



Software Release Notes

EtherCAT Software Framework (ESF)


REV	DATE	DESCRIPTION OF CHANGE
 <p>MICROCHIP Microchip Technology, Inc.</p> <p style="text-align: right;">Microchip Technology, Incorporated 2355 W. Chandler Boulevard Chandler, Arizona 85224 480/792-7416</p>		
1.00	Aug 26, 2020	Dummy cycle support for SPI & SQI firmware with all modes Addressed code review comments and code cleanup and Bug fixes Make ESF compliant to PC-Lint 2012 standard and as error free
1.01	Oct 05, 2020	Bug Fix -Odd address register access
1.02	Oct 09, 2020	HBI Direct mode support with 8bit and 16bit
1.10	Oct 29, 2020	HBI Direct mode with DC enable fix and code cleanup.
1.20	Nov 20, 2020	Bug Fix - 3 port mode failure and PDI counter error observed
1.21	Nov 27, 2020	HBI Multiplexed Single Phase 16 bit Direct and Indirect Mode
1.22	Dec 24, 2020	HBI Multiplexed Dual Phase 16 Bit and 8 Bit Direct/Indirect Mode
1.23	May 19, 2021	REV C support - Added Emulation support in ESF - Changed the SAMD51 clock source as External clock from LAN9253 - Created new demo project for LAN9252 EVB
1.24	Jul 11, 2022	Added DMA support for SPI Direct mode
1.25	Oct 03, 2022	Added DMA support for SPI Indirect and Beckhoff Mode
1.26	Oct 27,2022	Bug Fix - 4 Bytes DMA failure in Twincat for SPI Direct mode
1.27	Mar 03,2023	Bug Fix - LAN9252 Rev C EVB error led handling

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1 Introduction

Component Type	Firmware Framework
Target Silicon	LAN9253
Where can an end user see the version number	Version number included in ESF > Source > ESC > ProjectVersion.h

This document contains the EVB- LAN9253 EtherCAT Slave Controller SDK – SAMD51 firmware samples based on EVB-LAN9253-SAMD51 platform.

2 Release notes

2.1 Version 1.27

Release date	03-Mar-2022
Release Type	Beta
Pre-requisites (if any)	EVB_LAN9253_SAMD51, EVB_LAN9252_SAMD51
Source code path	https://bitbucket.microchip.com/scm/ung_apps/ethercat-software-framework-public-new.git
Source code label / branch & perforce change list number	Tag: ESF_STACK_V1.27

2.1.1 Not implemented / Limited functionality requirements

- **UNG_ESF-2:** CLONE - Harmony configuration is needed for the existing project.
- **UNG_ESF-28:** Compilation issues observed in LAN9252 for SPI and SQI modes with certain build environments.
- **UNG_ESF-36:** Compilation issues are observed with Sync mode due to Sync 0 and Sync 1 API's defined but not used.

2.1.2 Bug Fixes

- **UNG_ESF-10:** CLONE - Error LED functioning issue for LAN9252
- Added fix for code handling Error Led. LAN9252 does not control the led, so controlling is done through SAMD51. The code is available in LAN925x.c.

2.1.3 Features added

None

2.1.4 Notes

- The default frequency configured is 20 MHz.
- Migrated to new ESF directory [UNG_ESF](#) and all the not implemented / Limited functionality requirements have been added to the project.
- Added the ESI Files, SSC and Hex files for LAN9252.
- Closed UNG_ESF-1 due to known limitation in SAM controllers.

2.2 Version 1.26

Release date	27-Oct-2022
Release Type	Beta
Pre-requisites (if any)	EVB_LAN9253_SAMD51, EVB_LAN9252_SAMD51
Source code path	https://bitbucket.microchip.com/scm/ung_apps/ethercat-software-framework-public-new.git
Source code label / branch & perforce change list number	Tag: ESF_STACK_V1.26

2.2.1 Not implemented / Limited functionality requirements

- **UNG_ESF-2: CLONE** - Harmony configuration is needed for the existing project.
- **UNG_ESF-1: CLONE** - Enable DMA support for SQI (Direct and Indirect Modes).

2.2.2 Bug Fixes

- **UNG_ESF-4: Init-preop** observed in twincat for 4 Bytes DMA transfer
- Added DRV_SPITransferReceive API to perform Read and write. The resultant read data is stored in AL event register, which provides the required delay for SPI Fastread setup phase transfer for SPI Direct mode.

2.2.3 Features added

None

2.2.4 Notes

- The default frequency configured is 20 MHz.
- Migrated to new ESF directory [UNG_ESF](#) and all the not implemented / Limited functionality requirements have been added to the project.

2.3 Version 1.25

Release date	03-Oct-2022
Release Type	Beta
Pre-requisites (if any)	EVB_LAN9253_SAMD51, EVB_LAN9252_SAMD51
Source code path	https://bitbucket.microchip.com/scm/ung_apps/ethercat-software-framework-public-new.git
Source code label / branch & perforce change list number	Tag: ESF_STACK_V1.25

2.3.1 Not implemented / Limited functionality requirements

- **ESF-331:** Harmony configuration is needed for the existing project.
- **ESF-338:** Enable DMA support for SQI (Direct and Indirect Modes).

2.3.2 Bug Fixes

- **ESF-333:** SPI clock cannot be configured for values greater than half of the MCU clock frequency.
- **ESF-334:** Delay is generated in read and write while implementing SPI DMA transfer.
 - Delay can be avoided by making intra and inter dummy bytes to zero. This feature can be implemented by commenting `INCLUDE_DUMMY` macro in `ESF_Config.h` to obtain minimum cycle time.
- **ESF-335:** SPI Read and write fails for frequency above 40 MHz.
 - Changed the priority of the RX handler to 1 to avoid overwriting by TX handler.

2.3.3 Features added

- **ESF-327:** LAN9253- PDO Maximum size restriction.
- **ESF-329:** Change the IRQ API length from `DWORD` to max length.
- **ESF-330:** J2-EVB: Update the SPI driver to create continuous clock.
- **ESF-336:** Enable DMA support for SPI Indirect mode.
- **ESF-337:** Enable DMA support for SPI Beckhoff mode

2.3.4 Notes

- The default frequency configured is 20 MHz.
- The maximum frequency that can be configured is 60 MHz for SPI Direct and Indirect mode and 25 MHz for SPI Beckhoff mode.
- The present firmware implementation is valid for all SPI, SQI and HBI modes. However, the DMA implementation is applicable only for SPI modes.
- DMA implementation can be disabled by commenting `ESF_SPI_DMA_EN` macro in `ESF_Config.h`

2.4 Version 1.24

Release date	11-Jul-2022
Release Type	Beta
Pre-requisites (if any)	EVB_LAN9253_SAMD51, EVB_LAN9252_SAMD51
Source code path	https://bitbucket.microchip.com/scm/ung_apps/ethercat-software-framework-public-new.git
Source code label / branch & perforce change list number	Tag: ESF_STACK_V1.24

2.4.1 Not implemented / Limited functionality requirements

- **ESF-331:** Harmony configuration is needed for the existing project.
- **ESF-334:** Delay is generated in read and write while implementing SPI DMA transfer.
- **ESF-335:** Read and Write data mismatch for SPI frequency above 30 MHz.
- **ESF-338:** Enable DMA support for SQI (Direct and Indirect Modes).

2.4.2 Bug Fixes

- **ESF-332:** When transfer length is 2 Bytes the number of data read is more than the actual length.

2.4.3 Features added

- Added Harmony generated SPI Driver to the ESF stack.
- Enabled DMA support for SPI Indirect and Beckhoff mode.
- The data sent in a single buffer instead of byte by byte transactions.

2.4.4 Notes

- The default frequency configured is 20 MHz.
- The maximum frequency that can be configured is 30 MHz.
- For obtaining ideal cycle time fix the Intra D-word dummy bytes to zero.
- The present firmware implementation is valid only for SPI Direct Mode and implementation of Indirect and Beckhoff for both SPI and all the three modes of SQI will not be valid.

2.5 Version 1.23

Release date	19-May-2021
Release Type	Beta
Pre-requisites (if any)	EVB_LAN9253_SAMD51, EVB_LAN9252_SAMD51
Source code path	https://bitbucket.microchip.com/scm/ung_apps/ethercat-software-framework-public-new.git
Source code label / branch & perforce change list number	Tag: ESF_STACK_V1.23

2.5.1 Not implemented / Limited functionality requirements

None

2.5.2 Bug Fixes

None

2.5.3 Features added

- **ESF-319:** ESF REV C support, created new demo project for LAN9252 EVB

2.5.4 Notes

- The Rev C changes are added under conditional macro, to support backwards software version compatibility and the macro used is `CONFIG_USE_EXTERNAL_CLOCK_SOURCE`

2.6 Version 1.22

Release date	24-Dec-2020
Release Type	Beta
Pre-requisites (if any)	JUTLAND2-SVB3, PIC32 ADD-ON board
Source code path	https://bitbucket.microchip.com/scm/ung_apps/ethercat-software-framework-public-new.git
Source code label / branch & perforce change list number	Tag: ESF_STACK_V1.22

2.6.1 Not implemented / Limited functionality requirements

None

2.6.2 Bug Fixes

- **ESF- 308:** Provide support for HBI Multiplexed Dual phase 16-bit direct mode and Indirect Mode
- The PDI selection along with access mode (16bit_direct_mode/16bit_Indirect_mode) can be selected through the project configuration.
- **ESF – 309:** Provide support for HBI Multiplexed Dual phase 8-bit direct mode and Indirect Mode
- The PDI selection along with access mode (8bit_direct_mode/8bit_Indirect_mode) can be selected through the project configuration.

2.6.3 Features added

None

2.6.4 Notes

- The default frequency configured as 80MHz

2.7 Version 1.21

Release date	27-Nov-2020
Release Type	Beta
Pre-requisites (if any)	JUTLAND2-SVB3, SAME70 ADD-ON board
Source code path	https://bitbucket.microchip.com/scm/ung_apps/ethercat-software-framework-public-new.git
Source code label / branch & perforce change list number	Tag: ESF_STACK_V1.21

2.7.1 Not implemented / Limited functionality requirements

None

2.7.2 Bug Fixes

- **ESF-303:** Provide support for HBI Multiplexed Single phase 16-bit direct mode and Indirect Mode
- The PDI selection along with access mode (16bit_direct_mode/16bit_Indirect_mode) can be selected through the project configuration.

2.7.3 Features added

None

2.7.4 Notes

- The default frequency configured as 80MHz

2.8 Version 1.20

Release date	20-Nov-2020
Release Type	Bug Fix
Pre-requisites (if any)	JUTLAND2-SVB3, SAME70 ADD-ON board
Source code path	https://bitbucket.microchip.com/scm/ung_apps/ethercat-software-framework-public-new.git
Source code label / branch & perforce change list number	Tag: ESF_STACK_V1.20

2.8.1 Not implemented / Limited functionality requirements

None

2.8.2 Bug Fixes

- ESF-299: 3port mode failed in PDI counter error test

2.8.3 Features added

None

2.8.4 Notes

- The default frequency configured as 60MHz

2.9 Version 1.10

Release date	29-Oct-2020
Release Type	Bug Fix
Pre-requisites (if any)	JUTLAND2-SVB3, SAME70 ADD-ON board
Source code path	https://bitbucket.microchip.com/scm/ung_apps/ethercat-software-framework-public-new.git
Source code label / branch & perforce change list number	Tag: ESF_STACK_V1.10

2.9.1 Not implemented / Limited functionality requirements

- HBI Indirect mode with 8bit verified with basic OP mode verification.

2.9.2 Bug Fixes

- ESF-287: HBI De-mux DC compliance issue

2.9.3 Features added

None

2.9.4 Notes

- The PDI selection along with access mode (8bit_direct_mode/16bit_direct_mode) can be selected through the project configuration.
- This Version include HBI single phase direct mode with 8bit and 16bit.

2.10 Version 1.02

Release date	08-Oct-2020
Release Type	Production
Pre-requisites (if any)	JUTLAND2-SVB3, SAME70 ADD-ON board
Source code path	https://bitbucket.microchip.com/scm/ung_apps/ethercat-software-framework-public-new.git
Source code label / branch & perforce change list number	Tag: ESF_STACK_V1.02

2.10.1 Not implemented / Limited functionality requirements

- HBI Indirect mode with 8bit and 16bit

2.10.2 Bug Fixes

None

2.10.3 Features added

- ESF-209: SAME70 support for ESF
Add Demo application, which uses HBI as PD interface. Provided the Demo application with Direct mode 8bit and 16bit modes.

2.10.4 Notes

- The PDI selection along with access mode (8bit_direct_mode/16bit_direct_mode) can be selected through the project configuration.

2.11 Version 1.01

Release date	05-Oct-2020
Release Type	Production
Pre-requisites (if any)	EVB-LAN9253-SAMD51Rev B
Source code path	https://bitbucket.microchip.com/scm/ung_apps/ethercat-software-framework-public-new.git
Source code label / branch & perforce change list number	Tag: ESF_STACK_V1.01

2.11.1 Not implemented / Limited functionality requirements

None

2.11.2 Bug Fixes

- ESF-278: Odd address read with any length is failing in ESF - SQI mode
- ESF-279: PDRAM write is failing in Indirect mode - ESF SQI Interface

2.11.3 Features added

None

2.11.4 Notes

- The PDI frequency can be selected through the ESF configuration file. The frequency can be given in MHz to `ESF_PDI_FREQUENCY`.
- The PDI selection along with access mode (Direct/indirect/Beckhoff) can be selected through the project configuration.

2.12 Version 1.00

Release date	26-Aug-2020
Release Type	Production
Pre-requisites (if any)	EVB-LAN9253-SAMD51Rev B
Source code path	https://bitbucket.microchip.com/scm/ung_apps/ethercat-software-framework-public-new.git
Source code label / branch & perforce change list number	Tag: ESF_STACK_V1.00

2.12.1 Not implemented / Limited functionality requirements

None

2.12.2 Bug Fixes

- ESF-226: ETG compliance failed with minimum cycle time response test
The minimum cycle time is a device parameter which will be read by the master. In our setup, TwinCAT master has the provision to read the device configured parameters. the configured parameters will be listed in SSC configuration file. The configured parameter should be compliant to the device. Currently the "Minimum cycle time" parameter configured with 100 Microseconds, whereas the device is not compliant to that. So updated the "minimum cycle time" parameter, so that the device is compliant to that value. The value updated through "SSC configuration file".
- ESF-214: ERROR LED test in Compliance is failing
ECAT_LED has access to UC instead of ESC. Updated the ESC config files and ESI files, which provides ECAT_LED access to ESC. Also, EEPROM config data updated, which enables RUN and ERROR LED operation.
- ESF-189: LAN9253 - Direct mode SPI unable to enter OP mode
The Issue observed only in the case of SPI Direct mode. Debug the Read and write API's by enabling the SW break points and its observed that the API works fine and able to read proper values. Whenever there is a state change from PreOP to SafeOP, then there is an interrupt, and which needs to be served by reading proper AL event register. In Direct mode, we missed to add the Read piece of code, So AL event register gets loaded with old value, which results the error in state change. Added the read part in HW_EventReadIsr.

2.12.3 Features added

- ESF-243: PDI Frequency as a configurable parameter through ESF Config file
Enable the PDI frequency selection as a configurable parameter through ESF configuration file.
- ESF-250: Dummy cycle support for SPI modes
Provide the Dummy cycle support for SPI demo application with all the modes, such as Direct, Indirect and Beckhoff modes.
- ESF-237: PCLint setup with MISRA 2012 standard
Make the ESF to be compliant to MISRA 2012 standard and lint error-free code
- ESF-245: LAN9253- Some ESF source files do not have Microchip license disclaimer
All the files under the ESF code base should be having Microchip license disclaimer note.
- ESF-233: SQI support for SAMD51 Indirect mode
Enable the QSPI support for SAMD51 indirect mode and setup with 20Mhz and 60Mhz and the device should be able to enter OP mode.

- **ESF-234: ESF - Integration of SQI and SPI into a single demo**
We have separate Demo for SQI sample application. The SPI demo should be single and configuration option should be provided through IDE configuration. So that separate build happens based on the selected configuration.
- **ESF-229: ESF - SQI support for SAMD51 Direct mode**
Enable the QSPI support for SAMD51 direct mode and setup with 20Mhz and 60Mhz and the device should be able to enter OP mode.
- **ESF-227: SPI access times xls updated - FIRMWARE code needs to be modified accordingly**
The dummy cycle must be integrated to the code and should be dynamic. The dummy cycle code should use the latest SPI access times.

2.12.4 Notes

- The PDI frequency can be selected through the ESF configuration file. The frequency can be given in MHz to `ESF_PDI_FREQUENCY`.
- The PDI selection along with access mode (Direct/indirect/Beckhoff) can be selected through the project configuration.