Imperas Guide to using Virtual Platforms

Platform / Module Specific Information for freescale.ovpworld.org / FreescaleKinetis64

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Model Release Status

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1.0 Platform / Module: FreescaleKinetis64

This document provides the details of the usage of an Imperas OVP Virtual Platform / Module. The first half of the document covers specifics of this particular component. For more information about Imperas OVP virtual platforms, how they are built and used, please see the later sections in this document.

1.1 Virtual Platform / Module Type

Hardware described using OVP can either be a platform, module, processor, or peripheral.
This component has a purpose specified as being part of an Extendable Platform Kit (EPK). This is typically a platform that is part of a package that includes not only the platform but also software to run on the platform and scripts to control it.

1.2 Licensing

Open Source Apache 2.0

1.3 Description

Freescale Kinetis K64 platform

1.4 Limitations

Only enough functionality modeled to boot MQX. Most peripherals modeled as dummy register ports

1.5 Reference

based on document number: K64P144M120SF5RM Rev. 2, Jan 2014

1.6 Location

The FreescaleKinetis64 virtual platform / module is located in an Imperas/OVP installation at the VLNV: freescale.ovpworld.org / platform / FreescaleKinetis64 / 1.0.

1.7 Platform Simulation Attributes

Table 1. Platform Simulation Attributes

Attribute	Value	Description
stoponctrlc	stoponctrlc	Stop on control-C

2.0 Command Line Control of the Platform

2.1 Built-in Arguments

Table 2. Platform Built-in Arguments

Attribute	Value	Description

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allargs	allargs	The Command line parser will accept the complete imperas argument set. Note that this option is ignored in some Imperas products

When running a platform in a Windows or Linux shell several command arguments can be specified. Typically there is a '-help' command which lists the commands available in the platforms. For example:

    myplatform.exe -help

Some command line arguments require a value to be provided. For example:

    myplatform.exe -program myimagefile.elf

2.2 Platform Specific Command Line Arguments

Table 3. Platform Command Line Arguments

Name	Type	Description
uart0console	boolvar	enable console on UART0
uart1console	boolvar	enable console on UART1
uart2console	boolvar	enable console on UART2
uart3console	boolvar	enable console on UART3
uart4console	boolvar	enable console on UART4
uart5console	boolvar	enable console on UART5

3.0 External Ports for Module FreescaleKinetis64

Table 4. External Ports

Port Type	Port Name	Internal Connection
netport	p_uart0_tx	uart0_tx
netport	p_uart0_rx	uart0_rx
netport	p_uart1_tx	uart1_tx
netport	p_uart1_rx	uart1_rx
netport	p_uart2_tx	uart2_tx
netport	p_uart2_rx	uart2_rx
netport	p_uart3_tx	uart3_tx
netport	p_uart3_rx	uart3_rx
netport	p_uart4_tx	uart4_tx
netport	p_uart4_rx	uart4_rx
netport	p_uart5_tx	uart5_tx
netport	p_uart5_rx	uart5_rx
netport	p_gpioA_out	gpioA_out
netport	p_gpioA_in	gpioA_in
netport	p_gpioA_mask	gpioA_mask
netport	p_gpioB_out	gpioB_out
netport	p_gpioB_in	gpioB_in
netport	p_gpioB_mask	gpioB_mask
netport	p_gpioC_out	gpioC_out
netport	p_gpioC_in	gpioC_in
netport	p_gpioC_mask	gpioC_mask

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netport	p_gpioD_out	gpioD_out
netport	p_gpioD_in	gpioD_in
netport	p_gpioD_mask	gpioD_mask
netport	p_gpioE_out	gpioE_out
netport	p_gpioE_in	gpioE_in
netport	p_gpioE_mask	gpioE_mask
netport	p_gpioF_out	gpioF_out
netport	p_gpioF_in	gpioF_in
netport	p_gpioF_mask	gpioF_mask
netport	p_cmp_ext_sample	cmp_ext_sample
netport	p_cmp_vin1	cmp_vin1
netport	p_cmp_vin2	cmp_vin2
netport	p_cmp0_input0	cmp0_input0
netport	p_cmp0_input1	cmp0_input1
netport	p_cmp0_input2	cmp0_input2
netport	p_cmp0_input3	cmp0_input3
netport	p_cmp0_input4	cmp0_input4
netport	p_cmp0_input5	cmp0_input5
netport	p_cmp0_input6	cmp0_input6
netport	p_cmp0_DacOutput	cmp0_DacOutput
netport	p_cmp_coutSoc	cmp_coutSoc
netport	p_cmp_OPad	cmp_OPad
netport	p_cmp1_input0	cmp1_input0
netport	p_cmp1_input1	cmp1input1
netport	p_cmp1_input2	cmp1input2
netport	p_cmp1_input3	cmp1input3
netport	p_cmp1_input4	cmp1input4
netport	p_cmp1_input5	cmp1input5
netport	p_cmp1_input6	cmp1input6
netport	p_cmp1_DacOutput	cmp1_DacOutput
netport	p_cmp2_input0	cmp2_input0
netport	p_cmp2_input1	cmp2_input1
netport	p_cmp2_input2	cmp2_input2
netport	p_cmp2_input3	cmp2_input3
netport	p_cmp2_input4	cmp2_input4
netport	p_cmp2_input5	cmp2_input5
netport	p_cmp2_input6	cmp2_input6
netport	p_cmp2_DacOutput	cmp2_DacOutput
netport	p_cmp3_input0	cmp3_input0
netport	p_cmp3_input1	cmp3_input1
netport	p_cmp3_input2	cmp3_input2
netport	p_cmp3_input3	cmp3_input3
netport	p_cmp3_input4	cmp3_input4
netport	p_cmp3_input5	cmp3_input5
netport	p_cmp3_input6	cmp3_input6
netport	p_cmp3_DacOutput	cmp3_DacOutput
netport	p_adc0_input	adc0_input
netport	p_adc0_sample	adc0_sample

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netport	p_adc0_trigger	adc0_trigger
netport	p_adc1_input	adc1_input
netport	p_adc1_sample	adc1_sample
netport	p_adc1_trigger	adc1_trigger
netport	p_adc2_input	adc2_input
netport	p_adc2_sample	adc2_sample
netport	p_adc2_trigger	adc2_trigger
netport	p_adc3_input	adc3_input
netport	p_adc3_sample	adc3_sample
netport	p_adc3_trigger	adc3_trigger
netport	p_dac0_output	dac0_output
netport	p_dac1_output	dac1_output
netport	p_ftm_input	ftm_input
netport	p_ftm_output	ftm_output
netport	p_ftm_mask	ftm_mask
netport	p_ftm_fault	ftm_fault
netport	p_ftm_phaseA	ftm_phaseA
netport	p_ftm_phaseB	ftm_phaseB
netport	p_can0_tx	can0_tx
netport	p_can0_rx	can0_rx
netport	p_can1_tx	can1_tx
netport	p_can1_rx	can1_rx
netport	p_spi0_tx	spi0_tx
netport	p_spi0_rx	spi0_rx
netport	p_spi1_tx	spi1_tx
netport	p_spi1_rx	spi1_rx
netport	p_spi2_tx	spi2_tx
netport	p_spi2_rx	spi2_rx
netport	p_i2c0_tx	i2c0_tx
netport	p_i2c0_rx	i2c0_rx
netport	p_i2c1_tx	i2c1_tx
netport	p_i2c1_rx	i2c1_rx
netport	p_i2s0_tx	i2s0_tx
netport	p_i2s0_rx	i2s0_rx
netport	p_i2s1_tx	i2s1_tx
netport	p_i2s1_rx	i2s1_rx

4.0 Processor [arm.ovpworld.org/processor/armm/1.0] instance: cpu

4.1 Processor model type: 'armm' variant 'Cortex-M4F' definition

Imperas OVP processor models support multiple variants and details of the variants implemented in this model can be found in:

- the Imperas installation located at ImperasLib/source/arm.ovpworld.org/processor/armm/1.0/doc
- the OVP website: OVP_Model_Specific_Information_armm_Cortex-M4F.pdf

4.1.1 Description

ARMM Processor Model

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4.1.2 Licensing

Usage of binary model under license governing simulator usage.

Note that for models of ARM CPUs the license includes the following terms:

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Source of model available under separate Imperas Software License Agreement.

4.1.3 Limitations

Performance Monitors are not implemented.

Debug Extension and related blocks are not implemented.

4.1.4 Verification

Models have been extensively tested by Imperas. ARM Cortex-M models have been successfully used by customers to simulate the Micrium uC/OS-II kernel and FreeRTOS.

4.1.5 Features

The model is configured with 16 interrupts and 3 priority bits (use override_numInterrupts and override_priorityBits parameters to change these).

Thumb-2 instructions are supported.

MPU is present. Use parameter override_MPU_TYPE to disable it or change the number of MPU regions if required.

SysTick timer is present. Use parameter SysTickPresent to disable it if required.

FPU extension is present. Use parameter override_MVFR0 to disable it if required.

DSP extension is present. Use parameter override_InstructionAttributes3 to disable it if required.

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Bit-band region is not present. Use parameter BitBandPresent to enable it if required.

4.1.6 Unpredictable Behavior
Many instruction behaviors are described in the ARM ARM as CONSTRAINED UNPREDICTABLE. This section describes how such situations are handled by this model.

4.1.7 Equal Target Registers
Some instructions allow the specification of two target registers (for example, double-width SMULL, or some VMOV variants), and such instructions are CONSTRAINED UNPREDICTABLE if the same target register is specified in both positions. In this model, such instructions are treated as UNDEFINED.

4.1.8 Floating Point Load/Store Multiple Lists
Instructions that load or store a list of floating point registers (e.g. VSTM, VLDM, VPUSH, VPOP) are CONSTRAINED UNPREDICTABLE if either the uppermost register in the specified range is greater than 32 or (for 64-bit registers) if more than 16 registers are specified. In this model, such instructions are treated as UNDEFINED.

4.1.9 If-Then (IT) Block Constraints
Where the behavior of an instruction in an if-then (IT) block is described as CONSTRAINED UNPREDICTABLE, this model treats that instruction as UNDEFINED.

4.1.10 Use of R13
Use of R13 is described as CONSTRAINED UNPREDICTABLE in many circumstances. This model allows R13 to be used like any other GPR.

4.1.11 Use of R15
Use of R15 is described as CONSTRAINED UNPREDICTABLE in many circumstances. This model allows such use to be configured using the parameter "unpredictableR15" as follows:
Value "undefined": any reference to R15 in such a situation is treated as UNDEFINED;
Value "nop": any reference to R15 in such a situation causes the instruction to be treated as a NOP;
Value "raz_wi": any reference to R15 in such a situation causes the instruction to be treated as a RAZ/WI (that is, R15 is read as zero and write-ignored);
Value "execute": any reference to R15 in such a situation is executed using the current value of R15 on read, and writes to R15 are allowed.
Value "assert": any reference to R15 in such a situation causes the simulation to halt with an assertion message (allowing any such unpredictable uses to be easily identified).
In this variant, the default value of "unpredictableR15" is "execute".

4.2 Instance Parameters
Several parameters can be specified when a processor is instanced in a platform. For this processor instance 'cpu' it has been instanced with the following parameters:

Table 5. Processor Instance 'cpu' Parameters (Configurations)

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Parameter	Value	Description
endian	little	Select processor endian (big or little)
simulateexceptions	simulateexceptions	Causes the processor simulate exceptions instead of halting
mips	120	The nominal MIPS for the processor

Table 6. Processor Instance 'cpu' Parameters (Attributes)

Parameter Name	Value	Type
variant	Cortex-M4F	string
UAL	1	bool
override_priorityBits	4	uns32
override_numInterrupts	105	uns32

4.3 Memory Map for processor 'cpu' bus: 'pBus'

Processor instance 'cpu' is connected to bus 'pBus' using master port 'INSTRUCTION'.
Processor instance 'cpu' is connected to bus 'pBus' using master port 'DATA'.

Table 7. Memory Map ('cpu' / 'pBus' [width: 32])

Lo Address	Hi Address	Instance	Component
0x0	0xFFFFFF	flash	ram
0x1FFF0000	0x2000FFFF	sram	ram
0x40000000	0x40000FFF	aips0	KinetisAIPS
0x40004000	0x40004FFF	axbs	KinetisAXBS
0x40008000	0x40009FFF	dmac	KinetisDMA
0x4000C000	0x4000CFFF	flexbus	KinetisFB
0x4000D000	0x4000DFFF	mpu	KinetisMPU
0x4001F000	0x4001FFFF	fmc	KinetisFMC
0x40021000	0x40021FFF	dmamux0	KinetisDMAMUX
0x40022000	0x40022FFF	dmamux1	KinetisDMAMUX
0x40024000	0x40024FFF	can0	KinetisCAN
0x4002C000	0x4002CFFF	spi0	KinetisSPI
0x4002D000	0x4002DFFF	spi1	KinetisSPI
0x4002F000	0x4002FFFF	i2s0	KinetisI2S
0x40032000	0x40032FFF	crc	KinetisCRC
0x40034000	0x40034FFF	usbhs	KinetisUSBHS
0x40035000	0x40035FFF	usbdcd	KinetisUSBDCD
0x40036000	0x40036FFF	pdb	KinetisPDB
0x40037000	0x40037FFF	pit	KinetisPIT
0x40038000	0x40038FFF	ftm0	KinetisFTM
0x40039000	0x40039FFF	ftm1	KinetisFTM
0x4003B000	0x4003BFFF	adc0	KinetisADC
0x4003C000	0x4003CFFF	adc2	KinetisADC
0x4003D000	0x4003DFFF	rtc	KinetisRTC
0x4003E000	0x4003EFFF	vbat	KinetisRFVBAT
0x40040000	0x40040FFF	lptmr	KinetisLPTMR
0x40041000	0x40041FFF	rfsys	KinetisRFSYS
0x40045000	0x40045FFF	tsi	KinetisTSI
0x40047000	0x40048FFF	sim	KinetisSIM

0x40049000	0x40049FFF	amux	KinetisPORT
0x4004A000	0x4004AFFF	bmux	KinetisPORT
0x4004B000	0x4004BFFF	cmux	KinetisPORT
0x4004C000	0x4004CFFF	dmux	KinetisPORT
0x4004D000	0x4004DFFF	emux	KinetisPORT
0x4004E000	0x4004EFFF	fmux	KinetisPORT
0x40052000	0x40052FFF	wdog	KinetisWDOG
0x40061000	0x40061FFF	ewm	KinetisEWM
0x40062000	0x40062FFF	cmt	KinetisCMT
0x40064000	0x40064FFF	mcg	KinetisMCG
0x40065000	0x40065FFF	osc0	KinetisOSC
0x40066000	0x40066FFF	i2c0	KinetisI2C
0x40067000	0x40067FFF	i2c1	KinetisI2C
0x4006A000	0x4006AFFF	uart0	KinetisUART
0x4006B000	0x4006BFFF	uart1	KinetisUART
0x4006C000	0x4006CFFF	uart2	KinetisUART
0x4006D000	0x4006DFFF	uart3	KinetisUART
0x40072000	0x40072FFF	usb	KinetisUSB
0x40073000	0x40073007	cmp0	KinetisCMP
0x40073008	0x4007300F	cmp1	KinetisCMP
0x40073010	0x40073017	cmp2	KinetisCMP
0x40073018	0x4007301F	cmp3	KinetisCMP
0x40074000	0x40074FFF	vref	KinetisVREF
0x4007C000	0x4007CFFF	llwu	KinetisLLWU
0x4007D000	0x4007DFFF	pmc	KinetisPMC
0x4007E000	0x4007EFFF	smc	KinetisSMC
0x4007F000	0x4007FFFF	rcm	KinetisRCM
0x400A0000	0x400A0FFF	rng	KinetisRNG
0x400A4000	0x400A4FFF	can1	KinetisCAN
0x400A8000	0x400ABFFF	nfc	KinetisNFC
0x400AC000	0x400ACFFF	spi2	KinetisSPI
0x400AE000	0x400AEFFF	ddr	KinetisDDR
0x400AF000	0x400AFFFF	i2s1	KinetisI2S
0x400B1000	0x400B1FFF	sdhc	KinetisSDHC
0x400B8000	0x400B8FFF	ftm2	KinetisFTM
0x400B9000	0x400B9FFF	ftm3	KinetisFTM
0x400BB000	0x400BBFFF	adc1	KinetisADC
0x400BC000	0x400BCFFF	adc3	KinetisADC
0x400C0000	0x400C0FFF	enet	KinetisENET
0x400CC000	0x400CCFFF	dac0	KinetisDAC
0x400CD000	0x400CDFFF	dac1	KinetisDAC
0x400E5000	0x400E5FFF	osc1	KinetisOSC
0x400EA000	0x400EAFFF	uart4	KinetisUART
0x400EB000	0x400EBFFF	uart5	KinetisUART
0x400FF000	0x400FF03F	gpioA	KinetisGPIO
0x400FF040	0x400FF07F	gpioB	KinetisGPIO
0x400FF080	0x400FF0BF	gpioC	KinetisGPIO
0x400FF0C0	0x400FF0FF	gpioD	KinetisGPIO

| 0x400FF100 | 0x400FF13F | gpioE | KinetisGPIO |
| 0x400FF140 | 0x400FF17F | gpioF | KinetisGPIO |

4.4 Net Connections to processor: 'cpu'

Table 8. Processor Net Connections ('cpu')

Net Port	Net	Instance	Component
int45	int45	uart0	KinetisUART
int47	int47	uart1	KinetisUART
int49	int49	uart2	KinetisUART
int51	int51	uart3	KinetisUART
int53	int53	uart4	KinetisUART
int55	int55	uart5	KinetisUART
int59	int59	cmp0	KinetisCMP
int60	int60	cmp1	KinetisCMP
int61	int61	cmp2	KinetisCMP
int62	int62	ftm0	KinetisFTM
int63	int63	ftm1	KinetisFTM
int64	int64	ftm2	KinetisFTM
int68	int68	pit	KinetisPIT
int69	int69	pit	KinetisPIT
int70	int70	pit	KinetisPIT
int71	int71	pit	KinetisPIT
int98	int98	cmp3	KinetisCMP
int101	int101	ftm3	KinetisFTM
int0	int0	dmac	KinetisDMA
int1	int1	dmac	KinetisDMA
int2	int2	dmac	KinetisDMA
int3	int3	dmac	KinetisDMA
int4	int4	dmac	KinetisDMA
int5	int5	dmac	KinetisDMA
int6	int6	dmac	KinetisDMA
int7	int7	dmac	KinetisDMA
int8	int8	dmac	KinetisDMA
int9	int9	dmac	KinetisDMA
int10	int10	dmac	KinetisDMA
int11	int11	dmac	KinetisDMA
int12	int12	dmac	KinetisDMA
int13	int13	dmac	KinetisDMA
int14	int14	dmac	KinetisDMA
int15	int15	dmac	KinetisDMA
int16	int16	dmac	KinetisDMA

5.0 Peripheral Instances

5.1 Peripheral [freescale.ovpworld.org/peripheral/KinetisAIPS/1.0] instance: aips0

5.1.1 Description

Model of the AIPS peripheral used on the Freescale Kinetis platform

5.1.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.1.3 Reference

www.freescale.com/Kinetis

5.1.4 Licensing

Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.2 Peripheral [freescale.ovpworld.org/peripheral/KinetisAXBS/1.0] instance: axbs

5.2.1 Description

Model of the AXBS peripheral used on the Freescale Kinetis platform

5.2.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.2.3 Reference

www.freescale.com/Kinetis

5.2.4 Licensing

Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.3 Peripheral [freescale.ovpworld.org/peripheral/KinetisDMA/1.0] instance: dmac

5.3.1 Description

Model of the DMA peripheral used on the Freescale Kinetis platform

5.3.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.3.3 Reference

www.freescale.com/Kinetis

5.3.4 Licensing

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There are no configuration options set for this peripheral instance.

5.4 Peripheral [freescale.ovpworld.org/peripheral/KinetisFB/1.0] instance: flexbus

5.4.1 Description
Model of the FB peripheral used on the Freescale Kinetis platform

5.4.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.4.3 Reference
www.freescale.com/Kinetis

5.4.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.5 Peripheral [freescale.ovpworld.org/peripheral/KinetisMPU/1.0] instance: mpu

5.5.1 Description
Model of the MPU peripheral used on the Freescale Kinetis platform

5.5.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.5.3 Reference
www.freescale.com/Kinetis

5.5.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.6 Peripheral [freescale.ovpworld.org/peripheral/KinetisFMC/1.0] instance: fmc

5.6.1 Description
Model of the FMC peripheral used on the Freescale Kinetis platform

5.6.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

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5.6.3 Reference

www.freescale.com/Kinetis

5.6.4 Licensing

Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.7 Peripheral [freescale.ovpworld.org/peripheral/KinetisDMAMUX/1.0] instance: dmamux0

5.7.1 Description

Model of the DMAMUX peripheral used on the Freescale Kinetis platform

5.7.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.7.3 Reference

www.freescale.com/Kinetis

5.7.4 Licensing

Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.8 Peripheral [freescale.ovpworld.org/peripheral/KinetisDMAMUX/1.0] instance: dmamux1

5.8.1 Description

Model of the DMAMUX peripheral used on the Freescale Kinetis platform

5.8.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.8.3 Reference

www.freescale.com/Kinetis

5.8.4 Licensing

Open Source Apache 2.0

Table 9. Configuration options (attributes) set for instance 'dmamux1'

Attribute	Value	Type	Expression
startDMAChannel	16	uns32	

5.9 Peripheral [freescale.ovpworld.org/peripheral/KinetisCAN/1.0] instance: can0

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5.9.1 Description
Model of the CAN peripheral used on the Freescale Kinetis platform

5.9.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.9.3 Reference
www.freescale.com/Kinetis

5.9.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.10 Peripheral [freescale.ovpworld.org/peripheral/KinetisSPI/1.0] instance: spi0

5.10.1 Description
Model of the SPI peripheral used on the Freescale Kinetis platform

5.10.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.10.3 Reference
www.freescale.com/Kinetis

5.10.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.11 Peripheral [freescale.ovpworld.org/peripheral/KinetisSPI/1.0] instance: spi1

5.11.1 Description
Model of the SPI peripheral used on the Freescale Kinetis platform

5.11.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.11.3 Reference
www.freescale.com/Kinetis

5.11.4 Licensing
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There are no configuration options set for this peripheral instance.

5.12 Peripheral [freescale.ovpworld.org/peripheral/KinetisI2S/1.0] instance: i2s0

5.12.1 Description
Model of the I2S peripheral used on the Freescale Kinetis platform

5.12.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.12.3 Reference
www.freescale.com/Kinetis

5.12.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.13 Peripheral [freescale.ovpworld.org/peripheral/KinetisCRC/1.0] instance: crc

5.13.1 Description
Model of the CRC peripheral used on the Freescale Kinetis platform

5.13.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.13.3 Reference
www.freescale.com/Kinetis

5.13.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.14 Peripheral [freescale.ovpworld.org/peripheral/KinetisUSBHS/1.0] instance: usbhs

5.14.1 Description
Model of the USBHS peripheral used on the Freescale Kinetis platform

5.14.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

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5.14.3 Reference
www.freescale.com/Kinetis

5.14.4 Licensing
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There are no configuration options set for this peripheral instance.

5.15 Peripheral [freescale.ovpworld.org/peripheral/KinetisUSBDCD/1.0] instance: usbdcd

5.15.1 Description
Model of the USBDCD peripheral used on the Freescale Kinetis platform

5.15.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.15.3 Reference
www.freescale.com/Kinetis

5.15.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.16 Peripheral [freescale.ovpworld.org/peripheral/KinetisPDB/1.0] instance: pdb

5.16.1 Description
Model of the PDB peripheral used on the Freescale Kinetis platform

5.16.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.16.3 Reference
www.freescale.com/Kinetis

5.16.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.17 Peripheral [freescale.ovpworld.org/peripheral/KinetisPIT/1.0] instance: pit

5.17.1 Description

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Model of the PIT peripheral used on the Freescale Kinetis platform

5.17.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.17.3 Reference
www.freescale.com/Kinetis

5.17.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.18 Peripheral [freescale.ovpworld.org/peripheral/KinetisFTM/1.0] instance: ftm0

5.18.1 Description
Model of the FTM peripheral used on the Freescale Kinetis platform

5.18.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.18.3 Reference
www.freescale.com/Kinetis

5.18.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.19 Peripheral [freescale.ovpworld.org/peripheral/KinetisFTM/1.0] instance: ftm1

5.19.1 Description
Model of the FTM peripheral used on the Freescale Kinetis platform

5.19.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.19.3 Reference
www.freescale.com/Kinetis

5.19.4 Licensing
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There are no configuration options set for this peripheral instance.

5.20 Peripheral [freescale.ovpworld.org/peripheral/KinetisADC/1.0] instance: adc0

5.20.1 Description
Model of the ADC peripheral used on the Freescale Kinetis platform

5.20.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.20.3 Reference
www.freescale.com/Kinetis

5.20.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.21 Peripheral [freescale.ovpworld.org/peripheral/KinetisADC/1.0] instance: adc2

5.21.1 Description
Model of the ADC peripheral used on the Freescale Kinetis platform

5.21.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.21.3 Reference
www.freescale.com/Kinetis

5.21.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.22 Peripheral [freescale.ovpworld.org/peripheral/KinetisRTC/1.0] instance: rtc

5.22.1 Description
Model of the RTC peripheral used on the Freescale Kinetis platform

5.22.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.22.3 Reference

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5.22.4 Licensing
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There are no configuration options set for this peripheral instance.

5.23 Peripheral [freescale.ovpworld.org/peripheral/KinetisRFVBAT/1.0] instance: vbat

5.23.1 Description
Model of the RFVBAT peripheral used on the Freescale Kinetis platform

5.23.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.23.3 Reference
www.freescale.com/Kinetis

5.23.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.24 Peripheral [freescale.ovpworld.org/peripheral/KinetisLPTMR/1.0] instance: lptmr

5.24.1 Description
Model of the LPTMR peripheral used on the Freescale Kinetis platform

5.24.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.24.3 Reference
www.freescale.com/Kinetis

5.24.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.25 Peripheral [freescale.ovpworld.org/peripheral/KinetisRFSYS/1.0] instance: rfsys

5.25.1 Description
Model of the RFSYS peripheral used on the Freescale Kinetis platform

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5.25.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.25.3 Reference

www.freescale.com/Kinetis

5.25.4 Licensing

Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.26 Peripheral [freescale.ovpworld.org/peripheral/KinetisTSI/1.0] instance: tsi

5.26.1 Description

Model of the TSI peripheral used on the Freescale Kinetis platform

5.26.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.26.3 Reference

www.freescale.com/Kinetis

5.26.4 Licensing

Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.27 Peripheral [freescale.ovpworld.org/peripheral/KinetisSIM/1.0] instance: sim

5.27.1 Description

Model of the SIM peripheral used on the Freescale Kinetis platform

5.27.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.27.3 Reference

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There are no configuration options set for this peripheral instance.

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5.28 Peripheral [freescale.ovpworld.org/peripheral/KinetisPORT/1.0] instance: amux

5.28.1 Description

Model of the PORT peripheral used on the Freescale Kinetis platform

5.28.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.28.3 Reference

www.freescale.com/Kinetis

5.28.4 Licensing

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There are no configuration options set for this peripheral instance.

5.29 Peripheral [freescale.ovpworld.org/peripheral/KinetisPORT/1.0] instance: bmux

5.29.1 Description

Model of the PORT peripheral used on the Freescale Kinetis platform

5.29.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.29.3 Reference

www.freescale.com/Kinetis

5.29.4 Licensing

Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.30 Peripheral [freescale.ovpworld.org/peripheral/KinetisPORT/1.0] instance: cmux

5.30.1 Description

Model of the PORT peripheral used on the Freescale Kinetis platform

5.30.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.30.3 Reference

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5.30.4 Licensing
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There are no configuration options set for this peripheral instance.

5.31 Peripheral [freescale.ovpworld.org/peripheral/KinetisPORT/1.0] instance: dmux

5.31.1 Description
Model of the PORT peripheral used on the Freescale Kinetis platform

5.31.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.31.3 Reference
www.freescale.com/Kinetis

5.31.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.32 Peripheral [freescale.ovpworld.org/peripheral/KinetisPORT/1.0] instance: emux

5.32.1 Description
Model of the PORT peripheral used on the Freescale Kinetis platform

5.32.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.32.3 Reference
www.freescale.com/Kinetis

5.32.4 Licensing
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There are no configuration options set for this peripheral instance.

5.33 Peripheral [freescale.ovpworld.org/peripheral/KinetisPORT/1.0] instance: fmux

5.33.1 Description
Model of the PORT peripheral used on the Freescale Kinetis platform

5.33.2 Limitations

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Provides the base behaviour for the OVP Freescale Kinetis platforms

5.33.3 Reference
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5.33.4 Licensing
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There are no configuration options set for this peripheral instance.

5.34 Peripheral [freescale.ovpworld.org/peripheral/KinetisWDOG/1.0] instance: wdog

5.34.1 Description
Model of the WDOG peripheral used on the Freescale Kinetis platform

5.34.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.34.3 Reference
www.freescale.com/Kinetis

5.34.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.35 Peripheral [freescale.ovpworld.org/peripheral/KinetisEWM/1.0] instance: ewm

5.35.1 Description
Model of the EWM peripheral used on the Freescale Kinetis platform

5.35.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.35.3 Reference
www.freescale.com/Kinetis

5.35.4 Licensing
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There are no configuration options set for this peripheral instance.

5.36 Peripheral [freescale.ovpworld.org/peripheral/KinetisCMT/1.0] instance: cmt

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5.36.1 Description

Model of the CMT peripheral used on the Freescale Kinetis platform

5.36.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.36.3 Reference

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5.36.4 Licensing

Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.37 Peripheral [freescale.ovpworld.org/peripheral/KinetisMCG/1.0] instance: mcg

5.37.1 Description

Freescale Multipurpose Clock Generator

5.37.2 Limitations

Only models status register reads, based on writes to configuration registers atc register ATME bit is modeled as RAZ/WI

5.37.3 Licensing

Open Source Apache 2.0

5.37.4 Reference

Freescale Kinetis MCG

There are no configuration options set for this peripheral instance.

5.38 Peripheral [freescale.ovpworld.org/peripheral/KinetisOSC/1.0] instance: osc0

5.38.1 Description

Model of the OSC peripheral used on the Freescale Kinetis platform

5.38.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.38.3 Reference

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5.38.4 Licensing

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There are no configuration options set for this peripheral instance.

5.39 Peripheral [freescale.ovpworld.org/peripheral/KinetisI2C/1.0] instance: i2c0

5.39.1 Description
Model of the I2C peripheral used on the Freescale Kinetis platform

5.39.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.39.3 Reference
www.freescale.com/Kinetis

5.39.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.40 Peripheral [freescale.ovpworld.org/peripheral/KinetisI2C/1.0] instance: i2c1

5.40.1 Description
Model of the I2C peripheral used on the Freescale Kinetis platform

5.40.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.40.3 Reference
www.freescale.com/Kinetis

5.40.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.41 Peripheral [freescale.ovpworld.org/peripheral/KinetisUART/1.0] instance: uart0

5.41.1 Description
Model of the UART peripheral used on the Freescale Kinetis platform

5.41.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

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5.41.3 Reference

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5.41.4 Licensing

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Table 10. Configuration options (attributes) set for instance 'uart0'

Attribute	Value	Type	Expression
fifoSize	8	uns32	
moduleClkFreq	60000000	uns32	
outfile	uart0_outfile.txt	string	

5.42 Peripheral [freescale.ovpworld.org/peripheral/KinetisUART/1.0] instance: uart1

5.42.1 Description

Model of the UART peripheral used on the Freescale Kinetis platform

5.42.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.42.3 Reference

www.freescale.com/Kinetis

5.42.4 Licensing

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Table 11. Configuration options (attributes) set for instance 'uart1'

Attribute	Value	Type	Expression
fifoSize	8	uns32	
moduleClkFreq	60000000	uns32	
finishOnDisconnect	1	bool	
outfile	uart1_outfile.txt	string	

5.43 Peripheral [freescale.ovpworld.org/peripheral/KinetisUART/1.0] instance: uart2

5.43.1 Description

Model of the UART peripheral used on the Freescale Kinetis platform

5.43.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.43.3 Reference

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5.43.4 Licensing
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Table 12. Configuration options (attributes) set for instance 'uart2'

Attribute	Value	Type	Expression
fifoSize	1	uns32	
moduleClkFreq	60000000	uns32	
finishOnDisconnect	1	bool	
outfile	uart2_outfile.txt	string	

5.44 Peripheral [freescale.ovpworld.org/peripheral/KinetisUART/1.0] instance: uart3

5.44.1 Description
Model of the UART peripheral used on the Freescale Kinetis platform

5.44.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.44.3 Reference
www.freescale.com/Kinetis

5.44.4 Licensing
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Table 13. Configuration options (attributes) set for instance 'uart3'

Attribute	Value	Type	Expression
fifoSize	1	uns32	
moduleClkFreq	60000000	uns32	
finishOnDisconnect	1	bool	
outfile	uart3_outfile.txt	string	

5.45 Peripheral [freescale.ovpworld.org/peripheral/KinetisUSB/1.0] instance: usb

5.45.1 Description
Model of the USB peripheral used on the Freescale Kinetis platform

5.45.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.45.3 Reference
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There are no configuration options set for this peripheral instance.

5.46 Peripheral [freescale.ovpworld.org/peripheral/KinetisCMP/1.0] instance: cmp0

5.46.1 Description
Model of the CMP peripheral used on the Freescale Kinetis platform

5.46.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.46.3 Reference
www.freescale.com/Kinetis

5.46.4 Licensing
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Table 14. Configuration options (attributes) set for instance 'cmp0'

Attribute	Value	Type	Expression
cmpNumber	0	uns32	

5.47 Peripheral [freescale.ovpworld.org/peripheral/KinetisCMP/1.0] instance: cmp1

5.47.1 Description
Model of the CMP peripheral used on the Freescale Kinetis platform

5.47.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.47.3 Reference
www.freescale.com/Kinetis

5.47.4 Licensing
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Table 15. Configuration options (attributes) set for instance 'cmp1'

Attribute	Value	Type	Expression
cmpNumber	1	uns32	

5.48 Peripheral [freescale.ovpworld.org/peripheral/KinetisCMP/1.0] instance: cmp2

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5.48.1 Description
Model of the CMP peripheral used on the Freescale Kinetis platform

5.48.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.48.3 Reference
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5.48.4 Licensing
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Table 16. Configuration options (attributes) set for instance 'cmp2'

Attribute	Value	Type	Expression
cmpNumber	2	uns32	

5.49 Peripheral [freescale.ovpworld.org/peripheral/KinetisCMP/1.0] instance: cmp3

5.49.1 Description
Model of the CMP peripheral used on the Freescale Kinetis platform

5.49.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.49.3 Reference
www.freescale.com/Kinetis

5.49.4 Licensing
Open Source Apache 2.0

Table 17. Configuration options (attributes) set for instance 'cmp3'

Attribute	Value	Type	Expression
cmpNumber	3	uns32	

5.50 Peripheral [freescale.ovpworld.org/peripheral/KinetisVREF/1.0] instance: vref

5.50.1 Description
Model of the VREF peripheral used on the Freescale Kinetis platform

5.50.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

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5.50.3 Reference
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5.50.4 Licensing
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There are no configuration options set for this peripheral instance.

5.51 Peripheral [freescale.ovpworld.org/peripheral/KinetisLLWU/1.0] instance: llwu

5.51.1 Description
Model of the LLWU peripheral used on the Freescale Kinetis platform

5.51.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.51.3 Reference
www.freescale.com/Kinetis

5.51.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.52 Peripheral [freescale.ovpworld.org/peripheral/KinetisPMC/1.0] instance: pmc

5.52.1 Description
Model of the PMC peripheral used on the Freescale Kinetis platform

5.52.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.52.3 Reference
www.freescale.com/Kinetis

5.52.4 Licensing
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There are no configuration options set for this peripheral instance.

5.53 Peripheral [freescale.ovpworld.org/peripheral/KinetisSMC/1.0] instance: smc

5.53.1 Description

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Model of the SMC peripheral used on the Freescale Kinetis platform

5.53.2 Limitations
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5.53.3 Reference
www.freescale.com/Kinetis

5.53.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.54 Peripheral [freescale.ovpworld.org/peripheral/KinetisRCM/1.0] instance: rcm

5.54.1 Description
Model of the RCM peripheral used on the Freescale Kinetis platform

5.54.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.54.3 Reference
www.freescale.com/Kinetis

5.54.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.55 Peripheral [freescale.ovpworld.org/peripheral/KinetisRNG/1.0] instance: rng

5.55.1 Description
Model of the RNG peripheral used on the Freescale Kinetis platform

5.55.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.55.3 Reference
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There are no configuration options set for this peripheral instance.

5.56 Peripheral [freescale.ovpworld.org/peripheral/KinetisCAN/1.0] instance: can1

5.56.1 Description
Model of the CAN peripheral used on the Freescale Kinetis platform

5.56.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.56.3 Reference
www.freescale.com/Kinetis

5.56.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.57 Peripheral [freescale.ovpworld.org/peripheral/KinetisNFC/1.0] instance: nfc

5.57.1 Description
Model of the NFC peripheral used on the Freescale Kinetis platform

5.57.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.57.3 Reference
www.freescale.com/Kinetis

5.57.4 Licensing
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There are no configuration options set for this peripheral instance.

5.58 Peripheral [freescale.ovpworld.org/peripheral/KinetisSPI/1.0] instance: spi2

5.58.1 Description
Model of the SPI peripheral used on the Freescale Kinetis platform

5.58.2 Limitations
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5.58.3 Reference

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Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.59 Peripheral [freescale.ovpworld.org/peripheral/KinetisDDR/1.0] instance: ddr

5.59.1 Description
Model of the DDR peripheral used on the Freescale Kinetis platform

5.59.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.59.3 Reference
www.freescale.com/Kinetis

5.59.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.60 Peripheral [freescale.ovpworld.org/peripheral/KinetisI2S/1.0] instance: i2s1

5.60.1 Description
Model of the I2S peripheral used on the Freescale Kinetis platform

5.60.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.60.3 Reference
www.freescale.com/Kinetis

5.60.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.61 Peripheral [freescale.ovpworld.org/peripheral/KinetisSDHC/1.0] instance: sdhc

5.61.1 Description
Model of the SDHC peripheral used on the Freescale Kinetis platform

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5.61.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.61.3 Reference
www.freescale.com/Kinetis

5.61.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.62 Peripheral [freescale.ovpworld.org/peripheral/KinetisFTM/1.0] instance: ftm2

5.62.1 Description
Model of the FTM peripheral used on the Freescale Kinetis platform

5.62.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.62.3 Reference
www.freescale.com/Kinetis

5.62.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.63 Peripheral [freescale.ovpworld.org/peripheral/KinetisFTM/1.0] instance: ftm3

5.63.1 Description
Model of the FTM peripheral used on the Freescale Kinetis platform

5.63.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.63.3 Reference
www.freescale.com/Kinetis

5.63.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

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5.64 Peripheral [freescale.ovpworld.org/peripheral/KinetisADC/1.0] instance: adc1

5.64.1 Description
Model of the ADC peripheral used on the Freescale Kinetis platform

5.64.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.64.3 Reference
www.freescale.com/Kinetis

5.64.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.65 Peripheral [freescale.ovpworld.org/peripheral/KinetisADC/1.0] instance: adc3

5.65.1 Description
Model of the ADC peripheral used on the Freescale Kinetis platform

5.65.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.65.3 Reference
www.freescale.com/Kinetis

5.65.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.66 Peripheral [freescale.ovpworld.org/peripheral/KinetisENET/1.0] instance: enet

5.66.1 Description
Model of the ENET peripheral used on the Freescale Kinetis platform

5.66.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.66.3 Reference
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5.66.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.67 Peripheral [freescale.ovpworld.org/peripheral/KinetisDAC/1.0] instance: dac0

5.67.1 Description
Model of the DAC peripheral used on the Freescale Kinetis platform

5.67.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.67.3 Reference
www.freescale.com/Kinetis

5.67.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.68 Peripheral [freescale.ovpworld.org/peripheral/KinetisDAC/1.0] instance: dac1

5.68.1 Description
Model of the DAC peripheral used on the Freescale Kinetis platform

5.68.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.68.3 Reference
www.freescale.com/Kinetis

5.68.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.69 Peripheral [freescale.ovpworld.org/peripheral/KinetisOSC/1.0] instance: osc1

5.69.1 Description
Model of the OSC peripheral used on the Freescale Kinetis platform

5.69.2 Limitations

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Provides the base behaviour for the OVP Freescale Kinetis platforms

5.69.3 Reference
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5.69.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.70 Peripheral [freescale.ovpworld.org/peripheral/KinetisUART/1.0] instance: uart4

5.70.1 Description
Model of the UART peripheral used on the Freescale Kinetis platform

5.70.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.70.3 Reference
www.freescale.com/Kinetis

5.70.4 Licensing
Open Source Apache 2.0

Table 18. Configuration options (attributes) set for instance 'uart4'

Attribute	Value	Type	Expression
fifoSize	1	uns32	
moduleClkFreq	60000000	uns32	
finishOnDisconnect	1	bool	
outfile	uart4_outfile.txt	string	

5.71 Peripheral [freescale.ovpworld.org/peripheral/KinetisUART/1.0] instance: uart5

5.71.1 Description
Model of the UART peripheral used on the Freescale Kinetis platform

5.71.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.71.3 Reference
www.freescale.com/Kinetis

5.71.4 Licensing

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Table 19. Configuration options (attributes) set for instance 'uart5'

Attribute	Value	Type	Expression
fifoSize	1	uns32	
moduleClkFreq	60000000	uns32	
finishOnDisconnect	1	bool	
outfile	uart5_outfile.txt	string	

5.72 Peripheral [freescale.ovpworld.org/peripheral/KinetisGPIO/1.0] instance: gpioA

5.72.1 Description
Model of the GPIO peripheral used on the Freescale Kinetis platform

5.72.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.72.3 Reference
www.freescale.com/Kinetis

5.72.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.73 Peripheral [freescale.ovpworld.org/peripheral/KinetisGPIO/1.0] instance: gpioB

5.73.1 Description
Model of the GPIO peripheral used on the Freescale Kinetis platform

5.73.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.73.3 Reference
www.freescale.com/Kinetis

5.73.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.74 Peripheral [freescale.ovpworld.org/peripheral/KinetisGPIO/1.0] instance: gpioC

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5.74.1 Description

Model of the GPIO peripheral used on the Freescale Kinetis platform

5.74.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.74.3 Reference

www.freescale.com/Kinetis

5.74.4 Licensing

Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.75 Peripheral [freescale.ovpworld.org/peripheral/KinetisGPIO/1.0] instance: gpioD

5.75.1 Description

Model of the GPIO peripheral used on the Freescale Kinetis platform

5.75.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.75.3 Reference

www.freescale.com/Kinetis

5.75.4 Licensing

Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

5.76 Peripheral [freescale.ovpworld.org/peripheral/KinetisGPIO/1.0] instance: gpioE

5.76.1 Description

Model of the GPIO peripheral used on the Freescale Kinetis platform

5.76.2 Limitations

Provides the base behaviour for the OVP Freescale Kinetis platforms

5.76.3 Reference

www.freescale.com/Kinetis

5.76.4 Licensing

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There are no configuration options set for this peripheral instance.

5.77 Peripheral [freescale.ovpworld.org/peripheral/KinetisGPIO/1.0] instance: gpioF

5.77.1 Description
Model of the GPIO peripheral used on the Freescale Kinetis platform

5.77.2 Limitations
Provides the base behaviour for the OVP Freescale Kinetis platforms

5.77.3 Reference
www.freescale.com/Kinetis

5.77.4 Licensing
Open Source Apache 2.0

There are no configuration options set for this peripheral instance.

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6.0 Overview of Imperas OVP Virtual Platforms

This document provides the details of the usage of an Imperas OVP Virtual Platform / Module. The first half of the document covers specifics of this particular virtual platform / module.

This second part of the document, includes information about Imperas OVP virtual platforms and modules, how they are built and used.

The Imperas virtual platforms are designed to provide a base for you to run high-speed software simulations of CPU-based SoCs and platforms on any suitable PC. They are typically based on the functionality of vendors fixed or evaluation platforms, enabling you to simulate software on these reference platforms. Typically virtual platforms are fixed and require the vendor to modify or extend them. Imperas virtual platforms are different in that they enable you to extend the functionality of the virtual platform, to closer reflect your own platform, by adding more component models, running different operating systems or adding additional applications.

Imperas virtual platforms are created using the Imperas iGen technology, allowing them to be used with Imperas OVP based simulators and also with Accellera/OSCI compliant SystemC simulators and commercial EDA System Design environments that use SystemC.

Virtual platforms include simulation models of the target devices, including the processor model(s) for the target device plus enough peripheral models to boot an operating system or run bare metal applications. The platform and the peripheral models used in most of the virtual platforms are open source, so that you can easily add new models to the platform as well as modify the existing models. Some models are only provided as binary, normally because the IP owner has restricted the release of the model source. In this case, please contact Imperas for more information.

There are typically several generic flavors of the virtual platforms for specific processor families, some targeting full operating systems, such as Linux, and some which focus on Real Time Operating Systems (RTOS) such as Mentor Nucleus or freeRTOS. OVP models of the processor cores are included in the virtual platforms, and for those processors which support mulitple cores SMP Linux is often supported for that virtual platform. For all of these virtual platforms, many of the peripheral components of the platform are modeled, often including the Ethernet and USB components. The semi-hosting capability of the Imperas virtual platform simulator products enables connection via the Ethernet and USB components from the virtual platform to the real world via the x86 host machine.

The Imperas OVP CPU models are written using the OVP Virtual Machine Interface (VMI) API that defines the behavior of the processor. The VMI API makes a clear line between model and simulator allowing very good optimization and world class high speed performance. The processor models are Instruction Accurate and do not model the detailed cycle timing of the processor and they implement functionality at the level of a Programmers View of the processor and peripherals and the software running on them does not know it is not running on hardware. Many models are provided as a binary shared object

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and also as source. This allows the download and use of the model binary or the use of the source to explore and modify the model. The models are run through an extensive QA and regression testing process and most processor model families are validated using technology provided by the processor IP owners. All the models in this platform are developed with the Open Virtual Platforms APIs and are implemented in C. A platform can be modeled as different levels of hierarchy using separately describable and compilable modules.

More information on modeling and APIs can be found on the www.OVPworld.org site.

7.0 Getting Started with Imperas OVP Virtual Platforms

Virtual platforms are downloadable from the OVPworld website OVPworld.org/downloads. You need to browse and look for '<platform processor name> Examples'. You do need to be registered and logged in on the OVP site to download. OVPworld currently provides 32 bit host versions of packages containing virtual platforms.

When downloading, choose, Linux or Windows host. 32 bit packages can be installed and executed on 32 bit or 64 bit hosts. If you require a 64 bit host version please contact Imperas.

For example, for the ARM Versatile Express platform booting Linux on Cortex-A15MP Single, Dual, and Quad core procesors, you would want the download package: 'OVPsim_demo_Linux_ArmVersatileExpress_arm_Cortex-A15MP'.

Most virtual platform packages contain the platform and all the processor and peripheral models needed. You will need to download a simulator to run the platform. You can use OVPsim, downloadable from OVPworld.org/downloads, or you can use one of the Imperas simulators (imperas.com/products) available commercially from Imperas.

8.0 Simulating Software

8.1 Getting a license key to run

After you have downloaded you will need a runtime license key before the simulators will run. For OVPsim please visit OVPworld.org/likey and provide the required information and an evaluation/demo license key will be automatically sent to you. If you are using Imperas, then please contact Imperas for a license key.

8.2 Normal runs

To run a platform, read the section below on command line control of the platform and the section on setting command line arguments.

8.3 Loading Software

For most virtual platforms the platform is already configured to run the default software application/program and there is normally a script to run that sets some arguments. You can then copy/edit this script to select your own applications etc.

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The example application programs are typically .elf format files and are provided pre-compiled. There are normally makefiles and associated scripts to recompile the example applications.

To find more information about compiling and loading software, the following document should be looked at: Imperas_Installation_and_Getting_Started.pdf.

8.4 Semihosting
In a virtual platform, semihosting is not normally used as there is normally hardware that implements the appropriate functionality - for example I/O will be handled by UARTs etc.

8.5 Using a terminal (UART)
If the platform includes one or more UARTs you will need to connect a terminal program to it so that you can see output and type into the simulated program. Review the list of peripherals below and see what configuration options it has been set with. In most cases there is an option to set to instruct the simulator to 'pop up' a terminal window connected to the simulated UART.

8.6 Interacting with the simulation (keyboard and mouse)
If the platform has a simulated UART you can normally set a command to get the simulator to pop up a terminal window allowing you to see output from the simulated UART and also allowing you to type characters into the UART that can be processed by the simulated software.

If your simulated platform has an LCD device then you can often configure it to recognize mouse movements and mouse clicks - allowing full interaction.

To see these interactions in action, have a look at some of the available videos available at OVPworld.org/demosandvideos.

8.7 More Information (Documentation) on Simulation
To find more information about running simulations and more of the options the simulators provide, the following documents should be looked at:
Imperas_Installation_and_Getting_Started.pdf
Simulation_Control_of_Platforms_and_Modules_User_Guide.pdf
Advanced_Simulation_Control_of_Platforms_and_Modules_User_Guide.pdf
OVP_Control_File_User_Guide.pdf

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

9.0 Debugging Software running on an Imperas OVP Virtual Platform
The Imperas and OVP simulators have several different interfaces to debuggers. These include several proprietary formats and also the standard GNU RSP format is supported allowing many compatible debuggers to be used. Below are some examples that Imperas directly support.

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9.1 Debugging with GDB

A GNU debugger (GDB) can be connected to a processor in a platform using the RSP protocol. This allows the application program running on a processor to be debugged using a specific GDB for the processor selected. When using the Imperas Professional products many connections can be made allowing a GDB to be connected to all the processors in the platform.

The use of GDB is documented: OVPsim_Debugging_Applications_with_GDB_User_Guide.pdf.

9.2 Debugging with Imperas M*DBG

The Imperas multi-processor debugger can be connected to a platform and through this connection you can debug application programs running on all of the processors instanced within the platform. It is also capable, within this single unified environment, to debug peripheral model behavioral code in conjunction with the processor application programs.

For more information please see the Imperas M*DBG user guide.

The Imperas multi-processor debugger is also capable of controlling the Imperas Verification Analysis aand Profiling (VAP) tools in real time, making them invaluable to application program development, debugging and analysis.

For more information please see the Imperas VAP tools user guide.

9.3 Debugging with the Imperas eGui and GDB

Imperas eGui gives a GUI front end to the use of the GDB debugger. It allows use of all the features of GDB including source level application program debugging on processors.

9.4 Debugging with the Imperas eGui and M*DBG

Imperas eGui gives a GUI front end to the Imperas multi-processor debugger. It provides all the features of this debugger but does so with source level application program debugging on processors and source level debugging of the behavioral code on peripheral components in the platform. A context view shows all the processor and peripheral components within the platform and allows switching between them to examine the state of each at the event at which the simulation was stopped

Imperas eGui provides a menu from which the Imperas VAP tools can be controlled.

9.5 Debugging with Imperas eGui and Eclipse

Imperas provide a GUI based on Eclipse called eGui. This provides a GUI front end to use with a standard GDB or the Imperas MPD (Multi-Processor Debugger).

The use of eGui is documented: eGui_Eclipse_User_Guide.pdf.

A standard Eclipse CDT development environment can be connected to one or more processors in a

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platform (multiple processors require an Imperas professional product). The simulation platform is started remotely or using the external tool feature in Eclipse, opens a debug port and awaits the connection with Eclipse. All features provided by the Eclipse CDT development environment are available to be used to debug software applications executing on the processors in the platform.

The use of Eclipse is documented: OVPsim_Debugging_Applications_with_Eclipse_User_Guide.pdf.

9.6 Debugging applications running under a simulated operating system

If the simulated platform is running an Operating System and the platform has a UART or Ethernet etc connection then it is often possible to connect an external debugger and debug the applications running under the simulated operating system.

An example would be a simulated platform running the Linux operating system, such as the MIPS Malta, or ARM Versatile Express. Within the simulated Linux you can start a gdbserver that connects from within the simulation through a UART out to the host PC via a port. Within the host PC you start a terminal program and connect to the port with a debugger such as GDB and can then debug the simulated user application.

10.0 Modifying the Platform / Module

10.1 Platforms / Modules use C/C++ and OVP APIs

The Imperas and OVP simulators execute a platform / module that is written in C/C++ and that makes function calls into the simulator's APIs. Thus the virtual platform / module is compiled from C/C++ into a binary shared object that the simulator loads and runs. OVP provides the definition and documentation that defines the C APIs for modeling the platforms, modules, the peripherals, and the processors. You can find more information about these APIs on the OVP website and in the OVP API documentation.

10.2 Platforms/Modules/Peripherals can be easily built with iGen from Imperas

Imperas provides a product 'iGen' that takes an input script file and creates the C/C++ files needed for platforms, modules, and peripherals - it creates the C/C++ file that is compiled into the platform, module or peripheral that is needed as an object file by the simulator. iGen creates the C/C++ files, you then need to add any necessary behaviors or further details etc. For platforms iGen creates either a C platform or a C++ SystemC TLM2 platform. For peripherals or modules iGen creates the C files and also provides a native C++ SystemC TLM2 interface to allow the peripheral/module to be instantiated in SystemC TLM2 platforms.

Information on iGen is available from: imperas.com/products.

10.3 Re-configuring the platform

There will nornmally be several configuration options that you can set when running the platform without the neeed to change any source. Refer to the section above on command line arguments. If these do not allow you to make the changes you need, then you may need to edit and recompile the source of the platform.

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The source of the platform, modules, and the source of the peripherals will be installed as part of the packages you are using. The sources are located in the Imperas/OVP installation VLNV source tree. The VLNV term refers to: Vendor (eg arm.ovpworld.org), Library (eg platform), Name, (eg ArmVersatileExpress-CA15), and Version (eg 1.0). To modify the platform, locate the platform source files.

If you are an Imperas user and have access to iGen, we recommend you modify the source script files and regenerate and recompile the C that makes up the platform. Refer to the Imperas iGen model generator guide and the Imperas platform generator guide.

If you are using the C or SystemC TLM2 platforms with OVPsim, then you can edit the C/C++ files, recompile the source directly using the supplied makefiles, and the run the simulator directly with the resultant shared object.

10.4 Replacing peripherals components
If you need to replace peripherals, find the appropriate place in the source of the platform, make the change you need, and recompile etc. Look in the library for documentation on available peripherals and their configuration options.

10.5 Adding new peripherals components
If you need to add peripherals, find the appropriate place in the source, make the additions you need, and recompile etc. Look in the library for documentation on available peripherals and their configuration options.

If you need to create new peripheral components then use iGen to very quickly create the necessary C/C++ files that get you started. With iGen you can create peripherals with register/memory state in a few lines of iGen source. When adding behavior to the peripherals refer to the OVP API documentation.

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11.0 Available Virtual Platforms

Table 20. Imperas / OVP Extendable Platform Kits (13 available)

Name	Vendor
AlteraCycloneIII_3c120	altera.ovpworld.org
AlteraCycloneV_HPS	altera.ovpworld.org
ArmIntegratorCP	arm.ovpworld.org
ArmVersatileExpress	arm.ovpworld.org
ArmVersatileExpress-CA15	arm.ovpworld.org
ArmVersatileExpress-CA9	arm.ovpworld.org
AtmelAT91SAM7	atmel.ovpworld.org
FreescaleKinetis60	freescale.ovpworld.org
FreescaleKinetis64	freescale.ovpworld.org
FreescaleVybridVFxx	freescale.ovpworld.org
MipsMalta	mips.ovpworld.org
RenesasUPD70F3441	renesas.ovpworld.org
XilinxML505	xilinx.ovpworld.org

Table 21. Imperas General Virtual Platforms (6 available)

Name	Vendor
arm-ti-eabi	arm.imperas.com
armm-ti-coff	arm.imperas.com
armm-ti-eabi	arm.imperas.com
HeteroAlteraCycloneV_HPS_CycloneIII_3c120	imperas.ovpworld.org
HeteroArmNucleusMIPSLinux	imperas.ovpworld.org
SiFiveFU540	imperas.ovpworld.org

Table 22. Imperas Modules (component of other platforms) (55 available)

Name	Vendor
AlteraCycloneIII_3c120	altera.ovpworld.org
AlteraCycloneV_HPS	altera.ovpworld.org
AE350	andes.ovpworld.org
ARMv8-A-FMv1	arm.ovpworld.org
ArmIntegratorCP	arm.ovpworld.org
ArmVersatileExpress	arm.ovpworld.org
ArmVersatileExpress-CA15	arm.ovpworld.org
ArmVersatileExpress-CA9	arm.ovpworld.org
AtmelAT91SAM7	atmel.ovpworld.org
ArmCortexMFreeRTOS	imperas.ovpworld.org
ArmCortexMuCOS-II	imperas.ovpworld.org
ArmuKernel	imperas.ovpworld.org
ArmuKernelDual	imperas.ovpworld.org
BareMetalMIPS	imperas.ovpworld.org
Dual_ARMv8-A-FMv1_VLAN	imperas.ovpworld.org
Hetero_1xArm_3xMips32	imperas.ovpworld.org
Hetero_ARM_RISCV_NeuralNetwork	imperas.ovpworld.org

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Hetero_ARMv8-A-FMv1_Cortex-M3	imperas.ovpworld.org
Hetero_ARMv8-A-FMv1_MIPS_microAptiv	imperas.ovpworld.org
Hetero_AlteraCycloneV_HPS_AlteraCycloneIII_3c120	imperas.ovpworld.org
Hetero_ArmIntegratorCP_XilinxMicroBlaze	imperas.ovpworld.org
Hetero_ArmVersatileExpress_MipsMalta	imperas.ovpworld.org
Hetero_ArmVersatileExpress_XilinxMicroBlaze	imperas.ovpworld.org
Quad_ArmVersatileExpress-CA15	imperas.ovpworld.org
RiscvRV32FreeRTOS	imperas.ovpworld.org
MipsMalta	mips.ovpworld.org
iMX6S	nxp.ovpworld.org
RenesasUPD70F3441	renesas.ovpworld.org
ghs-multi	renesas.ovpworld.org
virtio	riscv.ovpworld.org
FaultInjection	safepower.ovpworld.org
PublicDemonstrator	safepower.ovpworld.org
Zynq_PL_DualMicroblaze	safepower.ovpworld.org
Zynq_PL_NoC	safepower.ovpworld.org
Zynq_PL_NoC_node	safepower.ovpworld.org
Zynq_PL_NostrumNoC	safepower.ovpworld.org
Zynq_PL_NostrumNoC_node	safepower.ovpworld.org
Zynq_PL_RO	safepower.ovpworld.org
Zynq_PL_SingleMicroblaze	safepower.ovpworld.org
Zynq_PL_TTELNoC	safepower.ovpworld.org
Zynq_PL_TTELNoC_node	safepower.ovpworld.org
Zynq_PL_TTELNoC_processing_node_public_demonstrator	safepower.ovpworld.org
Zynq_PL_TTELNoC_public_demonstrator	safepower.ovpworld.org
Zynq_PL_TTELNoC_sensor_actor_node_public_demonstrator	safepower.ovpworld.org
FU540	sifive.ovpworld.org
S51CC	sifive.ovpworld.org
coreip-s51-arty	sifive.ovpworld.org
coreip-s51-rtl	sifive.ovpworld.org
dualFifo	vendor.com
XilinxML505	xilinx.ovpworld.org
Zynq	xilinx.ovpworld.org
Zynq_PL_Default	xilinx.ovpworld.org
Zynq_PS	xilinx.ovpworld.org
zc702	xilinx.ovpworld.org
zc706	xilinx.ovpworld.org

Table 23. Imperas / OVP Bare Metal Virtual Platforms (22 available)

Name	Vendor
BareMetalNios_IISingle	altera.ovpworld.org
BareMetalArcSingle	arc.ovpworld.org
BareMetalArm7Single	arm.ovpworld.org
BareMetalArmCortexADual	arm.ovpworld.org
BareMetalArmCortexASingle	arm.ovpworld.org
BareMetalArmCortexASingleAngelTrap	arm.ovpworld.org
BareMetalArmCortexMSingle	arm.ovpworld.org

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ArmCortexMFreeRTOS	imperas.ovpworld.org
ArmCortexMuCOS-II	imperas.ovpworld.org
BareMetalArmx1Mips32x3	imperas.ovpworld.org
Or1kUclinux	imperas.ovpworld.org
BareMetalM14KSingle	mips.ovpworld.org
BareMetalMips32Dual	mips.ovpworld.org
BareMetalMips32Single	mips.ovpworld.org
BareMetalMips64Single	mips.ovpworld.org
BareMetalMipsDual	mips.ovpworld.org
BareMetalMipsSingle	mips.ovpworld.org
BareMetalOr1kSingle	ovpworld.org
BareMetalM16cSingle	posedgesoft.ovpworld.org
BareMetalPowerPc32Single	power.ovpworld.org
BareMetalV850Single	renesas.ovpworld.org
ghs-multi	renesas.ovpworld.org

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