

MIRIAC™-EK5744

QUICK START GUIDE (QSG)

Ultra-Reliable MCUs for Industrial and Automotive Applications

www.nxp.com/Miriac-EK5744



EXTERNAL USE



SECURE CONNECTIONS
FOR A SMARTER WORLD

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Quick Start Package Overview

Board:

Miriac™-EK5744	Low cost functional safety evaluation kit with MPC5744P Auto quality MCU on board
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Documents:

Name	Description
Quick Start Guide(QSG)	Detailed description on availability of Hardware, Software and Documents to quick start with Miriac™-EK5744 (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 Miriac™-EK5744 board

Downloads:

Name	Description
Integrated Development Environment (IDE)	Eclipse based S32DS IDE with free GCC compiler and Debugger support
Miriac™-EK5744 Quick Start Package	Software examples and supporting documents for getting started with the Miriac™-EK5744
Miriac™-EK5744 Schematics	PDF schematic files for the Miriac™-EK5744
Miriac™-EK5744 PCB Design Package	Gerber Files

Step-by-Step Installation Instructions: Overview

In this quick start guide, you will learn how to set up the **Miriac™-EK5744** board and run the OOB. E.



1

Power the Evaluation Kit

Connect a 24V power supply to the power terminal.

2

Connect the I/O

Connect the UART port to PC, the Ethernet port to a LAN, and CAN ports each other.

3

Pull up a UART Terminal

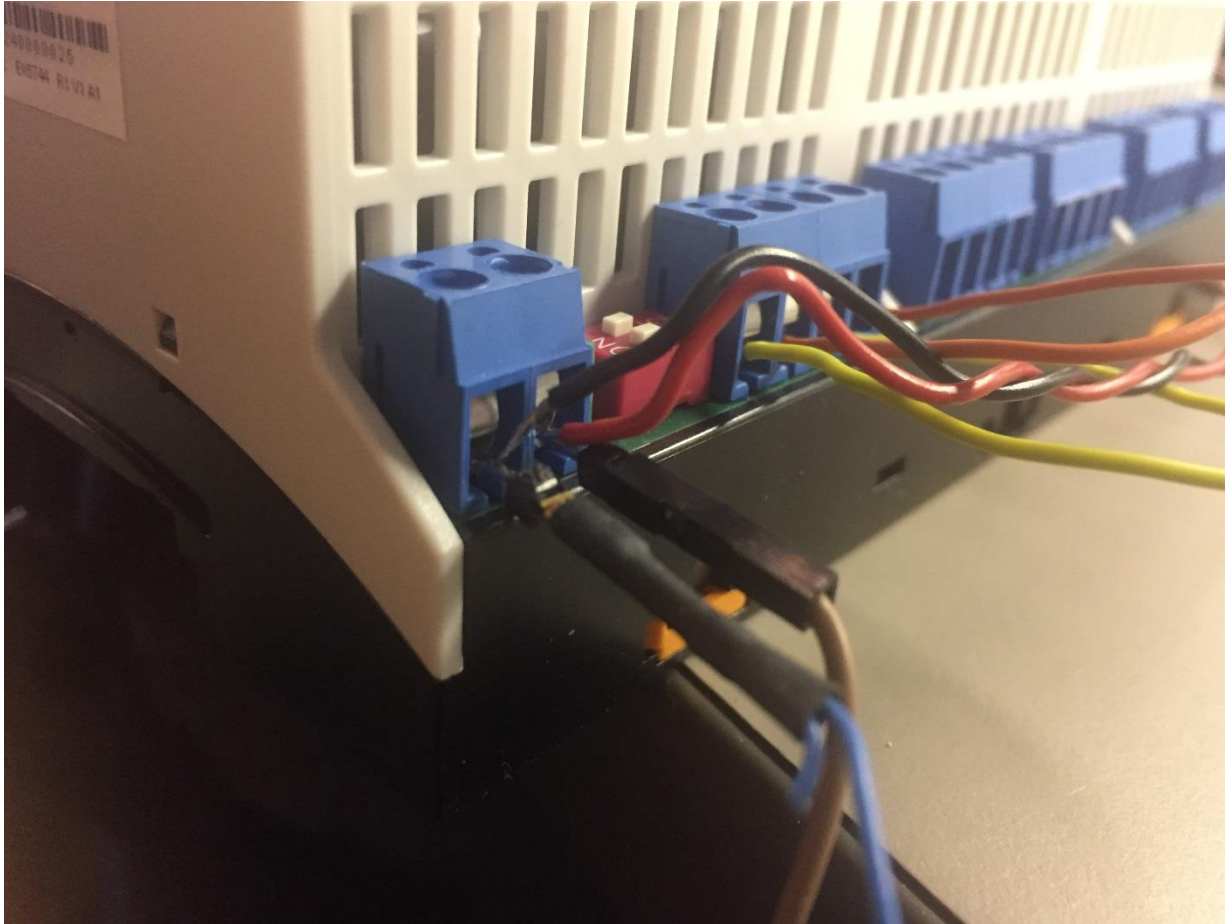
Open a UART terminal (e.g. Putty). Preloaded Miriac™-EK5744 firmware tests communication between the CAN ports.

4

Observe the Output

Watch the CAN ports communicate.

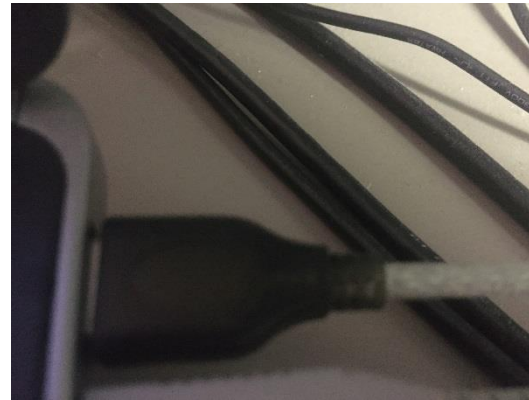
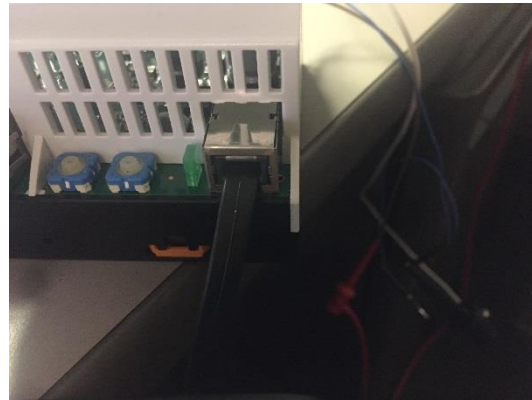
Step-by-Step Installation Instructions: Step 1



Connect a power supply to the power terminal. Miriac™-EK5744 is powered by through the 24V supply. The power can come from any DC power supply. The Miriac™-EK5744 supports 12-24V, but 24V is preferred in order to ensure all I/O behave properly.

Step-by-Step Installation Instructions: Step 2

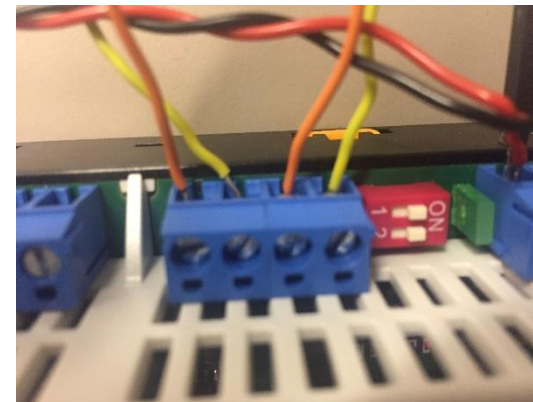
Make the following I/O connections



Connect console terminal to PC



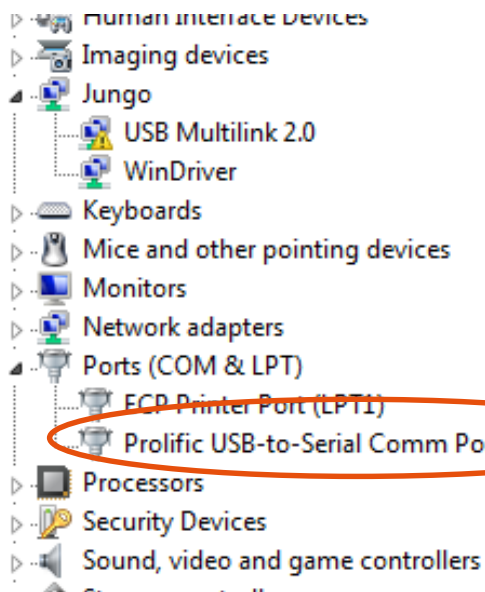
Connect ethernet to LAN



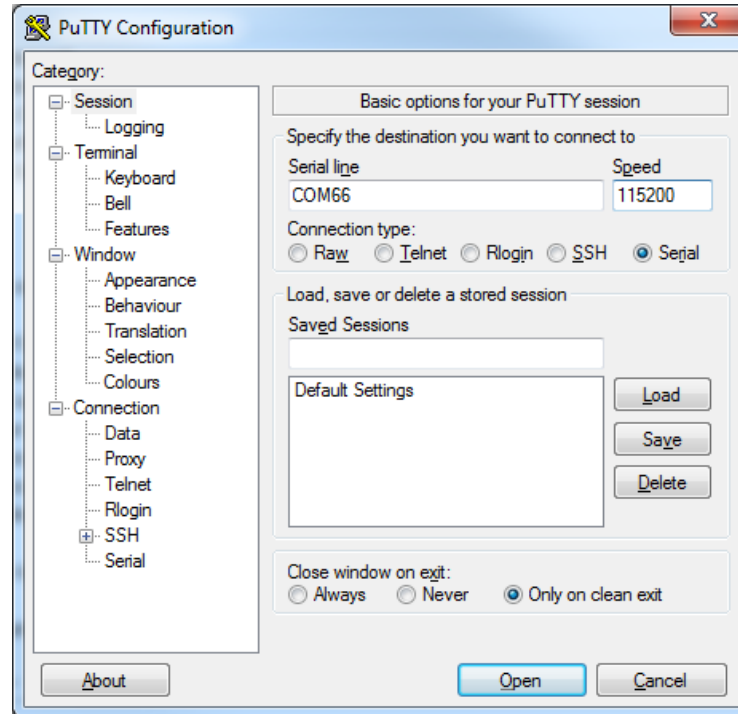
Connect CAN_H to CAN_H (orange)
and CAN_L to CAN_L (yellow)

Step-by-Step Installation Instructions: Step 3

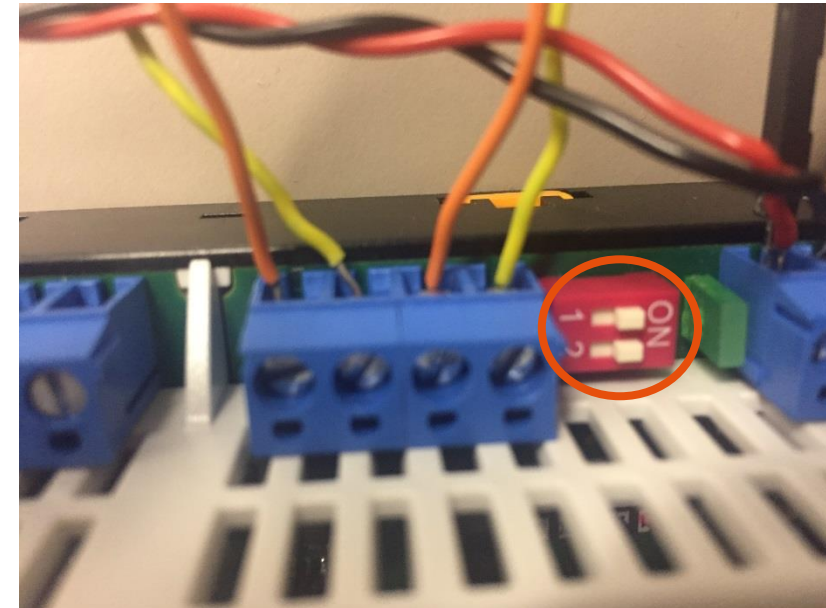
Find the EK5744's COMM port on your PC in Device Manager. Different for each computer



Load up terminal. Select the correct COMM port and use 115200 baud rate

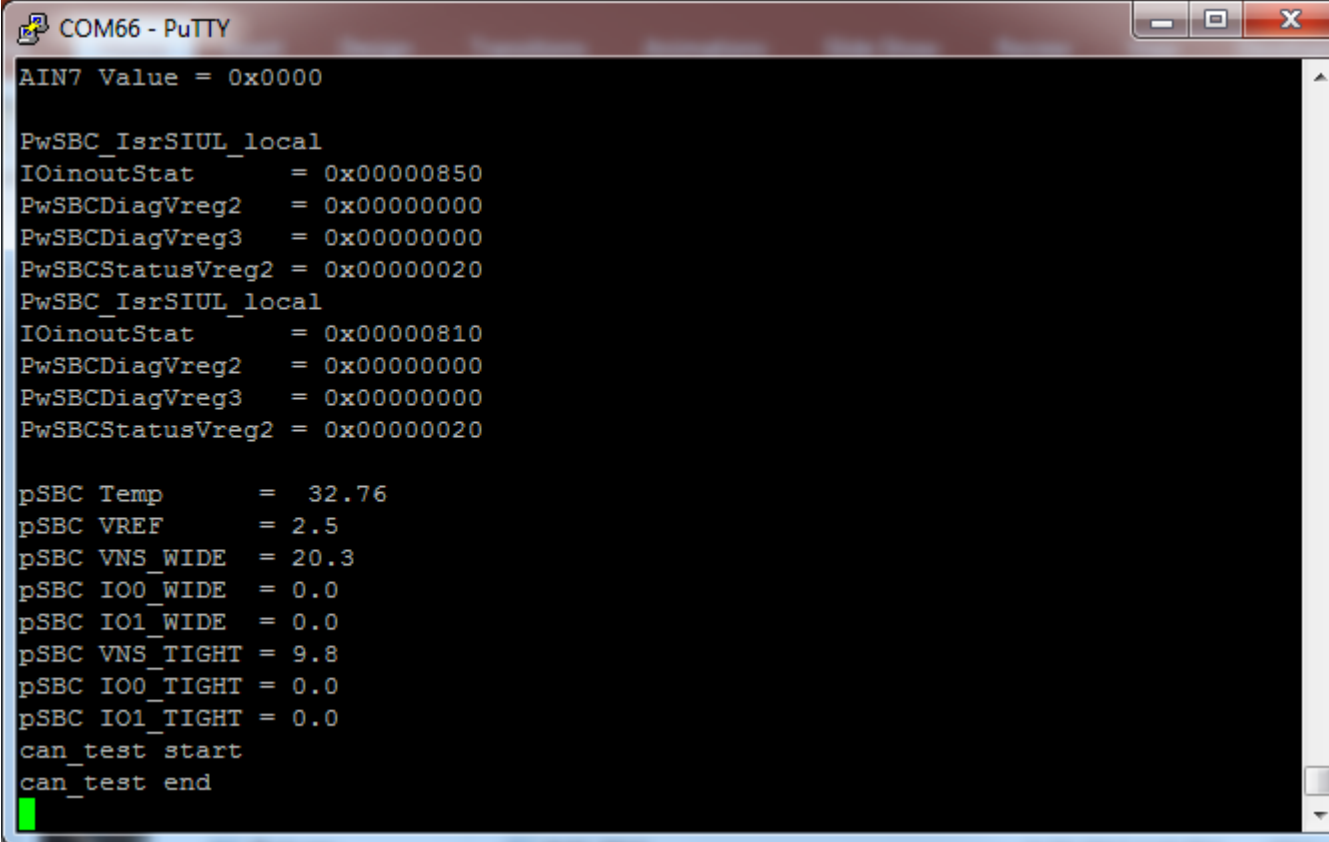


Make sure both CANs are enabled on the board



Step-by-Step Installation Instructions: Step 4

Observe the CAN test!



```
COM66 - PuTTY
AIN7 Value = 0x0000

PwSBC_IsrSIUL_local
IOinoutStat      = 0x00000850
PwSBCDiagVreg2   = 0x00000000
PwSBCDiagVreg3   = 0x00000000
PwSBCStatusVreg2 = 0x00000020
PwSBC_IsrSIUL_local
IOinoutStat      = 0x00000810
PwSBCDiagVreg2   = 0x00000000
PwSBCDiagVreg3   = 0x00000000
PwSBCStatusVreg2 = 0x00000020

pSBC Temp        = 32.76
pSBC VREF         = 2.5
pSBC VNS_WIDE    = 20.3
pSBC IO0_WIDE    = 0.0
pSBC IO1_WIDE    = 0.0
pSBC VNS_TIGHT   = 9.8
pSBC IO0_TIGHT   = 0.0
pSBC IO1_TIGHT   = 0.0
can_test start
can_test end
```


Miriac™-EK5744 Functional Safety Evaluation Kit: Features

- NXP MPC5744P-based functional safety kit
- 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
- 384 kB RAM (ECC) and 2.5 MB Flash (ECC)
- Up to 4 safe analog inputs (depending on desired SIL level)
- Up to 4 safe digital inputs (depending on desired SIL level)
- 4 safe digital outputs
- All I/O supports redundancy
- Easy access to the MCU I/O header pins for prototyping
- Advanced diagnostics on all I/Os and power inputs
- Basic abstraction layer for bus interfaces
 - CAN, UART, and Ethernet ports
- PLC on request
- 12-24V voltage range
- AutoSAR compatible hardware
- CANopen Safety (CIA304), Safety over EtherCAT, Profisafe, and openSAFETY on request

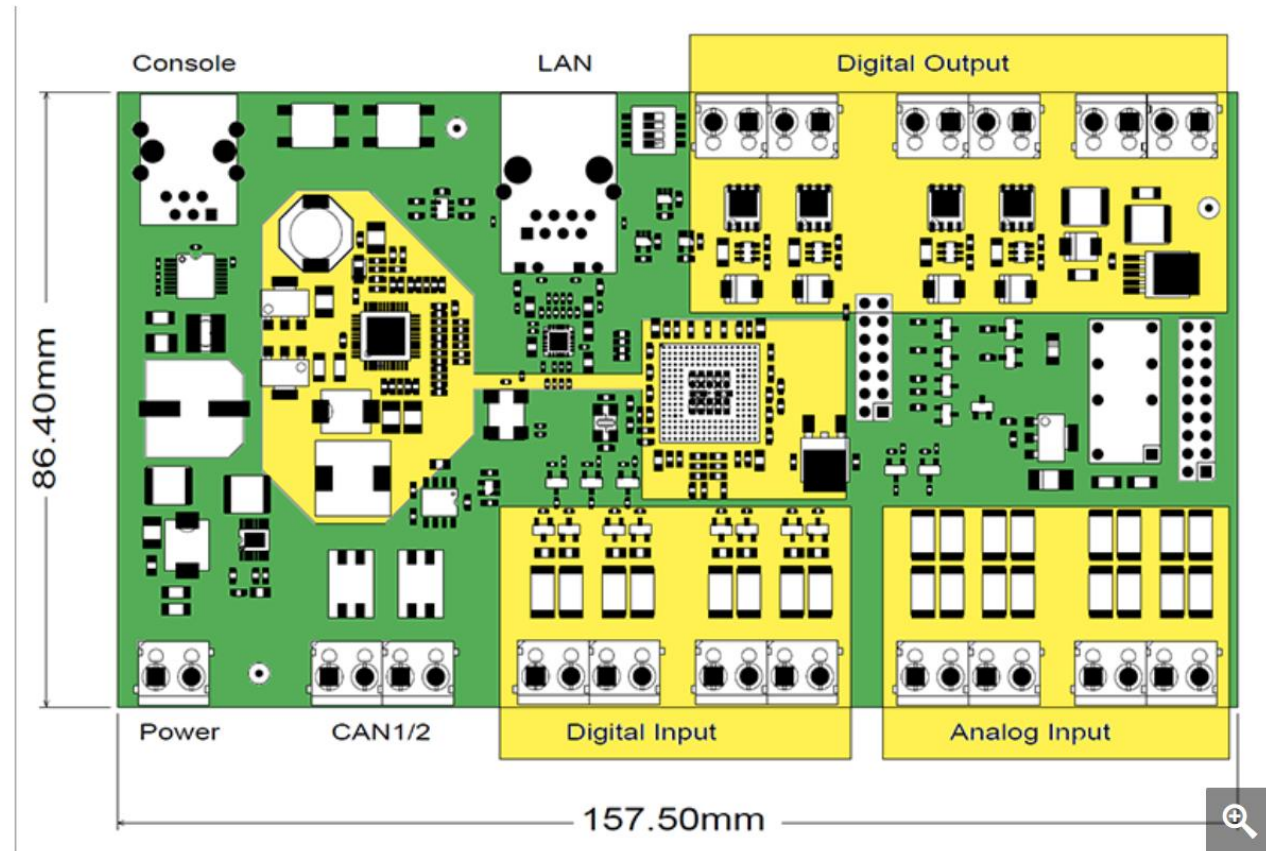


- Box includes:
 - Miriac™-EK5744
- Downloads include:
 - Appnotes
 - Code Examples
 - S32 Design Studio IDE
 - User Manual

Miriac™-EK5744 Functional Safety Evaluation Kit: Overview

The Miriac™-EK5744 is a low-cost functional safety kit for MPC5744P Microcontrollers. Built with functional safety in mind, you can base your production off this design, if you so desire.

Each I/O is redundant and has an associated GND pin. Therefore, all I/O ports occupy two pins on the outer rails. The LED next to each pin correspond to the state of the pin.



Miriac™-EK5744: Pinout 1 of 4



Relays & I/O Power

FUNCTION	PORT	PIN
	Relay	Relay
	GND	GND
Power Input	24V	24V
	GND	GND



Digital Outputs

FUNCTION	PORT	PIN
	PD10	DOUT0
	GND	GND
	PH8	DOUT1
	GND	GND



FUNCTION	PORT	PIN
	PA12	DOUT2
	GND	GND
	PA14	DOUT3
	GND	GND



Analog Inputs

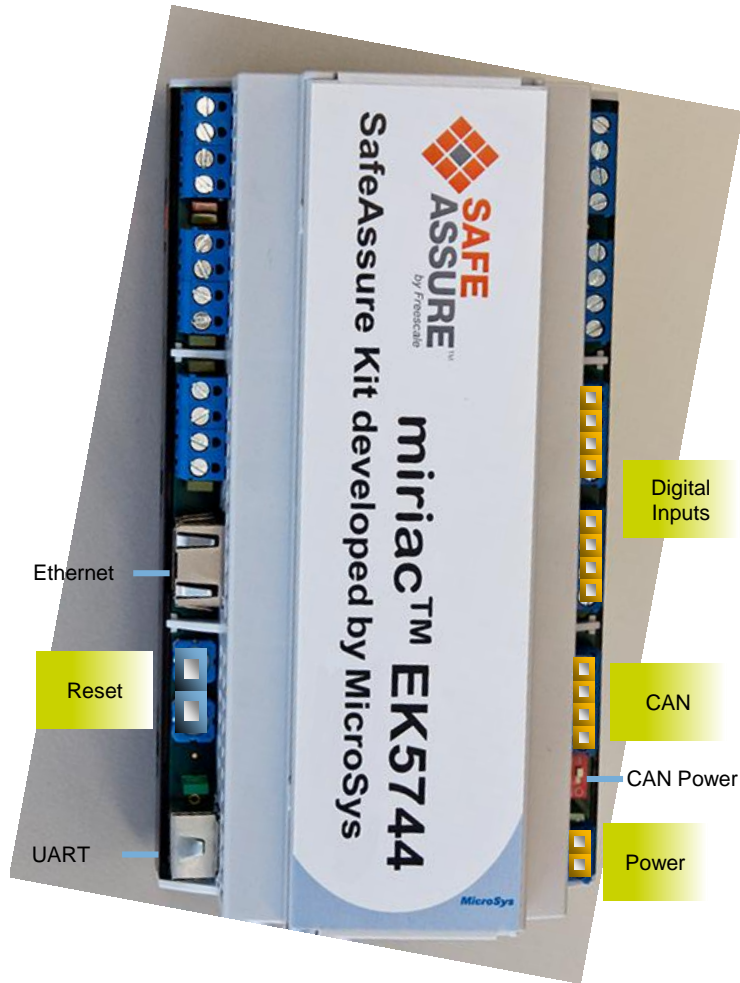
PIN	PORT	FUNCTION
GND	GND	
AIN3	PE6	
GND	GND	
AIN2	PE9	



PIN	PORT	FUNCTION
GND	GND	
AIN1	PB7	
GND	GND	
AIN0	PB9	



Miriac™-EK5744: Pinout 2 of 4



Reset

FUNCTION	PORT	PIN
Active Low	EXT_POR_B	POR
Active Low	RESET_B	Reset



Analog Inputs



PIN	PORT	FUNCTION
GND	GND	
DIN3	PD11	
GND	GND	
DIN2	PH9	



PIN	PORT	FUNCTION
GND	GND	
DIN1	PH11	
GND	GND	
DIN0	PE13	

CAN Ports



PIN	PORT	FUNCTION
		CAN2_H
		CAN2_L
		SBC-CAN_H
		SBC-CAN_L

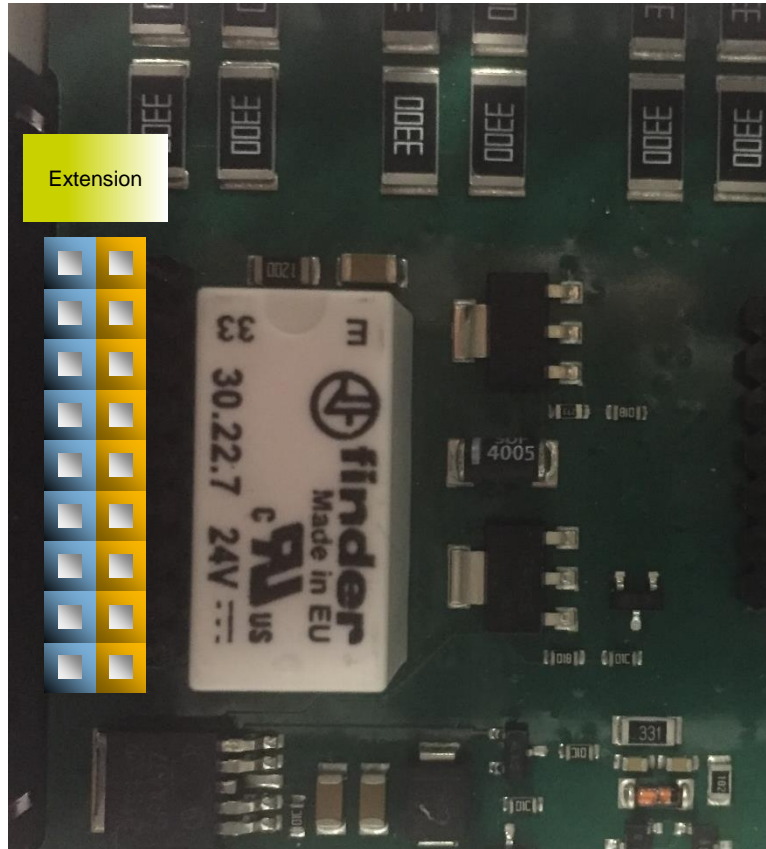
Power



PIN	PORT	FUNCTION
VDD	24V	
GND	GND	



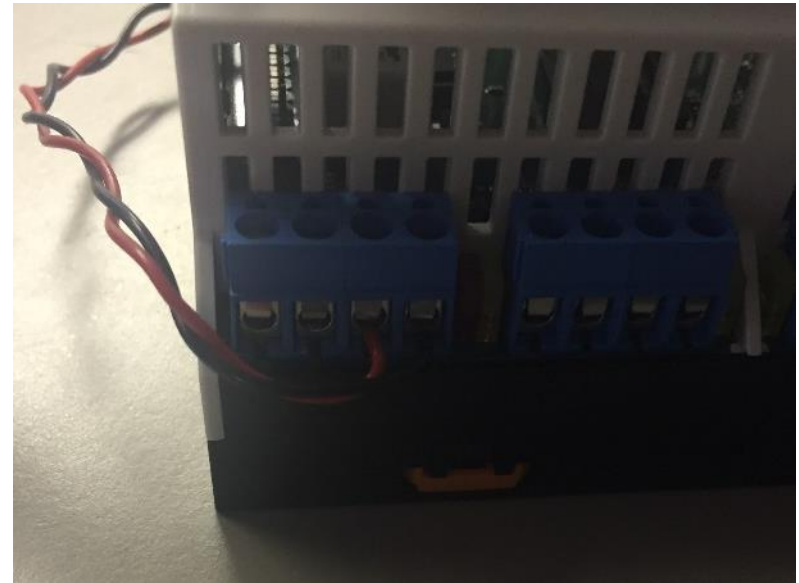
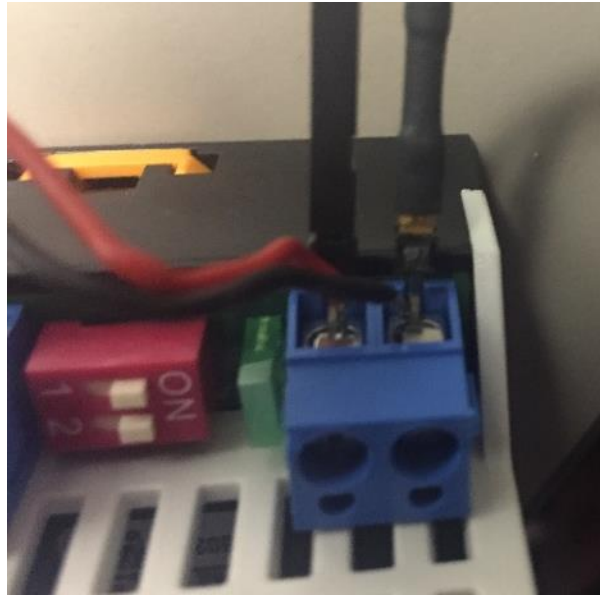
Miriac™-EK5744: Pinout 3 of 4



FUNCTION			Extension		FUNCTION		
	VDD	3.3V			GND	GND	
	PA0	GPIO0			GPIO1	PA1	
	PA9	GPIO9			GPIO13	PA13	
	NC	NC			NC	NC	
	NC	NC			NC	NC	
	PC11	GPIO43			GPIO44	PC12	
	PC14	GPIO46			GPIO62	PD14	
	PF13	GPIO93			GPIO107	PG11	
	GND	GND			GPIO135	PI7	

Miriac™-EK5744: Pinout 4 of 4

I/O must be powered externally with 24V input. Red LED will turn on to indicate I/O has power.

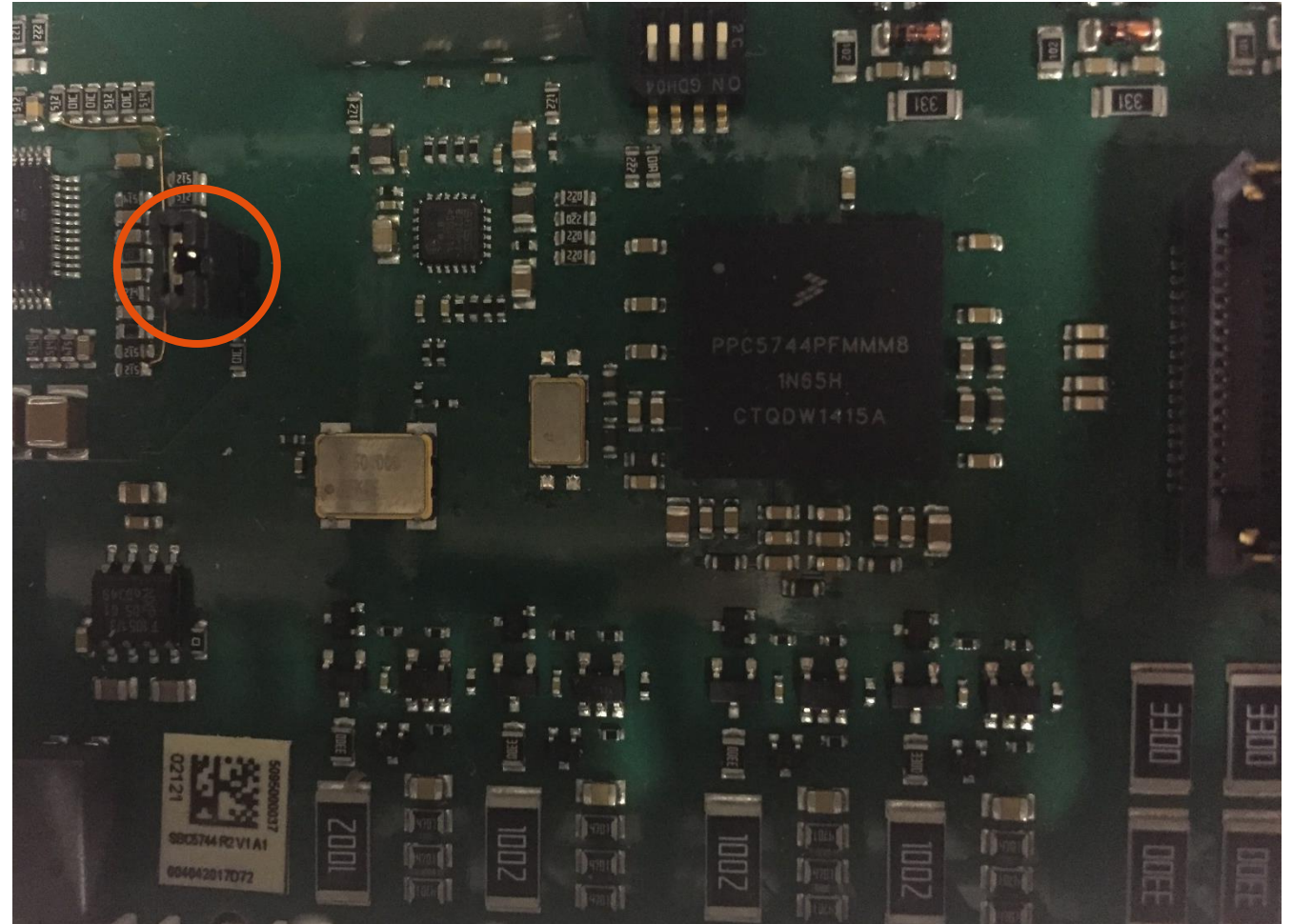


Connect 24V (red and black) to power IO

Miriac™-EK5744: Programming Interface 1 of 5

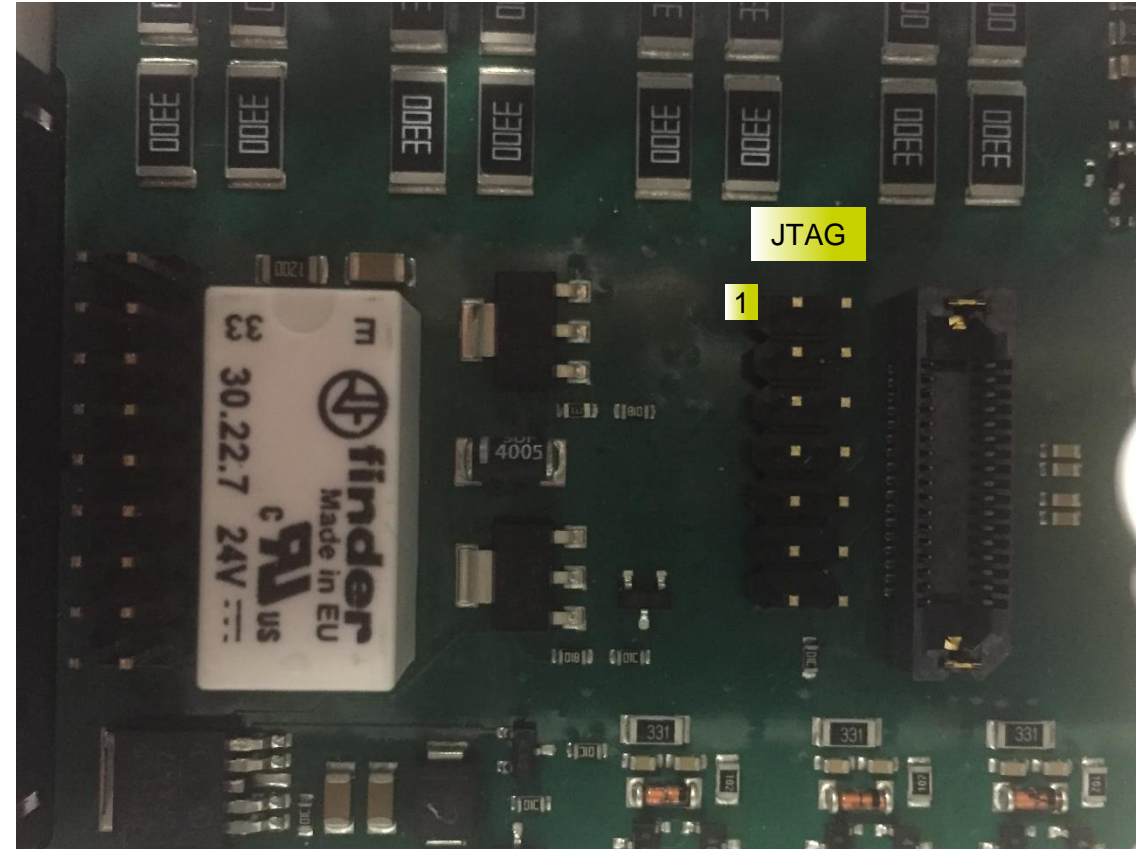
The Miriac™-EK5744 has a debug jumper. Short it to debug:

Connected: Debug Enabled
Disconnected: Debug Disabled



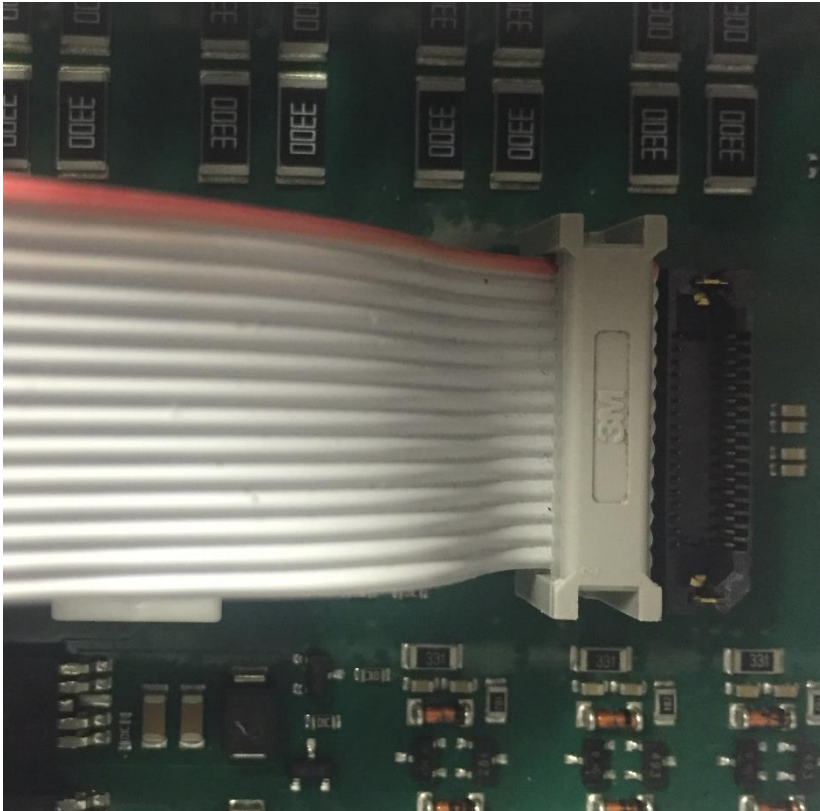
Miriac™-EK5744: Programming Interface 2 of 5

JTAG is supported in the Miriac™-EK5744. Shown is the port as well as the location of Pin 1. Make sure the red wire of the JTAG connector is on the side of Pin 1.



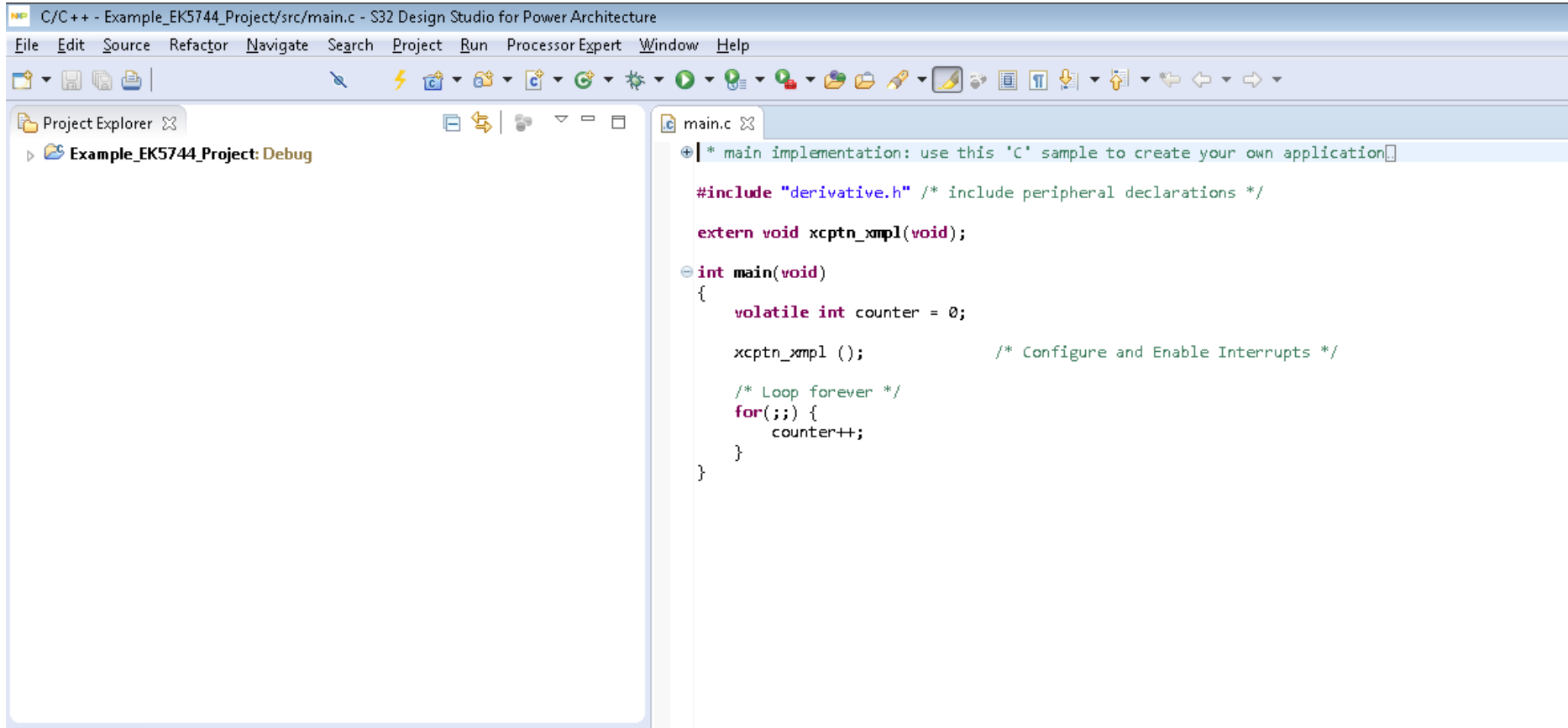
Miriac™-EK5744: Programming Interface 3 of 5

Use a JTAG interface, such as P&E Multilink to debug the board. Connect the JTAG connector to terminal with the red cable on the side of Pin 1. Allows you to program the Miriac™-EK5744 with S32DS.



Miriac™-EK5744: Programming Interface 4 of 5

Open your S32DS project



The screenshot shows the S32 Design Studio for Power Architecture IDE. The title bar reads "C/C++ - Example_EK5744_Project/src/main.c - S32 Design Studio for Power Architecture". The menu bar includes File, Edit, Source, Refactor, Navigate, Search, Project, Run, Processor Expert, Window, and Help. The toolbar contains various icons for file operations, editing, and execution. The Project Explorer on the left shows a project named "Example_EK5744_Project: Debug". The main editor window displays the following C code in "main.c":

```
/* main implementation: use this 'C' sample to create your own application */

#include "derivative.h" /* include peripheral declarations */

extern void xcptn_xmpl(void);

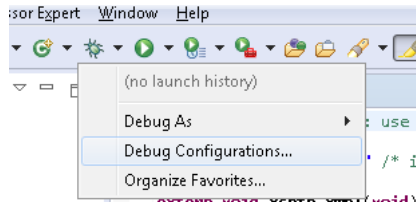
int main(void)
{
    volatile int counter = 0;

    xcptn_xmpl ();          /* Configure and Enable Interrupts */

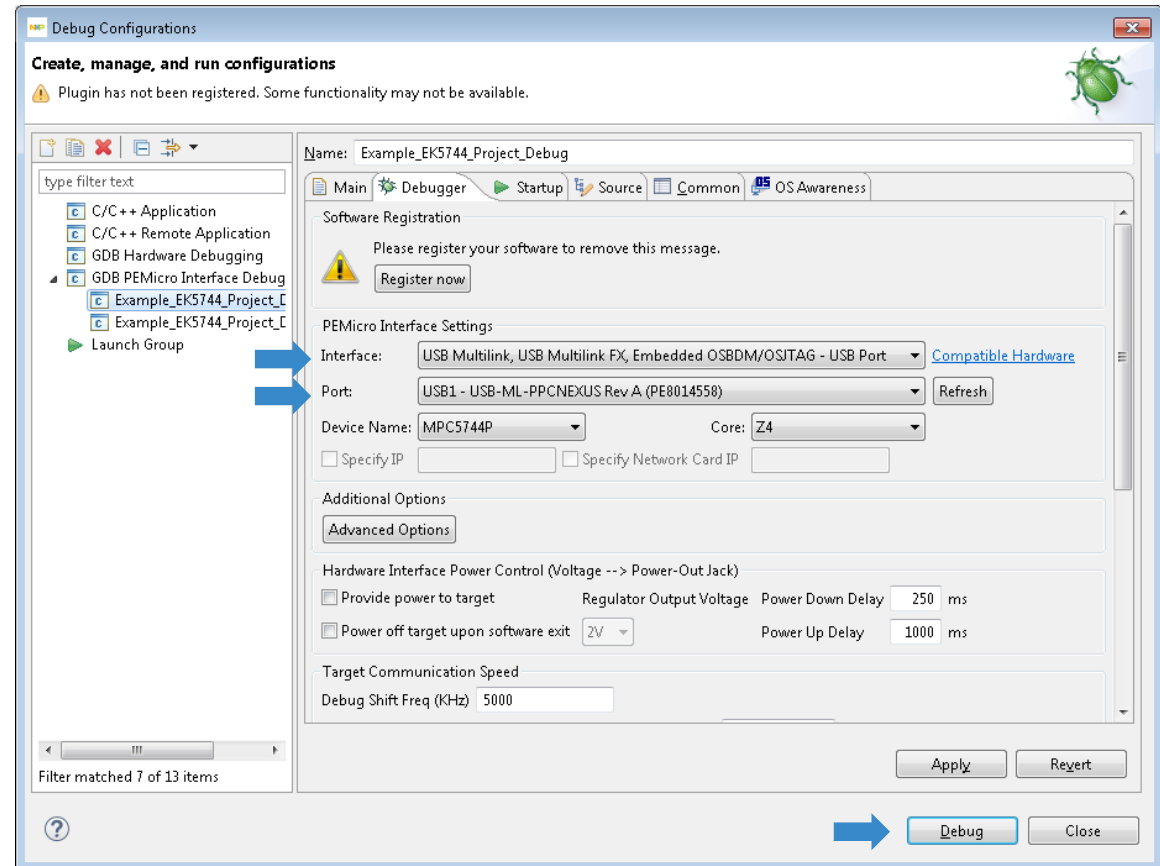
    /* Loop forever */
    for(;;) {
        counter++;
    }
}
```

Miriac™-EK5744: Programming Interface 5 of 5

- Open the debug configurations



- Make sure the debug interface for your project is USB Multilink
- Hit **Debug**
- S32DS will program the Miriac™-EK5744 through the JTAG port



Package Level Pinout Diagram – MPC5744P (257 MAPBGA)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A	VSS_HV_IO	VSS_HV_IO	A[14]	A[9]	D[3]	JCOMP	H[12]	C[15]	VDD_HV_IO	I[3]	E[13]	J[1]	F[15]	H[13]	F[13]	VSS_HV_IO	VSS_HV_IO
B	VSS_HV_IO/VSS_LV_COR	VDD_HV_IO	F[3]	D[2]	B[6]	F[0]	D[4]	D[0]	VSS_HV_IO	E[14]	A[10]	B[3]	H[0]	C[10]	J[3]	VDD_HV_IO	VSS_HV_IO
C	I[15]	J[0]	VSS_HV_IO	FCCU_F[1]	A[13]	I[0]	H[10]	E[15]	H[11]	I[14]	J[2]	B[2]	H[6]	E[1]	VSS_HV_IO	B[0]	H[15]
D	A[6]	I[7]	A[15]	C[6]	N/C	EXT_POR_B	A[12]	VDD_HV_IO	VSS_HV_IO	A[11]	[2]	F[14]	[4]	VDD_HV_IO	VPP_TEST	A[4]	F[12]
E	F[4]	F[6]	D[1]	NMI_B	.	.	.	.	.	.	.	.	.	N/C	C[13]	G[3]	D[14]
F	F[5]	H[7]	H[5]	H[4]	.	VDD_LV_COR	VDD_LV_COR	VDD_LV_COR	VDD_LV_COR	VDD_LV_COR	VDD_LV_COR	VDD_LV_COR	.	C[14]	D[12]	G[4]	G[2]
G	MDD0	VDD_HV_IO	C[5]	A[7]	.	VDD_LV_COR	VSS_LV_COR	VSS_LV_COR	VSS_LV_COR	VSS_LV_COR	VSS_LV_COR	VDD_LV_COR	.	E[4]	A[3]	J[8]	G[6]
H	A[8]	VSS_HV_IO	C[4]	A[5]	.	VDD_LV_COR	VSS_LV_COR	VSS_LV_COR	VSS_LV_COR	VSS_LV_COR	VSS_LV_COR	VDD_LV_COR	.	G[12]	TMS	VDD_HV_FLT	TCK
J	C[7]	I[4]	F[8]	F[7]	.	VDD_LV_COR	VSS_LV_COR	VSS_LV_COR	VSS_LV_COR	VSS_LV_COR	VSS_LV_COR	VDD_LV_COR	.	G[13]	H[1]	VDD_LV_NEXUS	B[5]
K	J[9]	F[10]	F[9]	I[8]	.	VDD_LV_COR	VSS_LV_COR	VSS_LV_COR	VSS_LV_COR	VSS_LV_COR	VSS_LV_COR	VDD_LV_COR	.	G[15]	H[0]	VSS_LV_NEXUS	J[10]
L	H[8]	F[11]	I[9]	D[8]	.	VDD_LV_COR	VSS_LV_COR	VSS_LV_COR	VSS_LV_COR	VSS_LV_COR	VSS_LV_COR	VDD_LV_COR	.	A[2]	G[14]	N/C	J[11]
M	VDD_HV_OSC	VDD_HV_IO	I[10]	D[5]	.	VDD_LV_COR	VDD_LV_COR	VDD_LV_COR	VDD_LV_COR	VDD_LV_COR	VDD_LV_COR	VDD_LV_COR	.	C[12]	I[6]	G[7]	G[5]
N	XTAL	VSS_HV_IO	D[9]	VSS_LV_PLL	.	.	.	.	.	.	.	.	.	G[8]	I[5]	VDD_LV_LFAST	VSS_LV_LFAST
P	VSS_HV_OSC	RESET_B	D[6]	VDD_LV_PLL	I[12]	I[13]	B[8]	J[5]	J[6]	J[7]	E[14]	A[0]	H[14]	G[9]	N/C	C[11]	D[11]
R	EXTAL	FCCU_F[0]	VSS_HV_IO	D[7]	B[7]	E[6]	VDD_HV_ADRE0	E[10]	VDD_HV_ADRE1	E[13]	E[15]	C[0]	BCTRL	N/C	VSS_HV_IO	D[10]	G[10]
T	VSS_HV_IO	VDD_HV_IO	I[1]	C[1]	E[5]	E[7]	VSS_HV_ADRE0	E[11]	VSS_HV_ADRE1	VDD_HV_ADV	E[10]	E[12]	E[0]	A[1]	G[11]	VDD_HV_IO	VSS_HV_IO
U	VSS_HV_IO	VSS_HV_IO	I[11]	E[4]	C[2]	E[2]	B[9]	E[12]	VSS_HV_ADV	E[9]	E[11]	N/C	N/C	VDD_HV_PMU/IO	N/C	VSS_HV_IO	VSS_HV_IO



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
 - iSystem winIDEA IDE
 - Sourcery™ CodeBench Development Tools
- Debuggers
 - P&E USB Multilink
 - iSystem iC6000
 - Lauterbach TRACE32 JTAG Debugger



Pre-Compiled Code Examples

- Download the Miriac™-EK5744 Quick Start Package to obtain code examples
- Example projects also includes the projects from Application Note, [AN4830: Qorivva Recipes for MPC574xG](#), migrated to MPC5744P platform

NOTE: Run these examples with S32DS for Power Architecture v1.2 or later

List of code examples:

1. sbc5744demo2 (Out-of-Box example)
2. Hello World
3. Hello World + PLL
4. Hello World + PLL + Interrupts
5. DMA
6. eTimer Frequency Measurement
7. eTimer Count
8. Flash ECC
9. FlexCAN
11. UART
12. TSENS
13. XBIC+DMA
14. FlexPWM
15. Register Protection
16. FCCU
17. LP STOP



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 Miriac™ EK5744 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 x 16 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 Miriac™ EK5744 platform

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 up-to-date for best results
- Post Technical Questions on NXP community for [MPC5xxx](#).
- Useful Links:
 - [MPC5744P Webpage](#)
 - [Miriac™ EK5744 Webpage](#)
 - nxp.com/s32ds
 - nxp.com/community





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