VTAP

VTAP25-DEV development kit user guide

Firmware from v2.4.0.9

VTAP25-DEV

Revised September 2025 v1.0

DOT ORIGIN

If you need help to set up or use your VTAP25-DEV board, beyond what is contained in this User Guide, then please contact our support team.

Email: **vtap-support@dotorigin.com**

Download the latest documentation and firmware from **https://vtapnfc.com**

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If you have any feedback on setting up or using your VTAP25-DEV board or this documentation, then please contact our support team. The product is constantly being reviewed and improved and we value feedback about your experience.

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Contents

1 Using this guide 1
1.1 Key features 1
1.1.1 Kit contents 3
1.1.2 Related documents 3
2 Block diagram 4
3 Using the VTAP25-DEV board 5
3.1 Power 5
3.2 Configuring the VTAP25-MOD reader module 5
3.2.1 Config bypass function 6
3.3 On-board user feedback 6
3.4 NFC Antenna 6
3.4.1 Using the on-board PCB trace NFC antenna 6
3.4.2 Using an alternative external antenna with the development board 7
3.5 USB Comms 9
3.6 Using the GPIO expansion pins 10
4 Schematics 12
VTAP25-DEV engineering drawings 13

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Safety instructions

WARNING: INTENDED USE

The VTAP25-DEV development kit is intended for use by suitably qualified integrators, who will integrate the VTAP25-MOD (surface mount module) into their own hardware, without any changes or modifications to the VTAP25-DEV device. The VTAP25-DEV development board should be modified only as explicitly described in this guide.

WARNING: ESD PRECAUTIONS

We recommend careful handling and storage of Electrostatic Sensitive Devices (ESDs) during installation. The VTAP25-DEV development board and VTAP25-MOD reader module should always be protected by static shielding bags for shipping or storage.

WARNING: POWER SUPPLY

Follow the power supply options described in Section **3.1 Power**

EMC emissions and immunity certifications are only valid when using the VTAP25-MOD reader module and VTAP25-DEV development kit in accordance with these instructions.

1 Using this guide

This guide contains the information you need to get started with the VTAP25-DEV development kit. The VTAP25-DEV is the complete development board for VTAP25-MOD reader modules.

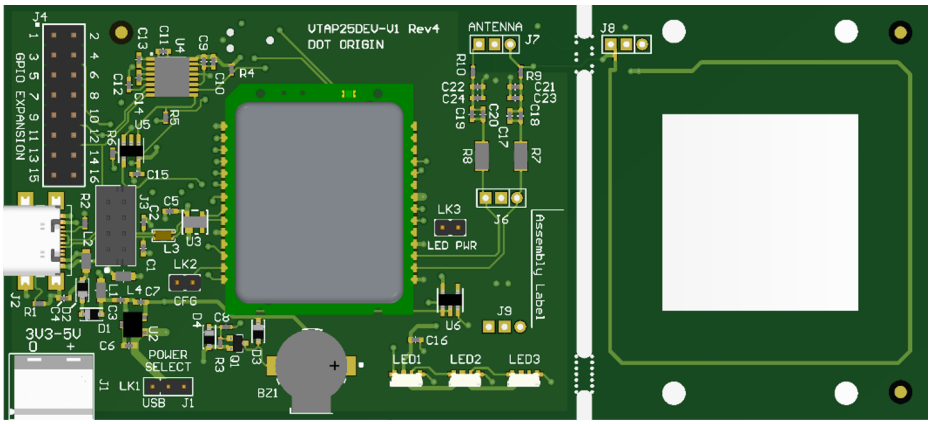


Figure 1-1 VTAP25-DEV development kit

Consult the VTAP25-MOD Integration Guide and the VTAP Commands Reference for more detailed information about commands and configuration.

If you need help with VTAP25-DEV development kit beyond what is contained in this guide please contact **vtap-support@dotorigin.com**.

1.1 Key features

The VTAP25-DEV board extends I/O connectivity from the VTAP25-MOD reader module so that it can be easily configured and evaluated in a development environment. This makes it easier to understand the module's operation and determine your own design requirements, in order to lay out your host board efficiently.

The main features of the VTAP25-DEV board include:

- Connect a VTAP25-MOD reader module to any of these NFC antennae:
  - Optimally tuned, FCC/ISED approved PCB trace antenna, included on the VTAP25-DEV board;
  - External NFC antenna, with its tuning circuit on the VTAP25-DEV board;
  - External NFC antenna with its own tuning circuit.
- Drive serial LEDs on-board, or externally through the expansion pin.
- Sound a buzzer on-board, or externally through the expansion pin.
- Use the configuration bypass function.

- Connect the VTAP25-MOD reader module to a PC using 8-way captive USB header or USB-C, to access the mass storage drive, keyboard emulation or USB virtual COM port.
- Connect the VTAP25-MOD reader module to a processor or other devices over Serial2 (UART, I2C or SPI) or Serial1 (UART or RS-232) for serial comms. Both Serial1 and Serial2 have OSDP option available over their physical layer protocols (UART, I2C, SPI, RS-232), giving users option to use either the VTAP protocol or OSDP over any of the interfaces.
- Use the sleep/wake functionality of the on-board VTAP25 module through expansion pins

The VTAP25-MOD reader module is configured for these operations by editing its `config.txt` file. This can be accessed via the USB mass storage drive or over any of the serial interfaces.

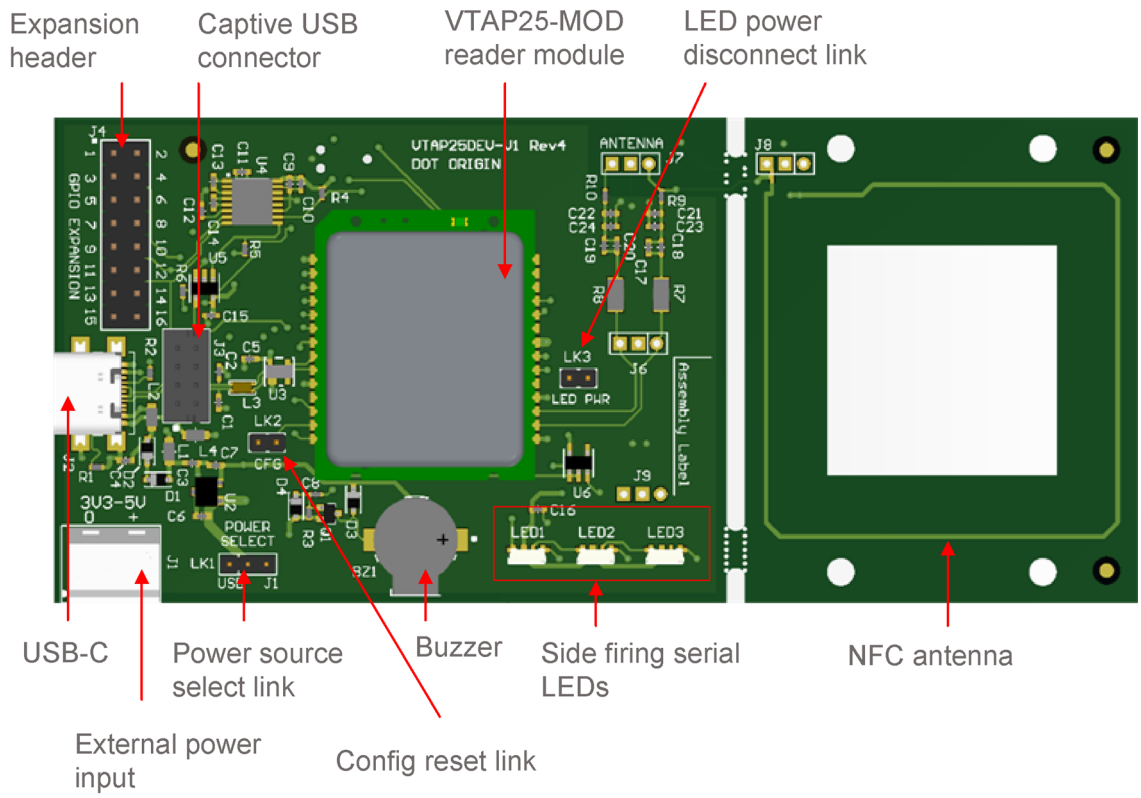


Figure 1-2 VTAP25-DEV board - top

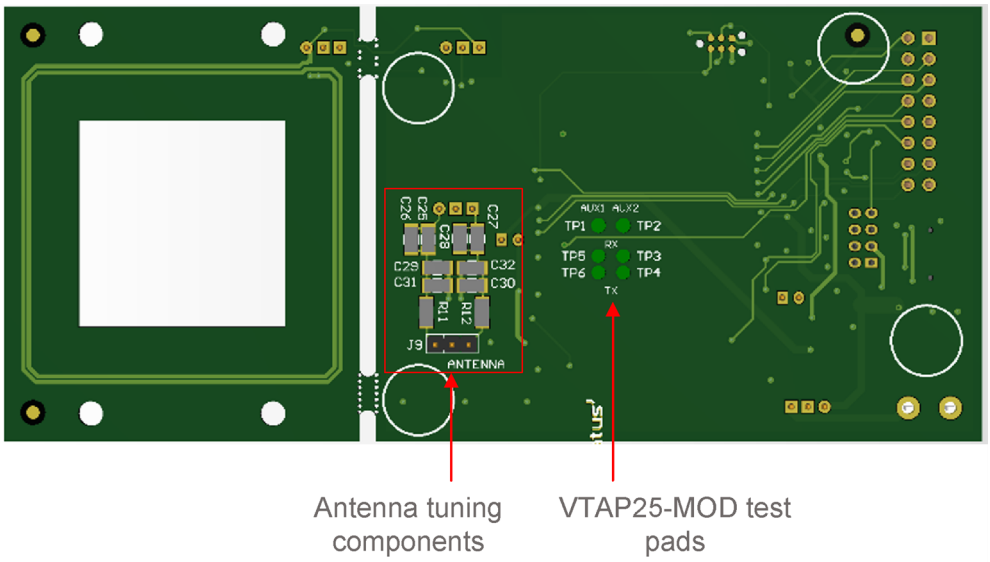


Figure 1-3 VTAP25-DEV board - bottom

1.1.1 Kit contents

The VTAP25 development kit includes following items:

- VTAP25-DEV board with inserted VTAP25-MOD reader module
- Captive USB cable 1.8m
- Smartcard for testing
- This user guide

1.1.2 Related documents

These are all available through **https://www.vtapnfc.com/documentation/**

- **VTAP25-MOD datasheet**
- **VTAP25-MOD integration guide**
- **VTAP Commands Reference**
- **VTAP Application Note on External Antennas**
- VTAP25-DEV board schematic (see Section **4 Schematics**)
- Gerbers (please contact **vtap-support@dotorigin.com**).

2 Block diagram

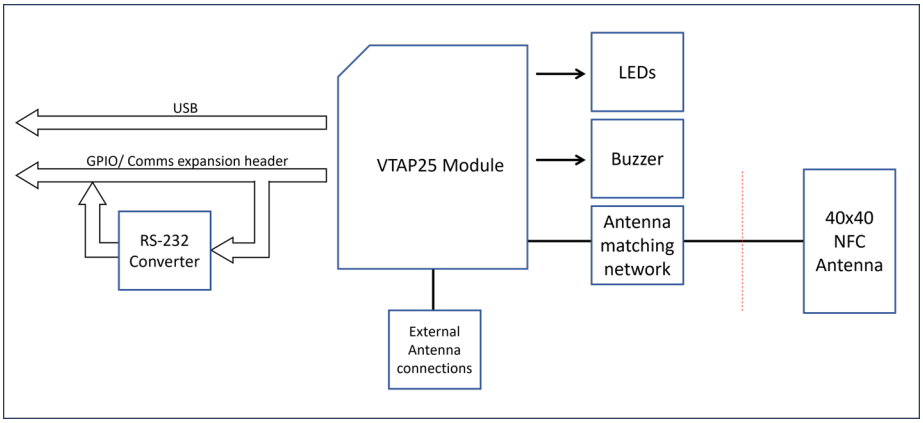


Figure 2-1 VTAP25-DEV Block diagram

3 Using the VTAP25-DEV board

This section contains information on all the features available on the VTAP25-DEV board.

3.1 Power

The following two power options are available for the VTAP25-DEV development board:

A: Powered through an external PSU

Use the 2-way terminal block (J1) to supply power from an external power supply unit. The voltage can be 3.3V to 5V DC.

Make sure the POWER SELECT link (LK1) is set between its centre pin and the right pin (J1), as shown below. In this configuration, the VTAP25-DEV board will be a self-powered USB device, enabling USB communications but without drawing power from the USB host.

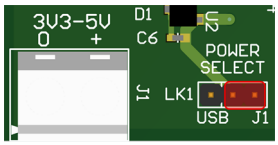


Figure 3-1 J1 terminal block and LK1 POWER SELECT link for external PSU power

B: Powered over USB

To power the board with USB power (5V), you can either use USB-C connector J2 or the 8-way captive header J3 to power the development board.

For either USB power scenario, the POWER SELECT link (LK1) should be set between its centre pin and the left pin (USB), as shown below. This will enable power over USB in addition to USB comms

Figure 3-2 J2 or J3 terminal block and LK1 POWER SELECT link for USB power

3.2 Configuring the VTAP25-MOD reader module

The VTAP25-MOD reader module in the VTAP25 development board can be configured by editing its `config.txt` file. This could be over USB mass storage, or by sending configuration settings over serial using either the USB COM port, RS-232 (via J3 or expansion header J4) or over serial comms (Serial1, Serial2), which are available on the expansion header J4. Refer to the VTAP Commands Reference for more information on configuration settings for the VTAP25-MOD reader module.

3.2.1 Config bypass function

The VTAP25-MOD reader module offers a bypass function for the saved `config.txt` file. Enabling this feature will revert to use of the default VTAP25-MOD reader module configuration at startup.

When designing your own product, using the VTAP25-MOD reader module, you might find it helpful to connect the VTAP25-MOD CONFIG pin to a GPIO on your host processor, so that you can enable this bypass when `config.txt` options might be inadvertently preventing communication with your host.

To use this feature on the VTAP25-DEV development board, simply fit a jumper across the two pins the of CFG (LK2) header, which will pull the VTAP25 CONFIG pin (13) low and trigger the bypass function at startup.

3.3 On-board user feedback

The VTAP25-DEV board has a buzzer and 3 serial LEDs for user feedback. These signals for these are also available on the J4 expansion header, for connecting external serial LEDs or an external buzzer.

3.4 NFC Antenna

The VTAP25-DEV board allows you to use either the on-board antenna or an external antenna, forming multiple configurations. Refer to the VTAP25-DEV board schematic sheet 4 for the antenna circuits. This development board comes with on-board antenna tuning components populated. You would need to populate the right tuning capacitors and resistors along with headers for using external antennas.

3.4.1 Using the on-board PCB trace NFC antenna

The on-board NFC antenna on the VTAP25-DEV board can be used out-of-the-box, as it is connected to the VTAP25-MOD reader module through PCB tracks and is already tuned for its optimum performance. The VTAP25-MOD is approved by FCC and ISED for use with this antenna .

If you need to position the built-in antenna in a different orientation to the main VTAP25-DEV board, you can carefully detach it by breaking through the two snap points between the main board and the antenna section, highlighted in the picture above. We recommend that you break the snap off points by applying pressure with a screwdriver, when the PCB is lying on a flat surface.

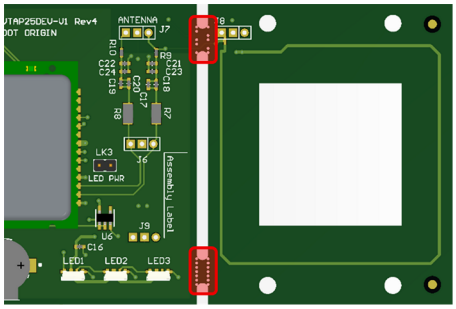


Figure 3-3 Connections between the on-board antenna and the rest of the VTAP25-DEV board

After this you will then need to connect headers to J7 and J8, in order to reconnect the antenna in a flexible way. Remember that your choice of connector may affect tuning.

CAUTION: Do NOT create a link between J7 and J8 while the on-board PCB trace antenna is connected.

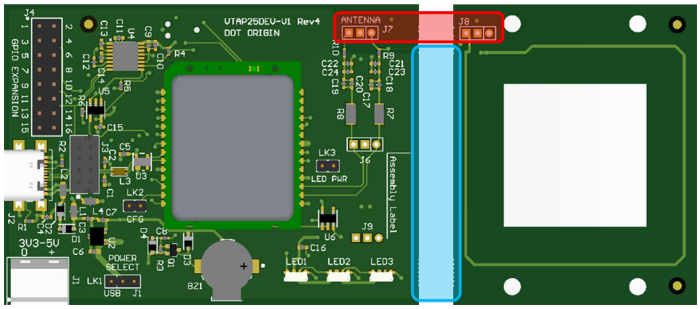


Figure 3-4 J7 and J8 to be connected if the on-board antenna is separated from the rest of the VTAP25-DEV board

3.4.2 Using an alternative external antenna with the development board

The VTAP25-DEV development board supports two ways to connect external, symmetrical, NFC antennas. This can be used to test your own antenna design before you lay out a host board for the VTAP25-MOD reader module.

Follow the instructions in the NFC antenna section of the VTAP25-MOD Integration Guide on the and in the VTAP Application Note on External Antennas on how to tune an NFC antenna for a VTAP25-MOD reader module, along with related design considerations and recommendations.

There are two external antenna connection options:

A: An external antenna which uses the tuning network on the VTAP25-DEV board

You can use the on-board tuning circuit for external antennas in scenarios where the antenna does not have a tuning circuit, such as with off-the-shelf antennas.

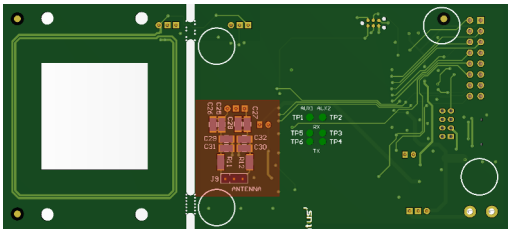


Figure 3-5 VTAP25-DEV bottom layer tuning circuit

Follow these steps to use an external antenna with tuning components on the development board.

1. Remove the R7 and R8 0R resistors to disconnect the on-board NFC antenna tuning circuit. You can re-populate the 0R 1206 resistors later, if you wish to use the on-board antenna again, but ensure that C25-C28 are removed which will disconnect the external antenna circuit.

   CAUTION: Always disable the VTAP25-DEV on-board antenna and tuning circuit before connecting an alternative antenna. Do this by removing R7, R8 and C25-C28 antenna tuning components. Detaching the VTAP25-DEV on-board antenna is not required and would not be sufficient.

2. Populate a 2mm pitch, 3-way header on J9.
3. Connect your symmetrical antenna to J9, with the centre pin being 0V.
4. Carry out the antenna tuning process before starting to use it. This will include populating the appropriate tuning capacitors and resistors on the tuning network, on the bottom layer of the development board. The external antenna tuning capacitors C25-C32 and resistors R11/R12 footprints are 1206. Capacitors should be 2% tolerance or better.

The VTAP25-MOD reader module test pads for tuning are accessible from the bottom of the VTAP25-DEV development board, with pad names on the silkscreen.

B: An external antenna which has its own tuning circuit at the antenna

Alternatively, you could directly connect the antenna outputs from the VTAP25-MOD reader module, which would require the tuning circuit to be at the antenna. In this configuration, make sure that your tuning circuit is as close to the antenna as possible. Refer to the NFC antenna section of the VTAP25-MOD Integration Guide for recommendations on antenna matching and connection.

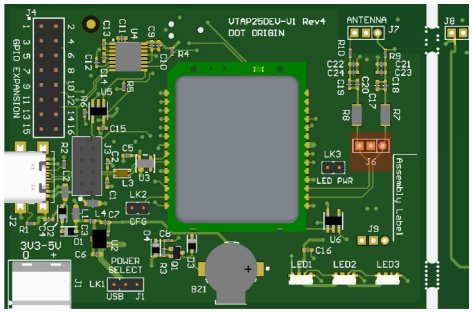


Figure 3-6 VTAP25-DEV top layer, with J6 highlighted to connect external antenna

You would still need to conduct an antenna tuning exercise, since the existing antenna tuning circuit might not be ideally tuned for connection to a VTAP25-MOD reader module. The chosen cable may also have some effect on the tuning. Refer to the VTAP Application Note on External Antennas on how to tune an NFC antenna for a VTAP25-MOD reader module, along with related design considerations and recommendations.

Remove the 0R resistors R7/R8 to disconnect the on-board antenna. Also remove any capacitors on C25-C28 pads, so that on-board external antenna tuning circuit is not connected.

CAUTION: Always disable the VTAP25-DEV on-board antenna and tuning circuit before connecting an alternative antenna. Do this by removing R7, R8 and C25-C28 antenna tuning components. Detaching the VTAP25-DEV on-board antenna is not required and would not be sufficient.

Use J6 to connect the external antenna to the VTAP25-DEV board. To do this you would need to populate a 2mm pitch, 3-way header here, as it is not populated on standard VTAP25-DEV boards.

3.5 USB Comms

There are two options for USB communications on the VTAP25-DEV board:

- an 8-way captive USB header (J3); and
- a USB-C connector (J2).

Both are connected to pins 7,8,9 on the VTAP25-MOD reader module for USB comms and VBUS.

These can be used to connect the VTAP25-MOD reader module to a PC, for:

- accessing the VTAP files (config.txt, boot.txt) over mass storage drive;
- keyboard emulation;
- USB ComPort for serial comms.

USB comms can be used regardless of your choice of power source (external power supply or USB).

3.6 Using the GPIO expansion pins

Although the VTAP25-DEV board has various I/Os connected on-board, such as LEDs, buzzers and config bypass, there are multiple interfaces, especially comms, which you may need to access in your development project. The 16-way GPIO expansion (J4) can be used to access the serial comms and other I/Os when you need to connect your equipment to the VTAP25-MOD for development and testing.

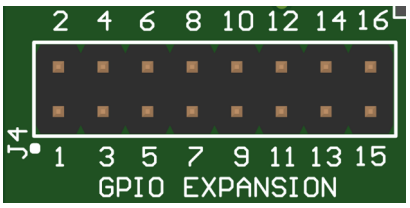


Figure 3-7 VTAP25-DEV GPIO expansion pins on J4

Pin no.	Pin name	Pin no.	Pin name
1	+3V	2	SERIAL1_TXD
3	SERIAL2_TYPE	4	SERIAL1_RXD
5	SERIAL2_DE / SPI_CS /I 2C_AD1	6	SPI_SCLK / I2C_AD0
7	SERIAL2_TXD / SPI_MISO / I2C_SDA	8	SERIAL2_RXD / SPI_MOSI / I2C_SCL
9	RS232 TX (SERIAL1)	10	WAKE IN
11	RS232 RX (SERIAL1)	12	BUZZER
13	WAKE OUT	14	SIGNAL
15	0V	16	LED

Note: TXD and RXD pins are named from the perspective of the VTAP25-MOD reader module, so SERIAL1_TXD is the VTAP25-MOD transmit output and SERIAL1_RXD is the VTAP25-MOD receiver input.

The +3V pin is for use as a voltage reference and should only be used to supply current less than 200mA.

Use J4 expansion pins 2 and 4 for direct connection to Serial1 (UART) on the VTAP25-MOD reader module. The VTAP25-DEV development board also has a UART-to-RS-232 circuit. Use pins 9 and 11 on the J4 expansion header to connect to the VTAP25-MOD reader module Serial1 over RS-232. The VTAP25-DEV schematic includes the UART-to-RS-232 circuit, should you need it for your host board development.

Serial2 can be used for RS-485 communications, by driving an external EIA485 transceiver. Use SERIAL2_DE, SERIAL2_TXD and SERIAL2_RXD for data enable, transmit and receive. Since OSDP is available on all the various physical interfaces of Serial1 and Serial2, the RS-485 layer using the external transceiver can also use OSDP. This will allow you to design and test an RS-485 OSDP NFC reader. Refer to the VTAP Commands Reference for all OSDP options, over any of the VTAP25 physical interfaces.

The VTAP25-MOD reader module Serial2 interface can be configured for SPI, I2C or UART. All the pins for Serial2 comms and SPI/I2C configuration are available on the J4 expansion header. Refer to the **VTAP25-MOD integration guide** for more information on setting SPI and I2C. To set the Serial2 for UART comms, you would need a config change. Refer to the **VTAP Commands Reference** for how to set the UART comms on Serial2.

Always ensure connection of the 0V (pin15) on J4 to the 0V of the connected equipment (over Serial1/Serial2) as a common reference point for signals.

Although the VTAP25-DEV development board features a buzzer and 3 serial LEDs, the outputs from the VTAP25-MOD reader module are also brought out to the J4 expansion, to drive external buzzer or serial LEDs. Refer to the **VTAP25-MOD integration guide** for more information on serial LED and buzzer outputs such as the output voltages, signal and protocol type, max number of external LEDs. The VTAP25-MOD reader module has buzzer and LED outputs at 3V which would need translation to 5V, if the buzzers/LEDs in use are 5V driven. Refer to the VTAP25-DEV schematic for the 3V buzzer and 5V serial LED driver circuits, should you need to use them in your own design.

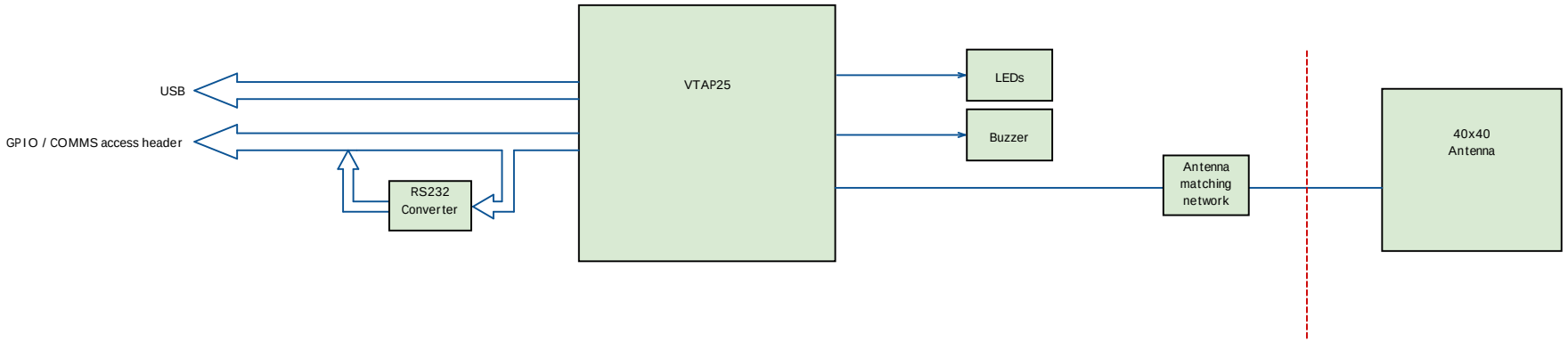
Note: Save power when using external LEDs by removing the LED PWR (LK3), which will disconnect the on-board serial LED circuit. If the link remains connected, the first three external serial LEDs will output the same flash/animation as the on-board LEDs. This duplication can be useful, if you need to verify the output of your external serial LED circuit.

The WAKE_IN and WAKE_OUT pins are also brought out on the expansion header. These can be used in low-power and sleep modes for waking up the VTAP25-MOD reader module (WAKE_IN) or waking up the host processor (WAKE_OUT).

The SIGNAL pin can be used in conjunction with any Serial2 interface type (I2C, SPI or UART). It will indicate that a command response is available to be read over this interface. This can eliminate the need for polling, to determine when a response is ready.

Refer to the **VTAP25-MOD integration guide** for further details on WAKE_IN, WAKE_OUT and SIGNAL pins and the **VTAP Commands Reference** for details about the sleep/low-power configuration available.

4 Schematics



Title: VTAP25 Reference Board Schematic

Variant: a - Std Build

Assembly Revision: 5

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VTAP25DEV-V1a5-Scm

Sheet 1
Of 4

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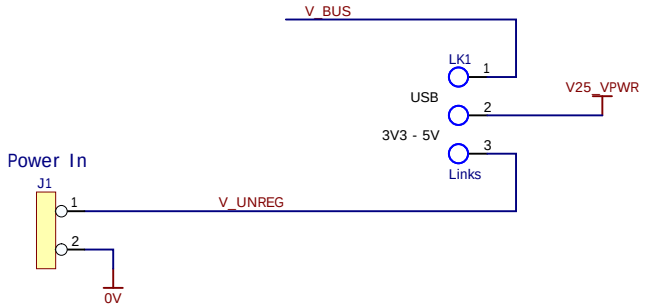

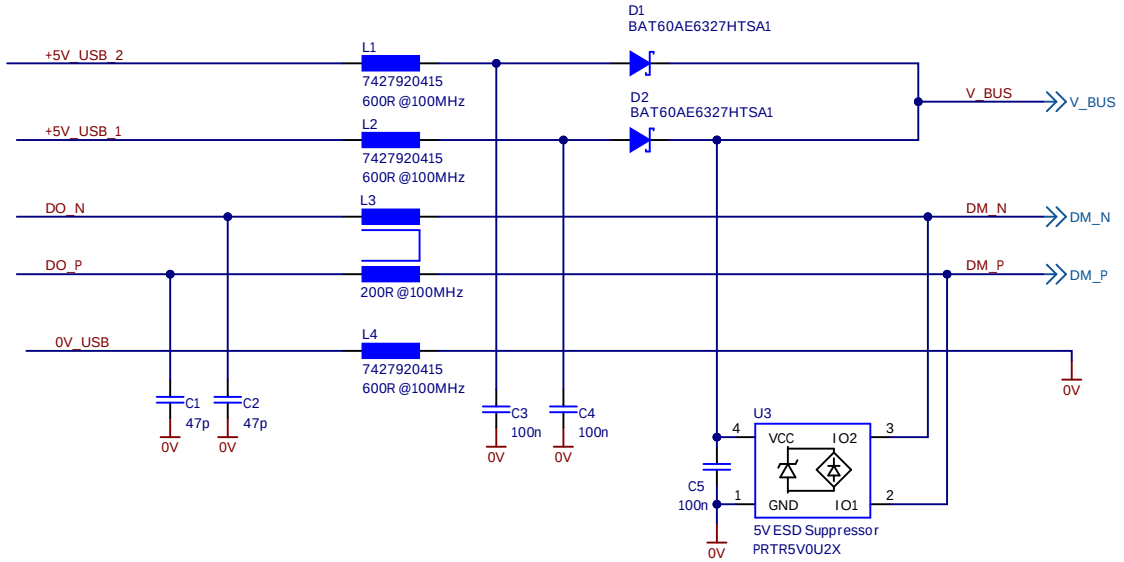

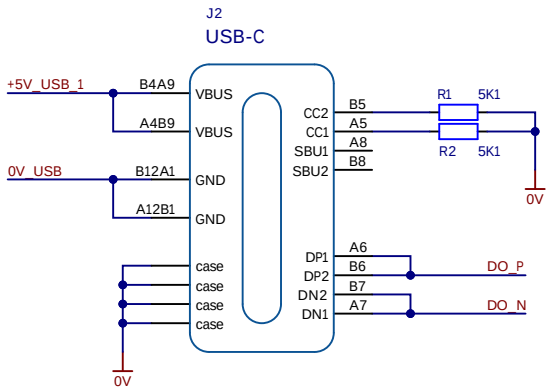

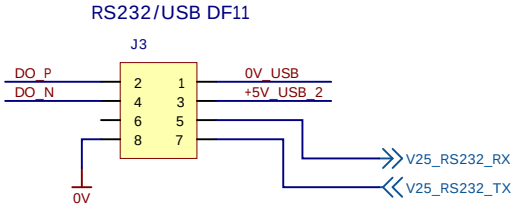

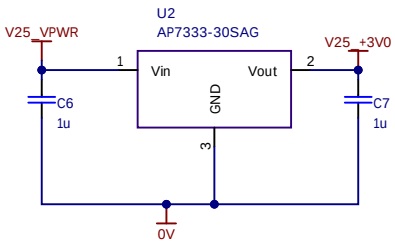

Title: VTAP25 Reference Board Schematic		A4
Variant: a - Std Build		
Assembly Revision: 5		

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ECN ECN092	Drawn M Faraz
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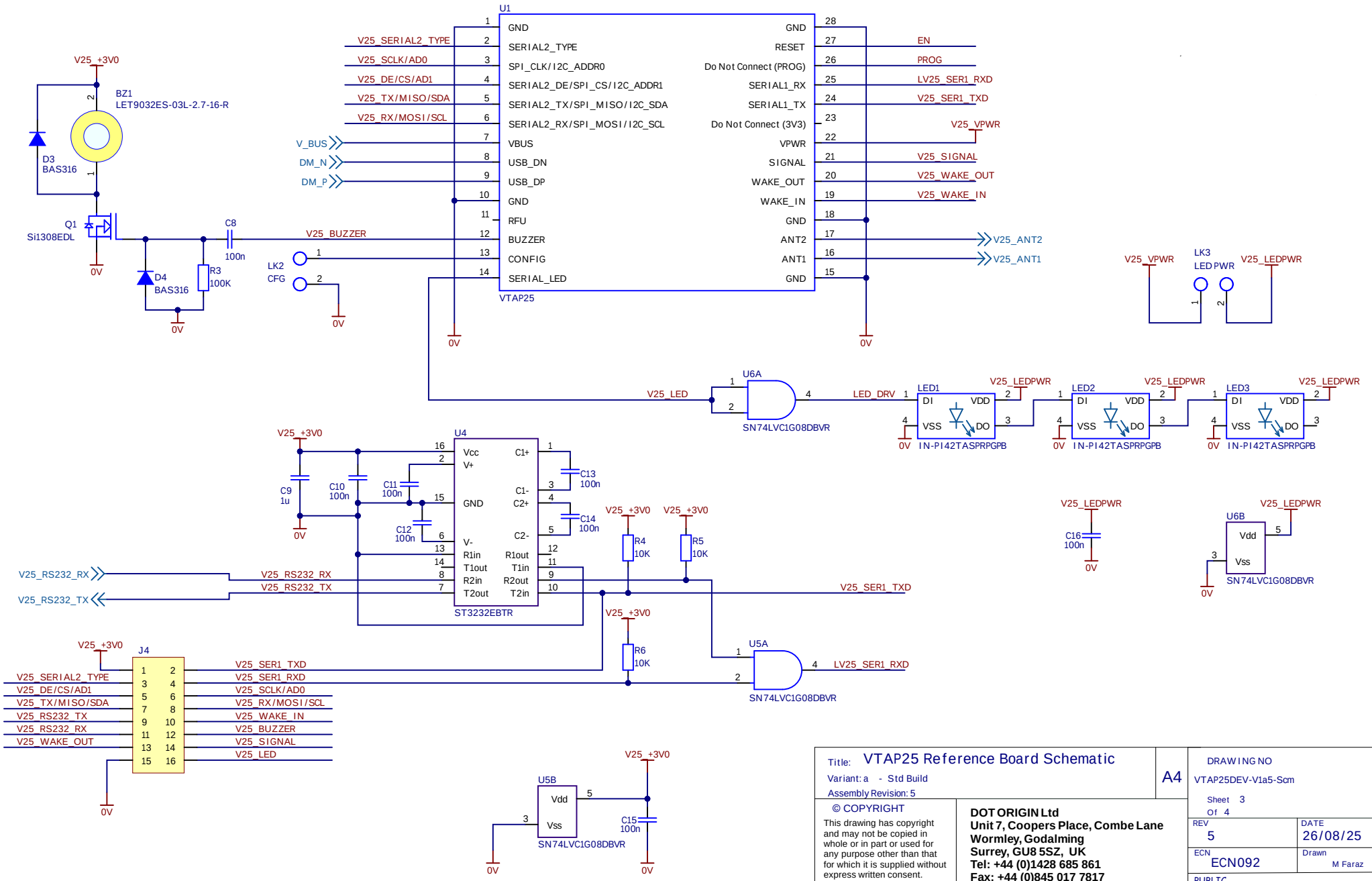
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USB_DN
USB_DP
GND
RFU
BUZZER
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SERIAL1_TX
Do Not Connect (3V3)
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WAKE_OUT
WAKE_IN
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ANT2
ANT1
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V25_SERIAL2_TYPE
V25_SCLK/AD0
V25_DE/CS/AD1
V25_TX/MISO/SDA
V25_RX/MOSI/SCL
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SN74LVC1G08DBVR
V25_LED
LED_DRV
LED1
LED2
LED3
DI
VDD
VSS
DO
IN-PI42TASPRPGPB
U4
ST3232EBTR
Vcc
V+
GND
V-
C1+
C1-
C2+
C2-
R1in
R1out
T1out
T1in
R2in
R2out
T2out
T2in
C9
1u
C10
100n
C11
100n
C12
100n
C13
100n
C14
100n
R4
10K
R5
10K
R6
10K
V25_RS232_RX
V25_RS232_TX
V25_SER1_TXD
V25_SER1_RXD
J4
V25_SERIAL2_TYPE
V25_DE/CS/AD1
V25_TX/MISO/SDA
V25_RS232_TX
V25_RS232_RX
V25_WAKE_OUT
V25_SCLK/AD0
V25_RX/MOSI/SCL
V25_WAKE_IN
V25_BUZZER
V25_SIGNAL
V25_LED
U5A
U5B
C15
100n
C16
100n
U6B
Vdd
Vss
Title: VTAP25 Reference Board Schematic
Variant: a - Std Build
Assembly Revision: 5
A4
DRAWING NO
VTAP25DEV-V1a5-Scm
Sheet 3
Of 4
REV
5
DATE
26/08/25
ECN
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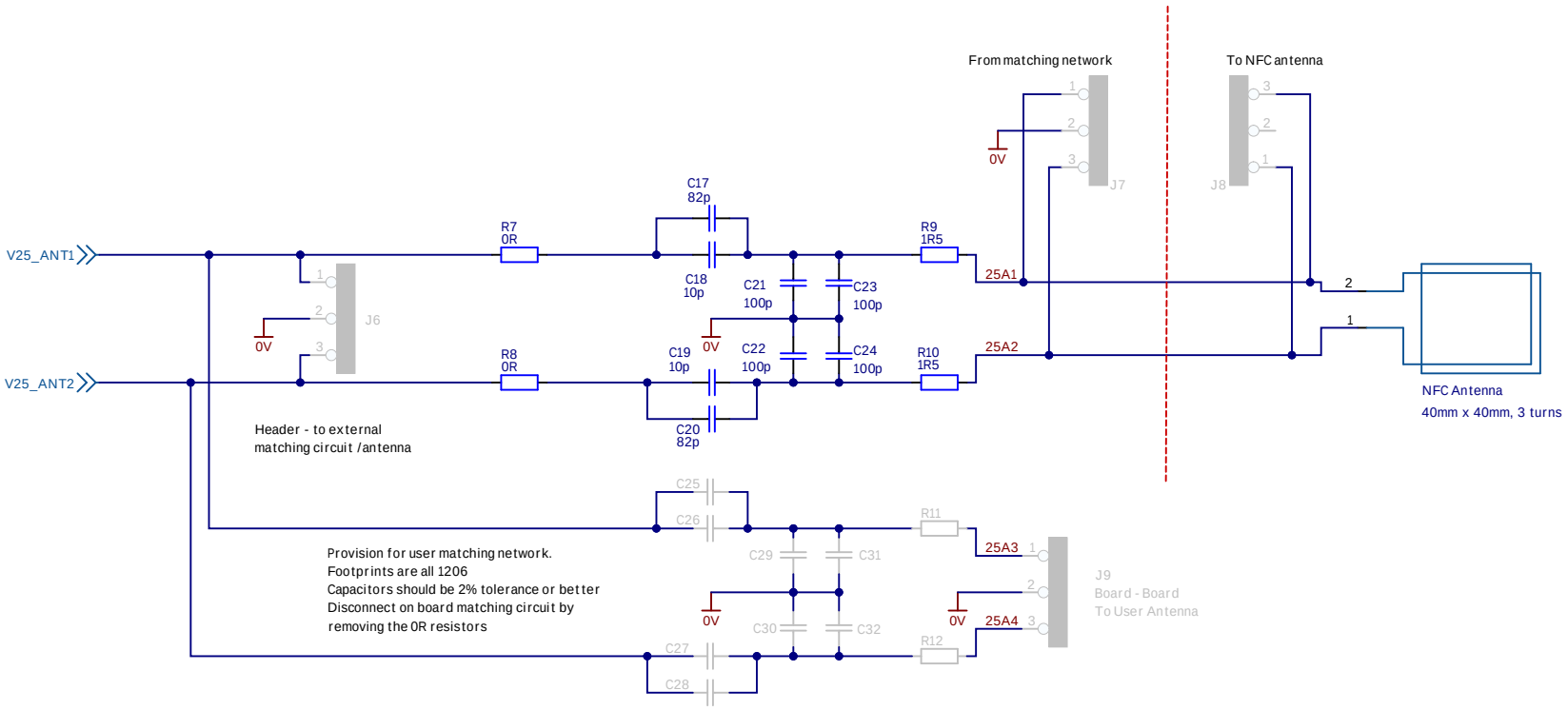

Title:	VTAP25 Reference Board Schematic
Variant: a - Std Build	A4
Assembly Revision: 5	

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