

SHARP

LCD Modules for
Industrial Appliances

July 2011

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.



HR-TFT LCD

Thin and lightweight, requiring no backlight.



Advanced TFT-LCD

Accommodates almost any application. Bright and clear whether indoors or outdoors.



Advanced Super V LCD

Excellent image quality with a wide viewing angle. Images are sharp and clear from edge to edge.



System LCD

LCD panels with integrated circuitry for a thinner profile and lower power consumption.



3D LCD

Vivid, lifelike 3D images without the need for special goggles.



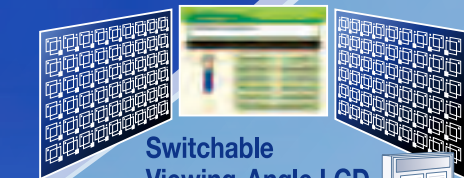
Super Mobile LCD

Extensively applying LCD TV AQUOS technology.



Sharp Dual Directional Viewing LCD

View two different images on one screen simultaneously.



Switchable Viewing-Angle LCD

Restrict visibility from the left or right by switching the viewing angle.



LED backlight

Liquid crystal displays that take safety, cost and the environment into consideration



Factory

Green Front Sakai is a factory complex designed with coproduction and coexistence with the environment in mind

Green Front Sakai is an environmentally conscious factory complex that is among the most advanced and the largest in the world. Sharp aims to be an "eco-positive" company by actively manufacturing products with excellent environmental performance in environmentally friendly factories. Green Front Sakai will be home to a diverse group of companies that work as one to realize eco-friendly and highly efficient operations. An eco-revolution is starting here in Sakai that aims to contribute to environmental preservation while bringing about a new age in electronics.



Portions indicated by dotted lines and rooftop solar cell panels are an artist's conception of the completed appearance.



Kameyama, Mie Prefecture



Taki, Mie Prefecture



Tenri, Nara Prefecture

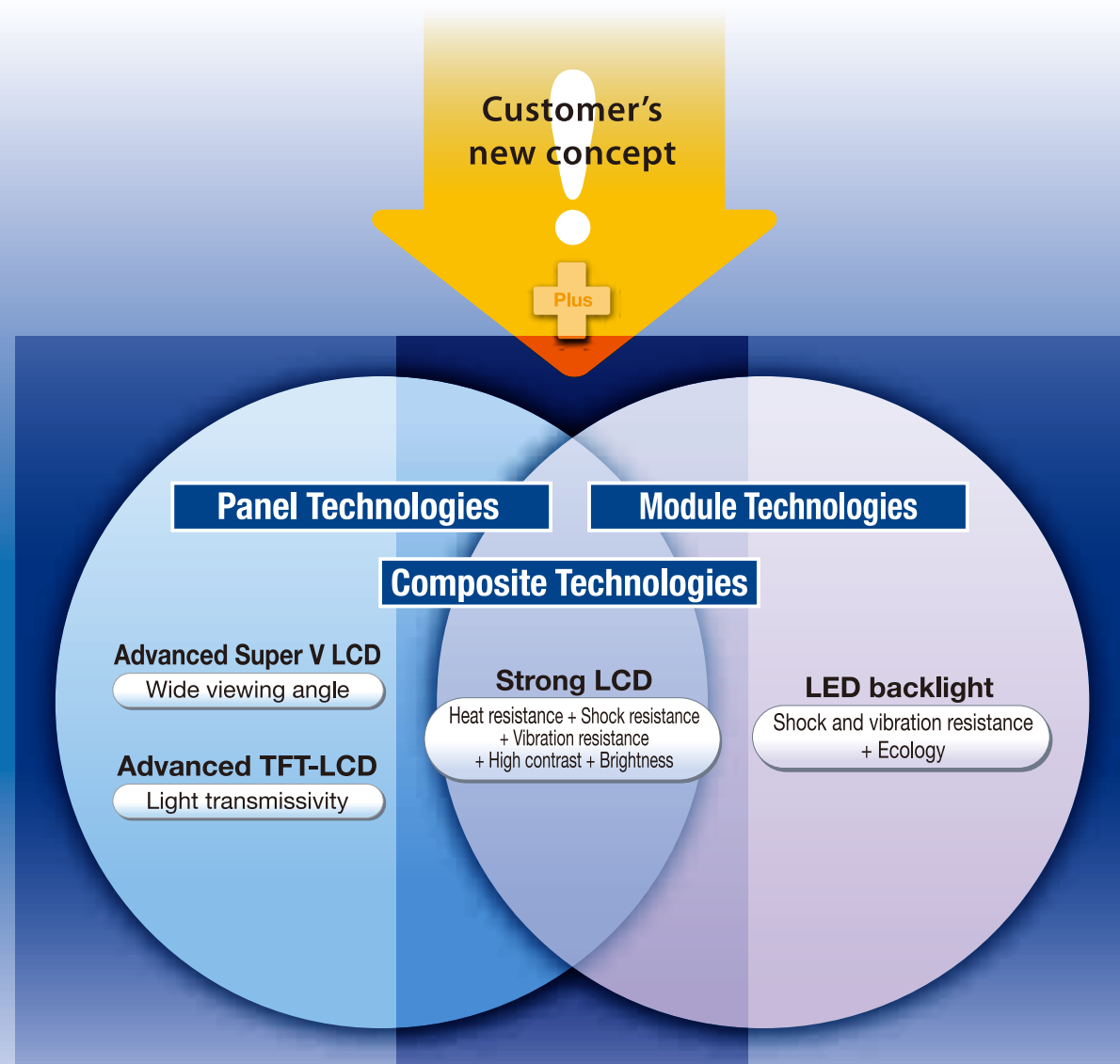
Kameyama Plant

Mie Plant

Tenri Plant

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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Advanced Super V LCD

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



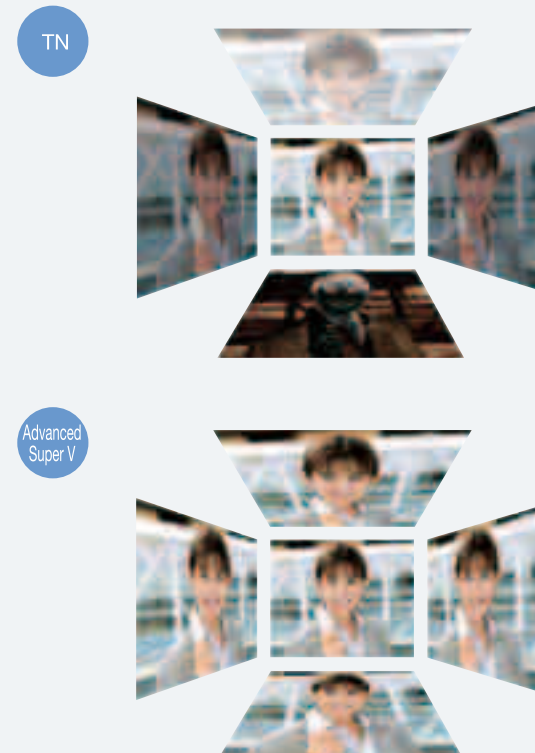
The Advanced Super V LCD is a high-image quality LCD panel employing advanced technology developed exclusively by Sharp. For LCD TV screens, Advanced Super V LCD achieves a wide viewing angle of 176° from the top, bottom, left, and right by optimizing the alignment of the liquid crystal molecules.

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

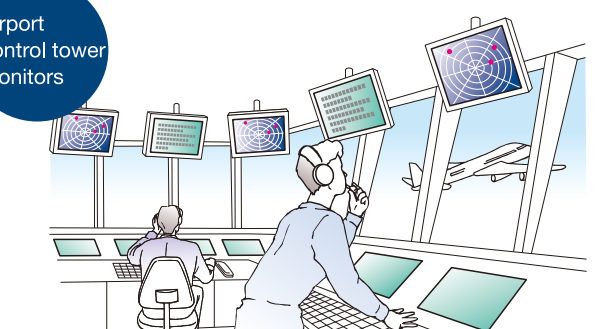
Video conferencing systems



Medical imaging



Airport control tower monitors



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

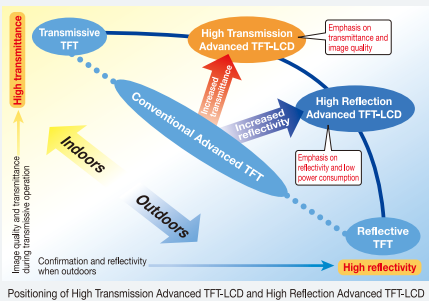


Super Mobile HR-TFT LCDs provide brilliant, vivid images outdoors where it is bright, but their visibility is poor indoors, where ambient light levels are lower. Sharp has solved this problem by developing a multi-location display, the Advanced TFT-LCD. It combines the performance of an HR-TFT LCD in 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.

Advanced TFT-LCD

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

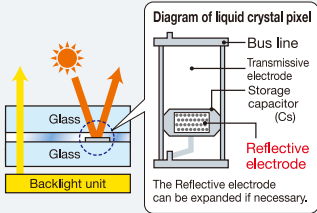
Advanced TFT-LCDs feature a display panel that is divided into reflective and transmissive sections. Since the ratio of the two parts can be changed freely, it is possible to design display panels that are ideally suited to specific applications. The present selection of Advanced TFT-LCDs includes the 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

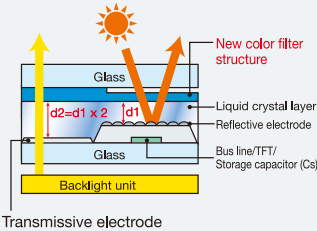
The transmissive part of the display panel is left as is and only the area that is not used for transmissive display is made reflective. Thus, though the display panel is transmissive, it provides high transmittance and excellent image quality on a par with conventional transmissive TFT-LCDs. At the 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.



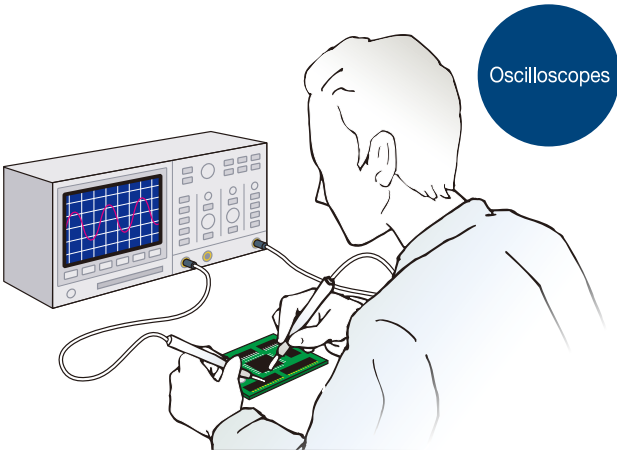
Reflectivity rivaling reflective TFT-LCDs for excellent visibility and low power consumption

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



Oscilloscopes



Portable data terminals

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.

Strong LCD

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

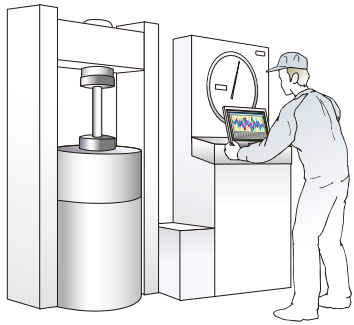
By suppressing brightness when displaying black and adopting a new drive system, we've been able to enhance contrast.

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

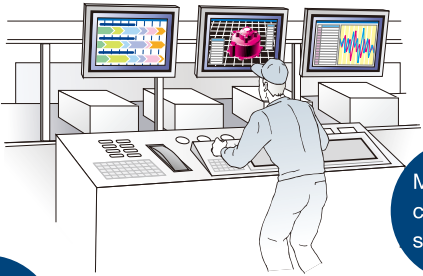
Elemental technology High contrast

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

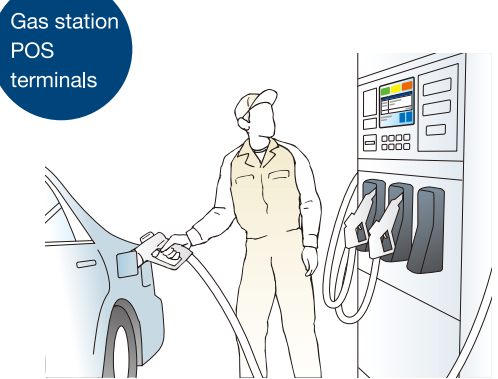
Applications



High pressure testing equipment

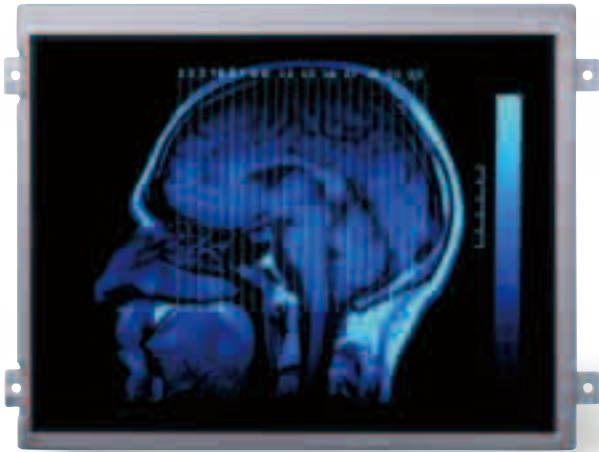


Monitoring control systems



Gas station POS terminals

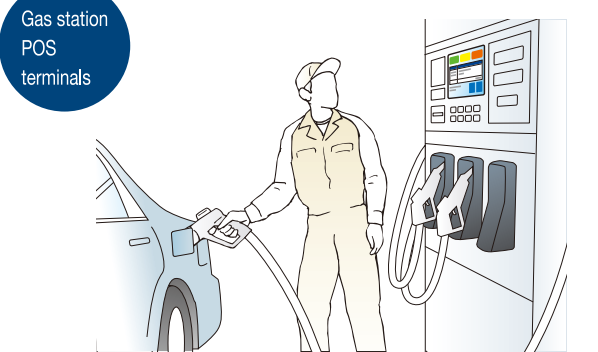
Liquid crystal displays that employ LED backlight technology in consideration of safety, cost, and the environment.



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.

LED

Applications



- 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

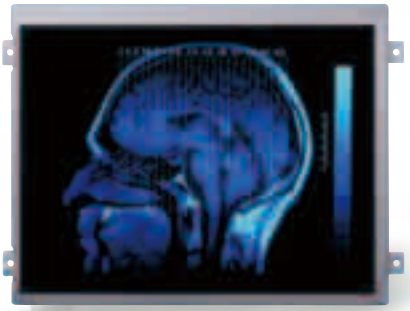
Application	Technology			
	Advanced Super V LCD	Advanced TFT-LCD	Strong LCD	LED backlight
Programmable displays			●	
ATMs/CDs		●	●	
POS/portable data terminals		●		●
Medical	Image displays	●		●
	Data displays	●		
Maritime	Fish finders	●	●	
	Marine charts	●	●	
Copiers	●			
Testers (measuring instruments)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



Product Specifications (23.1 to less than 5.0 inches)

Display size (inch)	Model No.	Resolution	Dot format H x V (dot)	Dot pitch H x V (mm)	Display colors	Brightness (cd/m ²)	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	
23.1	LQ231U1LW31/32	UXGA	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	65.5	AG	530.0 x 431.5 x 23.9	Max. 4 500	LED	Advanced Super V	
19.0	LQ190E1LX51	SXGA	1 280 x RGB x 1 024	0.294 x 0.294	16.77 M	1 000	900 : 1	170/170 (CR > 10)	12	-15 to +60 (panel surface)	-20 to +60	2ch LVDS 8-bit RGB	5.0, 12.0	75	Clear	404.2 x 330.0 x 34.0	Max. 2 600	LED	Advanced Super V	
15.0	LQ150X1LG91	XGA	1 024 x RGB x 768	0.297 x 0.297	16.19 M	350	800 : 1	160/160 (CR > 10)	30	0 to +70 (panel surface)	-30 to +70	LVDS 6-bit + FRC	3.3	6.8	AG	326.5 x 253.5 x 9.6	Max. 950	LED		
12.1	☆ LQ121X3LG02	XGA	1 028 x RGB x 764	0.240 x 0.240	260 K	1 200	1 000 : 1	140/110 (CR > 10)	30	-20 to +50 (ambient)	-35 to +75	1ch LVDS 6-bit RGB	3.3	9.7	AG	259.0 x 205.0 x 7.5	Max. 550	LED	Long life LED backlight	
	☆ LQ121S1DC71	SVGA	800 x RGB x 600	0.3075 x 0.3075		800	800 : 1	160/140 (CR > 10)		-15 to +75 (ambient)	-30 to +75	CMOS 6-bit RGB		7.4	Clear	265.0 x 205.0 x 9.5	550			
	LQ121S1LG71				12 M					450	-20 to +80 (panel surface)	-30 to +80		LVDS 6-bit + FRC	5.1	AG	265.0 x 205.0 x 9.5		Max. 550	
	LQ121S1LG81				260 K	-30 to +80 (panel surface)					LVDS 6-bit			276.0 x 209.0 x 9.1			600			
10.4	☆ LQ104V1LG81	VGA	640 x RGB x 480	0.330 x 0.330	260 K	(450)	(800 : 1)	(160/145 (CR > 10))	35	-30 to +80 (panel surface)	(-30 to +80)	1ch LVDS 6-bit RGB	3.3	TBD	AG	246.5 x 179.4 x 12.5	TBD	LED	Strong LCD2 Long life LED backlight Built-in LED driver circuit	
	☆ LQ104V1DG81					550	600 : 1	140/110 (CR > 10)				CMOS 6-bit RGB				246.5 x 179.4 x 12.5				
	LQ104V1DG62									-30 to +80 (panel surface)	-30 to +80	3.3/5.0	5.2	246.5 x 179.4 x 12.5		Max. 580	Strong LCD2 Long life LED backlight			
8.0" class	☆ LQ085Y3DW01	WVGA	800 x RGB x 480	0.231 x 0.231	16.77 M	350	1 000 : 1	176/176 (CR > 10)	35	0 to +50 (panel surface)	-10 to +60	CMOS 8-bit RGB	3.3	2.8	AG	210.0 x 134.0 x 7.0	210	LED	Advanced Super V System Driver	
	☆ LQ084S3LG03	SVGA	800 x RGB x 600	0.213 x 0.213	16 M	330	450 : 1	130/115 (CR > 10)		-30 to +75 (panel surface)	-30 to +75	1ch LVDS 8-bit RGB		4.1		199.5 x 154.0 x 11.6	Max. 320		Long life LED backlight Built-in LED driver circuit	
	LQ084V3DG02	VGA	640 x RGB x 480	0.267 x 0.267	260 K	400	600 : 1	130/115 (CR ≥ 10)	26	-30 to +80 (panel surface)	-30 to +80	CMOS 6-bit RGB		4.6		199.5 x 149.5 x 11.6	Max. 400		Long life LED backlight	
7.0" class	☆ LQ070Y3LW01	WVGA	800 x RGB x 480	0.1905 x 0.1905	16.19 M	360	800 : 1	170/170 (CR > 10)	35	-10 to +65 (panel surface)	-25 to +70	1ch LVDS 8-bit RGB	3.3	2.6	AG	170.0 x 110.0 x 9.0	175	LED	Advanced Super V Long life LED backlight	
	LQ070Y3DG3A					350	Min. 300 : 1	130/110 (CR > 10)		-20 to +50	-30 to +70	CMOS 6-bit + FRC		3.3		2.0	163.2 x 104.0 x 3.9		Max. 150	System Driver
	LQ070Y3DG3B					280											163.2 x 104.0 x 7.1		Max. 185	
	LQ070Y3LG4A					350	400 : 1										163.2 x 104.0 x 3.9		Max. 150	
5.0" class	LQ057V3LG11	VGA	640 x RGB x 480	0.180 x 0.180	260 K	350	500 : 1	140/120 (CR ≥ 10)	30	-20 to +70 (panel surface)	-30 to +80	1ch LVDS 6-bit RGB	3.3, 12.0	2.3	AG	144.0 x 104.6 x 12.3	Max. 190	LED		
	☆ LQ057Q3DC03	QVGA	320 x RGB x 240	0.360 x 0.360		(500)	(350 : 1)	(130/115 (CR > 10))	(29)	-10 to +70 (panel surface)		CMOS 6-bit RGB	3.3	TBD	TBD	(144.0 x 104.6 x TBD)	TBD		Long life LED backlight Built-in LED driver circuit	
Less than 5.0"	☆ LQ043T3DW03	WQVGA	480 x RGB x 272	0.198 x 0.198	16.77 M	400	800 : 1	160/160 (CR > 10)	60	-10 to +70 (panel surface)	-25 to +70	CMOS 8-bit RGB	3.3	1.2	AG	105.5 x 67.2 x 7.7	Max. 85	LED	Advanced Super V Long life LED backlight	
	LQ043T3DG01				260 K		900 : 1	160/140 (CR > 10)	29		-30 to +85	CMOS 6-bit RGB	3.15	0.6		105.5 x 67.2 x 5.05	65			
	LQ043T3DG02					480										105.5 x 67.2 x 3.95	55			
		LQ035Q3DG03	QVGA	320 x RGB x 240	0.2205 x 0.2205	16 M	450	300 : 1	120/100 (CR > 10)	60	-20 to +70 (panel surface)	-30 to +80	CMOS 8-bit RGB	3.3		0.8			76.9 x 63.9 x 4.7	42

☆ 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	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
Mie Plant	EC99J2051	January 28, 1997	The manufacture of compact LCD panels
Kameyama Plant	EC04J0284	October 12, 2004	Development, design and manufacture of LCDs
Electronic Components and Devices Group (Mihara)	20002660 UM	November 17, 2003	Production and development of Large LCD TVs
			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
Electronic Components and Devices Group*1	JQA-QM8688	The design / development and manufacture of integrated circuits The design / development and manufacture of RF devices The design / development and manufacture of Opto-electronic devices The design / development and manufacture of module The design / development and manufacture of printed circuit board The design / development and manufacture of LEDs The design / development and manufacture of laser diodes, hologram laser The design / development and manufacture of optical pick-ups
Liquid Crystal Display Group	JQA-QMA11778	1) Design, development and manufacture of LCD panels 2) Design and development of LCD modules
General Manager, Display Device Business*2	JQA-QM3776	Design, development, and manufacture of LCD panels and modules

*1 This Group designates Sharp Takaya Electronics Industry Co., Ltd. (JQA-AU0212) as an ISO/TS16949: 2009 management system registered facility with regard to design, development and manufacture of camera units for vehicle use, with registration as a management system support division.

*2 The Group name has been changed from Liquid Crystal Display Group as of April 1, 2011.

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