DISPLAY
SOLUTIONS

plus opto ©

THE OPTOELECTRONIC SPECIALISTS

The home of optoelectronic devices and systems . . .

Contents

In an ever-advancing industry, with the emergence of many new opportunist enterprises, the significance of our experience in direct application support for new project development cannot be underestimated . . .

Introduction

Continued advances in LCD technology make the addition of a display a cost-effective way to enhance the functionality and appearance of any product.

An analogue dial on the front panel might for example be replaced by a tactile switch and an alphanumeric display. A monochrome digital display may be upgraded a to a colour graphic module; or a full colour screen with touch control used to create an interface analogous to the ubiquitous smart phone with which so many users are now familiar.

Plus Opto's extensive range and experience in display technology will help you find the right solution for your next product upgrade.

Liquid Crystal Displays offer a low current, high-resolution solution for applications where data in the form of text or graphics is required.

Character Modules
Display formats from 8x2 through to 40x4 in STN and FSTN

Graphic Modules
Display formats from 80x32 through to 640x480 are available as standard. Compact TAB (Tape Automatic Bonding) LCD modules with resolution 128x64 pixel to 320x240 pixel. TAB LCD modules are ultra-thin and lightweight featuring low power consumption and are offered with and without a backlight

COG (Chip on Glass) Displays
Chip-On-Glass (COG) Displays are available in both character and graphics formats. The driver chip is bonded directly to the glass, and it is possible to connect many more common and segment lines to the LCD than with conventional heat seal or zebra strip technology.

OLED
Winstar is one of the first manufacturers to be able to deliver a standard range of OLED (Organic Light Emitting Displays) in both character and graphic formats using passive matrix PMOLED technology.

The standard character OLED displays facilitate simple upgrade from traditional STN displays and utilise the same mechanical size and pin-out as these traditional displays for easy upgrade. We also offer graphic & custom OLED displays.

Industrial TFT Displays
We now offer a comprehensive range of industrial TFT displays, ranging from 1.8" to 15" in size, with resolutions from QVGA (320x800) to SVGA (1280x800). These displays offer high quality, vibrant full colour screens. The range is supported with optional controller boards and touch panels.

LED Displays
For low-cost display of simple information, traditional LED displays may be the answer. Our experience in LEDs can help you identify the best solution, from 7 segment, dot matrix or bar graph displays to a custom icon display

Custom Displays
Whilst our range of "off-the-shelf" LCD modules is comprehensive, it may be that your product would benefit from a special display, perhaps with symbols or text, or a particular numerical layout to improve the user interface. Our custom display service can provide the perfect solution for a surprisingly small tooling charge and set-up charge.

Embedded Computing
Integration of a display into your system may not be your company's core skill. We have a range of embedded solutions, ranging from low cost SBCs or System-on-Module solutions to fully-integrated enclosed touch computing modules.

Electroluminescent Displays
Thin film electroluminescent displays are a mature technology. The Lumineq range from Beneq offers high contrast, fast response times and wide viewing angle, and is suitable for extremely harsh environments. Custom, and fully-transparent EL displays complement a range of standard products.

A wide range of standard parts is available from stock. If you are unable to find a standard device to meet your requirements then we would be pleased to assist with a bespoke solution.

Character OLED Displays

Standard OLED character displays have the same mechanical size and pin out as their STN alternatives but with significant advantages. These OLED displays are supplied with an integrated "4 in 1" font driver, allowing the user to select from English, Japanese, European or Russian characters.

Features include

- Fast Response Times 10µsec @ 25°C
- 175 degree viewing angle
- Low Profile - no backlight is required as OLED is an emissive technology
- High Brightness of up to 2000cd/m^2
- High Contrast Ratio of up to 2000:1
- Extended operating Temperature of -40° to +80°C
- Low Power Consumption
- Sunlight Readable

Selection Guide

Format	Construction	Model Number	Outline Dimension (mm)	Viewing Area (mm)	Active Area (mm)	Interface	Controller
8 x 2	COB	WEH000802A	58.0 x 32.0	38.0 x 16.0	28.16 x 11.86	6800,8080,SPI	WS0010
12 x 2	COB	WEH001202A	55.7 x 32.0	46.0 x 14.5	38.95 x 11.8	6800,8080,SPI	WS0010
16 x 1	COB	WEH001601A	80.0 x 36.0	66.0 x 16.0	56.95 x 6.35	6800,8080,SPI	WS0010
16 x 2	COB	WEH001602A	80.0 x 36.0	66.0 x 16.0	56.95 x 11.85	6800,8080,SPI	WS0010
	COB	WEH001602B	122.0 x 44.0	99.0 x 24.0	91.14 x 18.98	6800,8080,SPI	WS0010
	COB	WEH001602C	85.0 x 36.0	66.0 x 16.0	56.95 x 11.85	6800,8080,SPI	WS0010
	COB	WEH001602D	85.0 x 30.0	66.0 x 16.0	56.95 x 11.85	6800,8080	WS0010
	COB	WEH001602E	84.0 x 44.0	66.0 x 16.0	56.95 x 11.85	6800,8080,SPI	WS0010
	COB	WEH001602H	122 x 44	98 x 21	91.14 x 18.98	6800,8080,SPI	WS0010
	COG	WEO001602B	53.0 x 20.0	36.0 x 10.0	30.69 x 5.94	6800,8080,SPI	WS0012
	COG	WEO001602C	68.5 x 17.5	58.22 x 13.52	56.22 x 11.52	6800,8080,SPI,I²C	SSD1311M1Z
	COG	WEO001602G	84.5 x 19.28	75.52 x 13.52	73.52 x 11.52	6800,8080,SPI,I²C	SSD1311M1Z
20 x 2	COG	WEO002002A	84.5 x 19.28	75.52 x 13.52	73.52 x 11.52	6800,8080,SPI,I²C	SSD1311M1Z
	COB	WEH002002A	116.0 x 37.0	85.0 x 18.6	77.30 x 11.85	6800,8080,SPI	WS0010
	COB	WEH002002B	180.0 x 40.0	149.0 x 23.0	145.08 x 20.64	6800,8080,SPI	WS0010
	COB	WEH002004A	98.0 x 60.0	70.0 x 25.2	70.16 x 20.95	6800,8080,SPI	WS0010
	COB	WEH002004B	98.0 x 60.0	70.0 x 25.2	70.16 x 20.95	6800,8080,SPI	WS0010
	COG	WEO002004C	84.5 x 27.5	72.42 x 22.82	70.42 x 22.82	6800,8080,SPI,I²C	SSD1311M1Z
40 x 2	COB	WEH004002A	182.0 x 38.5	154.4 x 16.5	148.13 x 11.85	6800,8080,SPI	WS0010

Graphic OLED Displays

Choose OLED graphic displays as clearer, brighter alternatives to traditional LCD modules. Options include COB (Chip on Board), COG (Chip on Glass), and COF (Chip on Flex) construction PMOLED.

Features include

- Fast Response Times 10µsec @ 25°C
- 175 degree viewing angle
- Low Profile - no backlight is required due to OLED being an emissive technology
- High Brightness of up to 2000cd/m^2
- High Contrast Ratio of up to 2000:1
- Extended operating Temperature of -40° to +80°C
- Low Power Consumption
- Sunlight Readable

New Circular Monochrome OLED: WEH128128B

This display is thin, lightweight and 30mm diameter with 128x128 pixel resolution.

- Fast Response Times Typ 1µs
- Contrast Ratio 2000:1
- View Angle 160°
- Operating lifetime 50000 hours
- Wide temperature range -40+80°C
- Yellow, White, and Sky Blue emitting colours
- Ideal for handheld / wearable applications

New 0.96" COG Dual Colour OLED WEO012864MX

- Yellow/Sky Blue colour
- Module dimension 26.7 x 19.26 mm
- Active Area 21.744 x 11.204 mm
- Built-in SSD1306 controller IC
- Operating temperature range -40°C+80°C
- Storage temperatures -40°C +80°C
- Drive Duty 1/64
- Pixel Size 0.148 × 0.148 mm
- Pixel Pitch 0.17 × 0.17 mm

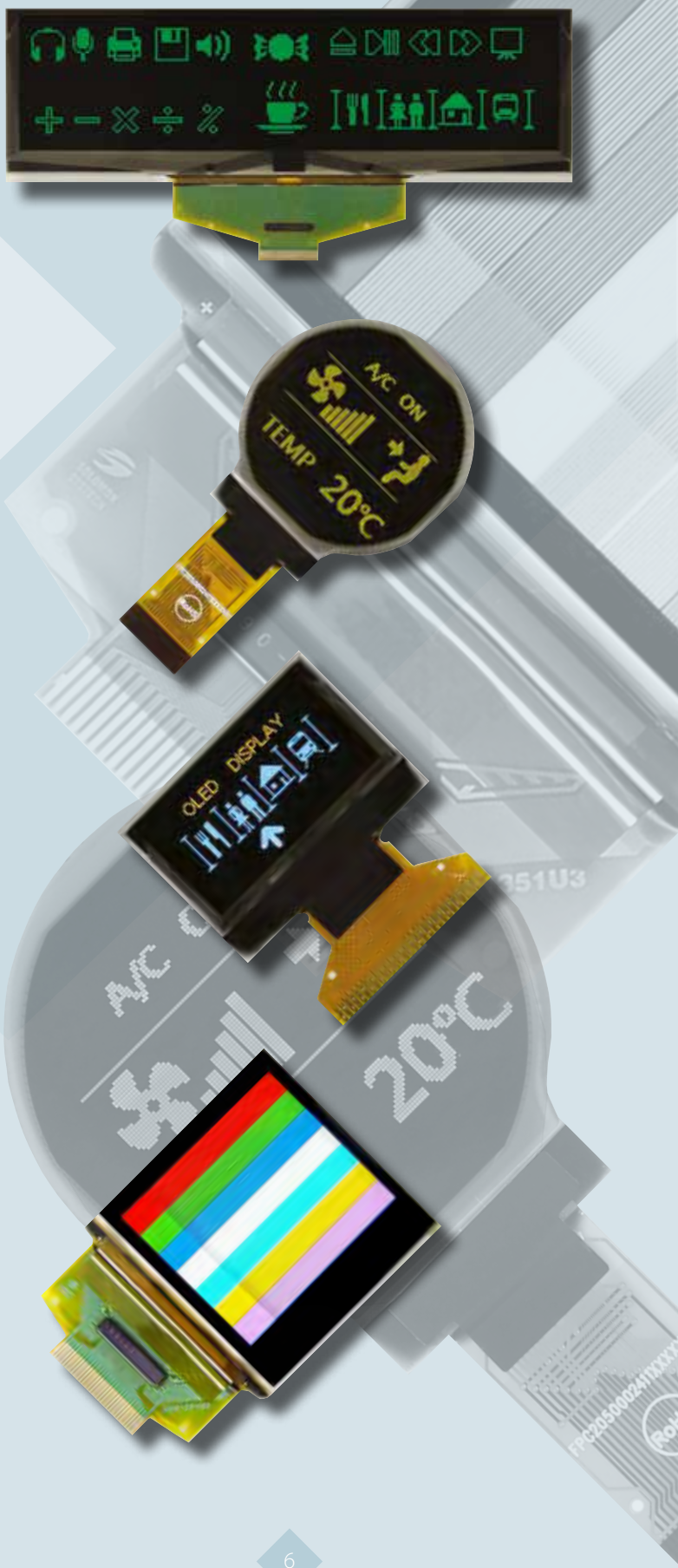
Monochrome equivalent is WEO012864D.

New Full Colour OLED

It is now now possible to produce PM OLEDs with full colour RGB capability. For example PO9664FO-2.

- 0.95" Diagonal
- 96x64 OLED
- Colour: Full colour 65k
- Driver IC: SSD1331Z
- Interface: 8-bit 68XX/80XX Parallel, 4-wire SPI

Contact our sales desk for the latest developments.



Graphic OLED Displays

Selector Guide

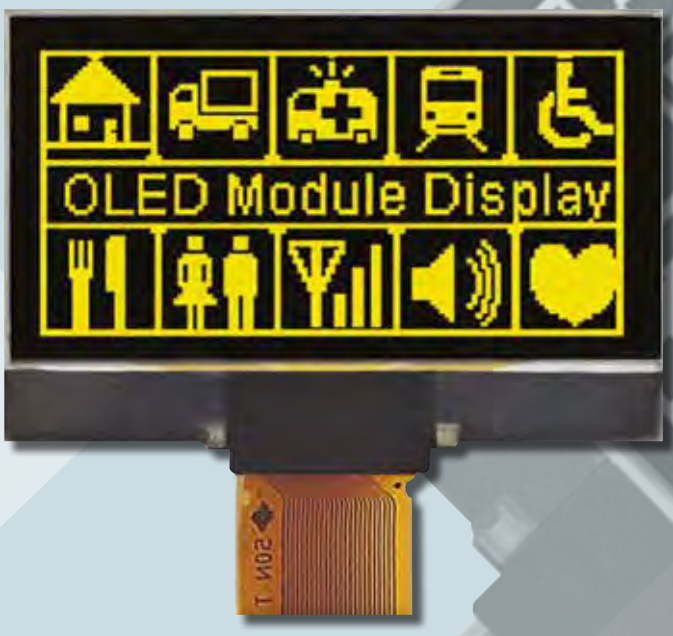
Display Format	Model Number	Structure	Size	Outline Dimension	Viewing Area	Active Area	Interface	IC
64 x 32	WEO006432A	COG	0.49″	14.5 x 11.6	12.58 x 6.58	11.18 x 5.58	I²C	SSD1306BZ
64 x 48	WEO006448A	COG	0.66″	18.46 x 18.10	15.42 x 12.06	13.42 x 10.06	6800,8080,SPI,I²C	SSD1306BZ
48 x 64	WEO004864A	COG	0.71″	13.9 x 22	12.14 x 16.3	10.54 x 14.7	I²C	SSD1306BZ
50 x 16	WEG005016A	COB	1.26″	58 x 32	38 x 16	29.96 x 11.16	6800,8080,SPI	WS0010
76 x 16	WEG007616A	COB	1.7″	55.7 x 32	46 x 14.5	47.7 x 11.1	6800,8080,SPI	WS0010
96 x 16	WEO009616A	COG	0.84″	29.1 x 9.2	23.104 x 5.504	21.104 x 3.504	I²C	SSD1306BZ
96 x 64	WEO009664A	COG	0.95″	24.9 x 22.95	21.953 x 15.424	19.946 x 13.418	6800,8080,SPI,I²C	SSD1305Z
100 x 8	WEG010008A	COB	2.37″	80 x 36	66 x 16	59.95 x 6.35	6800,8080,SPI	WS0010
100 x 16	WEG010016A	COB	2.4″	80 x 36	66 x 16	59.95 x 11.15	6800,8080,SPI	WS0010
	WEG010016C	COB	2.4″	85 x 36	66 x 16	59.95 x 11.15	6800,8080,SPI	WS0010
	WEG010016D	COB	2.4″	85 x 30	66 x 16	59.95 x 11.15	6800,8080	WS0010
	WEG010016E	COB	2.4″	84 x 44	66 x 16	59.95 x 11.15	6800,8080	WS0010
	WEG010016F	COB	2.59″	116 x 37	85 x 18.6	59.95 x 11.15	6800,8080,SPI	WS0010
	WEG010016B	COB	3.84″	122 x 44	99 x 24	95.94 x 17.86	6800,8080,SPI	WS0010
	WEG010016H	COB	4.86″	180 x 40	149 x 23	121.9 x 19.42	6800,8080,SPI	WS0010
128 x 32	WEG010032A	COB	2.44″	98 x 60	77.00 x 25.2	58.95 x 19.15	6800,8080,SPI	WS0010
	WEG010032B	COB	2.44″	98 x 60	77 x 25.2	58.95 x 19.15	6800,8080,SPI	WS0010
	WEO012832D	COG	0.91″	30 x 11.5	24.384 x 7.584	22.384 x 5.584	SPI	SSD1306BZ
	WEO012832F	COG	0.91″	30 x 11.5	24.38 x 7.58	22.38 x 5.58	I²C	SSD1306BZ
	WEO012832E	COG	1.04″	33.4 x 14.5	27.58 x 7.8	25.58 x 6.38	6800,8080,SPI,I²C	SSD1306BZ
	WEO012832A	COG	2.22″	62 x 24	57.02 x 15.1	55.018 x 13.098	6800,8080,SPI,I²C	SSD1305Z
128 x 64	WEO012864C	COG	0.96″	26.7 x 19.26	23.34 x 11.46	21.74 x 10.86	6800,8080,SPI,I²C	SH1106G
	WEO012864D	COG	0.96″	26.7 x 19.26	23.938 x 12.058	21.738 x 10.858	6800,8080,SPI,I²C	SSD1306Z
	WEO012864M Dual Colour	COG	0.96″	26.7 x 19.26	23.744 x 13.204	21.744 x 11.204	6800,8080,SPI,I²C	SSD1306BZ
	WEO012864L	COG	1.28″	34.5 x 23	31.42 x 16.3	29.42 x 14.2	6800,8080	SH1106G
	WEO012864B	COG	1.54″	45.24 x 29.14	37.056 x 19.52	35.056 x 17.52	6800,8080,SPI,I²C	SSD1305Z
	WEO012864A	COG	1.54″	42.04 x 27.22	37.05 x 19.52	35.05 x 17.51	6800,8080,SPI,I²C	SSD1309ZC
	WEO012864F	COG	1.6″	41.8 x 27.9	38.45 x 20.21	36.45 x 18.21	6800,8080,SPI	SSD1325Z2
	WEO012864G	COG	2.42″	60.5 x 37	57.01 x 28.91	55.01 x 27.49	6800,8080,SPI,I²C	SSD1309Z
	WEO012864H	COG	2.42″	60.5 x 37	57.01 x 28.91	55.01 x 27.49	6800,8080,SPI,I²C	SSD1309Z
	WEO012864J	COG	2.42″	75 x 52.7	57.01 x 29.49	55.01 x 27.49	6800,8080,SPI,I²C	SSD1309Z
	WEO012864K	COG	2.7″	73 x 41.86	63.41 x 32.69	61.41 x 30.69	6800,8080,SPI,I²C	SSD1309Z
128 x 128	WEO128128A	COG	1.5″	33.8 x 36.5	28.86 x 28.86	26.86 x 26.86	6800,8080,I²C	SSD1327ZB
	WEO128128B	COG	1.18″	36.98 x 41.23	-	30 (dia)	6800,8080,SPI,I²C	SSD1327ZB
200 x 16	WEG020016A	COB	4.9″	182 x 38.5	154.4 x 16.5	123.95 x 11.15	6800,8080,SPI	WS0010
256 x 64	WEX025664A	TAB	2.8″	84 x 25.8	71.104 x 19.264	69.098 x 17.258	6800,8080,SPI	SSD1322UR1
	WEX025664B	TAB	3.12″	88 x 27.8	78.78 x 21.18	76.778 x 19.178	6800,8080,SPI	SSD1322UR1
	WEX025664D	TAB	5.5″	146 x 45	137.65 x 35.89	135.65 x 33.89	6800,8080,SPI	SSD1322UR1

Denotes New Product

OLED Displays

Winstar has been in mass production and working with various OLED technologies for several years and is capable of custom design from full custom OLED modules to semi-custom.

Features include
- Custom Resolution
- Custom Panel Size
- Custom Colour
- Customer Interface Design
- Anti-glare polariser option



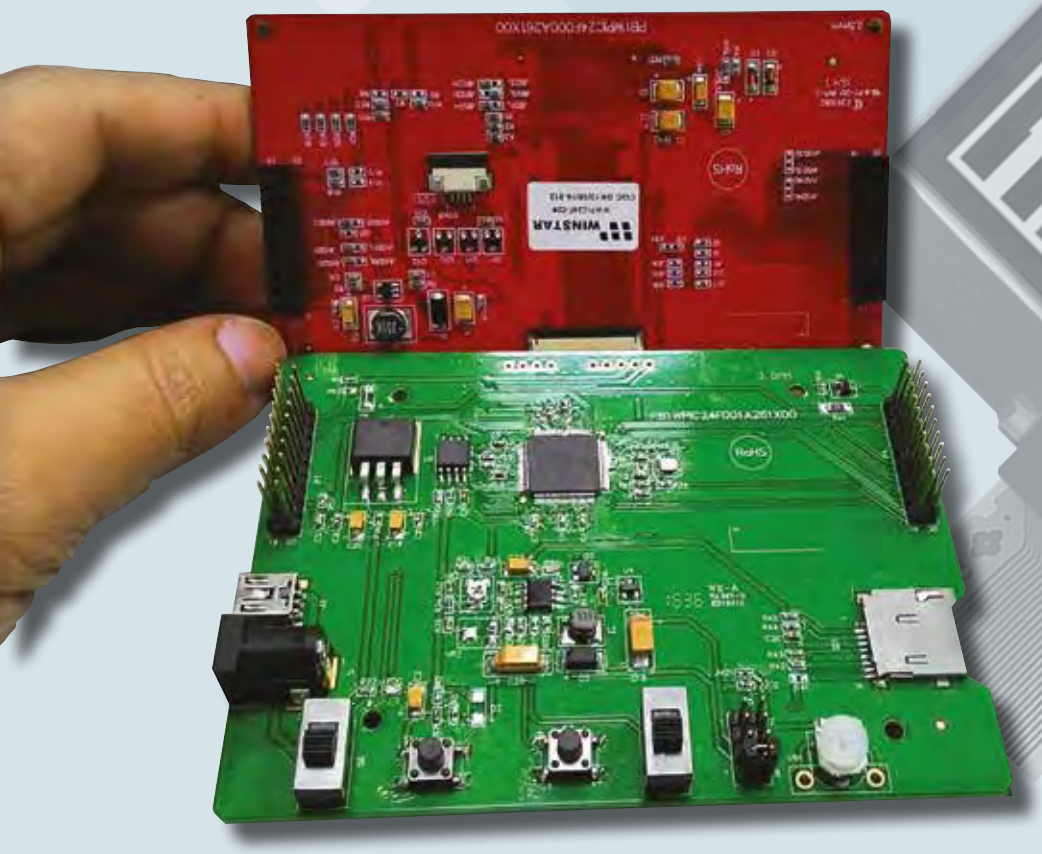
OLED modules are available in a choice of yellow, green, blue, red or white on black background.

OLED Technology Roadmap

Winstar continues to invest in both R&D and in manufacturing plant to support its position as a leading supplier of OLED displays. Coming soon are a wide range of small displays with diagonals under 1"; larger displays (our largest to date is 5.5" diagonal with a dot resolution of 256x64) and full colour OLED displays.

Please check the website regularly for the latest developments.

Graphic OLED Evaluation Board



OLED/TFT Displays

OLED comparison against STN and VFD (example COB 16x2)

Parameter	OLED	STN	VFD
Weight	22g	30g	35g~130g
Thickness	6.90mm	9.7mm	14.4mm
Viewing Angle	175(H) 175(V)	60(H) 60(V)	160(H) 160(V)
Contrast	2000:1	10:1	1000:1
Resolution	0.02x0.02mm	0.05x0.05mm	0.02~0.05 x 0.02~0.05
Power Consumption	200mW	500mW	680mW
Response Time	@+25°C ~ 10µS @-25°C ~ 10µS	@+25°C ~ 0.25S @-25°C ~ 4.0S	@+25°C ~ 10µS @-25°C ~ 10µS
Operating Temp	-40°C ~ + 80°C	-20°C ~ + 70°C	-40°C ~ + 80°C
Sunlight Readable	YES	NO	NO
Driving Voltage	3 ~ 5V	3v or 5V	35V
Lifetime	100k hours	30k ~ 50k hours	30k hours
Character Font	4 types in one IC	1 types in one IC	Only 1 or 2 types in one IC

TFT

We offer a comprehensive range of industrial TFT displays in sizes ranging from 1.8" to 15" plus with resolutions from QVGA (320x240) to XGA (1024x768). These displays offer high quality, vibrant full colour image with many optional characteristics.

Features include:

- Range of standard form factors
- Wide viewing angles
- Extended temperature ranges
- High colour saturation
- Range of standard form factors
- Factory fitted touchscreens
- Guaranteed long-term availability

A comprehensive range of industrial TFT displays . . .

TFT Selection Guide

Display Format	Size	Model No.	Dimensions (W x H) mm	Viewing Area (W x H) mm	Interface	Touch-Screen	Built-in Controller	High Brightness
240 x 320	2.4″	WF24F	42.72 x 60.26	37.72 x 49.96	RGB	N	N	N
	2.8″	WF28D	50.0 x 69.2	44.2 x 58.6	RGB	N	N	N
	3.2″	WF32C	55.04 x 77.6	50.66 x 66.86	RGB	Y	ILI9341	N
320 x 240	3.5″	WF35L	76.9 x 63.9	73.1 x 55.6	RGB/MCU	Y	N/SSD1963	Y
	3.5″	WF35M	100.00 x 66.44	73.1 x 55.6	UART/SPI	Y	PIC24	Y
	3.5″	WF35P	62.9 x 86.54	53.28 x 71.04	MCU	Y	RA8875	Y
	3.5″	WF35Q	93.5 x 66.44	73.1 x 55.6	MCU	Y	SSD1963	Y
	3.5″	WF35R	76.84 x 63.84	73.1 x 55.6	RGB/MCU/SPI	Y	SSD2119	400 nits
	3.5″	WF35T	76.9 x 63.9	72.88 x 55.36	RGB	N	N	N
	3.5″	WF35Y	76.9 x 63.9	72.1 x 54.6	RGB	Y	N	N
320 x 480	3.5″	WF35H	52.96 x 81.34	52.36 x 76.64	RGB	N	ILI9488	N
480 x 128 Bar	3.9″	WF39A	105.5 x 40.64	98.04 x 28.34	RGB	N	N	N
480 x 272	4.3″	WF43E	105.5 x 67.2	98.8 x 56.6	RGB	N	N	N
	4.3″	WF43G	105.5 x 67.2	98.9 x 57.7	RGB/MCU	Y	N/SSD1963	Y
	4.3″	WF43H	125.5 x 67.2	98.9 x 57.7	RGB/MCU	Y	N/SSD1963	Y
	4.3″	WF43M	125.5 x 67.2	98.9 x 57.7	UART/SPI	Y	PIC24	Y
	4.3″	WF43N	105.4 x 67.1	99.9 x 57.9	RGB	N	X	N
	4.3″	WF43P	106.7 x 83.98	98.8 x 57.5	MCU	Y	RA8875	N
	4.3″	WF43Q	106.7 x 83.98	98.8 x 57.5	MCU	Y	SSD1963	Y
	4.3″	WF43T	106.5 x 67.2	98.7 x 57.2	RGB	Y	SSD1963	Y
	4.3″	WF43Y	106.5 x 67.2	98.7 x 57.2	RGB	N	N	N N
	5.0″	WF50C	120.7 x 75.8	113.9 x 65.8	RGB	N	N	N
800 x 320 Bar	4.6″	WF46A	120.7 x 56.16	110.6 x 46.0	RGB	N	N	N
800 x 480	5.0″	WF50B	120.7 x 75.8	110.7 x 67.5	RGB	Y	N	N
	5.0″	WF50Q	120.7 x 75.8	110.7 x 67.5	8080/MPU	Y	SSD1963	N
480 x 128 Bar	5.2″	WF52A	140.4 x 49.87	133.4 x 39.4	RGB	N	N	Y
	5.2″	WF52Q	140.4 x 49.87	133.4 x 39.4	8080/MPU	Y	SSD1963	N
640 x 480	5.6″	WF56B	126.5 x 100	115.9 x 87.67	TTL	N	N	N
	5.7″	WF57F	125 x 98.8	117.5 x 88.7	RGB	Y	N	N
320 x 240	5.7″	WF57B	149 x 109	118.28 x 88.6	RGB/MCU	Y	NA/SSD1963	N
	5.7″	WF57B	149 x 109	118.28 x 88.6	LVDS	Y	N	N
	5.7″	WF57C	143.5 x 104.1	118.6 x 88.9	RGB/MCU	Y	N/SSD1963	N
	5.7″	WF57D	126.0 x 101.55	117.9 x 89.1	RGB/MCU	Y	N/SSD1963	Y
	5.7″	WF57E	141.12 x 101.5	117.9 x 89.1	RGB/MCU	Y	N/SSD1963	Y
	5.7″	WF57F	127.14 x 100.9	117.5 x 88.7	RGB	Y	N	N
	5.7″	WF57M	141.12 x 101.55	117.9 x 89.1	UART/SPI	Y	PIC24	Y
	5.7″	WF57P	141.12 x 101.5	115.2 x 86.4	MCU	Y	RA8875	Y
	5.7″	WF57Q	141.12 x 101.5	117.9 x 89.1	MCU	Y	SSD1963	Y
	5.7″	WF57Y	141.12 x 101.55	117.9 x 89.1	RGB	N	N	N

Denotes New Product

TFT

Display Format	Size	Model No.	Dimensions (W x H) mm	Viewing Area (W x H) mm	Interface	Touch-Screen	Built-in Controller	High Brightnes
320 x 240 (Wide temp -30+85°C)	5.7″	WF57R	144 x 89.4	118.2 x 89.4	RGB	N	N	N
800 x 480	7.0″	WF70G	65.0 x 100.0	157.0 x 89.50	RGB	Y	N/SSD1963	N
	7.0″	WF70H	165.0 x 104.8	155.3 x 94.3	RGB/MCU	Y	N/SSD1963	N
	7.0″	WF70M	166.2 x 101.2	157.0 x 89.5	UART/SPI	Y	PIC24	N
	7.0″	WF70P	165.0 x 100.0	157.0 x 89.5	MCU	Y	RA8875	N
	7.0″	WF70Q	165.0 x 100.0	157.0 x 89.50	MCU	Y	SSD1963	N
	7.0″	WF70R	164.9 x 100	156.7 x 89.1	RGB	N	N	N
	7.0″	WF70Y	165 x 100	156.6 x 89.1	RGB	N	N	N
1024 x 600	7.0″	WF70BT	168.5 x 102.0	157.2 x 88.9	LVDS	N	N	N
	7.0″	WF70BS	168.5 x 102.0	157.2 x 88.9	LVDS	N	N	1000 nits
	7.0″	WF70U	164.9 x 100.0	156.7 x 89.1	LVDS	N	N	N
800 x 480	8.0″	WF80B	192.8 x 116.9	180.1 x 103.4	RGB	Y	N	N
	8.0″	WF80P	192.8 x 116.9	180.10 x 103.40	MPU	Y	RA8875	N
	8.0″	WF80Q	192.8 x 116.9	180.1 x 103.4	MCU	Y	SSD1963	N
1024 x 600	9.0″	WF90B	211.1 x 126.5	200.01 x 117.55	RGB	N	N	N
1024 x 600	10.1″	WF101A	235.0 x 143.0	226.0 x 128.5	LVDS	N	N	N
1280 x 800	10.1″	WF101F	230.56 x 155.01	216.96 x 135.6	LVDS	N	N	1000 nits
		WF101G	229.34 x 148.98	216.96 x 135.6	LVDS	N	N	N
800 x 480	10.2″	WF102A	235.0 x 145.8	225.3 x 135.7	RGB	Y	N	N
	10.2″	WF102P	235.0 x 145.0	225.3 x 135.7	MCU	Y	RA8875	N
	10.2″	WF102Q	235.0 x 145.0	225.3 x 135.7	MCU	Y	SSD1963	N
1024 x 600	10.2″	WF102D	235 x 145.8	226.12 x 134.2	RGB	N	N	N
1024 x 768	12.1″	WF121A	260.5 x 204.0	249.0 x 187.5	RGB/MCU	N	N	N
	15″	MI1500HT-6	326.5x253.5x11.8	304.128x228.096	LVDS	N	N	N
	15″	MI1500JT-3	326.5 x 253.5 x 12	304.128x228.096		N	N	N

Denotes New Product

MIPI

The MIPI standard was developed for mobile phones. As the traditional mobile ecosystem has expanded, the MIPI specifications are extended to include industrial electronics, M2M (IoT), augmented reality, automotive, and medical technologies. Winstar now offers TFTs with MIPI interface.

Monochrome TFT

Winstar's Monochrome TFT is a low cost alternative to full colour displays. Featuring very high contrast (up to 900:1) and brightness up to 1000cd/m^2 the monochrome TFT is available in 3.5", 5.7" and 6.2" formats. With wide viewing angle the competitively priced Mono TFT offers an impressive enhancement to a standard STN graphic module.

Display Format	Size	Model No.	Dimension (W x H) mm	Viewing Area (W x H) mm	Interface	Touch-Screen	Built-in Controller	High Brightness
320 x 240	3.5"	WF35N	62.9 x 86.54	53.28 x 71.04	MCU	N	ST7511	N
320 x 240	5.7"	WF57S	160.0 x 109.0	118.28 x 88.64	MCU	N	ST7511	Y
640 x 320	6.2"	WF62A	170.32 x 88.3	141.6 x 73.4	MCU	N	ST7511	N

Scalable TFT families

The Q series is a scalable TFT module family including 3.5", 4.3", 5.7", 7.0", 8.0 " and 10.2" models. Q Series are derivatives of the existing standard TFT with uniform pin assignment for upward compatibility. The Q Series integrates SSD1963 controller board plus a 36 pin-out connector on board. Available in 8- or 16-bit options with pre-defined pins 33 ~36 as backlight supply, so there is no need to design a separate backlight circuit. The TFT Q Series displays provide the following innovative advantages to offer outstanding image quality and simplicity of use:

Key Advantages of TFT Q Series

- Integrated SSD1963 controller board with common 36 pin-out connector
- Suitable for 8 bit and 16 bit parallel interface
- Pins 33 ~ 36 already defined as backlight supply
- Built in backlight driver IC
- Driven at 5.0V (3.5" & 4.3" also support 3.3V). No need to change backlight driver circuits if changing module sizes
- 5.7", 7.0", 8.0" and 10.2" Q Series allow "Sleep Mode" to close BIAS (VGH, VGL, AVDD) low power consumption mode
- Resistive Touch Screen option available: 4-Line signal (X1 ,Y1, X2, Y2) can be input from 36pin connector
- Capacitive Touch Screen option available: I2C read/write protocol can be input from 36pin connector

The P series is a scalable family like the Q series but uses the more powerful RA8875 controller.
The Y series is also scalable with a common 40-way pin-out, but is supplied as panel only.

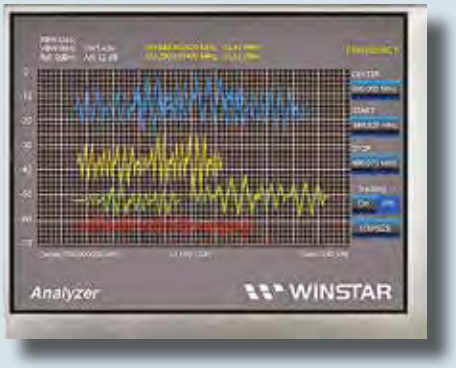
Enhancement films for TFT

If your applications require a wider viewing angle, Winstar O-Film TFT technology will be what you need. There are many wider view angle technologies for TFT displays in the market such as MVA (Multi-domain Vertical Alignment) and IPS (In-Plane Switching). Compared to MVA or IPS technology, O-Film TFT is a cost-effective method of improving view angle and reducing the effect of Greyscale Inversion. The Anti-Reflective (AR) polariser is a clear film that is applied to the panel which reduces the amount of reflection created by external bright light.

High brightness

Many TFTs are available with high-brightness backlight as standard.
For particular high brightness applications a special backlight may be possible.

Please call the office to discuss your requirements.

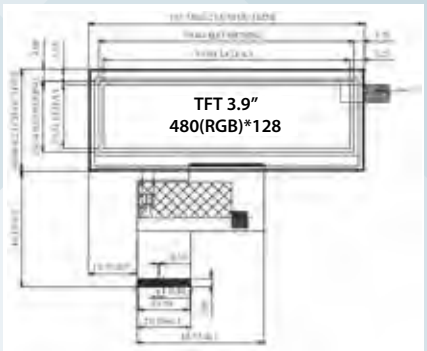


High brightness

Many TFTs are available with high-brightness backlight as standard. For particular high brightness applications a special backlight may be possible. Please call the office to discuss your requirements.

Display Format	Model No.	Size (")	Outline Dimension (mm)	Viewing Area (mm)	Active Area	View Direction	Interface	Built-in Controller	Brightness (cd/m^2)	Touch Screen	Temp Range (°C)
320 x 240	WF35LSIACDNN0	3.5	76.9 x 63.9	73.1 x 55.5	70.8 x 52.56	12H	RGB	x	1100	N	-20~70
320 x 240	WF35LSIACDNT0	3.5	76.9 x 63.9	73.1 x 55.5	70.8 x 52.56	12H	RGB	x	770	RTP	-20~70
320 x 240	WF35LSIACDNCA	3.5	76.9 x 63.9	73.1 x 55.5	70.8 x 52.56	12H	RGB	x	880	CTP	-20~70
480 x 128	WF52ASZASDNN0	5.2	140.4 x 49.87	133.4 x 39.4	127.152x33.9072	6H	RGB	x	850	N	-20~70
480 x 272	WF43GSIAEDNN0	4.3	105.5 x 67.2	97.1 x 55.9	95.04 x 53.86	12H	RGB	x	1000	N	-20~70
480 x 272	WF43GSIAEDNG0	4.3	105.5 x 67.2	97.1 x 55.9	95.04 x 53.86	12H	RGB	x	800	CTP	-20~70
480 x 272	WF43HSIAEDNNB	4.3	105.5 x 67.2	98.9 x 57.7	95.04 x 53.86	12H	RGB	x	1000	N	-20~70
480 x 272	WF43HSIAEDNTB	4.3	105.5 x 67.2	98.9 x 57.7	95.04 x 53.86	12H	RGB	x	700	RTP	-20~70
480 x 272	WF43HSIAEDNGB	4.3	105.5 x 67.2	98.9 x 57.7	95.04 x 53.86	12H	RGB	x	800	CTP	-20~70
480 x 272	WF43HSZAEDNNB	4.3	105.5 x 67.2	98.9 x 57.7	95.04 x 53.86	O-TFT	RGB	x	800	N	-20~70
480 x 272	WF43HSZAEDNTB	4.3	105.5 x 67.2	98.9 x 57.7	95.04 x 53.86	O-TFT	RGB	x	560	RTP	-20~70
480 x 272	WF43HSZAEDNCB	4.3	105.5 x 67.2	98.9 x 57.7	95.04 x 53.86	O-TFT	RGB	x	640	CTP	-20~70
480 x 128	WF52ASZASDNN0	5.2	140.4 x 49.87	133.4 x 39.4	127.152x33.9072	6H	RGB	ST7252	850	N	-20~70
320 x 240	WF70BSIAHLNN0	5.7	141.12 x 101.55	117.9 x 89.1	115.2 x 86.4	12H	RGB	x	800	N	-20~70
1024 x 600	WF70BSIAHLNN0	7	168.5 x 162	157.2 x 88.9	154.08 x 85.92	12H	LVDS	x	1100	N	-20~70
1024 x 600	WF70BSZAHLNN0	7	168.5 x 162	157.2 x 88.9	154.08 x 85.92	12H	LVDS	x	900	N	-20~70
800 x 480	WF70GSIAGDNNA	7	165 x 100	157 x 90.1	154.08 x 85.92	12H	RGB	x	1100	N	-20~70
1280 x 800	WF101FSAAPLNN0	10.1	230.56 x 155.01	220.60 x 138.7	216.96 x 135.6	6H	LVDS	x	1100	N	0~50

Bar TFT



The wide aspect ratio "Letterbox" or "Bar" format brings TFT to a wider range of industrial applications. The 5.2" WF52 is mechanically compatible with the WG24064 graphic LCD range with common mounting holes and many common pins for a quick upgrade. Other Bar TFT sizes are available and more are on the roadmap. The WF39A series is a 3.9" diagonal 480 x 128 pixel resolution TFT with just 40.64mm height, making it ideal for inclusion in 1U rack systems.

Clever System

Winstar TFT M Series is an easy introduction to enabling a display in your application. The M Series Modules are "all in one system" which has 2 user interfaces, RS232 and SPI. It supports backlight brightness adjust, PWM signal output and 4 switch button sensor. There are many benefits of Winstar TFT M Series: –

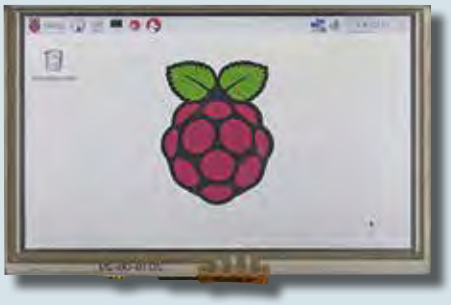
1.) All in One System: inbuilt micro controller drive TFT, backlight and touch panel directly. The M Series modules also have microcontrollers (PIC24), SRAM (frame buffer) and flash storage (graphic files).

2.) More Convenient to Upgrade: The software can be upgraded on line.

3.) Less Coding Process: Programming and test of these modes can be done by our free software "user interface" (UI) so users don't need to write any software.

4.) Reduce I/O Ports: You can use RS232 or SPI-4 Line to drive TFT directly. A compatible USB adapter is also available.

HDMI



The WF50B is designed to work with the Raspberry Pi single board computers (or desktop/laptops) with HDMI output. This module comes with a control board with HDMI interface; it is designed to make Raspberry Pi usage easy. The WF50B features an 800x480 resolution 5" TFT.

Other models are planned.

Chip On Glass Displays

Chip-On-Glass (COG) Displays are available in both character and graphics formats. The driver chip is bonded directly to the glass, and it is possible to connect many more common and segment lines to the LCD than with conventional heat seal or zebra strip technology.

This allows for a more compact design, offering the benefit of both weight and size savings.
Our range of COG displays are available with a choice of backlight colours. Custom and Semi-Custom COG solutions are also available.

Selection Guide - COG Character

Format	Model No.	Dimensions (W x H) mm	Viewing Area (W x H) mm	Dot Size (W x H) mm	Dot Pitch (W x H) mm	Interface	Controller
16 x 2	WO1602B	85.0 x 30.0	76.0 x 18.0	0.75 x 0.9	0.79 x 0.97	I²C	ST7032i
	WO1602F	72.1 x 29.6	61.0 x 15.1	0.55 x 0.65	0.6 x 0.70	6800/SPI/ I²C	ST7032
	WO1602G	74.2 x 25.2	61.0 x 15.1	0.55 x 0.65	0.60 x 0.70	I²C	ST7032i
	WO1602H	62.8 x 23.0	51.5 x 12.2	0.48 x 0.54	0.53 x 0.59	I²C	ST7032i
	WO1602I	51.2 x 20.7	40.0 x 10.0	0.36 x 0.43	0.41 x 0.48	I²C	ST7032i
20 x 2	WO2002A	74.2 x 25.2	61.0 x 15.1	0.45 x 0.54	0.50 x 0.59	I²C	ST7036i
	WO2004A	74.3 x 36.4	60.5 x 22.18	0.45 x 0.54	0.5 x 0.5	I²C	SDD1803A
24 x 2	WO2402A	86.2 x 24.7	72.3 x 11.84	0.45 x 0.45	0.50 x 0.59	I²C	RW1062

Selection Guide - COG Graphic

Format	Model No.	Dimensions (W x H) mm	Viewing Area (W x H) mm	Dot Size (W x H) mm	Dot Pitch (W x H) mm	Interface	Controller
128 x 64	WO12864A1	60.1 x 44.5	54.6 x 32.0	0.36 x 0.40	0.39 x 0.43	6800/8080/SPI	ST7565P
	WO12864B/B1	89.7 x 49.8	69.0 x 36.5	0.47 x 0.47	0.50 x 0.50	6800/8080/SPI	ST7565P
	WO12864C2	55.2 x 39.8	45.2 x 27.0	0.28 x 0.34	0.32 x 0.38	6800/8080/SPI	ST7565P
	WO12864D2	90.0 x 52.8	70.7 x 38.8	0.48 x 0.48	0.52 x 0.52	6800/8080/SPI	ST7565P
	WO12864D3	80 x 54.0 x 10.2	70.7 x 38.8	0.48 x 0.48	0.52 x 0.52	6800/8080/SPI	ST7565P
	WO12864H	80.00 x 77.80	70.70 x 38.80	0.48 x 0.48	0.52 x 0.52	6800/8080/SPI	ST7567
144 x 64	WO14464A5	80.00 x 54.00	70.70 x 38.80	0.43 x 0.50	0.45 x 0.52	6800/8080/SPI/I²C	RA8816
160 x 160	WO160160A	83.8 x 76.5	60.0 x 60.0	0.32 x 0.32	0.34 x 0.34	6800/8080	UC1698U
	WO160160B	82.2 x 77.5	60.0 x 60.0	0.32 x 0.32	0.34 x 0.34	6800/8080	UC1698U
240 x 64	WO24064A1	156.8 x 51.7	130.2 x 37.6	0.50 x 0.50	0.53 x 0.53	6800/8080/SPI	ST7565P
	WO24064B	142.5 x 51.7	129.0 x 37.6	0.50 x 0.50	0.53 x 0.53	6800/8080/SPI	ST7586S-G4
	WO24064C	111.4 x 45.5	106.2 x 31.2	0.40 x 0.40	0.43 x 0.43	6800/8080/SPI	ST7586S
	WO24064D	86.2 x 39.3	80.8 x 24.8	0.30 x 0.30	0.32 x 0.32	6800/8080/SPI	ST7586S
240 x 128	WO240128A	98.7 x 67.7	92.0 x 53.0	0.325 x 0.325	0.35 x 0.35	6800/8080/SPI	UC1608
	WO240128B	120.2 x 77.6	114 x 64	0.43 x 0.43	0.45 x 0.45	6800/8080/SPI	ST7586S
240 x 160	WO240160A	93.0 x 64.0	78.50 x 47.50	0.255 x 0.27	0.275 x 0.29	6800/8080	ST7529
256 x 128	WO256128A	80.0 x 54.0	70.7 x 38.8	0.24 x 0.24	0.26 x 0.26	6800/8080/SPI/I²C	ST75256
320 x 240	WO320240A	160.0 x 109.0	120.0 x 90.0	0.33 x 0.33	0.36 x 0.36	No Controller	NO
	WO320240B					6800/8080	RA8835

Denotes New Product

Standard Character Modules

We offer a wide range of low cost industry standard Character LCD Modules.

- Formats range from 8x2 to 40x4
- Choice of STN or FSTN, positive or negative modes
- Modules are supplied with extended operating temperature as standard
- Choice of LED backlight colours

Applications include industrial and consumer products.

Selection Guide

Display Format	Model Number	Outline Dimension (mm)	Viewing Area (mm)	Character Size
8 x 2	WH0802A1	58.0 x 32.0	38.0 x 16.0	2.96 x 5.56
12 x 2	WH1202A	55.7 x 32.0	46.0 x 14.5	2.65 x 5.50
16 x 1	WH1601A	80.0 x 36.0	66.0 x 16.0	3.07 x 6.56
	WH1601B	85.0 x 28.0	66.0 x 16.0	3.07 x 6.56
	WH1601L	122.0 x 33.0	99.0 x 13.0	4.84 x 8.06
16 x 2	WH1602A	84.0 x 44.0	66.0 x 16.0	2.95 x 5.55
	WH1602B	80.0 x 36.0	66.0 x 16.0	2.95 x 5.55
	WH1602B1 (SPI)	80.0 x 36.0	66.0 x 16.0	2.95 x 5.55
	WH1602B3 (I^2C)	80.0 x 36.0	66.0 x 16.0	2.95 x 5.55
	WH1602C	85.0 x 36.0	66.0 x 16.0	2.95 x 5.55
	WH1602D	85.0 x 30.0	66.0 x 16.0	2.95 x 5.55
	WH1602J	80.0 x 36.0	66.0 x 16.0	2.95 x 5.55
	WH1602L1	122.0 x 44.0	99.0 x 24.0	4.84 x 9.66
	WH1602M	85.0 x 32.6	66.0 x 16.0	2.95 x 5.55
	WH1602O	85.0 x 25.2	66.0 x 16.0	2.95 x 5.55
	WH1602P	85.0 x 25.2	66.0 x 16.0	2.95 x 5.55
	WH1602S	59.0 x 29.3	52.0 x 15.3	2.45 x 4.67
	WH1602T	65.4 x 28.2	54.8 x 19.0	2.67 x 5.57
	WH1602W	80.0 x 36.0	66.0 x 16.0	2.95 x 5.55
	WH1602V2	69.0 x 29.2	61.0 x 15.9	2.95 x 5.55
16 x 4	WH1604A	87.0 x 60.0	62.0 x 26.0	2.95 x 4.75
	WH1604B	70.6 x 60.0	60.0 x 32.6	2.95 x 4.75
	WH1604E	87.0 x 60.0	62.0 x 26.0	2.95 x 4.75
20 x 1	WH2001B	180.0 x 40.2	149.0 x 23.0	6.00 x 12.715
20 x 2	WH2002A	116.0 x 37.0	85.0 x 18.6	3.20 x 5.55
	WH2002D	89.0 x 21.5	75.0 x 15.0	2.95 x 5.15
	WH2002L	180.0 x 40.0	149.0 x 23.0	6.00 x 9.66
	WH2002M	146.0 x 43.0	123.0 x 23.0	4.84 x 9.75
20 x 4	WH2004A/B	98.0 x 60.6	77.0 x 25.2	2.95 x 4.75
	WH2004D	77.0 x 47.0	60.0 x 22.0	2.30 x 4.03
	WH2004H	87.0 x 58.0	74.4 x 24.8	2.95 x 4.75
	WH2004G			
	WH2004L	146.0 x 62.5	123.5 x 43.0	4.84 x 9.22
24 x 2	WH2402A	118.0 x 36.0	94.5 x 16.0	3.20 x 5.55
40 x 2	WH4002A	182.0 x 33.5	154.4 x 16.5	
40 x 4	WH4004A	190.0 x 54.0	147.0 x 29.5	2.78 x 4.89

VATN

Winstar have now released a range of 16x2 Vertically Aligned Twisted Nematic (VATN) displays that offer higher contrast and wider viewing angles than those currently offered by standard STN/FSTN displays.
These VATN displays offer a superior performance not only to STN/FSTN displays but also compared to DFSTN technology products.
This range of products has a built-in controller IC and can offer a choice of 6800, 4 line SPI or I²C interface option.

The advantages of VATN displays include

- Super black background
- High contrast ratio
- Wide viewing angle
- 6800, SPI or I²C interface options

Selector Guide

Display Format	Model Number	Outline Dimensions (mm)	Viewing Area (mm)	Active Area (mm)	Dot Size	Interface	Built-in Controller
8 x 2	WH0802A1-RLL	58 x 32	38 x 16	27.81 x 11.5	0.56 x 0.66	6800,SPI,I²C	ST7066
8 x 2	WH0802A1-GLL	58 x 32	38 x 16	27.81 x 11.5	0.56 x 0.66	6800,SPI,I²C	ST7066
8 x 2	WH0802A1-PLL	58 x 32	38 x 16	27.81 x 11.5	0.56 x 0.66	6800,SPI,I²C	ST7066
8 x 2	WH0802A1-YLL	58 x 32	38 x 16	27.81 x 11.5	0.56 x 0.66	6800,SPI,I²C	ST7066
8 x 2	WH0802A1-SLL	58 x 32	38 x 16	27.81 x 11.5	0.56 x 0.66	6800,SPI,I²C	ST7066
16 x 1	WH1601A-RLL	80 x 36	66 x 16	59.62 x 6.56	0.55 x 0.75	6800,SPI,I²C	ST7066
16 x 1	WH1601A-GLL	80 x 36	66 x 16	59.62 x 6.56	0.55 x 0.75	6800,SPI,I²C	ST7066
16 x 1	WH1601A-PLL	80 x 36	66 x 16	59.62 x 6.56	0.55 x 0.75	6800,SPI,I²C	ST7066
16 x 1	WH1601A-YLL	80 x 36	66 x 16	59.62 x 6.56	0.55 x 0.75	6800,SPI,I²C	ST7066
16 x 1	WH1601A-SLL	80 x 36	66 x 16	59.62 x 6.56	0.55 x 0.75	6800,SPI,I²C	ST7066
16 x 2	WH1602B-RLL	80 x 36	66 x 16	56.2 x 11.5	0.55 x 0.65	6800,SPI,I²C	ST7066
16 x 2	WH1602B-GLL	80 x 36	66 x 16	56.2 x 11.5	0.55 x 0.65	6800,SPI,I²C	ST7066
16 x 2	WH1602B-PLL	80 x 36	66 x 16	56.2 x 11.5	0.55 x 0.65	6800,SPI,I²C	ST7066
16 x 2	WH1602B-YLL	80 x 36	66 x 16	56.2 x 11.5	0.55 x 0.65	6800,SPI,I²C	ST7066
16 x 2	WH1602B-SLL	80 x 36	66 x 16	56.2 x 11.5	0.55 x 0.65	6800,SPI,I²C	ST7066
16 x 4	WH1604A-RLL	87 x 60	62 x 26	56.2 x 20.8	0.55 x 0.65	6800,SPI,I²C	ST7066
16 x 4	WH1604A-GLL	87 x 60	62 x 26	56.2 x 20.8	0.55 x 0.65	6800,SPI,I²C	ST7066
16 x 4	WH1604A-PLL	87 x 60	62 x 26	56.2 x 20.8	0.55 x 0.65	6800,SPI,I²C	ST7066
16 x 4	WH1604A-YLL	87 x 60	62 x 26	56.2 x 20.8	0.55 x 0.65	6800,SPI,I²C	ST7066
16 x 4	WH1604A-SLL	87 x 60	62 x 26	56.2 x 20.8	0.55 x 0.65	6800,SPI,I²C	ST7066
20 x 2	WH2002G-RLL	115 x 36	85 x 18.6	73.5 x 11.5	0.60 x 0.65	6800,SPI,I²C	ST7066
20 x 2	WH2002G-GLL	115 x 36	85 x 18.6	73.5 x 11.5	0.60 x 0.65	6800,SPI,I²C	ST7066
20 x 2	WH2002G-PLL	115 x 36	85 x 18.6	73.5 x 11.5	0.60 x 0.65	6800,SPI,I²C	ST7066
20 x 2	WH2002G-YLL	115 x 36	85 x 18.6	73.5 x 11.5	0.60 x 0.65	6800,SPI,I²C	ST7066
20 x 2	WH2002G-SLL	115 x 36	85 x 18.6	73.5 x 11.5	0.60 x 0.65	6800,SPI,I²C	ST7066
20 x 4	WH2004A-RLL	98 x 60	77 x 25.2	70.4 x 20.8	0.55 x 0.55	6800,SPI,I²C	ST7066
20 x 4	WH2004A-GLL	98 x 60	77 x 25.2	70.4 x 20.8	0.55 x 0.55	6800,SPI,I²C	ST7066
20 x 4	WH2004A-PLL	98 x 60	77 x 25.2	70.4 x 20.8	0.55 x 0.55	6800,SPI,I²C	ST7066
20 x 4	WH2004A-YLL	98 x 60	77 x 25.2	70.4 x 20.8	0.55 x 0.55	6800,SPI,I²C	ST7066
20 x 4	WH2004A-SLL	98 x 60	77 x 25.2	70.4 x 20.8	0.55 x 0.55	6800,SPI,I²C	ST7066

Standard Graphic Modules

Graphic modules offer tremendous flexibility in formatting data, and are the "next step up" from dot-matrix character modules allowing customers to form their own graphics and symbols, display waveform information and text in languages other than those supported on the standard character modules.
Our mono graphics modules range from 80x32 dots to 640x480 dots and most have an on-board controller.
Winstar have a comprehensive choice of formats to fit your mechanical and optical requirements.
Most modules can be specified with the following display and backlight options.

- Display mode - green/yellow, silver or blue
- Film or optically enhanced black/white modes
- Wide temperature versions

Standard Graphic Modules

Selection Guides

Display Format	Model Number	Outline Dimension (mm)	Viewing Area (mm)	Onboard Controller
122 x 32	WG12232A/C	84.0 x 44.0	60.0 x 18.0	SBN1661G
	WG12232BP1	65.4 x 28.2	54.8 x 19.0	SBN1661G
	WG12232B/G	65.4 x 29.1	54.8 x 19.0	SBN1661G
	WG12232D/D1	59.0 x 29.3	52.0 x 15.0	SBN1661G
	WG12232E/J	80.0 x 36.0	60.0 x 18.0	SBN1661G
	WG12232I	50.0 x 29.3	52.0 x 15.0	SBN1661G
	WG12232K	59.0 x 32.1	52.0 x 15.0	SBN1661G
	WG12232O	77.8 x 27.2	60.0 x 18.0	SBN1661G
	WG12232L	84.0 x 44.0	60.0 x 18.0	ST7920
	WG12232M	50.0 x 29.3	52.0 x 19.4	ST7920
	WG12232N	50.0 x 29.3	52.0 x 15.0	ST7920
	WG12232P	80.0 x 36.5	64.0 x 17.9	SBN1661G
128 x 64	WG12864A	93.0 x 70.0	72.0 x 40.0	NT7108
	WG12864B	75.0 x 52.7	58.8 x 31.4	NT7108
	WG12864C	78.0 x 70.0	62.0 x 44.0	NT7108
	WG12864D	78.0 x 70.0	62.0 x 44.0	RA6963
	WG12864E/EP1	54.0 x 50.0	43.5 x 29.0	KS0108
	WB12864F	87.0 x 70.0	72.0 x 40.0	RA6963
	WB12864G	78.0 x 70.0	62.0 x 44.0	RA6963
	WG12864I	80.0 x 70.0	72.0 x 40.0	NT7108
	WG12864K	113.0 x 53.0	72.0 x 40.0	KS0108
	WG12864M	95.5 x 50.2	72.0 x 40.0	NT7108
	WG12864P3/P5	83.0 x 52.7	60.0 x 32.6	ST7920
	WG12864U3/U5	93.0 x 70.0	72.0 x 40.0	ST7920
	WG12864V3/V5	93.0 x 70.0	72.0 x 40.0	ST7920
128 x 128	WG128128A	85.0 x 100.0	62.0 x 62.0	RA6963
	WG128128B	72.5 x 69.9	50.0 x 49.0	LC7981
	WG128128C	65.5 x 70.0	50.0 x 49.0	RA6963
	WG128128H	106.0 x 92.0	73.0 x 73.0	RA6963
144 x 32	WG14432A	85.0 x 36.0	66.0 x 16.0	ST7920 **
	WG14432B	80.0 x 36.0	66.0 x 16.0	ST7920 **
	WG14432C	84.0 x 44.0	66.0 x 16.0	ST7920 **
	WG14432D	85.5 x 30.0	66.0 x 16.0	ST7920 **
	WG14432E	80.30 x 36.0	66.0 x 16.0	ST7920 **
160 x 32	WG16032A	85.2 x 55.0	74.0 x 22.0	SED1520
	WG16032C	85.2 x 55.0	74.0 x 22.0	ST7920 **
	WG16032D3/D5	122.0 x 44.0	99.0 x 24.0	ST7920 **
	WG16032E	85.2 x 55.0	72.0 x 40.0	SBN1661G
160 x 80	WG16080B	93.0 x 70.0	72.0 x 40.0	LC7981
	WG16080C	100.0 x 55.0	72.0 x 40.0	LC7981
160 x 128	WG160128B	129.0 x 102.0	101.0 x 82.0	RA6963
	WG160128C	150.0 x 112.0	101.0 x 82.0	RA6963
	WG160128E	129.0 x 102.0	101.0 x 82.0	RA6963

Display Format	Model Number	Outline Dimension (mm)	Viewing Area (mm)	Onboard Controller
160 x 160	WG160160A	89.2 x 85.0	62.0 x 62.0	N/A
	WG160160B	85.0 x 100.0	62.0 x 62.0	LC7981
192 x 32	WG19232B	116.0 x 37.0	84.0 x 18.6	ST7920 **
	WG19232C	116.0 x 37.0	84.0 x 18.6	ST7920 **
192 x 64	WG19264A	130.0 x 65.0	102.0 x 39.0	NT7108
	WG19264C	100.0 x 60.0	84.0 x 31.0	NT7108
	WG19264D	120.0 x 62.0	102.0 x 39.0	NT7108
	WG19264E	150.0 x 62.5	123.5 x 43.0	NT7107/7108
	WG19264F	100.0 x 60.0	84.0 x 31.0	NT7107
192 x 128	WG192128A	102.3 x 86.0	78.5 x 55.0	LC7981
	WG192128B	98.0 x 86.0	78.5 x 55.0	LC7981
202 x 32	WG20232A	146.0 x 43.0	123.0 x 23.0	SED1520
	WG20232C	146.0 x 43.0	123.0 x 23.0	ST7920 **
240 x 64	WG24064A	180.0 x 65.0	133.0 x 39.0	RA6963
	WG24064B	180.0 x 65.0	133.0 x 39.0	LC7981
	WG24064C	180.0 x 65.0	133.0 x 39.0	RA6963
	WG24064E	180.0 x 60.0	131.0 x 38.0	RA6963
	WG24064G	180.0 x 65.0	133.0 x 39.0	RA8822 **
	WG24064J	180.0 x 65.0	132.6 x 39.0	RA6963
	WG24064R	180.0 x 65.0	133.0 x 39.0	RA8820 **
240 x 128	WG240128A	170.0 x 103.5	132.0 x 76.0	RA6963
	WG240128B	144.0 x 104.0	114.0 x 64.0	RA6963
	WG240128D	144.0 x 104.0	114.0 x 64.0	LC7981
	WG240128E	144.0 x 104.0	114.0 x 64.0	RA6963
	WG240128F	170.0 x 93.6	128.0 x 75.0	N/A
	WG240128T3/T5	140.0 x 82.0	114.0 x 64.0	RA8806 **
320 x 240	WG320240A	166.8 x 109.0	122.0 x 92.0	N/A
	WG320240B0	166.8 x 109.0	122.0 x 92.0	RA8835
	WG320240BX	166.8 x 109.0	122.0 x 92.0	SID13700
	WG320240C0	148.02 x 120.24	120.14 x 92.14	RA8835
	WG320240CX	148.02 x 120.24	120.14 x 92.14	SID13700
	WG320240D1	142.0 x 96.0	104.0 x 79.3	N/A
	WG320240E	143.0 x 98.0	104.0 x 79.3	N/A
	WG320240H	148.02 x 120.24	120.14 x 92.14	N/A
	WG320240K	142.0 x 96.0	104.0 x 79.3	SID13700
	WG320240L	160.0 x 109.0	122.0 x 92.0	N/A
	WG320240O	139.0 x 100.0	104.0 x 79.3	RA88035
	WG320240R	166.8 x 109.0	122.0 x 92.0	RA8803 **
	WG320240T3/T5	166.8 x 109.0	122.0 x 92.0	RA8806

** Suffix in controller column denotes Chinese fonts.

Other Displays

LED Displays
Our range of LED displays encompasses digit heights ranging from 0.7" to 4.0" with all industry standard types supported. Standard formats are 5x7, 5x8, 8x8 and 16x16 designed to be x, y, stackable with options including high intensity, low current, multicolour and custom types.

Displays are available in both Common Anode and Common Cathode polarity and for optimum viewing the segment and face colour can be selected.

We offer a spectrum of colours including white and high intensity types can be clearly viewed at a distance under bright ambient light conditions. In addition to the moulded tile packages we offer bespoke solutions based on discrete matrix modules for high intensity information systems.

Many of the standard types are available from stock and to ensure consistent matching across a multiline display, parts are supplied categorised for luminous intensity and hue.

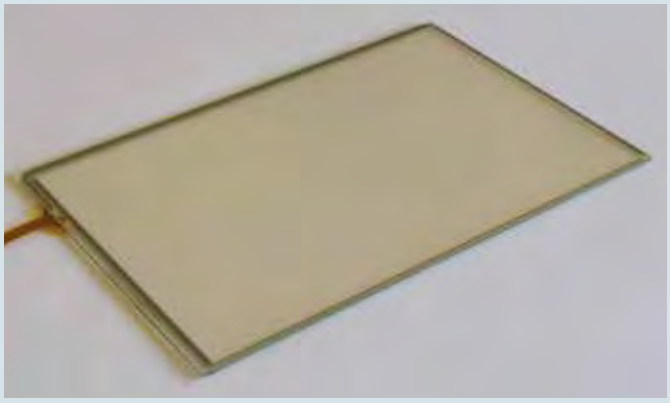
E-Paper
E-Paper is a bistable technology. This means the image displayed will remain even if all power is removed. E-paper is available in graphic, dot matrix formats in various sizes. Options are black and white, or black, white and red.

Electroluminescent Displays from Lumineq by Beneq
The black and yellow colours of the rugged Lumineq® TFEL displays are known as the Colours of Reliability®. Lumineq displays tolerate cold, pressure, shock and vibrations better than any other display type. They offer excellent readability, long product life and long-term availability for a wide range of demanding applications – on land, at sea and in the air. In addition to our range of standard products, you can design your own displays and still get all the benefits of our proven and robust thin film electroluminescent display technology, manufactured in-house at Beneq's factory in Finland.

Touch Panels
Only a few years ago touch screen control would have been purely the stuff of science fiction. Today though, almost any device can be enhanced by the addition of a touch-interactive display panel.
In general there are two classes of touch screen technology.

- Resistive touch gives high accuracy responses. Typically this is achieved with a four wire solution, but five wire resistive will enhance the accuracy further.
- Capacitive touch is a more robust solution seen in higher-end devices.

Many of our TFT modules offer a touch panel option. Touch screen technology is improving all the time so please contact us for the latest information.



Custom Displays

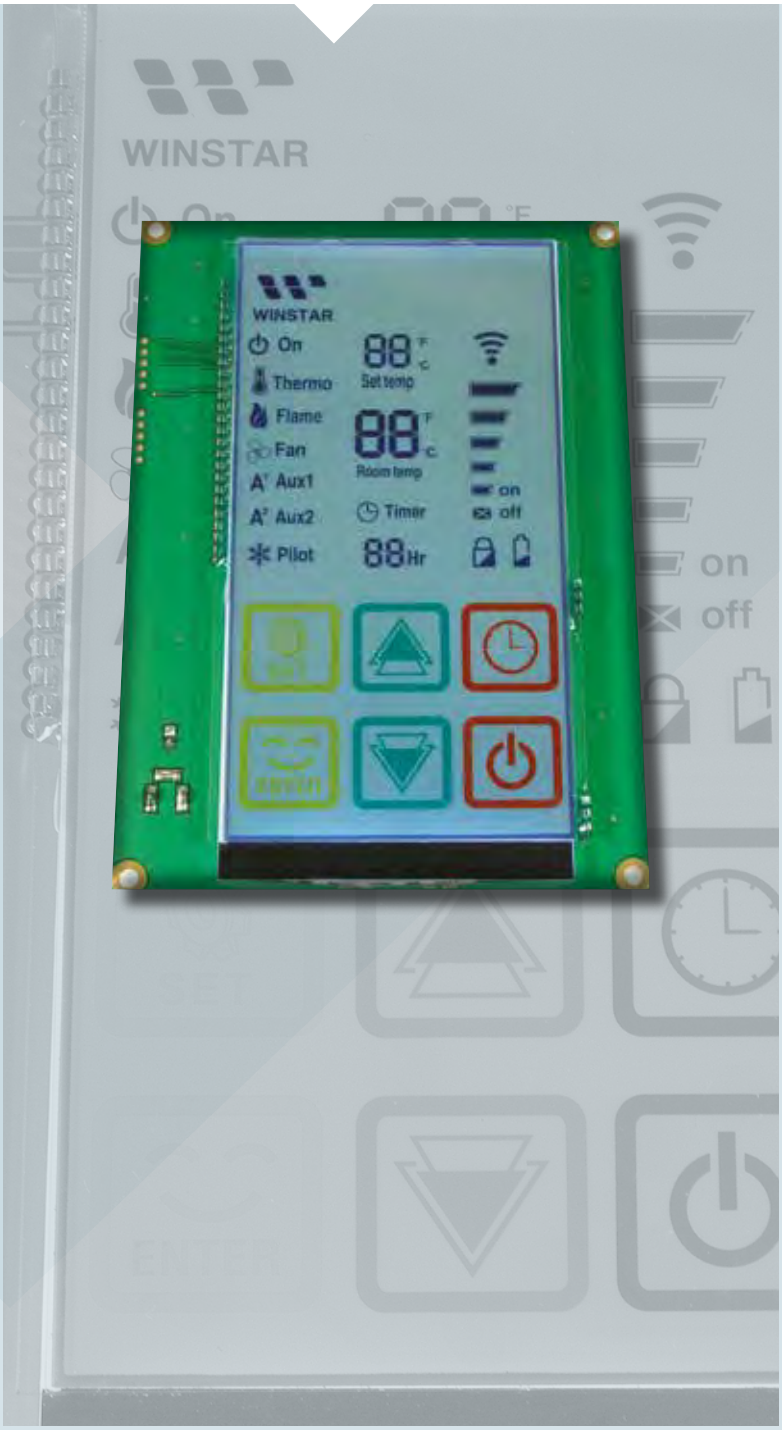
On occasions where a standard display cannot meet the requirement, then we are able to offer a bespoke solution. Whilst our range of off-the-shelf LCD modules is comprehensive, it may be that your product would benefit from a special display, perhaps with symbols or text and a particular numerical layout to improve end-user interface. Many of our customers have found that a custom display can help to differentiate & distinguish their product against competitors Ergonomic features can further enhance designs & interface. Examples include colour coded display segments and custom graphical design.

The process begins by identifying the preferred dimensions and segment content. We can advise on the most cost-effective overall size. This is generally determined by how many individual displays can be produced on one sheet of "motherglass" as it passes along the production line and can make a significant difference to unit cost. Drawings are then prepared and when approved, prototypes can be produced. Prototypes can then be evaluated and used to test the electronics design and function.

Once tested and approved the custom LCD can go into mass production.

Our interface is to advise and manage the project to ensure that the manufacturer correctly implements the design requirements. We use our expertise to reduce the time taken to arrive at cost effective and attractive display solution taking into account commercial needs.
In addition to size and segment detail, other options include:

- TN, STN or FSTN fluid
- Extended temperature ranges
- Polarizer mode and coloured polarizers (for bar-graphs etc.)
- Display mode positive/negative
- Connector method to suit your board layout and production processes
- Custom Backlights
- Fitted Connectors and Cable Assemblies are available



Our interface is to advise and manage the project to ensure that the manufacturer correctly implements the design requirements . . .

Embedded Computing

To support our range of TFT products we offer a number of embedded computing solutions with UK manufacture & support.

RE3

The RE3 is the latest addition to Blue Chip Technology's highly successful RE range of all in one ultra compact computers. Our RE boards have a typical power dissemination of circa 2 watts, support advanced power management modes in a very small footprint. The RE3 sets new standards for performance and integration with dual and quad core processor options supported by class leading graphics engines to drive two independent displays.

TM1 – Internet of Things Module

The TM1 features a NXP iMX6 ARM Cortex A9 processing core with a flexible clocking scheme from 24MHz up to 1GHz. This flexibility makes the TM1 suitable for running high level operating systems like Ubuntu Linux and Android Lollipop, or running bare metal applications that only require lower performance and the lowest power consumption.

- NXP iMX6 Single Core Processor
- NEON Co-processor
- 256MB, 512MB or 1GB of Low Power DDR3 memory
- MicroSD or eMMC storage devices
- Wifi & Bluetooth option
- Up to 60 GPIO lines with selectable 1.8 or 3.3 voltage levels
- Standard or Wide operating temperature ranges
- Android 4.4.3 and Ubuntu Linux 14.04 LTS operating systems supported
- Full source code available for supported operating systems
- Tiny module measuring just 42mm x 30mm x 5.3mm

The TM1 excels in headless (no display) and LCD applications.

a comprehensive range of resources and facilities which can be brought to bear on your project . . .

BlueChip Technology

Integrated Touch Computers

Beta

The Beta Touch Screen HMI is the ideal LCD platform for quickly creating your new touchscreen based product. Each Beta unit consists of a touch screen, LCD, Single Board Computer, mechanicals, injection moulded bezel together with the relevant approvals and rigorous environmental testing. So you just need to add your software to get your new product to market. The Beta provides USB, LAN, GPIO, LCD, RS232, RS422, RS485, I²C, SPI and Touch. If you need different interfaces (3G, GPS, CAN, Accelerometer, Light Sensor, ADC, DAC, Battery operation, etc.) please check the other models in the Beta range.

Available in 4.3" and 7.1" (also 9.7") formats with Resistive or Capacitive touchscreen The Beta Touch Screen HMI range is designed and manufactured in the UK.

As standard Beta Touch Screen HMI range includes:

- 1GHz ARM Cortex A9 Processor
- Wide viewing angles
- Digital input & outputs
- USB 2.0 Host Port
- USB 2.0 Device Port
- SPI & I²C
- Dual RS232 Ports, Single RS232/422/485 Port
- Stereo audio inputs and outputs
- Audio amplifier
- 10/100 Mbit LAN
- 5 volt DC power input
- Low power consumption
- Stylish injection moulded bezel
- CE and Thermally tested
- 5 years + Manufacturing Life Cycle

Alpha - Integrated touch screen computers

Designed and manufactured in the UK with integrated touch screens and a machined aluminum front bezel with an IP65 level of protection, the Alpha is compact, robust and attractive. The Alpha range of fan-less integrated touch screen computers offer engineers a fast track product platform for any embedded system requiring a feature-rich touch screen display, considerable processing power, low power consumption and high performance.
The Alpha range offers fast boot times, 24/7 operation and is available with a range of processor cores, operating temperatures and an impressive array of functionality and connectivity options. The Alpha range includes screen sizes 4.3" (480x272), 5.7" (640x480), 7.1" (800x480) and 12.1" (1280x800). OS support includes Windows CE, Linux and Android.

BlueChip Technology

About Plus Opto

About Plus Opto
Established in 1994 as a specialist supplier of optoelectronic components into the electronic manufacturing industry, our continued success is based upon well-maintained traditional values: quality, customer service and technical support.
Plus Opto is home to the complete range of optoelectronic devices and systems: LED discrete components & assemblies, displays and modules; LCD Modules; Single Board Computers; LED Drivers & Controllers, as well as custom and semi-custom displays and assemblies. In an ever-advancing industry, with the emergence of many new opportunist enterprises, the significance of our experience in direct application support for new project development cannot be underestimated.
Our thorough understanding of markets, trends and applications is of fundamental importance to our customers.
Supported by a comprehensive UK stocking facility and direct factory routes our clients profit from a highly competitive product range and short delivery times, thus instilling confidence that we are indeed dedicated to building ongoing working relationships.
Stock Policy - Our commitment to customer service is directly reflected in our stocking policy whereby several million components are held in stock at any time. Our stock investment is under continuous appraisal to ensure that we meet customer demands.
Items that are not held in stock can be obtained on the shortest possible delivery times by close liaison with our suppliers.
Technical Support - Customers are invited to call on our years of experience in the optoelectronics market. Customers have access to design and application support with a comprehensive cross reference and type number selection service. Samples and full manufacturing data are available on request.
Quality and Approvals - Plus Opto utilises modern and highly efficient logistics systems which comply to ISO9001:2008.

About Winstar
Established in 1998, Winstar Display Co., Ltd. has devoted itself to the manufacturing and development of high-quality industrial display products. Chairman Mr. Venson Liao and Vice Chairman Mr. Peter Tsai are regular winners of Taiwan's top Entrepreneurial and Enterprise awards, and take a strategic approach to new challenges with the main business objectives in mind; building core capabilities and continually developing business strategies with leading-edge technology, stable product quality, competitive price, managed efficiency and the best customer service.
Winstar has become a leader in the field of small & medium sized flat panel displays and with continuous innovation has secured several global patents.
Worldwide operations include R&D, manufacturing, assembly and logistics. Winstar's technology portfolio includes high- quality monochrome TN, STN, FSTN, VATN LCDs and modules, COG LCD, colour and monochrome TFT, and of course the widest range of OLED devices, where they are industry leaders.
Winstar Display is ISO certified for both quality, ISO9001 and environment, ISO14001. Meticulous attention to detail in engineering and production management have also enabled Winstar to attain the prestigious TS16949 automotive certification. As a leader in the display module market, Winstar will continue to dedicate research & development to the design of new technologies in LCD and OLED displays.

About Blue Chip
Blue Chip Technology developed its first Industrial Computer in 1986. This was a 4U rack mount unit based on a clone PC motherboard. Since then Blue Chip Technology has grown significantly from a pioneering Industrial Computer manufacturer and firmly established itself as the leading designer and manufacturer of embedded computer products in the UK. Blue Chip's in-house electronics engineers have extensive microprocessor, high speed digital, power supply, analogue and general electronics design experience. Software engineers develop operating systems for Windows, Linux and Android platforms. All products are designed, manufactured and supported in the UK.

About Lumineq by Beneq
Beneq's rugged, transparent and customized Lumineq displays, enabled by atomic layer deposition, are the display of choice for extreme conditions. The black and yellow colours of our Lumineq TFEL displays are known as the Colours of Reliability™. Lumineq displays have been serving for years on end without failing in demanding applications on land, at sea and in the air. The fully transparent Lumineq TASEL® displays are the most transparent displays on the market. They combine superior reliability with a unique see-through viewing experience. Lumineq displays are also available in custom shapes and sizes. You can design your own displays and still get all the benefits of Beneq's proven and robust display technology.
If you can draw it, Lumineq can make it!

B13 Derwent Court William Way
Moss Industrial Estate Leigh
Lancashire WN7 3PT
T +44 (0) 1942 671122
F +44 (0) 1942 671133
W www.plusopto.co.uk
E sales@plusopto.co.uk