

User Manual

DA14585/DA14531 HCI Commands

UM-B-146

Abstract

This document describes the HCI commands for the DA14585 and DA14531 devices which are related to the prod_test project in the SDK.

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1 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 purpose.

All the standard HCI commands are part of the Bluetooth specification (c.f [Core_v5.2](#), Volume 4 part E, section 7)

2 Overview of supported commands

Command not supported

Command supported

SUPPORTED COMMANDS

Definition	Opcode	IC Availability			Tab	Notes
		585	586	531		
HCI_CMD_OPCODE_CONT_PKT_TX	0x201E				Core Commands	
HCI_CMD_OPCODE_START_PKT_RX	0x201D				Core Commands	
HCI_CMD_OPCODE_STOPTEST	0x201F				Core Commands	
HCI_CMD_OPCODE_RESET	0x0C03				Core Commands	
HCI_CUSTOM_ACTION_CMD_OPCODE	0xFE00				Various Commands	
HCI_SLEEP_TEST_CMD_OPCODE	0xFE01				Sleep	
HCI_XTAL_TRIM_CMD_OPCODE	0xFE02				XTAL Trim	
HCI_OTP_RW_CMD_OPCODE	0xFE03				OTP	
HCI_OTP_READ_CMD_OPCODE	0xFE04				OTP	
HCI_OTP_WRITE_CMD_OPCODE	0xFE05				OTP	
HCI_REGISTER_RW_CMD_OPCODE	0xFE06				Register RW	
HCI_AUDIO_TEST_CMD_OPCODE	0xFE07				N/A	Reserved Opcode
HCI_FIRMWARE_VERSION_GET_CMD_OPCODE	0xFE08				Various Commands	
HCI_CHANGE_UART_PINS_ACTION_CMD_OPCODE	0xFE09				Various Commands	
HCI_RDTESTER_CMD_OPCODE	0xFE0A				Various Commands	
HCI_TX_TEST_CMD_OPCODE	0xFE0B				Core Commands	
HCI_START_PROD_RX_TEST_CMD_OPCODE	0xFE0C				Core Commands	
HCI_END_PROD_RX_TEST_CMD_OPCODE	0xFE0D				Core Commands	
HCI_UNMODULATED_ON_CMD_OPCODE	0xFE0E				Core Commands	
HCI_TX_START_CONTINUE_TEST_CMD_OPCODE	0xFE0F				Core Commands	
HCI_TX_END_CONTINUE_TEST_CMD_OPCODE	0xFE10				Core Commands	
HCI_SENSOR_TEST_CMD_OPCODE	0xFE11				Various Commands	
HCI_GPIO_SET_CMD_OPCODE	0xFE12				Various Commands	
HCI_GPIO_READ_CMD_OPCODE	0xFE13				Various Commands	
HCI_UART_LOOP_CMD_OPCODE	0xFE14				Various Commands	
HCI_UART_BAUD_CMD_OPCODE	0xFE15				Various Commands	
HCI_EXT32KHz_TEST_CMD_OPCODE	0xFE16				Various Commands	
HCI_GPIO_WD_CMD_OPCODE	0xFE17				Various Commands	
HCI_SLEEP_CLK_SEL_CMD_OPCODE	0xFE18				Various Commands	
HCI_RANGE_EXT_EN_CMD_OPCODE	0xFE19				N/A	Reserved Opcode
HCI_ADC_VBAT_CMD_OPCODE	0xFE1A				Various Commands	
HCI_SET_TX_POWER_CMD_OPCODE	0xFE1B				Various Commands	
HCI_CONFIGURE_TEST_MODE_CMD_OPCODE	0xFE1C				Various Commands	

3 Core Commands

3.1 Reset

reset			
Command Description	Perform 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 Bluetooth 4.0 specification for a list of error codes and descriptions.

3.2 cont_pkt_tx

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 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'
Return Message	Byte Description	Value	Notes
	HCI Event Packet	0x04	
	Event Code	0x0E	
	Parameter Length	0x04	
	Num_HCI_Command_Packets	0xFF	
	Command_Opcode_LSB	0x1E	
	Command_Opcode_MSB	0x20	
	Status	0x00 - 0xFF	0x00: command succeeded. 0x01 – 0xFF: command failed. See Volume 2, Part D -Error Codes in Bluetooth 4.0 specification for a list of error codes and descriptions.

3.4 pkt_tx

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	0xFF	
	Number of packets to receive MSB	0xFF	
Return Message	Byte Description	Value	Notes
	HCI Event Packet	0x04	
	Event Code	0x0F	
	Parameter Length	0x04	
	Status	0x00	
	Num_HCI_Command_Packets	0xFF	
	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	0xFF	
	Command_Opcode_LSB	0x0B	

	Command_Opcode MSB	0xFE	
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3.5 start_pkt_rx

start_pkt_rx			
Command Description	Start 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 Bluetooth 4.0 specification for a list of error codes and descriptions.

3.6 start_pkt_rx_stats

start_pkt_rx_stats			
Command Description	Start packet reception, it also 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 from 2402 MHz to 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	

3.7 stop test

stoptest			
Command Description	Stop 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	0xFF	
	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 Bluetooth 4.0 specification for a list of error codes and descriptions.
	Number of packets received LSB	0xFF	
	Number of packets received MSB	0xFF	

3.8 stop_pkt_rx_stats

stop_pkt_rx_stats			
Command Description	Stop 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 to 230. Any values lower than 40 should be ceiled to 40. Any values higher than 230 should be floored to 230.)
RSSI MSB	0xXX		

3.9 unmodulated OFF / TX / RX

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	0x4F, 0x52 or 0x54	0x4F: OFF 0x54: unmodulated TX 0x52: unmodulated RX
	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	0x03	
	Num_HCI_Command_Packets	0xFF	
	Command Opcode LSB	0x0E	
	Command Opcode MSB	0xFE	

3.10 start_cont_tx

start_cont_tx			
Command Description	Start 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 to 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	

3.11 stop_cont_tx

stop_cont_tx			
Command Description	Stop 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	

4 Sleep Commands

sleep none/extended /deep			
Command Description	Set 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	
	Seep Mode	0x00 - 0x02	0x00: active mode 0x01: extended sleep 0x02: deep sleep
	Minutes to sleep	0x00- 0xFF	If both minutes = 0 and seconds = 0 then 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	

5 XTAL trim Commands

xtrim rd/wr/en/dis/inc/dec			
Command Description	Perform 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 val 0x01: write trim val 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. E.g. P1_5 is encoded as 15 (0x0F). If the GPIO value equals to 0xFE then 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

	Trim value MSB	0xXX	<p>status code* for operation=6,7 0x0000 otherwise.</p> <p>*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 4: PARAMS_ERROR (wrong GPIO) 5: PARAMS_ERROR (wrong XTAL type)</p>
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6 OTP Commands

otp_wr_xtrim/rd_xtrim/wr_bdaddr/rd_bdaddr						
Command Description	Read or write 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 (not supported in DA14531)	write XTAL16M trim value OTP header field (not supported in DA14531)	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	write 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)
	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)

6.1 OTP read

otp_read			
Command Description	Read 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	

6.2 otp_write (not supported in DA14531)

otp_write (not supported in DA14531)			
Command Description	Write 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	$0x03 + 4 * (\# \text{ words to write})$
	Start word address LSB	0xXX	the address must be word aligned, lower than 0x8000 and the following must hold
	Start word address MSB	0xXX	$\text{start_address} + 4 * \text{number_of_words_to_write} < 0x8000$
	# 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	

7 Various Commands

7.1 Get Firmware version

hci_firmware_version_get			
Command Description	Retrieve the BLE 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 bytes string containing the BLE common firmware version.
BLE_application_firmware_version (32 bytes).	""	32 bytes string containing the BLE application firmware version.	

7.2 Change UART Pins

hci_change_uart_pins_action			
Command Description	Change 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. E.g. P1_5 is encoded as 15 (0x0F).
	tx_pin	0xXX	GPIO Px_y is encoded as x*10 + y. E.g. P1_5 is encoded as 15 (0x0F).

	rx_port	0xXX	GPIO Px_y is encoded as x*10 + y. E.g. P1_5 is encoded as 15 (0x0F).
	rx_pin	0xXX	GPIO Px_y is encoded as x*10 + y. E.g. 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	
	Command_Opcode_LSB	0x09	
	Command_Opcode_MSB	0xFE	
	Status LSB	0xXX	0x00: Command succeeded. 0x01: Commands failed
	Status MSB	0x00	

7.3 Custom Action

hci_custom_action			
Command Description	Run 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	0xFF	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	0xFF	
	Command_Opcode LSB	0x00	
	Command_Opcode MSB	0xFE	
	Return Data LSB	0xFF	By default, echos back the Custom action byte received on success Can be used by the user defined operation
	Return Data	0xFF	Can be used by the user defined operation
	Return Data	0xFF	Can be used by the user defined operation
	Return Data	0xFF	Can be used by the user defined operation

7.4 Sensor Test

hci_sensor_test			
Command Description	Perform 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	0xFF	DA14585/6: Ports 0x00 to 0x03 are available DA14531: This should always be 0x00
	spi_clk_pin or i2c_scl_pin	0xFF	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	0xFF	DA14585/6: Ports 0x00 to 0x03 are available DA14531: This should always be 0x00
	spi_di_pin or i2c_sda_pin	0xFF	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	0xFF	DA14585/6: Ports 0x00 to 0x03 are available DA14531: This should always be 0x00
	spi_do_pin	0xFF	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	0xFF	DA14585/6: Ports 0x00 to 0x03 are available DA14531: This should always be 0x00
spi_cs_pin	0xFF	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 = Do nothing. 1 = Set the following GPIO to input pull-down after the interface (SPI or I2C) has been initialized.
	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 = 3.3V 1 = 1.8V
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	Byte read from address specified in byte "Register address" shown 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.	

7.5 GPIO Set

GPIO_set			
Command Description	Set 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 $x*10 + y$. E.g. 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 = 3.3V 1 = 1.8V
	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	
	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

7.6 GPIO Read

GPIO_read			
Command Description	Read 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 $x*10 + y$. E.g. 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

7.7 UART Loop

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

7.8 UART Baud

UART_baud			
Command Description	Set 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	

7.9 XTAL32K Test

Ext32K test			
Command Description	Check 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

7.10 GPIO_WDOG

GPIO_WDOG			
Command Description	Continuously toggle 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. E.g. P1_5 is encoded as 15 (0x0F).
	Voltage level	0xXX	0 = 3.3V 1 = 1.8V
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

7.11 SLEEP Clock select (not supported in DA14531)

SLEEP_CLK_SEL (not supported in DA14531)			
Command Description	Select 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

7.12 ADC VBAT read

ADC_VBAT (only in DA14531)			
Command Description	Get 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	0x00	
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	

7.13 SET TX Power

SET_TX_POWER (only in DA14531)			
Command Description	Set 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: -18 dBm 0x02: -12 dBm 0x03: -8.6 dBm 0x04: -6.2 dBm 0x05: -4.3 dBm 0x06: -2.8 dBm 0x07: -1.5 dBm 0x08: -0.3 dBm 0x09: +0.6 dBm 0x0A: +1.5 dBm 0x0B: +2.3 dBm 0x0C: +3.1 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

7.14 Configure TEST (only in DA14531)

CONFIGURE_TEST (only in DA14531)			
Command Description	Set 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 2.5V. In boost mode, VBAT_LOW supply must be >2.2V
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	
	Error	0x00	0x00 = Command succeeded

7.15 RD Tester Command (not supported in DA14531)

RD_TESTER_COMMAND (not supported in DA14531)			
Command Description	Control the CPLD located on the PLT HW		
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	

	Data MSB	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 RDTESTER_UART_PULSE: DUT_map RDTESTER_XTAL_PULSE: N/A RDTESTER_PULSE_WIDTH: length
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	

8 Register Read/Write

read_reg32 / write_reg32 / read_reg16 / write_reg16						
Command Description	Read or Write 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 read_reg32	0x01 write_reg32	0x02 read_reg16	0x03 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)	

Revision History

Revision	Date	Description
1.0	10-11-2020	Initial Release

Status Definitions

Status	Definition
DRAFT	The content of this document is under review and subject to formal approval, which may result in modifications or additions.
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