

**PROPRIETARY NOTE** THIS SPECIFICATION IS THE PROPERTY OF HYDIS AND SHALL NOT BE REPRODUCED OR COPIED WITHOUT THE WRITTEN PERMISSION OF HYDIS AND MUST BE RETURNED TO HYDIS UPON ITS REQUEST

# **TITLE : HV070WS1-105**

## **Product Specification**

## **HYDIS** Technologies

SPEC. NUMBER	PRODUCT GROUP	REV.	ISSUE DATE	PAGE
S864-1470	TFT LCD	В	2012.12.20	1 OF 34
(1/3)				A4(210 X 297)

			PRODUCT GROUP	REV	ISSUE DATE
		13	TFT LCD PRODUCT	В	2012.12.20
			REVISION HISTORY		
REV.	ECN NO.		DESCRIPTION OF CHANGES	DATE	PREPARED
0		<ul> <li>Initia</li> </ul>	l Release	2012.04.10	J.H. Kim
А	E1206- F005	■ Add (TOC	Line Classification on Module Label No.3 :: T, IDS: C)	2012.06.25	T.C.KANG
В	E1212- F001	■ Char (QPN	nge Module Barcode Label I no AA070WS1008, MADE IN CHINA)	2012.12.20	T.C.KANG
SPEC S86	. NUMBER 64-1470	SPEC T HV070	ITLE WS1-105 Product Specification		PAGE 2 OF 34
(2/3)					A4(210 X 297)

	PRODUCT GROUP	REV	ISSUE DATE		
	TFT LCD PRODUCT	В	2012.12.20		
	Contents				
No	Item		Page		
1.0 General D	escription		4		
2.0 Absolute I	Maximum Ratings		6		
3.0 Electrical	Specifications		7		
4.0 Optical Sp	pecifications		8		
5.0 Interface	Connections		13		
6.0 Signal Tin	ning Specifications		16		
7.0 Signal Tin	Signal Timing Waveforms				
8.0 Input Sigr	Input Signals, Basic Display Colors & Gray Scale of Colors				
9.0 3-Wire Sp	3-Wire Special Port Interface (SPI Interface)				
10.0 Power Se	Power Sequence				
11.0 Mechanic	.0 Mechanical Characteristics				
12.0 Mechanic	12.0 Mechanical Drawing				
13.0 Reliability	Test		30		
14.0 Handling	& Cautions		31		
15.0 Labels	15.0 Labels				
16.0 Packing Ir	34				
SPEC. NUMBER SPEC S864-1470 HV0	SPEC. NUMBER     SPEC TITLE       S864-1470     HV070WS1-105 Product Specification				

PRODUCT GROUP

ISSUE DATE

REV

PRODUCT GROUP	REV	ISSUE DATE
TFT LCD PRODUCT	В	2012.12.20

## **1.0 GENERAL DESCRIPTION**

#### **1.1 Introduction**

HV070WS1-105 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 7.01 inch diagonally measured active area with WSVGA resolutions (1024 horizontal by 600 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical Stripe and this module can display 16.7M colors. The TFT-LCD panel used for this module is a low reflection and higher color type.



#### 1.2 Features

- FAB site : Hydis Korea
- Thin and Light Weight
- 3.3 V Logic Power & 16 V Back-light power Supply
- 1 Channel LVDS Interface
- SMD LED (20EA) Array (Bottom Side/Horizontal Direction)
- 16.7M Colors (With Dither & HFRC)
- Need SPI control (CSB, SCL, SDA) for module driving
- Green Product (RoHS) & Halogen free

SPEC. NUMBER	SPEC TITLE	PAGE
S864-1470	HV070WS1-105 Product Specification	4 OF 34
(n /n)	•	A 4 (010 V 007

<b>OHYDIS</b>	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	В	2012.12.20

#### **1.3 Application**

Display colors

Display mode

Weight

Back-light

**Outline dimension** 

• E-book, etc

#### **1.4 General Specifications**

	•	
Parameter	Specification	Unit
Active area	153.6(H) ×90.0(V)	mm
Number of pixels	1024(H) ×600(V)	pixels
Pixel pitch	0.15(H) ×0.15(V)	mm
Pixel arrangement	RGB Vertical Stripe	

 $163.6\pm0.3(H) \times 102.9\pm0.3(V) \times 2.47\pm0.2(D)$ 

Bottom edge side, 20-LEDs type

< 1	able	1.	General	Spec	ifications	>
-----	------	----	---------	------	------------	---

Note 1	: Support	16.7M with	dither and HFRC
--------	-----------	------------	-----------------

16.7M

95 (Max.)

Normally Black

Note 2 : Without component

Horizontal outline dimension is some different to customer request which is  $162.8\pm0.3(H) \times 102.9\pm0.3(V) \times 2.47\pm0.2(D)$ But outline dimension is confirm value between Hydis and Customer

SPEC. NUMBER S864-1470	SPEC TITLE HV070WS1-105 Product Specification	PAGE 5 OF 34
(2/2)		A4(210 V 207

Remark

Note 1

Note 2

colors

mm

g

<b>OHYDIS</b>	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	В	2012.12.20

## 2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

< Table 2. Absolute Maximum Ratings >

Ta=25+/-2°C

Parameter	Symbol	Min.	Max.	Unit	Remarks
Logic Power Supply Voltage	V <sub>cc</sub>	-0.3	V <sub>CC</sub> +0.3	V	
Back-light Power Supply Voltage	VL	-0.3	40	V	
Back-light LED Current	Ι <sub>L</sub>	-	30	mA	Note 1
Back-light LED Reverse Voltage	V <sub>R</sub>	-	5	V	
Operating Temperature	T <sub>OP</sub>	-20	+60	Ĵ	Note 1,
Storage Temperature	T <sub>SP</sub>	-40	+70	C°	Note 2

Note 1. Ambient temperature vs allowable forward current are shown in the figure below.

Note 2. Temperature and relative humidity range are shown in the figure below. 90% RH Max. (40°C ≥ Ta) Maximum wet - bulb temperature at 39°C or less. (>40°C) No condensation.



	PR	ODUCT GRC	UP	R	EV	ISSUE DATE	
	TFT		JCT		В	2012.12.20	
3.0 ELECTRICAL SPECIFICATIONS 3.1 Electrical Specifications < Table 3. Electrical Specifications >							
Parameter		Min.	Тур.	Max.	Unit	Remarks	
Logic Power Supply Voltage	V <sub>cc</sub>	3.0	3.3	3.6	V		
Logic Power Supply Current	I <sub>cc</sub>	-	220	270	mA	Note 1	
Logic Power Consumption	P <sub>c</sub>		0.73	0.89	W		
Back-light Power Supply Voltage	VL	-	16	17	V	Note 2	
Back-light Power Supply Current	I <sub>L</sub>	-	20	25	mA	Note 2	
Back-light Power Consumption	P <sub>BL</sub>	-	1.28	1.36	W	Note 2, 4	
High Level Differential Input Signa (V <sub>CM</sub> = 1.2V)	V <sub>TH</sub>	-	-	0.1	V		
Low Level Differential Input Signal	V <sub>TL</sub>	- 0.1	-	-	V		
Input voltage range (singled-end)	V <sub>IN</sub>	0	-	2.4	V	LVDS input	
Differential input voltage	V <sub>ID</sub>	0.1	-	0.6	V	LVDS input	
Differential input common mode voltage	V <sub>CM</sub>	(   V <sub>ID</sub>   /2)		2.4- (   V <sub>ID</sub>   /2)	V		
Input Current	V <sub>IN</sub>	-10	-	-10	μA		
Panel unit life time		50,000	-	-	Hrs	Without BL,PCB	
Total Power Consumption	P <sub>total</sub>	-	2.01	2.25	W	Note 1,2,4	

- 2. The supply voltage is measured and specified at the interface connector of LCM. The Backlight current draw and power consumption specified is 16V at 25 °C. The voltage and current value means value for chain.
- 3. PWM frequency and voltage level is fixed by customer.
- 4. Backlight power consumption is calculated value for reference ( $V_L \times I_L \times 4$  chains). About maximum power of backlight is  $17V \times 20mA \times 4$  chains = 1.36W

SPEC. NUMBER S864-1470	SPEC TITLE HV070WS1-105 Product Specification	PAGE 7 OF 34
$(\gamma )$		A 4 (210 V 207

PRODUCT GROUP	REV	ISSUE DATE
TFT LCD PRODUCT	В	2012.12.20

## 4.0 OPTICAL SPECIFICATIONS

#### 4.1 Overview

The test of optical specifications shall be measured in a dark room (ambient luminance  $\leq 1$  lux and temperature =  $25\pm2$ °C) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5A) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of  $\theta$  and  $\Phi$  equal to 0°. We refer to  $\theta_{\emptyset=0}$  (= $\theta$ 3) as the 3 o'clock direction (the "right"),  $\theta_{\emptyset=90}$  (=  $\theta$ 12) as the 12 o'clock direction ("upward"),  $\theta_{\emptyset=180}$  (=  $\theta$ 9) as the 9 o'clock direction ("left") and  $\theta_{\emptyset=270}$ (=  $\theta$ 6) as the 6 o'clock direction ("bottom"). While scanning  $\theta$  and/or  $\emptyset$ , the center of the measuring spot on the Display surface shall stay fixed. V<sub>CC</sub> shall be 3.3+/- 0.3V at 25°C.

#### 4.2 Optical Specifications

<table 4.<="" th=""><th>Optical</th><th>Specifications&gt;</th></table>	Optical	Specifications>

Paramo	ete	r	Symbol	Condition	Min.	Тур.	Max.	Unit	Remarks
	Ц		Θ <sub>3</sub>		75	85		Deg.	
Viewing Angle		nzonai	Θ <sub>9</sub>	CP > 10	75	85		Deg.	Noto 1
range		(ortical	Θ <sub>12</sub>	CK > 10	75	85		Deg.	NOLE I
		entical	$\Theta_6$		75	85		Deg.	
Luminance Co	ntra	ast ratio	CR	Θ = 0°	640	800	-		Note 2
Luminance of	1	Pointe	v			30		cd/m <sup>2</sup>	Note 4
White		1 Units	١w	<b>⊖</b> − 0°	340	400	-	cd/m <sup>2</sup>	
White Luminance uniformity	9	Points	ΔΥ9	0-0	72	80	-	%	Note 5
White Chro	mot	licity	W <sub>x</sub>	$O = 0^{\circ}$	0.280	0.301	0.340		
White Chio	mai	licity	W <sub>y</sub>	0 = 0	0.310	0.330	0.370		
		Pod	R <sub>x</sub>		0.563	0.593	0.623		
		Reu	R <sub>y</sub>		0.323	0.353	0.383		Noto 3
Reproduction	า	Green	G <sub>x</sub>	$\Theta = 0^{\circ}$	0.283	0.313	0.343		Note 5
of color			Gy	$\Theta = 0^{\circ}$	0.559	0.589	0.619		
		Plue	B <sub>x</sub>		0.121	0.151	0.181		
		Diue	B <sub>y</sub>		0.099	0.129	0.159		
Response Time			Total (T <sub>r</sub> + T <sub>d</sub> )	Ta= 25° C Θ = 0°	-	50	-	ms	Note 6
Cross Talk			СТ	<b>Θ</b> = 0°	-	-	2.0	%	Note 7
SPEC. NUMBER	2	SPEC T	ITLE						PAGE
S864-1470	-	HV070	)WS1-105 F	Product Specific	cation				3 OF 34
3) <i>A4(210 X 207</i>									

PRODUCT GROUP	REV	ISSUE DATE
TFT LCD PRODUCT	В	2012.12.20

Notes :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see Figure1).

2. Contrast measurements shall be made at viewing angle of  $\Theta$ = 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state (see Figure 1). Luminance Contrast Ratio (CR) is defined mathematically as CR = Luminance when displaying a white raster / Luminance when displaying a black raster.

3. Reference only / Standard Front Surface Treatment Measured with green cover glass. The color chromaticity coordinates specified in Table 4 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

4. The luminance value of 400 cd/m2 means the brightness of PWM is 100%. The luminance value of 30 cd/m2 means the brightness of lower PWM. CTF means that measure brightness at only center point at Figure 2.

SPEC. NUMBER S864-1470	SPEC TITLE HV070WS1-105 Product Specification	PAGE 9 OF 34
(3/3)		A4(210 X 297)







	ПЛС	PRODUCT	r groi	REV	ISSUE DATE				
V	ΠΙΓ	TFT LCD F	PRODU	В	2012.12.20				
5.0 INTERFACE CONNECTIONS 5.1 Electrical Interface Connection CN1 Interface Connector (DF23C-30DS-0.5V(51), Manufacture by HIROSE) <table 5,="" connection="" electrical="" interface=""></table>									
Pin No.SymbolFunctionPin No.SymbolFunction									
1	VCC	+3.3V Power Supply	16	D1-IN-N	LDVS differenti	al data input			
2	GND	Ground	17	Vendor[1]	Vendor distingu	iish pin 2			
3	VCC	+3.3V Power Supply	18	D1-IN-P	LDVS differenti	al data input			
4	CLK-IN-N	LVDS Clock input (Negative)	19	CSB	Serial Commur	ication Chip Select			
5	VCC	+3.3V Power Supply	20	GND	Ground				
6	CLK-IN-P	LVDS Clock input (Positive)	21	SCL	Serial Commur	ication Clock Input			
7	GND	Ground	22	D2-IN-N	LDVS differential data input				
8	GND	Ground	23	SDA	Serial Commur	ication Data Input			
9	LEDP	Power supply for LED [Anode]	24	D2-IN-P	LDVS differenti	al data input			
10	D0-IN-N	LDVS differential data input	25	GND	Ground				
11	11 LEDN Power supply for LED [Cat			GND	Ground				
12	D0-IN-P	LDVS differential data input	27	BL-PWM-IN	Brightness Con	trol Signal			
13	GND	Ground	28	D3-IN-N	LDVS differential data input				
14	GND	Ground	29	BL-PWM-OUT	Backlight Dimm	ner Signal			
15	Vendor[0]	Vendor distinguish pin 1	30	D3-IN-P	LDVS differenti	al data input			
SPEC S86	. NUMBER 64-1470	SPEC TITLE HV070WS1-105 Product Spe	TTLE 0WS1-105 Product Specification						

A4(210 X 297)

				PRODUCT GR	REV	ISSUE DATE	
		712		TFT LCD PRO	DUCT	В	2012.12.20
	5.2 LVDS Inte	rface					
	LVDS Tra	nsmitter	: THC63L	VDM83A			
			<	Table 6. LVDS	nterface >		
		Trane	mittor	Into	orfaço	AA01B-	
signal Pin No						P030VA1	Remark
	D0	Pin No	Pin No	System (1x)	TFT-LCD (RX)	Pin No.	
	RU D1	51					
	R1 D2	52					
	RZ	54	48	OUT0-	D0-IN-N	10	
	R3	55	47	OUT0+	D0-IN-P	12	
	R4	00					
	Ro	3					
	GU	4					
	Gi	6					
	G2	1	- 46 - 45 -			16	
	G3	11		OUT1-	D1-IN-N		
	G4	12		OUT1+	D1-IN-P	18	
	G5	14					
	B0	15					
	B1	19					
	B2	20					
	B3	22				22 24	
	B4	23	42	OUT2-			
	B5	24	41	OUT2+	D2-IN-P		
	HSYNC	27					
	VSYNC	28					
	DE	30					
	R6	50					
	R7	2					
	G6	8	38		D3-IN-N	28	
	G7	10	37	OUT3+	D3-IN-P	30	
	B6	16					
	B7	18					
	Reserved	25					
	MCLK	31	40	CLKOUT-	CLK-IN-N	4	
	_	-	39	CLKOUT+	CLK-IN-P	6	
	SPEC. NUMBER	SPEC T	TITLE				PAGF
	S864-1470	HV07	0WS1-105	Product Specific	ation		14 OF 34
				•			
(3/3)							A4(210 X 297)

		VDIC	PRODUCT GROUP	REV	ISSUE DATE		
	VП	IDI3	TFT LCD PRODUCT	В	2012.12.20		
ļ	5.3 Back-I	ight Interface					
	CN2	LED FPC Conn	ector ( solder type )				
			<table 7,="" connection="" fpc="" led=""></table>				
	Pin No.	Symbol	Function	Rema	ark		
	1 2	Anode1	LED Anode Power Supply	Тур. 16V			
	3	Cathode1	LED Cathode Power Supply				
	4	Calliouer	LED Cathode Power Supply				
	<b>5.4 Data Input Format</b> (1, 1) (2, 1) <b>R G B R G B</b> <b>1</b> Pixel = 3 Dots						
	R     G     B       R     G     B       R     G     B       (1, 600)     (2, 600)						
S	SPEC. NUM S864-147	IBER SPEC 70 HV07	VILLE VOWS1-105 Product Specification		PAGE 15 OF 34		

10 0
A 4 ( )

		PRODUCT GROUP TFT LCD PRODUCT			REV	ISSUE DATE			
V					В	2012.12.20			
6.0. SIGNAL TIMING SPECIFICATIONS 6.1 Timing specification at HV Mode (LVDS Transmitter Input)									
	ltem	Symbol	Min.	Tvp.	Max.	Unit			
F	rame Rate	-	40	60	73	Hz			
F	rame Period	T1	624	635	750	Lines			
V	ertical Display Time	T2	-	600	-	Lines			
V	ertical Blanking Time	Т3	-	35	-	Lines			
1	Line Scanning Time	T4	1200	1344	1400	Clocks			
Н	orizontal Display Time	Т5	-	1024	-	Clocks			
Н	orizontal Blanking Time	Т6	-	320	-	Clocks			
С	lock Rate	1/T7	40.8	51.2	63	MHz			
<b>7.1</b> VSI	7.1 Vertical Input Timing Waveforms of Interface Signal								
DE	N		ſĹſĹŊŀ	··					
<b>7.2</b> HSI	7.2 Horizontal Input Timing Waveforms of Interface Signal								
		חחח חחח		יחחחח					



<sup>(3/3)</sup> 

A4(210 X 297)

	אר	PRODU	CT GROUP		REV		ISSUE DATE
	713	TFT LCI	O PRODUCT	В		2012.12.20	
7.3 LVDS Rx Ir	nterface T	iming Parameter					
The specifica	tion of the	LVDS Rx interfac	e timing para	meter			
			ntorfaco Timin	a Specific	sations		
	<	Table 9, LVDS RX I	Internace Timin	g specind	ation>		
ltem	Symbol	Min.	Тур.	M	ax.	Unit	Remarks
CLKIN Period	tRCIP	-	19.53		-	nsec	
Input Data 0	tRIP0	-0.4	0.0	+	0.4	nsec	
Input Data 1	tRIP1	tRICP/7-0.4	tRICP/7	tRICF	P/7+0.4	nsec	
Input Data 2	tRIP2	2 ×tRICP/7-0.4	$2 \times tRICP/7$	2 ×tRI	CP/7+0.4	nsec	
Input Data 3	tRIP3	3 × tRICP/7-0.4	3 ×tRICP/7	3 ×tRI	CP/7+0.4	nsec	
Input Data 4	tRIP4	4 ×tRICP/7-0.4	4 ×tRICP/7	4 ×tRI	CP/7+0.4	nsec	
Input Data 5	tRIP5	5 ×tRICP/7-0.4	5 ×tRICP/7	5 ×tRI	CP/7+0.4	nsec	
input Data 5							



	ЛЛ					PR	ODI	JCT	GF	ROL	JP					RE	EV			ISS	UE	DAT	ΓE		
<b>V</b> I	٦٢L	וו	3				-	TFT	LC	D P	RO	DU	СТ					E	3			201	2.1	2.2	0
8.0 INP CO A tota	UT SIG LORS al of 16.7	MA M c		<b>6, E</b> ors a	<b>BA</b> S	<b>SIC</b>	C D	yed	PL/ wit	<b>AY</b> h di	<b>CC</b> ithe	DLC PLC PLC	DR HF	S &	G US	R/	<b>4Y</b> 64	<b>SC</b> gra	<b>AL</b> y fr	_E om	<b>OF</b> 8b	: it in	put		
Colors & 0	Gray Scale	PO	D1	]	Red	dat	a D5	DA	D7	GO	C1	G	reer	n da	ta	GG	67	BO	R1	E2	Blue	dat	a B5	RG	R7
	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	.0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Basic	Light Blue	0	0	0	0	· 0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Colors	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Purple	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale						↓ I							,	↓ I								↓ I			
orrica	Prightor	1	0	1	1	↓ 1	1	1	1	0	0	0	0	↓ 	0	0	0	0	0	0	0	↓ 	0		0
			0					I	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pod	1	1	1	1	↓ 1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Black	0	0	0	0	. 1	.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grav Scale	Δ					Ļ								Ļ								Ļ		<u> </u>	
of Green	$\bigtriangledown$					Ļ							,	Ļ								$\downarrow$			
	Brighter	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	$\bigtriangledown$	0	0	0	0	0	0	0	0				,	Ļ				0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	$\bigtriangleup$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker	0	0	0	0	• 0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Gray Scale	$\bigtriangleup$					↓								Ļ								↓ ·			
of Blue						↓ 			<u> </u>		-			•		-			-			↓		<u> </u>	
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	↓ I I	4		1
	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0		0
		1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Gray Scale	Δ					Ļ								Ļ								Ļ		LI	
White &	$\bigtriangledown$					Ļ							,	Ļ								$\downarrow$			
Black	Brighter	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1
	$\bigtriangledown$					Ļ							,	Ļ								$\downarrow$			
	White	1	1	1	1	· 1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SPEC. N	UMBER	S	PEC	C TI	TLE			)		<b>C</b>	- 1.61	1 !											PAC	ε	
S864-	1470		ΗV	070	vv5	1-10	72 F	100	uct	spe	CITI	catio	JU								·	18	O	- 34	1
(1)		1																			1	A 4 /	010		207

A4(210 X 297)

	PRODUCT GROUP	REV	ISSUE DATE									
	TFT LCD PRODUCT	В	2012.12.20									
<ul> <li>9.0 3-WIRE SERIAL PORT INTERFACE (SPI INTERFACE)</li> <li>This module use 3-wire serial port interface as function configuration and parameter setting</li> <li>9.1 3-Wire command format</li> </ul>												
Address[5:0]	W/R_Hi-ZData[7:0]	Dela	ay Next Transfer									
СЅВ												
	1 D 10 D 9 D 8 D 7 D 6 D 5 D 4 D 3 D 2											
·												

Bit	Description
D15-D10	Register Address [5:0]
D9	W/R control bit. "0" for Write; "1" for Read
D9	Hi-z bit during read mode. Any data within this bits will be ignored during write Mode
D7-D0	Data for the W/R operation to the address indicated by Address phase

### 9.2 3-Wire Write format

MSB	6														LSB
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D1
Register Address [5:0] 0 X						Х		Da	ata (Issu	ied by e	xternal	controlle	er)	-	

### 9.3 3-Wire Read format

MSB	-			-	_								_		LSB
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D1
Register Address [5:0] 1						Hi-Z	-Z Data (Issued by 3-wire engine)								

SPEC. NUMBER S864-1470	SPEC TITLE HV070WS1-105 Product Specification	PAGE 19 OF 34
(0.10)	-	

PRODUCT GROUP	REV	ISSUE DATE
TFT LCD PRODUCT	В	2012.12.20

## 9.4 3-wire control register

9.4.1 R00 : System Control Register

Designation	Address	Description	
MODE	R0[0]	DE/SYNC mode select. MODE = "0", HSD/VSD mode. MODE = "1", DE mode. (Default)	
DCKPOL	R0[1]	DCLK polarity control bit DCLKPOL = "0" : Data sampling at DCLK falling edge. (Do DCLKPOL = "1" : Data sampling at DCLK rising edge.	efault)
GRB	R0[2]	Global reset bit. GRB="0", The controller is in reset state. GRB="1", Normal operation. (Default)	
STBYB	R0[3]	Standby mode selection bit. STBYB = "0", Timing control, driver and DC-DC converter and all outputs are High-Z. STBYB = "1", Normal operation. (Default)	, are off,
UPDN	R0[4]	Gate Up or Down scan control. UPDN = "0", STV2 output vertical start pulse and UD pin of Logical "0" to Gate driver. (Default) UPDN = "1", STV1 output vertical start pulse and UD pin of Logical "1" to Gate driver. (Default)	output output
SHLR	R0[5]	Right/Left sequence control of source driver. SHLR = "0", Shift left : Last data = S1<-S2<-S3<-S960 = SHLR = "1", Shift left : Last data = S1->S2->S3>S960 = (Default)	= First Data = Last Data
-	R0[6]	Reserved	
PWR_EN	R0[7]	POWER enable. PWR_EN = H, enable PWM, Charge pump and VCOM bu	iffer.
SPEC. NUMBE	R SPEC	TITLE	PAGE

HV070WS1-105 Product Specification

S864-1470



REV

В

2012.12.20

#### 9.4.2 R01 : System Control Register

Designation	Address	Description
	R1[0]	Reserved
RES[1:0]	R1[2:1]	Display resolution selection. RES[1:0] = "01", for 1024(RGB)*768 display resolution. (dual or cascade) RES[1:0] = "00", for 1024(RGB)*600 display resolution. (dual or cascade) (Default) RES[1:0] = "10", for 800(RGB)*600 display resolution. (dual or cascade) RES[1:0] = "11", for 800(RGB)*480 display resolution. (dual or cascade) (601~936 channel disable)
BIST	R1[3]	Normal Operation / BIST pattern select. BIST = H : BIST (DCLK input is not needed) BIST = L : Normal Operation (Default)
DITHER	R1[4]	Dithering function enable control. DITHER = "1", Enable internal dithering function. DITHER = "0", Disable internal dithering function. (Default)
HFRC	R1[5]	H-FRC selection HFRC = H : H-FRC enable HFRC = L : H-FRC disable (Default) If DITHER = H and HFRC = L : enable only FRC/dithering function If DITHER = L, disable dithering function (H-FRC and FRC both disable)
CABC_EN[1:0]	R1[7:6]	CABC H/W enable pin. Normally pull low. When CABC_EN = "00", CABC OFF. (Default mode) When CABC_EN = "01", User interface Image. When CABC_EN = "10", Still Picture. When CABC_EN = "11", Moving Image.

#### 9.4.3 R02 : System Control Register

Designation	Address	Description	
	R2[5:0]	Reserved	
NBW	R2[6]	Normally black or normally white setting. NBW = H : Normally black NBW = L : Normally white (Default)	
BIST	R2[7]	Reserved	
SPEC. NUMBER SPEC TITL S864-1470 HV070WS		E 1-105 Product Specification	PAGE 21 OF 34
2/2)	1		AA(210 X 207

PRODUCT GROUP	REV	ISSUE DATE
TFT LCD PRODUCT	В	2012.12.20

9.4.4 R03 : Gate on sequence controller register

Designation	Address	Description						
		Gate on sequence select						
		SEL[0]	SEL[1]	Pin control function				
SEL[1:0]	:0] R3[1:0]	1	1					
		1	0					
		0	1	Σ				
			0	0	Z (Default)			
Frame	R3[2]	Frame inverse or not select. FRAME = "1", Uniform FRAME = "0", Frame inverse (Default)						
-	R3[7:3]	Reserved						

9.4.5 R0E : test mode (1)

Designation	Address	Description
TEST_mode(1)	R0E[7:0]	Enter test mode (1) TEST_mode = 8'h5F, enter TEST_mode = other exit (Default)

#### 9.4.6 R0F : test mode (2)

Designation	Address	Description
TEST_mode(2)	R0F[7:0]	Enter test mode (2) TEST_mode = 8'hA4, enter TEST_mode = other exit (Default)

SPEC. NUMBER	SPEC TITLE	P/	AGE
S864-1470	HV070WS1-105 Product Specification	22	OF 34
(3/3)		A4(2	10 X 297)

	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	В	2012.12.20

9.4.7 R0D : charging time control (3)

Designation	Address	Description
OE_WIDTH	R0D[7:0]	Inversion type select. Enter Test mode (1) and (2) first. Then R0D setting will be active TEST_mode = 8'h00, increase charge time

9.4.8 R02 : charge sharing control

Designation	Address	Description
EQC_ADJ	R02[7:0]	Inversion type select. Enter Test mode (1) and (2) first. Then R10 setting will be active EQC_ADJ = 8'h43, adjust charge sharing time

9.4.9 R0A : BIAS current control (5)

Designation	Address	Description
BIAS_TRIG	R0A[7:0]	Inversion type select. Enter Test mode (1) and (2) first. Then R10 setting will be active BIAS_TRIG = 8'h28, trigger bias reduction

9.4.10 R10 : inversion architecture

Designation	Address	Description	
INV	R10F[7:0]	Inversion type select. Enter Test mode (1) and (2) firs Then R10 setting will be active 2line / 1dot = 8'h41 1line / 1dot = 8'h01 (Default)	st.
	SPEC TITU	=	DAGE
SPEC. NUMBER S864-1470	HV070WS	- 1-105 Product Specification	23 OF 34
3/3)	L		A4(210 X 297)

	PRODUCT GROUP	REV	ISSUE DATE
	TFT LCD PRODUCT	В	2012.12.20

#### 9.4.11 R38 : PWM\_DIV setting

Designation	Address	Description											
		PWM Dimr	mer frequer	ncy step	setting								
		R38[7:0]	R38[7:0] PWM_DIV[3:0] Register function		Register function								
		0x0C 000		Don't use.									
		0x1C	001		1								
		0x2C	010		2								
		0x3C	011		3								
		0x4C	100		4								
		0x5C	101		5								
		0x6C	110		6								
		0x7C	111		7 (Default)								
PWM_DIV[3:0]	R38[7:0]	PWM Re Frequenc	eference cy (FOSC)		Real PWM Frequency of DIMO		f DIMO						
		51.2MHz (Typical) PWM Frequency = $\frac{1}{256 \times 12}$		F 128 x	OSC PWM_DIV[2:0]								
										In order in maintain the dimming frequency for brightnes at different display resolution (typical 1024 x 600) at norr will change default value of PWM_DIV to follow as table		ss control mal mode. We	
								Display R	esolution	Defau	It value of PWM_DIV	,	
								RES[1:0	] = "00"		111		
		RES[1:0	] = "01"		111								
			RES[1:0	] = "10"		110							
		RES[1:0	] = "11"		100								
		l											
Note : The R6 and	I R38 register	will be availal	ble when the	R0E ar	nd R0F register already	/ had is	ssued.						
SPEC. NUMBER	SPEC TI	TLE					PAGE						
S864-1470	HV070	0WS1-105 Product Specification 24 OF 34			24 OF 34								
A4(210 X 297													

PRODUCT GROUP	REV	ISSUE DATE
TFT LCD PRODUCT	В	2012.12.20

#### 9.5 Recommend Register Setting (CABC Off mode)

Register write sequence : R00 (Reset) → R00 (Into Standby mode) → R01 (Enable FRC / Dither, CABC off) → R02 (Enable Normally Black) → R0E (Enter Test mode (1)) → R0F (Enter Test mode (2)) → R0D (SDRRS on) → R00 (Release standby mode)

If you don't use register write sequence, it may cause faulty operation.

	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Setting	Remark
R00	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0x0029	
R00	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0x0025	
R01	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0x0430	
R02	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0x0840	
R0E	0	0	1	1	1	0	0	0	0	1	0	1	1	1	1	1	0x385F	
R0F	0	0	1	1	1	1	0	0	1	0	1	0	0	1	0	0	0x3CA4	
R10	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0X4041	2dot inv.
R0D	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0x3401	
R00	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0x002D	

#### 9.6 Recommend Register Setting (CABC on mode (Moving Picture)

Register write sequence : R00 (Reset) → R00 (Into Standby mode) → R01 (Enable FRC / Dither, CABC on) → R02 (Enable Normally Black) → R0E (Enter Test mode (1)) → R0F (Enter Test mode (2)) → R0D (SDRRS on) → R38 (PWM Frequency = 1.5KHz) → R00 (Release standby mode)

If you don't use register write sequence, it may cause faulty operation.

		D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Settir	ng	Remark	
	R00	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0x002	29		
	R00	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0x002	25		
	R01	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0x041	F0		
	R02	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0x0840			
	R0E	0	0	1	1	1	0	0	0	0	1	0	1	1	1	1	1	0x385F			
	R0F	0	0	1	1	1	1	0	0	1	0	1	0	0	1	0	0	0x3CA4			
	R10	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0X40	41	2dot inv.	
	R0D	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0x3401			
	R38	1	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0xE0	1C		
	R00	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0x002D			
																			i		
S	SPEC. NUMBERSPEC TITLES864-1470HV070WS1-105 Product Specification									2	PAGE 25 OF 34										
3/	3)																		ļ	A4(210 X 2	9

		PRODU	JCT GROUP		REV	ISSUE DATE				
		TFT LC	D PRODUCT		В	2012.12.20				
<b>10.0 POWER SEQUENCE</b> To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below										
Power Suppl VCC	y for LCD C OV				10% T7 ← T6					
Interface Vi (LVDS Signal of	Signal Transmitter) <sup>0V</sup>		Valid Data			_				
Initial 3-Wire	Command									
	$\stackrel{T3}{\longleftrightarrow} \qquad \stackrel{T4}{\longleftrightarrow}$									
LED Pow	ver	OFF	LED ON		OFF					
		Value			.,	Remark				
Parameter	Min.	Тур.	Max.		nit					
T1	0.5		10	n	าร					
T2	0		16	n	าร					
Т3	200			n	าร					
T4	200			n	าร					
T5	0			n	าร					
Т6	3			n	าร					
T7	400			n	าร					
<ul> <li>Notes : 1. When the power supply VDD is 0V, Keep the level of input signals on the low or keep high impedance.</li> <li>2. Do not keep the interface signal high impedance when power is on.</li> <li>3. Back Light must be turn on after power for logic and interface signal are valid.</li> </ul>										
SPEC. NUMBERSPEC TITLEPAGES864-1470HV070WS1-105 Product Specification26 OF 34										
(3/3)						A4(210 X 297)				

PRODUCT GROUP	REV	ISSUE DATE
TFT LCD PRODUCT	В	2012.12.20

## **11.0 MECHANICAL CHARACTERISTICS**

#### **11.1 Dimensional Requirements**

Figure 5 & 6 (located in 12.0) shows mechanical outlines for the model

<table9, characters="" mechanical=""></table9,>						
Parameter	Specification	Unit				
Active Area	153.60(H) X 90.00(V)	mm				
Number of pixels	1024(H) X 600(V) (1 pixel = R + G + B dots)					
Pixel pitch	0.15(H) X 0.15(V)					
Pixel arrangement	RGB Vertical stripe					
Display colors	16.7M					
Display mode	Normally Black					
Outline dimension	$163.6\pm0.3$ (H) $ imes$ 102.9 $\pm$ 0.3(V) $ imes$ 2.47 $\pm$ 0.2(D)	mm				
Weight	95 (Max.)	g				
Back-light	Edge side 20-LEDs type ( 5 X 4 Array)					

#### 11.2 Polarizer Hardness.

The surface of the LCD has an coating to reduce scratching.

#### 11.3 Light Leakage

There shall not be visible light from the back-lighting system around the edges of the screen as seen from a distance 50cm from the screen with an overhead light level of 150lux. The manufacture shall furnish limit samples of the panel showing the light leakage acceptable.

SPEC. NUMBER S864-1470	SPEC TITLE HV070WS1-105 Product Specification	PAGE 27 OF 34
(3/3)		A4(210 X 297)







PRODUCT GROUP	REV	ISSUE DATE
TFT LCD PRODUCT	В	2012.12.20

## **14.0 HANDLING & CAUTIONS**

#### 14.1 Cautions when taking out the module

• Pick the pouch only, when taking out module from a shipping package.

#### 14.2 Cautions for handling the module

- As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
- As the LCD panel and back light element are made from fragile glass (epoxy) material, impulse and pressure to the LCD module should be avoided.
- As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
- Do not pull the interface connector in or out while the LCD module is operating.
- Put the module display side down on a flat horizontal plane.
- Handle connectors and cables with care.

#### 14.3 Cautions for the operation

- When the module is operating, do not lose MCLK, DE signals. If any one of these signals were lost, the LCD panel would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.

#### 14.4 Cautions for the atmosphere

- Dew drop atmosphere should be avoided.
- Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.

#### 14.5 Cautions for the module characteristics

- Do not apply fixed pattern data signal to the LCD module at product aging.
- Applying fixed pattern for a long time may cause image sticking.

#### 14.6 Cautions for the digitizer assembly

- When assembling FPC connector, do not flip connector past 90° due to possible damage to connector.
- When positioning digitizer underneath driver IC, do not lift driver IC past 90° due to possible damage to drive IC pattern.
- Please be warned that during assembly of digitizer, the opening or closing of FPC will result in possible electrostatic discharge damage to the LED

#### 14.7 Other cautions

- Do not re-adjust variable resistor or switch etc.
- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

SPEC. NUMBER S864-1470	SPEC TITLE HV070WS1-105 Product Specification	PAGE 31 OF 34
(2, (2))		A 4/010 V 007



	IC	PRODUCT GROUP	REV	ISSUE DATE
	13	TFT LCD PRODUCT	В	2012.12.20
<b>15.2 Packing Lal</b> Label Size: 1 Contents Model: HV07 Q`ty: Module Serial No.: B Date: Packin FG Code: FC	bel 108 mm 70WS1- e Q`ty in ox Seria og Date G Code	(L) × 56 mm (W) 105 one box al No. See next figure for detail descripti of Product	on.	
MODEL : H SERIAL NO.		<b>IS HYDIS TECHNOLOGIE</b> 51-105 Q'TY : 40 000000000 DATE : XXXX. XX. XX	S	
		QA (QA XXXX)		
<u>00</u> <u>0</u> <u>00</u> Type     Grade     Ye	<u>♥</u> <u>0</u> ear Mon	0 000000 th ITEM-CODE Serial_no FG CODE	RoHS M	ark
SPEC. NUMBER S864-1470	SPEC T HV070	ITLE DWS1-105 Product Specification		PAGE 33 OF 34
(3/3)				A4(210 X 297)

