GW-MPC5748G RDB

QUICK START GUIDE (QSG)

Ultra-Reliable MCUs for Industrial and Automotive Applications

SECURE CONNECTIONS
FOR A SMARTER WORLD

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Quick Start Package Overview

- **Board:**

GW-MPC5748G	Gateway Reference Design Board based on MPC5748G(176 LQFP-EP)

- **Documents:**

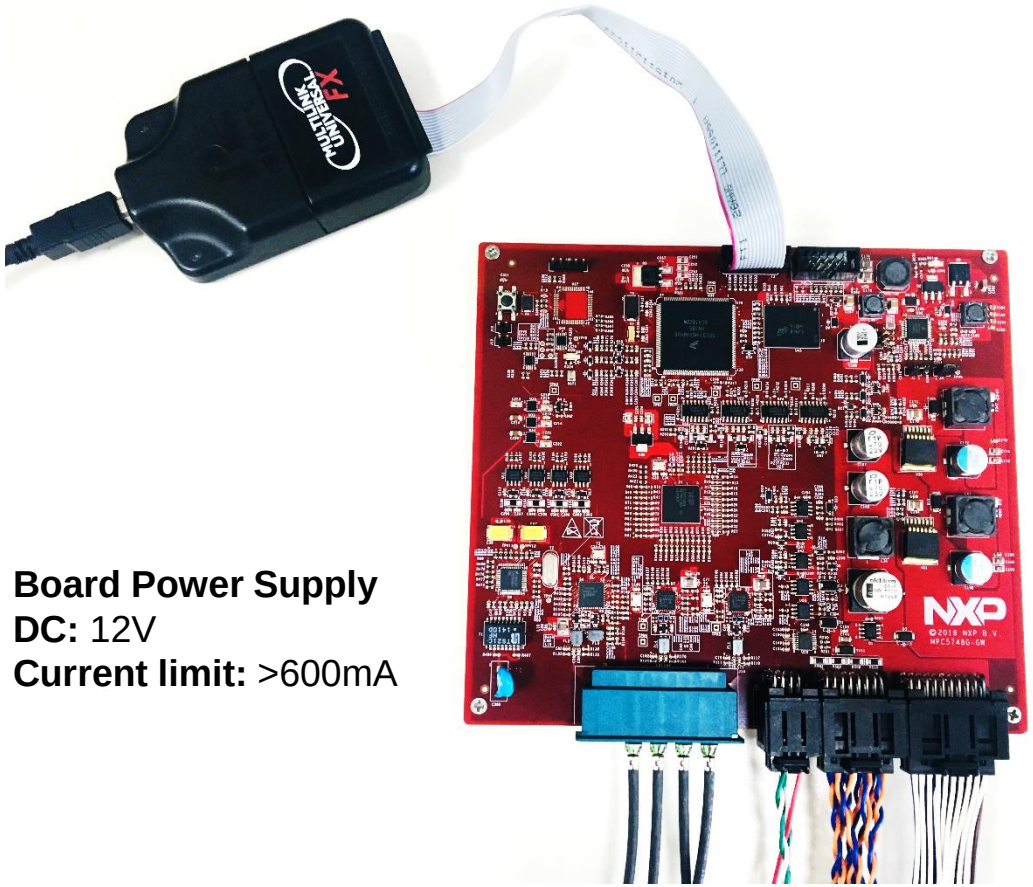
Name	Description
Quick Start Guide(QSG)	Detailed description on availability of Hardware, Software and Documents to quick start with MPC5748G project (this document)
Software Integration Guide(SWIG)	Detailed walk through on how to install and useS32 Design Studio IDE for Power Architecture. And how to use S32 SDK to build applications
Example Codes User Guide(ECUG)	S32 SDK based example codes user guide for GW-MPC5748G RDB
Application Notes	Detailed documents covering topics from ‘how to design hardware’ to ‘how to write software’
One Page Fact Sheet	One page fact sheet of GW-MPC5748G RDB
Reference Manuals, Data Sheets, and Fact Sheets	Detailed manuals for MPC5748G family of MCU

- **Downloads:**

Name	Description
Integrated Development Environment (IDE)	Eclipse based S32DS IDE with free GCC compiler and Debugger support, so as S32 SDK within the IDE
GW-MPC5748G Quick Start Package	All in one package: Software examples and supporting documents for getting started
GW-MPC5748G Schematics	PDF schematic files for the GW-MPC5748G board
GW-MPC5748G PCB Design Package	PCB Layout files and Bill of Material

Step-by-Step Installation Instructions

- In this quick start guide, you will learn how to setup the **GW-MPC5748G** board and run the example program.



Board Power Supply
DC: 12V
Current limit: >600mA

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 Cable and Debugger like PE Multilink

Connect all cables to the board. The description of cable can be found in the Document down load web page of GW-MPC5748G. Connect debugger to JTAG port onboard and the other end to the PC.
Keep Jumper J4,J5 onboard, and remove J3, J12,J13.

3 Set up DC Power supply

Connect power supply wires in the cable to the DC power supplier. Set the Voltage at **12V,** Current limit to **>600mA**. Check and make sure all connection is right.

4 Program example codes and see results

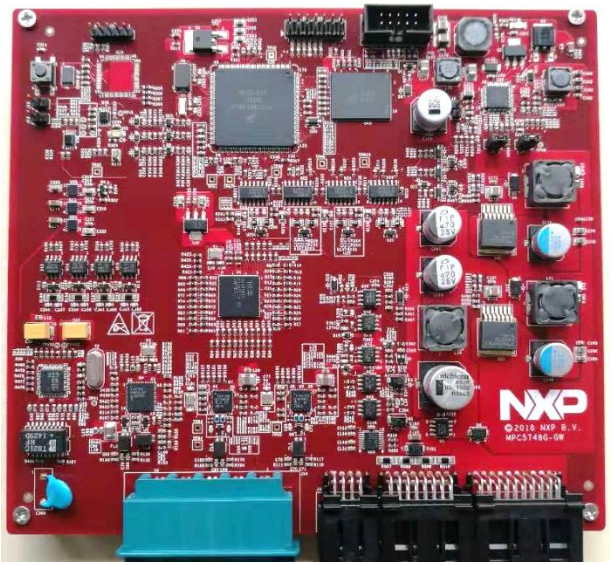
Open S32DS IDE and load example projects. Power up the board, then compile and program. Use debug function to see the status and results of the example code. More details, please refer to GW-MPC5748G Software Integration Guide(SWIG) and Example Codes User Guide(ECUG).

GW-MPC5748G Board: Features

- Provide A-sample like Ethernet Gateway ECU hardware and basic software. Sufficient hardware resources for fast prototyping of secure automotive ethernet gateway, supporting OTA management.
- Using automotive qualified connectors onboard, including MATEnet from Tyco tech. for 100base-T1 ethernet communication.
- 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 and ambient temperature of -40 to +125 °C
- The board support multi channels of Automotive Ethernet(x4) and CAN/CANFD(x8), FlexLIN(x2), UART/SCI and SPI, together with one channel of 100base-TX for DoIP application.
- Easy access to the MCU I/O header pins for prototyping.
- Onboard 4GB eMMC for developing OTA related functions, like firmware storage, key signals storage and uploading to remote server, etc..
- Support functional safety development by using NXP SafeAssure products and safety board architecture design.

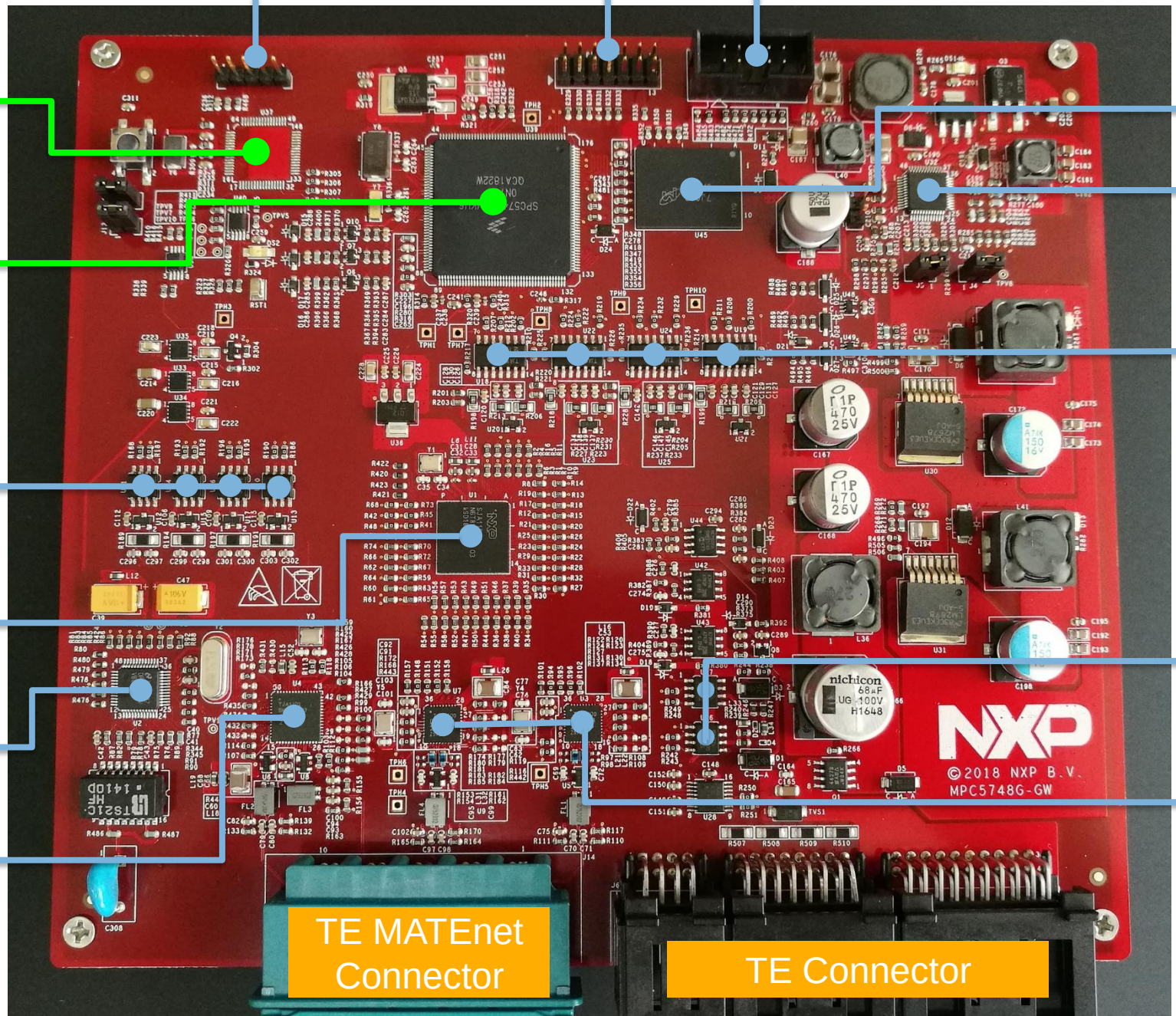
Hardware Resources

- 5 x 100Mbit/s Ethernet
  - 4x100Base-T1
  - 1x100Base-TX for DoIP
- 8 x CAN (CAN-FD compatible)
- 2 x LIN
- eMMC (4GB)
- 3 x PWM / Digital IN
- 2 x Analog IN
- 2 x HS Switch OUT
- Wake IN/Wake OUT
- 1 x RS232
- JTAG Debug

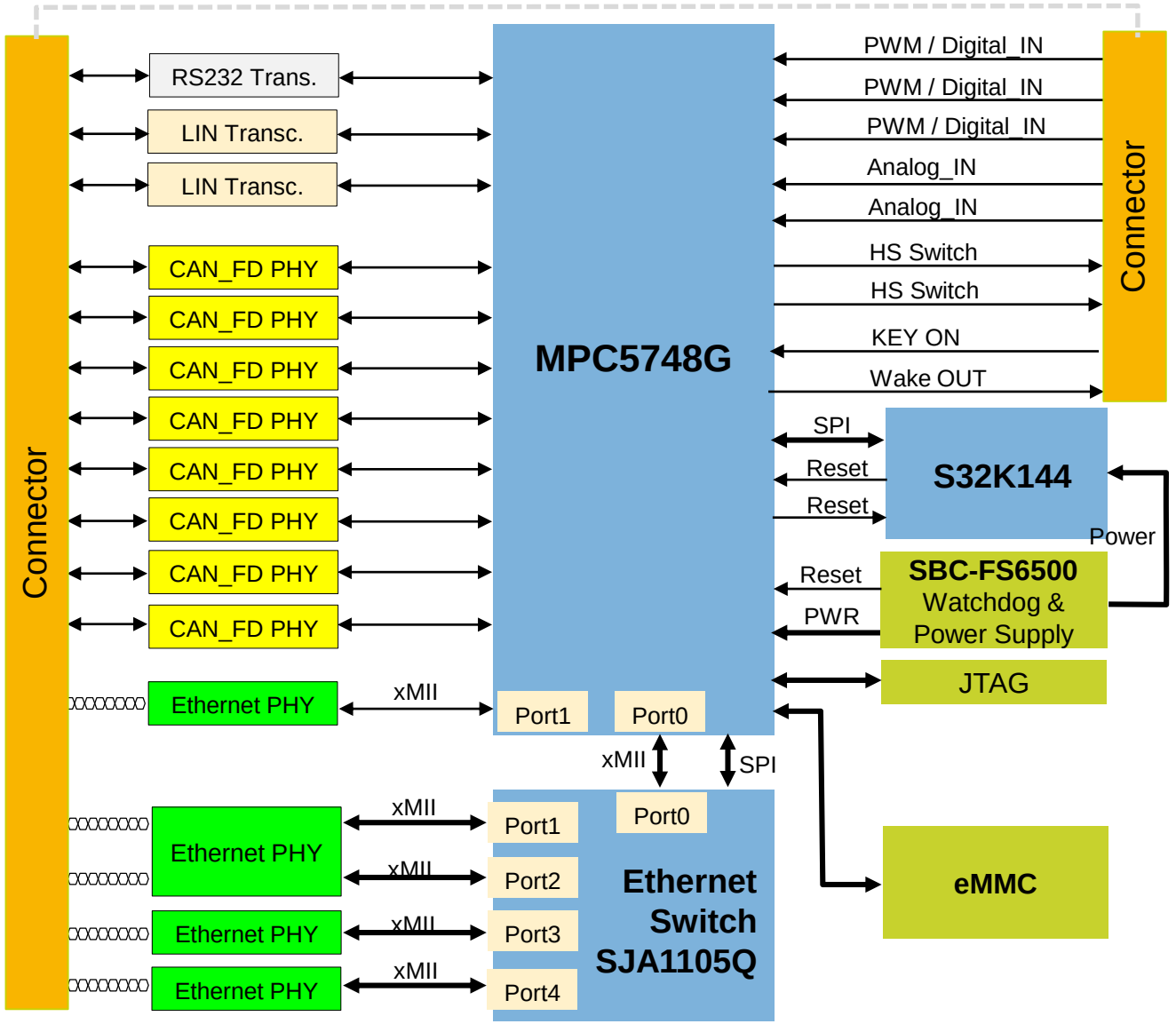


- Support ISO26262 functional safety features onboard:
  - ASIL-D Safety power SBC FS65xx
  - ASIL-B MPC5748G as main MCU
  - ASIL-B S32K144 as sub-MCU for monitoring/supervising
  - ASIL-A SJA1105Q 5-ports Ethernet Switch
  - Fault management and reset logics circuits

Main Components Onboard



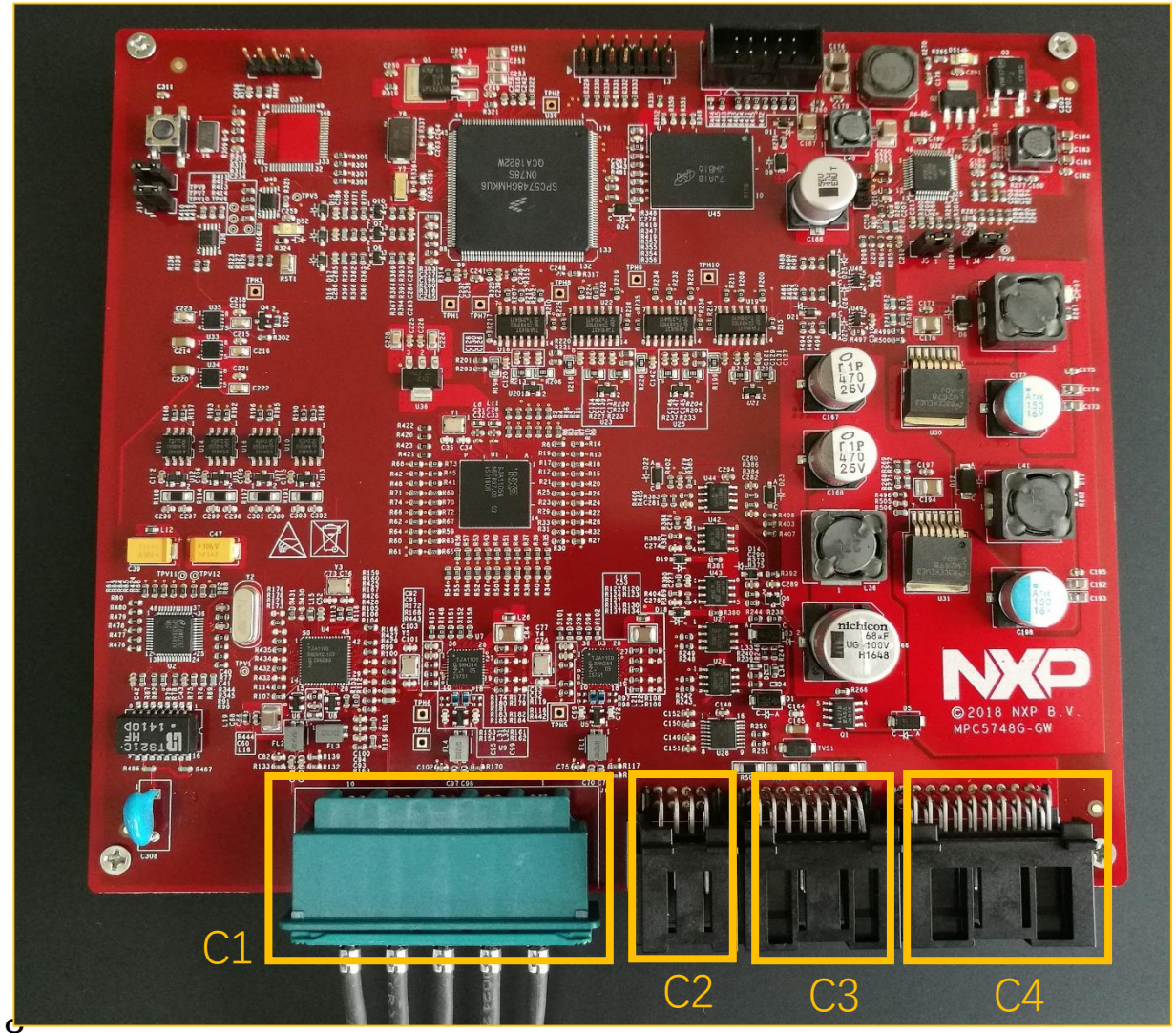
GW-MPC5748G Board Simplified Diagram

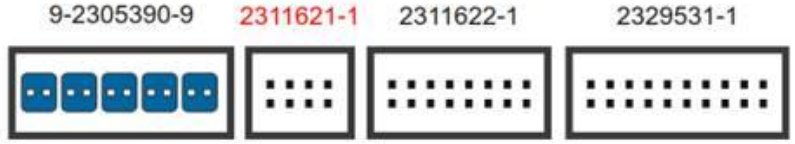


GW-MPC5748G Main Chips Onboard

Main Component	Product	Key Features
Main MCU	MPC5748G	• Multi Core 2*160MHz+1*80MHz; 6M Flash, 768KB SRAM; • 2x AVB Ethernet MAC(with switch); • 8x CANFD, FlexRay, 18x LIN, MLB, USB, SDIO, I2C, I2S • Hardware Security Module, Low Power Unit; • ISO26262 ASIL-B
Sub MCU	S32K144	• 112MHz, 512KB Flash, 64KB SRAM; • ISO26262 ASIL-B
Ethernet Switch	TJA1105Q	• 5-Port, Layer 2 Store and Forward Switch • Support AVB, TSN and Deterministic Ethernet • MII/RMII/RGMII Interface; Port Mirroring and VLAN
Ethernet PHY	TJA1100 & TJA1102	• 100Mbps OABR PHY and Dual PHY(TJA1102) • Fully automotive qualified • Robust automotive grade EMC/ESD
CAN PHY	TJA1043 & TJA1044GT	• Support 2Mbps CANFD, Sleep and Wakeup Function;
LIN PHY	TJA1021	• LIN 2.1/SAE J2602 compliant; Up to 20 kBd • Very low EME, High EMI
Power SBC	MC33FS6522LAE	• ISO26262 ASIL-D; Watchdog
eMMC	MTFC4GACAANA-4M IT	• 4GB Memory Space; Support eMMC V4.51;

GW-MPC5748G Board : Pinout





Auto Ethernet(100BASE/1000BASE-T1):
P4 TRX1→ TRX4
Have one channel reserved

DoIP(100BASE-TX):
P3 TX, RX, Enable

CAN Channel:
CAN0 → CAN7

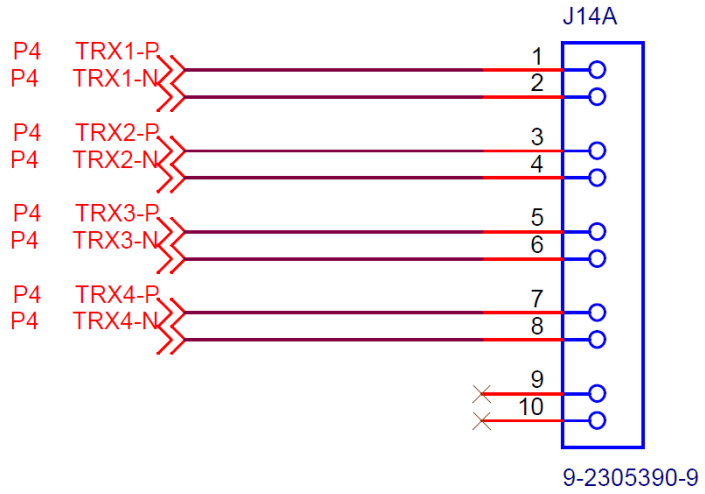
Others(Power, LIN, debug, control etc.):
P7 LIN1 → LIN2
BATT+, GND
P20 PWM_IN 1 →3
P20 AIN 1 →2
P20 WAKE_OUT
P10 WAKE_IN
P20 HS 1 → 2
RS232 TX, RX
+5V OUT 1 → 2

Connector name	Signals	Part number
C1	4-port 100Base-T1 Ethernet connector	Tyco Electronics MATEnet 9-2305390-9
C2	DoIP Port 4x2 PINs	Tyco Electronics 2311621-1
C3	CAN0-CAN7 8x2 PINs	Tyco Electronics 2311622-1
C4	Others(Power, LIN, URAT, ADC, PWM, IO etc.) 10x2 PINs	Tyco Electronics 2329531-1

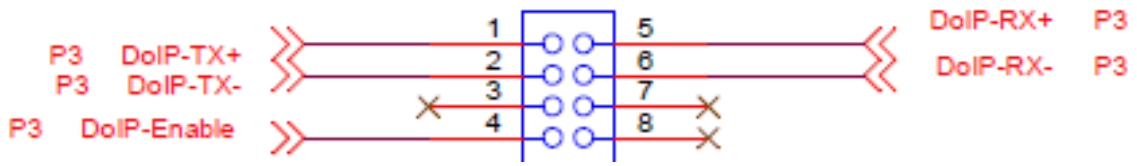
GW-MPC5748G Board : Pinout

- Connectors pinout in schematic

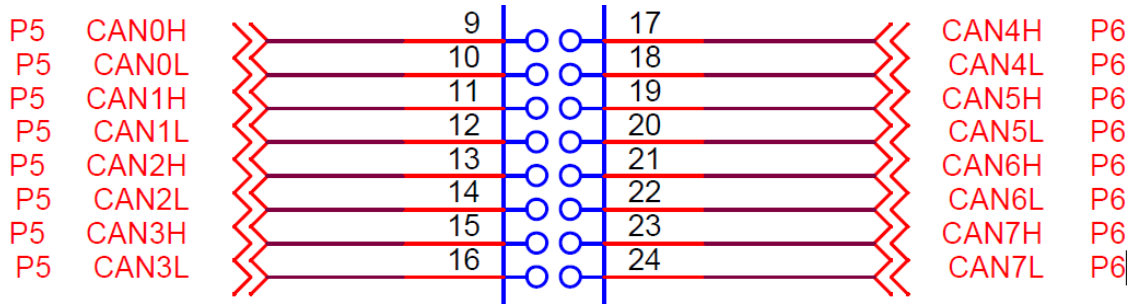
C1



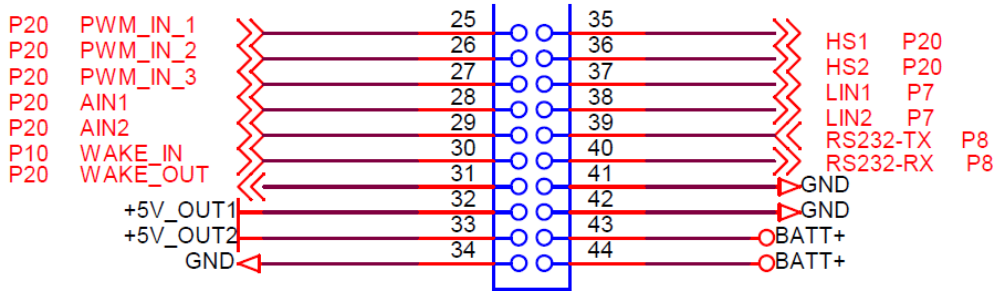
C2



C3



C4



GW-MPC5748G Board : Pinout

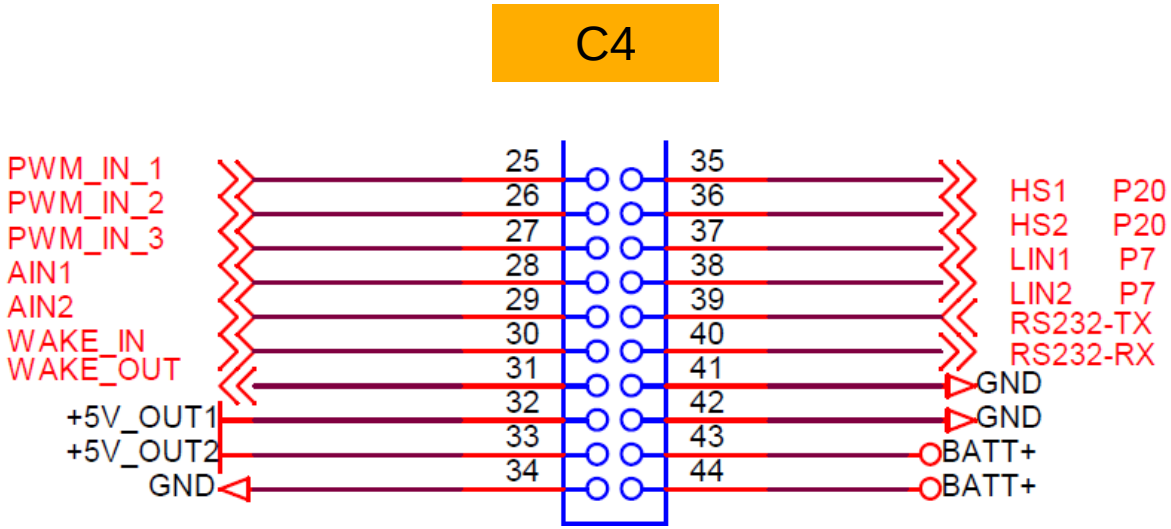
- **Power Supply:**

  - BATT+ connects to DC power supplier 12V+
  - GND connects to DC power supplier 12V-

  BATT+: PIN43, PIN44

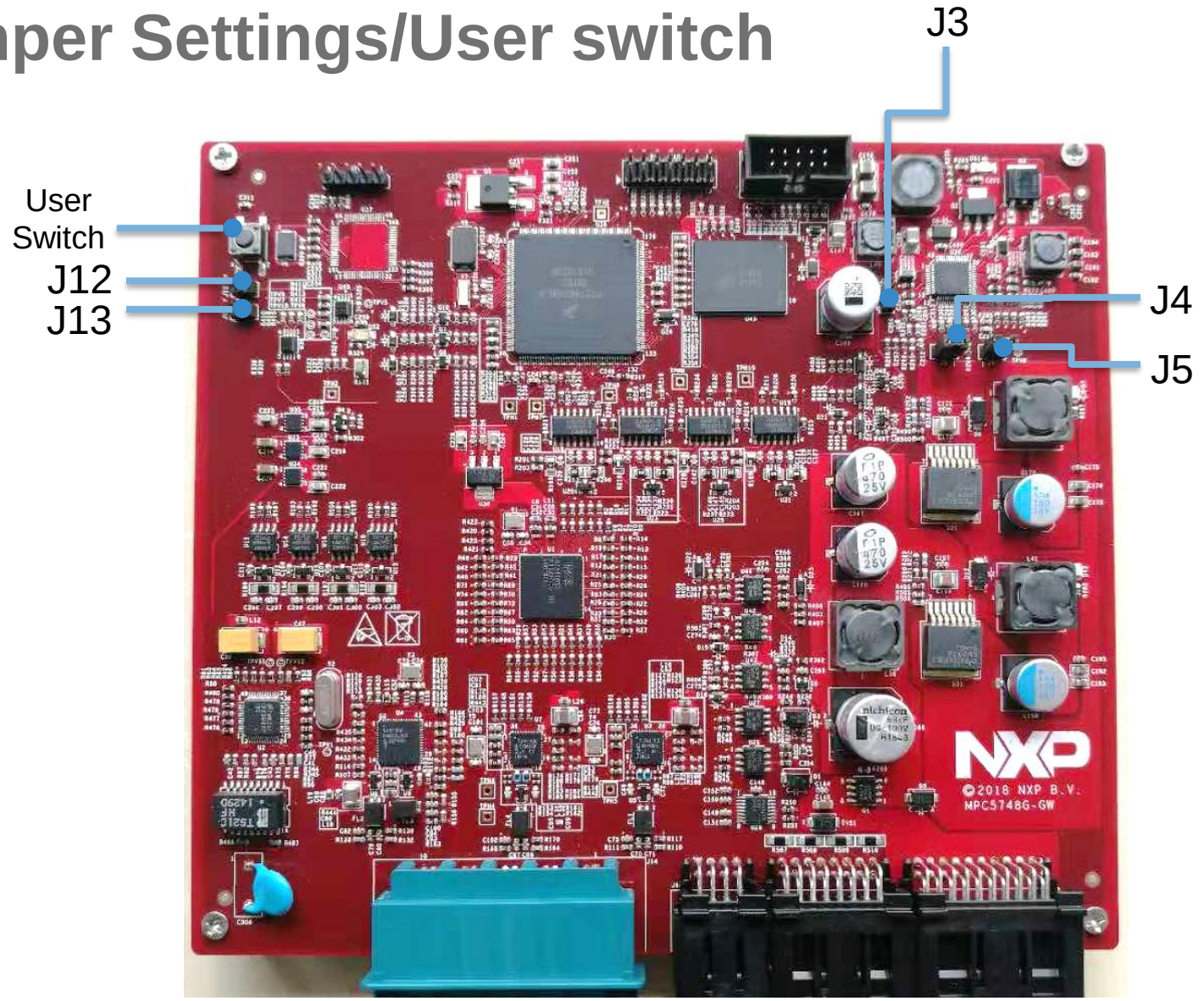
  GND: PIN41, PIN42, PIN34

  If user want to have a larger current supplier, connect more wires of BATT+/GND .

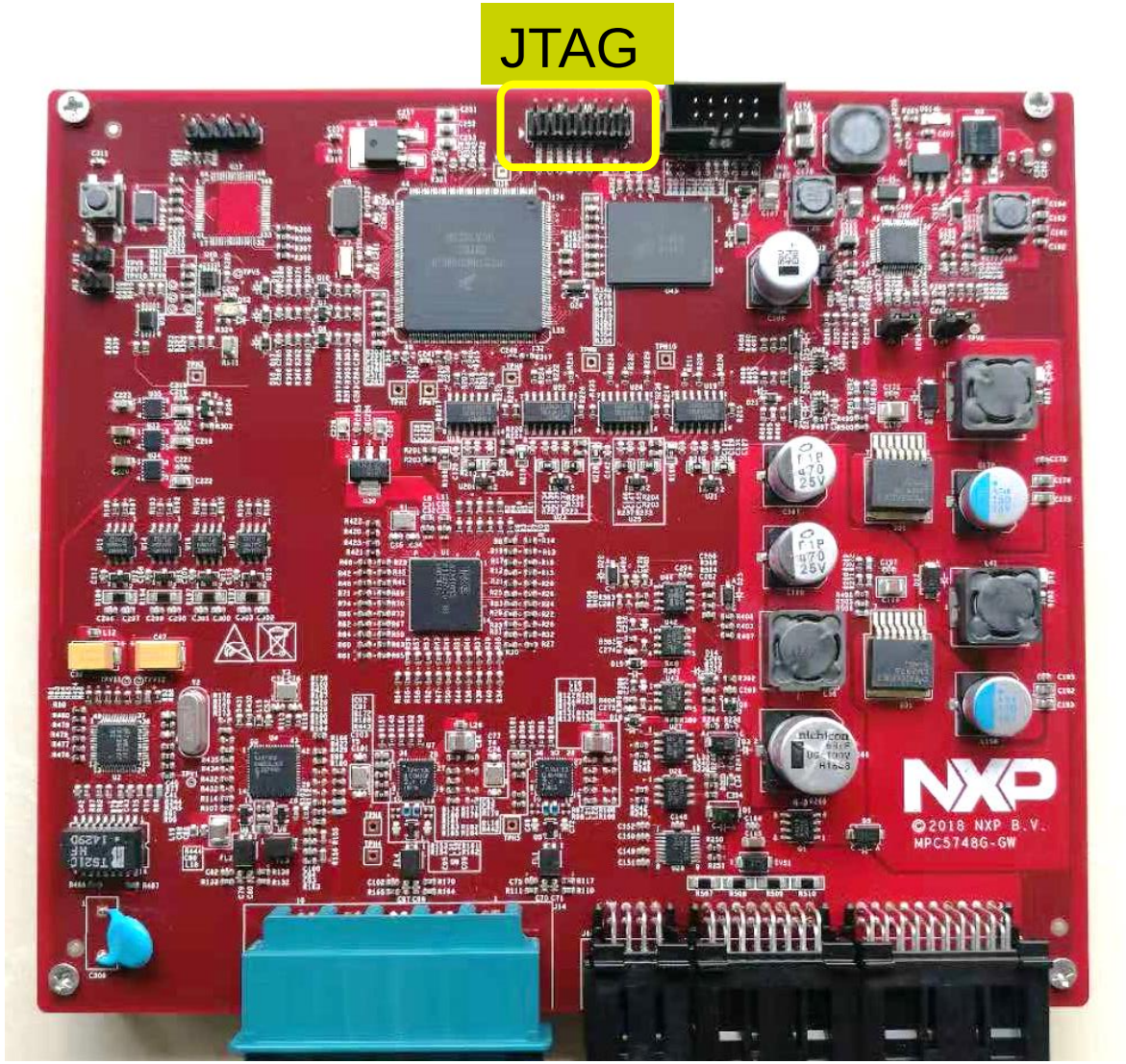


GW-MPC5748G Board : Jumper Settings/User switch

- **Jumper J3**
  - Must leave it open.
- **Jumper J4**
  - Close to enable SBC to reset MPC5748G. More details please refer to the schematic.
- **Jumper J5**
  - Close to put SBC enter into DEBUG mode. In this mode, SBC will work as a common power supplier. For more information, please refer to nxp.com/Power SBC
- **Jumper J12**
  - Close for MPC5748G reset by User Switch
- **Jumper J13**
  - Close for S32K reset by User Switch. Please keep this open and don't use this Jumper.
- **User Switch**
  - This onboard switch is just used for reset MCU. Refer to schematic for more information.



GW-MPC5748G Board : Programing Interface



JTAG

Description	PIN
Support for USB Multilink Interface	P2

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/GW-MPC5748G for quick start.
- Example projects also includes the projects from Application Note, AN4830: Qorivva Recipes for MPC574xG
- More examples for reference can be found in S32DS as well as on nxp.com/DEVKIT-MPC5748G. Those example codes can be easily ported into GW-MPC5748G board.
- More examples will be updated in Quick Start Package.

List of existing code examples:

1. CAN
2. CANFD
3. Ethernet_MAC0 and SPI
4. Ethernet_MAC1
5. UART

Documentation

General Documents

- MPC5748G Microcontroller Data Sheet
- MPC5748G Microcontroller Reference Manual
- MPC5748G Microcontroller Fact Sheet
- GW-MPC5748G Board Fact Sheet
- Software Integration Guide (SWIG)
- SDK based Example Codes User Guide(ECUG)

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

Recommendations

- For high power/current consuming applications (like using all communication ports and OTA function) , please arise current safe limit or capability of your “DC Power Supplier”.
- External 12 V Supply Specifications
  - Fully regulated Switching Power Supply
  - Input Voltage: 100-240V AC 50/60Hz
  - Output: 12V 1A/2A DC
  - Recommend supplier like: *ITECH IT6721*
- 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 S32 SDK Up-to-date for best results.
- Post Technical Questions on NXP community for MPC5xxx.
- Useful Links:
  - www.nxp.com/mpc5748g
  - www.nxp.com/devkit-mpc5748g
  - www.nxp.com/s32ds
  - www.nxp.com/community

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