Linux for Tegra Software Features

DA_06018_001 | December 1, 2017

Release 28.2



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TX1 Software Features

NVIDIA® Tegra® Linux Driver Package supports the following software features, which provide users a complete package to bring up Linux on targeted NVIDIA® Tegra® X1 devices.

Note: Always check the *Release Notes* for constraints related to these features.

Boot Loaders

Boot Loader	Feature	Notes
nvboot	Boot Device	eMMC
	2nd Stage Load Device	eMMC
U-Boot	Storage Device Support	eMMC (no CQ), SD card, USB (HS)
	Display: Console	UART
	Display: Splash/Menu	UART
	I/O Bus Support	I2C, USB (HS), USB (device)

Toolchain

Feature	Tool Chains	Notes
Aarch64	gcc-4.8.2-glibc-2.17	For 64-bit Kernel, Userspace, and U-Boot

Kernel

Interface	Feature	Notes
DSI	DSI Display Support	-
	DSI Ganged Mode	-
	PWM Backlight	-
	DC Continuous Mode	-
	Dual Display	-
	Run Time Power Management	-
HDMI	EDID Support	-
	Hot-Plug Detection Mechanism	-
	HDMI 1.4	480p, 720p, 1080p, RGB 444 4K @ 30 Hz
	Driver Suspend/Resume for Low Power	-
	HDMI as Primary Display	-

	Dual Display	-
	HDMI: 1.4b compliance	Pending certification
	HDMI: 2.0 compliance	Pending certification
	Audio Support	-
Ethernet	10/100/1000 BASE	-
	MAC Filtering	-
PWM	Speed Control from sysfs	-
	Control from Temperature Variation	-
I2C	Master Mode	-
Wifi	Wake on Wifi	BCM4354
	Dual-band 2.4 GHz/5 GHz	BCM4354
	STA mode	BCM4354
	HostAP mode	BCM4354
	P2P mode	BCM4354
	WPA2 security	BCM4354
Bluetooth	Bluetooth 4.0	BCM4354
Camera support (CSI input support)	V4L2 Media-Controller (V4L2 API bypasses ISP)	CSI0, CSI1, CSI2, CSI3, CSI4, CSI5 Note: The media-controller driver model is adopted in the 24.1 release. the Soc_camera driver is provided, but deprecated.
Peripheral devices	INA support	Current monitoring for: CPU/ GPU/VDD_IN
Platform support	Baseboard: P2597 Jetson module: P2180	

I/O

I/O Type	Feature	Notes
SPI	Max Bus Speed	SPI4: 65 MHz
		SPI1: 65 MHz
		SPI2: 65 MHz
	Chip Select	SPI4: 0
		SPI1: 0/1
		SPI2: 0/1
	Packed/Unpacked	SPI4, SPI1, SPI2
	Full Duplex Mode	SPI4, SPI1, SPI2
	Both Enable Bit	SPI4, SPI1, SPI2
	Both Enable Byte	SPI4, SPI1, SPI2

	Bi-directional	SPI4, SPI1, SPI2
	Least Significant Bit	SPI4, SPI1, SPI2
	Least Significant Byte First	SPI4, SPI1, SPI2
	Software or Hardware Chip Select Polarity Section	SPI4, SPI1, SPI2
	Supported Modes 1/2/3/4	SPI4, SPI1, SPI2
	Purpose/Client	SPI4: Touch
		SPI1: Audio
		SPI2: Cam/Display
SDMMC	I/O Speeds (Clock speed)	SDMMC1: 204 MHz
		SDMMC4: 200 MHz
		SDMMC (M.2/SDIO): 204 MHz
	Hot Plug Support	SDMMC1
	SD High Speed Mode	SDMMC1, SDMMC (M.2/SDIO)
	SDR50	SDMMC1, SDMMC4, SDMMC (M.2/SDIO)
	SDR104	SDMMC1, SDMMC (M.2/SDIO)
	HS533	SDMMC4
	HS400	SDMMC4
	HS200	SDMMC4
	DDR Mode	SDMMC1, SDMMC4, SDMMC (M.2/SDIO)
	Voltage Switching	SDMMC1, SDMMC (M.2/SDIO)
	Frequency Tuning	SDMMC1, SDMMC4, SDMMC (M.2/SDIO)
	Packed Commands	SDMMC4, SDMMC (M.2/SDIO)
	Cache Control	SDMMC4
	Discard	SDMMC4
	Sanitize	SDMMC4
	RPMB	SDMMC4
	HPI	SDMMC4
	BKOPS	SDMMC4
	Power Off Notification	SDMMC4
	Sleep	SDMMC4
	Field Firmware Upgrade	SDMMC4
	CMD Queuing	-
	Device Life Estimation Type A	SDMMC4
	Device Life Estimation Type B	SDMMC4
	PRE EOL Information	SDMMC4
	Power Management	SDMMC1, SDMMC4, SDMMC (M.2/SDIO)

SATA	Speed	GEN1
		GEN2
	AHCI Mode	1.3.1
	SATA Specification	3.1
	HIPM	-
	DIPM	-
	NCQ	-
	Port Multiplier Support	CBS
	Link Power Management States	Partial
		Slumber
	Device Power Management States	D0
		D1
		D2
	Runtime Time Power Management	-
	S.M.A.R.T	-
	ATA Error Logging	-
I2C	Master	I2C GEN1, I2C GEN2, I2C GEN3, I2C DDC, I2C PWR, I2C6
		Standard mode (SM – 100Kbps) Fast mode (FM – 400Kbps) Fast mode plus (FM+ - 1Mbps) High speed mode. (HS - 3.4Mbps)
		7-bit or 10-bit slave addressing
		Lost arbitration detect
		Only Packet mode
		Dynamic clock gating
		Multi-master support
		PIO mode: For I2C message length <= 20 bytes DMA mode: For I2C message length > 20 bytes
		Clock always ON feature for device which need faster responses
		Message split if message size is greater than 4K bytes
		Runtime I2C bus clock frequency changes through sysfs
		Bit banging through GPIOs
		Clubbing 2 transactions and program their packets together.
		Bus clear support
USB 2.0	Device Mode	USB0

	OTG Mode	USB0
	Host Mode	USB0, USB1
	Host - Low Speed Devices	USB0
	Host - Full Speed Devices	USB0
	Host - High Speed Devices	USB0, USB1
	Host - Auto Suspend Support	USB0
USB 3.0	Speeds	USB0: HS/480 Mbps
		USB1: SS/5 Gbps
	Lanes	USB1: pex5
	USB 3.0 Support	USB1
	Connector	USB0: Micro AB
		USB1: TYPE A
	USB 2.0 Support	USB0, USB1
	Remote Wakeup Support	USB0: USB 2.0
		USB1: USB 2.0/3.0
	Host - Auto Suspend Support	USB0, USB1
	OTG Support	USB0
	Class Support	Mass storage (USB0, USB1)
		USB video class (USB0, USB1)
		HID (USB0, USB1)
		USB audio class (USB0, USB1)
		MTP (USB0, USB1)
		CDC - NCM/ECM (USB0, USB1)
GPIO	Pinmux Configuration	-
	GPIO Configuration And Programming	-
	GPIO Interrupt Support	-
UART	Speed	UART0: 115200
		UART2: 921600
		UART3: 3000000
	Hardware Flow Control	UART2, UART3
	PIO Mode	UART0, UART2, UART3
	DMA Mode	UART0, UART2, UART3
	FIFO Mode	UART0, UART2, UART3
PCIe	Speed	PCIe 0: Gen1/Gen2
		PCIe 1: Gen1/Gen2
	Lane Width	PCIe 0: x1, x2, x4
		PCIe 1: x1
	Host Controller Features	Lanes Xbar config (X4_X1, X2_X1)

		Extended Config Space
		Hardware Clock Gating
		Deep Power Down (DPD)
	PCIe Features	Message Signaled Interrupts
		Vendor Specific Messages
		MSI-X
	PCIe Device Capabilities	Max Payload size 128 bytes
		Extended Tag Field Support
		Role-Based Error Reporting
		Maximum Link Speed; Supports Up to Gen2 Speeds
		Maximum Link Width; Supports Up to X4 Link Width
		ASPM Support (L0s and L1)
		L1 Clock Power Management
		Data Link Layer Link Active Reporting Capable
		Link Bandwidth Notification Capability
	Link Control	Read Completion Boundary
	Root Control	System Error on Correctable Error
		System Error on Non-Fatal Error
		System Error on Fatal Error
		PME Interrupt Enable
	Extended Capabilities	Advanced Error Reporting (AER)
		Latency Tolerance Reporting (LTR)
	L1 PM Substates	L1.1
		L1.2
	Misc Features	Dynamic Voltage Frequency (DVPS)
		Tegra Low Power Mode (LP0)
		Runtime PM
JTAG	JTAG Attach	-
	JTAG Halt/Step/Go	-

Note:	**PCIe: Tegra TX1 does not have any path from AHB-DMA or APB-DMA engines to PCIe IP as PCIe is connected directly to MSELECT and AHB-DMA and APB DMA engines only interact with IPs connected to respective AHB and APB buses. So it is not possible to use either AHB or APB engines for PCIe.**

CUDA

Feature	Version

CUDA	Version 8.0.84 with FP16 support

Graphics

Graphics APIs	Notes
OpenGL	4.5
OpenGL-ES	3.2
Vulkan	1.0.1
EGL	1.5
GLX	
GLVnd Version of EGL	Vendor neutral functionality
NVDC - Direct Rendering Manager (DRM)	Compatibility with DRM 2.0
EGL Stream	
X11 ABI-20	Legacy from 24.2 using Ubuntu 16.04
API Support	**Notes**
GL + EGL	
EGL without X11	Content display without X11 usage

EGL and OpenGL ES Support

EGL is an interface between Khronos rendering APIs, such as OpenGL ES, and the underlying native platform window system. It handles graphics context management, surface/buffer binding, and rendering synchronization. EGL enables high-performance, accelerated, mixed-mode 2D and 3D rendering using other Khronos APIs.

L4T supports the EGL 1.4 specification, **Khronos Native Platform Graphics Interface (EGL 1.4 Specification)**.

The OpenGL ES driver in this release supports the following OpenGL ES specifications:

- **OpenGL ES Common Profile Specification 2.0**
- OpenGL 4.5

For more information on OpenGL ES, see the **Khronos OpenGL ES API Registry**.

Video Decoders

Video Decode	Output Formats	Sampling Frequency and Bit rate/Frame rate	Notes
H.264	NV12, NVMM:NV12	3840 x 2160 at 60 fps Up to 120 Mbps	Full-frame, Disable-DPB, Skip-Frames
H.265	NV12, NVMM:NV12	3840 x 2160 at 60 fps Up to 160 Mbps	Decode Support in Gstreamer

JPEG	I420, NVMM:I420	600 MP/sec	-
VP8	NV12, NVMM:NV12	3840 x 2160 at 60 fps Up to 140 Mbps	-
VP9	NV12, NVMM:NV12	3840 x 2160 at 60 fps Up to 120 Mbps	-

Video Encoders

Video Encode	Input Formats	Sampling Frequency and Bit rate/Frame rate	Notes
H.264	I420, NV12, NVMM:1420, NVMM:NV12	3840 x 2160 at 30 fps Up to 120 Mbps	Supported features: control-rate, Bitrate, Iframeinterval, Quality-Level, Low-Latency, SliceIntrarefreshEnable, Sliceintrarefreshinterval, Bit-Packetization, VBV-Size, temporal-tradeoff, Insert-SPS-PPS, Slice-Header-Spacing, Profile, num-B-Frames, Force-IDR
JPEG	I420, NVMM:I420	600 MP/sec	-
H.265	I420, NVMM:I420, NVMM:NV12	3840 x 2160 at 30 fps Up to 100 Mbps	Supported features: control-rate, Bitrate, Iframeinterval, Quality-Level, SliceIntrarefreshEnable, Sliceintrarefreshinterval, Bit-Packetization, VBV-Size, temporal-tradeoff, Insert-SPS-PPS, Force-IDR
VP8	I420, NV12, NVMM:I420, NVMM:NV12	3840 x 2160 at 30 fps Up to 120 Mbps	Supported features: control-rate, Bitrate, Iframeinterval, Quality-Level, Force-IDR

Note: **Use the gst-inspect-1.0 utility to understand feature details. For example, the `gst-inspect-1.0 omxh264enc` command provides feature details of the H.264 encoder.**

Display Outputs

nveglglessink	nvoverlaysink

X11 Window	Panel Overlay
-	Overlay
-	Overlay-Depth
-	Overlay-X
-	Overlay-Y
-	Overlay-W
-	Overlay-H

Conversion, Scaling, and Rotation Formats

Input Formats	Output Formats	Notes
I420	I420	Flip-Method
UYVY	UYVY	Flip-Method
NV12	NV12	Flip-Method
GRAY8	GRAY8	Flip-Method
NVMM:I420	NVMM:I420	Flip-Method
NVMM:NV12	NVMM:NV12	Flip-Method

CSI and USB Camera Formats

Output Format	Options	Notes
NVMM:I420	Scene-Mode	-
	Color-Effect	-
	Auto-Exposure	-
	Flicker	-
	Contrast	-
	Saturation	-
	TNR-Strength	-
	TNR-Mode	-
	Edge-Enhancement	-
	Intent	Still, Video, Video snapshot, Preview
	Sensor-ID	-
	Enable-EXIF	-
	aeRegion	-
	wbRegion	-
	fpsRange	-

	Exposure-Time	-
	wbManualMode	-
	wbGains	-
	Embedded Metadata	Precision timestamping, DCT-NR, V4L2 interface for sensor driver, Gyro service for L4T for VSTAB and AF
	libargus	-
	RAW capture	-
	EGL producer	-
	Face detection	-
	HDFX	-
	Simultaneous Multi-Camera	Pluggable/replacable 3A, 12- and 14-bit sensors, DPCM sensors
	VSTAB support	AF2.8 support, Auto Iris
	Image De-Warping and Distortion Correction	Global Shutter
	Coordinated Multi-Camera Support	-

TX2 Software Features

NVIDIA® Tegra® Linux Driver Package supports the following software features, which provide users a complete package to bring up Linux on targeted NVIDIA® Tegra® X2 devices.

Note: **Check the *Release Notes* for constraints related to these features.**

Boot Loaders

Boot Loader	Feature	Notes
nvtboot-bpmp	Execution CPU	BPMP
	Storage location	Cold boot: eMMC
		RCM boot: Downloaded over USB recovery port
	Next stage storage location	Cold boot: eMMC
		RCM boot: Downloaded over USB recovery port
	Next stage	cboot
	Storage device support	eMMC
	Partition table support	GPT (with protective MBR)
	Filesystem support	None
	I/O bus support	I2C
	Console UART	
cboot	Execution CPU	CCPLEX
	Storage location	Cold boot: eMMC
		RCM boot: Downloaded over USB recovery port
	Next stage storage location	Cold boot: eMMC
		RCM boot: Downloaded over USB recovery port
	Next stage	U-boot or Linux kernel
	Storage device support	eMMC
	Partition table support	GPT (with protective MBR)
	Filesystem support	None
	I/O bus support	I2C
	Console	UART
U-Boot	Execution CPU	CCPLEX
	Storage location	Cold boot: eMMC
	Next stage storage location	Cold boot: eMMC

	Next stage	Linux kernel
	Storage device support	eMMC, SD card
	Partition table support	GPT (with protective MBR), DOS MBR
	Filesystem support	ext2/3/4. FAT
	I/O bus support	I2C, PCIe

Toolchain

Feature	Tool Chains	Notes
Aarch64	gcc-4.8.5-glibc-2.17	For 64-bit Kernel, Userspace, and U-Boot For more information see **Building the Kernel**.

Kernel I/O Interfaces

Interface	Feature	Notes
DSI	DSI Display Support	
	DSI Ganged Mode	
	PWM Backlight	
	DC Continuous Mode	
	Dual Display	
	Run Time Power Management	
HDMI	EDID Support	
	Hot-Plug Detection mechanism	
	Support for HDMI 1.4 (480p/720p/1080p/RGB 444 4K @ 30HZ)	
	Driver Suspend/Resume for low power	
	Support HDMI as Primary Display	
	Multi Display	
	HDMI: 1.4b compliance	
	HDMI 2.0 compliance	
	Audio Support	
	Support HDMI 2.0 (4K @ 60 HZ)	
DP	EDID Support	
	Support for DP	
	Driver Suspend/Resume for Low Power	
	Support eDP as Primary Display	
	Multi Display	
	DP Compliance	
PWM	PWM Operations	PWM registration to framework
	Prod Setting	Tegra specific controller configuration
	Clock accuracy calculation	Clock calculation
I2C	DMA Mode	

	Bus Clear Support	
	Multi Master Support	
	Normal/Byte Mode	
	General Support	
JTAG	JTAG Attach	Debugging capability
	JTAG Halt/Step/Go	Debugging capability
PCIe	Physical Port: PCI-E 0	Speed: Gen1/Gen2, Lane Width X1, X2, X4
	Physical Port: CPI-E 1	Speed: Gen1/Gen2, Lane Width X1, X2, X4
	Physical Port: CPI-E 2	General Support
	Host Controller Features	Lanes Xbar config (X4_X0_X1, X2_X1_X1, X1_X1_X1) Hot-plug (using GPIO)
	PCI Features	Message Signaled Interrupts
	PCIe Link Capabilities	ASPM Support (L0s and L1) L1 Clock Power Management
		ASPM Support (L1.1 and L1.2)
	Root Control	PME Interrupt Enable
	Extended Capabilities	Advanced Error Reporting (AER)
	Miscellaneous Features	Dynamic Voltage Frequency (DVFS) Tegra Low Power Mode (LP0) Runtime PM
	L1 PM Substates	Rest All Capabilities
Bluetooth	Bluetooth 4.0	BCM4354
	BLE 4.0	No BCM4354 (BlueZ limitation)
Camera support (CSI input support)	V4L2 Media-Controller (V4L2 API bypasses ISP)	CSI0, CSI1, CSI2, CSI3, CSI4, CSI5 Note: The media-controller driver model is adopted in the 24.1 release. the Soc_camera driver is provided, but deprecated. doublecheck with Sean or Shantanu
Peripheral devices	INA support	Current monitoring for: CPU/ GPU/VDD_IN
Platform support	P3310-B00 C03	
Wifi	Multi-Region support	Region Support: □ default (lowest-common-denominator)
	Dual-band 2.4 GHz/5 GHz	BCM 4354
	STA Mode	BCM 4354
	HostAP Mode	BCM 4354
	P2P Mode	BCM 4354
	WPA2 Security	BCM 4354

Note: PCIe: Tegra TX1 does not have any path from AHB-DMA or APB-DMA engines to PCIe IP as PCIe is connected directly to MSELECT, and AHB-DMA and APB DMA engines only interact with IPs connected to respective AHB and APB buses. Consequently, AHB or APB engines cannot be used for PCIe.

SPI

Feature	Notes
Physical Port: SPI1	Maximum bus speed: 65 MHz
Physical Port: SPI2	Maximum bus speed: 65 MHz
Physical Port: SPI 0/3	Maximum bus speed: N/A
Packed/Unpacked	
Full Duplex Mode	
Both Enable Bit	
Both Enable Byte	
Bi-directional	
Least Significant Bit	
Least Significant Byte First	
Software or Hardware Chip Select Polarity Section	
Supported Modes 1/2/3/4	
Dual SPI	SPI MISO/MOSI can act as Rx and Tx
Multiple transfer request	Multiple SPI transfer request from single call

SDMMC

Feature	Notes
I/O Speeds (Clock speed)	SDMMC1 (SD card): 204 MHz
	SDMMC4 (eMMC): 200 MHz
Hot Plug Support	SDMMC1 (SD card)
SD High Speed Mode	SDMMC1 (SD card)
SDR50	SDMMC1 (SD card), SDMMC4 (eMMC)
SDR104	SDMMC1 (SD card)
HS400	SDMMC4 (eMMC)
HS200	SDMMC4 (eMMC)
DDR Mode	SDMMC1 (SD card), SDMMC4 (eMMC)
Voltage Switching	SDMMC1 (SD card)
Frequency Tuning	SDMMC1 (SD card), SDMMC4 (eMMC)
Packed Commands	SDMMC4 (eMMC)
Cache Control	SDMMC4 (eMMC)
Discard	SDMMC4 (eMMC)
Sanitize	SDMMC4 (eMMC)
RPMB	SDMMC4 (eMMC)
HPI	SDMMC4 (eMMC)
BKOPS	SDMMC4 (eMMC)
Power Off Notification	SDMMC4 (eMMC)
Sleep	SDMMC4 (eMMC)
Field Firmware Upgrade	SDMMC4 (eMMC)
Device Life Estimation Type A	SDMMC4 (eMMC)
Device Life Estimation Type B	SDMMC4 (eMMC)
PRE EOL Information	SDMMC4 (eMMC)
Power Management	SDMMC4 (eMMC)

SATA

Feature	Notes
Speed	GEN1
	GEN2
AHCI Mode	1.3.1
SATA Specification	3.1
HIPM	Yes
NCQ	Yes
Port Multiplier Support	CBS
Link Power Management States	Partial
	Slumber
Device Power Management States	D0
	D1
	D2
Runtime Time Power Management	Yes
S.M.A.R.T	Self-Monitoring Analysis and Reporting Technology
Dev Sleep Support	-

USB 3.0

Feature	Notes
Speeds	USB0: HS/480 Mbps, USB1: SS/5 Gps
Lanes	USB 0: N/A, USB1: Lane Muxing and sharing with PCIe
USB 3.0 Support	
Connector	USB0: Micro AB, USB1: Type A
USB 2.0 Support	
Remote Wakeup Support	
Host - Auto Suspend Support	
XOTG Support	
XUSB SS/HS/FS/LS Host Mode	
XUSB SS/HS/FS/LS Device Mode	
XUSB Device Port U1/U2/U3 Transition	
XUSB Host Port U1/U2/U3 Transition	
XUSB Device ELPG	
XUSB Host ELPG	
Class Support	Mass storage
	USB video class
	HID
	USB video class
	MTP
	Ethernet
	Thumb/Hard Drive
	Mouse
	CDC - NCM/ECM

EQOS

Feature
Ping
Speed
LP_IDDQ Mode Support
Suspend Resume over NFS Support
NFS Boot

Max-Q and Max-P

Feature
Power Efficiency
NVPModel

RTC

Feature
Alarm
Wakeup from SC7

Watchdog

Feature	Notes
Tegra Watchdog	Watchdog reboot from hang
Tegra Watchdog	Watchdog kick
PMIC Watchdog	Watchdog reboot from hang
PMIC Watchdog	Watchdog kick

GPIO

Feature
System Programable GPIO Support
System Programable Pinmux SupportWakeable GPIO
Timestamping GPIO

UART

Feature	Notes
Speed	UART Controllers UART0 (Debug: 115200 UART1 (Camera/GPIO Expansion Header): Not Used UART2 (M2 Connector): 921600 UART3 (Bluetooth Only): 3000000
Hardware Flow Control for Debug	

PIO Mode	
DMA Mode	
FIFO Mode	

System

Feature
UCM1 4/4/16
UCM2 24x7
Reboot Support
Shutdown Support
SC7
Wake from Idle
Wake from Sleep
cpuidle
cpufreq
DVFS
CPU Hotplug
EMC Scaling
initrd Support
CPU Load Behavior
System Boot with ATF as Secure Monitor

CUDA

Feature	Version
CUDA	Version 8.0.84

Graphics

Graphics APIs	Notes
OpenGL	4.5
OpenGL-ES	3.2
Vulkan	1.0.1
EGL	1.5
GLX	
GLVnd Version of EGL	Vendor neutral functionality
NVDC - Direct Rendering Manager (DRM)	Compatibility with DRM 2.0
EGL Stream	
X11 ABI-20	Legacy from 24.2 using Ubuntu 16.04
API Support	**Notes**
GL + EGL	
EGL without X11	Content display without X11 usage

EGL and OpenGL ES Support

EGL is an interface between Khronos rendering APIs, such as OpenGL ES, and the underlying native

platform window system. It handles graphics context management, surface/buffer binding, and rendering synchronization. EGL enables high-performance, accelerated, mixed-mode 2D and 3D rendering using other Khronos APIs.

L4T supports the EGL 1.4 specification, **Khronos Native Platform Graphics Interface (EGL 1.4 Specification)**.

The OpenGL ES driver in this release supports the following OpenGL ES specifications:

- **OpenGL ES Common Profile Specification 2.0**
- OpenGL 4.5

For more information on OpenGL ES, see the **Khronos OpenGL ES API Registry**.

Video Decoders

Video Decode	Output Formats	Sampling Frequency and Bit rate/Frame rate	Notes
H.264	NV12, NVMM:NV12	3840 x 2160 at 60 fps Up to 120 Mbps	Full-frame, Disable-DPB, Skip-Frames
H.265	NV12, NVMM:NV12	3840 x 2160 at 60 fps Up to 160 Mbps	Decode Support in Gstreamer 1.4.5 and later
JPEG	I420, NVMM:I420	600 MP/sec	-
VP8	NV12, NVMM:NV12	3840 x 2160 at 60 fps Up to 140 Mbps	-
VP9	NV12, NVMM:NV12	3840 x 2160 at 60 fps Up to 120 Mbps	-

Video Encoders

Video Encode	Input Formats	Sampling Frequency and Bit rate/Frame rate	Notes
H.264	I420, NV12, NVMM:1420, NVMM:NV12	3840 x 2160 at 30 fps Up to 120 Mbps	Supported features: control-rate, Bitrate, Iframeinterval, Quality-Level, Low-Latency, SliceIntrarefreshEnable, Sliceintrarefreshinterval, Bit-Packetization, VBV-Size, temporal-tradeoff, Insert-SPS-PPS, Slice-Header-Spacing, Profile, num-B-Frames, Force-IDR
JPEG	I420, NVMM:I420	600 MP/sec	-
H.265	I420, NVMM:I420, NVMM:NV12	3840 x 2160 at 30 fps	Supported features: control-rate, Bitrate,

Video Encode	Input Formats	Sampling Frequency and Bit rate/Frame rate	Notes
		Up to 100 Mbps	Iframeinterval, Quality-Level, SliceIntrarefreshEnable, Sliceintrarefreshinterval, Bit-Packetization, VBV-Size, temporal-tradeoff, Insert-SPS-PPS, Force-IDR
VP8	I420, NV12, NVMM:I420, NVMM:NV12	3840 x 2160 at 30 fps Up to 120 Mbps	Supported features: control-rate, Bitrate, Iframeinterval, HW-Preset-Level, Force-IDR
Applies to TX2: VP9	I420, NV12, NVMM:I420, NVMM:NV12	3840 x 2160 at 30 fps Up to 120 Mbps	Supported features: control-rate, Bitrate, Iframeinterval, HW-Preset-Level, Force-IDR

Note: Use the gst-inspect-1.0 utility to understand feature details. For example, the `gst-inspect-1.0 omxh264enc` command provides feature details of the H.264 encoder.

Display Outputs

nveglglessink	nvoverlaysink
X11 Window	Panel Overlay
-	Overlay
-	Overlay-Depth
-	Overlay-X
-	Overlay-Y
-	Overlay-W
-	Overlay-H

Conversion, Scaling, and Rotation Formats

Input Formats	Output Formats	Notes
I420	I420	Flip-Method
UYVY	UYVY	Flip-Method
NV12	NV12	Flip-Method
GRAY8	GRAY8	Flip-Method
NVMM:I420	NVMM:I420	Flip-Method
NVMM:NV12	NVMM:NV12	Flip-Method

CSI and USB Camera Formats

Output Format	Options	Notes
Gst-nvcamerasrc	NVMM: I420, NV12	
	Whitebalance Mode	
	Color effect	

	Auto-exposure	
	Flicker	
	Contrast	
	Saturation	
	TNR strength	
	TNR Mode	
	Edge Enhancement	
	Intent	Still/Video/Video snapshot/ Preview
	sensor-id	
	aeRegion	
	wbRegion	
	fpsRange	
	exposure-time	
	wbManualMode	
	wbGains	
	Sensor Orientation	
	Embedded Metadata	
	EGL Producer	
	Simultaneous multi-camera	

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