SILICON LABS DKWF111 LABS WF111 Development Kit User Guide

Contents

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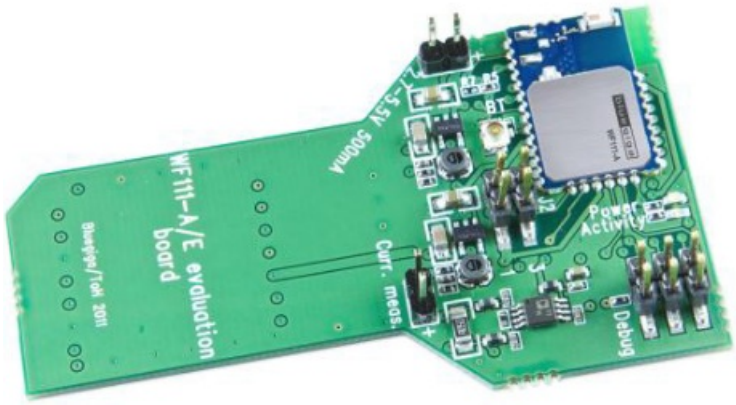


Product Information

Product Description

The WF111 Development Kit (DKWF111) is designed for evaluating the WF111 Wi-Fi module and as a basis for product development. It can be inserted directly into an SDIO card slot or connected through pin header or wires for alternative connections. The WF111 module is a fully integrated single 2.4GHz band 802.11 b/g/n module, suitable for portable and battery-powered applications requiring Wi-Fi connectivity. It includes an IEEE 802.11 b/g/n radio, antenna or U.FL antenna connector, and SDIO or CSPI host
interfaces. The module also supports Wi-Fi encryption protocols and various coexistence schemes for exceptional performance.

Key Features

- SDIO host connection
- Two switch mode converters
- Current measurement voltage output

Physical Outlook

DKWF111

Board Description

WF111 Wi-Fi Module

The DKWF111 contains a WF111-A module variant with an internal chip antenna.

Configurable I/O Ports

The board provides programmable bi-directional input/output (I/O) ports that can be soldered on using a surface-mounted pin header. The PIO lines can be configured through software to have weak or strong pull-ups or pull-downs. They can also be configured as interrupt request lines, wake-up lines, status LED drivers, general I/O pins, Bluetooth co-existence interface, or as a sleep clock input.

Debug SPI Interface

A header is provided for the module debug bus for certification RF. Access to internal settings and test modes is available using a CSR compatible SPI adapter and UniTest software. For more information, please contact Bluegiga’s technical support.

Bluetooth Co-Existence

The DKWF111 supports industry-standard co-existence schemes such as 2-wire, 3-wire, Unity-3, Unity-4, Unity-3e, and Unity+ extension. The PIO pads can be configured for these functions. The co-existence parameters are set through the settings file uploaded
through the host connection. An U.FL connector is also present for antenna sharing using the module’s internal RF switch.

Product Usage Instructions

To use the WF111 Development Kit, follow the instructions below:

1. Insert the DKWF111 board directly into an SDIO card slot or solder pin headers or wires to the board for alternative connections.
2. If using pin headers, configure the PIO lines through software to meet your application requirements, such as pull-ups, pull-downs, interrupt request lines, wake-up lines, status LED drivers, or general I/O pins.
3. For debugging purposes, use a CSR-compatible SPI adapter and UniTest software to access internal settings and test modes through the provided debug SPI interface. Contact Bluegiga's technical support for more information.
4. If required, configure the co-existence schemes using the settings file uploaded through the host connection. The DKWF111 supports various co-existence schemes, including 2-wire, 3-wire, Unity-3, Unity-4, Unity-3e, and Unity+ extension.
5. If antenna sharing is needed, utilize the U.FL connector provided on the board along with the module's internal RF switch.

VERSION HISTORY

Version	Comment
1.0	First version
1.1	Minor updates

Product description

DESCRIPTION

- DKWF111 is intended for evaluating the WF111 Wi-Fi module and as a basis for product development. The board can be inserted directly into an SDIO card slot, or a pin header or wires can be soldered to the board for alternative connections into the test system or application.
- The WF111 is a fully integrated single 2.4GHz band 802.11 b/g/n module, intended for portable and battery powered applications, where Wi-Fi connectivity is needed. WF111 integrates an IEEE 802.11 b/g/n radio, antenna or U.FL antenna connector and SDIO or CSPI host interfaces.
- The WF111 provides a low cost and simple Wi-Fi solution for devices that run an operating system and a TCP/IP stack on-board, but still offers the benefits of a module – small form factor, easy integration and certifications. Bluegiga also provides WF111 drivers for the Linux operating system.
- The WF111 has hardware support for Wi-Fi encryption protocols and for various co-existence schemes which enables exceptional performance during simultaneous use of IEEE 802.11 and Bluetooth with a single antenna.

KEY FEATURES

- SDIO host connection
- Two switch mode converters
- Current measurement voltage output

PHYSICAL OUTLOOK

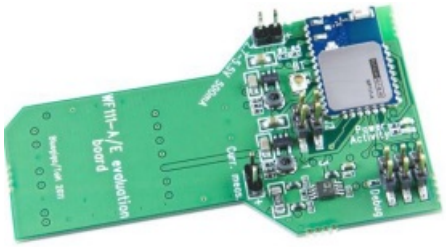


Figure 1: DKWF111

Board Description

WF111 Wi-Fi Module

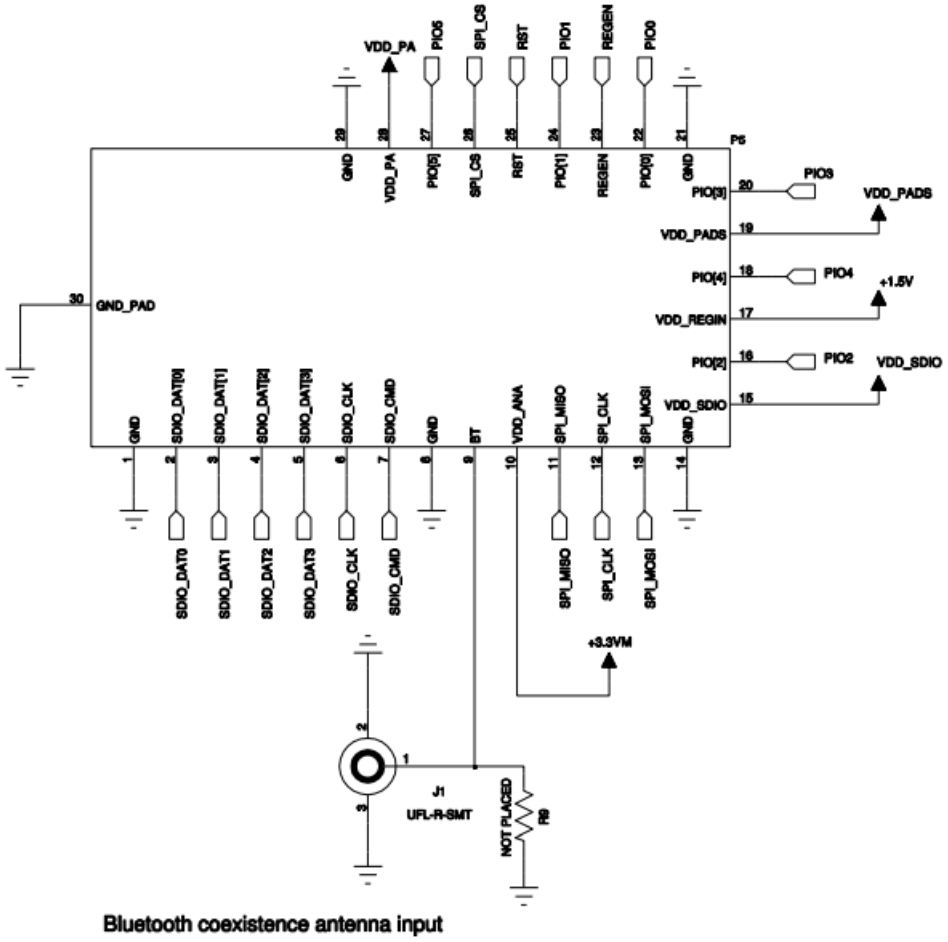
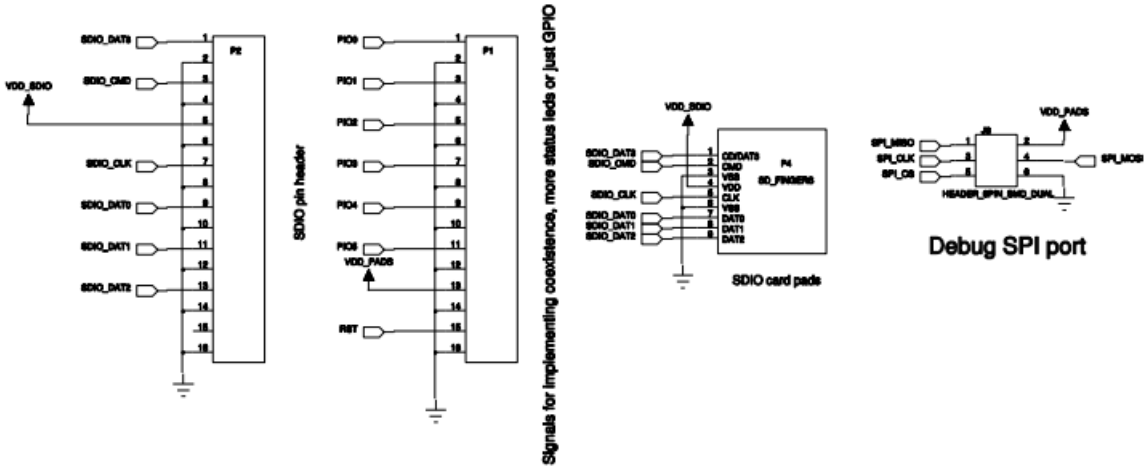


Figure 2: WF111 Wi-Fi module example schematic

DKWF111 contains a WF111-A module variant with an internal chip antenna.

Configurable I/O Ports



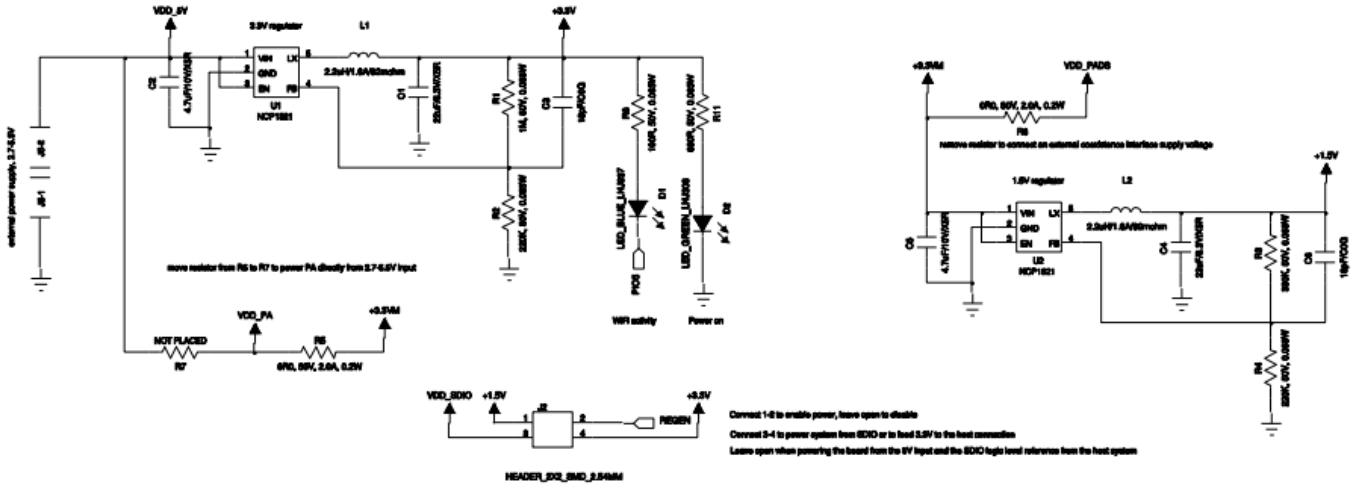
- A number of programmable bi-directional input/outputs (I/O) are provided on a number of pads on the board, arranged for a surface mounted pin header that can be soldered on if needed. PIO[0:5] are powered from VDD_PADS.
- PIO lines can be configured through software to have either weak or strong pull-ups or pull-downs. All PIO lines are configured as inputs with weak pull-downs at reset. Configuration is done through the settings file (MIB) uploaded through the host connection at device configuration.
- In addition to PIO, the lines can be can be configured as interrupt request lines, wake-up lines from sleep modes, status led drivers with multiple internally generated modes, general I/O pins controlled by the host, Bluetooth co-existence interface or as a 32.768 kHz sleep clock input.

Debug SPI Interface
A header is provided for the module debug bus for certification RF. Access to internal settings and test modes is available using a CSR compatible SPI adapter and UniTest-software.
For more information, please contact Bluegiga's technical support.

Bluetooth co-existence
Industry standard 2-wire and 3-wire, as well as Unity-3, Unity-4, Unity-3e co-existence schemes are supported as well as the Unity+ -extension, and the associated signals are available. The PIO pads can be configured for these functions among others. The co-existence parameters are set through the settings file uploaded through the host connection.
A U.FL connector is also present for antenna sharing using the module internal RF switch.

SDIO/SDIO SPI/CSPI Host Connection
The board is shaped to fit into a standard SDIO card slot, with the corresponding contact pads. The signals are also present on a separate row of pads, where a standard surface mount pin header can be soldered if an alternative connection is needed. Please note that after soldering this header the board will no longer fit into an SDIO card slot.
The SDIO supply line is always connected to the module VDD_SDIO pad, as this supply pad provides the voltage to which the bus voltage levels are referred, and should always be connected to the host system's logic supply. This voltage can range from 1.7V to 3.6V.

Board Powering



DKWF111 board can be powered through the SDIO host power line as mentioned in the previous section, or through a two pin header with a standard 2.54mm raster. The pin header can be used with an external supply voltage between 2.7V and 5.5V to the system. This voltage feeds a switch-mode converter that provides 3.3V to the system (assuming the input is above 3.3V, below this it acts as a small resistance). The external power supply should be specified for at least 500mA.
A second on-board switch-mode converter converts the 3.3V supply line from either supply input into a WiFi core supply voltage of 1.5V.

Jumper Header

There is a four pin header on the board with two jumpers inserted.
The jumper connecting pins 1 and 2 connects module signal REGEN to the 1.5V supply line, enabling the module. Removing the jumper will cause the module to fully power off.
The other jumper connecting pins 3 and 4 connects the module 3.3V supply line to the VDD_SDIO line. When the SDIO host has 3.3V logic levels and can supply enough power for the evaluation board, this jumper is left inserted. However, when the bus logic levels are at a voltage lower than 2.7V, the external power connector on the board should be used to power the board. In this case the jumper should be removed to isolate the two supply domains (thus preventing smoke).

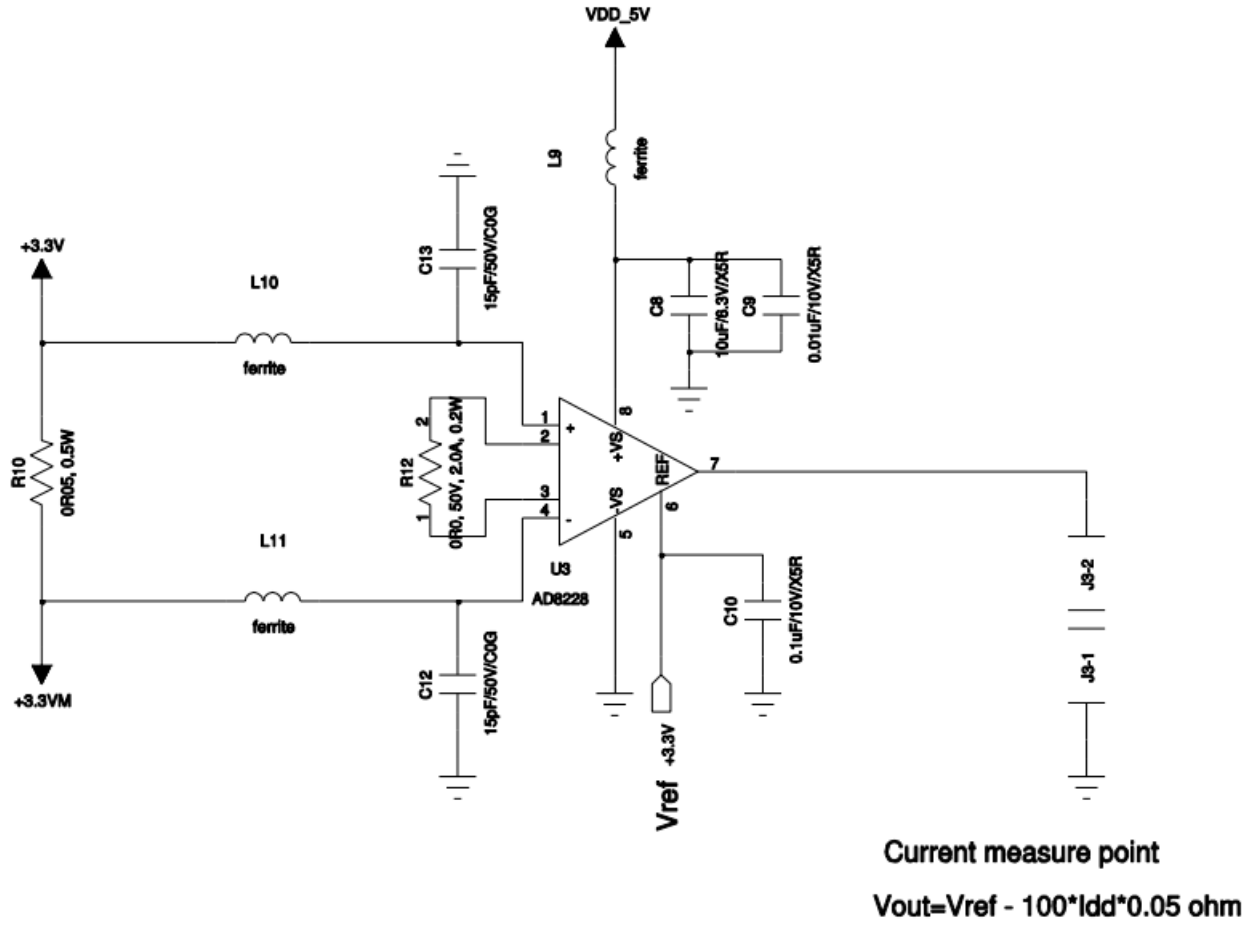
LEDs

Two LEDs are present on the board: a green one, indicating when a 3.3V supply voltage is present, and a blue one for indicating various operating modes. The blue led is connected to a PIO line, and its functions can be set through the host connection.

Resistor Jumpers

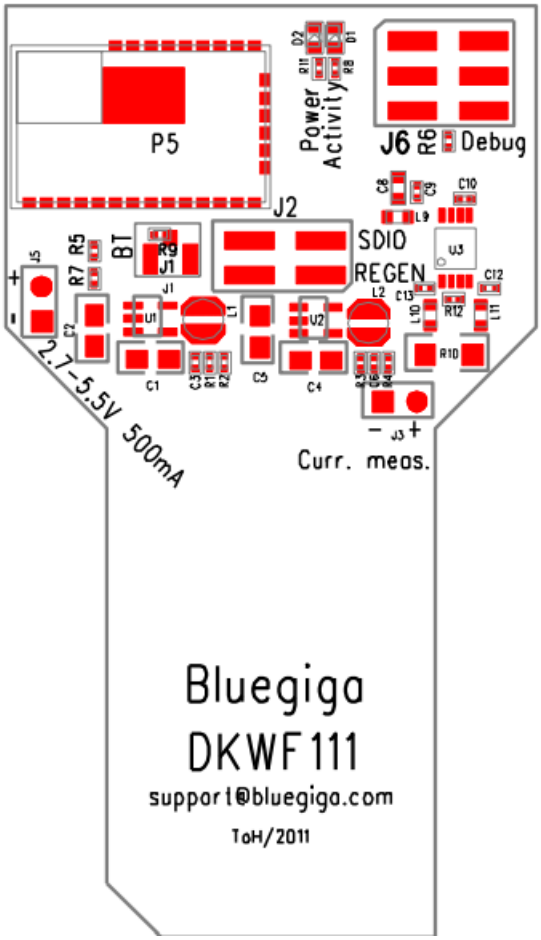
There are three places for 0 ohm resistors on board, with two populated. These can be used to change some functionality of the board.
R6 connects the module 3.3V power supply to the VDD_PADS supply line, which acts as the logic level reference for the PIO lines. If an external system running at a different voltage is required to be connected to the PIO lines, R6 can be removed and the reference supply voltage fed to the PIO header supply pad.
R5 connects the module power amplifier supply to the switch mode regulator 3.3V output. If it is necessary to connect the PA supply directly to the input (testing total consumption while powering directly from a lithium battery, for example), the 0 ohm resistor can be moved from R5 to R7. The power amplifier is recommended to be supplied with a voltage from 2.7V to 4.8V, with an absolute maximum of 5.5V (set by the switch mode regulator input). Please note that this will remove the power amplifier from behind the current consumption measurement circuit.

Current Measurement Point



A two pin header is provided for measuring module momentary current consumption. Due to the dual voltage requirement of the module, the measurement point only measures 3.3V consumption, including the consumption and conversion losses of the switch mode converter providing the 1.5V core supply voltage. The header gives the voltage dropped over a high-side series resistor, amplified suitably and referred to the 3.3V voltage. The voltage relates to the current consumption with the following equation:
Imodule = (3.3V – Vout)/5
For example, a momentary reading of 2.6V would imply a current draw of 140mA.
An oscilloscope can be connected to this header to find the power consumption profiles of common use cases in different use cases.
Detaching the jumper connecting the REGEN signal lowers the total consumption of the module and the regulator to about 80µA. With the REGEN jumper removed the voltage across the measurement jumper can be used to calibrate the current measurement reference.

Board Layout


P5
Power
Activity
J6
R6
Debug
J2
SDIO
REGEN
BT
2.7-5.5V 500mA
Curr. meas.
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DKWF111
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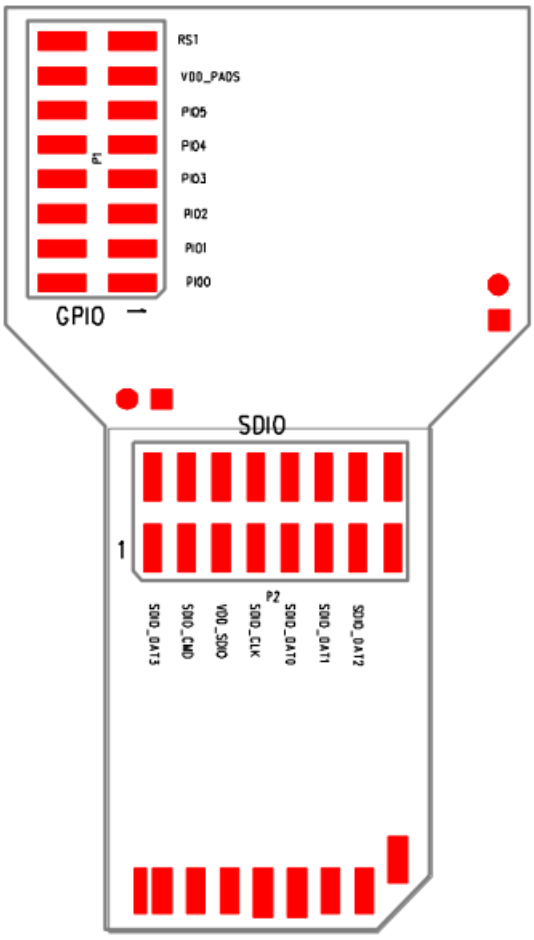
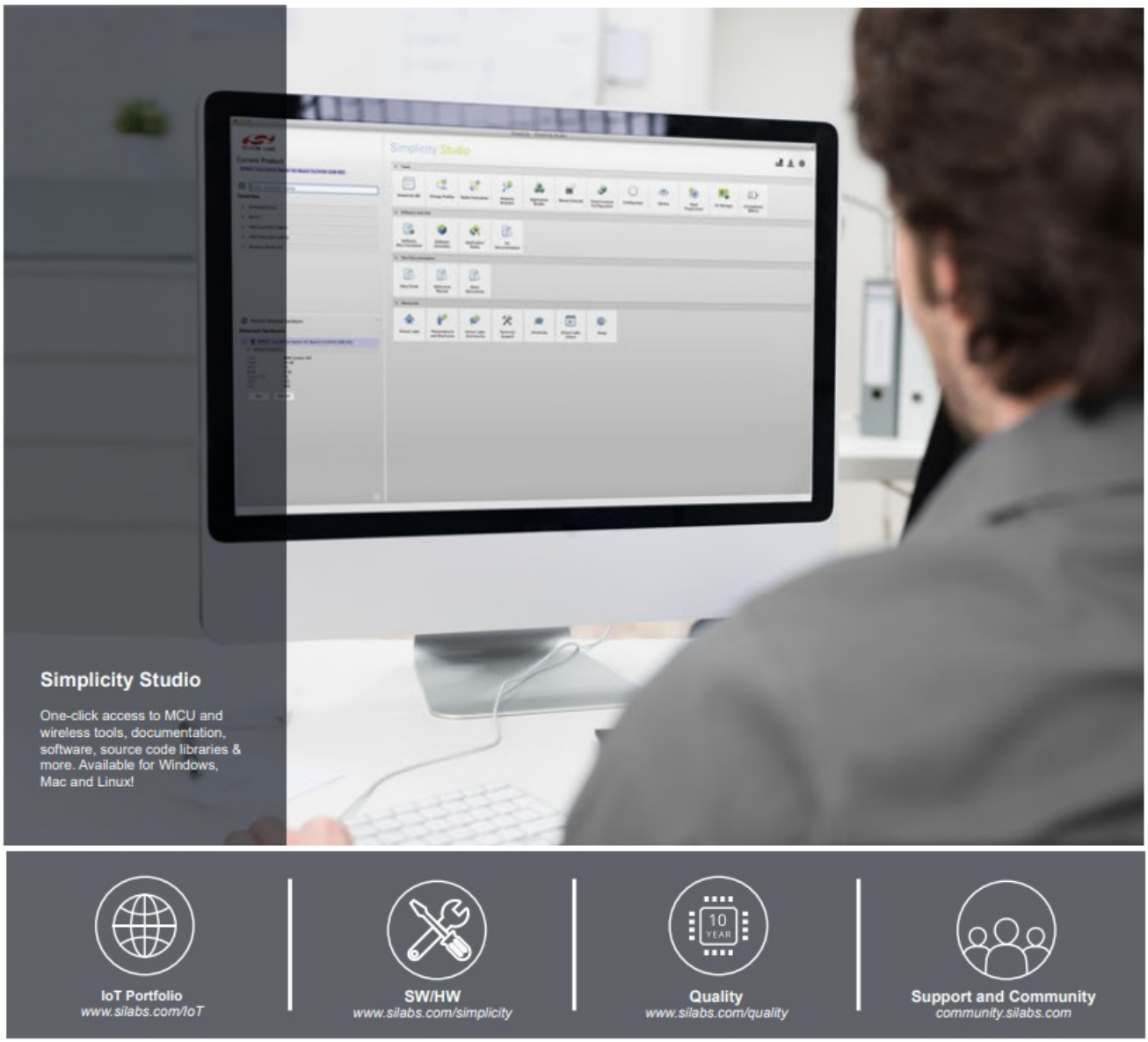
ToH/2011


RS1
VDD_PADS
PIO5
PIO4
PIO3
PIO2
PIO1
PIO0
GPIO
SDIO
SDIO_DAT3
SDIO_CMD
VDD_SDIO
SDIO_CLK
SDIO_DAT0
SDIO_DAT1
SDIO_DAT2



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References

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