MIPI-Touch DVK
User's Guide

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Revision history

Date	Revision	Changes
22th Feb 2016	1	Initial release.

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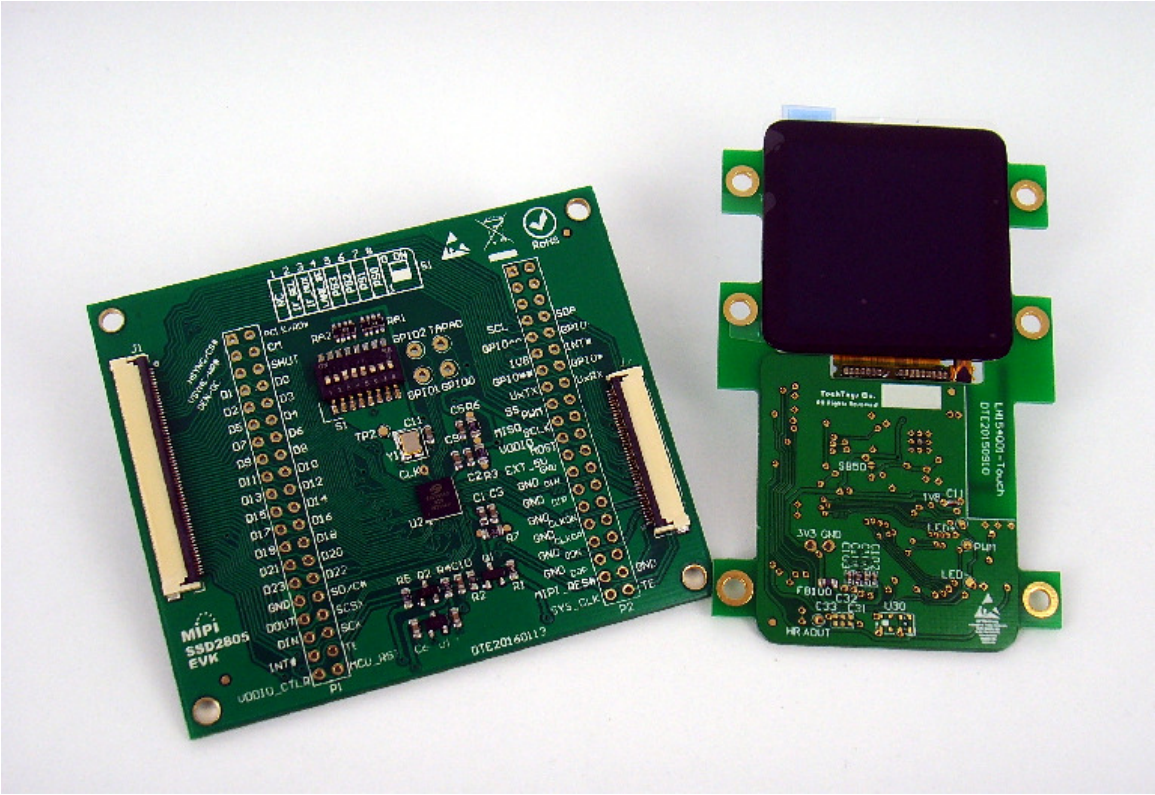
Overview

1.1 Introduction

MIPI-Touch DVK is a development kit consist of an application module (LH154Q01-Touch) and a SSD2805 MIPI Master Bridge breakout board.

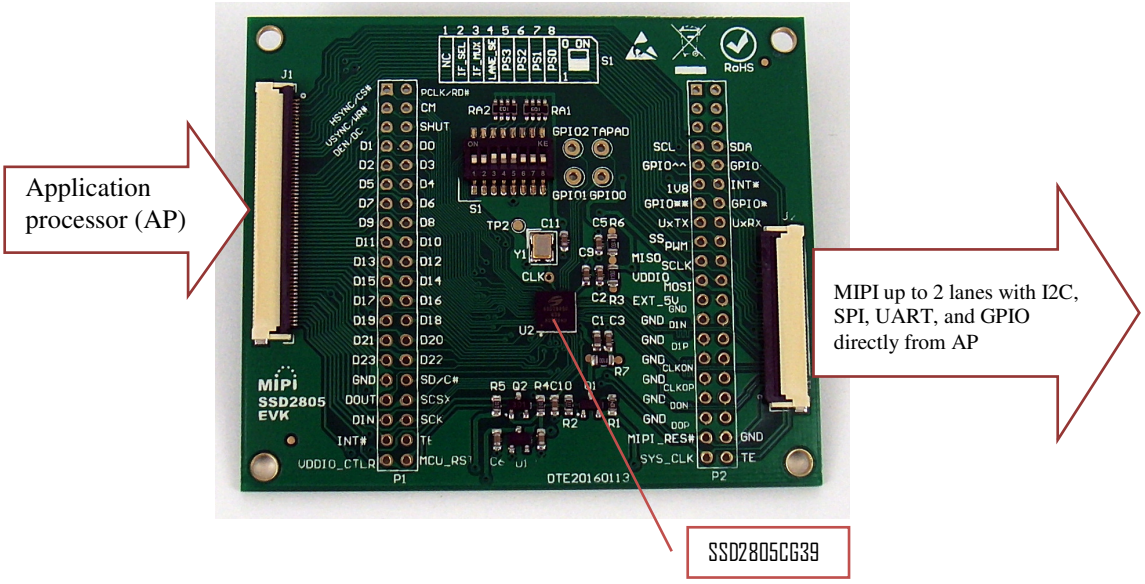
SSD2805 is MIPI bridge chip that converts traditional MCU & RGB interface to DSI [i] interface. Although there are high-end processors with built-in MIPI driver, tons of microcontrollers and microprocessors with traditional parallel LCD interfaces (RGB and MCU interface) are still alive in the market, especially for low-range MCUs a MIPI interface is not standard. The purpose of this development kit is to provide a handy hardware platform to kick-start MIPI design through proven firmware. A 1.54" MIPI display of 1 data lane is used in the application module as a demonstration. Some bonus features such as a capacitive touch panel and Bluetooth Smart Connectivity [ii] are included to make development of practical applications like "wearable device" possible.

Firmware example includes a port for 8080 MCU interface for TouchGFX[iii] graphical framework that resembles todays smartphone standards without overhead of Linux or Android.

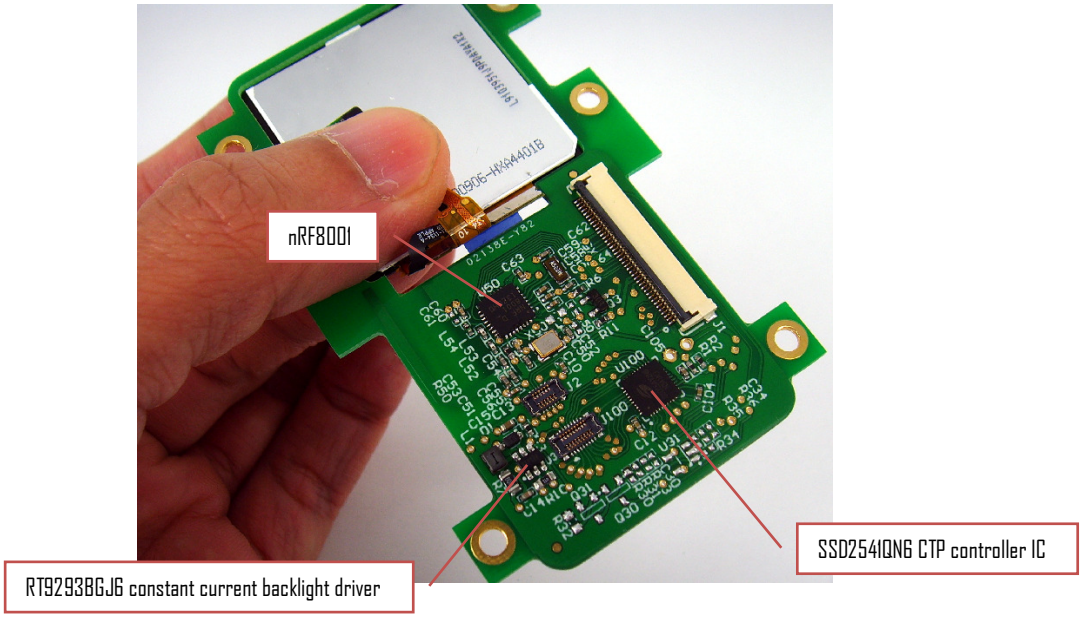


SSD2805 MIPI Master Bridge breakout board has been routed with simplicity in mind. Pixel data from an application processor (MCU/MPU) in RGB/8080 data bus is fed to the 60 pin FPC connector J1 from the left. After conversion and protocol translation finished by SSD2805, differential signals that conform to DSI specification is output through a 40 pin FPC connector J2 at the right.

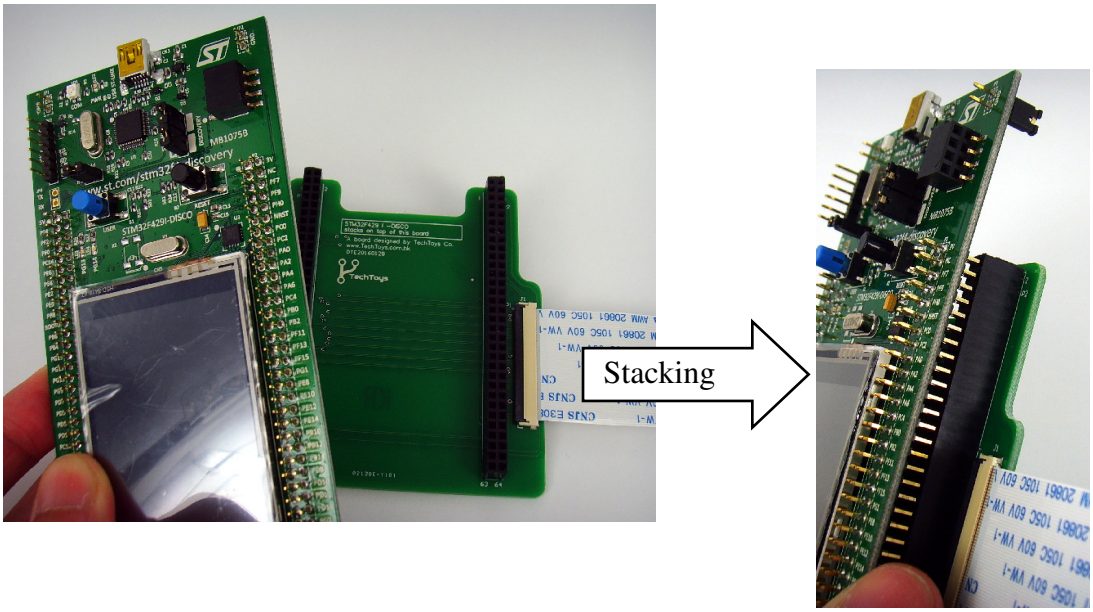
Headers P1 and P2 are 2.54mm pin headers giving users full access to all input and output signals.



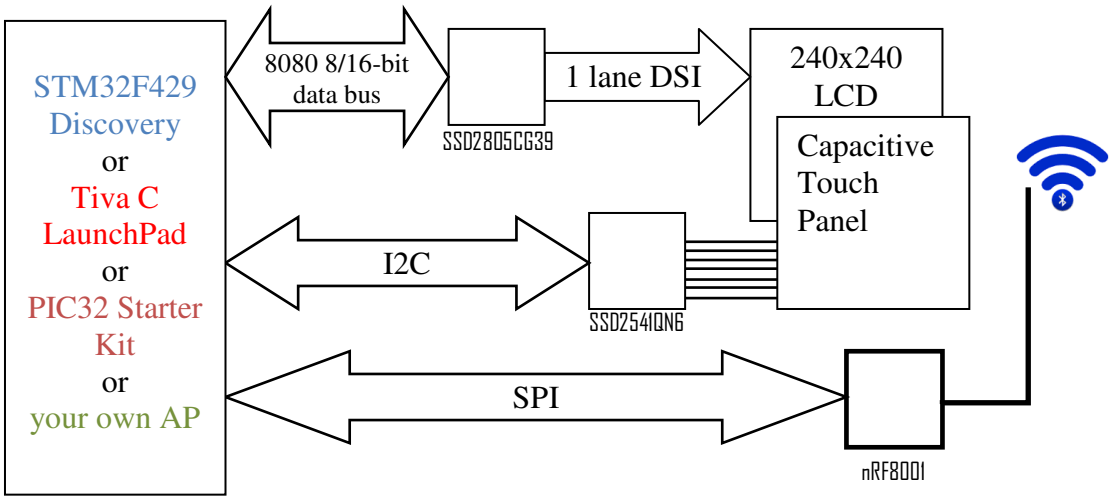
LH154Q01-Touch is an application module completed with a 1.54” 240x240 MIPI display, constant current backlight driver (RT9293BGJ6), SSD2541QN6 CTP controller IC, and nRF8001 single-chip Bluetooth Smart Connectivity IC with PCB antenna.



Optional adapters to various low cost development platforms are available. Example here shows the adapter for STM32F429-Discovery.



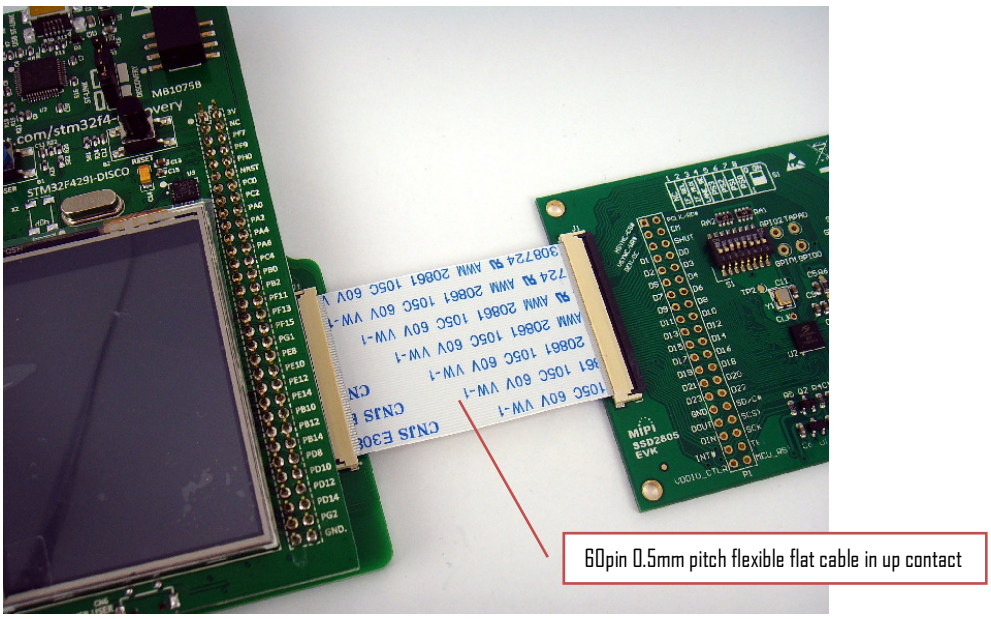
Block diagram below shows the connection to various application processors (AP).



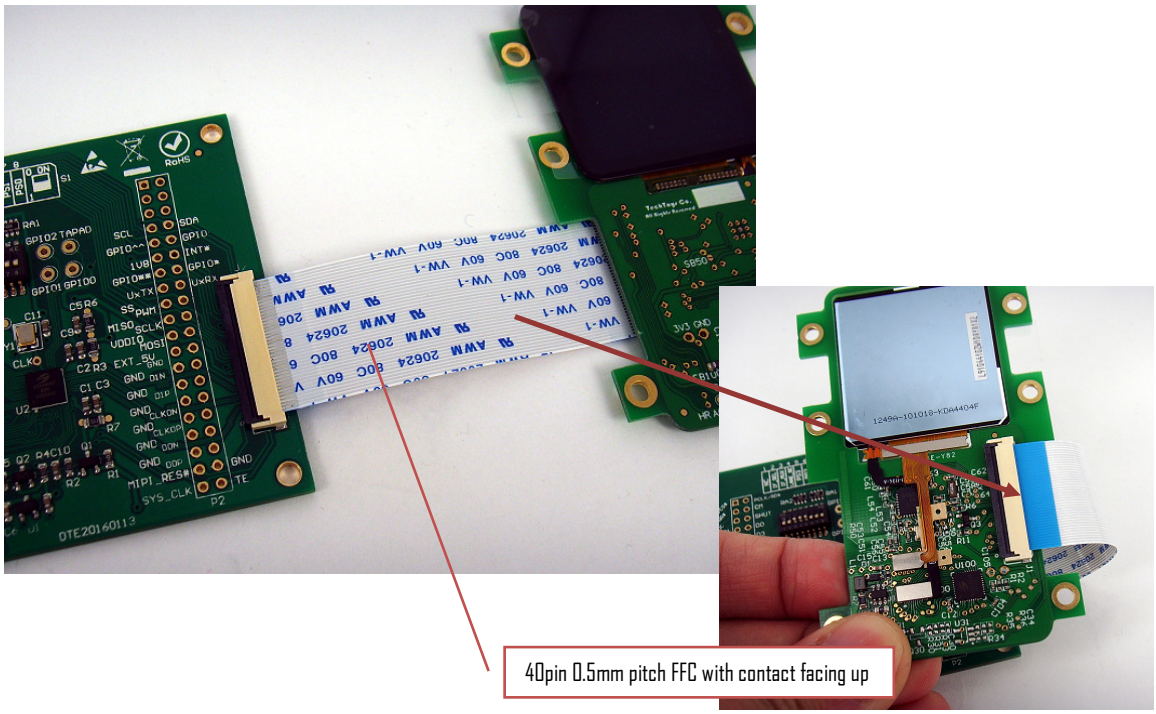
Full schematics of all components above are available from the same web site you have obtained this user guide.

1.2 Putting up the hardware

Connection is simply finished by 0.5mm pitch flexible flat cables (FFC). Onboard of SSD2805 breakout board and application module are all Omron XF2M dual contact connectors. It is possible to use up or bottom contact connection. Picture below shows the connection to an adapter board for STM32F429I-Discovery Kit.



Wiring to the application module is finished with a 40pin 0.5mm pitch FFC.



1.3 TouchGFX

Extract from Draupner Graphics A/S web site:

"TouchGFX is a unique software framework that unlocks the graphical user interface (GUI) performance of your low-resource hardware.

The revolutionizing technology breaks existing restraints, as it lets you create sophisticated GUIs that fully live up to today's smartphone standards at a fraction of the cost.

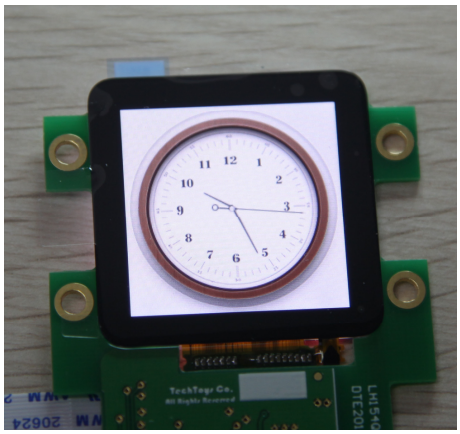
By using TouchGFX, your embedded product gets outstanding graphics and smooth animations with minimal resource and power consumption. You get a high-end product with a low cost per unit and a long battery life. "

TouchGFX framework is not an open source project. For details about pricing, please contact sales of Draupner Graphics.

Fully functional evaluation version is available at no cost with watermark appearing on the display occasionally when running on real hardware. This allows you to test and create with a PC-simulator, supported developer boards, and custom target hardware . TouchGFX requires C++ compiler. Various development environments are available including IAR Embedded Workbench[iv], GCC[v], and Keil[vi].

Example applications included in this DVK is based on TouchGFX release-4.4.1 evaluation version with SSD2805 and SSD2541QN6 drivers developed for STM32F429 MCU in Keil. Pictures below show swipe-enabled analog clock and a home automation demo with STM32F429-Discovery Kit.

For further details, please contact John Leung at john@techtoys.com.hk.



APPENDIX A Something about MIPI

There are two useful sources to understand DSI.

1. MIPI Alliance Standard for Display Serial Interface V1.0 : 79 pages
2. MIPI Alliance Standard for Display Command Set : 131 pages

An extract from the first document is summarized below:

"The Display Serial Interface (DSI) specification defines protocols between a host processor and peripheral devices that adhere to MIPI Alliance specifications for mobile device interfaces.....
By standardizing this interface, components may be developed that provide higher performance, lower power, less EMI and fewer pins than current devices, while maintaining compatibility across products from multiple vendors."
"For display modules with a display controller and frame buffer, DSI shares a common command set with MIPI Alliance Standard for Display Bus Interface."

Standardization leads to a common command set defined in the second document. An extract of the second document is summarized below:

"The Display Command Set (DCS) specification defines display module behavior for devices that adhere to the MIPI specifications for mobile device host processor, and display interfaces in an abstract, device independent way....
Implementing the DCS standard reduces the time-to-market and design cost of mobile devices by simplifying the interconnection of products from different manufacturers."

What it really means to programmers is that, the command written to a MIPI is the same across different MIPI displays or different vendors.

Table below gives an example comparing commands for three MIPI displays for Sleep In/Out, Display ON/OFF against the Display Command Set laid on the specification.

Operation	DCS Specification	LH350H01 3.54" MIPI display for iPod Touch3	LH154Q01 1.54" MIPI display for iPod Nano 6	7" MIPI display for a tablet
Soft Reset	0x01	-	0x01	0x01
Sleep Out	0x11	0x11	0x11	0x11
Sleep In	0x10	0x10	0x10	0x10
Display On	0x29	0x29	0x29	-
Display Off	0x28	0x28	0x28	-

References

[i] http://en.wikipedia.org/wiki/Display_Serial_Interface

[ii] https://www.nordicsemi.com/eng/Products/Bluetooth-Smart-Bluetooth-low-energy/nRF8001

[iii] http://touchgfx.com/

[iv] https://www.iar.com/iar-embedded-workbench/

[v] https://gcc.gnu.org/

[vi] http://www.keil.com/