

Character drivers

These low-power CMOS LCD controller/drivers are designed to drive dot-matrix LCD displays. The PCF2113x controls up to two lines of 12 or one line of 24 characters, with a dot format of 5 x 8, and supports up to 120 icons. The icon-driving feature can also be used to drive a number of segments, such as a line of 7- or 14-segment digits. The PCF2119x is the same as the PCF2113x, but controls up to two lines of 16 or one line of 32 characters and supports up to 160 icons. Both devices are standalone ICs with on-chip generation of LCD bias voltages, including temperature compensation. The result is fewer external components and lower current consumption. Both devices interface to most microcontrollers using a 4- or 8-bit parallel bus or the two-wire I²C-bus. Both devices also include a character generator and display alphanumeric and kana (Japanese) characters. Custom character sets can be provided on request. Combining a number of digits results in a full-graphic block with up to 16 x 40 pixels. The block can be controlled by the 16-digit CGRAM, which can also be used to generate custom, user-specific characters. To reduce power consumption during idle time, the Icon Mode can be used to show device activity status on the display.

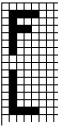
Key features

- ▶ Single-chip LCD controller / driver
- ▶ 5 x 7 character format plus cursor; 5 x 8 for kana (Japanese) and user-defined symbols.
- ▶ Very low power consumption (20 to 200 µA), in Icon Mode < 25 µA, in Power-down mode < 2 µA
- ▶ Integrated generation of V_{LCD} with temperature compensation (external supply also possible)
- ▶ Icon and display blinking mode
- ▶ Display shift or static display modes
- ▶ Display data RAM: 80 characters
- ▶ Character generator ROM: 240 characters
- ▶ User-defined characters: 16
- ▶ Multiplex rates 1:18 (normal operation), 1:9 (single line operation) and 1:2 (for icon mode only)
- ▶ I²C-bus and parallel interfaces
- ▶ Internal oscillator, with external clock also possible

Character driver selection guide

Type	Matrix size (lines x chars)	V _{DD} [V] logic	V _{DD2} [V] V _{LCD} gen.	Effective V _{LCD} [V]	I _{DD} , typ [µA] (int. V _{LCD} gen.)	On-chip bias/ V _{LCD} generator	Temp comp	Interface	Frame frequency [Hz] (internal osc)	Packages	Operating temperature [°C]
PCF2113	2 lines by 12 + 120 icons or 1 line by 24 + 120 icons	1.8 - 5.5	2.2 - 4.0	2.2 - 6.5	190	Yes	Yes	I ² C Fast Mode and 4/8-bit parallel	95, typ.	U, LQFP100	-40 to +85
PCF2116	1 or 2 lines by 24 or up to 4 lines by 12	2.5 - 6.0	2.5 - 6.0	3.5 - 9.0	700	Yes	No	I ² C and 4/8-bit parallel	65, typ.	U	-40 to +85
PCF2119	2 lines by 16 + 160 icons or 1 line by 32 + 160 icons	1.5 - 5.5	2.2 - 4.0	2.2 - 6.5	190	Yes	Yes	I ² C Fast Mode and 4/8-bit parallel	95, typ.	U	-40 to +85

Character drivers



Graphics drivers

Also known as dot-matrix drivers, these are low-power CMOS LCD row/column drivers, designed to drive dot-matrix graphic displays at multiplex rates up to 80. They can drive a large number of icons, and can drive a series of 7- or 14-segment digits. Each driver is a standalone IC, including on-chip generation of V_{LCD} and the LCD bias voltages. The result is fewer external components and lower power consumption. Most of the drivers communicate with a microcontroller using the two-wire, bidirectional I²C-bus; some use the SPI-bus or a parallel bus. Large display matrixes – such as 65 x 133 or 80 x 128 – make it possible to display more text, and ensure that fonts are sharp and easy to read, with almost invisible pixels.

Key features

- ▶ Standalone LCD controller / driver
- ▶ Low power consumption, suitable for battery-operated systems
- ▶ Display data RAM with one-to-one pixel correspondence
- ▶ Can also drive icons
- ▶ Software-selectable multiplex rates
- ▶ Integrated generation of V_{LCD} with temperature compensation (external supply also possible)
- ▶ No external components required
- ▶ I²C-bus, SPI-bus and parallel interfaces

Graphic driver selection guide

Type	Rows	Columns	Matrix size	V _{DD} [V] logic	V _{DD2} [V] V _{LCD} gen.	Effective V _{LCD} [V]	On-chip V _{LCD} generator	Temp comp	Interface	Frame frequency [Hz] (internal osc)	Packages	Operating temperature [°C]
PCF8531	34, 26, 17	128	34 x 128 or 33 x 128 plus 128 icons	1.8 - 5.5	2.5 - 4.5	4.0 - 9.0	Yes	Yes	I ² C Fast Mode	66 (typ.)	U (chip with bumps)	-40 to +85
PCF8578	8, 16, 24, 32	32, 24, 16, 8	8 x 32 or 16 x 24 stand alone Up to 40960 dots combined with 32 PCF8579	2.5 - 6.0	-	3.5 - 9.0	No	No	I ² C	64 (typ.)	VSO56, TQFP64	-40 to +85
PCF8579	32, driven by PCF8578	40	32 PCF8579 drive up to 40960 dots, matrix size 32 x 1280. Must be used with PCF8578	2.5 - 6.0	-	3.5 - 9.0	No	No	I ² C	64 (typ.)	VSO56, TQFP64	-40 to +85

Graphic drivers



Seeing is believing

LCD display driver solutions



LCD display drivers

NXP’s standalone LCD display drivers bring high reliability and low power consumption to a broad range of applications. They require few external components for operation, operate over a wide temperature range, support a wide range of supply voltages, and integrate vital interfaces. They are available in several different packages and delivery forms, to support various assembly technologies, and can be used in conjunction with an NXP RGB LED controller for LED backlighting.

NXP’s portfolio includes segment, character, and graphic display drivers. NXP’s segment display drivers lead the industry in terms of the number of segments that can be driven per device. That means more information can be displayed, at a lower cost. For automotive applications, NXP even has options that are AEC-Q100 compliant, ensuring reliable operation under the harshest conditions. NXP’s character display drivers can be configured to drive almost any character set, including Japanese, and support a large number of icons. The graphic display drivers, for use with monochrome, dot-matrix LCDs, are available in two resolutions: 34 x 128, and 80 x 128.

Key features

- ▶ Standalone LCD controllers / drivers
- ▶ No external components required
- ▶ Low power consumption
- ▶ Wide temperature range
- ▶ Wide supply-voltage range
- ▶ Various interfaces, including I²C-bus, SPI, and parallel
- ▶ Suitable packages for different assembly technologies
 - TSSOP, QFP, and surface-mount for standard assembly
 - Bare die for chip-on-board (COB) modules
 - Bumped die for chip-on-glass (COG) modules
 - Bumped die for chip-on-flexfoil (COF)
- ▶ Add NXP RGB LED controller for LED backlighting in any color

Applications

- ▶ eMetering (electricity, gas, water)
- ▶ Automotive display clusters
- ▶ Consumer electronics
- ▶ White goods
- ▶ Medical equipment
- ▶ Telecommunication equipment
- ▶ Industrial
- ▶ Test & measurement
- ▶ Simple graphical charts
- ▶ Point-of-sale terminals



For more information log on to:
http://www.standardics.nxp.com/support/boards/lcd_demo.board/



Segment drivers

These peripheral devices can be interfaced to almost any LCD with low multiplex rates. They generate the drive signals for any static or multiplexed LCD, with up to four backplanes and up to 160 segments, making it possible to drive up to 640 elements at once. Some devices can be used to drive eight or 16 backplanes. Most drivers are easy to cascade together for use with larger LCDs. Most of the devices communicate via a two-line I²C-bus; a driver for the SPI bus is also available. Several features minimize communication overhead, including a display RAM with auto-incremented addressing, hardware sub-addressing, and display memory switching (in static and duplex drive modes).

Key features

- ▶ Standalone LCD controller / driver
- ▶ Industry-leading in terms of number of segments that can be driven per device
- ▶ Internal LCD bias generation with voltage follower buffers
- ▶ Internal oscillator, with external clock also possible
- ▶ On-chip RAM with auto-incremental addressing for storing display data
- ▶ Cascadable with auto-incremented display data loading across device sub-address boundaries
- ▶ Versatile blinking modes
- ▶ AEC-Q100 compliant options for automotive applications
- ▶ Low power consumption
- ▶ I²C-bus, C-bus or SPI-bus interface
- ▶ Wide range of packages for different assembly technologies, including chip-on-glass (COG)

NEW:

PCA9620 – Automotive 60 x 8 segment driver for multiplex rates up to 1:8

This 60 x 8 LCD high-drive segment driver offers AEC-Q100 grade 2 compliance and is optimized for use in automotive applications such as instrument clusters, car radios, and climate-control units. It also supports displays in demanding industrial applications, including machine control systems and measuring equipment.

The PCA9620 generates the drive signals for static or multiplexed LCD containing up to 8 backplanes, 60 segments, and 480 elements. Housed in a single LQFP80 package, it can drive almost any LCD with low multiplex rates. It is compatible with most microcontrollers and communicates via the two-line bidirectional 400 kHz I²C-bus.

NEW:

PCF8536 and PCA8536 – Automotive and industrial 40 x 8 segment driver with integrated PWM channels for LEDs

This advanced, highly integrated LCD controller drives up to eight backplanes, up to 44 segments, and up to 320 elements. It includes an on-chip PWM controller for LED backlight illumination. The PWM controller has six outputs with 7-bit resolution (128 steps), and is ideal for driving external transistors. Up to six independent channels can be configured. The 128 levels per channel can control two RGB backlights with a spectrum of more than 2 million colors. Each channel can also be used for static LED drive or as a logic output.

Communication overheads are minimized by using a 320-bit display RAM with auto-incremented addressing. The device is available in an industrial version (PCF8536, for white goods and consumer products) and in an automotive version (PCA8536, e.g. for car radios, climate control and dashboard displays). The automotive type supports an extended operating temperature range up to 95 °C, and is AEC-Q100 compliant.

Both types of the peripheral device are equipped with a low-power serial interface: either the two-line bidirectional I²C-bus (400 kHz) or the three-line unidirectional SPI bus (5 MHz). The interface controls and drives almost any LCD display with multiplex rates up to 1:8.

Coming soon:

PCA8538 – Automotive 9 x 102 segment driver with AEC-Q100 grade 2 compliance

- ▶ 918 elements
- ▶ Temp range: -40 to +105 °C
- ▶ Enhanced temp compensation
 - Programmable temp regions
 - Programmable compensation slope
- ▶ Selectable backplane configuration: static, 2, 4, 6, 8, or 9 backplane multiplexing
- ▶ Wide LCD voltage range from 4.0 to 12.0 V for TN LCDs
- ▶ Programmable frame frequency from 45 to 300 Hz (factory calibrated)

Coming soon:

PCF8537 and PCA8537 – Industrial and automotive 8 x 44 segment driver with AEC-Q100 compliance

- ▶ 352 elements
- ▶ Temp range: -40 to +95 °C
- ▶ Selectable backplane configuration: static, 2, 4, 6, or 8 backplane multiplexing
- ▶ Integrated temp sensor with temperature read out
- ▶ Programmable frame frequency from 60 Hz to 300 Hz (factory calibrated)

Segment driver selection guide

Product	Multiplex rate versus number of segments							AECQ100 compliant	SPI-bus	C-bus	I ² C-bus	I ² C speed	V _{DD1} [min] (V)	V _{DD1} [max] (V)	I _{DD} [typ] (μA)	V _{LCD} [min] (V)	V _{LCD} [max] (V)	T _{amb} [min] (°C)	T _{amb} [max] (°C)	f _{fr} (Hz)	Cascade for larger conf
	1:1	1:2	1:3	1:4	1:6	1:8	1:16														
OM4068H	32	64	96	-	-	-	-	N	Y	-	-	-	2.5	5.5	12	3.5	6.5	-40	105	84	Y
PCA85132U	160	320	480	640	-	-	-	Y	-	-	Y	Fast	1.8	5.5	-	1.8	8	-40	95	SEL	Y
PCA85133U	80	160	240	320	-	-	-	Y	-	-	Y	Fast	1.8	5.5	16	2.5	8	-40	95	SEL	Y
PCA85134H	60	120	180	240	-	-	-	Y	-	-	Y	Fast	1.8	5.5	24	2.5	8	-40	95	82	Y
PCA85162T	32	64	96	128	-	-	-	Y	-	-	Y	Fast	1.8	5.5	-	2.5	8	-40	95	110	Y
PCA85176H	40	80	120	160	-	-	-	Y	-	-	Y	Fast	1.8	5.5	-	2.5	8	-40	95	82	Y
PCA85176T	40	80	120	160	-	-	-	Y	-	-	Y	Fast	1.8	5.5	-	2.5	8	-40	95	82	Y
PCA85232U	160	320	480	640	-	-	-	Y	-	-	Y	Fast	1.8	5.5	-	1.8	8	-40	95	SEL	Y
PCA8533U	80	160	240	320	-	-	-	N	-	-	Y	Fast	1.8	5.5	-	2.5	6.5	-40	85	64	Y
PCA8534AH	60	120	180	240	-	-	-	Y	-	-	Y	Fast	1.8	5.5	8	2.5	6.5	-40	85	64	Y
PCA8536AT	-	-	-	176	252	320	-	Y	-	-	Y	Fast	1.8	5.5	30	2.5	9	-40	95	SEL	N
PCA8536BT	-	-	-	176	252	320	-	Y	Y	-	-	-	1.8	5.5	30	2.5	9	-40	95	SEL	N
PCA8576CH	40	80	120	160	-	-	-	Y	-	-	Y	Fast	2	6	-	2.5	6	-40	85	69	Y
PCA8576DU	40	80	120	160	-	-	-	Y	-	-	Y	Fast	1.8	5.5	18	2.5	6.5	-40	85	77	Y
PCA9620H	60	120	-	240	320	480	-	Y	-	-	Y	Fast	2.5	5.5	100	2.5	9	-40	105	SEL	N
PCA9620U	60	120	-	240	320	480	-	Y	-	-	Y	Fast	2.5	5.5	100	2.5	9	-40	105	SEL	N
PCF2100CT	-	40	-	-	-	-	-	N	-	Y	-	-	2.25	6	-	2.25	6	-40	80	75	Y
PCF2111CT	-	64	-	-	-	-	-	N	-	Y	-	-	2.25	6	-	2.25	6	-40	80	75	Y
PCF2112CT	32	-	-	-	-	-	-	N	-	Y	-	-	2.25	6	-	2.25	6	-40	80	35	Y
PCF85132U	160	320	480	640	-	-	-	N	-	-	Y	Fast	1.8	5.5	-	1.8	8	-40	85	SEL	Y
PCF85133U	80	160	240	320	-	-	-	N	-	-	Y	Fast	1.8	5.5	16	2.5	6.5	-40	85	SEL	Y
PCF85134HL	60	120	180	240	-	-	-	N	-	-	Y	Fast	1.8	5.5	24	2.5	6.5	-40	85	82	Y
PCF85162T	32	64	96	128	-	-	-	N	-	-	Y	Fast	1.8	5.5	-	2.5	6.5	-40	85	82	Y
PCF85176H	40	80	120	160	-	-	-	N	-	-	Y	Fast	1.8	5.5	-	2.5	6.5	-40	85	82	Y
PCF85176T	40	80	120	160	-	-	-	N	-	-	Y	Fast	1.8	5.5	-	2.5	6.5	-40	85	82	Y
PCF8532U	160	320	480	640	-	-	-	N	-	-	Y	Fast	1.8	5.5	8	1.8	8	-40	85	SEL	Y
PCF8533U	80	160	240	320	-	-	-	N	-	-	Y	Fast	1.8	5.5	-	2.5	6.5	-40	85	64	Y
PCF8534AHL	60	120	180	240	-	-	-	N	-	-	Y	Fast	1.8	5.5	8	2.5	6.5	-40	85	64	Y
PCF8534AU	60	120	180	240	-	-	-	N	-	-	Y	Fast	1.8	5.5	8	2.5	6.5	-40	85	64	Y
PCF8536AT	-	-	-	176	252	320	-	N	-	-	Y	Fast	1.8	5.5	30	2.5	9	-40	85	SEL	N
PCF8536BT	-	-	-	176	252	320	-	N	Y	-	-	-	1.8	5.5	30	2.5	9	-40	85	SEL	N
PCF8562TT	32	64	96	128	-	-	-	Y	-	-	Y	Fast	1.8	5.5	8	2.5	6.5	-40	85	77	Y
PCF8566P	24	48	72	96	-	-	-	N	-	-	Y	Standard	2.5	6	-	2.5	6	-40	85	69	Y
PCF8566T	24	48	72	96	-	-	-	N	-	-	Y	Standard	2.5	6	-	2.5	6	-40	85	69	Y
PCF8566TS	24	48	72	96	-	-	-	N	-	-	Y	Standard	2.5	6	-	2.5	6	-40	85	69	Y
PCF8566U	24	48	72	96	-	-	-	N	-	-	Y	Standard	2.5	6	-	2.5	6	-40	85	69	Y
PCF8576CHL	40	80	120	160	-	-	-	N	-	-	Y	Standard	2	6	-	2.5	6	-40	85	69	Y
PCF8576CT	40	80	120	160	-	-	-	N	-	-	Y	Standard	2	6	-	2.5	6	-40	85	69	Y
PCF8576CU	40	80	120	160	-	-	-	N	-	-	Y	Standard	2	6	-	2.5	6	-40	85	69	Y
PCF8576DH	40	80	120	160	-	-	-	Y	-	-	Y	Fast	1.8	5.5	18	2.5	6.5	-40	85	77	Y
PCF8576DT	40	80	120	160	-	-	-	Y	-	-	Y	Fast	1.8	5.5	2.7	2.5	6.5	-40	85	77	Y
PCF8576DU	40	80	120	160	-	-	-	N	-	-	Y	Fast	1.8	5.5	2.7	2.5	6.5	-40	85	77	Y
PCF8576T	40	80	120	160	-	-	-	N	-	-	Y	Standard	2	9	-	2	9	-40	85	64	Y
PCF8577CT	32	64	-	-	-	-	-	N	-	-	Y	Standard	2.5	6	-	2.5	6	-40	85	90	Y
PCF8577CU	32	64	-	-	-	-	-	N	-	-	Y	Standard	2.5	6	-	2.5	6	-40	85	90	Y