



USB Billboard Controller

Features

- USB 2.0-certified, Full-Speed (12 Mbps)
 - Supports native Billboard Device Class Driver
 - Integrated USB termination resistors
- CY7C65210/210A: Single-channel I²C interface
 - Master up to 400 kHz
 - 190 bytes for each transmit and receive buffer
- CY7C65217/217A: Dual-channel UART/I²C interface
 - UART interface
 - Supports 2 pin
 - Data rates up to 115200 bps
 - 190 bytes for each transmit and receive buffer
 - Data format: 7 or 8 data bits, 1 or 2 stop bits
 - No parity, even, odd, mark, or space parity
 - Supports parity, overrun, and framing errors
 - Supports single-channel RS-232 and RS-422 interface
 - I²C Interface
 - Master up to 400 kHz
 - 190 bytes for each transmit and receive buffer
- General-purpose input/output (GPIO) pins:
 - CY7C65210: 9
 - CY7C65217: 7
 - CY7C65210A: 11
 - CY7C65217A: 9
- 2560 bytes flash for storing configuration parameters
- Billboard Device Class-specific descriptors
- Driver support for Billboard Device
 - Billboard Device Class is natively supported by Windows 10
- Clocking: Integrated 48-MHz clock oscillator
- Supports bus- or self-powered configurations

- USB Suspend mode for low power
- Operating voltage: 1.71 V to 5.5 V
- Operating temperature:
 - Commercial: 0 °C to 70 °C
 - Industrial: -40 °C to 85 °C
- ESD protection: 2.2-kV HBM
- RoHS-compliant package
 - 24-pin QFN (4.0 mm × 4.0 mm, 0.55 mm, 0.5-mm pitch)
- Ordering part number
 - CY7C65210-24LTXI
 - CY7C65217-24LTXI
 - CY7C65210A-24LTXI
 - CY7C65217A-24LTXI

Applications

Any Type-C Device Container that supports Alternate Mode requires Billboard Device support such as:

- Dongles for Type-C
- Docking Stations
- Monitors

Functional Description

The CY7C6521x^[1] is a Full-Speed USB controller, which enumerates as a Billboard Device. It integrates a voltage regulator, an oscillator, and flash memory for storing configuration parameters, offering a cost-effective solution. CY7C6521x supports bus-powered mode and enables efficient system power management with suspend and remote wake-up signals. It is available in a 24-pin QFN package.

For a complete list of related resources, click [here](#).

Comparison of Billboard Parts

| Feature | CY7C65210 | CY7C65217 | CY7C65210A | CY7C65217A |
|------------------------|-----------|-----------|------------|------------|
| Billboard Spec | 1.1 | 1.1 | 1.21 | 1.21 |
| Number of GPIOs | 9 | 7 | 11 | 9 |
| Suspend/Wakeup Support | Yes | Yes | No* | No* |

* Because these features are not relevant to Billboard, support for these features is removed.

Note

1. CY7C6521x refers to CY7C65210, CY7C65217, CY7C65210A, and CY7C65217A.

Block Diagram – CY7C65210/CY7C65210A



Block Diagram – CY7C65217/CY7C65217A



More Information

Cypress provides a wealth of data at www.cypress.com to help you to select the right device for your design, and to help you to quickly and effectively integrate the device into your design.

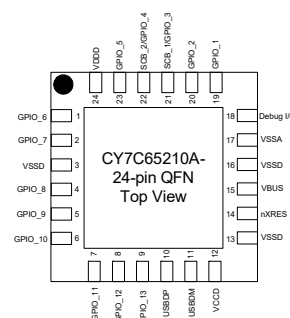
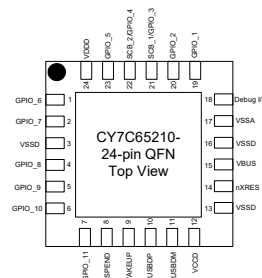
- Overview: [USB Portfolio](#), [USB Roadmap](#)
- USB 2.0 Product Selectors: [USB-Serial Bridge Controller](#), [USB to UART Controller \(Gen I\)](#), [enCoRe II](#), [enCoRe III](#), [enCoRe V](#)
- Code Examples: [USB Full-Speed](#)
- Models: [IBIS](#)

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Pin Description – CY7C65210/CY7C65210A

| Pin ^[2] | Type | Name | Default | Description |
|--------------------|----------|--------------|----------|---|
| 1 | GPIO | GPIO_6 | Tristate | GPIO |
| 2 | GPIO | GPIO_7 | Tristate | GPIO |
| 3 | Power | VSSD | – | Digital Ground |
| 4 | GPIO | GPIO_8 | Tristate | GPIO |
| 5 | GPIO | GPIO_9 | Tristate | GPIO |
| 6 | GPIO | GPIO_10 | Tristate | GPIO |
| 7 | GPIO | GPIO_11 | POWER# | GPIO (CY7C65210) |
| | GPIO | GPIO_11 | Tristate | GPIO (CY7C65210A) |
| 8 | Output | SUSPEND | – | On CY7C65210, this pin indicates that the device in Suspend mode. Can be configured as active LOW/HIGH using the configuration utility. |
| | GPIO | GPIO_12 | Tristate | On CY7C65210A, this pin serves as GPIO. |
| 9 | Input | WAKEUP | – | On CY7C65210, this pin is configured to wake up the device from Suspend mode. Can be configured as active LOW/HIGH using the configuration utility. |
| | GPIO | GPIO_13 | Tristate | On CY7C65210A, this pin serves as GPIO. |
| 10 | USBIO | USBDP | – | USB Data Signal Plus, integrates termination resistor and a 1.5-k Ω pull-up resistor |
| 11 | USBIO | USBDM | – | USB Data Signal Minus, integrates termination resistor |
| 12 | Power | VCCD | – | This pin should be decoupled to ground using a 1- μ F capacitor or by connecting a 1.8-V supply |
| 13 | Power | VSSD | – | Digital Ground |
| 14 | nXRES | nXRES | – | Chip reset, active low. Can be left unconnected or have a pull-up resistor connected if not used |
| 15 | Power | VBUS | – | VBUS Supply, 3.15 V to 5.25 V |
| 16 | Power | VSSD | – | Digital Ground |
| 17 | Power | VSSA | – | Analog Ground |
| 18 | Input | Debug I/O | – | Used for debug purpose. Should be left floating. |
| 19 | GPIO | GPIO_1 | Input | Can be used as wakeup source to wakeup device from Suspend mode. |
| 20 | GPIO | GPIO_2 | Tristate | GPIO |
| 21 | SCB/GPIO | SCB_1/GPIO_3 | SCL | I ² C SCL |
| 22 | SCB/GPIO | SCB_2/GPIO_4 | SDA | I ² C SDA |
| 23 | GPIO | GPIO_5 | Tristate | GPIO |
| 24 | Power | VDDD | – | Supply to the device core and Interface, 1.71 V to 5.5 V |

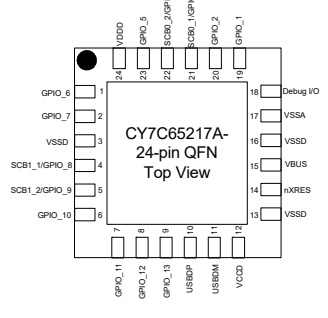
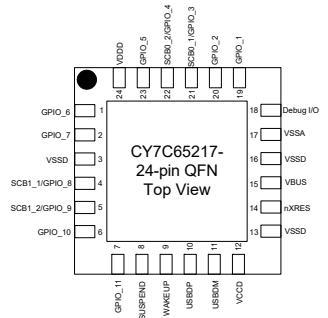


Note

2. Any pin acting as an Input pin should not be left unconnected.

Pin Description – CY7C65217/CY7C65217A

| Pin ^[3] | Type | Name | Default | Description |
|--------------------|----------|---------------|----------|---|
| 1 | GPIO | GPIO_6 | Tristate | GPIO |
| 2 | GPIO | GPIO_7 | Tristate | GPIO |
| 3 | Power | VSSD | – | Digital Ground |
| 4 | SCB/GPIO | SCB1_0/GPIO_8 | RXD | UART RXD/I ² C SCL |
| 5 | SCB/GPIO | SCB1_1/GPIO_9 | TXD | UART TXD/I ² C SDA |
| 6 | GPIO | GPIO_10 | Tristate | GPIO |
| 7 | GPIO | GPIO_11 | POWER# | GPIO (CY7C65217) |
| | GPIO | GPIO_11 | Tristate | GPIO (CY7C65217A) |
| 8 | Output | SUSPEND | – | On CY7C65217, this pin indicates that the device in Suspend mode. Can be configured as active LOW/HIGH using the configuration utility. |
| | GPIO | GPIO_12 | Tristate | GPIO |
| 9 | Input | WAKEUP | – | On CY7C65217, this pin is configured to wake up the device from Suspend mode. Can be configured as active LOW/HIGH using the configuration utility. |
| | GPIO | GPIO_13 | Tristate | On CY7C65217A, this pin serves as GPIO. |
| 10 | USBIO | USBDP | – | USB Data Signal Plus, integrates termination resistor and a 1.5-kΩ pull-up resistor |
| 11 | USBIO | USBDM | – | USB Data Signal Minus, integrates termination resistor |
| 12 | Power | VCCD | – | This pin should be decoupled to ground using a 1-μF capacitor or by connecting a 1.8-V supply |
| 13 | Power | VSSD | – | Digital Ground |
| 14 | nXRES | nXRES | – | Chip reset, active low. Can be left unconnected or have a pull-up resistor connected if not used |
| 15 | Power | VBUS | – | VBUS Supply, 3.15 V to 5.25 V |
| 16 | Power | VSSD | – | Digital Ground |
| 17 | Power | VSSA | – | Analog Ground |
| 18 | Input | Debug I/O | – | Used for debug purpose. Should be left floating. |
| 19 | GPIO | GPIO_1 | Input | Can be used as wakeup source to wakeup device from Suspend mode. |
| 20 | GPIO | GPIO_2 | Tristate | GPIO |
| 21 | SCB/GPIO | SCB0_1/GPIO_3 | SCL | SCB0 I ² C SCL |
| 22 | SCB/GPIO | SCB0_2/GPIO_4 | SDA | SCB0 I ² C SDA |
| 23 | GPIO | GPIO_5 | Tristate | GPIO |
| 24 | Power | VDDD | – | Supply to the device core and Interface, 1.71 V to 5.5 V |



Note

3. Any pin acting as an Input pin should not be left unconnected.

GPIO Configuration

| GPIO Configuration Option | Description |
|---------------------------|--|
| INPUT | Input GPIO |
| POWER# | This active low output signal is used to control power to an external logic through a switch to cut power off during an Unconfigured USB device and USB suspend. 0 - USB device in Configured state 1 - USB device in Unconfigured state or during USB suspend mode Note: CY7C65210A and CY7C65217A do not support POWER#. |
| TRISTATE | I/O Tristated (Open-Drain) |
| OUTPUT | Drive LOW or HIGH |

Functional Overview

USB and Billboard Device Functionality

USB

CY7C6521x has a built-in USB 2.0 Full-Speed transceiver. The transceiver incorporates the internal USB series termination resistors on the USB data lines and a 1.5-k Ω pull-up resistor on USBDP.

Billboard Device Functionality

CY7C6521x is used to communicate Alternate Modes supported by a Device Container to a USB Host system. CY7C6521x sends this information through BOS descriptor and string descriptors in human-readable format. CY7C6521x supports the Billboard descriptor as part of the complete BOS descriptor. The CY7C65210/65217 supports USB Billboard Device class Rev. 1.1 while the CY7C65210A/65217A supports USB Billboard Device class Rev. 1.21. For further details on the device class, refer to the [USB Billboard Device Class specification](#).

Serial Communication

CY7C65210 and CY7C65210A have one Serial Communication Block (SCB) whereas CY7C65217 and CY7C65217A have two SCBs that implement either UART or I²C interface.

I²C Interface

The I²C interface implements full multi-master mode and supports up to 400 kHz. For further details on the protocol, refer to the NXP I²C specification, Rev. 5.

Notes

- I²C ports are not tolerant to higher voltages. Therefore, they cannot be hot-swapped or powered up independently when chip is not powered.
- The minimum fall time of the SCL is met (as per NXP I²C specification Rev5) when V_{DD} is between 1.71 V and 3.0 V. When V_{DD} is within the range of 3.0 V to 3.6 V, it is recommended to add a 50 pF capacitor on the SCL signal.

Note

4. Parity error gets detected when UART transmitter device is configured for odd parity and UART receiver device is configured for even parity.
5. Frame error gets detected when UART transmitter device is configured for 7 bits data width and 1 stop bit, whereas UART receiver device is configured for 8 bit data width and 2 stop bits.

UART Interface

Only the SCB1 interface of CY7C65217 and CY7C65217A can be configured as a UART interface.

The 2-pin UART interface (RXD and TXD) provides asynchronous serial communication with other UART devices operating at speeds of up to 115200. It supports seven or eight data bits, one or two stop bits, odd, even, mark, space, and no parity. The UART interface supports full-duplex communication with a signaling format that is compatible with the standard UART protocol. The UART pins may be interfaced to industry-standard RS-232/RS-422 transceivers to manage different voltage levels. Common UART functions, such as parity error^[4] and frame error^[5], are supported. The UART parameters can be set using native APIs.

GPIO Interface

CY7C65210 has nine configurable GPIOs whereas CY7C65217 has 7 configurable GPIOs. CY7C65210A has 11 configurable GPIOs whereas CY7C65217A has nine configurable GPIOs.

The configurable options are as follows:

- INPUT: Input GPIO
- POWER#: Power control
- TRISTATE: I/O tristated
- OUTPUT: Drive LOW or HIGH

Memory

CY7C6521x has a 2560-bytes configurable flash. Flash is used to store USB parameters such as VID/PID, serial number, product and manufacturer descriptors, and Billboard Device Class-specific descriptors.

System Resources

Power System

CY7C6521x supports USB Suspend mode to control power usage. CY7C6521x operates in bus-powered or self-powered modes over a range of 3.15 V to 5.5 V.

Clock System

CY7C6521x has a fully integrated clock with no external components required. The clock system is responsible for providing clocks to all subsystems.

Internal 48-MHz Oscillator

The internal 48-MHz oscillator is the primary source of internal clocking in CY7C6521x.

Internal 32-kHz Oscillator

The internal 32-kHz oscillator is primarily used to generate clocks for peripheral operation in USB Suspend mode.

Reset

The reset block provides reliable power-on reset and brings the device back to the default known state. The nXRES (active LOW) pin can be used by the external devices to reset CY7C6521x.

Suspend and Resume

The CY7C65210 and CY7C65217 device asserts the SUSPEND pin when the USB bus enters the suspend state. This helps in meeting the stringent suspend current requirement of the USB 2.0 specification, while using the device in bus-powered mode. The device resumes from the suspend state under either of the two following conditions:

1. Any activity is detected on the USB bus.
2. The WAKEUP pin is asserted to generate remote wakeup to the host.

WAKEUP

The WAKEUP pin on CY7C65210 and CY7C65217 is used to generate the remote wakeup signal on the USB bus. The remote wakeup signal is sent only if the host enables this feature through the SET_FEATURE request. The device communicates support for the remote wakeup to the host through the configuration descriptor during the USB enumeration process.

Internal Flash Configuration

The internal flash memory can be used to store the configuration parameters provided in [Table 1](#).

Table 1. Internal Flash Configuration for CY7C65210/CY7C65210A

| Parameter | Default Value | Description |
|--------------------------|-----------------------|--|
| USB Configuration | | |
| USB Vendor ID (VID) | 0x04B4 | Default Cypress VID. Can be configured to customer VID. |
| USB Product ID (PID) | 0x5210 | Default Cypress PID. Can be configured to customer PID. |
| Manufacturer string | Cypress Semiconductor | Can be configured with any string up-to 126 characters ^[6] . |
| Product string | Billboard Device | Can be configured with any string up-to 126 characters ^[6] . |
| Serial string | User-defined | Can be configured with any string up-to 126 characters ^[6] . If the Serial string is not configured by the user, a unique serial number will be generated using the wafer die parameters. |
| Power mode | Bus powered | Can be configured to bus-powered or self-powered mode. |
| Max current draw | 100 mA | Can be configured to any value from 0 to 500 mA. The configuration descriptor will be updated based on this. |
| Remote wakeup | Enabled | Can be disabled on CY7C65210. Remote wakeup is initiated by asserting the WAKEUP or GPIO_1 pin. |
| | Disabled | On CY7C65210A, this feature is removed. |
| bcdDevice | 0x00 | Can be configured with specific binary coded decimal number. |

Note

6. Maximum available configuration space for all string descriptors is 1920 bytes. Each string descriptor can be configured up to 126 characters.

Table 1. Internal Flash Configuration for CY7C65210/CY7C65210A (continued)

| Parameter | Default Value | Description |
|--|--|---|
| GPIO Configuration | | |
| GPIO_1 | Input | GPIO can be configured as shown in GPIO Configuration on page 6 . |
| GPIO_2 | Tristate | |
| GPIO_3 | I ² C SCL | |
| GPIO_4 | I ² C SDA | |
| GPIO_5 | Tristate | |
| GPIO_6 | Tristate | |
| GPIO_7 | Tristate | |
| GPIO_8 | Tristate | |
| GPIO_9 | Tristate | |
| GPIO_10 | Tristate | |
| GPIO_11 | Power# (CY7C65210) Tristate (CY7C65210A) | |
| GPIO_12 | Tristate ^[7] | |
| GPIO_13 | Tristate ^[7] | |
| Billboard Device Class Descriptor Configuration | | |
| iAdditionalInfoURL | www.cypress.com/Type-C | Can be configured with any string up-to 126 characters ^[8] . |
| bNumberOfAlternateModes | 0x01 | Can be configured with any value from 0x01 to 0x08. |
| bPreferredAlternateMode | 0x00 | Can be configured with any value from 0x00 to 0x07. |
| VCONN Power | 0x0000 | Can be configured with any value from 0x0000 to 0x0006 or it can be configured with value 0x8000. |
| SVID | 0xFF01 | Can be configured to specific SVID. |
| bAlternateMode | 0x01 | Can be configured with any value from 0x01 to 0x08. |
| iAlternateModeString | Type-C to Display adapter. For further assistance, see http://help.vesa.org/dp-usb-type-c | Can be configured with any string up-to 126 characters ^[8] . |
| dwAlternateModeVdo | 0x000C00C5 | Can be configured with any 4-byte value (applicable only for CY7C65210A/CY7C65217A). |

Notes

- 7. These GPIOs are available only on CY7C65210A.
- 8. Maximum available configuration space for all string descriptors is 1920 bytes. Each string descriptor can be configured up to 126 characters.

Table 2. Internal Flash Configuration for CY7C65217/CY7C65217A

| Parameter | Default Value | Description |
|--|--|--|
| USB Configuration | | |
| USB Vendor ID (VID) | 0x04B4 | Default Cypress VID. Can be configured to customer VID. |
| USB Product ID (PID) | 0x5217 | Default Cypress PID. Can be configured to customer PID. |
| Manufacturer string | Cypress Semiconductor | Can be configured with any string up-to 126 characters ^[9] . |
| Product string | Billboard Device | Can be configured with any string up-to 126 characters ^[9] . |
| Serial string | User-defined | Can be configured with any string up-to 126 characters ^[9] . If the Serial string is not configured by the user then a unique serial number will be generated using the wafer die parameters. |
| Power mode | Bus powered | Can be configured to bus-powered or self-powered mode. |
| Max current draw | 100 mA | Can be configured to any value from 0 to 500 mA. The configuration descriptor will be updated based on this. |
| Remote wakeup | Enabled | Can be disabled on CY7C65217. Remote wakeup is initiated by asserting the WAKEUP or GPIO_1 pin. |
| | Disabled | On CY7C65217A, this feature is removed. |
| bcdDevice | 0x00 | Can be configured with specific binary coded decimal number. |
| GPIO Configuration | | |
| GPIO_1 | Input | GPIO can be configured as shown in Table on page 6 . |
| GPIO_2 | Tristate | |
| GPIO_3 | SCB0 I ² C SCL | |
| GPIO_4 | SCB0 I ² C SDA | |
| GPIO_5 | Tristate | |
| GPIO_6 | Tristate | |
| GPIO_7 | Tristate | |
| GPIO_8 | SCB1 UART RXD | |
| GPIO_9 | SCB1 UART TXD | |
| GPIO_10 | Tristate | |
| GPIO_11 | Power#(CY7C65217) | |
| | Tristate(CY7C65217A) | |
| GPIO_12 | Tristate ^[10] | |
| GPIO_13 | Tristate ^[10] | |
| Billboard Device Class Descriptor Configuration | | |
| iAdditionalInfoURL | www.cypress.com/Type-C | Can be configured with any string up-to 126 characters ^[9] . |
| bNumberOfAlternateModes | 0x01 | Can be configured with any value from 0x01 to 0x08. |
| bPreferredAlternateMode | 0x00 | Can be configured with any value from 0x00 to 0x07. |
| VCONN Power | 0x0000 | Can be configured with any value from 0x0000 to 0x0006 or it can be configured with value 0x8000. |
| SVID | 0xFF01 | Can be configured to specific SVID. |
| bAlternateMode | 0x01 | Can be configured with any value from 0x01 to 0x08. |
| iAlternateModeString | Type-C to Display adapter. For further assistance, see http://help.vesa.org/dp-usb-type-c | Can be configured with any string up-to 126 characters ^[9] . |
| dwAlternateModeVdo | 0x000C00C5 | Can be configured with any 4-byte value (applicable only for CY7C65210A and CY7C65217A). |

Notes

9. Maximum available configuration space for all string descriptors is 1920 bytes. Each string descriptor can be configured up to 126 characters.

10. These GPIOs are available only on CY7C65217A.

Electrical Specifications

Absolute Maximum Ratings

Exceeding maximum ratings^[11] may shorten the useful life of the device.

Storage temperature -55 °C to +100 °C

Ambient temperature with power supplied (Industrial) -40 °C to +85 °C

Supply voltage to ground potential

V_{DDD} 6.0 V

V_{BUS} 6.0 V

V_{CCD} 1.95 V

V_{GPIO} V_{DDD} + 0.5 V

Static discharge voltage ESD protection levels:
 2.2-kV HBM per JESD22-A114

Latch-up current 140 mA

Current per GPIO 25 mA

Operating Conditions

T_A (ambient temperature under bias)

Commercial 0 °C to 70 °C

Industrial -40 °C to +85 °C

V_{BUS} supply voltage 3.15 V to 5.50 V

V_{DDD} supply voltage 1.71 V to 5.50 V

V_{CCD} supply voltage 1.71 V to 1.89 V

Device-Level Specifications

All specifications are valid for -40 °C ≤ T_A ≤ 85 °C, T_J ≤ 100 °C, and 1.71 V to 5.50 V, except where noted.

Table 3. DC Specifications

| Parameter | Description | Min | Typ | Max | Units | Details/Conditions |
|------------------|-----------------------------------|------|------|------|-------|---|
| V _{BUS} | V _{BUS} supply voltage | 3.15 | 3.30 | 3.45 | V | Set and configure the correct voltage range using a configuration utility for V _{BUS} . Default 5 V. |
| | | 4.35 | 5.00 | 5.5 | V | |
| V _{DDD} | V _{DDD} supply voltage | 1.71 | 1.80 | 1.89 | V | Used to set I/O and core voltage. Set and configure the correct voltage range using a configuration utility for V _{DDD} . Default 3.3 V. |
| | | 2.0 | 3.3 | 5.5 | V | |
| V _{CCD} | Output voltage (for core logic) | – | 1.80 | – | V | Do not use this supply to drive the external device. <ul style="list-style-type: none"> • 1.71 V ≤ V_{DDD} ≤ 1.89 V: Short the V_{CCD} pin with the V_{DDD} pin • V_{DDD} > 2 V – Connect a 1-μF capacitor (Cefc) between the V_{CCD} pin and ground |
| Cefc | External regulator voltage bypass | 1.00 | 1.30 | 1.60 | μF | X5R ceramic or better. |
| I _{DD1} | Operating supply current | – | 20 | – | mA | USB 2.0 FS, UART at 1-Mbps single channel, no GPIO switching. |
| I _{DD2} | USB Suspend supply current | – | 5 | – | μA | Does not include current through a pull-up resistor on USB DP. |

Note

11. Usage above the Absolute Maximum conditions may cause permanent damage to the device. Exposure to Absolute Maximum conditions for extended periods of time may affect device reliability. When used below Absolute Maximum conditions but above normal operating conditions, the device may not operate to specification.

Table 4. AC Specifications

| Parameter | Description | Min | Typ | Max | Units | Details/Conditions |
|--------------|------------------------------|-------|---------|-------|----------|--------------------------------------|
| Fall Time_FS | FS USB Fall Time | – | 7.815 | – | ns | 90% to 10% of full swing, 50-pF load |
| Rise Time_FS | FS USB Rise Time | – | 8.367 | – | ns | 10% to 90% of full swing, 50-pF load |
| TRFM_FS | FS Rise/Fall Matching | – | 107.024 | – | % | – |
| VCRS_FS | FS Crossover Voltage | – | 1.797 | – | V | – |
| TDJ1 | FS Driver Jitter (next) | – | –0.339 | – | ns | – |
| TDJ2 | FS Driver Jitter (paired) | – | –0.285 | – | ns | – |
| TFDEOP | FS Differential to EOP Skew | – | –0.076 | – | ns | – |
| F1 | Frequency | 47.04 | 48 | 48.96 | MHz | Non-USB mode |
| F2 | | 47.88 | 48 | 48.12 | MHz | USB mode |
| Zout | USB driver output impedance | 28 | – | 44 | Ω | – |
| Twakeup | Wakeup from USB Suspend mode | – | 25 | – | μ s | – |

GPIO

Table 5. GPIO DC Specification

| Parameter | Description | Min | Typ | Max | Units | Details/Conditions |
|-----------------|---|-----------------------|-----|----------------------|------------|--|
| $V_{IH}^{[12]}$ | Input voltage HIGH threshold | $0.7 \times V_{DDD}$ | – | – | V | CMOS Input |
| V_{IL} | Input voltage LOW threshold | – | – | $0.3 \times V_{DDD}$ | V | CMOS Input |
| $V_{IH}^{[12]}$ | LVTTL input, $V_{DDD} < 2.7$ V | $0.7 \times V_{DDD}$ | – | – | V | – |
| V_{IL} | LVTTL input, $V_{DDD} < 2.7$ V | – | – | $0.3 \times V_{DDD}$ | V | – |
| $V_{IH}^{[12]}$ | LVTTL input, $V_{DDD} \geq 2.7$ V | 2 | – | – | V | – |
| V_{IL} | LVTTL input, $V_{DDD} \geq 2.7$ V | – | – | 0.8 | V | – |
| V_{OH} | CMOS output voltage HIGH level | $V_{DDD} - 0.4$ | – | – | V | $I_{OH} = 4$ mA, $V_{DDD} = 5$ V +/- 10% |
| V_{OH} | CMOS output voltage HIGH level | $V_{DDD} - 0.6$ | – | – | V | $I_{OH} = 4$ mA, $V_{DDD} = 3.3$ V +/- 10% |
| V_{OH} | CMOS output voltage HIGH level | $V_{DDD} - 0.5$ | – | – | V | $I_{OH} = 1$ mA, $V_{DDD} = 1.8$ V +/- 5% |
| V_{OL} | CMOS output voltage LOW level | – | – | 0.4 | V | $I_{OL} = 8$ mA, $V_{DDD} = 5$ V +/- 10% |
| V_{OL} | CMOS output voltage LOW level | – | – | 0.6 | V | $I_{OL} = 8$ mA, $V_{DDD} = 3.3$ V +/- 10% |
| V_{OL} | CMOS output voltage LOW level | – | – | 0.6 | V | $I_{OL} = 4$ mA, $V_{DDD} = 1.8$ V +/- 5% |
| Rpullup | Pull-up resistor | 3.5 | 5.6 | 8.5 | k Ω | – |
| Rpulldown | Pull-down resistor | 3.5 | 5.6 | 8.5 | k Ω | – |
| I_{IL} | Input leakage current (absolute value) | – | – | 2 | nA | 25 °C, $V_{DDD} = 3.0$ V |
| C_{IN} | Input capacitance | – | – | 7 | pF | – |
| Vhysttl | Input hysteresis LVTTL; $V_{DDD} > 2.7$ V | 25 | 40 | C | mV | – |
| Vhyscmos | Input hysteresis CMOS | $0.05 \times V_{DDD}$ | – | – | mV | – |

Note

12. V_{IH} must not exceed $V_{DDD} + 0.2$ V.

Table 6. GPIO AC Specification

| Parameter | Description | Min | Typ | Max | Units | Details/Conditions |
|------------------------|------------------------|-----|-----|-----|-------|--|
| T _{RiseFast1} | Rise Time in Fast mode | 2 | – | 12 | ns | V _{DDD} = 3.3 V/ 5.5 V, Cload = 25 pF |
| T _{FallFast1} | Fall Time in Fast mode | 2 | – | 12 | ns | V _{DDD} = 3.3 V/ 5.5 V, Cload = 25 pF |
| T _{RiseSlow1} | Rise Time in Slow mode | 10 | – | 60 | ns | V _{DDD} = 3.3 V/ 5.5 V, Cload = 25 pF |
| T _{FallSlow1} | Fall Time in Slow mode | 10 | – | 60 | ns | V _{DDD} = 3.3 V/ 5.5 V, Cload = 25 pF |
| T _{RiseFast2} | Rise Time in Fast mode | 2 | – | 20 | ns | V _{DDD} = 1.8 V, Cload = 25 pF |
| T _{FallFast2} | Fall Time in Fast mode | 20 | – | 100 | ns | V _{DDD} = 1.8 V, Cload = 25 pF |
| T _{RiseSlow2} | Rise Time in Slow mode | 2 | – | 20 | ns | V _{DDD} = 1.8 V, Cload = 25 pF |
| T _{FallSlow2} | Fall Time in Slow mode | 20 | – | 100 | ns | V _{DDD} = 1.8 V, Cload = 25 pF |

nXRES

Table 7. nXRES DC Specifications

| Parameter | Description | Min | Typ | Max | Units | Details/Conditions |
|----------------------|------------------------------|------------------------|-----|------------------------|-------|--------------------|
| V _{IH} | Input voltage HIGH threshold | 0.7 × V _{DDD} | – | – | V | – |
| V _{IL} | Input voltage LOW threshold | – | – | 0.3 × V _{DDD} | V | – |
| R _{pullup} | Pull-up resistor | 3.5 | 5.6 | 8.5 | kΩ | – |
| C _{IN} | Input capacitance | – | 5 | – | pF | – |
| V _{hysxres} | Input voltage hysteresis | – | 100 | – | mV | – |

Table 8. nXRES AC Specifications

| Parameter | Description | Min | Typ | Max | Units | Details/Conditions |
|-------------------------|-------------------|-----|-----|-----|-------|--------------------|
| T _{resetwidth} | Reset pulse width | 1 | – | – | μs | – |

UART Specifications

Table 9. UART AC Specifications

| Parameter | Description | Min | Typ | Max | Units | Details/Conditions |
|-------------------|---------------|-----|-----|------|-------|---|
| F _{UART} | UART bit rate | 0.3 | – | 3000 | kbps | Single SCB: TX + RX Dual SCB: TX or RX |

I²C Specifications

Table 10. I²C AC Specifications

| Parameter | Description | Min | Typ | Max | Units | Details/Conditions |
|------------------|----------------------------|-----|-----|-----|-------|--------------------|
| F _{I2C} | I ² C frequency | 1 | – | 400 | KHz | – |

Flash Memory Specifications

Table 11. Flash Memory Specifications

| Parameter | Description | Min | Typ | Max | Units | Details/Conditions |
|------------------|---|------|-----|-----|--------|--------------------|
| F _{end} | Flash endurance | 100K | – | – | cycles | – |
| F _{ret} | Flash retention. T _A ≤ 85 °C, 10K program/erase cycles | 10 | – | – | years | – |

Application Schematic

Figure 1 shows the application schematic for CY7C65210. Refer to the [Pin Description – CY7C65210/CY7C65210A](#) on page 4 for signal details.

Figure 1. CY7C65210 Application Schematic



Figure 2 shows the application schematic for CY7C65210A. Refer to the [Pin Description – CY7C65210/CY7C65210A](#) on page 4 for signal details.

Figure 2. CY7C65210A Application Schematic

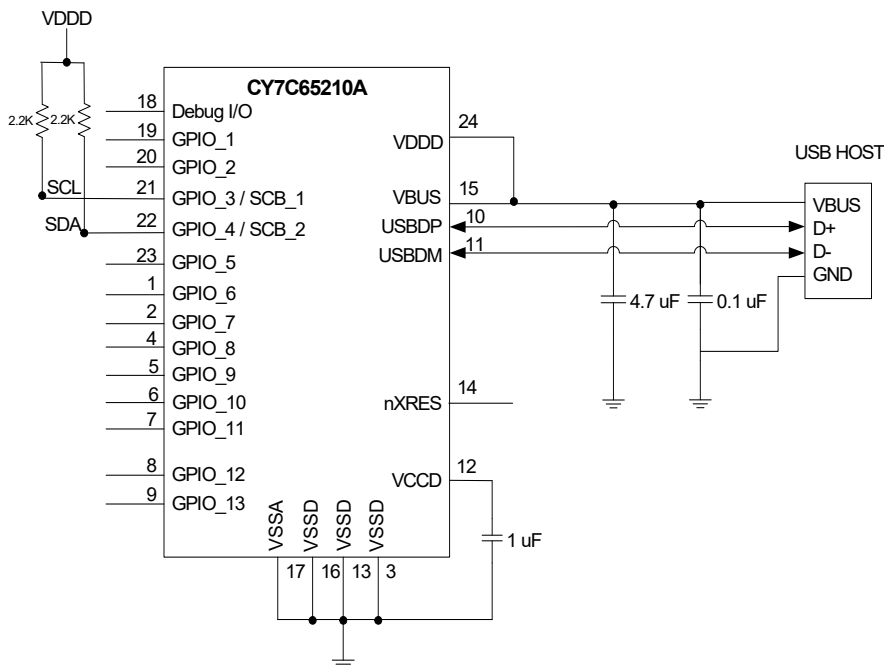


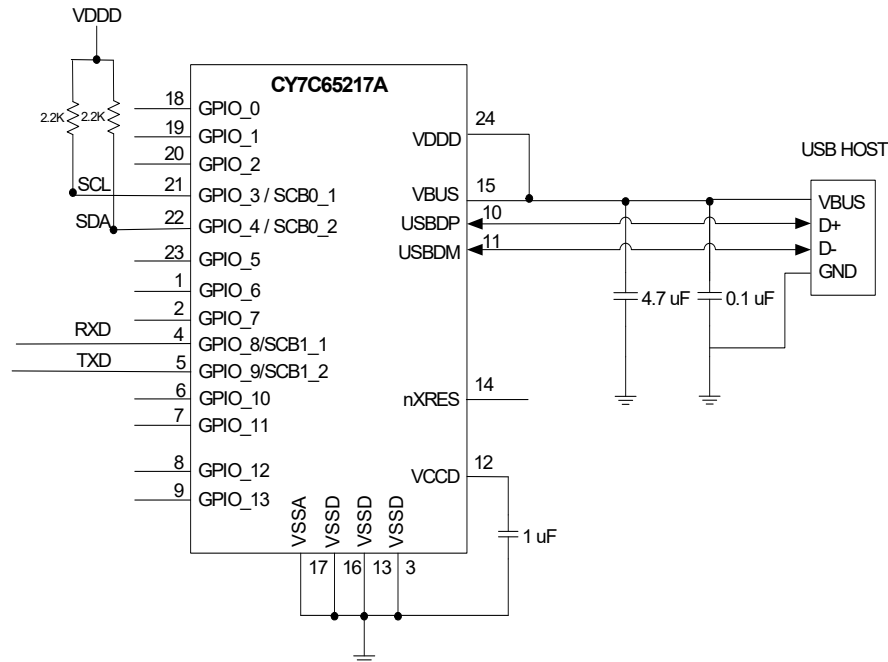
Figure 3 shows the application schematic for CY7C65217. Refer to the [Pin Description – CY7C65217/CY7C65217A](#) on page 5 for signal details.

Figure 3. CY7C65217 Application Schematic



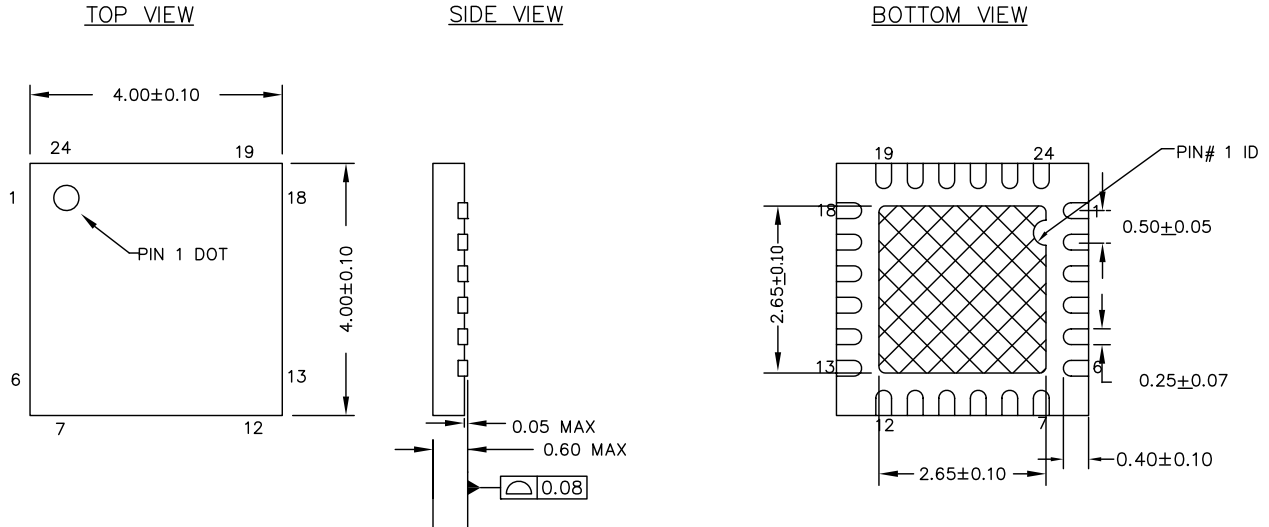
Figure 4 shows the application schematic for CY7C65217A. Refer to the [Pin Description – CY7C65217/CY7C65217A](#) on page 5 for signal details.

Figure 4. CY7C65217A Application Schematic



Packaging Information

Figure 5. 24-pin QFN (4 mm × 4 mm × 0.55 mm) LQ24A 2.65 × 2.65 E-Pad (Sawn) Package Outline, 001-13937



NOTES :

1.  HATCH IS SOLDERABLE EXPOSED METAL.
2. REFERENCE JEDEC # MO-248
3. PACKAGE WEIGHT : 29 ± 3 mg
4. ALL DIMENSIONS ARE IN MILLIMETERS

001-13937 *F

Table 13. Package Characteristics

| Parameter | Description | Min | Typ | Max | Units |
|-----------|-------------------------------|-----|------|-----|-------|
| T_A | Operating ambient temperature | -40 | 25 | 85 | °C |
| THJ | Package θ_{JA} | - | 18.4 | - | °C/W |

Table 14. Solder Reflow Peak Temperature

| Package | Maximum Peak Temperature | Maximum Time at Peak Temperature |
|------------|--------------------------|----------------------------------|
| 24-pin QFN | 260 °C | 30 seconds |

Table 15. Package Moisture Sensitivity Level (MSL), IPC/JEDEC J-STD-2

| Package | MSL |
|------------|-------|
| 24-pin QFN | MSL 3 |

Acronyms

Table 16. Acronyms Used in this Document

| Acronym | Description |
|------------------|---|
| BOS | binary device object store |
| ESD | electrostatic discharge |
| GPIO | general purpose input/output |
| HBM | human-body model |
| I ² C | inter-integrated circuit |
| MCU | microcontroller unit |
| OSC | oscillator |
| PID | product identification |
| SCB | serial communication block |
| SCL | I ² C serial clock |
| SDA | I ² C serial data |
| SIE | serial interface engine |
| SVID | standard or vendor ID |
| UART | Universal Asynchronous Receiver/Transmitter |
| USB | Universal Serial Bus |
| VID | vendor identification |

Document Conventions

Units of Measure

Table 17. Units of Measure

| Symbol | Unit of Measure |
|--------|---|
| °C | degree Celsius |
| DMIPS | Dhrystone million instructions per second |
| kΩ | kilo-ohm |
| KB | kilobyte |
| kHz | kilohertz |
| kV | kilovolt |
| Mbps | megabits per second |
| MHz | megahertz |
| mm | millimeter |
| V | volt |

Document History Page

| Document Title: CY7C65210/CY7C65217/CY7C65210A/CY7C65217A, USB Billboard Controller | | | | |
|---|---------|-----------------|-----------------|---|
| Document Number: 001-97082 | | | | |
| Revision | ECN | Orig. of Change | Submission Date | Description of Change |
| ** | 4715309 | MVTA | 04/10/2015 | New data sheet. |
| *A | 4839996 | MVTA | 07/22/2015 | Updated Features : Replaced 10 with 9 under "General-purpose input/output (GPIO) pins". Replaced "1536 bytes flash for storing configuration parameters" with "2560 bytes flash for storing configuration parameters". Updated "Pin Description – CY7C65210": Updated details corresponding to pins 18, 19, 21 and 22. Updated Functional Overview : Updated GPIO Interface : Updated description. Updated Memory : Updated description. Updated Internal Flash Configuration : Updated Table 1 : Updated details corresponding to Serial string, and Remote wakeup parameters under "USB Configuration". Removed GPIO_0 parameter and its details under "GPIO Configuration". Updated details corresponding to iAdditionalInfoURL, and iAlternateModeString parameters under "Billboard Device class Descriptor Configuration". Updated Packaging Information : spec 001-13937 – Changed revision from *E to *F. |
| *B | 4881560 | MVTA | 08/13/2015 | Updated Document Title to read as "CY7C65210/CY7C65217, USB Billboard Controller". Added CY7C65217 part related information in all instances across the document. Replaced CY7C65210 with CY7C6521x in the required instances across the document. Updated Features : Updated details under "I ² C interface". Updated Functional Description : Added Note 1 and referred the same note in CY7C6521x. Added "Block Diagram – CY7C65217". Added "Pin Description – CY7C65217". Updated Functional Overview : Added UART Interface . Updated Internal Flash Configuration : Updated Table 1 : Updated details corresponding to GPIO_3, and GPIO_4 parameters under "GPIO Configuration". Added Table 2 . Updated Serial Communication : Updated description. Updated GPIO Interface : Updated description. Updated Application Schematic : Added Figure 3 . Updated Ordering Information : Updated part numbers. |
| *C | 5310895 | MVTA | 06/16/2016 | Updated Features : Updated details under "Driver support for Billboard Device". Updated "Pin Description – CY7C65217": No changes in detail. Removed all existing shades. Updated GPIO Configuration : Added "TRISTATE" and "OUTPUT" options. |

Document History Page *(continued)*

| Document Title: CY7C65210/CY7C65217/CY7C65210A/CY7C65217A, USB Billboard Controller | | | | |
|---|---------|-----------------|-----------------|--|
| Document Number: 001-97082 | | | | |
| Revision | ECN | Orig. of Change | Submission Date | Description of Change |
| *C (cont.) | 5310895 | MVTA | 06/16/2016 | Updated Functional Overview : Updated USB and Billboard Device Functionality : Updated Billboard Device Functionality : Updated description. Updated UART Interface : Added Note 4 and referred the same note in "parity error". Added Note 5 and referred the same note in "frame error". Updated GPIO Interface : Updated description. Updated Internal Flash Configuration : Updated Table 2 : Updated details corresponding to GPIO_8 and GPIO_9 parameters under "GPIO Configuration". Updated Electrical Specifications : Added UART Specifications . Updated Application Schematic : Updated Figure 3 . |
| *D | 5768506 | AESATMP8 | 06/09/2017 | Updated logo and Copyright. |
| *E | 5920593 | UMSH | 10/13/2017 | Updated Document Title to read as "CY7C65210/CY7C65217/CY7C65210A/CY7C65217A, USB Billboard Controller". Added CY7C65210A, CY7C65217A parts related information in all instances across the document. Updated Pin Description – CY7C65210/CY7C65210A: Replaced "CY7C65210" with "CY7C65210/CY7C65210A" in heading. Updated details corresponding to pins 7, 8 and 9. Updated Pin Description – CY7C65217/CY7C65217A: Replaced "CY7C65217" with "CY7C65217/CY7C65217A" in heading. Updated details corresponding to pins 7, 8 and 9. Updated GPIO Configuration : Updated details in "Description" column corresponding to POWER# option. Updated Functional Overview : Updated USB and Billboard Device Functionality : Updated Billboard Device Functionality : Updated description. Updated Internal Flash Configuration : Updated Table 1 : Updated details corresponding to Serial string, and Remote wakeup parameters under "USB Configuration". Updated details corresponding to GPIO_11 parameter under "GPIO Configuration". Added GPIO_12, GPIO_13 parameters and their details under "GPIO Configuration". Added dwAlternateModeVdo parameter and its details under "Billboard Device Class Descriptor Configuration". Updated Table 2 : Updated details corresponding to Serial string, and Remote wakeup parameters under "USB Configuration". Updated details corresponding to GPIO_11 parameter under "GPIO Configuration". Added GPIO_12, GPIO_13 parameters and their details under "GPIO Configuration". Added dwAlternateModeVdo parameter and its details under "Billboard Device Class Descriptor Configuration". Updated Application Schematic : Added Figure 2 . Added Figure 4 . Updated Ordering Information : Updated part numbers. |
| *F | 6118883 | MUTH | 04/02/2018 | Updated to new template. Completing Sunset Review. |

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