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Find the *Lattice HW7265-DL3A* at our website: *Click HERE*

ispDOWNLOAD® Cables

For Programming Lattice ISP™ Devices

October 2009

Features

- **Support for All Lattice Programmable Products**
  - 1.2V to 5V programming
  - Ideal for design prototyping and debugging
- **Connect to Multiple PC Interfaces**
  - USB (v.1.0, v.2.0)
  - PC Parallel Port
- **Easy-to-Use Programming Connectors**
  - Versatile flywire, 2 x 5 (.100") or 1 x 8 (.100") connectors
  - 6 feet (2 meters) or more of programming cable length (PC to DUT)
- **Lead-Free/RoHS Compliant Construction**

ispDOWNLOAD Cables

Lattice ispDOWNLOAD cables are designed to facilitate in-system programming for all Lattice Semiconductor ISP™ devices directly from a PC. With in-system programmability, hardware functions can be programmed and modified in real time on the system board to give additional product features, shorten system design and debug cycle time, enhance product manufacturability and simplify field upgrades.

After you complete your logic design and create a programming file with the ispLEVER® development tools, you can use ispVM™ System software to program devices on your board. The ispVM System software automatically generates the appropriate ISP commands, programming addresses and programming data based on information stored in the programming file and parameters you set in ispVM. Programming signals are then generated from the USB or parallel port of a PC and directed through the ispDOWNLOAD Cable to the device. No additional components are required for programming.

ispVM System software is included with all Lattice design tool products and is available for download from the Lattice web site at www.latticesemi.com.

ispDOWNLOAD Cable Pin Definitions

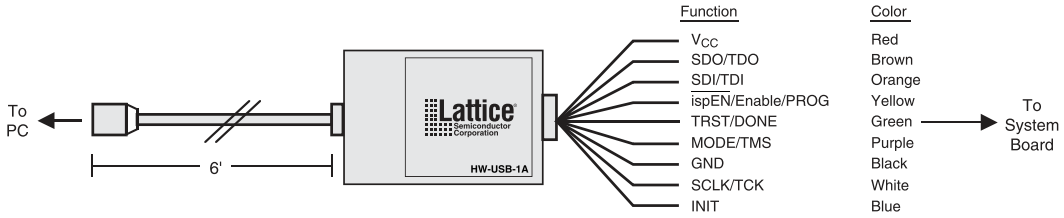
The functions provided by the ispDOWNLOAD cables correspond with available functions on Lattice programmable devices. Since some devices contain different programming features, the specific functions provided by the ispDOWNLOAD cable may depend on the selected target device. ispVM System software will automatically generate the appropriate functions based on the selected device. See Table 1 for an overview of the ispDOWNLOAD cable functions.

Table 1. ispDOWNLOAD Cable Pin Definitions

ispDOWNLOAD Cable Pin	Name	ispDOWNLOAD Cable Input/Output	Description
VCC	Programming Voltage	Input	Connect to V_{CC} or V_{CCJ} plane of the target device. Typical I_{CC} = 10mA. *Note: this may not be the same as a target device's V_{CCO} plane.*
SDO/TDO	Test Data Output	Input	Used to shift data out via the IEEE1149.1 (JTAG) programming standard.
SDI/TDI	Test Data Input	Output	Used to shift data in via the IEEE1149.1 programming standard.
$\overline{\text{ispEN}}$/Enable/ PROG	Enable	Output	Enable device to be programmed.
TRST	Test Reset	Output	Optional IEEE 1149.1 state machine reset.
DONE	DONE	Input	DONE indicates status of configuration
MODE/TMS	Test Mode Select Input	Output	Used to control the IEEE1149.1 state machine.
GND	Ground	Input	Connect to ground plane of the target device
SCLK/TCK	Test Clock Input	Output	Used to clock the IEEE1149.1 state machine
INIT	Initialize	Input	Indicates that ORCA® device is ready for configuration.

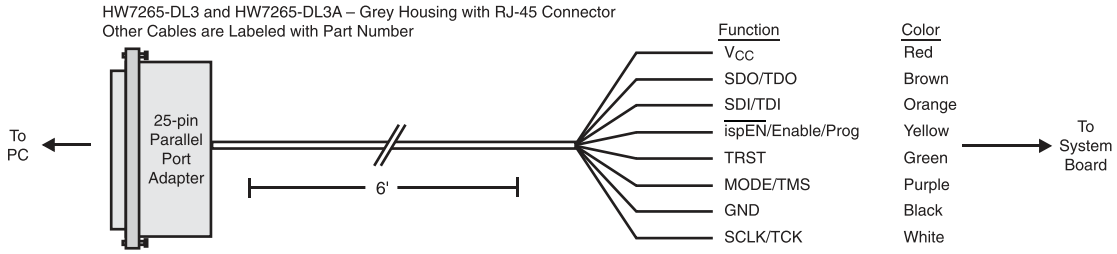
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Figure 1. ispDOWNLOAD Cable In-System Programming Interface for the PC (HW-USB-1A or HW-USB-2A)[1]



1. Lattice PAC-Designer® software does not support programming with USB cables. To program ispPAC devices with these cables, use the ispVM System software.

Figure 2. ispDOWNLOAD Cable In-System Programming Interface for the PC (HW-DLN-3C and Equivalents)[1]



1. HW7265-DL3, HW7265-DL3A, HW-DL-3B, HW-DL-3C and HW-DLN-3C are functionally equivalent products.

Figure 3. ispDOWNLOAD Cable In-System Programming Interface for the PC (pDS4102-DL2 or pDS4102-DL2A)

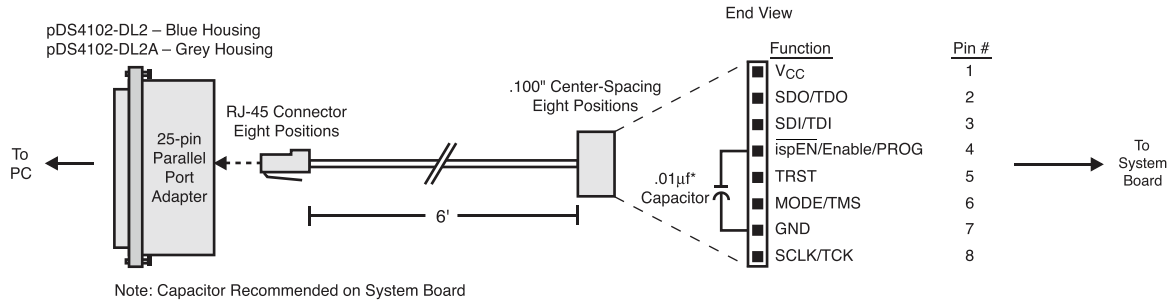
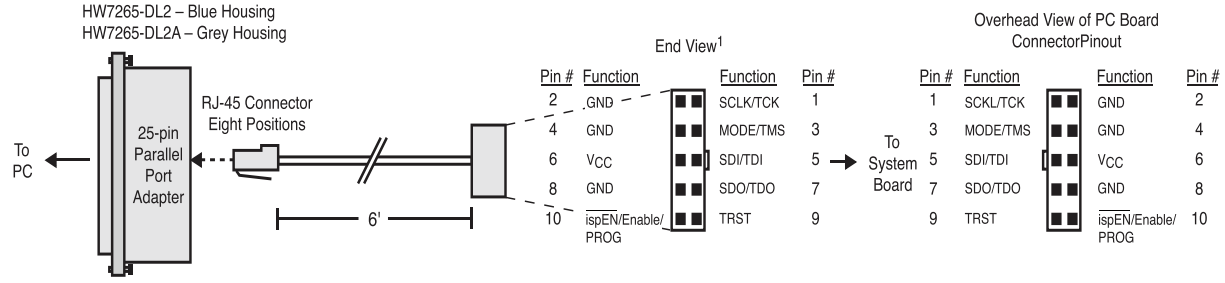


Figure 4. ispDOWNLOAD Cable In-System Programming Interface for the PC (HW7265-DL2 or HW7265-DL2A)



1. For reference purposes, the 2x10 connector on the HW7265-DL2 or HW7265-DL2A is equivalent to Tyco 102387-1. This will interface to standard 100-mil spacing 2x5 headers, or a 2x5 keyed, recessed male connector such as the 3M N2510-5002RB.

Programming Software

ispVM System is the preferred programming management software tool for all Lattice devices and download cables. The latest version of ispVM System is always available for download from the Lattice web site at www.latticesemi.com/software.

Target Board Design Considerations

A 4.7K pull-down resistor is recommended on the TCK connection of the target board. This pull-down is recommended to avoid inadvertent clocking of the TAP controller induced by fast clock edges or as Vcc ramps up. This pull-down is recommended for all Lattice programmable families.

Programming Flywire and Connection Reference

Refer to Table 2 when connecting a flywire download cable to systems that use the 1x8-position or 2x5-position connectors. For newer Lattice FPGA families, a 1x10 connector used in conjunction with the ispDOWNLOAD USB cable adds support for the DONE and INITN signals. Both of these signals are inputs to the cable, and can be used to help verify device configuration.

Table 2. Flywire Conversion Reference

Function	Flywire Cable	1x10 Connector	1x8 Connector	2x5 Connector
V_{CC}[1]	Red	1	1	6
TDO/SDO	Brown	2	2	7
TDI/SDI	Orange	3	3	5
$\overline{\text{ispEN}}$[2]/Enable/PROGRAMN	Yellow	4	4	10
TRST[3]	Green	5	5	9
TMS/MODE	Purple	6	6	3
GND	Black	7	7	4 (2 and 8)
TCK[4]/SCLK	White	8	8	1
DONE[3]	Green	9		
INITN	Blue	10		

1. For devices that have a V_{CCJ} pin, the V_{CCJ} must be connected to the cable's $V_{CC,}$ and a 0.1µF decoupling capacitor is required on V_{CCJ} close to the device. Please refer to the device data sheet to determine if the device has a V_{CCJ} pin.
2. For older Lattice ISP devices, a 0.01µF decoupling capacitor is required on $\overline{\text{ispEN}}$/ENABLE of the target board.
3. The TRST and DONE pin is multiplexed on the ispDOWNLOAD USB cable. If the device TRST signal is available on the board, connect the USB flywire TRST/DONE wire to TRST. If the device DONE signal is available on the board (or if both TRST and DONE are available), connect the USB flywire TRST/DONE wire to DONE. Please make sure the correct setting is selected in ispVM (Options, Cable and I/O Port Setup). This will tell ispVM whether the TRST/DONE cable is used as a TRST or a DONE signal.
4. A 4.7K pull-down resister is recommended on TCK of the target board.

Table 3 lists the recommend pin connections. Please contact Lattice technical support for information on unlisted device families. (e-mail: techsupport@latticesemi.com, phone: 1-800-LATTICE).

Table 3. Recommend Cable Connections

Device Family	TCK, TMS, TDI and TDO	$\overline{\text{ispEN}}$/ ENABLE[1]	PROGRAMN[6]/ PRGM	TRST[2, 6]	DONE[3, 6]	INITN[3, 6]
LatticeSC/M	Mandatory	N/A	Do Not Connect	N/A	Optional	Optional
LatticeECP2/M	Mandatory	N/A	Do Not Connect	N/A	Optional	Optional
LatticeXP™, LatticeXP2™	Mandatory	N/A	Do Not Connect	N/A	Optional	Optional
LatticeECP/EC	Mandatory	N/A	Do Not Connect	N/A	Optional	Optional
MachXO™	Mandatory	N/A	N/A	N/A	N/A	N/A
ORCA/FPSC	Mandatory	N/A	Mandatory	N/A	Optional	Optional
ispXPGA®	Mandatory	N/A	Optional	N/A	Optional	Optional
ispXPLD™	Mandatory	N/A	Optional	N/A	Optional	Optional
ispMACH® 4000	Mandatory	N/A	N/A	N/A	N/A	N/A
ispMACH/ispLSI® 5000	Mandatory	N/A	N/A	N/A	N/A	N/A
MACH®4A[4]	Mandatory	Optional	N/A	Optional	N/A	N/A
ispGDX2™	Mandatory	N/A	N/A	N/A	N/A	N/A
ispClock™	Mandatory	N/A	N/A	N/A[5]	N/A	N/A
ispPAC Power Manager/ Power Manager II	Mandatory	N/A	N/A	Optional[5]	N/A	N/A
ispPAC	Mandatory	N/A	N/A	N/A[5]	N/A	N/A

1. Please refer to the ispDOWNLOAD Cable $\overline{\text{ispEN}}$ Pin section below for detailed information on connecting the $\overline{\text{ispEN}}$/ENABLE pin.
2. Please refer to the ispDOWNLOAD Cable TRST Pin section below for detailed information on connecting the TRST pin.
3. The DONE and INITN signals are only available on the ispDOWNLOAD USB cable. These signals are inputs to the cable and can be used to help verify device configuration.
4. Please refer to the device data sheet. Not all packages have the ENABLE or TRST pin.
5. When using PAC-Designer software to program ispPAC devices, do not connect this pin.
6. When using these connections, be sure to select the correct settings in the Cable and I/O Port Setup dialog in the ispVM System software.

Connecting the ispDOWNLOAD Cable

The target board must be un-powered when connecting, disconnecting, or reconnecting the ispDOWNLOAD Cable. Always connect the ispDOWNLOAD Cable's GND pin (black wire), before connecting any other JTAG pins. Failure to follow these procedures can result in damage to the target programmable device.

ispDOWNLOAD Cable TRST Pin

Connecting the board TRST pin to the cable TRST pin is not recommended. Instead, connect the board TRST pin to Vcc. If the board TRST pin is connected to the cable TRST pin, instruct ispVM to drive the TRST pin high as follows:

1. Select the **Options** menu item
2. Select **Cable and I/O Port Setup**
3. Check the **TRST/Reset Pin Connected** check box
4. Select the **Set High** radio button

If the proper option is not selected, the TRST pin will be driven low by ispVM. Consequently, the BSCAN chain will not work because the chain will be locked into RESET state.

ispDOWNLOAD Cable $\overline{\text{ispEN}}$ Pin

The following pins should be grounded:

- BSCAN pin of the 2000VE devices
- ENABLE pin of MACH4A3/5-128/64, MACH4A3/5-64/64 and MACH4A3/5-256/128 devices.

However, the user has the option of having the BSCAN and ENABLE pins driven by the ispEN pin from the cable. In this case, ispVM must be configured to drive the ispEN pin low as follows:

1. Select the **Options** menu item
2. Select **Cable and I/O Port Setup**
3. Check the **ispEN/BSCAN Pin Connected** check box
4. Select the **Set Low** radio button

Table 4. ispDOWNLOAD Cable Feature Summary

Feature	HW-USBN-2A	HW-USB-2A	HW-USB-1A	HW-DLN-3C	HW7265-DL3, HW7265-DL3A, HW-DL-3B, HW-DL-3C	HW7265-DL2	HW7265-DL2A	PDS4102-DL2	PDS4102-DL2A
USB	X	X	X						
PC-Parallel				X	X	X	X	X	X
1.2V Support	X	X							
1.8V Support	X	X	X	X	X		X		X
2.5-5.0V Support	X	X	X	X	X	X	X	X	X
2x5 Connector	X	X	X	X	X	X	X		
1x8 Connector	X	X	X	X	X			X	X
Flywire	X	X	X	X	X				
Lead-free Construction	X			X					
Available for order	X			X					

Each ispDOWNLOAD Cable ships with two small connectors that help you keep the flywires organized. The following manufacturer and part number is one possible source for equivalent connectors:

- 1x8 Connector (e.g. Samtec SSQ-108-02-T-S)
- 2x5 Connector (e.g. Samtec SSQ-105-02-T-D)

The ispDOWNLOAD Cable flywire or headers are intended to connect to standard 100-mil spacing headers (pins spaced 0.100 inch apart). Lattice recommends a header with length of 0.243 inches or 6.17 mm. Though, headers of other lengths may work equally well.

Ordering Information

Description	Ordering Part Number	China RoHS Environment-Friendly Use Period (EFUP)
ispDOWNLOAD cable (USB). Contains 6' USB cable, flywire connectors, 8-position (1x8) adapter and 10-position (2x5) adapter, lead-free, RoHS compliant construction.	HW-USBN-2A	
ispDOWNLOAD cable (PC only). Contains parallel port adapter, 6' cable, flywire connectors, 8-position (1x8) adapter and 10-position (2x5) adapter, lead-free, RoHS compliant construction.	HW-DLN-3C	

Note: Additional cables are described in this document for legacy purposes only, these cables are no longer produced. The cables currently available for order are fully equivalent replacement items.

Technical Support Assistance

Hotline: 1-800-LATTICE (North America)
+1-503-268-8001 (Outside North America)
e-mail: techsupport@latticesemi.com
Internet: www.latticesemi.com

Revision History

Date	Version	Change Summary
—	—	Previous Lattice releases.
July 2009	24.1	Added Target Board Design Considerations text section.
		Added Programming Flywire and Connection Reference section heading.
October 2009	24.2	Added information related to the physical specifications of the flywire connectors.

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