APPROVAL SHEET

ITEM : 3M CMOS AF CAMERA MODULE

MODEL : NSM-053A

CUSTOMER: HP

DATE : 2010. 01. 14

Approval	**Prepared by**	**Confirmed by**	**Confirmed by**	**Approved by**

Namuga	**Draft by**	**R&D. Dept by**	**QA. Dept by**	**Approved. by**

APPROVAL SHEET REVISION HISTORY

Revision NO	Date	Revision Contents	Drafter
REV 1.0	2010.01.05	1.Initial Release	

Contents

1. GENERAL DESCRIPTION

1.1 Coverage

There specifications specify the delivery specification of CCM manufactured by Namuga Co., Ltd supplied to HP Technology LTD.

1.2 Purpose

These specifications are provide by Namuga as a service to it's customer and my be used for comprehension of product and their application.
Namuga may make changes to specifications and product descriptions with Customer's approval.
Moreover, when a problem arises under the matter which is not defined as these specification, it talks an acts over sincerity each other prudently This product apply RoHS.

2. MAIN FEAUTURE

2.1 Applications

- Celluar phones
- PC Multimedia
- Digital still camera

2.2 Features

- Ultra low power and low cost
- Automatic image control functions
  - automatic exposure control (AEC)
  - automatic white balance (AWB)
  - automatic band filer (ABF)
  - automatic 50/60 HZ luminance detection
  - automatic black level calibration (ABLC)
- Programmable controls for frame rate, AEC/AGC 16-zone size/position/weight control, mirror and flip, scaling, copping, windowing, and panning.
- Image quality controls: color saturation, hue, gamma, sharpness (edge enhancement), lens correction, defective pixel canceling, and noise canceling.
- Support for output formats
  - RAW RGB, RGB565/555/444, CCIR656. YUV422/420 YCbCr422,and compression
- Support for images sizes : QXGA, and any arbitrary size scaling down from QXGA
- Support for video or snapshot operations
- Support for horizontal and vertical sub-sampling
- Support for data compression output
- Support for auto focus control (AFC)
- Support for anti-shake
- Support for internal and external frame synchronization
- Support for LED and flash strobe mode
- Support for serial SCCB interface
- Digital video port (DVP) parallel output interface
- MIPI serial output interface
- Support for second camera chip-sharing ISP and MIPI interface

3. PRODUCT SPECIFICATION

3.1 Main Specification

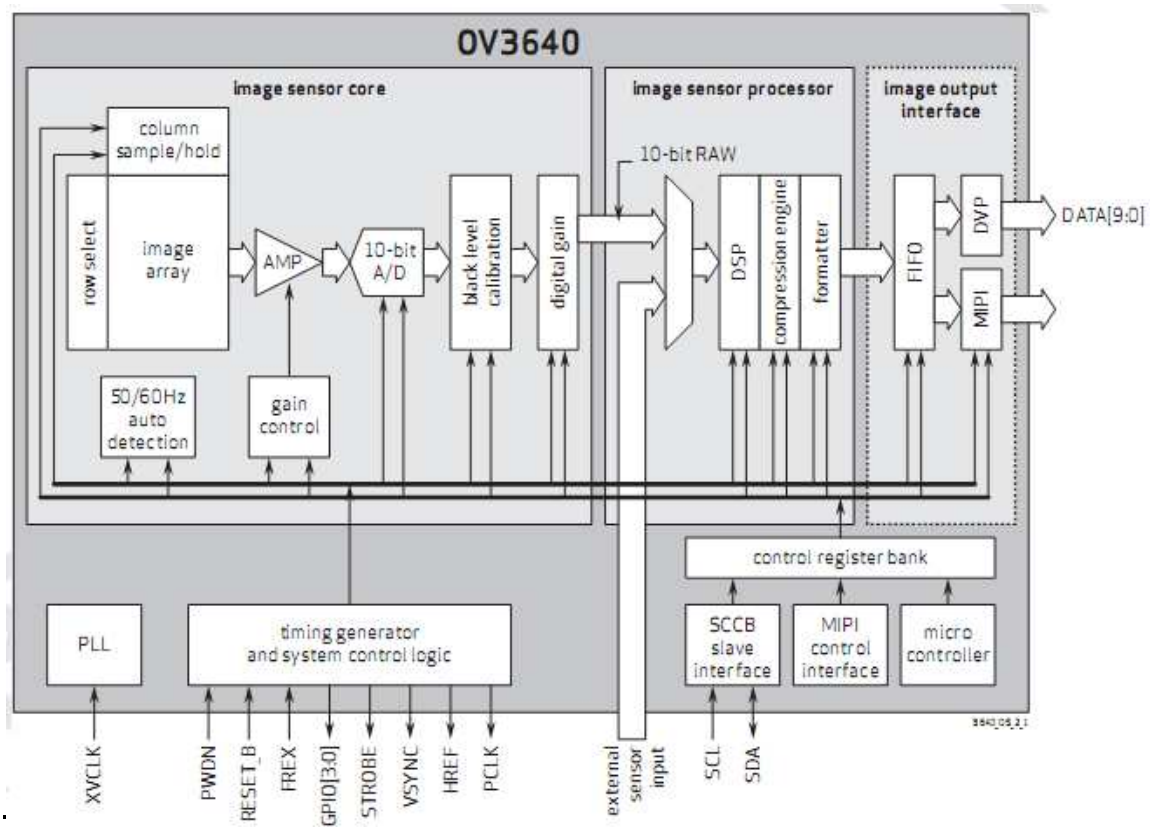
Item	Specification
Active array size	2048 x 1536
Power supply	Core : 1.5VDC ±5% Analog : 2.6 ~ 3.0V I/O : 1.7 ~ 3.0V (1.8V is strongly recommended)
Output formats (8-bit)	YUV(422/420) / YCbCr422 / RGB565/555/444, CCIR656, 8-bit compression data, 8/10-bit raw RGB data
Pixel size	1.75μm x 1.75μm
Maximum image transfer rate	3 Megapixel (2048 x 1536) : 15fps for QXGA (and any size scaling down form QXGA) XGA (1024 x 768) : 30fps for XGA (and any size scaling down form XGA)
Temperature range	Operating : -20℃ to 70℃ Stable image : 0℃ to 50℃
Input clock frequency	6 ~ 54MHz
Dynamic range	60 dB
	progressive

3.2 Mechanical Specification

Item	Specification
Dimension	22.2X 10X 5.98mm
Lens Construction	4P
Lens size	1/4”
Optical FOV (D)	65.° +/- 5% tolerance
Max chief ray angle	<25°
Weight	TBD
Item	Specification

4. BLOCK DIAGRAM

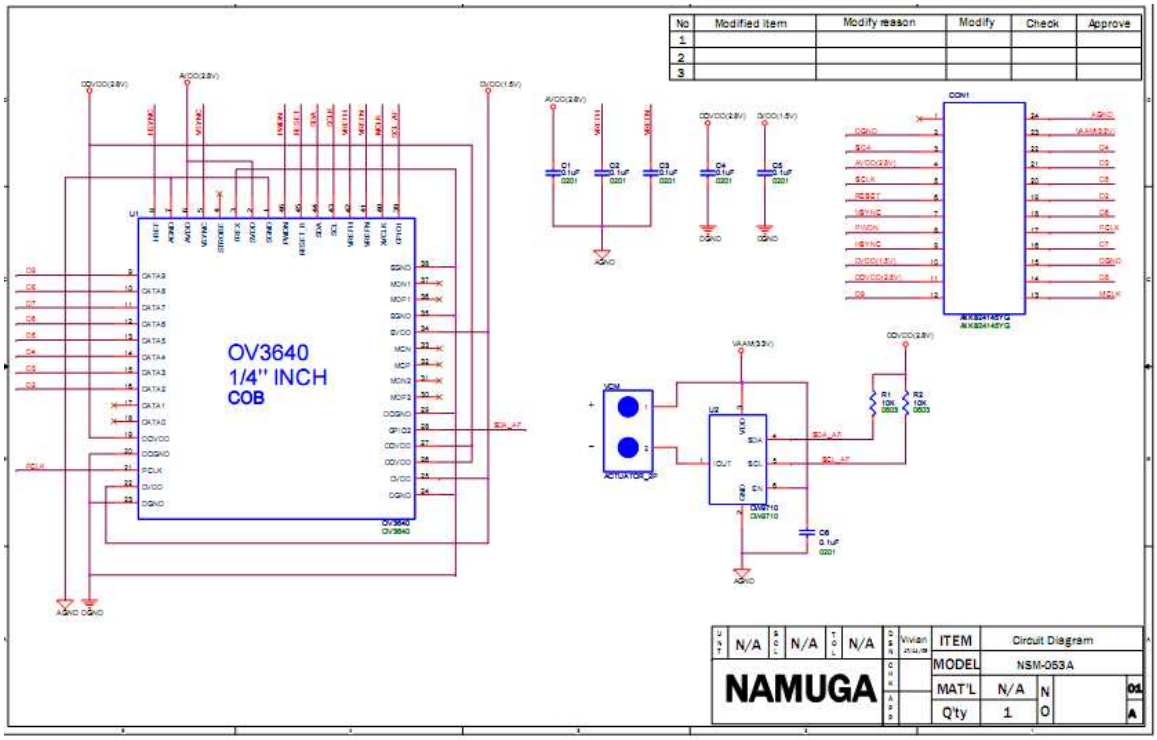
4.1 Mechanical Specification



5.1 Signal descriptions

Pin number	Signal name	Pin type	Description
1	NC	-	No connect
2	DGND	Ground	Ground for I/O circuit
3	SDA	I/O	SCCB DATA
4	AVDD	Power	Analog power
5	SCL	Input	SCCB input clock
6	RESET	Input	Reset (active low with internal pull-up resistor
7	VSYNC	I/O	Vertical sync output
8	PWDN	Input	Power down active high with internal pull-down resistor
9	HREF	I/O	Horizontal reference output
10	DVDD	reference	Power for digital core
11	DOVDD	Power	Power for I/O circuit
12	D9	I/O	Digital video port (DVP) bit[9]
13	MCLK	Input	Master clock
14	D8	I/O	Digital video port (DVP) bit[8]
15	DGND	Ground	Ground for I/O circuit
16	D7	I/O	Digital video port (DVP) bit[7]
17	PCLK	I/O	Pixel clock outputw
18	D6	I/O	Digital video port (DVP) bit[6]
19	D2	I/O	Digital video port (DVP) bit[2]
20	D5	I/O	Digital video port (DVP) bit[5]
21	D3	I/O	Digital video port (DVP) bit[3]
22	D4	I/O	Digital video port (DVP) bit[4]
23	VAAM	Power	Power for VCM
24	AGND	Ground	Ground for analog circuit

5.2 Schematic



Note : PWDN should be connected to ground outside of module if unused

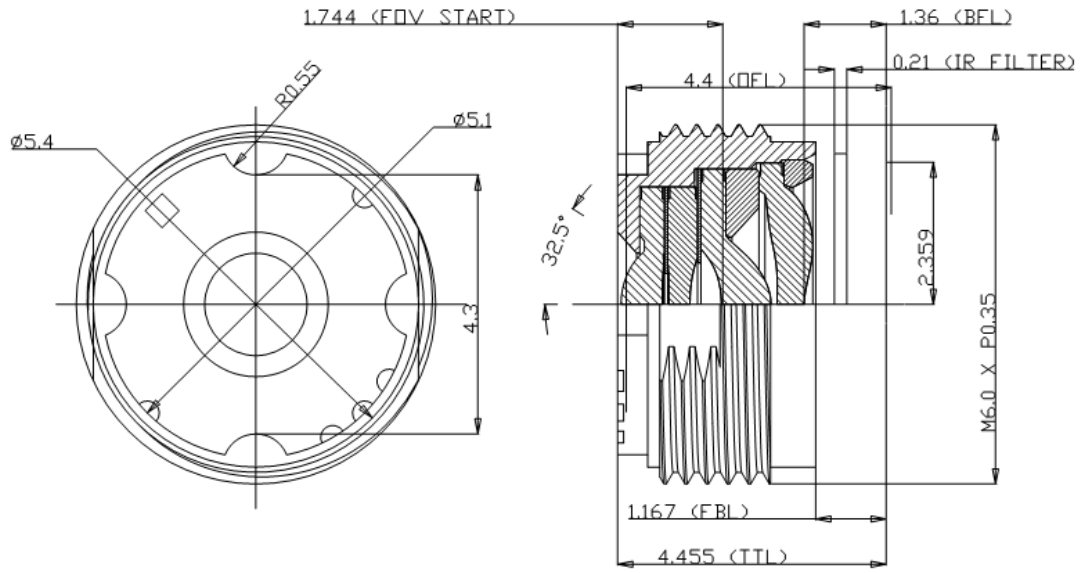
RESETB should be connected to DOVDD outside of module if unused

DVDD is 1.5V ±10% of sensor digital power. Using the internal DVDD regulator is strongly recommended.

Sensor AGND and DGND should be separated and connected a single point outside PCB (Do not connect inside module)

6. DIMENSIONAL INFORMATION

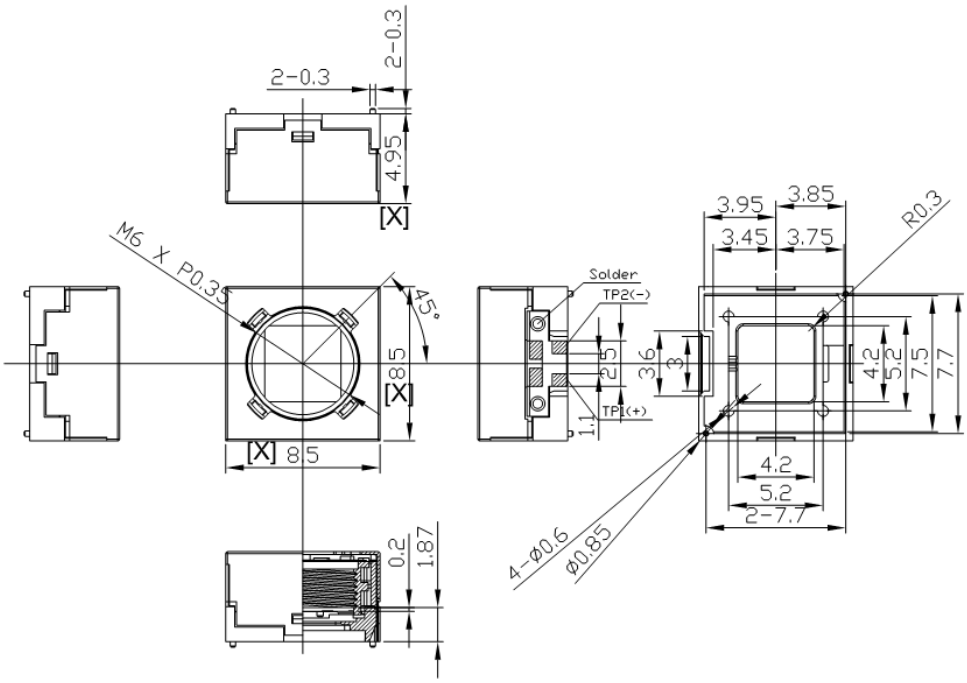
6.1 Lens dimension



No	ITEM	SPEC
1	Sensor	OV3640
2	Lens Construction	4P
3	TTL	4.455mm
4	IR-Cut Coating Filter	T50%=650±10nm
5	F.O.V	65°
6	Mount Dimension	M6x0.35P

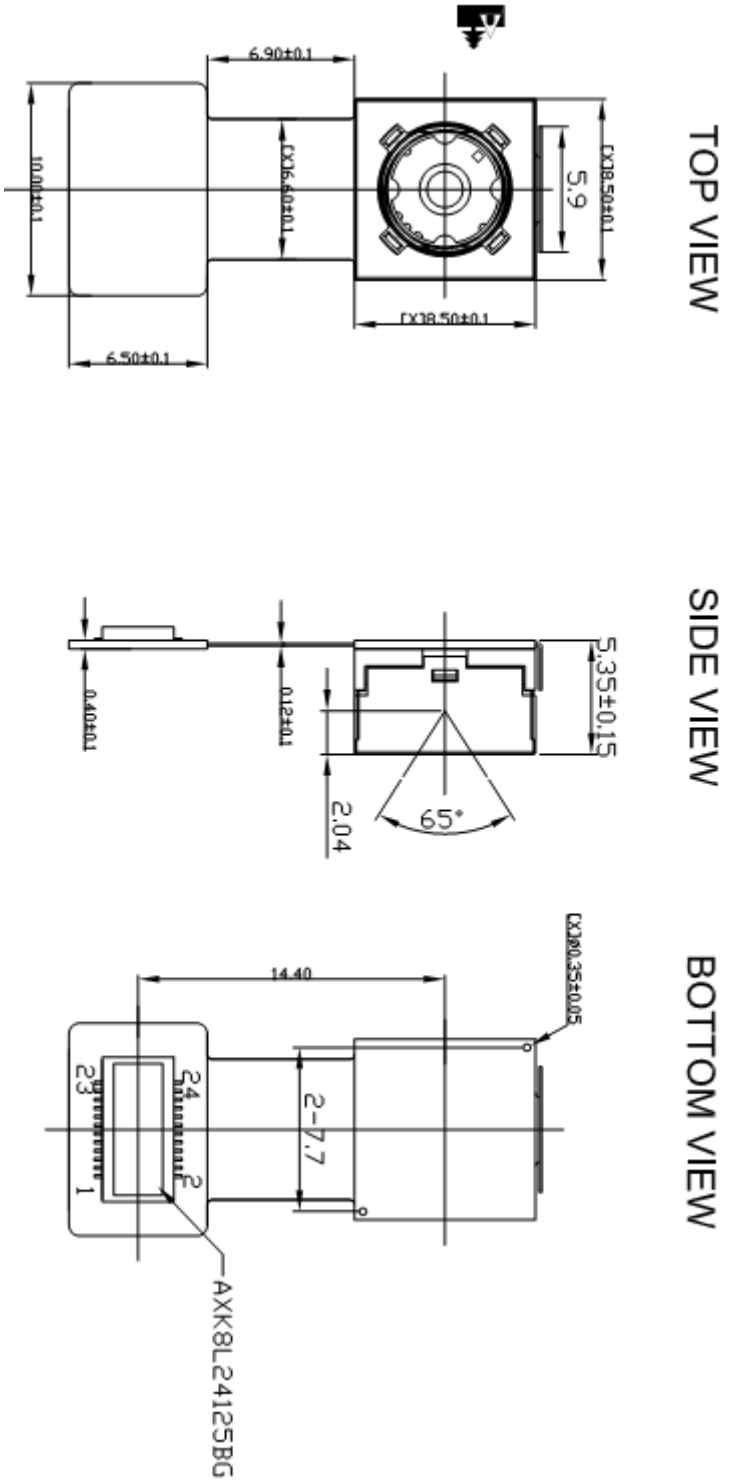
TOLERANCE		NAME	DATA	PART NO.	REV
LINEARITY TOLERANCES ±0.10 ANGULAR TOLERANCES ARE ±2° DRAFT ANGLES AREA ±0.5° / SIDE	DRAWN	Face	09.12.02	T1315-A LENS SPEC.	0
	CHECKED	Hongtao	09.12.02		
	APPR.	C.Cho	09.12.02	SHEET 1OF 1	

6.2 VCM (Holder) dimension



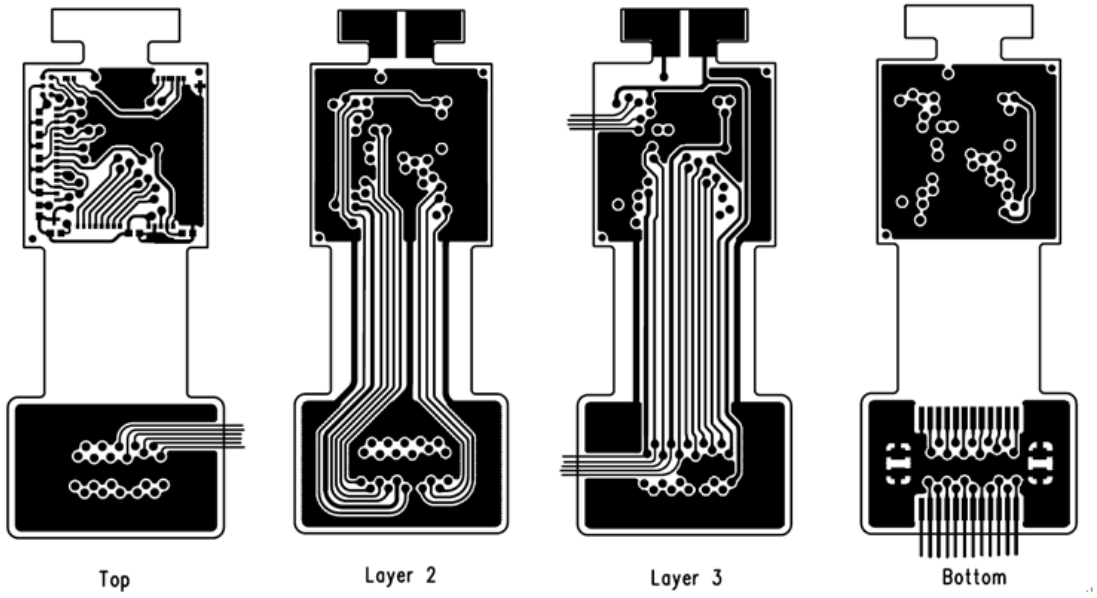
TOLERANCE		NAME	DATA	PART NO.	REV
LINEARITY TOLERANCES ±0.10 ANGULAR TOLERANCES ARE ±30' DRAFT ANGLES AREA ±0.5° / SIDE	DRAWN	Face	09.12.02	OV3040-6001-01	1
	CHECKED	Hongtao	09.12.02		
	APPR.	C.Cho	09.12.02	SHEET 1OF 1	

6.3 Module dimension



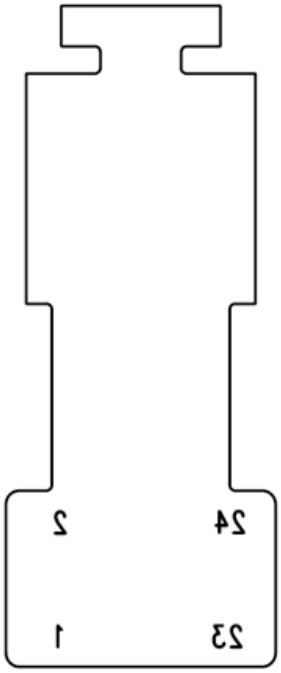
7. PCB INFORMATION

7.1 PCB Layout

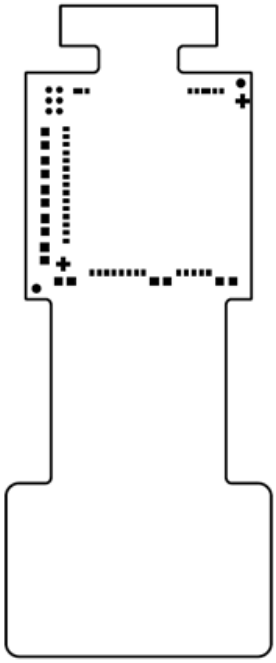


DRAWN	CHECK	APPRO	MATERIAL	MODEL	DATE	REV	SHEET	LAYER
Irene	Vivian	C.Cho	RFPCB 0.4T	NSM-053A	2009.09.08	1.0	1 OF 2	LAYOUT

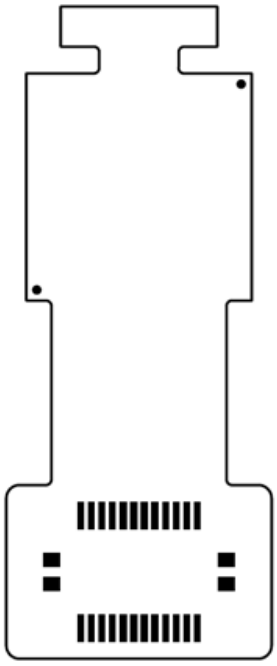
7.2 Part location



Silkscreen Bottom



Solder Mask Top



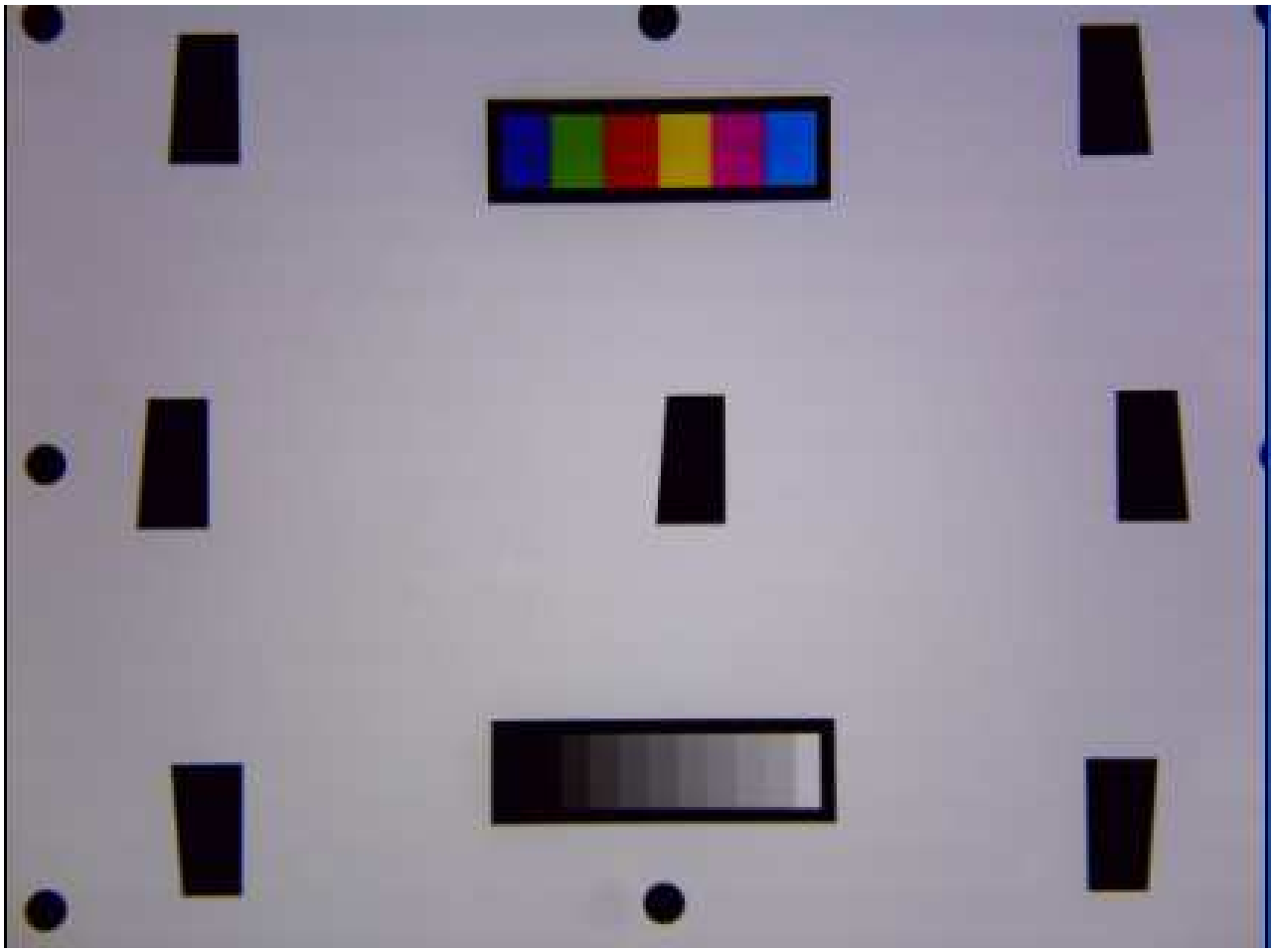
Solder mask Bottom

DRAWN	CHECK	APPRO	MATERIAL	MODEL	DATE	REV	SHEET	LAYER
Irene	Vivian	C.Cho	HPCB 0.4T	NSM-053A	2009.09.08	1.0	2 OF 2	SILK

8. FOCUS SPEC

8.1 FOCUSING SPEC

■ With DSC Resolution Chart
■ Distance between Chart and Camera Module : 1.5m

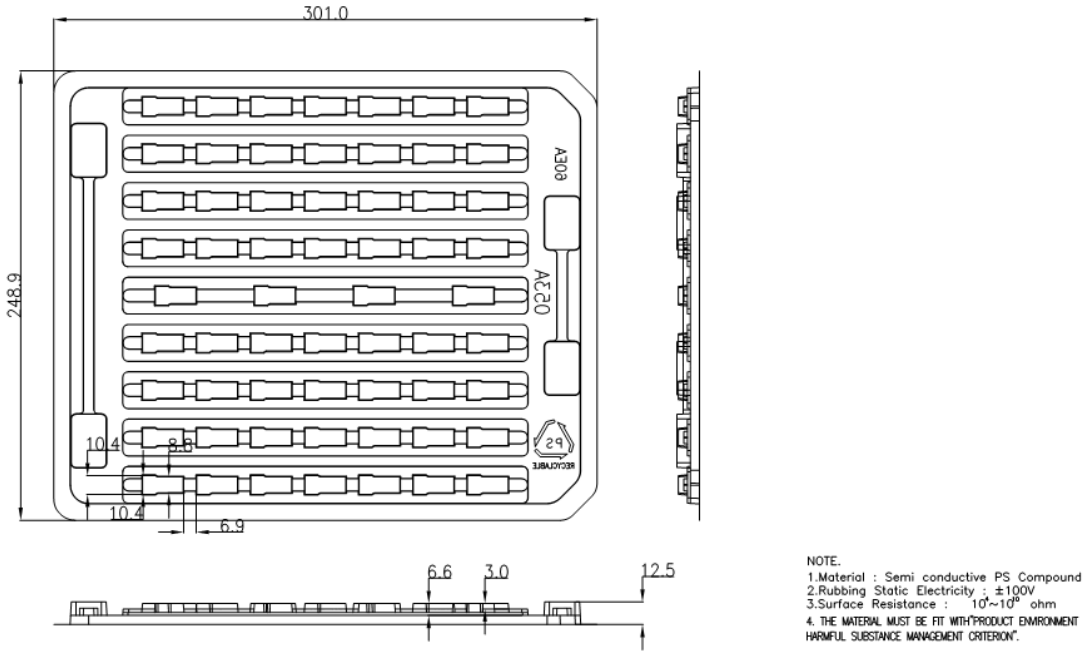


■ Focusing spec

No	Factor	Criteria	Description
1	Center	90	
2	Corner	75	

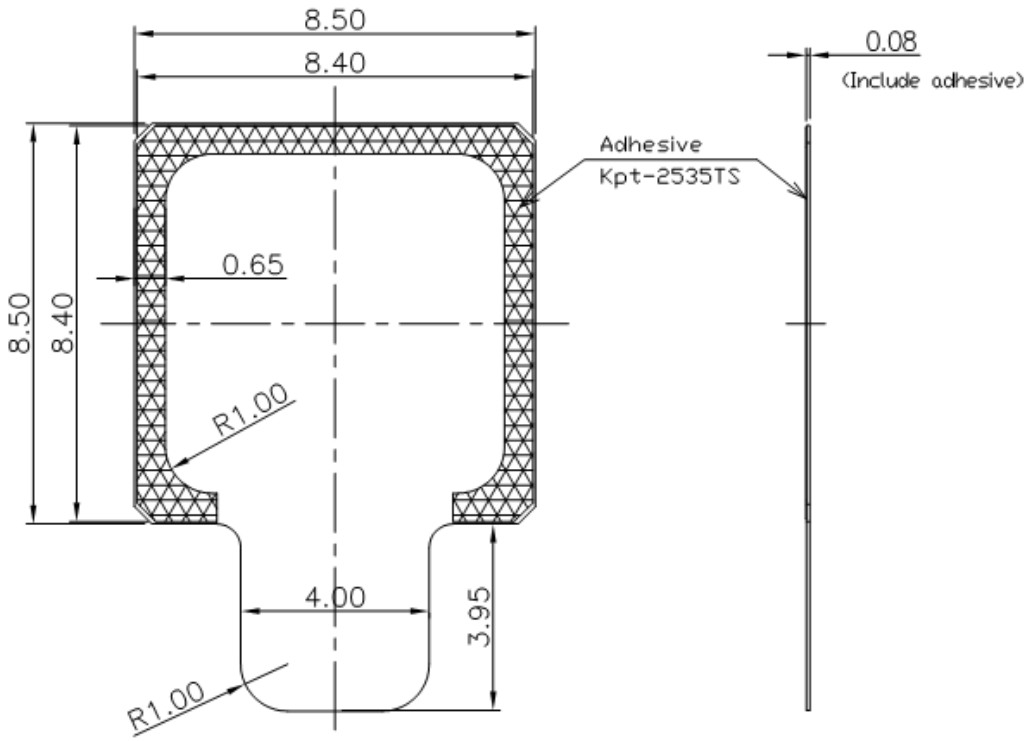
9. PACKAGE

9.1 Tray dimension

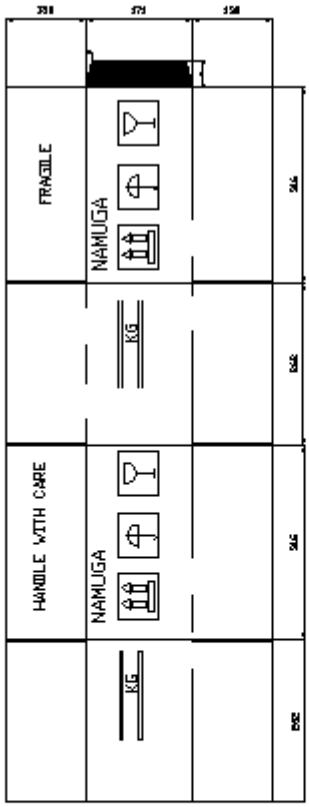


DRAWN	CHECK	APPRO	MODEL	DATE	REV	SHEET	DESCRIPTION
Face	Melissa	C.Cho	NSM-053A	09.12. 02	1.0	1 OF 1	Tray

9.2 Lens protect tape

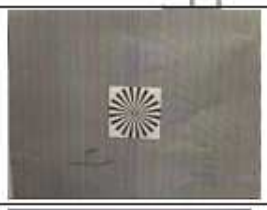


9.3 Out Box dimension(TBD)



NOTE
1.The above dimensions are actual measurement as unfolded
2.Caution not to get loose and be crushed when assembled
3.Printing colour:Refer to Sample
4.Material type:B type
5.Stencil and Organization
SK210XK180XK180XKLB175
6.Breaking strength:Min 12Kg

10. RELIABILITY TEST

Reliability Testing Report				
TO: Glan		DOC NO:RD09/12/16 -5		
CC: Eric Qiu		Date:2009/12/16		
FM: Qian Xiaomin	APPD: 尹钟秀	Page No: 6/6		
Product: 053A	Lot No: /	Date code: /	Customer: HP	
Test Item: ESD test	Q'ty: 5ea	Serial No.:1#~5#		
Purpose	Reliability Test request for 053A project 1st sample , To evaluate sample quality			
Test condition	150PF/330欧、12KV/4次			
Item	Before Test	After Test	Result	
			Pass	Fail
Resolution			√	
Spot			√	
Hot/Dead pixel	NO Hot/Dead pixel	NO Hot/Dead pixel	√	
External appearance	No cracks No scratch	No cracks No scratch	√	
Conclusion	√ ☐ PASS			

11. OUTGOING INSPECTION

11.1 Application Limit

This guide is applied outgoing inspection for quality assurance of NSM-053A to make from NAMUGA

11.2 Inspection lot and a Unit

11.2.1 The lot make according standard what Unit to made in same week and production line.

11.2.2 The lot can change according order of quality assurance team manager and request of Customer.

11.2.3 The unit is one production to finish packing of a color box.

11.3 Inspection Machine

11.3.1 PC to Install with driver and have USB port (Windows XP Service pack 2, DirectX 9.0 Pentium)

11.3.2 Black and white board for test black and white dot.

11.3.3 Scanner for test barcode scanning.

11.3.4 Resolution chart

11.4 Sampling

11.4.1 Sample pick by random in packed the pallet.

11.3.1 Sample is tested according MIL-STD-105E, Standard Inspection and G-II except that the guide do not change specially.

11.5 Inspection Item and level

No	Item	Method / Criteria	Level	Remark
1	Appearance(C/T Box) (n = 32 Box/LOT)	※ Inspection Method : Sampling ※ Limited : Regard attachment document No.1	MIL-STD-105E, G-II, MA 0.4, MI 1.0	
2	Function			
3	Packing			

11.6 Test Method

11.6.1 Decision Method

11.6.2 Decision of the lot : Detected defects is decided to Accept less than Ac and

11.6.3 Decide to reject more than Acc.

11.6.4 Decision apply to deal minor and major defect

11.6.5 Cosmetic Inspection for packing material decided by standard of IQA or CQS.

11.6.6 Test Condition

11.6.6.1 Environment Condition

No	Factor	Standard
1	PC Monitor Size	17” LCD Color monitor
2	Display	1024 X 768
3	Monitor Color	32 bit
4	Test Video Size	640 X 480
5	Ambience Luminance	More than 800 lux
6	Light Frequency	60 Hz or 50 Hz

11.6.6.2 Verify Method to decide Black dot, White dot, Wounded and Color Spread

a. Ambience luminance level : 150~250 lux

b. Distance between sensor and target: 10 Cm

c. Whole image luminance level to test black dot, Wounded and SPOT : 120 ~ 190

d. Whole image luminance level to test white dot and Color Spread : 20 ~ 40

e. Captured image format : BMP

11.6.6.3 Failure Definition

a. [Normal mean pixel 1] is defined as 40 pixels x 40 pixels surrounding the defect pixel.

b. [Normal mean pixel 2] is defined as 100 pixels x 100 pixels surrounding the SPOT.

c. [Whole mean pixel] is defined whole pixel of captured image.

d. Black dot[BD] is defined by pixels that are 40% lower than the normal mean pixel 1. Pixel size is smaller than 3x3 pixels.

e. White dot[WD] is 40% higher than normal mean pixel 1. Pixel size is smaller than 3x3 pixels. At dark mode, White dot is 50DN higher than normal mean pixels 1.

f. Wound[WUD] is between 20% and 40% than normal mean pixel 1.Pixel size is smaller than 3x3 pixels.

g. Spot[SP] can include [Vivid SPOT] or [Dim SPOT]. SPOT is defined stain bigger than 10 pixels x 10 pixels. [Vivid SPOT] is defined 8% higher than Normal mean pixel 2. [Dim SPOT] is between 4% and 8% lower than normal mean pixel 2.

h. [Color Spread] is defined that standard RGB difference is higher than 10%.

i. Abnormal Image

. Additional Wizard [AW] is that camera image device is not detected.

. No Picture[NP] is that camera image device is detected but no picture on preview.

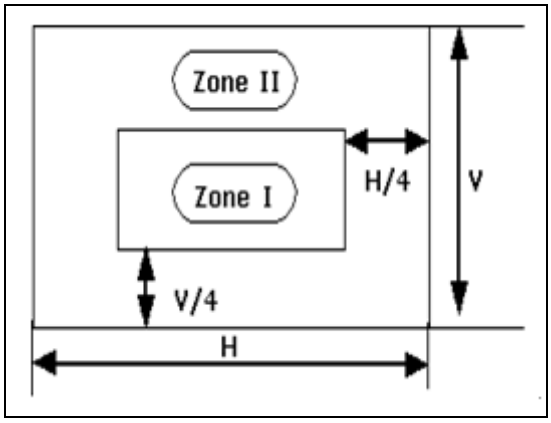
. Vertical Line[VL] is that be happened vertical line on preview.

. Horizontal Line[HL] is that be happened horizontal line on preview.

. Color Lump[CL] is that color is abnormal on preview.

. Horizontal Line Noise[HLN] is that horizontal line is wave on preview.

11.6.7 Zone Definition



11.6.8 Image Quality Criteria

11.6.8.1 Black dot, White dot and Wounded (Allowable Dead and Wounded pixel)

Whole image Luminance	Black dot		White dot		Wounded	
	Zone1	Zone2	Zone1	Zone2	Zone1	Zone2
20 ~ 40	0	1	0	1	1	4
120 ~ 190	0	1	0	1	1	4

11.6.8.2 SPOT (Allowable Dead and Wounded pixel)

Whole image Luminance	Vivid Spot		Dim Spot	
	Zone1	Zone2	Zone1	Zone2
120 ~ 190	0	0	0	1

11.6.8.3 Abnormal Picture

a. USB Device not recognize

. Result : Failure

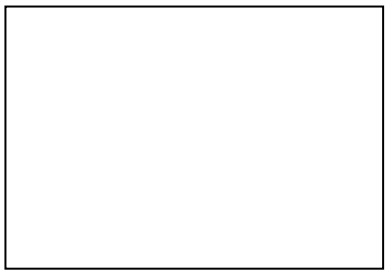
. Appearance

Camera device recognize failure	USB device not recognize
means no device recognize after connecting camera or displayed message	due to abnormal connecting.
	

c. No Picture

. Result : Failure

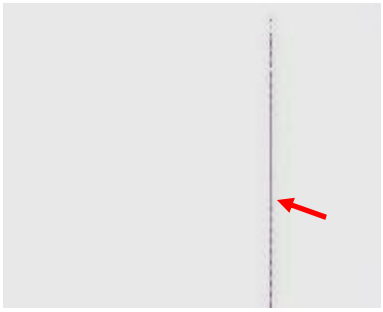
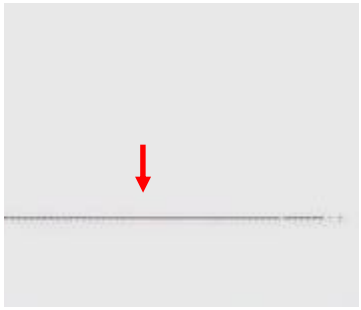
. Appearance

displayed as black	displayed as white
screen when operating camera 	screen when operating camera 

d. Vertical Line

. Result : Failure

. Appearance

Occurred a vertical line when operating camera.	Occurred a horizontal line when operating camera.
	

e. Color Lump

. Result : Failure

. Appearance

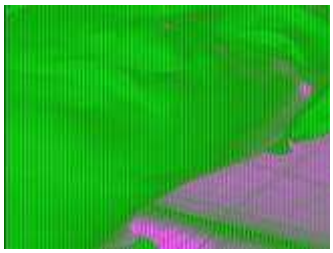
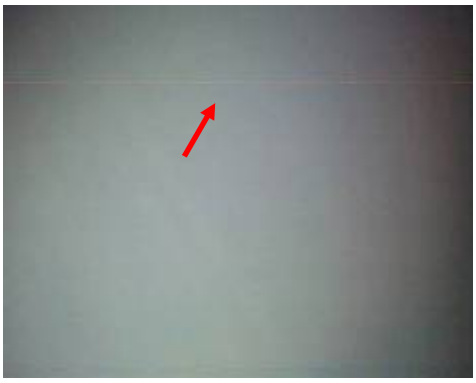
displaying green tone screen when operating camera	displaying pink screen when operating camera under 10lux and below condition.
	

Figure of normal goods	
	

f. Horizontal Line

. Result : Failure

. Appearance

Occurred a fixed horizontal line when operating camera	Occurred a moving horizontal line when operating camera
	

11.6.9 Test Procedure

11.6.9.1 Plug in USB cable after then do operation preview software(Play camera)

11.6.9.2 Inspect image quality(Dead pixel, Color)

11.6.9.3 Inspect Focus of lens quality

11.6.9.4 Inspect cosmetic surface quality on the product.

11.6.9.5 Inspect packing and label

11.6.9.6 Inspect bar-code(if barcode present, do scanning)

11.6.9.7 Do aging during 30 min(Temp : 20'C ~ 30'C, Humidity : 40% ~ 60%)

11.6.9.8 Verify after aging test(execute 6.1.1 ~ 6.1.6)

11.6.9.9 If OQC test result is PASS, stamp on every packing box

11.6.9.10 Then will be insert the OQC Inspection Report to the tail boxes and label on packing surface.

11.6.10 Inspect packing and label

11.6.10.1 Inspect present and condition of label

11.6.10.2 Inspect number on label(Model no, UPC code, qty, production date, etc)

11.6.10.3 Inspect box condition

11.6.11 Barcode scan test

Inspect number scanned with number on label whether same or not.

11.6.12 Aging

9.6.11.1 Operate preview program for 30 min.

9.6.11.1 After 30 min, inspect above test item from 6.3

11.6.13 OQC STAMP

11.7 Test Method

No	Item	Failures type	Failure grade	
			Major	Minor
1	Surface	Wrong, reverse, missing mounting of material	o	
		Crack, damage of material	o	
		Bridge, open, code solder joint of material	o	
		Electronic Particle on PCB	o	
		Not electronic particle		o
2	Packing	No present sticker of version, accept	o	
		Difference quantity in the box	o	
		Dirty, not present, wrong present of label	o	
		Wrong of printed code.	o	
		Not scan of barcode and difference of number scanned with printed number	o	
3	Function	Inspect item of 6.6	o	
4	Aging	Inspect item of 6.6	o	

11.8 Decision Method

11.8.1 decision of the lot : Detected defects is decided to Accept less than Ac and decide to Reject more than Ac.

11.8.2 Decision apply to deal minor and major defect

11.8.3 Cosmetic Inspection for packing material decided by standard of IQA or CQS.

11.9 Management after Inspection

11.9.1 Inspector stamp acceptation and reject about tested a lot

11.9.2 Reject lot process according rules for reject management

11.9.3 If OQC test result is PASS, stamp on every packing boxes and then the boxes can be transfer to warehouse Reworked or repaired lot test again according No.2 ~ No.7

11.9.4 Then will be insert the OQC Inspection Report to the tail boxes and label on packing surface.

11.10 Retest

Reworked or repaired lot test again according No.2 ~ No.7

11.11 Recording and Government

Outgoing report has to govern and record according the rules for test working