

NVIDIA Jetson TK1 Pro User Manual

Before you start

This document is intended to cover the Hardware aspects of the Jetson TK1 Pro Development Kit. The document covers how to bring the board up for the first time – and includes information about all the available interfaces on the platform (including header connectors).

 **Tip:** Please refer to the documentation provided with the Android package that comes with the Jetson TK1 Pro Development Kit for more details regarding the software options on the platform.

Assumptions

This document assumes you have received a Jetson TK1 Pro Development Kit from NVIDIA with a pre-installed Android OS. If this is not the case, please contact your NVIDIA representative.

Hardware

You should have received the following items with your Jetson TK1 Pro Platform as depicted in **Error! Reference source not found.**:

- Jetson TK1 Pro Platform which consists of:
 - Jetson TK1 Pro Main Board (P1860)
 - Tegra VCM board (connected to the main board – top) (P1859)
 - Embedded Breakout Board (connected to the main board – bottom) (P1892)
 - Touch Screen Display (P1332)
- Power Supply
- 3 Antennas (Wi-Fi, Bluetooth and GPS)
- USB cable (mini-USB to USB)
- mDP cable
- Cable for Touch Screen (Touch and Power)

Minimum Hardware Setup

The minimum requirements to bring the system up are:

- Power Supply
- Touch Screen Display or HDMI monitor(not provided)
 - mDP and Tyco cables (are required for the Touch Screen configuration)
 - HDMI cable(not provided) can be used for HDMI monitor instead of Touch Screen
- USB Keyboard and Mouse (not provided) but strongly recommended

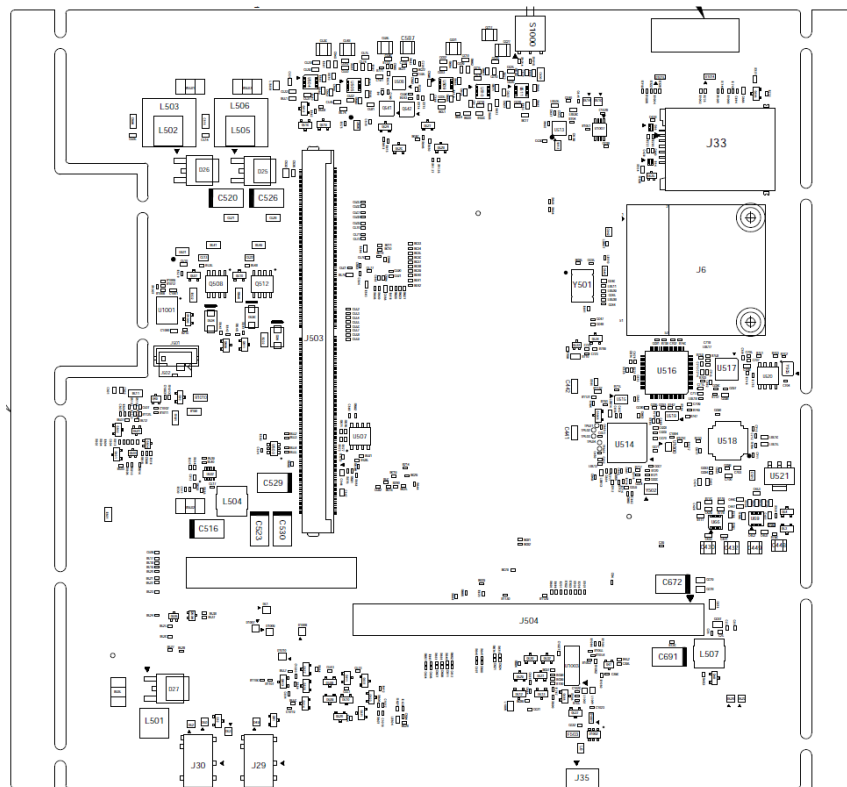
While the Jetson TK1 Pro platform supports multiple configurations and its modular approach provides flexibility, the section below focuses on bringing the platform up for the first time with the minimum configuration effort required.

Connections need to be done to: the Main board (P1860), the EBB board (P1892) and Touch Screen (P1332).

Main Board (P1860) Minimum Connections

Figure 1 shows all the main board component with labels.

Bottom:



Top:

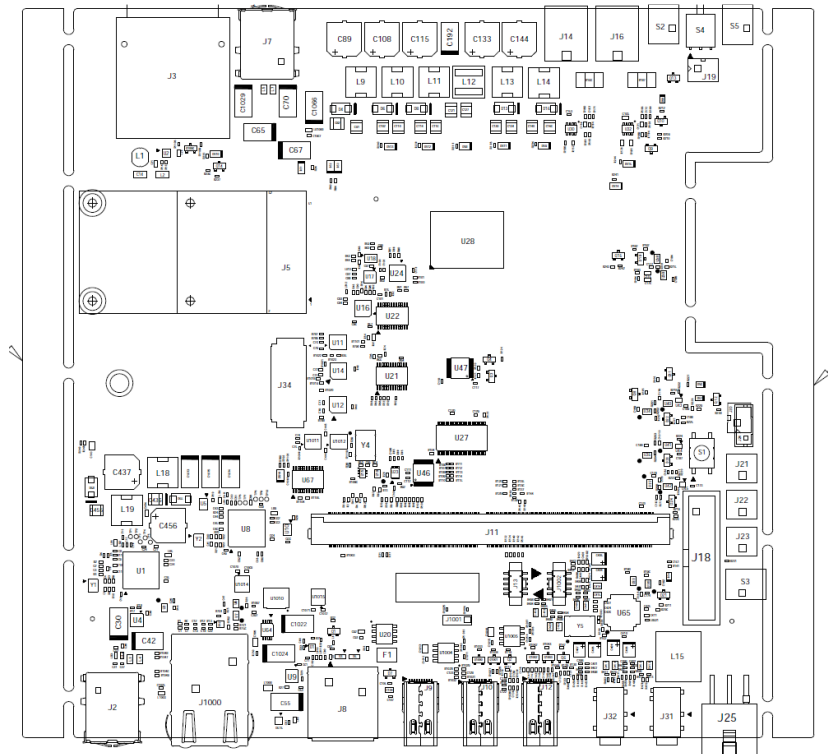


Figure 1: Mainboard with Component Labels

The following connections need to be made on the main board (P1860) as a minimum in order to boot Jetson TK1 Pro for the first time:

Power Supply (J14): Power supply can be connected to the connector labeled J14 as shown on **Error!**
Reference source not found..

mDP Connector (J9): Using the mDP cable provided, the board needs to be connected to the Touch Screen Display included in the package.

Main Board (P1860) Optional Connections

The following connections are not required for the board to boot.

USB Mouse and Keyboard (J2&J3): While this is optional, is highly recommended that a USB mouse and keyboard are plugged-in in to the platform via the main board J2 connector.

HDMI Connector (J8): This is only required if the Touch Screen provided with the platform will not be used.

USB Connection (J35): The USB cable provided with the Jetson TK1 Pro platform while is not required to boot it is recommended to be connected to mini-USB connector labeled “*Host PC USB (Console)*” on the Jetson TK1 Pro board and to a USB 2.0 port on the workstation running Ubuntu Linux 12.04. The

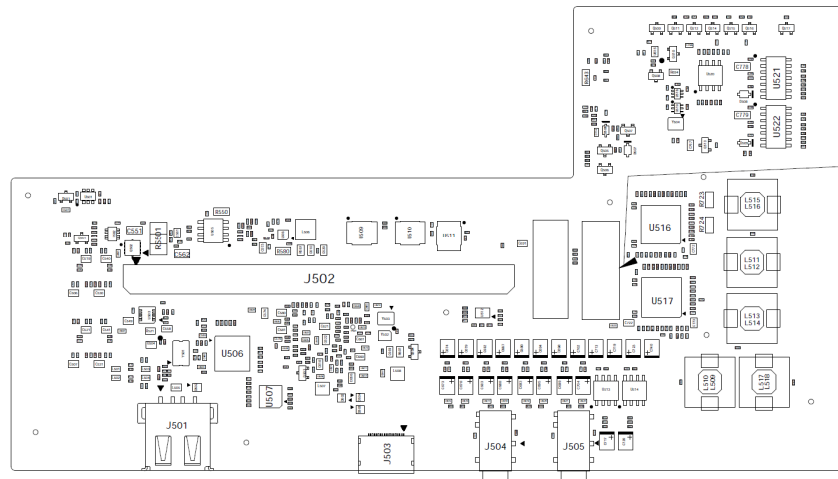
“Host PC USB (Console)” port is labeled J4 on Figure 1. The USB connection enables debug and development capabilities. Please refer to the.CHM documentation file for more details on how to configure this capability.

Ethernet Connection (J1000): While the Ethernet port connection is optional – and may require further configuration not covered on this document – to gain network access, an Ethernet cable can be connected to the port labeled J1000 on Figure 1.

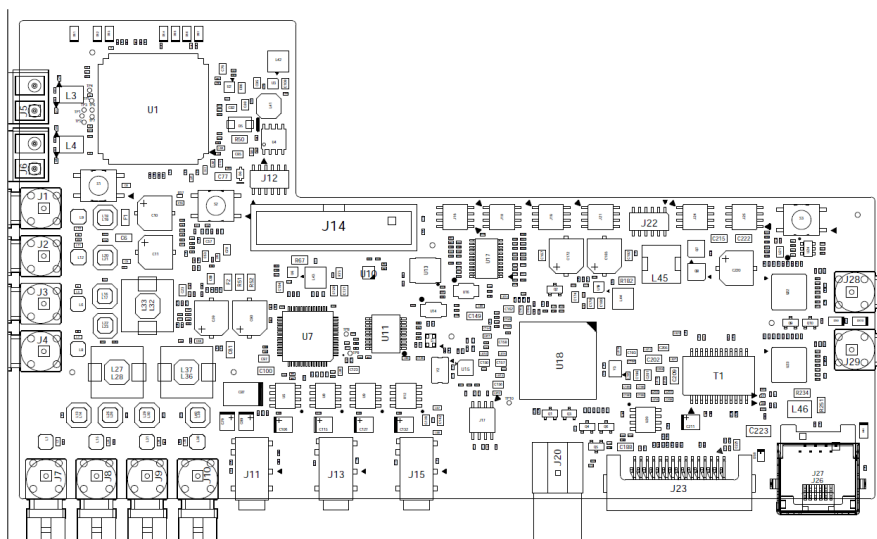
EBB Board (P1892) Minimum Connections

Error! Reference source not found. shows all the EBB board component with labels. Please be aware that some connectors - while accessible on the side of the board - their labels are not visible as are placed on the other side of the EBB board. Please refer to Figure 3 for details on these connectors.

Bottom:



Top:



The following connections need to be made on the main board (P1892) as a minimum in order to boot Jetson TK1 Pro for the first time (assuming the Touch Panel Display is utilized):

Touch Screen Connector (J23): Using the Tyco cable provided, the board needs to be connected to the display as well.

If the Touch Panel Display will not be utilized a HDMI monitor can be used instead.

RF module

Jetson TK1 Pro comes equipped with a Wi-Fi/BT/GPS module (labeled J6 on Figure 1). The board is shipped with 3 different antennas that need to be connected to J6. The Communication Module (J6) has four different connectors as depicted on Figure .

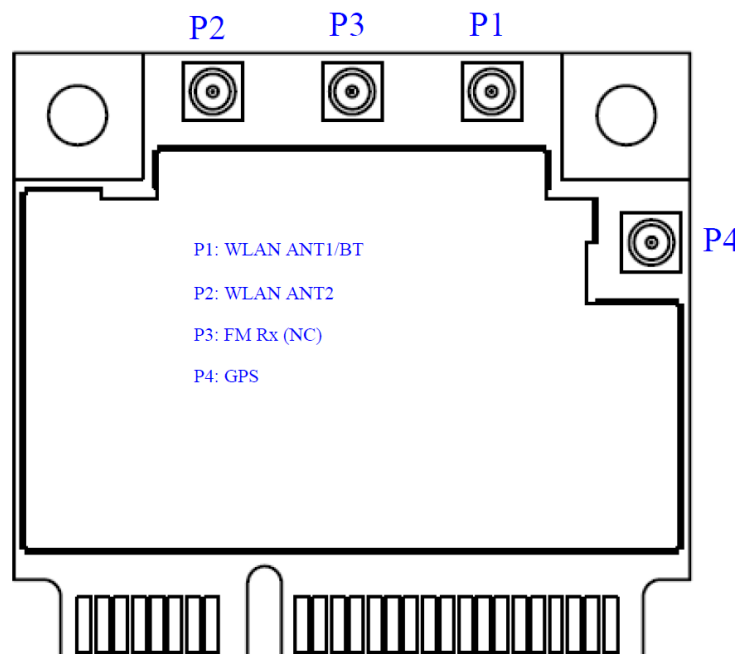


Figure 4: Communication Module (J6) - Antenna Connectors

The antennas shall be connected as described on Table 1.

Antenna (Part Number)	Connects on:
311-0046-000 (2.4GHz – Wi-Fi Main / Bluetooth)	P1
311-0045-000 (5GHz –Wi-Fi Aux)	P2
311-0047-000 (GPS)	P4

Table 1: Antenna Mapping of Communication Module (J6)

Jetson TK1 Pro Hardware Architecture

The Jetson TK1 Pro board architecture is depicted on Figure below. The modular architecture allows maximum flexibility and custom configurations.

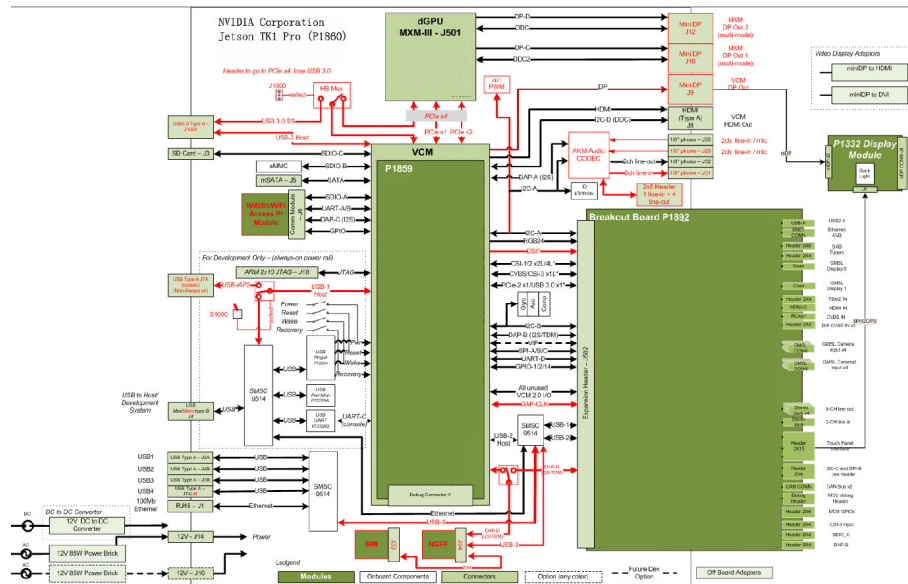


Figure 5: Jetson TK1 Pro Hardware Architecture

It is important to highlight the use of SMSC's 9514 in order to simplify the connection to the Jetson TK1 Pro Platform. With this approach only a USB connection is needed (via J4) in order to have a serial console, network connectivity to the board (i.e. NFS drive mounting, etc.) and reflashing of the system.

Boot up

Step 1, Connect the touch panel to the P1860 main platform. The miniDP cable should plug into the VCM DP port. Main platform side:

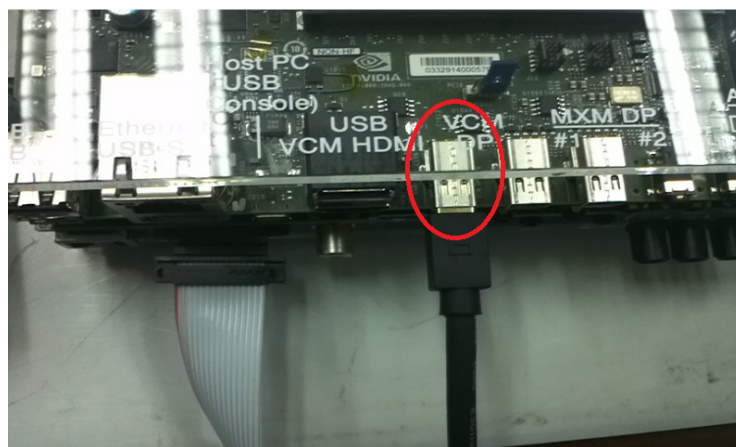


Figure 6

Touch panel side:



Figure 7

Step 2, plug the AC-DC adaptor into the Power In #1 port and turn on the power switch.

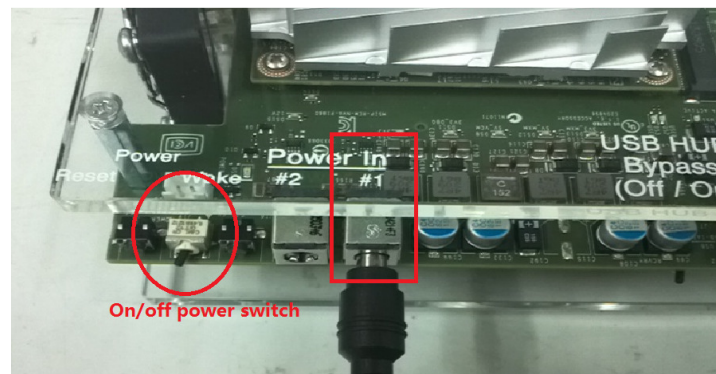


Figure 8

Step 3, done.



Figure 9: Jetson TK1 Pro up and running

Compliance

The P1860 is compliant with the regulations listed in this section.

United States

Federal Communications Commission (FCC)

FCC ID: VOB-P1860

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including any interference that may cause undesired operation of the device.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Warning: The FCC requires that you be notified that any changes or modifications to this device not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Caution: Within the 5.15 to 5.25 GHz band (5 GHz radio channels 34 to 48) this device is restricted to indoor operations to reduce any potential for harmful interference to co-channel Mobile Satellite System (MSS) operations

RF Radiation Exposure Statement:

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

Underwriters Laboratories (UL)



I.T.E E204896

Canada

Industry Canada (IC)

IC: 7361A-P1860

CAN ICES-3(A)/NMB-3(A)

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS-102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

Le dispositif rencontre l'exemption des limites courantes d'évaluation dans la section 2.5 de RSS 102 et la conformité à l'exposition de RSS-102 rf, utilisateurs peut obtenir l'information canadienne sur l'exposition et la conformité de rf.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

Cet émetteur ne doit pas être Co-placé ou ne fonctionnant en même temps qu'aucune autre antenne ou émetteur. Cet équipement devrait être installé et actionné avec une distance minimum de 20 centimètres entre le radiateur et votre corps.

This radio transmitter (identify the device by certification number) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

i. the device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;

ii. the maximum antenna gain permitted for devices in the band 5725–5825 MHz shall comply with the e.i.r.p. limits specified for point-to-point and non point-to-point operation as appropriate.

Cet émetteur radio (identifier le dispositif par numéro de certification ou le numéro de modèle si Catégorie II) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous avec le gain maximal admissible indiquée. Types d'antennes ne figurant pas dans cette liste, ayant un gain supérieur au gain maximum indiqué pour ce type, sont strictement interdits pour une utilisation avec cet appareil.

(i) les dispositifs fonctionnant dans la bande 5 150-5 250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux;

(iii) le gain maximal d'antenne permis (pour les dispositifs utilisant la bande 5 725-5 825 MHz) doit se conformer à la limite de p.i.r.e. spécifiée pour l'exploitation point à point et non point à point, selon le cas.

European Union

European Conformity; Conformité Européenne (CE)



This device bears the CE mark and class-2 identifier in accordance with Directive 1999/5/CE

This device complies with the following Directives:

EMC Directive for Class A, I.T.E equipment.

R&TTE Directive for radio equipment

RoHS Directive for hazardous substances

Japan

Voluntary Control Council for Interference (VCCI)

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用する
と電波妨害を引き起こすことがあります。この場合には使用者が適切な対策
を講ずるよう要求されることがあります。 VCCI-A

Translation:

This is a Class A product based on the standard of the VCCI Council. If this is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

Radio/ Telecommunications Certification



China

State Radio Regulation of China (SRRC)

CMIIT ID: YYYYxxxxxx

South Korea

Radio Research Agency (RRA)

Korean Agency for Technology and Standards (KATS)



MSIP-CMM-NVA-P1860

Taiwan

Bureau of Standards, Metrology and Inspection (BSMI)

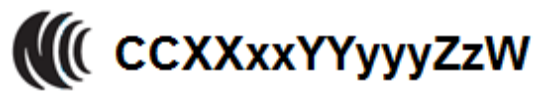


R33088

This device complies with CNS 13438 (2006) Class A

National Communications Commission

國家通訊傳播委員會



經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

Translation:

Certified by the type of low-power radio, non-licensed, company, firm or user is not allowed to change the frequency, increase the power or change the characteristics of the original design and function.

The use of low-power radio-frequency devices shall not influence aircraft security and interfere legal communications; interference phenomenon discovered over time, should be immediately suspended, and improved to no interference may continue to be used. Legal communications, referring to the provisions of the Telecommunications Act of radio communications operations. Low-power radio communications to tolerate interference radiated devices legal or industrial, scientific and medical radio waves.

India

Wireless Planning & Coordination Wing (WPC)

ETA CERTIFICATION NO: XXXX/YYYY/WROL

Russia/Kazakhstan/Belarus

EurAsian Customs Union



Complies with the technical regulations of the Customs Union (CU TR)

Russian Federal Agency for Communication

Israel

Standards Institution of Israel (SII)

Ministry of Communications (MoC)

Additional information

Please contact your NVIDIA representative or visit <http://www.nvidia.com/object/jetson-automotive-development-platform.html> for more details.