LamaPLC: ST7789 driver / TFT-LCD screen

The ST7789 is a popular single-chip controller/driver used for graphic-type TFT-LCD screens, typically featuring vibrant IPS (In-Plane Switching) technology. It is widely used in DIY electronics for its high resolution and fast communication speeds.

Key Technical Specs

- **Resolution:** Commonly 240 x 240 or 240 x 320 pixels.
- **Interface:** Uses 4-wire SPI (Serial Peripheral Interface) for high-speed data transfer.
- **Color Support:** 262K colors (18-bit) or 65K colors (16-bit).
- **Voltage:** Typically operates at 3.3V; using 5V on data pins without a level shifter can damage it.
- **View Angle:** IPS versions offer “full viewing angles,” meaning colors don't wash out when viewed from the side.
- **On-Chip Memory:** Features an integrated display data RAM (DDRAM) of 240 x 320 x 18 bits. This allows the chip to refresh the display independently of the host microcontroller, saving power.
- **Colour Depth Options:** Supports various colour formats, including 12-bit, 16-bit (65K colours), and 18-bit (262K colours).
- **Logic Voltage:** 1.65V to 3.3V. Signal levels must match this range; using 5V logic (like an Arduino Uno) requires level shifters.
- **Temperature Range:** Typically rated for -30 °C to +85 °C, making it suitable for outdoor or industrial use.
- **Tearing Effect (TE) Signal:** Provides a synchronization signal to the host MCU to prevent “tearing” artifacts during fast animations by syncing writes with the display's vertical blanking period.
- **Hardware Scrolling:** Supports vertical scrolling directly in the hardware, which is much faster and smoother than redrawing the screen via software.

Software Libraries

- **ESP32:** The `TFT_eSPI` library usually delivers the fastest performance.
- **Arduino:** Use the `Adafruit_ST7789` or `Arduino_ST7789_Fast` for basic projects.
- **Python/MicroPython:** The `st7789-mpy` or `st7789.py` library is excellent for rapid prototyping.

Pro Tip: If your screen shows “inverted” colors (e.g., black is white), look for an invertDisplay() command in your library setup.

ST7789 driver Pinout

The pinout for the ST7789 depends on whether you have a 7-pin or 8-pin breakout board. Most common DIY modules use a 7-pin layout, but many professional breakouts include a `CS (Chip Select)` pin.

- **GND:** Ground (0V).
- **VCC:** Power (Typically 3.3V; some modules support 5V).
- **SCL:** Serial Clock (SPI Clock / SCK).
- **SDA:** Serial Data (SPI MOSI).
- **RES (RST):** Reset pin (Active low).
- **DC (D/C):** Data/Command selection.
- **LK (BL):** Backlight control.

Some modules add an eighth pin to allow multiple devices on the same SPI bus.

- **CS (Chip Select):** Enables or disables the display on the SPI bus.

Visual designer for ST7789

To create graphics for an ST7789 display, you can either use professional GUI editors for complex interfaces or simple image converters for static images. If you want to drag-and-drop buttons, sliders, and charts, use these tools that export code directly:

- **SquareLine Studio:** The official visual editor for LVGL. It is the most professional option for creating modern, high-end interfaces. You can design the UI and export the C++ code for your RP2040.
- **LVGL UI Editor:** An XML-based development environment that provides real-time previews and code generation specifically for embedded UIs.
- **EEZ Studio:** An open-source visual tool for designing dashboards and complex user interfaces that can run on small TFT screens

Image & Asset Converters

If you have a picture (JPG/PNG) and just want to display it on the screen:

- **LVGL Image Converter:** An online tool that turns images into C arrays that the ST7789 can read.
- **LCD Image Converter:** A flexible desktop program for converting bitmaps and custom fonts into various code formats (C array, Binary, etc.).
- **image2cpp:** A quick web tool often used with the Adafruit GFX library to turn small icons into code snippets.

SPI topics on lamaPLC

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• lamaPLC: Bi-Directional Logic Level Converter 3.3V ↔ 5V	2026/04/12 00:34	bi-directional, logic level converter, i2c, uart, spi
• LamaPLC: CJMCU-3901/PMW-3901 compact optical flow sensor module/IC by PixArt with SPI communication	2026/04/23 21:52	cjmcu-3901, cjmcu, pmw3901, pmw-3901, optical flow, sensor, pixart, spi, communication, arduino, code, pmw3901mb-txqt
• LamaPLC: CJMCU-6701: Biosensor for measuring Galvanic Skin Response (GSR) with SPI communication	2026/04/23 21:52	cjmcu, cjmcu-6701, acs758, acs-758, galvanic skin response, gsr, electrodermal activity, eda, spi, communication, arduino, code, sensor, healthcare
• lamaPLC: ESP32 / ESP8266	2025/11/22 00:07	esp8266, esp32, esp32-c2, esp32-c3, esp32-c5, esp32-c6, esp32-c61, esp32-h2, esp32-s2, esp32-s3, esp32-p4, espressif systems, communication, ethernet, ip, wi-fi, thread, zigbee, matter, homekit, bluetooth, mqtt, adc, spi, uart, i2c, i2s, rmt, pwm, usb, usb otg, twai
• LamaPLC: GY-9250 MPU-9250/6500 9-axis Attitude Sensor Board	2026/04/23 21:52	ak8963, gy-9250, mpu-9250, 9-axis, motion detection, magnetometer, communication, i c, i2c, spi
• lamaPLC: Max31865 RTD to Digital Converter - PT100/PT1000 Platine	2026/04/23 21:52	max31865, rtd, pt 100, pt 1000, temperature, spi, platinum, arduino, code, sensor, adafruit
• lamaPLC: MCP23017 / MCP23S17 16-Bit I/O Expander with Serial Interface I²C / SPI	2026/04/23 21:52	communication, i2c, mcp23017, mcp23s17, spi, i o expander, serial, cjmcu-2317, cjmcu
• LamaPLC: SC16IS750 / SC16IS752: One or two serial (UART) ports from microcontroller via I²C or SPI communication	2026/04/23 21:52	cjmcu-750, cjmcu-752, cjmcu, nxp, sc16is750, sc16is752, uart, serial, i2c, spi, modul, converter, arduino, code
• lamaPLC: st756x display drivers	2026/05/20 16:17	display, driver, i2c, spi, lcd, cog, oled, st7565, st7567, gm12864, gm12864-59n, gm12864-03a, gm12864-01a, gme12864-41
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• LamaPLC: Texas Instruments ADCs: Delta-sigma multi-channel Analog Converters with SPI communication	2026/04/23 21:52	ads111x, ads12xx, delta-sigma, converter, texas instruments, adc, spi, communication, sensor, arduino, code, ads1110, ads1112, ads1113, ads1114, ads1115, ads1118, ads1119, ads1220, ads1232, ads1234, ads1256, ads1261, ads1263, multi channel
• lamaPLC: Waveshare LoRA products	2026/03/07 01:46	waveshare, lora manufacturer, communication, lora, modul, usb-to-lora-xf02, core 1262, 1262, spi, arduino, rp2040-lora, rp2040
• Magnetic angle sensors	2026/04/23 21:52	magnetic angle sensor, magnetic flux, sensor, spi, i2c, pwm, communication, modul, as5047p, as5600, mt6701, mt6816, mt6835, tle5012b, amr, gmr, tmr, anisotropic magnetoresistive

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