DA14585/DA1453x

HCI Commands

This document describes the HCI commands for the DA14585 and DA1453x devices which are related to the prod_test project in the SDK.

Contents

Tables

1. Terms and Definitions

BD	Bluetooth Device
CPLD	Complex Programmable Logic Device
GPIO	General Purpose Input Output (pin)
HCI	Host Controller Interface
LSB	Least Significant Bit/Byte
MCU	Micro Controller Unit
MSB	Most Significant Bit/Byte
OTP	One Time Programmable
PWM	Pulse-width Modulation
RSSI	Received Signal Strength Indication/Indicator
SDK	Software Development Kit
UART	Universal Asynchronous Receiver Transmitter

2. References

[1] Bluetooth Core Specification_v5.2., Bluetooth Core Specification

3. Introduction

This application note describes all vendor specific HCI commands related to the prod_test project in the SDK. `<sdk_root_directory>\projects\target_apps\prod_test`. The prod_test application implements commands for production test purposes. There is a basic HCI example in SDK6 directory `<sdk_root_directory>\projects\target_apps\hci\hci\`, showing how DA1453x and DA14585 perform in HCI mode.

All the standard HCI commands are part of the Bluetooth Specification, see Volume 4 part E, section 7 in Ref. [1].

4. Overview of Supported Commands

Table 1. Supported commands

Definition	Opcode	IC Availability			Tab	Notes
		585	586	53x		
HCI_CMD_OPCODE_CONT_PKT_TX	0x201E	Yes	Yes	Yes	Core Commands	
HCI_CMD_OPCODE_START_PKT_RX	0x201D	Yes	Yes	Yes	Core Commands	
HCI_CMD_OPCODE_STOPTEST	0x201F	Yes	Yes	Yes	Core Commands	
HCI_CMD_OPCODE_RESET	0x0C03	Yes	Yes	Yes	Core Commands	
HCI_CUSTOM_ACTION_CMD_OPCODE	0xFE00	Yes	Yes	Yes	Various Commands	
HCI_SLEEP_TEST_CMD_OPCODE	0xFE01	Yes	Yes	Yes	Sleep	
HCI_XTAL_TRIM_CMD_OPCODE	0xFE02	Yes	Yes	Yes	XTAL Trim	
HCI_OTP_RW_CMD_OPCODE	0xFE03	Yes	Yes	Yes	OTP	
HCI_OTP_READ_CMD_OPCODE	0xFE04	Yes	Yes	Yes	OTP	
HCI_OTP_WRITE_CMD_OPCODE	0xFE05	Yes	Yes	Yes	OTP	
HCI_REGISTER_RW_CMD_OPCODE	0xFE06	Yes	Yes	Yes	Register RW	
HCI_AUDIO_TEST_CMD_OPCODE	0xFE07	No	No	No	N/A	Reserved Opcode
HCI_FIRMWARE_VERSION_GET_CMD_OPCODE	0xFE08	Yes	Yes	Yes	Various Commands	
HCI_CHANGE_UART_PINS_ACTION_CMD_OPCODE	0xFE09	Yes	Yes	Yes	Various Commands	
HCI_RDTESTER_CMD_OPCODE	0xFE0A	Yes	Yes	Yes	Various Commands	
HCI_TX_TEST_CMD_OPCODE	0xFE0B	Yes	Yes	Yes	Core Commands	
HCI_START_PROD_RX_TEST_CMD_OPCODE	0xFE0C	Yes	Yes	Yes	Core Commands	
HCI_END_PROD_RX_TEST_CMD_OPCODE	0xFE0D	Yes	Yes	Yes	Core Commands	
HCI_UNMODULATED_ON_CMD_OPCODE	0xFE0E	Yes	Yes	Yes	Core Commands	
HCI_TX_START_CONTINUE_TEST_CMD_OPCODE	0xFE0F	Yes	Yes	Yes	Core Commands	
HCI_TX_END_CONTINUE_TEST_CMD_OPCODE	0xFE10	Yes	Yes	Yes	Core Commands	
HCI_SENSOR_TEST_CMD_OPCODE	0xFE11	Yes	Yes	Yes	Various Commands	
HCI_GPIO_SET_CMD_OPCODE	0xFE12	Yes	Yes	Yes	Various Commands	
HCI_GPIO_READ_CMD_OPCODE	0xFE13	Yes	Yes	Yes	Various Commands	
HCI_UART_LOOP_CMD_OPCODE	0xFE14	Yes	Yes	Yes	Various Commands	
HCI_UART_BAUD_CMD_OPCODE	0xFE15	Yes	Yes	Yes	Various Commands	
HCI_EXT32KHz_TEST_CMD_OPCODE	0xFE16	Yes	Yes	Yes	Various Commands	
HCI_GPIO_WD_CMD_OPCODE	0xFE17	Yes	Yes	Yes	Various Commands	
HCI_SLEEP_CLK_SEL_CMD_OPCODE	0xFE18	Yes	Yes	No	Various Commands	
HCI_RANGE_EXT_EN_CMD_OPCODE	0xFE19	No	No	No	N/A	Reserved Opcode
HCI_ADC_VBAT_CMD_OPCODE	0xFE1A	No	No	Yes	Various Commands	
HCI_SET_TX_POWER_CMD_OPCODE	0xFE1B	No	No	Yes	Various Commands	
HCI_CONFIGURE_TEST_MODE_CMD_OPCODE	0xFE1C	No	No	Yes	Various Commands	Only in DA14531
HCI_RESET_MODE_CMD_OPCODE	0xFE1E	Yes	Yes	Yes	Various Commands	

5. Core Commands

Table 2.The reset command

reset			
Command Description	Performs the reset.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x03	
	Command Opcode MSB	0x0C	
	Parameter Length	0x00	
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x04	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x03	
	Command_Opcode MSB	0x0c	
	Status	0x00 - 0xFF	0x00: Reset command succeeded, was received and will be executed. 0x01-0xFF: Reset command failed. See Volume 2, Part D -Error Codes in Ref. [1].

Table 3. The cont_pkt_tx command

cont_pkt_tx			
Command Description	Continuous packet transmission		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x1E	
	Command Opcode MSB	0x20	
	Parameter Length	0x03	
	Frequency	0x00 - 0x27	= (F – 2402) / 2, where F ranges 2402 MHz - 2480 MHz
	Data Length	0x01 - 0x25	Length in bytes of payload data in each packet
	Payload Type	0x00 - 0x07	▪ 0x00: Pseudo-Random bit sequence 9 ▪ 0x01: Pattern of alternating bits 11110000 ▪ 0x02: Pattern of alternating bits 10101010 ▪ 0x03: Pseudo-Random bit sequence 15 ▪ 0x04: Pattern of All 1 bit ▪ 0x05: Pattern of All 0 bits ▪ 0x06: Pattern of alternating bits 00001111 ▪ 0x07: Pattern of alternating bits 0101
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x04	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x1E	

cont_pkt_tx			
	Command_Opcode MSB	0x20	
	Status	0x00 - 0xFF	0x00: Command succeeded. 0x01 – 0xFF: Command failed. See Volume 2, Part D -Error Codes in Ref. [1].

Table 4. The pkt_tx command

pkt_tx			
Command Description	Packet transmission		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x0B	
	Command Opcode MSB	0xFE	
	Parameter Length	0x05	
	Frequency	0x00 - 0x27	= (F – 2402) / 2, where F ranges from 2402 MHz to 2480 MHz
	Data Length	0x01- 0x25	Length in bytes of payload data in each packet
	Payload Type	0x00 - 0x07	▪ 0x00: Pseudo-Random bit sequence 9 ▪ 0x01: Pattern of alternating bits 11110000 ▪ 0x02: Pattern of alternating bits 10101010 ▪ 0x03: Pseudo-Random bit sequence 15 ▪ 0x04: Pattern of All 1 bits ▪ 0x05: Pattern of All 0 bits ▪ 0x06: Pattern of alternating bits 00001111 ▪ 0x07: Pattern of alternating bits 0101
	Number of packets to receive LSB	0xXX	
	Number of packets to receive MSB	0xXX	
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0F	
	Parameter Length	0x04	
	Status	0x00	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x0B	
	Command_Opcode MSB	0xFE	
Message returned when transmission is completed	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x03	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x0B	
	Command_Opcode MSB	0xFE	

Table 5. The start_pkt_rx command

start_pkt_rx			
Command Description	Starts packet reception.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x1D	
	Command Opcode MSB	0x20	
	Parameter Length	0x01	
	Frequency	0x00 - 0x27	= (F – 2402) / 2, where F ranges from 2402 MHz to 2480 MHz
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x04	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x1D	
	Command_Opcode MSB	0x20	
	Status	0x00 - 0xFF	0x00: Command succeeded. 0x01-0xFF: Command failed. See Volume 2, Part D Error Codes in Ref. [1].

Table 6. The start_pkt_rx_stats command

start_pkt_rx_stats			
Command Description	Starts packet reception, and gathers statistics		
Notes	Works with 0xFE0D		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x0C	
	Command Opcode MSB	0xFE	
	Parameter Length	0x01	
	Frequency	0x00 - 0x27	= (F – 2402) / 2, where F ranges 2402 MHz-2480 MHz
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x03	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x0C	
	Command_Opcode MSB	0xFE	

Table 7. The stoptest command

stoptest			
Command Description	Stops test.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x1F	
	Command Opcode MSB	0x20	
	Parameter Length	0x00	
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x06	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x1F	
	Command_Opcode MSB	0x20	
	Status	0x00 - 0xFF	0x00: Command succeeded. 0x01-0xFF: Command failed. See Volume 2, Part D -Error Codes in Ref. [1].
	Number of packets received LSB	0xXX	
	Number of packets received MSB	0xXX	

Table 8. The stop_pkt_rx_stats command

stop_pkt_rx_stats			
Command Description	Stops packet reception, it also returns statistics gathered during the test.		
Notes	Works with 0xFE0C		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x0D	
	Command Opcode MSB	0xFE	
	Parameter Length	0x00	
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x0B	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0X0D	
	Command_Opcode MSB	0xFE	
	Number of received packets LSB	0xXX	
	Number of received packets MSB	0xXX	
	Number of received packets with sync errors LSB	0xXX	
	Number of received packets with sync errors MSB	0xXX	
	Number of received packets with CRC errors LSB	0xXX	
	Number of received packets with CRC errors MSB	0xXX	
	RSSI LSB	0xXX	RSSI value is converted to dBm according to the following formula: DA14585: dBm = ((479* RSSI) / 1000) - 112.5 DA14531: dBm = 0.498 * RSSI - 127 (The range of valid DA14531 RSSI values is 40-230. Any values lower than 40 should be ceiled to 40. Any values higher than 230 should be floored to 230).
	RSSI MSB	0xXX	

Table 9. The unmodulated OFF/TX/RX command

Unmodulated OFF/TX/RX			
Command Description	Unmodulated transmission/reception		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x0E	
	Command Opcode MSB	0xFE	
	Parameter Length	0x02	
	Operation	0x4 F, 0x52 or 0x54	0x4 F: OFF 0x54: Unmodulated TX 0x52: Unmodulated RX
	Frequency	0x00 - 0x27	= (F – 2402) / 2, where F ranges 2402 MHz - 2480 MHz
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x03	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x0E	
	Command_Opcode MSB	0xFE	

Table 10. The start_cont_tx command

start_cont_tx			
Command Description	Starts a continuous transmission.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x0F	
	Command Opcode MSB	0xFE	
	Parameter Length	0x02	
	Frequency	0x00 - 0x27	= (F – 2402) / 2, where F ranges from 2402 MHz- 2480 MHz
	Payload Type	0x00 - 0x07	▪ 0x00: Pseudo-Random bit sequence 9 ▪ 0x01: Pattern of alternating bits 11110000 ▪ 0x02: Pattern of alternating bits 10101010 ▪ 0x03: Pseudo-Random bit sequence 15 ▪ 0x04: Pattern of All 1 bits ▪ 0x05: Pattern of All 0 bits ▪ 0x06: Pattern of alternating bits 00001111 ▪ 0x07: Pattern of alternating bits 0101
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x03	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x0F	
	Command_Opcode MSB	0xFE	

Table 11. The stop_cont_tx command

stop_cont_tx			
Command Description	Stops a continuous transmission.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x10	
	Command Opcode MSB	0xFE	
	Parameter Length	0x00	
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Length	0x03	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x10	
	Command_Opcode MSB	0xFE	

6. Sleep Commands

Table 12. The sleep none/extended/deep command

sleep none/extended /deep			
Command Description	Sets the sleep state of the device.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x01	
	Command Opcode MSB	0xFE	
	Parameter Length	0x03	
	Sleep Mode	0x00 - 0x02	0x00: Active mode 0x01: Extended sleep 0x02: Deep sleep
	Minutes to sleep	0x00-0xFF	If both minutes = 0 and seconds = 0,the device sleeps forever.
	Seconds to sleep	0x00-0xFF	
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0F	
	Parameter Length	0x04	
	Status	0x00	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x01	
	Command_Opcode MSB	0xFE	

7. XTAL Trim Commands

Table 13.The XTAL xtrim rd/wr/en/inc/dec command

xtrim rd/wr/en/dis/inc/dec			
Command Description	Performs XTAL calibration operation.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x02	
	Command Opcode MSB	0xFE	
	Parameter Length	0x03	
	Operation	0x00 - 0x07	▪ 0x00: Read trim value ▪ 0x01: Write trim value ▪ 0x02: Enable output XTAL on P05 ▪ 0x03: Increase trim value by delta ▪ 0x04: Decrease trim value by delta ▪ 0x05: Disable XTAL output on P05 ▪ 0x06: Auto calibration test ▪ 0x07: Auto calibration test (+ Burn calculated value to OTP, Burn applies only for DA14585/6)
	Trim value or delta LSB	0x00 - 0xFF	Trim value L.SB when operation = 1 delta value LSB when operation = 3,4 GPIO* when operation = 6,7 0x00 otherwise. *GPIO Px_y is encoded as x*10 + y. For example: P1_5 is encoded as 15 (0x0F). If the GPIO value equals to 0xFE,the firmware automatically finds the UART RX pin and set it as an input pulse pin.
	Trim value or delta MSB	0x00 - 0xFF	Trim value MSB when operation = 1 delta value MSB when operation = 3,4 XTAL type* when operation = 6,7 0x00 otherwise. *XTAL type is 0: XTAL16M or 1: XTAL32M.
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x05	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x02	
	Command_Opcode MSB	0xFE	
	Trim value LSB	0xXX	CLK_FREQ_TRIM_REG value for operation = 0 status code* for operation = 6,7 0x0000 otherwise. *XTAL trim value calibration returns zero on success. A non-zero value indicates failure. 1: XTAL_TRIM_OUT_OF_RANGE 2:XTAL_TRIM_FREQ_CAL_NOT_CONNECTED 3: XTAL_TRIM_OTP_WRITE_FAILED
	Trim value MSB	0xXX	

xtrim rd/wr/en/dis/inc/dec			
			4: PARAMS_ERROR (wrong GPIO) 5: PARAMS_ERROR (wrong XTAL type)

8. OTP Commands

Table 14. The otp wr_xtrim/rd_xtrim/wr_bdaddr/rd_bdaddr command

otp wr_xtrim/rd_xtrim/wr_bdaddr/rd_bdaddr						
Command Description	Reads or writes BD address and XTAL Trim fields in OTP header.					
Command Format	**Byte Description**	**Value**	**Notes**			
	HCI Command Packet	0x01				
	Command Opcode LSB	0x03				
	Command Opcode MSB	0xFE				
	Parameter Length	0x07				
	Operation	0xXX	0x00	0x01	0x02	0x03
			Read XTAL16M trim value OTP header field.	Write XTAL16M trim value OTP header field.	Read BD address OTP header field.	Write BD address OTP header field.
	Data[0]	0xXX	(Not used)	Trim value LSB	(Not used)	bdaddr[0] (LSB)
	Data[1]	0xXX	(Not used)	Trim value MSB	(Not used)	bdaddr[1]
	Data[2]	0xXX	(Not used)	(Not used)	(Not used)	bdaddr[2]
	Data[3]	0xXX	(Not used)	(Not used)	(Not used)	bdaddr[3]
	Data[4]	0xXX	(Not used)	(Not used)	(Not used)	bdaddr[4]
	Data[5]	0xXX	(Not used)	(Not used)	(Not used)	bdaddr[5]
Return Message	**Byte Description**	**Value**	**Notes**			
	HCI Event Packet	0x04				
	Event Code	0x0E				
	Parameter Length	0x0A				
	Num_HCI_Command_ Packets	0xXX				
	Command_Opcode LSB	0x03				
	Command_Opcode MSB	0xFE				
	Operation	0xXX	0x00	0x01	0x02	0x03
			Read XTAL16M Trim value (not supported in DA14531).	Write XTAL16M trim value (not supported in DA14531)	Read BD address	Rrite BD address
	Data[0]	0xXX	Trim value LSB	(Not used)	bdaddr[0] (LSB)	(Not used)
	Data[1]	0xXX	Trim value MSB	(Not used)	bdaddr[1]	(Not used)

otp wr_xtrim/rd_xtrim/wr_bdaddr/rd_bdaddr						
	Data[2]	0xXX	(Not used)	(Not used)	bdaddr[2]	(Not used)
	Data[3]	0xXX	(Not used)	(Not used)	bdaddr[3]	(Not used)
	Data[4]	0xXX	(Not used)	(Not used)	bdaddr[4]	(Not used)
	Data[5]	0xXX	(Not used)	(Not used)	bdaddr[5]	(Not used)

Table 15. The otp_read command

otp_read			
Command Description	Reads a field in OTP.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x04	
	Command Opcode MSB	0xFE	
	Parameter Length	0x03	
	Start word address LSB	0xXX	The address must be word-aligned.
	Start word address MSB	0xXX	
	# words to read	0xXX	Min = 1 Max = 60
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0xXX	0x05 + 4 *(# words returned)
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x04	
	Command_Opcode MSB	0xFE	
	Status	0x00 or 0x12	0x00: Command succeeded 0x12: Invalid HCI parameter
	# words returned (=n)	0xXX	(# words returned)
	word 1 byte 0 (LSB)	0xXX	
	word 1 byte 1	0xXX	
	word 1 byte 2	0xXX	
	word 1 byte 3	0xXX	
	…	…	
	word n byte 0 (LSB)	0xXX	
	word n byte 1	0xXX	
	word n byte 2	0xXX	
	word n byte 3	0xXX	

Table 16. The otp write command

otp_write			
Command Description	Writes a field in OTP.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x05	
	Command Opcode MSB	0xFE	
	Parameter Length	0xXX	0x03 + 4 * (# words to write)
	Start word address LSB	0xXX	The address must be word aligned, lower than 0x8000 and the following must hold.
	Start word address MSB	0xXX	start_address + 4 * number_of_words_to_write < 0x8000
	# words to write (= n)	0xXX	Min = 1 Max = 60
	word 1 byte 0 (LSB)	0xXX	
	word 1 byte 1	0xXX	
	word 1 byte 2	0xXX	
	word 1 byte 3	0xXX	
	…	0xXX	
	word n byte 0 (LSB)	0xXX	
	word n byte 1	0xXX	
	word n byte 2	0xXX	
	word n byte 3	0xXX	
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x05	
	Num_HCI_Command_ Packets	0xXX	
	Command_Opcode LSB	0x05	
	Command_Opcode MSB	0xFE	
	Status	0x00 or 0x12	0x00: Command succeeded 0x12: Invalid HCI parameter
	# words written	0xXX	

9. Various Commands

Table 17. The hci_firmware_version_get command

hci_firmware_version_get			
Command Description	Retrieves the Bluetooth® LE and application version of the firmware.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x08	
	Command Opcode MSB	0xFE	
	Parameter Length	0x00	
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x45	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x08	
	Command_Opcode MSB	0xFE	
	BLE_version_length	0xXX	Min = 0 Max = 32
	Application_version_length (Max value 32).	0xXX	Min = 0 Max = 32
	BLE_common firmware_version (32 bytes).	""	32-byte string containing the Bluetooth® LE common firmware version.
	BLE_application_firmware_version (32 bytes).	""	32-byte string containing the Bluetooth® LE application firmware version.

Table 18. The change UART pins command

hci_change_uart_pins_action			
Command Description	Changes the UART pins.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x09	
	Command Opcode MSB	0xFE	
	Parameter Length	0x04	
	tx_port	0xXX	GPIO Px_y is encoded as x*10 + y. For example, P1_5 is encoded as 15 (0x0F).
	tx_pin	0xXX	GPIO Px_y is encoded as x*10 + y. For example, P1_5 is encoded as 15 (0x0F).
	rx_port	0xXX	GPIO Px_y is encoded as x*10 + y. For example, P1_5 is encoded as 15 (0x0F).
	rx_pin	0xXX	GPIO Px_y is encoded as x*10 + y. For example, P1_5 is encoded as 15 (0x0F).
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x05	
	Num_HCI_Command_Packets	0xXX	

hci_change_uart_pins_action			
	Command_Opcode LSB	0x09	
	Command_Opcode MSB	0xFE	
	Status LSB	0xXX	0x00: Command succeeded. 0x01: Commands failed
	Status MSB	0x00	

Table 19. The hci_custom_action command

hci_custom_action			
Command Description	Runs a custom action. These actions are user-defined inside the code		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x00	
	Command Opcode MSB	0xFE	
	Parameter Length	0x01	
	Custom action	0xXX	User-defined inside the firmware
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x07	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x00	
	Command_Opcode MSB	0xFE	
	Return Data LSB	0xXX	By default, echoes back the Custom action byte received on success Can be used by the user-defined operation
	Return Data	0xXX	Can be used by the user-defined operation
	Return Data	0xXX	Can be used by the user-defined operation
	Return Data	0xXX	Can be used by the user-defined operation

Table 20. The hci_sensor_test command

hci_sensor_test			
Command Description	Performs basic communication test on an attached sensor		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x11	
	Command Opcode MSB	0xFE	
	Parameter Length	0x11	
	Interface	0x00 - 0x01	0x00: Sensor connected to SPI bus 0x01: Sensor connected to I2C bus
	Read/Write	0x00 - 0x01	0x00: Read 0x01: Write
	spi_clk_port or i2c_scl_port	0xXX	DA14585/6: Ports 0x00 to 0x03 are available DA14531: This should always be 0x00
	spi_clk_pin or i2c_scl_pin	0xXX	DA14585/6: Port0: 0x00 to 0x07 Port1: 0x00 to 0x05 Port2: 0x00 to 0x09 Port3: 0x00 to 0x07 DA14531: 0x00 to 0x0B
	spi_di_port or i2c_sda_port	0xXX	DA14585/6: Ports 0x00 to 0x03 are available DA14531: This should always be 0x00
	spi_di_pin or i2c_sda_pin	0xXX	DA14585/6: Port0: 0x00 to 0x07 Port1: 0x00 to 0x05 Port2: 0x00 to 0x09 Port3: 0x00 to 0x07 DA14531: 0x00 to 0x0B
	spi_do_port	0xXX	DA14585/6: Ports 0x00 to 0x03 are available DA14531: This should always be 0x00
	spi_do_pin	0xXX	DA14585/6: Port0: 0x00 to 0x07 Port1: 0x00 to 0x05 Port2: 0x00 to 0x09 Port3: 0x00 to 0x07 DA14531: 0x00 to 0x0B
	spi_cs_port	0xXX	DA14585/6: Ports 0x00 to 0x03 are available DA14531: This should always be 0x00
	spi_cs_pin	0xXX	DA14585/6: Port0: 0x00 to 0x07 Port1: 0x00 to 0x05 Port2: 0x00 to 0x09 Port3: 0x00 to 0x07 DA14531: 0x00 to 0x0B
	Register address	0xXX	Sensor register address
	Register data to write	0xXX	Data to write to the sensor register if Read/Write = 0x01
	I2C slave address	0xXX	The sensor I2C slave address used if Interface = 0x01
	int_gpio_check	0xXX	0 = Does nothing. 1 = Sets the following GPIO to input pull-down after the interface (SPI or I2C) has been initialized.

hci_sensor_test			
	int_port	0xXX	DA14585/6: Ports 0x00 to 0x03 are available DA14531: This should always be 0x00
	int_pin	0xXX	DA14585/6: Port0: 0x00 to 0x07 Port1: 0x00 to 0x05 Port2: 0x00 to 0x09 Port3: 0x00 to 0x07 DA14531: 0x00 to 0x0B
	Pins voltage level	0xXX	0 = 3.3 V 1 = 1.8 V
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x05	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x11	
	Command_Opcode MSB	0xFE	
	Sensor register data or INT GPIO level	0xXX	A byte is read from the address specified by the "Register Address" in the command format above, or the INT GPIO level (high = 0x01 or low = 0x00) if int_gpio_check = 0x01.
	Error	0x00 or 0xFF	0x00 = Command succeeded - Sensor register data or INT GPIO level data are valid. 0xFF = Command error - Sensor register data or INT GPIO level data are invalid.

Table 21. The GPIO_set command

GPIO_set			
Command Description	Sets the state of a GPIO.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x12	
	Command Opcode MSB	0xFE	
	Parameter Length	0x06	
	GPIO pad	0xXX	GPIO Px_y is encoded as x*10 + y. For example, P1_5 is encoded as 15 (0x0F).
	Mode	0x00 - 0x03	0: mode = INPUT 1: mode = INPUT_PULLUP 2: mode = INPUT_PULLDOWN 3: mode = OUTPUT
	Voltage level	0x00 - 0x01	0 = 3.3 V 1 = 1.8 V
	State	0x00 - 0x01	0 = low 1 = high
	PWM	0xXX	0 = No PWM Otherwise = frequency in kHz
	duty_cycle	0x00 - 0x64	duty_cycle percentage
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	

GPIO_set			
	Parameter Length	0x04	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x12	
	Command_Opcode MSB	0xFE	
	Error	0x00 or 0xFF	0x00 = Command succeeded 0xFF = Command error

Table 22. The GPIO_read command

GPIO_read			
Command Description	Reads the state of a GPIO.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x13	
	Command Opcode MSB	0xFE	
	Parameter Length	0x01	
	GPIO pad	0xXX	GPIO Px_y is encoded as x*10 + y. For example, P1_5 is encoded as 15 (0x0F).
Return Message	**Byte Description**	**Value**	Notes
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x04	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x13	
	Command_Opcode MSB	0xFE	
	Data	0x00, 0x01 or 0xFF	0x00 = high GPIO state 0x01 = low GPIO state 0xFF = command error

Table 23. The UART_loop command

UART_loop			
Command Description	Test UART noise existence using an echo test		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x14	
	Command Opcode MSB	0xFE	
	Parameter Length	0x64	
	Data[100]	0xXX	Input data buffer
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x67	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x14	

UART_loop			
	Command_Opcode MSB	0xFE	
	Data[100]	0x00 - 0x05	Echo of input data buffer

Table 24. The UART_baud command

UART_baud			
Command Description	Sets the UART baud rate.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x15	
	Command Opcode MSB	0xFE	
	Parameter Length	0x01	
	Data	0xXX	▪ 0x00: UART_BAUDRATE_9K6 ▪ 0x01: UART_BAUDRATE_19K2 ▪ 0x02: UART_BAUDRATE_57K6 ▪ 0x03: UART_BAUDRATE_115K2 ▪ 0x04: UART_BAUDRATE_1M ▪ 0x05: UART_BAUDRATE_38K4
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x04	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x15	
	Command_Opcode MSB	0xFE	
	Error	0xXX	

Table 25. The Ext32K_test command

Ext32K_test			
Command Description	Checks the accuracy of the XTAL32K		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x16	
	Command Opcode MSB	0xFE	
	Parameter Length	0x00	
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x04	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x16	
	Command_Opcode MSB	0xFE	
	Error	0x00 or 0xFF	0x00 = Command succeeded 0xFF = Command error

Table 26. The GPIO_WDOG command

GPIO_WDOG			
Command Description	Continuously toggles a GPIO to be used as a WDOG indication on an external MCU.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x17	
	Command Opcode MSB	0xFE	
	Parameter Length	0x02	
	GPIO pad	0xXX	GPIO Px_y is encoded as x*10 + y. For example, P1_5 is encoded as 15 (0x0F).
	Voltage level	0xXX	0 = 3.3 V 1 = 1.8 V
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x04	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x17	
	Command_Opcode MSB	0xFE	
	Error	0x00 or 0xFF	0x00 = Command succeeded 0xFF = Command error

Table 27. The SLEEP clock select command

SLEEP_CLK_SEL			
Command Description	Selects the clock that will be used during sleep		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x18	
	Command Opcode MSB	0xFE	
	Parameter Length	0x01	
	sleep_clk	0x00 or 0x01	0x00 = RCX20 0x01 = XTAL32K
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x04	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x18	
	Command_Opcode MSB	0xFE	
	Error	0x00 or 0xFF	0x00 = Command succeeded 0xFF = Command error

Table 28. The ADC_VBAT read command

ADC_VBAT (only in DA1453x)			
Command Description	Gets the VBAT voltage using the ADC		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x1A	
	Command Opcode MSB	0xFE	
	Parameter Length	0x01	
	DC-DC mode: BOOST	0xXX	
	DC-DC mode: BUCK	0xXX	
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x05	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x1A	
	Command_Opcode MSB	0xFE	
	vbat level LSB	0xXX	= vbat_level * (3600/2047)
	vbat level MSB	0xXX	

Table 29. The SET_TX_POWER command (only in DA1453x)

SET_TX_POWER (only in DA1453x)			
Command Description	Sets radio TX power.		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x1B	
	Command Opcode MSB	0xFE	
	Parameter Length	0x01	
	rf_tx_pwr_lvl	0x01 to 0x0C	0x01: -19.5 dBm 0x02: -13.5 dBm 0x03: -10 dBm 0x04: -7 dBm 0x05: -5 dBm 0x06: -3.5 dBm 0x07: -2 dBm 0x08: -1 dBm 0x09: 0 dBm 0x0A: +1 dBm 0x0B: +1.5 dBm 0x0C: +2 dBm
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x04	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x1B	
	Command_Opcode MSB	0xFE	
	Error	0x00	0x00 = Command succeeded

Table 30. The CONFIGURE_TEST command (only in DA14531)

CONFIGURE_TEST (only in DA14531)			
Command Description	Sets radio continuous mode		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x1C	
	Command Opcode MSB	0xFE	
	Parameter Length	0x01	
	Data	0xXX	0x00 = Radio LDOs in slotted mode 0x01 = Radio LDOs in continuous mode. In Buck mode, VBAT_LOW is configured at 2.5 V. In Boost mode, VBAT_LOW supply must be >2.2 V
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x04	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x1C	
	Command_Opcode MSB	0xFE	

CONFIGURE_TEST (only in DA14531)			
	Error	0x00	0x00 = command succeeded

Table 31. The RD_TESTER_COMMAND command (not supported in DA1453x)

RD_TESTER_COMMAND (not supported in DA1453x)			
Command Description	Controls the CPLD located on the PLT hardware		
Command Format	**Byte Description**	**Value**	**Notes**
	HCI Command Packet	0x01	
	Command Opcode LSB	0x0A	
	Command Opcode MSB	0xFE	
	Parameter Length	0x03	
	Operation	0xXX	▪ 0x00: RDTESTER_INIT ▪ 0x01: RDTESTER_UART_CONNECT ▪ 0x02: RDTESTER_UART_LOOPBACK ▪ 0x03: RDTESTER_VBAT_CNTRL ▪ 0x04: RDTESTER_VPP_CNTRL ▪ 0x05: RDTESTER_RST_PULSE ▪ 0x06: RDTESTER_UART_PULSE ▪ 0x07: RDTESTER_XTAL_PULSE ▪ 0x08: RDTESTER_PULSE_WIDTH
	Data LSB	0xXX	▪ RDTESTER_INIT: N/A ▪ RDTESTER_UART_CONNECT: DUT_map ▪ RDTESTER_UART_LOOPBACK: DUT_port ▪ RDTESTER_VBAT_CNTRL: DUT_map ▪ RDTESTER_VPP_CNTRL: VPP_state ▪ RDTESTER_RST_PULSE: delay_ms ▪ DTESTER_UART_PULSE: DUT_map ▪ RDTESTER_XTAL_PULSE: N/A ▪ RDTESTER_PULSE_WIDTH: length
	Data MSB	0xXX	
Return Message	**Byte Description**	**Value**	**Notes**
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x03	
	Num_HCI_Command_Packets	0xXX	
	Command_Opcode LSB	0x0A	
	Command_Opcode MSB	0xFE	

Table 32. The read_reg32/write_reg32/read_reg16/write_reg16 command

read_reg32/write_reg32/read_reg16/write_reg16						
Command Description	Reads or writes a register					
Command Format	**Byte Description**	**Value**	**Notes**			
	HCI Command Packet	0x01				
	Command Opcode LSB	0x06				
	Command Opcode MSB	0xFE				
	Parameter Length	0x09				
	Operation	0xXX	0x00	0x01	0x02	0x03
			read_reg32	write_reg32	read_reg16	write_reg16
	Addr[0]	0xXX	Register address byte 0 (LSB)			
	Addr[1]	0xXX	Register address byte 1			
	Addr[2]	0xXX	Register address byte 2			
	Addr[3]	0xXX	Register address byte 3			
	Data[0]	0xXX	(Not used)	value byte 0 (LSB)	(Not used)	value byte 0 (LSB)
	Data[1]	0xXX	(Not used)	value byte 1	(Not used)	value byte 1
	Data[2]	0xXX	(Not used)	value byte 2	(Not used)	(Not used)
	Data[3]	0xXX	(Not used)	value byte 3	(Not used)	(Not used)
Return Message	**Byte Description**	**Value**	**Notes**			
	HCI Event Packet	0x04				
	Event Code	0x0E				
	Parameter Length	0x09				
	Num_HCI_Command_Packets	0xXX				
	Command_Opcode LSB	0x06				
	Command_Opcode MSB	0xFE				
	Operation	0xXX	0x00	0x01	0x02	0x03
			read_reg32	write_reg32	read_reg16	write_reg16
	Reserved	0x00	0x00	0x00	0x00	0x00
	Data[0]	0xXX	value byte 0 (LSB)	(Not used)	value byte 0 (LSB)	(Not used)
	Data[1]	0xXX	value byte 1	(Not used)	value byte 1	(Not used)
	Data[2]	0xXX	value byte 2	(Not used)	(Not used)	(Not used)
	Data[3]	0xXX	value byte 3	(Not used)	(Not used)	(Not used)

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Revision	Date	Description
1.3	July 11, 2024	DA14535 added to document. Updated and modified Sections 6.1, 7.13, 7.14, 7.15, 7.6. Editorial changes.
1.2	Aug 25, 2022	Updated Sections 2, 7.12, 7.13
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1.0	Nov 10, 202	Initial release.

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