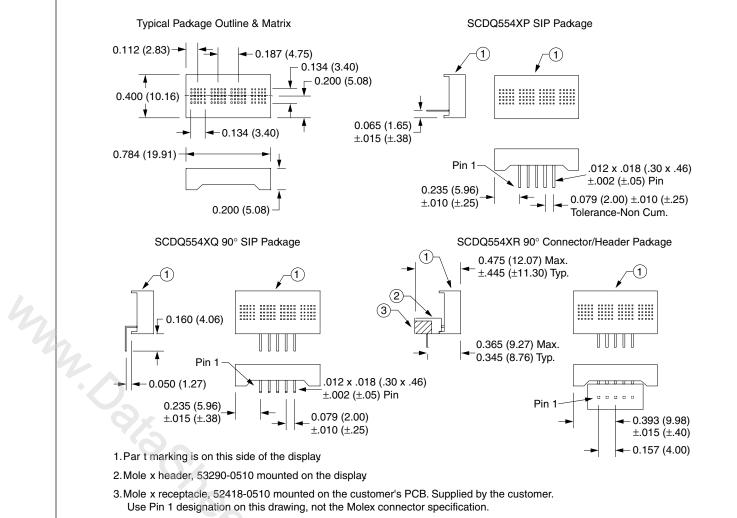


YELLOW SCDQ5541P/Q/R HIGH EFFICIENCY RED SCDQ5542P/Q/R GREEN SCDQ5543P/Q/R HIGH EFFICIENCY GREEN SCDQ5544P/Q/R

Square 0.134" 4-Character 5x5 Dot Matrix Serial Input Dot Addressable Intelligent Display[®] Devices



4. Unless otherwise specified all tolerances are ±.010 (±.25)

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FEATURES

- Four 0.134" (3.40 mm) 5x5 Dot Matrix Characters in Yellow, High Efficiency Red, Green, or High Efficiency Green
- Optimum Display Surface Efficiency (display area to package ratio)
- Square Character Format to Display Data in a Vertical or Horizontal Format
- High Speed Data Input Rate: 5.0 MHz
- ROMless Serial Input, Dot Addressable Display— Ideal for User Defined Characters
- Built-in Decoders, Multiplexers and LED Drivers
- Readable from 6 Feet (1.8 meters)
- Wide Viewing Angle, ±55°in X-Axis and Y-Axis
- Attributes:
 - 100 Bit RAM for User Defined Characters
 - Eight Dimming Levels
 - Power Down Model (<250 μW)
 - Software Clear Function
 - Lamp Test
 - 3.3 V Capability

Absolute Maximum Ratings

Operation in excess of any of these conditions may result in permanent damage to this device ($T_A=25^{\circ}C$).

Supply Voltage V _{CC} to Gnd (non-operating)	–0.5 to 7.0 V
Input Voltage, Any Pin to Gnd	–0.5 to V _{CC} to 5.5 V
Operating Temperature Range	–40°C to 85°C
Storage Temperature (T _S)	40°C to 100°C
Relative Humidity (non-condensing)	
Maximum Solder Temperature, Connector (Dnly
0.063" below Seating Plane T≤5 s	260°C
Maximum Power Dissipation	0.65 W at 85°C
ESD (100 pF, 1.5 kΩ)	2.0 kV
Maximum Input Current	±100 mA

Electrical characteristics (over operating temperature, unless otherwise specified, T_{Δ} =25°C)

DESCRIPTION

The SCDQ5541X (Yellow), SCDQ5542X (High Efficiency Red), SCDQ5543X (Green), and SCDQ5544X (High Efficiency Green) are four digit, dot addressable 5x5 dot matrix, serial input, alphanumeric Intelligent Display devices in a square format. The four digits are packaged in a rugged, high quality, optically transparent, plastic package several mounting options. The SIP Pin for standard display mounting and 90° Bend SIP for side mounting. Additionally, a connector/header configuration is also available for display side mounting.

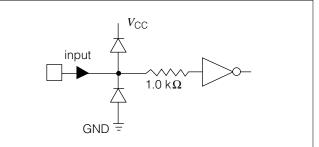
The on-board CMOS has a 100 bit RAM, one bit associated with one LED, each to generate User Defined Characters. In Power Down Mode, quiescent current is $<50 \ \mu$ A.

The SCDQ554XX is designed for work with the serial port of most common microprocessors. Data is transferred into the display through the Serial Data Input (DATA), clocked by the Serial Data Clock (SDCLK), and enabled by the Load Input (LOAD).

Input Circuit

The input resistor/diode network shown below is used for ESD protection and to eliminate substrate latch-up caused by input voltage over/under shoot.

Figure 1. Inputs



Parameter	Min.	Тур.	Max.	Units	Conditions
V _{CC}	4.5	_	5.5	V	—
I _{CC} (Pwr. Dwn. Mode)	_	—	5.0	μA	$V_{\rm CC}$ =5.0 V, all inputs=0 V or $V_{\rm CC}$
$I_{\rm CC}$ (16 dots on per digit) ⁽¹⁾	—	100	145	mA	V _{CC} =5.0 V, "#" displayed in all 4 digits at 100% brightness at 25°C
V _{IH}	3.5	—	—	V	V _{CC} =4.5 V to 5.5 V
V _{IL}	_	_	1.5	V	V _{CC} =4.5 V to 5.5 V
I _{IH}	—	—	10	μA	$V_{\rm CC} = V_{\rm IN} = 5.0 \text{ V}$ (all inputs)
I _{IL}	_	—	-10	μA	$V_{\rm CC}$ =5.0 V, $V_{\rm IN}$ =0 V (all inputs)
Internal Mux Frequency	375	768	1086	Hz	—
θ_{ja}	—	65	—	°C/W	—

Notes:

¹⁾ $I_{\rm CC}$ is an average value, the Peak current is $^{5}/_{3} \times I_{\rm CC}$.

²⁾ Contact manufacturer for 3.3 volt operation.

Figure 2. Close Up of Data "Write" Cycle

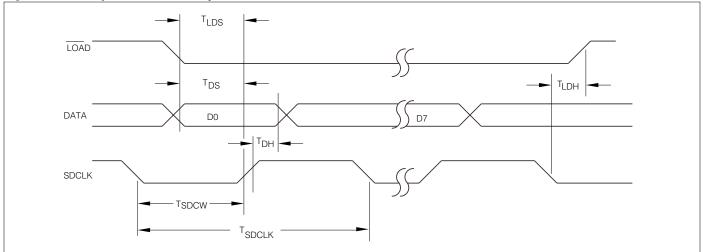
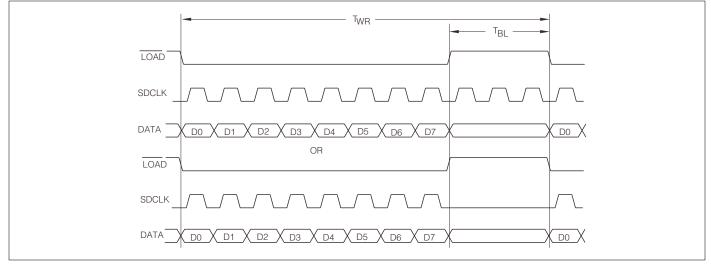


Figure 3. Device Timing



Write Cycle Timing

(over operating temperature range, $V_{CC}=V_{LL}=4.5$ V to 5.5 V)

Symbol	Description	Min.	Max.	Units
T _{LDS}	Load Setup Time	50	—	ns
T _{DS}	Data Setup Time	50	—	ns
T _{SDCLK}	Clock Period	200	—	ns
T _{SDCW} (HI or LOW)	Clock Width	70	—	ns
T _{LDH}	Load Hold Time	0	—	ns
T _{DH}	Data Hold Time	25	—	ns
T _{WR}	Total Write Time	2.25	—	μs
T _{BL}	Time Between Writes	600	—	ns
T _{RST}	Reset Active Time	600	—	ns

Notes:

1. T_{WR}=Setup Time + 8 Clock Times + Hold Times + Time Between Writes.

- Data is shifted into the display's 8 bit shift register on the positive going edge of the SDClk.
- 3. Shift register data is evaluated when Load\ goes high.

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Optical Characteristics at 25°C

 $(V_{CC}=5.0 \text{ V at } 100\% \text{ brightness level, viewing angle: X axis } \pm 55^{\circ}, \text{ Y axis } \pm 65^{\circ})$

Yellow SCDQ5541X

Description	Symbol	Min.	Тур.	Units
Luminous Intensity Character Average (# displayed all digits)	I _V	1.8	5.4	mcd
Peak Wavelength	λ _{peak}	—	583	nm
Dominant Wavelength	λ _{dom}		585	nm

High Efficiency Red SCDQ5542X

Description	Symbol	Min.	Тур.	Units
Luminous Intensity Character Average (# displayed all digits)	I _V	1.8	5.4	mcd
Peak Wavelength	λ _{peak}	—	630	nm
Dominant Wavelength	λ _{dom}		620	nm

Green SCDQ5543X

Description	Symbol	Min.	Тур.	Units
Luminous Intensity Character Average (# displayed all digits)	I _V	1.8	5.4	mcd
Peak Wavelength	λ _{peak}	_	565	nm
Dominant Wavelength	λ _{dom}	_	570	nm

High Efficiency Green SCDQ5544X

Description	Symbol	Min.	Тур.	Units
Luminous Intensity Character Average (# displayed all digits)	I _V	2.1	6.4	mcd
Peak Wavelength	λ _{peak}	—	568	nm
Dominant Wavelength	λ _{dom}	_	574	nm

Notes:

1. Dot to dot intensity matching at 100% brightness is 1.8:1.

2. Displays are binned for hue at 2.0 nm intervals.

3. Displays within a given intensity category have an intensity matching of 1.5:1 (max.).

Pinout and Pin Definitions

Pin	Function	Definitions
1	LOAD	Low input enables data clocking into 8-bit serial shift register. When LOAD goes high, the contents of 8- bit serial Shift Register will be decoded.
2	SDATA	Serial data input
3	SDCLK	Loads data into the 8-bit serial data register on a low to high transition
4	V _{CC}	Power supply
5	GND	Power supply ground

Figure 4. Dot Matrix Format

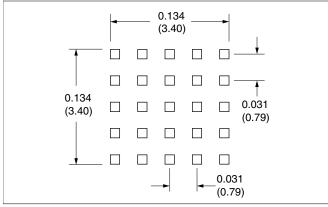
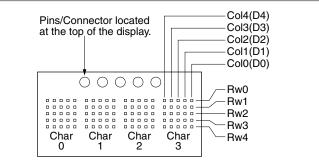


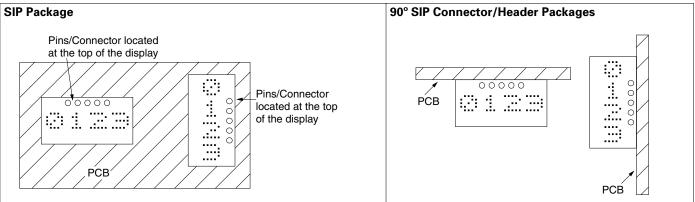
Figure 5. Character Address, Row, & Column Data Map



1. Viewed from the LED side of the display with the display in a horizontal position.

 The row address and column data are typical for all character positions. The LED is on when the data bit = 1 and off when the data bit = 0.

Figure 6. Suggested Display Mounting



Operation of the SCDQ554XX

The SCDQ554XX display consists of a CMOS IC containing control logic and drivers for four 5x5 characters. These components are assembled in a compact plastic package.

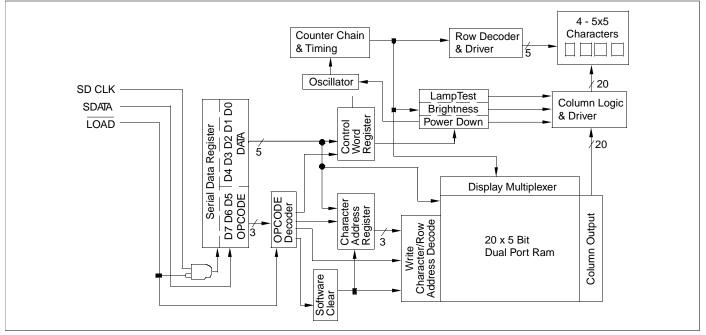
Individual LED dot addressablity allows the user great freedom in creating special characters or mini-icons. The User Definable Character Set examples illustrate 200 different character and symbol possibilities. Each example has the hexadecimal code required to display characters in a horizontal or vertical format. See Figure 6., Suggested Display Mounting for the display positioning. Generally, the contacts should be on the right side of the display for the vertical format and on the top of the display for the horizontal format.

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The serial data interface provides a highly efficient interconnection between the display and the mother board. The SCDQ554XX requires only three input lines as compared to 15 for an equivalent four character parallel input part.

The on-board CMOS IC is the electronic heart of the display. The IC accepts decoded serial data, which is stored in the internal RAM. Asynchronously the RAM is read by the character multiplexer at a strobe rate that results in a flicker free display. Figure 7. shows the three functional areas of the IC. These include: the input serial data register and control logic, a 100 bits two port RAM, and an internal multiplexer/display driver.

Figure 7. SCDQ Block Diagram



The following explains how to format the serial data to be loaded into the display. The user supplies a string of bit mapped decoded characters. The contents of this string is shown in Figure 8.A. Figure 8.B shows that each character consists of six 8 bit words. The first word encodes the display character location and the succeeding five bytes are row data. The row data represents the status (On, Off) of individual column LEDs. Figure 8.C shows that each 8 bit word is formatted to include a three bit Operational Code (OPCODE) defined by bits D7–D5 and five bits (D4–D0) representing Column Data, Character Address, or Control Word Data.

Figure 8.D shows the sequence for loading the bytes of data. Bringing the LOAD line low enables the serial register to accept data. The shift action occurs on the low to high transition of the serial data clock (SDCLK). The least significant bit (D0) is loaded first. After eight clock pulses the LOAD line is brought high. With this transition the OPCODE is decoded. The decoded OPCODE directs D4–D0 to be latched in the Character Address register, stored in the RAM as Column data, or latched in the Control Word register. The control IC requires a minimum 600 ns delay between successive byte loads.

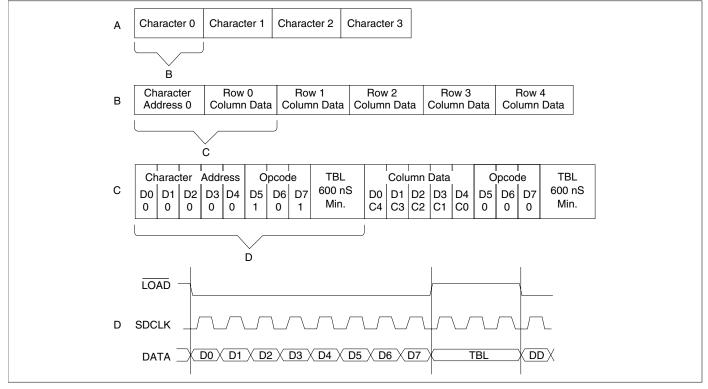


Figure 8. Loading Serial Character Data

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The Character Address bits, D4–D0 stored in the Character Address Register and the Column Data Instruction's Row Address bits, D7–D5, direct the Column Data bits, D4–D0 to specific RAM location. See the Instruction Set Table for address and data format. Figure 9. shows the Row Address for the example character "D" See Figure 5., Character Address, Row, & Column Data Map for the dot positioning (Display contacts are at the top of the display).

Column data is written and read asynchronously from the 200 bit RAM. Once loaded the internal oscillator and character multiplexer reads the data from the RAM. These characters are row strobed with column data as shown in Figure 10. The character strobe rate is determined by the internal IC's÷320 counter.

OPERATION	D 7	D 6	D 5	D 4	D 3	D 2	D 1	D 0	HEX	DESCRIPTION
CONTROL WORD	1	1	1	1	L T	B r	B r	B r	F0+X	Select Control Word plus operand See Control Word Format
Power Down Mode	1	1	1	1	1	1	1	1	FF	Power Down Mode–0% Brightness
SFT CLEAR	1	1	0	0	0	0	0	0	C0	Software Clear
ADDRESS	1	0	1	0	0	0	0	0	A0	Select Digit Address 0
REGISTER	1	0	1	0	0	0	0	1	A1	Select Digit Address 1
CHR ADRS	1	0	1	0	0	0	1	0	A2	Select Digit Address 2
0–3	1	0	1	0	0	0	1	1	A3	Select Digit Address 3
	0	0	0	D 4	D 3	D 2	D 1	D 0	00+X	Row 0 D4–D0=Column Data
	0	0	1	D 4	D 3	D 2	D 1	D 0	20+X	Row 1 D4–D0=Column Data
COLUMN DATA	0	1	0	D 4	D 3	D 2	D 1	D 0	40+X	Row 2 D4–D0=Column Data
	0	1	1	D 4	D 3	D 2	D 1	D 0	60+X	Row 3 D4–D0=Column Data
	1	0	0	D 4	D 3	D 2	D 1	D 0	80+X	Row 4 D4–D0=Column Data

Instruction Set

Row data is written to the character address contained in the Character Address Register.

Figure 9. Writing Character "D" Example

		code D6		D4	D3	Data D2 C2	D1	-	Hex
Row 0	0	0	0	1	1	1	1	0	1E
Row 1	0	0	1	1	0	0	0	1	31
Row 2	0	1	0	1	0	0	0	1	51
Row 3	0	1	1	1	0	0	0	1	71
Row 4	1	0	0	1	1	1	1	0	9E

Row and Column Locations for a Character "D"

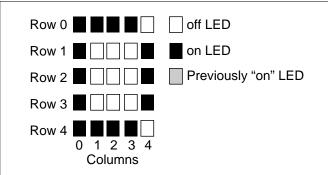
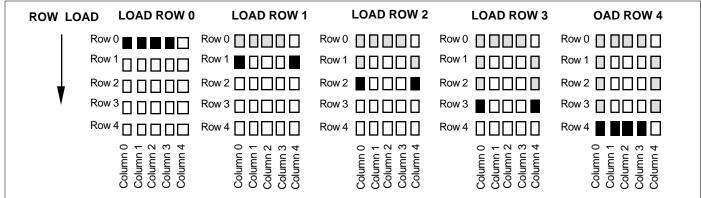


Figure 10. Row Strobe Example



The user can activate four Control functions. These include: LED Brightness Level, Lamp Test, IC Power Down, or Display Clear. OPCODEs and five bit words are used to initiate these functions. The OPCODEs and Control Words for the Character Address and Loading Column Data are shown in Instruction Set Table.

The user can select seven specific LED brightness levels. These brightness levels (in percentages of full brightness of the display) include: 100% (F0HEX), 53% (F1HEX), 40% (F2HEX), 27% (F3HEX), 20% (F4HEX), 13% (F5HEX), and 6.6% (F6HEX). The brightness levels are controlled by changing the duty factor of the row strobe pulse.

Display Brightness

Ор	code	;	Cor	ntrol	Hex	Operation			
D7	D6	D5	D4	D3	D2	D1	D0		Level
1	1	1	1	0	0	0	0	F0	100%
1	1	1	1	0	0	0	1	F1	53%
1	1	1	1	0	0	1	0	F2	40%
1	1	1	1	0	0	1	1	F3	27%
1	1	1	1	0	1	0	0	F4	20%
1	1	1	1	0	1	0	1	F5	13%
1	1	1	1	0	1	1	0	F6	6.6%

The SCDQ554X offers a unique Display Power Down feature which reduces I_{CC} to less than 50 μ A. When FFHEX is loaded the display is set to 0% brightness and the internal multiplex clock is stopped. When in the Power Down mode data may still be written into the RAM. The display is reactivated by loading a new rightness Level Control Word into the display.

Power Down

	code D6			Control Word D4 D3 D2 D1 D0				Hex	Operation Level
1	1	1	1	1	1	1	1	FF	0% brightness

The Lamp Test is enabled by loading F8HEX into the serial shift register. This Control Word sets all of the LEDs to a 53% brightness level. Operation of the Lamp Test has no affect on the RAM and is cleared by loading a Brightness Control Word.

Lamp Test

Op code D7 D6 D5					Wor D2		Hex	Operation Level				
1	1	1	1	0	В	В	В		Lamp Test (OFF)			
1	1	1	1	1	0	0	0	F8	Lamp Test (ON)			

The Software Clear (C0HEX) clears the Address Register and the RAM. The display is blanked and the Character Address Register will be set to Character 0. The internal counter and the Control Word Register are unaffected. The Software Clear will remain active until the next data input cycle is initiated.

Software Clear

	code D6	9 D5	Cor D4	ntrol D3	Wor D2	d D1	D0	Hex	Operation Level
1	1	0	0	0	0	0	0	CO	CLEAR

Electrical & Mechanical Considerations

Interconnect Considerations

Optimum product performance can be had when the following electrical and mechanical recommendations are adopted. The SCDQ554XX's IC is constructed in a high speed CMOS process, consequently high speed noise on the SERIAL DATA, SERIAL DATA CLOCK, and LOAD lines may cause incorrect data to be written into the serial shift register. Adhere to transmission line termination procedures when using fast line drivers and long cables (>10 cm).

Good digital grounds (pin 1) and power supply decoupling (pin 2) will insure that $I_{\rm CC}$ (<350 mA peak) switching currents do not generate localized ground bounce. Therefore it is recommended that each display package use a 0.1 μ F and 20 μ F capacitor between $V_{\rm CC}$ and ground.

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ESD Protection

The input protection structure of the SCDQ554XX provides significant protection against ESD damage. It is capable of withstanding discharges greater than 2.0 kV. Take all the standard precautions, normal for CMOS components. These include properly grounding personnel, tools, tables, and transport carriers that come in contact with unshielded parts. If these conditions are not, or cannot be met, keep the leads of the device shorted together or the parts in anti-static packaging.

Soldering Considerations

The SCDQ554XX can be hand soldered with SN63 solder using a grounded iron set to 260°C.

Wave soldering is also possible following these conditions: Preheat that does not exceed 93°C on the solder side of the PC board or a package surface temperature of 85°C. Water soluble organic acid flux (except carboxylic acid) or resin-based RMA flux without alcohol can be used.

Wave temperature of $245^{\circ}C \pm 5^{\circ}C$ with a dwell between 1.5 s to 3.0 s. Exposure to the wave should not exceed temperatures above 260°C for five seconds at 0.063" below the seating plane. The packages should not be immersed in the wave.

The SCDQ554XR connects to an external connector receptacle which may be soldered before inserting the SCDQ554XR Display. In this way, only the connector is subject to the user's soldering process. The Molex 52418-0510 receptacle called out in the product drawing can be used in solder reflow processes. See Molex for specifications.

Post Solder Cleaning Procedures

The least offensive cleaning solution is hot D.I. water (60°C) for less than 15 minutes. Addition of mild saponifiers is acceptable. Do not use commercial dishwasher detergents.

For faster cleaning, solvents may be used. Exercise care in choosing solvents as some may chemically attack the nylon package. For further information refer to Appnotes 18 and 19 at www.infineon.com/opto or in the current Infineon Optoelectronic Data Book. See Appnote 19, Table 2, "Displays–Group 2".

Optical Considerations

The 0.123" high character of the SCDQ554XX gives readability up to five feet. Proper filter selection enhances readability over this distance.

Using filters emphasizes the contrast ratio between a lit LED and the character background. This will increase the discrimination of different characters. The only limitation is cost. Take into consideration the ambient lighting environment for the best cost/benefit ratio for filters.

Incandescent (with almost no green) or fluorescent (with almost no red) lights do not have the flat spectral response of sunlight. Plastic band-pass filters are an inexpensive and effective way to strengthen contrast ratios. The SCDQ5542X is a high efficiency red display and should be matched with long wavelength pass filter in the 570 nm to 590 nm range. The SCDQ5541X/3X/4X should be matched with a yellow-green band-pass filter that peaks at 565 nm. For displays of multiple colors, neutral density grey filters offer the best compromise. Additional contrast enhancement is gained by shading the displays. Plastic band-pass filters with built-in louvers offer the next step up in contrast improvement. Plastic filters can be improved further with anti-reflective coatings to reduce glare. The trade-off is fuzzy characters. Mounting the filters close to the display reduces this effect. Take care not to overheat the plastic filter by allowing for proper air flow.

Optimal filter enhancements are gained by using circular polarized, anti-reflective, band-pass filters. The circular polarizing further enhances contrast by reducing the light that travels through the filter and reflects back off the display to less than 1%.

Several filter manufacturers supply quality filter materials. Some of them are: Panelgraphic Corporation, W. Caldwell, NJ; SGL Homalite, Wilmington, DE; 3M Company, Visual Products Division, St. Paul, MN; Polaroid Corporation, Polarizer Division, Cambridge, MA; Marks Polarized Corporation, Deer Park, NY, Hoya Optics, Inc., Fremont, CA.

One last note on mounting filters: recessing displays and bezel assemblies is an inexpensive way to provide a shading effect in overhead lighting situations. Several Bezel manufacturers are: R.M.F. Products, Batavia, IL; Nobex Components, Griffith Plastic Corp., Burlingame, CA; Photo Chemical Products of California, Santa Monica, CA; I.E.E.-Atlas, Van Nuys, CA.

Figure 11. SCDQ554XX Interface to Siemens/Intel 8031

Microprocessor (using serial port in mode 0)

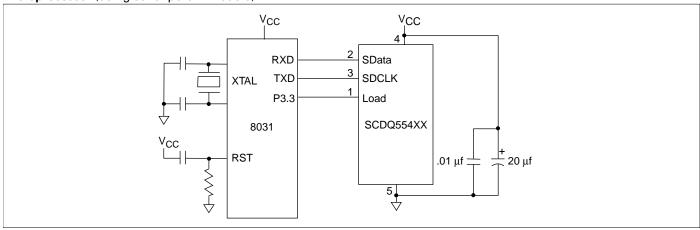
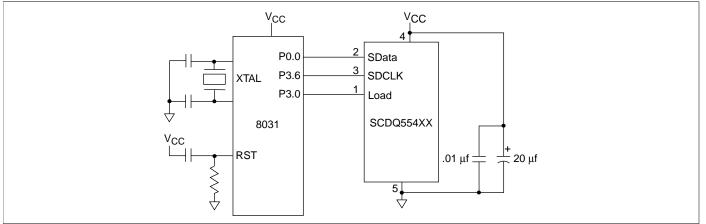


Figure 12. SCDQ554XX Interface to Siemens/Intel 8031 Microprocessor (using one bit of parallel port as serial input)



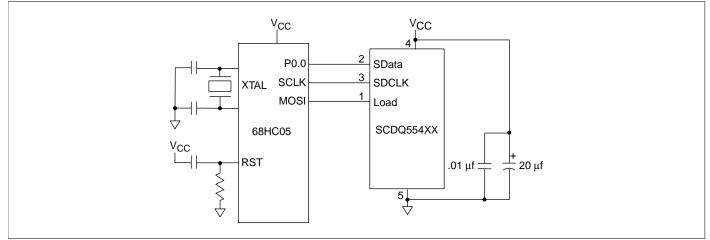
Microprocessor Interface

The microprocessor interface is through the serial port, SPI port or one out of eight data bits on the eight bit parallel port and also control lines SDCLK and LOAD.

Power Up Sequence

Upon power up display will come on at random. Thus the display should be reset at power-up. The reset will set the Address Register to Digit 0, User RAM is set to 0 (display blank) the Control Word is set to 0 (100% brightness with Lamp Test off) and the internal counters are reset.

Figure 13. SCDQ554XX Interface with Motorola 68HC05C4 Microprocessor (using SPI port)



Loading Data into the Display

- Use following procedure to load data into the display:
- 1. Power up the display.
- 2. Step A: software clear the display.
- 3. Step B: Load the Control Word with the desired brightness level.

Step	D7	D6	D5	D4	D3	D2	D1	D0	Function
A B (optional)	1 1	1 1	0 1	0 1	0 0	0 B	0 B	0 B	CLEAR BRIGHTNESS SELECT
1 2 3 4 5 6	1 0 0 0 1	0 0 1 1 0	1 0 1 0 1 0	0 0 1 0	0 0 1 0 0 0	0 1 1 1 1 1	0 0 1 0 0	0 0 1 0 0	DIGIT D0 SELECT ROW 0 D0 (Î) ROW 1 D0 (Î) ROW 2 D0 (Î) ROW 3 D0 (Î) ROW 4 D0 (Î)
7 8 9 10 11 12	1 0 0 0 1	0 0 1 1 0	1 0 1 0 1 0	0 0 1 1 1	0 0 1 1 0 0	0 1 0 1 0 0	0 0 1 1 0 0	1 0 1 1 1	DIGIT D1 SELECT ROW 0 D1 (A) ROW 1 D1 (A) ROW 2 D1 (A) ROW 2 D1 (A) ROW 3 D1 (A) ROW 4 D1 (A)
13 14 15 16 17 18	1 0 0 0 1	0 0 1 1 0	1 0 1 0 1 0	0 1 0 0 1	0 1 1 1 1 1	0 1 0 1 0 1	1 1 0 1 0 1	0 0 1 0 1 0	DIGIT D2 SELECT ROW 0 D2 (B) ROW 1 D2 (B) ROW 2 D2 (B) ROW 2 D2 (B) ROW 3 D2 (B) ROW 4 D2 (B)
19 20 21 22 23 24	1 0 0 0 1	0 0 1 1 0	1 0 1 0 1 0	0 0 1 0	0 0 0 1 0	0 1 1 1 1 1	1 0 0 1 0	1 0 1 0	DIGIT D3 SELECT ROW 0 D3 (↓) ROW 1 D3 (↓) ROW 2 D3 (↓) ROW 3 D3 (↓) ROW 4 D3 (↓)

Data Contents for the Display in a Horizontal Format " $AB\downarrow$ "

- 4. Load the Digit Address into the display.
- 5. Load display row and column data for the selected digit.
- 6. Repeat steps 4 and 5 for all digits.

User Definable Character Set Examples*

Upper and lower case alphabets

HEX		HEX CODE		HE X CII DE		HEX C D D E		HE X CODE		HE X CO DE		HEX CODE		HE X CODE		HE X CODE]
	54 87 87		917533A		路기진원::		21 년 22 문		성입입∺		972926		17 51 8E		964221 9744		00 5F 80	CE RE X
04 2A 5F 71 91		1E 29 4E 69 9E		0F 30 50 70 8F		1E 29 49 69 9E		1F 30 5E 70 9F		1F 30 5E 70 90		0F 30 53 71 8F		11 31 5F 71 91	0 0 0 0 0 0 0 0 0 0 0 0 0 0	0E 24 44 64 8E	• • • • • • •	
	21 E 82		9F 44 9F		9F 61 12 01		28 28 44 9F		22 44 95		951 8E		974 974 974		8122R1		974 974 974	HEX
01 21 41 71 8E	• • • • •	13 34 58 74 93		10 30 50 70 9F	0 0 0 0 0 0 0 0 0	11 3B 55 71 91		11 39 55 73 91	0 0 0 0 0 0 0 0 0 0 0 0 0	0E 31 51 71 8E		1E 31 5E 70 90		0C 32 56 72 8D		1E 31 5E 74 92		
	89 55 55 55 55 55 55 55 55 55 55 55 55 55		90 SF 30		9£ 61 12 9£		9C 41		위원 4 22 Fi		21 11 11 11 11 11 11 11 11 11 11 11 11 1		28 28 47 90		91 33 91 33			HEX
0F 30 4E 61 9E	•••• ••• •••	1F 24 44 64 84	• • • • • • • •	11 31 51 71 8E	• • • • • • • • •	11 31 51 6A 84	• • •	11 31 55 7B 91		11 2A 44 6A 91	••••	11 2A 44 64 84	•••	1F 22 44 68 9F	• • • • • • • • • • • • •			
	201 869 86		001400 70007		864909 6696		85557		860 400 4		825280		86920B		96400 972440		80 57 80 80	CEDE HEX
00 26 42 72 80	• • • • • • •	10 30 5E 71 9E	• • • • • • • • •	00 2F 50 70 8F	0000 0 0 00000	01 21 4F 71 8F		00 2E 5F 70 8E	000 0000 0 000	04 2A 48 7C 88	0 0 0 0 0 0 0 0	00 2F 50 73 8F	0000 0000 0000	10 30 56 79 91	0 0 0 0 0 0 0 0 0	04 20 4C 64 8E	• • • •	
	2E 49 82		88.6 3 P		8기1558		28 28 44 87		864 807 8F 48		29 86 86		864204 8722		86420 4227		862 87 87	CI HE X
00 26 42 72 80	•••	10 30 56 78 96	• • • • •	0C 24 44 64 8E	• • • • •	00 2A 55 71 91		00 36 59 71 91	0 0 0 0 0 0 0 0	00 2E 51 71 8E	000 000 000	00 3E 51 7E 90	• • • • • • • • •	00 2F 51 6F 81	• • • • • • • • •	00 33 54 78 90	0 0 0 0 0 0 0	
	208 20 61 80		00 22 49 7E 88		8E 41 8E		22 41 80		86409 86240 97		200 46 89		08 42 89		29 68 89			НЕХ
00 23 44 62 80	•••	08 3C 48 6A 84		00 32 52 72 8D		00 31 51 6A 84	• •	00 31 55 7B 91	0 0 0 0 0 0 0 0 0 0	00 32 4C 6C 92		00 31 4A 64 98	• • • • •	00 3E 44 68 9E	• • • • • • • • •			

Numerals and punctuation

HEX		HEX CODE		HE X CII DE		HEX		HE X CODE		HE X CO DE		HEX CODE		HEX		HE X CODE		
	8E 73 55 8E		866 위 22 8		09 55 73 91		9122230A		82674¥2		12 35 55 75 91		892385		10 54 90		55 75 8 A	HEX
0E 33 55 79 8E		04 2C 44 64 8E	0 0 0 0 0	1E 21 46 68 9F	• • • • • • • • • • • •	1E 21 4E 61 9E	• • • • • • • • •	06 2A 5F 62 82		1F 30 5E 61 9E		06 28 5E 71 8E		1F 22 44 68 88	• • • • • • • •	0E 31 4E 71 8E		
	88 25 36 25 36 25 36 25 36 25 36 25 36 25 36 25 36 25 36 25 36 25 36 25 36 25 36 25 36 25 36 25 36 25 36 25 36 25 36 36 36 36 36 36 36 36 36 36 36 36 36		24 A 8 A 8 A		12 35 5F 75 81		85 85 85		13 2B 44 7A 99		05 22 41 75 8A		200 7 A 7 A 80		866 #3100		80 거유 80	HEX
0E 31 4F 62 8C	••••	0A 3F 4A 7F 8A		0F 34 E 65 9E	• • • • • • • • • • • • •	06 29 50 68 9F	•••	19 3A 44 6B 93		08 34 4D 72 8D	••••	0C 2C 44 68 80	•••	02 24 44 64 82	•	08 24 44 64 88	•	
	5Å 200		86.UP20 447248		60 80		864220 84444		864200		10 28 44 81		ଷଟଘନ୍ତ		878 00 878 00		865년31 ==	CODE
0C 2C 48 64 80	• • • • •	04 24 5F 64 84	• • • • • •	00 2C 4C 64 88	0 0 0 0 0	00 20 5F 60 80		00 20 40 6C 8C	• •	01 22 44 60 84	•	04 24 44 60 84	•	0A 2A 40 60 80	•••	07 24 44 64 87	• • • • • • •	
	90 68 44 22 90		917년88		₩723%C		86420		80 28 28 28 20 00		20 75 75 75		86400 8640 8640		86 4 12 0 8 A A A A		80 71 A 20	CODE NE X
10 28 44 62 81	•	1C 24 44 64 9C	0 0 0 0 0 0 0 0	0E 35 57 70 8E		00 20 40 9F		0C 2C 40 6C 8C	• • • • • •	0C 20 4C 64 88	•••	02 24 48 64 82	0 0 0	00 3F 40 7F 80	0 0 0 0 0 0 0 0 0 0	08 24 42 64 88	•	
	08 34 71 88		864 80		200 24 5B 71 80		80 5 B 80		10 2A 47 6A 90		15 2F 5F 95		04 50 84		208 24 70 88			HEX
0E 31 42 64 88	••••	06 24 48 64 86	• • • •	0C 24 42 64 8C	• • • •	04 24 40 64 84	•	11 2A 44 6E 84		15 2E 5F 6E 95		04 2A 51 60 80	• • •	08 35 42 60 80	••••			

*CAUTION: No more than 128 LEDs "on" at one time at 100% brightness.

User Definable Character Set Examples* (continued)

Scientific notations, ect.

HEX		HE X CODE		HE X CODE		HE X CO DE		HE X CODE		HEX		HE X C D D E		HEX CODE		HE X CODE]
	² 유위위8		02 23 59 82 82		17 31 52 74 97		13 34 54 97		80 80		월기진당=		85 25 25 25 25 25 25 25 25 25 25 25 25 25		83588		865320	HEX
06 2E 5E 6E 86		04 24 48 71 8E	•••••	1F 20 59 75 93	•••••	1F 20 56 79 91	•••••	0E 20 4A 64 8A	•••	0D 32 52 72 8D		0C 32 56 71 96	•••••••••••••••••••••••••••••••••••••••	0E 24 4E 71 8E	••••	00 24 4A 71 9F		
	01 26 48 9E		86 22 22 22 22 22 22 22 22 22 22 22 22 22		01 22 44 91		1C 22 42 7E 81		10 28 4F 84		04 84 84		80 73 80		84 84 84 84 84 70		8년 7 1 2 2 2 10	HEX
10 3C 52 72 81	•••••••••••••••••••••••••••••••••••••••	0E 31 5F 71 8E		10 28 44 6A 91	•••••	09 29 49 6E 90	•	01 2E 54 64 84	••••	04 2E 55 6E 84	••••	0E 31 51 6A 9B		01 2E 5A 6A 8A	••••	0F 32 52 72 8C		
	81 월 23 81 11		00 20 4A 76 92		20 74 92		84 84 84		0A 52 84		14 52 84		92 4 50 92		827586		865224 49974	HEX CODE
1F 28 44 68 9F	•••••	18 24 48 70 80	••••	1C 28 44 78 80		12 36 5A 67 80		06 21 5A 67 80	•••••	07 22 59 66 80	•••••	1C 34 5C 60 80	•••	0F 28 48 78 88	••••	04 2E 5F 6E 80		
	82 82 82 82		864704 8667704		08 5E 7C 88		2472A8		84 84 84 84 84 84 84 84 84 84 84 84 84 8		8 귀뚜워 8		86 * 8 8		865584 48787		865 472 4	HEX
00 24 4E 7F 8E		00 2E 5F 6E 84	••••	0E 3F 4E 64 80	••••	04 3E 5F 7E 84		04 2F 5F 6F 84	••••	0E 2E 4E 6E 8E	• • • • • • • • • • • •	00 3F 5F 7F 80		04 2E 55 64 84		04 24 55 6E 84		
	865720 445724		84 84 84		위기진의 F		83 7 2 48 83 7 7 8		0A 35 4A 75 8A		000000 00000 00000		\$7555 ₽2555 ₽		89.438		ᇥᅿᄢᇮᇷ	HEX
04 22 5F 62 84	•••••	04 28 5F 68 84		1F 31 51 71 9F		08 2C 4A 78 98		0A 35 4A 75 8A		15 2A 55 6A 95		1F 35 5F 75 9F		00 3F 5F 7C 80		0E 3F 5B 7F 8E		
	2C 4D 83		03 27 40 60 80		01 21 40 60 80		861 81 81 81 81 81 81 81 81 81 81 81 81 81		0F 2F 47 67 87		역 뉘 넥 방 응		5F 90 90					CODE
00 27 4F 78 9C	••• ••• ••	00 3C 5F 63 87	•••	00 20 40 60 83	••	00 20 40 67 9F	•••	00 23 5F 7F 9F		0C 3C 5C 7C 9C	• • • • • • • • • • •	15 2E 44 64 84	• • • •					

Foreign characters

HEX CODE		HE X CODE		НЕ Х СО ДЕ		HE X CO DE				НЕХ СПДЕ		HEX		HEX		HE X CODE		
	55 94		18 34 71 90		10 80 80		80 29 29 29		29 47 89		89 4 C 98		0C 2A 48 7F 88		1E 32 57 71 90		8C 8C	HEX
1F 21 5F 62 84	••••	1F 21 46 64 88	••••	01 22 46 6A 82	0 0 0 0 0	02 3F 51 61 86		00 3F 44 64 9F	0 0 0 0 0 0 0 0 0 0 0 0	02 3F 46 6A 92		08 3F 49 6A 88		1F 21 45 67 8C		04 3F 51 62 8C		
	0E 29 48 7E 89		04 57 8 A 8 A		1C 32 51 79 84		25 25 48 78 84		1F 21 21 21		08 3E 7D 88		1C 22 41 75 95		1E 32 55 79 84		12 2년 48 84 84	HEX
08 3F 49 69 92		04 3F 44 7F 84	0 0 0 0 0 0 0 0 0 0 0 0	0F 29 51 62 8C		08 2F 52 62 82		0F 21 41 61 9F	• • • • • • • • • • • • • •	0A 3F 4A 62 8C		19 21 59 62 90		0F 29 55 63 8C		01 3E 42 7F 86		
	1C 22 50 9C		04 34 75 85		954200 974200		68 2E 82 82 82 82 82		82151 821 151 151 151 151 151 151 151 151 151 1		91 91 91		01 24 55 89		81 81 81 81 81 81 81 81 81 81 81 81 81 8		07 28 50 87	HEX
15 35 55 80		0E 20 5F 64 98	0 0 0 0 0 0 0 0 0 0	08 28 4C 6A 88	0 0 0 0 0	04 3F 44 64 98		0E 20 40 60 9F	• • • •	1F 21 4A 64 9A	• • • • • • •	04 3E 44 6E 95		02 22 42 64 88	•	04 22 51 71 91	• • • • •	
	29 29 49 9E		10 10 10		82330		86 86 86 86		865238		94 75 75		21 21 21 21 21 21 21 21 21 21 21 21 21 2		83384		84 84	HEX
10 3F 50 70 8F	• • • • • • •	1F 21 41 62 8C	• • • • • • • •	0E 20 4E 60 8F	0 0 0 0 0 0 0 0 0 0	04 28 51 7F 81		01 21 4A 64 8A	•	1F 28 5F 68 87		1E 22 42 62 9F		1F 21 5F 61 9F		0E 20 5F 61 8E	•••	
	9612 90		ფ인십555		852430D		^{ខ្ព} ក្ខភ្លួរ ខ្លុកខ្លួរ		89 75 89		87531E		路기십였 <u>2</u>		86400 66660		27 4D 75	HEX
12 32 52 64 88		04 34 54 75 96	0 0 0 0 0 0 0	1E 25 4F 74 8F		0F 34 5F 74 97		0F 30 4F 64 98	• • • • •	0F 33 55 79 9E		0F 34 57 74 8F		00 2A 5F 74 8B	••••	08 24 4E 72 8F	• • • • • • • • •	
	07 44 74 87		8654 <u>3</u> 0		85255 85255 85255 85255 85255 85255 855555 85555 85555 85555 85555 85555 85555 85555 85555 85555 855555 85555 85555 85555 85555 85555 855555 85555 85555 85555 85555 855555 85555 85555 85555 85555 85555 855555 855555 855555 85555 85555 85555 85555 85555 855555 85555 85555 855555 855		872 497 872		21 21 21 21 21 21		06 49 86		869 51 29 06					CIDE HEX
0A 2E 51 7F 91		02 24 4C 64 8E		04 2A 4E 71 8E		0A 34 52 7A 96		08 24 51 71 8E	• • • • • •	02 24 51 71 8E	• • • • • •	04 2A 51 71 8E						

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