

TI81XX PSP 04.04.00.02 Feature Performance Guide



TI81xx PSP 04.04.00.02 Feature & Performance Guide

Linux PSP

This page is currently under construction. The content of this page is due to change quite frequently and thus the quality and accuracy are not guaranteed until this message has been removed. Please feel free to contribute to this page while construction is in progress.



IMPORTANT

TI81XX refers to TI816X, TI814X and TI813X.

Important

This datasheet is applicable for 04.04.00.02 release only.

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Read This First

All performance numbers provided in this document are gathered using

- TI816X EVM with DDR3 configured at 800 MHz clock (effective 1600MHz data rate)
- TI814X EVM with DDR3 configured at 400 MHz clock (effective 800MHz data rate).
- TI813X EVM with DDR3 configured at 400Mhz clock (effective 800MHz data rate).

About This Manual

This document provides an overview and performance data for each of the device drivers which are part of the Linux PSP package supporting

- TI816X EVM (Base board with daughter card required for second Ethernet port and NOR) -henceforth referred to as **TI816X EVM**
 - TI814X EVM (Base board with daughter card required for NOR) - henceforth referred to as **TI814X EVM**.
- and
- TI813X EVM

Note that only a subset of the drivers may have actually been fully tested and verified in the package you are using. Please refer to the release notes provided with the package for information on which of the drivers have actually been verified.

If You Need Assistance

For further information or to report any problems, contact <http://community.ti.com/or> <http://support.ti.com/>

U-Boot

Hardware Related Info

U-Boot currently does the bare minimum configuration needed to boot the kernel. The following table lists various resources enabled by the ROM code + U-Boot running on the host ARM (that is, Cortex A8).

TI816X EVM

Hardware/module usage Info

Resource	Specifics	Notes
OCMC RAM	OCMC0 and OCMC1	U-Boot initially runs out of OCMC1 and then relocates to DDR. OCMC0 is used by ROM code and by U-Boot in case of NOR boot.
Control module	NA	Needs to be enabled prior to enabling other modules.
Main PLL clocks	Clocks 1-5	Clock1 ~= 800MHz, Clock2 ~= 1GHz, Clock3 ~= 600MHz, Clock4 ~= 500 MHz, Clock5 ~= 125MHz
DDR PLL clocks	Clocks 1-3	Clock1 ~= 800MHz, Clock2 ~= 48MHz, Clock3 ~= 400MHz
UART	UARTs 0-2	On Base EVMs, UART2 is used as console by U-Boot and later by the kernel
Timers	Timer1	Used by U-Boot for timekeeping purposes
RAM	Both the EMIFs	Configuration done differs based on the type of memory on the EVM (DDR2 or DDR3)
I2C	I2C0	
eFuse	Customer_eFuse	Module enabled.
GPIO	GPIO0	Module enabled.
SPI		Module enabled.
CPGMAC	CPGMAC0 and CPGMAC1	Base EVM has 1 Ethernet port associated to CPGMAC0. Please refer module specific documentation and respective release details for CPGMAC1 usage.

NAND	Whole	Base EVM has 256MiB NAND. Mutually exclusive with NOR.
NOR	Whole	Not available on Base EVM. Mutually exclusive with NAND.
MMC/SD	MMC/SD	Enabled as a part of the boot process

TI814X EVM

Hardware/module usage Info

Resource	Specifics	Notes
OCMC RAM	OCMC0	- 1st stage U-Boot runs out of OCMC0 - Suspend code runs from OCMC0 (uses 1 KB from the end)
Control module	NA	Needs to be enabled prior to enabling other modules.
Clocks/PLL Setup	TI814x: Modena (A8), L3, DDR, SATA, DSP, DSS, IVA, ISS, USB TI813x:Modena (A8), L3, DDR, SATA, DSS, IVA, ISS, USB	
UART	UARTs 0-5	UART0 is available as console on base board.
Timers	Timer1	Used for timekeeping purpose
RAM	TI814x :Both the EMIFs TI813x: single EMIF	Non-interleaved configuration
I2C	I2C0	
SPI		Module enabled.
EMACSW	Ethernet port (with internal switch)	Used for DHCP, TFTP load of kernel (and/or) filesystem images.
NAND	Whole	Base EVM has 256MiB NAND. Mutually exclusive with NOR.
NOR	Whole	Available only on Daughter Board. Mutually exclusive with NAND.

Linux Kernel

Module/Subsystem Usage

Following table covers various onchip modules/subsystems enabled and used in U-Boot and Kernel. It also lists module status on reset. Note that there may be a few modules which are enabled but not used currently but will be used in future.

The table uses following conventions for enabled status:

- BOOTCFG - Module is enabled depending upon boot mode
- YES - Module is enabled always and is critical for functioning (*should never be turned off*).
- CONFIG - Module will be enabled depending upon build time or run time configuration (e.g., SATA module is enabled if SATA is enabled in kernel build configuration, UART1 is enabled if 'ttyO1' is passed as console through kernel command line). *Note that there may be many modules included in default build configuration and thus they will be enabled by default (e.g., EMACSW), though these can be disabled by disabling respective configuration in build.*
- KEEP - Module already enabled and kept as is. Note that, *except for Control Module, eFuse and EMIFs*, in most of the other cases, this means that the corresponding module is not currently used and was enabled by the

component which executed earlier. This is, module enabled status 'KEEP' in Kernel means it was enabled by U-Boot (or boot time) but kernel doesn't touch it.

- NO - Module is not used and is not enabled

TI81XX

Module/Subsystem Usage Info

Module/Subsystem	Enabled on Reset?	Enabled in UBoot?	Enabled in Linux?	Remarks
Control Module	YES	KEEP	KEEP	
eFuse	YES	YES	KEEP	
OCMC0 & 1	BOOTCFG	YES	KEEP	
GPIO0	NO	YES	YES - TI816X KEEP - TI814X/3X	
GPIO1	NO	NO	YES - TI816X NO - TI814X/3X	
EMIF0	NO	YES	KEEP	
EMIF1	NO	YES	KEEP	NA for TI813X - It has a single emif
UART0	BOOTCFG	YES	CONFIG	
UART1	NO BOOTCFG - TI814X/3X	YES	CONFIG	
UART2	NO BOOTCFG - TI814X/3X	YES	CONFIG	
Timer1	NO	YES	YES	
Timer2	NO	NO	YES	
Timer3	NO	NO	NO	
Timer4	NO	NO	CONFIG NO- TI814X/3X	
Timer5 to 7	NO	NO	NO	
GPMC	BOOTCFG	YES	CONFIG	
EDMA TPCC	NO	NO	YES	
EDMA TPTC	NO	NO	YES	
SPI	BOOTCFG	YES	KEEP	
I2C0	NO	YES	CONFIG	
I2C1	NO	NO	NO	
I2C2	NO	YES	CONFIG	NA - TI816X
I2C3	NO	NO	NO	NA- TI816X
EMACSW	BOOTCFG	YES	CONFIG	NA - TI816X
CPGMAC0	BOOTCFG	YES	CONFIG	NA- TI814X/3X
CPGMAC1	NO	NO	NO	NA- TI814X/3X
USB	NO	NO	CONFIG	

SATA	NO	NO	CONFIG	
SATA1	NO	NO	CONFIG	NA- TI86X/4X
PCIe	BOOTCFG	NO	CONFIG	
SGX	NO	NO	NO	
IVAHD	NO	NO	NO	
Ducati	NO	NO	CONFIG	
MMU	NO	NO	NO	
MMU DATA	NO	NO	NO	
DSP	NO	NO	CONFIG	
Spinbox	NO	NO	CONFIG	
Mailbox	NO	NO	CONFIG	
HDMI	NO	NO	NO	
McASP0	NO	NO	CONFIG	
McASP1	NO	NO	NO	
			YES- TI813X	
McASP2	NO	NO	YES	
			NO - TI813X	
McBSP	NO	NO	NO	
MMC	BOOTCFG	YES	CONFIG	
MMC1	BOOTCFG	YES	CONFIG	NA - TI816X
MMC2	NO	NO	NO	NA - TI816X

Hardware Resources Reserved for Kernel

Following table lists various resources owned and used exclusively by kernel (that is, Cortex A8). Care must be taken not to share these across other processors. Of course, there can be a kernel module/driver which monitors the sharing - this is particularly applicable for shared buffers in RAM - but the control should still remain with kernel. *For modules having multiple instances, numbering is assumed to be from '0'.*

TI816X EVM

Hardware resources reserved

Resource	Specifics	Notes
UART	UART0, UART2	This is configurable through kernel command line ('bootargs') and is board dependent. On Base EVMs, UART2 is used as console. With daughter card, UART0 can be used for console.
Timers	Timer1, Timer2, Timer6	Timer1 - System Timer, Timer2 - Free Running, Timer6 - Graphics (SGX)
RAM	0x80000000 - 0x88000000	The RAM size allocated for kernel is configurable through boot argument 'mem=' passed to kernel during boot. The start address (0x80000000) is fixed. Also note that it is possible to map RAM region beyond this range into kernel virtual memory space using kernel drivers/modules. Multiple 'mem=' arguments can be passed to have the system RAM spanned across holes in between. Please refer User Guide for example and also the Kernel Virtual Memory Layout section below.

I2C	I2C0	Though I2C1 control from kernel is not supported, it is possible to add this support by editing arch/arm/plat-omap/i2c.c and arch/arm/mach-omap2/board-ti8168evm.c for 'Bus 2'
GPIO	GPIO0 & GPIO1	Total 64 GPIO lines
CPGMAC	CPGMAC0, CPGMAC1	Base EVM has 1 Ethernet port associated to CPGMAC0. Please refer module specific documentation and respective release details for CPGMAC1 usage.
NAND	Whole	Base EVM has 256MiB NAND. Mutually exclusive with NOR.
NOR	Whole	Not available on Base EVM. Available in daughter card (64MiB). Mutually exclusive with NAND.
EDMA	4 to 47, 52 to 54	Peripheral Only: 4 to 31, 52 to 54 Mem to Mem: 32 to 47
OCMC0	0x40300000 - 0x4033FFFF	OCMC 0 will be used by ROM Code and U-boot. Once Linux kernel boots, OCMC0 is free and kernel can use it. If OCMC0 should not be used to load u-boot if loaded using CCS.
OCMC1	0x40400000 - 0x4043FFFF	OCMC 1 will be used by ROM Code and U-boot. Once Linux kernel boots, OCMC0 is free and kernel can use it.
PCIe Memory	0x20000000 - 0x2FFFFFFF	PCIe Window for outbound access (RC mode)
PCIe I/O	0x40000000 - 0x402FFFFFFF	PCIe I/O window (RC mode)

TI814X / TI813X EVM

Hardware resources reserved

Resource	Specifics	Notes
UART	UART0	This is configurable through kernel command line ('bootargs') and is board dependent. On Base board, UART0 is used as console.
Timers	Timer1, Timer2	Timer1 - System Timer, Timer2 - Free Running
RAM	0x80000000 - 0x88000000	- The RAM size allocated for kernel is configurable through boot argument 'mem=' passed to kernel during boot. The start address (0x80000000) is fixed. Also note that it is possible to map RAM region beyond this range into kernel virtual memory space using kernel drivers/modules. Multiple 'mem=' arguments can be passed to have the system RAM spanned across holes in between. Please refer User Guide for example and also the Kernel Virtual Memory Layout section below.
I2C	I2C0	Refer board reference document/schematics for more details.
EMACSW		Has internal Ethernet switch.
NAND	Whole	Base EVM has 256MiB NAND. Mutually exclusive with NOR.
NOR	Whole	Currently for TI814X only. Available on daughter board (64 MiB). Mutually exclusive with NAND.
EDMA	4 to 47, 52 to 54	Peripheral Only: 4 to 31, 52 to 54 Mem to Mem: 32 to 47
OCMC0	0x40300000 - 0x4031FFFF (TI814x) 0x40300000 - 0x4033FFFF (TI813x)	- OCMC 0 will be used by ROM Code and U-boot. Once Linux kernel boots, OCMC0 is free and kernel can use it. If OCMC0 should not be used to load u-boot if loaded using CCS.
PCIe Memory	0x20000000 - 0x2FFFFFFF	Currently for TI814X only. PCIe Window for outbound access (RC mode)

PCIe I/O	0x40000000 - 0x402FFFFFF	Currently for TI814X only. PCIe I/O window (RC mode)
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Kernel Virtual Memory Layout

The default TI816X/TI814X kernel configuration, with "mem=200M" passed as boot argument, uses following Virtual Memory layout:

Note: Around 50MB of RAM is reserved for FB driver by default hence you see total memory as 150MB when passing 'mem=200M'.

TI816X EVM

Memory: 150MB = 150MB total

Memory: 146540k/146540k available, 58260k reserved, 0K highmem

Virtual kernel memory layout:

```

vector   : 0xffff0000 - 0xffff1000   (   4 kB)
fixmap   : 0xffff0000 - 0xffffe000   ( 896 kB)
DMA      : 0xffc00000 - 0xffe00000   (   2 MB)
vmalloc  : 0xcd000000 - 0xf8000000   ( 688 MB)
lowmem   : 0xc0000000 - 0xcc800000   ( 200 MB)
pkmap    : 0xbfe00000 - 0xc0000000   (   2 MB)
modules  : 0xbf000000 - 0xbfe00000   (  14 MB)
 .init   : 0xc0008000 - 0xc0039000   ( 196 kB)
 .text   : 0xc0039000 - 0xc0498000   (4476 kB)
 .data   : 0xc0498000 - 0xc04def80   ( 284 kB)
```

TI814X / TI813X EVM

Memory: 150MB = 150MB total

Memory: 146268k/146268k available, 58532k reserved, 0K highmem

Virtual kernel memory layout:

```

vector   : 0xffff0000 - 0xffff1000   (   4 kB)
fixmap   : 0xffff0000 - 0xffffe000   ( 896 kB)
DMA      : 0xffc00000 - 0xffe00000   (   2 MB)
vmalloc  : 0xcd000000 - 0xf8000000   ( 688 MB)
lowmem   : 0xc0000000 - 0xcc800000   ( 200 MB)
pkmap    : 0xbfe00000 - 0xc0000000   (   2 MB)
modules  : 0xbf000000 - 0xbfe00000   (  14 MB)
 .init   : 0xc0008000 - 0xc0039000   ( 196 kB)
 .text   : 0xc0039000 - 0xc04d9000   (4736 kB)
 .data   : 0xc04da000 - 0xc0521d80   ( 288 kB)
```

Please note following points:

- Default kernel build is set up with 3G/1G split for User/Kernel space. In addition, "High Memory" support in kernel (CONFIG_HIGHMEM) is enabled by default to accommodate larger physical memory/address space. Please refer HIGHMEM section below.
- It should be possible to allow larger *direct mapped* memory into kernel space by changing User/Kernel split to 2/2 or 1/3. Please note that these are NOT TESTED and may lead to unpredictable behavior - particularly some applications may fail.

Memory Holes Configuration

Note: This subsection is applicable to all platforms.

It is possible to indicate the kernel that the usable RAM is spanned across holes in between. This is achieved from passing multiple "mem=<size>@<start-address>" arguments to kernel.

CAUTION: Even when passing memory with holes, the kernel reserves contiguous space incorporating the whole memory passed through all 'mem' arguments. This means, the actual lowmem mapped will be more than the total size of all memory arguments combined together.

Some examples indicating above constraint and impact follow:

- mem=128M mem=128M@0xA0000000
 - Total direct mappable RAM space lost here is 0x80000000 to 0xA0000000 + 128M = ~768MB, vmalloc space available 120MB
- mem=128M mem=324M@0x9F900000
 - Total direct mappable RAM space lost here is 0x80000000 to 0x9F900000 + 324M = ~829MB
- mem=364M@0x80000000 mem=324M@0x9F900000
 - Total direct mappable RAM space lost here is 0x80000000 to 0xA0000000 + 324M = ~829MB
- In the later 2 cases above, the RAM direct mapped space is divided as 768 MB from actual required ~829MB with remaining designated as highmem (see below section) to be able to accommodate 120MB minimum vmalloc space.
 - This also means ~60MB RAM towards the end of the of the second partition is not used if CONFIG_HIGHMEM is disabled.

To summarize, in all of the above cases, the default vmalloc space available will be 120MB max (further reduced as in built drivers/modules will have some regions mapped from vmalloc region on bootup) and passing vmalloc=<size> can be used to increase the vmalloc region (which will result into part of RAM being used as highmem or truncated and unusable depending upon CONFIG_HIGHMEM is enabled or disabled respectively).

HIGHMEM

Note: This subsection is applicable to all platforms.

The default kernel configuration in this release has HIGHMEM support enabled. This means the address space above the directly mapped in kernel space can be accessed by creating run time non-permanent mappings.

Without HIGHMEM support, the *vmalloc* and *lowmem* sizes are dependent - on RAM available to kernel (as specified by 'mem=<size-in-MB>M' boot argument) and vmalloc size required - restricted by the amount of space that can be directly mapped into kernel. As you provide more memory for kernel to map, the *vmalloc* space will be lowered. Vice versa is true when vmalloc region is changed by passing 'vmalloc=<size-in-MB>M' argument.

Furthermore, RAM size more that 768M will be truncated to maintain minimum *vmalloc* at 120MB.

Using HIGHMEM support in kernel addresses these restrictions. Some examples follow (note all of the examples assume ~50MB reserved for FB at boot time):

E.g. 1 Consider the case where usable RAM for kernel is 1GB (mem=1G)

In this case, the total directly mapped RAM will be 768MB with vmalloc size maintained as 120MB. While the rest of the RAM (~210MB) will be available as highmem.

Here, if CONFIG_HIGHMEM is disabled, the RAM size will be truncated to 768MB and rest of the RAM will be unusable.

E.g. 2 Consider the case where usable RAM for kernel is 1GB (mem=1G) and vmalloc region set to 500MB (vmalloc=500M)

In this case, the total directly mapped RAM will be 396MB with vmalloc size maintained as 496MB. While the rest of the RAM (~591MB) will be available as highmem.

Here, if CONFIG_HIGHMEM is disabled, the RAM size will be truncated to 396MB and rest of the RAM will be unusable.

Note 1: HIGHMEM is labelled as EXPERIMENTAL feature and may have performance impact if not used carefully - e.g., on a system where most of the memory used lies in highmem region causing run time mapping creation.

Note 2: Though HIGHMEM configuration is enabled by default, the mapping for highmem will only be created on need basis and in case where total space comprising of specified RAM, vmalloc and memory holes (see the section on Memory Holes Configuration) exceeds directly mappable space (that is, 888MB).

Boot-time measurement

Boot-time measurement

Platform	Boot Device	u-boot time (sec)	reading uImage (2.55MB) (sec)	kernel+file system (13.4 MB)(sec)	total time (sec)
TI816X	SD Card	0.719	2.719	2.654	6.092
TI814X	SD Card	0.625	2.675	3.5	6.8
TI813X	SD Card	0.648	3.422	4.202	7.624

For boot-time measurement the following setup was used

TI81XX EVM

- 2-Stage SD boot (binaries picked from the release package)
- Kernel image of size 2.55MB (image picked from the release package)
- Sandisk Class-10 4GB SD card
- Filesystem on the SD card - 14MB

The kernel image used had the features enabled by the default configurations provided.

The following was the kernel command line passed

TI816X

```
console=ttyO2,115200n8 root=/dev/mmcblk0p2 mem=128M init=/bin/sh rootwait
```

TI814X/TI813X

```
console=ttyO0,115200n8 root=/dev/mmcblk0p2 mem=128M init=/bin/sh rootwait
```

The break-up of the boot-time is as given below: **Ti816X**

- Booting the compressed kernel (calculated from the time U-Boot displays "## Booting..." to the prompt) :3.84 secs
- Reading the 2.3MB uImage from SD card : 2.71 secs
- Misc time in U-Boot : 1.15 secs

TI814X

- Booting the compressed kernel (calculated from the time U-Boot displays "## Booting..." to the prompt) :4.92 secs
- Reading the 2.3MB uImage from SD card : 2.79 secs

- Misc time in U-Boot : 1.38 secs

TI813X

- Booting the compressed kernel (calculated from the time U-Boot displays "## Booting..." to the prompt) :TBD
- Reading the 2.3MB uImage from SD card :TBD
- Misc time in U-Boot : TBD

PSP Linux Drivers

This section provides brief overview of the device drivers supported in the Linux PSP release based on Linux OMAP git tree.

Note: The constraints may vary across product releases. Please refer to the Release Notes accompanying the release for an updated list of constraints.

Boot modes supported

Green colored box in the table below means that the particular boot mode is supported on the device in the release.

Note: These are supported boot modes in PSP software, the actual hardware may support many more boot modes than shown here. Please refer to hardware documentation for list of all supported boot modes.

TI81XX Linux PSP Supported Boot Modes

Boot Mode	TI816X EVM	TI814X EVM	TI813X EVM
NAND Flash	Yes	Yes	Yes
NOR Flash*	Yes	Yes	Yes
SPI EEPROM	Yes	Yes	Yes
SD	Yes	Yes	Yes
UART Boot	No	Yes	Yes
EMAC Boot	Yes **	Yes****	Yes****
PCIe Boot	Yes ***	Yes	No

* With Daughter card

** MACID blown processors required to verify this mode

*** Currently tested only with booting from TI816X/TI814X RC or a x86 PC

**** Only EMAC 0 is supported

Device driver list

Boot-time measurement

Peripheral	Description	Linux driver type
Audio (McASP)	Audio record and playback	ALSA SoC
Ethernet driver(TI816X)	Transmit/receive network data. Supports Auto negotiation with 10/100/1000 Mbps link speed	Netdev
Ethernet Switch driver(TI814X/TI813X)	Transmit/receive network data. Supports Auto negotiation with 10/100/1000 Mbps link speed	Netdev
I2C	Inter-IC Communication	Character
MUSB Host	Supports MSC/HID/Audio/Video classes	USB HCD
MUSB Gadget	Supports CDC/RNDIS/FSG classes	USB Gadget
NAND Flash	Flash storage system	MTD Character and Block
UART	Serial Communication Interface	Character
Video Display	Video Display Driver	Frame-buffer and V4L2 display driver
Video Capture	Video Capture Driver	V4L2 capture driver
SATA	Storage	Block Device
NOR	Flash Storage system	MTD character and Block
PCI Express	PCIe Root Complex Driver	PCI/PCIe Bus Driver
PCI Express	PCIe EP Boot Driver	Character
MMC/SD	Interface to MultiMedia Secure Digital cards	Block Device
AVS	Adaptive voltage scaling	Power Management driver
Watchdog	Interface to h/w Watchdog	/dev/watchdog

Driver DMA usage

TI81xx peripheral driver DMA usage

Driver	DMA usage
Audio (McASP)	EDMA
Ethernet Driver(TI816X)	Internal DMA
Ethernet Switch Driver(TI814X/TI813X)	Internal DMA
MUSB Host	Internal DMA
MUSB Gadget	Internal DMA
NAND Flash	None
NOR Flash	None
UART	None
I2C	None
SATA	Internal DMA
SPI	None
MMC/SD	EDMA
PCIe RC	None (Individual EPs may use Inbound DMA)

PCIe EP	None
AVS	None

SATA Driver

SATA controller is AHCI Ver.1.1 spec compliant . It supports SATA1 (1.5Gbps) and SATA 2 (3Gbps) speeds. Port Multiplier support is available in the SATA controller. The controller can support drives up to UDMA-133 speeds. Please refer PSP SATA FAQ for more information.

Note: Controller can inter-operate with Gen3 disks for TI813x platform. On TI816x and TI814x platforms, link negotiation may fail when a Gen3 device is connected

Driver Features

Registers as a SCSI controller with the Linux SCSI Subsystem. SATA devices get registered as SCSI devices and can be accessed as `"/dev/sd{*}"` devices.

The driver supports the following features:

1. CD/DVD support
2. HDD
3. Port Multiplier support(command based switching)

[Linux Libata feature table ^[1]] for more details.

Features Not Supported

- FIS based port-multiplier support
- Power Management: Though supported, validation is still pending.

Supported System Calls

All Linux ATA/SCSI system calls related to SATA

Supported IOCTLs

Supports IOCTLs available in Linux SCSI and ATA frameworks and which are applicable for SATA. Refer kernel source or documentation for details.

Performance and Benchmarks

Test Parameters

Test Parameters

Silicon Revision	TI814X PG 2.1 and PG3.0, TI816X PG1.1, TI813X PG1.0
EVM	
DDR3	TI816X - 800Mhz, TI814X/TI813X - 400Mhz
CPU Speed	TI816X - 1Ghz, TI814X/TI813X - 600Mhz
Sata Port Instance	1
Port 0 - HDD	Seagate Constellation ES ST3500514NS 500GB

SATA - ext2 File System Performance

SATA Write Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	117.88	59.09	105.26	86.00	102.24	93.14
256	100	118.47	55.68	86.87	71.07	103.54	91.18
512	100	110.12	53.68	105.02	84.00	97.70	85.98
1024	100	116.51	55.56	86.99	70.25	97.15	87.50
5120	100	117.24	56.18	87.75	70.59	103.31	90.20

SATA Read Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	132.84	44.30	132.25	78.48	129.43	100
256	100	131.88	48.10	131.61	79.75	129.26	97.56
512	100	131.86	41.03	131.73	71.43	129.30	95.06
1024	100	132.04	48.11	131.77	72.50	130.88	97.47
5120	100	131.75	45.57	131.93	82.50	127.81	95.12

SATA - vfat File System Performance

SATA Write Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	99.63	80.95	66.43	80.89	61.14	83.14
256	100	98.85	74.53	65.91	82.39	61.28	83.72
512	100	98.51	77.57	65.89	79.25	61.89	82.25
1024	100	100.56	73.33	66.07	80.38	62.78	80.72
5120	100	99.25	74.53	66.12	79.75	62.84	82.63

SATA Read Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	131.78	52.50	129.80	77.78	120.01	96.55
256	100	131.81	47.50	130.35	75.31	120.34	90.80
512	100	131.80	41.77	130.46	82.72	120.48	93.02
1024	100	131.71	46.75	129.94	79.01	122.27	93.10
5120	100	131.75	42.50	129.84	82.50	121.33	93.10

ALSA SoC Audio Driver

This section an overview of the ALSA SoC audio driver features along with the throughput and CPU load numbers. For the architecture, installation, basic usage and sample applications (if any) please refer to the driver user guide.

Driver Features

The driver supports the following features:

1. Supports AIC3106 audio codec (on TI814X base EVM)
2. Supports audio in stereo mode
3. Supports simultaneous playback and record (full-duplex mode).
4. Supports mixer interface for the audio codec

Features Not Supported

1. OSS based applications, which use ALSA-OSS emulation layer, are not supported.
2. Formats such as TDM, Left and Right Justified are currently not supported.
3. Synthesizer and midi interfaces are not supported.

Constraints

1. By default, codec is configured in master mode and McASP is used as slave. Testing of the audio sub-system is done in this configuration only.
2. Sampling frequencies for playback and capture streams should be same.
3. The audio driver does not allow opening the same stream (playback/capture) multiple times.

Supported System Calls

Refer ALSA project - the C library reference [2] for API calls.

Supported IOCTLs

NA

Performance and Benchmarks

Test setup:

1. Access type - RW_INTERLEAVED
2. Channels - 2
3. Format - S16_LE
4. Period size - 64

Audio Capture

			TI816x	TI814x	TI813x
Sampling Rate (in Hz)	Duration (in secs)	Bitrate (in bits/sec)	CPU (in %)	Load	CPU Load (in %)/sec
8000	327.69	255991	0.18	0.31	0.31
11025	237.78	352787	0.22	0.40	0.43
16000	163.85	511982	0.34	0.56	0.59
22050	118.89	705575	0.45	1.12	1.22
24000	118.89	705575	0.45	1.12	1.24
32000	81.93	1023963	0.94	1.59	1.59
44100	59.45	1411148	1.3	2.13	2.23
48000	54.62	1525943	1.47	2.68	2.78
88000	29.72	2822296	2.5	4.45	4.55
96000	27.31	3071885	2.35	6.87	6.94

Audio Playback

			TI816x	TI814x	TI813x
Sampling Rate (in Hz)	Duration (in secs)	Bitrate (in bits/sec)	CPU (in %)	Load	CPU Load (in %)/sec
8000	327.69	256094	0.14	0.23	0.26
11025	237.68	352930	0.17	0.28	0.36
16000	163.78	512188	0.26	0.45	0.51
22050	118.84	705859	0.36	0.63	0.70
24000	118.84	705859	0.34	0.67	0.76
32000	81.88	1024376	0.73	1.59	1.68
44100	59.42	1411718	0.96	2.18	2.26
48000	54.6	1536564	1.12	2.37	2.45
88000	29.72	2823432	2.1	4.36	4.49

96000	27.3	3073123	2.88	6.72	6.88
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ALSA SoC HDMI Audio Driver

This section an overview of the ALSA SoC HDMI audio driver features. For the architecture, installation, basic usage and sample applications (if any) please refer to the driver user guide.

Driver Features

The driver supports the following features:

1. Supports HDMI audio codec on TI81XX in ALSA SoC framework.
2. Multiple sample rates support (32KHz, 44.1KHz, 48KHz, 96KHz and 192KHz)playback.
3. Supports audio 16bit and 24bit (S16_LE ,S24_LE) audio format.
4. Supports audio in stereo mode.
5. Supports all audio mode in all video modes

Constraints

1. HDMI Audio sampling rate support is based on the Video resolution in use.
2. Restart the audio while changing the video resolution.
3. The audio driver does not allow opening the same stream (playback) multiple times.

Supported System Calls

Refer ALSA project - the C library reference [2] for API calls.

Supported IOCTLs

NA

Performance and Benchmarks

Test setup:

1. Access type - RW_INTERLEAVED
2. Channels - 2
3. Format - S16_LE
4. Period size - 64

Audio Playback

			TI816x	TI814x	TI813x
Sampling Rate (in Hz)	Duration (in secs)	Bitrate (in bits/sec)	CPU Load (in %)	CPU Load (in %)	CPU Load (in %)/sec)
32000	81.88	1024513	1.59	1.59	TDB
44100	59.41	1411907	2.18	2.18	TDB
48000	54.59	1536769	2.37	2.37	TDB
96000	27.29	3073534	6.72	6.72	TDB
192000	13.65	6147076	14.2	14.2	TDB

Ethernet Driver

This section provides an overview of the TI816X Ethernet driver features along with throughput and CPU load numbers. Ethernet driver follows standard Linux network interface Architecture.

Driver Features

The driver supports the following features:

1. 10/100/1000 Mbps mode of operation.
2. Auto negotiation.
3. Support for multicast and broadcast frames.
4. Promiscuous mode of operation.
5. Full duplex and half duplex mode of operation.
6. Linux NAPI support
7. Support for HW interrupt pacing using ethtool interface

Features Not Supported

None

Constraints

NA

Supported System Calls

Supports the socket() and related system calls in accordance with Linux architecture.

Performance and Benchmarks

Ethernet Port0 TCP - 1Gbps Mode Rx Performance

TCP Window Size (in KBytes)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth - With Pacing (in Mbits/sec)	CPU Load (in %)
16	473.60	88.43	542.40	54.38
32	500.80	92.47	582.40	58.83
64	490.40	90.92	568.80	54.44
128	471.20	88.40	570.40	53.07
256	478.40	89.27	469.60	87.62

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- iperf version 2.0.5
- On the DUT iperf is invoked in server mode : "-s -w 256k"
- On PC Host invoke iperf in the client mode : "-c <server ip> -w <window size> -t60"
- Interrupt pacing feature enabled with pacing interval set to 500usecs (# ethtool -C eth0 rx-usecs 500)
- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- Root filesystem mounted from MMC/SD.

- ARM running at 1Ghz and DDR3@800Mhz

Ethernet Port0 TCP - 1Gbps Mode Tx Performance

TCP Window Size (in KBytes)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth - With Pacing (in Mbits/sec)	CPU Load (in %)
16	549	97.02	245	18.3
32	544	97.55	451.2	35.7
64	536	97.26	647	71.8
128	530	97.65	670	88.2
256	518	97.65	678	85.5

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- iperf version 2.0.5
- On the DUT iperf is invoked in client mode : "-c <server ip> -w <window size> -t60"
- Interrupt pacing feature enabled with pacing interval set to 500usecs (# ethtool -C eth0 rx-usecs 500)
- On PC Host invoke iperf in the server mode : "-s -w 256k"
- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- Root filesystem mounted from MMC/SD.
- ARM running at 1Ghz and DDR3@800Mhz

Ethernet Port0 TCP - 1Gbps Mode Dual Performance

TCP Window Size (in KBytes)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth - With Pacing (in Mbits/sec)	CPU Load (in %)
16	528	97.50	433	42.5
32	519	96.26	568	64.9
64	509	97.65	652	89.6
128	514	97.65	674	94.8
256	516	96.49	669	93.95

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- iperf version 2.0.5
- On the DUT iperf is invoked in server mode : "-s -w 256k"
- On PC Host invoke iperf in the client mode : "-c <server ip> -w <window size> -t60 -d"
- Interrupt pacing feature enabled with pacing interval set to 500usecs (# ethtool -C eth0 rx-usecs 500)
- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- Root filesystem mounted from MMC/SD.
- ARM running at 1Ghz and DDR3@800Mhz

Ethernet Port0 UDP - 1Gbps Mode Rx Performance

UDP Bandwidth (in MBytes)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Jitter (in ms)	Packet loss (in %)
50	46.72	6.05	0	0
100	93.6	12.27	0	0
150	140	18.65	0	0
200	187.2	25.11	0	0.01
250	233.6	48.68	0.01	0.06
300	280	75.31	0.02	0.14
350	328.00	96.97	0.01	0.47
400	228.00	99.63	15.64	39.00

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- iperf version 2.0.5
- Increase Network stack's s/w queue size to eliminate network stack packet drops using below commands
 - `sysctl -w net.core.rmem_max=33554432`
 - `sysctl -w net.core.wmem_max=33554432`
 - `sysctl -w net.core.rmem_default=33554432`
 - `sysctl -w net.core.wmem_default=33554432`
 - `sysctl -w net.ipv4.udp_mem='4096 87380 33554432'`
 - `sysctl -w net.ipv4.route.flush=1`
- On the DUT iperf is invoked in server mode : "-s -u -w 256k"
- On PC Host invoke iperf in the client mode : "-c <server ip> -w 128k -l 1500 -f M -u -t 60 -b <band width>"
- Interrupt pacing feature enabled with pacing interval set to 500usecs (# ethtool -C eth0 rx-usecs 500)
- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- Root filesystem mounted from MMC/SD.
- ARM running at 1Ghz and DDR3@800Mhz

Ethernet Port0 UDP - 1Gbps Mode Tx Performance

UDP Bandwidth (in MBytes)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Jitter (in ms)	Packet loss (in %)
50	46.72	1.45	0	0
100	93.6	33.6	0	0
150	140	34.3	0.01	0
200	187.2	42	0.01	0
250	233.6	50.93	0.02	0
300	280	62.4	0.02	0
350	329	59.5	0.02	0
400	372	64.2	0.02	0

450	427.2	79.9	0.02	0
500	461.6	84.81	0.02	0
550	523	93.99	0.02	0
600	540.8	95.78	0.02	0
650	541.6	97.72	0.03	0.01

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- iperf version 2.0.5
- Increase Network stack's s/w queue size to eliminate network stack packet drops using below commands
 - `sysctl -w net.core.rmem_max=33554432`
 - `sysctl -w net.core.wmem_max=33554432`
 - `sysctl -w net.core.rmem_default=33554432`
 - `sysctl -w net.core.wmem_default=33554432`
 - `sysctl -w net.ipv4.udp_mem='4096 87380 33554432'`
 - `sysctl -w net.ipv4.route.flush=1`
- On the DUT iperf in the client mode : `"-c <server ip> -w 128k -l 1500 -f M -u -t 60 -b <band width>"`
- On PC iperf is invoked in server mode : `"-s -u -w 256k"`
- Interrupt pacing feature enabled with pacing interval set to 500usecs (# `ethtool -C eth0 rx-usecs 500`)
- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- Root filesystem mounted from MMC/SD.
- ARM running at 1Ghz and DDR3@800Mhz

Ethernet Switch Driver

This section provides an overview of the TI814X/TI813X Ethernet Switch driver features along with throughput and CPU load numbers. Ethernet driver follows standard Linux network interface Architecture.

Driver Features

The driver supports the following features:

1. 10/100/1000 Mbps mode of operation.
2. Auto negotiation.
3. Support for multicast and broadcast frames.
4. Linux NAPI support
5. Second switch port
6. IEEE 1588/802.1AS PTP Support
7. VLAN (Subscription common for all ports)
8. Ethertool (Supports only Slave 0)
9. Support for HW interrupt pacing using ethtool interface (Interrupt pacing is common for both EMACs)
10. Switch mode of operation
11. Dual EMAC mode
 1. Bringing up the Two Ethernet switch ports as Individual EMAC interfaces to Applications and Disabling Switch functionality.

Features Not Supported

1. Flow control
2. Jumbo packet support
3. DMA scatter-gather support
4. Promiscuous mode

Constraints

NA

Supported System Calls

Supports the socket() and related system calls in accordance with Linux architecture.

Performance and Benchmarks

Ethernet Port0 TCP - 1Gbps Mode Rx Performance

TCP Window Size (in KBytes)	TI814x				TI813x			
	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth With Pacing(in Mbits/sec)	CPU Load (in %)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth With Pacing(in Mbits/sec)	CPU Load (in %)
16	361.6	82.38	370.80	61.22	304	81.96	349.6	62.73
32	351.20	88.72	381.60	62.79	290	81.44	373.6	67.55
64	348.00	89.18	375.20	61.64	244	68.33	356.8	64.99
128	348.00	89.52	381.60	61.74	276	75.27	336	61.19
256	347.20	88.85	348.80	90.36	283	77.80	266.4	73.00

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- iperf version 2.0.5
- On the DUT iperf is invoked in server mode : "-s -w 256k"
- On PC Host invoke iperf in the client mode : "-c <server ip> -w <window size> -t60"
- Interrupt pacing feature enabled with pacing interval set to 500usecs (# ethtool -C eth0 rx-usecs 500)
- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- Root filesystem mounted from MMC/SD.
- ARM running at 600Mhz and DDR3@400Mhz

Ethernet Port0 TCP - 1Gbps Mode Tx Performance

	TI814x				TI813x			
TCP Window Size (in KBytes)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth With Pacing(in Mbits/sec)	CPU Load (in %)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth With Pacing(in Mbits/sec)	CPU Load (in %)
16	328.80	97.67	165.60	20.82	303	97.65	158.4	23.75
32	328.80	97.44	260.60	30.37	297	97.75	281.6	43.01
64	326.40	97.78	430.40	62.76	286	97.64	399.2	84.06
128	324.80	97.67	489.60	89.33	280	97.68	400.8	95.92
256	324.80	97.60	488.00	88.90	279	97.67	404.8	95.70

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- iperf version 2.0.5
- On the DUT iperf is invoked in client mode : "-c <server ip> -w <window size> -t60"
- Interrupt pacing feature enabled with pacing interval set to 500usecs (# ethtool -C eth0 rx-usecs 500)
- On PC Host invoke iperf in the server mode : "-s -w 256k"
- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- Root filesystem mounted from MMC/SD.
- ARM running at 600Mhz and DDR3@400Mhz

Ethernet Port0 TCP - 1Gbps Mode Dual Performance

	TI814x				TI813x			
TCP Window Size (in KBytes)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth With Pacing(in Mbits/sec)	CPU Load (in %)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth With Pacing(in Mbits/sec)	CPU Load (in %)
16	325	96.93	288	39.52	300.8	97.29	280.8	51.74
32	329	97.37	366.4	57.47	292.8	97.23	344	72.16
64	326	97.67	452	82.67	284.5	97.65	385.6	94.56
128	344	97.67	472.8	94.18	306.4	97.23	408	60.23
256	346	97.67	472	94.58	306.4	97.29	386.4	97.10

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- iperf version 2.0.5
- On the DUT iperf is invoked in server mode : "-s -w 256k"
- On PC Host invoke iperf in the client mode : "-c <server ip> -w <window size> -t60 -d"
- Interrupt pacing feature enabled with pacing interval set to 500usecs (# ethtool -C eth0 rx-usecs 500)
- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps

- Root filesystem mounted from MMC/SD.
- ARM running at 600Mhz and DDR3@400Mhz

Ethernet Port0 UDP - 1Gbps Mode Rx Performance

	TI814x				TI813x			
UDP Bandwidth (in MBytes)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Jitter (in ms)	Packet loss (in %)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Jitter (in ms)	Packet loss (in %)
50	46.72	10.45	0	0	46.72	10.82	0	0
100	93.60	20.83	0.01	0	93.60	20.83	0	0
150	140.00	38.86	0.01	0.07	140	53.17	0.28	0
200	186.40	61.08	0.04	0.19	187.2	95.52	0.03	0.02
250	208.00	99.64	0.04	11.00	100	99.58	0.09	57

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- iperf version 2.0.5
- Increase Network stack's s/w queue size to eliminate network stack packet drops using below commands
 - `sysctl -w net.core.rmem_max=33554432`
 - `sysctl -w net.core.wmem_max=33554432`
 - `sysctl -w net.core.rmem_default=33554432`
 - `sysctl -w net.core.wmem_default=33554432`
 - `sysctl -w net.ipv4.udp_mem='4096 87380 33554432'`
 - `sysctl -w net.ipv4.route.flush=1`
- On the DUT iperf is invoked in server mode : "-s -u -w 256k"
- On PC Host invoke iperf in the client mode : "-c <server ip> -w 128k -l 1500 -f M -u -t 60 -b <band width>"
- Interrupt pacing feature enabled with pacing interval set to 500usecs (# ethtool -C eth0 rx-usecs 500)
- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- Root filesystem mounted from MMC/SD.
- ARM running at 600Mhz and DDR3@400Mhz

Ethernet Port0 UDP - 1Gbps Mode Tx Performance

	TI814x				TI813x			
UDP Bandwidth (in MBytes)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Jitter (in ms)	Packet loss (in %)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Jitter (in ms)	Packet loss (in %)
50	46.72	33.44	0	0	46.72	33.44	0	0
100	93.60	44.65	0	0	93.6	44.65	0	0
150	140.00	52.06	0.01	0	140	44.6	0.01	0
200	186.40	69.90	0.01	0	186.4	73.6	0.01	0
250	231.20	85.62	0.01	0	231	80.7	0.01	0
300	274.40	93.67	0.01	0	275.2	92.2	0.02	0
350	288.80	95.98	0.01	0	300	97.67	0.01	0

400	291.20	91.39	0.01	0	300	97.6	0.01	0.01
450	291.20	91.37	0.01	0	300.8	91.8	0.02	0

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- iperf version 2.0.5
- Increase Network stack's s/w queue size to eliminate network stack packet drops using below commands
 - `sysctl -w net.core.rmem_max=33554432`
 - `sysctl -w net.core.wmem_max=33554432`
 - `sysctl -w net.core.rmem_default=33554432`
 - `sysctl -w net.core.wmem_default=33554432`
 - `sysctl -w net.ipv4.udp_mem='4096 87380 33554432'`
 - `sysctl -w net.ipv4.route.flush=1`
- On the DUT iperf in the client mode : `"-c <server ip> -w 128k -l 1500 -f M -u -t 60 -b <band width>"`
- On PC iperf is invoked in server mode : `"-s -u -w 256k"`
- Interrupt pacing feature enabled with pacing interval set to 500usecs (# `ethtool -C eth0 rx-usecs 500`)
- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- Root filesystem mounted from MMC/SD.
- ARM running at 600Mhz and DDR3@400Mhz

NAND Driver

This section provides an overview of the NAND flash driver features along with throughput and CPU load numbers. For the architecture, installation, basic usage and sample applications (if any) please refer to the driver user guide.

Driver Features

The driver supports the following features:

1. UBIFS file system (enabled by default)
2. Supports Read/Write, Erase operations
3. Prefetch mode of transfer (enabled by default)
4. SLC NAND
5. PIO mode

Features Not Supported

Subpage support in NAND

Constraints

None

Supported System Calls

Supports the system call support provided by MTD interface viz. `open()`, `close()`, `read()`, `write()`, `ioctl()`

Performance Benchmarks

Please refer MTD Test Setup before proceeding.

NAND Write Performance

NAND - Write Performance values

Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
	8-bit NAND	16-bit NAND	8-bit NAND	16-bit NAND	8-bit NAND	16-bit NAND
40	2.07MB/s	3.42MB/s	1.82MB/s	3.14MB/s	1.82MB/s	3.14MB/s

NAND Read Performance

NAND - Read Performance values

Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
	8-bit NAND	16-bit NAND	8-bit NAND	16-bit NAND	8-bit NAND	16-bit NAND
40	2.29MB/s	3.90MB/s	1.95MB/s	3.34MB/s	1.96MB/s	3.34MB/s

NOTE: The filesystem performance tests are obtained by carrying out raw read/write tests:

For eg:

```
# flash_eraseall /dev/mtdX      ('X' is the partition number)
# cd /dev/shm
# dd if=/dev/zero of=40MB bs=1M count=40
# time nandwrite -q -p /dev/mtdX /dev/shm/40MB      (to obtain write speed)
# rm 40MB
# time nanddump -f /dev/shm/40MB -l 41943040 /dev/mtdX      (to obtain read speed)
```

NOR Driver

This section provides an overview of the NOR flash driver features along with throughput and CPU load numbers. For the architecture, installation, basic usage and sample applications (if any) please refer to the driver user guide.

Driver Features

The driver supports the following features:

1. Supports Read/Write, Erase operations
2. Support all CFI compatible NOR flash devices

Features Not Supported

None

Constraints

None

Supported System Calls

Supports the system call support provided by MTD interface viz. `open()`, `close()`, `read()`, `write()`, `ioctl()`

NOR Raw Read Performance

- 1.64 MBytes/sec

NOR Raw Write Performance

- 579 KBytes/sec

NOR JFFS2 Performance

Buffer Size in Bytes	8192	16384	102400	256000	512000	1048576	5242830
NOR Write (MBytes/sec)	0.156768	0.156366	0.156296	0.154594	0.151763	0.151121	0.150227
NOR Read (MBytes/sec)	1.400180	1.395503	1.399395	1.395531	1.398563	1.395949	1.399866

PCIe RC Driver

This section provides an overview of the PCIe Root Complex (RC) driver features along with throughput and CPU load numbers when using PCIe Gigabit Ethernet card as Endpoint (EP). For the architecture, installation, basic usage, please refer to the PCI Express Root Complex Driver User Guide.

Driver Features

The driver supports the following features:

1. Fits into Linux PCI Bus framework to provide PCI compatible software enumeration support
2. In addition, provides interface to Endpoint Drivers to access the respective devices detected downstream.
3. The same interface can be used by the PCI Express Port Bus Driver framework in Linux to perform AER, ASP etc handling
4. Interrupt handling facility for EP drivers as MSI interrupts or Legacy Interrupts (INTx).
5. Seamless handling of PCIe errors

Features Not Supported

1. PCIe I/O access
2. Port Bus Driver integration
3. 64-bit PCIe addressing.

Constraints

NA

Supported System Calls

None. Access to individual PCIe EPs may be provided by respective drivers.

Setup

- For TI814X - TI814X PG2.1 EVM (Beta) with DDR3 @400MHz clock set up as Root Complex with Cortex A8 @600MHz (referred as DUT)
- For TI816X - TI816X PG2.0 EVM (Rev H) with DDR3 @800MHz clock set up as Root Complex with Cortex A8 @1GHz (referred as DUT)
- NetXtreme BCM5751 Gigabit Ethernet PCI Express (rev 01) card with x1 link connected in PCIe slot on EVM
- Ethernet port on x86 PC Host running Linux is used to connect to PCIe EP Ethernet port
- Both Host and DUT have iperf version 2.0.4 (7 Apr 2008) installed

Execution

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- On PC Host iperf was invoked in server mode : "-s" - window size default of 85.3KB. E.g.,

```
# iperf -B 192.168.0.1 -s
```

- On the DUT iperf is invoked in the client mode (TX) : "-c <server ip> -w <window size> -t60". E.g.,

```
# iperf -c 192.168.0.1 -w 16KB -t60
```

- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- On-chip Ethernet ports (Port0 and Port1) disabled (not brought up).
- Ramdisk filesystem was used as root filesystem.

PCIe Ethernet TCP - 1Gbps Mode Performance

TCP Window Size (in KBytes)	TI814X			TI816X		
	Bandwidth (in Mbits/sec)	Transfer Size (In GBytes)	CPU Load (In %)	Bandwidth (in Mbits/sec)	Transfer Size (In GBytes)	CPU Load (In %)
16	577	4.03	56	704	4.92	34
32	659	4.60	99	836	5.84	63
64	663	4.63	99	854	5.97	62
128	665	4.65	99	858	6	61
256	664	4.64	99	862	6.02	63

Observations

- PCIe Gigabit Ethernet Card used supported GEN1 speeds with x1 link.
- The Ethernet NIC used supported hardware offloading and checksum calculations (enabled by default).

PCIe EP Boot Driver

This section provides an overview of the PCIe Endpoint (EP) Boot driver features. For the architecture, installation, basic usage, please refer to the PCI Express Endpoint Boot Driver User Guide.

Driver Features

The driver supports the following features:

1. Provides character device interface to boot application for booting TI816X/TI814X PCIe Endpoint
2. Provide mmap support to enable the boot application to copy image files (U-Boot, kernel etc) to EP memory
3. Can be built as loadable module or into kernel

Features Not Supported

1. Operate more than one TI816X/TI814X EP. If more than one TI816X/TI814X EPs are connected in the system, this driver operates only on the first detected with TI816X given preference.
2. No interrupt support
3. Not validated on any other RC than TI816X, TI814X or x86 PC. E.g., this driver may require some porting to build on Linux PPC kernel.

Constraints

NA

Supported System Calls

Character device interface through open(), ioctl(), close() and mmap() system calls.

USB Driver

This section gives an overview of the USB (MUSB) driver features supported/not supported, constraints and performance numbers.

TI81XX USBSS

The TI81XX USB subsystem consists of two instances of Mentor Controller (referred as musb). The **musb** driver is implemented on top of Mentor controller IP which supports all the speeds (High, Full and Low). TI81XX USB subsystem uses CPPI 4.1 DMA for all the transfers.

Driver Features

The driver supports the following features

USB Host Mode

Host Mode Feature	TI816x PG1.X	TI816x PG2.X	TI814x	TI813x
HUB class support	No ^[3]	Yes	Yes	Yes
Human Interface Class (HID) ^[4]	Yes	Yes	Yes	Yes
Mass Storage Class (MSC) ^[5]	Yes	Yes	Yes	Yes
USB Video Class (UVC) ^[6]	Yes	Yes	Yes	Yes
USB Audio Class (UAC) ^[7]	Yes	Yes	Yes	Yes
USB CDC Host ^[8]	Yes	Yes	Yes	Yes

USB gadget mode

Gadget Mode Feature	TI816x	TI814x	TI813x
Mass Storage Class (MSC) ^[9]	Yes	Yes	Yes
USB Networking - RNDIS ^[10]	Yes	Yes	Yes
USB Networking - CDC ^[10]	Yes	Yes	Yes

USB Dual Mode

Each instance of musb controller can be configured for host/gadget mode of operation. For example the usb0 can be configured for gadget mode and usb1 can be configured for host mode operation. refer to user's guide for more details.

Dual Mode Feature	TI816x	TI814x	TI813x
USB0 as host, USB1 as gadget ^[11]	Yes	Yes	Yes
USB0 as gadget, USB1 as host ^[11]	Yes	Yes	Yes
USB0 as host, USB1 as host ^[11]	Yes	Yes	Yes

Note: This feature not supported for PG1.X TI814X (refer to known issues at release notes)

USB OTG mode

OTG Mode Feature	TI816x	TI814x	TI813x
OTG support	No	No	No

USB Mass Storage Class Host Driver

Driver Features

Supports PIO and DMA mode

Constraint

None

Supported System Calls

`open()`, `close()`, `read()`, `write()`, `ioctl()`

Supported IOCTLs

None

Performance Benchmarks (DMA mode)

Setup : Toshiba HDD (500GB) connected to usb0 port.
File read/write performance data on usb0 port (WDD HDD) has been captured.
LFTB Version 2.00.00.04 used for performance.

For Test setup details refer to usb-host-msc test setup ^[12]

USB - ext2 File System Performance

USB Host DMA-Write Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813x	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	23.04	14.38	22.14	15.61	20.61	18.22
256	100	23.98	12.73	21.68	15.91	21.04	19.56
512	100	22.59	12.88	22.19	15.01	21.14	20.00
1024	100	23.77	12.93	22.13	16.03	20.95	19.43
5120	100	23.67	13.29	22.49	16.06	20.70	10.09

USB Host DMA-Read Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813x	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	23.64	15.33	20.25	13.32	20.25	22.59
256	100	23.44	17.19	20.58	10.98	20.68	19.80
512	100	23.92	15.89	20.19	13.10	20.24	20.46
1024	100	23.58	13.76	20.62	17.91	20.54	19.22
5120	100	23.51	13.36	20.61	16.50	20.64	18.34

USB - vfat File System Performance

USB Host DMA-Write Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	18.02	22.91	15.99	28.32	15.83	29.05
256	100	17.17	23.65	16.67	28.75	15.88	27.51
512	100	17.85	22.39	16.44	30.03	15.82	28.90
1024	100	18.66	23.54	15.76	30.53	16.17	29.26
5120	100	17.76	21.96	16.37	29.08	15.82	29.46

USB Host DMA-Read Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	18.29	13.84	15.36	20.30	14.76	21.05
256	100	18.99	14.36	15.16	19.54	14.96	21.79
512	100	18.31	13.15	14.21	19.51	14.90	22.17
1024	100	18.38	13.91	14.79	20.03	14.92	22.11
5120	100	18.40	13.41	15.29	22.73	14.77	20.88

USB - ext2 File System Performance on simulataneous read/write on two HDD

Setup : WesternDigital HDD (500GB) connected to usb0 port and Toshiba HDD connected to usb1 port.
 File read/write performance data on usb0 port(WDD HDD) has been captured while simultaneous file write is in progress on usb1 port (Toshiba HDD).
 LFTB Version 2.00.00.04 used for performance.

USB Host DMA-Write Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	19	40	16	54	15	55
256	100	20	43	16	53	15	55
512	100	19	44	16	59	15	60
1024	100	19	44	15	58	14	60
5120	100	19	43	15	56	15	60

USB Host DMA-Read Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	21	55	18	62	17	20
256	100	21	51	17	64	17	65
512	100	21	55	17	68	16	70
1024	100	21	58	18	65	17	70
5120	100	21	59	17	62	16	65

USB - VFAT, File System Performance on simulataneous read/write on two HDD

Setup : WesternDigital HDD (500GB) connected to usb0 port and Toshiba HDD connected to usb1 port.

File read/write performance data on usb0 port(WDD HDD) has been captured while simultaneous file write is in progress on usb1 port (Toshiba HDD).

LFTB Version 2.00.00.04 used for performance.

USB Host DMA-Write Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	18	57	14	63	14	76
256	100	18	59	14	64	15	70
512	100	18	57	14	61	13	65
1024	100	18	56	15	64	15	70
5120	100	18	57	14	60	14	70

USB Host DMA-Read Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	20	59	17	62	16	70
256	100	19	55	15	59	15	60
512	100	20	56	17	62	16	70
1024	100	19	58	17	62	16	72
5120	100	20	56	17	62	16	70

USB Mass Storage Class Slave Driver

Driver Features

- Supports both PIO and DMA mode
- Support for File storage Gadget driver

Features Not Supported

None

Constraint

None

Supported System Calls

NA

Supported IOCTLs

NA

Performance Benchmarks

The performance numbers are captured in DMA Mode using SATA HDD as file storage gadget media exposing as removable media to windows-xp over USB. The SATA HDD is formatted using the NTFS on windows-xp.
#SATA HDD used - Western Digital 500GB drive

While insert g_file_storage.ko use the module parameter **buflen** set to 65536
insmod g_file_storage.ko file=/dev/sda buflen=65536 stall=0 removable=1

For test setup details refer to msc-device setup^[13]

USB Slave- DMA Write Performance values

Bytes Transferred (MB)'SATA HDD'as storage device	Total Transferred Bytes (in MBytes)	TI816X		TI814X		TI813X	
		XP	Linux	XP	Linux	XP	Linux
		(MB/sec)	(MB/sec)	(MB/sec)	(MB/sec)	(MB/sec)	(MB/sec)
250	250	25	30	17	25	15	23

USB Slave- DMA Read Performance values

Bytes Transferred (MB)'SATA HDD'as storage device	Total Transferred Bytes (in MBytes)	TI816X		TI814X		TI813X	
		XP	Linux	XP	Linux	XP	Linux
		(MB/sec)	(MB/sec)	(MB/sec)	(MB/sec)	(MB/sec)	(MB/sec)
250	250	35	40	25	28	23	25

USB CDC/RNDIS Slave Driver

Description

The CDC RNDIS gadget driver that is used to send standard Ethernet frames using USB. The driver will create an Ethernet device by the name usb0.

Driver Features

Supports PIO and DMA mode.

Features Not Supported

None

Constraint

None

Supported System Calls

`open()`, `close()`, `read()`, `write()`, `ioctl()`

Supported IOCTLs

None

Performance Benchmarks

Performance benchmarks were collected using the Iperf tool and default options were used to collect the throughput numbers.

USB RNDIS-DMA Performance

```
Setup : EVM as client and Linux Host PC as server
command at EVM: iperf -c <window/linux host ip_adr> -w <8|16|32|64|128>K -t 60 -d
command at Host: iperf -s
```

For test setup details refer cdc-rndis setup^[14]

USB RNDIS-DMA Performance values - Client

TCP Window Size(in KBytes)	Interval (in Seconds)	TI816X (Mbps)	TI814X (Mbps)	TI813X (Mbps)
16	60	127	103	100
32	60	123	95	95
64	60	130	99	95
128	60	131	100	98

USB Gadget CDC-DMA Performance

USB CDC-DMA Performance values - Client

TCP Window Size(in KBytes)	Interval (in Seconds)	TI816X (Mbps)	TI814X (Mbps)	TI813X (Mbps)
16	60	170	174	160
32	60	180	179	179
64	60	180	181	180
128	60	185	183	180

MMC/SD Driver

The MMC controller provides an interface to external MMC cards that follow the MMC specification v4.0. The MMC driver is implemented as a block driver. Block device nodes(such as /dev/mmcblkp1, /dev/mmcblkp2) are created for user space access.

Driver Features

The driver supports the following features:

1. MMC/SD native protocol command/response set
2. Single/multiple block data transfers
3. Linux file system and generic MMC layer abstract details of block devices (MMC)
4. High-speed (SDv1.1) and High Capacity (SDv2.0) cards
5. MMC/SD card hot insertion and removal
6. SDXC cards are supported(backward compatible) but can only be run at HSMMC speeds

Features Not Supported

1. 8-bit MMC
2. SPI mode of operation

Constraints

1. MMC/SD cards should not be removed when the mount operation is in progress. If done so, data integrity cannot be guaranteed.

Supported System Calls

`open()` , `close()` , `read()` , `write()`

Supported IOCTLs

None

Performance and Benchmarks

Important

The performance numbers can be severely affected if the media is mounted in sync mode.

Please refer MMC/SD Test Setup before proceeding.

The performance numbers were captured using the following:

- SD Card (Sandisk Extreme, SDHC, Class 10, 4GB)
- 100MB file size
- Partition was mounted with async option
- LTP-DDT test suite

EXT2 file system

SD - Write Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	8.898853	6.88	8.772633	11.12	8.389523	11.93
256	100	8.408709	6.58	8.382574	10.40	8.276804	10.81
512	100	9.002925	7.22	8.396258	9.61	7.943129	12.73
1024	100	9.232489	6.51	8.539677	10.26	8.334637	12.24
5120	100	8.861453	6.68	8.200966	10.01	8.143051	11.27

SD - Read Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	18.191280	11.98	17.449301	14.81	17.092495	19.90
256	100	18.178263	11.83	17.451921	18.80	17.060186	18.43
512	100	18.202732	12.17	17.460024	20.33	17.095018	20.39
1024	100	18.197847	13.02	17.445963	18.94	17.086903	18.57
5120	100	18.202175	14.24	17.463547	18.17	17.083899	19.58

VFAT file system

SD - Write Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	9.167303	9.62	9.426215	14.67	8.640010	18.30
256	100	8.736581	8.75	9.357816	16.95	8.973682	18.25
512	100	9.348620	10.97	9.273531	15.83	9.420897	17.34
1024	100	9.249720	9.27	9.191129	18.40	8.986058	19.37
5120	100	9.734599	11.61	9.311593	15.19	8.939456	17.48

SD - Read Performance values

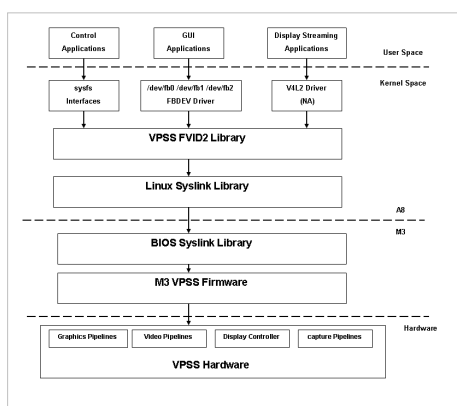
Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	17.866987	13.29	16.917168	22.65	16.569788	20.54
256	100	17.818867	10.88	16.992708	22.89	16.630856	17.75
512	100	17.731287	12.18	16.927343	23.87	16.653711	17.46
1024	100	17.844290	12.10	16.973387	23.46	16.639519	17.78
5120	100	17.828140	12.27	16.929251	20.62	16.546604	17.98

Video Display Driver

This section describes the Video Display driver architecture, driver features.

Description

The following diagram shows the architecture of the Video display Driver



Driver Features

1. Support 1080p-60/1080p-50/1080P-30/1080I-60/1080I-50/720P-60/720P-50 mode display through HDMI VENC
2. Support mux multiple graphics planes into single VENC
3. Support Video PLL configuration
4. Support Venc Clock source configuration
5. Support VENC output configuration(digital data format, sync mode, analog output format)
6. Support PAL/NTSC SVIDEO output through SD_VENC
7. Support reshuffling display order
8. Support Customized timing configuration for DVO1/DVO2 output.
9. Support on-chip HDMI display together with HDMI Kernel Driver.

Features Not Supports

1. EVM RF output is not supported
2. EVM Composite output is not supported
3. EVM VGA output is not support

Fbdev Driver

Frame-buffer Display Driver.

Driver Features

1. Support 3 independent graphics planes
2. Support
RGB888/ARGB8888/RGBA8888/RGB565/ARGB1551/RGBA5551/RGBA4444/ARGB4444/ARGB6666/RGBA6666
3. Support 0.25x-4x scaling
4. Support boundingbox blending
5. Support global blending
6. Support Pixel blending
7. Support Palette blending
8. Support RGB888 color key mapping
9. Support anti-flickering filter.
10. Support wait for VSYNC and panning
11. Support mmapmed (driver allocated) buffers

Features Not Supported

1. Rotation is not supported
2. Mirroring is not supported
3. Stenciling is not supported

Constrains

None

Supported System Calls

open(), close(), mmap(), munmap() and ioctl()

Performance Benchmarks

Please check HDVPSS Feature Performance Guide here ^[15]

Default Clock Configuration

Following are the configuration of clocks and their usecount immediately after the kernel booted up. The clock rates are either configured in the u-boot or kernel during init or as part of a driver initialization. The usecount reflects the number of times the clock has been enabled or one of it's child clocks are enabled in kernel init or by drivers but does not reflect enable requests done in uboot.

TI814X

Clock Rates

```
./sys_32k_clkin_ck/rate ==> 32768
./tclkin_ck/rate ==> 32768
./oscl_clkin_ck/rate ==> 22579000
./oscl_x1_ck/rate ==> 20000000
./xref1_ck/rate ==> 27000000
./xref2_ck/rate ==> 27000000
./tsi0_dck_ck/rate ==> 82000000
./tsil_dck_ck/rate ==> 82000000
./external_ck/rate ==> 50000000
./atl0_clk_ck/rate ==> 22579000
./atl1_clk_ck/rate ==> 22579000
./atl2_clk_ck/rate ==> 22579000
./atl3_clk_ck/rate ==> 22579000
./dvi_ch1_ck/rate ==> 166000000
./dvi_ch2_ck/rate ==> 166000000
./dvi_ch3_ck/rate ==> 166000000
./dvi_ch4_ck/rate ==> 166000000
./dvoi1_ck/rate ==> 162000000
./dvoi2_ck/rate ==> 162000000
./video_m_pclk_ck/rate ==> 165000000
./hdmi_phy_tclk_ck/rate ==> 185625000
./xref0_ck/mcasp1_ahx_ck/rate ==> 27000000
./xref0_ck/mcasp1_ahr_ck/rate ==> 27000000
./xref0_ck/mcasp2_ahx_ck/rate ==> 27000000
./xref0_ck/mcasp2_ahr_ck/rate ==> 27000000
./xref0_ck/mcasp3_ahx_ck/rate ==> 27000000
./xref0_ck/mcasp4_ahx_ck/rate ==> 27000000
./xref0_ck/mcasp5_ahx_ck/rate ==> 27000000
./xref0_ck/mcasp6_ahx_ck/rate ==> 27000000
./xref0_ck/rate ==> 27000000
./ljcb_serdesp_ck/pciessp_ck/rate ==> 100000000
./ljcb_serdesp_ck/rate ==> 100000000
./ljcb_serdesn_ck/pciessn_ck/rate ==> 100000000
./ljcb_serdesn_ck/rate ==> 100000000
./pciess_50m_ck/rate ==> 50000000
```

```
./pciess_125m_ck/rate ==> 125000000
./satassp_ck/rate ==> 100000000
./satassn_ck/rate ==> 100000000
./satass_20m_ck/rate ==> 20000000
./satass_50m_ck/emac_rmii_fck/rate ==> 50000000
./satass_50m_ck/rate ==> 50000000
./satass_125m_ck/emac_gmii_fck/rate ==> 125000000
./satass_125m_ck/rate ==> 125000000
./rtc_divider_ck/audio_dpll_clk1_ck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/rtc_c32k_fck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio1_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/gpio2_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/gpio3_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/gpio4_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/rtc_fck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/mmchs1_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/mmchs2_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/mmchs3_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/sync_timer_fck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/bandgaps_fck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/arm_oper_fck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/rate ==> 32768
./rtc_divider_ck/wdt1_fck/rate ==> 32768
./rtc_divider_ck/rate ==> 32768
./rcosc_32k_ck/wdt2_fck/rate ==> 32768
./rcosc_32k_ck/rate ==> 32768
./osc0_clkin_ck/dcan0_fck/rate ==> 20000000
./osc0_clkin_ck/dcan1_fck/rate ==> 20000000
./osc0_clkin_ck/srl_fck/rate ==> 20000000
./osc0_clkin_ck/sr2_fck/rate ==> 20000000
./osc0_clkin_ck/sr3_fck/rate ==> 20000000
./osc0_clkin_ck/sr4_fck/rate ==> 20000000
./osc0_clkin_ck/arm_dpll_clkin_ck/arm_dpll_ck/mpu_ck/rate ==> 600000000
./osc0_clkin_ck/arm_dpll_clkin_ck/arm_dpll_ck/rate ==> 600000000
./osc0_clkin_ck/arm_dpll_clkin_ck/rate ==> 20000000
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/sgx_ck/rate ==> 5000000
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/sgx_sys_ck/rate ==> 5000000
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/sgx_mem_ck/rate ==> 5000000
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/rate ==> 5000000
./osc0_clkin_ck/sgx_dpll_ck/rate ==> 20000000
./osc0_clkin_ck/hdvicp_dpll_ck/sysclk3_ck/ivahd0_ck/rate ==> 306000000
./osc0_clkin_ck/hdvicp_dpll_ck/sysclk3_ck/rate ==> 306000000
./osc0_clkin_ck/hdvicp_dpll_ck/rate ==> 306000000
./osc0_clkin_ck/hdvpss_dpll_ck/hdvpss_proc_fck/rate ==> 20000000
./osc0_clkin_ck/hdvpss_dpll_ck/hdvpss_proc_d2_fck/rate ==> 10000000
```



```
./osc0_clkin_ck/hdvpss_dp11_ck/rate ==> 20000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_phy0_rclk_ick/rate ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_phy1_rclk_ick/rate ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/mcspi1_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/mcspi2_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/mcspi3_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/mcspi4_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c02_ck/i2c1_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c02_ck/i2c3_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c02_ck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c13_ck/i2c2_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c13_ck/i2c4_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c13_ck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/uart1_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/uart2_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/uart3_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/hdmi_cec_dcc_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/mmchs1_fck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/mmchs2_fck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/mmchs3_fck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/uart4_fck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/uart5_fck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/uart6_fck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/csi2_phy_fck/rate ==> 96000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/rate ==> 20000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr0_phy_fck/rate ==> 400000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr1_phy_fck/rate ==> 400000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr0_half_fck/ddr0_phy_d2_fck/rate ==> 200000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr0_half_fck/ddr0_emif_fck/rate ==> 200000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr0_half_fck/dmm_phy_fck/rate ==> 200000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr0_half_fck/rate ==> 200000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr1_half_fck/ddr1_phy_d2_fck/rate ==> 200000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr1_half_fck/ddr1_emif_fck/rate ==> 200000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr1_half_fck/rate ==> 200000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/rate ==> 400000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/rate ==> 20000000
./osc0_clkin_ck/video1_dp11_clkin_ck/video1_dp11_ck/sysclk14_c1mux_ck/rate ==> 10000000
./osc0_clkin_ck/video1_dp11_clkin_ck/video1_dp11_ck/hd_venc_g_ck/rate ==> 20000000
./osc0_clkin_ck/video1_dp11_clkin_ck/video1_dp11_ck/rate ==> 20000000
./osc0_clkin_ck/video1_dp11_clkin_ck/rate ==> 20000000
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/hd_venc_d_ck/hdmi_phy_gclk_ck/rate ==> 20000000
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/hd_venc_d_ck/rate ==> 20000000
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/sysclk16_b3mux_ck/sysclk14_ck/tpss_stc0_fck/rate ==> 909090
```

```
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/sysclk16_b3mux_ck/sysclk14_ck/rate ==> 909090
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/sysclk16_b3mux_ck/rate ==> 909090
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/rate ==> 20000000
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/rate ==> 20000000
./osc0_clkin_ck/hdmi_dp11_clkin_ck/rate ==> 20000000
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sysclk16_d1mux_ck/sysclk16_ck/tpss_stc1_fck/rate ==> 31250000
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sysclk16_d1mux_ck/sysclk16_ck/rate ==> 31250000
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sysclk16_d1mux_ck/rate ==> 31250000
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sd_venc_ck/rate ==> 250000000
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/video012_dp11_muxout_ck/sysclk21_ck/rate ==> 250000000
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/video012_dp11_muxout_ck/rate ==> 250000000
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/rate ==> 250000000
./osc0_clkin_ck/video0_dp11_clkin_ck/rate ==> 20000000
./osc0_clkin_ck/sysclk22_ck/mcasp3_fck/rate ==> 20000000
./osc0_clkin_ck/sysclk22_ck/hdmi_i2s_ck/hdmi_i2s_fck/rate ==> 20000000
./osc0_clkin_ck/sysclk22_ck/hdmi_i2s_ck/rate ==> 20000000
./osc0_clkin_ck/sysclk22_ck/rate ==> 20000000
./osc0_clkin_ck/iss_dp11_ck/iss_ick/rate ==> 400000000
./osc0_clkin_ck/iss_dp11_ck/isp_ick/rate ==> 400000000
./osc0_clkin_ck/iss_dp11_ck/tpss_tso_ick/rate ==> 400000000
./osc0_clkin_ck/iss_dp11_ck/tpss_fck/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/ducati_ick/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/securess_fck/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/sysclk19_ck/tpss_tso_fck/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/sysclk19_ck/at1_fck/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/sysclk19_ck/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/rate ==> 400000000
./osc0_clkin_ck/gpt1_fck/rate ==> 20000000
./osc0_clkin_ck/gpt2_fck/rate ==> 20000000
./osc0_clkin_ck/gpt3_fck/rate ==> 20000000
./osc0_clkin_ck/gpt4_fck/rate ==> 20000000
./osc0_clkin_ck/gpt5_fck/rate ==> 20000000
./osc0_clkin_ck/gpt6_fck/rate ==> 20000000
./osc0_clkin_ck/gpt7_fck/rate ==> 20000000
./osc0_clkin_ck/gpt8_fck/rate ==> 20000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/l3_fast_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/ivahd0_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/exp_slot_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/mmu_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/gem_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/tptc0_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/tptc1_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/tptc2_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/tptc3_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/ivahd0_s12_ick/rate ==> 200000000
```

[illegible]

[illegible]

```
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/sysclk20_ck/mcaspl1_fck/rate ==> 250000000
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/sysclk20_ck/mcaspl2_fck/rate ==> 250000000
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/sysclk20_ck/rate ==> 250000000
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/cpts_rft_clk_ck/rate ==> 250000000
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/rate ==> 250000000
./osc0_clkin_ck/audio_dp11_clkin_ck/rate ==> 200000000
./osc0_clkin_ck/pciess_20m_ck/rate ==> 200000000
./osc0_clkin_ck/dsp_dp11_ck/gem_fck/rate ==> 500000000
./osc0_clkin_ck/dsp_dp11_ck/clkout_prcm_mux_ck/clkout_prcm_ck/sys_clkout1/rate ==> 500000000
./osc0_clkin_ck/dsp_dp11_ck/clkout_prcm_mux_ck/clkout_prcm_ck/sys_clkout2/rate ==> 500000000
./osc0_clkin_ck/dsp_dp11_ck/clkout_prcm_mux_ck/clkout_prcm_ck/rate ==> 500000000
./osc0_clkin_ck/dsp_dp11_ck/clkout_prcm_mux_ck/rate ==> 500000000
./osc0_clkin_ck/dsp_dp11_ck/rate ==> 500000000
./osc0_clkin_ck/rate ==> 200000000
```

Use Count

```
./sys_32k_clkin_ck/usecount ==> 0
./tclkin_ck/usecount ==> 0
./osc1_clkin_ck/usecount ==> 0
./osc1_x1_ck/usecount ==> 0
./xref1_ck/usecount ==> 0
./xref2_ck/usecount ==> 0
./tsi0_dck_ck/usecount ==> 0
./tsi1_dck_ck/usecount ==> 0
./external_ck/usecount ==> 0
./atl0_clk_ck/usecount ==> 0
./atl1_clk_ck/usecount ==> 0
./atl2_clk_ck/usecount ==> 0
./atl3_clk_ck/usecount ==> 0
./dvi_ch1_ck/usecount ==> 0
./dvi_ch2_ck/usecount ==> 0
./dvi_ch3_ck/usecount ==> 0
./dvi_ch4_ck/usecount ==> 0
./dvoi1_ck/usecount ==> 0
./dvoi2_ck/usecount ==> 0
./video_m_pclk_ck/usecount ==> 0
./hdmi_phy_tclk_ck/usecount ==> 0
./xref0_ck/mcaspl1_ahx_ck/usecount ==> 0
./xref0_ck/mcaspl1_ahr_ck/usecount ==> 0
./xref0_ck/mcaspl2_ahx_ck/usecount ==> 0
./xref0_ck/mcaspl2_ahr_ck/usecount ==> 0
./xref0_ck/mcaspl3_ahx_ck/usecount ==> 0
./xref0_ck/mcaspl4_ahx_ck/usecount ==> 0
./xref0_ck/mcaspl5_ahx_ck/usecount ==> 0
./xref0_ck/mcaspl6_ahx_ck/usecount ==> 0
./xref0_ck/usecount ==> 0
./l1jcb_serdesp_ck/pciessp_ck/usecount ==> 0
```

```
./ljcb_serdes_ck/usecount ==> 0
./ljcb_serdesn_ck/pciessn_ck/usecount ==> 0
./ljcb_serdesn_ck/usecount ==> 0
./pciess_50m_ck/usecount ==> 0
./pciess_125m_ck/usecount ==> 0
./satassp_ck/usecount ==> 0
./satassn_ck/usecount ==> 0
./satass_20m_ck/usecount ==> 0
./satass_50m_ck/emacs_rmii_fck/usecount ==> 0
./satass_50m_ck/usecount ==> 0
./satass_125m_ck/emacs_gmii_fck/usecount ==> 0
./satass_125m_ck/usecount ==> 0
./rtc_divider_ck/audio_dpll_clk1_ck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/rtc_c32k_fck/usecount ==> 1
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio1_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/gpio2_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/gpio3_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/gpio4_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/rtc_fck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/mmchs1_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/mmchs2_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/mmchs3_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/sync_timer_fck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/bandgaps_fck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/arm_oper_fck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/usecount ==> 1
./rtc_divider_ck/audio_prcm_clkin_ck/usecount ==> 1
./rtc_divider_ck/wdt1_fck/usecount ==> 0
./rtc_divider_ck/usecount ==> 1
./rcosc_32k_ck/wdt2_fck/usecount ==> 0
./rcosc_32k_ck/usecount ==> 0
./osc0_clkin_ck/dcan0_fck/usecount ==> 1
./osc0_clkin_ck/dcan1_fck/usecount ==> 0
./osc0_clkin_ck/sr1_fck/usecount ==> 0
./osc0_clkin_ck/sr2_fck/usecount ==> 0
./osc0_clkin_ck/sr3_fck/usecount ==> 0
./osc0_clkin_ck/sr4_fck/usecount ==> 0
./osc0_clkin_ck/arm_dpll_clkin_ck/arm_dpll_ck/mpu_ck/usecount ==> 0
./osc0_clkin_ck/arm_dpll_clkin_ck/arm_dpll_ck/usecount ==> 0
./osc0_clkin_ck/arm_dpll_clkin_ck/usecount ==> 0
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/sgx_ck/usecount ==> 0
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/sgx_sys_ck/usecount ==> 0
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/sgx_mem_ck/usecount ==> 0
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/usecount ==> 0
./osc0_clkin_ck/sgx_dpll_ck/usecount ==> 0
./osc0_clkin_ck/hdvicp_dpll_ck/sysclk3_ck/ivahd0_ck/usecount ==> 0
```

```

./osc0_clkin_ck/hdvpss_dp11_ck/sysclk3_ck/usecount ==> 0
./osc0_clkin_ck/hdvpss_dp11_ck/usecount ==> 0
./osc0_clkin_ck/hdvpss_dp11_ck/hdvpss_proc_fck/usecount ==> 0
./osc0_clkin_ck/hdvpss_dp11_ck/hdvpss_proc_d2_fck/usecount ==> 0
./osc0_clkin_ck/hdvpss_dp11_ck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_phy0_rclk_ick/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_phy1_rclk_ick/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/mcspi1_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/mcspi2_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/mcspi3_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/mcspi4_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c02_ck/i2c1_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c02_ck/i2c3_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c02_ck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c13_ck/i2c2_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c13_ck/i2c4_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c13_ck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/uart1_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/uart2_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/uart3_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/hdmi_cec_dcc_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/usecount ==> 4
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/mmchs1_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/mmchs2_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/mmchs3_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/uart4_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/uart5_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/uart6_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/usecount ==> 4
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/csi2_phy_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/usecount ==> 2
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usecount ==> 1
./osc0_clkin_ck/dds_dp11_clkin_ck/dds_dp11_ck/dds0_phy_fck/usecount ==> 0
./osc0_clkin_ck/dds_dp11_clkin_ck/dds_dp11_ck/dds1_phy_fck/usecount ==> 0
./osc0_clkin_ck/dds_dp11_clkin_ck/dds_dp11_ck/dds0_half_fck/dds0_phy_d2_fck/usecount ==> 0
./osc0_clkin_ck/dds_dp11_clkin_ck/dds_dp11_ck/dds0_half_fck/dds0_emif_fck/usecount ==> 0
./osc0_clkin_ck/dds_dp11_clkin_ck/dds_dp11_ck/dds0_half_fck/dmm_phy_fck/usecount ==> 0
./osc0_clkin_ck/dds_dp11_clkin_ck/dds_dp11_ck/dds0_half_fck/usecount ==> 0
./osc0_clkin_ck/dds_dp11_clkin_ck/dds_dp11_ck/dds1_half_fck/dds1_phy_d2_fck/usecount ==> 0
./osc0_clkin_ck/dds_dp11_clkin_ck/dds_dp11_ck/dds1_half_fck/dds1_emif_fck/usecount ==> 0
./osc0_clkin_ck/dds_dp11_clkin_ck/dds_dp11_ck/dds1_half_fck/usecount ==> 0
./osc0_clkin_ck/dds_dp11_clkin_ck/dds_dp11_ck/usecount ==> 0
./osc0_clkin_ck/dds_dp11_clkin_ck/usecount ==> 0
./osc0_clkin_ck/video1_dp11_clkin_ck/video1_dp11_ck/sysclk14_c1mux_ck/usecount ==> 0
./osc0_clkin_ck/video1_dp11_clkin_ck/video1_dp11_ck/hd_venc_g_ck/usecount ==> 0
./osc0_clkin_ck/video1_dp11_clkin_ck/video1_dp11_ck/usecount ==> 0

```

```
./osc0_clkin_ck/video1_dp11_clkin_ck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/hd_venc_d_ck/hdmi_phy_gclk_ck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/hd_venc_d_ck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/sysclk16_b3mux_ck/sysclk14_ck/tpss_stc0_fck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/sysclk16_b3mux_ck/sysclk14_ck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/sysclk16_b3mux_ck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/usecount ==> 0
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sysclk16_d1mux_ck/sysclk16_ck/tpss_stc1_fck/usecount ==> 0
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sysclk16_d1mux_ck/sysclk16_ck/usecount ==> 0
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sysclk16_d1mux_ck/usecount ==> 0
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sd_venc_ck/usecount ==> 0
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/video012_dp11_muxout_ck/sysclk21_ck/usecount ==> 0
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/video012_dp11_muxout_ck/usecount ==> 0
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/usecount ==> 0
./osc0_clkin_ck/video0_dp11_clkin_ck/usecount ==> 0
./osc0_clkin_ck/sysclk22_ck/mcasp3_fck/usecount ==> 1
./osc0_clkin_ck/sysclk22_ck/hdmi_i2s_ck/hdmi_i2s_fck/usecount ==> 0
./osc0_clkin_ck/sysclk22_ck/hdmi_i2s_ck/usecount ==> 0
./osc0_clkin_ck/sysclk22_ck/usecount ==> 1
./osc0_clkin_ck/iss_dp11_ck/iss_ick/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/isp_ick/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/tpss_tso_ick/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/tpss_fck/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/ducati_ick/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/seuress_fck/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/sysclk19_ck/tpss_tso_fck/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/sysclk19_ck/at1_fck/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/sysclk19_ck/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/usecount ==> 0
./osc0_clkin_ck/gpt1_fck/usecount ==> 1
./osc0_clkin_ck/gpt2_fck/usecount ==> 1
./osc0_clkin_ck/gpt3_fck/usecount ==> 0
./osc0_clkin_ck/gpt4_fck/usecount ==> 0
./osc0_clkin_ck/gpt5_fck/usecount ==> 0
./osc0_clkin_ck/gpt6_fck/usecount ==> 0
./osc0_clkin_ck/gpt7_fck/usecount ==> 0
./osc0_clkin_ck/gpt8_fck/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/l3_fast_ick/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/ivahd0_ick/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/exp_slot_ick/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/mmu_ick/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/gem_ick/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/tptc0_ick/usecount ==> 1
```


[illegible]

```

./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/wdt1_ick/usecount ==> 1
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/wdt2_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/sync_timer_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/pata_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/mailbox_ick/usecount ==> 1
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/spinbox_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/sr1_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/sr2_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/sr3_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/sr4_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/usb_ick/usecount ==> 2
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/mmu_cfg_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/p1500_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/elm_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/elm_fck/usecount ==> 1
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/mmchs1_ick/usecount ==> 2
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/mmchs2_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/at1_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/fdif_enb_ck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/rtc_c32k_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/dcan0_ick/usecount ==> 1
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/dcan1_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/usecount ==> 21
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/13_med_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/14_fast_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/securess_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/tpgsw_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/sata_ick/usecount ==> 1
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/pcie_ick/usecount ==> 1
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/vcp2_fck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/fdif_fck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/dap_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/ocmc_ram_ick/usecount ==> 1
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mmchs3_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/cpsw_ick/usecount ==> 2
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/gem_trc_fck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mcasp4_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mcasp5_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mcasp6_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/hdvpss_l4_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mlb_ick/mcasp_auxclk_mux0_ck/mcasp4_fck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mlb_ick/mcasp_auxclk_mux0_ck/mcasp5_fck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mlb_ick/mcasp_auxclk_mux0_ck/mcasp6_fck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mlb_ick/mcasp_auxclk_mux0_ck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mlb_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/usecount ==> 4
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/usecount ==> 7

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```

./osc0_clkin_ck/l3_dpll_clkin_ck/l3_dpll_ck/usecount ==> 1
./osc0_clkin_ck/l3_dpll_clkin_ck/usecount ==> 1
./osc0_clkin_ck/audio_dpll_clkin_ck/audio_dpll_ck/sysclk20_ck/audio_prcm1_out_ck/mcbsp_fck/usecount ==> 0
./osc0_clkin_ck/audio_dpll_clkin_ck/audio_dpll_ck/sysclk20_ck/audio_prcm1_out_ck/usecount ==> 0
./osc0_clkin_ck/audio_dpll_clkin_ck/audio_dpll_ck/sysclk20_ck/mcaspl1_fck/usecount ==> 0
./osc0_clkin_ck/audio_dpll_clkin_ck/audio_dpll_ck/sysclk20_ck/mcaspl2_fck/usecount ==> 0
./osc0_clkin_ck/audio_dpll_clkin_ck/audio_dpll_ck/sysclk20_ck/usecount ==> 0
./osc0_clkin_ck/audio_dpll_clkin_ck/audio_dpll_ck/cpts_rft_clk_ck/usecount ==> 0
./osc0_clkin_ck/audio_dpll_clkin_ck/audio_dpll_ck/usecount ==> 0
./osc0_clkin_ck/audio_dpll_clkin_ck/usecount ==> 0
./osc0_clkin_ck/pciess_20m_ck/usecount ==> 0
./osc0_clkin_ck/dsp_dpll_ck/gem_fck/usecount ==> 0
./osc0_clkin_ck/dsp_dpll_ck/clkout_prcm_mux_ck/clkout_prcm_ck/sys_clkout1/usecount ==> 0
./osc0_clkin_ck/dsp_dpll_ck/clkout_prcm_mux_ck/clkout_prcm_ck/sys_clkout2/usecount ==> 0
./osc0_clkin_ck/dsp_dpll_ck/clkout_prcm_mux_ck/clkout_prcm_ck/usecount ==> 0
./osc0_clkin_ck/dsp_dpll_ck/clkout_prcm_mux_ck/usecount ==> 0
./osc0_clkin_ck/dsp_dpll_ck/usecount ==> 0
./osc0_clkin_ck/usecount ==> 6

```

TI816X

Clock Rates

```

./secure_32k_ck/rate ==> 32768
./tclkin_ck/rate ==> 32768
./audio_pll_clk1_ck/audio_pll_a_ck/rate ==> 32768
./audio_pll_clk1_ck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/gpt3_fck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/gpt4_fck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/gpt5_fck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/gpt6_fck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/gpt7_fck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/wdt2_fck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/gpio1_dbck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/gpio2_dbck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/mmchsd1_fck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/rate ==> 32768
./sys_32k_ck/rate ==> 32768
./sys_clkin_ck/main_pll_clk6_ck/rate ==> 24000000
./sys_clkin_ck/main_pll_clk1_ck/sysclk1_ck/gem_ick/rate ==> 813176470
./sys_clkin_ck/main_pll_clk1_ck/sysclk1_ck/rate ==> 813176470
./sys_clkin_ck/main_pll_clk1_ck/rate ==> 813176470
./sys_clkin_ck/main_pll_clk2_ck/sysclk2_ck/mpu_ck/rate ==> 987428571
./sys_clkin_ck/main_pll_clk2_ck/sysclk2_ck/rate ==> 987428571
./sys_clkin_ck/main_pll_clk2_ck/sysclk23_ck/sgx_ck/rate ==> 246857142
./sys_clkin_ck/main_pll_clk2_ck/sysclk23_ck/rate ==> 246857142
./sys_clkin_ck/main_pll_clk2_ck/rate ==> 987428571
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd0_ck/rate ==> 531692931

```

```
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd0_sl2_ick/rate ==> 531692931
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd1_ick/rate ==> 531692931
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd1_sl2_ick/rate ==> 531692931
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd2_ick/rate ==> 531692931
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd2_sl2_ick/rate ==> 531692931
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/rate ==> 531692931
./sys_clkin_ck/main_pll_clk3_ck/rate ==> 531692931
./sys_clkin_ck/ddr_pll_clk1_ick/rate ==> 796500000
./sys_clkin_ck/ddr_pll_clk3_ck/rate ==> 398250000
./sys_clkin_ck/ddr_pll_clk4_ick/rate ==> 227571428
./sys_clkin_ck/ddr_pll_clk5_ick/rate ==> 227571428
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/mmu_ick/rate ==> 493714554
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/ducati_ucache_ick/rate ==>
493714554
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tpcc_ick/rate ==> 493714554
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc0_ick/rate ==> 493714554
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc1_ick/rate ==> 493714554
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc2_ick/rate ==> 493714554
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc3_ick/rate ==> 493714554
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/pcie_ick/rate ==>
246857277
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/sata_ick/rate ==>
246857277
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/emac1_ick/rate ==>
246857277
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/emac2_ick/rate ==>
246857277
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/ducati_ick/rate ==>
246857277
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/gem_trc_fck/rate ==>
246857277
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/rate ==> 246857277
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mmu_cfg_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mailbox_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/spinbox_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gem_vbusp_fck/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/uart1_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/uart2_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/uart3_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mcspi1_ick/rate ==>
```

```
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/wdt2_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt1_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt2_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt3_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt4_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt5_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt6_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt7_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpio1_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpio2_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/i2c1_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/i2c2_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mmchs1_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/sr_hvt_fck/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/sr_svt_fck/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/usb_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpmc_fck/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/rate ==> 123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/rate ==> 493714554
./sys_clkin_ck/main_pll_clk4_ck/rate ==> 493714554
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/uart1_fck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/uart2_fck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/uart3_fck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/mcspi1_fck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/i2c1_fck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/i2c2_fck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/mmchs1_fck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/rate ==> 48000049
```

```

./sys_clkin_ck/main_pll_clk5_ck/sysclk24_ck/rate ==> 125000160
./sys_clkin_ck/main_pll_clk5_ck/rate ==> 125000160
./sys_clkin_ck/video_pll_clk1_ck/rate ==> 27000000
./sys_clkin_ck/video_pll_clk2_ck/rate ==> 27000000
./sys_clkin_ck/video_pll_clk3_ck/rate ==> 27000000
./sys_clkin_ck/gpt1_fck/rate ==> 27000000
./sys_clkin_ck/gpt2_fck/rate ==> 27000000
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk2_ck/rate ==> 157988571
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk4_ck/sysclk21_ck/rate ==>
45158421
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk4_ck/rate ==> 45158421
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk5_ck/sysclk22_ck/rate ==>
32768000
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk5_ck/rate ==> 32768000
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/mcaspl0_fck/rate
==> 196608000
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/mcaspl1_fck/rate
==> 196608000
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/mcaspl2_fck/rate
==> 196608000
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/rate ==>
196608000
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/rate ==> 196608000
./sys_clkin_ck/main_pll_clk7_ck/rate ==> 432000000
./sys_clkin_ck/rate ==> 27000000

```

Use Count

```

./secure_32k_ck/usecount ==> 0
./tclkin_ck/usecount ==> 0
./audio_pll_clk1_ck/audio_pll_a_ck/usecount ==> 0
./audio_pll_clk1_ck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/gpt3_fck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/gpt4_fck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/gpt5_fck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/gpt6_fck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/gpt7_fck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/wdt2_fck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/gpio1_dbck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/gpio2_dbck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/mmchsd1_fck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/usecount ==> 0
./sys_32k_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk6_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk1_ck/sysclk1_ck/gem_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk1_ck/sysclk1_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk1_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk2_ck/sysclk2_ck/mpu_ck/usecount ==> 0

```

```
./sys_clkin_ck/main_pll_clk2_ck/sysclk2_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk2_ck/sysclk23_ck/sgx_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk2_ck/sysclk23_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk2_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd0_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd0_sl2_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd1_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd1_sl2_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd2_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd2_sl2_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk3_ck/usecount ==> 0
./sys_clkin_ck/DDR_pll_clk1_ck/usecount ==> 0
./sys_clkin_ck/DDR_pll_clk3_ck/usecount ==> 0
./sys_clkin_ck/DDR_pll_clk4_ck/usecount ==> 0
./sys_clkin_ck/DDR_pll_clk5_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/mmu_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/ducati_ucache_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tpcc_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc0_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc1_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc2_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc3_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/pcie_ck/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/sata_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/emac1_ick/usecount ==> 2
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/emac2_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/ducati_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/gem_trc_fck/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/usecount ==> 4
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mmu_cfg_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mailbox_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/spinbox_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gem_vbusp_fck/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/uart1_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/uart2_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/uart3_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mcspi1_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/wdt2_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt1_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt2_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt3_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt4_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt5_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt6_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt7_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpio1_ick/usecount ==> 1
```

```

./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpio2_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/i2c1_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/i2c2_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mmchs1_ick/usecount ==> 2
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/sr_hvt_fck/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/sr_svt_fck/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/usb_ick/usecount ==> 2
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpmc_fck/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/usecount ==> 16
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/usecount ==> 7
./sys_clkin_ck/main_pll_clk4_ck/usecount ==> 1
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/uart1_fck/usecount ==> 1
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/uart2_fck/usecount ==> 1
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/uart3_fck/usecount ==> 1
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/mcspi1_fck/usecount ==> 0
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/i2c1_fck/usecount ==> 0
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/i2c2_fck/usecount ==> 0
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/mmchs1_fck/usecount ==> 1
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/usecount ==> 4
./sys_clkin_ck/ddr_pll_clk2_ck/usecount ==> 1
./sys_clkin_ck/main_pll_clk5_ck/sysclk24_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk5_ck/usecount ==> 0
./sys_clkin_ck/video_pll_clk1_ck/usecount ==> 0
./sys_clkin_ck/video_pll_clk2_ck/usecount ==> 0
./sys_clkin_ck/video_pll_clk3_ck/usecount ==> 0
./sys_clkin_ck/gpt1_fck/usecount ==> 1
./sys_clkin_ck/gpt2_fck/usecount ==> 1
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk2_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk4_ck/sysclk21_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk4_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk5_ck/sysclk22_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk5_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/mcasp0_fck/usecount ==> 0
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/mcasp1_fck/usecount ==> 0
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/mcasp2_fck/usecount ==> 1
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/usecount ==> 1
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/usecount ==> 1
./sys_clkin_ck/main_pll_clk7_ck/usecount ==> 1
./sys_clkin_ck/usecount ==> 5

```



This page is currently under construction. The content of this page is due to change quite frequently and thus the quality and accuracy are not guaranteed until this message has been removed. Please feel free to contribute to this page while construction is in progress.



IMPORTANT

TI81XX refers to TI816X, TI814X and TI813X.

Important

This datasheet is applicable for 04.04.00.02 release only.

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Read This First

All performance numbers provided in this document are gathered using

- TI816X EVM with DDR3 configured at 800 MHz clock (effective 1600MHz data rate)
- TI814X EVM with DDR3 configured at 400 MHz clock (effective 800MHz data rate).
- TI813X EVM with DDR3 configured at 400Mhz clock (effective 800MHz data rate).

About This Manual

This document provides an overview and performance data for each of the device drivers which are part of the Linux PSP package supporting

- TI816X EVM (Base board with daughter card required for second Ethernet port and NOR) -henceforth referred to as **TI816X EVM**
- TI814X EVM (Base board with daughter card required for NOR) - henceforth referred to as **TI814X EVM**.

and

- TI813X EVM

Note that only a subset of the drivers may have actually been fully tested and verified in the package you are using. Please refer to the release notes provided with the package for information on which of the drivers have actually been verified.

If You Need Assistance

For further information or to report any problems, contact <http://community.ti.com/or> <http://support.ti.com/>

U-Boot

Hardware Related Info

U-Boot currently does the bare minimum configuration needed to boot the kernel. The following table lists various resources enabled by the ROM code + U-Boot running on the host ARM (that is, Cortex A8).

TI816X EVM

Resource	Specifics	Notes
OCMC RAM	OCMC0 and OCMC1	U-Boot initially runs out of OCMC1 and then relocates to DDR. OCMC0 is used by ROM code and by U-Boot in case of NOR boot.
Control module	NA	Needs to be enabled prior to enabling other modules.
Main clocks	PLL Clocks 1-5	Clock1 ~= 800MHz, Clock2 ~= 1GHz, Clock3 ~= 600MHz, Clock4 ~= 500 MHz, Clock5 ~= 125MHz
DDR clocks	PLL Clocks 1-3	Clock1 ~= 800MHz, Clock2 ~= 48MHz, Clock3 ~= 400MHz
UART	UARTs 0-2	On Base EVMs, UART2 is used as console by U-Boot and later by the kernel
Timers	Timer1	Used by U-Boot for timekeeping purposes
RAM	Both the EMIFs	Configuration done differs based on the type of memory on the EVM (DDR2 or DDR3)
I2C	I2C0	
eFuse	Customer_eFuse	Module enabled.
GPIO	GPIO0	Module enabled.
SPI		Module enabled.
CPGMAC	CPGMAC0 and CPGMAC1	Base EVM has 1 Ethernet port associated to CPGMAC0. Please refer module specific documentation and respective release details for CPGMAC1 usage.
NAND	Whole	Base EVM has 256MiB NAND. Mutually exclusive with NOR.
NOR	Whole	Not available on Base EVM. Mutually exclusive with NAND.
MMC/SD	MMC/SD	Enabled as a part of the boot process

TI814X EVM

Resource	Specifics	Notes
OCMC RAM	OCMC0	- 1st stage U-Boot runs out of OCMC0 - Suspend code runs from OCMC0 (uses 1 KB from the end)
Control module	NA	Needs to be enabled prior to enabling other modules.
Clocks/PLL Setup	TI814x: Modena (A8), L3, DDR, SATA, DSP, DSS, IVA, ISS, USB TI813x:Modena (A8), L3, DDR, SATA, DSS, IVA, ISS, USB	
UART	UARTs 0-5	UART0 is available as console on base board.
Timers	Timer1	Used for timekeeping purpose
RAM	TI814x :Both the EMIFs TI813x: single EMIF	Non-interleaved configuration
I2C	I2C0	
SPI		Module enabled.
EMACSW	Ethernet port (with internal switch)	Used for DHCP, TFTP load of kernel (and/or) filesystem images.
NAND	Whole	Base EVM has 256MiB NAND. Mutually exclusive with NOR.
NOR	Whole	Available only on Daughter Board. Mutually exclusive with NAND.

Linux Kernel

Module/Subsystem Usage

Following table covers various onchip modules/subsystems enabled and used in U-Boot and Kernel. It also lists module status on reset. Note that there may be a few modules which are enabled but not used currently but will be used in future.

The table uses following conventions for enabled status:

- BOOTCFG - Module is enabled depending upon boot mode
- YES - Module is enabled always and is critical for functioning (*should never be turned off*).
- CONFIG - Module will be enabled depending upon build time or run time configuration (e.g., SATA module is enabled if SATA is enabled in kernel build configuration, UART1 is enabled if 'ttyO1' is passed as console through kernel command line). *Note that there may be many modules included in default build configuration and thus they will be enabled by default (e.g., EMACSW), though these can be disabled by disabling respective configuration in build.*
- KEEP - Module already enabled and kept as is. Note that, *except for Control Module, eFuse and EMIFs*, in most of the other cases, this means that the corresponding module is not currently used and was enabled by the component which executed earlier. This is, module enabled status 'KEEP' in Kernel means it was enabled by U-Boot (or boot time) but kernel doesn't touch it.
- NO - Module is not used and is not enabled

TI81XX**Module / Subsystem usage**

Module/Subsystem	Enabled on Reset?	Enabled in U-Boot?	Enabled in Linux?	Remarks
Control Module	YES	KEEP	KEEP	
eFuse	YES	YES	KEEP	
OCMC0 & 1	BOOTCFG	YES	KEEP	
GPIO0	NO	YES	YES - TI816X	
			KEEP - TI814X/3X	
GPIO1	NO	NO	YES - TI816X	
			NO - TI814X/3X	
EMIF0	NO	YES	KEEP	
EMIF1	NO	YES	KEEP	NA for TI813X - It has a single emif
UART0	BOOTCFG	YES	CONFIG	
UART1	NO	YES	CONFIG	
	BOOTCFG - TI814X/3X			
UART2	NO	YES	CONFIG	
	BOOTCFG - TI814X/3X			
Timer1	NO	YES	YES	
Timer2	NO	NO	YES	
Timer3	NO	NO	NO	
Timer4	NO	NO	CONFIG	
			NO- TI814X/3X	
Timer5 to 7	NO	NO	NO	
GPMC	BOOTCFG	YES	CONFIG	
EDMA TPCC	NO	NO	YES	
EDMA TPTC	NO	NO	YES	
SPI	BOOTCFG	YES	KEEP	
I2C0	NO	YES	CONFIG	
I2C1	NO	NO	NO	
I2C2	NO	YES	CONFIG	NA - TI816X
I2C3	NO	NO	NO	NA- TI816X
EMACSW	BOOTCFG	YES	CONFIG	NA - TI816X
CPGMAC0	BOOTCFG	YES	CONFIG	NA- TI814X/3X
CPGMAC1	NO	NO	NO	NA- TI814X/3X
USB	NO	NO	CONFIG	
SATA	NO	NO	CONFIG	
SATA1	NO	NO	CONFIG	NA- TI86X/4X
PCIe	BOOTCFG	NO	CONFIG	

SGX	NO	NO	NO	
IVAHD	NO	NO	NO	
Ducati	NO	NO	CONFIG	
MMU	NO	NO	NO	
MMU DATA	NO	NO	NO	
DSP	NO	NO	CONFIG	
Spinbox	NO	NO	CONFIG	
Mailbox	NO	NO	CONFIG	
HDMI	NO	NO	NO	
McASP0	NO	NO	CONFIG	
McASP1	NO	NO	NO	
			YES- TI813X	
McASP2	NO	NO	YES	
			NO - TI813X	
McBSP	NO	NO	NO	
MMC	BOOTCFG	YES	CONFIG	
MMC1	BOOTCFG	YES	CONFIG	NA - TI816X
MMC2	NO	NO	NO	NA - TI816X

Hardware Resources Reserved for Kernel

Following table lists various resources owned and used exclusively by kernel (that is, Cortex A8). Care must be taken not to share these across other processors. Of course, there can be a kernel module/driver which monitors the sharing - this is particularly applicable for shared buffers in RAM - but the control should still remain with kernel. *For modules having multiple instances, numbering is assumed to be from '0'.*

TI816X EVM

Resource	Specifics	Notes
UART	UART0, UART2	This is configurable through kernel command line ('bootargs') and is board dependent. On Base EVMs, UART2 is used as console. With daughter card, UART0 can be used for console.
Timers	Timer1, Timer2, Timer6	Timer1 - System Timer, Timer2 - Free Running, Timer6 - Graphics (SGX)
RAM	0x80000000 - 0x88000000	The RAM size allocated for kernel is configurable through boot argument 'mem=' passed to kernel during boot. The start address (0x80000000) is fixed. Also note that it is possible to map RAM region beyond this range into kernel virtual memory space using kernel drivers/modules. Multiple 'mem=' arguments can be passed to have the system RAM spanned across holes in between. Please refer User Guide for example and also the Kernel Virtual Memory Layout section below.
I2C	I2C0	Though I2C1 control from kernel is not supported, it is possible to add this support by editing arch/arm/plat-omap/i2c.c and arch/arm/mach-omap2/board-ti8168evm.c for 'Bus 2'
GPIO	GPIO0 & GPIO1	Total 64 GPIO lines
CPGMAC	CPGMAC0, CPGMAC1	Base EVM has 1 Ethernet port associated to CPGMAC0. Please refer module specific documentation and respective release details for CPGMAC1 usage.

NAND	Whole	Base EVM has 256MiB NAND. Mutually exclusive with NOR.
NOR	Whole	Not available on Base EVM. Available in daughter card (64MiB). Mutually exclusive with NAND.
EDMA	4 to 47, 52 to 54	Peripheral Only: 4 to 31, 52 to 54 Mem to Mem: 32 to 47
OCMC0	0x40300000 - 0x4033FFFF	OCMC 0 will be used by ROM Code and U-boot. Once Linux kernel boots, OCMC0 is free and kernel can use it. If OCMC0 should not be used to load u-boot if loaded using CCS.
OCMC1	0x40400000 - 0x4043FFFF	OCMC 1 will be used by ROM Code and U-boot. Once Linux kernel boots, OCMC0 is free and kernel can use it.
PCIe Memory	0x20000000 - 0x2FFFFFFF	PCIe Window for outbound access (RC mode)
PCIe I/O	0x40000000 - 0x402FFFFFFF	PCIe I/O window (RC mode)

TI814X / TI813X EVM

Resource	Specifics	Notes
UART	UART0	This is configurable through kernel command line ('bootargs') and is board dependent. On Base board, UART0 is used as console.
Timers	Timer1, Timer2	Timer1 - System Timer, Timer2 - Free Running
RAM	0x80000000 - 0x88000000	The RAM size allocated for kernel is configurable through boot argument 'mem=' passed to kernel during boot. The start address (0x80000000) is fixed. Also note that it is possible to map RAM region beyond this range into kernel virtual memory space using kernel drivers/modules. Multiple 'mem=' arguments can be passed to have the system RAM spanned across holes in between. Please refer User Guide for example and also the Kernel Virtual Memory Layout section below.
I2C	I2C0	Refer board reference document/schematics for more details.
EMACSW		Has internal Ethernet switch.
NAND	Whole	Base EVM has 256MiB NAND. Mutually exclusive with NOR.
NOR	Whole	Currently for TI814X only. Available on daughter board (64 MiB). Mutually exclusive with NAND.
EDMA	4 to 47, 52 to 54	Peripheral Only: 4 to 31, 52 to 54 Mem to Mem: 32 to 47
OCMC0	0x40300000 - 0x4031FFFF (TI814x) 0x40300000 - 0x4033FFFF (TI813x)	OCMC 0 will be used by ROM Code and U-boot. Once Linux kernel boots, OCMC0 is free and kernel can use it. If OCMC0 should not be used to load u-boot if loaded using CCS.
PCIe Memory	0x20000000 - 0x2FFFFFFF	Currently for TI814X only. PCIe Window for outbound access (RC mode)
PCIe I/O	0x40000000 - 0x402FFFFFFF	Currently for TI814X only. PCIe I/O window (RC mode)

Kernel Virtual Memory Layout

The default TI816X/TI814X kernel configuration, with "mem=200M" passed as boot argument, uses following Virtual Memory layout:

Note: Around 50MB of RAM is reserved for FB driver by default hence you see total memory as 150MB when passing 'mem=200M'.

TI816X EVM

Memory: 150MB = 150MB total

Memory: 146540k/146540k available, 58260k reserved, 0K highmem

Virtual kernel memory layout:

```
vector   : 0xffff0000 - 0xffff1000   (   4 kB)
fixmap   : 0xffff0000 - 0xffffe000   ( 896 kB)
DMA       : 0xffc00000 - 0xffe00000   (   2 MB)
vmalloc   : 0xcd000000 - 0xf8000000   ( 688 MB)
lowmem    : 0xc0000000 - 0xcc800000   ( 200 MB)
pkmap     : 0xbfe00000 - 0xc0000000   (   2 MB)
modules   : 0xbf000000 - 0xbfe00000   (  14 MB)
 .init    : 0xc0008000 - 0xc0039000   ( 196 kB)
 .text    : 0xc0039000 - 0xc0498000   (4476 kB)
 .data    : 0xc0498000 - 0xc04def80   ( 284 kB)
```

TI814X / TI813X EVM

Memory: 150MB = 150MB total

Memory: 146268k/146268k available, 58532k reserved, 0K highmem

Virtual kernel memory layout:

```
vector   : 0xffff0000 - 0xffff1000   (   4 kB)
fixmap   : 0xffff0000 - 0xffffe000   ( 896 kB)
DMA       : 0xffc00000 - 0xffe00000   (   2 MB)
vmalloc   : 0xcd000000 - 0xf8000000   ( 688 MB)
lowmem    : 0xc0000000 - 0xcc800000   ( 200 MB)
pkmap     : 0xbfe00000 - 0xc0000000   (   2 MB)
modules   : 0xbf000000 - 0xbfe00000   (  14 MB)
 .init    : 0xc0008000 - 0xc0039000   ( 196 kB)
 .text    : 0xc0039000 - 0xc04d9000   (4736 kB)
 .data    : 0xc04da000 - 0xc0521d80   ( 288 kB)
```

Please note following points:

- Default kernel build is set up with 3G/1G split for User/Kernel space. In addition, "High Memory" support in kernel (CONFIG_HIGHMEM) is enabled by default to accommodate larger physical memory/address space. Please refer HIGHMEM section below.
- It should be possible to allow larger *direct mapped* memory into kernel space by changing User/Kernel split to 2/2 or 1/3. Please note that these are NOT TESTED and may lead to unpredictable behavior - particularly some applications may fail.

Memory Holes Configuration

Note: This subsection is applicable to all platforms.

It is possible to indicate the kernel that the usable RAM is spanned across holes in between. This is achieved from passing multiple "mem=<size>@<start-address>" arguments to kernel.

CAUTION: Even when passing memory with holes, the kernel reserves contiguous space incorporating the whole memory passed through all 'mem' arguments. This means, the actual lomem mapped will be more than the total size of all memory arguments combined together.

Some examples indicating above constraint and impact follow:

- mem=128M mem=128M@0xA0000000
 - Total direct mappable RAM space lost here is 0x80000000 to 0xA0000000 + 128M = ~768MB, vmalloc space available 120MB
- mem=128M mem=324M@0x9F900000
 - Total direct mappable RAM space lost here is 0x80000000 to 0x9F900000 + 324M = ~829MB
- mem=364M@0x80000000 mem=324M@0x9F900000
 - Total direct mappable RAM space lost here is 0x80000000 to 0xA0000000 + 324M = ~829MB
- In the later 2 cases above, the RAM direct mapped space is divided as 768 MB from actual required ~829MB with remaining designated as highmem (see below section) to be able to accommodate 120MB minimum vmalloc space.
 - This also means ~60MB RAM towards the end of the of the second partition is not used if CONFIG_HIGHMEM is disabled.

To summarize, in all of the above cases, the default vmalloc space available will be 120MB max (further reduced as in built drivers/modules will have some regions mapped from vmalloc region on bootup) and passing vmalloc=<size> can be used to increase the vmalloc region (which will result into part of RAM being used as highmem or truncated and unusable depending upon CONFIG_HIGHMEM is enabled or disabled respectively).

HIGHMEM

Note: This subsection is applicable to all platforms.

The default kernel configuration in this release has HIGHMEM support enabled. This means the address space above the directly mapped in kernel space can be accessed by creating run time non-permanent mappings.

Without HIGHMEM support, the *vmalloc* and *lowmem* sizes are dependent - on RAM available to kernel (as specified by 'mem=<size-in-MB>M' boot argument) and vmalloc size required - restricted by the amount of space that can be directly mapped into kernel. As you provide more memory for kernel to map, the *vmalloc* space will be lowered. Vice versa is true when vmalloc region is changed by passing 'vmalloc=<size-in-MB>M' argument.

Furthermore, RAM size more that 768M will be truncated to maintain minimum *vmalloc* at 120MB.

Using HIGHMEM support in kernel addresses these restrictions. Some examples follow (note all of the examples assume ~50MB reserved for FB at boot time):

E.g. 1 Consider the case where usable RAM for kernel is 1GB (mem=1G)

In this case, the total directly mapped RAM will be 768MB with vmalloc size maintained as 120MB. While the rest of the RAM (~210MB) will be available as highmem.

Here, if CONFIG_HIGHMEM is disabled, the RAM size will be truncated to 768MB and rest of the RAM will be unusable.

E.g. 2 Consider the case where usable RAM for kernel is 1GB (mem=1G) and vmalloc region set to 500MB (vmalloc=500M)

In this case, the total directly mapped RAM will be 396MB with vmalloc size maintained as 496MB. While the rest of the RAM (~591MB) will be available as highmem.

Here, if CONFIG_HIGHMEM is disabled, the RAM size will be truncated to 396MB and rest of the RAM will be unusable.

Note 1: HIGHMEM is labelled as EXPERIMENTAL feature and may have performance impact if not used carefully - e.g., on a system where most of the memory used lies in highmem region causing run time mapping creation.

Note 2: Though HIGHMEM configuration is enabled by default, the mapping for highmem will only be created on need basis and in case where total space comprising of specified RAM, vmalloc and memory holes (see the section on Memory Holes Configuration) exceeds directly mappable space (that is, 888MB).

Boot-time measurement

Platform	Boot Device	u-boot boot time (sec)	reading uImage (2.14MB)(sec)	kernel + file system (sec)	total time (sec)
TI816X	SD Card	0.719	2.719	2.654 (13.4 MB)	6.092
TI814X	SD Card	0.625	2.675	3.5 (13.4 MB)	6.8
TI813X	SD Card	0.648	3.422	4.202(13.4 MB)	7.624

For boot-time measurement the following setup was used

TI81XX EVM

- 2-Stage SD boot (binaries picked from the release package)
- Kernel image of size 2.3MB (image picked from the release package)
- Sandisk Extreme 3 Class-6 4GB SD card
- Filesystem on the SD card - 14MB

The kernel image used had the features enabled by the default configurations provided.

The following was the kernel command line passed

TI816X

```
console=ttyO2,115200n8 root=/dev/mmcblk0p2 mem=128M init=/bin/sh rootwait
```

TI814X/TI813X

```
console=ttyO0,115200n8 root=/dev/mmcblk0p2 mem=128M init=/bin/sh rootwait
```

The break-up of the boot-time is as given below: **TI816X**

- Booting the compressed kernel (calculated from the time U-Boot displays "## Booting..." to the prompt) :3.84 secs
- Reading the 2.3MB uImage from SD card : 2.71 secs
- Misc time in U-Boot : 1.15 secs

TI814X

- Booting the compressed kernel (calculated from the time U-Boot displays "## Booting..." to the prompt) :4.92 secs
- Reading the 2.3MB uImage from SD card : 2.79 secs
- Misc time in U-Boot : 1.38 secs

TI813X

- Booting the compressed kernel (calculated from the time U-Boot displays "## Booting..." to the prompt) :TBD

- Reading the 2.3MB uImage from SD card :TBD
- Misc time in U-Boot : TBD

PSP Linux Drivers

This section provides brief overview of the device drivers supported in the Linux PSP release based on Linux OMAP git tree.

Note: The constraints may vary across product releases. Please refer to the Release Notes accompanying the release for an updated list of constraints.

Boot modes supported

Green colored box in the table below means that the particular boot mode is supported on the device in the release.

Note: These are supported boot modes in PSP software, the actual hardware may support many more boot modes than shown here. Please refer to hardware documentation for list of all supported boot modes.

TI81XX Linux PSP Supported Boot Modes

Boot Mode	TI816X EVM	TI814X EVM	TI813X EVM
NAND Flash	Yes	Yes	Yes
NOR Flash*	Yes	Yes	No
SPI EEPROM	Yes	Yes	Yes
SD	Yes	Yes	Yes
UART Boot	No	Yes	Yes
EMAC Boot	Yes **	Yes ****	Yes ****
PCIe Boot	Yes ***	Yes	No

* With Daughter card

** MACID blown processors required to verify this mode

*** Currently tested only with booting from TI816X/TI814X RC or a x86 PC

**** Only EMAC 0 is supported

Device driver list

TI81XX Device Driver List

Peripheral	Description	Linux driver type
Audio (McASP)	Audio record and playback	ALSA SoC
Ethernet driver(TI816X)	Transmit/receive network data. Supports Auto negotiation with 10/100/1000 Mbps link speed	Netdev
Ethernet Switch driver(TI814X/TI813X)	Transmit/receive network data. Supports Auto negotiation with 10/100/1000 Mbps link speed	Netdev
I2C	Inter-IC Communication	Character
MUSB Host	Supports MSC/HID/Audio/Video classes	USB HCD
MUSB Gadget	Supports CDC/RNDIS/FSG classes	USB Gadget
NAND Flash	Flash storage system	MTD Character and Block
UART	Serial Communication Interface	Character
Video Display	Video Display Driver	Frame-buffer and V4L2 display driver
Video Capture	Video Capture Driver	V4L2 capture driver
SATA	Storage	Block Device
NOR	Flash Storage system	MTD character and Block
PCI Express	PCIe Root Complex Driver	PCI/PCIe Bus Driver
PCI Express	PCIe EP Boot Driver	Character
MMC/SD	Interface to MultiMedia Secure Digital cards	Block Device
AVS	Adaptive voltage scaling	Power Management driver
Watchdog	Interface to h/w Watchdog	/dev/watchdog

Driver DMA usage

TI81xx peripheral driver DMA usage

Driver	DMA usage
Audio (McASP)	EDMA
Ethernet Driver(TI816X)	Internal DMA
Ethernet Switch Driver(TI814X/TI813X)	Internal DMA
MUSB Host	Internal DMA
MUSB Gadget	Internal DMA
NAND Flash	None
NOR Flash	None
UART	None
I2C	None
SATA	Internal DMA
SPI	None
MMC/SD	EDMA
PCIe RC	None (Individual EPs may use Inbound DMA)

PCIe EP	None
AVS	None

SATA Driver

SATA controller is AHCI Ver.1.1 spec compliant . It supports SATA1 (150MBps) and SATA 2 (300MBps) speeds. Port Multiplier support is available in the SATA controller. The controller can support drives upto UDMA-133 speeds. Please refer PSP SATA FAQ for more information.

Driver Features

Registers as a SCSI controller with the Linux SCSI Subsystem. SATA devices get registered as SCSI devices and can be accessed as `"/dev/sd{*}"` devices.

The driver supports the following features:

1. CD/DVD support
2. HDD
3. Port Multiplier support

[Linux Libata feature table ^[1]] for more details.

Features Not Supported

- Power Management : Though supported, validation is still pending.

Supported System Calls

All Linux ATA/SCSI system calls related to SATA

Supported IOCTLs

Supports IOCTLs available in Linux SCSI and ATA frameworks and which are applicable for SATA. Refer kernel source or documentation for details.

Performance and Benchmarks

Test Parameters

Test Parameters

Silicon Revision	TI814X PG 2.1, TI816X PG1.1, TI813X PG1.0
EVM	
DDR3	TI816X - 800Mhz, TI814X/TI813X - 400Mhz
CPU Speed	TI816X - 1Ghz, TI814X/TI813X - 600Mhz
Sata Port Instance	1
Port 0 - HDD	WDC WD5000AAKX - 500 GB HDD (used with 3Gbps Jumper)

SATA - ext2 File System Performance

SATA Write Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	102.41	50.19	91.56	46.87	92.01	87.33
256	100	101.20	46.97	102.13	51.70	93.47	87.39
512	100	98.60	45.92	103.27	52.35	92.59	86.72
1024	100	102.37	48.01	100.99	50.87	91.03	83.74
5120	100	100.74	47.85	101.21	51.25	91.97	84.63

SATA Read Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	123.28	49.35	123.43	50.35	117.69	95.76
256	100	123.28	46.82	123.19	49.06	117.92	95.18
512	100	123.15	47.25	123.18	51.23	118.59	94.48
1024	100	123.02	46.96	122.67	49.36	118.60	95.49
5120	100	122.95	46.07	123.17	48.71	118.53	93.48

SATA - vfat File System Performance

SATA Write Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	77.46	63.77	60.43	50.43	56.61	80.24
256	100	62.54	51.81	57.55	48.96	50.54	71.85
512	100	64.91	52.13	59.58	48.55	52.35	74.04
1024	100	63.51	50.82	57.97	49.42	50.28	71.29
5120	100	64.64	52.12	61.72	51.44	51.29	71.64

SATA Read Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	124.18	52.42	124.56	52.84	113.84	94.60
256	100	124.06	49.41	124.32	52.79	114.06	93.93
512	100	124.55	48.93	124.56	53.79	114.38	93.15
1024	100	124.55	48.58	124.74	49.42	115.01	93.12
5120	100	124.42	48.76	124.31	51.44	114.90	92.69

ALSA SoC Audio Driver

This section an overview of the ALSA SoC audio driver features along with the throughput and CPU load numbers. For the architecture, installation, basic usage and sample applications (if any) please refer to the driver user guide.

Driver Features

The driver supports the following features:

1. Supports AIC3106 audio codec (on TI814X base EVM)
2. Supports audio in stereo mode
3. Supports simultaneous playback and record (full-duplex mode).
4. Supports mixer interface for the audio codec

Features Not Supported

1. OSS based applications, which use ALSA-OSS emulation layer, are not supported.
2. Formats such as TDM, Left and Right Justified are currently not supported.
3. Synthesizer and midi interfaces are not supported.

Constraints

1. By default, codec is configured in master mode and McASP is used as slave. Testing of the audio sub-system is done in this configuration only.
2. Sampling frequencies for playback and capture streams should be same.
3. The audio driver does not allow opening the same stream (playback/capture) multiple times.

Supported System Calls

Refer ALSA project - the C library reference [2] for API calls.

Supported IOCTLs

NA

Performance and Benchmarks

Test setup:

1. Access type - RW_INTERLEAVED
2. Channels - 2
3. Format - S16_LE
4. Period size - 64

Audio Capture

			TI816x	TI814x	TI813x
Sampling Rate (in Hz)	Duration (in secs)	Bitrate (in bits/sec)	CPU (in %)	Load	CPU Load (in %)/sec
8000	327.69	255991	0.18	0.31	0.31
11025	237.78	352787	0.22	0.40	0.43
16000	163.85	511982	0.34	0.56	0.59
22050	118.89	705575	0.45	1.12	1.22
24000	118.89	705575	0.45	1.12	1.24
32000	81.93	1023963	0.94	1.59	1.59
44100	59.45	1411148	1.3	2.13	2.23
48000	54.62	1525943	1.47	2.68	2.78
88000	29.72	2822296	2.5	4.45	4.55
96000	27.31	3071885	2.35	6.87	6.94

Audio Playback

			TI816x	TI814x	TI813x
Sampling Rate (in Hz)	Duration (in secs)	Bitrate (in bits/sec)	CPU (in %)	Load	CPU Load (in %)/sec
8000	327.69	256094	0.14	0.23	0.26
11025	237.68	352930	0.17	0.28	0.36
16000	163.78	512188	0.26	0.45	0.51
22050	118.84	705859	0.36	0.63	0.70
24000	118.84	705859	0.34	0.67	0.76
32000	81.88	1024376	0.73	1.59	1.68
44100	59.42	1411718	0.96	2.18	2.26
48000	54.6	1536564	1.12	2.37	2.45
88000	29.72	2823432	2.1	4.36	4.49

96000	27.3	3073123	2.88	6.72	6.88
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ALSA SoC HDMI Audio Driver

This section an overview of the ALSA SoC HDMI audio driver features. For the architecture, installation, basic usage and sample applications (if any) please refer to the driver user guide.

Driver Features

The driver supports the following features:

1. Supports HDMI audio codec on TI81xx in ALSA SoC framework.
2. Multiple sample rates support (32KHz, 44.1KHz, 48KHz, 96KHz and 192KHz)playback.
3. Supports audio 16bit and 24bit (S16_LE ,S24_LE) audio format.
4. Supports audio in stereo mode.
5. Supports all audio mode in 1080P@60,1080I@60,720P@60 and 1080P@30 video modes

Features Not Supported

Note: TI814X/TI813X HDMI Audio is muted on some HDMI TV's due to problem with the S/W ACR packet generations. This make the HDMI audio compatibility issue on different TV models.

Constraints

1. HDMI Audio sampling rate support is based on the Video resolution in use.
2. Restart the audio while changing the video resolution.
3. The audio driver does not allow opening the same stream (playback) multiple times.

Supported System Calls

Refer ALSA project - the C library reference [2] for API calls.

Supported IOCTLs

NA

Performance and Benchmarks

Test setup:

1. Access type - RW_INTERLEAVED
2. Channels - 2
3. Format - S16_LE
4. Period size - 64

Audio Playback

			TI816x	TI814x	TI813x
Sampling Rate (in Hz)	Duration (in secs)	Bitrate (in bits/sec)	CPU Load (in %)	CPU Load (in %)	CPU Load (in %)/sec)
32000	81.88	1024513	1.59	1.59	TDB
44100	59.41	1411907	2.18	2.18	TDB
48000	54.59	1536769	2.37	2.37	TDB
96000	27.29	3073534	6.72	6.72	TDB
192000	13.65	6147076	14.2	14.2	TDB

Ethernet Driver

This section provides an overview of the TI816X Ethernet driver features along with throughput and CPU load numbers. Ethernet driver follows standard Linux network interface Architecture.

Driver Features

The driver supports the following features:

1. 10/100/1000 Mbps mode of operation.
2. Auto negotiation.
3. Support for multicast and broadcast frames.
4. Promiscuous mode of operation.
5. Full duplex and half duplex mode of operation.
6. Linux NAPI support
7. Support for HW interrupt pacing using ethtool interface

Features Not Supported

None

Constraints

NA

Supported System Calls

Supports the socket() and related system calls in accordance with Linux architecture.

Performance and Benchmarks

Ethernet Port0 TCP - 1Gbps Mode Rx Performance

TCP Window Size (in KBytes)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth - With Pacing (in Mbits/sec)	CPU Load (in %)
16	473.60	88.43	542.40	54.38
32	500.80	92.47	582.40	58.83
64	490.40	90.92	568.80	54.44
128	471.20	88.40	570.40	53.07
478.40	89.27	469.60	87.62	

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- iperf version 2.0.5
- On the DUT iperf is invoked in server mode : "-s -w 256k"
- On PC Host invoke iperf in the client mode : "-c <server ip> -w <window size> -t60"
- Interrupt pacing feature enabled with pacing interval set to 500usecs (# ethtool -C eth0 rx-usecs 500)
- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- Root filesystem mounted from MMC/SD.
- ARM running at 1Ghz and DDR3@800Mhz

Ethernet Port0 TCP - 1Gbps Mode Tx Performance

TCP Window Size (in KBytes)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth - With Pacing (in Mbits/sec)	CPU Load (in %)
16	549	97.02	245	18.3
32	544	97.55	451.2	35.7
64	536	97.26	647	71.8
128	530	97.65	670	88.2
256	518	97.65	678	85.5

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- iperf version 2.0.5
- On the DUT iperf is invoked in client mode : "-c <server ip> -w <window size> -t60"
- Interrupt pacing feature enabled with pacing interval set to 500usecs (# ethtool -C eth0 rx-usecs 500)
- On PC Host invoke iperf in the server mode : "-s -w 256k"
- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- Root filesystem mounted from MMC/SD.
- ARM running at 1Ghz and DDR3@800Mhz

Ethernet Port0 TCP - 1Gbps Mode Dual Performance

TCP Window Size (in KBytes)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth - With Pacing (in Mbits/sec)	CPU Load (in %)
16	528	97.50	433	42.5
32	519	96.26	568	64.9
64	509	97.65	652	89.6
128	514	97.65	674	94.8
256	516	96.49	669	93.95

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- iperf version 2.0.5
- On the DUT iperf is invoked in server mode : "-s -w 256k"
- On PC Host invoke iperf in the client mode : "-c <server ip> -w <window size> -t60 -d"
- Interrupt pacing feature enabled with pacing interval set to 500usecs (# ethtool -C eth0 rx-usecs 500)
- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- Root filesystem mounted from MMC/SD.
- ARM running at 1Ghz and DDR3@800Mhz

Ethernet Switch Driver

This section provides an overview of the TI814X/TI813X Ethernet Switch driver features along with throughput and CPU load numbers. Ethernet driver follows standard Linux network interface Architecture.

Driver Features

The driver supports the following features:

1. 10/100/1000 Mbps mode of operation.
2. Auto negotiation.
3. Support for multicast and broadcast frames.
4. Linux NAPI support
5. Second switch port
6. IEEE 1588/802.1AS PTP Support
7. VLAN (Subscription common for all ports)
8. Ethertool (Supports only Slave 0)
9. Support for HW interrupt pacing using ethtool interface (Interrupt pacing is common for both EMACs)
10. Switch mode of operation
11. Dual EMAC mode
 1. Bringing up the Two Ethernet switch ports as Individual EMAC interfaces to Applications and Disabling Switch functionality.

Features Not Supported

None

Constraints

NA

Supported System Calls

Supports the socket() and related system calls in accordance with Linux architecture.

Performance and Benchmarks

Ethernet Port0 TCP - 1Gbps Mode Rx Performance

	TI814x				TI813x			
TCP Window Size (in KBytes)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth With Pacing(in Mbits/sec)	CPU Load (in %)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth With Pacing(in Mbits/sec)	CPU Load (in %)
16	398	87	404	85	378	89	375	66
32	428	95	414	86	375	88	382	66
64	428	95	420	88	383	92	379	67
128	431	95	418	88	380	92	375	67
256	431	96	420	88	386	93	377	67

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- iperf version 2.0.4
- On the DUT iperf is invoked in server mode : "-s -w 256k"
- On PC Host invoke iperf in the client mode : "-c <server ip> -w <window size> -t60"
- Interrupt pacing feature enabled with pacing interval set to 500usecs (# ethtool -C eth0 rx-usecs 500)
- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- Root filesystem mounted from Ramdisk (EXT2).
- ARM running at 600Mhz and DDR3@400Mhz

Ethernet Port0 TCP - 1Gbps Mode Tx Performance

	TI814x				TI813x			
TCP Window Size (in KBytes)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth With Pacing(in Mbits/sec)	CPU Load (in %)	Bandwidth(in Mbits/sec)	CPU Load (in %)	Bandwidth With Pacing(in Mbits/sec)	CPU Load (in %)
16	298	100	164	34	288	100	154	24
32	299	100	279	55	289	100	287	41
64	299	100	472	86	289	100	466	77
128	298	100	552	95	289	100	530	91
256	298	100	552	96	290	100	528	93

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- iperf version 2.0.4
- On the DUT iperf is invoked in client mode : "-c <server ip> -w <window size> -t60"
- Interrupt pacing feature enabled with pacing interval set to 500usecs (# ethtool -C eth0 rx-usecs 500)
- On PC Host invoke iperf in the server mode : "-s -w 256k"
- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- Root filesystem mounted from Ramdisk (EXT2).
- ARM running at 600Mhz and DDR3@400Mhz

NAND Driver

This section provides an overview of the NAND flash driver features along with throughput and CPU load numbers. For the architecture, installation, basic usage and sample applications (if any) please refer to the driver user guide.

Driver Features

The driver supports the following features:

1. UBIFS file system (enabled by default)
2. Supports Read/Write, Erase operations
3. Prefetch mode of transfer (enabled by default)
4. SLC NAND
5. PIO mode

Features Not Supported

Subpage support in NAND

Constraints

None

Supported System Calls

Supports the system call support provided by MTD interface viz. `open()`, `close()`, `read()`, `write()`, `ioctl()`

Performance Benchmarks

Please refer MTD Test Setup before proceeding.

NAND Write Performance

NAND - Write Performance values

Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
	8-bit NAND	16-bit NAND	8-bit NAND	16-bit NAND	8-bit NAND	16-bit NAND
	8-bit NAND	16-bit NAND	8-bit NAND	16-bit NAND	8-bit NAND	16-bit NAND
40	2.07MB/s	3.42MB/s	1.82MB/s	3.14MB/s	1.82MB/s	3.14MB/s

NAND Read Performance

NAND - Read Performance values

Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
	8-bit NAND	16-bit NAND	8-bit NAND	16-bit NAND	8-bit NAND	16-bit NAND
	8-bit NAND	16-bit NAND	8-bit NAND	16-bit NAND	8-bit NAND	16-bit NAND
40	2.29MB/s	3.90MB/s	1.95MB/s	3.34MB/s	1.96MB/s	3.34MB/s

NOTE: The filesystem performance tests are obtained by carrying out raw read/write tests:

For eg:

```
# flash_eraseall /dev/mtdX      ('X' is the partition number)
# cd /dev/shm
# dd if=/dev/zero of=40MB bs=1M count=40
# time nandwrite -q -p /dev/mtdX /dev/shm/40MB      (to obtain write speed)
# rm 40MB
# time nanddump -f /dev/shm/40MB -l 41943040 /dev/mtdX      (to obtain read speed)
```

NOR Driver

This section provides an overview of the NOR flash driver features along with throughput and CPU load numbers. For the architecture, installation, basic usage and sample applications (if any) please refer to the driver user guide.

Driver Features

The driver supports the following features:

1. Supports Read/Write, Erase operations
2. Support all CFI compatible NOR flash devices

=== Features Not Supported ===

None

Constraints

None

Supported System Calls

Supports the system call support provided by MTD interface viz. `open()`, `close()`, `read()`, `write()`, `ioctl()`

Performance Benchmarks

Please refer MTD Test Setup before proceeding.

NOR Raw Read Performance

- 1.64 MBytes/sec
- Command used: "time mtd_debug read /dev/mtd3 0 41943040 /dev/shm/40MB". This command reads 40 MBytes of data from partition 3 and measure the time using "time" command.

NOR Raw Write Performance

- 579 KBytes/sec
- Command used: "time flashcp /dev/shm/40MB /dev/mtd3". This command writes 40 MBytes of data to partition 3 and measure the time using "time" command. This command assumes that /dev/shm/40MB file is already available.

NOR JFFS2 Performance

Note: LFTB has been used after making the following changes

- Create a 35MB file with Random data. This is required as JFFS2 uses compression.

```
dd if=/dev/urandom of=/dev/shm/35MB_file.bin bs=1M count=35
```

- Run the following command from mtd_test_suite folder (mtd_test_suite/scripts/common)

```
./mtd_tests_script.sh -device_type nor -plat ti814x -type perf  
-partition_number 3 -fs_type jffs2 -size 35 -erase_size 120000  
-file_name /dev/shm/35MB_file.bin
```

Buffer Size in Bytes	8192	16384	102400	256000	512000	1048576	5242830
NOR Write (MBytes/sec)	0.156768	0.156366	0.156296	0.154594	0.151763	0.151121	0.150227
NOR Read (MBytes/sec)	1.400180	1.395503	1.399395	1.395531	1.398563	1.395949	1.399866

PCIe RC Driver

This section provides an overview of the PCIe Root Complex (RC) driver features along with throughput and CPU load numbers when using PCIe Gigabit Ethernet card as Endpoint (EP). For the architecture, installation, basic usage, please refer to the PCI Express Root Complex Driver User Guide.

Driver Features

The driver supports the following features:

1. Fits into Linux PCI Bus framework to provide PCI compatible software enumeration support
2. In addition, provides interface to Endpoint Drivers to access the respective devices detected downstream.
3. The same interface can be used by the PCI Express Port Bus Driver framework in Linux to perform AER, ASP etc handling
4. Interrupt handling facility for EP drivers as MSI interrupts or Legacy Interrupts (INTx).
5. Seamless handling of PCIe errors

Features Not Supported

1. PCIe I/O access
2. Port Bus Driver integration
3. 64-bit PCIe addressing.

Constraints

NA

Supported System Calls

None. Access to individual PCIe EPs may be provided by respective drivers.

Setup

- For TI814X - TI814X PG2.1 EVM (Beta) with DDR3 @400MHz clock set up as Root Complex with Cortex A8 @600MHz (referred as DUT)
- For TI816X - TI816X PG2.0 EVM (Rev H) with DDR3 @800MHz clock set up as Root Complex with Cortex A8 @1GHz (referred as DUT)
- NetXtreme BCM5751 Gigabit Ethernet PCI Express (rev 01) card with x1 link connected in PCIe slot on EVM
- Ethernet port on x86 PC Host running Linux is used to connect to PCIe EP Ethernet port
- Both Host and DUT have iperf version 2.0.4 (7 Apr 2008) installed

Execution

The performance numbers were captured using the iperf tool. Usage details are mentioned below:

- On PC Host iperf was invoked in server mode : "-s" - window size default of 85.3KB. E.g.,

```
# iperf -B 192.168.0.1 -s
```

- On the DUT iperf is invoked in the client mode (TX) : "-c <server ip> -w <window size> -t60". E.g.,

```
# iperf -c 192.168.0.1 -w 16KB -t60
```

- The transfers are measured over a duration of 60Secs
- Cross cable is used to measure performance.
- Speed is set to 1000Mbps
- On-chip Ethernet ports (Port0 and Port1) disabled (not brought up).
- Ramdisk filesystem was used as root filesystem.

PCIe Ethernet TCP - 1Gbps Mode Performance

TCP Window Size (in KBytes)	TI814X			TI816X		
	Bandwidth	Transfer Size	CPU Load	Bandwidth	Transfer Size	CPU Load (In %)
	(in Mbits/sec)	(In GBytes)	(In %)	(in Mbits/sec)	(In GBytes)	
16	577	4.03	56	704	4.92	34
32	659	4.60	99	836	5.84	63
64	663	4.63	99	854	5.97	62
128	665	4.65	99	858	6	61
256	664	4.64	99	862	6.02	63

Observations

- PCIe Gigabit Ethernet Card used supported GEN1 speeds with x1 link.
- The Ethernet NIC used supported hardware offloading and checksum calculations (enabled by default).

PCIe EP Boot Driver

This section provides an overview of the PCIe Endpoint (EP) Boot driver features. For the architecture, installation, basic usage, please refer to the PCI Express Endpoint Boot Driver User Guide.

Driver Features

The driver supports the following features:

- Provides character device interface to boot application for booting TI816X/TI814X PCIe Endpoint
- Provide mmap support to enable the boot application to copy image files (U-Boot, kernel etc) to EP memory
- Can be built as loadable module or into kernel

Features Not Supported

1. Operate more than one TI816X/TI814X EP. If more than one TI816X/TI814X EPs are connected in the system, this driver operates only on the first detected with TI816X given preference.
2. No interrupt support
3. Not validated on any other RC than TI816X, TI814X or x86 PC. E.g., this driver may require some porting to build on Linux PPC kernel.

Constraints

NA

Supported System Calls

Character device interface through open(), ioctl(), close() and mmap() system calls.

USB Driver

This section gives an overview of the USB (MUSB) driver features supported/not supported, constraints and performance numbers.

TI81XX USBSS

The TI81XX USB subsystem consists of two instances of Mentor Controller (referred as musb). The **musb** driver is implemented on top of Mentor controller IP which supports all the speeds (High, Full and Low). TI81XX USB subsystem uses CPPI 4.1 DMA for all the transfers.

Driver Features

The driver supports the following features

USB Host Mode

Host Mode Feature	TI816x PG1.X	TI816x PG2.X	TI814x	TI813x
HUB class support	No ^[3]	Yes	Yes	Yes
Human Interface Class (HID) ^[4]	Yes	Yes	Yes	Yes
Mass Storage Class (MSC) ^[5]	Yes	Yes	Yes	Yes
USB Video Class (UVC) ^[6]	Yes	Yes	Yes	Yes
USB Audio Class (UAC) ^[7]	Yes	Yes	Yes	Yes
USB CDC Host ^[8]	Yes	Yes	Yes	No

USB gadget mode

Gadget Mode Feature	TI816x	TI814x	TI813x
Mass Storage Class (MSC) ^[9]	Yes	Yes	Yes
USB Networking - RNDIS ^[10]	Yes	Yes	Yes
USB Networking - CDC ^[10]	Yes	Yes	Yes

USB Dual Mode

Each instance of musb controller can be configured for host/gadget mode of operation. For example the usb0 can be configured for gadget mode and usb1 can be configured for host mode operation. refer to user's guide for more details.

Dual Mode Feature	TI816x	TI814x	TI813x
USB0 as host, USB1 as gadget ^[11]	Yes	Yes	Yes
USB0 as gadget, USB1 as host ^[11]	Yes	Yes	Yes
USB0 as host, USB1 as host ^[11]	Yes	Yes	Yes

Note: This feature not supported for PG1.X TI814X (refer to known issues at release notes)

USB OTG mode

	TI816x	TI814x	TI813x
OTG support	No	No	No

USB Mass Storage Class Host Driver

Driver Features

Supports PIO and DMA mode

Constraint

None

Supported System Calls

`open()`, `close()`, `read()`, `write()`, `ioctl()`

Supported IOCTLs

None

Performance Benchmarks (DMA mode)

Setup : Toshiba HDD (500GB) connected to usb0 port.
File read/write performance data on usb0 port (WDD HDD) has been captured.
LFTB Version 2.00.00.04 used for performance.

For Test setup details refer to usb-host-msc test setup ^[12]

USB - ext2 File System Performance

USB Host DMA-Write Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813x	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	20.07	13.80	18.37	21.72	17.37	17.91
256	100	17.60	10.32	17.43	16.45	17.69	17.48
512	100	20.99	13.44	18.26	21.84	17.80	17.86
1024	100	20.75	11.70	17.65	20.27	18.30	17.83
5120	100	19.60	15.14	16.67	20.67	18.19	18.75

USB Host DMA-Read Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813x	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	19.92	19.02	17.32	22.02	16.39	24.53
256	100	20.14	16.67	16.10	22.39	15.67	23.99
512	100	19.90	14.88	16.28	23.68	15.78	24.43
1024	100	20.60	14.42	16.03	23.73	15.85	21.34
5120	100	19.82	15.95	16.70	20.77	16.18	21.84

USB - vfat File System Performance

USB Host DMA-Write Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	20.11	25.63	19.55	25.88	18.18	29.84
256	100	20.86	30.28	19.36	25.65	18.31	28.77
512	100	20.69	30.97	19.50	26.07	18.19	28.05
1024	100	20	27	19.52	25.93	18.22	29.14
5120	100	20	26	19.31	24.91	18.22	30.24

USB Host DMA-Read Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	22	18	19.64	15.73	18.32	20.84
256	100	22	18	19.26	13.58	18.31	19.72
512	100	23	15	19.42	17.22	18.25	21.29
1024	100	23	22	19.39	17.78	18.41	19.19
5120	100	22	18	19.27	13.44	18.33	18.56

USB - ext2 File System Performance on simulataneous read/write on two HDD

Setup : WesternDigital HDD (500GB) connected to usb0 port and Toshiba HDD connected to usb1 port.
 File read/write performance data on usb0 port(WDD HDD) has been captured while simulatenous file write is in progress on usb1 port (Toshiba HDD).
 LFTB Version 2.00.00.04 used for performance.

USB Host DMA-Write Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	19	40	16	54	15	55
256	100	20	43	16	53	15	55
512	100	19	44	16	59	15	60
1024	100	19	44	15	58	14	60
5120	100	19	43	15	56	15	60

USB Host DMA-Read Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	21	55	18	62	17	20
256	100	21	51	17	64	17	65
512	100	21	55	17	68	16	70
1024	100	21	58	18	65	17	70
5120	100	21	59	17	62	16	65

USB - VFAT, File System Performance on simulataneous read/write on two HDD

Setup : WesternDigital HDD (500GB) connected to usb0 port and Toshiba HDD connected to usb1 port.
 File read/write performance data on usb0 port(WDD HDD) has been captured while simulatenous file write is in progress on usb1 port (Toshiba HDD).
 LFTB Version 2.00.00.04 used for performance.

USB Host DMA-Write Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	18	57	14	63	14	76
256	100	18	59	14	64	15	70
512	100	18	57	14	61	13	65
1024	100	18	56	15	64	15	70
5120	100	18	57	14	60	14	70

USB Host DMA-Read Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	20	59	17	62	16	70
256	100	19	55	15	59	15	60
512	100	20	56	17	62	16	70
1024	100	19	58	17	62	16	72
5120	100	20	56	17	62	16	70

USB Mass Storage Class Slave Driver

Driver Features

- Supports both PIO and DMA mode
- Support for File storage Gadget driver

Features Not Supported

None

Constraint

None

Supported System Calls

NA

Supported IOCTLs

NA

Performance Benchmarks

The performance numbers are captured in DMA Mode using SATA HDD as file storage gadget media exposing as removable media to windows-xp over USB. The SATA HDD is formatted using the NTFS on windows-xp.

#SATA HDD used - Western Digital 500GB drive

While insert g_file_storage.ko use the module parameter **buflen** set to 65536
insmod g_file_storage.ko file=/dev/sda buflen=65536 stall=0 removable=1

For test setup details refer to msc-device setup^[13]

USB Slave- DMA Write Performance values

Bytes Transferred (MB)'SATA HDD'as storage device	Total Transferred Bytes (in MBytes)	TI816X		TI814X		TI813X	
		XP	Linux	XP	Linux	XP	Linux
		(MB/sec)	(MB/sec)	(MB/sec)	(MB/sec)	(MB/sec)	(MB/sec)
250	250	25	30	17	25	15	23

USB Slave- DMA Read Performance values

Bytes Transferred (MB)'SATA HDD'as storage device	Total Transferred Bytes (in MBytes)	TI816X		TI814X		TI813X	
		XP	Linux	XP	Linux	XP	Linux
		(MB/sec)	(MB/sec)	(MB/sec)	(MB/sec)	(MB/sec)	(MB/sec)
250	250	35	40	25	28	23	25

USB CDC/RNDIS Slave Driver

Description

The CDC RNDIS gadget driver that is used to send standard Ethernet frames using USB. The driver will create an Ethernet device by the name usb0.

Driver Features

Supports PIO and DMA mode.

Features Not Supported

None

Constraint

None

Supported System Calls

`open()`, `close()`, `read()`, `write()`, `ioctl()`

Supported IOCTLs

None

Performance Benchmarks

Performance benchmarks were collected using the Iperf tool and default options were used to collect the throughput numbers.

USB RNDIS-DMA Performance

Setup : EVM as client and Linux Host PC as server
 command at EVM: `iperf -c <window/linux host ip_addr> -w <8|16|32|64|128>K -t 60 -d`
 command at Host: `iperf -s`

For test setup details refer cdc-rndis setup^[14]

USB RNDIS-DMA Performance values - Client

TCP Window Size(in KBytes)	Interval (in Seconds)	TI816X (Mbps)	TI814X (Mbps)	TI813X (Mbps)
16	60	127	103	100
32	60	123	95	95
64	60	130	99	95
128	60	131	100	98

USB Gadget CDC-DMA Performance

USB CDC-DMA Performance values - Client

TCP Window Size(in KBytes)	Interval (in Seconds)	TI816X (Mbps)	TI814X (Mbps)	TI813X (Mbps)
16	60	170	174	160
32	60	180	179	179
64	60	180	181	180
128	60	185	183	180

MMC/SD Driver

The MMC controller provides an interface to external MMC cards that follow the MMC specification v4.0. The MMC driver is implemented as a block driver. Block device nodes (such as /dev/mmcblkp1, /dev/mmcblkp2) are created for user space access.

Driver Features

The driver supports the following features:

1. MMC/SD native protocol command/response set
2. Single/multiple block data transfers
3. Linux file system and generic MMC layer abstract details of block devices (MMC)
4. High-speed (SDv1.1) and High Capacity (SDv2.0) cards
5. MMC/SD card hot insertion and removal

Features Not Supported

1. 8-bit MMC
2. SPI mode of operation

Constraints

1. MMC/SD cards should not be removed when the mount operation is in progress. If done so, data integrity cannot be guaranteed.

Supported System Calls

`open()`, `close()`, `read()`, `write()`

Supported IOCTLs

None

Performance and Benchmarks

Important

The performance numbers can be severely affected if the media is mounted in sync mode.

Please refer MMC/SD Test Setup before proceeding.

The performance numbers were captured using the following:

- SD Card (Sandisk Extreme, SDHC, Class 10, 4GB)
- 100MB file size
- Partition was mounted with async option
- LTP-DDT test suite

EXT2 file system

SD - Write Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	8.898853	6.88	8.772633	11.12	8.389523	11.93
256	100	8.408709	6.58	8.382574	10.40	8.276804	10.81
512	100	9.002925	7.22	8.396258	9.61	7.943129	12.73
1024	100	9.232489	6.51	8.539677	10.26	8.334637	12.24
5120	100	8.861453	6.68	8.200966	10.01	8.143051	11.27

SD - Read Performance values

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	18.191280	11.98	17.449301	14.81	17.092495	19.90
256	100	18.178263	11.83	17.451921	18.80	17.060186	18.43
512	100	18.202732	12.17	17.460024	20.33	17.095018	20.39
1024	100	18.197847	13.02	17.445963	18.94	17.086903	18.57
5120	100	18.202175	14.24	17.463547	18.17	17.083899	19.58

VFAT file system**SD - Write Performance values**

Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	9.167303	9.62	9.426215	14.67	8.640010	18.30
256	100	8.736581	8.75	9.357816	16.95	8.973682	18.25
512	100	9.348620	10.97	9.273531	15.83	9.420897	17.34
1024	100	9.249720	9.27	9.191129	18.40	8.986058	19.37
5120	100	9.734599	11.61	9.311593	15.19	8.939456	17.48

SD - Read Performance values

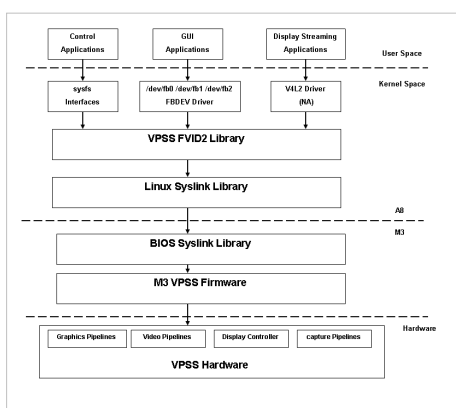
Buffer Size (in KBytes)	Total Bytes Transferred (in MBytes)	TI816X		TI814X		TI813X	
		MB/sec	cpu load (%)	MB/sec	cpu load (%)	MB/sec	cpu load (%)
100	100	17.866987	13.29	16.917168	22.65	16.569788	20.54
256	100	17.818867	10.88	16.992708	22.89	16.630856	17.75
512	100	17.731287	12.18	16.927343	23.87	16.653711	17.46
1024	100	17.844290	12.10	16.973387	23.46	16.639519	17.78
5120	100	17.828140	12.27	16.929251	20.62	16.546604	17.98

Video Display Driver

This section describes the Video Display driver architecture, driver features.

Description

The following diagram shows the architecture of the Video display Driver



Driver Features

1. Support 1080p-60/1080p-50/1080P-30/1080I-60/1080I-50/720P-60/720P-50 mode display through HDMI VENC
2. Support mux multiple graphics planes into single VENC
3. Support Video PLL configuration
4. Support Venc Clock source configuration
5. Support VENC output configuraiton(digital data format, sync mode, analog output format)
6. Support PAL/NTSC SVIDEO output through SD_VENC
7. Support reshuffling display order
8. Support Customized timing configuration for DVO1/DVO2 output.
9. Support on-chip HDMI display together with HDMI Kernel Driver.

Features Not Supports

1. EVM RF output is not supported
2. EVM Composite output is not supported
3. EVM VGA output is not support

Fbdev Driver

Frame-buffer Display Driver.

Driver Features

1. Support 3 independent graphics planes
2. Support
RGB888/ARGB8888/RGBA8888/RGB565/ARGB1551/RGBA5551/RGBA4444/ARGB4444/ARGB6666/RGBA6666
3. Support 0.25x-4x scaling
4. Support boundingbox blending
5. Support global blending
6. Support Pixel blending
7. Support Palette blending
8. Support RGB888 color key mapping
9. Support anti-flickering filter.
10. Support wait for VSYNC and panning
11. Support mmapmed (driver allocated) buffers

Features Not Supports

1. Rotation is not supported.
2. Mirroring is not supported.
3. Stencililing is not supported

Constrains

None

Supported System Calls

open(), close(), mmap(), munmap() and ioctl()

Performance Benchmarks

Please check HDVPSS Feature Performance Guide here ^[15]

Default Clock Configuration

Following are the configuration of clocks and their usecount immediately after the kernel booted up. The clock rates are either configured in the u-boot or kernel during init or as part of a driver initialization. The usecount reflects the number of times the clock has been enabled or one of it's child clocks are enabled in kernel init or by drivers but does not reflect enable requests done in uboot.

TI814X

Clock Rates

```
./sys_32k_clkin_ck/rate ==> 32768

./tclkin_ck/rate ==> 32768

./oscl_clkin_ck/rate ==> 22579000

./oscl_x1_ck/rate ==> 20000000

./xref1_ck/rate ==> 27000000

./xref2_ck/rate ==> 27000000

./tsi0_dck_ck/rate ==> 82000000

./tsi1_dck_ck/rate ==> 82000000

./external_ck/rate ==> 50000000

./atl0_clk_ck/rate ==> 22579000

./atl1_clk_ck/rate ==> 22579000

./atl2_clk_ck/rate ==> 22579000

./atl3_clk_ck/rate ==> 22579000

./dvi_ch1_ck/rate ==> 166000000

./dvi_ch2_ck/rate ==> 166000000

./dvi_ch3_ck/rate ==> 166000000

./dvi_ch4_ck/rate ==> 166000000

./dvoi1_ck/rate ==> 162000000

./dvoi2_ck/rate ==> 162000000

./video_m_pclk_ck/rate ==> 165000000

./hdmi_phy_tclk_ck/rate ==> 185625000

./xref0_ck/mcasp1_ahx_ck/rate ==> 27000000

./xref0_ck/mcasp1_ahr_ck/rate ==> 27000000

./xref0_ck/mcasp2_ahx_ck/rate ==> 27000000

./xref0_ck/mcasp2_ahr_ck/rate ==> 27000000

./xref0_ck/mcasp3_ahx_ck/rate ==> 27000000

./xref0_ck/mcasp4_ahx_ck/rate ==> 27000000

./xref0_ck/mcasp5_ahx_ck/rate ==> 27000000

./xref0_ck/mcasp6_ahx_ck/rate ==> 27000000

./xref0_ck/rate ==> 27000000

./ljcb_serdesp_ck/pciessp_ck/rate ==> 100000000

./ljcb_serdesp_ck/rate ==> 100000000

./ljcb_serdesn_ck/pciessn_ck/rate ==> 100000000

./ljcb_serdesn_ck/rate ==> 100000000

./pciess_50m_ck/rate ==> 50000000

./pciess_125m_ck/rate ==> 125000000

./satassp_ck/rate ==> 100000000

./satassn_ck/rate ==> 100000000

./satass_20m_ck/rate ==> 20000000

./satass_50m_ck/emac_rmii_fck/rate ==> 50000000

./satass_50m_ck/rate ==> 50000000

./satass_125m_ck/emac_gmii_fck/rate ==> 125000000

./satass_125m_ck/rate ==> 125000000

./rtc_divider_ck/audio_dp11_clk1_ck/rate ==> 32768
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./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/rtc_c32k_fck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio1_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/gpio2_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/gpio3_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/gpio4_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/rtc_fck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/mmchs1_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/mmchs2_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/mmchs3_dbck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/sync_timer_fck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/bandgaps_fck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/arm_oper_fck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/rate ==> 32768
./rtc_divider_ck/audio_prcm_clkin_ck/rate ==> 32768
./rtc_divider_ck/wdt1_fck/rate ==> 32768
./rtc_divider_ck/rate ==> 32768
./rcosc_32k_ck/wdt2_fck/rate ==> 32768
./rcosc_32k_ck/rate ==> 32768
./osc0_clkin_ck/dcan0_fck/rate ==> 20000000
./osc0_clkin_ck/dcan1_fck/rate ==> 20000000
./osc0_clkin_ck/sr1_fck/rate ==> 20000000
./osc0_clkin_ck/sr2_fck/rate ==> 20000000
./osc0_clkin_ck/sr3_fck/rate ==> 20000000
./osc0_clkin_ck/sr4_fck/rate ==> 20000000
./osc0_clkin_ck/arm_dpll_clkin_ck/arm_dpll_ck/mpu_ck/rate ==> 600000000
./osc0_clkin_ck/arm_dpll_clkin_ck/arm_dpll_ck/rate ==> 600000000
./osc0_clkin_ck/arm_dpll_clkin_ck/rate ==> 20000000
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/sgx_ck/rate ==> 5000000
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/sgx_sys_ck/rate ==> 5000000
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/sgx_mem_ck/rate ==> 5000000
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/rate ==> 5000000
./osc0_clkin_ck/sgx_dpll_ck/rate ==> 20000000
./osc0_clkin_ck/hdvpss_dpll_ck/sysclk3_ck/ivahd0_ck/rate ==> 306000000
./osc0_clkin_ck/hdvpss_dpll_ck/sysclk3_ck/rate ==> 306000000
./osc0_clkin_ck/hdvpss_dpll_ck/rate ==> 306000000
./osc0_clkin_ck/hdvpss_dpll_ck/hdvpss_proc_fck/rate ==> 20000000
./osc0_clkin_ck/hdvpss_dpll_ck/hdvpss_proc_d2_fck/rate ==> 10000000
./osc0_clkin_ck/hdvpss_dpll_ck/rate ==> 20000000
./osc0_clkin_ck/usb_dpll_clkin_ck/usb_phy0_rclk_ick/rate ==> 0
./osc0_clkin_ck/usb_dpll_clkin_ck/usb_phy1_rclk_ick/rate ==> 0
./osc0_clkin_ck/usb_dpll_clkin_ck/usb_dpll_ck/usb_dpll_clk2_ck/sysclk10_ck/mcspi1_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dpll_clkin_ck/usb_dpll_ck/usb_dpll_clk2_ck/sysclk10_ck/mcspi2_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dpll_clkin_ck/usb_dpll_ck/usb_dpll_clk2_ck/sysclk10_ck/mcspi3_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dpll_clkin_ck/usb_dpll_ck/usb_dpll_clk2_ck/sysclk10_ck/mcspi4_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dpll_clkin_ck/usb_dpll_ck/usb_dpll_clk2_ck/sysclk10_ck/i2c02_ck/i2c1_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dpll_clkin_ck/usb_dpll_ck/usb_dpll_clk2_ck/sysclk10_ck/i2c02_ck/i2c3_fck/rate ==> 48000000
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./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c02_ck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c13_ck/i2c2_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c13_ck/i2c4_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c13_ck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/uart1_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/uart2_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/uart3_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/hdmi_cec_dcc_fck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/rate ==> 48000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/mmchs1_fck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/mmchs2_fck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/mmchs3_fck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/uart4_fck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/uart5_fck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/uart6_fck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/csi2_phy_fck/rate ==> 96000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/rate ==> 192000000
./osc0_clkin_ck/usb_dp11_clkin_ck/rate ==> 20000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr0_phy_fck/rate ==> 400000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr1_phy_fck/rate ==> 400000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr0_half_fck/ddr0_phy_d2_fck/rate ==> 200000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr0_half_fck/ddr0_emif_fck/rate ==> 200000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr0_half_fck/dmm_phy_fck/rate ==> 200000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr0_half_fck/rate ==> 200000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr1_half_fck/ddr1_phy_d2_fck/rate ==> 200000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr1_half_fck/ddr1_emif_fck/rate ==> 200000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr1_half_fck/rate ==> 200000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/rate ==> 400000000
./osc0_clkin_ck/ddr_dp11_clkin_ck/rate ==> 20000000
./osc0_clkin_ck/video1_dp11_clkin_ck/video1_dp11_ck/sysclk14_c1mux_ck/rate ==> 10000000
./osc0_clkin_ck/video1_dp11_clkin_ck/video1_dp11_ck/hd_venc_g_ck/rate ==> 20000000
./osc0_clkin_ck/video1_dp11_clkin_ck/video1_dp11_ck/rate ==> 20000000
./osc0_clkin_ck/video1_dp11_clkin_ck/rate ==> 20000000
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/hd_venc_d_ck/hdmi_phy_gclk_ck/rate ==> 20000000
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/hd_venc_d_ck/rate ==> 20000000
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/sysclk16_b3mux_ck/sysclk14_ck/tpss_stc0_fck/rate ==> 909090
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/sysclk16_b3mux_ck/sysclk14_ck/rate ==> 909090
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/sysclk16_b3mux_ck/rate ==> 909090
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/rate ==> 20000000
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/rate ==> 20000000
./osc0_clkin_ck/hdmi_dp11_clkin_ck/rate ==> 20000000
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sysclk16_d1mux_ck/sysclk16_ck/tpss_stc1_fck/rate ==> 31250000
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sysclk16_d1mux_ck/sysclk16_ck/rate ==> 31250000
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sysclk16_d1mux_ck/rate ==> 31250000
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sd_venc_ck/rate ==> 250000000
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./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/video012_dp11_muxout_ck/sysclk21_ck/rate ==> 250000000
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/video012_dp11_muxout_ck/rate ==> 250000000
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/rate ==> 250000000
./osc0_clkin_ck/video0_dp11_clkin_ck/rate ==> 200000000
./osc0_clkin_ck/sysclk22_ck/mcasp3_fck/rate ==> 200000000
./osc0_clkin_ck/sysclk22_ck/hdmi_i2s_ck/hdmi_i2s_fck/rate ==> 200000000
./osc0_clkin_ck/sysclk22_ck/hdmi_i2s_ck/rate ==> 200000000
./osc0_clkin_ck/sysclk22_ck/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/iss_ick/rate ==> 400000000
./osc0_clkin_ck/iss_dp11_ck/isp_ick/rate ==> 400000000
./osc0_clkin_ck/iss_dp11_ck/tpss_tso_ick/rate ==> 400000000
./osc0_clkin_ck/iss_dp11_ck/tpss_fck/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/ducati_ick/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/securess_fck/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/sysclk19_ck/tpss_tso_fck/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/sysclk19_ck/at1_fck/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/sysclk19_ck/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/rate ==> 200000000
./osc0_clkin_ck/iss_dp11_ck/rate ==> 400000000
./osc0_clkin_ck/gpt1_fck/rate ==> 200000000
./osc0_clkin_ck/gpt2_fck/rate ==> 200000000
./osc0_clkin_ck/gpt3_fck/rate ==> 200000000
./osc0_clkin_ck/gpt4_fck/rate ==> 200000000
./osc0_clkin_ck/gpt5_fck/rate ==> 200000000
./osc0_clkin_ck/gpt6_fck/rate ==> 200000000
./osc0_clkin_ck/gpt7_fck/rate ==> 200000000
./osc0_clkin_ck/gpt8_fck/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/l3_fast_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/ivahd0_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/exp_slot_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/mmu_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/gem_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/tptc0_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/tptc1_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/tptc2_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/tptc3_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/ivahd0_sl2_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/tpcc_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/fdif_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/hdvpss_l3_ick/rate ==> 200000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/sysclk6_ck/l3_slow_ick/rate ==> 100000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/sysclk6_ck/l4_slow_ick/rate ==> 100000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/sysclk6_ck/uart1_ick/rate ==> 100000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/sysclk6_ck/uart2_ick/rate ==> 100000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/sysclk6_ck/uart3_ick/rate ==> 100000000
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/sysclk6_ck/uart4_ick/rate ==> 100000000

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[illegible]

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./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/elm_ick/rate ==> 100000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/elm_fck/rate ==> 100000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/mmchs1_ick/rate ==> 100000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/mmchs2_ick/rate ==> 100000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/at1_ick/rate ==> 100000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/fdif_enb_ck/rate ==> 100000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/rtc_c32k_ick/rate ==> 100000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/dcan0_ick/rate ==> 100000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/dcan1_ick/rate ==> 100000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/rate ==> 100000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/13_med_ick/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/14_fast_ick/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/securess_ick/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/tpgsw_ick/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/sata_ick/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/pcie_ck/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/vcp2_fck/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/fdif_fck/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/dap_ick/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/ocmc_ram_ick/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mmchs3_ick/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/cpsw_ick/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/gem_trc_fck/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mcasp4_ick/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mcasp5_ick/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mcasp6_ick/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/hdvpss_l4_ick/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mlb_ick/mcasp_auxclk_mux0_ck/mcasp4_fck/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mlb_ick/mcasp_auxclk_mux0_ck/mcasp5_fck/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mlb_ick/mcasp_auxclk_mux0_ck/mcasp6_fck/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mlb_ick/mcasp_auxclk_mux0_ck/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mlb_ick/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/rate ==> 200000000
./osc0_clkin_ck/13_dp11_clkin_ck/rate ==> 200000000
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/sysclk20_ck/audio_prcm1_out_ck/mcbsp_fck/rate ==> 250000000
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/sysclk20_ck/audio_prcm1_out_ck/rate ==> 250000000
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/sysclk20_ck/mcasp1_fck/rate ==> 250000000
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/sysclk20_ck/mcasp2_fck/rate ==> 250000000
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/sysclk20_ck/rate ==> 250000000
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/cpts_rft_clk_ck/rate ==> 250000000
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/rate ==> 250000000
./osc0_clkin_ck/audio_dp11_clkin_ck/rate ==> 200000000
./osc0_clkin_ck/pciess_20m_ck/rate ==> 200000000
./osc0_clkin_ck/dsp_dp11_ck/gem_fck/rate ==> 500000000
./osc0_clkin_ck/dsp_dp11_ck/clkout_prcm_mux_ck/clkout_prcm_ck/sys_clkout1/rate ==> 500000000
```

```
./osc0_clkin_ck/dsp_dpll_ck/clkout_prcm_mux_ck/clkout_prcm_ck/sys_clkout2/rate ==> 500000000
./osc0_clkin_ck/dsp_dpll_ck/clkout_prcm_mux_ck/clkout_prcm_ck/rate ==> 500000000
./osc0_clkin_ck/dsp_dpll_ck/clkout_prcm_mux_ck/rate ==> 500000000
./osc0_clkin_ck/dsp_dpll_ck/rate ==> 500000000
./osc0_clkin_ck/rate ==> 20000000
```

Use Count

```
./sys_32k_clkin_ck/usecount ==> 0
./tclkin_ck/usecount ==> 0
./oscl_clkin_ck/usecount ==> 0
./oscl_x1_ck/usecount ==> 0
./xref1_ck/usecount ==> 0
./xref2_ck/usecount ==> 0
./tsi0_dck_ck/usecount ==> 0
./tsil_dck_ck/usecount ==> 0
./external_ck/usecount ==> 0
./atl0_clk_ck/usecount ==> 0
./atl1_clk_ck/usecount ==> 0
./atl2_clk_ck/usecount ==> 0
./atl3_clk_ck/usecount ==> 0
./dvi_ch1_ck/usecount ==> 0
./dvi_ch2_ck/usecount ==> 0
./dvi_ch3_ck/usecount ==> 0
./dvi_ch4_ck/usecount ==> 0
./dvoi1_ck/usecount ==> 0
./dvoi2_ck/usecount ==> 0
./video_m_pclk_ck/usecount ==> 0
./hdmi_phy_tclk_ck/usecount ==> 0
./xref0_ck/mcasp1_ahx_ck/usecount ==> 0
./xref0_ck/mcasp1_ahr_ck/usecount ==> 0
./xref0_ck/mcasp2_ahx_ck/usecount ==> 0
./xref0_ck/mcasp2_ahr_ck/usecount ==> 0
./xref0_ck/mcasp3_ahx_ck/usecount ==> 0
./xref0_ck/mcasp4_ahx_ck/usecount ==> 0
./xref0_ck/mcasp5_ahx_ck/usecount ==> 0
./xref0_ck/mcasp6_ahx_ck/usecount ==> 0
./xref0_ck/usecount ==> 0
./ljcb_serdesp_ck/pciessp_ck/usecount ==> 0
./ljcb_serdesp_ck/usecount ==> 0
./ljcb_serdesn_ck/pciessn_ck/usecount ==> 0
./ljcb_serdesn_ck/usecount ==> 0
./pciess_50m_ck/usecount ==> 0
./pciess_125m_ck/usecount ==> 0
./satassp_ck/usecount ==> 0
./satassn_ck/usecount ==> 0
./satass_20m_ck/usecount ==> 0
./satass_50m_ck/emac_rmii_fck/usecount ==> 0
```

```
./satass_50m_ck/usecount ==> 0
./satass_125m_ck/emac_gmii_fck/usecount ==> 0
./satass_125m_ck/usecount ==> 0
./rtc_divider_ck/audio_dpll_clk1_ck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/rtc_c32k_fck/usecount ==> 1
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio1_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/gpio2_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/gpio3_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/gpio4_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/gpio234_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/rtc_fck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/mmchs1_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/mmchs2_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/mmchs3_dbck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/sync_timer_fck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/bandgaps_fck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/arm_oper_fck/usecount ==> 0
./rtc_divider_ck/audio_prcm_clkin_ck/sysclk18_ck/usecount ==> 1
./rtc_divider_ck/audio_prcm_clkin_ck/usecount ==> 1
./rtc_divider_ck/wdt1_fck/usecount ==> 0
./rtc_divider_ck/usecount ==> 1
./rcosc_32k_ck/wdt2_fck/usecount ==> 0
./rcosc_32k_ck/usecount ==> 0
./osc0_clkin_ck/dcan0_fck/usecount ==> 1
./osc0_clkin_ck/dcan1_fck/usecount ==> 0
./osc0_clkin_ck/sr1_fck/usecount ==> 0
./osc0_clkin_ck/sr2_fck/usecount ==> 0
./osc0_clkin_ck/sr3_fck/usecount ==> 0
./osc0_clkin_ck/sr4_fck/usecount ==> 0
./osc0_clkin_ck/arm_dpll_clkin_ck/arm_dpll_ck/mpu_ck/usecount ==> 0
./osc0_clkin_ck/arm_dpll_clkin_ck/arm_dpll_ck/usecount ==> 0
./osc0_clkin_ck/arm_dpll_clkin_ck/usecount ==> 0
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/sgx_ck/usecount ==> 0
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/sgx_sys_ck/usecount ==> 0
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/sgx_mem_ck/usecount ==> 0
./osc0_clkin_ck/sgx_dpll_ck/sysclk23_ck/usecount ==> 0
./osc0_clkin_ck/sgx_dpll_ck/usecount ==> 0
./osc0_clkin_ck/hdvpss_dpll_ck/sysclk3_ck/ivahd0_ck/usecount ==> 0
./osc0_clkin_ck/hdvpss_dpll_ck/sysclk3_ck/usecount ==> 0
./osc0_clkin_ck/hdvpss_dpll_ck/usecount ==> 0
./osc0_clkin_ck/hdvpss_dpll_ck/hdvpss_proc_fck/usecount ==> 0
./osc0_clkin_ck/hdvpss_dpll_ck/hdvpss_proc_d2_fck/usecount ==> 0
./osc0_clkin_ck/hdvpss_dpll_ck/usecount ==> 0
./osc0_clkin_ck/usb_dpll_clkin_ck/usb_phy0_rclk_ick/usecount ==> 0
./osc0_clkin_ck/usb_dpll_clkin_ck/usb_phy1_rclk_ick/usecount ==> 0
./osc0_clkin_ck/usb_dpll_clkin_ck/usb_dpll_ck/usb_dpll_clk2_ck/sysclk10_ck/mcspi1_fck/usecount ==> 0
./osc0_clkin_ck/usb_dpll_clkin_ck/usb_dpll_ck/usb_dpll_clk2_ck/sysclk10_ck/mcspi2_fck/usecount ==> 0
```

```

./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/mcspi3_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/mcspi4_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c02_ck/i2c1_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c02_ck/i2c3_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c02_ck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c13_ck/i2c2_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c13_ck/i2c4_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/i2c13_ck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/uart1_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/uart2_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/uart3_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/hdmi_cec_dcc_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk10_ck/usecount ==> 4
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/mmchs1_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/mmchs2_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/mmchs3_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/uart4_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/uart5_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/uart6_fck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/sysclk8_ck/usecount ==> 4
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/csi2_phy_fck/usecount ==> 0
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usb_dp11_clk2_ck/usecount ==> 2
./osc0_clkin_ck/usb_dp11_clkin_ck/usb_dp11_ck/usecount ==> 1
./osc0_clkin_ck/usb_dp11_clkin_ck/usecount ==> 1
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr0_phy_fck/usecount ==> 0
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr1_phy_fck/usecount ==> 0
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr0_half_fck/ddr0_phy_d2_fck/usecount ==> 0
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr0_half_fck/ddr0_emif_fck/usecount ==> 0
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr0_half_fck/dmm_phy_fck/usecount ==> 0
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr0_half_fck/usecount ==> 0
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr1_half_fck/ddr1_phy_d2_fck/usecount ==> 0
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr1_half_fck/ddr1_emif_fck/usecount ==> 0
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/ddr1_half_fck/usecount ==> 0
./osc0_clkin_ck/ddr_dp11_clkin_ck/ddr_dp11_ck/usecount ==> 0
./osc0_clkin_ck/ddr_dp11_clkin_ck/usecount ==> 0
./osc0_clkin_ck/video1_dp11_clkin_ck/video1_dp11_ck/sysclk14_c1mux_ck/usecount ==> 0
./osc0_clkin_ck/video1_dp11_clkin_ck/video1_dp11_ck/hd_venc_g_ck/usecount ==> 0
./osc0_clkin_ck/video1_dp11_clkin_ck/video1_dp11_ck/usecount ==> 0
./osc0_clkin_ck/video1_dp11_clkin_ck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/hd_venc_d_ck/hdmi_phy_gclk_ck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/hd_venc_d_ck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/sysclk16_b3mux_ck/sysclk14_ck/tpss_stc0_fck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/sysclk16_b3mux_ck/sysclk14_ck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/sysclk16_b3mux_ck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/hdmi_dp11_muxout_ck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/hdmi_dp11_ck/usecount ==> 0
./osc0_clkin_ck/hdmi_dp11_clkin_ck/usecount ==> 0

```

```

./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sysclk16_d1mux_ck/sysclk16_ck/tpss_stc1_fck/usecount ==> 0
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sysclk16_d1mux_ck/sysclk16_ck/usecount ==> 0
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sysclk16_d1mux_ck/usecount ==> 0
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/sd_venc_ck/usecount ==> 0
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/video012_dp11_muxout_ck/sysclk21_ck/usecount ==> 0
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/video012_dp11_muxout_ck/usecount ==> 0
./osc0_clkin_ck/video0_dp11_clkin_ck/video0_dp11_ck/usecount ==> 0
./osc0_clkin_ck/video0_dp11_clkin_ck/usecount ==> 0
./osc0_clkin_ck/sysclk22_ck/mcasp3_fck/usecount ==> 1
./osc0_clkin_ck/sysclk22_ck/hdmi_i2s_ck/hdmi_i2s_fck/usecount ==> 0
./osc0_clkin_ck/sysclk22_ck/hdmi_i2s_ck/usecount ==> 0
./osc0_clkin_ck/sysclk22_ck/usecount ==> 1
./osc0_clkin_ck/iss_dp11_ck/iss_ick/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/isp_ick/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/tpss_tso_ick/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/tpss_fck/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/ducati_ick/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/securess_fck/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/sysclk19_ck/tpss_tso_fck/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/sysclk19_ck/at1_fck/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/sysclk19_ck/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/audio_dp11_clk2_ck/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/iss_dp11_d2_ck/usecount ==> 0
./osc0_clkin_ck/iss_dp11_ck/usecount ==> 0
./osc0_clkin_ck/gpt1_fck/usecount ==> 1
./osc0_clkin_ck/gpt2_fck/usecount ==> 1
./osc0_clkin_ck/gpt3_fck/usecount ==> 0
./osc0_clkin_ck/gpt4_fck/usecount ==> 0
./osc0_clkin_ck/gpt5_fck/usecount ==> 0
./osc0_clkin_ck/gpt6_fck/usecount ==> 0
./osc0_clkin_ck/gpt7_fck/usecount ==> 0
./osc0_clkin_ck/gpt8_fck/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/l3_fast_ick/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/ivahd0_ick/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/exp_slot_ick/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/mmu_ick/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/gem_ick/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/tptc0_ick/usecount ==> 1
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/tptc1_ick/usecount ==> 1
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/tptc2_ick/usecount ==> 1
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/tptc3_ick/usecount ==> 1
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/ivahd0_sl2_ick/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/tpcc_ick/usecount ==> 1
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/fdif_ick/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/hdvpss_l3_ick/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/sysclk6_ck/l3_slow_ick/usecount ==> 0
./osc0_clkin_ck/l3_dp11_clkin_ck/l3_dp11_ck/sysclk4_ck/sysclk6_ck/l4_slow_ick/usecount ==> 0

```

[illegible]

```

./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/sr4_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/usb_ick/usecount ==> 2
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/mmu_cfg_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/p1500_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/elm_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/elm_fck/usecount ==> 1
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/mmchs1_ick/usecount ==> 2
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/mmchs2_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/at1_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/fdif_enb_ck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/rtc_c32k_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/dcan0_ick/usecount ==> 1
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/dcan1_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk6_ck/usecount ==> 21
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/13_med_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/14_fast_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/securess_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/tpgsw_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/sata_ick/usecount ==> 1
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/pcie_ck/usecount ==> 1
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/vcp2_fck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/fdif_fck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/dap_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/ocmc_ram_ick/usecount ==> 1
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mmchs3_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/cpsw_ick/usecount ==> 2
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/gem_trc_fck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mcasp4_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mcasp5_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mcasp6_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/hdvpss_l4_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mlb_ick/mcasp_auxclk_mux0_ck/mcasp4_fck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mlb_ick/mcasp_auxclk_mux0_ck/mcasp5_fck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mlb_ick/mcasp_auxclk_mux0_ck/mcasp6_fck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mlb_ick/mcasp_auxclk_mux0_ck/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/mlb_ick/usecount ==> 0
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/sysclk5_ck/usecount ==> 4
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/sysclk4_ck/usecount ==> 7
./osc0_clkin_ck/13_dp11_clkin_ck/13_dp11_ck/usecount ==> 1
./osc0_clkin_ck/13_dp11_clkin_ck/usecount ==> 1
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/sysclk20_ck/audio_prcm1_out_ck/mcbasp_fck/usecount ==> 0
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/sysclk20_ck/audio_prcm1_out_ck/usecount ==> 0
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/sysclk20_ck/mcasp1_fck/usecount ==> 0
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/sysclk20_ck/mcasp2_fck/usecount ==> 0
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/sysclk20_ck/usecount ==> 0
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/cpts_rft_clk_ck/usecount ==> 0
./osc0_clkin_ck/audio_dp11_clkin_ck/audio_dp11_ck/usecount ==> 0

```



```
./osc0_clkin_ck/audio_dp11_clkin_ck/usecount ==> 0
./osc0_clkin_ck/pciess_20m_ck/usecount ==> 0
./osc0_clkin_ck/dsp_dp11_ck/gem_fck/usecount ==> 0
./osc0_clkin_ck/dsp_dp11_ck/clkout_prcm_mux_ck/clkout_prcm_ck/sys_clkout1/usecount ==> 0
./osc0_clkin_ck/dsp_dp11_ck/clkout_prcm_mux_ck/clkout_prcm_ck/sys_clkout2/usecount ==> 0
./osc0_clkin_ck/dsp_dp11_ck/clkout_prcm_mux_ck/clkout_prcm_ck/usecount ==> 0
./osc0_clkin_ck/dsp_dp11_ck/clkout_prcm_mux_ck/usecount ==> 0
./osc0_clkin_ck/dsp_dp11_ck/usecount ==> 0
./osc0_clkin_ck/usecount ==> 6
```

TI816X

Clock Rates

```
./secure_32k_ck/rate ==> 32768
./tclkin_ck/rate ==> 32768
./audio_pll_clk1_ck/audio_pll_a_ck/rate ==> 32768
./audio_pll_clk1_ck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/gpt3_fck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/gpt4_fck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/gpt5_fck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/gpt6_fck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/gpt7_fck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/wdt2_fck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/gpio1_dbck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/gpio2_dbck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/mmchsd1_fck/rate ==> 32768
./sys_32k_ck/sysclk18_ck/rate ==> 32768
./sys_32k_ck/rate ==> 32768
./sys_clkin_ck/main_pll_clk6_ck/rate ==> 24000000
./sys_clkin_ck/main_pll_clk1_ck/sysclk1_ck/gem_ick/rate ==> 813176470
./sys_clkin_ck/main_pll_clk1_ck/sysclk1_ck/rate ==> 813176470
./sys_clkin_ck/main_pll_clk1_ck/rate ==> 813176470
./sys_clkin_ck/main_pll_clk2_ck/sysclk2_ck/mpu_ck/rate ==> 987428571
./sys_clkin_ck/main_pll_clk2_ck/sysclk2_ck/rate ==> 987428571
./sys_clkin_ck/main_pll_clk2_ck/sysclk23_ck/sgx_ck/rate ==> 246857142
./sys_clkin_ck/main_pll_clk2_ck/sysclk23_ck/rate ==> 246857142
./sys_clkin_ck/main_pll_clk2_ck/rate ==> 987428571
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd0_ck/rate ==> 531692931
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd0_sl2_ick/rate ==> 531692931
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd1_ck/rate ==> 531692931
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd1_sl2_ick/rate ==> 531692931
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd2_ck/rate ==> 531692931
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd2_sl2_ick/rate ==> 531692931
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/rate ==> 531692931
./sys_clkin_ck/main_pll_clk3_ck/rate ==> 531692931
./sys_clkin_ck/main_pll_clk3_ck/rate ==> 531692931
./sys_clkin_ck/dds_pll_clk1_ck/rate ==> 796500000
./sys_clkin_ck/dds_pll_clk3_ck/rate ==> 398250000
```

```
./sys_clkin_ck/ddr_pll_clk4_ck/rate ==> 227571428
./sys_clkin_ck/ddr_pll_clk5_ck/rate ==> 227571428
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/mmu_ick/rate ==> 493714554
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/ducati_ucache_ick/rate ==>
493714554
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tpcc_ick/rate ==> 493714554
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc0_ick/rate ==> 493714554
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc1_ick/rate ==> 493714554
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc2_ick/rate ==> 493714554
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc3_ick/rate ==> 493714554
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/pcie_ck/rate ==>
246857277
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/sata_ick/rate ==>
246857277
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/emacs1_ick/rate ==>
246857277
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/emacs2_ick/rate ==>
246857277
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/ducati_ick/rate ==>
246857277
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/gem_trc_fck/rate ==>
246857277
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/rate ==> 246857277
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mmu_cfg_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mailbox_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/spinbox_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gem_vbusp_fck/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/uart1_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/uart2_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/uart3_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mcspi1_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/wdt2_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt1_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt2_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt3_ick/rate ==>
123428638
```

```
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt4_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt5_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt6_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt7_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpio1_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpio2_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/i2c1_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/i2c2_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mmchs1_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/sr_hvt_fck/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/sr_svt_fck/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/usb_ick/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpmc_fck/rate ==>
123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/rate ==> 123428638
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/rate ==> 493714554
./sys_clkin_ck/main_pll_clk4_ck/rate ==> 493714554
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/uart1_fck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/uart2_fck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/uart3_fck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/mcspi1_fck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/i2c1_fck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/i2c2_fck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/mmchs1_fck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/rate ==> 48000049
./sys_clkin_ck/ddr_pll_clk2_ck/rate ==> 48000049
./sys_clkin_ck/main_pll_clk5_ck/sysclk24_ck/rate ==> 125000160
./sys_clkin_ck/main_pll_clk5_ck/rate ==> 125000160
./sys_clkin_ck/video_pll_clk1_ck/rate ==> 27000000
./sys_clkin_ck/video_pll_clk2_ck/rate ==> 27000000
./sys_clkin_ck/video_pll_clk3_ck/rate ==> 27000000
./sys_clkin_ck/gpt1_fck/rate ==> 27000000
./sys_clkin_ck/gpt2_fck/rate ==> 27000000
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk2_ck/rate ==> 157988571
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk4_ck/sysclk21_ck/rate ==>
```

```

45158421
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk4_ck/rate ==> 45158421
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk5_ck/sysclk22_ck/rate ==>
32768000
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk5_ck/rate ==> 32768000
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/mcaspl0_fck/rate
==> 196608000
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/mcaspl1_fck/rate
==> 196608000
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/mcaspl2_fck/rate
==> 196608000
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/rate ==>
196608000
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/rate ==> 196608000
./sys_clkin_ck/main_pll_clk7_ck/rate ==> 432000000
./sys_clkin_ck/rate ==> 270000000

```

Use Count

```

./secure_32k_ck/usecount ==> 0
./tclkin_ck/usecount ==> 0
./audio_pll_clk1_ck/audio_pll_a_ck/usecount ==> 0
./audio_pll_clk1_ck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/gpt3_fck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/gpt4_fck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/gpt5_fck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/gpt6_fck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/gpt7_fck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/wdt2_fck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/gpio1_dbck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/gpio2_dbck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/mmchsd1_fck/usecount ==> 0
./sys_32k_ck/sysclk18_ck/usecount ==> 0
./sys_32k_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk6_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk1_ck/sysclk1_ck/gem_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk1_ck/sysclk1_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk1_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk2_ck/sysclk2_ck/mpu_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk2_ck/sysclk2_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk2_ck/sysclk23_ck/sgx_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk2_ck/sysclk23_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk2_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd0_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd0_sl2_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd1_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd1_sl2_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd2_ck/usecount ==> 0

```

```

./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/ivahd2_sl2_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk3_ck/sysclk3_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk3_ck/usecount ==> 0
./sys_clkin_ck/ddr_pll_clk1_ck/usecount ==> 0
./sys_clkin_ck/ddr_pll_clk3_ck/usecount ==> 0
./sys_clkin_ck/ddr_pll_clk4_ck/usecount ==> 0
./sys_clkin_ck/ddr_pll_clk5_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/mmu_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/ducati_ucache_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tpcc_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc0_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc1_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc2_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/tptc3_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/pcie_ck/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/sata_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/emacs1_ick/usecount ==> 2
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/emacs2_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/ducati_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/gem_trc_fck/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk5_ck/usecount ==> 4
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mmu_cfg_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mailbox_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/spinbox_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gem_vbusp_fck/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/uart1_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/uart2_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/uart3_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mcspil_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/wdt2_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt1_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt2_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt3_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt4_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt5_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt6_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpt7_ick/usecount ==> 0
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpio1_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpio2_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/i2c1_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/i2c2_ick/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/mmchs1_ick/usecount ==> 2
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/sr_hvt_fck/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/sr_svt_fck/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/usb_ick/usecount ==> 2
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/gpmc_fck/usecount ==> 1
./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/sysclk6_ck/usecount ==> 16

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```

./sys_clkin_ck/main_pll_clk4_ck/sysclk4_ck/usecount ==> 7
./sys_clkin_ck/main_pll_clk4_ck/usecount ==> 1
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/uart1_fck/usecount ==> 1
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/uart2_fck/usecount ==> 1
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/uart3_fck/usecount ==> 1
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/mcspi1_fck/usecount ==> 0
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/i2c1_fck/usecount ==> 0
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/i2c2_fck/usecount ==> 0
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/mmchs1_fck/usecount ==> 1
./sys_clkin_ck/ddr_pll_clk2_ck/sysclk10_ck/usecount ==> 4
./sys_clkin_ck/ddr_pll_clk2_ck/usecount ==> 1
./sys_clkin_ck/main_pll_clk5_ck/sysclk24_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk5_ck/usecount ==> 0
./sys_clkin_ck/video_pll_clk1_ck/usecount ==> 0
./sys_clkin_ck/video_pll_clk2_ck/usecount ==> 0
./sys_clkin_ck/video_pll_clk3_ck/usecount ==> 0
./sys_clkin_ck/gpt1_fck/usecount ==> 1
./sys_clkin_ck/gpt2_fck/usecount ==> 1
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk2_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk4_ck/sysclk21_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk4_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk5_ck/sysclk22_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk5_ck/usecount ==> 0
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/mcas0_fck/usecount ==> 0
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/mcas1_fck/usecount ==> 0
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/mcas2_fck/usecount ==> 1
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/sysclk20_ck/usecount ==> 1
./sys_clkin_ck/main_pll_clk7_ck/audio_pll_clk3_ck/usecount ==> 1
./sys_clkin_ck/main_pll_clk7_ck/usecount ==> 1
./sys_clkin_ck/usecount ==> 5

```

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