Byte	All Speeds	Field Name	Description
3,4	0x0089[4]	wHubCharacteristics	b1, b0: Logical Power Switching Mode 00: Ganged power switching (all ports' power at once) 01: Individual port power switching (Default in TetraHub) b2: Identifies a Compound Device, 0: Hub is not part of a compound device (Default in TetraHub), 1: Hub is part of a compound device. b4, b3: Overcurrent protection mode 00: Global overcurrent protection. The hub reports overcurrent as a summation of all ports current draw, without a breakdown of individual port overcurrent status. 01: Individual port overcurrent protection. The hub reports overcurrent on a per-port basis. Each port has an overcurrent status (Default in TetraHub). 1X: No overcurrent protection. This option is enabled only for bus-powered hubs that do not implement overcurrent protection. b6, b5: TT Think Time 00: TT requires at most 8 FS bit times of inter transaction gap on a full/low speed downstream bus (Default in TetraHub). 01: TT requires at most 16 FS bit times. 10: TT requires at most 24 FS bit times. 11: TT requires at most 32 FS bit times. b7: Port indicators supported, 0: Port indicators are not supported on its downstream facing ports and the PORT_INDICATOR request has no effect. 1: Port indicators are supported on its downstream facing ports and the PORT_INDICATOR request controls the indicators. b15...b8: Reserved
5	0x32[4]	bPwrOn2PwrGood	Time from when the port is powered to when the power is good on that port
6	0x64[4]	bHubContrCurrent	Maximum current requirement for the hub controller
7	0x00[4]	bDeviceRemovable	Indicates if the port has a removable device attached
8	0xFF[4]	bPortPwrCtrlMask	Required for compatibility with software written for 1.0 compliant devices

Configuration Options

Systems using TetraHub must have an external EEPROM for the device to have a unique VID, PID, and DID. The TetraHub can talk to SPI EEPROM that are double byte addressable only. TetraHub uses the command format from the '040 parts. The TetraHub cannot talk to '080 EEPROM parts, as the read command format used for talking to '080 is not the same as '040. The '010s and '020s uses the same command format as used to interface with the '040 and hence these can also be used to interface with the TetraHub.

Default – 0xD0 Load

When used in default mode, only a unique VID, PID, and DID must be present in the external SPI EEPROM. The contents of the EEPROM must contain this information in the following format:

Byte	Value
0	0xD0
1	VID (LSB)
2	VID (MSB)
3	PID (LSB)
4	PID (MSB)
5	DID (LSB)
6	DID (MSB)

Configured – 0xD2 Load

Byte	Value (MSB->LSB)
0	0xD2
1	VID (LSB)
2	VID (MSB)
3	PID (LSB)
4	PID (MSB)
5	DID (LSB)
6	DID (MSB)
7	EnableOverCurrentTimer[3:0], DisableOvercurrent-Timer[3:0]
8	ActivePorts[3:0], RemovablePorts[3:0]
9	MaxPower
10	HubControllerPower
11	PowerOnTimer
12	IllegalHubDescriptor, Unused, FullspeedOnly, NoPortIndicators, Reserved, GangPowered, SingleTTOnly, NoEOPatEOF1

Byte 0: 0xD2

Needs to be programmed with 0xD2

Byte 1: VID (LSB)

Least Significant Byte of Vendor ID

Byte 2: VID (MSB)

Most Significant Byte of Vendor ID

Byte 3: PID (LSB)

Least Significant Byte of Product ID

Byte 4: PID (MSB)]

Most Significant Byte of Product ID

Byte 5: DID (LSB)

Least Significant Byte of Device ID

Byte 6: DID (MSB)]

Most Significant Byte of Device ID

Byte 7: EnableOvercurrentTimer[3:0], DisabledOvercurrent-Timer[3:0]

Count time in ms for filtering over current detection. Bits 7–4 are for an enabled port, and bits 3–0 are for a disabled port. Both range from 0 ms to 15 ms. See "Port Indicators" on page 5. Default: 8 ms = 0x88.

Byte 8: ActivePorts[3:0], RemovablePorts[3:0]

Bits 7–4 are the ActivePorts[3:0] bits that indicates if the corresponding port is usable. For example, a two-port hub that uses ports 1 and 4 sets this field to 0x09. The total number of ports reported in the hub descriptor: bNbrPorts field is calculated from this. Bits 3–0 are the RemovablePorts[3:0] bits that indicates whether the corresponding port is removable (set to HIGH). This bit's values are recorded appropriately in the HubDescriptor:DeviceRemovable field. Default: 0xFF.

Byte 9: MaximumPower

This value is reported in the ConfigurationDescriptor:bMaxPower field and is the current in 2 mA intervals that is required from the upstream hub. Default: 0x32 = 100 mA

Byte 10: HubControllerPower

This value is reported in the HubDescriptor:bHubContrCurrent field and is the current in milliamperes required by the hub controller. Default: 0x64 = 100 mA.

Byte 11: PowerOnTimer

This value is reported in the HubDescriptor:bPwrOn2PwrGood field and is the time in 2 ms intervals from the SetPortPower command until the power on the corresponding downstream port is good. Default: 0x32 = 100 ms.

Byte 12: IllegalHubDescriptor, Unused, FullspeedOnly, NoPortIndicators, Reserved, GangPowered, SingleTTOnly, NoEOPatEOF1

Bit 7: IllegalHubDescriptor: For GetHubDescriptor request, some USB hosts use a DescriptorTypeof 0x00 instead of HUB_DESCRIPTOR, 0x29. According to the USB 2.0 standard, a hub must treat this as a Request Error, and stall the transaction accordingly (USB 2.0, 11.24.2.5). For systems

that do not accept this, the IllegalHubDescriptor configuration bit may be set to enable TetraHub to accept a DescriptorType of 0x00 for this command. Default is 0, recommended setting is 1.

Bit 6: Unused: This bit is an unused, ‘don’t care’ bit and can be set to anything.

Bit 5: Fullspeed: Only configures the hub to be a full speed only device. Default set to 0.

Bit 4: NoPortIndicators: Turns off the port indicators and does not report them as present in the HubDescriptor, wHubCharacteristics b7 field. Default set to 0.

Bit 3: Reserved: This bit is reserved and should not be set to 1. Must be set to 0.

Bit 2: GangPowered: Indicates whether the port power switching is ganged (set to 1) or per-port (set to 0). This is reported in the HubDescriptor, wHubCharacteristics field, b4, b3, b1, and b0. Default set to 0.

Bit 1: SingleTTOnly: Indicates that the hub should only support single transaction translator mode. This changes various descriptor values. Default set to 0.

Bit 0: NoEOPatEOF1 turns off the EOP generation at EOF1 in full speed mode. Note that several USB 1.1 hosts cannot handle EOPatEOF1 properly. Cypress recommends that this option be turned off for general purpose hubs. Default is 0, recommended setting is 1.

Supported USB Requests

Device Class Commands

Table 12. Device Class Requests

Request	bmRequestType	bRequest	wValue	wIndex	wLength	Data
GetDeviceStatus	10000000B	0x00	0x0000	0x0000	0x0002	2 Byte Device Status
GetInterfaceStatus	10000001B	0x00	0x0000	0x0000	0x0002	2 Byte Endpoint Status
GetEndpointStatus	10000010B	0x00	0x0000	0x0000	0x0002	2 Byte Endpoint Status
GetDeviceDescriptor	10000000B	0x06	0x0001	Zero or Language ID	Descriptor Length	Descriptor
GetConfigDescriptor	10000000B	0x06	0x0002	Zero or Language ID	Descriptor Length	Descriptor
GetDeviceQualifierDescriptor	10000000B	0x06	0x0006	Zero or Language ID	Descriptor Length	Descriptor
GetOtherSpeedConfigurationDescriptor	10000000B	0x06	0x0007	Zero or Language ID	Descriptor Length	Descriptor
GetConfiguration[5]	10000000B	0x08	0x0000	0x0000	0x0001	Configuration value
SetCongfiguration[5]	00000000B	0x09	Configuration Value	0x0000	0x0000	None
GetInterface	10000001B	0xA	0x0000	0x0000	0x0001	Interface Number
SetInterface	00000001B	0x0B	Alternate Setting	Interface Number	0x0000	None
SetAddress	00000000B	0x05	Device Address	0x0000	0x0000	None
SetDeviceRemoteWakeup	00000000B	0x03	0x01	0x0000	0x0000	None
SetDeviceTest_J	00000000B	0x03	0x02	0x0100	0x0000	None
SetDeviceTest_K	00000000B	0x03	0x02	0x0200	0x0000	None
SetDeviceTest_SE0_NAK	00000000B	0x03	0x02	0x0300	0x0000	None
SetDeviceTest_Packet	00000000B	0x03	0x02	0x0400	0x0000	None
SetEndpointHalt	00000000B	0x03	0x00	0x0000	0x0000	None
ClearDeviceRemoteWakeup	00000000B	0x01	0x01	0x0000	0x0000	None
ClearEndpointHalt	00000000B	0x01	0x00	0x0000	0x0000	None

Note
5. Only one configuration is supported in TetraHub.

Hub Class Commands

Table 13. Hub Class Requests

Request	bmRequestType	bRequest	wValue	wIndex	wLength	Data
GetHubStatus	10100000B	0x00	0x0000	0x0000	0x0004	Hub Status (See Table 11-19 of Spec) Change Status (See Table 11-20 of Spec)
GetPortStatus	10100011B	0x00	0x0000	Byte 0: 0x00 Byte 1: Port	0x0004	Port Status (See Table 11-21 of Spec) Change Status (See Table 11-20 of Spec)
ClearHubFeature	00100000B	0x01	Feature Selectors[6] 0 or 1	0x0000	0x0000	None
ClearPortFeature	00100011B	0x01	Feature Selectors[6] 1, 2, 8, 16, 17, 18, 19, or 20	Byte 0: 0x00 Byte 1: Port	0x0000	None
ClearPortFeature	00100011B	0x01	Feature Selectors[6] 22 (PORT_INDICATOR)	Byte 0: Selectors[7] 0, 1, 2, or 3 Byte 1: Port	0x0000	None
SetHubFeature	00100000B	0x03	Feature Selector[6]	0x0000	0x0000	TetraHub STALLs this request
SetPortFeature	00100011B	0x03	Feature Selectors[6] 2, 4 or 8	Port	0x0000	None
SetPortFeature	00100011B	0x03	Feature Selector[6] 21 (PORT_TEST)	Byte 0: Selectors[8] 1,2, 3, 4 or 5 Byte 1: Port	0x0000	None
SetPortFeature	00100011B	0x03	Feature Selector[6] 22 (PORT_INDICATOR)	Byte 0: Selectors[7] 0, 1, 2, or 3 Byte 1: Port	0x0000	None
GetHubDescriptor	10100000B	0x06	Descriptor Type and Descriptor Index		Hub Descriptor Length	
ClearTTBuffer	00100011B	0x08	Dev_Addr, EP_Num	TT_Port	0x0000	None
ResetTT	00100000B	0x09	0x0000	Byte 0: 0x00 Byte 1: Port	0x0000	None
GetTTState	10100011B	0X0A	TT_Flags	Byte 0: 0x00 Byte 1: Port	TT State Length	TT State
StopTT	00100011B	0x0B	0x0000	Byte 0: 0x00 Byte 1: Port	0x0000	None

Notes
6. Feature selector values for different features are presented in Table 14.
7. Selector values for different features are presented in Table 16.
8. Selector values for different features are presented in Table 15.

Table 14. Hub Class Feature Selector

Feature Selector	Recipient	Value
C_HUB_LOCAL_POWER	Hub	0
C_HUB_OVER_CURRENT	Hub	1
PORT_CONNECTION	Port	0
PORT_ENABLE	Port	1
PORT_SUSPEND	Port	2
PORT_RESET	Port	4
PORT_POWER	Port	8
PORT_LOW_SPEED	Port	9
C_PORT_CONNECTION	Port	16
C_PORT_ENABLE	Port	17
C_PORT_SUSPEND	Port	18
C_PORT_OVER_CURRENT	Port	19
C_PORT_RESET	Port	20
PORT_TEST	Port	21
PORT_INDICATOR	Port	22

Table 15. Test Mode Selector for Feature Selector PORT_TEST (0x21)

PORT_TEST Mode Description	Selector Value
Test_J	1
Test_K	2
Test_SE0_NAK	3
Test_Packet	4
Test_Force_Enable	5

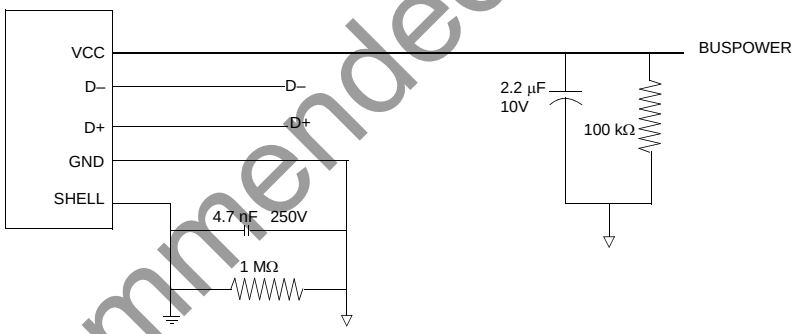
Table 16. Port Indicator Selector for Feature Selector PORT_INDICATOR (0x22)

Port Indicator Color	Selector Value	Port Indicator Mode
Color Set Automatically as shown in Table 1	0	Automatic Mode
Amber	1	Manual Mode
Green	2	Manual Mode
Off	3	Manual Mode

Upstream USB Connection

The following is a schematic of the USB upstream connector.

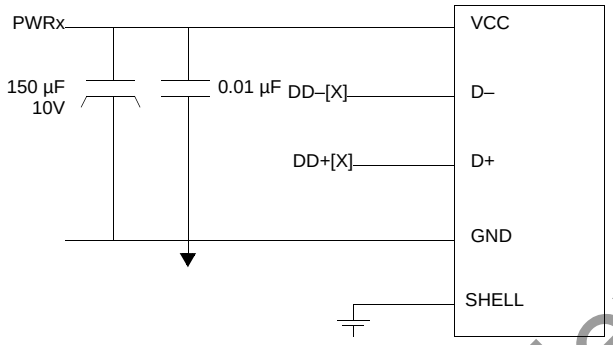
Figure 2. USB Upstream Port Connection



Downstream USB Connections

The following is a schematic of the USB downstream connector.

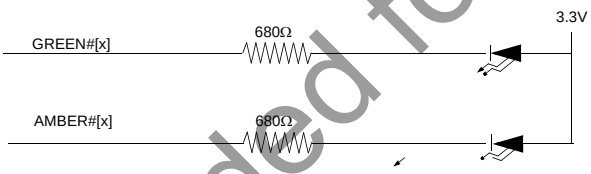
Figure 3. USB Downstream Port Connection



LED Connections

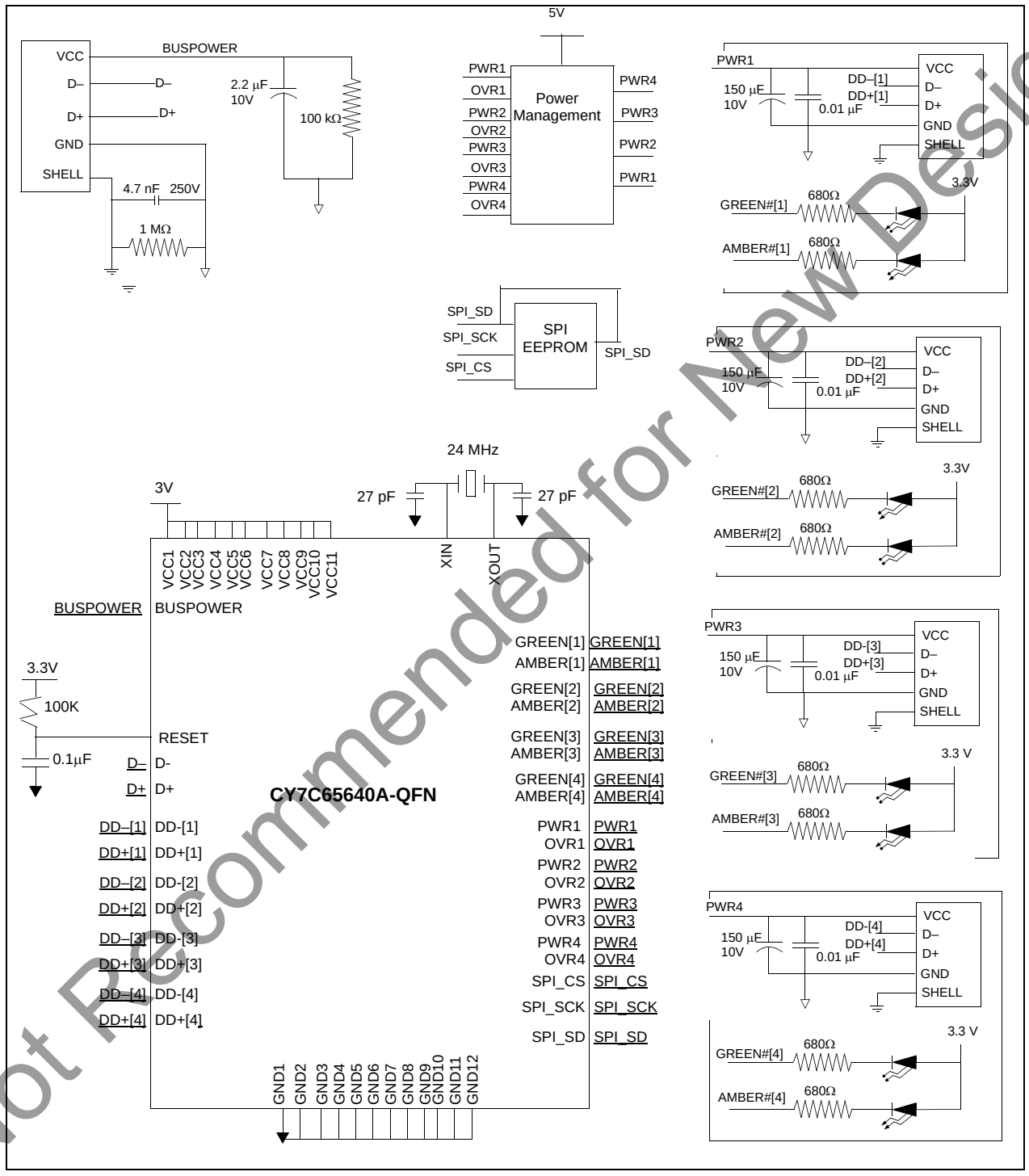
The following is a schematic of the LED circuitry.

Figure 4. USB Downstream Port Connection



Sample Schematic

Figure 5. Sample Schematic



Maximum Ratings

Storage Temperature ..... –65 °C to +150 °C

Ambient Temperature with Power Applied ..... 0 °C to +70 °C

Supply Voltage to Ground Potential .....–0.5 V to +4.0 V

DC Voltage Applied to Outputs in High Z State ..... –0.5 V to V_{CC} + 0.5 V

Power Dissipation (4 HS ports)..... 1.6 W

Static Discharge Voltage..... > 2000 V

Maximum Output Sink Current per I/O ..... 10 mA

Operating Conditions

T_A (Ambient Temperature Under Bias) ..... 0 °C to +70 °C

Supply Voltage.....+3.15 V to +3.45 V

Ground Voltage..... 0 V

FOSC (Oscillator or Crystal Frequency)..... 24 MHz ± 0.05%, parallel resonant, fundamental mode, 27 pF load capacitance, 0.5 mW

DC Electrical Characteristics

Parameter	Description	Conditions	Min	Typ	Max	Unit
V_{CC}	Supply Voltage		3.15	3.3	3.45	V
V_{IH}	Input High Voltage		2	–	5.25	V
V_{IL}	Input Low Voltage		–0.5	–	0.8	V
I_I	Input Leakage Current	$0 < V_{IN} < V_{CC}$	–	–	±10	µA
V_{OH}	Output Voltage High	I_{OUT} = 4 mA	2.4	–	–	V
V_{OL}	Output Low Voltage	I_{OUT} = –4 mA	–	–	0.4	V
I_{OH}	Output Current High		–	–	4	mA
I_{OL}	Output Current Low		–	–	4	mA
C_{IN}	Input Pin Capacitance		–	–	10	pF
I_{SUSP}	Suspend Current		–	100	–	µA
I_{CC}	**Supply Current**					
	4 Active ports	Full speed Host, Full speed Devices	–	255	–	mA
		High speed Host, High speed Devices	–	460	–	mA
		High speed Host, Full speed Devices	–	395	–	mA
	2 Active Ports	Full speed Host, Full speed Devices	–	255	–	mA
		High speed Host, High speed Devices	–	415	–	mA
		High speed Host, Full speed Devices	–	380	–	mA
	No Active Ports	Full speed Host	–	255	–	mA
		High speed Host	–	370	–	mA
USB Transceiver						
Z_{HSDRV}	Driver Output Resistance		41	45	49	Ω
I_i	Input Leakage Current		–	±0.1	±5	µA
I_{OZ}	Three-state Output OFF-State Current		–	–	±10	µA
V_{HSRS}	High speed Receiver Sensitivity Level		210	–	–	mV
T_{rfi}	Full speed Frame Jitter		–	–	133	ns
Thermal Resistance						
T_{JA}	Theta Thermal Coefficient Junction to Ambient	E-Pad configuration in section at zero airflow	23.27	–	–	°C/W

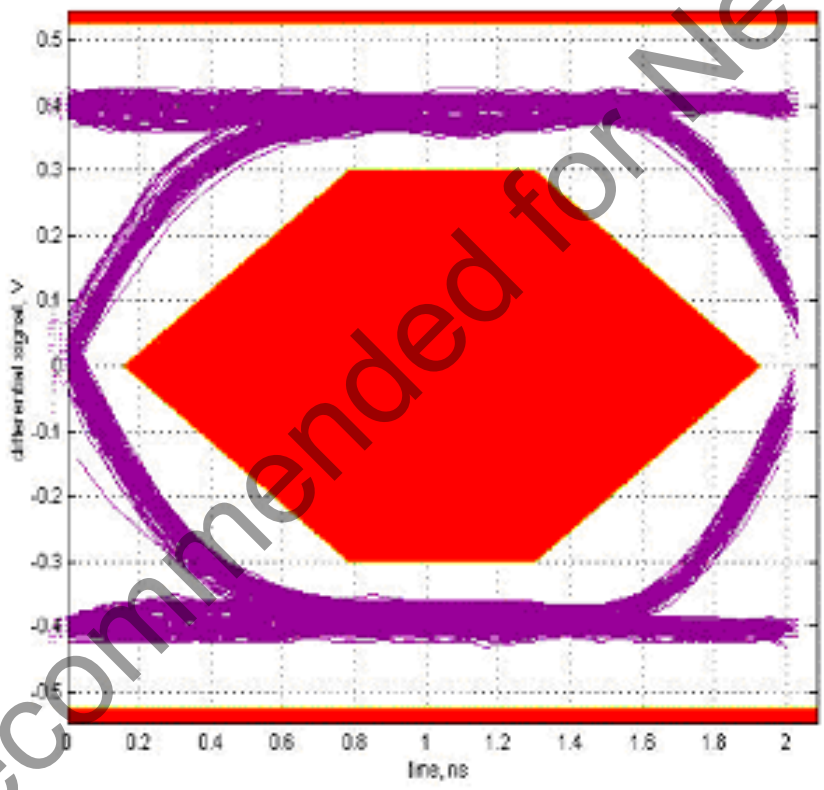
AC Electrical Characteristics

Both the upstream USB transceiver and all four downstream transceivers have passed the USB-IF USB 2.0 Electrical Certification Testing.

Table 17. Serial Peripheral Interface

Parameter	Description	Conditions	Min	Typ	Max	Unit
	Clock Rise/Fall Time		–	–	500	ns
	Clock Frequency		–	–	250	kHz
	Data Setup Time		50	–	–	ns
	Hold Time		100	–	–	ns
	Reset period		1.9	–	–	ms

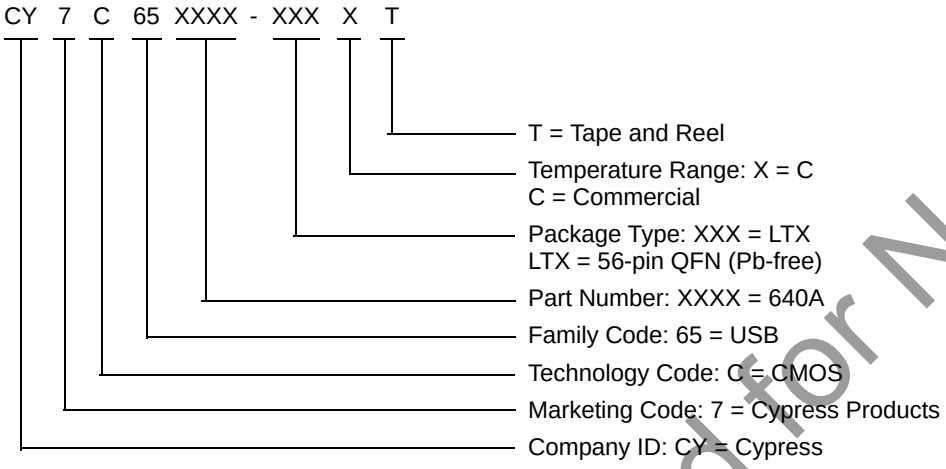
Figure 6. Eye Diagram



Ordering Information

Ordering Code	Package Type
CY7C65640A-LTXCKM	56-pin QFN Sawn type Pb-free Package
CY7C65640A-LTXC	56-pin QFN Sawn type Pb-free Package
CY7C65640A-LTXCT	56-pin QFN Sawn type Pb-free Package
CY4602	TetraHub USB 2.0 4 port Hub Reference Design Kit

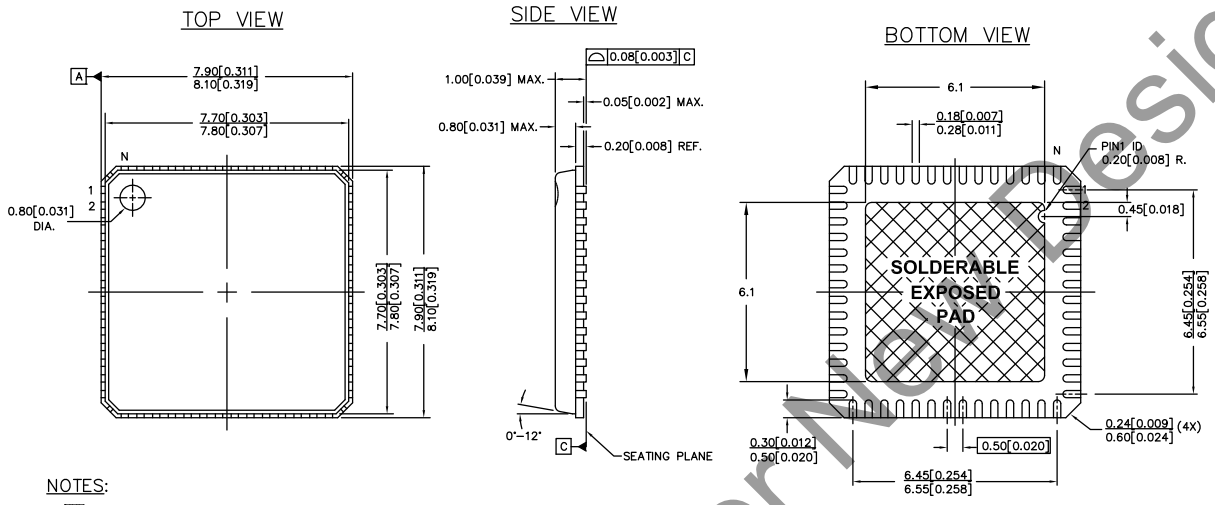
Ordering Code Definitions



Package Diagrams

The TetraHub is available in a space-saving 56-pin QFN (8 × 8 mm)

Figure 7. 56-pin QFN 8 × 8 mm



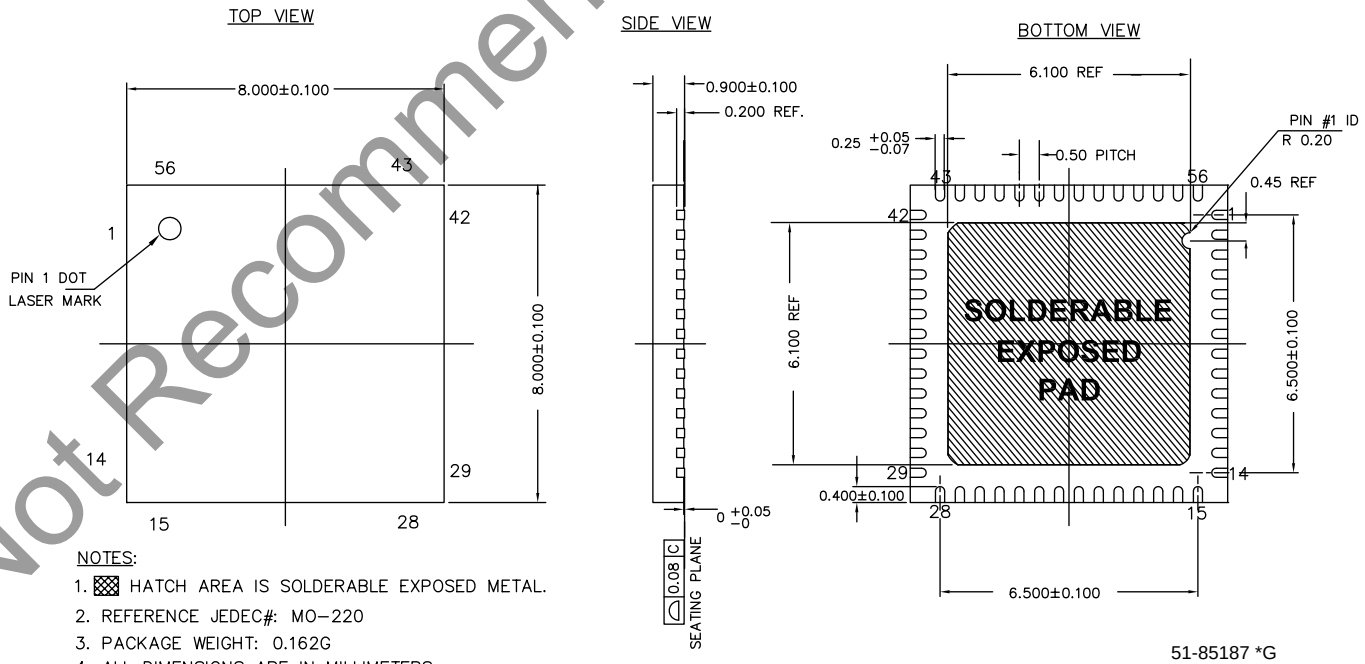
NOTES:

1. HATCH AREA IS SOLDERABLE EXPOSED METAL.
2. REFERENCE JEDEC#: MO–220
3. PACKAGE WEIGHT: 0.162g
4. ALL DIMENSIONS ARE IN MM [MIN/MAX]
5. PACKAGE CODE

PART #	DESCRIPTION
LF56	STANDARD
LY56	PB–FREE

51-85144 *J

Figure 8. 56-pin Sawn QFN (8 × 8 × 1.0 mm)



NOTES:

1. HATCH AREA IS SOLDERABLE EXPOSED METAL.
2. REFERENCE JEDEC#: MO–220
3. PACKAGE WEIGHT: 0.162G
4. ALL DIMENSIONS ARE IN MILLIMETERS

51-85187 *G

Note. The bottom metal pad size varies by product due to die size variable. If metal pad design or dimension are critical with your board designs, contact a Cypress Sales office to get the specific outline option.

Quad Flat Package No Leads (QFN) Package Design Notes

The QFN (Quad Flatpack No Leads), being a lead free package, the electrical contact of the part to the printed circuit board (PCB) is made by soldering the lands on the bottom surface of the package to the PCB. Hence special attention is required for the heat transfer area below the package to provide a good thermal bond to the circuit board. A Copper (Cu) fill should be designed into the PCB as a thermal pad under the package. Heat is transferred from the TetraHub through the device's metal paddle on the bottom side of the package. Heat from here is conducted to the PCB at the thermal pad. It is then conducted from the thermal pad to the PCB inner ground plane by a 5 × 5 array of via. A via is a plated through-hole in the PCB with a finished diameter of 13 mil. The QFN's metal die paddle must be soldered to the PCB's thermal pad. Solder mask is placed on the board top side over each via to resist solder flow into the via. The mask on the top side also minimizes outgassing during the solder reflow process.

Follow the layout guidelines provided in the PCB layout files accompanied with the CY4602 TetraHub Reference Design Kit. The information in this section was derived from the original application note by the package vendor. For further information on this package design, refer to the application note on Surface Mount Assembly of Amkor's MicroLeadFrame (MLF) Technology. You can find this on Amkor's website at this URL: http://www.amkor.com/products/notes_papers/MLF_AppNote. This application note provides detailed information on board mounting guidelines, soldering flow, rework process, and so on.

Figure 9 on page 22 displays a cross-sectional area underneath the package. The cross section is of only one via. The solder paste template needs to be designed to enable at least 50 percent solder coverage. The thickness of the solder paste template should be 5 mil. It is recommended that 'No Clean', type 3 solder paste is used for mounting the part. Nitrogen purge is recommended during reflow.

Figure 9. Cross section of Area Below the QFN Package

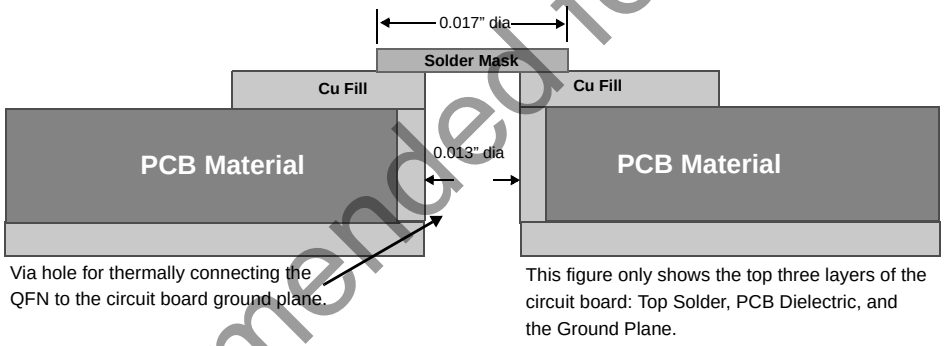


Figure 10 is a plot of the solder mask pattern and Figure 11 displays an X-Ray image of the assembly (darker areas indicate solder).

Figure 10. Plot of the Solder Mask (White Area)

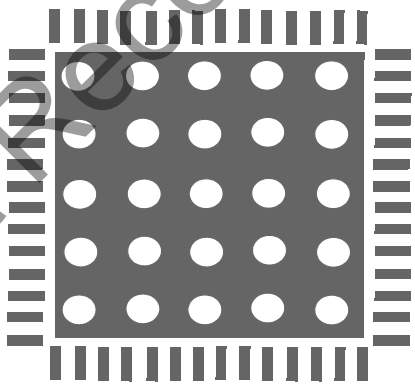
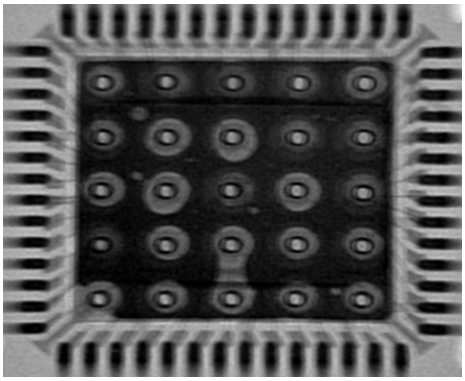


Figure 11. X-Ray Image of the Assembly



Errata

This section describes the errata for the Tetrahub/CY7C65640A device. Details include errata trigger conditions, available workarounds, and silicon revision applicability. Contact your local Cypress Sales Representative if you have further questions.

Part Numbers Affected

Part Number	Device Characteristics
CY7C65640A	All Packages

Markings
Markings for the CY7C65640A consist of:

CY7C65640A-LFXC

YYWW R

Where YYWW is the date code consisting of YY for a two digit year (that is, 2004 is 04) and WW for a work week number within the year (range is 01 to 52). The chip's revision letter is represented by the R in the above format.

CY7C65640A Qualification Status
In Production

CY7C65640A Errata Summary

The following table defines the errata applicable to available CY7C65640A family devices. An "X" indicates that the errata pertains to the selected device.
Note Errata titles are hyperlinked. Click on table entry to jump to description.

Items	CY7C65640A	Rev Letter	Fix Status
1. Compliance Testing Setup	X	E	Use workaround.
2. D- Driven High on Power Cycling the Hub	X	E	Use workaround.
3. Inter-Packet Delay Timing between LS and FS packet	X	E	Use workaround.

1. Compliance Testing Setup

- **PROBLEM DEFINITION**
  If downstream ports are not defined contiguously from Port 1 to Port n, the current USB-IF test tool is unable to put TetraHub into high-speed disconnect test mode.
  •PARAMETERS AFFECTED
  N/A.
- **TRIGGER CONDITION**
  Non contiguous port numbering. For example, physical ports 1, 3, and 4 are used instead of physical ports 1, 2, and 3.
- **SCOPE OF IMPACT**
  The high-speed test patterns cannot be enabled on given ports.
- **WORKAROUND**
  Use contiguous port numbering from port 1 to port n.
- **FIX STATUS**
  Use workaround.

2. D- Driven High on Power Cycling the Hub

■ **PROBLEM DEFINITION**

When power is cycled on a TetraHub that is already connected to the host and powered (the BUSPOWER pin is in a high state) and configured to operate in high-speed mode (high-speed chirp is not disabled via EEPROM configuration), then TetraHub drives D- high for about 4.5 ms at the same time that the pull-up resistor on D+ is enabled, resulting in an SE1 state on the bus during this interval. This SE1 state has been observed to cause the part to not complete enumeration on some full-speed hosts.

• **PARAMETERS AFFECTED**

N/A

■ **TRIGGER CONDITION(S)**

1. TetraHub is configured to operate in high-speed mode (high-speed chirp is not disabled via EEPROM configuration.
2. TetraHub is connected to the host and powered (BUSPOWER pin is in a high state)
3. Power is cycled on TetraHub.

■ **SCOPE OF IMPACT**

Some full-speed hosts fail to recognize the TetraHub “attach” event and the TetraHub will not enumerate.

■ **WORKAROUND**

Disconnecting and reconnecting the TetraHub after a power cycle event results in the successful enumeration of the TetraHub.

■ **FIX STATUS**

Use workaround.

3. Inter-Packet Delay Timing Between LS and FS Packet

■ **PROBLEM DEFINITION**

A bus contention situation can occur between TetraHub and a Cypress M8- based full-speed hub, when a full-speed hub (which uses Cypress’ M8 based full-speed hub silicon) is plugged into TetraHub and both low-speed and full-speed devices are plugged into the downstream ports of the full-speed Cypress hub. This bus contention causes the Cypress full-speed hub repeater to enter an invalid state, affecting communication to a full-speed device downstream of the full-speed hub.

• **PARAMETERS AFFECTED**

N/A.

■ **TRIGGER CONDITION(S)**

1. TetraHub is connected to a high-speed host and configured to operate in high-speed mode
2. A Cypress M8-based full-speed hub is connected to TetraHub.
3. Low and full-speed devices are connected to Cypress M8-based full-speed hub (P/N CY7C650xx, CY7C651xx, CY7C660xx, and CY7C661xx).
4. Full-speed traffic immediately follows low-speed traffic.

■ **SCOPE OF IMPACT**

This issue has only been observed with full-speed hubs based on Cypress’ M8 based full-speed parts. When the trigger conditions exist and traffic is actively flowing to/from the attached devices, the full-speed device will no longer operate and may drop off the bus. Note that the problem has not been observed with any other full-speed hub.

■ **WORKAROUND**

Avoid using a full-speed hub based on an old Cypress M8 based hub part directly downstream of the TetraHub.

■ **FIX STATUS**

Use workaround.

References

[1] Document # 7C1304, TetraHub™ High-Speed USB Hub Controller

Document History Page

Document Title: CY7C65640A, TetraHub™ High Speed USB Hub Controller Document Number: 38-08019				
Revision	**ECN**	**Orig. of Change**	**Submission Date**	**Description of Change**
**	113506	BHA	04/25/02	New data sheet (Preliminary)
*A	116812	MON	08/15/02	Supply voltage range changed from 3.3V–3.6V to 3.15V–3.45 Added EPROM types that can be used with HX2 (p. 14) Added description of bit 7 of Byte 12 (Illegal Hub Descriptor) D2 Load (p. 15) Added high speed sensitivity level of receiver (p. 20) Added QFN package design notes (section 16.1)
*B	118518	MON	10/31/02	Fixed the Spec field in the Default Device Descriptor section 7.1 Fixed Interface Protocol field of the interface descriptor, section 7.3 Fixed Device Protocol field of the interface descriptor, section 7.7 Modified table 9-2, section 9.2 Added table 9-4, 9-5, section 9.2 Added table 4-1, 4-2, section 4.8 Added information on bits in wHubCharacterestics, section 7.8 Modified figure 16-1 in QFN package design notes, section 16.1 Included the eye diagram, section 14.4.2 Preliminary to Final
*C	121793	MON	12/09/02	Fixed the SPI clock Frequency to 250 KHz, section 14.4.1 Added information on the configuration of unused port pins, section 6.0 Added statement that no special power up procedure is required, section 6.0
*D	125275	MON	04/02/03	Changed the name of Bit 3 of Byte 12 of EEPROM for a 0xD2 load (section 8.2) from *BusPowered* to *Reserved*. Removed all indication to the misconception that the hub can support bus power. Added information as to which nibble of byte 8 in the EEPROM defines the active ports and which nibble defines the removable ports, section 8.2. Added further information on the BUSPOWER pin (pin 26) functionality in section 6.0.
*E	234272	MON	see ECN	Added part number for the lead free package (CY7C65640-LFXC), section 15.0 Changed the name of Bit 6 of Byte 12 of EEPROM for a 0xD2 load from *CompoundDevice* to *Unused*, section 8.2.
*F	285171	KKU	see ECN	Changed CY7C65640 to CY7C65640A and reformatted to new format
*G	308296	KKU	see ECN	Added reset period under AC characteristics. Removed compound device from features list. Updated section 7.1 DID from 0x0007 to 0x000B for rev E silicon.
*H	390258	KKU	see ECN	Added theta thermal coefficient junction to ambient (T_{JA}) to section 14.3
*I	522224	TEH	see ECN	Corrected typo in table 6-1. Changed downstream port 4 signal labels from [3] to [4]. Updated package diagram. Updated to new template.
*J	2657415	DPT / PYRS	02/10/09	Added package diagram spec 51-85187, updated package diagram spec 51-85144 and updated Ordering Information table
*K	2742387	DPT	07/22/09	Updated 56 QFN (sawn) package drawing
*L	2766203	DPT	09/18/09	Updated 56-Pin Sawn QFN package (FIgure 8)
*M	2825358	RSKV / PYRS	12/10/09	Added Contents. Added ‘Pb-free Package‘ for Sawn parts in the Ordering Information table.
*N	3149016	ODC	01/20/2011	Updated Operating Conditions. Updated Ordering Information and added Ordering Code Definitions. Updated to new template.

Document History Page *(continued)*

Document Title: CY7C65640A, TetraHub™ High Speed USB Hub Controller Document Number: 38-08019				
Revision	**ECN**	**Orig. of Change**	**Submission Date**	**Description of Change**
*O	3404993	AASI	10/13/2011	Moving tetrahub (CY7C65640A) to NRND. Adding watermark “Not recommended for new designs” on all pages of the datasheet.
*P	4566232	PRJI	11/10/2014	Updated Package Diagrams: spec 51-85187 – Changed revision from *E to *F. Updated to new template. Completing Sunset Review.
*Q	5686754	PRVE	04/06/2017	Added Errata. Updated the template. Updated package diagrams to current revision.

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