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# NVIDIA Jetson TK1 Documentation

## PM375 Module Specification



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## REVISION HISTORY

Revision	Author	Date	Description
1.00	NVIDIA	03/1/2014	Initial release

## BOARD PRODUCT OVERVIEW

### PM375 – High Level Definition Summary

PM375 is a board for Tegra K1 development. PM375 provides basic boot options with expansion connectors to enable unused ports to be interfaced with customized hardware.

#### ***Basic Configuration***

- Tegra K1 SOC
- 2 Gbyte x16 memory with 64 bit width (can accommodate from 1-4 GByte total)
- 16GB 4.51 eMMC memory (footprint expandable from 16-256GByte memory)
- One empty half mini-PCIE slot with one USB and single lane PEX
- One SD/MMC connector
- One USB 2.0 port, micro AB
- One USB 3.0 port, type A
- HDMI port, type A
- TMP451 temperature monitor
- RS232 Serial port routed to UART4
- ALC5639 Realtek Audio codec with separate MIC in and Line out jacks
- RTL8111GS Realtek GigE LAN/PHY with PEX interface
- One SATA data port
- SPI 4MByte Boot Flash device
- AMS AS3722 Power Management IC for power and sequencing
- Board ID EEPROM

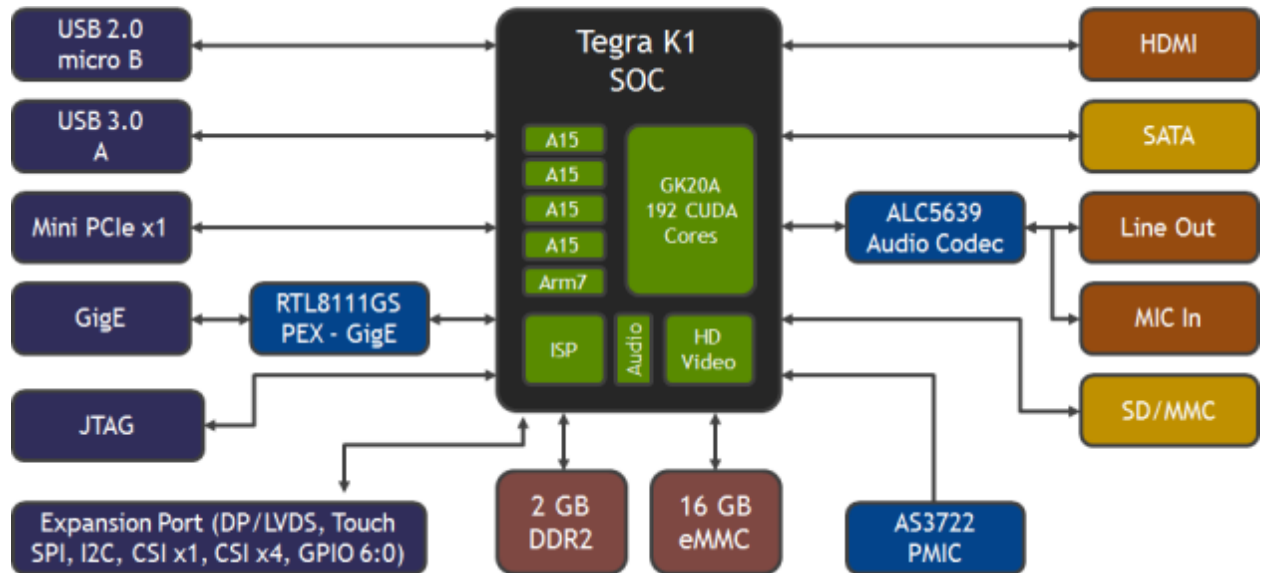
#### ***Signal Groups Routing to Expansion Headers***

- DP / LVDS
- Touch SPI
- Camera\_0 (one CSI differential data pair) & Camera\_1 (four CSI differential data pairs)
- GPIO PU(6:0) general purpose IO
- UART
- HSIC
- GEN(2:1)\_I2C, PWR\_I2C, CAM\_I2C
- Miscellaneous Power

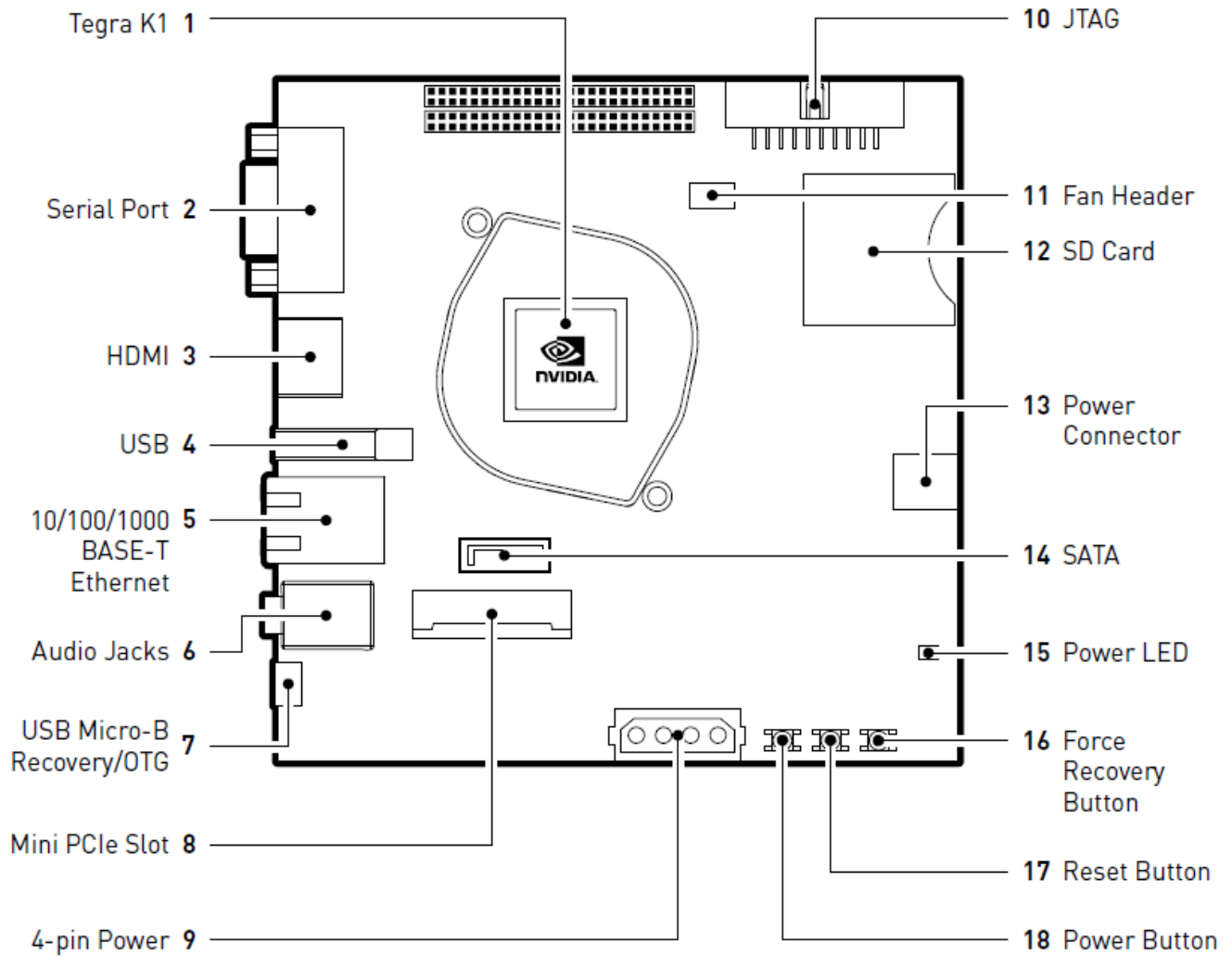
#### ***Connectors and Expansion Headers***

- USB 2.0 OTG
- USB 3.0, flag configuration
- 2mm pitch Expansion headers (5x25 configuration)
- RJ45 ethernet with integrated gigabit magnetics
- HDMI type A port
- DSUB9 male serial port
- MIC-in, Headphone-out 3.5mm jacks
- JTAG 2x10 100 mil pitch THM (Through Hole Mount)
- DC power jack

PM375 – Block Diagram



PM375 – Board Layout





## Mechanical System

The PM375 board is 5.0" wide and 5.0" long. Connectors are placed around the perimeter to facilitate easy routing. The layout will facilitate any add-on cards stacked immediately above the base board, using stacked board to board connectors in the expansion connector footprints.

Each corner will have a 130 mil diameter, plated mounting hole tied to ground.

## Signal Assignments for Expansion Connectors

There are 2 expansion connectors on PM375.

### J3A1 Display / Touch Expansion Connector

This is a 2mm pitch, 2x25 female connector.

Pin	PM375 Signal	Comment
1	+5V_SYS	Main 5V from system
2	GND	
3	+1.8V_VDDIO	AMS PMIC switcher 5
4	TS_SPI_SCK	
5	TS_SPI_MOSI	
6	TS_SPI_CS_L	
7	TS_SPI_MISO	
8	GND	
9	GND	
10	+3.3V_RUN_TOUCH	AMS PMIC LDO9
11	TS_SHDN_L	
12	TS_CLK	
13	TS_RESET_L	
14	GND	
15	GND	
16	+3.3V_SYS	Main 3.3V supply
17	TS_IRQ_L	
18	GEN2_I2C_SCL_3.3V	Pulled up to +3.3V_LP0
19	+1.8V_VDDIO	AMS PMIC switcher 5
20	GEN2_I2C_SDA_3.3V	Pulled up to +3.3V_LP0
21	GEN1_I2C_SCL	Pulled to +1.8V_VDDIO
22	+3.3V_RUN	+3.3V rail that is off in LP0
23	GEN1_I2C_SDA	Pulled to +1.8V_VDDIO
24	EN_AVDD_LCD	AMS PMIC GPIO4
25	+VDD_MUX	Main 12V from Jack
26	GND	
27	EN_VDD_BL	
28	DP_AUX_P	
29	GND	
30	DP_AUX_N	
31	LVDS_TXD0_P	
32	GND	
33	LVDS_TXD0_N	
34	LVDS_TXD1_P	
35	GND	
36	LVDS_TXD1_N	
37	LVDS_TXD3_P	
38	GND	
39	LVDS_TXD3_N	
40	LVDS_TXD2_P	
41	GND	





42	LVDS_TXD2_N	
43	LVDS_TXD4_N	
44	GND	
45	LVDS_TXD4_P	
46	EDP_HPD	
47	GND	
48	LCD_BL_EN	
49	LCD_TE	
50	LCD_BL_PWM	

**J3A2 General Expansion Connector**

Pin	PM375 Signal Name	Comment
1	+5V_SYS	Main 5V from system
2	CAM2_PWDN	
3	+1.05V_RUN_CAM_REAR_EN	AMS PMIC LDO7
4	CAM2_MCLK	
5	CAM_RST_L	
6	+2.8V_RUN_CAM	AMS PMIC LDO4
7	CAM2_GPIO	
8	CAM_I2C_SDA	
9	GND	
10	GND	
11	CAM_I2C_SCL	
12	CSI_A_CLK_P	
13	CSI_E_CLK_N	
14	GND	
15	CSI_A_CLK_N	
16	CSI_E_CLK_P	
17	CSI_E_D0_N	
18	GND	
19	GND	
20	CSI_E_D0_P	
21	CSI_A_D1_N	
22	+1.2V_RUN_CAM_FRONT	AMS PMIC LDO5
23	GND	
24	CSI_A_D1_P	
25	+2.8V_RUN_CAM_AF	AMS PMIC LDO10
26	+1.8V_VDDIO	AMS Switcher 5
27	GND	
28	+1.2V_GEN_AVDD	AMS PMIC LDO2, used to sync HSIC rails
29	+1.8V_RUN_CAM	AMS PMIC LDO1
30	CSI_A_D0_N	
31	HSIC1_STROBE	
32	GND	
33	CSI_A_D0_P	
34	GND	
35	HSIC1_DATA	
36	GND	
37	+1.8V_VDDIO	AMS Switcher 5



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38	GND	
39	CSI_B_D1_N	
40	GPIO_PU0	
41	BR_UART1_TXD	For PM342 style Laguna FFD header
42	CSI_B_D1_P	
43	GPIO_PU1	
44	BR_UART1_RXD	For PM342 style Laguna FFD header
45	GND	
46	GPIO_PU2	
47	GND	
48	CSI_B_D0_P	
49	GPIO_PU3	
50	PWR_I2C_SCL	
51	CSI_B_D0_N	
52	GPIO_PU4	
53	PWR_I2C_SDA	
54	GND	
55	GPIO_PU5	
56	GEN1_I2C_SCL	
57	CAM1_GPIO	
58	GPIO_PU6	
59	GEN1_I2C_SDA	
60	CAM1_AF_PWDN	
61	ONKEY_L	Pushbutton for on/off
62	GND	
63	CAM_FLASH	
64	PMU_RESET_IN_L	Pushbutton for reset
65	UART2_RXD	
66	CAM1_PWDN	
67	FORCE_RECOVERY_L	Pushbutton for forced recovery
68	UART2_TXD	
69	CAM1_MCLK	
70	CLK3_OUT	
71	UART2_CTS_L	
72	NC	
73	GND	
74	UART2_RTS_L	
75	NC	

## FUNCTIONAL DESCRIPTION

### CPU Support

Device	Quantity	Manufacturer	Comment
T124	1	NVIDIA	Mobile 4+1 Core Processor, MID PKG, BGA813

### Heatsink

Quantity	Manufacturer	Comment
1	Coolermaster	Fansink, 2 pushpins, 12V, 110mA

### Expansion Slot Configuration

Type	# Lanes	Color	Comment
Mini PCIE	1	Black	Mini PCIE, lane #4

### Down Devices

Device	Quantity	Manufacturer	Comment
SDIN8DE4-16G-Q	1	SanDisk	16GB eMMC 4.51 memory TFBGA153
W25Q32DW	1	Winbond	32Mbit SPI Flash, 1.8V
CAT24C02HU4	1	On Semi	Board ID EEPROM, 2kx8
TMP451	1	On Semi	I2C Temperature Monitor
H5TC4G63AFR-RDA	4	Hynix	DDR3L FBGA96, 256Mbit x 16, 933MHz
ALC5639	1	Realtek	HD Audio Codec
RTL8111GS	1	Realtek	GigE MAC/PHY, PEX interface
AS3722	1	AMS	PMIC for T124

Note – the NAND eMMC memory device footprint will accommodate 16B to 128GB with a standard footprint.

### Internal Connector Configuration

Device	Quantity	Pinout
Half Mini PCIe	1	Mini PCIe Std
SATA	1	SATA Std
1x4 HDD Power	1	ATX type Std
Display / Touch Expansion Header	1	2x25
General Expansion Header	1	3x25

Expansion headers are chosen so stacked heights of mated connectors are consistent between all header/connector pairs and any standoffs. Note that expansion headers are intended for prototyping and may not be ideal for high speed differential pairs.

### External Connector Configuration

Device	Quantity	Notes
DSUB9, male, black, RA, RS232	1	Serial debug port for Linux
SD/MMC Connector/Cage	1	Supports card detect & write protect
USB 3.0 A, Flag, Female, RA, THM	1	
USB 2.0 $\mu$ AB, Female, RA, THM	1	Recovery port



2x 3.5mm audio jack	1	Line out stereo, microphone is mono
RJ45 w/ GigE Integrated Magnetics	1	
HDMI, RA	1	
Right Angle, THM, 5 pin power jack	1	12V power input

### Debug/Test Header Configuration

Connector	Quantity	Function	Connector type
2x10 STR	1	JTAG	100 mil pitch 2x10 right angle THM header

Pinout will be compatible with ARM JTAG20 pinout used on Amontec JTAG2Key2 debugger and others. More information on the ARM JTAG 20 is here –

<http://infocenter.arm.com/help/index.jsp?topic=/com.arm.doc.dui0499d/BEHEIHCE.html>

### Jumper / Button Configuration

Feature	Function	Default State
Pushbutton	Power	Open
Pushbutton	Reset	Deasserted (Open)
Pushbutton	Force Recovery	Deasserted (Open)

### LED Configuration

Color	Function	Comment
Green	PMIC controlled	
Green	LAN for Mini PCIE slot	

The GigE RJ45 will also have LEDs for speed and activity.