DEVKIT-MPC5748G
QUICK START GUIDE (QSG)

Ultra-Reliable MCUs for Industrial and Automotive Applications

www.nxp.com/DEVKIT-MPC5748G



EXTERNAL USE

SECURE CONNECTIONS
FOR A SMARTER WORLD

Contents

- Quick Start Package Overview
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- Hardware: DEVKIT-MPC5748G Board
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- Recommendations

Quick Start Package Overview

Board:

DEVKIT-MPC5748G	Low cost EVB with MPC5748G(176 LQFP-EP) Auto quality MCU on board

Documents:

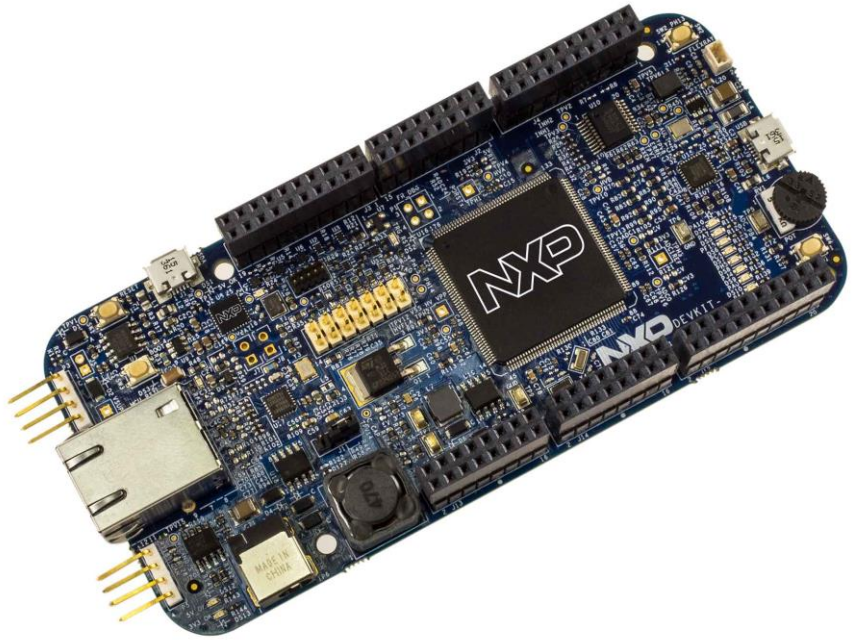
Name	Description
Quick Start Guide(QSG)	Detailed description on availability of Hardware, Software and Documents to quick start with MPC5748G project (this document)
Software Integration Guide(SWIG)	Detailed walk through on how to install and use S32 Design Studio IDE for Power Architecture
Application 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 MPC5748G family of MCU and DEVKIT-MPC5748G board

Downloads:

Name	Description
Integrated Development Environment (IDE)	Eclipse based S32DS IDE with free GCC compiler and Debugger support
DEVKIT-MPC5748G Quick Start Package	All in one package: Software examples and supporting documents for getting started
DEVKIT-MPC5748G Schematics	PDF schematic files for the DEVKIT-MPC5748G board
DEVKIT-MPC5748G PCB Design Package	Gerber files and Bill of Material

DEVKIT-MPC5748G Board : Features

- MPC5748G has 2 x 160 MHz Power Architecture® e200Z4 Dual issue cores and 1 x 80 MHz Power Architecture® e200Z2 Single issue core
- MPC5748G qualified to AEC-Q100 Grade 1, ambient temperature of -40 to +125 °C and suitable for ASIL-B/SIL2 applications
- Arduino™ UNO R3 footprint-compatible with expansion “shield” support
- 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 Ethernet, FlexRay, USB, SDHC, CAN, LIN, UART/SCI and SPI
- MicroSD card slot for access to SDHC interface.
- Potentiometer for precise voltage and analog measurement
- 8 user LED
- 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
- DEVKIT-COMM shield boards for extended 4 CAN and 6 LIN ports



- Box includes:
    - DEVKIT-MPC5748G Board
    - USB Cable
- Downloads includes:
    - Quick Start Package
    - S32 Design Studio IDE
    - Application notes

DEVKIT-MPC5748G Board : Revision D Update

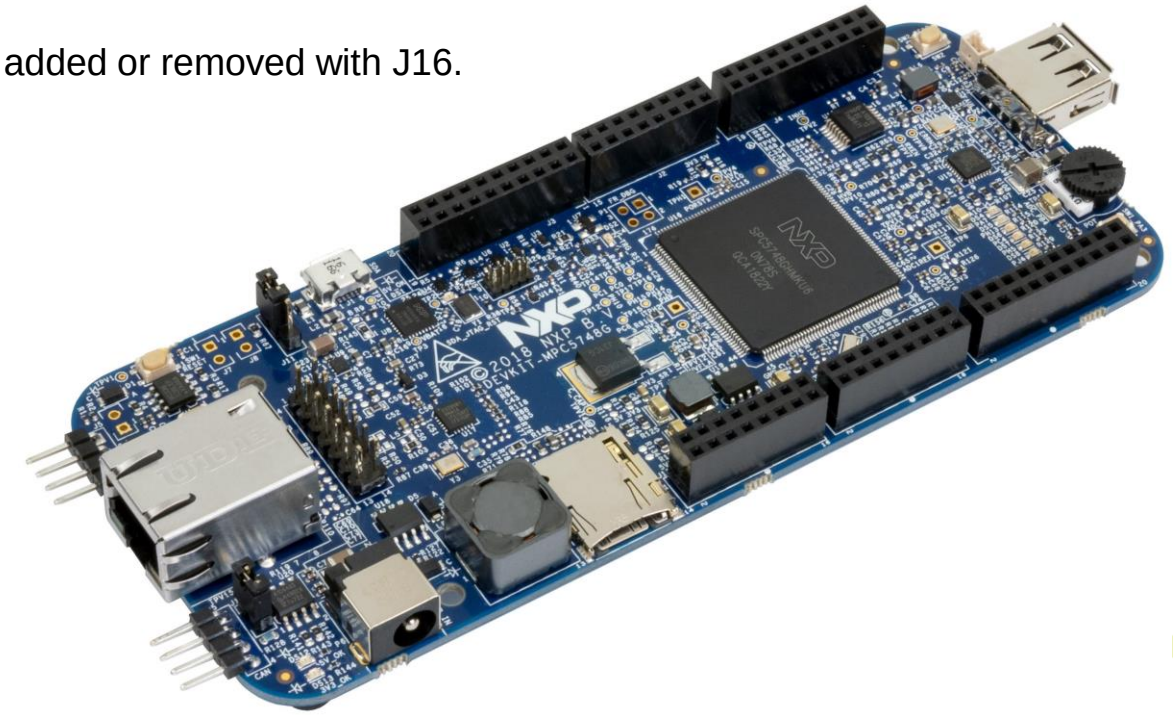
The release of DEVKIT-MPC5748G **Revision D** brought several changes and improvements to the development board:

Improvements

- Latest MPC5748G silicon used (mask set 0N78S).
- Added MicroSD connector for SDHC access.
- MicroUSB connector replaced with full-size connector for easier use with USB devices.
- Alternative placement of JTAG header and power supply jumper for easier access when using shields.
- User LEDs: DS4 changed to red, and DS5 changed to orange.
- Added pre-soldered pull resistor on CAN0 interface which can be can be added or removed with J16.
- Shorter array of female pin headers, allowing for smaller form factor.

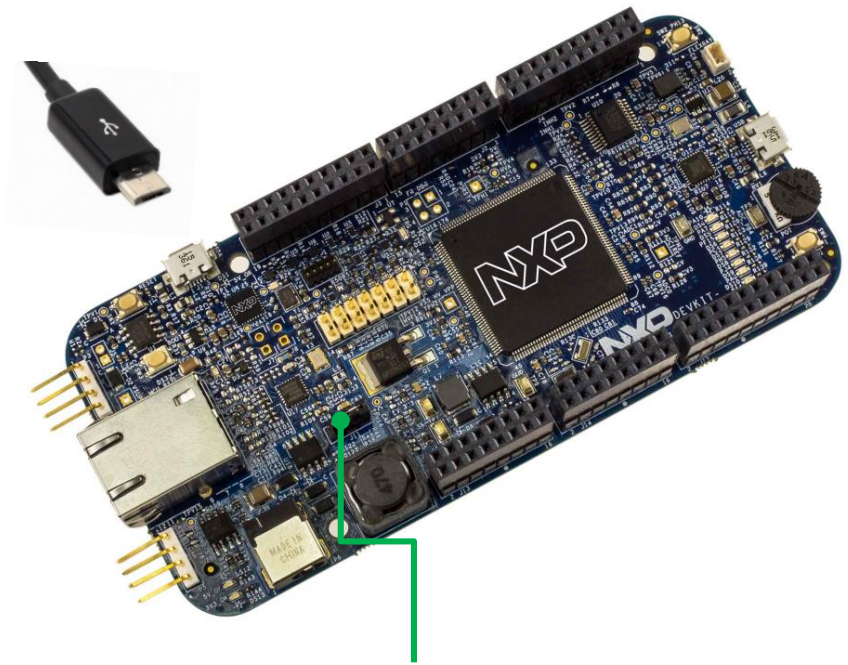
Fixes

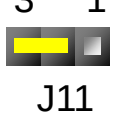
- Fixed issue with USB



Step-by-Step Installation Instructions

In this quick start guide, you will learn how to set up the **DEVKIT-MPC5748G** board and run the default program.





Jumper Setting:
2-3: USB powered
5V Supply, through
OpenSDA interface

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-MPC5748G board. Allow the PC to automatically configure the USB drivers.

3 **Observe the Default Program reaction**

The pre-loaded example project utilizes the **DEVKIT-MPC5748G** user push button (SW2) and the user LEDs. Once the board is plugged in, LEDs will blink in default pattern. Press push button to switch between the two different patterns. Use Potentiometer to change blinking speed. (Clock is configured to PLL running at 160 MHz)

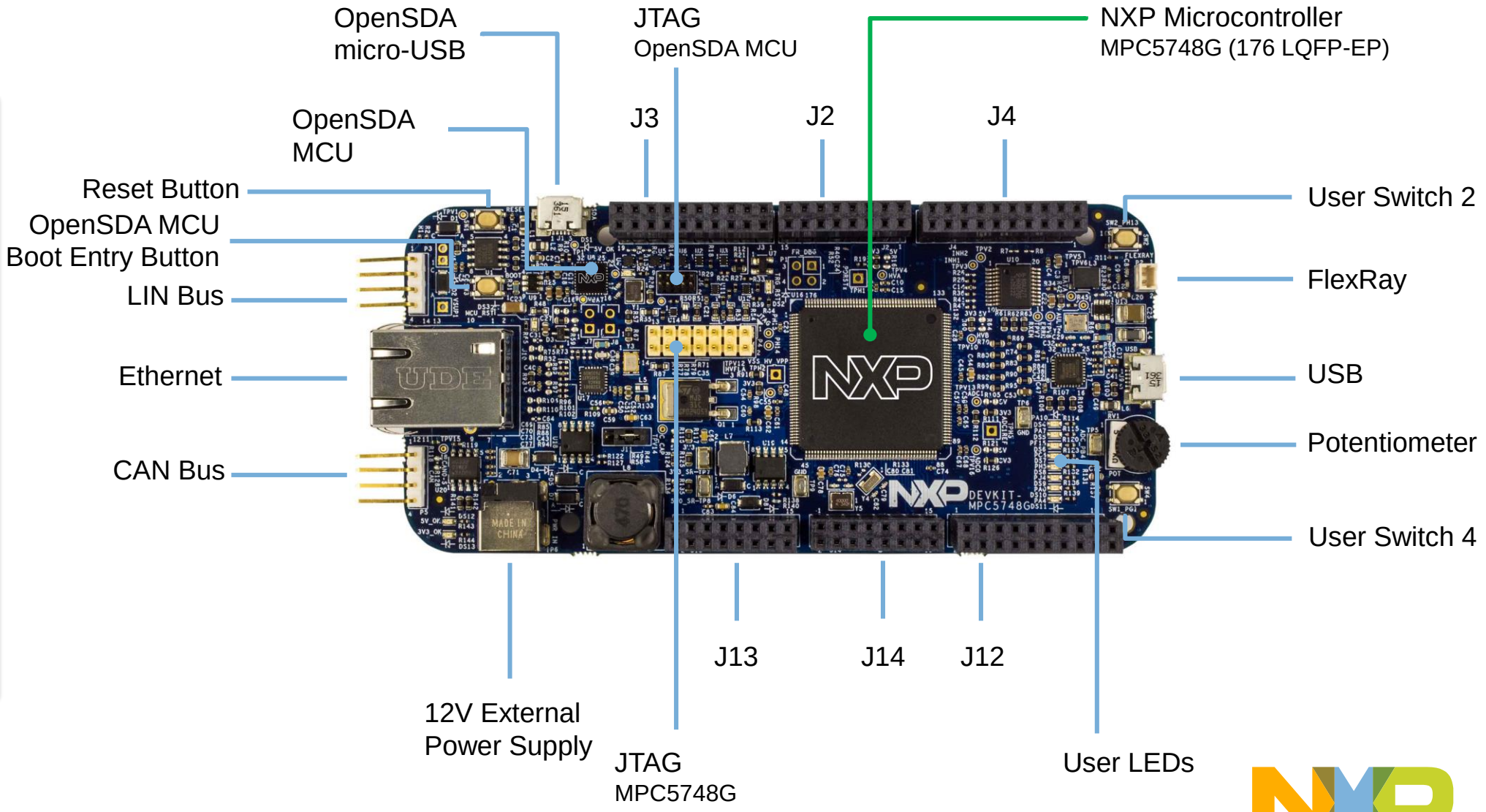
4 **Learn More About the DEVKIT-MPC5748G**

Read release notes and documentation on the
nxp.com/DEVKIT-MPC5748G
nxp.com/MPC5748G

DEVKIT-MPC5748G Board Rev B : Overview

The DEVKIT-MPC5748G is an ultra-low-cost development platform for MPC5748G Microcontrollers.

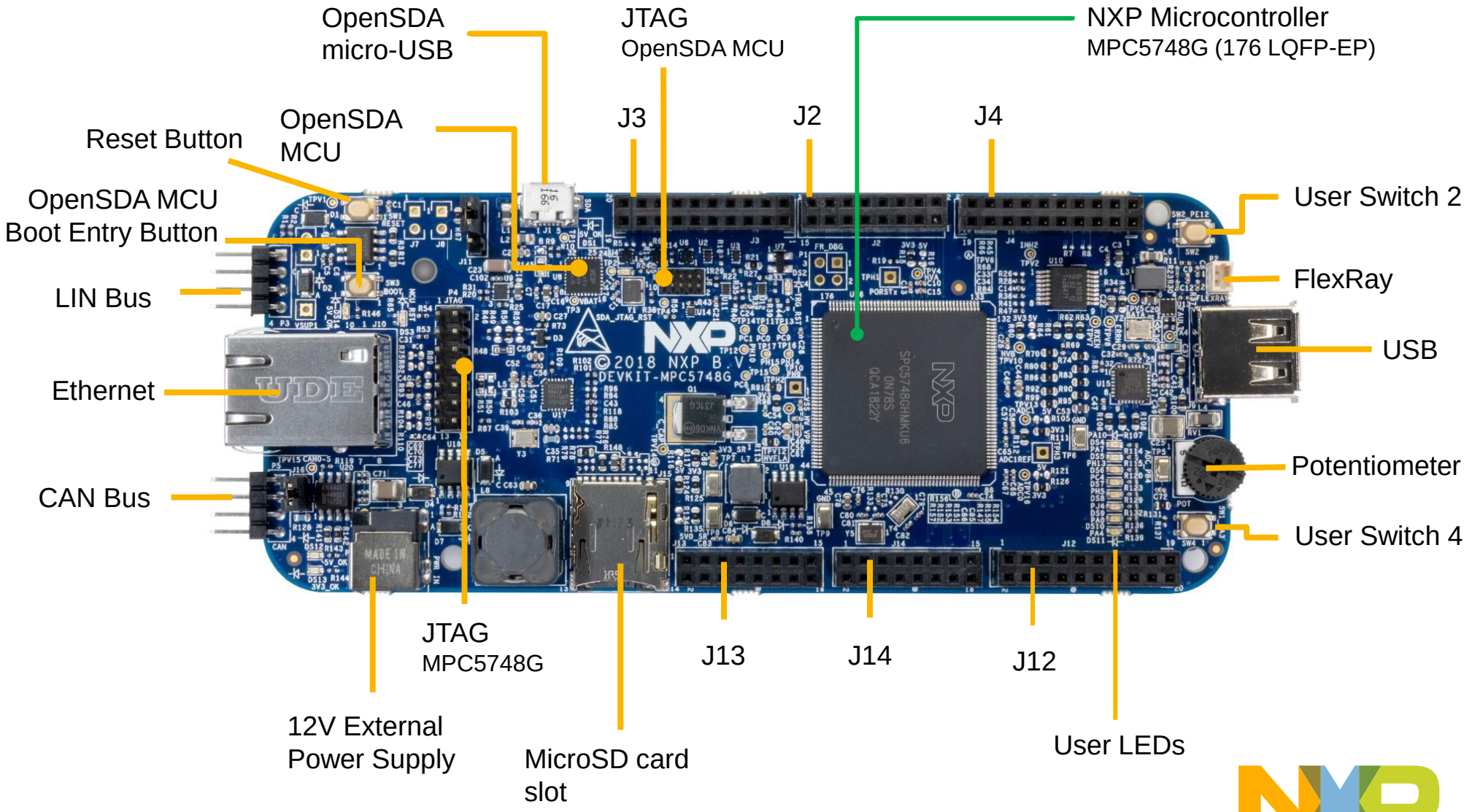
Features include easy access to all MCU I/Os, a standard-based form factor compatible with the Arduino™ pin layout, providing a broad range of expansion board options, and a USB serial port interface for connection to the IDE. The board has option to be powered via USB or an external power supply.



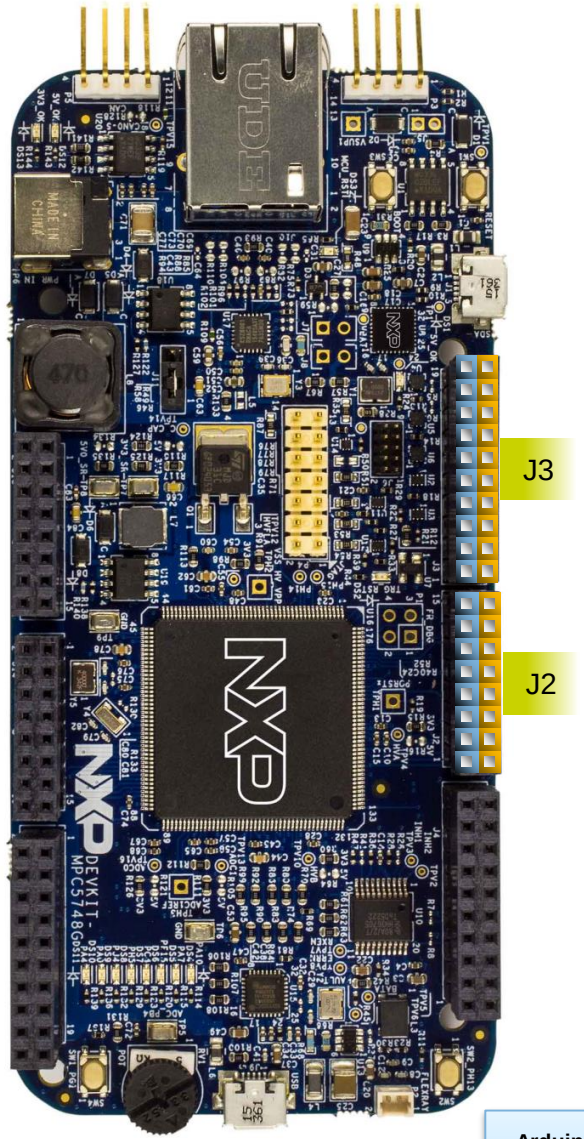
DEVKIT-MPC5748G Board Rev D : Overview

The DEVKIT-MPC5748G is an ultra-low-cost development platform for MPC5748G 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-MPC5748G Board : Pinout



J3

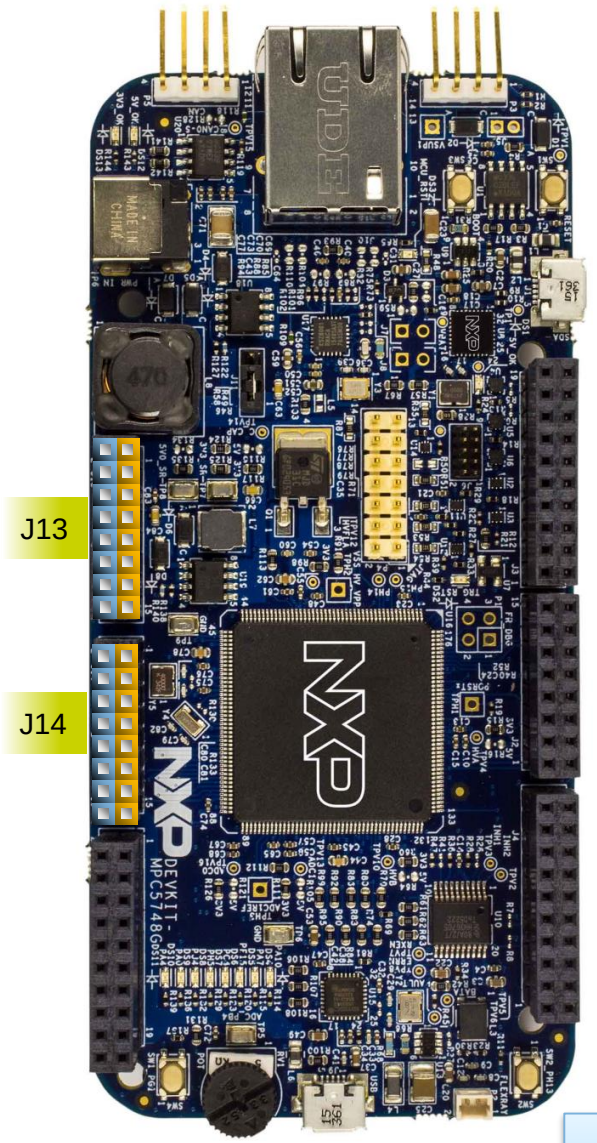
FUNCTION	PORT	PIN	PIN	PORT	FUNCTION
SCL1	PI1	J3-19	J3-20	PG9	
SDA1	PI0	J3-17	J3-18	PG8	
	NC	J3-15	J3-16	PG7	
	GND	J3-13	J3-14	PG6	
SCLK_4	PF2	J3-11	J3-12	PI7	
SIN_4	PF1	J3-09	J3-10	PI6	
SOUT_4	PF0	J3-07	J3-08	PA15	
SS_4	PF3	J3-05	J3-06	PA14	
Timer	PA2	J3-03	J3-04	PA13	
	PA1	J3-01	J3-02	PA12	

J2

FUNCTION	PORT	PIN	PIN	PORT	FUNCTION
	PB15	J2-15	J2-16	PE13	
Timer	PB14	J2-13	J2-14	PF15	
Timer	PB13	J2-11	J2-12	PE11	
	PB12	J2-09	J2-10	PE10	
Timer	PB11	J2-07	J2-08	PE9	
	PB10	J2-05	J2-06	PE8	
LIN4TX(UART)	PA5	J2-03	J2-04	PE7	
LIN4RX(UART)	PA6	J2-01	J2-02	PE6	

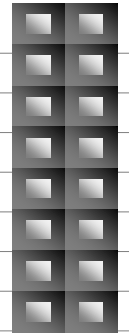
Arduino Compatibility
The internal rows of the I/O headers on the DEVKIT-MPC5748G are arranged to fulfill Arduino™ shields compatibility .

DEVKIT-MPC5748G Board : Pinout



J13

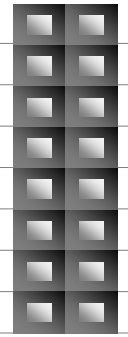
FUNCTION	PORT	PIN
	PF11	**J13-02**
	PF10	**J13-04**
	PF6	**J13-06**
	PF4	**J13-08**
	PF5	**J13-10**
	PF7	**J13-12**
	PF8	**J13-14**
	PF9	**J13-16**



PIN	PORT	FUNCTION
J13-01	VIN	12V
J13-03	PER_HVA	
J13-05	RESET	MPC5748G Reset
J13-07	3V3_SR	3.3V
J13-9	5V0_SR	5V
J13-11	GND	
J13-13	GND	
J13-15	VIN	12V

J14

FUNCTION	PORT	PIN
	PB4	**J14-02**
	PB5	**J14-04**
	PB6	**J14-06**
	PB7	**J14-08**
	PD0	**J14-10**
	PD1	**J14-12**
	PD2	**J14-14**
	PD3	**J14-16**



PIN	PORT	FUNCTION
J14-01	PG13	ADC1_S[1]
J14-03	PG12	ADC1_S[2]
J14-05	PI8	ADC0_S[16]
J14-07	PI11	ADC0_S[19]
J14-9	PI12	ADC0_S[20]
J14-11	PI13	ADC0_S[21]
J14-13	PI14	ADC0_S[22]
J14-15	PI15	ADC0_S[23]

Arduino Compatibility
The internal rows of the I/O headers on the DEVKIT-MPC5748G are arranged to fulfill Arduino™ shields compatibility .

DEVKIT-MPC5748G Board : Pinout



J4

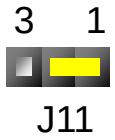
FUNCTION	PORT	PIN	PIN	PORT	FUNCTION
	PF12	J4-19	J4-20	PE5	
	PF13	J4-17	J4-18	PE4	
	PC6	J4-15	J4-16	PE0	
	PC7	J4-13	J4-14	PE1	
	PI2	J4-11	J4-12	GND	
	PI3	J4-09	J4-10	PER_HVA	
	PH3	J4-07	J4-08	PC11	
	PH4	J4-05	J4-06	PC10	
	PG3	J4-03	J4-04	PG5	
	PG2	J4-01	J4-02	PG4	

J12

FUNCTION	PORT	PIN	PIN	PORT	FUNCTION
	PD12	J12-2	J12-1	PD15	
	PD10	J12-4	J12-3	PD14	
	PD9	J12-6	J12-5	PD13	
	PD8	J12-8	J12-7	PH8	
	PER_HVA	J12-10	J12-9	PH7	
	GND	J12-12	J12-11	PH6	
	PD7	J12-14	J12-13	PJ3	
	PD6	J12-16	J12-15	PJ2	
	PD5	J12-18	J12-17	PJ1	
	PD4	J12-20	J12-19	PJ0	

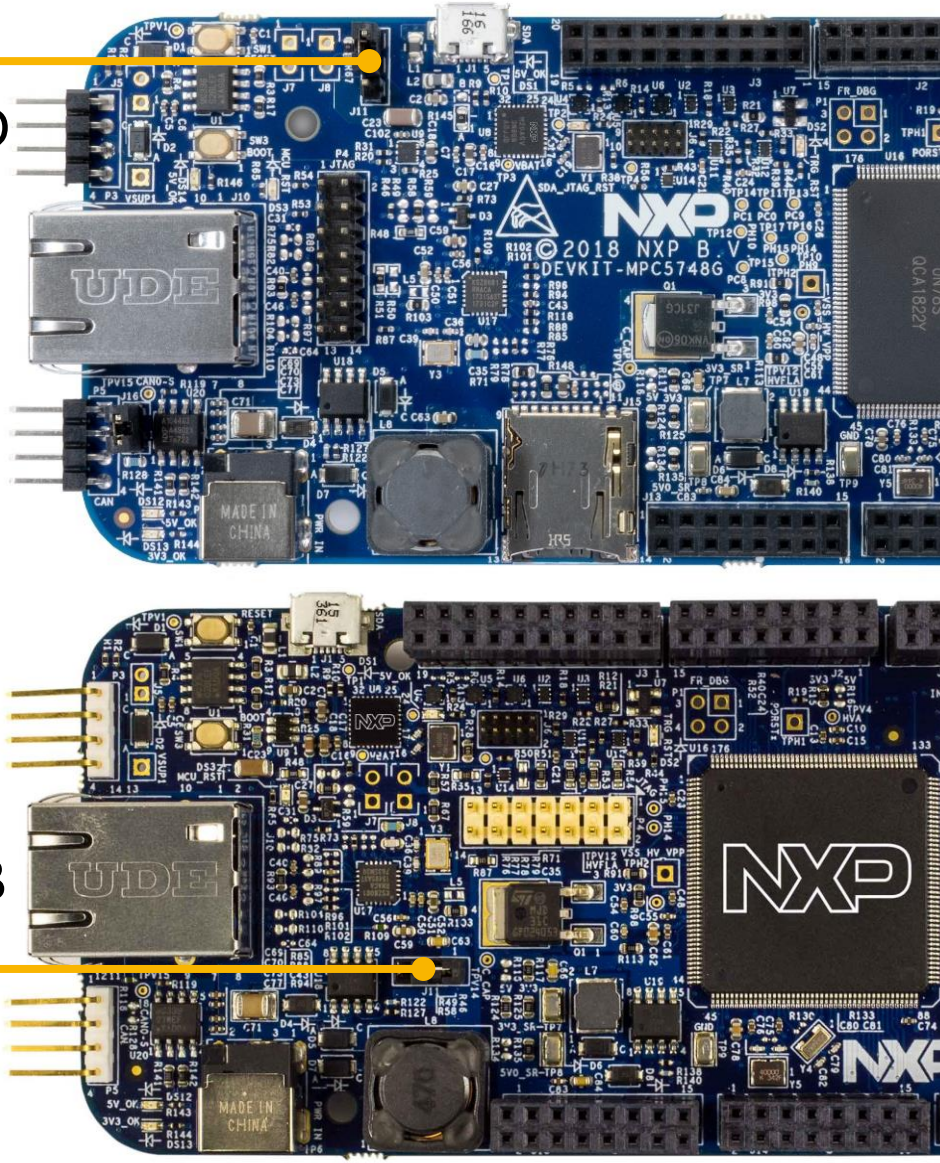
Arduino Compatibility
The internal rows of the I/O headers on the DEVKIT-MPC5748G are arranged to fulfill Arduino™ shields compatibility .

DEVKIT-MPC5748G Board : Jumper Settings



There is only one jumper: J11
It is to select Power source:

1-2: **Default** External 12 V Supply
2-3: 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-MPC5748G Board : Communication Interfaces

LIN_0

DESCRIPTION	NAME	PIN
	GND	**P3-01**
	GND	**P3-02**
Connect to 12V	VBAT	**P3-03**
Port PB2 & PB3	LIN	**P3-04**

CAN_0

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



FlexRay_A

DESCRIPTION	NAME	PIN
	FRA-DATA-A	**P2_1**
	FRA-DATA-B	**P2_2**

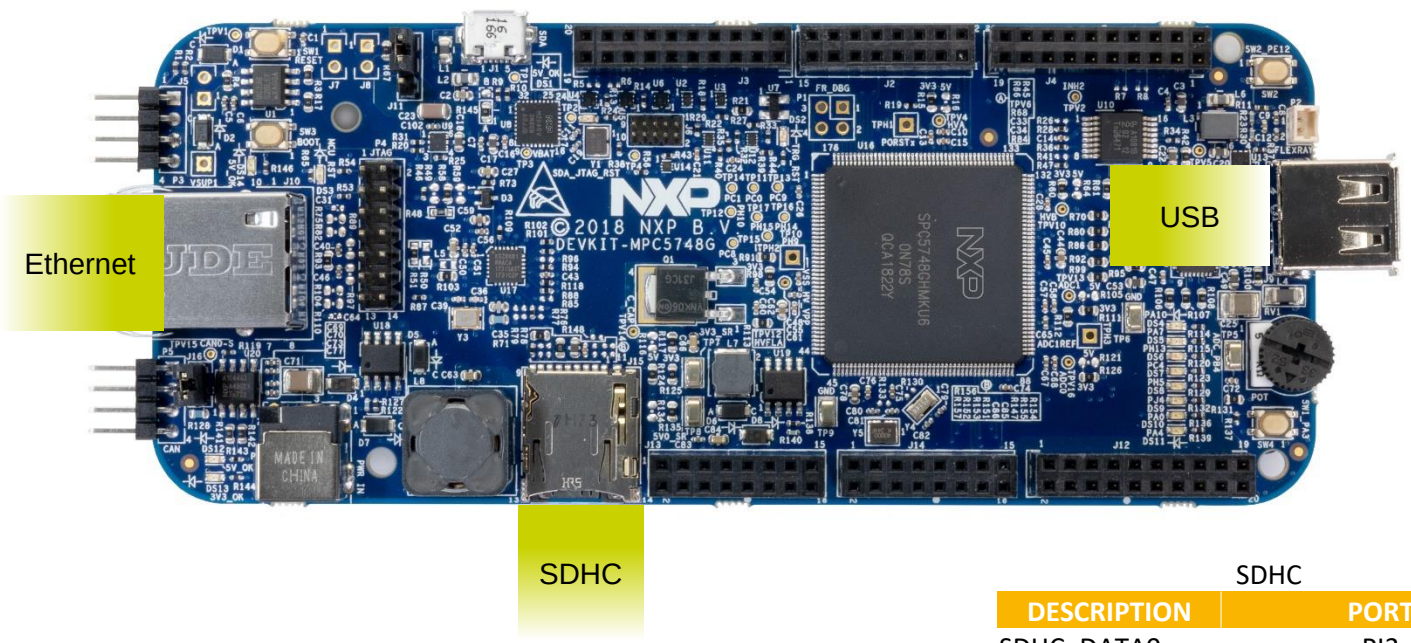
FlexRay_A

DESCRIPTION	PORT
FR_A_TX	PC5
FR_A_TX_EN	PE2
FR_A_RX	PE3

CAN termination resistor jumper:
Open = No resistor
Closed = 120Ohm
(Rev D only)

Note: LIN Physical Interface require 12V supply on pin P3-03

DEVKIT-MPC5748G Board : Communication Interfaces



UART_2 – LinFlex_2
OpenSDA micro-USB

DESCRIPTION	PORT
TX	PC8
RX	PC9

USB_1

DESCRIPTION	PORT
ULPI1_D7	PH12
ULPI1_D6	PH11
ULPI1_D5	PG11
ULPI1_D4	PG10
ULPI1_D3	PE15
ULPI1_D2	PE14
ULPI1_D1	PG15
ULPI1_D0	PG14
ULPI1_STP	PI4
ULPI1_NXT	PI5
ULPI1_DIR	PC3
ULPI1_CLK	PC2

ETHERNET_0

DESCRIPTION	PORT
RMII_0_TXD[0]	PH1
RMII_0_TXD[1]	PH0
RMII_0_TX_EN	PH2
RMII_0_RXD[0]	PA9
RMII_0_RXD[1]	PA8
RMII_0_RX_ER	PA11
RMII_0_RX_DV	PF15
RMII_0_MDC	PG0
RMII_0_MDIO	PF14
RMII_0_TX_CLK (Reference clock)	PG1

SDHC

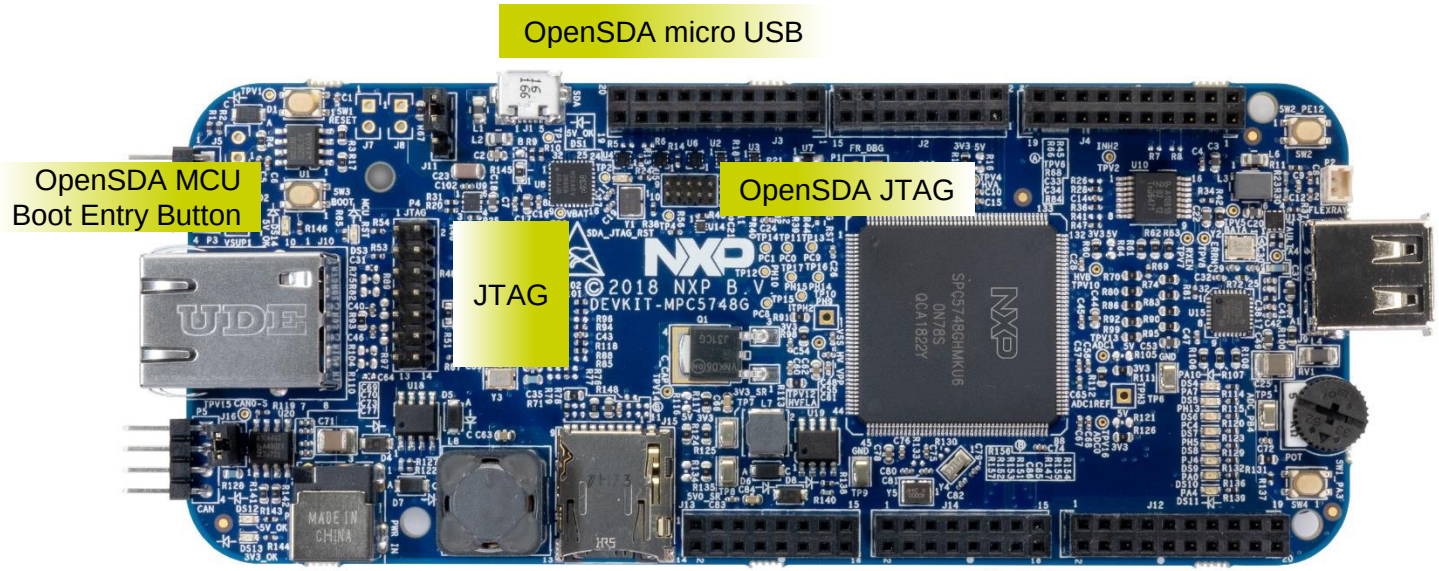
DESCRIPTION	PORT
SDHC_DATA0	PI3
SDHC_DATA1	PI2
SDHC_DATA2	PI1
SDHC_DATA3	PI0
SDHC_CMD	PE6
SDHC_CLK	PE7
SDHC_CD	PA1
SDHC_WP	N/A for MicroSD

DEVKIT-MPC5748G Board : User Peripherals



DESCRIPTION	PIN	PORT
Potentiometer (ADC0 CH9)	RV1/POT	PB4
User Switch 2	SW2	PE12
User Switch 4	SW4	PA3
User LEDs	DS4	PA10
	DS5	PA7
	DS6	PH13
	DS7	PC4
	DS8	PH5
	DS9	PJ4
	DS10	PA0
	DS11	PA4
Reset Button	SW1	

DEVKIT-MPC5748G Board : Programing Interface



JTAG

DESCRIPTION	PIN
Support for USB Multilink Interface	P4

OpenSDA Interface

DESCRIPTION	PIN
OpenSDA MCU Boot Entry	SW3
OpenSDA micro USB: On-board JTAG connection via open source OSBDM circuit using the MC9S08JM60 Microcontroller	J1
OpenSDA JTAG: JTAG to update firmware in OpenSDA MCU	J6

Software Development Tools

- IDE & Compilers
  - Free S32 Design Studio IDE for Power Architecture 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-MPC5748G for quick start

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

List of code examples:

1. Hello
2. Hello+pll
3. Hello+pll+interrupts
4. eDMA+ PBridge
5. Semaphores
6. Register Protection
7. Low Power: STOP mode
8. Analog-to-digital Converter
9. Timed I/O (eMIOS)
10. CAN
11. CAN+DMA
12. LIN
13. UART
14. SPI
15. SPI+DMA
16. I2C
17. Ethernet
18. Body Cross Trigger Unit (BCTU)
19. System Memory Protection Unit (SMPU)
20. Flash

Documentation

General Documents

- MPC5748G Microcontroller Data Sheet
- MPC5748G Microcontroller Reference Manual
- MPC5748G Microcontroller Fact Sheet
- DEVKIT-MPC5748G Board Fact Sheet
- Software Integration Guide (SWIG)

Application Notes

- AN4830: Qorivva Recipes for MPC574xG
- AN5220: MPC5748G Hardware Design Guidelines
- AN5114: Migrating between MPC5748G and MPC5746C
- AN4868: EEPROM Emulation with NXP MPC55xx, MPC56xx, and MPC57xx Microcontrollers
- AN4805: A Practical Approach to Hardware Semaphores

MPC574xG/C/B/D Family : Phantom Feature Differences

Flash/RAM	Package			
	100MAPBGA (11x11mm, 1mm)	176LQFP-EP (24x24mm, 0.5mm)	256MAPBGA (17x17mm, 1mm)	324MAPBGA (19x19mm, 1mm)
6M/768k 6M/768k		**SPC5748G** **SPC5748C**	**SPC5748G** **SPC5748C**	**SPC5748G** **SPC5748C**
4M/768k 4M/512k		**SPC5747G** **SPC5747C**	**SPC5747G** **SPC5747C**	**SPC5747G** **SPC5747C**
3M/768k		**SPC5746G**	**SPC5746G**	**SPC5746G**
3M/384k (512k optional) 3M/384k (512k optional)	**SPC5746C** **SPC5746B**	**SPC5746C** **SPC5746B**	**SPC5746C** **SPC5746B**	**PPC5746C**
2M/256k 2M/256k	**SPC5745C** **SPC5745B**	**SPC5745C** **SPC5745B**	**SPC5745C** **SPC5745B**	
1.5M/192k 1.5M/192k	**SPC5744C** **SPC5744B**	**SPC5744C** **SPC5744B**	**SPC5744C** **SPC5744B**	

Color Coding:

- Triple Core, Ethernet, FlexRay, USB, SDHC, (optional HSM, 2nd Ethernet + switch)
- Dual Core, Ethernet, FlexRay (all: optional HSM, 5747C/5748C: 2nd Ethernet + switch)
- Single Core, FlexRay, Ethernet (optional HSM)
- Debug device for SPC5745B/C and SPC5746B/C - not for production

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-MPC5748G 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 Reset button (SW3)
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. ***********Download Application**********
3. Locate the ***OpenSDA Applications*** folder
4. Copy & paste or drag & drop the Application *to the* ***BOOTLOADER*** *drive*
5. 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-MPC5748G 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 (SW1) 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 high power/current consuming applications (like using external shield boards) use “External 12 V Supply” only.
- External 12 V 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 
- 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.
- For faster debugging, debug from RAM, because this cuts down the lengthy Flash erase operation cycles. Follow the Software Integration Guide (SWIG) for details.
- Keep S32 Design Studio IDE and OpenSDA firmware Up-to-date for best results.
- Post Technical Questions on NXP community for MPC5xxx.
- Useful Links:
  - nxp.com/mpc5748g
  - nxp.com/devkit-mpc5748g
  - nxp.com/s32ds
  - nxp.com/community