

Overview

The SCDM-43P display module is a full-color character display-compatible LCD module with fully-configurable background image, font(s), character effects, text locations, and backlight. The module includes a 4-bit or 8-bit parallel bus interface suitable for direct drive from discrete microprocessor I/O signals or RAM/ROM memory signals. The SCDM-43P operates from a single 5 VDC to 12 VDC power supply.

Applications

- cash registers, POS
- fuel dispensers
- security alarms
- industrial controls
- test and measurement equipment
- weighing systems
- telephones, phone switching
- vending machines
- digital signage

Features

- Drop-in replacement for traditional dot-matrix character displays
- Compatible with Hitachi HD44780, Sitronix ST7066, Densitron NT7603, Samsung KS0066U, Samsung S6A0069, Sunplus SPLC780D chipsets
- 1-4 text lines placed anywhere on-screen
- Custom font and background image
- Wide viewing angle

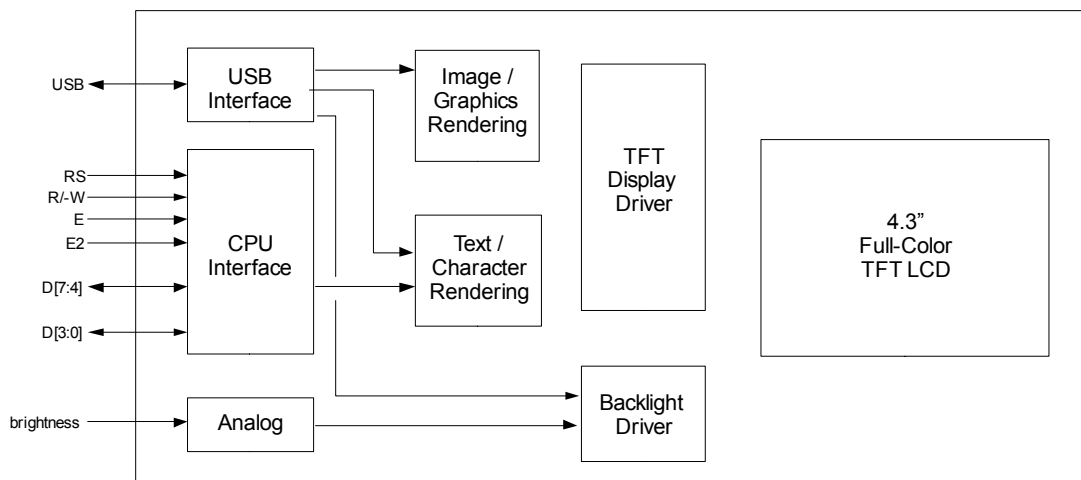
Production Status

In production.

Ordering Information

Contact The Chicago Firmware Factory for pricing and availability.

Functional Diagram



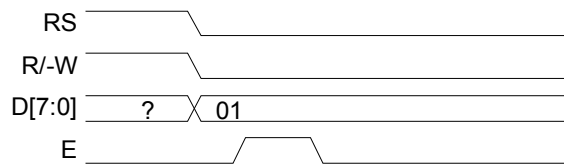
Pin Description (J1)

pin	signal	I/O	function
1	V _{SS}	—	GND: 0V
2	V _{DD}	—	regulated 5.0 VDC to 12.0 VDC power input to module
3	V _O	I	backlight brightness driving voltage (if configured by software) 0.0V to 3.3VDC input. offset and slope can be configured in software to map brightness values to a desired voltage range
4	RS	I	register select 0: instruction register (for write), busy flag and address counter (for read) 1: data register (for read and write)
5	R/-W	I	read or write operation select 0: write 1: read
6	E	I	enable 1: starts data read/write
7	D0	I/O	used for data transfer to/from module not used in 4-bit operation
8	D1	I/O	used for data transfer to/from module not used in 4-bit operation
9	D2	I/O	used for data transfer to/from module not used in 4-bit operation
10	D3	I/O	used for data transfer to/from module not used in 4-bit operation
11	D4	I/O	used for data transfer to/from module
12	D5	I/O	used for data transfer to/from module
13	D6	I/O	used for data transfer to/from module
14	D7	I/O	used for data transfer to/from module can be used as a busy flag
15	E2	I	enable - used only in dual-controller emulation mode 1: starts data read/write
16	NC	—	make no connection to this pin

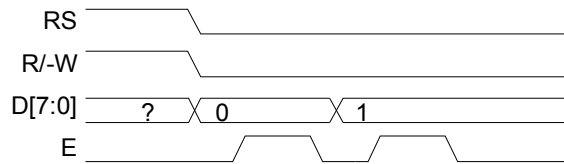
CPU Interface

The SCDM-43P's CPU interface consists of an 8-bit bidirectional data bus (4 or 8 signals are used, depending on configuration). The RS signal is driven by the host CPU and control whether instructions are performed or data is written. The R/-W signal is driven high to transfer data from the module to the host CPU, and low to write data from the CPU to the module. The CPU drives the E signal from low to high to start any read or write operation.

CPU interface signals use 3.3VDC output logic, and all inputs are 5V tolerant, which allows the module to be driven by the CPU from 5V or 3.3V I/O logic.



Example: Clear Display Instruction executes when E signal is driven high.



Above example performed using 4-bit mode.

Clear Display Instruction executes when the E signal is driven high the second time.

Function Description

The SCDM-43P has two 8-bit registers, selectable using the RS signal.

The instruction register (RS=0) accepts instruction opcodes such as clear display, send cursor home, turn cursor off, written by the host system to the module. When read, the instruction register reports the busy flag (BF) in bit 7, and the address counter (AC) in bits 6-0.

The data register (RS=1), when written, updates either ASCII text data to be displayed by the module (display RAM) or bit pattern data for inclusion in custom display character bitmaps (character generator RAM). Display data or custom character bitmap patterns can also be read via this register.

The SCDM-43P module can be operated solely by writing to the IR and DR (no reads are needed) if certain timing considerations are met.

RS	R/-W	E	operation
0	0	1	write to instruction register to perform an operation (e.g. turn display on)
0	1	1	read busy flag (BF) and address counter (AC)
1	0	1	write to display RAM or character generator RAM
1	1	1	read back display RAM or character generator RAM

Instruction Register Opcodes

To issue a command to the display module, program the instruction register using D[7:0] with RS=0 and R/-W=0, then drive the enable signal high.

RS=0, R/-W=0								operation
DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	
1	A6	A5	A4	A3	A2	A1	A0	Set display RAM address to A[6:0]
0	1	A5	A4	A3	A2	A1	A0	Set character RAM address to A[5:0]
0	0	1	DL	—	—	—	—	Set interface data length to 4 bits (DL=0) or 8 bits (DL=1), number of lines to N
0	0	0	1	S/C	R/L	—	—	Move cursor (S/C=0) or shift display (S/C=1) right or left (R/L)
0	0	0	0	1	D	C	B	Turns display on/off (D), turns cursor on/off (C), turns cursor blinking on/off (B)
0	0	0	0	0	1	I/D	S	Configures cursor movement increment/decrement (I/D) and enables display shifting when text is written (S=1)
0	0	0	0	0	0	1	—	Resets display RAM address (AC) to 0 and unshifts display if shifted
0	0	0	0	0	0	0	1	Clears display and display RAM, resets AC to 0.

Display RAM

Up to 128 bytes can be written to the SCDM-43P. The module is software-configured to display ranges of these character bytes in up to 4 areas of the screen. This configurable mapping allows the user to simulate various dot matrix character display modules.

Example: simulation of Lumex™ LCM-S01602DTR

The LCM-S01602DTR is a 16 character 2-line display (16×2). Its display RAM is mapped as follows:

Line 1: Display RAM addresses 0-15 (00-0F hex)

Line 2: Display RAM addresses 64-79 (40-4F hex)

Example: simulation of Kyocera™ C-51847NFJ-SLW-AEN

The C-51847NFJ-SLW-AEN is a 20 character 4-line display (20×4). Its display RAM is mapped as follows:

Line 1: Display RAM addresses 0-19 (00-13 hex)

Line 2: Display RAM addresses 32-51 (20-33 hex)

Line 3: Display RAM addresses 64-83 (40-53 hex)

Line 4: Display RAM addresses 96-115 (60-83 hex)

These lines can be individually configured for screen location, font face and style, font size, and text effects (e.g. drop shadow) using the configuration software via the module's USB port.

Character RAM

Character RAM is used for rendering custom characters (e.g. arrows, logos) that aren't included in a font's character set. This functionality is included only for compatibility with legacy dot matrix character display module chipsets and renders symbols using a low-resolution 5×8 matrix. To render higher-resolution custom symbols, upload custom character images via the configuration software and USB port.

Typical Startup Sequences

The following table illustrates startup initialization and display of a simple 1-line string using 8-bit data entry mode and automatic incrementing of the address counter:

	RS	R/-W	D[7:0]	Display line 1	operation
1	0	0	30		Function set DL=1 (8-bit)
2	0	0	0E	–	Display on/off D=1: turn display on C=1: show cursor B=0: inhibit cursor blinking
3	0	0	06	–	Set entry mode I/D=1: increment address after each write
4	1	0	53	S_	Write to display RAM 53 = 'S'
5	1	0	78	Sw_	Write to display RAM 78 = 'w'
6	1	0	61	Swa_	Write to display RAM 61 = 'a'
7	1	0	6E	Swan_	Write to display RAM 6E = 'n'
8	1	0	20	Swan_	Write to display RAM 20 = <i>space</i>
9	1	0	43	Swan C_	Write to display RAM 43 = 'C'
10	1	0	44	Swan CD_	Write to display RAM 44 = 'D'
11	1	0	4D	Swan CDM_	Write to display RAM 4D = 'M'

The following example illustrates startup initialization and display of a short string using 4-bit data entry mode and automatic increment of the address counter:

	RS	R/-W	D[7:4]	Display line 1	operation
1	0	0	2		Function set DL=0 (4-bit)
2	0	0	2		Function set DL=0 (4-bit)
3	0	0	0	–	Display on/off D=1: turn display on C=1: show cursor B=0: inhibit cursor blinking
	0	0	E		
4	0	0	0	–	Set entry mode
	0	0	6		I/D=1: increment address after each write
5	1	0	5	S_	Write to display RAM 53 = 'S'
	1	0	3		
6	1	0	7	Sw_	Write to display RAM 78 = 'w'
	1	0	8		
7	1	0	6	Swa_	Write to display RAM 61 = 'a'
	1	0	1		
8	1	0	6	Swan_	Write to display RAM 6E = 'n'
	1	0	E		