

Smart Socket

User Guide

FPGA-UG-02046 Version 1.1

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1. Introduction

This document describes Smart Socket, the next generation programming solution, from Lattice Semiconductor. Smart Socket replaces the legacy Lattice Model 300 and its associated Socket Adapters. Smart Socket uses the same JTAGbased Lattice Diamond[®] Programmer programming software that is used with Lattice Semiconductor's popular evaluation and customer boards. Standard ESD environment and procedures should be followed when working with loose devices and the Smart Socket.

2. Features

Each Smart Socket board is unique for a device family and package. Smart Socket boards have common features such as:

- Powered over simple USB cable
- Power switch to remove power from the socket
- Integrated FTDI USB interface to work directly with Lattice Programming tools
- Power indicator LEDs
- Convenient test points

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3. Block Diagram

Figure 3.1 shows the high level blocks of a Smart Socket board. The four major blocks on the board are:

- USB connector
- USB-to-SPI/JTAG communication bridge
- Board power regulator
 - Some product families, such as MachX02, have parts with different core supply voltage requirements. The Smart Socket board jumper (J2) allows you to select between 1.2 V and 3.3 V core supply voltage. The selected core supply voltage is indicated by LEDs located next to the jumper on the board.
- Lattice Semiconductor Socket (family specific)

A switch controls power to the socket. Three separate LEDs indicate USB power, Socket Power and Programming Done (Programming Done support varies by device family).



*Note: Programming Done support depends on the device family.

Figure 3.1. Smart Socket Programming Board Block Diagram

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4. Board Specifications

The outline dimension is the same for all Smart Socket boards. The dimensions of the socket vary based on target device family and package.

Board dimensions:

- Width: 4 inch
- Length: 6 inch
- Height: < 2 inch

Electrical Specification:

• +5 V @ 500 mA or less (provided by USB cable)

The complete list of sockets is available at: http://www.latticesemi.com/sockets

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5. Software Requirements

Smart Socket is supported by Lattice Diamond[®] Programmer. The latest version of the Lattice Diamond Programmer can be downloaded at:

http://www.latticesemi.com/en/Products/DesignSoftwareAndIP/FPGAandLDS/LatticeDiamond.aspx

Smart Socket works with the Lattice Diamond Programmer using only a USB cable. Connect the cable from the Smart Socket to a PC, and use the cable search feature in Lattice Diamond Programmer to establish the programming link. The steps to program a device are described below.

5.1. Generic Programming

To program the device:

1. Launch the Lattice Diamond Programmer software. The **Diamond Programmer Getting Started** dialog box appears as shown in Figure 5.1.

Diamond Programmer - Getting Started	2 2
Select an Action	
Oreate a new project from a JTAG scan	
Cable: HW-USBN-2B (FTD1) Port: FTUSB-0 Detect Cable	
Create a new blank project	
Open an existing programmer project	
C:/Users/rkoche/Desktop/Apps_2/Smart_Socket_UG/ECP5/Smart_socket_ECP5/ecp5um_8	5f_es_test_SS/smart_socket_ECP5_test_diamond_prog.xcf 💌 🛄
	OK Cancel

Figure 5.1. Getting Started

2. Click **OK.** The Diamond Programmer automatically starts scanning. The scanning page appears as shown in Figure 5.2.

🔮 Diamond Programmer		_ 🗆 X
File Edit View Design Help 21번 문제 : 이 영 영 영 경 양 1월		
	Scanning	Cable Settings Cable Settings Cable: [HV/-USEA-23 (FTDI) + Pert: FTUSE-0 + Custom part: Programming Speed Settings @ Use default Cleck Dowder USe custom Cleck Dowder US Settings (@ Use default 1/0 settings
Output	info*	6 ×
Latice WA Drivers detected (HW-DUN-2C (Parallet), HW-USBN-2B (FTDS)) Programmer detected tabbase control of the second s	2342002 INFO - Scanning USB2 Port F	Message TUS8-0
(inspire Tid Console	Error Whrning arin*	

Programmer: Loading Device Datab

Figure 5.2. Scanning

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When the device scanning is completed, the Diamond Programmer tool shows the device present in socket in the **Device** tab. If the Diamond Programmer is unable to identify the device in socket, the device family name is highlighted with a yellow background under **Device** as shown in Figure 5.3. Some device families may not support the scan operation. For details, see the Software Requirements for Specific Device Families section.

🕗 Diamo	nd Progr	ammer - Untitled *			
File Edi	t View	Design Help	<u>.</u>		
206			.05		
Enable	Status	Device Family	Device	Operation	File Name
1		ECP5UM	LFE5UM-85F	Fast Program	
Output	Drivers de	tected (HW-DLN-3C (Paral	(el), HW-USBN-28 (FTDI)	i i i i i i i i i i i i i i i i i i i	Info*
Programme INFO - Sca	er device o nning USB	atabase loaded 2 Port FTUS8-0	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		3 23
INFO - Sca WARNING -	n complete Cannot ic	ed successfully. lentify detected device on	row 1. Please manually s	elect the correct device.	3 23
Output	Tcl Con	sole			Error
Paadu					

Figure 5.3. Unable to Identify Device

In such case, click in the yellow highlighted area and select the appropriate device by matching the device name on the package with the dropdown list in the **Device** tab. Select the correct device on the dropdown list, and the yellow background highlighting disappears as shown in Figure 5.4.

File Edit Vi	ew Design Help			
안 🖻 🔒 📗	* 0 0 0 0 0 0			
Enable Sta	tus Device Family	Device	Operation	File Name
	ECP5UM_ENG	LFE5UM-85F-ES	Fast Program	

Figure 5.4. Identifying Correct Device

3. Verify that the desired **Operation** is specified, and update if necessary. To update the operation, select the device row so that it is highlighted in blue as shown in Figure 5.5. On the menu bar, click **Edit**, and on the dropdown menu click **Device Properties** as shown in Figure 5.5.

ile Edit View Design Help			
🖄 🔂 Copy Ctrl+C			
E Paste Ctrl+V	Device	Operation	File Name
🔯 🎯 Add Device	LFE5UM-85F-ES	Fast Program	
Remove Device		ALSO AN SERVICE.	
Device Properties_			
Edit I/O State			
Custom Devices			
Settings			

Figure 5.5. Access Device Properties through Edit



- 4. Select the appropriate programming file by clicking the **Browse** button in the **Programming Options** section as shown in Figure 5.6.
- 5. Click OK.

seneral	Device Information	
Device O	peration	
Access r	node:	JTAG 1532 Mode 🔹
Operatio	n:	Fast Program 🔻
Device O	ntions	

Figure 5.6. Programming Options

6. The selected file is shown under File Name in the Diamond Programmer main interface as shown in Figure 5.7.

Diamond Programmer - Untitled *										
<u>File</u> Edit	View	<u>D</u> esign <u>H</u> elp								
1 😬 📸 🗔	00									
Enable	Status	Device Family	Device	Operation	File Name	File Date/Time	Checksum	USERCODE		
1 🗸		ECP5UM_ENG	LFE5UM-85F-ES	Fast Program	3/ecp5um_85f_es_test_SS_ecp5um_85f_es_test_SS.bit	8/16 12:17:51	N/A	0x00000000		

Figure 5.7. Bit File Selection

7. To start programming the device, click the **Program** icon shown in Figure 5.8.

🔄 Diamon	d Progra	ammer - Untitled *						
<u>File</u> <u>E</u> dit	View	<u>D</u> esign <u>H</u> elp						
🛉 😬 😁	00	😂 😂 🧭 🐼 🚳 🔤						
Enable	Status	Device Family Program	Device	Operation	File Name	File Date/Time	Checksum	USERCODE
1		ECP5UM_ENG	FE5UM-85F-ES	Fast Program	3/ecp5um_85f_es_test_SS_ecp5um_85f_es_test_SS.bit	8/16 12:17:51	N/A	0x00000000

Figure 5.8. Program Icon

You can also click **Design** and select **Program** as shown in Figure 5.9.

<u>File</u> <u>E</u> dit	View	Des	sign <u>H</u> elp			
안 🖻 🖯	00	<u>00</u>	JTAG <u>S</u> can			
Enable	Status		Check XCF Project	Device	Operation	File Name
1			<u>P</u> rogram	M-85F-ES	Fast Program	3/ecp5um_85f_es_test_SS_ecp5um_85f_es_test_SS.bit
		LOG	<u>L</u> og Clear L <u>og</u> File			
			Utilities •	X		
			BSCAN Configuration			

Figure 5.9. Design Menu



Figure 5.10 shows that the programming of device is in progress.

Pile dit View Pesign Help Enable Status Device Family Device Operation File Name File Date/Time Checksum USERCODE VIECPSUM_ENG LFESUM-85F-ES Fast Program S/ecp5um_85f_es_test_SS_bit	🔮 Diamo	nd Progr	ammer - Untitled *							
Image: Status Device Family Device Operation File Name File Date/Time Checksum USERCODE I ECPSUM_ENG LFESUM-85F-ES Fast Program 3/ecpSum_85f_es_test_SS_ecpSum_85f_es_test_SS.bit	<u>Eile E</u> di	t <u>V</u> iew	<u>D</u> esign <u>H</u> elp							
Enable Status Device Family Device Operation File Name File Date/Time Checksum USERCODE 1 Image: CCPSUM_ENG LFE5UM-85F-ES Fast Program 3/ecp5um_85f_es_test_SS_ecp5um_85f_es_test_SS.bit image:8/16 12:17:51 N/A 0x0000000	1 🗎 🛍 🛛									
1 CCPSUM_ENG LFESUM-85F-ES Fast Program 3/ecpSum_85f_es_test_SS_bit	Enable	Status	Device Family	Device	Operation	File Nam	ie	File Date/Time	Checksum	USERCODE
Programming XCF	1		ECP5UM_ENG	LFE5UM-85F-ES	Fast Program	3/ecp5um_85f_es_test_SS_ecp5u	um_85f_es_test_SS.bit	8/16 12:17:51	N/A	0x00000000
Output Info*	Output					Programming XCF.				

Figure 5.10. Programming in Progress

8. When the programming of the device is completed, the **Status** option changes to **PASS** and **Operation: successful** message appears in the **Output** console as shown in Figure 5.11.

Diamond Pro	grammer - Untifled *										
Eile Edit Viel	v Design Help										
Enable Stat.	is Device Family	Device	Operation	7	ile Nan	ne	File Date/Time	Checksum	USERCODE		
1	ECPSUM_ENG	LFESUM 85F ES	Fast Program	ə∕orpSum 85f es test St	ecp5i	am_85f_os_test_	SS.bt	N/A	0x00000000	Cable and I/O Settings	Cable Settings Cable: HVM-USEH-28 (FTD3) Part: FTUSE-0 Custom port: Programming Speed Settings Use default Clock Didder Use custom Clock Didder TCK Divider Setting (0-10k) 1
Output					Into*	1					e×
INCO Check contr	nuration sature: Succeptul					ID			Messa	ige	
NEO Designation	Site of Sector Continues				•	2342002	INFO - Scanning USB2	Port FTUSB-	0.27		15
INFO - DEVICEI LFE	Supresiries, rest ringram				9	2342003	INFO - Scan complete	d successfully	4		
INFO - Elapsed tim	e: 00 min : 03 sec				D	85021074	INFO - Check configu	ation setup: 5	Rart		
INFO - Operation: :	successful.			-	Q	85021076	INFO - JTAG Chain Ver	ification. No	Errors.		
Output Tel Ci	ansole				Erro	r Warning*	Info*				

Figure 5.11. Successful Programming

On the board, the green *Done* LED is lit when the device is successfully programmed (*Done* LED behavior is device dependent, see the Software Requirements for Specific Device Families section for details).



5.2. Software Requirements for Specific Device Families

5.2.1. MachXO3 Device Family Programming

The programming of MachXO3 device family follows steps similar to the process described in the Generic Programming section. *Done* is not a dedicated output in the MachXO3 device family. *Done* LED indication is not supported.

5.2.2. ECP5 Device Family Programming

The programming of ECP5 device family follows steps similar to the process described in the Generic Programming section. When the programming of these devices is completed successfully, the *Done* LED is lit.

5.2.3. L-ASC10 Device Programming

To program the ASC device:

1. Launch the Lattice Diamond Programmer software.

The Diamond Programmer automatically starts scanning the device and detects the MachXO2 device as shown in Figure 5.12.

Diamond Prog	grammer - Untitled *									_ = X
File Edit View	w Design Help									
? 18 년 🗯	: @ @ # @ @ # 2	3								
Enable Statu	is Device Family	Device	Operation	File Nar	ne	File Date/Time	Checksum	USERCODE		6.11 Calara
1 [2]	MachXO2	LCMXO2-7000HC	FLASH Erase.Program,Verify						Cable and No Settings	Cable Settings Detect Cable Cable Settings Cable Settings Port: FTUSB-0 Programming Speed Settings O Use default Cack broker O Use default Cack broker O Use default Cack Droker TCK Devicer Setting (0-10x) 1 0 VO Settings O Settings O Use default 10 settings
Output				Info*						5 ×
Lattice VM Drivers of Programmer device	detected (HW-DUN-3C (Paralle	el), HW-USBN-2B (FTDI))			ID			Mes	sage	
INFO - Scanning US	SE2 Port FTUSE-0			0	2342002	INFO - Scanning USB2	Port FTUSB-0	N.:		
WARNING - Cannot	identify detected device on ro	w 1. Please manually sele	of the correct device.	0	2342003	INFO - Scan completed	successfully			
Output Tel Co Ready	onsole			Em	or Warning*	info*				

Figure 5.12. ASC Socket – Scanned MachXO2 Device

2. Double click in the box under **Operation** as shown in Figure 5.13.

File Edit	View	Design Help			
안 🖻 🖯	- 00 00				
Enable	Status	Device Family	Device	Operation	File Name
1 🗸		MachXO2	LCMXO2-7000HC	FLASH Erase, Program, Verify	



3. The **Device Properties** dialog box appears as shown in Figure 5.14. In the **Access Mode** dropdown list, select **PTM Programming**. Note that in the main interface, **PTM Bypass** is indicated under **Operation**.

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Device Operation				
Access mode:	Flash Programming Mode	•		
Operation:	Advanced Security Keys Programming Advanced Security File Programming Advanced Security Production Programming	*		
Programming Options	SPI Flash Programming Slave SPI Interface Programming I2C Interface Programming JTAGI2C Interface Programming Advanced Flash Programming (FPGA Loader)			
Programming file:				
Device Options	PTM Programming PTM Background Programming	Ŧ		
Reinitialize part on pr	ogram error			

Figure 5.14. ASC Socket – Device Properties

4. Add an external ASC device, by clicking the to button as shown in Figure 5.15. The **Device Properties** dialog box appears as shown in Figure 5.16.

General	Device Infor	mation	
Device O	peration		
Access r	mode:	PTM Programming	*
Operatio	on:	PTM Bypass	
External	ASC Options		
			=
+ A	dd external ASC	C device	

Figure 5.15. ASC Socket – Add External ASC Device



eneral	Device Info	rmation			
Device O	peration				
Access r	node:	PTM P	rogramming		•
Operatio	n:	PTM	1 Bypass		•
External	ASC Options				
Ex	ternal ASC De	vice #1			
Fil	e:		I2C Sla	ive Address:	
Op	eration: AS	C Erase,Progra	m,Verify 🔹] 1100000	
					-
					-
+ 4	dd external AS	SC device			+
•		III.			

Figure 5.16. ASC Socket – ASC File Load Menu

- 5. Select the programming file by clicking the **Browse** button . In the **Device Properties** dialog box, select the *ASCx.hex file.
- 6. From the **Operation** dropdown list, select **ASC Erase**, **Program**, **Verify**.

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	ormation	
Device Operation		
Access mode:	PTM Programming	•
Operation:	PTM Bypass	•
External ASC Options		
External ASC D	evice #1	-
		Ш
+ Add external A	SC device	

Figure 5.17. ASC Socket – Operation Menu

The warning shown in Figure 5.18 may appear if the selected external ASC device and the File targeting device do not match.



Figure 5.18. Warning

7. Click **OK**. The same warning appears in the output console window as shown Figure 5.19.



Diamond Progr	rammer - Untitled *									in the second	×
File Edit View	Design Help										
안 😁 🖂 🛛 🚟	888 8 8 8								-		
Enable Status	Device Family	Device	Operation	File N	вте	File Date/Time	Checksum	USERCODE		cells compare	
1	MadiXO2	LCMXO2-7000HC	PTM Bypass						Cable and I/O Settings	Detect Cable Cobie: HM4-USBR-28 (FTD)) Port: FTUSE-0 Custom port: Programming Speed Settings © Use detail Cock Divider Use custom Clock Unider TCX Divider Setting (0-10x) 1 V(0 Settings 100 Settings	
Output				Info	•						8 :
Lattice VM Drivers de Programmer device o INFO - Scanning USE	stosted (HW-DLN-3C (Parallel database loaded 12 Port FTU58-0), HW-USBN-28 (FTDI))		ŕ 🛛	ID 2342002	INFO - Scanning USB2	Port FTUSB-I	Me:	sage		
INFO - Scan complet WARNING - Cannot in WARNING - Werning: External ASC device File targetting device These do not match.	red successfully. dentify detected device on roy File C:/USERS/RKOCHE/DES selected: 0. e 2:	w 1. Please manually sele KTOP/APPS_2/SMART_S/	3. Lite correct, device. DCKET_UG/ASC_XO2/HEX_FILE_FOR_PROGRAMM	ING/FL_SP[_T	2342003	INFO - Scan completed	I successfully				
4	Matching and	441		+							
Output Tel Con	sole			E	ror Warning*	Info*					

Figure 5.19. ASC Socket – Warning for MachXO2

Under **Operation**, **PTM Bypass** is indicated. The **File Name** field is greyed out (to prevent adding a new file) as shown in Figure 5.20.

🔄 Diamond Programmer - Untitled *			
File Edit View Design Help			
2 🗠 🖶 🔡 😂 😂 🖉 🔛			
Enable Status Device Family	Device	Operation	File Name
1 MachXO2	LCMXO2-7000HC	PTM Bypass	
		5	

Figure 5.20. ASC Socket – Ready to Program Step

8. Program the ASC device through the MachXO2 device on the Smart Socket board by clicking the **Program** icon as shown in Figure 5.21.

ile Edit	View	Design Help			
2 🖻 🖥	00	😂 😳 🥝 🕼 🔯 🛄			
Enable	Status	Device Famil	Device	Operation	File Name
V		MachXO2	LCMXO2-7000HC	PTM Bypass	

Figure 5.21. ASC Socket – Programming

9. When the programming of the device is completed, the Status option changes to PASS and Operation: successful message appears in the Output console as shown in Figure 5.22. During the programming activity the MXO2_SDA and MXO2_SCL LED light blink on the board showing communication between the MachXO2 and ASC devices. *Done* is not a dedicated output in the MachXO2 family. *Done* LED indication is not supported.

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Diamond Progr	ammer - Untitled *											×
File Edit View	Design Help											
Enable Status	Device Family	Device	Operation	F	le Nar	ne	File Date/Time	Checksum	USERCODE	11 11	(Constant of the second of the	-
1 🗹 PASS	MachXO2	LCMX02:7000HC	PTM Bypass							Cable and I/O Settings	Detect Cable Cobie: HVV-USBV-28 (PTD) Port: FTUSB 0 Custon port: Programming Speed Settings © Use default Clock Divider Use custom Clock Divider TCk Divider Setting (0-10x) 1 1 V/O Settings	-
Outnut					Info.*						Des notsult sin cattione	A X
octput					210	ID.			More			
INFO - External ASC	Operation Done. No errors.				m	2142002	MICO. Complex LICDO		Wiess	age		1
INFO - Operation Dor	ne. No orrors.				~	2342002	INFO - Scanning USB2	PORT FIUSB-C	h			-
THEO - Elapsed time:	00 min : 02 sec				2	2342003	INFO - Scan completed	successfully				
INFO - Operation : su	ocessful.			1	0	85021074	INFO - Check configura	tion setup: S	tart			
14.1		10			٢	85021076	INFO - JTAG Chain Verit	ication. No l	mors.			~
Output Td Con	sole				Erro	or Warning*	info*					

Figure 5.22. ASC Socket – Programming Completed

5.2.4. iCE40 Device Family Programming

To program the iCE40 device:

1. Launch the Lattice Diamond Programmer software.

The scanning of the device fails because the Scan operation is supported over JTAG interface only, and the iCE40 family of devices uses SPI interface for programming. See Figure 5.23.

Diamond Program	mer *									- C -X
File Edit View D 안한되 # G	lesign Help GOID G IS 🔁								N: W.	
Enable Status	Device Family eneric JTAG Device	Device JTAG-NOP	Operation Bypass	Fite Na	ne	Fie Date/Time	Checksum	USERCODE	Cable and I/O Settings	Cable Settings
Dutput				Info ^w						6
Lattice VM Drivers detect	ted (HW-DLN-3C (Parallel)	, HW-USBN-2B (FTDI))			ID			Mess	sage	
Lautuce vm Universidenceur (inv Dur Su (initiality, invindiore 28 (* 101)) Programmer divide dottabase location IIIE-0 - Searching USER Port - F USE-0 E2006 - Failed Di sam board.				30	2342002	INFO - Scanning USB2 Port FTUSB-0				
INFO - Scanning USB2 Po ERROR - Failed to scan b ERROR - Scan Failed - Cr	HC - Scanning USE2 Por F / USE-0 RROR - Field to san baard. RROR - Scan Failed - Creating Blank Programmer Project.						01111030-0			

Figure 5.23. iCE40 Family – Scanning Failed

- 2. Manually select the device by choosing the following options as shown in Figure 5.24.
 - **Device Family**: iCE5LP (select the appropriate device from the dropdown list)
 - **Device**: iCE5LP1K (choose the size of the device based on the device present in the socket)



	Design Help		
Enable Status	Device Family	Device	Operation
1	iCE5LP 👻	iCE5LP1K	Fast Program
	ECP5UM ECP5U ECP5U_ENG MachX03L MachX03LF iCE40 iCE40_ENG iCE40LM CCE5LP		

Figure 5.24. iCE40 Family – Device Family List

3. Select the programming file to program the iCE40 device by double clicking the **Browse** button under **File Name** as shown in Figure 5.25.

1	Diamon	id Progr	ammer *				
F	ile Edit	View	Design Help				
-	° 🖻 🖯						
	Enable	Status	Device Family	Device	Operation	File Name	File Date/Time
1			iCE5LP	iCE5LP1K	Fast Program	ile_for_testing_Smart_socket/SS_test_prog_bitmap.bin	
	<i>n</i>						

Figure 5.25. iCE40 Family – Select the Programming File

4. Click the **Program** icon let to program the device as shown in Figure 5.26.

File Edit View Design Help	
Enable Status Device Family Program Device Operation File Name File Date/Time Checksum	USERCODE
1 CESLP iCESLP1K Fast Program ile_for_testing_Smart_socket/SS_test_prog_bitmap.bin	

Figure 5.26. iCE40 Family – Program Icon

5. When the programming of the device is completed, the **Status** option changes to **PASS** and **Operation: successful** message appears in the **Output** console as shown in Figure 5.27.



S Diathons	Progra	antrier.										Contract Dented	
File Edit	View	Design Help	<i></i>										
1 II III III	100	868 8 8 8 8	i l								1		
Enable	Status	Device Family	Device	Operation	F	lle Nai	me	File Date/Time	Checksum	USERCODE		Cable Settings	^
3 (4)	9035	ICESP	KESIPIK	Fast Program	lie_tor_testing_Smort_so	ket/S	S_test_proo_bin	oo.bifi (mj2/16 17:20:08			Cable and I/O Settings	Detect Coble Coble: INV-USBN-28 (PTDI) Port: TUSB-0 Custom port: Programming Speed Settings © Use default Clock Divider © Use castom Clock Divider TCK Denser Setting (0-10x) 1 UO Settings	
												(a) Ilca default I/O cottine	
Output						Info*							a >
INFO - Check	configur	ation setup: Successful (Igr	nored JTAG Connection C	hecking).	*		ID			Messa	age		-
INFO - Device	1 iCE5UP	1K: Fast Program				Ð	2342002	INFO - Scanning USB2	Port FTUSB	0			-
INFO Opera	tion Done	e. No errors.				D	85021074	INFO - Check configura	tion setup: S	itart.			
INFO Elapse	d time: I	00 min : 01 sec											
INFO - Opera	tion: suc	cesstul.			Ħ	Ð	85021077	INFO - Check configura	tion setup: S	iuccessful (Igno	red JTAG	5 Connection Checking).	
						m	85021278	INFO - Device1 iCESUP	1K: Fast Prog	ram			
Output	Td Cons	ole				Err	or* Warning	info*					

Figure 5.27. iCE40 Family – Programming Completed Successfully

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5.2.5. CrossLink Device Family Programming

To program the CrossLink Device:

1. Launch the Lattice Diamond Programmer software.

The scanning of the device fails as the Scan operation is supported over JTAG interface only, and the CrossLink family of devices uses SPI interface for programming. See Figure 5.28.

🔄 Diamond Program	mer •									_ 0 <mark></mark>
File Edit View D	esign Help Long Gal (2) (3) 1920									
Enable Status 1 ☑ Ge	Device Family	Device G NOP	Operation Bypass	Filo Xe	me	File Dzte/Time	Checkaum	USERCODE	Cable and I/O Settings	Cable Settings Detect Cable Detect Cable Cable: HW-US9H-2B (FTDI) • Port: TTUS0-0 Custom port: Drogramming Speed Settings O Use custom Clock Divider TCK Divider Setting (0-10x) 1 2 VO Settings VO Settings
Output				Toto"	,				0 2	B X
Output: Lattice VM Drivers detected (HW DLV 3C (Forallel), HW USBN 28 (FTDD)) Programmer device database loaded HIPO - Sconing USB2 Port FTLISE-0 ERROR - Failed in scon loard. ERROR - Scan Felled - Creating Blank Programmer Project.			3	ID 2342002	INFO - Scanning USB2 i	Port FTUSB-0	Mes I	isage		
Output Tcl Console Ready				Err	or* Warning	Info*				Li

Figure 5.28. CrossLink Family – Scanning Failed

- 2. Manually select the device by choosing the following options as shown in Figure 5.29.
 - Device Family: LIFMD (select the appropriate device from the dropdown list)
 - **Device**: LIF-MD6000 or LIA-MD6000 (choose between industrial or automotive grade of CrossLink based on the device present in the socket)

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Diamond Prog	rammer *							• X
File Edit View	v Design Help							
2 2 2			207304 53.5					
Enable Status	Device Family	Device	Operation		_	Cable Settings		^
1		LIF-MD6000	Fast Program		sốc			
	Generevice				Settir		Detect Cable	
					9I	Cable:	HW-USBN-2B (FTDI)	•
	ECPSUM				e and	Port:	FTUSB-0	•
	ECP50 ECP5UM_ENG				Cabl	Custom port:		
	MachXO3L MachXO3LF					Programming S	Speed Settings	
Output				Info	1			ē ×
				ID			Message	
Output Td Co	nsole			Error Warnin	ig In	ifo		

Figure 5.29. CrossLink Family – Device Family List

3. Select the programming file that you want to program in the CrossLink device by double clicking the **Browse** button under **File Name** as shown in Figure 5.30.

Diamond Prog	rammer *		-						
<u>File Edit Vie</u>	v <u>D</u> esign <u>H</u> elp								
2 🖻 🖆 🗔 🗍	8 8 8 8								
Enable Status	Device Family	Device	Operation				File Name		Colle College
1 🗸	LIFMD	LIF-MD6000	SSPI NVCM Program, Verify	C:/Projects/New folder/	impl 1/Ge	n_Test_impl1.jed		sbui	
-								Sett	Detect Cable
								D/I Pu	Cable: HW-USBN-2B (FTDI)
								able at	Port:
								S	Custom port:
•	m				1477		F	L	Programming Speed Settings
Output					Info*				₽×
INFO - Please selec	t the data file.					ID			Message
					•	2342006	INFO - Please select th	ne da	ita file.
Output Td Co	nsole				Erro	w Warning	Info*		

Figure 5.30. CrossLink Family – Select the Programming File

4. Click the **Program** icon icon to program the device as shown in Figure 5.31.

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Diamond Programmer - MasterLink_2B_Prog.xcf*	
<u>File Edit View D</u> esign <u>H</u> elp	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
Enable Status Device Family Dev Program Operation	File Name
1 V LIFMD LIF-MD6000 SSPI NVCM Program, Verify C:/Projects/Nev	v folder/impl1/Gen_Test_impl1.jed
	Gable: [HW-JSBN-28 (FTDI) ▼
	한 Port: FTUSB-0 ▼
< m	Custom port:
Output	Info &
Lattice VM Drivers detected (HW-DLN-3C (Parallel), HW-USBN-2B (FTDI))	ID Message
Programmer device database loaded	
Output Td Console	Error Warning Info

Figure 5.31. CrossLink Family – Program Icon

5. When the programming of the device is completed, the **Status** option changes to **PASS** and **Operation: successful** message appears in the **Output** console as shown in Figure 5.32.

Enable Status Device Family Device Qperation IF PASS LIF-MD6000 SSPI NVCM Program, Verify C:/Projects/New folder/impl1/Gen_Test_impl1.jed Impl2/Gen_Test_impl1.jed Impl2/Gen_Test_impl1.jed Impl2/Gen_Test_impl1.jed Impl2/Gen_Test_impl2/Gen_Tes	Eile Edit View Design Help						
tput ogrammer device database loaded FO - Check configuration setup: Start. FO - Device1 LIF-MD6000: Fast Program FO - Operation Done. No errors. FO - Elapsed time: 00 min : 01 sec FO - Operation: successful,	Enable Status Device Family Device Operation Image: Comparison of the state of the sta	Operation File Name SSPI NVCM Program, Verify C:/Projects/New folder/impl1/Gen_Test_impl1.jed				Cable Settin	gs Detect Cable HM-JISBN-28 (ETDT)
rogrammer device database loaded IFO - Check configuration setup: Start. IFO - Check configuration setup: Successful (Ignored JTAG Connection Checking). IFO - Operation Done. No errors. IFO - Elapsed time: 00 min : 01 sec IFO - Operation: successful. IFO - Operation: successful.	utput		Info*			Port:	FTUSB-0
IFO - Device 1 LIF-MD6000: Fast Program IFO - Operation Done. No errors. IFO - Clapsed time: 00 min : 01 sec S5021077 IFO - Operation: successful. INFO - Check configuration setup: Successful (Ignored JTAG Connection Checking).	rogrammer device database loaded NFO - Check configuration setup: Start. NFO - Check configuration setup: Successful (Ignored JTAG Connection Checking).	^	•	ID 85021074	INFO - Check configuration	Messag setup: Start.	e
IFO - Elapsed time: 00 min : 01 sec IFO - Operation: successful.	IFO - Device 1 LIF-MD6000: Fast Program IFO - Operation Done. No errors.	E	Q	85021077	INFO - Check configuration Checking).	s <mark>etup: Success</mark>	ful (Ignored JTAG Connection
85021209 INEC - Operation Done No errors	IFO - Elapsed time: 00 min : 01 sec IFO - Operation: successful.		٩	85021278	INFO - Device1 LIF-MD6000:	Fast Program	

Figure 5.32. CrossLink Family – Programming Completed Successfully

6. Ordering Information

Ordering part numbers for a particular socket are available at http://www.latticesemi.com/sockets

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Technical Support

For assistance, submit a technical support case at <u>www.latticesemi.com/techsupport</u>

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Appendix A. Smart Socket Board Schematics

The following are representative schematics of a Smart Socket board. The FTDI and voltage regulator portions are the same across various Smart Socket boards.





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Figure A.2. Voltage Regulator and LEDs

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Figure A.3. JTAG Bank and Connections

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Figure A.4. VCC Core, Bypass Caps, and Test Points

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Appendix B. Debugging

Check the following if the programming fails:

- USB power supply
- ON/OFF switch is turned ON to provide power to the socket
- Device scanning failed



Figure B.1. Failed to Scan Device

Click the **Detect Cable** button and the Diamond Programmer starts detecting all the cables attached to USB ports. In the **Cable** dropdown menu, select the option which has the FTDI as shown in the figure below.

Diamond Programmer *								
Eile Edit View Design Help	<u>100</u>							
Endoic Stati IIAG Scan hver Family 1 V Generic ITAG Device	Device JTAG-NOP	Operation Bypass	File	Name	File Date/Time	Checksum USERCO	n Cable and I/O Settings	Cable Settings
Output			In	fo*				
ERROR - Failed to scan board. ERROR - Scan Failed - Creating Blank Programm 24FO - Cable Auto Detection Activated.	mar Project.			ID 2342002	INFO - Scanning USB2			
INFO - No Lattice HW-DLN-3C (parallel) cable d	leterted.		4	85021092	INFO - Cable Auto Dete	ection Activated.		
NFO - No Lattice HW/USBN 2A cobie detected. NFO - Beerd with FTOI USB Heat Chip detected.			÷.	85021094	INFO No Lattice HW-	DEN-3C (parallel) cable	detected.	
TRED - Multiple cables were detected.			- 0	85021096	INFO - No Lattice HW-	USBN-2A cable detecte	d.	
Output Td Console				Error* Warning	Info**			

Figure B.2. Detect Cable (FTDI)

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Ensure that the ON/OFF switch is turned to the ON position. The Diamond Programmer starts scanning the device in the socket. When the scan is completed, the exact device present in the socket appears in the **Device** tab as shown in Figure B.3.

5 M R	ew Design Help 22 G G G G G G									
Enable Sta	tus Device Family	Device	Operation	File	Name	File Date/Time	Checksum	USERCODE		5111 (MARCH 1997)
	MachXO3L	LCMIXO3L 4300E	NVCM Erase,Program,Verify						d J/O Settings	Cable Settings
									Cable a	Use custom Clock Dander TCIC Dander Setting (0-10x) VO Settings Use default VO settings Use custom VO settings
out				'n	10*				Cable a	Use custom Cleck Dander TCK Dander Setting (0-10x) 1 VO Settings Use default VO settings Use custom I/O settings
put O - Ceble Auto	a Detection Activated.			*	to*. ID			Messa	age	Use custom Cleck Dander TCK Dander Setting (0-10x) TO Settings Use default 2'O settings Use default 2'O settings Use custom 1/O settings
put - Cable Auto - No Lattice	a Detection Activated. HW-DLH-3C (parallel) coble det	scted.		n	10* ID 2 2342002	INFO + Scanning USB2 F	fort FTUSB-0	Messa	age	 Use custom Cleck Dadler TCK Dirloer Setting (9-10x) 1 VO Settings Use default 1/0 settings Use custom 1/0 settings
out O - Cable Auto O - No Lattice O - No Lattice	a Detection Activated. HW-DUF-3C (parallel) coble det HW-U50H-2A cable detected.	icted.		- In 	ID 2342002 55021092	INFO - Scanning USB2 F INFO - Cable Auto Dete	Fort FTUSB-0	Messa 	age	 Use custom Cleck Dadler TCK Dirloer Setting (9-10x) VO Settings Use default YO settings Use castern I/O settings
put O - Ceble Auto O - No Lattice O - No Lattice O - Saard with O - Multiple co	a Detection Activated. I HW-DUH-3C (parallel) (pbla dati I W-USBII 2A cable detected. h H DL USB Hast Chy detected. bies ware detected.	eeted.		رو د د د	ID 2342002 85021092 85021094	INFO - Scanning USB2 F INFO - Cable Auto Dete INFO - No Lattice HW-C	fort FTUSB-0 cction Activa DIN-3C (para	Messa I., ted. allel) cable deta	age ected.	Use custom Cleck Date TOK Date: Setting (0-10x) Do Settings Use default 2/0 settings Use custom 1/0 settings

Figure B.3. Scanning Completed

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Revision History

Date	Version	Change Summary
April 2018	1.1	Changed document number from UG114 to FPGA-UG-02046.
		Change document status from Preliminary to final.
		Removed copyright page.
		Added Appendix A. Smart Socket Board Schematics section.
		Applied minor editorial and formatting changes.
February 2016	1.0	Initial release.



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