
Application Note
TOSHIBA TC35661 *Chiron*
RF parameter adjustment

Contents

1 Purpose	1
2 Target	1
3 Feedback	1
4 Vendor-specific HCI commands	2
4.1 <i>HCI_LOC_DBUS_WRITE</i>	2
4.2 <i>HCI_M2_MESSAGE_SET</i>	2
5 Adjustment of the crystal frequency parameter	3
5.1 Example	3
6 General improvement of RF characteristics	4
6.1 Implementation	4
7 Disclaimer	6

1 Purpose

The purpose of this document is to explain the RF parameter adjustment possibilities for TOSHIBA TC35661 *Chiron*.

2 Target

This application note is applicable for TOSHIBA TC35661 *Chiron* ROM-Version 500 and ROM-Version 501 only.

3 Feedback

The goal is to make TOSHIBA TC35661 *Chiron* as good as possible. If you have a problem, please drop a short note to

TEEWirelessProducts@tee.toshiba.de

and we'll try to help you out. Thank you for your feedback!

4 Vendor-specific HCI commands

TOSHIBA TC35661 *Chiron* can be configured with vendor-specific HCI commands when in HCI mode.

The following commands will be used in this application note:

- *HCI_LOC_DBUS_WRITE*
- *HCI_M2_MESSAGE_SET*

Please refer to *Extension_HCI* document for further details about these commands.

4.1 *HCI_LOC_DBUS_WRITE*

Please note that TOSHIBA TC35661 *Chiron* will answer the *HCI_LOC_DBUS_WRITE* command in two steps.

First the HCI command itself will be acknowledged with a *HCI_COMMAND_STATUS* event, indicating that the HCI command itself was received correctly.

In the second step, a *HCI_LOC_DBUS_WRITE* event will be sent that contains the result of the *HCI_LOC_DBUS_WRITE* command itself.

4.2 *HCI_M2_MESSAGE_SET*

TOSHIBA TC35661 *Chiron* will answer the *HCI_M2_MESSAGE_SET* command directly with a *HCI_M2_MESSAGE_SET* event.

5 Adjustment of the crystal frequency parameter

The crystal frequency parameter can be adjusted when TOSHIBA TC35661 *Chiron* is still in HCI mode using the *HCI.LOC.DBUS.WRITE* command.

The crystal frequency parameter can be found at address 0xa6, the default value is 0x0100. Usually the crystal frequency parameter is 1 - 2kHz per single step. Refer to the datasheet of your crystal in order to get more detailed informations.

5.1 Example

If you want to change the crystal frequency to parameter to 0x0101, the following *HCI.LOC.DBUS.WRITE* command has to be given to TOSHIBA TC35661 *Chiron*:

01	HCI command
03	OCF
fc	OCF + OGF
05	Length
00	Reserverd
c2	<i>HCI.LOC.DBUS.WRITE</i>
a6	Crystal frequency parameter address
01	Parameter (LSB)
01	Parameter (MSB)

You will receive a *HCI.COMMAND.STATUS* event, followed by a *HCI.LOC.DBUS.WRITE* event as explained in section [4.1](#).

6 General improvement of RF characteristics

TOSHIBA TC35661 *Chiron* ROM-Version 500 and ROM-Version 501 need some special configuration to improve RF characteristics. We strongly recommend to always apply these settings after reset.

This is only necessary when using the BLE functionality of TOSHIBA TC35661 *Chiron*. If you plan to use HCI or SPP mode of TOSHIBA TC35661 *Chiron* only, then this special setup can be omitted.

A series of *HCI_LOC_DBUS_WRITE* and *HCI_M2_MESSAGE_SET* needs to be executed to apply the special settings.

If you have problems applying these settings, please check the log output of *EasyBLE*. *EasyBLE* will apply these settings after startup as well, if it detects a TOSHIBA TC35661 *Chiron* with ROM-Version 500 or ROM-Version 501.

6.1 Implementation

First, the following series of *HCI_LOC_DBUS_WRITE* commands need to be executed, one after another. Please make sure to follow the sequence as described in section 4.1.

```
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0xAE, 0x18, 0xCD
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0xEE, 0x00, 0xD9
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0xFA, 0xA4, 0xA4
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x81, 0xF3, 0xC7
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x63, 0xF4, 0x04
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x83, 0x00, 0xE6
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x64, 0xAF, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x84, 0xFF, 0x80
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x65, 0xB0, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x85, 0x1B, 0x60
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x66, 0xED, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x86, 0x6E, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x67, 0xEA, 0x0E
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x87, 0x80, 0x80
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x68, 0xF4, 0x49
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x88, 0x00, 0xEE
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x69, 0xF4, 0x27
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x89, 0x00, 0xFE
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x6A, 0x00, 0xFF
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x8A, 0x00, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x6B, 0xEA, 0x09
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x8B, 0x80, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x6C, 0xF4, 0x01
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x8C, 0x00, 0x80
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x6D, 0xE2, 0x01
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x8D, 0x08, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x6E, 0xA4, 0x01
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x8E, 0x80, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x6F, 0x00, 0xFF
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x8F, 0x00, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0xA0, 0x21, 0x10
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x81, 0xD3, 0xC7
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x82, 0xA8, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x63, 0xF4, 0x04
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x83, 0x00, 0xE2
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x64, 0xAF, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x84, 0xF8, 0x80
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x65, 0xB0, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x85, 0x18, 0x60
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x66, 0xED, 0x00
```

```

0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x86, 0x6E, 0x70
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x67, 0xEA, 0x0E
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x87, 0x80, 0x80
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x68, 0xF4, 0x14
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x88, 0x00, 0xE6
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x69, 0xF4, 0x04
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x89, 0x00, 0xFE
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x6A, 0x00, 0xFF
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x8A, 0x00, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x6B, 0xEA, 0x02
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x8B, 0x80, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x6C, 0xF4, 0x01
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x8C, 0x00, 0x80
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x6D, 0xE2, 0x01
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x8D, 0x08, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x6E, 0xA4, 0x01
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x8E, 0x80, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x6F, 0x00, 0xFF
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0x8F, 0x00, 0x00
0x01, 0x03, 0xFC, 0x05, 0x00, 0xC2, 0xA0, 0x21, 0x00

```

Second, the following series of *HCI_M2_MESSAGE_SET* commands need to be executed, one after another. Please make sure to follow the sequence as described in section 4.2.

```

0x01, 0x08, 0xfc, 0x2f, 0x00, 0xa0, 0x00, 0x00, 0x00, 0x14, 0x55, 0xff, 0x10, 0x25, 0x03,
    0x9c, 0xad, 0x09, 0x00, 0xe0, 0x7b, 0x00, 0x28, 0x01, 0xd0, 0x02, 0x21, 0x38, 0xe0,
    0xbb, 0xf7, 0xab, 0xfe, 0x4a, 0xe1, 0x01, 0xd0, 0xe5, 0xf7, 0x7e, 0xff, 0x01, 0x2e,
    0x00, 0xd0, 0x00, 0x27, 0x20, 0x7c, 0x04, 0x28

```

```

0x01, 0x08, 0xfc, 0xee, 0x00, 0xa0, 0x00, 0x00, 0x00, 0x14, 0x56, 0xff, 0x10, 0xe4, 0x00,
    0x6B, 0x05, 0x00, 0x26, 0x4a, 0x05, 0x20, 0x30, 0xb4, 0x10, 0x80, 0x26, 0x48, 0x25,
    0x49, 0x88, 0x82, 0xff, 0x20, 0xc8, 0x82, 0xc8, 0x8a, 0xc0, 0x07, 0xfc, 0xd1, 0x01,
    0x20, 0x80, 0x03, 0x88, 0x82, 0x48, 0x8b, 0x00, 0x09, 0x00, 0x01, 0x08, 0x21, 0x01,
    0x43, 0x51, 0x83, 0xff, 0x21, 0xff, 0x31, 0x91, 0x83, 0x1d, 0x4c, 0x00, 0x22, 0xa2,
    0x80, 0xff, 0x23, 0xe4, 0x33, 0xe3, 0x80, 0x0c, 0x24, 0x04, 0x43, 0x1a, 0x48, 0x84,
    0x81, 0xc1, 0x81, 0x82, 0x82, 0xc3, 0x82, 0x19, 0x49, 0x08, 0x88, 0x01, 0x23, 0x02,
    0x1c, 0x9a, 0x43, 0x0a, 0x80, 0x17, 0x4a, 0x03, 0x23, 0x5b, 0x04, 0x5a, 0x62, 0x60,
    0x32, 0xda, 0x62, 0x16, 0x4a, 0x14, 0x4d, 0x5a, 0x66, 0x15, 0x4a, 0x17, 0x4c, 0x9a,
    0x66, 0x15, 0x4a, 0x5a, 0x67, 0xda, 0x1d, 0xf9, 0x32, 0x9d, 0x62, 0x54, 0x62, 0x08,
    0x34, 0xd4, 0x62, 0x95, 0x62, 0x13, 0x4a, 0x12, 0x4c, 0x54, 0x62, 0x13, 0x4c, 0x94,
    0x62, 0x13, 0x4c, 0xd4, 0x62, 0x1b, 0x68, 0x12, 0x4a, 0x93, 0x42, 0xfd, 0xd1, 0x08,
    0x80, 0x30, 0xbc, 0x70, 0x47, 0x20, 0x02, 0x06, 0x00, 0xc0, 0x08, 0x06, 0x00, 0xbe,
    0x2f, 0x00, 0x00, 0x60, 0x03, 0x06, 0x00, 0x60, 0x0b, 0x06, 0x00, 0xa0, 0x02, 0x06,
    0x00, 0x0b, 0x20, 0x00, 0x20, 0x00, 0x20, 0x18, 0x20, 0x07, 0xa0, 0x01, 0x21, 0x00,
    0xa0, 0x1d, 0x21, 0x0c, 0xa0, 0x01, 0x21, 0x0f, 0x20, 0x00, 0x20, 0x01, 0x20, 0x01,
    0x20, 0x40, 0x01, 0x06, 0x00, 0x00, 0x20, 0x1d, 0x20, 0x03, 0x20, 0x01, 0x20, 0xff,
    0x0f, 0x00, 0x00

```

```

0x01, 0x08, 0xfc, 0x0b, 0x00, 0xa0, 0x00, 0x00, 0x00, 0x14, 0x57, 0xff, 0x02, 0x03, 0x01

```

```

0x01, 0x08, 0xfc, 0x09, 0x00, 0xa0, 0x00, 0x00, 0x00, 0x14, 0x01, 0xff, 0x00

```

7 Disclaimer

RESTRICTIONS ON PRODUCT USE

- Toshiba Corporation, and its subsidiaries and affiliates (collectively "TOSHIBA"), reserve the right to make changes to the information in this document, and related hardware, software and systems (collectively "Product") without notice.
- This document and any information herein may not be reproduced without prior written permission from TOSHIBA. Even with TOSHIBA's written permission, reproduction is permissible only if reproduction is without alteration/omission.
- Though TOSHIBA works continually to improve Product's quality and reliability, Product can malfunction or fail. Customers are responsible for complying with safety standards and for providing adequate designs and safeguards for their hardware, software and systems which minimize risk and avoid situations in which a malfunction or failure of Product could cause loss of human life, bodily injury or damage to property, including data loss or corruption. Before customers use the Product, create designs including the Product, or incorporate the Product into their own applications, customers must also refer to and comply with (a) the latest versions of all relevant TOSHIBA information, including without limitation, this document, the specifications, the data sheets and application notes for Product and the precautions and conditions set forth in the "TOSHIBA Semiconductor Reliability Handbook" and (b) the instructions for the application with which the Product will be used with or for. Customers are solely responsible for all aspects of their own product design or applications, including but not limited to (a) determining the appropriateness of the use of this Product in such design or applications; (b) evaluating and determining the applicability of any information contained in this document, or in charts, diagrams, programs, algorithms, sample application circuits, or any other referenced documents; and (c) validating all operating parameters for such designs and applications. TOSHIBA ASSUMES NO LIABILITY FOR CUSTOMERS' PRODUCT DESIGN OR APPLICATIONS.
- Product is intended for use in general electronics applications (e.g., computers, personal equipment, office equipment, measuring equipment, industrial robots and home electronics appliances) or for specific applications as expressly stated in this document. Product is neither intended nor warranted for use in equipment or systems that require extraordinarily high levels of quality and/or reliability and/or a malfunction or failure of which may cause loss of human life, bodily injury, serious property damage or serious public impact ("Unintended Use"). Unintended Use includes, without limitation, equipment used in nuclear facilities, equipment used in the aerospace industry, medical equipment, equipment used for automobiles, trains, ships and other transportation, traffic signaling equipment, equipment used to control combustions or explosions, safety devices, elevators and escalators, devices related to electric power, and equipment used in finance-related fields. Do not use Product for Unintended Use unless specifically permitted in this document.
- Do not disassemble, analyze, reverse-engineer, alter, modify, translate or copy Product, whether in whole or in part.
- Product shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable laws or regulations.
- The information contained herein is presented only as guidance for Product use. No responsibility is assumed by TOSHIBA for any infringement of patents or any other intellectual property rights of third parties that may result from the use of Product. No license to any intellectual property right is granted by this document, whether express or implied, by estoppel or otherwise.
- ABSENT A WRITTEN SIGNED AGREEMENT, EXCEPT AS PROVIDED IN THE RELEVANT TERMS AND CONDITIONS OF SALE FOR PRODUCT, AND TO THE MAXIMUM EXTENT ALLOWABLE BY LAW, TOSHIBA (1) ASSUMES NO LIABILITY WHATSOEVER, INCLUDING WITHOUT LIMITATION, INDIRECT, CONSEQUENTIAL, SPECIAL, OR INCIDENTAL DAMAGES OR LOSS, INCLUDING WITHOUT LIMITATION, LOSS OF PROFITS, LOSS OF OPPORTUNITIES, BUSINESS INTERRUPTION AND LOSS OF DATA, AND (2) DISCLAIMS ANY AND ALL EXPRESS OR IMPLIED WARRANTIES AND CONDITIONS RELATED TO SALE, USE OF PRODUCT, OR INFORMATION, INCLUDING WARRANTIES OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, ACCURACY OF INFORMATION, OR NONINFRINGEMENT.
- Do not use or otherwise make available Product or related software or technology for any military purposes, including without limitation, for the design, development, use, stockpiling or manufacturing of

nuclear, chemical, or biological weapons or missile technology products (mass destruction weapons). Product and related software and technology may be controlled under the Japanese Foreign Exchange and Foreign Trade Law and the U.S. Export Administration Regulations. Export and re-export of Product or related software or technology are strictly prohibited except in compliance with all applicable export laws and regulations.

- Product may include products subject to foreign exchange and foreign trade control laws.
- The technical information described in this document is subject to foreign exchange and foreign trade control laws.
- Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. Please use Product in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. TOSHIBA assumes no liability for damages or losses occurring as a result of noncompliance with applicable laws and regulations.