DEVKIT-MPC5744P
QUICK START GUIDE (QSG)

Ultra-Reliable MCUs for Industrial and Automotive Applications

www.nxp.com/DEVKIT-MPC5744P

SECURE CONNECTIONS
FOR A SMARTER WORLD

Contents

Quick Start Package Overview

Board:

DEVKIT-MPC5744P	Low cost EVB with MPC5744P Auto quality MCU on board

Documents:

Name	Description
Quick Start Guide(QSG)	Detailed description on availability of Hardware, Software and Documents to quick start with MPC5744P project (this document)
Software Installation Guide(SWIG)	Detailed walk through on how to install and use S32 Design Studio for Power Architecture
Application Notes	Detailed documents covering topics from ‘how to design hardware’ to ‘how to write software’
Fact Sheets, Reference Manuals and Data Sheets	Detailed manuals for MPC5744P family of MCU and DEVKIT-MPC5744P board

Downloads:

Name	Description
Integrated Development Environment (IDE)	Eclipse based S32DS IDE with free GCC compiler and Debugger support
DEVKIT-MPC5744P Quick Start Package	Software examples and supporting documents for getting started with the DEVKIT-MPC5744P
DEVKIT-MPC5744P Schematics	PDF schematic files for the DEVKIT-MPC5744P board
DEVKIT-MPC5744P PCB Design Package	Gerber files and Bill of Material

Step-by-Step Installation Instructions

In this quick start guide, you will learn how to set up the **DEVKIT-MPC5744P** board and run the default program.

1 **Install Software and Tools**

Install S32 Design Studio IDE for Power Architecture.
S32 Design Studio for Power
See Software Installation Guide (SWIG) for detailed procedure

2 **Connect the USB Cable**

Connect one end of the USB cable to the PC and the other end to the micro-B connector on the DEVKIT-MPC5744P board. Allow the PC to automatically configure the USB drivers.

3 **Observe the Default Program reaction**

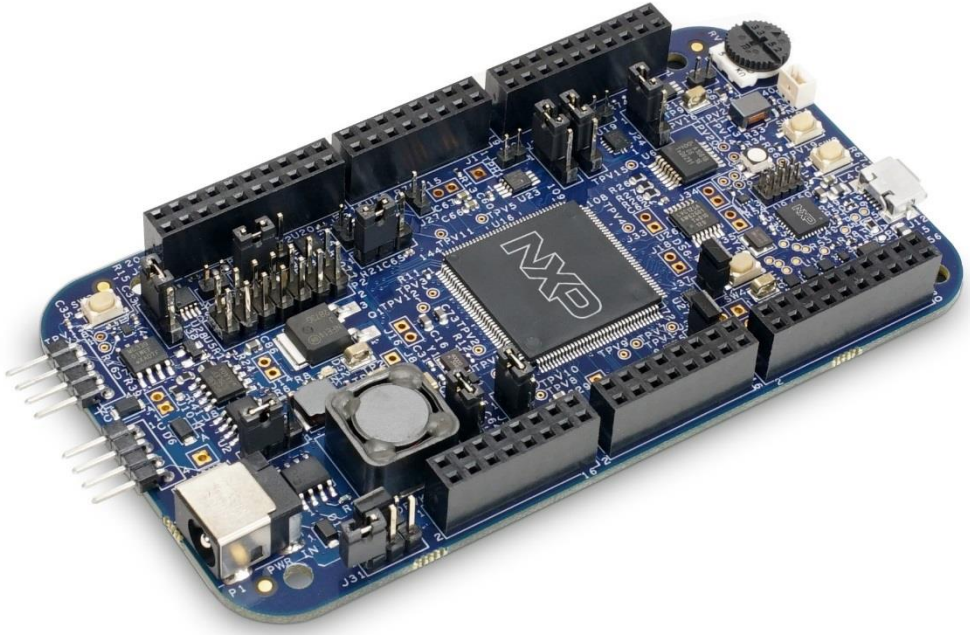
The pre-loaded example project utilizes the **DEVKIT-MPC5744P** user potentiometer and the user LEDs. Once the board is plugged in the ADC will scan the potentiometer result and shine LEDs based on result. Turn the potentiometer to turn on a different LED pattern. (Clock is configured to PLL running at 160 MHz)

4 **Learn More About the DEVKIT-MPC5744P**

Read release notes and documentation on the
nxp.com/DEVKIT-MPC5744P
nxp.com/MPC5744P

DEVKIT-MPC5744P Board : Features

- MPC5744P has 2 x 200 MHz Power Architecture® e200Z4 Dual issue cores operating in delayed lockstep
- MPC5744P qualified to AEC-Q100 Grade 1 and ambient temperature of -40 to +125 °C
- Arduino™ UNO R3 footprint-compatible with expansion “shield” support
  - **Supports DEVKIT-MOTORGD motor control shield**
- Integrated Open-standard Serial and Debug Adapter (OpenSDA) with support for several industry-standard debug interfaces as well as JTAG connector
- Easy access to the MCU I/O header pins for prototyping
- On-chip connectivity for FlexRay, CAN, LIN, UART/SCI and SPI
- Potentiometer for precise voltage and analog measurement
- One user RGB LED (1 red, 1 green, 1 blue in single package)
- 2 user push-button switches
- Flexible power supply options
  - micro-B USB
  - 12V External power supply
- Similar hardware across ARM®, S12 and Power Architecture® architecture based MCUs

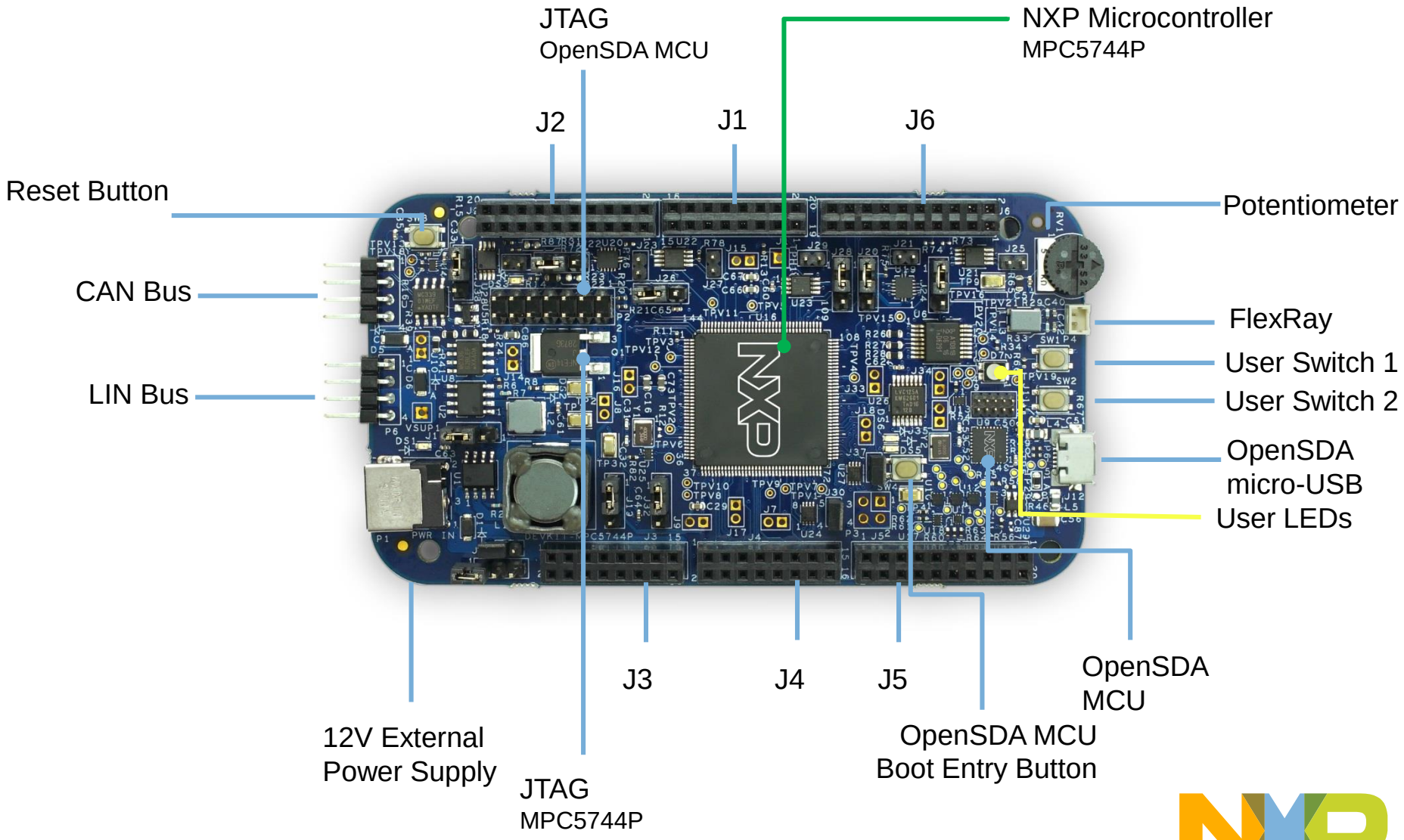


- Box includes:
  - DEVKIT-MPC5744P Board
- Downloads includes:
  - Quick Start Package
  - S32 Design Studio IDE
  - Application notes
- NOTE: DEVKIT-MPC5744P RevB does not support shield reset. Any Arduino™ shield that relies on reset signal from DEVKIT-MPC5744P RevB will not work. Shield reset *is supported* starting with RevC.

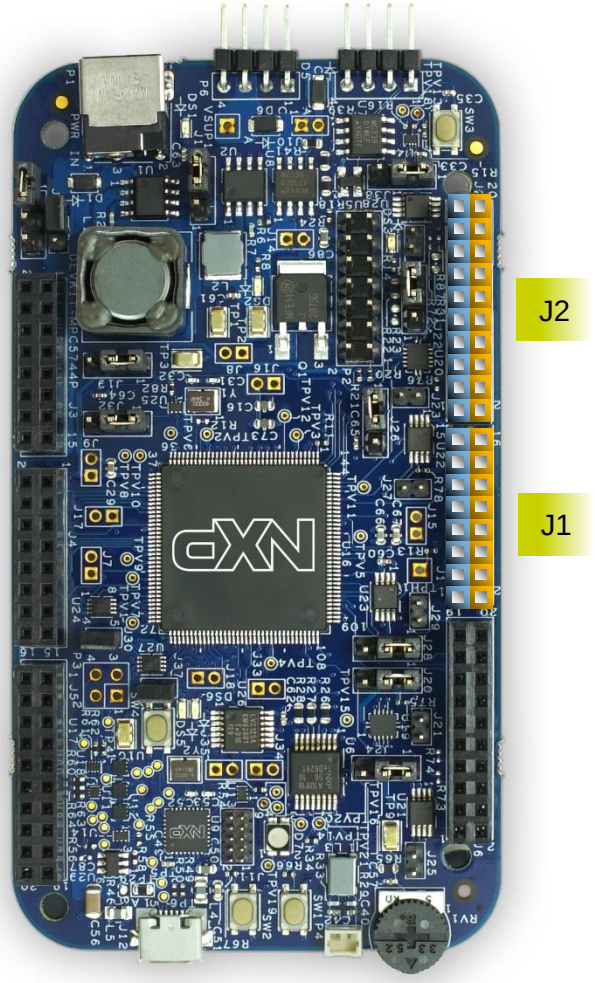
DEVKIT-MPC5744P Board : Overview

The DEVKIT-MPC5744P is an ultra-low-cost development platform for MPC5744P Microcontrollers.

Features include easy access to all MCU I/Os, a standard-based form factor compatible with the Arduino™ pin layout, providing a broad range of expansion board options, and a USB serial port interface for connection to the IDE. The board has option to be powered via USB or an external power supply.



DEVKIT-MPC5744P Board : Pinout



J2

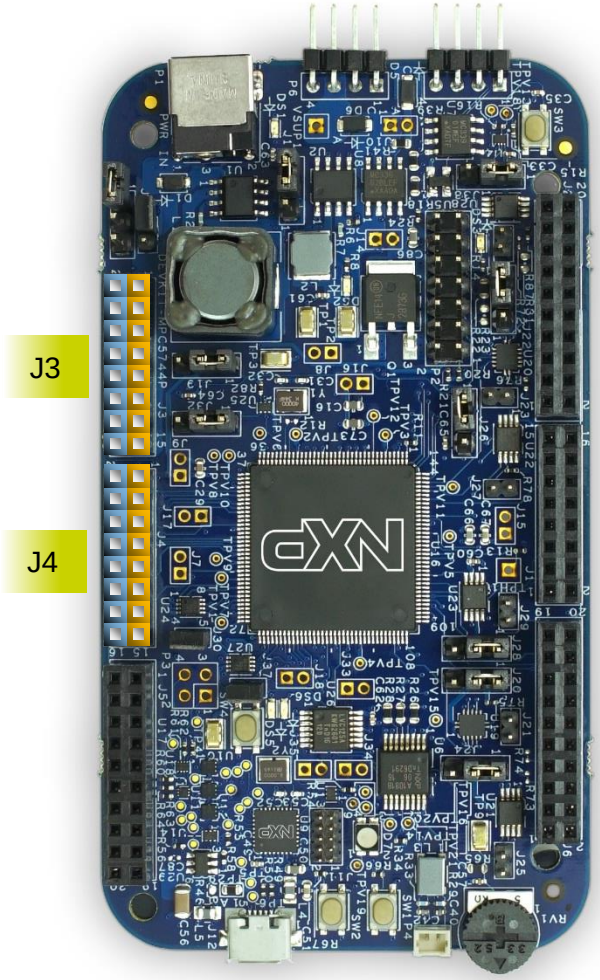
FUNCTION	PORT	PIN	PIN	PORT	FUNCTION
	LT_PA15	J2-19	J2-20	PA15	CAN1_RXD
	LT_PA9	J2-17	J2-18	PA14	CAN1_TXD
	NC	J2-15	J2-16	PB3	LIN0_RXD
	GND	J2-13	J2-14	PB2	LIN0_TXD
DSPI0_SCK	LT_PC5	J2-11	J2-12	PD10	FLEXPWM_0_A0
DSPI0_SIN	LT_PC7	J2-09	J2-10	PD4	FLEXPWM_0_B3
DSPI0_SOUT	LT_PC6	J2-07	J2-08	PD3	FLEXPWM_0_A3
DSPI0_CS0	LT_PC4	J2-05	J2-06	PE11	
	LT_PG7	J2-03	J2-04	PC14	
	LT_PD2	J2-01	J2-02	PC10	

J1

FUNCTION	PORT	PIN	PIN	PORT	FUNCTION
	LT_PA13	J1-15	J1-16	PB6	CLKOUT
	LT_PA12	J1-13	J1-14	PE7	
ETIMER_0_ETC3	LT_PD14	J1-11	J1-12	PA8	ETIMER_2_ETC4
ETIMER_0_ETC2	LT_PF0	J1-09	J1-10	PA7	ETIMER_2_ETC3
FLEXPWM_0_B0	LT_PA10	J1-07	J1-08	PA6	ETIMER_2_ETC2
FLEXPWM_0_A0	LT_PA11	J1-05	J1-06	PA5	ETIMER_1_ETC5
FLEXPWM_0_X0	LT_PD9	J1-03	J1-04	PA4	ETIMER_0_ETC4
	LT_PD12	J1-01	J1-02	PA3	ETIMER_0_ETC3

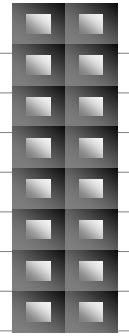
Arduino Compatibility
The internal rows of the I/O headers on the DEVKIT-MPC5744P are arranged to fulfill Arduino™ shields compatibility .

DEVKIT-MPC5744P Board : Pinout



J3

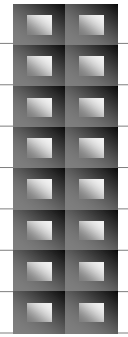
FUNCTION	PORT	PIN
	PD12	**J3-02**
	PD9	**J3-04**
	PJ8	**J3-06**
	PE13	**J3-08**
	PE14	**J3-10**
	PE15	**J3-12**
	PF14	**J3-14**
	PF15	**J3-16**



PIN	PORT	FUNCTION
J3-01	EXT_HV_PWR	12V_IN
J3-03	EXT_LV_PWR	3.3V or 5V Selectable
J3-05	RESET	MPC5744P Reset
J3-07	3V3_SR	3.3V
J3-09	5V0_SR	5V
J3-11	GND	
J3-13	GND	
J3-15	EXT_HV_PWR	12V_IN

J4

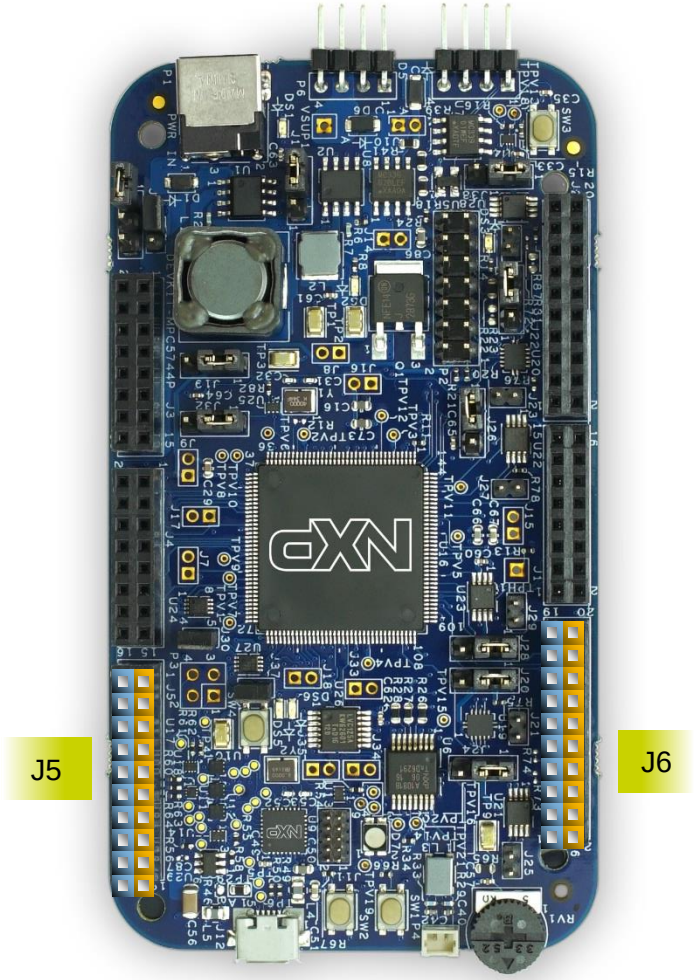
FUNCTION	PORT	PIN
	PE0	**J4-02**
	PE6	**J4-04**
	PG2	**J4-06**
	PG3	**J4-08**
	PG4	**J4-10**
	PG5	**J4-12**
	PG6	**J4-14**
	PD11	**J4-16**



PIN	PORT	FUNCTION
J4-01	PB8	ADC0_AN1
J4-03	PB12	ADC0_ADC1_AN14
J4-05	PB9	ADC0_ADC1_AN11
J4-07	PB10	ADC0_ADC1_AN12
J4-09	PB11	ADC0_ADC1_AN13
J4-11	PB7	ADC0_AN0
J4-13	PB13	ADC1_AN0
J4-15	PJ9	ETIMER_2_ETC5

Arduino Compatibility
The internal rows of the I/O headers on the DEVKIT-MPC5744P are arranged to fulfill Arduino™ shields compatibility .

DEVKIT-MPC5744P Board : Pinout



J6

FUNCTION	PORT	PIN	PIN	PORT	FUNCTION
	PF12	J6-19	J6-20	PE5	
	PF13	J6-17	J6-18	PE4	
	PC6	J6-15	J6-16	PE0	
	PC7	J6-13	J6-14	PE1	
	PI2	J6-11	J6-12	GND	
	PI3	J6-09	J6-10	PER_HVA	
	PH3	J6-07	J6-08	PC11	
	PH4	J6-05	J6-06	PC10	
	PG3	J6-03	J6-04	PG5	
	PG2	J6-01	J6-02	PG4	

J5

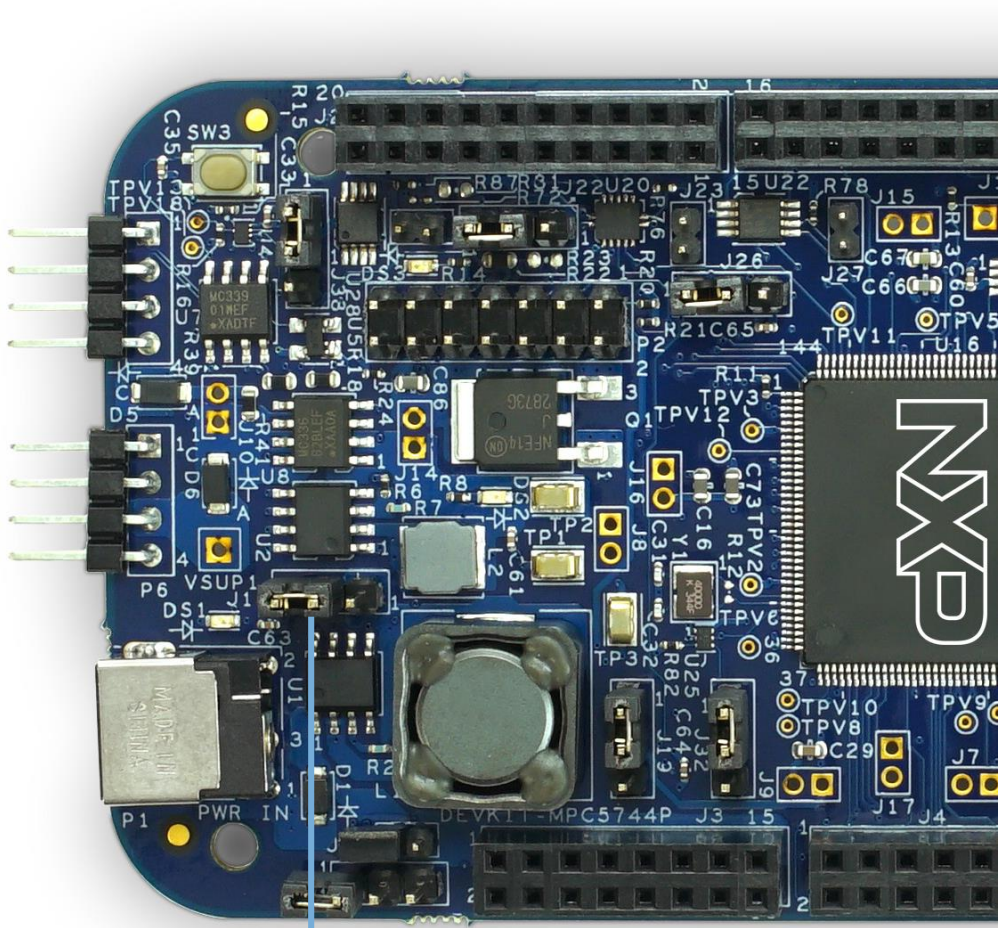
FUNCTION	PORT	PIN	PIN	PORT	FUNCTION
	PD5	J5-2	J5-1	PA0	
	PD6	J5-4	J5-3	PA1	
	PD7	J5-6	J5-5	PA2	
	PD8	J5-8	J5-7	PG8	
3.3V	3V3_SR	J5-10	J5-9	PF3	
	GND	J5-12	J5-11	PG11	
	PC1	J5-14	J5-13	PG9	
	PE4	J5-16	J5-15	PE2	
	PC2	J5-18	J5-17	PE5	
	PB14	J5-20	J5-19	PG10	

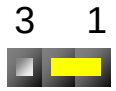
Arduino Compatibility
The internal rows of the I/O headers on the DEVKIT-MPC5744P are arranged to fulfill Arduino™ shields compatibility .

DEVKIT-MPC5744P Board : Jumper Settings

There is only one jumper: J13
It is to select Power source:

1-2: External 12 V Supply
2-3: **Default** USB powered 5V Supply, through OpenSDA interface





Note: For high power/current consuming applications (like using external shield boards) use “External 12 V Supply” only

DEVKIT-MPC5744P Board : Communication Interfaces

CAN_0

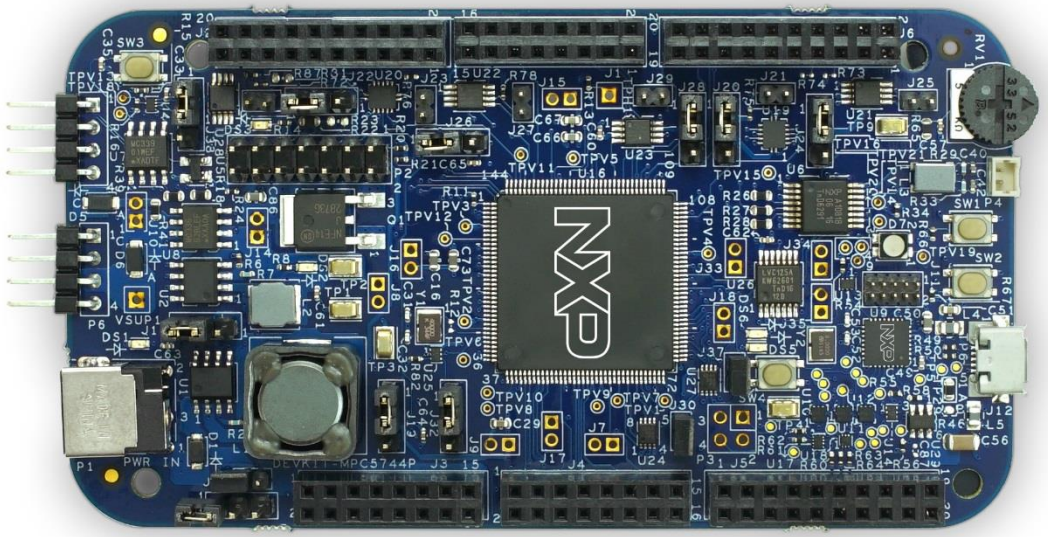
DESCRIPTION	NAME	PIN
Port PB0 & PB1	CANH	**P5-01**
	CANL	**P5-02**
	NC	**P5-03**
	GND	**P5-04**

LIN_0

DESCRIPTION	NAME	PIN
	GND	**P6-01**
	GND	**P6-02**
Connect to 12V	VSUP	**P6-03**
Port PB2 & PB3	LIN	**P6-04**

CAN

LIN



FlexRay

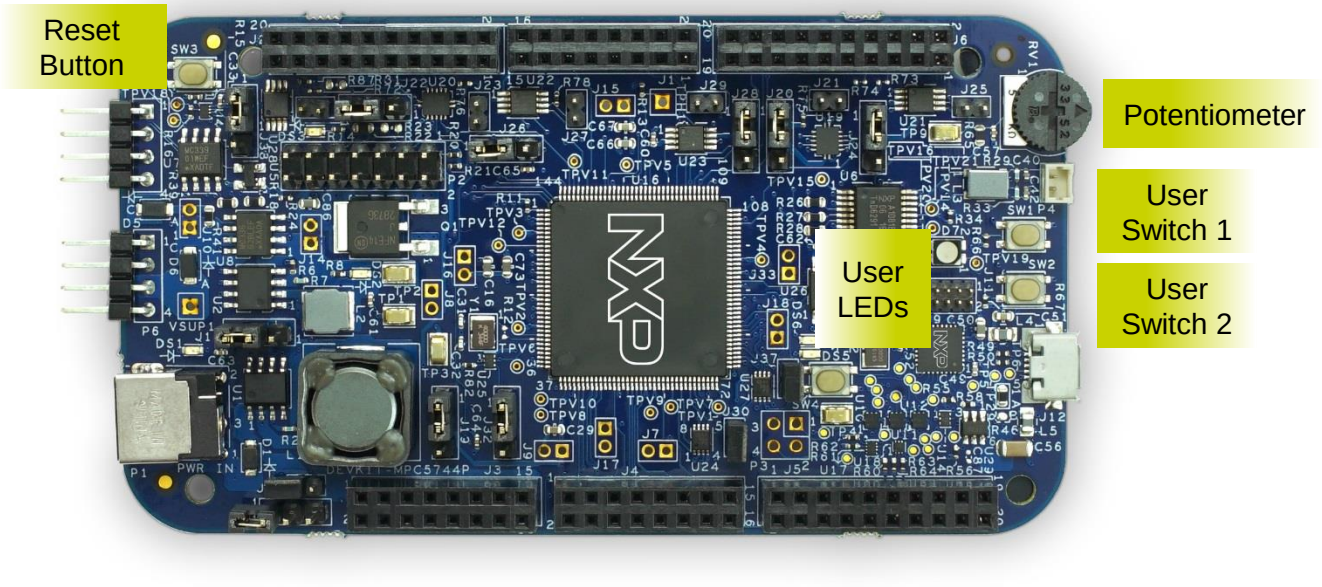
FlexRay_A

DESCRIPTION	NAME	PIN
	FRA-DATA-A	**P4_1**
	FRA-DATA-B	**P4_2**

FlexRay_A

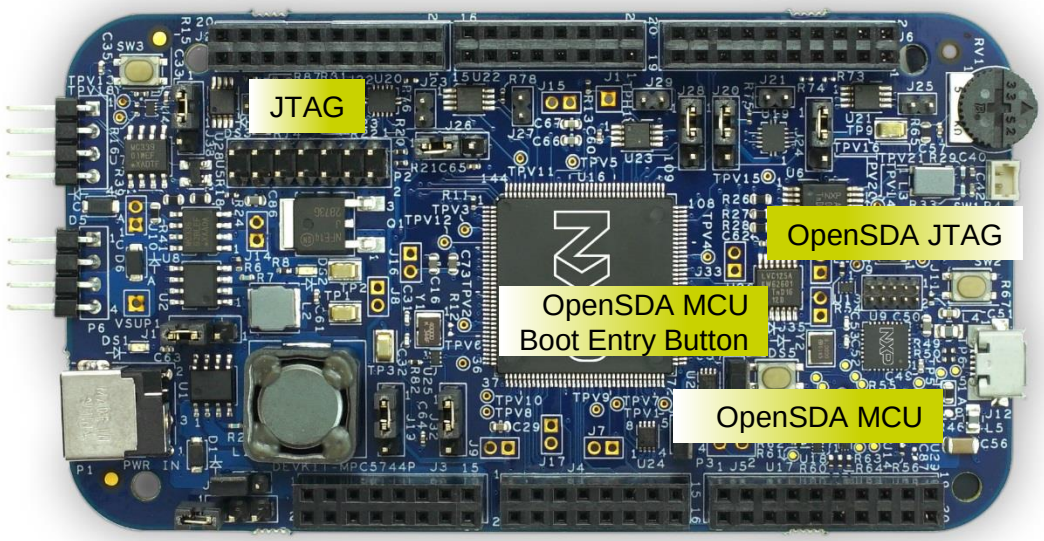
DESCRIPTION	PORT
FR_A_TX	PD0
FR_A_TX_EN	PC15
FR_A_RX	PD1

DEVKIT-MPC5744P Board : User Peripherals



DESCRIPTION	PIN	PORT
Potentiometer (ADC1_AN6)	RV1/POT	PE12
User Switch 1	SW1	PF12
User Switch 2	SW2	PF13
User LEDs		PC11
		PC12
	D7	PC13
Reset Button	SW3	

DEVKIT-MPC5744P Board : Programing Interface



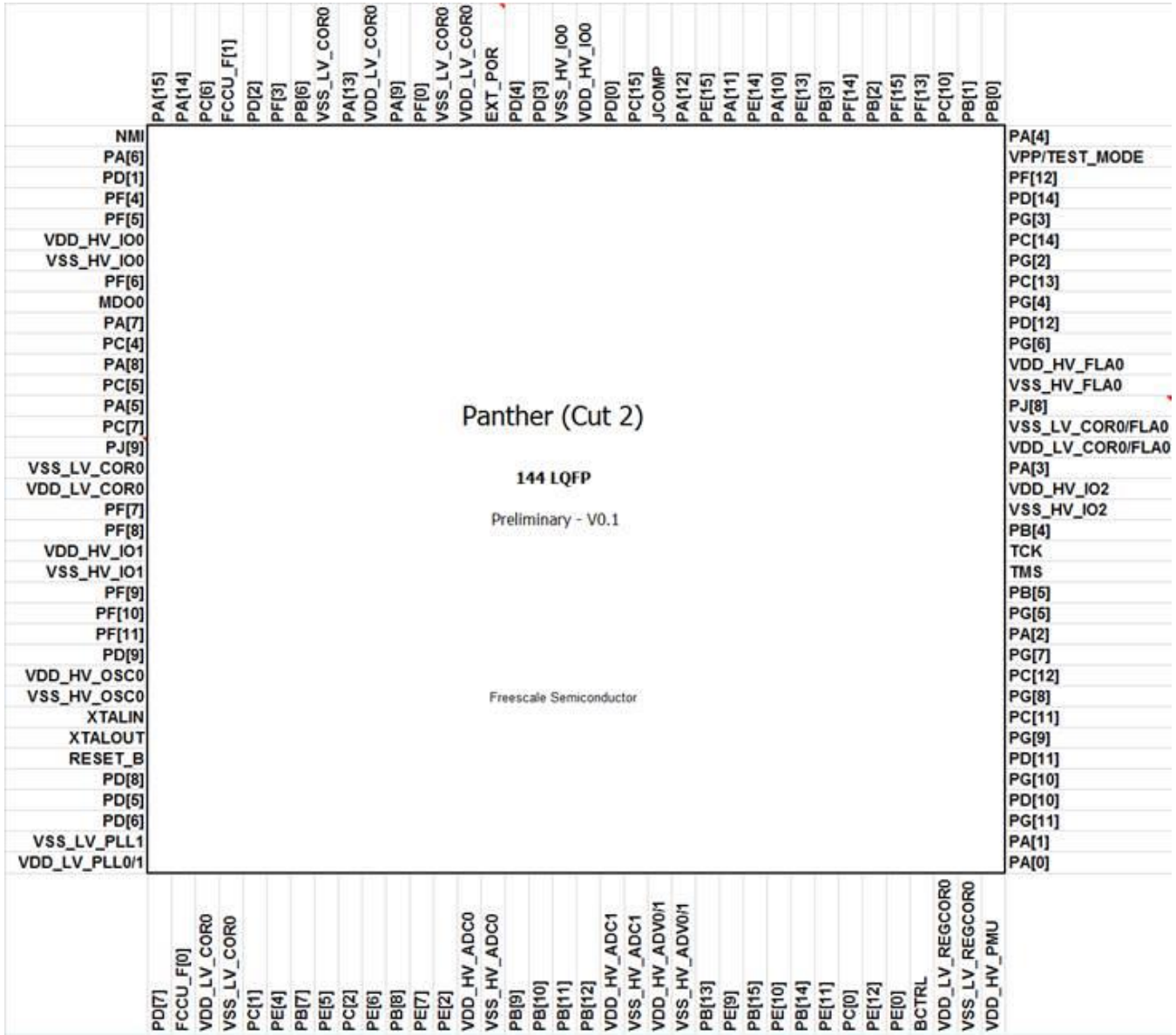
JTAG

DESCRIPTION	PIN
Support for USB Multilink Interface	P2

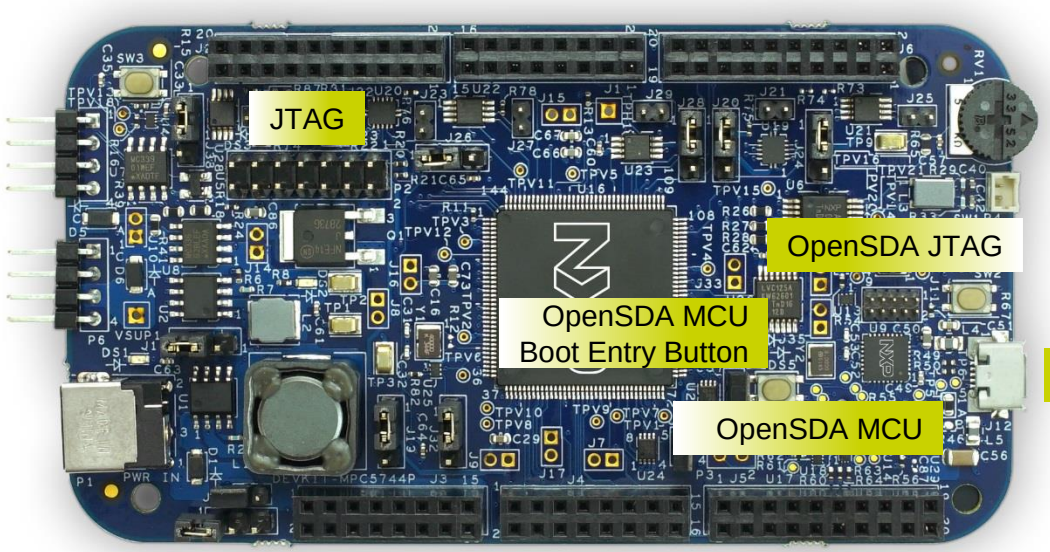
OpenSDA Interface

DESCRIPTION	PIN
OpenSDA MCU Boot Entry	SW4
OpenSDA micro USB: On-board JTAG connection via open source OSBDM circuit using the MK20DX128VFM5 Microcontroller	J12
OpenSDA JTAG: JTAG to update firmware in OpenSDA MCU	J11

Package Level Pinout Diagram – MPC5744P (144 LQFP)



DEVKIT-MPC5744P Board : Power Supply



DEVKIT-MPC5744P supports power through OpenSDA (USB) and external 12V power supply. NXP does not directly sell 12V power supplies. You can obtain a power supply through a third-party.

Power supply specifications:
Fully regulated Switching Power Supply
Input Voltage 100-240V AC 50/60Hz
Output 12V 1A/2A DC
Plug size: 5.5mm x 2.1 mm, Center Positive

12V must be used for CAN and LIN/UART communication.

Software Development Tools

- S32 Design Studio IDE for Power Architecture

- IDE & Compilers
  - Free S32 Design Studio IDE with GCC compiler
  - GHS MULTI Integrated Development Environment
  - Cosmic IDE
  - iSystems winIDEA IDE
  - Sourcery™ CodeBench Development Tools

- Debuggers
  - Free OpenSDA debugger on board and supported by S32DS IDE
  - P&E USB Multilink
  - iSystems iC6000
  - Lauterbach TRACE32 JTAG Debugger

Pre-Compiled Code Examples

- Pre-compiled example projects are available in S32DS as well as on nxp.com/DEVKIT-MPC5744P for quick start

- Example projects also includes the projects from Application Note, AN4830: Qorivva Recipes for MPC574xG, migrated to MPC5744P platform

List of code examples:

1. Hello World
2. Hello World + PLL
3. Hello World + PLL + Interrupts
4. ADC
5. eTimer Frequency Measurement
6. eTimer Count
7. Flash ECC
8. FlexCAN
11. LIN Master
12. LIN Slave
13. UART
14. SPI
15. SPI+DMA
16. TSENS
17. XBIC+DMA
18. SGEN + FlexPWM
19. Low Power STOP
20. Register Protection
21. FCCU

Documentation and Reference Material

- **Documentation Links**
  - MPC574xP Datasheet
  - MPC574xP Product Brief
  - MPC574xP Factsheet
- **Application Notes**
  - MPC5744P Startup Self Test Control Unit (STCU) Overview
  - MPC574xP Hardware Design Guide
  - Migrating from MPC5743L to MPC5744P
  - MPC5744P Standard 144 LQFP EVB User Guide
  - MPC5744P Standard 257 BGA EVB User Guide
  - MPC5744P Clock Calculator Guide
- **Reference Manuals**
  - MPC574xP Family Reference Manual
  - MPC574xP Family Safety Manual

MPC574xP Family – Phantom Feature Differences

MCU	FEATURES			
	Flash*	RAM	EE PROM	Packages
MPC5744P	2.5MB	384K	Emulate	144 LQFP/ 257 MAPBGA
MPC5743P	2.0MB	256K	Emulate	144 LQFP/ 257 MAPBGA
MPC5742P	1.5MB	192K	Emulate	144 LQFP/ 257 MAPBGA
MPC5741P	1.0MB	128K	Emulate	144 LQFP/ 257 MAPBGA

Available in NXP DEVKIT platform

*Differences in memory are all in the Large Flash Block

MPC574xP Family – Package Feature Set Comparison

MPC574xP Package	FEATURES														
	FREQ	FlexCAN	ENET	DSPI	FlexPWM	eTimer	PIT	ADC	LinFlexD	eDMA	CTU	Zipwire	FlexRay	GPI	GPIO
144 LQFP	4.76 MHz to 200 MHz	3	No	3	2 [1)]	3 [2)]	1	4 x 12 bit x 16 ch [3)]	2	32 ch	2 [4)]	No	1	26	79
257 MAPMGA	4.76 MHz to 200 MHz	3	Yes	4	2	3	1	4 x 12 bit x16 ch [3)]	2	32 ch	2	Yes	1	29	112

1) FlexPWM1 has available only A[0-2] and B[0-2] external signals.
2) eTimer2 has available only ETC2-5 external signals.
3) There are 38 ADC channels which include internal channels (temperature sensors, bandgap voltage) and shared channels.
4) CTU1 has not external trigger output.

Available in NXP DEVKIT platform

OpenSDA

- OpenSDA is an open-standard serial and debug adapter
- It bridges serial and debug communications between a USB host and an embedded target processor
- DEVKIT-MPC5744P comes with the OpenSDA Application preinstalled
- Follow these instructions to run the OpenSDA Bootloader and update or change the installed OpenSDA Application

Enter OpenSDA Bootloader Mode

1. Unplug the OpenSDA USB cable if attached
2. Press and hold the Bootloader Entry button (SW4)
3. Plug in a USB cable between a USB host and the OpenSDA USB connector (labeled “SDA”)
4. Release the Reset button

A removable drive should now be visible in the host file system with a volume label of BOOTLOADER. You are now in OpenSDA Bootloader mode.

IMPORTANT NOTE: Follow the “Load an OpenSDA Application” instructions to update the application on your MK20DX128VFM5 to the latest version. It is likely that the version provided in this package is newer than what was preprogrammed on your MK20DX128VFM5.

Load an OpenSDA Application

1. While in OpenSDA Bootloader mode, double-click ***SDA_INFO.HTML*** in the ***BOOTLOADER*** drive. A web browser will open the OpenSDA homepage containing the name and version of the installed Application. This information can also be read as text directly from ***SDA_INFO.HTML***
2. Locate the ***OpenSDA Applications*** folder
3. Copy & paste or drag & drop the Application *to the* ***BOOTLOADER*** *drive*
4. Unplug the USB cable and plug it in again. The new OpenSDA Application should now be running and check the latest version by repeating Step-1

Use the same procedure to load other OpenSDA Applications.

OpenSDA

Using the Virtual Serial Port

1. Determine the symbolic name assigned to the DEVKIT-MPC5744P virtual serial port. On Windows platform open Device Manager and look for the COM port named “OpenSDA-CDC Serial Port”.
2. Open the serial terminal emulation program of your choice. Examples for Windows platform include Tera Term, PuTTY, or HyperTerminal.
3. Program one of the “code examples” using S32 Design Studio IDE.
4. Configure the terminal emulation program. Most embedded examples use 8 data bits, no parity bits, and one stop bit (8-N-1). Match the baud rate to the selected serial test application and open the port.
5. Press and release the Reset button (SW3) at anytime to restart the example application. Resetting the embedded application will not affect the connection of the virtual serial port to the terminal program.

NOTE: Refer to the OpenSDA User’s Guide for a description of a known Windows issue when disconnecting a virtual serial port while the COM port is in use.

Recommendations

- For faster debugging, debug from RAM, because this cuts down the lengthy Flash erase operation cycles. Follow the Software Integration Guide (SWIG) for details.
- By default “New Project” in S32 Design Studio IDE makes application to run at 16 MHz Internal RC (IRC) oscillator. For faster performance, configure PLL to desired frequency and switch clock source to PLL before executing application code.
- Keep S32 Design Studio IDE and OpenSDA firmware Up-to-date for best results

- Post Technical Questions on NXP community for MPC5xxx.

- Useful Links:
  - MPC5744P Webpage
  - nxp.com/devkit-mpc5744p
  - nxp.com/s32ds
  - nxp.com/community

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