



产 品 承 认 书

SPECIFICATIONS

品 名 (Module Name): WDN01A-100

客户型号 (Cust. P/N):

文档接受时间 (Received):

DATE: 2022 / 03 / 23

客 户 名 称 (Customer)		
批 准 (Approved)	审 核 (Checked)	担 当 (In charge)

产品承认书 共 17 页

(These specifications are composed of 17 pages, including this title page.)

深圳市御光视觉科技有限公司		
批 准 (Approved)	审 核 (Checked)	担 当 (In charge)



Revise History

Rev	Date	Description
Ver1.0	2022-03-23	First release



1. Scope

This approval sheet contains the general information of WDN01A-100 camera module designed for SHENZHEN UCO VISION CO., LTD. It contains the key features of the module as well as the information for the quality inspection and reliability test purposes.

2. Features

- ◆ Back-illuminated and stacked CMOS image sensor “Exmor-RS™”
- ◆ Single Frame High Dynamic Range (HDR) with equivalent full pixels.
- ◆ High signal to noise ratio (SNR).
- ◆ Full resolution @30fps (Normal / HDR). 4K2K @30fps (Normal / HDR) 1080p @60fps (Normal / HDR)
- ◆ Output video format of RAW10/8, COMP8/6.
- ◆ Pixel binning readout and H/V sub-sampling function.
- ◆ Advanced Noise Reduction (Chroma noise reduction and luminance noise reduction).
- ◆ Independent flipping and mirroring.
- ◆ CSI-2 serial data output (MIPI 2lane/4lane, Max. 1.2Gbps/lane, D-PHY spec. ver. 1.1 compliant)
- ◆ 2-wire serial communication.
- ◆ Two PLLs for independent clock generation for pixel control and data output interface.
- ◆ Advanced Noise Reduction.
- ◆ Dynamic Defect Pixel Correction.
- ◆ Zero shutter lag.
- ◆ Power-on reset function
- ◆ Dual sensor synchronization operation.
- ◆ 8K bit of OTP ROM for users.
- ◆ Built-in temperature sensor

Applications

- ◆ Cellular phones
- ◆ Tablet PC
- ◆ Others



3. General Description

3.1 Camera Module Specification

No.	Item	Specification
1	Sensor	IMX214-0AQH5-C
2	Lens Size	1/3.06 inch
3	Pixel array number	4208 (H) × 3120 (V)
4	Power Supply	Core = 1.0+0.15V/-0.1V; Analog = 2.7+0.2V/-0.1V; I/O = 1.8±0.1V
5	Sensor output formats	RAW10/8
6	Sensor input clock frequency	6MHz - 27MHz
7	Maximum frame rate	4208 (H)* 3120 (V) @30 frame/s
8	Sensor Pixel size	1.12 μm (H) × 1.12 μm (V)
9	Image area	Diagonal 5.867mm

3.2 Camera Lens Specification

No.	Item	Specification
1	Lens Size	1/3.06 inch
2	Focal Length	2.04
3	F/NO.	2.4±5%
4	Field of View Angle	124.8° (D)/101.9° (H)/82.1° (V) ±3°
5	Distortion	<12.1%
6	Image Quality	Center≥1900 LW/PH; Corner≥1400 LW/PH
7	Focusing Range	0.52m - ∞ (AT=1.6m)
8	IR Filter	BG



4. Sensor Electrical Specification

4.1 Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	notes
Supply voltage (analog)	VANA	-0.3 to +3.3	V	refer to Vss level
Supply voltage (digital)	VDIG	-0.3 to +1.8	V	
Supply voltage (interface)	VIF	-0.3 to +3.3	V	
Input voltage (digital)	VI	-0.3 to +3.3	V	
Output voltage (digital)	VO	-0.3 to +3.3	V	
Guaranteed Operating temperature	TOPR	-20 to +70	°C	
Guaranteed storage temperature	TSTG	-30 to +80	°C	
Guaranteed performance temperature	TSPEC	-20 to +60	°C	

4.2 Application Conditions

Item	Symbol	Ratings	Unit	notes
Supply voltage (analog)	VANA	$2.7 + 0.2/-0.1$ V	V	refer to Vss level
Supply voltage (digital)	VDIG	$1.0 + 0.15/-0.1$	V	
Supply voltage (interface)	VIF	1.8 ± 0.1	V	



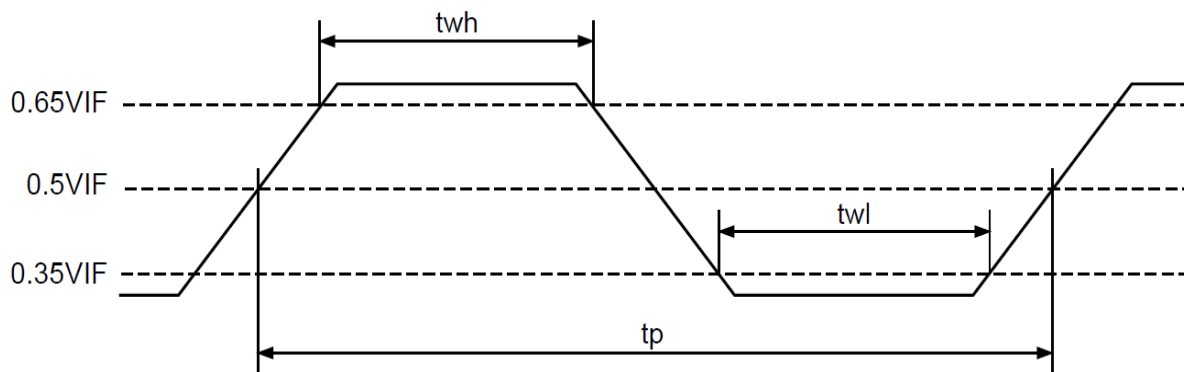
4.2.1 Sensor DC Characteristics

Item	Pins	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage	VDDSUBD VDDHCM1,2 VDDHSN1,2,3 VDDHAN VDDHCP VPI1,2 *1)	VANA		2.6	2.7	2.9	V
	VDDL1,2 VDDLSC1,2,3,4,5,6,7, VDDLIO1,2	VDIG		0.9	1	1.15	V
	VDDMIO1,2,3,4,VDD	VIF		1.7	1.8	1.9	V
Digital input voltage	SDA SCL	VIH		0.7VIF		2.9	V
		VIL		-0.3		0.3VIF	V
Digital input voltage	XCLR INCK (EXTCLK)	VIH		0.65VIF		VIF + 0.3	V
		VIL		-0.3		0.35VIF	V
Digital output voltage	SDA SDO	VOH		VIF-0.4			V
		VOL				0.4	V

Note: 1) Applies only in case VPI1, 2 are externally applied (register setting is required)

4.2.2 Sensor AC Characteristics

Input specifications are shown below when square-wave signal is input directly into the external pin INCK



Master Clock Square Waveform Input Diagram



Master Clock Square Waveform Input Characteristics

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
INCK (EXTCLK) clock frequency	f_{SCK}	6		27	MHz
INCK (EXTCLK) clock period	t_p	37		166.7	ns
INCK (EXTCLK) low level width	t_{wl}	0.4tp		0.6tp	ns
INCK (EXTCLK) high level width	t_{wh}	0.4tp		0.6tp	ns
INCK (EXTCLK) jitter	Tjitter			600	ps

PLL block characteristics (VTsystem)

Item	Min.	Typ.	Max.	Unit	Note
Input frequency range	6.0		27.0	MHz	
Input frequency range of phase comparator	6.0		27.0	MHz	
VCO frequency range	338.0		1200.0	MHz	
Output frequency range	338.0		1200.0	MHz	
Settling time			200.0	μs	

PLL block characteristics (OPsystem)

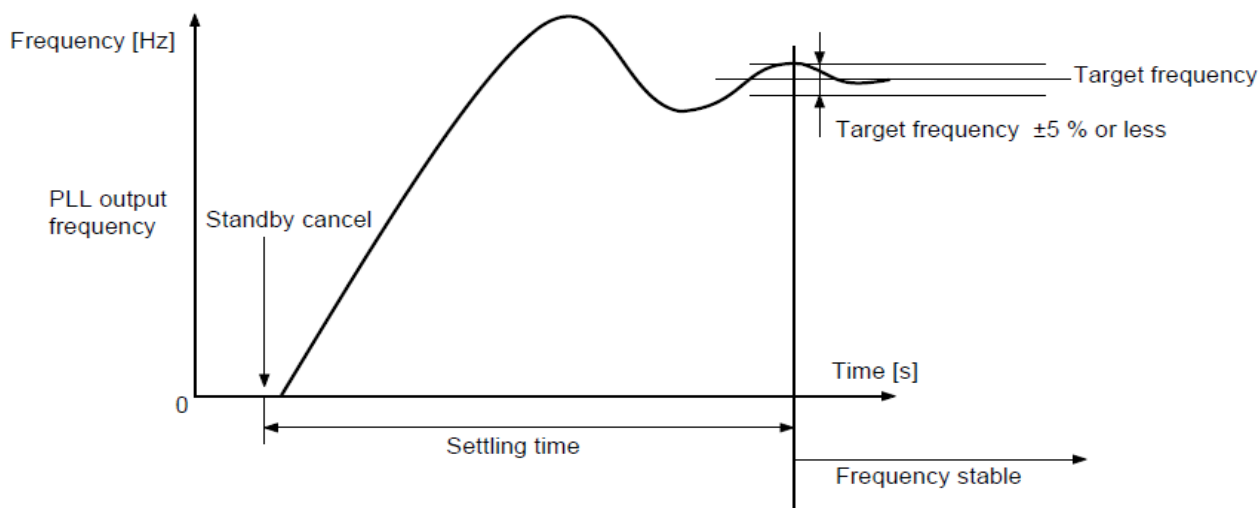
Item	Min.	Typ.	Max.	Unit	Note
Input frequency range	6.0		27.0	MHz	
Input frequency range of phase comparator	1.0		27.0	MHz	
VCO frequency range	338.0		1200.0	MHz	
Output frequency range	338.0		1200.0	MHz	
Settling time			900.0	μs	

Conditions) $V_{\text{ANA}} = 2.7 \text{ V}$, $V_{\text{DIG}} = 1.0 \text{ V}$, $T_j = 25^\circ\text{C}$, Output frequency = 1200 MHz.

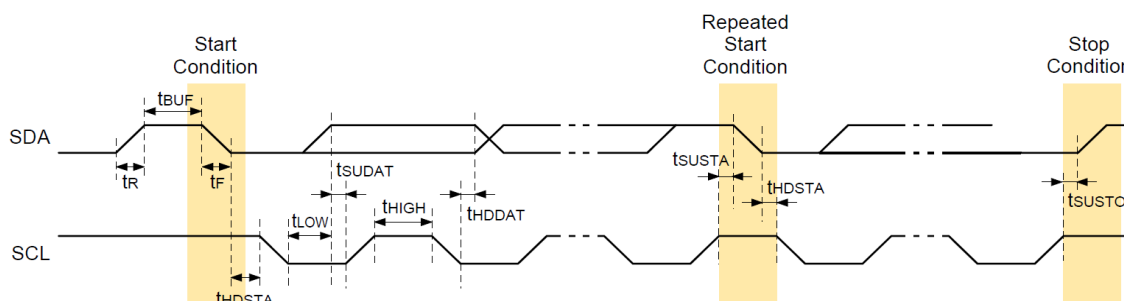


Definition of settling time of PLL block

After start operation, the oscillation frequency of PLL output transits from 0 Hz to target frequency then gradually become stable. The duration for oscillation frequency becomes within 5 % of the target frequency is defined as “settling time”.



Definition of settling time



2-wire serial communication block specification



2-wire serial communication block specification

Parameter	Symbol	Conditions	Min.	Max.	Unit
Low level input voltage	V_{IL}		-0.3	$0.3V_{IF}$	V
High level input voltage	V_{IH}		$0.7V_{IF}$	2.9	V
Low level output voltage	V_{OL1}	$V_{IF} > 2\text{ V}$, Sink 3 mA	0	0.4	V
	V_{OL2}	$V_{IF} < 2\text{ V}$, Sink 3 mA	0	$0.2V_{IF}$	V
High level output voltage	V_{OH}		$V_{IF} - 0.4$		V
Output fall time	t_{of}	Load 10 pF – 400 pF, $0.7 V_{IF} \rightarrow 0.3 V_{IF}$		250	ns
Input current	I_I	$0.1 V_{IF} \rightarrow 0.9 V_{IF}$	-10	10	μA
SDA I/O capacitance	$C_{I/O}$			8	pF
SCL Input capacitance	C_I			6	pF

2-wire serial communication block AC specification

Parameter	Symbol	Min.	Max.	Unit
SCL clock frequency	f_{SCL}	0	400	kHz
Rise time (SDA and SCL)	t_R	—	300	ns
Fall time (SDA and SCL)	t_F	—	300	ns
Hold time (start condition)	t_{HSTA}	0.6	—	μs
Setup time (rep.-start condition)	t_{SUSTA}	0.6	—	μs
Setup time (stop condition)	t_{SUSTO}	0.6	—	μs
Data setup time	t_{SUDAT}	100	—	ns
Data hold time	t_{HDDAT}	0	0.9	μs
Bus free time between Stop and Start condition	t_{BUF}	1.3		μs
Low period of the SCL clock	t_{LOW}	1.3		μs
High period of the SCL clock	t_{HIGH}	0.6		μs

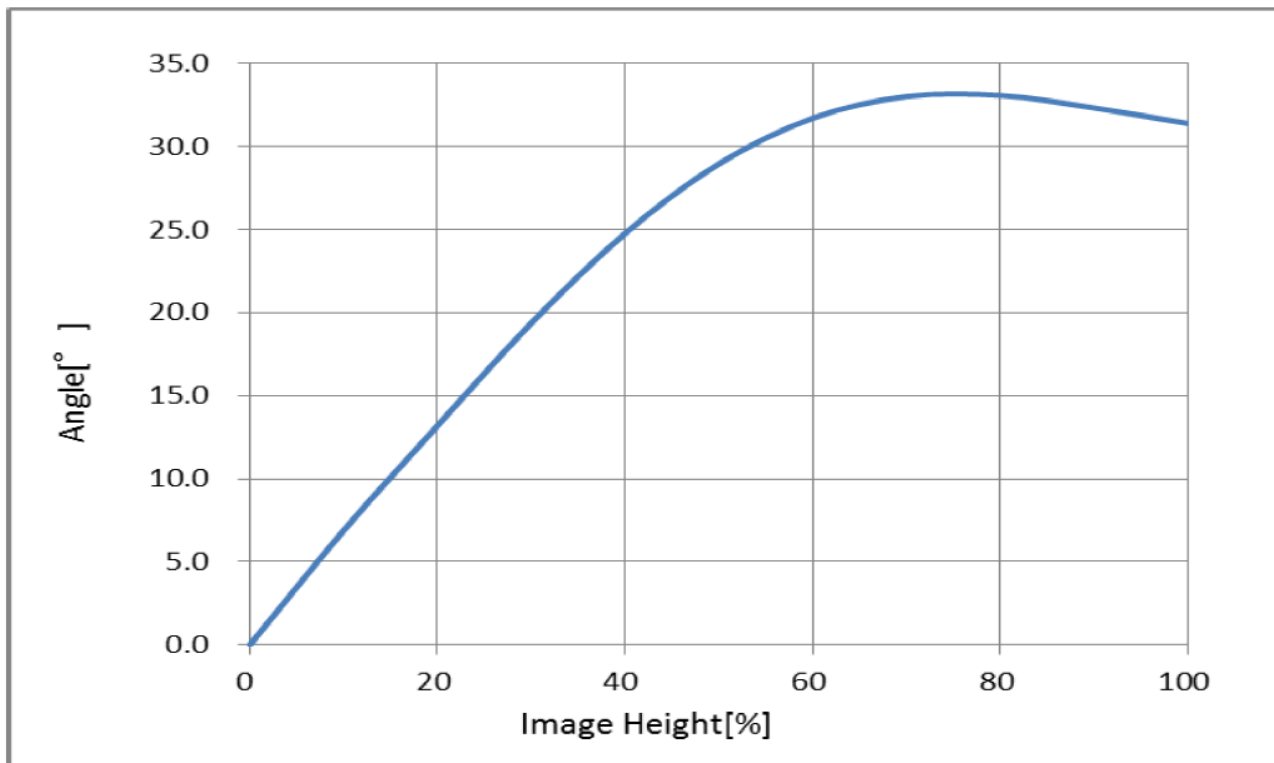
Current consumption and standby current

(30 frame/s, $V_{ANA} = 2.7\text{ V}$, $V_{DIG} = 1.0\text{ V}$, $V_{IF} = 1.8\text{ V}$, $T_j = 60\text{ }^\circ\text{C}$)

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Current consumption (analog)	I_{ANA}		39.2	44.7	mA	
Current consumption (digital)	I_{DIG}		76.7	140.3	mA	DPC, HDR, LNR, CNR function off
Standby current (analog)	I_{STBANA}			43.1	μA	XCLR (XSHUTDOWN) : Low fixed INCK (EXTCLK) :stop
Standby current (digital)	I_{STBDIG}			58.2	mA	XCLR (XSHUTDOWN) : Low fixed INCK (EXTCLK) :stop
Standby current (IF)	I_{STBIF}			48.7	μA	XCLR (XSHUTDOWN) : Low fixed INCK (EXTCLK) :stop

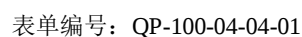


4.2.3 Optical Characteristic



CRA characteristics

For more information of sensor please refer to the IMX214-0AQH5-C specification.





6. Camera Module PIN Description

Pin Number	Name	Pin type	Function/Description
Pin 1#	XCLK	I	System input clock
Pin 2#	DGND	GND	Digital GND
Pin 3#	MDP0	O	MIPI TX clock positive output
Pin 4#	MDN0	O	MIPI TX data negative output
Pin 5#	DGND	GND	Digital GND
Pin 6#	MDN1	O	MIPI TX data negative output
Pin 7#	MDP1	O	MIPI TX clock positive output
Pin 8#	DGND	GND	Digital GND
Pin 9#	MCN	O	MIPI TX data negative output
Pin 10#	MCP	O	MIPI TX clock positive output
Pin 11#	DGND	GND	Digital GND
Pin 12#	NC	—	—
Pin 13#	NC	—	—
Pin 14#	AVDD2.8V	POWER	Supply voltage (analog)
Pin 15#	AGND	GND	Analog GND
Pin 16#	DVDD1.0V	POWER	Supply voltage (digital)
Pin 17#	DOVDD1.8V	POWER	Supply voltage (interface)
Pin 18#	DGND	GND	Digital GND
Pin 19#	SIO_C	I/O	I2C PIN
Pin 20#	SIO_D	I/O	I2C PIN
Pin 21#	RESET	I	System clear (active low)
Pin 22#	NC	—	—
Pin 23#	DVDD1.0V	POWER	Supply voltage (digital)
Pin 24#	DGND	GND	Digital GND
Pin 25#	MDP3	O	MIPI TX clock positive output
Pin 26#	MDN3	O	MIPI TX data negative output
Pin 27#	DGND	GND	Digital GND



Pin 28#	MDN2	0	MIPI TX data negative output
Pin 29#	MDP2	0	MIPI TX data positive output
Pin 30#	DGND	GND	Digital GND



7. 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.: $80\pm3^{\circ}\text{C}$; Low Temp.: $-40\pm3^{\circ}\text{C}$; 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: $85\%\text{RH}$; 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.



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 70 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 10 trays.
4. Insert three stacks into a outside box. Then attach the label onto the outside box.

8.2 Labeling

8.2.1 External box label

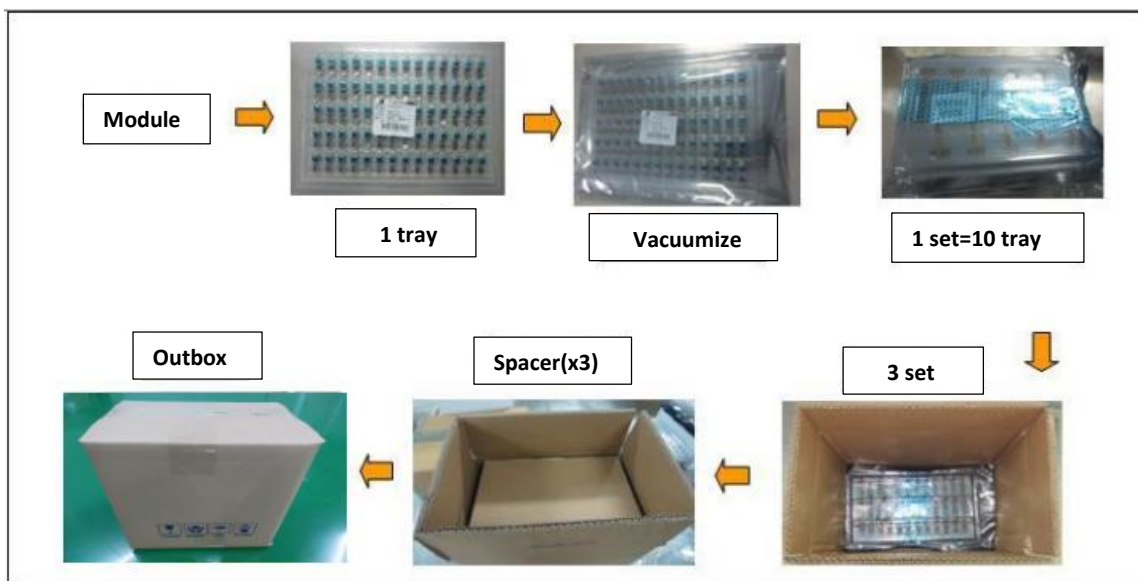
Product Inspection Certificate RoHS	
Product name	
Product code	 XXX
Purchase number	
Product model	
Quantity	 XXX
Production date	
Shipping number	 XXX
Inspector	

8.2.2 Internal case label

Product Inspection Certificate RoHS	
Product name	
Product code	 XXX
Purchase number	
Product model	
Quantity	 XXX
Production date	
Shipping number	 XXX
Inspector	



8.3 Sketch Map of Packing Process





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°C

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.

— END —