 <i>Good Display</i>	EPAPER SPECIFICATIONS	SPEC NO	
	GDEP133UT1-S	REV NO	

Good Display Specifications



Good Display

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Revision History

Rev.	Issued Date	Revised Contents
1.0	July 25, 2013	New



TECHNICAL SPECIFICATION

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1. General Description

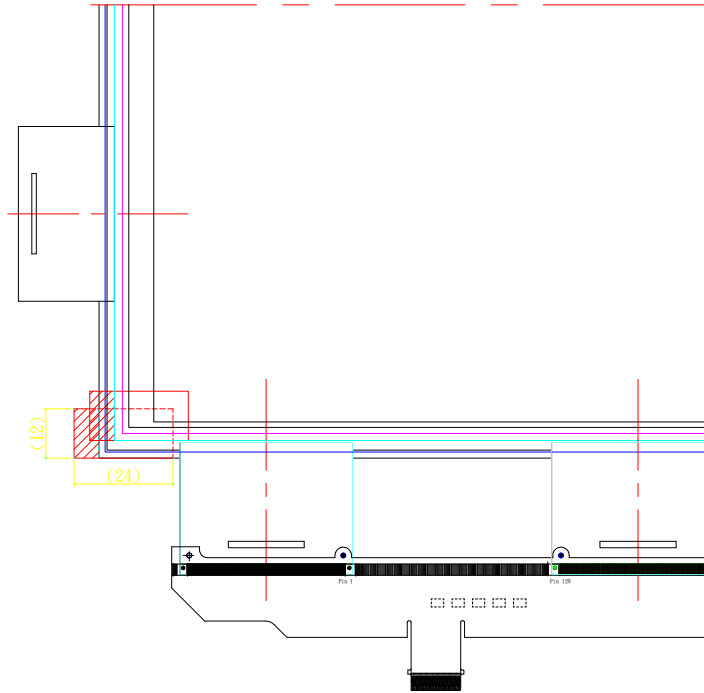
GDEP133UT1 is a reflective electrophoretic E Ink technology display module based on active matrix TFT and plastic substrate. The plastic substrate is protected by an outer covering, which is a part of the display. It has 13.3" active area with 1600 x 1200 pixels, the display is capable to display images at 2-16 gray levels (1-4 bits) depending on the display controller and the associated waveform file it used.

2. Features

- High contrast TFT electrophoretic
- 1600x1200 display
- High reflectance
- Ultra wide viewing angle
- Ultra low power consumption
- Pure reflective mode
- Bi-stable
- Commercial temperature range
- Antiglare hard-coated front-surface
- Plastic substrate

3. Mechanical Specifications

Parameter	Specifications	Unit	Remark
Screen Size	13.3	Inch	
Display Resolution	1600 (H)×1200(V)	Pixel	
Active Area	270.4 (H)×202.8 (V)	mm	
Pixel Pitch	0.169 (H)×0.169 (V)	mm	
Pixel Configuration	Rectangle		
Outline Dimension	289.8(W)×217.65(H)×0.732(D) (panel area height)	mm	
Module Weight	62±5	g	
Number of Gray	16 Gray Level (monochrome)		
Display operating mode	Reflective mode		
Surface treatment	Anti-glare treatment for protective sheet		





5. Input/Output Interface

5-1) Pin Assignment

Pin	Signal	Description
1	VNEG	Negative power supply source driver
2	VPOS	Positive power supply source driver
3	VSS	Ground
4	VDD	Digital power supply drivers
5	SCLK	Clock source driver
6	LE	Latch enable source driver
7	OE	Output enable source driver
8	VSS	Ground
9	VSS	Ground
10	NC	No Connection
11	STL	Start pulse source driver
12	D0	Data signal source driver
13	D1	Data signal source driver
14	D2	Data signal source driver
15	D3	Data signal source driver
16	D4	Data signal source driver
17	D5	Data signal source driver
18	D6	Data signal source driver
19	D7	Data signal source driver
20	VSS	Ground
21	NC	No Connection
22	VCOM	Common connection
23	VGG	Positive power supply gate driver
24	VEE	Negative power supply gate driver
25	NC	No Connection
26	NC	No Connection
27	NC	No Connection
28	MODE1	Output mode selection gate driver
29	VSS	Ground
30	VSS	Ground
31	VSS	Ground
32	STV	Start pulse gate driver
33	CKV	Clock gate driver
34	BORDER	Border connection
35	VSS	Ground
36	VSS	Ground
37	VSS	Ground

**6. Electrical Characteristics****6-1) Absolute maximum rating**

Parameter	Symbol	Rating	Unit
Logic Supply Voltage	VDD	-0.3 to +7	V
Positive Supply Voltage	V _{POS}	-0.3 to +18	V
Negative Supply Voltage	V _{NEG}	+0.3 to -18	V
Max .Drive Voltage Range	V _{POS} - V _{NEG}	36	V
Supply Voltage	VGG	-0.3 to +55	V
Supply Voltage	VEE	-32 to +0.3	V
Supply Range	VGG-VEE	-0.3 to +55	V
Operating Temp. Range	TOTR	0 to +50	°C
Storage Temperature	TSTG	-25 to +70	°C

6-2) Panel DC characteristics

Parameter	symbol	conditions	Min	Typ	Max	Unit
Signal ground	Vss			0		V
Logic voltage supply	Vdd		2.75	3.3	3.6	V
	Ivdd	Vdd=3.3V		2.5	10	mA
Gate negative supply	GVee		-19	-20	-21	V
	Glee	Gvee=-20V		1.3	4.0	mA
Gate Positive supply	GVdd		26	27	28	V
	Glidd	GVdd=27V		1.3	4.0	mA
Source negative supply	Vneg		-15.4	-15	-14.6	V
	Ineg	Vneg=-15V		6	135	mA
Source Positive supply	Vpos		14.6	15	15.4	V
	Ipos	Vpos=15V		6	135	mA
Border supply	Vcom		-2.5	Adjusted	-0.3	V
Asymmetry source	Vasm	Vpos+Vneg	-800		800	mV
Common voltage	Vcom		-2.5	Adjusted	-0.3	V
	Icom			0.42	0.8	mA
Maxmum Power panel	Pmax				4300	mW
Typcal power panel	Ptyp			265		mW
Standby power panel	Pstby				0.4	mW

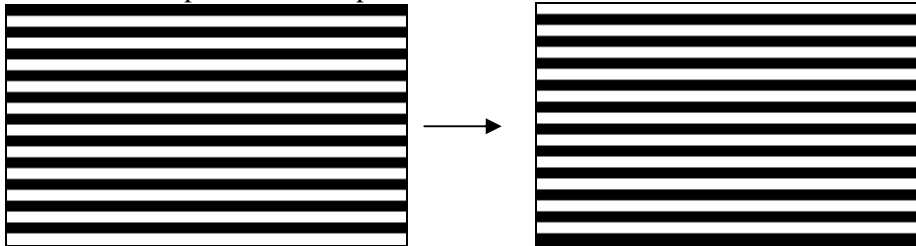
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-
-
-
-
-
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- The maximum power consumption is measured at 65 Hz operation with following pattern transition: from pattern of repeated 1 consecutive black scan lines followed by 1 consecutive white scan line to that of repeated 1 consecutive white scan lines followed by 1 consecutive black scan lines.(Note 6-1)
- The Typical power consumption is measured at 65 Hz operation with following pattern transition: from horizontal 4 gray scale pattern to vertical 4 gray scale pattern.(Note 6-2)
- The standby power is the consumed power when the panel controller is in standby mode.
- The listed electrical/optical characteristics are only guaranteed under the controller & waveform provided by E Ink.
- Vcom is recommended to be set in the range of assigned value $\pm 0.1V$

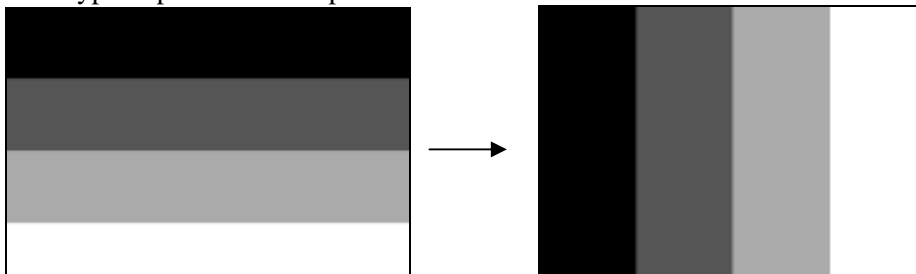
Note 6-1

The maximum power consumption



Note 6-2

The Typical power consumption



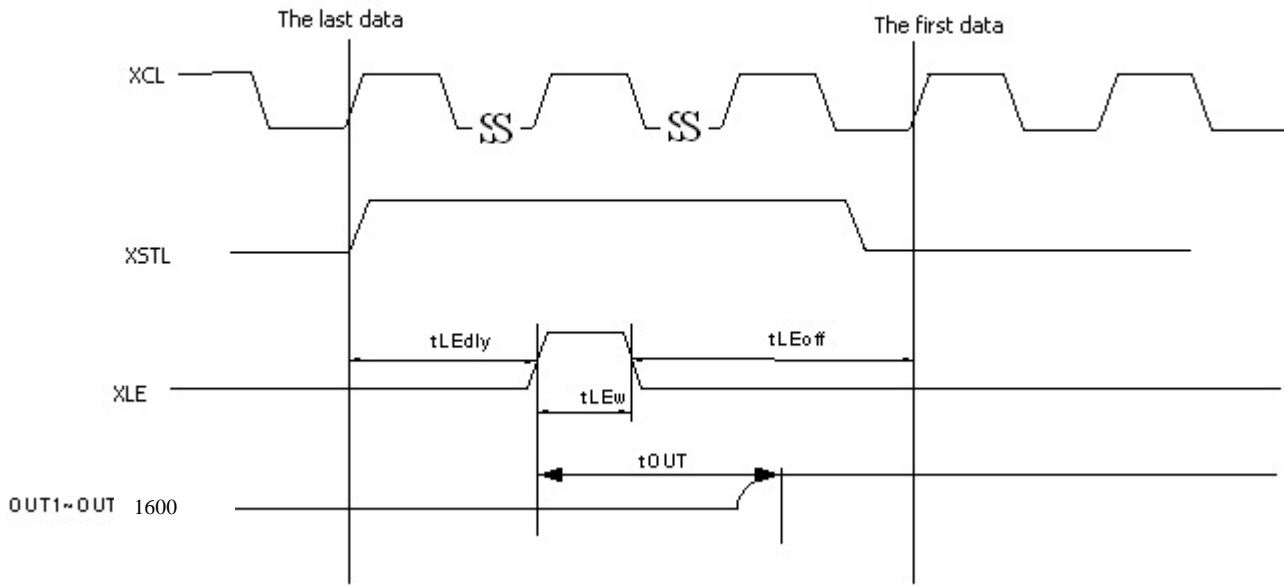
**6-3) Panel AC characteristics**

VDD=2.73V to 3.6V, unless otherwise specified.

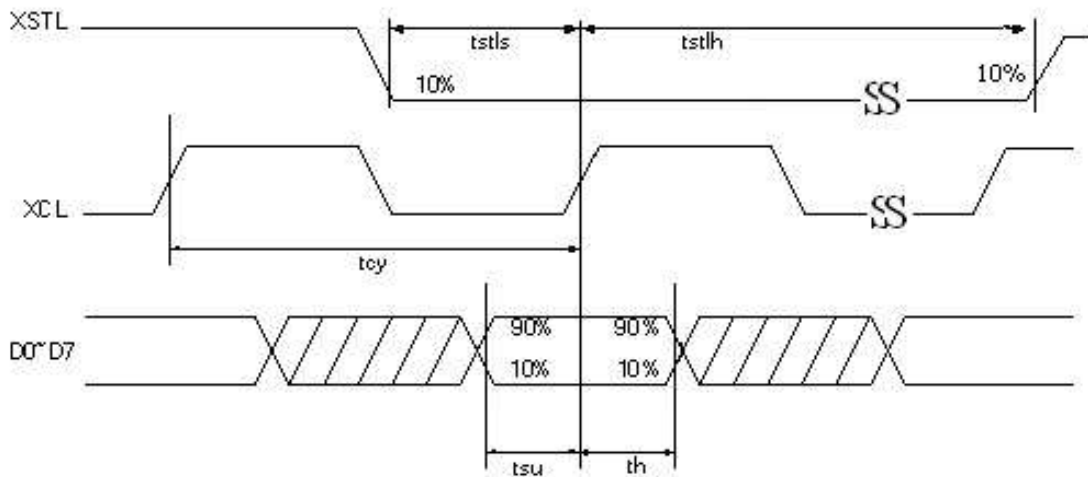
Parameter	Symbol	Min.	Typ.	Max.	Unit
Clock frequency	fckv	-	-	200	kHz
Minimum “L” clock pulse width	twL	0.5	-	-	us
Minimum “H” clock pulse width	twH	0.5	-	-	us
Clock rise time	trckv	-	-	100	ns
Clock fall time	tfckv	-	-	100	ns
SPV setup time	tSU	100	-	twH-100	ns
SPV hold time	tH	100	-	twH-100	ns
Pulse rise time	trspv	-	-	100	ns
Pulse fall time	tfspv	-	-	100	ns
Clock XCL cycle time	tcy	16.7	-	-	ns
D0 .. D7 setup time	tsu	8	-	-	ns
D0 .. D7 hold time	th	8	-	-	ns
XSTL setup time	tstls	8.35	-	-	ns
XSTL hold time	tstlh	8.35	-	-	ns
XLE on delay time	tLEdly	40	-	-	ns
XLE high-level pulse width (When VDD=2.73V to 3.6V)	tLEw	40	-	-	ns
XLE off delay time	tLEoff	200	-	-	ns
Output setting time to +/- 30mV(C _{load} =200pF)	tout	-	-	12	us
Frame Sync Length (Mode 1)	t1	1			1 line



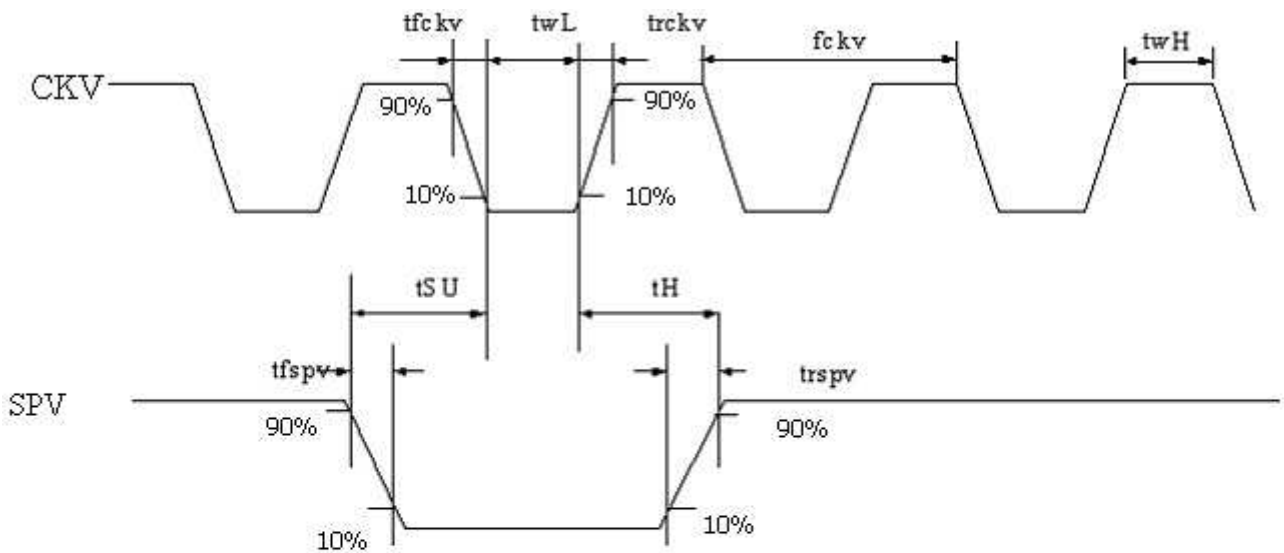
OUTPUT LATCH CONTROL SIGNALS



CLOCK & DATA TIMING

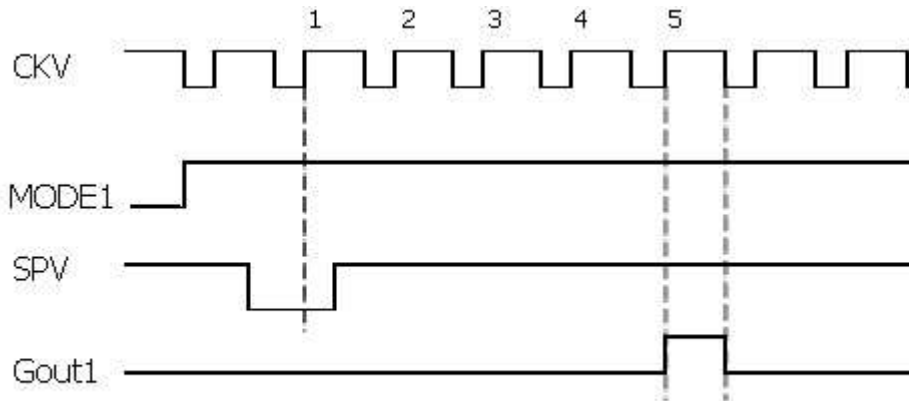


CKV & SPV TIMING

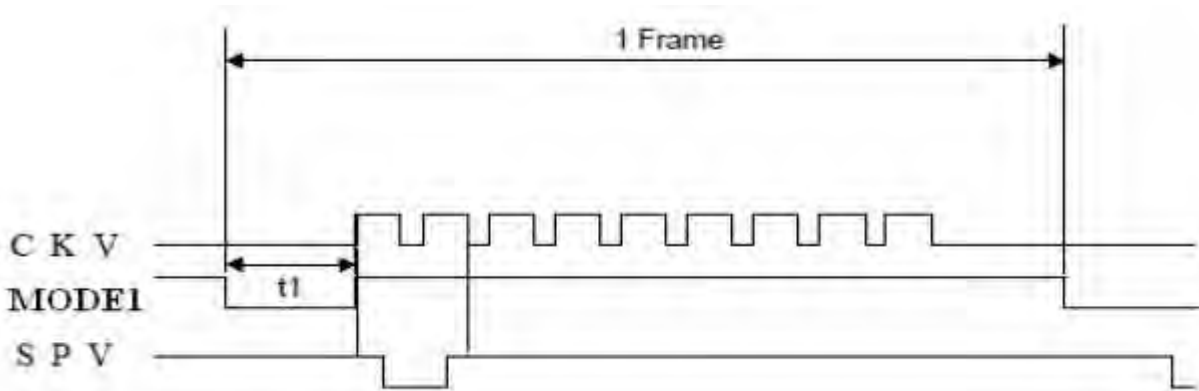




GATE OUTPUT TIMING



Frame Sync Length



Note : First gate line on timing
After 5CKV , gate line is on .



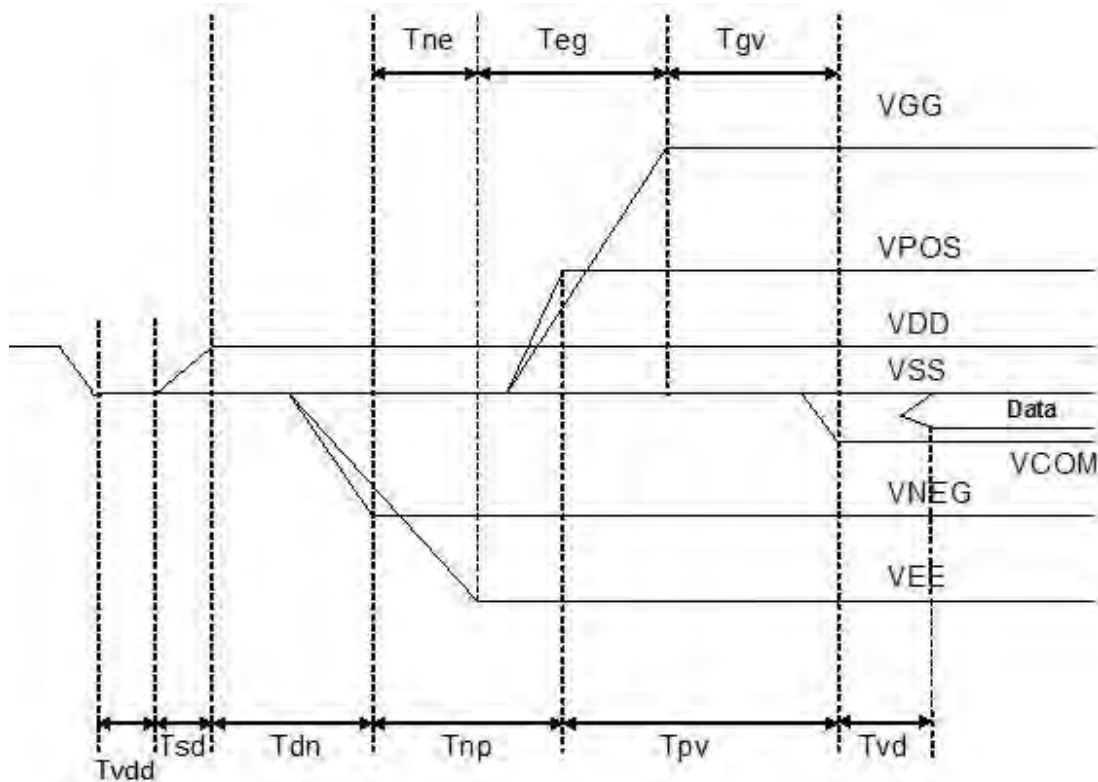
7. Power Sequence

Power Rails must be sequenced in the following order :

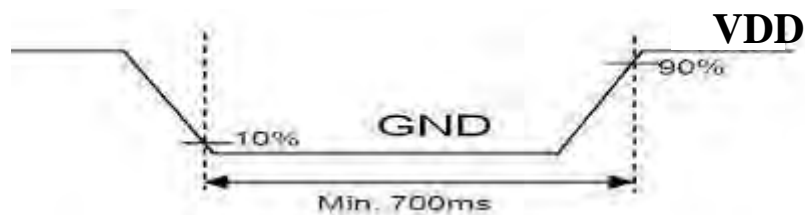
1. VSS → VDD → VNEG → VPOS (Source driver) → VCOM

2. VSS → VDD → VEE → VGG (Gate driver)

POWER ON



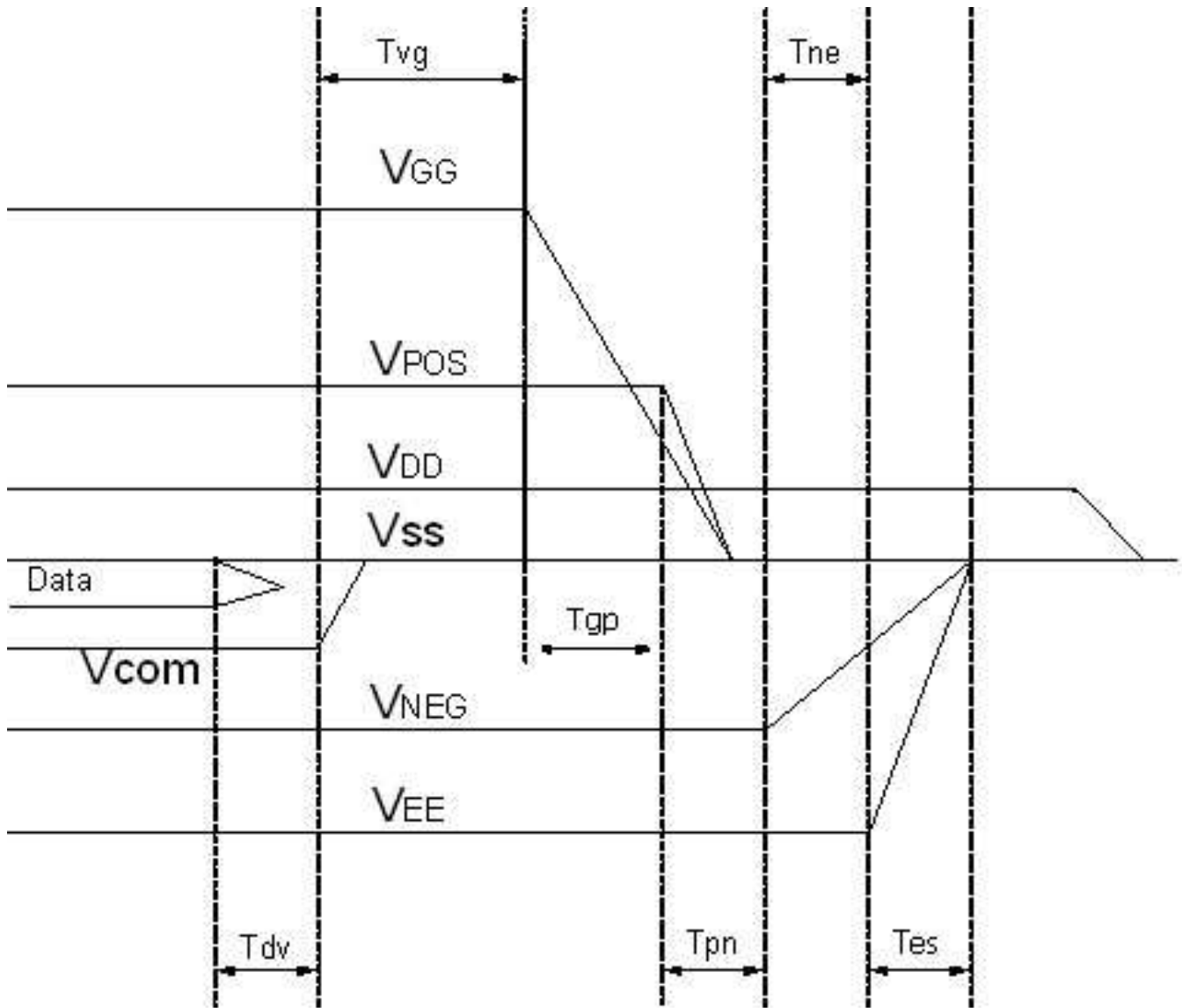
Note: If move from standby mode or power down to power on, VDD voltage must be set GND in the period of 700ms before VDD power on.



	Min	Max
Tsd	30us	20ms
Tdn	100us	-
Tnp	1000us	-
Tpv	100us	-
Tvd	100us	-
Tne	0us	-
Teg	1000us	-
Tgv	100us	-
Tvdd	700ms	-



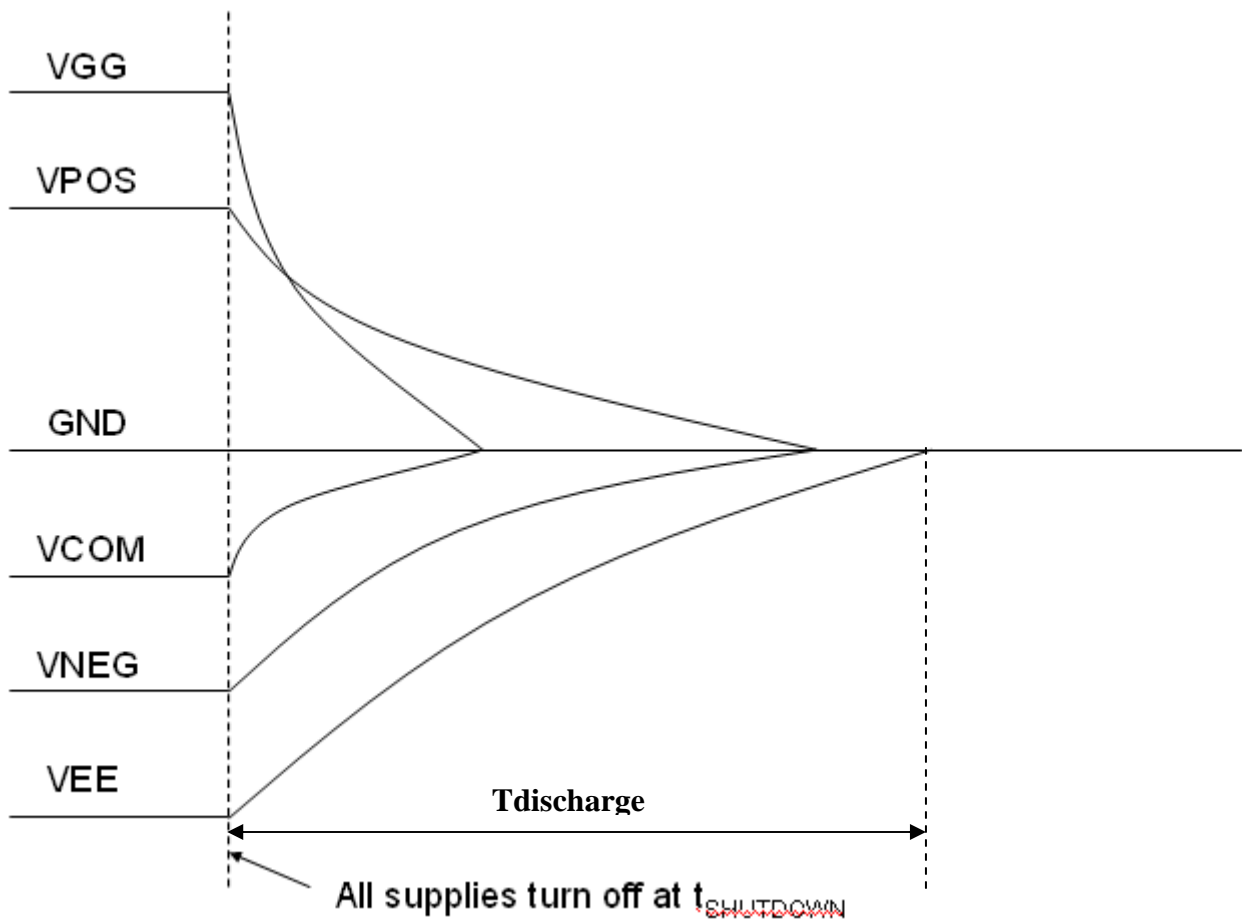
POWER DOWN



	Min	Max
T_{dv}	100 μs	-
T_{vg}	0 μs	-
T_{gp}	0 μs	-
T_{pn}	0 μs	-
T_{ne}	0 μs	-



8. Discharge time Sequence



Note8-1 : Supply voltages decay through pulldown resistors.

Note8-2 : VEE must remain negative of all other supplies during decay period.

8-1) Refresh Rate

The module ES133UT1 is applied at a maximum screen refresh rate of 65Hz.

	Min	Max
Refresh Rate	-	65Hz



9. Optical characteristics

9-1) Specifications

Measurements are made with that the illumination is under an angle of 45 degrees, the detection is perpendicular unless otherwise specified.

T = 25°C

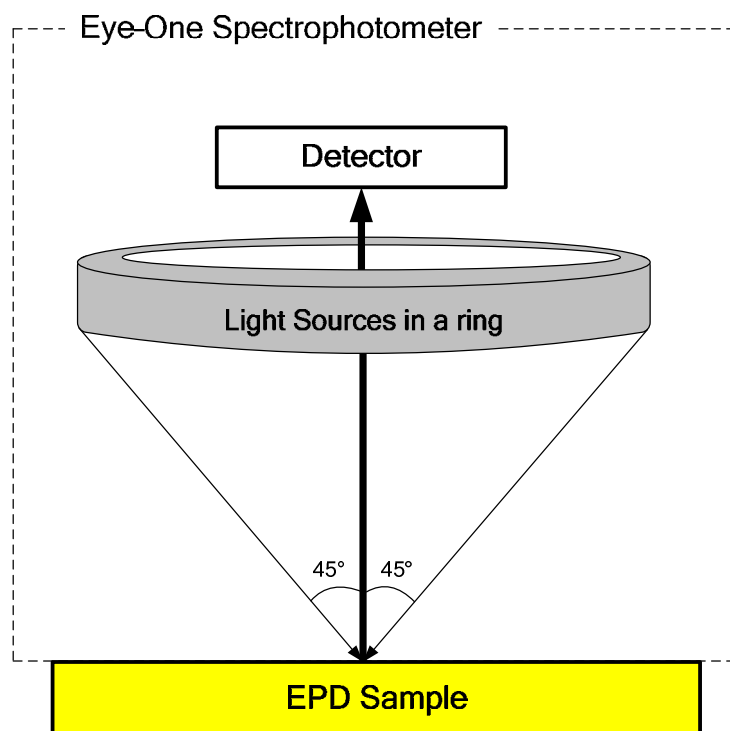
Symbol	Parameter	Conditions	Min	Typ.	Max	Unit	Note
R	Reflectance	White	30	35	-	%	Note 9-1
G _n	N _{th} Grey Level	-	-	$DS+(WS-DS) \times n/(m-1)$	-	L*	-
CR	Contrast Ratio	-	10	12	-		-
T _{update}	Update time	2~4-bit mode 1-bit mode		770 250	-	ms ms	-

WS: White state , DS: Dark state, Gray state from Dark to White :DS 、 G1 、 G2... 、 G_n... 、 G_{m-2} 、 WS
m:4 、 8 、 16 when 2 、 3 、 4 bits mode

Note 9-1: Luminance meter :Eye – One Pro Spectrophotometer.

9-2) Definition of contrast ratio

The contrast ratio (CR) is the ratio between the reflectance in a full white area (R_I) and the reflectance in a dark area (R_d): $CR = R_I / R_d$





9-3) Reflection Ratio

The reflection ratio is expressed as:

$$R = \text{Reflectance Factor}_{\text{white board}} \times (L_{\text{center}} / L_{\text{white board}})$$

L_{center} is the luminance measured at center in a white area (R=G=B=1). $L_{\text{white board}}$ is the luminance of a standard white board. Both are measured with equivalent illumination source. The viewing angle shall be no more than 2 degrees.

**10.HANDLING, SAFETY AND ENVIROMENTAL REQUIREMENTS****WARNING**

The display glass may break when it is dropped or bumped on a hard surface. Handle with care. Should the display break, do not touch the electrophoretic material. In case of contact with electrophoretic material, wash with water and soap.

CAUTION

The display module should not be exposed to harmful gases, such as acid and alkali gases, which corrode electronic components.

Disassembling the display module can cause permanent damage and invalidate the warranty agreements.

This part doesn't contain any substances which are specified as level-1 in SS-00259.

Used raw materials of the parts as molding resin ,inks, paints, and coated wires shall be purchased from green partner suppliers.

Observe general precautions that are common to handling delicate electronic components. The glass can break and front surfaces can easily be damaged. Moreover the display is sensitive to static electricity and other rough environmental conditions.

Data sheet status

Product specification	This data sheet contains final version product specifications.
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Limiting values

Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Application information

Where application information is given, it is advisory and does not form part of the specification.

**11. Reliability test**

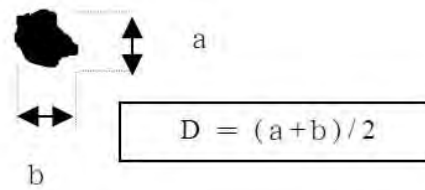
	TEST	CONDITION	METHOD
1	High Temperature Operation	T=+50C RH=30% for 240hrs	IEC 60 068-2-2Bp
2	Low Temperature Operation	T=0C for 240 hrs	IEC 60 068-2-2Ab
3	High Temperature Storage	T=+70C RH=23% for 240hrs (Test in White Pattern)	IEC 60 068-2-2Bp
4	Low Temperature Storage	T=-25C for 240hrs (Test in White Pattern)	IEC 60 068-2-1Ab
5	High Temperature High Humidity Operation	T=+40C RH=90% for 168hrs	IEC 60 068 2-3CA
6	High Temperature High Humidity Storage	T=+60C RH=80% for 240hrs (Test in White Pattern)	IEC 60 068 2-3CA
7	Temperature Cycle	1 cycle [-25C 30min] -> [+70c 30min] : 100cycles (Test in White Pattern)	IEC 60 068-2-14
8	Solar radiation test	765mW/m2 for 168hrs 40C (Test in White Pattern)	IEC 60 068-2-5Sa
9	Altitude test Operation	700hPa (=3000m) 48hrs	
10	Altitude test Storage	260hPa (=10,000m) 48hrs (Test in White Pattern)	
11	Electrostatic Efficient (non-operating)	With bezel (Machine model) +/- 250V, 0 ohm , 200Pf	IEC 62179 IEC 62180
12	Package Vibration	1.04G Frequency 10-500Hz Direction: X,Y,Z Duration: 1 hours in each direction	full package for shipment
13	Package Drop Impact	Drop from height of 122 cm on concrete surface Drop sequence: 1corner, 3edges, 6surfaces One drop for each	full package for shipment
14	Stylus Tapping	POLYACETAL Pen Top R0.7mm Load:200gf Speed: 30times/min Total: 13,500times	
15	Stylus Drag	POLYACETAL Pen Top R0.7mm Load:200gf Speed: 50mm/sec Total: 6,500times	
16	Bending test	3corner fixed,1corner pushed Bending depth 15cm 4position,10sec	



Actual EMC level to be measured on customer application

Note 11-1 : The front protective film must be removed before temperature test.

Note 11-2 : $D \leq 0.15\text{mm}$ capsule burst can be judged as "no damage"



[Criteria]

In the standard conditions, there is not display function NG issue occurred. (including : line defect ,no image). All the cosmetic specification is judged before the reliability stress.

**12. Bar Code definition**

E7S 00 6 01 1 I 7 4 00361 A T
 [1] [2] [3] [4] [2] [5] [6] [2] [7] [2] [8]

[1] : EPD model code:

ES133UT1: E7S

[2] : Internal control codes:

[3] : FPL reversion code

V220C:6 V220E:8

[4] : FPL batch code:

01~99	001~099	G0~G9	160~169	Q0~Q9	230~239	X0~X9	300~309
A0~A9	100~109	H0~H9	170~179	R0~R9	240~249	Y0~Y9	310~319
B0~B9	110~119	J0~J9	180~189	S0~S9	250~259	Z0~Z9	320~329
C0~C9	120~129	K0~K9	190~199	T0~T9	260~269		
D0~D9	130~139	L0~L9	200~209	U0~U9	270~279		
E0~E9	140~149	M0~M9	210~219	V0~V9	280~289		
F0~F9	150~159	N0~N9	220~229	W0~W9	290~299		

[5] : Year:

N: 2013 / P: 2014 / Q: 2015 / R: 2016 /... / Z: 2024

[6] : Month:

1:Jan. 2:Feb. ... 9:Sep. A:Oct. B:Nov. C:Dec.

[7] : Serial number

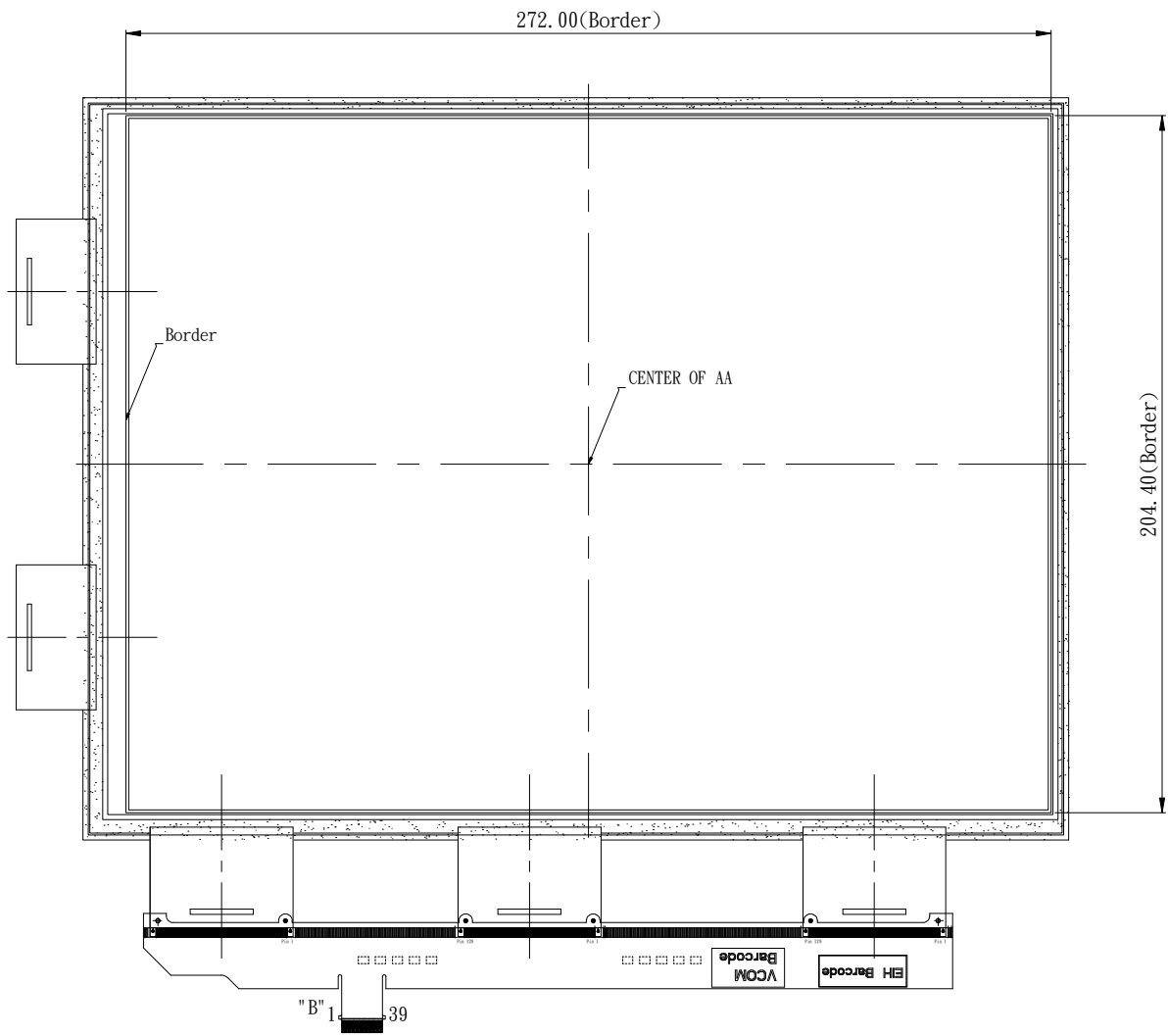
00000-99999

[8] : MFG code:

TYT FAB 5:G TYT FAB 4:L TOC FAB 3:T TOC FAB 2:Y TOC FAB 1:K EIH : P

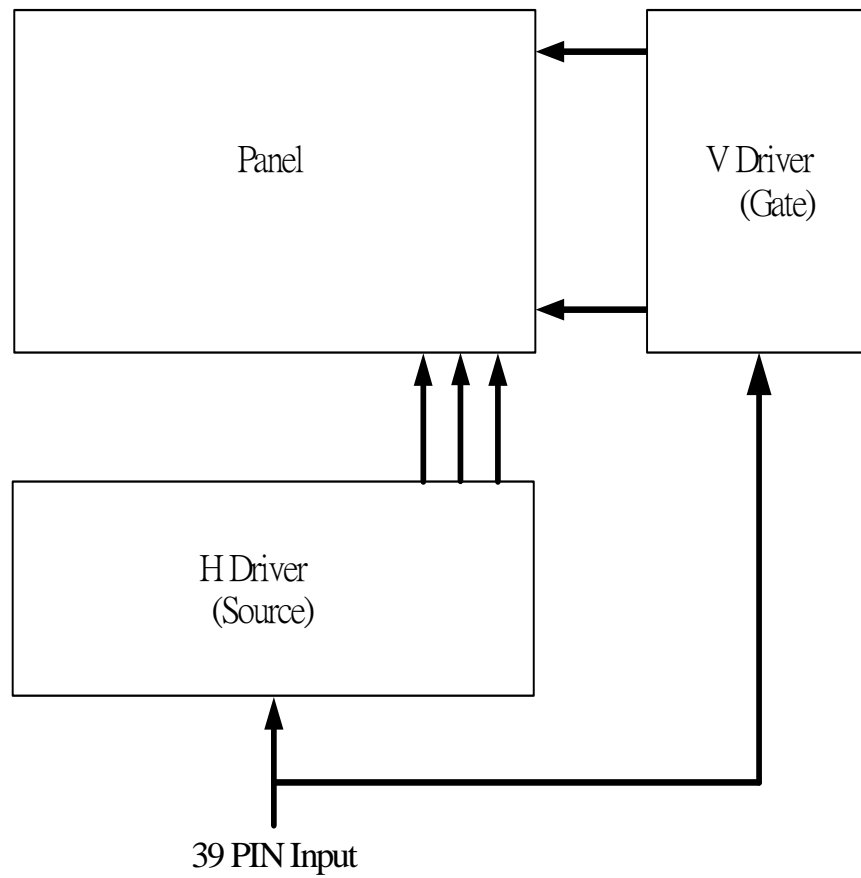


13. Border definition





14. Block Diagram





15.Packing

REV	DESCRIPTION	DESIGN	DATE
01	INITIAL RELEASE	Seint Tsai	2012.11.19

NOTE:

1. One layer include: 1 piece of cushion sheet, 1 pcs panel & 1 piece of tray.
2. Q'TY: 12 pcs panel/carton.
3. Dimension: 455*375*190mm
4. Weight: 3.5 KG

⚠️ Make sure tray stacked with 180° rotation. We can check this by lateral side view.

9	EASY TAPE	12	For Remove Protect Sheet
8	30g加厚複合紙面纖維紙73*95mm(商標JK0030)	2	
7	防鏽膏(保護容積25L)	3	
6	CARTON INTERNAL	1	
5	摺口袋450*380*700mm	1	抗靜電
4	EPD 13.3" Panel	12	
3	EPE CUSHION SHEET	12	抗靜電
2	PS TRAY	13	抗靜電
1	EPE FOAM	2	
ITEM	DESCRIPTION	QTY	REMARK

MTL.SPEC.	UNSPECIFIED TOL'S	REMARK
	ANGLE ROUGHNESS	

APPROVE	Jimmy Chen	SCALE	UNIT	SHEET	DWG.TITLE	
CHECK	Jimmy Chen	1:1	mm	1 OF 1	13.3" PACKING DRAW	
DESIGN	Seint Tsai	MTL.NO.		DWG.NO.		
					REV. 03	A4 SIZE