UCSI ENGINEERING CHANGE NOTICE FORM

Title: Addition of UCSI_READ_POWER_LEVEL Command
Applied to: UCSI Specification Version 2.0 Revision 1

Brief description of the changes:
Adding capability to read power consumption of the port partner device.

Benefits as a result of the changes:
Be able to tell actual power consumption of the connected device either when device is active or in the low power mode

An assessment of the impact to the existing revision and systems that currently conform to the USB specification:

An analysis of the hardware implications:
HW shall have an ADC reading capability in provider mode

An analysis of the software implications:

An analysis of the compliance testing implications:

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Actual Change

(a). A.1, Page 83, Table A-1

From Text:

Command	Value
RESERVED	0x00
PPM_RESET	0x01
CANCEL	0x02
CONNECTOR_RESET	0x03
ACK_CC_CI	0x04
SET_NOTIFICATION_ENABLE	0x05
GET_CAPABILITY	0x06
GET_CONNECTOR_CAPABILITY	0x07
SET_CCOM	0x08
SET_UOR	0x09
SET_PDM (obsolete)	0x0A
SET_PDR	0x0B
GET_ALTERNATE_MODES	0x0C
GET_CAM_SUPPORTED	0x0D
GET_CURRENT_CAM	0x0E
SET_NEW_CAM	0x0F
GET_PDOS	0x10
GET_CABLE_PROPERTY	0x11
GET_CONNECTOR_STATUS	0x12
GET_ERROR_STATUS	0x13
SET_POWER_LEVEL	0x14
GET_PD_MESSAGE	0x15
GET_ATTENTION_VDO	0x16
Reserved	0x17
GET_CAM_CS	0x18
LPM_FW_UPDATE_REQUEST	0x19
SECURITY_REQUEST	0x1A
SET_RETIMER_MODE	0x1B
SET_SINK_PATH	0x1C

To Text:

Command	Value
RESERVED	0x00
PPM_RESET	0x01
CANCEL	0x02
CONNECTOR_RESET	0x03
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SET_UOR	0x09
SET_PDM (obsolete)	0x0A
SET_PDR	0x0B
GET_ALTERNATE_MODES	0x0C
GET_CAM_SUPPORTED	0x0D
GET_CURRENT_CAM	0x0E
SET_NEW_CAM	0x0F
GET_PDOS	0x10
GET_CABLE_PROPERTY	0x11
GET_CONNECTOR_STATUS	0x12
GET_ERROR_STATUS	0x13
SET_POWER_LEVEL	0x14
GET_PD_MESSAGE	0x15
GET_ATTENTION_VDO	0x16
Reserved	0x17
GET_CAM_CS	0x18
LPM_FW_UPDATE_REQUEST	0x19
SECURITY_REQUEST	0x1A
SET_RETIMER_MODE	0x1B
SET_SINK_PATH	0x1C
READ_POWER_LEVEL	0x1E

(b). Section Y.Y.Y, Page x, Figure/Table x-x

New Text:

Y.Y.Y Read Connectors Power Level (R)

This command is used by the OPM to read peak power and average power levels from the LPM that is in the sourcing mode. If the connector does not have an active connection or the LPM is in the sink mode, this command has no effect, and the PPM shall set the Error Information field to indicate Invalid Command Specific Parameters.

If the PPM receives a READ _POWER_LEVEL command while there is an active connection, the PPM shall notify the OPM that it has completed the command.

The alarm shall be raised and the CCI bit changed only when measurements are ready after the READ_POWER_LEVEL command is issued. No alarm shall be raised on the consecutive reads or upon device connection without the READ_POWER_LEVEL command. If the READ_POWER_LEVEL command has not been issued, the LPM shall use default values. (see Average current and Voltage fields in the GET_CONNECTOR_STATUS table)

It is the OPM responsibility to trace Time to Read and Time Interval fields (default or specified in the READ_POWER_LEVEL command)

Here is an example of the command:

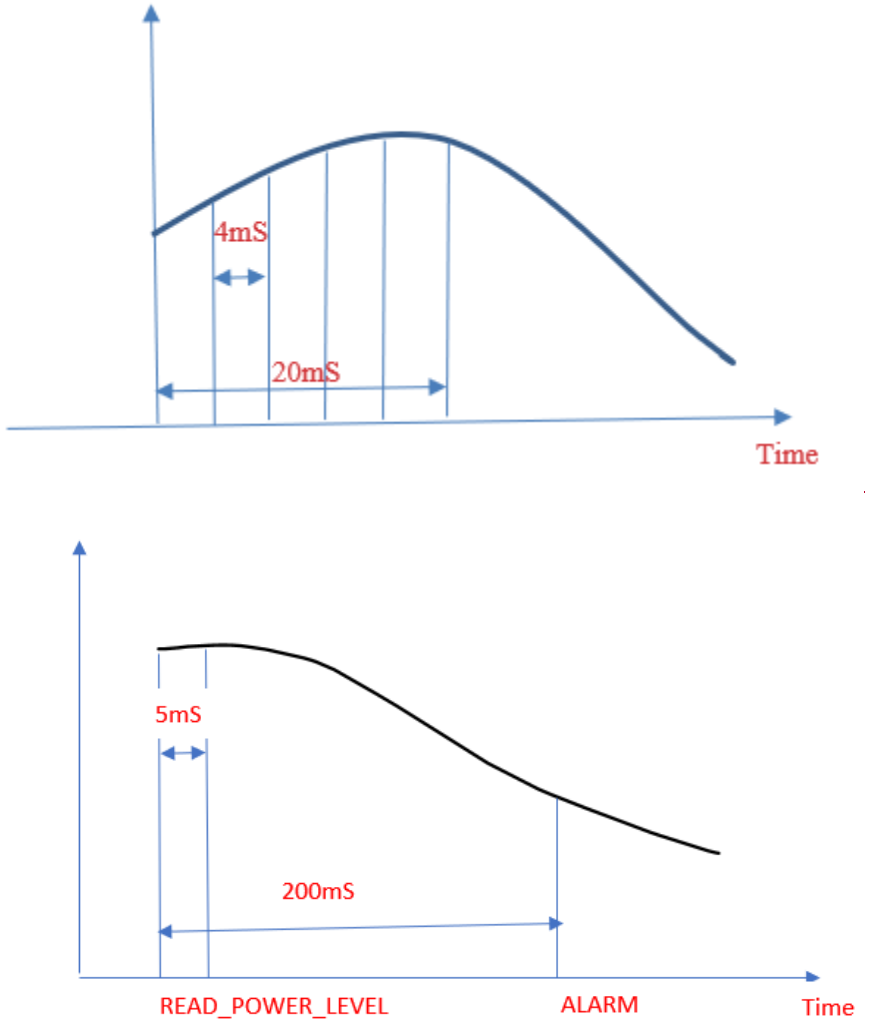
Command: 0x1E

Data Length: 0x0

Connector Number: 0x1

Time To Read Power: 0x2 (200mS)

Time Interval between readings: 0x1 (5mS)



When LPM is ready to provide the data LPM sets the Connector Change Indicator, and the data shall be a part of the MESSEGE_IN of the GET_CONNECTOR_STATUS.

Table X-XX: READ_POWER_LEVEL Command

Offset (Bits)	Field	Size (Bits)	Description
0	*Command*	8	This field shall be set to READ_POWER_LEVEL.
8	*Data Length*	8	Set to 0x00.
16	*Connector Number*	7	This field shall be set to the connector being queried.
23	*Time to Read Power*	~~8~~5	This field shall be set to the time interval during which the measurement happens. 1 bit matches to 100mS. ~~The total time to conduct the measurement is 25 S. If the field is set to 0, the measurement is done for 25 S.~~ If the field is set to 0 – 100mS, 1 – 200mS, and etc.
28	*Reserved*	3	Shall be set to zero
31	*Time Interval between readings*	2	This field shall be set to the time interval between measurements. 1 bit matches to 5mS. ~~If the field is set to 0, the time interval shall between the reading shall be set to 10mS~~
33	*Reserved*	31	Reserved and shall be set to zero.

On successful completion of the command the PPM shall set the CCI Data Structure as described in Table 4-50.

Offset (Bits)	Field	Size (Bits)	Description
0	*Reserved*	1	Reserved and shall be set to zero.
1	*Connector Change Indicator*	7	If an asynchronous event occurred on a connector then the PPM shall set this field to the connector number on which the change occurred.
8	*Data Length*	8	Set to 0x00.
16	*Reserved*	7	Reserved and shall be set to zero.
23	*Security Request Indicator*	1	Set to 0b
24	*FW Update Request Indicator*	1	Set to 0b
25	*Not Supported Indicator*	1	Set to 0b.
26	*Cancel Completed Indicator*	1	Set to 0b.
27	*Reset Completed Indicator*	1	Set to 0b.
28	*Busy Indicator*	1	Set to 0b. If the PPM is Busy then the PPM shall set this field to a 1b and all other fields to zero.
29	*Acknowledge Command Indicator*	1	Set to 0b.
30	*Error Indicator*	1	If the command was not successfully completed the PPM shall set this field to 1b.
31	*Command Completed Indicator*	1	Set this field to a 1b.

If the command completed successfully then the PPM shall set the MESSAGE IN Data Structure as described in the following table.

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From Text:

10.1.1 Get Connector Status (R)

This command is used to get the current status of the connector identified by this command. The format of the CONTROL Data Structure for this command is given in Table 4-41.

…

88	*Reverse Current Protection Status*	1	This field is valid if the *Reverse Current Protection Support* field is set to one in the GET_CONNECTOR_CAPABILITY. This field shall be set to one when the Reverse Current Protection happens. Otherwise, this bit shall be set to zero.
89	*Reserved*	39	Reserved and shall be set to zero.

To Text:

10.1.2 Get Connector Status (R)

This command is used to get the current status of the connector identified by this command. The format of the CONTROL Data Structure for this command is given in Table 4-41.

When a device got connected, the *Power Reading Ready* field in GET_CONNECTOR_STATUS shall be set initially to 0b and set to 1b only after the default *Time To Read* elapsed (no alarm raised) unless the new command READ_POWER_LEVEL command is issued.

The Power Reading Ready field shall be set to 1b for the first measurement only after device connection or the READ_POWER_LEVEL command is issued. On the consequent GET_CONNECTOR_STATUS without the READ_POWER_LEVEL command the field shall be reset to 0b.

The LPM shall continuously update the current and voltage fields and provide the latest measurements upon the GET_CONNECTOR_STATUS command either using the default values of *Time to Read* and *Time Interval* fields or specified in the READ_POWER_LEVEL command if it has been issued.

Upon the connectors power state change, reset or disconnect the average values shall be zeroed.

The changes to 4-43 TABLE: GET_CONNECTOR_STATUS

…	…		
88	*Reverse Current Protection Status*	1	This field is valid if the *Reverse Current Protection Support* field is set to one in the GET_CONNECTOR_CAPABILITY. This field shall be set to one when the Reverse Current Protection happens. Otherwise, this bit shall be set to zero.
89	*Power Reading Ready*	1	This field is an indicator to the OPM that power measurements are ready and valid
90	*Scale*	3	This field indicates the current resolution. Each bit is 5mA. Example of values: 1b – 5mA 101b – 25mA
93	*Peak Current*	16	This field is a peak current measurement reading. If the ADC supports only less than 16 bits, the most significant bits shall be set to 0
109	*Average Current*	16	This field represents the moving average for the minimum time interval specified either in the READ_POWER_LEVEL command or default 100mS of total time with interval of 5mS if the READ_POWER_LEVEL command has not been issued. If the ADC supports less than 16 bits, the most significant bits shall be set to 0
125	*Scale*	4	This field indicates the voltage resolution. Each bit is 5mV. Example of values: 010b – 10mV 0101b – 25mV 1010b – 50mV
129	*Voltage Reading*	16	This field is the most recent VBUS voltage measurement within the time window specified by the READ_POWER_LEVEL command “Time to Read Power” or 100mS which is the default value. If the ADC supports less than 16 bits, the most significant bits shall be set to 0.
145	*Reserved*		Shall be set to 0

The Power Reading Ready field shall be set by LPM in response to READ_POWER_LEVEL command when data is ready for OPM collection. This field shall be cleared to 0 after OPM read the values.

Example of Sequence Diagram: