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	1SSUE:Dec.20,2006
Specifications for	
TFT -LCD Monitor	
MODEL: COM43T4123KTY	
APPROVED BY	
Signature :	
Name :	
Section :	
Title :	
Date :	



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Dec. 1,2006			FIRSLISSUE.
Dec 20 2006	P 6		Add W tape
		A ×5	
<u>A</u> ×8	P.13		Add electrical , mechanical & reliability and optical characteristics in touch panel.
		$A \times A$	
	P.21		Change resistance mark in "12. Driving Circuit Example(module)".
		ZAS XI	
	P.23		Change of Center brightness value in "15.10ptical characteristics".
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1.APPLICATIONS	
These specifications apply to 10.9cm (4.3inch) TFT-LCD monitor products, which are intended	l for civilian use.
 As to the use of these products, and/or the use of the information and/or the drawings specifications, CASIO shall not guarantee or grant Samsung Electronics Co., Ltd. to an industrial right, intellectual property, or any other rights of a third party. Therefore CASIO shall not be liable to infringement of rights of a third party by Samsung Electronics Co., Ltd. These specifications contain CASIO's proprietary information that is protected by the Therefore, Samsung Electronics Co., Ltd. shall treat this information with utmost care any part of these specifications without prior permission from CASIO. 	in these use or exercise / e copyright. e, and shall not duplicate

- If these products will be used in an application where a higher level of reliability and safety is needed, in terms of function and accuracy, such as transportation equipment (aircraft, train, automobile, etc.), disaster-prevention, security equipment, or various safety equipment, Samsung Electronics Co., Ltd. shall contact CASIO for technical assistance in advance.
- O These products shall not be used in critical application that requires the highest level of reliability and safety, such as aerospace equipment, main lines of telecommunications equipment, control equipment for nuclear plants, or medical life-support equipment.
- O CASIO shall not be liable for any damage arising from the misuse, abuse, and/or miss-operation of these products that do not meet with the operating conditions and precautions described in these specifications.
- If any issues arise as to the information provided in these specifications or any other information, CASIO will discuss them with Samsung Electronics Co., Ltd. in good faith and try to seek solutions or improvements.
- Casio shall not be obliged to burden the responsibility for destruction by static electricity broken out in your processes, such as the protection film peeling off process.
- CASIO apply these specifications, only when carried in your company Grobal Positioning System product. When used for the other use, since CASIO do not do, please understand a guarantee entirely.
- O Complaint about non-conformance to the specifications on this document shall be notified to CASIO within six months from the date of production or three months from the date of shipment, together with return of the actual products. After the expiration date designated above, CASIO shall have the right to reject any complaint.

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2.GENERAL SPECIFICATIONS

ltem	Specification	Remark
Display type	TN type 16,777,216 Colors, Transmissive mode	
	Normally white	
Driving method	a-Si TFT Active matrix	
	Line-scanning, Non-interlace	
Dot arrangement	RGB stripe arrangement	Refer to figure 1
Input signal type	8-bit RGB, parallel input	
Backlight	High bright white LED	
Touch panel	Resistance type, transmissive analog tablet	
Viewing		



Figure-1 Dot arrangement (down for FPC)

3. DIMENSIONS AND OUTWARD FORM

3.1 Dimensions

Item	Specification	Unit	Remarks
Monitor outline dimensions	105.50[H] ×67.20[V] ×4.10[D]	mm	Cable partial convex
			size is not included
Effective display area	95.040[H] ×53.856[V]	mm	Diagonal: 109.22mm
Number of dots	1440[H] ×272[V]	Dot	
Dot pitch	66.0[H] ×198.0[V]	μm	
Hardness of TouchPanel surface	3	Н	It complies with the
			way of test method
			JIS K5400.
			However, the adding
			weight is set to 4.9N.
Weight	54.4	g	





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3.3 SERIAL LABEL(S LABEL)

1) Contents

lot month (1 digit), module model code (4 digits), and serial number of the module (6 digits).

* Content of Characters

**** _____ * * * * * * * с b d а

	Content of Characters							
а	The unit's place of the year							
b	Production Lot	JanA MayE Sept-l						
	(month)	FebB	JunF	Oct-J				
		MarC	JulyG	NovK				
	AprD AugH DecL							
С	Model code 43KY (made in Japan), 43LY (made in China)							
d	Serial Number							

,

* Example of SERIAL LABEL(S LABEL)

In case of COM43T4123KTY

6J43KY500125

means Oct 2006, 4.3" K type, Y version No.000125

In case of COM43T4123LTY

6J43LY500125

means Oct 2006, 4.3" L type, Y version No.000125

2) SERIAL LABEL(S LABEL) location Refer to Subsection 3.2 Outward Form.

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4.INTERFACE TERMINALS ASSIGNMENT

No.	Symbol	Functions
1	VSS	ground
2	AVDD	Power supply for analog circuit
3	VDD	Power supply for logic circuit
4	VSS	ground
5	POCB	Power on clear (Low: Active)
6	DE	Horizontal sync control signal
7	VSYNC	Vertical sync signal
8	HSYNC	Horizontal sync signal
9	DISP	Display on/off control signal Lo:display off、Hi:display on
10	CLK	Clock signal for data latching and internal counter of the timing controller
11	V13	Source driver output level voltage(negative case Lo)
12	V7	Source driver output level voltage(negative case Hi)
13	V6	Source driver output level voltage(positive case Lo)
14	VO	Source driver output level voltage(positive case Hi)
15	D27	
16	D26	Display data(B)
17	D25	00h: Black
18	D24	D20:LSB D27:MSB
19	D23	
20	D22	Driver has internal gamma conversion.
21	D2I	
22	D20	
23	DI7	
24	DIG	Display data(G)
25	D15	
20	D14	DIU:LSB DI7:MSB
21	D13	Driver has internal commo conversion
20		Driver has internal gamma conversion.
30		
31		
.32	D06	Display data(R)
33	D05	O0h: Black
34	 D04	D00;LSB D07:MSB
35	D03	
36	D02	Driver has internal gamma conversion.
37	D01	-
38	D00	
39	COML	Output pin of regulator for COMOUT out put L level
_ 40	COMH	Output pin of regulator for COMOUT out put H level
41	COMDC	Adjust the amplitude Voltage level for COMOUT output
42	COMPP	Adjust the amplitude Voltage level for COMOUT output
43	VDD2	output pin of internal regulator circuit
44	VDD3	Output pin of internal reference voltage
45	OSCIN	Terminal for internal oscillation circuit
46	OSCOUT	Terminal for internal oscillation circuit
47	VSS	ground

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No.	Symbol	Functions	
48	VDD	Power supply for logic circuit.	
49	AVDD	Power supply for analog circuit	
50	C5P	Connection terminal for capacitor for charge pump	
51	C5M	Connection terminal for capacitor for charge pump	
52	VDD4	Negative power supply	
53	VGH	Positive voltage for gate driver	
54	C2P	Connection terminal for capacitor for charge pump	
55	C1AP	Connection terminal for capacitor for charge pump	
56	C1BP	Connection terminal for capacitor for charge pump	
57	C1M	Connection terminal for capacitor for charge pump	
58	C2M	Connection terminal for capacitor for charge pump	
59	C4P	Connection terminal for capacitor for charge pump	
60	C3P	Connection terminal for capacitor for charge pump	
61	C3M	Connection terminal for capacitor for charge pump	
62	C4M	Connection terminal for capacitor for charge pump	
63	VGL	Negative voltage for gate driver	
64	COMOUT	Output signal for common electrode	
65	VCOM	Input signal for common electrode	
66	XL	X-axis left terminal	
67	YD	Y-axis lower terminal	
68	XR	X-axis right terminal	
69	YU	Y-axis upper terminal	
70	BLL	Backlight drive (cathode side)	
71	BLH	Backlight drive (anode side)	

* Recommended connector: Kyocera Elco, 6281 series (04 6281 071 2X2 829+) This terminal uses the gilding.

* Please refer to the "Outline drawing" for terminal order.

*LCD-FPC's terminal uses the gilding.

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5. ABSOLUTE MAXIMUM RATINGS

						VSS=0V
Item	Symbol	Condition	Ra	ting	Unit	Applicable terminals
			MIN	MAX	1	
Supply voltage for logic	VDD	Ta=25℃	-0.3	6.0	V	VDD
Supply voltage for analog	AVDD	Note1	-0.3	6.0	V	AVDD
Input voltage for logic	VI	1	-0.3	VDD+0.3	V	POCB, DE, VSYNC, HSYNC
						DISP,CLK,INV,CLK_REV,
						D[27:00]
Common electrode voltage	COMDC	1	0.1	AVDD-1	V	COMDC
	COMPP	1	0.1	AVDD-1	V	COMPP
	VCOM	1	-6.0	10.0	V	VCOM
			—	12.0	Vp-p	1
LED direction current of order	IF	Ta = 25℃	-	35	mA	BLH,BLL
		Ta = 70℃	-	15		
Touch Panel Input Voltage			-	7	V	XL,XR,YU,YL
Storage temperature	Tstg		-20	80	°C	
Storage humidity Range	Hstg	Ta≦40°C	20	80	%	
		Ta>40° C	It is a thing with	out	1	
			drew condensation blow in 40°C 80%RH of the amount of moisture.			

Note1 : Please refer to the "Power on and off sequence section of this document

Note 2 : Apply the 1KHz Sine wave. Insert 10 $\!\Omega$ min resistor. Duration:Within 1 hour.

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6.RECOMMENDED OPERATING CONDITIONS

								VSS=0V
Item		Symbol	Condition	Rating			Unit	Applicable terminals
				MIN	TYP	MAX		
Supply voltage	for logic	VDD		2.7	3.0	3.6	V	VDD
Supply voltage	for analog	AVDD		4.8	5.0	5.2	V	AVDD
Common	Amplitude	VCOMPP	COMH-COML	2.00	—	7.80	Vр-р	COMH Note3
electrode signal								COML
	Center voltage	Vcom/c		0.38	2.19	4.00	V	COMDC
	Note1							
Output amplitude	for source			0.50	—	4.50	Vр-р	
dri	iver (Contrast)							
		VA1	VA1>VB1	2.50	4.50	AVDD-0.2		VO
Output amplitude	for source	VB1		VSS+0.2	0.20	2.50		V6
driver (Contrast)		VA2	VA2>VB2	2.50	4.20	AVDD-0.2	V	V7
		VB2		VSS+0.2	0.50	2.50		V13
External resistance for osil1ator				-	75	-	KΩ	OSCOUT, OSCIN
Operational temperature Note2		Тор		-10	+25	+70	°C	Touch Panel surface temp.

Note 1: This range indicates the most probable range for the optimal setting for VCOMDC. It does not mean that the optimal settings for VCOMDC for all monitors will be in this range. VCOMDC should be optimized by viewing/using the monitor.

Note 2: Acceptable Forward Current to LED is up to 15mA, when Ta=+7C°C. Do not exceed Allowable Forward Current shown on the chart below.

Note 3: COMH=COMDC + COMPP,COML=COMDC - COMPP



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7. Characteristics 7.1 DC Characteristics

7.1.1 Module Block

			ľ	f not specifie	d, Ta=25℃, V	′DD=3.0∖	,AVDD=5.0V,VSS=0V
Item	Symbol	Condition		Rating		Unit	Applicable terminals
			MIN	TYP	MAX		
Input voltage for	VIH		0.7*VDD	—	VDD	V	POCB, DE, VSYNC
logic							HSYNC, DISP, CLK
	VIL		0	—	0.3*VDD	V	INV,CLK_REV
							D[27:00]
Pull up	Rpu		150	_	—	kΩ	INV,CLK_REV
resister value							RESETB, DISP
Pull down	Rpu		150	_	—	kΩ	DE,D[27:00]
resister value							
Current	IDD	fCLK=9.00MHz	—	3.3	6.6	mA	VDD
consumption	IAVDD	Color bar display	_	15.0	30.0	mA	AVDD

7.1.2 Backlight Block

							Та=25°С
Item	Symbol	Condition		Rating		Unit	Applicable terminals
			MIN	TYP	MAX		
Forward current	IL25	Ta=25℃	—	20.0	35.0	mA	BLH,BLL
	IL70	Ta=70℃	—	—	15.0	mA	
Forward voltage	VL	Ta=25°C, IL=20.0mA	—	32.0	35.0	V	

A 7.1.3 Touch Panel

Electrial Char	racteristics						Та=25°С
Item	Symbol	Condition		Rating		Unit	Applicable terminals
			MIN	TYP	MAX		
Linearity	LE		—	—	±2.0	%	XR,XL,YU,YL
Insulation Resistance	RI	DC 25V	20	—	—	MΩ	
Terminal		Х	400	_	1800	Ω	XR,XL
Resistance		Υ	100	—	700		YU,YL
Rated Voltage		DC	_	—	5	V	XR,XL,YU,YL
ON/OFF		R0.8mm polyacetal pen	_	—	10	ms	XR,XL,YU,YL
Chattering							

Mechanical&Reliability Characteristics

Item		Rating		Unit	Note
	MIN	TYP	MAX		
Operation Force	0.05	—	1.47	N	RO.8mm Polyacetal pen
					or finger
Durability					Tapping at same points by
(Tapping life by finger)	1000000	—	—	times	silicom rubber
					 shape of rubber end-R8,
					Hardness60°
					 Load-2.45N
					 Frequency-3Hz
Surface hardness of Film					
(pencil hardness)	3	—	—	Н	JIS K5400

Optical Characteristics

Item		Rating			Note
	MIN	TYP	MAX		
Transparency	80	82	_	%	JIS K7105

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7.2 AC Characteristics

Common Item			If not spe	cified, Ta=	=25°C,VD[D=3.0∖	,AVDD=5.0V,VSS=0V
Item	Symbol	Condition	Rating			Unit	Applicable terminals
			MIN	TYP	MAX		
Clock Low period	tw1L	0.3×VDD or shorter	26.7	_	—	ns	CLK
Clock High period	tw1H	0.7×VDD or longer	26.7	-	-	ns	CLK
HSYNC setup time	tspl		10	-	—	ns	HSYNC,CLK
HSYNC hold time	thd1		10	-	—	ns	HSYNC,CLK
Data setup time	tsp2		10	-	—	ns	D[27:00],CLK
Data hold time	thd2		10	-	—	ns	
VSYNC setup time1	tsp3		10	-	—	ns	VSYNC,CLK
VSYNC hold time1	thd3		10	-	—	ns	VSYNC,CLK
DE setup time	tsp4		10	—	—	ns	DE,CLK
DE hold time	thd4		10	—	_	ns	DE,CLK
DISP setup time	tsp5		10	—	_	ns	DISP,CLK
DISP hold time	thd5		10	_	—	ns	DISP,CLK
Clock frequency	fCLK		—	9.00	15	MHz	CLK

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8. Input timing

8.1 Input timing

If not specified, Ta=25°C, VDD=3.0V, AVDD=5.0V, VSS=0V Item Symbol Rating Unit Applicable terminals TYP. MAX. MIN. HSYNC pulse width CLK HSYNC, CLK tw2H 2 41 VSYNC pulse width tw3H 1 10 Н VSYNC, HSYNC 59.94 VSYNC frequency **fVSYNC** Hz VSYNC — _ 17.14 KHz HSYNC frequency **fHSYNC** HSYNC _ fCLK 9.00 15 MHz CLK Clock frequency _ 525 CLK HSYNC,CLK HSYNC signal cycle time th — — 480 Horizontal display period thdp _ CLK HSYNC,CLK _ Horizontal front porch thf 2 CLK HSYNC,CLK _ Horizontal back porch thb 2 2 _ CLK HSYNC,CLK _ VSYNC signal cycle time 286 Н VSYNC,HSYNC tv ____ 272 Vartical display period VSYNC, HSYNC ____ Н tvdp _ 2 Н VSYNC, HSYNC Vartical front porch t∨f 1 _ 2 Vartical back porch tvb 1 ____ Н VSYNC, HSYNC

* The characteristic of this item is recommended standard.

Please use it after it confirms it enough like the display fineness etc. when it comes off from this characteristic and it is used. Note: %1 thdp=480CLK, thf=2CLK, tw2H=41CLK, thb=2CLK, thf+tw2H+thb>44



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10.Display on/off Sequence	
It explains the Display on/off sequence. When the DISP pin is Hi, "White" data is output from rising up of the first VSYNC signal to rising up of VSYNC after 10 frames. (FFh) Similarly, when the DISP pin is Lo, "White" data is output from rising up of the first VSYNC to rising up VSYNC after 10 frames. (FFh)	signal
DISP	
DISPG	10 11
	· ↓ · ↓
DATA output INVALID White(FFh) VALID White(FFh)	INVALID
11.Power On Clear There is a limitation between Power On and POCB (power on clear) . Please defend the following conditions.	
VDD	
POCBT>1ms	

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15. OPTICAL CHARACT 15.1 OPTICAL CHARA Measuring condition	ERISTIC CTERIST	s 🛕 rics						
Measuring equipment CS1000(Konika Minolta), LCD7000(otsuka Electronics)								
Driving conditions	AVDD=5.	0V, VDD=3.0V, V	SS=0V,					
	Vcom	/C is adjusted to	an optimum	value.				
	VLCD	= Vsigpp±Vcor	mpp /2					
Back light	IL=20.0m	A (Use Casio's	measuring	circuit (refer	to the apper	ıdix.))		
Measuring tempera	ature Ta=	25° C						
Item	Symbol	Condition	MIN	TYP	MAX	Unit	Note	Remarks
	-						#	

se	Rise time	TON	VLCD=	-	-	40	ms	1	*	
ы б			1V→5V							
tin	Fall time	TOFF	VLCD=	-	-	60	ms			
Å			5V→1V							
Contra	ast ratio	CR	VLCD=	60	250	-		2		
			1V/5V							
D	Left	θL	VLCD=	65	80	-	deg	3	*	
de vi	Right	θR	1V/5V	65	80	-	deg			
/ie/	Up	φU	CR≧5	40	80	-	deg			
1	Down	φD		65	80	-	deg			
V-T T	nreshold	V90 1.4 1.7 2.0 V					V	4	*	
voltag	e	V50		1.8	2.1	2.4	V			
		V10		2.5	2.8	3.1	V			
White	V-T								Reference	
chara	cteristic			9	See figure 3	3.				
White		X	VLCD=IV		see tigure 2	ł.		5		
chrom	atically	У								
Maxin	num contrast	$CR\phi$		-16	-8	-1	deg	6	*	
angle									Downward	
Image	mage sticking No image sticking shall remain after							7		
				displaying the window pattern for						
				2 hours						
Cente	r brightness		VLCD=1V	400	540	-	cd/m2	8		
Bright	ness distribution		VLCD=1V	70	-	-	%	9		

*: Note1-9 Refer to the Appendix "Standed measurement method of optical characteristics for TFT-LCD monitor".

 $\ensuremath{\overset{\,}{\times}}$: Note) The value are measured in module states.



Figure 3 White V-T characteristics



15.2 TEMPERATURE CHARACTERISTICS

Measuring condition

Measuring equipment CS1000(Konika Minolta), LCD7000(otsuka Electronics) Driving conditions AVDD=5.0V, VDD=3.0V, VSS=0V,

Vcom/C is adjusted to an optimum value.

VLCD= | Vsigpp±/compp | /2

Back light IL=20.0mA (Use Casio's measuring circuit (refer to the appendix.))

	Item	Ra	ting	Remarks
		Ta=-10°C	Ta=70° C	
Contrast ratio		40 or more	40 or more	
Response	Rise time	Less than 200ms	Less than 30ms	
time				
	Fall time	Less than 200ms	Less than 50ms	
Display quality		Defects and ununiformit	As criteria of 16	
		inconspicuous.		

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6. CR 16.1	ITERIA DISPLAY	APPEARAN	NCE SPE		ATIONS							
Te D	esting conditi isplay monito	ons or should be ir	nspected	with the	following c	onditions.						
D Si D III Bi	Driving signal Signal condition Distance between display and eye Illuminance Back light					Raster pattern(RGB signal color and white) VLCD: 1.5V,2.5V,5V(3steps) 30cm 500 to 1500 LUX IL=20.0mA , Use Casio's measuring circuit (refer to the append						
Item		Definition						Criteria				
	Line	Black.white.	or color li	ne				None				
	defect	3 or more do	ot defects	on a str	aitline							
Display defect	Dot defect	Unusual br defects of T brightness Vis Dark defec Vis		Refer to	Table 1.							
	Stain	Unevenness	s of brig	htness				Invisible	ethrough			
		(white stair	n,black s [.]	tain,etc.)	1			1%ND filter				
	Foreign	Dust betwe	en the	[Dot form	0.25mm<φ			N=0			
	mater	touch pane and t	el the LCD		0.15<φ≦0.25mm				N≦2			
lali				_		φ≦0.15mm			ignored			
ਰੋ				l	_ine form	3.0mm <length 0.08r<="" td=""><td>mm<wi< td=""><td>dth</td><td>N=0</td></wi<></td></length>	mm <wi< td=""><td>dth</td><td>N=0</td></wi<>	dth	N=0			
						length≦3.0mm widt	h≦0.0	8mm	ignored			
	Flaw	Flaw of touc	ch panel s	surface		W≦0.02mm			ignored			
						0.02 <w< td=""><td>L≦2r</td><td>nm</td><td>ignored</td></w<>	L≦2r	nm	ignored			
Display						≦0.05mm	2 <l≦< td=""><td>≦5mm</td><td>N≦5</td></l≦<>	≦5mm	N≦5			
						0.05mm <w< td=""><td>·</td><td></td><td>regarded as a foreign matter</td></w<>	·		regarded as a foreign matter			
	Otheres					Due to boundary san	nple.					
Table	e 1			F	Average of Permissible	diameters=(long diame number :N	eter+sh	nort diam	eter)/2:D(mm)			
Mode	el		Bright	Dark	Total							
COM	43T4123KT\	(3	3	Connected 2 dark de	fects is	i not allov	wed.			

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16.2 APPEARANCE CRITERIA

Te	sting conditions			
	Illumir	nance	500~1500Lx	
	Distar	nce between display and eye	30cm	
Item		Criteria		Remarks
	Scratch	Invisible items while the monitor is	s turned	Applied to
5	Stain	on shall be ignored		effective display area
rize	Bubble,dust			(3.2 form screen area)
ola	dent			
م				
	S-case	No function trouble		
	Cable	No function trouble		

Item		appearance	Criteria
	Glass		a≦5 unit (mm)
	chipping	с	b≦1
		a	c≦t (t Glass thick)
			but chipping satisfying
			[a,b≦0.5]shall not be counted.
			Maximum allowable number
			on one edge is 5.
		C	a≦2 unit (mm)
		a	b≦2
			$c \leq t$ (t Glass thick)
			Maximum allowable number is 2.
e l			
par		Progressive cracks	All NG.
L L	Newton-	Interference fringe forming concentric circles.	None
nc	ring	(In case of doubtful situations)	Average diameter \leq 8mm: OK
4 H		Observe on the 60° from the product surface	
		under a while fluorescent lamp (3-wavelength	Newton-ring level:
		lamp).	Due to boundary sample.
	Swell	Ivieasure the neight of swell on the	$[\Pi < 0.4 \qquad \qquad \text{Unit} (\text{MM})$
			(AL the utfling of the initial delivery)
1		1	

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REL	IABILITY	•	
Τe	est item	Test condition	Criteria
	High temperature storage	Ta=80°C, 240H	Refer to Table 2.
	Low temperature storage	Ta=-20°C, 240H	Refer to Table 2.
st	High temperature/	Ta=60°C, RH=90%, 240H	Functions and
e te	humidity storage		pictures shall have
ЭС			no trouble.
la	High temperature operation	Tp=70°C, 240H	Refer to Table 2.
рц	Low temperature operation	Tp=-10°C, 240H	Refer to Table 2.
Ш	High temperature/	Tp=40°C, RH=90%, 240H	Refer to Table 2.
	humidity operation		
	Thermal shock storage	-20←→80°C (30min/30min) 100cycle	Refer to Table 2.
	Electrostatic	In accordance with EIAJ ED-4701 C-111	No destruction
	discharge test	$C=200pF,R=0\Omega,V=\pm200V$	
	(No operation)	5 times discharge between the power terminal	
		and the other terminals.	
	Surface discharge test	C=250pF,R=100Ω,V=±15kV	No destruction
	(No operation)	5 times discharge at the center of the display.	
		Shield case is connected to the Ground.	
ц,	Vibration test	Amplitude 1.5mm, f=10 to 55Hz,	Functions and
tes		2 hours each in the X, Y, and Z directions.	pictures shall have
<u>0</u>			no trouble.
nio	FPC tension test	Apply 3N force for 10 seconds in the direction	Functions and
iha		of ±90 degrees against the FPC original direction.	pictures shall have
lec		(It applies to FPC of LCD.)	no trouble.
2	FPC bend test	Apply 3N force for 10 seconds in the direction	Functions and
		of \pm 80 degrees against the FPC original direction.	pictures shall have
		Coming and going three times.	no trouble.
		(It applies to FPC of LCD.)	
	Impact test	Use CASIO original jigs.	Functions and
		Apply half-sine curve of peak acceleration 981 m/s ²	pictures shall have
		for operation time 6ms, 3 times each in X, Y, and Z	no trouble. Refer to
		directions, in accordance with JIS C 60068-2-27-1995.	the below diagram.
.	Packing	19.6m/s ² acceleration and f=10 \rightarrow 55 \rightarrow 10Hz,	Functions and
est	vibration-proof test	apply in each of X, Y, and Z direction	pictures shall have
gt		for 30 minutes.	
kin	Packing drop test	Drop the packing from 75cm height,	Functions and
ac		one time each for 6-faces, 3-edges, and 1-corner.	pictures shall have
α.			no trouble.

Note : Ta = Ambient temperature Tp = Panel temperature

Table 2 Reliability Criteria Measure the parameters after leaving the monitors at the room temperature for more than

2 hours from the test completion.

ltem	Standard	Remarks
Contrast ratio	40 or more	
Response speed	MAX:TON=60msec TOFF=80msec	
Display quality	No visible abnormality shall be seen.	As criteria of 16.

Reduced response time and image residual are passed over in operation under -10 °C to -20°C temperature. Note :





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18. PACKING SPECIFICATION	
(S=FREE)	$1 - \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{i=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} $
Sieh	I. Each product is to be placed in one of the cut-outs of the tray with the display surface fraing upward
	(2 products per trav)
Ster	2 Each tray needs to be same orientation respect to the tray below
	or above it and the travs be in a stack of 10.
AS - CONSON	One empty trav is to be put on the top of stack of 10 travs.
Step Step	3. 2 packs of moisture absobers are to be placed on the top tray as
A share a share of	shown in the drawing.
	Put piled trays into a sealing bag.
	Vacuum and seal the sealing bag with the vacuum sealing
	machine.
6 Step	4. The stack of trays in the plastic back is to be inserted into a inner
Star of Star	carton.
STEP STEP	5. A corrugated board is to be placed on the top and on the bottom
A Star o Star	OT the Inner carton.
No Scheller	into an outer carton
Step	6 The outer carton needs to sealed with packing tape as shown in
	the drawing.
	The model number, quantity of products, and shipping date are to
	be printed on the outer carton.
	If necessary, shipping labels or impression markings are to be put
2	on the outer carton.
Step	7. The outer carton is to be inserted into a extra outer carton with
	Same direction. The extra outer carton needs to sealed with nacking tane as
	shown in the drawing
Step	8. The model number, quantity of products, and shipping date are to
	be printed on the extra outer carton.
(3)	If necessary, shipping labels or impression markings are to be put
	on the extra outer carton.
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CASIO COMPUTER	
	COMPUTER CO. LTO.
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Remark: The return of packing materials is not required.

	Packing item name	Specs., Material
	Tray	PP
2	Sealing bag	
3	Inner carton	Corrugated cardboard
4	Inner board	Corrugated cardboard
5	Outer carton	Corrugated cardboard
6	Drier	Moisture absorber
\bigcirc	Packing tape	
8	Extra outer carton	Corrugated cardboard

	4	
Dimensio	n of extra outer carton	
D : Approx.	(338mm)	
W : Approx.	(549mm)	
H : Approx.	(198mm)	
Quantity of products	s packed in one carton:	80
Gross weight :	Approx. 8.0Kg	

19.HANDING PRECAUTIONS

19.1 PRECAUTIONS

	Caution
(1)	Do not make an impact on the glass, because it may break, causung possible dangers.
(2)	When the glass breaks, do not touch it directly with hands. (You may get glass splinters in your hands or cut your skin.)
(3)	In the event that you injure yourself, receive first aid and consult a physician.
(4)	Do not put the liquid crystal in your mouth. (In the event that the liquid crystal panel breaks, the liquid crystal inside will seep out. Although its toxicity has not been verified, you should not put the panel in your mouth.)
(5)	If the liquid crystal gets on your skin or clothing, wash it off thoroughly. (In the event that the liquid crystal gets on your clothing or hand, wipe it off with alcohol, or carefully wash it off with soap and water. If it gets into your eyes, wash your eyes in clean running water for at least 15 minutes, then see a physician)
(6)	When disposing of this product, follow the industrial waste diposal standards existing In the country or region concerned.
(7)	Do not connect or disconnect this product while the set remains switched on.
(8)	This product has been assembled to a high degree of accuracy. Do not attempt to dismantle or modify it.



Caution :

This mark is used to indicate a precaution or an instruction which, if not correctly observed, may result in bodily injury, or material damages alone.

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19.2 HANDLING PRECAUTIONS	
 Wear finger sacks when handling the modules at the incoming inspection and/or the production lines, and keep the working area very clean. Do not touch the surface of the polarizing film because it is vulnerable. 	
2) Wear a wrist-strap and use an ion blower to avoid electrostatic discharge when handlin because the LCD panel and the driver ICs are valuerable to an electrostatic discharge.	g the modules,
3)Do not scratch or hit the module surface with a tool, and do not drop the module, because the LCD panel made of glass substrates is fragile and the polaizing film is vulnerable to frictions and mechanical impacts. In case that the module was accidentally dropped, it must be regarded as defective, and do not use it any longer.	
4)Do not use or store the module in a place where dew is expected.	
5)Do not store the LCD under direct sunlight or at a place exposed to ultraviolet rays because it will cause the deterioration of the LCD.	
6)Do not stain the cables or make them damaged, because these might cause contact defects and/or wrong effects on the reliability.	
7)Do not bend or pull the FPC part or carry the module just by holding the FPC with finger	ſS.
8)Since the protection film is stuck on the polarizing plate of a monitor's surface, please us at the time of mounting, removing. Refer to the 19.5th clause for how to remove. In addition, please understand that our company cannot take responsibility to faults, su electric destruction produced on the occasion of protection film exfoliation.	se it ch as
19.3 OPERATING PRECAUTIONS	
 Do not expose the driver ICs on the module to strong lights during operation. It may cause function failures, because the driver ICs have no light shield. 	
2)When driving the monitor, apply the input signal after the power voltage is supplied. When turning off the power, turn off the input signal before or at the same timing of switching off the power.	
3)Apply an optimum value of Vcom/c when using the module.	
4)It causes a trouble when a cable is plugged in and out under the condition that a power supply voltage is input. Plug the cable in and out after cutting off the power supply volt	age.
5)Do not operate in the strong magnetic field. It may break a module.	
6)Do not indicate a fixed pattern for a long time. It has the possibility that an afterimage breaks out by character of the liquid crystal. Please use a screen sa and do not indicate a fixed pattern.	aver,

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19.4 SHIPPING CARTON BOX STORAGE CONDITIONS

Environment

Temperature	0 to 40 ° C
Relative humidity	60% or less Shall have no dew if the temperature is low and the humidity is high.
Atmosphere	Any poisonous gases and chemical substances such as acid or alkaline, which will erode electronic components and/or wiring materials, shall not be detected in a storage room.
Period	Within approx. 3 months
Unpacking	In order to prevent the TFT modules from being damaged by static electricity during the unpacking process, adjust the relative humidity of the working room to 50%RH or higher, and take effective measures such as static electricity grounding.

Maximum allowable quantity of piling : 10

19.5 PRECAUTIONS AT PROTECTION FILM REMOVING PROCESS

When removing the protection film from the mointor screen, static electricity may be generated, causing a function destruction or absorbing dusts. To avoid them, the following environment and working methods are recommended.

A)Working environment

a)Keep the relative humidity at 50% to 70% and the temperature at 15 to 27° C
b)Workers shall wear conductive working clothes, conductive shoes, conductive finger sacks, and wrist-strap bands. The working floor shall also be conductive.
c)The working room shall be a clean room, preventing dusts from coming in.

Setting an adhesive mat at the entrance of the room is recommeded.

B)Working method

a)Place an ion blower at an optimal distance from the monitor and ,set an optimal wind direction.

b)Put an adhesive tape (Scotch tape, etc.) on the LCD protection film's corners near the ion blower to protect the polarizing film from damage.

c)Pull the adhesive tape slowly (taking more than 2 seconds to complete) towards the operator to remove the protection film.

Blower wind direction (Set an ion blower with its adequate value.)	/

19.6 QUALITY ASSURANCE

Casio shall be obliged to compensate for defective products by payment at the unit price of the product or substitutes in case that the products are used and stored under the conditions specified in this document, the defect causes are attributable to Casio, and such claims are notified to Casio within one year from the day of product delivery.

Casio shall not be obliged to guarantee the product quality in case that the products are used under conditions beyond the specifications or reorganized by Samsung Electronics Co., Ltd.

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19.7 OTHERS

In case of revisions of specifications, ordinarily Samsung Electronics Co., Ltd.

at least one month prior to the product delivery. But in an emergent case, procedures for revision will be separately determined by consultations between Samsung Electronics Co., Ltd. and Casio.

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APPENDIX Standard Measurement Method of Optical Characteristics for TFT-LCD Monitors. Testing conditions Measuring instrument: CS1000(Konika Minolta), LCD7000(Otsuka Electronics) Measuring temperature : Unless otherwise specified, the temperature is 25°C Measuring system : See the diagram below. The luminance meter is positioned on the normal line on the measuring point. Measuring points: In usually the center point of the screen	
Constant temperature dark box	
Monitor Luminance meter	
A measuring run should be started after allowing the back light to be lit for 30 minutes. Measuring points: The center point of the screen For obtaining the luminance distribution only, nine points shall be measured shown below. $\frac{16 \times 32 \times 32 \times 16}{9}$	

Backlight

IL=20.0mA Use Casio's measuring circuit.(refer to the appendix.)

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lote	litem	l esting method	Measuring equipment	remarks
	Response	Measure output signal waves with a luminance meter	LCD7000	Black
	time	when the raster or window pattern is changed over from		VLCD=5V
		white to black and from black to white		White
				VI CD=1V
		White Black White		
				Pico timo
				Fall time
		90%		
		10% \		
2	Contract		<u></u>	
Ζ	Contrast	There reasons the requirement of the display.	CSIOU	
	rauo	Then measure the maximum luminance $Y = (V \cup D = V)$		
		and the minimum luminance $Y \ge (V \perp C D = 5V)$ at the center		
		of the display.		
		Contrast ratio = Y 1/Y2		
		Measurement spot diameter. $8mm\phi$		
3	Viewing	Change the viewing angles step by step in up, down, left,	LCD7000	
	angle	and right direction each, and measure contrast ratio		
	Horizontal E	to obtain respective angle where contrast ratio		
	Vertical ϕ	becomes 5.		
4	V-T	Change the VLCD by 0.1V step and measure monitor	LCD7000	
	threshold	luminances. VLCD, where the luminance is 90%, 50%, and		
		10% of the maximum value ,is defined as V90, V50, and		
		V10 respectively.		
		100%		
		90%		
		lë 50%		
5	White	Measure chromatically coordinates x and y of the CIF 1931	CS1000	
5	chromatic	calorimetric system under VI $CD = 1V$		
	ty balance	Color matching function is at view of 2°.		
6	Max.	Change the viewing angles step by step in up/down	LCD7000	
-	contrast	direction, and measure the contrast ratio at each steps to		
	angle	obtain angles where the contrast ratio becomes maximum.		
				<u>U</u>

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Note	ltem	Testing method	Measuring equipment	remarks
7	Image sticking	Confirm image stickings with eyes after displaying the window pattern (VLCD=1/5V) for 2 hours		Vcom/C is adjusted to optimum value.
8	Center Iuminance	Measure the luminance at the center of the screen.	CS1000	
9	Luminance distribution	(Luminance distribution) = 100 x B/A % A : max. luminance of the 9 points B : min. luminance of the 9 points	CS1000	