MT793X IoT SDK for Boots User Manual

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Version History

Version	Date	Author	Description
0.1	2021-03-03	David-YH Cheng	Initial draft
0.2	2021-03-04	David-YH Cheng	
1.0	2021-03-05	David-YH Cheng	First official release
1.1	2021-04-06	David-YH Cheng	Second Internal release
1.2	2021-04-14	David-YH Cheng	Third Internal Release 1. Remove pa, duplex, palna, setxo, getxo and trimxo. 2. Add note for txpwoffset 3. Modify description of txtone
2.0	2021-04-22	David-YH Cheng	1. Second Official Release 2. Support efuse read/write command
2.1	2022-07-10	Tingyu Lin	1. Add hexadecimal/decimal/binary hints of input value. 2. Add more detail of the inquiry option.
2.2	2022-10-27	David-YH Cheng	1. Move pwcomp to the position before txpow. 2. Modify example and add note for pwcomp. 3. Modify example and add note for txpow. 4. Add initial setup descriptions. 5. Add confidential level label. 6. Add RF Calibration Flow for LE Only FW

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1   What Is Boots

Boots is a tool for Bluetooth chip test. The full name of Boots is the Bluetooth test suite. Boots allows you to perform RF (Radio Frequency) tests such as BT/BLE non-signaling, signaling and direct mode tests.

Boots communicates with Bluetooth chips via the Bluetooth driver. It supports two input types, bringing more flexibility for you. Between DUT (Device Under Test) and PC/NB, Boots can support UART communication interface, reducing the limitation of the platform.

Boots should be able to expedite the development process and improve the verification performance. If you have any feedback, please contact MediaTek's ICB Bluetooth software team.

2 How to Use

You can run Boots by using CLI command with the debug UART port. All of the commands start with 'bt btpriv boots'.

2.1 Initial Setup

Please remember to run the following three commands in sequential order before using the boots commands.

1. Download the Bluetooth firmware from the flash.

   # bt btdrv dlfw

2. Power on Bluetooth.

   # bt btdrv bt_on

3. Setup log level.

   # bt btdrv boots [-l <DEC>]

   # bt btdrv boots [-l <1-4>]

   log level: 1:err 2: warn, 3: info, 4: debug

   EX: bt btdrv boots -l 3

2.2 Raw Data

If you want to input raw data, please follow the command format:

   # bt btpriv boots –r CMD <HEX> <HEX> …

Example: # bt btpriv boots –r CMD 03 0C 00

Note: Boots only supports command raw data (**CMD/cmd**).

2.3 Modular Command

If you use modular command, please follow the usage request and command format:

   # bt btpriv boots –c COMMAND [parameters] [hci interface]

 Note: If you do not indicate the HCI interface, it is sent to hci0

2.3.1 Command List

Use **# bt btpriv boots –c** to show command list.

Use **# bt btpriv boots –c detail** to show all command details.

   reset - HCI Reset

EX: # bt btpriv boots -c reset

inq - Inquiry [-t <DEC>]

Inquiry [-t <X>]

[t] Inquiry timeout. FW will times 1.28 as the final setting.

EX: # bt btpriv boots -c inq -t 5, Actual timeout: 5*1.28 sec

Note : Only supported for DUAL mode.

dut - Enter DUT mode

EX: # bt btpriv boots -c dut

raddr - Read BD address

EX: # bt btpriv boots -c raddr

waddr – Write BD address <HEX:HEX:HEX:HEX:HEX:HEX>

Write BD address <0E:8D:76:68:00:01>

EX: # bt btpriv boots -c waddr 0E:8D:76:68:00:01

pwcomp – Power compensation [-a <BINARY>] [-l <DEC>]

Power compensation [-a <0-1>] [-l <0-3>]

7933(6 groups):

[-g0 <DEC>] [-g1 <DEC>] [-g2 <DEC>] [-g3 <DEC>]

[-g4 <DEC>] [-g5 <DEC>]

[-g0 <-16~16>] [-g1 <-16~16>] [-g2 <-16~16>] [-g3 <-16~16>]

[-g4 <-16~16>] [-g5 <-16~16>]

[a] Antenna index: 0: Antenna0 1: Antenna1

[l] Offset level: 0: LMAX offset   1: LMAX-1 offset

2: LMAX-2 offset 3: LMAX-3 offset

[g] GroupX: Number of groups

EX: # bt btpriv boots -c pwcomp -a 0 -l 0 -g0 6 -g1 5 -g2 4 -g3 3 -g4 2 -g5 1

Note : The parameter value after -l should always 0.

txpow – TX power setting (Unit dbm) [-b <DEC>] [-e <DEC>] [-m <DEC>]

[-n <BINARY>] [-o <BINARY>]

TX power setting (Unit dbm) [-b <-32~12>] [-e <-29~20>] [-m <-32~12>]

[-n <0-1>] [-o <0-1>]

[b] EDR init TX power (Unit: dbm)

[e] BLE TX power (Unit: dbm)

[m] EDR Max TX power (Unit: dbm)

[n] 0 - Default disable Lv9, 1 - enable Lv9

[o] 0 - Default 3db diff, 1 - 0db diff mode to BR/EDR

EX: # bt btpriv boots -c txpow -b 10 -e 10 -m 10 -n 0 -o 0

Note : 1. If tx power is not 20 dbm,

the parameter value for -n should be 0 (disable level 9).

2. Suggest that the parameter value for -m and -b should be the same.

txpwoffset - TX power offset

7933(16 groups) :

[-g0 <DEC>] [-g1 <DEC>] [-g2 <DEC>] [-g3 <DEC>] [-g4 <DEC>]

[-g5 <DEC>] [-g6 <DEC>] [-g7 <DEC>] [-g8 <DEC>] [-g9 <DEC>]

[-g10 <DEC>] [-g11 <DEC>] [-g12 <DEC>] [-g13 <DEC>] [-g14 <DEC>]

[-g15 <DEC>]

[-g0 <-16~8>] [-g1 <-16~8>] [-g2 <-16~8>] [-g3 <-16~8>] [-g4 <-16~8>]

[-g5 <-16~8>] [-g6 <-16~8>] [-g7 <-16~8>] [-g8 <-16~8>] [-g9 <-16~8>]

[-g10 <-16~8>] [-g11 <-16~8>] [-g12 <-16~8>] [-g13 <-16~8>] [-g14 <-16~8>]

[-g15 <-16~8>]

EX: # bt btpriv boots -c txpwoffset g16 -g0 6 –g1 6

Note : Only take effect when Tx Power is 20 dbm

whiten – Set whiten <BINARY>

Set whiten <0:disable/1:enable>

EX: # bt btpriv boots -c whiten 1

Note : Only supported for DUAL mode.

sync – Access Code <HEX:HEX:HEX:HEX:HEX:HEX:HEX:HEX>

Access Code <AA:BB:CC:DD:EE:FF:GG:HH>

EX: # bt btpriv boots -c sync AA:BB:CC:DD:EE:FF:GG:HH

Note : Only supported for DUAL mode.

rft – RF TX test [-p <HEX>] [-c <DEC>] [-t <HEX>] [-l <DEC>] [-o <DEC>]

RF TX test [-p <XX>] [-c <0-78>] [-t <XX>] [-l <XX>] [-o <XX>]

[p] Pattern:

01:0000   02:1111

03:1010   04:Pseudo Random Bit Sequence 9(Default)

09:11110000 0A:Tx single tone

[c] Channel: 0-78, hopping if ignore this

[t] Packet Type:

00:NULL 01:POLL 02:FHS   03:DM1   04:DH1   05:HV1   06:HV2   07:HV3

08:DV   09:AUX   0A:DM3   0B:DH3   0E:DM5   0F:DH5   17:EV3   1C:EV4

1D:EV5   24:2DH1 28:3DH1 2A:2DH3 2B:3DH3 2E:2DH5 2F:3DH5 36:2EV3

37:3EV3 3C:2EV5 3D:3EV5

[l] Length: Decimal value. If ignore this parameter, the default value will be used

[o] Poll Period: Decimal value. Unit: 1.25ms. If ignore 2.5ms is default setting

NOTE: For other parameters command order is RFTX -> Sync / Whiten -> txpow

EX: # bt btpriv boots -c rft -p A -c 78 -t 3D

Note : Only supported for DUAL mode.

rfr – RF RX test/stop [-p <HEX>] [-c <DEC>] [-t <HEX>] [-a <HEX:HEX:HEX:HEX>]

RF RX test/stop [-p <XX>] [-c <0-78>] [-t <XX>] [-a <AA:BB:CC:DD>]

[p] Pattern:

01:0000   02:1111

03:1010   04:Pseudo Random Bit Sequence 9(Default)

09:11110000

[c] Channel: 0-78

[t] Packet Type:

03:DM1   04:DH1   0A:DM3   0B:DH3   0E:DM5   0F:DH5

24:2DH1 28:3DH1 2A:2DH3 2B:3DH3 2E:2DH5 2F:3DH5

[a] Tester Address: AA:BB:CC:DD(Default: 0x00A5F0C3 if ignore it)

EX: # bt btpriv boots -c rfr -p 9 -c 78 -t 2F

Note : Only supported for DUAL mode.

rf_stop - RF TX/RX test stop(Except SignalTone "rft -p a ...", for that need "reset" to stop)

EX: # bt btpriv boots -c rf_stop

Note : Only supported for DUAL mode.

rfr_stop – RF RX test/stop [-p <HEX>] [-c <DEC>] [-t <HEX>] [-a <HEX:HEX:HEX:HEX>]

RF RX test/stop [-p <XX>] [-c <0-78>] [-t <XX>] [-a <AA:BB:CC:DD>]

[p] Pattern:

01:0000   02:1111

03:1010   04:Pseudo Random Bit Sequence 9(Default)

09:11110000

[c] Channel: 0-78

[t] Packet Type:

03:DM1 04:DH1 0A:DM3 0B:DH3 0E:DM5 0F:DH5

24:2DH1 28:3DH1 2A:2DH3 2B:3DH3 2E:2DH5 2F:3DH5

[a] Tester Address: AA:BB:CC:DD(Default: 0x00A5F0C3 if ignore it)

EX: # bt btpriv boots -c rfr_stop -p 9 -c 78 -t 2F

Note : Only supported for DUAL mode.

rfr_result – RF RX test result [-p <HEX>] [-c <DEC>] [-t <HEX>] [-a<HEX:HEX:HEX:HEX>]

RF RX test result [-p <XX>] [-c <0-78>] [-t <XX>] [-a <AA:BB:CC:DD>]

[p] Pattern:

01:0000   02:1111

03:1010   04:Pseudo Random Bit Sequence 9(Default)

09:11110000

[c] Channel: 0-78

[t] Packet Type:

03:DM1 04:DH1 0A:DM3 0B:DH3 0E:DM5 0F:DH5

24:2DH1 28:3DH1 2A:2DH3 2B:3DH3 2E:2DH5 2F:3DH5

[a] Tester Address: AA:BB:CC:DD(Default: 0x00A5F0C3 if ignore it)

EX: # bt btpriv boots -c rfr_result -p 9 -c 78 -t 2F

Note : Only supported for DUAL mode.

ble_tx – BLE TX test [-c <DEC>] [-l <DEC>] [-p <HEX>]

BLE TX test [-c <0-39>] [-l <0-255>] [-p <0-7>]

Can replace this by ble_etx, EX: "*ble_etx –y 1 …*"

[c] Channel: 0-39

[l] Length in bytes of packet: 0-255(**DEC**, Default is 37 if ignore this)

[p] Pattern:

0:PRBS9   1:11110000   2:10101010   3:PRBS15

4:11111111   5:00000000   6:00001111   7:01010101

EX: # bt btpriv boots -c ble_tx -c 39 -p 2

ble_rx – BLE RX test [-c <DEC>]

BLE RX test [-c <0-39>]

EX: # bt btpriv boots -c ble_rx -c 39

ble_etx – BLE Enhanced TX test [-c <DEC>] [-l <DEC>] [-p <DEC>] [-y <DEC>]

BLE Enhanced TX test [-c <0-39>] [-l <0-255>] [-p <0-7>] [-y <1-4>]

[c] Channel: 0-39

[l] Length in bytes of packet: 0-255(**DEC**)

[p] Pattern:

   0:PRBS9   1:11110000   2:10101010   3:PRBS15

   4:11111111   5:00000000   6:00001111   7:01010101

[y] Phy:

   1:LE 1M   2:LE 2M   3:LE Coded(S=8)   4:LE Coded(S=2)

   MT7668 only supports LE-1M and LE-2M

EX: # bt btpriv boots -c ble_etx -c 39 -l 255 -p 7 -y 2

ble_erx – BLE Enhanced RX test [-c <DEC>] [-y <DEC>] [-m <BINARY>]

      BLE Enhanced RX test [-c <0-39>] [-y <1-3>] [-m <0-1>]

[c] Channel: 0-39

[y] Phy: 1:LE 1M   2:LE 2M   3: LE Coded

   LE Coded MT7668/6632 not support

[m] Modulation: 0:Standard 1:Stable

EX: # bt btpriv boots -c ble_erx -c 39 -y 2 -m 0

ble_stop - Stop BLE test

EX: # bt btpriv boots -c ble_stop

txtone – TX tone test [-t <DEC>] [-c <DEC>] [-d <DEC>] [-p <BINARY>]

     TX tone test [-t <0-4>] [-c <0-78>] [-d <0-6>] [-p <0-1>]

[t] Tone Type: 0:SingleTone_DC   1:SingleTone_250K

             2:SignleTone_400K   3:SignleTone_1M

             4:ModulationTone

[c] Channel: 0-78

[d] Modulation: 0:BT BDR 1M   1:BT EDR 2M

              2:BT EDR 3M   3:BLE 1M

              4:BLE 2M   5:BLR 125K

              6:BLR 500K

[p] Pattern: 0:PRBS9   1:PRBS15

EX: # bt btpriv boots -c txtone -t 4 -c 78 -d 3 -p 1

efuse - Read/Write eFuse [-r/w] [-a <HEX>] [-v <HEX>]

     Read/Write eFuse [-r/w] [-a <0-FFFFFFFE>] [-v <0-FFFFFFFE>]

[w] Write: write efuse value

[r] Read: read efuse value

[a] Addr: address of efuse

[v] Value: value of effuse

EX: # bt btpriv boots -c efuse -r -a 1A5F

   # bt btpriv boots -c efuse -w -a 1A5F –v 0

stt – Stress test using "Write Local Name HCI Command" <pkt size 1-248>

EX: # bt btpriv boots -c stt 248

Note : Not supported yet.

lbt – Loopback test using "ACL Packet" <pkt size 1-1021>

EX: # bt btpriv boots -c lbt 255

Note : Not supported yet.

ltt - Loopback test with timer using "ACL Packet" [-t <ms>] [-s <pkt size>]

EX: # bt btpriv boots -c ltt -t 100 -s 255

Note : Not supported yet.

tx_hopping – Set hopping 20 channel : low/middle/high

low:　hopping 2402~2421MHz

middle: hopping 2432~2451MHz

high:　hopping 2461~2480MHz

EX: # bt btpriv boots -c tx_hopping low

pwbdry – Power boundary [-a <BINARY>]

Power boundary [-a <0-1>]

5 boundaries:

[-b0 <DEC>] [-b1 <DEC>] [-b2 <DEC>] [-b3 <DEC>] [-b4 <DEC>]

[-b0 <0-80>] [-b1 <0-79>] [-b2 <0-79>] [-b3 <0-79>] [-b4 <0-79>]

[a] Antenna index: 0: Antenna0, 1: Antenna1

[b] BoundaryX: number of boundaries

EX: # bt btpriv boots -c pwbdry -a 0 -b0 12 -b1 21 -b2 45 -b3 60 -b4 79

a2ploss – Set ANT-to-ChipPin loss [-c a2ploss <BINARY> <DEC>]

Set ANT-to-ChipPin loss [-c a2ploss <ant 0-1> <loss 0-20>]

Note : loss is 0.25dB/step

EX: # bt btpriv boots -c a2ploss 0 18

redrinfo – Read EDR information

EX: # bt btpriv boots -c redrinfo

Note: If you use a command that is not supported by Boots, you will see the log as below.

00-00 00:03:17.092 105 I boots_cmd_set_handler: Command Not Found(abc)

2.3.2 List of Supported Commands

Below is the list of supported commands.

Table 1 Supported Commands

Command	DUAL MODE	BLE ONLY MODE
reset	Supported	Supported
inq	Supported	**Not Supported**
dut	Supported	Supported
raddr	Supported	Supported
waddr	Supported	Supported
txpow	Supported	Supported
txpwoffset	Supported	Supported
whiten	Supported	**Not Supported**
sync	Supported	**Not Supported**
rft	Supported	**Not Supported**
rfr	Supported	**Not Supported**
rf_stop	Supported	**Not Supported**
rfr_stop	Supported	**Not Supported**
rfr_result	Supported	**Not Supported**
ble_tx	Supported	Supported
ble_rx	Supported	Supported
ble_etx	Supported	Supported
ble_erx	Supported	Supported
ble_stop	Supported	Supported
txtone	Supported	Supported
efuse	Supported	Supported
stt	**Not Supported**	**Not Supported**
lbt	**Not Supported**	**Not Supported**
ltt	**Not Supported**	**Not Supported**
tx_hopping	Supported	**Not Supported**
pwcomp	Supported	Supported
pwbdry	Supported	Supported
a2ploss	Supported	Supported
redrinfo	Supported	Supported

2.4 Relay

You can use the command below to enable relay feature with UART1.

 # bt btpriv boots –relay 2 [BAUDRATE]

2.5 Log Level

You can use the command below to change log level.

 # bt btpriv boots [–l \<DEC>]

  bt btpriv boots [–l \<0-4>]

   [l] Log level

      0 : None

      1 : Error

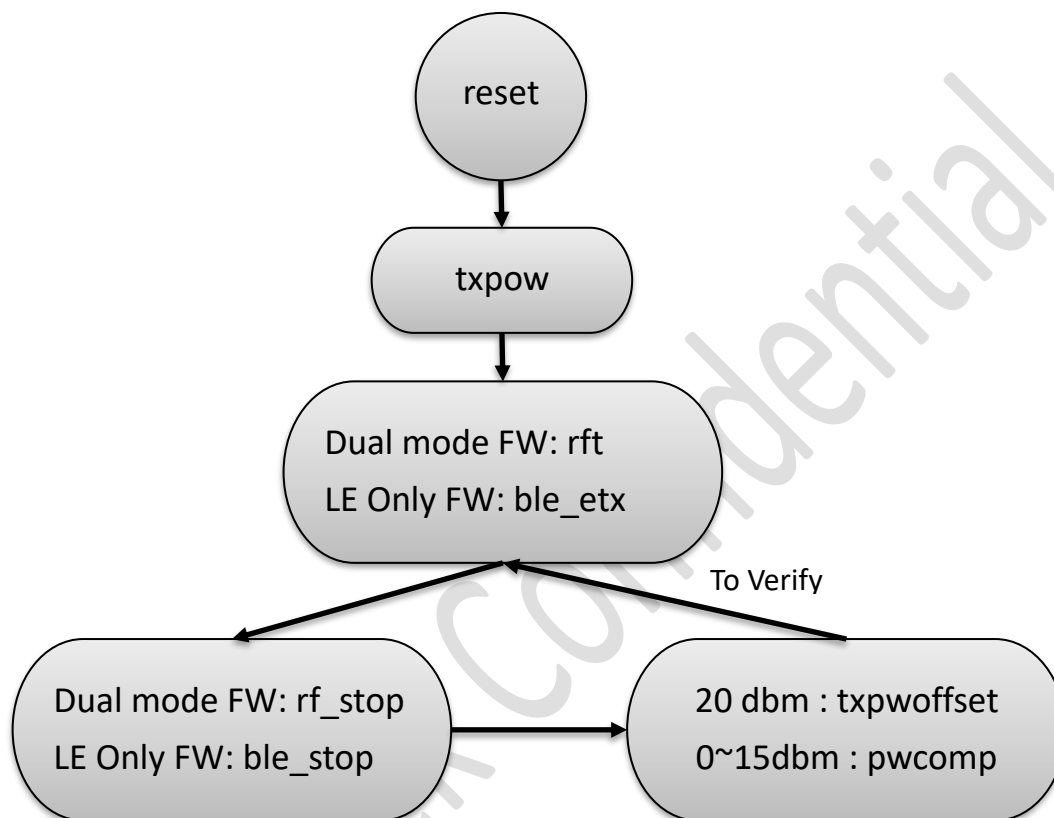   2 : Warning

      3 : Info

      4 : Debug

2.6 Stop

You can use the command below to stop the Boots service.

 # bt btpriv boots –d

3   Recommended RF Calibration Flow

For Bluetooth RF calibration, you can follow the steps to set and verify.

3.1   7933

Figure 1 Recommended RF Calibration Flow for 7933

The commands are as the following.

```
For Dual mode FW
# bt btpriv boots -c reset
# bt btpriv boots -c txpow …
# bt btpriv boots -c rft …
# bt btpriv boots -c rf_stop
# (if 0~15dbm) bt btpriv boots -c pwcomp …
# (if 20 dbm) bt btpriv boots -c txpwoffset …
# bt btpriv boots -c rft …

For LE Only FW
# bt btpriv boots -c reset
# bt btpriv boots -c txpow …
# bt btpriv boots -c ble_etx …
```
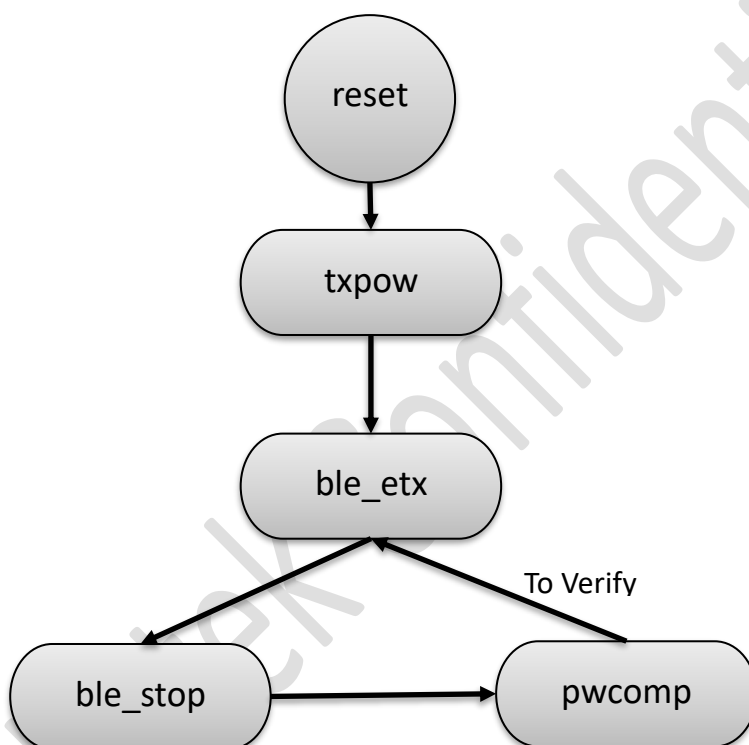
 # bt btpriv boots -c ble_stop

 # (if 0~15dbm) bt btpriv boots -c pwcomp …

 # (if 20 dbm) bt btpriv boots -c txpwoffset …

 # bt btpriv boots -c ble_etx …

Once confirmed, write to eFuse etc.

Note : 1. 7933 cannot apply rf power as 16~19 dbm, 20 dbm can only apply for LE

2. 7933 can support Dual mode FW and LE Only FW

3.2   7931

Figure 2 Recommended RF Calibration Flow for 7931

The commands are as the following.

 # bt btpriv boots -c reset

 # bt btpriv boots -c txpow …

 # bt btpriv boots -c ble_etx …

 # bt btpriv boots -c ble_stop

 # bt btpriv boots -c pwcomp …

 # bt btpriv boots -c ble_etx …

Once confirmed, write to eFuse etc.

Note : 7931 only support LE only FW and maximum TX power is 10 dbm

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