15/03/2024

Driver v. 5.02

Interfacing FlashRunner 2.0 with TEXAS INSTRUMENTS TDA

Moreno Ortolan

HQ and Registered Office
Via Giovanni Agnelli 1
33083 Villotta di Chions (PN) Italy
Società Unipersonale

Capitale sociale €102.040
P.I. 01697470936
C.F. 01697470936
REA PN-97255

D-U-N-S® 51-724-9350
T + 39 0434 421 111
F + 39 0434 639 021

→smh-tech.com

info@smh-tech.com

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TEXAS INSTRUMENTS TDA Introduction

TDA2x SoC for Advanced Driver Assistance Systems (ADAS)

TI's new TDA2x System-on-Chip (SoC) is a highly optimized and scalable family of devices designed to meet the requirements of leading Advanced Driver Assistance Systems (ADAS).
The TDA2x family enables broad ADAS applications in automobiles by integrating an optimal mix of performance, low power and ADAS vision analytics processing that aims to facilitate a more autonomous and collision-free driving experience.

The TDA2x SoC enables sophisticated embedded vision technology in automobiles by broadest range of ADAS applications including front camera, park assist, surround view and sensor fusion on a single architecture.

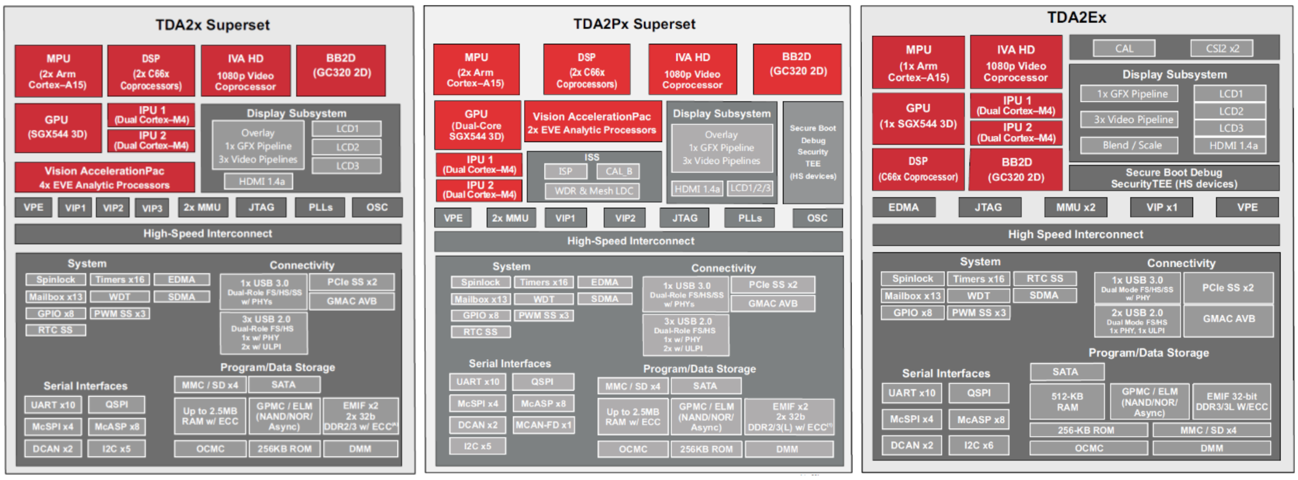
The TDA2x SoC incorporates a heterogeneous, scalable architecture that includes a mix of TI's fixed and floating-point TMS320C66x digital signal processor (DSP) generation cores, Vision AccelerationPac, Arm® Cortex®-A15 MPCore™ and dual-Cortex-M4 processors.

The integration of a video accelerator for decoding multiple video streams over an Ethernet AVB network, along with graphics accelerators for rendering virtual views, enable a 3D viewing experience.
And the TDA2x SoC also integrates a host of peripherals including multi-camera interfaces (both parallel and serial) for LVDS-based surround view systems, displays, CAN and GigB Ethernet AVB.

The Vision AccelerationPac for this family of products includes multiple embedded vision engines (EVEs) offloading the vision analytics functionality from the application processor while also reducing the power footprint.
The Vision AccelerationPac is optimized for vision processing with a 32-bit RISC core for efficient program execution and a vector coprocessor for specialized vision processing.

Additionally, TI provides a complete set of development tools for the Arm, DSP, and EVE coprocessor, including C compilers, a DSP assembly optimizer to simplify programming and scheduling, and a debugging interface for visibility into source code execution.
The TDA2x ADAS processor is qualified according to the AEC-Q100 standard.

PART NUMBER	PACKAGE	BODY SIZE
TDA2SXABC	FCBGA (760)	23.0 mm × 23.0 mm
TDA2SGABC	FCBGA (760)	23.0 mm × 23.0 mm
TDA2SAABC	FCBGA (760)	23.0 mm × 23.0 mm
TDA2HGABC	FCBGA (760)	23.0 mm × 23.0 mm
TDA2HVABC	FCBGA (760)	23.0 mm × 23.0 mm
TDA2HFABC	FCBGA (760)	23.0 mm × 23.0 mm
TDA2LFABC	FCBGA (760)	23.0 mm × 23.0 mm
TDA2Px	FCBGA (760)	23.0 mm × 23.0 mm
TDA2EGABC	FCBGA (760)	23.0 mm × 23.0 mm



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REA PN-97255

D-U-N-S® 51-724-9350
T + 39 0434 421 111
F + 39 0434 639 021

→smh-tech.com
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TDA3x SoC for Advanced Driver Assistance Systems (ADAS)

TI's TDA3x System-on-Chip (SoC) is a highly optimized and scalable family of devices designed to meet the requirements of leading Advanced Driver Assistance Systems (ADAS).
The TDA3x family enables broad ADAS applications in automobiles by integrating an optimal mix of performance, low power, smaller form factor and ADAS vision analytics processing that aims to facilitate a more autonomous and collision free driving experience.

The TDA3x SoC enables sophisticated embedded vision technology in today's automobile by enabling the industry's broadest range of ADAS applications including front camera, rear camera, surround view, radar, and fusion on a single architecture.

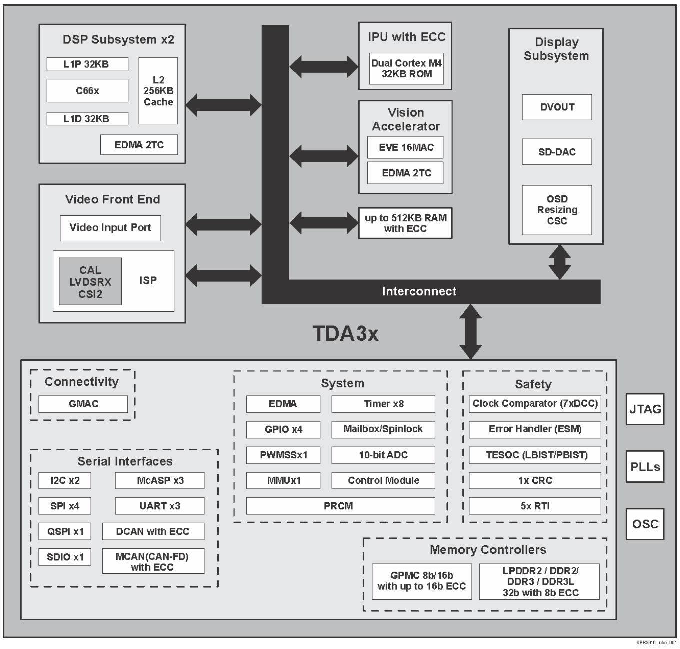
The TDA3x SoC incorporates a heterogeneous, scalable architecture that includes a mix of Texas Instruments (TI)'s fixed and floating-point TMS320C66x digital signal processor (DSP) generation cores, Vision Acceleration Pac (EVE), and dual-Cortex-M4 processors.

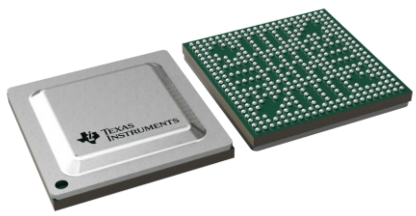
The device allows low power profile in different package options (including Package-On-Package) to enable small form factor designs. TDA3x SoC also integrates a host of peripherals including multi-camera interfaces (both parallel and serial) for LVDS-based surround view systems, displays, CAN and GigB Ethernet AVB.

The Vision Acceleration Pac for this family of products includes embedded vision engine (EVE) offloading the vision analytics functionality from the application processor while also reducing the power footprint.
The Vision Acceleration Pac is optimized for vision processing with a 32-bit RISC core for efficient program execution and a vector coprocessor for specialized vision processing.

Additionally, TI provides a complete set of development tools for the Arm, DSP, and EVE coprocessor, including C compilers, a DSP assembly optimizer to simplify programming and scheduling, and a debugging interface for visibility into source code execution.
The TDA3x ADAS processor is qualified according to AEC-Q100 standard.

PART NUMBER	PACKAGE	BODY SIZE
TDA3LAxABFQ1	FCBGA (367)	15.0 mm x 15.0 mm
TDA3MVxABFQ1	FCBGA (367)	15.0 mm x 15.0 mm
TDA3MAxABFQ1	FCBGA (367)	15.0 mm x 15.0 mm
TDA3MDxABFQ1	FCBGA (367)	15.0 mm x 15.0 mm
TDA3LXxABFQ1	FCBGA (367)	15.0 mm x 15.0 mm





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HQ and Registered Office
Via Giovanni Agnelli 1
33083 Villotta di Chions (PN) Italy
Società Unipersonale

Capitale sociale €102.040
P.I. 01697470936
C.F. 01697470936
REA PN-97255

D-U-N-S® 51-724-9350
T + 39 0434 421 111
F + 39 0434 639 021

→smh-tech.com
info@smh-tech.com

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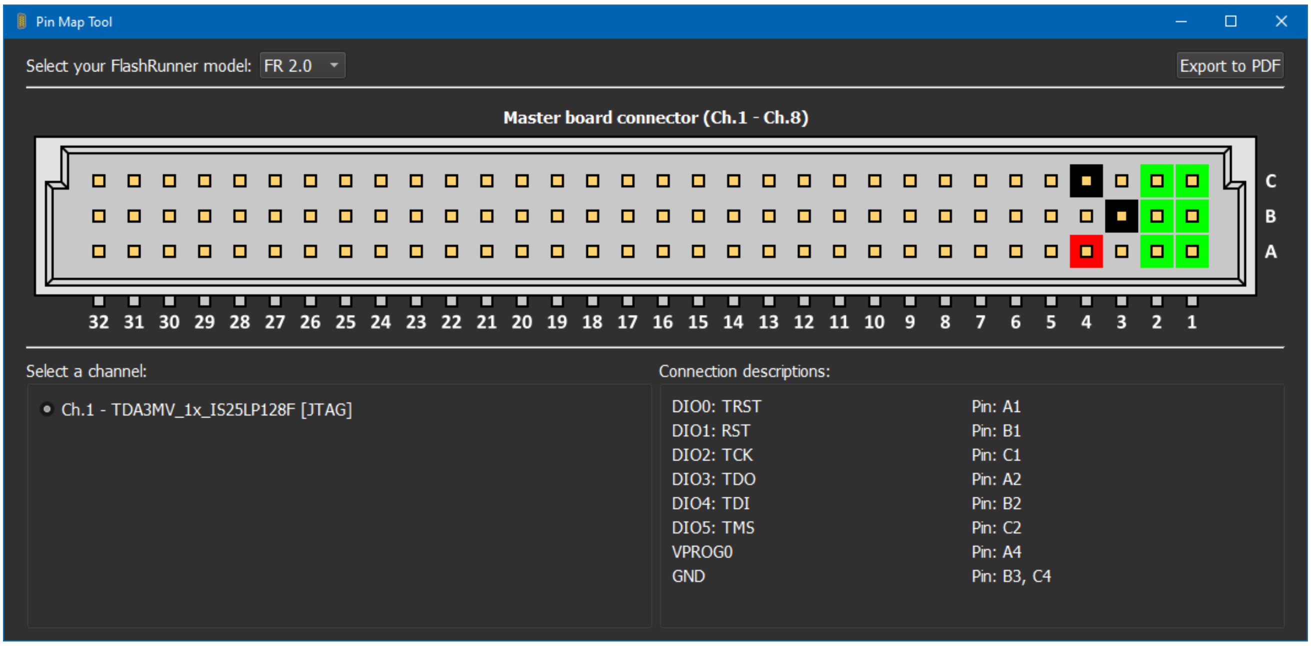
TEXAS INSTRUMENTS TDA Protocol and PIN map

TDA2 and **TDA3** devices support the JTAG protocol.

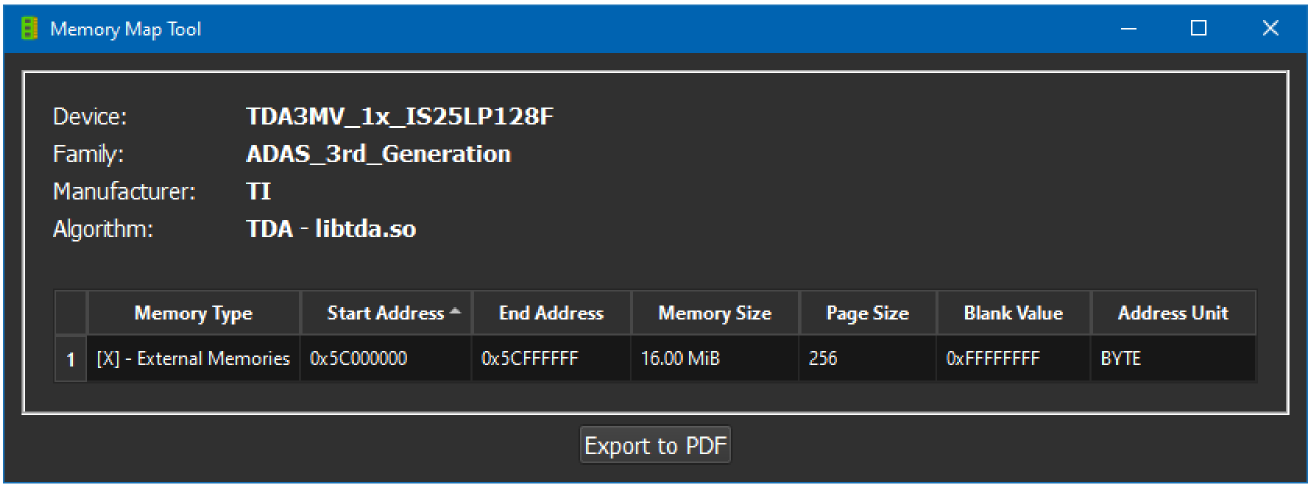
`#TCSETPAR CMODE <JTAG>`

TEXAS INSTRUMENTS TDA PIN MAP



TEXAS INSTRUMENTS TDA Memory Map

Memory Type	Start Address	End Address	Memory Size	Page Size	Blank Value	Address Unit
[X] – External Memories	0x5C000000	0x5CFFFFFF	16.00 MiB	256	0xFFFFFFFF	BYTE



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Via Giovanni Agnelli 1
33083 Villotta di Chions (PN) Italy
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TEXAS INSTRUMENTS TDA Driver Parameters

The standard parameters are used to configure some specific options inside TDA driver.

#TCSETPAR ENTRY_CLOCK

Syntax: `#TCSETPAR ENTRY_CLOCK` <Frequency>

<Frequency> Accepted parameters 4000000, 2000000, 1000000, 500000, 100000 Hz

Description: Set the JTAG frequency used in the Connect procedure before raising the PLL of the device, if the device PLL is available

Note: Default value 4.00 MHz

#TCSETPAR QSPI_PROTOCOL

Syntax: `#TCSETPAR QSPI_PROTOCOL` <Value>

<Value> Accepted values are SPI and QUAD-SPI

Description: Use this parameter to set the protocol used to communicate with the external memory connected to TDA3xx device

The TDA3xx device doesn't support the 4-4-4 QPI mode, so when you set the QUAD-SPI mode, 1-1-4 mode is used for reading from external memory and 1-1-1 for writing into external memory

In fact, the TDA3x device does not allow you to use writing in 1-1-4 or 4-4-4

- 1-1-1 means one line for command, one for address, and one for data
- 1-1-4 means one line for command, one for address, and four for data
- 4-4-4 means four lines for command, four for address and four for data

The TDA3xx device doesn't support the DTR - DDR mode (Double Transfer/Data Rate)

Note: Default value SPI

#TCSETPAR QSPI_FREQUENCY

Syntax: `#TCSETPAR QSPI_FREQUENCY` <Value [MHz]>

<Value [MHz]> Accepted values are 12, 16, 24, 32, 48, 64, 77, 96 and 128 MHz

Description: Use this parameter to set the frequency of SPI - QUAD-SPI used to communicate with the external memory connected to TDA3xx device

Note: Default value 128 MHz

#TCSETPAR QSPI_CHIP_SELECT

Syntax: `#TCSETPAR QSPI_CHIP_SELECT` <Value>

<Value> Accepted values are 0, 1, 2 and 3

Description: Use this parameter to select which chip select you want to use
The TDA3xx device has 4 chips select available, so the accepted values of this parameter are 0, 1, 2 and 3

Note: Default value 0

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Via Giovanni Agnelli 1
33083 Villotta di Chions (PN) Italy
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C.F. 01697470936
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D-U-N-S® 51-724-9350
T + 39 0434 421 111
F + 39 0434 639 021

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#TCSETPAR SAMPLING_POINT

Syntax: `#TCSETPAR SAMPLING_POINT <Value>`

<Value> Accepted values are in the range 1-15

Description: Use this parameter to permanently set the sampling point of the FPGA
It is recommended to leave this parameter with the default value

Note: Default value 17

TEXAS INSTRUMENTS TDA Driver Commands

Here you can find the complete list of all available commands for TDA driver.

```
Memory type:

X → External memory
```

#TPCMD CONNECT

`#TPCMD CONNECT`

This function performs the entry and is the first command to be executed when starting the communication with the device.

```
---#TPCMD CONNECT
Protocol selected JTAG.
Entry Clock is 4.00 MHz.
Trying Hot Plug connect procedure.
> Trying to read from ICEPick Module the ID-Code.
 * ICEPick rev.D device ID-Code: 0x3BB4C02F.
 * Designer: 0x017, Part Number: 0xBB4C, Version: 0x3.
> Trying to read from ICEPick Module the ICEPick Code.
 * ICEPick Code: 0x10321AD6.
 * Major version: 0x1, Minor version: 0x0.
 * Test only taps: 0x3, Emulation taps: 0x2.
 * ICEPick type: 0x1AD, Capabilities: 0x6.
> Connecting TAP n.4 Cortex M4 core to ICEPick TAP.
 * Cortex M4 IDCODE: 0x4BA00477.
 * Designer: 0x23B, Part Number: 0xBA00, Version: 0x4.
 * ID-Code read correctly at 4.00 MHz.
 * JTAG Debug Port enabled.
> Scanning AP map to find all APs.
 * AP[0] IDR: 0x24770011, Type: AMBA AHB3 bus.
 * AP[0] ROM table base address 0xE00FF000.
> Trying to connect to Arm Cortex M4 core.
 * CPUID: 0x410FC241.
 * Implementer Code: 0x41 - [ARM].
 * Found Cortex M4 revision r0p1.
 * Cortex M4 Core halted [0.002 s].
> Trying to use the JTAG frequency inserted by user.
 * Requested Clock is 25.00 MHz.
 * Generated Clock is 25.00 MHz.
 * ID-Code read correctly at 25.00 MHz.
> TDA3xx Cortex M4 Startup Sequence In Progress.
 * TDA3xx GP Device detected.
 * ID-Code 0x3BB4C02F TDA3x SR2.0A revision 3.
 * Found device TDA3MV-FD.
 * Package 15x15 FCBGA Lidded, Ball pitch 0.65mm, 367 pins.
> Unlock all Control module lock registers.
 * All Control module lock registers unlocked.
> Changing RTI1 reaction type to avoid RTI1 resetting the device.
 * Completed change RTI1 reaction type.
Time for Connect: 0.133 s.
>|
```


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Via Giovanni Agnelli 1
33083 Villotta di Chions (PN) Italy
Società Unipersonale
Capitale sociale €102.040
P.I. 01697470936
C.F. 01697470936
REA PN-97255
D-U-N-S® 51-724-9350
T + 39 0434 421 111
F + 39 0434 639 021
→smh-tech.com
info@smh-tech.com

#TPCMD MASSERASE

```
#TPCMD MASSERASE <X>
```

Use this command to erase the entire external memory.

#TPCMD ERASE

```
#TPCMD ERASE <X> <4KB>
#TPCMD ERASE <X> <4KB> <start address> <size>
#TPCMD ERASE <X> <32KB>
#TPCMD ERASE <X> <32KB> <start address> <size>
#TPCMD ERASE <X> <64KB>
#TPCMD ERASE <X> <64KB> <start address> <size>
```

Erase external memory with Page/Sector/Block erase.
With this command, a Page/Sector/Block Erase of the external memory will be performed.
Typically running the Page/Sector/Block Erase of the external Flash memory takes much longer than running the Masserase command.
Enter the Start Address and Size in hexadecimal format.

#TPCMD BLANKCHECK

```
#TPCMD BLANKCHECK <X>
#TPCMD BLANKCHECK <X> <CRC64>
#TPCMD BLANKCHECK <X> <start address> <size>
#TPCMD BLANKCHECK <X> <start address> <size> <CRC64>
```

Verify if selected part of an external memory is erased.
The two commands with CRC64 are available only for memories that support CRC64 such as MICRON memories.
Enter the Start Address and Size in hexadecimal format.

#TPCMD PROGRAM

```
#TPCMD PROGRAM <X>
#TPCMD PROGRAM <X> <start address> <size>
```

Program selected part of an external memory.
Enter the Start Address and Size in hexadecimal format.

#TPCMD VERIFY

```
#TPCMD VERIFY <X> <R>
#TPCMD VERIFY <X> <R> <start address> <size>
```

R: Readout Mode.
Verify selected part of an external memory with readout method.
Enter the Start Address and Size in hexadecimal format.

```
#TPCMD VERIFY <X> <S>
#TPCMD VERIFY <X> <S> <CRC64>
#TPCMD VERIFY <X> <S> <start address> <size>
#TPCMD VERIFY <X> <S> <start address> <size> <CRC64>
```

S: Checksum 32 Bit Mode.
Verify selected part of an external memory through Checksum 32Bit or CRC64 method.
The two commands with CRC64 are available only for memories that support CRC64 such as MICRON memories.
Enter the Start Address and Size in hexadecimal format.

#TPCMD READ

```
#TPCMD READ <X>
```


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33083 Villotta di Chions (PN) Italy
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C.F. 01697470936
REA PN-97255

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`#TPCMD READ <X> <start address> <size>`

Read selected part of external memory.
The result of the read command will be visible into the Terminal.
Enter the Start Address and Size in hexadecimal format.

#TPCMD DUMP

`#TPCMD DUMP <X>`
`#TPCMD DUMP <X> <start address> <size>`

Dump selected part of external memory.
The result of the dump command will be stored in the FlashRunner 2.0 internal memory.
Enter the Start Address and Size in hexadecimal format.

#TPCMD CALC_FRB_CRC64

Syntax: `#TPCMD CALC_FRB_CRC64`

Prerequisites: This command can be used without `#TPCMD CONNECT`

Description: Calculate the CRC64 used for Blankcheck CRC64 and Verify X S CRC64 based on FRB contents

Examples: Correct command execution: 😊

```
---#TPSETSRC 16MB.frb
>|
---#TPCMD CALC_FRB_CRC64
Verify CRC64 is available only for MICRON memories.
Use the following commands to verify the content of the whole memory:
> Blankcheck:
 * #TPCMD BLANKCHECK X 0xB171A45E88C175B7
 * #TPCMD BLANKCHECK X 0x5C000000 0x01000000 0xB171A45E88C175B7
> Verify checksum:
 * #TPCMD VERIFY X S 0x49757BE6D34FADC9
 * #TPCMD VERIFY X S 0x5C000000 0x01000000 0x49757BE6D34FADC9
Time for Calculate CRC64: 0.515 s.
>|
```

#TPCMD GET_MEMORY_ID

Syntax: `#TPCMD GET_MEMORY_ID`

Prerequisites: none

Description: Read the external memory ID and print it into Real Time Log and Terminal.

Note: This command is available from driver version **4.01**

Examples: Correct command execution: 😊

```
---#TPCMD GET_MEMORY_ID
Trying to execute kernel into OCMC RAM.
> Kernel init sequence completed.
Configured Chip Select n.0.
Initialize QSPI peripheral frequency.
> QSPI peripheral frequency is 128 MHz.
Initialize QSPI GPIO pins.
> QSPI GPIO pins are initialized.
Configure QSPI peripheral.
> Configured QSPI peripheral.
External Memory enter Direct Mode.
> Enter Direct Mode completed.
Read and check external memory.
 * QSPI Chip Select 0: Memory ID: 0x18BA20.
Time for Get Memory ID: 0.271 s.
```


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33083 Villotta di Chions (PN) Italy
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C.F. 01697470936
REA PN-97255

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#TPCMD RUN

Syntax: `#TPCMD RUN <Time [s]>`

<Time [s]> Time in seconds (i.e., 2 s). This time is an optional parameter.

Prerequisites: none

Description: Move the Reset line up and down quickly if no parameter <Time [s]> is inserted.
`#TPCMD RUN <Time [s]>` instead moves the Reset line down, waits for the entered time and then sets the Reset line high.
This command typically can be used to execute the firmware programmed in the device.

#TPCMD GET_ID_CODE

Syntax: `#TPCMD GET_ID_CODE`

Prerequisites: none

Description: Get the TDA device ID Code

Note: This command prints into Terminal and Real Time Log
This command is available from driver version **5.02**

Examples: Correct command execution: 😊

Real Time Log:

```
---#TPCMD GET_ID_CODE
Device Id Code: 0x3BB4C02F.
 * Revision number: 0x3.
 * Ramp system number: 0xBB4C.
 * Manufacturer identity (TI): 0x17.
 * Always set to 1: 0x1.
Time for Get ID Code: 0.002 s.
```

Terminal:

```
Device Id Code: 0x3BB4C02F
```

#TPCMD GET_DIE_ID

Syntax: `#TPCMD GET_DIE_ID`

Prerequisites: none

Description: Get the TDA device DIE ID

Note: This command prints into Terminal and Real Time Log
This command is available from driver version **5.02**

Examples: Correct command execution: 😊

Real Time Log:

```
---#TPCMD GET_DIE_ID
Device DIE ID 0: 0x1202A00F.
Device DIE ID 1: 0x0D5AB3DF.
Device DIE ID 2: 0x94954209.
Device DIE ID 3: 0x43A40003.
Time for Get Die ID: 0.002 s.
```

Terminal:

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```
Device DIE ID 0: 0x1202A00F
Device DIE ID 1: 0x0D5AB3DF
Device DIE ID 2: 0x94954209
Device DIE ID 3: 0x43A40003
```

#TPCMD GET_PROD_ID

Syntax: `#TPCMD GET_PROD_ID`

Prerequisites: none

Description: Get the TDA device Prod ID

Note: This command prints into Terminal and Real Time Log
This command is available from driver version **5.02**

Examples: Correct command execution: 😊

Real Time Log:

```
---#TPCMD GET_PROD_ID
Device Prod ID: 0x2ED30CF0.
Time for Get Prod ID: 0.001 s.
```

Terminal:

```
Device Prod ID: 0x2ED30CF0
```

#TPCMD GET_DEVICE_TYPE

Syntax: `#TPCMD GET_DEVICE_TYPE`

Prerequisites: none

Description: Get the TDA device Type

Note: This command prints into Terminal and Real Time Log
This command is available from driver version **5.02**

Examples: Correct command execution: 😊

Real Time Log:

```
---#TPCMD GET_DEVICE_TYPE
Device Type: 0x000000F8.
Time for Get Device Type: 0.001 s.
```

Terminal:

```
Device Type: 0x000000F8
```

#TPCMD READ_MEM8

Syntax: `#TPCMD READ_MEM8` <Address> <Byte Count>

<Address>	Address in HEX format (i.e., 0x52002020)
<Byte Count>	Byte count in decimal format (i.e., 8 -> eight bytes)

Prerequisites: none

Description: Read memory byte per byte from target TDA device

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Note: This command prints into Terminal and Real Time Log

Examples: Correct command execution: 😊

```
---#TPCMD READ_MEM8 0x52002020 8
Read[0x52002020]: 0xF0
Read[0x52002021]: 0xAA
Read[0x52002022]: 0x16
Read[0x52002023]: 0x14
Read[0x52002024]: 0x00
Read[0x52002025]: 0x00
Read[0x52002026]: 0x00
Read[0x52002027]: 0x00
Time for Read Mem: 0.002 s
```

#TPCMD READ_MEM16

Syntax: #TPCMD READ_MEM16 <Address> <16-bit Word Count>

<Address> Address in HEX format (i.e., 0x52002020)
<16-bit Word Count> 16-bit Word count in decimal format (i.e., 4 -> four 16-bit words)

Prerequisites: none

Description: Read memory 16-bit word per 16-bit word from target TDA device

Note: This command prints into Terminal and Real Time Log

Examples: Correct command execution: 😊

```
---#TPCMD READ_MEM16 0x52002020 4
Read[0x52002020]: 0xAAF0
Read[0x52002022]: 0x1416
Read[0x52002024]: 0x0000
Read[0x52002026]: 0x0000
Time for Read Mem: 0.002 s
```

#TPCMD READ_MEM32

Syntax: #TPCMD READ_MEM32 <Address> <32-bit Word Count>

<Address> Address in HEX format (i.e., 0x52002020)
<32-bit Word Count> 32-bit Word count in decimal format (i.e., 2 -> two 32-bit words)

Prerequisites: none

Description: Read memory 32-bit word per 32-bit word from target TDA device

Note: This command prints into Terminal and Real Time Log

Examples: Correct command execution: 😊

```
---#TPCMD READ_MEM32 0x52002020 2
Read[0x52002020]: 0x1416AAF0
Read[0x52002024]: 0x00000000
Time for Read Mem: 0.002 s
```

#TPCMD DISCONNECT

#TPCMD DISCONNECT

Disconnect function. Power off and exit.

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TEXAS INSTRUMENTS TDA Driver Examples

Here you can see a complete example of TEXAS INSTRUMENTS TDA3 projects.

1 – TEXAS INSTRUMENTS TDA3 example 16MB Commands

TDA3MV_1x_IS25LP128F

```
#TCSETPAR ENTRY_CLOCK 4000000
#TCSETPAR PROTCLK 37500000
#TCSETPAR PWDOWN 100
#TCSETPAR PWUP 100
#TCSETPAR QSPI_CHIP_SELECT 0
#TCSETPAR QSPI_FREQUENCY 128MHz
#TCSETPAR QSPI_PROTOCOL QUAD-SPI
#TCSETPAR RSTDOWN 100
#TCSETPAR RSTDRV OPENDRAIN
#TCSETPAR RSTUP 100
#TCSETPAR VPROG0 3300
#TCSETPAR CMODE JTAG
#TPSETSRC WholeMemory.frb
#TPSTART
#TPCMD CONNECT
#IFERR TPCMD BLANKCHECK X
#THEN TPCMD MASSERASE X
#THEN TPCMD BLANKCHECK X
#TPCMD PROGRAM X
#TPCMD VERIFY X R
#TPCMD VERIFY X S
#TPCMD DISCONNECT
#TPEND
```

1 – TEXAS INSTRUMENTS TDA3 example 16MB Real Time Log

```
---#TPCMD CONNECT
Protocol selected JTAG.
Entry Clock is 4.00 MHz.
Trying Hot Plug connect procedure.
> Trying to read from ICEPick Module the ID-Code.
 * ICEPick rev.D device ID-Code: 0x3BB4C02F.
 * Designer: 0x017, Part Number: 0xBB4C, Version: 0x3.
> Trying to read from ICEPick Module the ICEPick Code.
 * ICEPick Code: 0x10321AD6.
 * Major version: 0x1, Minor version: 0x0.
 * Test only taps: 0x3, Emulation taps: 0x2.
 * ICEPick type: 0x1AD, Capabilities: 0x6.
> Connecting TAP n.4 Cortex M4 core to ICEPick TAP.
 * Cortex M4 IDCODE: 0x4BA00477.
 * Designer: 0x23B, Part Number: 0xBA00, Version: 0x4.
 * ID-Code read correctly at 4.00 MHz.
 * JTAG Debug Port enabled.
> Scanning AP map to find all APs.
 * AP[0] IDR: 0x24770011, Type: AMBA AHB3 bus.
 * AP[0] ROM table base address 0xE00FF000.
> Trying to connect to Arm Cortex M4 core.
 * CPUID: 0x410FC241.
 * Implementer Code: 0x41 - [ARM].
 * Found Cortex M4 revision r0p1.
 * Cortex M4 Core halted [0.002 s].
> Trying to use the JTAG frequency inserted by user.
 * Requested Clock is 25.00 MHz.
 * Generated Clock is 25.00 MHz.
 * ID-Code read correctly at 25.00 MHz.
> TDA3xx Cortex M4 Startup Sequence In Progress.
 * TDA3xx GP Device detected.
 * ID-Code 0x3BB4C02F TDA3x SR2.0A revision 3.
 * Found device TDA3MV-FD.
 * Package 15x15 FCBGA Lidded, Ball pitch 0.65mm, 367 pins.
> Unlock all Control module lock registers.
 * All Control module lock registers unlocked.
> Changing RTI1 reaction type to avoid RTI1 resetting the device.
```

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HQ and Registered Office
Via Giovanni Agnelli 1
33083 Villotta di Chions (PN) Italy
Società Unipersonale
Capitale sociale €102.040
P.I. 01697470936
C.F. 01697470936
REA PN-97255
D-U-N-S® 51-724-9350
T + 39 0434 421 111
F + 39 0434 639 021
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info@smh-tech.com

```
 * Completed change RTI1 reaction type.
Time for Connect: 0.133 s.
>|
---#IFERR TPCMD BLANKCHECK X
Trying to execute kernel into OCMC RAM.
> Kernel init sequence completed.
Configured Chip Select n.0.
Initialize QSPI peripheral frequency.
> QSPI peripheral frequency is 128 MHz.
Initialize QSPI GPIO pins.
> QSPI GPIO pins are initialized.
Configure QSPI peripheral.
> Configured QSPI peripheral.
External Memory enter Direct Mode.
> Enter Direct Mode completed.
Read and check external memory.
 * QSPI Chip Select 0: Memory ID: Expected 0x18609D - Read 0x18609D.
 * QSPI Chip Select 0: Status register 0x40.
 * Clean memory status register.
 * QSPI Chip Select 0: Status register 0x00.
 * QSPI Chip Select 0: SFDP table supported.
 * QSPI Chip Select 0: Flash size check passed: 16MiB.
> Completed read and check external memory.
Configure external memory.
 * Switching from SPI to QUAD-SPI protocol.
 * Set eight dummy cycles.
 * Use 3-Byte address mode operation.
> External memory configured.
Execute selected command...
External Memory is in Direct Mode.
Time for Blankcheck X: 2.446 s.
>|
---#TPCMD PROGRAM X
External Memory is in Direct Mode.
Time for Program X: 16.363 s.
>|
---#TPCMD VERIFY X R
External Memory is in Direct Mode.
Time for Verify Readout X: 6.790 s.
>|
---#TPCMD VERIFY X S
External Memory is in Direct Mode.
Time for Verify Checksum 32bit X: 2.543 s.
>|
---#TPCMD DISCONNECT
>|
```

1 – TEXAS INSTRUMENTS TDA3 example 16MB Programming Times

Operation	Timings FlashRunner 2.0
Time for Connect	0.133 s
Conditional Blankcheck External Flash	2.446 s
Program External Flash	16.363 s
Verify Readout External Flash	6.790 s
Verify Checksum External Flash	2.543 s
Cycle Time	**00:28.370 s**

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Società Unipersonale
Capitale sociale €102.040
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C.F. 01697470936
REA PN-97255
D-U-N-S® 51-724-9350
T + 39 0434 421 111
F + 39 0434 639 021
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info@smh-tech.com

2 – TEXAS INSTRUMENTS TDA3 example 16MB Commands

TDA3MV_1x_MT25QL128

```
---#TPSETSRC 16MB.frb
>|
---#TPCMD CALC_FRB_CRC64
Verify CRC64 is available only for MICRON memories.
Use the following commands to verify the content of the whole memory:
> Blankcheck:
 * #TPCMD BLANKCHECK X 0xB171A45E88C175B7
 * #TPCMD BLANKCHECK X 0x5C000000 0x01000000 0xB171A45E88C175B7
> Verify checksum:
 * #TPCMD VERIFY X S 0x49757BE6D34FADC9
 * #TPCMD VERIFY X S 0x5C000000 0x01000000 0x49757BE6D34FADC9
Time for Calculate CRC64: 0.515 s.
>|
```

```
#TCSETPAR ENTRY_CLOCK 4000000
#TCSETPAR PROTCLK 37500000
#TCSETPAR PWDOWN 100
#TCSETPAR PWUP 100
#TCSETPAR QSPI_CHIP_SELECT 0
#TCSETPAR QSPI_FREQUENCY 128MHz
#TCSETPAR QSPI_PROTOCOL QUAD-SPI
#TCSETPAR RSTDOWN 100
#TCSETPAR RSTDRV OPENDRAIN
#TCSETPAR RSTUP 100
#TCSETPAR VPROG0 3300
#TCSETPAR CMODE JTAG
#TPSETSRC SampleCode_ECUG2_WholeMemory.frb
#TPSTART
#TPCMD CONNECT
#TPCMD BLANKCHECK X 0xB171A45E88C175B7
#TPCMD PROGRAM X
#TPCMD VERIFY X S 0x49757BE6D34FADC9
#TPCMD DISCONNECT
#TPEND
```

2 – TEXAS INSTRUMENTS TDA3 example 16MB Real Time Log

```
---#TPCMD CONNECT
Protocol selected JTAG.
Entry Clock is 4.00 MHz.
Trying Hot Plug connect procedure.
> Trying to read from ICEPick Module the ID-Code.
 * ICEPick rev.D device ID-Code: 0x3BB4C02F.
 * Designer: 0x017, Part Number: 0xBB4C, Version: 0x3.
> Trying to read from ICEPick Module the ICEPick Code.
 * ICEPick Code: 0x10321AD6.
 * Major version: 0x1, Minor version: 0x0.
 * Test only taps: 0x3, Emulation taps: 0x2.
 * ICEPick type: 0x1AD, Capabilities: 0x6.
> Connecting TAP n.4 Cortex M4 core to ICEPick TAP.
 * Cortex M4 IDCODE: 0x4BA00477.
 * Designer: 0x23B, Part Number: 0xBA00, Version: 0x4.
 * ID-Code read correctly at 4.00 MHz.
 * JTAG Debug Port enabled.
> Scanning AP map to find all APs.
 * AP[0] IDR: 0x24770011, Type: AMBA AHB3 bus.
 * AP[0] ROM table base address 0xE00FF000.
> Trying to connect to Arm Cortex M4 core.
 * CPUID: 0x410FC241.
 * Implementer Code: 0x41 - [ARM].
 * Found Cortex M4 revision r0p1.
 * Cortex M4 Core halted [0.002 s].
> Trying to use the JTAG frequency inserted by user.
 * Requested Clock is 25.00 MHz.
 * Generated Clock is 25.00 MHz.
 * ID-Code read correctly at 25.00 MHz.
> TDA3xx Cortex M4 Startup Sequence In Progress.
 * TDA3xx GP Device detected.
```


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Via Giovanni Agnelli 1
33083 Villotta di Chions (PN) Italy
Società Unipersonale

Capitale sociale €102.040
P.I. 01697470936
C.F. 01697470936
REA PN-97255

D-U-N-S® 51-724-9350
T + 39 0434 421 111
F + 39 0434 639 021

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```
 * ID-Code 0x3BB4C02F TDA3x SR2.0A revision 3.
 * Found device TDA3MV-FD.
 * Package 15x15 FCBGA Lidded, Ball pitch 0.65mm, 367 pins.
> Unlock all Control module lock registers.
 * All Control module lock registers unlocked.
> Changing RTI1 reaction type to avoid RTI1 resetting the device.
 * Completed change RTI1 reaction type.
Time for Connect: 0.133 s.
>|
---#TPCMD BLANKCHECK X 0xB171A45E88C175B7
Trying to execute kernel into OCMC RAM.
> Kernel init sequence completed.
Configured Chip Select n.0.
Initialize QSPI peripheral frequency.
> QSPI peripheral frequency is 128 MHz.
Initialize QSPI GPIO pins.
> QSPI GPIO pins are initialized.
Configure QSPI peripheral.
> Configured QSPI peripheral.
External Memory enter Direct Mode.
> Enter Direct Mode completed.
Read and check external memory.
 * QSPI Chip Select 0: Memory ID: Expected 0x18BA20 - Read 0x18BA20.
 * QSPI Chip Select 0: Status register 0x00.
 * QSPI Chip Select 0: SFDP table supported.
 * QSPI Chip Select 0: Flash size check passed: 16MiB.
> Completed read and check external memory.
Configure external memory.
 * Switching from SPI to QUAD-SPI protocol.
 * Set eight dummy cycles.
 * Use 3-Byte address mode operation.
> External memory configured.
Execute selected command...
External Memory is in Direct Mode.
Time for Blankcheck CRC64 X: 0.434 s.
>|
---#TPCMD PROGRAM X
External Memory is in Direct Mode.
Time for Program X: 11.792 s.
>|
---#TPCMD VERIFY X S 0x49757BE6D34FADC9
External Memory is in Direct Mode.
Time for Verify CRC64 X: 0.425 s.
>|
---#TPCMD DISCONNECT
>|
```

2 – TEXAS INSTRUMENTS TDA3 example 16MB Programming Times

Operation	Timings FlashRunner 2.0
Time for Connect	0.133 s
Conditional Blankcheck External Flash	2.446 s
Program External Flash	16.363 s
Verify Readout External Flash	6.790 s
Verify Checksum External Flash	2.543 s
Cycle Time	**00:12.837 s**

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C.F. 01697470936
REA PN-97255

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T + 39 0434 421 111
F + 39 0434 639 021

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TEXAS INSTRUMENTS TDA Driver Changelog

Info about driver version 4.00 - 31/03/2022
Supported TDA3x System-on-Chip (SoC) of Texas Instruments processors.
Supported MICRON memories programming via TDA3x device.

Info about driver version 4.01 - 22/04/2022
Supported ISSI memories programming via TDA3x device.
Added #TPCMD READ_MEMORY_ID to get the Device ID of an external memory through TDA3xx device.

Info about driver version 4.02 - 16/06/2022
Print current FPGA version loaded into TPSTART command.
Upgraded internal code to align all drivers.

Info about driver version 4.03 - 29/06/2022
Connection procedure updated to correctly manage TDA3 boot when valid firmware is present into the external memory connected to the device.

Info about driver version 5.00 - 27/07/2022
Added FPGA for new FlashRunner 2.0 models.

Info about driver version 5.01 - 13/09/2023
Internal driver upgrade.

Info about driver version 5.02 - 15/03/2024
Supported TDA2x System-on-Chip (SoC) of Texas Instruments processors.
Added new commands for all TDA devices:

- `#TPCMD GET_ID_CODE`
- `#TPCMD GET_DIE_ID`
- `#TPCMD GET_PROD_ID`
- `#TPCMD GET_DEVICE_TYPE`

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C.F. 01697470936
REA PN-97255

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T + 39 0434 421 111
F + 39 0434 639 021

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