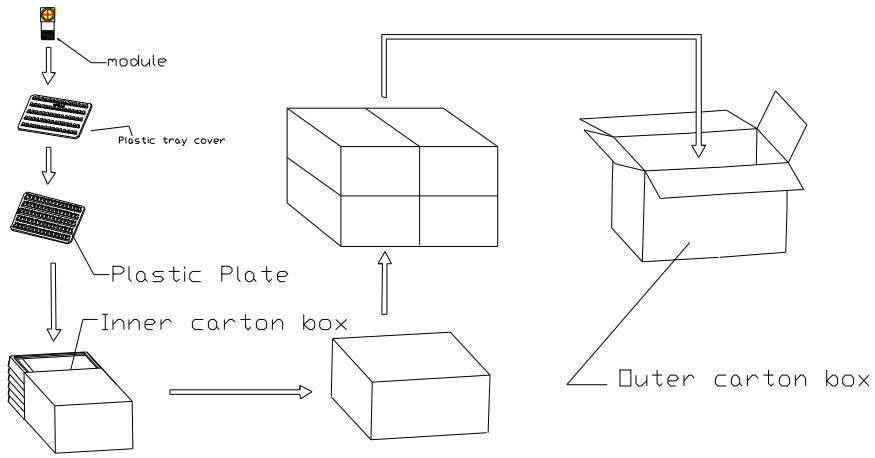
Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet, conductors and terminals.

Package Specification

Packaging Design One

Product No.	CM5594-B200SF-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): 0.75 Kg
2. Height (Max): 0.29 M
3. Prohibition: Box made by log

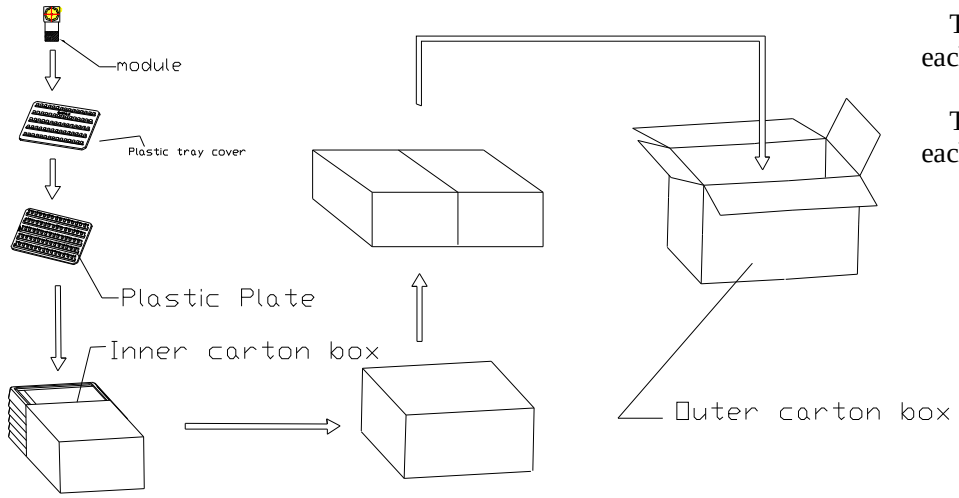
Material for Plastic tray

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

Packaging Design Two

Product No.	CM5594-B200SF-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 *280 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): 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