# **USB BitJetLite Download Cable**

# **User Guide**



System Level Solutions, Inc. (USA) 14100 Murphy Avenue San Martin, CA 95046 (408) 852 - 0067

Product Version:1.0Document Version:1.0Document Date:August 2010

http://www.slscorp.com

Copyright©2010, System Level Solutions.All rights reserved. SLS, An Embedded systems company, the stylized SLS logo, specific device designations, and all other words and logos that are identified as trademarks and/or service marks are, unless noted otherwise, the trademarks and service marks of SLS in India and other countries. All other products or service names are the property of their respective holders. SLS products are protected under numerous U.S. and foreign patents and pending applications, mask working rights, and copyrights. SLS warrants performance of its semiconductor products to current specifications in accordance with SLS is standard warranty, but reserves the right to make changes to any products and services at any time without notice. SLS assumes no responsibility or liability arising out of the application or use of any information, products, or service described herein except as expressly agreed to in writing by SLS. SLS customers are advised to obtain the latest version of specifications before relying on any published information and before orders for products or services.

ug\_dc\_ubjl\_1.0





## Introduction

This document familiarizes you with the contents of the USB BitJetLite Download Cable that allows to configure the Altera FPGA.

Table below shows the revision history of this document.

Version	Date	Description
1.0	August 2010	First Publication

# How to Contact SLS

For the most up-to-date information about SLS products, go to the SLS worldwide website at http://www.slscorp.com. For additional information about SLS products, consult the source shown below.

Information Type	E-mail
Product literature services, SLS liter- ature services, Non-technical cus- tomer services, Technical support.	support@slscorp.com

# Typographic Conventions

The document uses the typographic conventions shown as below.

Visual Cue	Meaning
Bold Type with Initial Capital Letters	All Headings and Sub Headings Titles in a document are dis- played in bold type with initial capital letters; Example: Introduction, Hardware Setup, Software Setup
Bold Type with Italic Letters	All Definitions, Figure and Table Headings are displayed in Italics. Examples: Figure 1. USB BitJetLite Download Cable
1. 2.	Numbered steps are used in a list of items, when the sequence of items is important. such as steps listed in procedure.
• ■	Bullets are used in a list of items when the sequence of items is not important.
<b>₽</b> ₽	The hand points to information that requires special attention.
CAUTION	The caution indicates required information that needs special con- sideration and understanding and should be read prior to starting or continuing with the procedure or process.
WARNING	The warning indicates information that should be read prior to starting or continuing the procedure or processes.
••••	The feet direct you to more information on a particular topic.

# Contents



Ab	oout this Guide	iii
	Introduction	
	How to Contact SLS	iii
	Typographic Conventions	iv
1.	Introduction	1
	Device Support	1
	Power Requirements	1
	Software Requirements	1
_		
2.	USB BitJetLite Hardware and Software Setup	
	Hardware Setup	
	Software Setup	
	Installing USB BitJetLite Driver on Windows XP systems	
	Installing USB BitJetLite Driver on Windows Vista System	9
	Installing USB BitJetLite Driver on Windows 7 Systems	14
	Setting up the USB BitJetLite hardware in the Quartus II software	
3.	USB BitJetLite Download Cable Specifications	
	USB BitJetLite Connections	
	Voltage Requirements	
	USB BitJetLite Plug Connection	
	Circuit Board Header Connection	
	Operating Conditions	
	LED Indication	

# 1. Introduction



	The USB BitJetLite interfaces a USB port on a host computer to an Altera <sup>®</sup> FPGA mounted on a printed circuit board. The cable sends configuration data from the PC to a standard 10-pin header connected to the FPGA. You can use the USB BitJetLite to iteratively download configuration data to a system during prototyping or to program data into the system during production.
Device Support	<ul> <li>The USB BitJetLite download cable allows you to program and configure Altera devices. Specifically, you can do the followings:</li> <li>Download configuration data to FPGA devices: <ul> <li>Stratix<sup>®</sup> series FPGAs</li> <li>Cyclone<sup>®</sup> series FPGAs</li> <li>MAX<sup>®</sup> series CPLDs</li> <li>Arria<sup>®</sup> series FPGAs</li> </ul> </li> <li>In-system programming of the following devices: <ul> <li>Serial configuration devices including EPCS1, EPCS4, EPCS16, EPCS64 and EPCS128 devices.</li> </ul> </li> <li>Perform SignalTap<sup>®</sup> II logic analysis</li> <li>USB BitJetLite supports target systems using 3.3 V LVTTL/LVCMOS and single-ended I/O standards from 1.5 V to 3.3 V.</li> </ul>
Power Requirements	<ul> <li>The USB BitJetLite download cable requires the following power sources:</li> <li>5.0 V from the USB cable</li> <li>Between 1.5 V and 3.3 V from the target circuit board</li> </ul>
Software Requirements	The USB BitJetLite is available for Windows XP (32-bit and 64-bit) with service pack 2, Windows Vista (32-bit and 64-bit) and Windows 7 (32-bit and 64-bit) systems.

Use the Quartus<sup>®</sup> II software version 7.2 or later to configure your device.

B

The USB BitJetLite download cable also supports the following:

- Quartus II Programmer (for programming and configuration)
- Quartus II SignalTap<sup>®</sup> II Logic Analyzer (for logic analysis)
- Quartus II Programmer (standalone version)
- Quartus II SignalTap II logic analyzer (standalone version)
- Quartus II v8.1 service pack 1.0 is required to be installed in Quartus II v8.1.
- ® indicates registered mark of Altera products only.



# 2. USB BitJetLite Hardware and Software Setup

## Hardware Setup

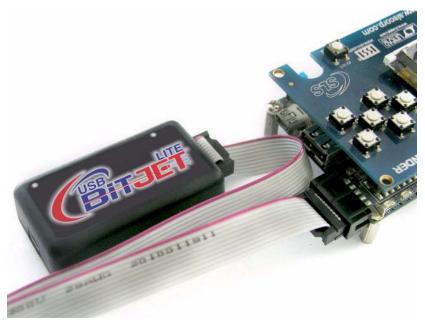
This section describes how to install and set up the USB BitJetLite download cable for device configuration or programming.

For plug and header dimensions, pin names, and operating conditions, see Chapter 3, "USB BitJetLite Download Cable Specifications".

Connect your USB BitJetLite download cable to the circuit board as instructed below.

- **1.** Disconnect the power cable from the circuit board.
- 2. Connect the USB cable to the USB port on your PC and to the USB BitJetLite port.
- **3.** Connect the USB BitJetLite download cable to the 10-pin header on the device board. Figure 2-1. shows the USB BitJetLite download cable and the circuit board connector.

Figure 2-1. USB BitJetLite Download Cable





To avoid damaging the USB BitJetLite cable, first unplug the cable from the 10-pin header on the target board before unplugging the cable from the USB port on your PC. It is safest to remove power first from the target board before unplugging the USB BitJetLite cable.

4. Reconnect the power cable to apply power to the circuit board.

This section describes the following:

- Installing USB BitJetLite Driver on Windows XP systems
- Installing USB BitJetLite Driver on Windows Vista systems
- Installing USB BitJetLite Driver on Windows 7 systems
- Settings up USB BitJetLite hardware in Quartus II software

Before you begin the installation, verify that the USB BitJetLite drivers are located in *<USB BitJetLite Installation Path>*\**Drivers** directory.

## Software Setup

### Installing USB BitJetLite Driver on Windows XP systems

This section describes how to install the USB BitJetLite drivers on Windows XP 32/64-Bit systems.

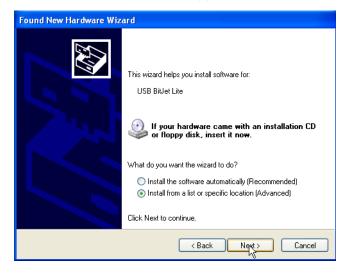
To install the driver, follow the directions below:

- 1. Plug in the USB BitJetLite download cable to the PC.
- 2. On the Found New Hardware Wizard window, click Yes, this time only and then click Next to continue. See Figure 2-2.

Figure 2-2. Found New Hardware Wizard (1)

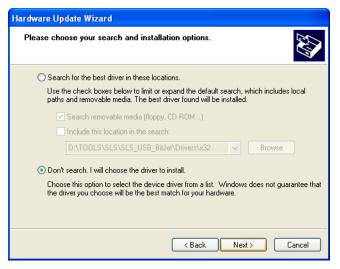
Found New Hardware Wizard		
	Welcome to the Found New Hardware Wizard Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission). Read our privacy policy	
	Can Windows connect to Windows Update to search for software?	
	< Back Next> Cancel	

**3.** Select **Install from a list or specific location (Advanced)** and click **Next** to continue. See Figure 2-3.



#### Figure 2-3. Found New Window Wizard (2)

- 4. Select Don't search. I will choose the driver to install. Click Next. See Figure 2-4.
- Figure 2-4. Choosing Installation Option Window



5. Select Universal Serial Bus controllers and click Next to continue. See Figure 2-5.

Figure 2-5. Hardware type Window

Hardware Update Wizard	
Hardware Type.	E.
Select a hardware type, and then click Next. Common <u>h</u> ardware types:	
<ul> <li>Smart card readers</li> <li>Sound, video and game controllers</li> <li>Storage volume shadow copies</li> <li>Storage volumes</li> <li>System devices</li> <li>Tape drives</li> <li>Tape drives</li> <li>Universal Serial Bus controllers</li> <li>Windows CE USB Devices</li> </ul>	
<back next=""></back>	Cancel

 Click on Have Disk button and browse to the location your <USB BitJetLite Installation Path>\Drivers\(x32|x64) of the driver. Click OK. See Figure 2-6.

Figure 2-6. Install From Disk Window



7. Select SLS USB BitJetLite and click Next to continue. See Figure 2-7.

Select the device driver you want to	install for this hardware.
Select the manufacturer and model of have a disk that contains the driver y	of your hardware device and then click Next. If you you want to install, click Have Disk.
Show compatible hardware	
SLS USB BitJet Lite	
This driver is not digitally signed!     Tell me why driver signing is important	Have Disk

#### Figure 2-7. Device Driver Selection Window

**8.** It will install the driver for the download cable. On successful driver installation you will see the windows as shown in Figure 2-8.

Figure 2-8. Finish Installation

Found New Hardware Wizard		
	Completing the Found New Hardware Wizard	
	The wizard has finished installing the software for:	
	SLS USB BilJet Lite	
	Click Finish to close the wizard.	
	< Back Finite Cancel	

9. Click **Finish** to exit the New Hardware Installation Wizard.

# Installing USB BitJetLite Driver on Windows Vista System

This section describes how to install the USB BitJetLite driver on Windows Vista systems.

To install the driver, follow the directions below:

- 1. Plug in the USB BitJetLite download cable to the PC.
- 2. On the Found New Hardware Wizard window, click Locate and install driver software to continue. See Figure 2-9.

Figure 2-9. Choosing Installation Option (1)

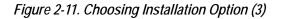
💽 Found New Hardware
Windows needs to install driver software for your USB BitJet Lite
Cocate and install driver software (recommended) Windows will use you through the process of installing driver software for your device.
Ask me again later Windows will ask again the next time you plug in your device or log on.
On't show this message again for this device Your device will not function until you install driver software.
Cancel

**3.** Click on **I don't have the disk**. **Show me other options** to continue. See Figure 2-10.

		X
0	D Found New Hardware - USB BitJet Lite	
	Insert the disc that came with your USB BitJet Lite	
	If you have the disc that came with your device, insert it now. Windows will automatically search the disc for driver software.	
	✤ I don't have the disc. Show me other options.	
		Cancel

Figure 2-10. Choosing Installation Option (2)

4. Click on Browse my computer for driver software to continue. See Figure 2-11.



G	🗓 Update Driver Software - USB BitJet Lite	×
	How do you want to search for driver software?	
	Search automatically for updated driver software Windows will search your computer and the Internet for the latest driver software for your device.	
	Browse my computer for driver software Locate and install driver software manually.	
		Cancel

 Select on Browse and browse to the location <*USB BitJetLite* Installation Path>\Drivers\(x32|x64) of the driver. Click OK. See Figure 2-12.

Browse for driv	Browse For Folder	23
Browse for driv	Select the folder that contains drivers for your ha	ardware.
C:\Program Files\!	▶ 🎉 Reference Assemblies	se
☑ Include subfolde	SLS SLS_USB_BitJet	
	Docs	-
	To view subfolders, dick the symbol next to a fol	
		Cancel

Figure 2-12. Browsing Driver Installation Directory

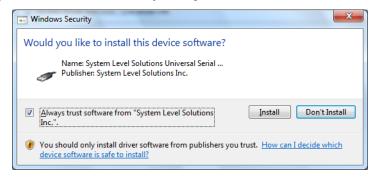
6. Click Next to install the driver. See Figure 2-13.

Figure 2-13. Driver Installation Directory Selection

	C. Found Many Hardware, USB Piblio Line
9	Found New Hardware - USB BitJet Lite
	Browse for driver software on your computer
	Search for driver software in this location:
	C:\Program Files\SLS\SLS_USB_BitJetLite\Drivers\x32
	Include subfolders
	Next Cancel

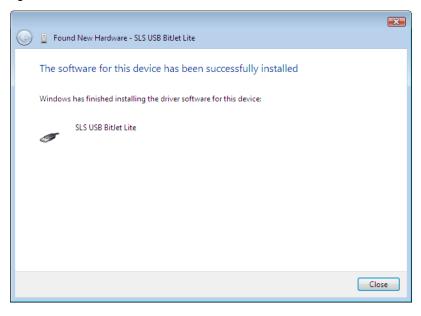
 Windows security dialog box pop up. Check on "Always trust software from "System Level Solutions, Inc." and click Install. See Figure 2-14.

Figure 2-14. Windows Security Dialog Box



8. Click on Close to exit Hardware Installation Wizard. See Figure 2-15.

#### Figure 2-15. Finish Installation



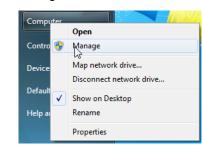
### Installing USB BitJetLite Driver on Windows 7 Systems

This section describes how to install the USB BitJetLite driver on Windows 7 systems.

To install the driver, follow the directions below:

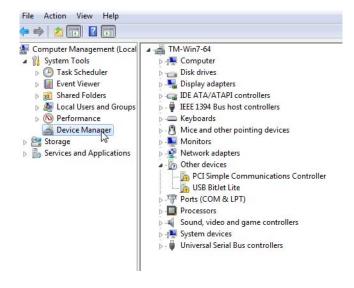
- 1. Plug in the USB BitJetLite download cable to the PC.
- 2. Right click on My Computer. Select Manage option. See Figure 2-16.

Figure 2-16. Device Manager Selection



**3.** Select **Device Manage**. It will list all drivers of all devices. See Figure 2-17.

Figure 2-17. Device Manager Window



4. Expand Other devices option. Right click on USB BitJetLite and Select on Update Driver Software... option. See Figure 2-18.

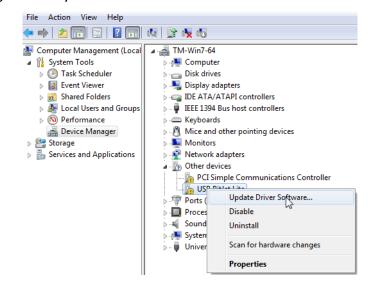


Figure 2-18. Update Driver Software Selection

5. On the Update Driver Software wizard, select **Browse my computer** for driver software. See Figure 2-19.

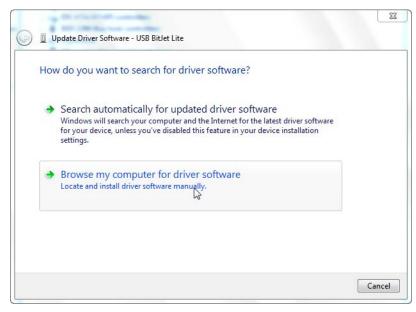


Figure 2-19. Update Driver Software Wizard

 Click on Browse and browse to the location <USB BitJetLite Installation Path>\Drivers\(x32|x64) of the driver. Click OK. See Figure 2-20.

Browse for driv	Select the folder that contains driver	s for your hardware.	
Search for driver so	Docs	^	
C:\PROGRAM FILE	Drivers x32		se
✓ Include subfold	↓ x64		
	🖻 🌗 TechSmith		
	TextPad 5		
	🍌 Uninstall Informatio	n 🔻	
Let me pie	Folder: x64		
This list will s	LOK	Cancel	l driver
software in t	<u> </u>		
<u> </u>			

Figure 2-20. Browsing Driver Installation Directory

7. Click Next to install the driver. See Figure 2-21.

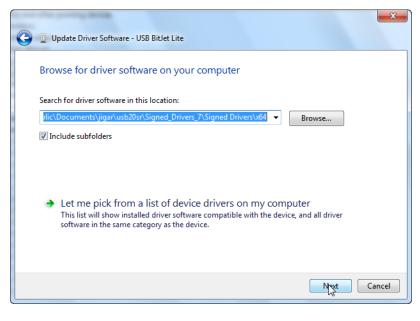


Figure 2-21. Driver Installation Directory Selection

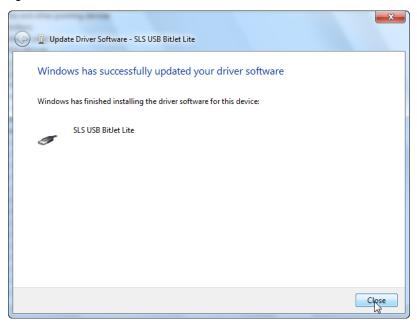
 Windows security dialog box pop up. Check on "Always trust software from "System Level Solutions, Inc." and click Install. See Figure 2-22.

Figure 2-22. Windows Security Dialog Box



9. Click on Close to exit Update Driver Software Wizard. See Figure 2-23.

#### Figure 2-23. Finish Installation



# Setting up the USB BitJetLite hardware in the Quartus II software

Use the following steps to set up the USB BitJetLite hardware in the Quartus II software:

- 1. Start the Quartus II software.
- 2. Choose Tools>Programmer.
- **3.** Click on **Hardware Setup**. The Hardware Setup dialog box is displayed. See Figure 2-24.

#### Figure 2-24. Hardware Setup

Hardware Setup XIAG Settings JTAG Settings JAC Settings Select a programming hardware setup to use when programming devices. This programming hardware setup applies only to the current programmer window.						
Currently selected hardware: USB-BikJetLite (USB-0)						
Hardware	Server	Port	Add Hardware			
			Close			

- 4. From the drop-down menu, select USB-BitJetLite [USB-0]. See Figure 2-24.
- 5. Click **Close** to close Hardware Setup dialog box.
- 6. In the Mode list, select the desired mode to program in Programmer Window. Table 2-1 describes each mode.



The USB BitJetLite supports the Joint Test Action Group (JTAG), Passive Serial Programming and Active Serial modes.

Table 2-1. Programming Modes	
Mode	Mode Description
Joint Test Action Group (JTAG)	Programs or configures all Altera devices supported by Quartus II software, excluding FLEX 6000.
In-Socket Programming	Not supported by USB-BitJetLite
Passive Serial Programming	Configures all Altera devices supported by Quartus II soft- ware excluding MAX 3000 and MAX 7000 devices.
Active Serial Programming	Programs a single EPCS1, EPCS4, EPCS16 and EPCS64 serial configuration device.

R

For more information about programming devices and creating secondary programming files, refer to *Programming & Configuration* chapter of the Introduction to Quartus II Manual.



# 3. USB BitJetLite Download Cable Specifications

# USB BitJetLite Connections

The USB BitJetLite cable has a USB universal plug that connects to the PC USB port and a 10-pin female plug that connects to the circuit board. Data is downloaded from the USB port on the PC through the USB BitJetLite cable to the circuit board via the connections discussed in this section.

## **Voltage Requirements**

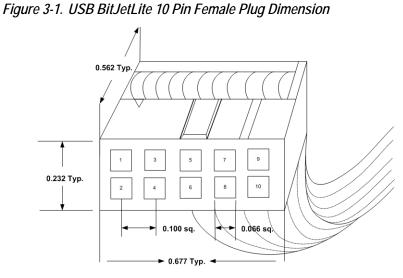
The USB BitJetLite VCC (TRGT) pin must be connected to a specific voltage for the device being programmed. It supports maximum VCC (TRGT) of 3.3 V. Connect pull-up resistors to the same power supply as the USB BitJetLite  $V_{CC(TRGT)}$ . See Table 3-1.

Table 3-1. Typical USB BitJetLite V <sub>CC(TRGT)</sub> Pin Voltage Requirements					
Device Family	USB BitJetLite V <sub>CC</sub> Voltage Required				
MAX <sup>®</sup> II devices	As specified by $V_{\mbox{CCIO}}$ of Bank 1				
MAX 7000AE and MAX 3000A devices	3.3 V				
MAX 7000B devices	2.5 V				
Cyclone and Cyclone II devices	As specified by $V_{CCIO}$				
Cyclone III devices	As specified by $V_{\mbox{\scriptsize CCA}}$ or $V_{\mbox{\scriptsize CCIO}}$				
Cyclone <sup>®</sup> IV devices	V <sub>CCA</sub>				
Stratix devices	As specified by $V_{CCSEL}$				
Stratix II, Stratix III, Stratix <sup>®</sup> IV, Arria <sup>TM</sup> II GX and Arria GX devices	V <sub>CCPD</sub>				
EPC2 devices	3.3 V				
EPC4, EPC8 and EPC16 devices	3.3 V				
EPCS1, EPCS4, EPCS16, EPCS64 and EPCS128 devices	3.3 V				

 Table 3-1. Typical USB BitJetLite V<sub>CC(TRGT)</sub> Pin Voltage Requirements

## USB BitJetLite Plug Connection

The 10-pin female plug connects to a 10-pin male header on the circuit board containing the target device. Figure 3-1. shows the dimension of the female plug.



Dimensions are shown in inches. Spacing between pin centers is 0.1 inches.

Table 3-2. identifies the 10-pin female plug pin names and the corresponding programming mode.

Table .	Table 3-2. USB BitJetLite Female Plug Signal Names & Programming Modes								
Pin	in AS Mode PS Mode JTAG Mode				Mode				
1	DCLK	Clock signal	DCLK	Clock signal	ТСК	Clock signal			
2	GND	Signal ground	GND	Signal ground	GND	Signal ground			
3	CONF_DONE	Configuration done	CONF_DONE	Configuration done	TDO	Data from device			
4	VCC (TRGT)	Target power supply	VCC (TRGT)	Target power supply	VCC (TRGT)	Target power supply			
5	nCONFIG	Configuration control	nCONFIG	Configuration control	TMS	JTAG state machine			

Table	Table 3-2. USB BitJetLite Female Plug Signal Names & Programming Modes								
Pin	Pin AS Mode		PS Mode		JTAG Mode				
6	nCE	Cyclone chip enable		No connect		No connect			
7	DATAOUT	Active serial data out	nSTATUS	Configuration status	—	No connect			
8	nCS	Serial configuration device chip select		No connect		No connect			
9	ASDI	Active serial data in	DATA0	Data to device	TDI	Data to device			
10	GND	Signal ground	GND	Signal ground	GND	Signal ground			

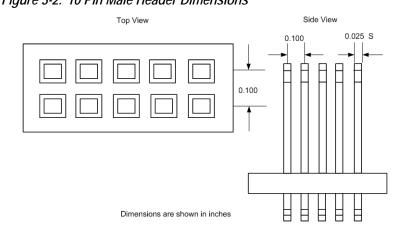
R S

The circuit board must supply  $V_{CC(TRGT)}$  and ground to the USB BitJetLite cable for the I/O drivers.

## **Circuit Board Header Connection**

The circuit board's 10-pin male header, which connects to the USB BitJetLite cable's 10-pin female plug, has two rows of five pins. These pins are connected to the device's programming or configuration pins. Figure 3-2. shows the dimensions of a typical 10-pin male header.

Although a 10-pin surface mount header can be used for the JTAG, AS or PS download cable, Altera recommends using a through-hole connector because of the repeated insertion and removal force needed.



#### Figure 3-2. 10 Pin Male Header Dimensions

## **Operating Conditions**

Table 3-3. and Table 3-4. summarize the maximum ratings, recommended operating conditions and DC operating conditions for the USB BitJetLite cable.

Table 3-3. USB BitJetLite Cable Absolute Maximum Ratings							
Symbol Parameter Conditions Min Max Un							
V <sub>CC(TRGT)</sub>	Target supply voltage	With respect to ground	-0.3	4.6	V		
V <sub>CC(USB)</sub>	USB supply voltage	With respect to ground	-0.3	6.0	V		
l <sub>l</sub>	Input current	TDO or dataout	-10.0	10.0	mA		
I <sub>O</sub>	Output current	TCK, TMS,TDI, nCS,nCE	-50.0	50.0	mA		

Table 3-4. USB BitJetLite Cable Recommended Operating Conditions

Symbol	Parameter	Conditions	Min	Мах	Unit
V <sub>CC(TRGT)</sub>	Target supply voltage, 3.3 V operation		3.0	3.6	V
	Target supply voltage, 2.5 V operation		2.375	2.625	V
	Target supply voltage, 1.8 V operation		1.72	1.89	V
	Target supply voltage, 1.5 V operation		1.43	1.57	V

## **LED Indication**

The USB BitJetLite is having LED for the power and process status indication. The LED on the USB connector side is used for power indication and LED on 10x2 connector side is used for process status indication. Figure 3-3. shows the Power LED and Status LED on the USB BitJetLite.





While programming the device the Status LED will continuously blink and as the process gets completed, it becomes OFF. The power LED will remain ON until the USB cable is connected to the hardware.