S32 SDK for S32V23x
Release Notes
Version 0.9.0 BETA

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1. Description

The S32 Software Development Kit (S32 SDK) is an extensive suite of peripheral drivers, RTOS, stacks and middleware designed to simplify and accelerate application development on NXP S32V23x ARM based microcontrollers.

This release has BETA quality status in terms of testing and quality documentation.
BETA releases are not fully qualified and tested. BETA releases are release candidates that can be used by customer for development and qualification. It is not recommended to be used in production.

This SDK can be used as is (see Documentation) or it can be used with S32 Design Studio IDE.

Refer to *License(License.txt)* for licensing information and *Software content register(SW-Content-Register-S32-SDK.txt)* for the Software contents of this product. The files can be found in the root of the installation directory.

For support and issue reporting use the following ways of contact:

- NXP Support to https://www.nxp.com/support/support:SUPPORTHOME
- NXP Community https://community.nxp.com/

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2. New in this release

2.1 Drivers

PINS

- Added support for managing the identifier field for each pin and generate it as a define in the code.

FLEXRAY

- Added driver.

CPU

- Added Cache Management API.
- Modified data and bss initialization mechanism. Regions that must be copied at startup or bss(zero initialized) regions are now grouped into two tables: zero_table and copy_table.

FLEXCAN, CAN_PAL

- Added bitrate configuration in S32CT components.

2.2 Examples

FreeRTOS

- Replaced makefile example with DS example project.

2.3 PAL

PWM_PAL

- Added default configuration for configurator.

ADC_PAL

- Configurator improvements.

2.4 Middleware

- Added configuration components for TCP/IP and SDHC.

2.5 RTOS

FreeRTOS

- Updated to v10.1.1

2.6 Fixed from EAR 0.8.1

Component	Description
adc_sar	ADC returned incorrect values when left aligned representation was used for conversion results.
can_pal	Configuration component allowed invalid message buffer allocation (RX FIFO plus MBs space to exceed available MBs no).
clock_manager	VIDEO_PLL_PHI0_CLK could not be routed to clock output pin.
clock_manager	Description for several clock names in "Module clocks" table was incorrect.
clock_manager	Divider enablement was not implemented.

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clock_manager	Values of selector entries generated by S32CT were incorrect for several peripheral clocks.
crc	When multiple instances of CRC were selected in peripheral tool, there were compilation errors.
eim	Added note in documentation for error recovery on channels 8 and 9, targeting Cortex-M4 System Cache Tag.
examples	Warnings were shown when examples were imported.
examples	Delay period was not large enough in hello_world_mkf.
examples	STM example was issuing warning because interrupt manager header file was not included in main.c
examples	STM example was not working according to description.
flexcan	Driver did not clear MB RAM, which could trigger the module to enter Freeze mode on parts with ecc memory detection.
header_file	CDATA bitfield width was changed from 12 to 16 to match ADC_SAR working behavior.
i2c	Default name for I2C configuration structure was updated to avoid duplicated variables.
i2c	Bus busy was checked in case the previous transfer ended with repeated start to avoid the case when the master is keeping the bus busy until stop is generated and next transfer are blocked.
i2c	If DMA configuration erros are detected I2C_DRV_MasterSendDataBlocking and I2C_DRV_MasterSendData returns STATUS_ERROR.
i2c_pal	Default name for I2C_PAL configuration structure was updated to avoid duplicated variables.
ic_pal	Some internal variables were updated to avoid unexpected behavior if IC_PAL over FTM channels are initialized as IC_DISABLE_OPERATION.
interrupt_manager	INT_SYS_GenerateDirectedCpuInterrupt method was removed from interrupt_manager public API because it did not feature any requirements, design and test cases.
mpu_pal	An error was raised when MPU access error attributes were checked.
phy	PHY_GetState returned active state even when the PHY was powered down.
phy	The value of the OUI field returned by PHY_GetID was incorrect.
pins	NUM_OF_CONFIGURED_PINS was not generated correctly by the pins component.
pins	PINS configurator was generating incorrect base addresses for some pins.
pins	PINS configurator was not allowing multiple configurations to be generated.

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pit	LPIT_DRV_InitChannel() was disabling interrupts for all channels, if interrupt was not enabled in the configuration structure.
pit	Duplicate configuration names were not checked in driver configurators.
power_manager	Duplicate configuration names were not checked in driver configurators.
pwm_pal	Updated PWM_PAL component to verify that the duty is lower or equal to the period, to check that there are no duplicate configurations for one channel and removed Fixed clock that is not available over FTM.
qspi	All drivers needed by QSPI were added automatically to project by CT component.
qspi	If errors are detected by QSPI the DMA channels used in transfer were disabled.
qspi	QSPI read modes were updated in CT to match the driver code.
stm	STM configurator did not allow configuration of multiple channels.
stm	Duplicate configuration names were not checked in driver configurators.
swt	When multiple instances of SWT were selected in peripheral tool, there were compilation errors.
wdog_pal	Hint for Timeout Value was not correct in WDG_PAL configurator.
xrdc	Duplicate configuration names were not checked in driver configurators.

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3. Software Contents

3.1 Drivers

- ADC_SAR
- CLOCK MANAGER
- CPU
- CRC
- CSE3
- DSPI
- EDMA
- EIM
- ENET
- ERM
- FCCU
- FLEXCAN
- FLEXRAY
- FTM
- HEADER
- HYPERFLASH
- I2C
- INTERRUPT MANAGER
- LINFLEXD_UART
- OSIF
- PHY
- PINS
- PIT
- POWER MANAGER
- QSPI
- SEMA42
- STM
- SWT
- USDHC
- WKPU
- XRDC

3.2 PAL

- ADC_PAL
- CAN_PAL
- I2C_PAL
- IC_PAL
- MPU_PAL
- OC_PAL
- PWM_PAL
- SECURITY_PAL
- SPI_PAL
- TIMING_PAL
- UART_PAL
- WDOG_PAL

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3.3 RTOS

- FreeRTOS version 10.1.1

3.4 Middleware

- SDHC
- TCP/IP

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4. Documentation

- Quick start guide available in “doc” folder.
- User and integration manual available at “doc\Start_here.html”.
- Driver user manuals available in “doc” folder.
- Release notes for Middleware available in “doc” folder.
- Documentation for the Middleware can be found in the respective folder.

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5. Examples

	Name	Description
Driver examples	adc_swtrigger	Shows the functionality of ADC_SAR
	adc_pal	Shows the functionality of ADC_PAL
	can_pal	Shows the usage of CAN PAL over FlexCAN interface
	crc_checksum	Calculates CRC using the peripheral driver for multiple standards
	edma_transfer	Shows the usage of eDMA
	eim_injection	Shows the functionality of the EIM
	enet_ping	Shows the functionality of ENET
	erm_report	Shows the functionality of the ERM
	fccu_fault_injection	Show the usage of FCCU driver
	flexcan	Shows the usage of FlexCAN driver configured as both bus master and slave
	flexray	Shows the functionality of FLEXRAY
	ftm	Shows the usage of the FTM
	linflexd_uart	Shows the functionality of LINFLEXD
	mpu_pal_memory_protection	Shows the usage of the MPU_PAL
	oc_pal	Shows the usage of the OC_PAL over FTM
	phy_autoneg	Shows the functionality of PHY
	pit_periodic_interrupt	Shows the usage of the PIT
	power_mode_switch	Transitions the MCU into all available power modes
	stm_periodic_interrupt	Shows the usage of the STM
	swt_interrupt	Shows the usage of the SWT
	timing_pal	Shows the usage of the TIMING_PAL over PIT and FTM
	uart_pal	Shows the usage of UART PAL over LinFlexD
	wdg_pal_interrupt	Shows the usage of the WDOG_PAL
	xrdc_memory_protection	Shows how to use Extended Resource Domain Controller
Demos	FreeRTOS	Shows the usage of FreeRTOS
	hello_world	This is a simple application created to show the basic configuration with S32DS
	hello_world_mkf	This is a simple application created to show the basic configuration with makefile for the supported compilers
	lwip	Shows the usage of TCP IP stack
	sdhc_fatfs	Shows the usage of SDHC stack

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6. Supported hardware and compatible software

6.1 CPUs

- S32V234 - 1N81U
- S32V232

The following processor reference manual has been used to add support:

- S32V234RM Rev. 3 10/2017

6.2 Boards

- EVB SBC-S32V234 Microsys
- X-TR-DVAL-625 PCB RevX2

6.3 Compiler and IDE versions:

- GCC Compiler for ARM NXP GCC 6.3.1
  - 20170509 (BLD = 1574 rev=g924fb68)
  - included in S32 Design Studio v2018.EAR3
- Green Hills Multi 7.1.4 / v.2017.1.4
- Windriver DIAB Compiler v5.9.6.2

6.4 Debug Probes

- Lauterbach TRACE32 JTAG Debugger
- P&E Multilink (with P&E GDB Server)

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7. Known issues and limitations

7.1 S32 Design Studio integration

- An error is returned when a new component is added to the project.
- Attach / Detach SDK functionality does not work at the moment, therefore the user cannot create a project without the SDK and add it afterwards. Workaround: Create a project with SDK enabled from the beginning with New Project Wizard or start from an example from the SDK release.

7.2 S32 Configuration Tool integration

- If the same configuration component is enabled over multiple module instances, the according generated structures will have the same name. It is user's responsibility to make sure different names are used for different structures.

7.3 Drivers

CLOCK_MANAGER

- Clock sources can't be enabled/disabled per power mode. A clock source is enabled or is disabled in all power modes. Module clock gate can't be configured from "Peripheral clocks". As a workaround module clock gate must be configured from clock diagram
- SMDEN, SSCGBYP, STEPSIZE, STEPNO PLL parameters are not configurable.

PINS

- Generating the settings for the DDR pins is not supported.
- For PINS PA1 and PA2 the default values for drive strength, slew rate, Pull select field and Pull Up / Down Config are different from the reset values.

LINFLEXD_UART

- In DMA mode, a new reception may contain junk data received previously; the FIFO cannot be flushed before receiving a new buffer.

SWT

- Module does not return a bus error when accesses are invalid and the module is configured to not reset the CPU on invalid accesses.

FTM_MC

- Frequency Value from user interface is always 1200000000Hz, no matter how clock tree is configured.
- The hardware trigger is not work as expected when the source is ENET module from MAC0_TIMER3 to trigger0 of FTM.

PIT/STM

- Module cannot run in Debug Mode (counter not count).

QSPI

- Despite QSPI_READ_MODE_LOOPBACK_DQS and QSPI_READ_MODE_INTERNAL_SAMPLING modes being available in CT component, they are not available in source code. Please don’t use these modes in your application.

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CTU

- Component appears in the drivers list in "Manage SDK Components" view in S32 Configuration Tool, but it is not supported in this release (should be disregarded).

ETIMER

- Component appears in the drivers list in "Manage SDK Components" view in S32 Configuration Tool, but it is not supported in this release (should be disregarded).

POWER_MANAGER

- User must enable clock source in other mode of the clock configuration which correspond with peripheral clock source. This one is changed before user calls the API CLOCK_DRV_Init.

FLEXRAY

- FLEXRAY_DRV_ClearGlobalInterruptFlag does not clear FLEXRAY_FIFOA_INTERRUPT.
- FLEXRAY_DRV_SendBlocking, FLEXRAY_DRV_GetTransferStatus return STATUS_SUCCESS in case of conflict on TX.

7.4 Stacks

TCP/IP

- No FreeRTOS support (i.e. only bareboard version is available).

SDHC

- File system timestamp is not available.

7.5 Examples

- Some examples may display warning messages with unresolved includes.

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8. Compiler options

8.1 GCC Compiler/Linker/Assembler options

Table 8-1 GCC Compiler options

Option	Description
-mcpu=cortex-m4	Selects target processor: Arm Cortex M4
-mthumb	Selects generating code that executes in Thumb state.
-std=gnu99	Use C99 standard
-DCPU_S32V234	Define a preprocessor symbol for MCU
-L$(<library_path>)	Add specific library used in the compiler options. V23X : ../arm-none-eabi/newlib/lib/thumb/v7e-m/fpv4-sp/(softfp or hard)
-g	Generate debug information
-mfpu=fpv4-sp-d16 -mfloat-abi=hard	Use single precision FPU instructions
-O1	Optimize option
-Werror	Treat warnings as errors
-Wall	Produce warnings about questionable constructs
-Wextra	Produce extra warnings that -Wall
-Wstrict-prototypes	Warn if a function is declared or defined without specifying the argument types.
-pedantic	Issue all the warnings demanded by strict ISO C
-Wunused	Produce warnings for unused variables
-Wsign-compare	Produce warnings when comparing signed type
-funsigned-char	Let the type char be unsigned, like unsigned char
-funsigned-bitfields	Bit-fields are signed by default
-fshort-enums	Allocate to an enum type only as many bytes as it needs for the declared range of possible values.
-ffunction-sections	Place each function into its own section in the output file
-fdata-sections	Place data item into its own section in the output file
-fno-common	The -fno-common option specifies that the compiler should place uninitialized global variables in the data section of the object file.
-fno-jump-tables	Do not use jump tables for switch statements

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Table 8-2 GCC Linker options

Option	Description
-mcpu=cortex-m4	Selects target processor
-mthumb	Selects generating code that executes in Thumb state
--entry=<entry_symbol>	Make the symbol Reset_Handler be treated as a root symbol and the start label of the application
-T <linker_script_file.ld>	Use the specified linker file
-Xlinker --gc-sections	Remove unused sections
-lc	Link C library
-lm, -lgcc	Link Math library, Link libgcc
-Wl, -Map=<map_file_name>	Produce a map file
-mfpu=fpv4-sp-d16 -mfloat-abi=hard	Use single precision FPU instructions

Table 8-3 GCC Assembler options

Option	Description
-mcpu=cortex-m4	Selects target processor
-mthumb	Selects generating code that executes in Thumb state
-mfpu=fpv4-sp-d16 -mfloat-abi=hard	Use single precision FPU instructions
-x assembler-with-cpp	Preprocess assembly files

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8.2 GHS Compiler/Linker/Assembler options

Table 8-4 GHS Compiler options

Option	Description
-cpu=cortexm4	Selects target processor
-thumb	Selects generating code that executes in Thumb state.
-c99	Use C99 standard
--gnu_asm	Enables GNU extended asm syntax support
-DCPU_S32V234	Define CPU name
-L$(<library_path>)	Add specific library used in the compiler options. /lib/thumb2
-gdwarf-2	Generate DWARF 2.0 debug information
-G	Generate debug information
-fsingle, -fhard, -fpu=vfpv4_d16	Use single precision FPU instructions
-Wunknown-pragmas	
-Wimplicit-int	Produce warnings if functions are assumed to return int
-Wshadow	Produce warnings if variables are shadowed
-Wtrigraphs	Produce warnings if trigraphs are detected
-Wundef	Produce a warning if undefined identifiers are used in #if preprocessor statements
--quit_after_warnings	Treat warnings as errors
--unsigned_chars	Let the type char be unsigned, like unsigned char
-unsigned_fields	Bitfields declared with an integer type are unsigned
--short-enum	Store enumerations in the smallest possible type
-fno-common	Allocates uninitialized global variables to a section and initializes them to zero at program startup

Table 8-5 GHS Linker options

Option	Description
-cpu=cortexm4	Selects target processor
-entry=<entry_symbol>	Make the symbol Reset_Handler be treated as a root symbol and the start label of the application
-T <linker_script_file.ld>	Use the specified linker file
-map=<map_file_name>	Produce a map file
-larch	Link architecture specific library
-entry=<entry_symbol>	Make the symbol Reset_Handler be treated as a root symbol and the start label of the application

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Table 8-6 GHS Assembler options

Option	Description
-cpu=cortexm4	Selects target processor
-preprocess_assembly_files	Preprocess assembly files

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8.3 DIAB Compiler/Linker/Assembler options

Table 8-7 DIAB Compiler options

Option	Description
-tARMCORTEXM4LV	Selects target processor
-mthumb	Selects generating code that executes in Thumb state
-Xdialect-c99	Use C99 standard
-DCPU_S32V234	Define CPU name
-Xfp-float-only	Use single precision FPU
-g	Add debug information to the executable
-ei5388,5387,1824	ignore some specific warnings
-Xstop-on-warning	Treat warnings as error
-Xsection-split	Generate a separate section for each function/variable to remove some unused function
-Xno-common	Allocates uninitialized global variables to a section and initializes them to zero at program startup

Table 8-8 DIAB Linker options

Option	Description
-tARMCORTEXM4LV	Selects target processor
-Xremove-unused-sections	Removes unused code sections
-lc	Link the standard C library to the project in order to support elementary operations that are used by the drivers
-lm	Link the standard math library to the project in order to support elementary math operations that are used by the drivers
<linker_script_file.dld>	Use the specified linker file
-e <entry_symbol>	Make the symbol Reset_Handler be treated as a root symbol and the start label of the application
-m6 > <map_file_name>	Produce a linker map

Table 8-9 DIAB Assembler options

Option	Description
-tARMCORTEXM4LV	Selects target processor
-Xpreprocess-assembly	Preprocess assembly files

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9. Acronyms

Acronym	Description
EAR	Early Access Release
JRE	Java Runtime Environment
EVB	Evaluation board
PAL	Peripheral Abstraction Layer
RTOS	Real Time Operating System
S32CT	S32 Configuration Tool
PD	Peripheral Driver
S32DS	S32 Design Studio IDE
SDK	Software Development Kit
SOC	System-on-Chip
RTM	Release To Manufacture

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10. Version Tracking

Date (dd-Mmm-YYYY)	Version	Comments	Author
14-Oct-2016	1.0	First version for EAR 0.8.0	Cezar Dobromir
30-Ian-2017	1.1	First version for S32V EAR 0.8.0	Iulian T.
10-Dec-2018	1.2	First version for S32V EAR 0.8.1	Banciu Alexandru
26-Mar-2019	1.3	First version for S32V BETA 0.9.0	Banciu Alexandru

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