



Imperas Peripheral Model Guide

Model Specific Information for freescale.ovpworld.org / KinetisSPI

Imperas Software Limited

Imperas Buildings, North Weston
Thame, Oxfordshire, OX9 2HA, U.K.
docs@imperas.com.



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Model Release Status

This model is released as part of OVP releases and is included in OVPworld packages. Please visit OVPworld.org.

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1.0 Model Specific Information

This document provides usage information for an Imperas OVP peripheral behavioral model.

The document is split into sections providing specific information for this peripheral, including any ports for connecting into a platform, registers, other component parts, and configuration options and general information for peripheral modeling with Imperas OVP.

1.1 Licensing

Open Source Apache 2.0

1.2 Location

The KinetisSPI peripheral model is located in an Imperas/OVP installation at the VLNV: [freescale.ovpworld.org / peripheral / KinetisSPI / 1.0](http://freescale.ovpworld.org/peripheral/KinetisSPI/1.0).

2.0 Net Ports

This model has the following net ports:

Table 1. Net Ports

Name	Type	Must Be Connected	Description
Reset	input	F (False)	

3.0 Bus Slave Ports

This model has the following bus slave ports:

3.1 Bus Slave Port: *bport1*

Table 2. Bus Slave Port: *bport1*

Name	Size (bytes)	Must Be Connected	Description
bport1	0x1000	F (False)	

Table 3. Bus Slave Port: *bport1* Registers:

Name	Offset	Width (bits)	Description	R/W	is Volatile
ab_MCR	0x0	32	DSPI Module Configuration Register, offset: 0x0		
ab_TCR	0x8	32	DSPI Transfer Count Register, offset: 0x8		
ab_CTAR0	0xc	32	DSPI Clock and Transfer Attributes Register 0, Master/Slave modes, offset 0x0c		
ab_CTAR1	0x10	32	DSPI Clock and Transfer Attributes Register 1, Master mode, offset 0x10		
ab_SR	0x2c	32	DSPI Status Register, offset: 0x2C		

ab_RSER	0x30	32	DSPI DMA/Interrupt Request Select and Enable Register, offset: 0x30		
ab_PUSHR	0x34	32	DSPI PUSH TX FIFO Register In Master Mode, offset: 0x34		
ab_POPR	0x38	32	DSPI POP RX FIFO Register, offset: 0x38		
ab_TXFR0	0x3c	32	DSPI Transmit FIFO Registers, offset: 0x3C		
ab_TXFR1	0x40	32	DSPI Transmit FIFO Registers, offset: 0x40		
ab_TXFR2	0x44	32	DSPI Transmit FIFO Registers, offset: 0x44		
ab_TXFR3	0x48	32	DSPI Transmit FIFO Registers, offset: 0x48		
ab_RXFR0	0x7c	32	DSPI Receive FIFO Registers, offset: 0x7C		
ab_RXFR1	0x80	32	DSPI Receive FIFO Registers, offset: 0x80		
ab_RXFR2	0x84	32	DSPI Receive FIFO Registers, offset: 0x84		
ab_RXFR3	0x88	32	DSPI Receive FIFO Registers, offset: 0x88		

4.0 Peripheral components in the library

Table 4. Publicly available Imperas/OVP peripheral models (158 models)

Peripheral	Peripheral	Peripheral
freescale.ovpworld.org/KinetisTSI	freescale.ovpworld.org/KinetisUART	freescale.ovpworld.org/KinetisUSB
freescale.ovpworld.org/KinetisUSBDCD	freescale.ovpworld.org/KinetisUSBHS	freescale.ovpworld.org/KinetisVREF
freescale.ovpworld.org/KinetisWDOG	freescale.ovpworld.org/Uart	freescale.ovpworld.org/VybridADC
freescale.ovpworld.org/VybridANADIG	freescale.ovpworld.org/VybridCCM	freescale.ovpworld.org/VybridDMA
freescale.ovpworld.org/VybridGPIO	freescale.ovpworld.org/VybridI2C	freescale.ovpworld.org/VybridLCD
freescale.ovpworld.org/VybridQUADSPI	freescale.ovpworld.org/VybridSDHC	freescale.ovpworld.org/VybridSPI
freescale.ovpworld.org/VybridUART	freescale.ovpworld.org/VybridUSB	intel.ovpworld.org/82077AA
intel.ovpworld.org/82371EB	intel.ovpworld.org/8253	intel.ovpworld.org/8259A
intel.ovpworld.org/NorFlash48F4400	intel.ovpworld.org/PciIDE	intel.ovpworld.org/PciPM
intel.ovpworld.org/PciUSB	intel.ovpworld.org/Ps2Control	marvell.ovpworld.org/GT6412x
mips.ovpworld.org/16450C	mips.ovpworld.org/MaltaFPGA	mips.ovpworld.org/SmartLoaderLinux
motorola.ovpworld.org/MC146818	national.ovpworld.org/16450	national.ovpworld.org/16550
ovpworld.org/Alpha2x16Display	ovpworld.org/dummyPort	ovpworld.org/DynamicBridge
ovpworld.org/FlashDevice	ovpworld.org/ledRegister	ovpworld.org/SerInt
ovpworld.org/SimpleDma	ovpworld.org/VirtioBlkMMIO	philips.ovpworld.org/ISP1761
renesas.ovpworld.org/adc	renesas.ovpworld.org/bcu	renesas.ovpworld.org/brg
renesas.ovpworld.org/can	renesas.ovpworld.org/can	renesas.ovpworld.org/clkgen
renesas.ovpworld.org/crc	renesas.ovpworld.org/csib	renesas.ovpworld.org/csie
renesas.ovpworld.org/dma	renesas.ovpworld.org/intc	renesas.ovpworld.org/memc
renesas.ovpworld.org/rng	renesas.ovpworld.org/taa	renesas.ovpworld.org/tms
renesas.ovpworld.org/tmt	renesas.ovpworld.org/uartc	renesas.ovpworld.org/UPD70F3441Logic
smc.ovpworld.org/LAN9118	smc.ovpworld.org/LAN91C111	ti.ovpworld.org/UartInterface
xilinx.ovpworld.org/mdm	xilinx.ovpworld.org/mpmc	xilinx.ovpworld.org/xps-gpio
xilinx.ovpworld.org/xps-iic	xilinx.ovpworld.org/xps-intc	xilinx.ovpworld.org/xps-ll-temac
xilinx.ovpworld.org/xps-mch-emc	xilinx.ovpworld.org/xps-sysace	xilinx.ovpworld.org/xps-timer
xilinx.ovpworld.org/xps-uartlite	altera.ovpworld.org/dw-apb-timer	altera.ovpworld.org/dw-apb-uart
altera.ovpworld.org/IntervalTimer32Core	altera.ovpworld.org/IntervalTimer64Core	altera.ovpworld.org/JtagUart
altera.ovpworld.org/PerformanceCounterCore	altera.ovpworld.org/RSTMGR	altera.ovpworld.org/SystemIDCore
altera.ovpworld.org/Uart	amd.ovpworld.org/79C970	arm.ovpworld.org/AaciPL041
arm.ovpworld.org/CompactFlashRegs	arm.ovpworld.org/CoreModule9x6	arm.ovpworld.org/DebugLedAndDipSwitch
arm.ovpworld.org/DMemCtrlPL341	arm.ovpworld.org/IcpControl	arm.ovpworld.org/IcpCounterTimer
arm.ovpworld.org/IntICP	arm.ovpworld.org/IntICP	arm.ovpworld.org/KbPL050
arm.ovpworld.org/L2CachePL310	arm.ovpworld.org/LcdPL110	arm.ovpworld.org/MmciPL181
arm.ovpworld.org/RtcPL031	arm.ovpworld.org/SerBusDviRegs	arm.ovpworld.org/SmartLoaderArm64Linux
arm.ovpworld.org/SmartLoaderArmLinux	arm.ovpworld.org/SMemCtrlPL354	arm.ovpworld.org/SysCtrlSP810
arm.ovpworld.org/TimerSP804	arm.ovpworld.org/TzpcBP147	arm.ovpworld.org/UartPL011
arm.ovpworld.org/VexpressSysRegs	arm.ovpworld.org/WdtSP805	atmel.ovpworld.org/AdvancedInterruptController
atmel.ovpworld.org/ParallelIIOController	atmel.ovpworld.org/PowerSaving	atmel.ovpworld.org/SpecialFunction
atmel.ovpworld.org/TimerCounter	atmel.ovpworld.org/UsartInterface	atmel.ovpworld.org/WatchdogTimer
cirrus.ovpworld.org/GD5446	freescale.ovpworld.org/KinetisADC	freescale.ovpworld.org/KinetisAIPS
freescale.ovpworld.org/KinetisAXBS	freescale.ovpworld.org/KinetisCAN	freescale.ovpworld.org/KinetisCMP
freescale.ovpworld.org/KinetisCMT	freescale.ovpworld.org/KinetisCRC	freescale.ovpworld.org/KinetisDAC
freescale.ovpworld.org/KinetisDDR	freescale.ovpworld.org/KinetisDMA	freescale.ovpworld.org/KinetisDMAC

freescale.ovpworld.org/KinetisDMAMUX	freescale.ovpworld.org/KinetisENET	freescale.ovpworld.org/KinetisEWM
freescale.ovpworld.org/KinetisFB	freescale.ovpworld.org/KinetisFMC	freescale.ovpworld.org/KinetisFTFE
freescale.ovpworld.org/KinetisFTM	freescale.ovpworld.org/KinetisGPIO	freescale.ovpworld.org/KinetisI2C
freescale.ovpworld.org/KinetisI2S	freescale.ovpworld.org/KinetisLLWU	freescale.ovpworld.org/KinetisLPTMR
freescale.ovpworld.org/KinetisMCG	freescale.ovpworld.org/KinetisMPU	freescale.ovpworld.org/KinetisNFC
freescale.ovpworld.org/KinetisOSC	freescale.ovpworld.org/KinetisPDB	freescale.ovpworld.org/KinetisPIT
freescale.ovpworld.org/KinetisPMC	freescale.ovpworld.org/KinetisPORT	freescale.ovpworld.org/KinetisRCM
freescale.ovpworld.org/KinetisRFSYS	freescale.ovpworld.org/KinetisRFVBAT	freescale.ovpworld.org/KinetisRNG
freescale.ovpworld.org/KinetisRTC	freescale.ovpworld.org/KinetisSDHC	freescale.ovpworld.org/KinetisSIM
freescale.ovpworld.org/KinetisSMC	freescale.ovpworld.org/KinetisSPI	

5.0 General Information on Peripheral Models

This document provides usage information for an Imperas OVP peripheral behavioral model.

The document is split into sections providing specific information for this peripheral, including any ports for connecting into a platform, registers etc. and configuration options and general information for peripheral modeling with Imperas OVP.

5.1 Background

Imperas OVP simulation technology enables very high performance simulation, debug and analysis of platforms containing multiple processors and peripheral models. The technology is designed to be extensible: you can create new models of processors, peripherals and other platform components using interfaces and libraries defined by OVP.

The peripheral models created using the OVP APIs run on the Peripheral Simulation Engine (PSE).

The model is typically written in C and compiled into an executable for the PSE processor architecture. The model is compiled for speed of execution and to protect IP. It is dynamically loaded by the simulator at run time.

6.0 Building peripherals easily with Imperas iGen

To aid with model creation, Imperas products include iGen, a model generation tool. iGen takes the laborious and error-prone task of constructing the various hardware model and software element files required for a typical model, and automates this process. iGen creates the needed C files. iGen also creates the C++ SystemC TLM2 interface files needed to run peripheral models in SystemC simulations.

iGen takes as input a simple script specification that includes device internals such as registers and memories, port information, component descriptors, and other elements. iGen then builds the C code model files and user editable templates. These include model frameworks with registers, function calls, memory map, and other items. It ensures that all component parts of the model are well-structured using best practices, and are consistent throughout the files, thus eliminating a common source of errors.

More information on iGen can be found: imperas.com/products.

Please contact Imperas to get access to the Imperas documents: Imperas_Model_Generator_Guide.pdf and Imperas_Peripheral_Generator_Guide.pdf.

7.0 Peripheral model internals

Each instance of a peripheral model runs on its own virtual machine with an address space large enough for the model. This processor (the PSE) and its memory are separate from any processors, memories and buses

in the platform being simulated; they exist only to execute the code of the peripheral model.

Interception of functions defined in the peripheral model allows the use of features of the host system in the implementation of the behavior of a peripheral. As an example, a real platform might contain a video display device. When simulating this system, it is generally more convenient not to simulate the complete video display device but to use a video package available on the host machine, such as SDL, and to use this to render to the host display. Also models of uarts, ethernet devices and USB components can make use of the host PC resources during simulation, to allow, for example, a simulation to browse the real internet, or the simulation to connect to a real USB device.

8.0 Parts of peripheral models

8.1 Configuring the Peripheral Instance with Parameters

A peripheral can include the behaviour of several configurations. These are controlled when the peripheral is instanced in the platform by setting parameters defined on the peripheral.

8.2 Net Ports

Peripherals may be connected to other peripherals or processors with signal wires (nets). These can be used to act as interrupt signals or used to control behavior between peripherals.

The wires are created in the platform as nets and this net is connected into the peripheral using a net port.

8.3 Bus master ports

A bus master port initiates (and controls the address of) a bus cycle. Bus cycles are generated by behavioral code within the peripheral model.

8.4 Bus slave ports

A peripheral can be defined as having several bus slave ports. The bus slave ports can be split into several address blocks. Each address block be either local memory or memory mapped registers. Both of these can have associated callback functions. A memory mapped register can also be defined as specific read/write access, whether it is volatile, and also whether it is associated with a reset pin and mask. A memory mapped register can also have specific bit fields defined.

8.5 Packetnets

A peripheral can be defined as being connected to packetnet ports. A packetnet is used to model packet based communication such as Ethernet, CAN bus or GSM. A packetnet is created in a platform, then connected to packetnet ports on model instances. A packetnet can have many connections, each able to send or receive packets. A packetnet is used as an efficient method of communication within OVP models.

For more information on modeling with packetnets, please see the peripheral modeling documentation: [OVP_Peripheral_Modeling_Guide.pdf](#), [OVPsim_and_CpuManager_User_Guide.pdf](#) and the example: [\\$IMPERAS_HOME/Examples/Models/Peripherals/packetnet](#).

9.0 More information (documentation) on peripheral models and modeling

More information on modeling and APIs can be found at: OVPworld.org/technology_apis.

Specifics on modeling peripherals can be found: [OVP_Peripheral_Modeling_Guide.pdf](#).

A full list of the currently available OVP documentation is available: OVPworld.org/documentation.

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