TC55343 CONTROLLER

USER MANUAL

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TOUCH SCREEN LCD MODULE HANDLING PRECAUTIONS

The following precautions will guide you in handling of our product correctly:

1. Liquid crystal display devices:
   1.1. The liquid crystal display device panel used in the liquid crystal display module is made of plate glass. Avoid any strong mechanical shock on LCD and touch screen. Should the glass break, handle it with care.
   1.2. The polarizer adhering to the surface of the LCD is made of a soft material. Guard against scratching it.
   1.3. Wash your hands or clothes if you touch liquid crystal!

2. Avoid Static electricity!
   2.1. When working with the module, use your naked or gloved hand and wear non-conductive work suit to prevent generating static electricity by friction. ESD ground straps should be utilized.
   2.2. Be sure to ground any electrical appliances you may be using, such as soldering iron, cutting pliers, tweezers, etc.
   2.3. Floors, doors, and work tables must be grounded to discharge electricity.

3. When the LCD module alone must be stored for long periods of time:
   3.1. Protect the modules from high temperature and humidity.
   3.2. Keep the modules out of direct sunlight or direct exposure to ultraviolet rays.
   3.3. Protect the modules from excessive external forces.

4. Use the module with a power supply that is equipped with an over current protector circuit, since the module is not provided with this protective feature.

5. Do not ingest the LCD fluid itself should it leak out of a damaged LCD module. Should hands or clothing come in contact with LCD fluid, wash immediately with soap.

6. Conductivity is not guaranteed for models that use metal holders where solder connections between the metal holder and the PCB are not used.

7. Do not stack up modules since they can be damaged by components on neighboring modules.

8. Do not place heavy objects on top of the product. This could cause glass breakage.

9. Do not scratch LCD or touch screen!

10. In order to maintain module reliability, do not touch or hold by the connector area.

11. Avoid any bending, pulling, or other excessive force on flexible cables, which can result in broken connections.

PREFACE

About This Manual

This user's manual describes the function and operation of the TC55343 controller Firmware rev 1.0 and higher. This manual will help you quickly set up the touch screen controller evaluation board and its accompanying software, so that you can rapidly test and evaluate their usefulness for your application.

If You Need an Assistance

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DOCUMENT CONVENTIONS

The following icons are used as necessary to distinguish elements of text.

NOTE. Notes emphasize additional information that may be useful to the reader.

CAUTION. Describes a situation or practice that requires operator awareness or action in order to avoid undesirable consequences.

MANDATORY ACTION. Gives directions that, if not observed, could result in loss of data or in damage to equipment.

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1. FUNCTIONS AND STRUCTURE

1.1. GENERAL

The TC55343 is an intelligent LCD controller with an integrated touch screen control that supports Kyocera Display (former Optrex) T-55343 320x240 TFT Transmissive Color Graphic LCDs. This controller allows user to individually control each display pixel. This independent pixel control allows user displaying both text and graphics simultaneously. The TC55343 utilizes AT32UC3B0256 microcontroller, Epson S1D13781 simple LCD controller and external 64Mbit serial flash. The device can be used as an "intelligent" LCD controller or as stand-alone controller. There is enough of flash and RAM memory in the controller on board to incorporate additional graphical commands or to customize the firmware for particular tasks.

1.2. FEATURES

1.2.1. Serial (RS-232 or USB) communication interface with seven programmable baud rates

The serial parameters for communication between the TC55343 controller and the host are as follows:
Baud Rate: 9600, 14400, 19200, 28800, 38400, 57600 or 115200 bps (default)
Parity: None
Data Bits: 8
Stop Bits: 1

1.2.2. 64Mbit external flash memory

TC55343 has 64Mbit of flash memory for fonts, bitmaps and images storage. The external flash memory is capable to save up to 54 (320x240) screen images, 16 keypad icons (67x47 pixels) and 10 icons up to 7920 pixels (for example: 90x88 pixels will equal to 7920 pixels). A utility program allows user to save 320x240 pixels *.bmp, *.jpg and *.gif patterns to memory.

1.2.3. Voltage regulator

The TC55343 has a built-in voltage regulator with input 5-15 VDC, connector J8 or J9 optional. 3.3V power may be applied to J12 eliminating the need for an onboard voltage regulator.

1.2.4. Touch screen controller

The touch screen controller can operate in an XY Mode or a Keypad Mode. In XY Mode the controller will send raw XY coordinates of touch screen contact location. In Keypad Mode the controller will send digits to host microprocessor or PC. In Keypad Mode the touch screen is divided into 16 rectangles. The controller will send ids of each rectangle. The TC55343 controller is calibrated for touch screen.

1.2.5. *Draw line/rectangle/circle*

The TC55343 controller simplifies drawing of horizontal, vertical and skew lines and shapes, such as rectangles and circles.

1.2.6. *Fonts*

The TC55343 controller supports 3 user-selectable fonts and 1 system font. The imported font size should not exceed the maximum character size, which is 48 pixels high. Use TVI Electronics utility program to convert and save computer fonts to the controller flash memory.

1.2.7. *180° screen rotation*

The TC55343 controller allows 180° screen rotation. A screen rotation is saved in the controller's memory and will default after power on.

1.2.8. *Flip Screen Horizontal / Vertical*

The TC55343 controller allows flipping the screen horizontally or vertically.

1.2.9. *Firmware update*

The TC55343 controller's firmware can be updated through the USB port.

1.3. POWER REQUIREMENTS

Power to the TC55343 is derived from the external power supply through J1, J8, J9 or J12 connectors. Voltages of 5-15VDC must be supplied through J8 or J9 connectors. Since it is regulated on the TC55343, this input voltage does not need to be regulated as long as it falls within this range. Voltage of 3.3VDC must be supplied through J12 and should be regulated. Powering up the controller from J8 or J9 will require installation of a jumper on J10 "UV". Powering up the controller from J1 (USB) will require installation of jumpers on J10 "UV" and "USB". Powering up the controller from J12 (3.3VDC) will require installation of jumper on J10 "3.3V". See Table 3-2.

Do not reverse the polarity on the power inputs. Doing so will permanently damage the controller board and void the warranty.

Do not install J10 "USB" jumper if using external power from J8 or J9 connectors. Doing so will permanently damage the controller board and/or PC and void the warranty.

2. GETTING STARTED

This chapter guides you through the hardware connection, powering up the TC55343 controller and setting up the software for initial testing.

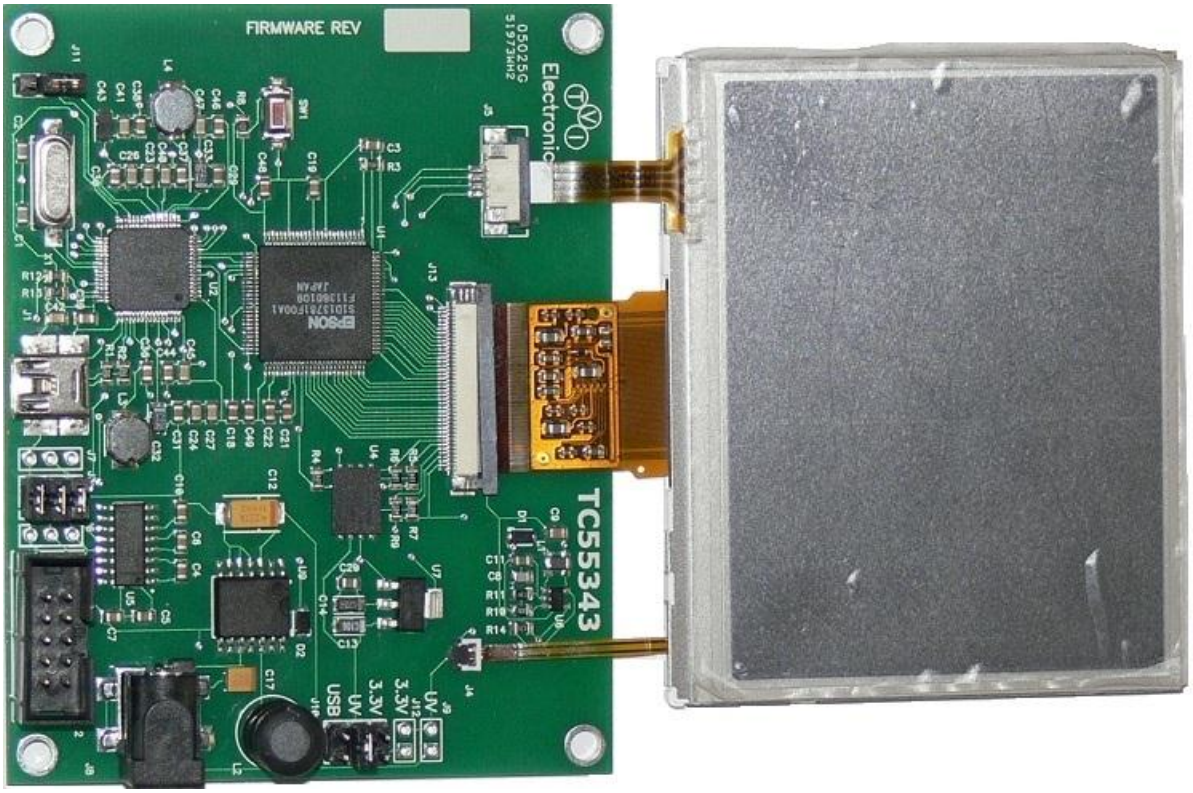
2.1. HARDWARE CONNECTION

Carefully open the LCD connector latch J13 by pulling the brown latch upwards. Insert the flat data cable contacts side down into the connector being sure the cable is fully seated, push the latch back in being sure the cable is pushed all the way in. Insert the backlight cable into connector J4. Carefully peel off the double sided tape installed on the board and firmly press on the backlight ribbon cable to adhere it to the board. This will ensure that the flex cable stays in place.

The backlight ribbon cable is very fragile and could be damaged easily. Avoid pulling the backlight cable of the board once it is adhered. Doing so can damage the cable.

If you have a touch screen carefully pull the latch on connector J5 out. Insert the touch screen cable into J5 being sure it is seated, push the latch back in.

Figure 2-1: Hardware Connection



2.2. POWER UP

To power up the controller follow the instructions in paragraph 1.3. The controller will display a power up screen#1 each time it is powered up. The power up screen can be customized through the GUI Manager software. The factory default will show TVI Electronics logo and current controller firmware revision as shown on Default Power-Up Screen below.

Example 2-1: Default Power-Up Screen

2.3. QUICK START

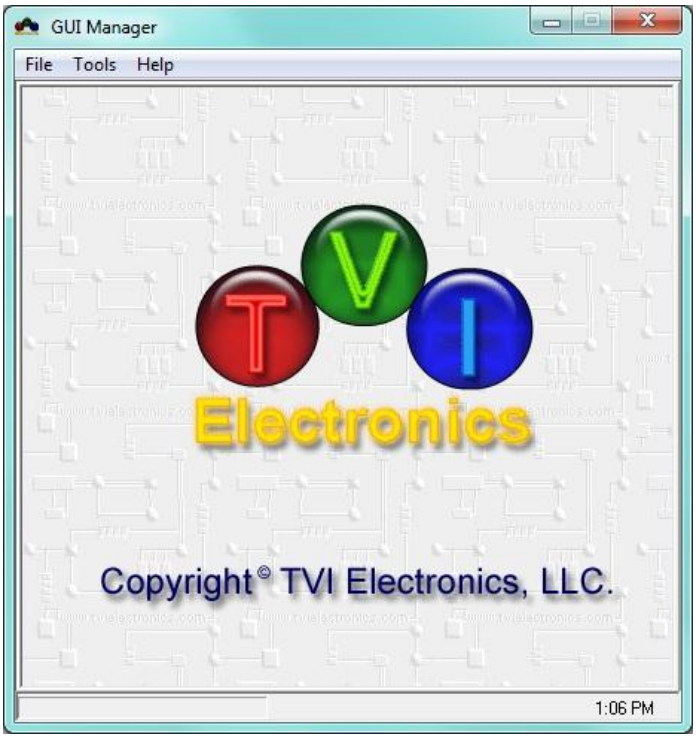
Install the GUI Manager software on your PC. A serial connection is required between the TC55343 controller board and PC in order to communicate with the controller.

You can use a USB to serial converter if your PC doesn't have a serial port or connect directly to a USB port.

Once the connection with the TC55343 controller is established launch the GUI Manager software on your PC. Bring up Communication utility (accessed from the "File" menu), select COM Port, Baud Rate (default 115200) and click "Connect" button. Now you may begin using the software to evaluate the TC55343 controller board.

For communication through the USB port, installation of the USB Communications Device Class (CDC) driver is required before you can start evaluating the TC55343 controller board.

Figure 2-2: Startup Screen



3.OPERATION

This chapter describes each function of the TC55343 LCD controller.

3.1. TC55343 CONTROLLER JUMPERS AND SWITCHES

Figure 3-1: TC55343 Controller Board Layout

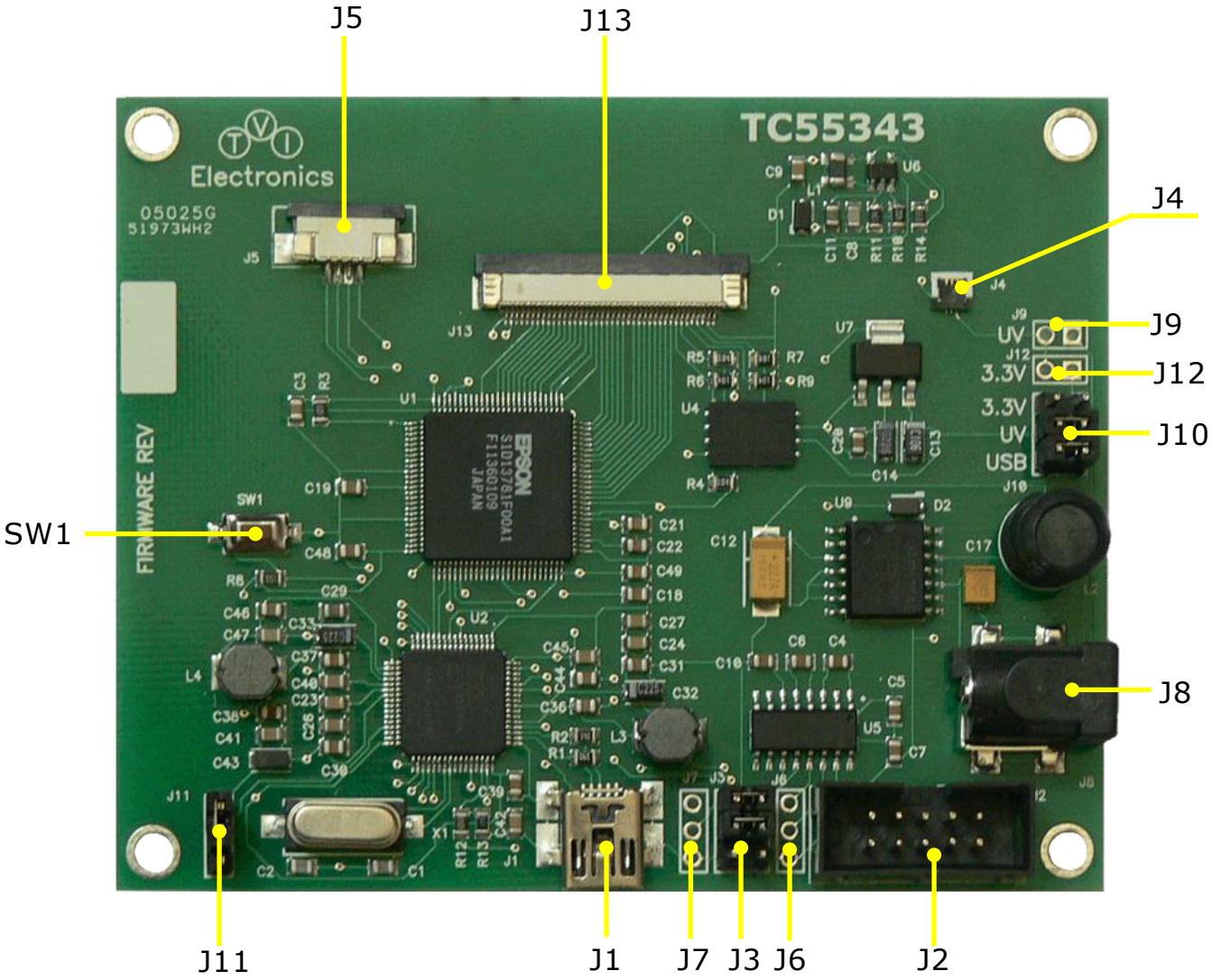


Figure 3-2: J3 Jumpers

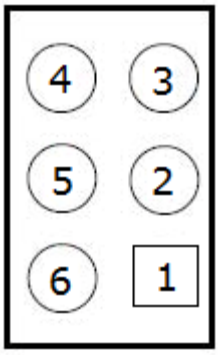


Figure 3-3: J10 Jumpers

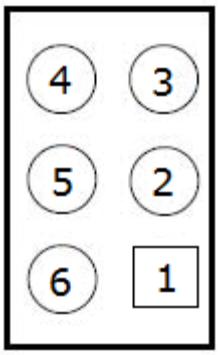


Figure 3-4: J11 Jumpers

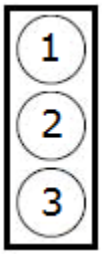


Figure 3-5: J6 Pin Out

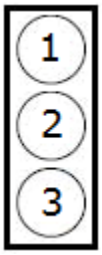


Figure 3-6: J7 Pin Out

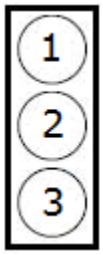


Figure 3-7: J9 Pin Out

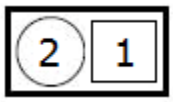


Figure 3-8: J12 Pin Out

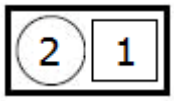


Table 3-1: J3 Jumper Descriptions

PIN #	PIN Name	Subsection
1,6	GND	3.1.1
2,5	TxD	
3,4	RxD	

Table 3-2: J10 Jumper Descriptions

PIN #	Function	Paragraph
1,6	USB Power	1.3
2,5	Unregulated Voltage	
3,4	3.3V Power	

Table 3-3: J11 Jumper Descriptions

PIN #	Function	Subsection
1,2	Default Baud Rate (115200bps)	3.1.2
2,3	User Defined Baud Rate	

Table 3-4: Headers

Reference Designator	Function
J2	RS232 Interface

Table 3-5: Connectors

Reference Designator	Function
J1	USB Connector
J4	T-55343 LCD Backlight Connector
J5	Touch Screen Connector
J6	Optional RS232 Interface
J7	Optional Serial Communication
J8	External 5–15 VDC Input
J9	Optional External 5–15 VDC Input
J12	Optional External 3.3VDC Input
J13	T-55343 LCD Interface

Table 3-6: Switches

Reference Designator	Function	Subsection
SW1	Programming	3.1.3

Table 3-7: J6 Pin Descriptions

PIN Name	PIN #	Type	Description
RD	1	DIN	RS232 Receiver Input. This pin should be connected to the host RS232 TD.
TD	2	DOUT	RS232 Transmitter Output. This pin should be connected to the host RS232 RD.
GND	3	PWR	Power Ground

Table 3-8: J7 Pin Descriptions

PIN Name	PIN #	Type	Description
RxD	1	DIN	UART Receiver Input. This pin should be connected to the host UART TxD.
TxD	2	DOUT	UART Transmitter Output. This pin should be connected to the host UART RxD.
GND	3	PWR	Power Ground

Table 3-9: J9 Pin Descriptions

PIN Name	PIN #	Type	Tolerance	Description
V+	1	PWR	5-15V	+5-15V Power Input
GND	2	PWR	0V	Power Ground

Table 3-10: J12 Pin Descriptions

PIN Name	PIN #	Type	Tolerance	Description
V+	1	PWR	3.3V	3.3V Power Input
GND	2	PWR	0V	Power Ground

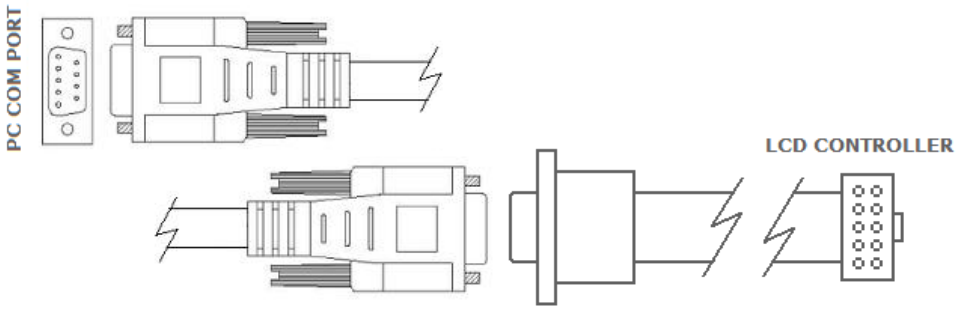
3.1.1. Serial Communication

RS232 Communication through J2 header requires DB9MF serial cable and DB-9 to 10 Pin IDC adapter.

This requires installation of the jumpers on J3 Pins 2,5 and 3,4 (Factory Default).

J6 can be used as an optional RS232 connector.

Figure 3-9: PC to TC55343 Controller Connection



A serial TTL interface is supplied at J7, see Table 3-8. For TTL interface, remove jumpers from J3 Pins 2,5 and 3,4.

3.1.2. Baud Rate Settings

The TC55343 controller has seven programmable baud rates (default is 115200 bit/sec). A baud rate is set by a command and stored in the flash memory.

3.1.3. Firmware Update

TC55343 controller supports firmware updates. The firmware can be updated through the USB port.

3.2. TC55343 COMMANDS LIST

Upon power-up, the controller will display screen#1 and send code 0x21 (ASCII "!") to the host. The host controller will need to wait until it receives the 0x21 code before sending another command to the controller. This will prevent the host from jamming the interface and filling the command buffer and also keep the host and LCD controller in synch.

Table 3-11: Color Data Format

	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Byte 1	B^4	B^3	B^2	B^1	B^0	G^2	G^1	G^0
Byte 2	G^5	G^4	G^3	R^4	R^3	R^2	R^1	R^0

Table 3-12: Coordinate Data Format

	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
Byte 1								X^8
Byte 2	X^7	X^6	X^5	X^4	X^3	X^2	X^1	X^0
Byte 3	Y^7	Y^6	Y^5	Y^4	Y^3	Y^2	Y^1	Y^0

Load Screen Pattern

Description	Load picture from the flash memory
Command Syntax	0x4C 0x53 0x50 "screen ID" 0x0D
Response	0x21
Note	Screen ID = 0x01 – 0x35

Load Icon Pattern

Description	Load icon from the flash memory
Command Syntax	0x4C 0x49 0x50 "icon ID" "Coordinate" 0x0D
Response	0x21
Note	Icon ID = 0x01 – 0x0A Coordinate (upper left corner of the icon): 16 bit X address and 8 bit Y address, see Table 3-12

Load Keypad

Description	Load built-in 4x4 Keypad and insert 16 keypad icons from the flash memory
Command Syntax	0x4C 0x4B 0x0D
Response	0x21
Note	Keypad icons must be preprogrammed

Unload Keypad

Description	Unload Keypad
Command Syntax	0x55 0x4B 0x0D
Response	0x21
Note	

Write Text

Description	Write text on the screen with the selected font from current cursor position
Command Syntax	0x57 0x54 "color" "font" 0x0D "wait" "text" 0x0D
Response	0x21
Note	Color: 16 bit see Table 3-11 Font 1: 0x31, Font 2: 0x32, Font 3: 0x33, System font: 0x53 Wait: wait for the controller response with code 0x21 Text: ASCII string

Draw Pixel

Description	Change color of the specified pixel
Command Syntax	0x44 0x50 "coordinate" "color" 0x0D
Response	0x21
Note	Coordinate: 16 bit X address and 8 bit Y address, see Table 3-12 Color: 16 bit, see Table 3-11

Set Cursor

Description	Set cursor to the specified XY location
Command Syntax	0x53 0x43 "coordinate" 0x0D
Response	0x21
Note	Coordinate: 16 bit X address and 8 bit Y address, see Table 3-12

Draw Line

Description	Draw line with the selected color from one point to another
Command Syntax	0x44 0x4C "start coordinate" "end coordinate" "color" 0x0D
Response	0x21
Note	Coordinate: 16 bit X address and 8 bit Y address, see Table 3-12 Color: 16 bit, see Table 3-11

Draw Rectangle

Description	Draw rectangle outline with the selected color from upper left corner to lower right corner
Command Syntax	0x44 0x52 "upper left coordinate" "lower right coordinate" "color" 0x0D
Response	0x21
Note	Coordinate: 16 bit X address and 8 bit Y address, see Table 3-12 Color: 16 bit, see Table 3-11

Fill Rectangle

Description	Fill rectangle with the selected color from upper left corner to lower right corner
Command Syntax	0x46 0x52 "upper left coordinate" "lower right coordinate" "color" 0x0D
Response	0x21
Note	Coordinate: 16 bit X address and 8 bit Y address, see Table 3-12 Color: 16 bit, see Table 3-11

Draw Circle

Description	Draw circle outline with the selected color from XY coordinate (central point) with radius
Command Syntax	0x44 0x43 "center coordinate" "radius" "color" 0x0D
Response	0x21
Note	Coordinate: 16 bit X address and 8 bit Y address, see Table 3-12 Radius: 8 bit Color: 16 bit, see Table 3-11

Fill Circle

Description	Fill circle with the selected color from XY coordinate (central point) with radius
Command Syntax	0x46 0x43 "center coordinate" "radius" "color" 0x0D
Response	0x21
Note	Coordinate: 16 bit X address and 8 bit Y address, see Table 3-12 Radius: 8 bit Color: 16 bit, see Table 3-11

Fill Screen

Description	Fill the entire screen with color
Command Syntax	0x46 0x53 "color" 0x0D
Response	0x21
Note	Color: 16 bit, see Table 3-11

Touch Screen Calibration

Description	Activate touch screen calibration routine
Command Syntax	0x54 0x43 0x0D
Response	0x21
Note	

Touch Screen Enable

Description	Enable touch screen response in XY mode
Command Syntax	0x54 0x45 0x0D
Response	0x21
Note	

Touch Screen Disable

Description	Disable touch screen response
Command Syntax	0x54 0x44 0x0D
Response	0x21
Note	

Keypad Enable

Description	Enable touch screen response in keypad mode
Command Syntax	0x4B 0x45 0x0D
Response	0x21
Note	

Keypad Disable

Description	Disable touch screen response in keypad mode
Command Syntax	0x4B 0x44 0x0D
Response	0x21
Note	

Back Light

Description	Turn the display backlight ON or OFF
Command Syntax	0x42 0x4C "on/off" 0x0D
Response	0x21
Note	On: 0x31, Off: 0x30

Rotate Screen

Description	Rotate screen 180°
Command Syntax	0x52 0x53 "normal/180°" 0x0D
Response	0x21
Note	Normal: 0x30, 180°: 0x31

Flip Display Horizontally

Description	Flip entire display horizontally
Command Syntax	0x46 0x44 0x48 0x0D
Response	0x21
Note	

Flip Display Vertically

Description	Flip entire display vertically
Command Syntax	0x46 0x44 0x56 0x0D
Response	0x21
Note	

Change Baud Rate

Description	Set the specified baud rate
Command Syntax	0x43 0x42 "baud rate" 0x0D
Response	
Note	Baud rate: 9600 – 0x30, 14400 – 0x31, 19200 – 0x32, 28800 – 0x33, 38400 – 0x34, 57600 – 0x35, 115200 – 0x36 This command will reboot the controller.

Power Save

Description	Turn the display backlight and LCD ON or OFF
Command Syntax	0x50 0x53 "on/off" 0x0D
Response	0x21
Note	On: 0x31, Off: 0x30

4.ELECTRICAL SPECIFICATIONS

This chapter contains the TC55343 controller board electrical specifications.

4.1. MODULE POWER CONSUMPTION

All measurements are done with T-55343GD035JU-LW-AEN LCD connected to the TC55343 controller.

Table 4-1: Electrical Specifications

Parameter	Condition	Min.	Typ.	Max.	Units
Input Current	3.3V Supply*		140	145	mA
	3.3V Supply Back Light OFF*		80		
	3.3V Supply Power Save*		70		
	5V Supply		130	135	
	5V Supply Back Light OFF		80		
	5V Supply Power Save		70		
	12V Supply		55	60	
	12V Supply Back Light OFF		35		
	12V Supply Power Save		25		

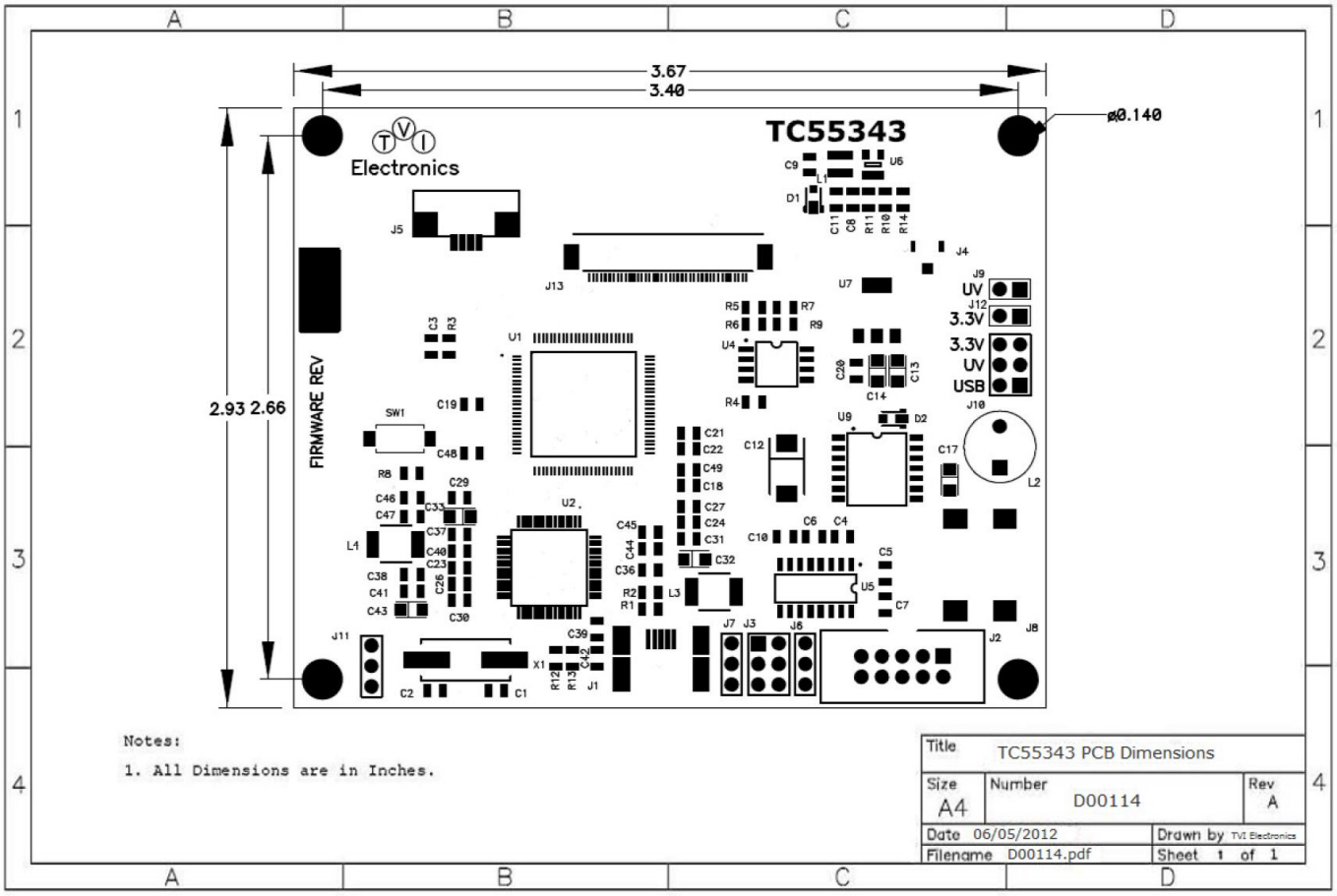
* Bypass on board voltage regulator

4.2. TC55343 CONTROLLER OPERATING TEMPERATURE

The TC55343 controller is rated for commercial temperature operation of -20ºC to 70ºC.

5.MECHANICAL SPECIFICATIONS

This chapter contains the TC55343 controller board mechanical specifications.



5.1. TC55343 CONTROLLER PHYSICAL DIMENSIONS

- 93.2mm (W) x 15.0mm (H) x 74.5mm (D)
  3.67in (W) x .59in (H) x 2.93in (D)