Confidential

Preliminary

Product Information

ISSUE DATA : 2012-04-03
MODEL : AMS767KC04-1
CUSTOMER : General

Note : The Product and specifications are subject to change with notice.
Please ask for the latest Product Standards to guarantee the satisfaction of your product requirements.

Samsung Mobile Display

Revision History

Date	Rev. No.	Page	Summary
2012.04.03	00		First issued.

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1. Scope

This Specification defines general provisions as well as inspection standards for AMOLED module supplied by SAMSUNG Mobile Display Co., Ltd.,
If the event of unforeseen problems or unspecified items occurs, we naturally shall negotiate and agree to solution with customer.

2. Warranty

Basically, warranty term is 15 months of reliability characteristics of quality level after the outgoing date in SAMSUNG Mobile Display Co., Ltd., and SAMSUNG Mobile Display Co., Ltd., could compensate for defectives which happens within warranty term under condition that the products should be stored or be used as Specified under normal condition within the contents of Specification.
Otherwise, it is impossible to compensate for defectives when they happens by customer's mistake such as careless handing or circuit change, etc.
And after 15 months of warranty term, all replacements for defectives will be charged.

This Specification stipulates the final and comprehensive requirements for the respective products hereof. Beyond this Specification, it is responsibility of the customer to explicitly disclose any additional requirements, information or reservations regarding these requirements to Samsung Mobile Display prior to implementation, where any and all disclosures of the customer shall be with an authorized representative of Samsung Mobile Display in writing. Samsung Mobile Display shall not be responsible for safety, performance, functionality, compatibility of the system with which the SAMSUNG Mobile Display-supplied components are integrated unless such features have been expressly communicated and described in the Specification. SAMSUNG Mobile Display MAKES NO GUARANTY OR WARRANTY, EXPRESS OR IMPLIED , INCLUDING BUT NOT LIMITED TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, TO ANY PARTY.Moreover, any party should do their own due diligence regarding these requirements prior to implementation.

3. Features

1) Display Color : 16M Color (RGB)
2) Display Format : 7.67" WX 1280(W)×800(H)
3) Interface : SPI(3line), MIPI-DSI(4lane)
4) Driver IC : S6E8AB0, SEC-SYS.LSI
5) Polarizer : NZFUJDCVSRHCK(2 CoP) By NITTO
6) Touch IC : MXT768E(F/W 2.0), ATMEL
7) Window : Corning Gorilla glass, AF coating(DON SH-HT 9055), Hyupjin I&C

4. Mechanical specification

Item	Specification	Unit	Note
Outline dimension	197.7(H) x 128.4(V) x 2.418(T)	mm	Landscape
Number of pixel	1280(H) x 800(V)	ea	-
Glass Size	172.12(H) x 115.2(V) x 0.4	mm	-
Active area	165.12 (H) x 103.2 (V)	mm	-
Pixel pitch	129 (H) x 129 (V)	um	RGB
Sub Pixel size	43 (H) x 129 (V)	um	-
Glass Thickness	0.41 (LTPS), 0.50 (Encap)	mm	-
Weight	106	g	

5. Maximum Rating

Item		Symbol	Min	Max	unit	note
Supply Voltage	Analog	VCI	>Vss	5.0	V	note-1),2)
	Logic	VDD3	>Vss	5.0	V	note-1),2)
	Analog	VLIN1	>Vss	6.5	V	note-1),2)
	DCDC	VDCDC	>Vss	13.0	V	note-1),2)
	Analog	AVDD	>Vss	3.3	V	note-1),2)
	Logic	VDD	>Vss	3.3	V	note-1),2)
Input voltage		VIN	>Vss	VDD3+0.5	V	note-2)
Operating temperature		Topr	-20	60	℃	-
Humidity		Hopr	10	90	%RH	note-3)
Storage temperature		Tstg	-30	70	℃	-

Note 1) Supply voltage VDD3, VCI, VLIN1, VDCDC should satisfy the below condition of VDD3, VCI, VLIN1, VDCDC > VSS (AGND).

Note 2) If the supplied voltage exceeds the maximum limitation,
Driver IC can be damaged permanently.
Therefore, while operating, it is recommend to use Driver IC within the maximum electrical limitation.
If not, Driver IC can cause decreased reliability or operational problems.

Note 3) Maximum wet-bulb temperature at 29 °C or less. (Ta > 40 °C) No condensation.

6. Electrical Characteristics

(VSS=0.0V, VDD3=1.8V, VCI=3.0V, VLIN1=5.8V, VDCDC=6.3V, Tamb=-20 to 60℃)

Item		Symbol	Condition	Min	Typ	Max	unit	Note
Battery Voltage		VDCDC	-	6.0	6.3	6.8	VDC	-
DDI	Logic Voltage	VDD3	-	1.7	1.8	3.3	VDC	-
	Analog Voltage	VCI	-	2.8	3.0	3.8	VDC	-
	Analog Voltage	VLIN1	-	5.6	5.8	6.0	VDC	-
TSP	Logic Voltage	VDD	-	1.71	1.8	1.98	VDC	-
	Analog Voltage	AVDD	-	2.5	3.0	3.6	VDC	-
Input Signal	H-level	VIH	-	0.7xVDD3	-	VDD3	VDC	-
	L-level	VIL	-	0.0	-	0.3xVDD3	VDC	-
Output Signal	H-level	VOH	Iout=-1mA	0.8xVDD3	-	VDD3	VDC	-
	L-level	VOL	Iout=+1mA	0.0	-	0.2xVDD3	VDC	-
Analog&Logic current dissipation		IDD3	Full White (Normal)	-	7.0	9.0	mA	note-3)
		ICI		-	15.0	17.0	mA	note-1) note-3)
		IDD3	Sleep mode	-	28	34	uA	note-2)
		ICI		-	21	30	uA	note-2)
Battery power dissipation		Idcdc(1)	Full White (Normal)	-	640	845	mA	note-3)
Quiescent Current		Idcdc(2)	Sleep Mode	-	0	0	uA	note-4)
Frame Frequency		fFRM	-	-	(60)	-	Hz	note-5)

Note-1) DDI Analog/Logic current at full white mode

Note-2) Analog/Logic current in Sleep in command and MIPI LP11/ULPS mode

Note-3) Battery current at VDCDC=6.3(V), Full White mode

Note-4) Battery current at Sleep in mode and DC-DC OFF (Sleep Mode)

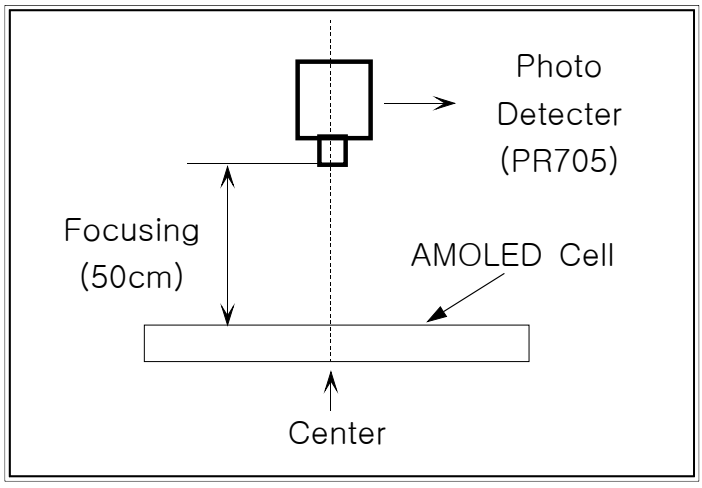
Note-5) Frame Frequency can be changed by Software Setting

7. Electro-Optical characteristics

(VSS=0.0V, VDD3=1.8V, VCI=3.0V, VLIN1=5.8V, VDCDC=6.3V, Tamb=25℃)

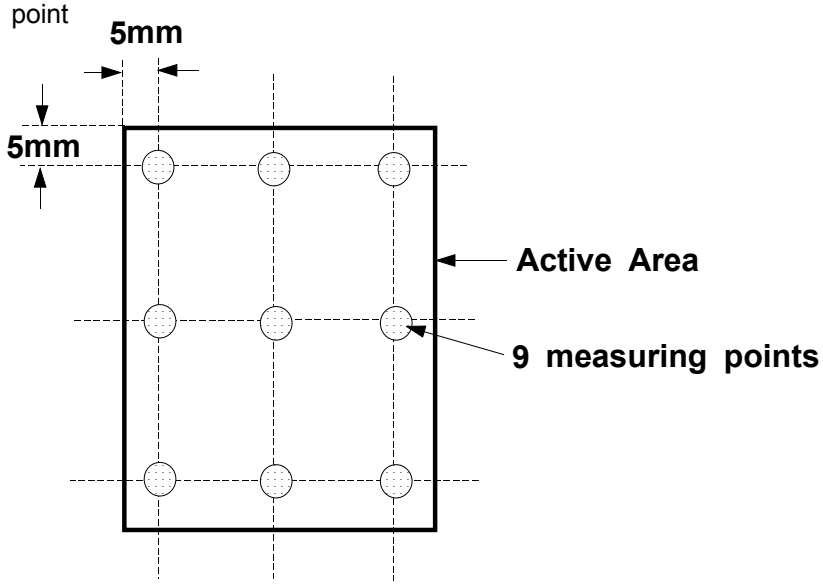
Item		Symbol	Condition		Min	Typ	Max	Unit	note
Brightness		L	FULL WHITE		212	250	288	cd/m²	Note-1)
Uniformity		LRU	FULL WHITE		70	80	-	%	Note-2)
Viewing Angle		Φ	C/R≥10 (Black & White)	θ= 0°	88	-	-	degree	Note-3)
				θ= 90°	88	-	-	degree	
				θ=180°	88	-	-	degree	
				θ=270°	88	-	-	degree	
Contrast ratio		C/R	WHITE/BLACK		3,400	-	-	-	Note-4)
Color Gamut		-	-		95	110	125		
Color chromaticity (CIE 1931)	White	W_x	θ=Φ=0° (R255*G255*B255)		0.268	0.298	0.328		Note-1)3)4)
		W_y			0.288	0.318	0.348		
	Red	R_x	θ=Φ=0° (R255*G0*B0)		0.640	0.670	0.700	-	
		R_y			0.296	0.326	0.356	-	
	Green	G_x	θ=Φ=0° (R0*G255*B0)		0.162	0.212	0.262	-	
		G_y			0.674	0.724	0.774	-	
	Blue	B_x	θ=Φ=0° (R0*G0*B255)		0.096	0.136	0.176	-	
		B_y			0.026	0.066	0.106	-	
Life time		-	FULL WHITE @typical condition		15K	-	-	hrs	Note-5)

Note (1) Optical measuring system, temperature regulated chamber, external Light : dark state



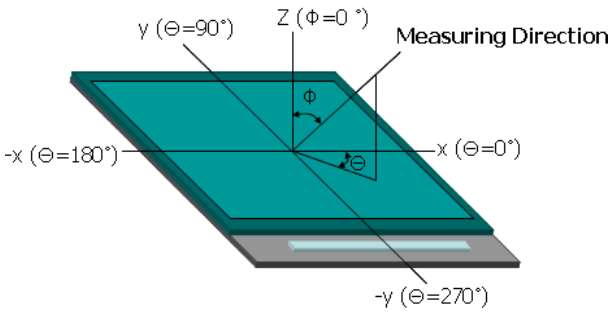
Instead of above measurement system. CA-210 can be used to measure brightness and color chromaticity.

Note (2) Uniformity measuring point



Uniformity = Lmin / Lmax * 100 [%]

Note (3) Define of Φ and θ



Note (4) Definition of contrast ratio (K)

$$\text{Contrast Ratio(K)} = \frac{\text{Brightness of White pattern center at } 139\text{cd/m}^2}{\text{Brightness of black pattern center at } 139\text{cd/m}^2}$$

Note (5) Lifetime means the use time that the brightness of full white become under the half of initial one(@room temperature)

7-1. Touch characteristics

Item	Symbol	Min	Max	Unit	note
Accuracy	Acc	-	1.5	mm	
Precision	Pre	-	1.5	mm	
Linearity	Lin	-	1.5	mm	

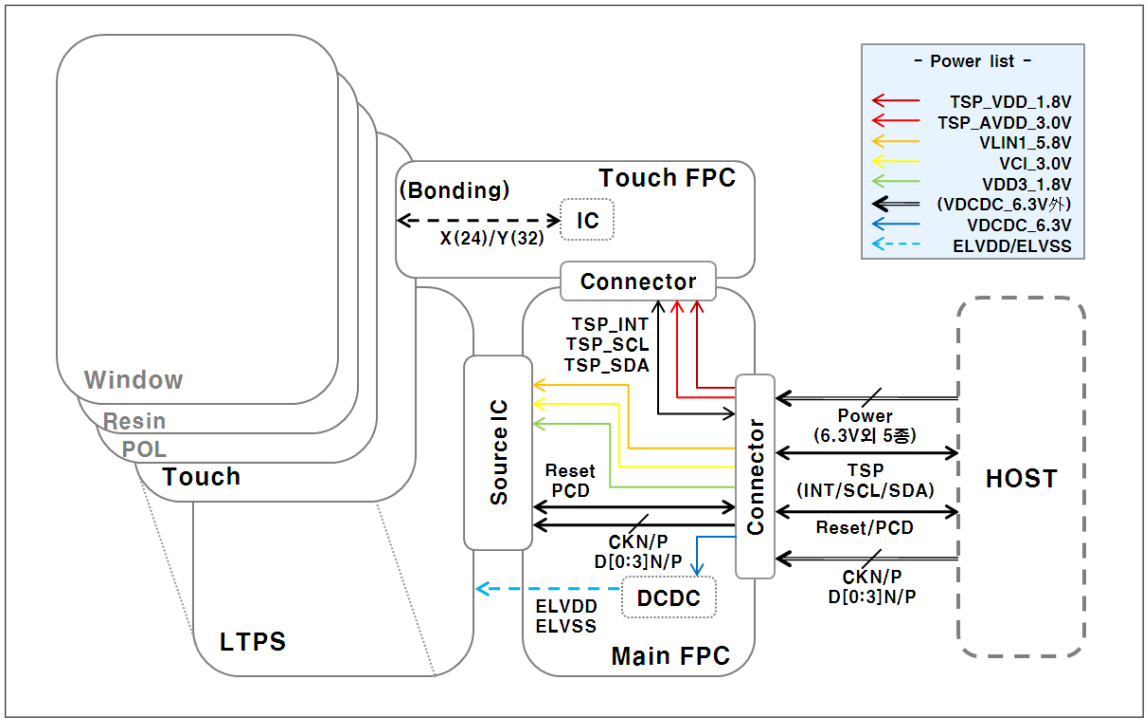
※ Minimum pi of the stylus pen : 5mm

8. Input/Output Terminal Assignment

8-1. I/O Connection (SMD Connector : ELCO/UJU 04-6298-706-000-883)

No	Symbol	Description	No	Symbol	Description
1	VDCDC_6.3V	DCDC Supply voltage	2	GND	Ground
3	VDCDC_6.3V	DCDC Supply voltage	4	D2P	3rd differential data
5	VDCDC_6.3V	DCDC Supply voltage	6	D2N	3rd differential data
7	VDCDC_6.3V	DCDC Supply voltage	8	GND	Ground
9	VDCDC_6.3V	DCDC Supply voltage	10	D1P	2nd differential data
11	VDCDC_6.3V	DCDC Supply voltage	12	D1N	2nd differential data
13	NC	No connection	14	GND	Ground
15	MTPHV	SMD Internal use	16	CKP	Differential clock
17	OLED_ID	OLED ID	18	CKN	Differential clock
19	GND	Ground	20	GND	Ground
21	GND	Ground	22	D0P	1st differential data
23	PCD	Panel crack detection output	24	D0N	1st differential data
25	RESX	Reset	26	GND	Ground
27	GND	Ground	28	D3P	4th differential data
29	OLED_TE	Tearing effect control	30	D3N	4th differential data
31	TSP_AVDD_3.0V	Analog power for TSP	32	GND	Ground
33	TOUCH_ID	Touch ID	34	GND	Ground
35	TSP_VDD_1.8V	Digital power for TSP	36	NC	No connection
37	TSP_SDA	Serial data input for TSP	38	VDD3_1.8V	Digital power for LDI
39	TSP_SCL	Serial interface clock for TSP	40	VCI_3.0V	Analog power for LDI
41	TSP_INT	State change interrupt for TSP	42	NC	No connection
43	GND	Ground	44	VLIN1_5.8V	Analog power for LDI

8-2. Block diagram



9. Recommended Operating Sequence

[Power On Sequence]

START

[System Power On]
(1) turn-ON VDCDC (+6.3VDC)
(2) turn-ON VDD3 (+1.8VDC)
(3) turn-ON VCI (+3.0VDC)
(4) turn-ON VLIN1 (+5.8VDC)

Wait 25ms

Activate Reset (System Reset)

Wait 5ms

Apply Level2 key (Auto Pow On)
(F0h ← 5A5Ah)

VSYNC/HSYNC Packet 입력

[0] Power control Set

Sleep Out Command (11h)

Wait 50ms

ID READ

Apply MTP key (F1h ← 5A5Ah)
[1] Panel Condition Set
(Refer to Next Page in detail)

[2] Display Condition Set
(Refer to Next Page in detail)

[3] Gamma Condition Set
(Refer to Next Page in detail)

[4] Etc Condition Set
(Refer to Next Page in detail)

[5-1] Dynamic ELVSS set:DEFAULT

[5-2] Dynamic ELVSS (ID3=44h)

Wait 120ms

[6] VREGOUT SET

Display On Command (29h)

[Power Off Sequence]

DISPLAY Off Command (28h)

Stand-by On Command (10h)

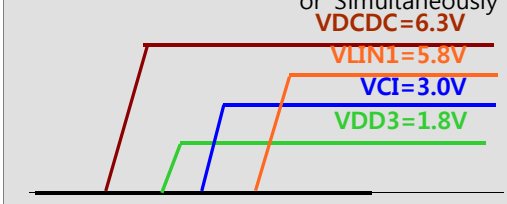
Wait 120ms

[System Power Off]
(1) turn-OFF VLIN1 (+5.8VDC)
(1) turn-OFF VCI (+3.0VDC)
(2) turn-OFF VDD3 (+1.8VDC)
(3) turn-OFF VDCDC (+6.3VDC)

[System Power On Sequence]

VDCDC→VDD3→VCI→VLIN1

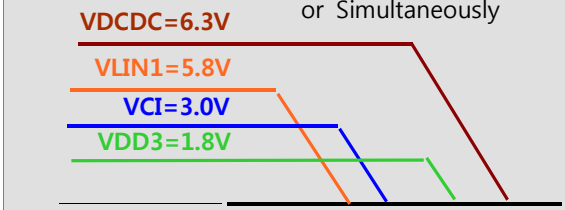
or Simultaneously



[System Power OFF Sequence]

VLIN1→VCI→VDD3→VDCDC

or Simultaneously



[5-3] Optimum ELVSS (ID3≠44h)

Wait 120ms

[6] VREGOUT SET

Display On Command (29h)

10. Sub- routine (Initial condition setting)

[0] Power Control Set

Command	Parameter		Description
F5h	1st	50	IC TEST REGISTER
	2nd	33	IC TEST REGISTER
	3rd	33	IC TEST REGISTER
	4th	00	IC TEST REGISTER
	5th	54	DTC_GLS_ON,DTC_ELS_ON
	6th	96	DTC_DISP_O,DTC_EL_ON
	7th	33	DTC_ELS_OFF,DTC_GLS_OFF
	8th	01	DTC_EL_OFF

[1] Panel Condition Set

Command	Parameter		Description
F8h (PANEL CONTROL)	1st	01h	DOTC_H,DOTC
	2nd	8Eh	FLTE
	3rd	00h	FLTE_H
	4th	00h	FLTE2
	5th	00h	FLTE2_H
	6th	ACh	FLWE
	7th	00h	FLWE2
	8th	9Eh	SCTE
	9th	8Dh	SCWE
	10th	1Fh	INTE
	11th	4Eh	INWE
	12th	9Ch	E_INWE
	13th	7Dh	E_INWE
	14th	3Fh	EMPS
	15th	10h	E_FLTE
	16th	00h	E_FLTE_H
	17th	20h	E_FLWE2
	18th	02h	E_FLWE_H
	19th	10h	E_SCTE
	20th	7Dh	E_SCWE
	21th	10h	A_FLTE
	22th	00h	A_FLTE_H
	23th	00h	A_FLWE2
	24th	02h	A_FLWE_H
	25th	08h	CLTE
	26th	10h	SHE
	27th	34h	CLWEA
	28th	34h	CLWEB
	29th	34h	CLWEC
	30th	C0h	FLM_DC,FLM2_DC,FLM_CON,FLM2_CON
	31th	C1h	CLK1_DC,CLK2_DC,CLK1_CON,CLK2_CON
	32th	01h	INT1_DC,INT2_DC,INT1_CON,INT2_CON
	33th	00h	BICTL_DC,BICTLB_DC,BICTL_CON,BICTLB_CON
	34th	C1h	CLA_DC,CLB_DC,CLA_CON,CLB_CON
	35th	82h	CLC_DC,CLC_CON
	36th	00h	SESR_DC,ESR_DC,SESR_CON,ESR_CON
	37th	C8h	ACL_FLM_DC,EM_FLM_DC,ACL_FLM_CON,EM_FLM_CON
	38th	C1h	EM_CLK1_DC,EM_CLK1B_DC,EM_CLK1_CON,EM_CLK1B_CON
	39th	E3h	EM_CLK2_DC,EM_CLK2B_DC,EM_CLK2_CON,EM_CLK2B_CON
	40th	01h	EM_INT1_DC,EM_INT2_DC,EM_INT1_CON,EM_INT2_CON

[2] Display Condition Set (RGB Data Interface)

Command	Parameter		Description
F2h	1st	C8h	Display line
	2nd	05h	VBP : 3 HSYNC + VSYNC 2
	3rd	0Dh	VFP : 13 HSYNC

[3] Gamma Condition Set

- Procedure
  1) Gamma Select
  2) Gamma Setting
  3) Gamma / LTPS Set Update

Note. All gamma adjusting register values and offset register values are applied at the first VSYNC time after GAMMA/LTPS update command.

1) Gamma Select

Command	Parameter		Description
26h	1st	01h	Bright gamma(01h)

2) Gamma 2.2 Setting_Bright gamma(250cd, 7500K)

Command	Parameter		Description
FAh	1st	1Fh	Red V1 Gamma
	2nd	1Fh	Green V1 Gamma
	3rd	43h	Blue V1 Gamma
	4th	F7h	Red V15 Gamma
	5th	ECh	Green V15 Gamma
	6th	E1h	Blue V15 Gamma
	7th	DBh	Red V35 Gamma
	8th	DFh	Green V35 Gamma
	9th	D7h	Blue V35 Gamma
	10th	E0h	Red V59 Gamma
	11th	DFh	Green V59 Gamma
	12th	DAh	Blue V59 Gamma
	13th	BCh	Red V87 Gamma
	14th	B8h	Green V87 Gamma
	15th	ADh	Blue V87 Gamma
	16th	C2h	Red V171 Gamma
	17th	BFh	Green V171 Gamma
	18th	B7h	Blue V171 Gamma

	19th	00h	Red V255 Gamma
	20th	BAh	Red V255 Gamma
	21th	00h	Green V255 Gamma
	22th	CBh	Green V255 Gamma
	23th	00h	Blue V255 Gamma
	24th	D7h	Blue V255 Gamma

3) Gamma / LTPS Set Update

Command	Parameter		Description
F7h	1st	03h	Gamma set update enable LTPS set update enable

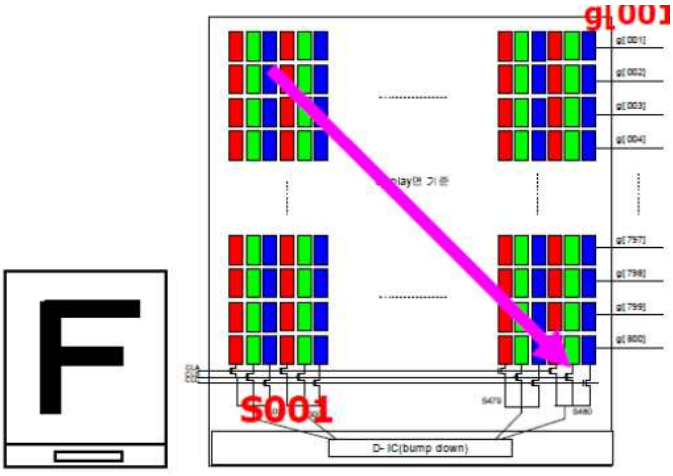
[4] Etc Condition Set

Command	Parameter		Description
F4h (PWRCTL)	1st	0Bh	
	2nd	0Ah	
	3rd	06h	
	4th	0Bh	
	5th	33h	
	6th	02h	

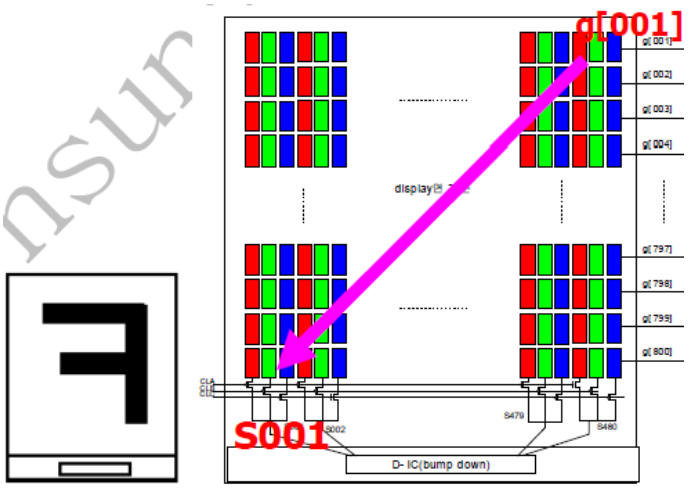
Command	Parameter		Description
F6h (Source Control)	1st	04h	SS, GTCON
	2nd	00h	
	3rd	02h	

note) Scan direction control

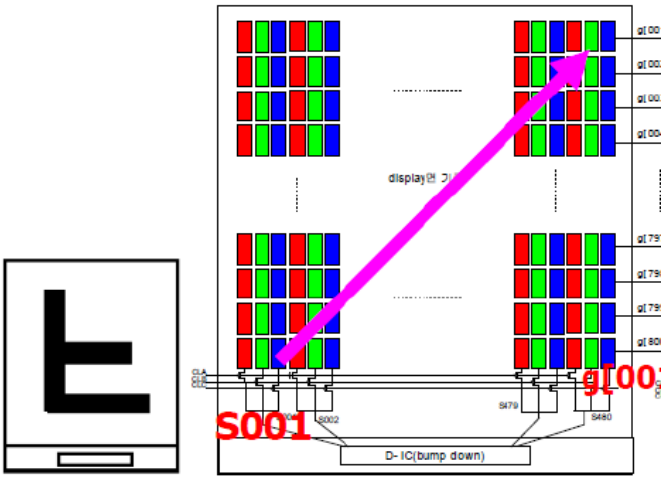
◆ The default position of the display module is always as follow, when SS=0, GTCON[0:2]=101



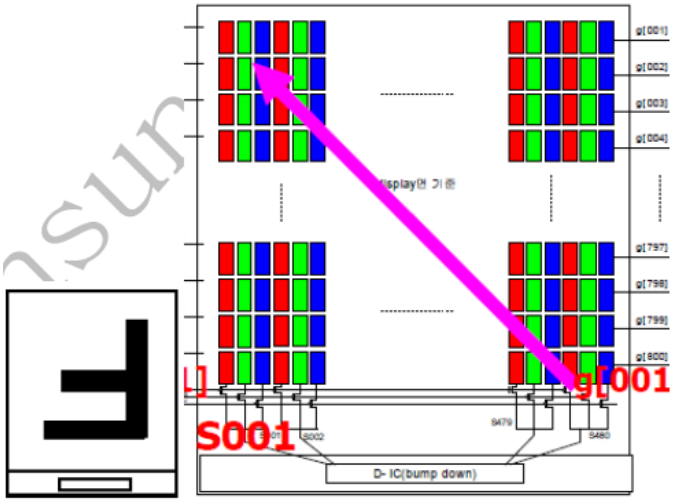
◆ The default position of the display module is always as follow, when SS=1, GTCON[0:2]=101



◆ The default position of the display module is always as follow, when SS=0, GTCON[0:2]=100



◆ The default position of the display module is always as follow, when SS=1, GTCON[0:2]=100



[5-1] Dynamic ELVSS set:DEFAULT

Command	Parameter		Description
B1h	1st	04h	
	2nd	00h	

Command	Parameter		Parameter	
D9h (NVM SETTING)	1st	14h	12th	55h
	2nd	5Ch (PCD enable,note1)	13th	00h
	3rd	20h	14th	00h
	4th	0Ch	15th	00h
	5th	0Fh	16th	00h
	6th	41h	17th	80h
	7th	00h	18th	CBh
	8th	10h	19th	EDh
	9th	11h	20th	7Fh
	10th	12h	21th	AFh
	11th	A8h (dynamic ELVSS on)		

note. Main CNT #23 : PCD event output

- PCD = Low : Normal
- PCD = High : Panel Crack Event → OCTA power off

[5-2] Dynamic ELVSS set:(ID3 = 44h)

Command	Parameter		Description
B1h	1st	84h	Smart D-ELVSS On
	2nd	15h	

1) Brightness : 250cd/m² ~ 200cd/m²

Command	Parameter		Description
B2h	1st	00h	ELVSS : -4.4V(Default)
	2nd	00h	
	3th	00h	
	4th	00h	
	5th	00h	

2) Brightness : 200cd/m² ~ 150cd/m²

Command	Parameter		Description
B2h	1st	04h	ELVSS : -4.0V
	2nd	04h	
	3th	04h	
	4th	04h	
	5th	04h	

3) Brightness : 150cd/m² ~ 100cd/m²

Command	Parameter		Description
B2h	1st	08h	ELVSS : -3.8V
	2nd	08h	
	3th	08h	
	4th	08h	
	5th	08h	

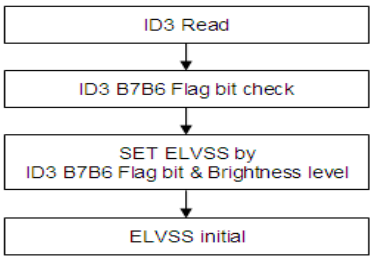
4) Brightness : 100cd/m² ~ 30cd/m²

Command	Parameter		Description
B2h	1st	0Ch	ELVSS : -3.2V
	2nd	0Ch	
	3th	0Ch	
	4th	0Ch	
	5th	0Ch	

6] 個別驅動電壓(Optimum ELVSS) Setting Guide

Brightness	ELVSS	Condition
250~200	ELVSS2	ID3 = ELVSS
200~150	ELVSS2 + 04h	ID3 = ELVSS + 04h
150~100	ELVSS2 + 08h	ID3 = ELVSS + 08h
100~50	ELVSS2 + 0Ch	ID3 = ELVSS + 0Ch

◆ Flow



■ Read ID3 Value → ELVSS 1(h)

1) Brightness : 250cd/m2 ~ 200 cd/m2 (READ ID3 Value = ELVSS)

Command	Parameter		Description
B1h	1st	84h	
	2nd	ELVSS 2h	ID3's ELVSS

Condition

1. ELVSS 1 : 01h ~ 29h READ.
2. Read ID3 Value → apply 2nd parameter (ID3 Value refer to 個別驅動電壓 Table)
   ex) Read ID3 : 17h → 2nd parameter : 97h = ELVSS 2(-4.2V)
   Read ID3 : 1Dh → 2nd parameter : 9Dh = ELVSS 2(-3.6V)

2) Brightness : 200cd/m2 ~ 150 cd/m2 (READ ID3 Value + 04h)

Command	Parameter		Description
B1h	1st	84h	
	2nd	ELVSS 3h (ELVSS 2h + 04h)	ID3's ELVSS + 0.4V

Condition

1. ELVSS 2h + 04h
   ex) ELVSS 2 : 97h → 97h + 04h = 9Bh = ELVSS 3h

2. 2 case of ELVSS Limit for enhancement of driving voltage margin
   (ELVSS Limit : Before -3.2V, After -2.4V)
   □ CASE 1 : 00h < ELVSS 1h < 3Fh
   → ELVSS 1h + 04h > 21h, then 21h(ELVSS limit : -3.2V)
   ELVSS 3h ≥ A1h, then ELVSS 3h = A1h
   → ELVSS 1h + 04h < 21h, then ELVSS 1h + 04h
   ELVSS 3h < A1h, then ELVSS 3h = ELVSS 3h
   □ CASE 2 : 40h < ELVSS 1h < 7Fh
   → ELVSS 1h + 04h > 29h, then 29h(ELVSS limit : -2.4V)
   ELVSS 3h ≥ A9h, then ELVSS 3h = A9h
   → ELVSS 1h + 04h < 29h, then ELVSS 1h + 04h
   ELVSS 3h < A9h, then ELVSS 3h = ELVSS 3h

3) Brightness : 150cd/m2 ~ 100 cd/m2 (READ ID3 Value + 08h)

Command	Parameter		Description
B1h	1st	84h	
	2nd	ELVSS 4h (ELVSS 2h + 08h)	ID3's ELVSS+ 0.8V

Condition 1. ELVSS 2h + 08h

ex) ELVSS 2 : 97h → 97h + 08h = 9Fh = ELVSS 4h

2. 2 case of ELVSS Limit for enhancement of driving voltage margin

(ELVSS Limit : Before -3.2V, After -2.4V)

□ CASE 1 : 00h < ELVSS 1h < 3Fh

→ ELVSS 1h + 08h > 21h, then 21h(ELVSS limit : -3.2V)

ELVSS 4h ≥ A1h, then ELVSS 4h = A1h

→ ELVSS 1h + 08h < 21h, then ELVSS 1h + 08h

ELVSS 4h < A1h, then ELVSS 4h = ELVSS 4h

□ CASE 2 : 40h < ELVSS 1h < 7Fh

→ ELVSS 1h + 08h > 29h, then 29h(ELVSS limit : -2.4V)

ELVSS 4h ≥ A9h, then ELVSS 4h = A9h

→ ELVSS 1h + 08h < 29h, then ELVSS 1h + 08h

ELVSS 4h < A9h, then ELVSS 4h = ELVSS 4h

4) Brightness : 100cd/m2 ~ 30 cd/m2 (READ ID3 Value + 0Ch)

Command	Parameter		Description
B1h	1st	84h	
	2nd	ELVSS 5h (ELVSS 2h + 0Ch)	ID3 = ELVSS + 1.2V

Condition 1. ELVSS 2h + 0Ch

ex) ELVSS 2 : 97h → 97h + 08h = 9Fh = ELVSS 5h

2. 2 case of ELVSS Limit for enhancement of driving voltage margin

(ELVSS Limit : Before -3.2V, After -2.4V)

□ CASE 1 : 00h < ELVSS 1h < 3Fh

→ ELVSS 1h + 0Ch > 21h, then 21h(ELVSS limit : -3.2V)

ELVSS 5h ≥ A1h, then ELVSS 5h = A1h

→ ELVSS 1h + 0Ch < 21h, then ELVSS 1h + 0Ch

ELVSS 5h < A1h, then ELVSS 5h = ELVSS 5h

□ CASE 2 : 40h < ELVSS 1h < 7Fh

→ ELVSS 1h + 0Ch > 29h, then 29h(ELVSS limit : -2.4V)

ELVSS 5h ≥ A9h, then ELVSS 5h = A9h

→ ELVSS 1h + 0Ch < 29h, then ELVSS 1h + 0Ch

ELVSS 5h < A9h, then ELVSS 5h = ELVSS 5h

※ Reference 1. ID3 Value = ELVSS 1

▶ ID3 bit structure

B7	B6	B5	B4	B3	B2	B1	B0

B7B6 flag 2bit : ELVSS Limit voltage level check

B5B4B3B2B0 ELVSS Pulse 6bit : Set ELVSS voltage by Pulse

[個別驅動電壓 Table].AMS767KC04 ELVSS 1,2

ID3 B7B6									
PULSE	**HEX**	**ELVSS(V)**	**ID3(h) ELVSS 1**	**ELVSS 2 (h)**	**PULSE**	**HEX**	**ELVSS(V)**	**ID3(h) ELVSS 1**	**ELVSS 2 (h)**
1	1	-6.4	1	81	22	16	-4.3	16	96
2	2	-6.3	2	82	23	17	-4.2	17	97
3	3	-6.2	3	83	24	18	-4.1	18	98
4	4	-6.1	4	84	25	19	-4.0	19	99
5	5	-6.0	5	85	26	1A	-3.9	1A	9A
6	6	-5.9	6	86	27	1B	-3.8	1B	9B
7	7	-5.8	7	87	28	1C	-3.7	1C	9C
8	8	-5.7	8	88	29	1D	-3.6	1D	9D
9	9	-5.6	9	89	30	1E	-3.5	1E	9E
10	0A	-5.5	0A	8A	31	1F	-3.4	1F	9F
11	0B	-5.4	0B	8B	32	20	-3.3	20	A0
12	0C	-5.3	0C	8C	33	21	-3.2	21	A1
13	0D	-5.2	0D	8D	34	22	-3.1	22	A2
14	0E	-5.1	0E	8E	35	23	-3.0	23	A3
15	0F	-5.0	0F	8F	36	24	-2.9	24	A4
16	10	-4.9	10	90	37	25	-2.8	25	A5
17	11	-4.8	11	91	38	26	-2.7	26	A6
18	12	-4.7	12	92	39	27	-2.6	27	A7
19	13	-4.6	13	93	40	28	-2.5	28	A8
20	14	-4.5	14	94	41	29	-2.4	29	A9
21	15	-4.4	15	95					

[6] VREGOUT SET

On the case of using the Optimum ELVSS, the value of Register(D1h) of Vregout and ID1/2/3 is same so when you setting D1h register, read the previous ID1/2/3 value by the use of global parameter.

1) Global parameter

Command	Parameter		Description
B0h	1st	03h	

2) Vregout Set

Command	Parameter		Description
D1h	1st	-	Read the previous ID1/2/3 value by the use of global parameter(03h).
	2nd	-	
	3rd	-	
	4th	01	
	5th	0B	
	6th	00	
	7th	00	
	8th	40	Vint= - 2.0V
	9th	0D	Vregout = 4.8V
	10th	00	
	11th	00	

[7] ACL Control Set

On the case of using ACL

1) Set ACL parameter → Etc condition
2) ACL On/Off → ACL On/Off command
3) Set ACL3 command by Set Brightness step → Refer to ACL3 parameter setting

1) ACL On/Off command

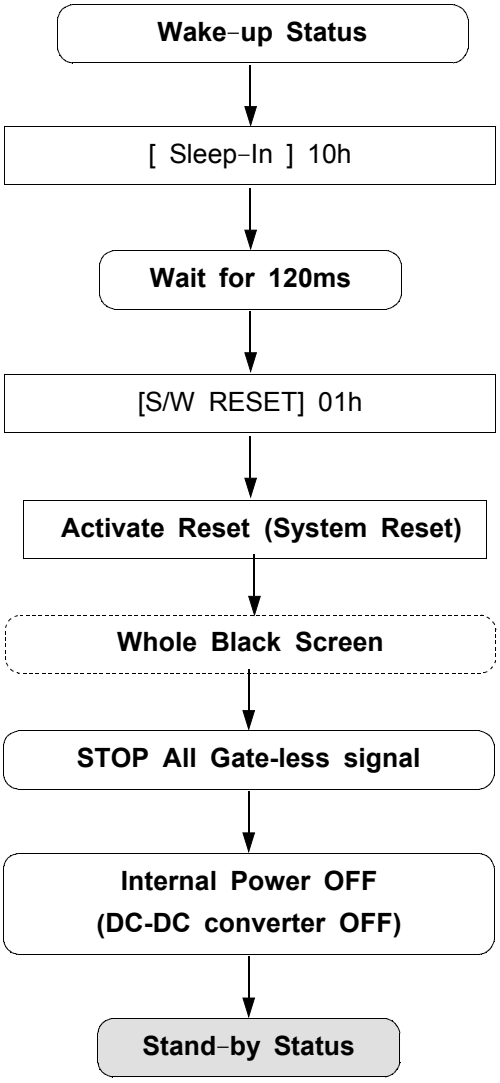
Command	Parameter		Description
C0h	1st	00h	- 00h : ACL Off (default) - 01h : ACL On

2) ACL parameter setting (Full White 40% reduction setting)

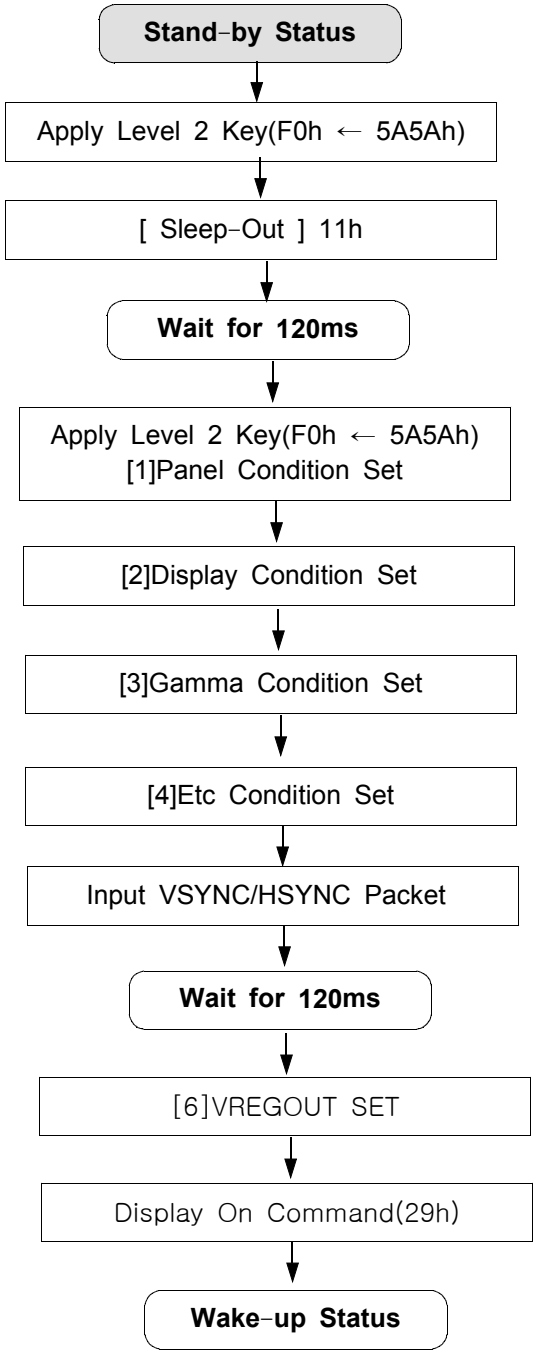
Command	Parameter		Description
C1h	1st	4Dh	Coefficient register of Red.(When RGB convert Y)
	2nd	96h	Coefficient register of Green1.(When RGB convert Y)
	3rd	1Dh	Coefficient register of Blue.(When RGB convert Y)
	4th	00h	ACL window horizontal start point register.
	5th	00h	ACL window horizontal start point register.
	6th	04h	ACL window horizontal start point register.
	7th	FFh	ACL window horizontal end point register.
	8th	00h	AACL window vertical start end register.
	9th	00h	ACL window vertical start end register.
	10th	03h	ACL window vertical start end register.
	11th	1Fh	ACL window vertical start end register.
	12th	00h	Delta Y register for inflection point 0.(Y average = 15)
	13th	00h	Delta Y register for inflection point 1.(Y average = 31)
	14th	00h	Delta Y register for inflection point 2.(Y average = 47)
	15th	00h	Delta Y register for inflection point 3.(Y average = 63)
	16th	00h	Delta Y register for inflection point 4.(Y average = 79)
	17th	00h	Delta Y register for inflection point 5.(Y average = 95)
	18th	00h	Delta Y register for inflection point 6.(Y average = 111)
	19th	21h	Delta Y register for inflection point 7.(Y average = 127)
	20th	37h	Delta Y register for inflection point 8.(Y average = 143)
	21th	37h	Delta Y register for inflection point 9.(Y average = 159)
	22th	37h	Delta Y register for inflection point 10.(Y average = 175)
	23th	37h	Delta Y register for inflection point 11.(Y average = 191)
	24th	37h	Delta Y register for inflection point 12.(Y average = 207)
	25th	37h	Delta Y register for inflection point 13.(Y average = 223)
	26th	37h	Delta Y register for inflection point 14.(Y average = 239)
	27th	37h	Delta Y register for inflection point 15.(Y average = 255)
	28th	1Dh	Coefficient register of Red.(When RGB convert Y)
	29th	4Dh	Coefficient register of Red.(When RGB convert Y)
	30th	96h	Coefficient register of Red.(When RGB convert Y)

■ Stand-by / Wake-up Sequence

[Stand-by]



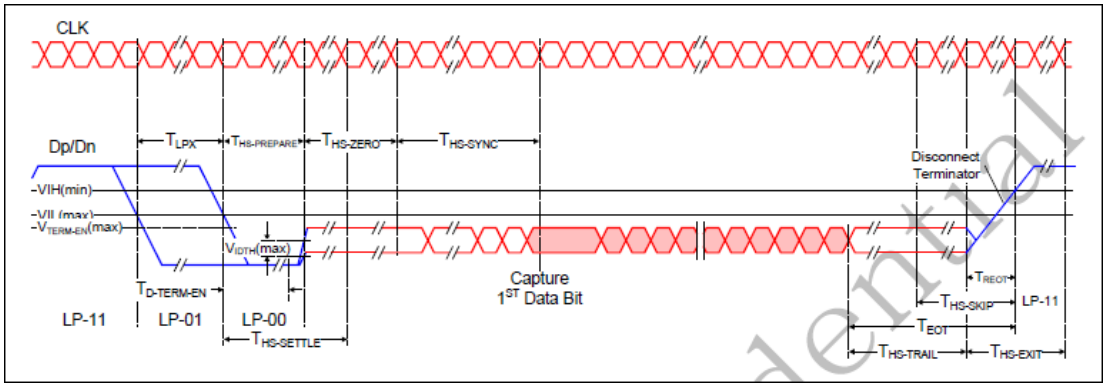
[Wake-up]



11. AC Timing Characteristics

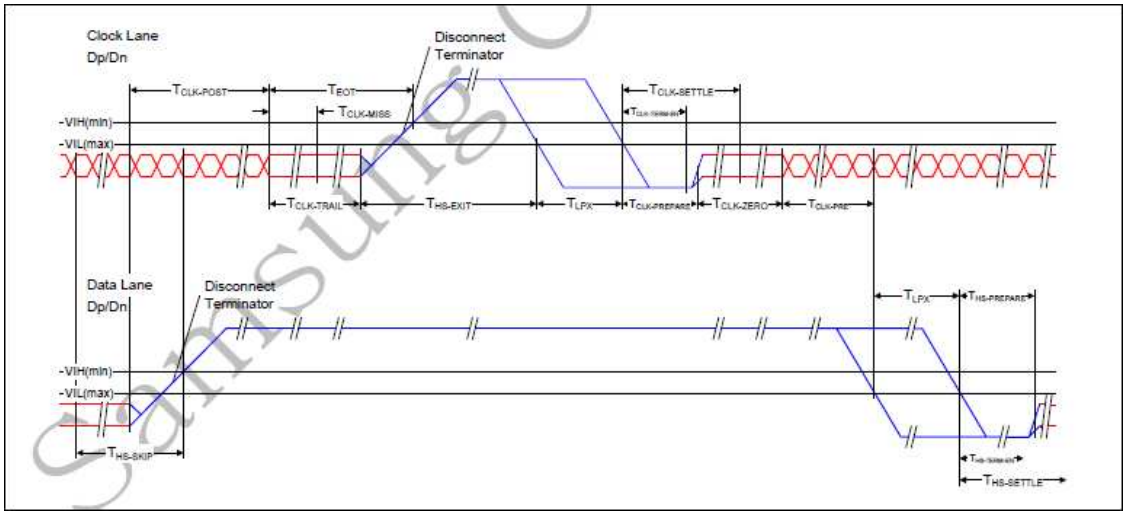
■ MIPI Interface

- The sequence of the high speed data transmission(Figure1)



- Figure 1 -

- The sequence of the high speed clock transmission(Figure 2).
- In high speed mode the clock lane provides a low-swing differential DDR clock signal from Master to slave for high speed data transmission.



- Figure 2 -

■ **Global Operating Timing Parameters**

Parameter	Description	Min.	Typ.	Max.	Unit	Note
$T_{CLK-MISS}$	Timeout for receiver to detect absence of Clock transitions and disable the Clock Lane HS–RX.			60	ns	(1, 6)
$T_{CLK-POST}$	Time that the transmitter continues to send HS clock after the last associated Data Lane has transitioned to LP Mode. Interval is defined as the period from the end of $T_{HS-TRAIL}$ to the beginning of $T_{CLK-TRAIL}$.	60ns + 52 × UI				
$T_{CLK-PRE}$	Time that the HS clock shall be driven by the transmitter prior to any associated Data Lane beginning the transition from LP to HS mode.	8			UI	(5)
$T_{CLK-PREPARE}$	Time that the transmitter drives the Clock Lane LP–00 Line state immediately before the HS–0 Line state starting the HS transmission.	38		95	ns	
$T_{CLK-SETTLE}$	Time interval during which the HS receiver shall ignore any Clock Lane HS transitions, starting from the beginning of $T_{CLK-PREPARE}$.	95		300		(6)
$T_{CLK-TERM-EN}$	Time for the Clock Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$.	Time for Dn to reach $V_{TERM-EN}$		38		
$T_{CLK-TRAIL}$	Time that the transmitter drives the HS–0 state after the last payload clock bit of a HS transmission burst.	60				(5)
$T_{CLK-PREPARE}$ + $T_{CLK-ZERO}$	$T_{CLK-PREPARE}$ + time that the transmitter drives the HS–0 state prior to starting the Clock.	300				
$T_{D-TERM-EN}$	Time for the Data Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$.	Time for Dn to reach $V_{TERM-EN}$		35ns + 4 × UI		(6)
T_{EOT}	Transmitted time interval from the start of $T_{HS-TRAIL}$ or $T_{CLK-TRAIL}$, to the start of the LP–11 state following a HS burst.			105ns + n × 12 × UI		(3, 5)
$T_{HS-EXIT}$	Time that the transmitter drives LP–11 following a HS burst.	100			ns	(5)
$T_{HS-PREPARE}$	Time that the transmitter drives the Data Lane LP–00 Line state immediately before the HS–0 Line state starting the HS transmission	40 ns + 4 × UI		85ns + 6 × UI		
$T_{HS-PREPARE}$ + $T_{HS-ZERO}$	$T_{HS-PREPARE}$ + time that the transmitter drives the HS–0 state prior to transmitting the Sync sequence.	145 ns + 10 × UI				

Parameter	Description	Min.	Typ.	Max.	Unit	Note
$T_{HS-SETTLE}$	Time interval during which the HS receiver shall ignore any Data Lane HS transitions, starting from the beginning of $T_{HS-PREPARE}$.	85ns + 6 × UI		145ns + 10 × UI		(6)
$T_{HS-SKIP}$	Time interval during which the HS–RX should ignore any transitions on the Data Lane, following a HS burst. The end point of the interval is defined as the beginning of the LP–11 state following the HS burst.	40		55ns + 4 × UI		
$T_{HS-TRAIL}$	Time that the transmitter drives the flipped differential state after last payload data bit of a HS transmission burst	max (n × 8 × UI, 60ns + n × 4 × UI)				(2, 3, 5)
T_{INIT}						
T_{LPX}	Transmitted length of any Low–Power state period	50			ns	(4, 5)
Ratio T_{LPX}	Ratio of T_{LPX}(MASTER)/T_{LPX}(SLAVE) between Master and Slave side	2/3		3/2		
T_{TA-GET}	Time that the new transmitter drives the Bridge state (LP–00) after accepting control during a Link Turnaround.	5 × TLPX			ns	(5)
T_{TA-GO}	Time that the transmitter drives the Bridge state (LP–00) before releasing control during a Link Turnaround.	4 × TLPX				
$T_{TA-SURE}$	Time that the new transmitter waits after the LP–10 state before transmitting the Bridge state (LP–00) during a Link Turnaround.	TLPX		2 × TLPX		
T_{WAKEUP}	Time that a transmitter drives a Mark–1 state prior to a Stop state in order to initiate an exit from ULPS.	1			ms	

NOTE:

1. The minimum value depends on the bit rate. Implementations should ensure proper operation for all the supported bit rates.
2. If a > b then max (a, b) = a otherwise max (a, b) = b
3. Where n = 1 for Forward–direction HS mode and n = 4 for Reverse–direction HS mode
4. T_{LPX} is an internal state machine timing reference. Externally measured values may differ slightly from the specified values due to asymmetrical rise and fall times.
5. Transmitter–specific parameter
6. Receiver–specific parameter

12. Quality Level

12-1. Environment Condition

The environmental conditions for inspection shall be as follows.

① Temperature & Humidity

Room temperature : 22 ± 3℃

Humidity : 65 ± 20%RH

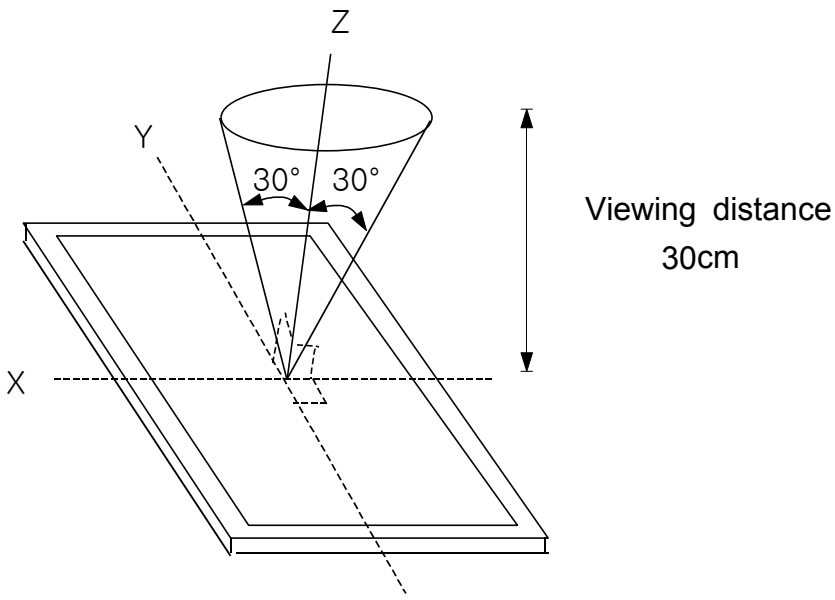
② Viewing distance : 30 ± 5cm

Viewing angle(tolerance) : 90° ± 30°

③ Ambient light

Display visual inspection : 150±50 lux

Cosmetic inspection : 800~1200 lux



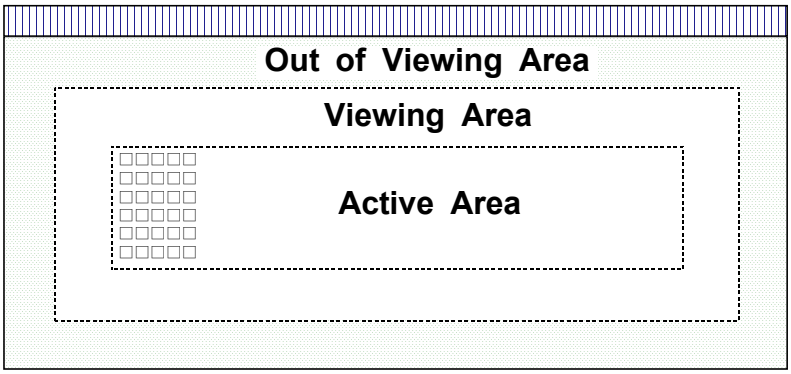
12-2. Sampling Procedures for each item's acceptance table

Defect type	Sampling Procedures	AQL
Major Defect	MIL-STD-105D Inspection level Ⅰ normal inspection single sample inspection	0.65
Minor Defect	MIL-STD-105D Inspection level Ⅰ normal inspection single sample inspection	1.5

① Major defect
: A major defect refers to a defect which may substantially degrade usability for product applications.

② Minor defect
: A minor defects refers to a defect which is not considered to substantially degrade product application,or a defect which deviates from existing standards almost unrelated to the effective use of the product or its operation.

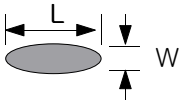
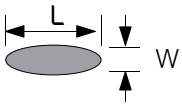
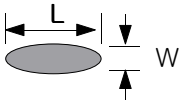
③ Display visual defect application zone : Viewing Area

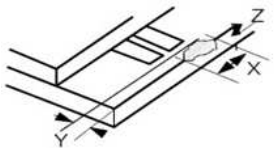
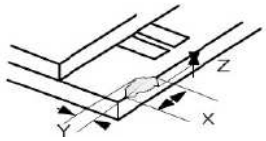
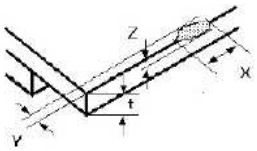
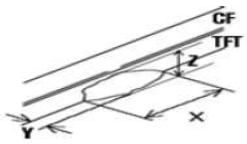


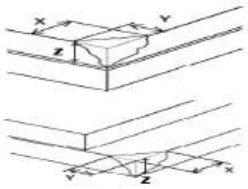
- Display visual defect in "Out of View Area" Zone should not be judged.

Note) The viewing area of AMS767KC04 is all front window area.

12-3. Cosmetic defect(OLED)

<table>
<tr><th>No.</th><th>Item</th><th>Criterion for Defects</th><th>Defect type</th></tr>
<tr><td>1</td><td>No Display</td><td>Disallowance</td><td>Major</td></tr>
<tr><td>2</td><td>Irregular operating</td><td>Disallowance</td><td>Major</td></tr>
<tr><td>3</td><td>Line defect</td><td>Disallowance (Vertical line/ Horizontal line / Periodical line)</td><td>Major</td></tr>
<tr><td>4</td><td>Bright Dot
Dark Dot</td><td>
<table>
<tr><th>구 분</th><th>Acceptable number</th></tr>
<tr><td>Bright DOT</td><td>0</td></tr>
<tr><td>Dark DOT</td><td>3</td></tr>
</table>
※ Dark dots shall be counted on a pure R,G,B pattern
※ dark dot Distance > 20mm
</td><td>Minor</td></tr>
<tr><td>5</td><td>Polarizer:
(S/C,line particle)
 
Ø=(L+W)/2</td><td>
<table>
<tr><th>Width (mm)</th><th>Length (mm)</th><th>Acceptable number</th></tr>
<tr><td>W ≤ 0.03</td><td>Ignore</td><td>Ignore</td></tr>
<tr><td rowspan="2">0.03 < W ≤ 0.05</td><td>L ≤ 2.0</td><td>Ignore</td></tr>
<tr><td>2.0 < L ≤ 5.0</td><td>2</td></tr>
<tr><td rowspan="2">0.05 < W ≤ 0.08</td><td>L ≤ 1.0</td><td>Ignore</td></tr>
<tr><td>1.0 < L ≤ 5.0</td><td>2</td></tr>
<tr><td>0.08 < W</td><td colspan="2">considered as spot particle</td></tr>
</table>
※ Maximum Acceptable number : 2
</td><td>Minor</td></tr>
<tr><td>6</td><td>Polarizer:
(Dent, bubble)
 
Ø=(L+W)/2</td><td>
<table>
<tr><th>Size (mm)</th><th>Acceptable number</th></tr>
<tr><td>Ø ≤ 0.20</td><td>Ignore</td></tr>
<tr><td>0.20< Ø ≤ 0.30</td><td>5</td></tr>
<tr><td>0.30< Ø</td><td>0</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>7</td><td>Foreign material
(Pol.~Window)
(Judge area:V/A)
 
Ø=(L+W)/2</td><td>
<table>
<tr><th>Size [mm]</th><th>Acceptable number</th></tr>
<tr><td>Ø ≤ 0.10</td><td>Ignore</td></tr>
<tr><td>0.10 < Ø ≤ 0.2</td><td>4</td></tr>
<tr><td>0.20 < Ø</td><td>0</td></tr>
</table>
※ Maximum Acceptable number : 6
(include window foreign material)
</td><td>Minor</td></tr>
<tr><td>8</td><td>Display Mura</td><td>Judged by confirmed limit samples.</td><td>Minor</td></tr>
<tr><td>9</td><td>Window stain
(front)</td><td>Front side window stain disregard when it can clean by using soft cloth and wiping gently.</td><td>Minor</td></tr>
<tr><td>10</td><td>Window stain,
foreign material
(rear side)</td><td>Rear side window stain and foreign material disregard when it can't see front side.</td><td>Minor</td></tr>
</table>

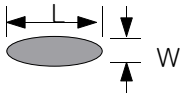
<table>
<tr><th>No.</th><th>Item</th><th>Criterion for Defects</th><th>Defect type</th></tr>
<tr><td>11</td><td>OLED PAD
Chipping
(Pattern area)</td><td> 
<table>
<tr><th>Z</th><th>X</th><th>Y</th></tr>
<tr><td>≤ t</td><td>≤ 5.0mm</td><td>≤ 0.4mm</td></tr>
</table></td><td>Minor</td></tr>
<tr><td>12</td><td>OLED PAD
Chipping
(No pattern area)</td><td> 
<table>
<tr><th>Z</th><th>X</th><th>Y</th></tr>
<tr><td>≤ t</td><td>≤ 5.0mm</td><td>≤ 0.5mm</td></tr>
</table></td><td>Minor</td></tr>
<tr><td>13</td><td>OLED PAD
Chipping
(PAD rear side)</td><td> 
<table>
<tr><th>Z</th><th>X</th><th>Y</th></tr>
<tr><td>≤ t</td><td>≤ 5.0mm</td><td>≤ 0.6mm</td></tr>
</table></td><td>Minor</td></tr>
<tr><td>14</td><td>OLED Chipping
(No pad area)</td><td> 

<table>
<tr><th>Z</th><th>X</th><th>Y</th></tr>
<tr><td>≤ t</td><td>≤ 2.0mm</td><td>≤ 0.5mm</td></tr>
</table></td><td>Minor</td></tr>
<tr><td>15</td><td>OLED Chipping
(Corners)</td><td> 
<table>
<tr><th>Z</th><th>X</th><th>Y</th><th>Area</th></tr>
<tr><td rowspan="2">≤ t</td><td>≤ 1.0mm</td><td>≤ 1.0mm</td><td>No pad area</td></tr>
<tr><td>≤ 2.0mm</td><td>≤ 1.2mm</td><td>Pad area</td></tr>
</table></td><td>Minor</td></tr>
<tr><td>16</td><td>FPC</td><td>1. Not to effect to function, reliability and quality
2. Crack : Disallowed
3. Dent : Disallowed if Cu layer is exposed
4. Scratch : Disallowed if Cu layer is exposed
5. Dimple : Ignore "U" type
6. Oxidation : Disallowed if color is changed by oxidation
7. Folding : Disallowed having angle</td><td>Minor</td></tr>
</table>

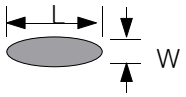
12-4. Window appearance defect

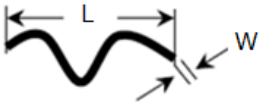
■ Inspection Condition

1) Light source : D65, Bar type 1 Lamp
2) Ambient light intensity : 800 ~ 1200 lux
3) Inspection distance : 30cm ± 5cm
4) Inspection angle : 90° ± 30° (Front side only)
5) Inspection mode : Reflective only (No backlight)
6) Inspection time : 10sec ± 5sec (It is considered with defect items)
7) Inspection method : Naked eyes
8) Background Color : Black only

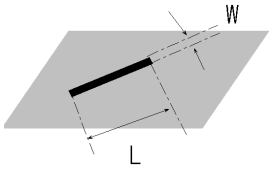
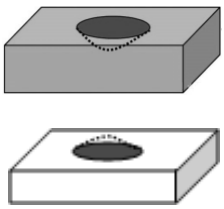
<table>
<tr><th>No.</th><th>Item</th><th>Criterion for Defects</th><th>Inspection method/type</th></tr>
<tr><td>1</td><td>Black/White Spots
(Foreign Material)
(V/A Area)
 

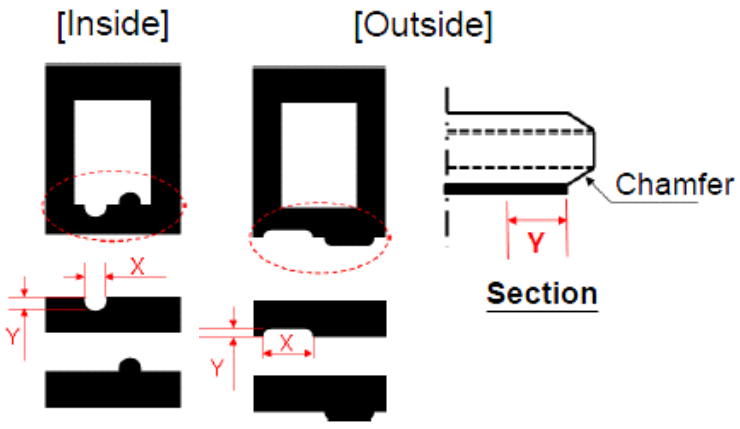
Ø=(L+W)/2</td><td>
<table>
<tr><th>Size Ø (mm)</th><th>Acceptable number</th></tr>
<tr><td>Ø ≤ 0.10</td><td>Ignore</td></tr>
<tr><td>0.10＜Ø≤0.20</td><td>4ea</td></tr>
<tr><td>0.20＜Ø</td><td>0ea</td></tr>
</table>
(In case a foreign material is removed with a soft cloth, it is ignored)

※ Maximum Acceptable number : 6
(include POL foreign material)
</td><td>Front reflection/ Minor</td></tr>
<tr><td>2</td><td>Black/White Spots
(Foreign Material)
(B/M Area)
 

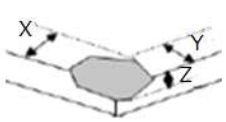
Ø=(L+W)/2</td><td>
<table>
<tr><th colspan="2">BLACK</th><th colspan="2">WHITE</th></tr>
<tr><th>Size Ø (mm)</th><th>Acceptable number</th><th>Size Ø (mm)</th><th>Acceptable number</th></tr>
<tr><td>Ø ≤ 0.15</td><td>Ignore</td><td>Ø ≤ 0.15</td><td>Ignore</td></tr>
<tr><td>0.15＜Ø≤0.25</td><td>2ea</td><td>0.15＜Ø≤0.20</td><td>2ea</td></tr>
<tr><td>0.25＜Ø</td><td>0ea</td><td>0.2＜Ø</td><td>0ea</td></tr>
</table>
- Maximum Acceptable number (only window) : 2ea
(In case a foreign material is removed with a soft cloth, it is ignored)
</td><td>Front reflection/ Minor</td></tr>
<tr><td>3</td><td>Line-shaped
foreign material
 
</td><td>
<table>
<tr><th>Width (㎜)</th><th>Length (㎜)</th><th>Acceptable number</th></tr>
<tr><td>W≤0.03</td><td>Ignore</td><td>Ignore</td></tr>
<tr><td rowspan="2">0.03＜W≤0.06</td><td>L≤2.0</td><td>Ignore</td></tr>
<tr><td>L≤5.0</td><td>3ea</td></tr>
<tr><td>0.06＜W</td><td>Apply to spot spec. (#1,2)</td><td>Apply to spot spec.(#1,2)</td></tr>
</table>
(In case a foreign material is removed with a soft cloth, it is ignored)

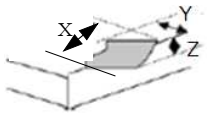
※ Maximum Acceptable number : 5
(include POL line-shaped foreign material)
</td><td>Front reflection/ Minor</td></tr>
</table>

<table>
<tr>
<td>4</td>
<td>Scratch
 
</td>
<td>
<table>
<tr><th>Width (㎜)</th><th>Length (㎜)</th><th>Acceptable number</th></tr>
<tr><td>W≤0.03</td><td>Ignore</td><td>Ignore</td></tr>
<tr><td rowspan="2">0.03＜W≤0.06</td><td>L≤2.0</td><td>Ignore</td></tr>
<tr><td>2.0 ＜ L≤7.0</td><td>2ea</td></tr>
<tr><td>0.06＜W</td><td>Apply to spot spec. (#1,2)</td><td>Apply to spot spec. (#1,2)</td></tr>
</table>
※ Maximum Acceptable number : 4
(include POL scratch)
</td>
<td>Front reflection/ Minor</td>
</tr>
<tr>
<td>5</td>
<td>Dent / Bubble
 

Ø=(L+W)/2</td>
<td>
<table>
<tr><th colspan="2">V/A Area</th><th colspan="2">B/M Area</th></tr>
<tr><th>Size Ø (mm)</th><th>Acceptable number</th><th>Size Ø (mm)</th><th>Acceptable number</th></tr>
<tr><td>Ø ≤ 0.15</td><td>Ignore</td><td>Ø ≤ 0.15</td><td>Ignore</td></tr>
<tr><td>0.15＜Ø≤0.25</td><td>1ea</td><td>0.15＜Ø≤0.25</td><td>1ea</td></tr>
<tr><td>0.25＜Ø</td><td>0ea</td><td>0.25＜Ø</td><td>0ea</td></tr>
</table>
</td>
<td>Front reflection/ Minor</td>
</tr>
<tr>
<td>6</td>
<td>Printing Defect</td>
<td>
Inside of printing
<table>
<tr><th>Size Ø (mm)</th><th>Acceptable number</th></tr>
<tr><td>Ø ≤ 0.15</td><td>Ignore</td></tr>
<tr><td>0.15＜Ø≤0.30</td><td>2ea</td></tr>
<tr><td>0.30＜Ø</td><td>0ea</td></tr>
</table>
Outside of printing
<table>
<tr><th>Size Ø (mm)</th><th>Acceptable number</th></tr>
<tr><td>Y ≤ 0.1</td><td>Ignore</td></tr>
<tr><td>X≤4.0, 0.1<Y≤0.15</td><td>1ea</td></tr>
<tr><td>4.0<X or 0.15<Y</td><td>0ea</td></tr>
</table>


※ X : Defect length, Y : Defect depth
</td>
<td>Front reflection/ Minor</td>
</tr>
</table>

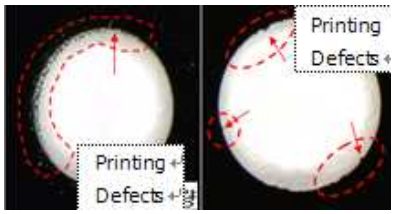
<table>
<tr>
<td>7</td>
<td>Chipping</td>
<td>


Corner-Area


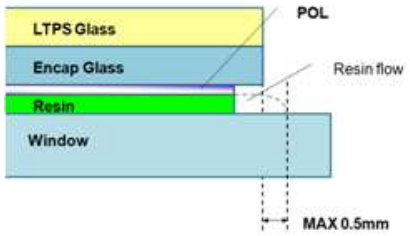
Side-Area
<table>
<tr><th>Location</th><th colspan="2">X</th><th>Y</th><th>Z</th><th>Acceptable number</th></tr>
<tr><td>Front</td><td colspan="2">Ø<0.15</td><td></td><td>Z≤1/2t</td><td>Ignore</td></tr>
<tr><td>Side/Corner/Bottom</td><td colspan="2">X≤1.0</td><td>Y≤0.16</td><td>Z≤1/2t</td><td>1ea</td></tr>
</table>
Acceptable number of Side/Corner/Bottom is applied per each side

※ All area Ø<0.15, Z≤1/2t : Ignore (Ø=(X+Y)/2)
</td>
<td>Front reflection/ Minor</td>
</tr>
<tr>
<td>8</td>
<td>LED hole area defect</td>
<td>


<table>
<tr><th>Item</th><th>Size Ø (mm)</th><th>Acceptable number</th></tr>
<tr><td>Pin hole</td><td>Ø ≤ 0.15</td><td>1ea</td></tr>
<tr><td rowspan="2">Black foreign material</td><td>Ø ≤ 0.1</td><td>Ignore</td></tr>
<tr><td>0.1<Ø≤0.15</td><td>1ea</td></tr>
<tr><td rowspan="2">Abnormal color stain</td><td>Ø ≤ 0.15</td><td>Ignore</td></tr>
<tr><td>0.15<Ø</td><td>0ea</td></tr>
</table>
※ Acceptable number is applied per each hole
</td>
<td>Front reflection/ Minor</td>
</tr>
<tr>
<td>9</td>
<td>Camera hole defect</td>
<td>
Foreign material, stain, scratch, printing defects
1) Disallowed at camera hole center area
2) Allowed at edge area printing face : within 0.2㎜

</td>
<td>Front reflection/ Minor</td>
</tr>
<tr>
<td>10</td>
<td>Surface contamination</td>
<td>There should be no surface contamination which can not be removed when being cleaned with a soft cloth.</td>
<td>Front reflection/ Minor</td>
</tr>
</table>

11	Cushion sheet bubble / dent	If it can't be seen at the front side and it's not affect the function : allowed	Minor
12	Window Cover window (protect film)	Cover film shall not be located out of the window area. Cover film shall not be torn, made a hole	Minor
13	Resin Cleaning & Flow	 - It's allowed stain of resin cleaning	Major

13. Reliability

13-1. Test item

◎ **All test result of items should be judged in 2 hours recovery time at room temperature.**

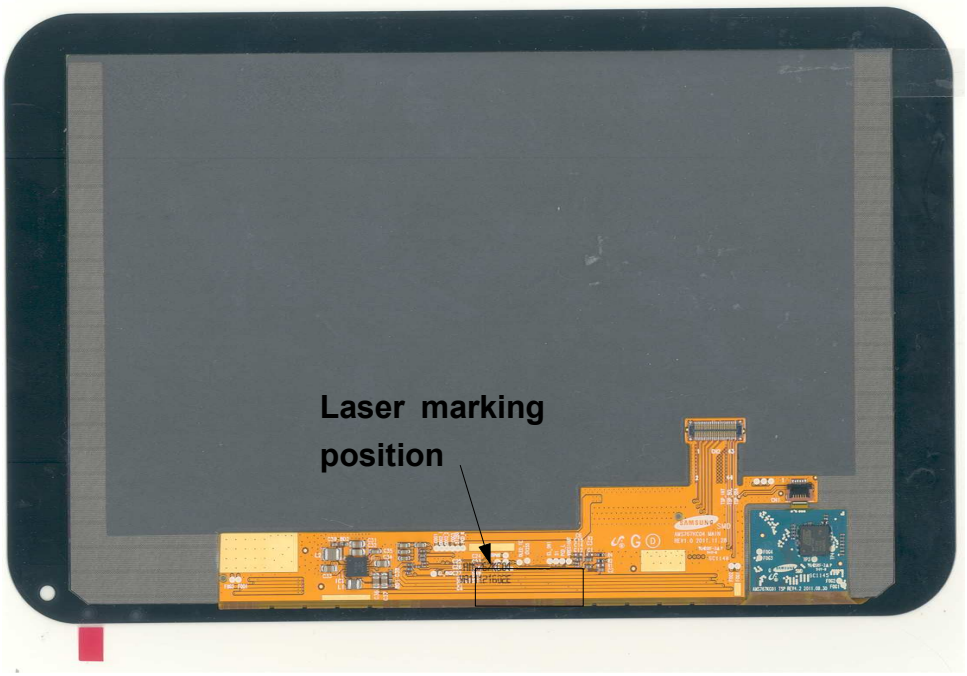
◎ **SMD can guarantee the quality at the below test item.**

◎ **After test WHTS, SMD can only guarantee the driving function.**

No	Item	Condition	Qty.	Judgment Criterion
1	High Temperature Operation	70℃ 256hours	6	- After testing, Cosmetic defects should not happen. - After testing, the defective of brightness should be less than 40% of the initial value. - After testing, total current consumption should be in the range of initial Spec. - After testing, color coordinate value should be in the range of initial Spec.
2	High Temperature Storage	85℃ 256hours	6	
3	Low Temperature Operation	-20℃ 256hours	6	
4	Low Temperature Storage	-40℃ 256hours	6	
5	High Humidity Operation	60℃ 93%RH 256hours	6	
6	Wet Humidity temperature Storage	85℃ 85%RH 256hours	6	
7	Temperature Cycle	-40/85℃ 30 minute 50Cycle	6	
8	ESD (Contact)	± 8㎸, 150pF/330Ω, Center, 2 times (Non-operation)	3	-In case of malfunction defect caused by ESD damage,if it would be recovered to normal state after resetting, it would be judged as a good part. - After testing, H/W fail should not happen
9	ESD (Air)	± 15㎸, 150pF/330Ω, Center, 2 times (Non-operation)	3	
10	Vibration Test (Packing)	Random, 1.047Grms, 6~200Hz Z:60min, X,Y each 30min	30	- After testing,cosmetic and electrical defects should not happen

14. Module laser marking

14.1 laser marking position on AMOLED Module



14.2 laser marking format

- 10 digits marking on the back side of AMOLED module

D	A	10	05	28	A	0
①	②	③	④	⑤	⑥	⑦

① Module Site
→ K (SEC), V (Voda), I (IDS Korea), Z(BK), C (DTC), T (Intelligent),
H (IDS, China), L (E-Litecom), D (DSMD), J (CSMD), M (SM HITECH)

② Production Shift

③ Year : 10(2010), 11(2011)

④ Month : 01(January), 02(February), 03(March)

⑤ Day

⑥ ASS'Y LINE

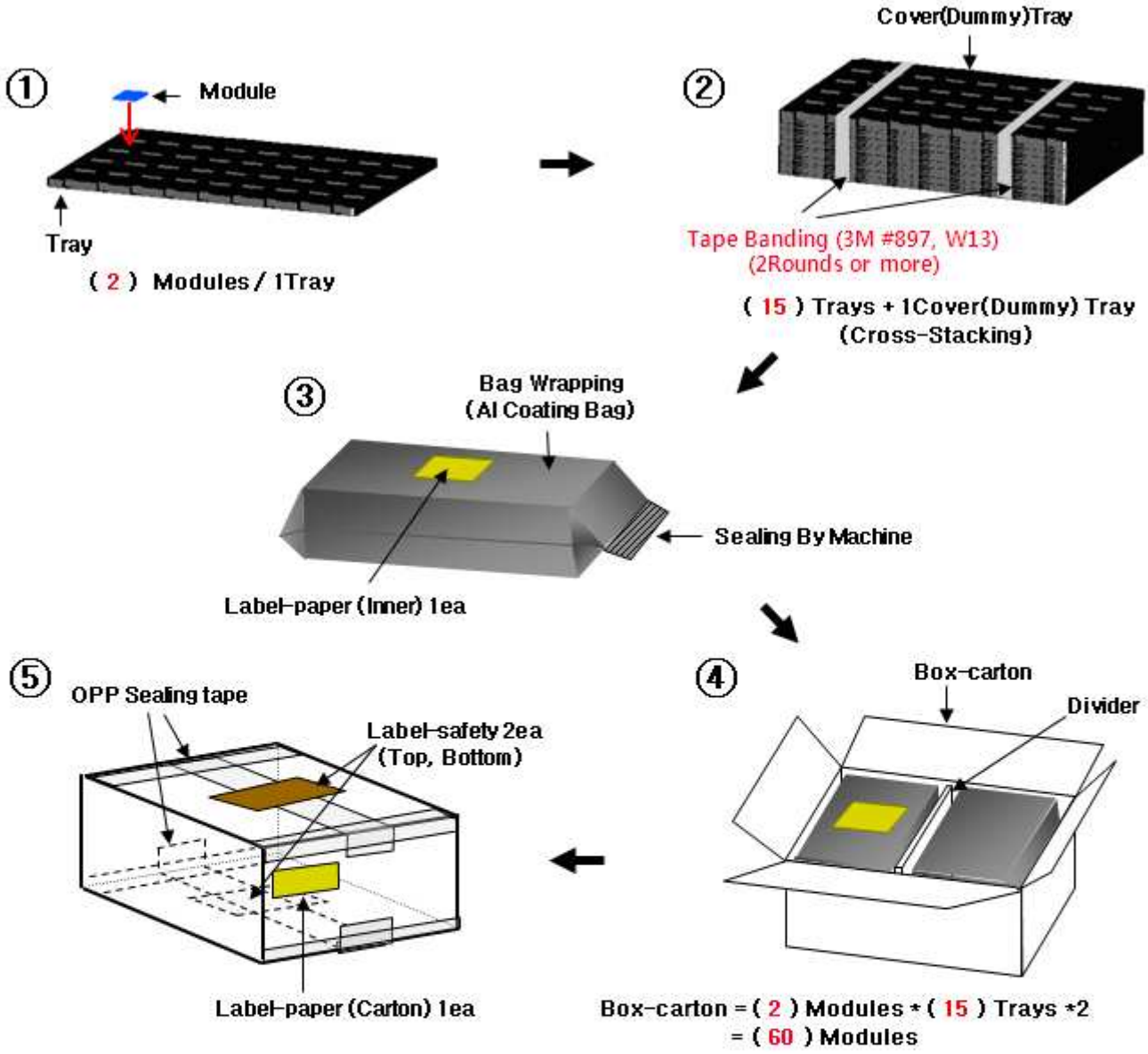
⑦ SAMPLE STAGE
→ W (Working Sample), E (Engineering Sample),
O (Customer Sample & Mass Production)

14.3 Cover glass(Cushion sheet) protection film removing method

- Grip ① point, and remove follow arrow.

15. Packing Drawing

15.1 Box Pack



Note

(1) Total :Box-carton approx. : (11.4)kg

(2) Size : 583(L) x 388(W) x 210(H)

(3) Place the Module in the tray facing the active area direction.

(4) Stack the trays and cover (dummy) tray.

(5) Resistance of tray surface : 10^6~$10^9\Omega$

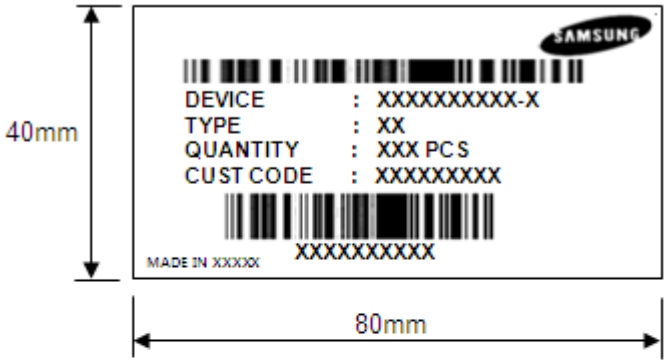
(6) Wrap the Al coating bag by packing machine and affix the Label-Paper on Bag

(7) Put the bag in the Box-carton .

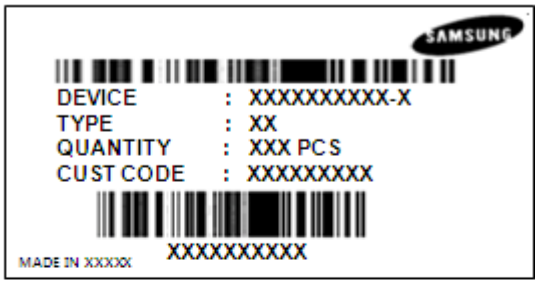
(8) Seal the Box-carton and affix the Label-safety & Label-paper.

15-2. Label

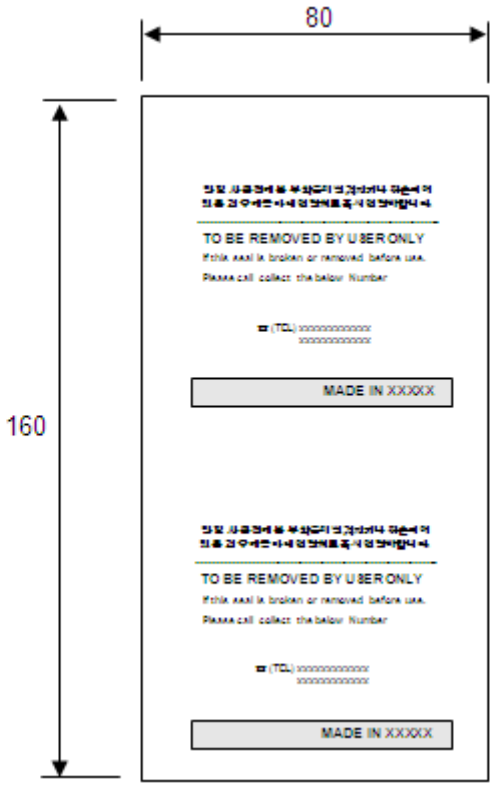
* Label-paper (Inner)



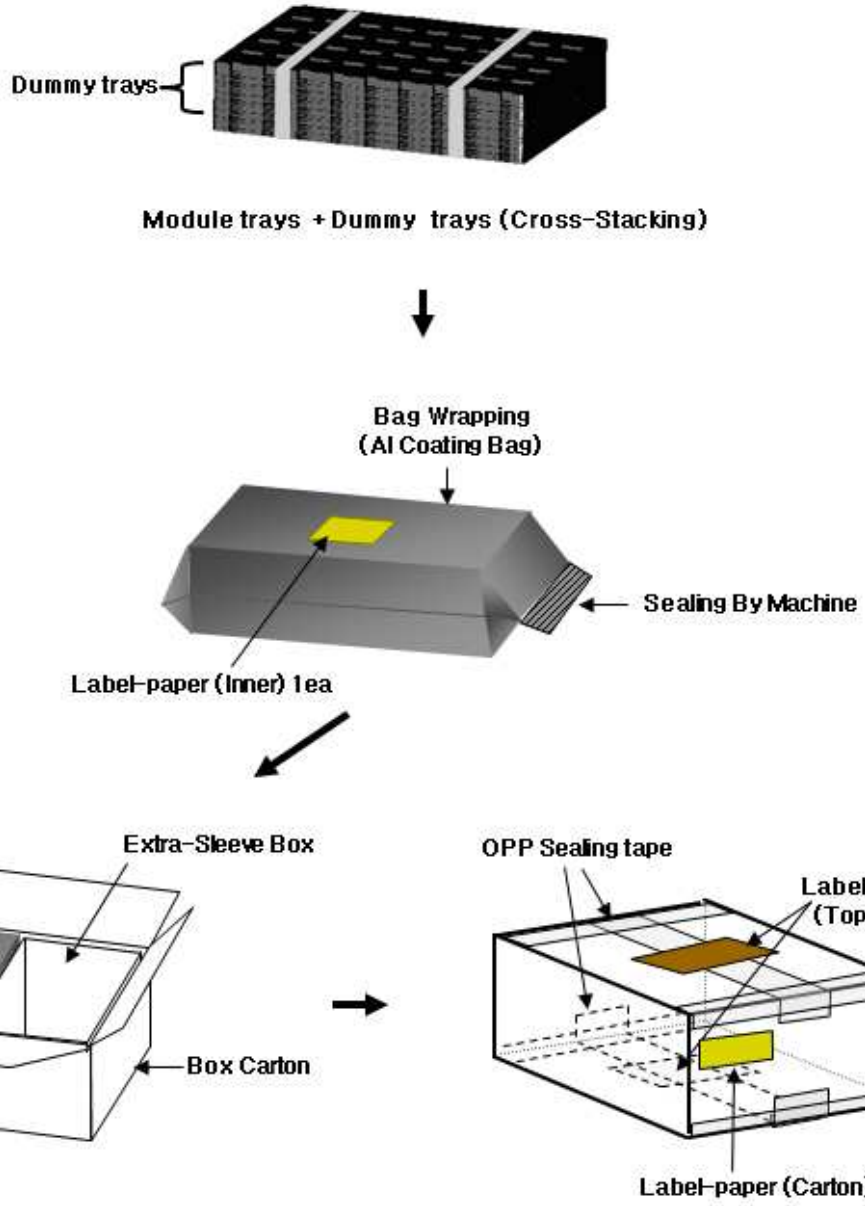
* Label-paper (Carton)



* Label-safety



15-3. Packing for small Quantities

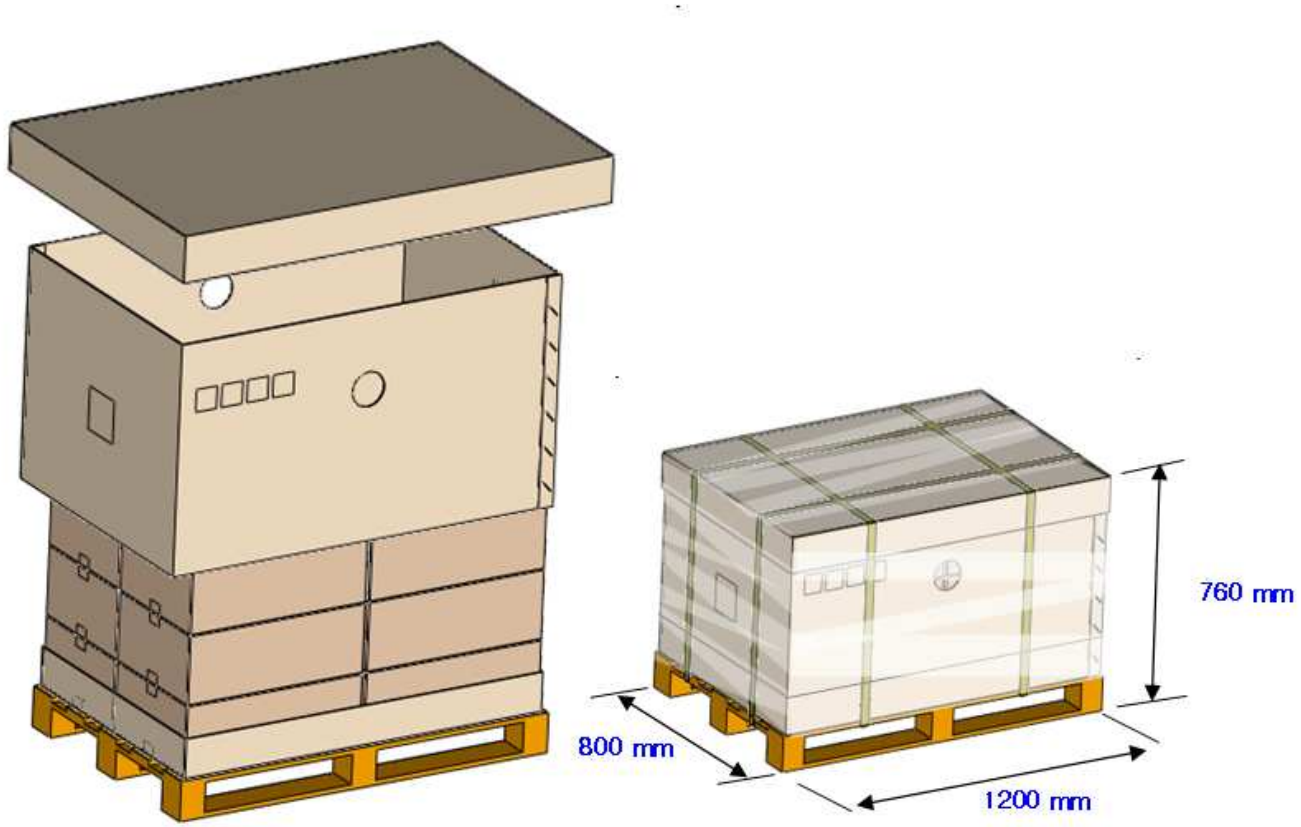


Note

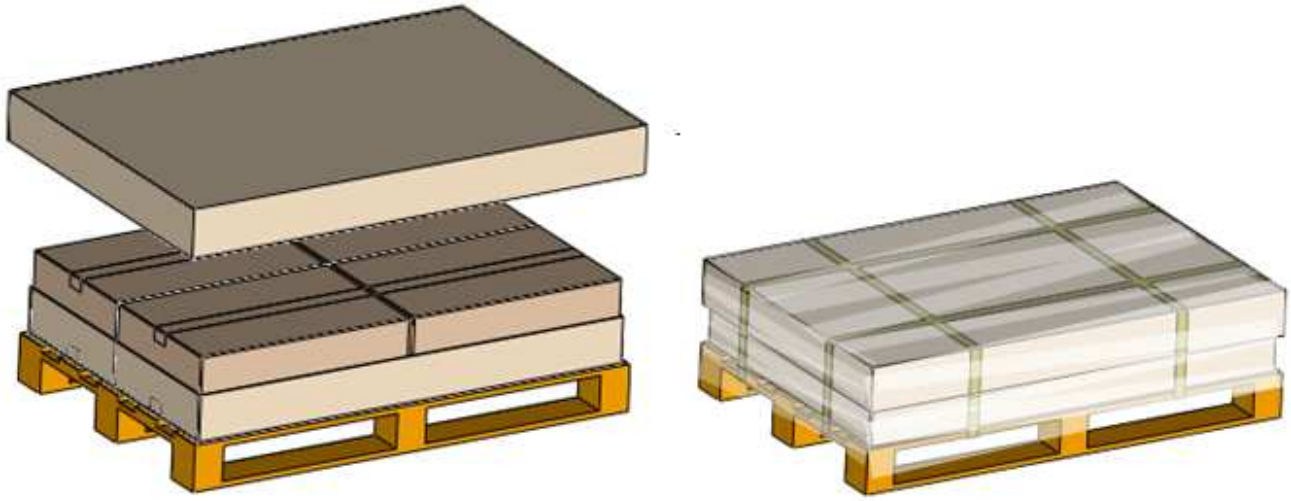
(1) When package quantity is small, Modules containing trays are stacked the bottom, and dummy trays are stacked at the top of package, then wrap the Al coating bag by packing machine machine and affix the Label-Paper on Bag. Put the Bag in the Box-carton. Seal the Box-carton and affix the Label-safety & Label-Paper.

(2) When only one tray bag(Packing bag) is available, dummy box is inserted into the vacant space

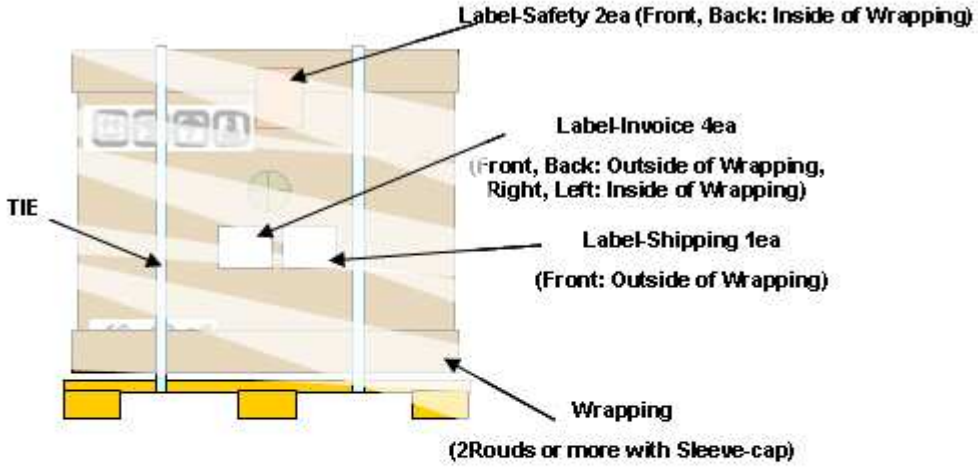
15-4. Over pack



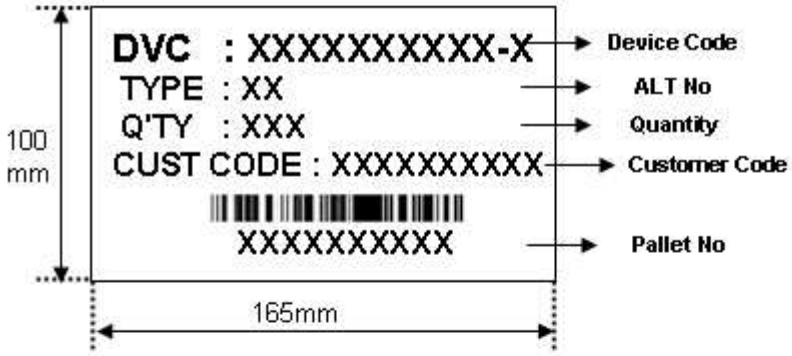
15-5. Packing for small Quantities



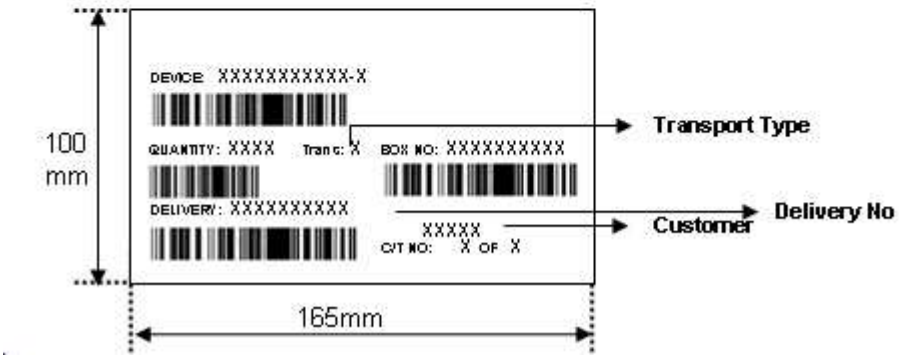
15-6. Over pack Attach



* Label-invoice



* Label-shipping



* Reference Image (Except Label and Wrap)

Carton Box	
Sleeve Box	

16. Handling Precautions

16-1. Mounting Method

The AMOLED+TSP+Window of SAMSUNG Mobile Display CO.,LTD. module consists of two slim glasses with polarizer which can easily get damaged. Since the module is constructed as to be fixed by utilizing fitting holes in the printed circuit board. Extreme care should be used when handling the AMOLED modules.

16-2. Caution of AMOLED Handling and Cleaning

When cleaning the display surface, use soft cloth solvent as recommended below and wipe gently.

◎ Isopropyl alcohol
◎ Ethyl alcohol
◎ Trichlorotriflorothane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface. Do not use the following solvent.

◎ Water
◎ Ketone
◎ Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns.
Do not use the following solvent on the pad and prevent it from being contaminated.

◎ HCFC
◎ Soldering flux
◎ Chlorine(Cl), Sulfur(S)
◎ Spittle, Fingerprint

If the product is not wrapped with a desiccant added pad, ITO pattern can be damaged by corrosion. SAMSUNG Mobile Display CO,.LTD. suggests wrapping a product with a desiccant unless customers particularly indicate that they do not want it. In case ITO pattern corrodes due to the usage of chlorine, sulfur or customer's mishandling of the product, the responsibility lies with the customer.

16-3. Caution Against Static Charge

For AMOLED module, use C-MOS LSI drivers, therefore we recommend that you ;
Connect any unused input terminal to VDD or VSS, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity. It could occur static electricity when taping off the film which protects AMOLED.
Against static charge, you should make sure that the product is safe or not by experiment in advance.

16-4. Packing

◎ The packing principle is that AMOLED module should keep its packing condition at the time of delivery. When storing the AMOLED after unpacking, note the followings.

◎ AMOLED module is consisted of GLASS and assemblies. It should avoid pressure, strong impact, and being dropped from a height.

◎ To prevent modules from degradation, do not operate or store them in a place where they are directly exposed to sunlight or high temperature/humidity.

◎ To keeping safe quality from outer exposure or contamination, modules should be consumed within 2 months after unpacking.

16-5. Caution for Operation

◎ If you do not follow normal POWER ON , OFF sequence or abnormal operating, then AMOLED module can be damaged Electro-optically and does not recover.

◎ Response time may extremely delay at a temperature lower than operating range, AMOLED does not normally operate at a high temperature. But this may recover at a proper temperature.

◎ When you set optimal operating voltage to AMOLED module, you can see the optimal contrast of AMOLED. So, add voltage controllable function at SET Module.

◎ AMOLED module may not display normally when twisting power or pressing power is added. Therefore you should secure AMOLED module maximum thickness at set assembly not to have any pressure affect AMOLED module.

◎ Electro-chemical reaction may occur when there is humidity on pad, therefore, you should use AMOLED Module below maximum operating humidity.

◎ AMOLED Module Power Vdd should be designed to protect surge current at SET Module.

◎ You should not damage connector and cable for AMOLED module assembly by force folding or by applying extreme power.

◎ AMOLED may not display normally when it is interfered by surrounding elements, therefore you should consider setting design not to damage AMOLED module by surrounding elements.

◎ To satisfy EMI standards, you should plan your design after considering emitting energy.

◎ We can not guarantee display characteristics outside viewing area, therefore your set window should be fixed into viewing area.

◎ Image-sticking may occur if AMOLED displays same image for a long time, so you need to make a pattern change for AMOLED.

16-6. Storage

◎ Place in a dark place where neither exposure to direct sunlight or any fluorescent light is permitted and keep at room temperature & room humidity.

◎ Store with no contact with polarizer surface.

[It is recommended to store them as they have been contained in the inner container when we delivered them.

◎ This AMOLED product must be stored in the range of temperature and Humidity as defined in this approval data sheet.

◎ This AMOLED product must not exposed in the direct sunlight,strong ultraviolet light or fluorescent lamp and be stored in the dark condition

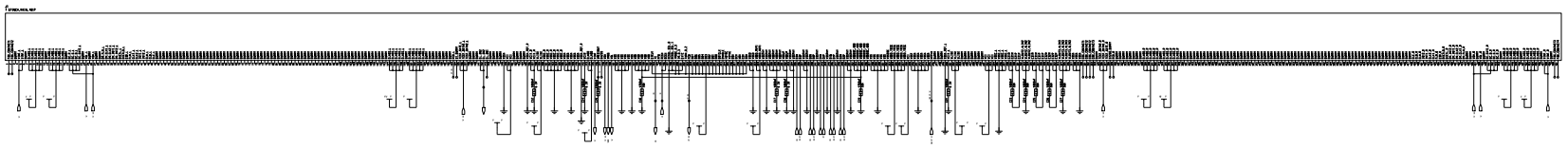
16-7. Safety Precautions

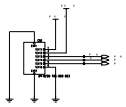
◎ Disassembly or modification may cause electric shock, damages to sensitive part inside of the AMOLED module, dust adhesion, or scratches on the display part.
◎ In the event that the contents of AMOLED module are on skin, wipe them with a paper towel or gauge and wash the part well, and receive medical attention if necessary.
◎ Do not use the AMOLED module for the Special purpose besides display units.
◎ Be careful of the glass chips that may cause injury to fingers of skin, when the display part is broken.

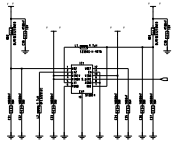
16-8. Precautions before Use

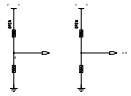
You should discuss the following case with SAMSUNG Mobile Display CO.,LTD.
◎ in case of any questions about contents of this "Specification For Approval".
◎ in case of occurring new problems not mentioned at this "Specification For Approval".
◎ in case of your request about income inspection Specification change.
◎ in case of occurring new problem at your driving test.

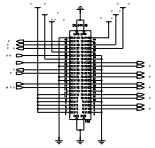
※ **If SMD has to change the conditions specified in the specification, previously the negotiation shall be held and decided.**











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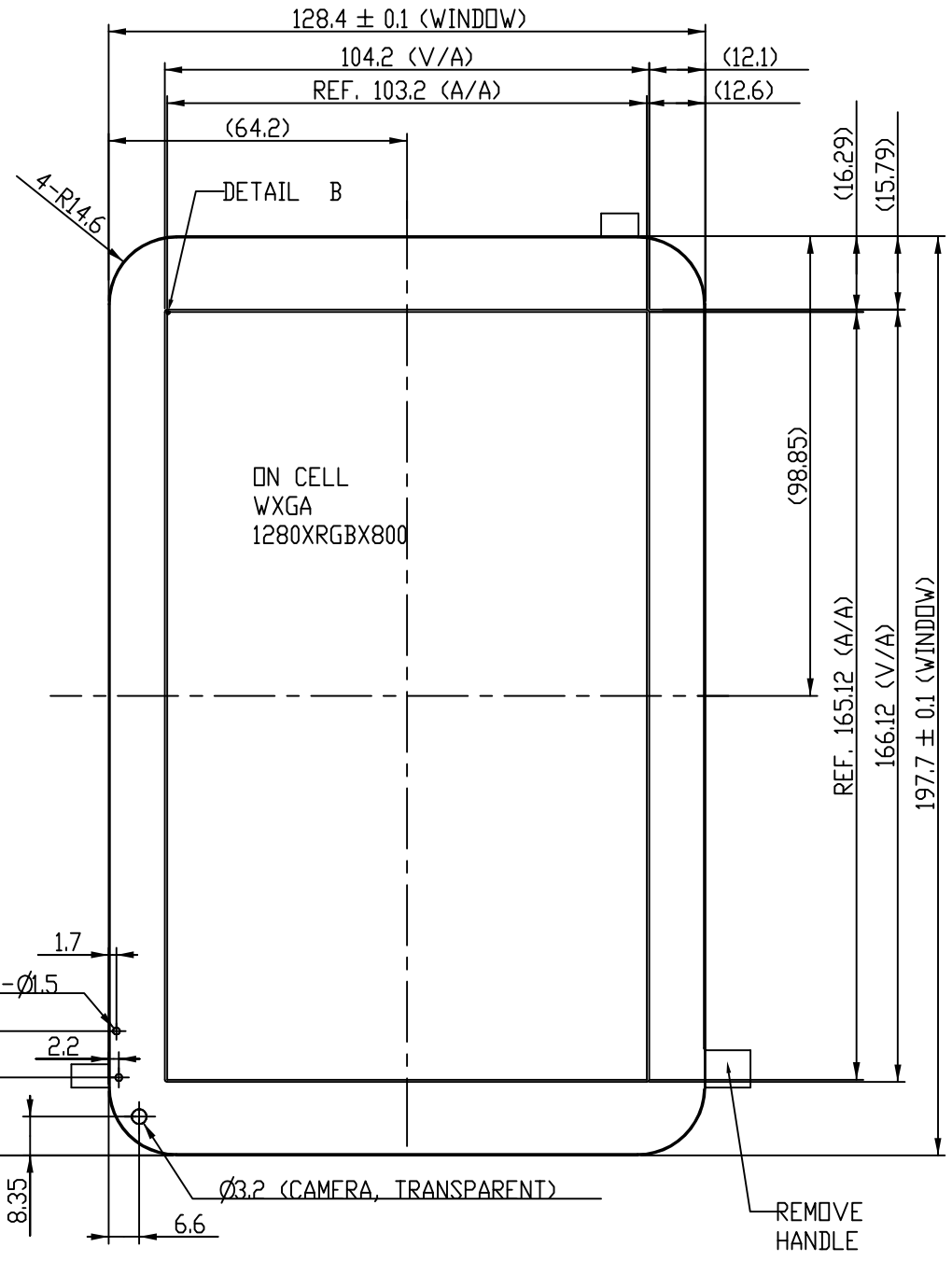
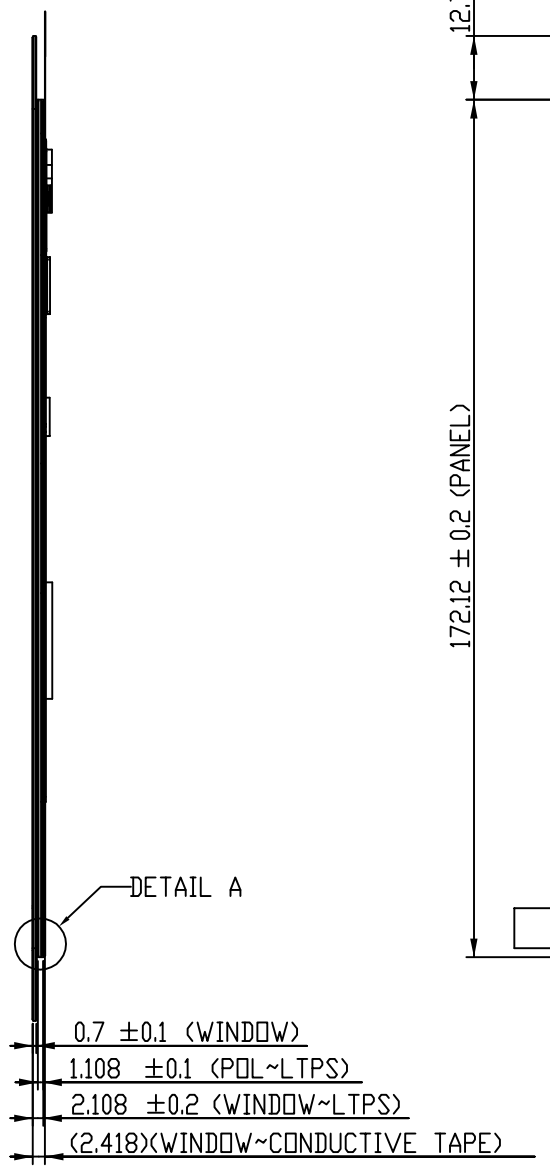
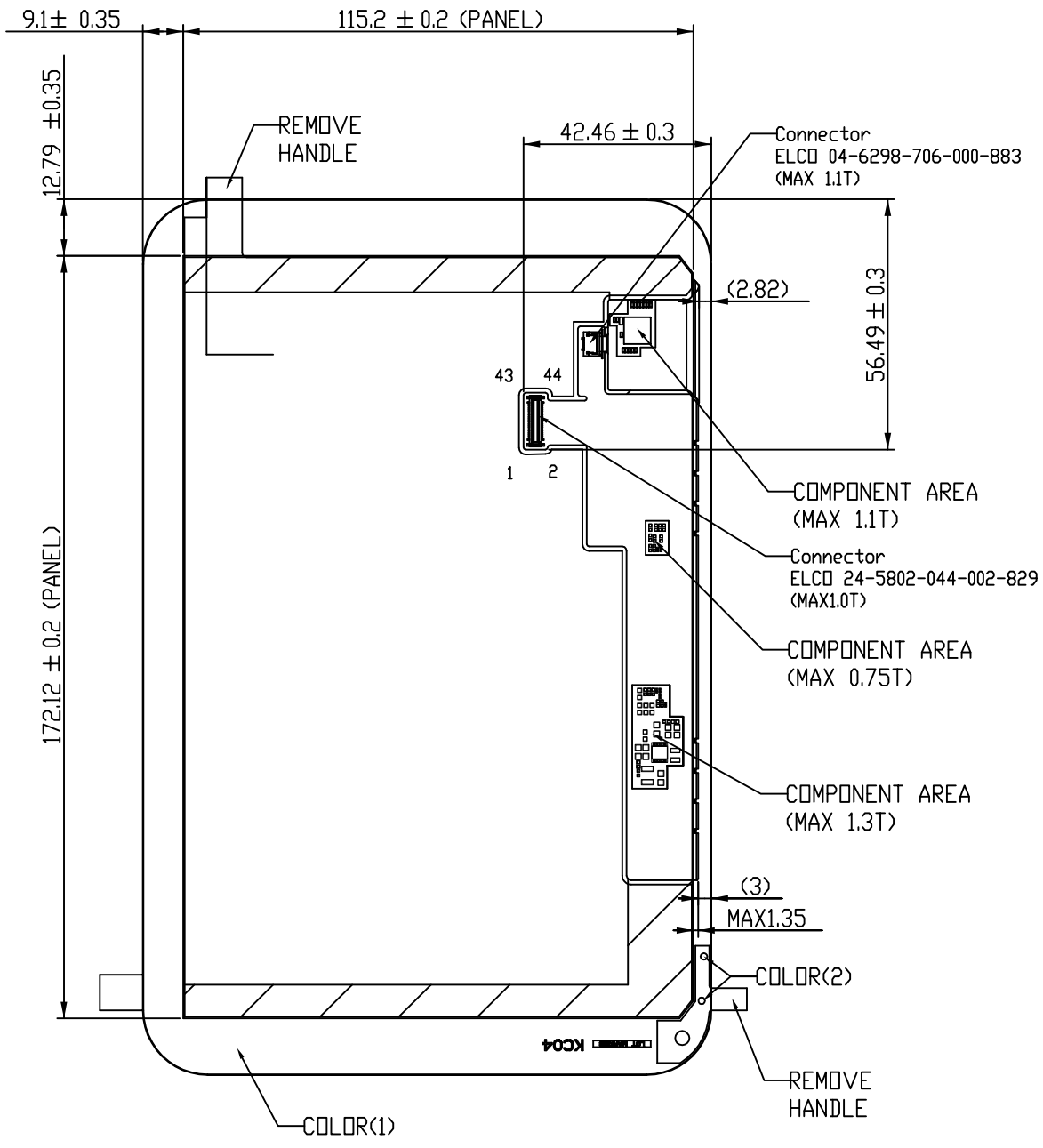
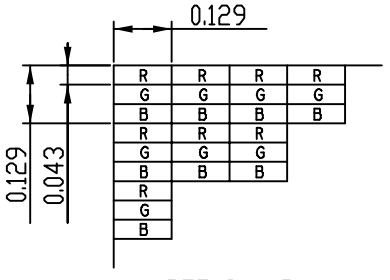
Changed by	Date	Time	Spec No.	-	Samsung Mobile Display
J.D.YOO	2011/08/26	10:52:36	a t Name	ASSY FPC-MAIN	
Engineer	Drawn By	R&D CHK	BA Code	LJ94-XXXXXA	
1	J.D.YOO		Sheet	1/1 [AX]	SPEC FICATION AMS767KC04 MAIN REV1.0

	COLOR(1)	COLOR(2)
COLOR	BLACK	BLACK TONE
TRANSPARENT	-	15±5% at 550nm

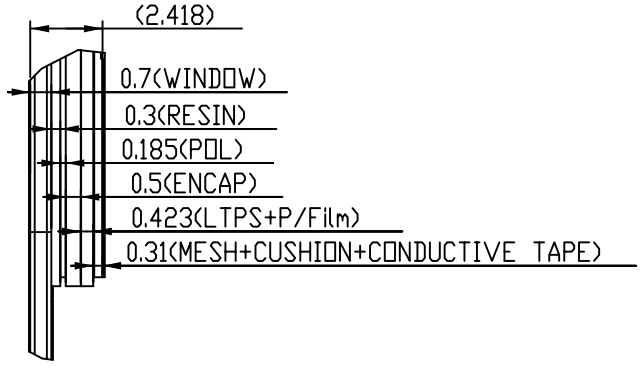








DETAIL B
SCALE 60:1



DETAIL A
SCALE 4:1

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REV	DATE	DESCRIPTION OF REVISION	REASON

GENERAL TOLERANCE			
STEP	LEV.1	LEV.2	LEV.3
0 < X < 4	±0.05	±0.10	±0.2
4 < X < 16	±0.08	±0.15	±0.3
16 < X < 64	±0.12	±0.25	±0.5
64 < X < 256	±0.25	±0.40	±0.8

UNIT	mm	DES'D BY	CHK'D BY	APP'D BY
SCALE	2:3	J.Y.WANG	J.S.OH	S.H.LEE
TOLERANCE		2012.03.09	2012.03.09	2012.03.09

SAMSUNG MOBILE DISPLAY

PROJUCTIION	STD.TOL	SIZE
	±0.2	A3

MODEL NAME	AMS767KC04		
PART/SHEET NAME	OUTLINE DIMENSION		
CODE NO.		SHEET	1/1
SPEC NO.		VER.	