DE1-SoC-MTL

1. Overview

DE1-SoC-MTL delivers everything you need to develop multimedia applications using a digital multi-touch panel and includes complete reference designs and source code for implementing on a wide range of applications. The fully integrated kit allows developers to rapidly customize to best suit their specific application. The DE1-SoC-MTL features the DE1-SoC development board comes with the Cyclone V SoC FPGA, and the Terasic Multi-touch LCD Module (MTL), which is an all-purpose capacitive touch-screen for FPGA applications it provides multi-touch gesture and single-touch support. An IDE cable with an IDE to GPIO adapter (ITG) is used to interface the MTL with DE1-SoC board through a 2x20 GPIO interface.

The DE1-SoC-MTL is preconfigured with an FPGA hardware reference design including several ready-to-run demonstration
applications stored on the provided SD card. Software developers can use these reference designs as their platform to quickly
architect, develop, and build complex embedded systems.

2. Specification

FPGA Device

- Cyclone V SoC 5CSEMA5F31C6 Device
- Dual-core ARM Cortex-A9 (HPS)
- 85K Programmable Logic Elements

- **Company: Terasic**
- **Tel: +886-3-5750880**
- **Fax:+886-3-5726690**
- **Add: 9F., No.176, Sec.2, Gongdao 5th Rd, East Dist, Hsinchu City, 30070. Taiwa**

- 4,450 Kbits embedded memory
- 6 Fractional PLLs
- 2 Hard Memory Controllers

Configuration and Debug

- Quad Serial Configuration device – EPCQ256 on FPGA
- On-Board USB Blaster II (Normal type B USB connector)

Memory Device

- 64MB (32Mx16) SDRAM on FPGA
- 1GB (2x256Mx16) DDR3 SDRAM on HPS
- Micro SD Card Socket on HPS

Communication

- Two Port USB 2.0 Host (ULPI interface with USB type A connector)
- USB to UART (micro USB type B connector)
- 10/100/1000 Ethernet
- PS/2 mouse/keyboard
- IR Emitter/Receiver

Connectors

- Two 40-pin Expansion Headers
- One 10-pin ADC Input Header
- One LTC connector (One Serial Peripheral Interface (SPI) Master ,one I2C and one GPIO interface)

Display

- 24-bit VGA DAC

Audio

- 24-bit CODEC, Line-in, line-out, and microphone-in jacks

Video Input

- TV Decoder (NTSC/PAL/SECAM) and TV-in connector

- **Company: Terasic**
- **Tel: +886-3-5750880**
- **Fax:+886-3-5726690**
- **Add: 9F., No.176, Sec.2, Gongdao 5th Rd, East Dist, Hsinchu City, 30070. Taiwa**

ADC

- Fast throughput rate: 1 MSPS
- Channel number: 8
- Resolution: 12 bits
- Analog input range : 0 ~ 2.5 V or 0 ~ 5V as selected via the RANGE bit in the control registe

Switches, Buttons and Indicators

- 4 User Keys (FPGA x4)
- 10 User switches (FPGA x10)
- 11 User LEDs (FPGA x10 ; HPS x 1)
- 2 HPS Reset Buttons (HPS_RST_n and HPS_WARM_RST_n)
- Six 7-segment displays

Sensors

- G-Sensor on HPS

Power

- 12V DC input

Features

LCD

- 7-inch panel
- 800x480 pixels
- 24-bits color depth
- TTL interface

Multi-touch

- Capacitive Touch Screen
- Multi-touch Gestures
- Single Touch Support

Interface

- IDE Connector
- 2x20 GPIO connector with ITG (IDE to GPIO) adapter

- **Company: Terasic**
- **Tel: +886-3-5750880**
- **Fax:+886-3-5726690**
- **Add: 9F., No.176, Sec.2, Gongdao 5th Rd, East Dist, Hsinchu City, 30070. Taiwa**
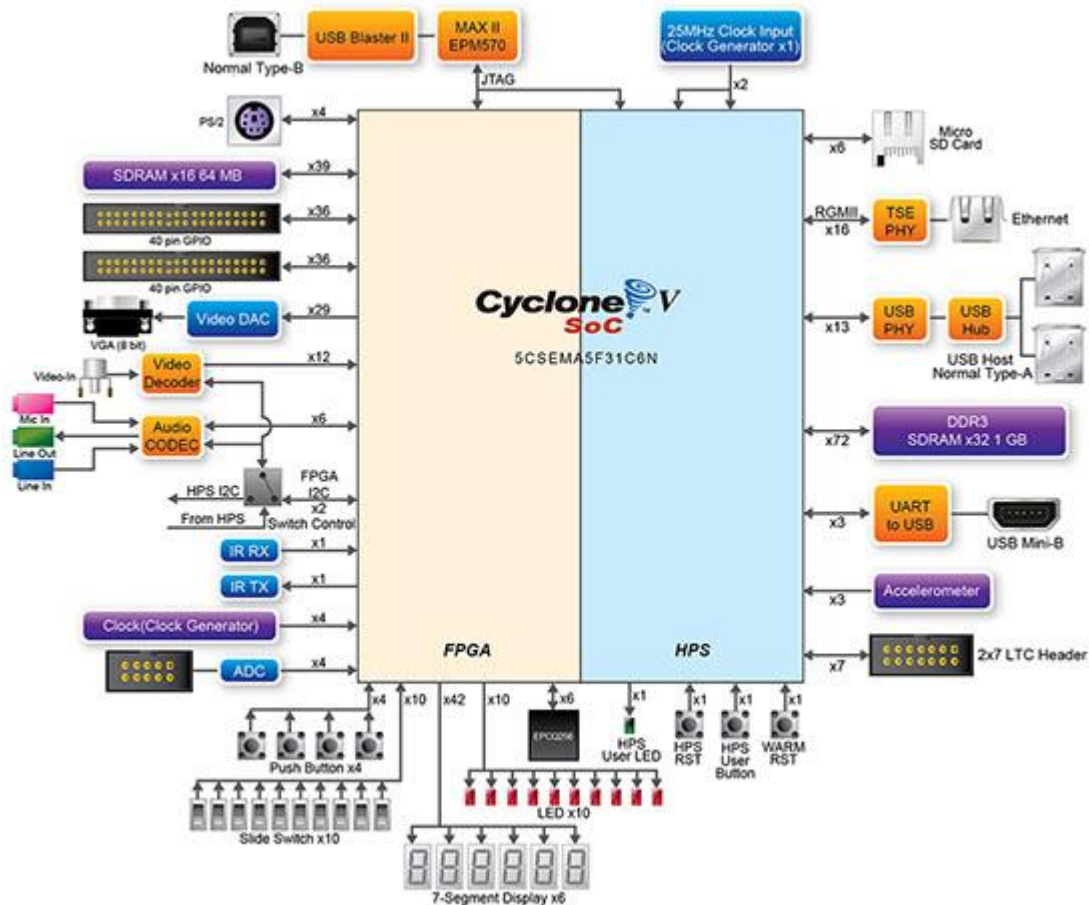
Gesture Table

- One Point

Single North	Single North-East	Single East	Single South-East	Single South	Single South-West
Single West	**Single North-West**	**Right Loop**	**Left Loop**	**Single Tap Once**	**Single Tap Twice**

- Two Point

Double North	Double North-East	Double East	Double South-East	Double South	Double South-West
Double West	**Double North-West**	**Double Tap Once**	**Double Tap Twice**	**Zoom-in**	**Zoom-out**

- **Company: Terasic**
- **Tel: +886-3-5750880**
- **Fax:+886-3-5726690**
- **Add: 9F., No.176, Sec.2, Gongdao 5th Rd, East Dist, Hsinchu City, 30070. Taiwa**

Block Diagram of the DE1-SOC Board

3. Kit content

- **Company: Terasic**
- **Tel: +886-3-5750880**
- **Fax:+886-3-5726690**
- **Add: 9F., No.176, Sec.2, Gongdao 5th Rd, East Dist, Hsinchu City, 30070. Taiwa**

- DE1-SoC-MTL Kit
- DE1-SoC-MTL Quick Start Guide
- Type A to B USB Cable
- Type A to Mini-B USB Cable
- MicroSD Adapter
- 8GB microSD Card (Pre-programmed & Installed)
- Card Reader
- Power DC Adapter (12V)

4. Layout

- Size：354*130*20 mm

- **Company: Terasic**
- **Tel: +886-3-5750880**
- **Fax:+886-3-5726690**
- **Add: 9F., No.176, Sec.2, Gongdao 5th Rd, East Dist, Hsinchu City, 30070. Taiwa**

- **Company: Terasic**
- **Tel: +886-3-5750880**
- **Fax:+886-3-5726690**
- **Add: 9F., No.176, Sec.2, Gongdao 5th Rd, East Dist, Hsinchu City, 30070. Taiwa**