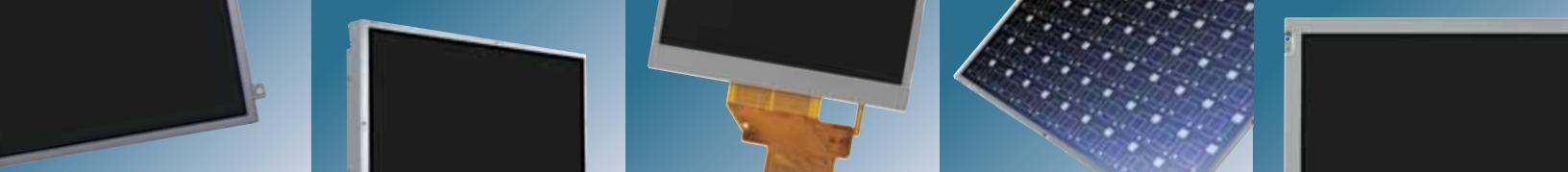


SHARP

LCD Modules for
Industrial Appliances

July 2010

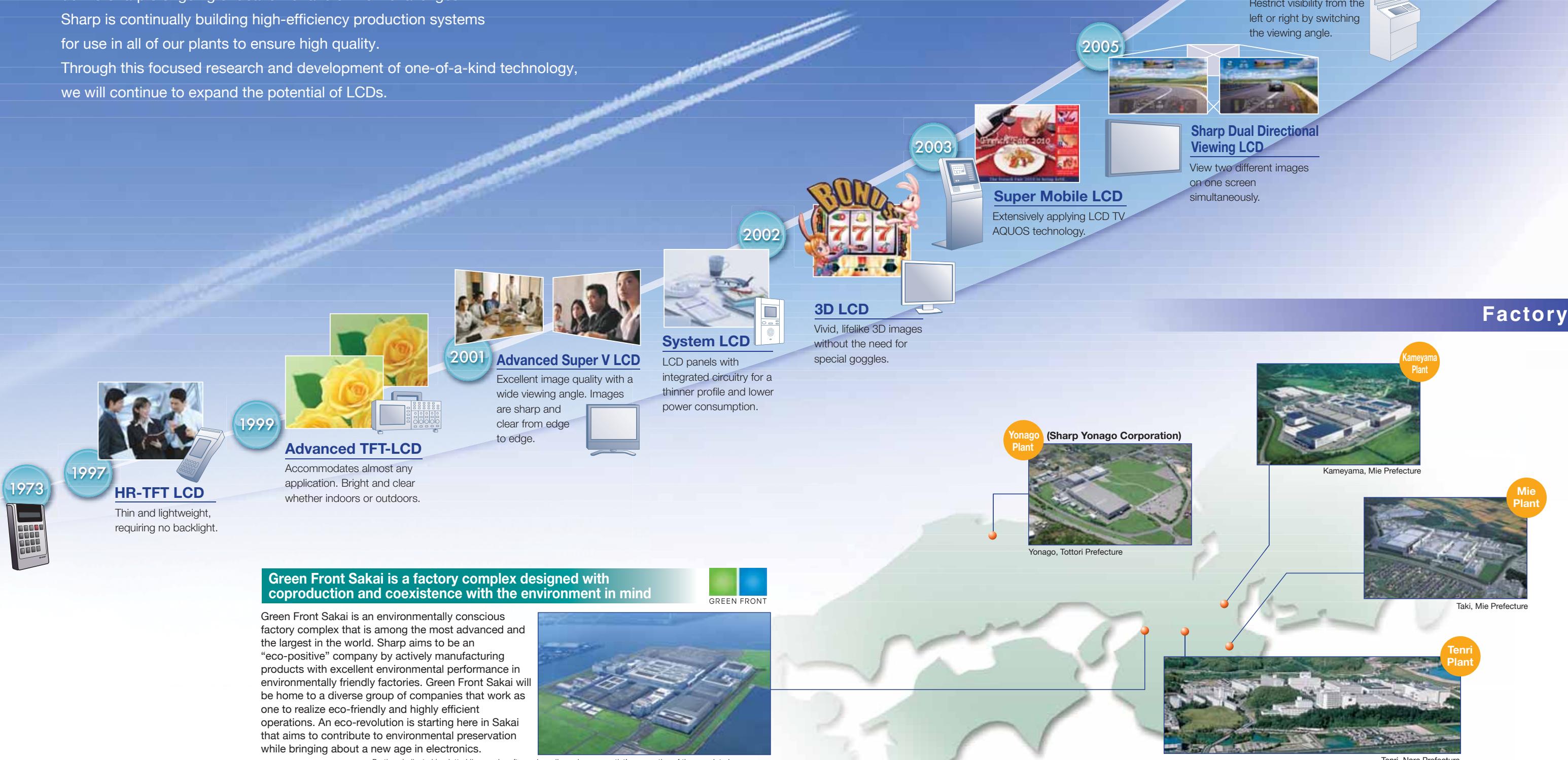
Sharp LCDs for Comprehensive Use





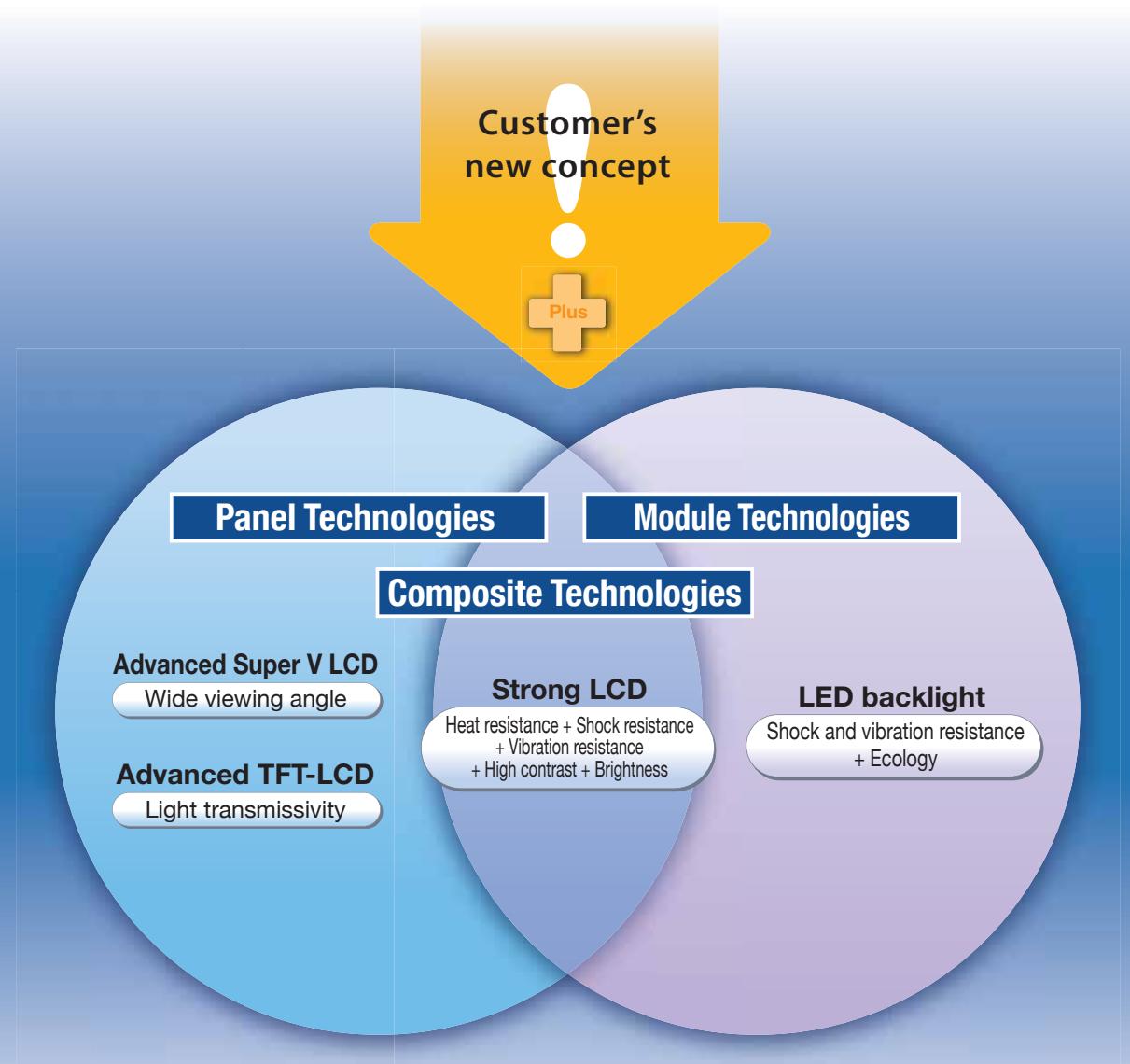
Sharp continues to write the history of LCDs.

First appearing as displays for electronic calculators in 1973, LCDs continue to make a difference in all aspects of people's lives today. Constant technological development and the creation of new applications define Sharp's ongoing endeavor to take on new challenges. Sharp is continually building high-efficiency production systems for use in all of our plants to ensure high quality. Through this focused research and development of one-of-a-kind technology, we will continue to expand the potential of LCDs.



Creating one-of-a-kind technology as our customers' partner for innovation.

For example, if a customer's new product concept requires superior LCD technology, we focus our resources to meet that need. That is because we are driven by our long years of experience and success to develop unique LCD technologies and create LCD products required by the next generation. We have a desire to advance with our customers as their innovation partner while looking at their needs from their viewpoint and sometimes beyond. We at Sharp continually strive to create together with our partners.



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With a wide viewing angle of up to 176° vertically and horizontally, the superior image quality further expands the potential of LCD monitors.



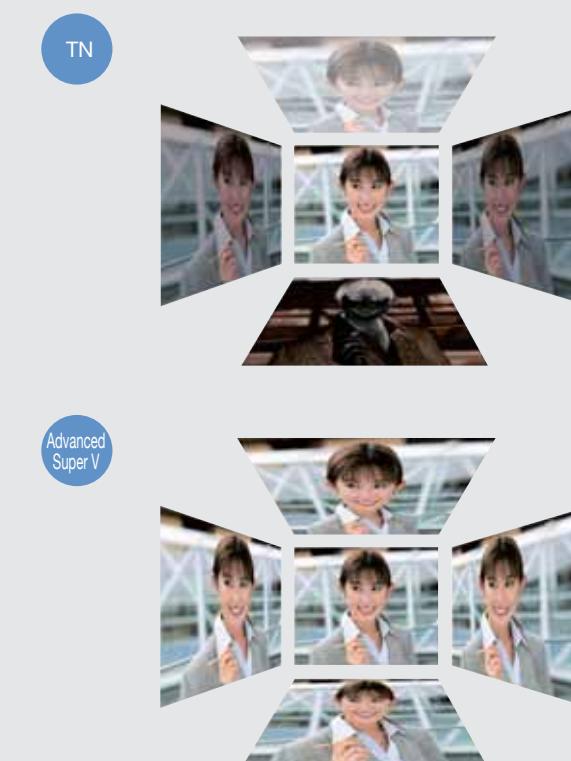
The Advanced Super V LCD is a high-image quality LCD panel employing advanced technology developed exclusively by Sharp. For LCD TV screens, Advanced Super V LCD achieves a wide viewing angle of 176° from the top, bottom, left, and right by optimizing the alignment of the liquid crystal molecules.

Advanced Super V LCD

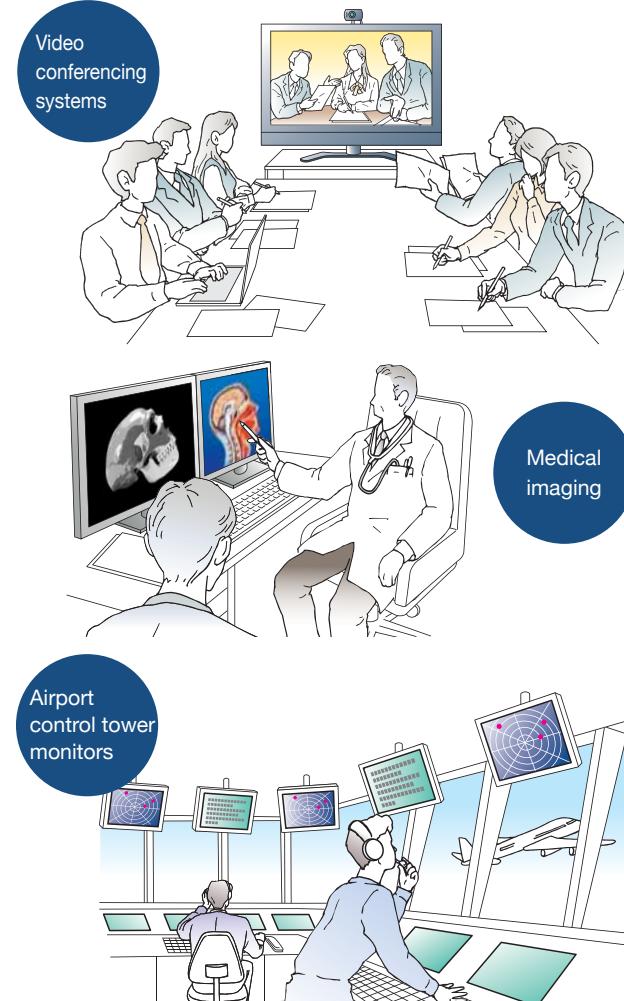
Wide viewing angle for bright, clear images from any direction

The Advanced Super V LCD delivers a wide viewing angle of 176° from the top, bottom, left, and right, which makes it ideal for all sorts of applications and usage configurations. There is very little color shift with viewing angle changes and no gray scale inversion, so the picture looks bright and sharp from any direction.

Conceptual illustration of viewing angle characteristics



Applications



Advanced TFT-LCD

A third type of liquid crystal display that combines the advantages of transmissive and reflective LCDs.



Super Mobile HR-TFT LCDs provide brilliant, vivid images outdoors where it is bright, but their visibility is poor indoors, where ambient light levels are lower.

Sharp has solved this problem by developing a multi-location display, the Advanced TFT-LCD. It combines the performance of an HR-TFT LCD in brightly lit locations with the functionality of a backlit transmissive LCD in dimmer environments. The Advanced TFT-LCD has been further refined to produce the High Transmission Advanced TFT-LCD and the High Reflection Advanced TFT-LCD. This enables users to choose the best possible panel for their particular application.

Strong LCD

Superior reliability and resistance to temperature extremes, shocks, and vibrations make these display panels ideal for applications in manufacturing and distribution businesses.

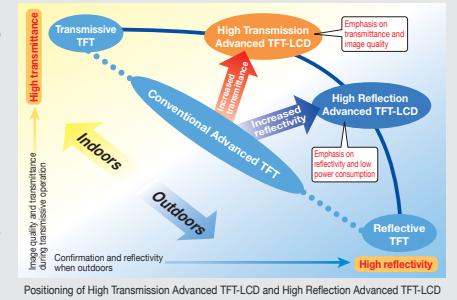


In locations such as factories, resistance to physical shock and heat is a highly important issue for display devices. There is enormous demand for compact LCDs, but it can be difficult to overcome the requirements imposed by harsh environments, such as resistance to vibration or temperature extremes. Sharp's Strong LCDs employ a new reinforcement mechanism design, liquid crystal capable of withstanding a wide range of temperatures, and high-luminance backlights. These TFT-LCDs are capable of standing up to physical shocks, vibrations, and variations in temperature. They provide a high degree of reliability in punishing environments, such as applications in manufacturing and distribution.

Advanced TFT-LCD

The High Transmission Advanced TFT-LCD and High Reflection Advanced TFT-LCD—two types of panels optimized for different applications

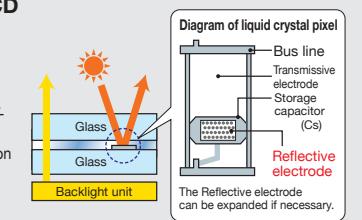
Advanced TFT-LCDs feature a display panel that is divided into reflective and transmissive sections. Since the ratio of the two parts can be changed freely, it is possible to design display panels that are ideally suited to specific applications. The present selection of Advanced TFT-LCDs includes the High Transmission Advanced TFT-LCD, which is optimized for superior image quality, and the High Reflection Advanced TFT-LCD, which is designed for low power consumption.



Excellent visibility and image quality under outdoor light

High Transmission Advanced TFT-LCD

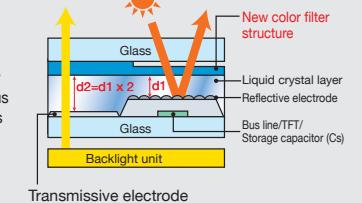
The transmissive part of the display panel is left as is and only the area that is not used for transmissive display is made reflective. Thus, though the display panel is transreflective, it provides high transmittance and excellent image quality on a par with conventional transmissive TFT-LCDs. At the same time, the panel provides good visibility under bright light, such as outdoors. The High Transmission Advanced TFT-LCD is suitable for applications where indoor use is of primary importance but outdoor use is occasionally necessary.



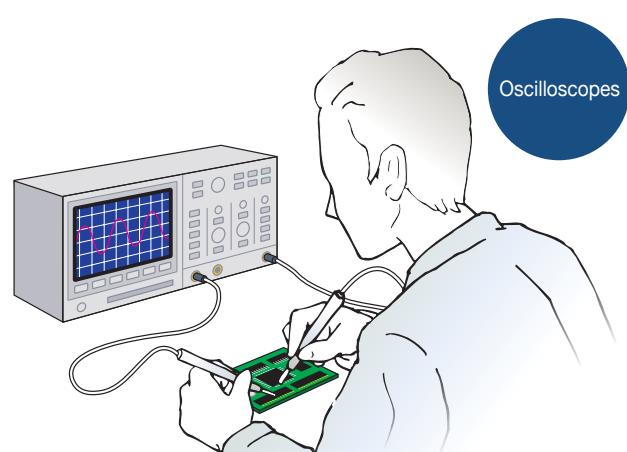
Reflectivity rivaling reflective TFT-LCDs for excellent visibility and low power consumption

High Reflection Advanced TFT-LCD

The rate of external light used to illuminate the display is increased by boosting the ratio of reflective display space and using reflective electrodes in parts other than the transmissive display area. This produces reflectivity nearly equal to that of a conventional reflective TFT-LCD. It is thus possible to reduce the amount of time the backlight needs to be used, and even retain excellent visibility with the backlight turned off. The High Reflection Advanced TFT-LCD is suitable for applications where outdoor use is emphasized and low power consumption is necessary.



Applications



Innovation of LCD materials for enhanced reliability under extreme temperatures

LCDs can be used reliably in extreme temperatures through the use of newly developed liquid crystal and optimization of heat dissipation treatment.

	Conventional LCD	Strong LCD1	Strong LCD2
Operating temperature range	0 to +50 °C	-10 to +65 °C	-30 to +80 °C
Storage temperature range	-25 to +60 °C	-30 to +70 °C	-30 to +80 °C

Elemental technology LCD material for use in wide-ranging temperatures

Compared to conventional LCDs, this LCD material can be used under low to high temperature extremes and in various outdoor applications.

High reliability with regard to vibration and shock

By reinforcing the module structure, we have developed a module significantly more resistant to shock and vibration than conventional modules.

	Conventional LCD	Strong LCD1	Strong LCD2
Vibration resistance	57 to 500 Hz Acceleration 1 G	57 to 500 Hz Acceleration 1 G	57 to 500 Hz Acceleration 1.5 to 2 G
Shock resistance	50 G 11 ms	50 G 11 ms	60 to 70 G 11 ms

Elemental technology Reinforced structural design and components

Pursuing a structural design able to withstand vibration and shock, we've also redesigned the components for enhanced reliability.

Brightness

Brightness is greatly enhanced by improving the transmissivity of the panel and developing a bright backlight system.

	Conventional LCD	Strong LCD1	Strong LCD2
Brightness	300 cd/m ²	Greater than 300 cd/m ²	Greater than 400 cd/m ²

Elemental technology High transmissivity panel + bright backlight

We've realized a bright LCD with superior image quality compared to conventional LCDs.

High contrast

By suppressing brightness when displaying black and adopting a new drive system, we've been able to enhance contrast.

	Conventional LCD	Strong LCD1	Strong LCD2
Contrast	350 : 1	350 : 1	600 : 1

Elemental technology High contrast

Deeper blacks help to realize more vivid images compared to conventional LCDs.

Strong LCD

Applications



Liquid crystal displays that employ LED backlight technology in consideration of safety, cost, and the environment.



Developed from today's heightened ecological consciousness, these TFT liquid crystal displays adopt LED technology in their backlights. Offering significantly increased life expectancy over previous materials, it is now unnecessary to replace the display's backlight, thus preventing the unnecessary waste of our precious natural resources.

While answering the call for mercury-free materials, tolerance for vibration, impact, and low temperature environments has been improved as well, enabling these displays to be applicable to a wider range of solutions. TFT liquid crystal displays that consider safety, costs and the environment in this way will be extremely useful in a wide variety of fields.

Low electrical noise

Electrical noise is suppressed through a direct current, low voltage drive, enabling installation in medical equipment, etc., that can't tolerate electromagnetic waves.

Greatly improved safety

Tolerance for mechanical shock has been greatly improved by eliminating the use of thin glass tubes. And, because no mercury is used, these products can be utilized without the usual apprehension for the environment. Moreover, by moving away from the use of an inverter motor drive, high voltage has become unnecessary, making these displays appropriate for use in applications with greater safety demands.

Wide dimmer range

A wide dimmer range has been achieved.

Quick attainment of stable light intensity

Stable light intensity can be reached instantaneously, even in a low temperature environment.

Longer backlight life

Vastly increased longevity is now available, for a richer variation of possible applications.

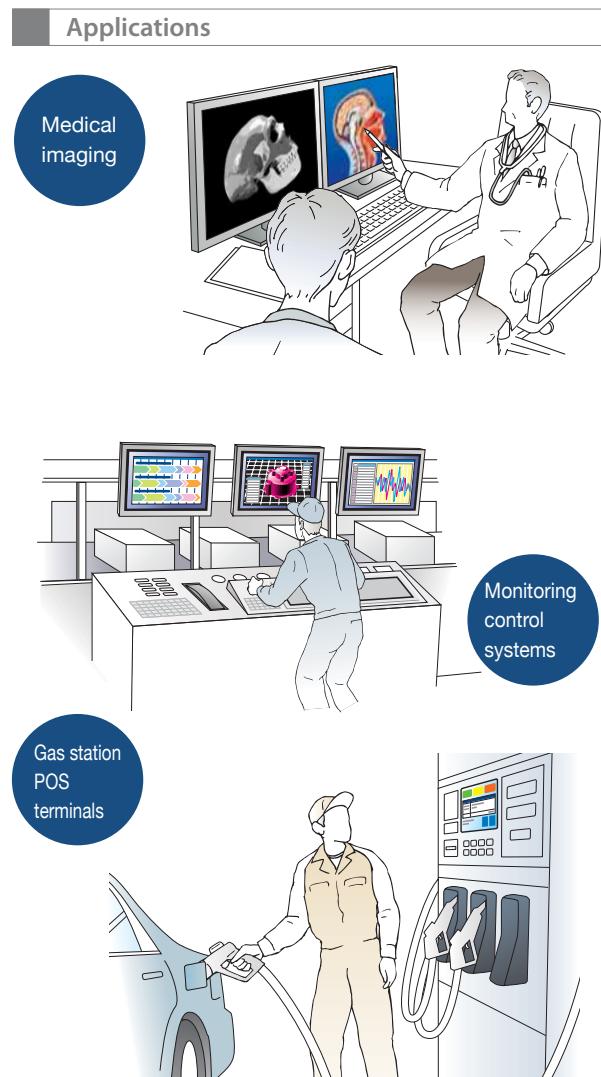
Comparison of longevity between CCFT and LED backlights

Note) The estimated time that the amount of relative luminescence will decrease by 50%

	CCFT*	LED
At normal temperature (+25°C)	up to 50,000 hrs	5,000 to 70,000 hrs
At low temperature (-20°C)	up to 3,000 hrs	

* Lifetime for lamp only

Application	Technology			
	Advanced Super V LCD	Advanced TFT-LCD	Strong LCD	LED backlight
Programmable displays			●	
ATMs/CDs		●	●	
POS/portable data terminals		●		●
Medical	●			●
Image displays				
Data displays	●			
Maritime	●			●
Fish finders	●			
Marine charts	●		●	
Copiers	●			
Testers (measuring instruments)		●	●	●
Airlines	●		●	
Cockpits	●			
Control towers	●			
Passenger lounges			●	
Door intercoms	●			●
IP telephones	●			●
Photo frames	●			●
Video conference systems	●			
Display boards	●		●	



Product Map

Display Size (inch)	Resolution						Technology						
	4M	UXGA	SXGA	XGA	SVGA	WVGA	VGA	WQVGA	QVGA	Advanced Super V LCD	Strong LCD2	System Driver	LED backlight
28.1	LQ281L1LW14									●			
23.1		LQ231U1LW31/32								●			●
20.1		LQ201U1LW11Z								●			
19.0			LQ190E1LW02							●			
			LQ190E1LW43							●			
			LQ190E1LX51							●			●
15.0				LQ150X1LGB1									
				LQ150X1LG55									
				LQ150X1LG81									
				LQ150X1LG91									
				LQ150X1LW73							●		●
12.1					LQ121S1DG42/LG42								
					LQ121S1DG61/LG61								
					LQ121S1LG71						●		
					LQ121S1LG81								●
10.4					LQ104S1DG2A/LG2A								
					LQ104S1DG61/LG61								
8.0" class					LQ084S3LG01								
7.0" class						LQ070Y3DG3A							
						LQ070Y3DG3B							
						LQ070Y3LG4A							
5.0" class							LQ057V3DG02						
							LQ057V3DG21						
							LQ057V3LG11						
Less than 5.0"								LQ057Q3DG01					
								LQ057Q3DG02					
								LQ057Q3DG21					
								LQ043T3DG01					
								LQ043T3DG02					
									LQ035Q3DG03				
									LQ035Q3DW02				
									LQ025Q3DW02	●			
										●			
										●			

Product Specifications (28.1 to 10.4 inches)

Display size (inch)	Model No.	Dot format H x V (dot)	Dot pitch H x V (mm)	Display colors	Brightness (cd/m²)	Contrast	Viewing angle (°) L/R / U/D	Response time (ms)	Operating temperature (°C)	Storage temperature (°C)	Input signal	Power supply (V)	Power consumption (W)	Screen treatment	Dimensions H x V x T (mm)	Weight (g)	Backlight	Remarks
28.1	LQ281L1LW14	2 048 x RGB x 2 048	0.246 x 0.246	16.77 M	225	1 000 : 1	170/170 (CR \geq 10)	25	0 to +40 (ambient)	-20 to +60	4ch LVDS	12.0	96.0	AG	594.0 x 594.0 x 83.0	15 000	18CCFT	Built-in inverter Advanced Super V
23.1	★ LQ231U1LW31/32	1 600 x RGB x 1 200	0.294 x 0.294	16.77 M	500	(600 : 1)	170/170 (CR > 10)	12	0 to +60 (panel surface)	-20 to +65	LDI 8-bit RGB	5.0, 12.0	TBD	AG	530.0 x 431.5 x 32.5	(Max. 4 500)	LED	Advanced Super V LED backlight
20.1	LQ201U1LW11Z	1 600 x XYZ x 1 200	0.255 x 0.255	256 (gray scales)	700	1 000 : 1	170/170 (CR \geq 10)	25	0 to +50 (ambient)	-25 to +60	2ch LVDS 8-bit XYZ	12.0	32.9	AG	436.0 x 335.0 x 27.5	Max. 3 800	6CCFT	Advanced Super V
19.0	LQ190E1LW02	1 280 x RGB x 1 024	0.294 x 0.294	16.77 M	300	900 : 1	170/170 (CR \geq 10)	12	0 to +60 (panel surface)	-25 to +60	2ch LVDS 8-bit RGB	5.0	(25.5)	AG	404.2 x 330.0 x 20.0	Max. 2 800	4CCFT	Advanced Super V
	LQ190E1LW43				400		170/170 (CR > 10)						37	404.2 x 330.0 x 22.0	Max. 3 200	6CCFT		
	LQ190E1LX51				1 000		5.0, 12.0						75	Clear	404.2 x 330.0 x 34.0	Max. 2 600	LED	Advanced Super V LED backlight
15.0	LQ150X1LGB1	1 024 x RGB x 768	0.297 x 0.297	16.19 M	600	350 : 1	120/100 (CR \geq 10)	30	0 to +60 (panel surface)	-30 to +70	1ch LVDS 8-bit RGB	3.3	16.0	AG	331.6 x 254.76 x 12.5	1 200 \pm 50	4CCFT	Based on the PSWG standard
	LQ150X1LG55				550	550 : 1		8		-25 to +60			9.6	326.5 x 253.5 x 11.2	Max. 1 000	2CCFT		
	LQ150X1LG81				(600 : 1)	160/145 (CR > 10)	(35)	0 to +70 (panel surface)	-30 to +70	LVDS 6-bit + FRC	TBD	9.8	326.0 x 252.0 x 11.2					
	★ LQ150X1LG91				600 : 1	170/170 (CR \geq 10)	25		-25 to +60	1ch LVDS 8-bit RGB		326.5 x 253.5 x 9.6	Max. 950	LED	LED backlight			
	★ LQ150X1LW73				350	(600 : 1)	140/110 (CR > 10)	35	-0 to +60 (panel surface)	-30 to +70	331.6 x 254.76 x 12.5	Max. 1 350	4CCFT	Advanced Super V				
12.1	LQ121S1DG42/LG42	800 x RGB x 600	0.3075 x 0.3075	260 K	370	450 : 1	140/110 (CR > 10)	35	-10 to +65 (ambient)	-30 to +70	CMOS 6-bit RGB/1ch LVDS 6-bit RGB	3.3/5.0	8.3	AG	276.0 x 209.0 x 11.0	Max. 660	2CCFT	Strong LCD2
	LQ121S1DG61/LG61				450	600 : 1				-30 to +80 (panel surface)	-30 to +80		9.6	265.0 x 205.0 x 9.5	Max. 550	LED		
	★ LQ121S1LG71			12 M	(450)	(800)	160/145 (CR > 10)	(30)	-10 to +75 (panel surface)	-30 to +75	LVDS 6-bit + FRC	3.3	TBD	276.0 x 209.0 x 8.7	TBD			
	★ LQ121S1LG81			260 K	(350)	(600 : 1)	-30 to +80 (panel surface)	-30 to +80		LVDS 6-bit	246.5 x 179.4 x 15.5	Max. 620		2CCFT	Strong LCD2			
10.4	LQ104S1DG2A/LG2A	800 x RGB x 600	0.264 x 0.264	260 K	350	300 : 1	140/110 (CR > 10)	35	-10 to +65 (ambient)	-30 to +70	CMOS 6-bit RGB/1ch LVDS 6-bit RGB	3.3/5.0	6.5/6.6	AG	246.5 x 179.4 x 15.5	Max. 620	Strong LCD2	
	LQ104S1DG61/LG61				420	600 : 1				-30 to +80 (panel surface)	-30 to +80		8.0	246.5 x 179.4 x 13.7				
	LQ104V1DG21				350	300 : 1				-10 to +65 (ambient)	-30 to +70	CMOS 6-bit RGB	6.4	265.0 x 195.0 x 11.5	Max. 700			
	LQ104V1DG5A	640 x RGB x 480	0.330 x 0.330	260 K	450	600 : 1	140/110 (CR > 10)	35	-30 to +80 (panel surface)	-30 to +80	CMOS 6-bit RGB/1ch LVDS 6-bit RGB	6.3	246.5 x 179.4 x 15.5	Max. 620				
	LQ104V1DG61/LG61				550	(600 : 1)				-30 to +80 (panel surface)	-30 to +80	CMOS 6-bit RGB	5.2	246.5 x 179.4 x 13.7				
	LQ104V1DG62				(350)	(800)				246.5 x 179.4 x 12.5	Max. 580	LED	Strong LCD2 Super Longevity LED backlight					

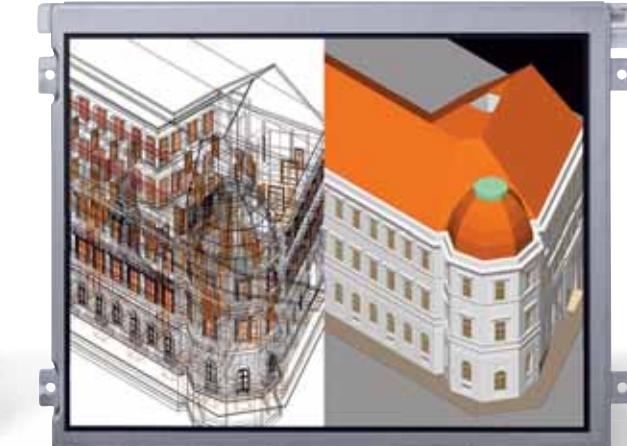
★ New model/under development



Product Specifications (Less than 10.0 inches)

Display size (inch)	Model No.	Dot format H x V (dot)	Dot pitch H x V (mm)	Display colors	Brightness (cd/m²)	Contrast	Viewing angle (°) L/R / U/D	Response time (ms)	Operating temperature (°C)	Storage temperature (°C)	Input signal	Power supply (V)	Power consumption (W)	Screen treatment	Dimensions H x V x T (mm)	Weight (g)	Backlight	Remarks												
8.0" class	LQ084S3LG01	800 x RGB x 600	0.213 x 0.213	16.19 M	400 600 : 1 300	130/115 (CR \geq 10) 140/110 (CR > 10)	26 35	-30 to +80 (panel surface) -10 to +65 -20 to +60	-30 to +80	1ch LVDS 8-bit RGB CMOS 6-bit RGB	3.3	5.9 4.6 4.9	AG	199.5 x 149.5 x 11.6 221.0 x 152.4 x 12.0	Max. 405 Max. 400 Max. 430	2CCFT LED 1CCFT	Strong LCD2 Super-Longevity LED backlight													
	LQ084V3DG02	640 x RGB x 480	0.267 x 0.267	260 K																										
	LQ084V1DG41																													
7.0" class	★ LQ070Y3DG3A	800 x RGB x 480	0.1905 x 0.1905	16.19 M	350 280 350	Min. 300 400	130/110 (CR > 10)	35	-20 to +50 -20 to +60	-30 to +70	CMOS 6-bit + FRC LVDS 6-bit + FRC	3.3	2.0 TBD 2.1	AG	163.2 x 104.0 x 3.9 163.2 x 104.0 x 7.1 163.2 x 104.0 x 3.9	Max. 150 Max. 185 Max. 150	LED System Driver LED backlight													
	★ LQ070Y3DG3B																													
	★ LQ070Y3LG4A																													
5.0" class	LQ057V3DG02	640 x RGB x 480	0.180 x 0.180	260 K	400	600 : 1	160/150 (CR \geq 5)	29	-30 to +80 (panel surface)	-30 to +80	CMOS 6-bit RGB	3.3	4.5	AG	144.0 x 104.6 x 13.0	Max. 250	LED	Super-Longevity LED backlight												
	★ LQ057V3LG11				350	500 : 1	140/120 (CR \geq 10)	30	-20 to +70 (panel surface)		1ch LVDS 6-bit RGB	3.3, 12.0	2.3		144.0 x 104.6 x 12.3	Max. 190														
	★ LQ057V3DG21				TBD	TBD	TBD	TBD	-30 to +80		CMOS 6-bit	3.3	TBD		TBD	TBD														
	LQ057Q3DG01	320 x RGB x 240	0.360 x 0.360	260 K	320	500 : 1	160/145 (CR \geq 5)	40	-30 to +70	-30 to +70	CMOS 6-bit RGB	3.3, 16.0	1.4	AG	144.0 x 104.6 x 13.8	230														
	LQ057Q3DG02				400	550 : 1			-30 to +80		CMOS 6-bit	3.3	TBD		144.0 x 104.6 x 12.3	190														
	★ LQ057Q3DG21				(500)	TBD	160/145 (CR > 5)	30	-30 to +80	-30 to +80	CMOS 6-bit	3.3	TBD		(131.6 x 103.8 x 9.0)	(Max. 170)														
	LQ043T3DG01	480 x RGB x 272	0.198 x 0.198	260 K	400	900 : 1	160/140 (CR > 10)	29	-10 to +70	-30 to +85	CMOS 6-bit RGB	3.15	0.6	AG	105.5 x 67.2 x 5.05	65	LED	LED backlight												
	LQ043T3DG02				480				-20 to +70 (panel surface)		CMOS 8-bit RGB	TBD	0.5		105.5 x 67.2 x 3.95	55														
Less than 5.0"	LQ035Q3DG03	320 x RGB x 240	0.2205 x 0.2205	16 M	450	300 : 1	120/100 (CR > 10)	60	-10 to +70 (panel surface)	-30 to +80	CMOS 6-bit RGB		AG	76.9 x 63.9 x 4.7	TBD	LED		Super-Longevity LED backlight												
	LQ035Q3DW02			260 K	450	500 : 1	160/160 (CR \geq 10)	30	-10 to +70 (panel surface)	-25 to +70	CMOS 6-bit RGB	3.3		0.5	76.9 x 63.9 x MAX. 3.5				33											
	LQ025Q3DW02		0.156 x 0.156		TYP. 350				-10 to +60		CMOS 6-bit RGB	0.28		56.8 x 48.8 x MAX. 3.5	Max. 25															

★ New model/under development



SHARP CORPORATION

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■ Specifications are subject to change without notice.

■ All screen images are simulated.

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The following facilities of Sharp Corporation have been certified under the ISO 14001 international standard for environmental management systems. In our products and manufacturing processes, we are actively engaged in environmental preservation efforts.

Facility	Certificate No.	Date of Registration/Renewal	Scope of Registered Activities
Headquarters and Associated Companies Group	EC97J1037	June 24, 1997	Research and development of electronic and electric products and general electronic components, sales and service activities, and general administration within the registered organization
Katsuragi Works	EC99J2006	June 25, 1996	Development, design and production of photovoltaic cells and electronic devices
Electronic Components and Devices Group (Fukuyama)	EC99J2016	September 24, 1996	The manufacture of IC (Memory, Logic, etc.)
Advanced Development and Planning Center	EC99J2038	December 3, 1996	Research and development, production engineering development and promotion, design and manufacture of electronic devices
Mobile Liquid Crystal Display Group	EC99J2051	January 28, 1997	Development, design and manufacture of LCDs and inorganic electroluminescence
Kameyama Plant	EC04J0284	October 12, 2004	Production and development of Large LCD TV including affiliate companies
Electronic Components and Devices Group (Mihara)	20002660 UM	November 17, 2003	Design, development and manufacture of laser diodes, hologram laser and LED devices and printed wiring board, design of optical pick-up units



The following groups of Sharp Corporation have been certified under the ISO 9001:2008 international standard for quality management systems.

Certifying organization: Japan Quality Assurance Organization (JQA) [JAB certified]

Group	Certificate No.	Scope of Registered Activities
General Manager Liquid Crystal Display Business / Liquid Crystal Display Administration Group / Liquid Crystal Display Group / Liquid Crystal Display Production Group*1	JQA-QMA11778	1) Design, development and manufacture of LCD panels 2) Design and development of LCD modules
Liquid Crystal Display Administration Group / Liquid Crystal Display Group / Liquid Crystal Display Production Group*2	JQA-QM3776	Design, development, and manufacture of LCD panels and modules

*1 These four Group names have been changed from AVC Liquid Crystal Display Group as of April 1, 2010.

*2 These three Group names have been changed from Mobile Liquid Crystal Display Group as of April 1, 2010.

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