User Manual

DAMOSYS

Wiced Serial To WiFi

DS640

Data Sheet

Version: 1.1
2015-04-24

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1. Product introduction

1.1 Overview

Fig.1 DS640 Module

This is a complete WiFi module which is designed for embedded wireless solution and a cost-effective, low power capabilities high performance MCU in M2M applications. It includes standards-based wired and wireless technologies to enable IP infrastructures for smart grid, smart home, security, building automation, toys, robots, remote health and wellness monitoring and other M2M applications.

The module integrates ARM CortexTM-M3 MCU, WIFi and front end into a smallest form factor LGA package. It is based on Broadcom IEEE802.11 b/g/n antenna diversity single-stream Broadcom align technology. Thus, it can be used to enable wireless connectivity to the simplest existing sensor products with minimal engineering effort.

The solution is provided as a module to reduce development time, lower manufacturing costs, save board space, ease certification, and minimize RF expertise required. Additionally it is provided as a complete platform solution including software drivers, sample applications, API guide, user documentation.

Table 1.1 : DS640 Family

Name	Type	R/F	Description
DS640	Module	WiFi	DS640 WiFi Module
DS640-EVB	EVB B/D	WiFi	DS640 Evaluation Board

1.2 Features

- Small size : 19 x 28 x 2 mm (With PCB Antenna) / 19 x 21 x 2 mm (Without PCB Antenna)
- 802.11b: 1, 2, 5.5, 11Mbps
- 802.11g: 6, 9, 12, 18,24, 36, 48, 54Mbps
- 802.11n: HT30, MCS0~7.
- Antenna : On-board PCB Antenna
- Ultra-low power save mode
- Max Transmitter power
  - 802.11b : 13.5 dBm
  - 802.11g : 11.5 dBm
  - 802.11n : 11.5 dBm
- Receiver sensitivity
  - 802.11b : -90dBm
  - 802.11g : -85dBm
  - 802.11n : -84dBm
- Security support for WEP,WPA/WPA2
- Serial Interface : UART, SPI

- Peripheral Interface : I2C, I2S, GPIO
- Support Serial 2ports
- Support GPIO 10 ports (shared pin)
- Operating temperature range: -40 ℃ to +85 ℃
- Support 2.4GHz band, power management.
- TCP throughput greater than 20Mbps
- Support GPIO 10 ports (shared pin)
- Compatible with Broadcom WICED™ SDK

Typical Applications

- IOT aware-able device
- Health care Device Server
- Building automation and smart energy control.
- Industrial remote equipment monitoring.
- Home Automation & Security
- Sensor Networks.

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1.3 Specification

Table 1.2 : Module specification

Item	Features
MCU	ARM Cortex M3 @ 48 MHz
Memory Integration	448Kbytes of application SRAM, 16Mb Flash
Serial interfaces	UART, SPI
Common interfaces	GPIO, I2C, I2S
Wi-Fi Integration	MAC/BB/RF
Operating Temperature	-40℃ to 85℃
Data Throughput	2 Mbit/s over UART, 10 Mbit/s over SPI
Supply voltage	3.3V ±10%
Dimension	19 x 28 x 2 (Without PCB Antenna) / 19 x 21 x 2(With PCB Antenna)
Mount Type	SMT
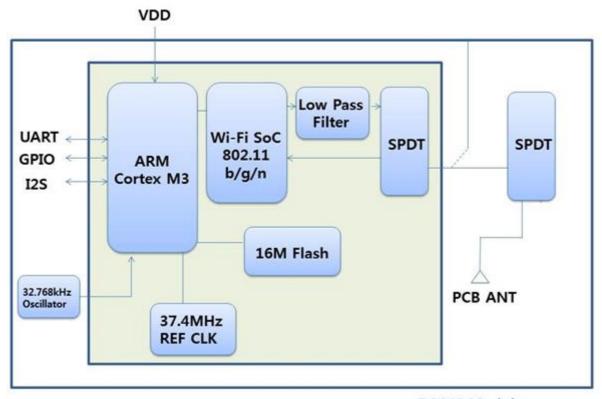
Table 1.3 : Wireless specification

Item	Features
Standards	IEEE 802 Part 11b/g/n (802.11b/g/n single stream n)
Antenna	Firmware control Antenna selection(PCB)
Frequency Band	2.412 – 2.462 GHz
Receiver Sensitivity	-94dBm @ 11Mb/s
Number of selectable Sub channels	13 channels
Supported Data Rates	IEEE 802.11b 1 – 11 Mbps IEEE 802.11g 6 – 54 Mbps IEEE 802.11n (2.4 GHz) 7.2 – 72.2 Mbps
Advanced 1x1 802.11n features	Full/Half Guard Interval Frame Aggregation Space Time Block Coding (STBC) Low Density Parity Check (LDPC) Encoding
Modulation	CCK and OFDM with BPSK, QPSK, 16 QAM, 64QAM
Communications Range	150 m (line of sight)
Wi-Fi Security	Open, WEP,WEP-SHARED, WPA-TKIP, WPA-AES, WPA2-AES, WPA2-TKIP, WPA2-MIXED
Network Security	SSL / TLS, HTTPS
Broadcom WICED SDK 3.x	SDL 3.1.0 Above

2. Block Diagram

Figure 2 is a block diagram of the DS640 module. The main components of the module are ARM Cortex M3 microprocessor and BCM4390 Wi-Fi System-on-Chip (SoC).

FIGURE 2: DS640 Block Diagram

3. Electrical Specifications

3.1 Absolute Maximum Rating

Table 3.1 Absolute Maximum Rating

Absolute Maximum Rating			
Item	**Condition**		
Supply Power	Max +3.63 Volt		
Storage Temperature	- 40° to 85° Celsius		
Voltage ripple	+/- 2%	Max. Values not exceeding Operating voltage	
	Power	Min	Max
Power Supply Absolute Maximum Ratings	VDD	0	3.63

3.2 Recommendable Operation Condition

The DS640 module has to withstand the operational requirements as listed in the table below.

Table 3.2 Temperature, Humidity

Temperature, Humidity		
Item	**Condition**	
Operating Temperature	-40° to 85° Celsius	
Humidity range	Max 95%	Non condensing, relative humidity

Power supply for the DS640 module will be provided by the host via the power pins

Table 3.2 Voltage

Voltage					
Item	**Condition**	**Min**	**Typ**	**Max**	**Unit**
VDD_1	WiFi Voltage	2.97	3.3	3.63	V

3.3 Current Consumption

Condition: Condition: 25deg.C, includes Both WiFi and Micro-Controller

Table 3.3.1 : WLAN Current Consumption

WLAN					
Item	**Condition**	**Min**	**Nom**	**Max**	**Unit**
Tx mode(11b Max current)	11Mbps		295	345	mA
Tx mode(11g Max current)	54Mbps		165	235	mA
Tx mode(11n Max current)	MCS7		160	230	mA
Rx mode	11b(11Mbps)		70		mA
	11g(54Mbps)				
	11n(MCS7)				

4. RF Specifications

4.1 WiFi RF Transmitter specification

Table 4.1.1 WiFi RF Transmitter specification 802.11b

802.11b Transmit					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Output power level	1M/2M/5.5M/11M	11.5	13.5	15.5	dBm
Center frequency tolerance		-20	0	20	Ppm
Spectrum mask	Fc-22MHz<F<Fc-11MHz & Fc+11MHz<F<Fc+22MHz(1/2/5.5/11Mbps; channel 1~13)			-30*	dBr
	F<Fc-22MHz & F>Fc+22MHz(1/2/5.5/11Mbps; channel 1~11)			-50*	dBr
Power-on	10% ~ 90 %		0.3	2*	us
Power-down	90% ~ 10 %		1.5	2*	us
Modulation accuracy	1/2/5.5/11 Mbps		-17	-10	dB

Table 4.1.2 : Wifi RF Transmitter specification 802.11g

802.11g Transmit					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Output power level	6M/9M/12M/18M/24M/36M/48M/54M	9.5	11.5	13.5	dBm
Center frequency tolerance		-20	0	20	Ppm
Modulation accuracy	6Mbps		-30	-5*	dB
	9Mbps		-30	-8*	dB
	12Mbps		-30	-10*	dB
	18Mbps		-30	-13*	dB
	24Mbps		-30	-16*	dB
	36Mbps		-30	-19*	dB
	48Mbps		-30	-22*	dB
	54Mbps		-30	-25*	dB
spectrum mask	@ 11MHz			-20*	dBr
	@ 20MHz			-28*	dBr
	@ 30MHz			-40*	dBr

Table 4.1.3 : WiFi RF Transmitter specification 802.11n

802.11n Transmit					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Output power level	HT20 MCS 0~7	9.5	11.5	13.5	dBm
Center frequency tolerance		-20	0	20	ppm
Modulation accuracy	HT20, MCS0~7		-30	-27*	dB
Spectrum mask	@ 11MHz			-20*	dBr
	@ 20MHz			-28*	dBr
	@ 30MHz			-40*	dBr

4.2 WiFi RF Receiver specification

Table 4.2.1 : WiFi RF Receiver specification 802.11b

802.11b Receiver					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Receiver minimum input level sensitivity (PER< 8 %)	1Mbps		-90	-80*	dBm
	2Mbps		-90	-80*	dBm
	5.5Mbps		-90	-76*	dBm
	11Mbps		-87	-76*	dBm
Receiver maximum input level sensitivity (PER< 8 %)	1/2/5.5/11 Mbps			-10*	dBm

Table 4.2.2 : WiFi RF Receiver specification 802.11g

802.11g Receiver					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Receiver minimum input level sensitivity (PER<10%)	6Mbps		-85	-82*	dBm
	9Mbps		-85	-81*	dBm
	12Mbps		-85	-79*	dBm
	18Mbps		-84.5	-77*	dBm
	24Mbps		-82	-74*	dBm
	36Mbps		-78.5	-70*	dBm
	48Mbps		-74	-66*	dBm
	54Mbps		-70	-65*	dBm
Receiver maximum input level (PER<10%)	6/9/12/18/24/36/48/54			-20*	dBm

Table 4.2.3 : WiFi RF Receiver specification 802.11n

802.11n Receiver					
Item	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Receiver minimum input level sensitivity (PER<10%)	HT20, MCS0		-84	-82*	dBm
	HT20, MCS1		-84	-79*	dBm
	HT20, MCS2		-82.5	-77*	dBm
	HT20, MCS3		-80.5	-74*	dBm
	HT20, MCS4		-77	-70*	dBm
	HT20, MCS5		-73	-66*	dBm
	HT20, MCS6		-71	-65*	dBm
	HT20, MCS7		-70	-64*	dBm
Receiver maximum input level (PER<10%)	MSC0~MSC7			-20*	dBm
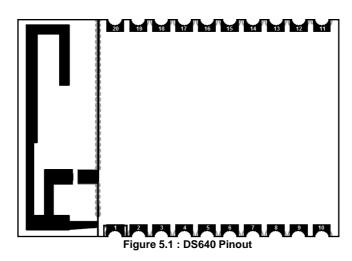
"*" indicates IEEE802.11 specification

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5. Pin Definition

5.1 Pinout
Pin Number sequence definition

Figure 5.1 : DS640 Pinout

5.2 Pin Description

Table 5.2 : DS640 Pin Description

Pin	Name	Description
1	VDD_3V3	3.3V supply
2	GND	Ground
3	I2S_WS_A7 (GPIOA7)	I2S WORD SELECT or GPIO A7
4	I2S_CLK_A9 (GPIOA9)	I2S CLOCK or GPIO A9
5	I2S_DO_A8 (GPIOA8)	I2S DATA OUTPUT or GPIO A8
6	UART1_CTS_N_A1 (GPIOA1)	UART1 ACTIVE_LOW CLEAR-TO-SEND or GPIO A1
7	I2S_DI_A6 (GPIOA6)	I2S DATA INPUT or GPIO A6
8	UART1_RTS_N_A0 (GPIOA0)	UART1 ACTIVE LOW REQUEST-TO-SEND or GPIO A0
9	SPI1_IRQ_A11 (GPIOA11)	SPI IRQ INPUT or GPIO A11
10	JTAG_TCK_A3 (GPIOA3)	JTAG_TCK or GPIO A10
11	WAKE_A10 (GPIOA10)	WAKE or GPIO A10
12	UART1_RXD	UART1 SERIAL INPUT
13	UART1_TXD	UART1 SERIAL OUTPUT
14	JTAG_TDO_A5 (GPIOA5)	JTAG_TDO or GPIO A5
15	GND	Ground
16	JTAG_TMS_A2(GPIOA2)	JTAG_TMS or GPIO A2
17	JTAG_TDI_A4(GPIOA4)	JTAG_TDI or GPIO A4
18	MODULE_RESET_N	Module Reset (Internal Pull-up)
19	SPI1_SFLASH_CS_N_Pinout	SPI_SFLASH
20	ANTENNA1_BD	Signal Pin for External Antenna

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5.3 Pin Interface selection Guide

Table 5.3.1 : Using Interface alternative functions

Name	UART1	UART2	*I2C	*I2S	GPIO	DEBUG
I2S_DO_A8		CTS_N		DO	A8	
I2S_DI_A6		RTS_N		DI	A6	
I2S_CLK_A9		RXD		CLK	A9	
I2S_WS_A7		TXD		WS	A7	
UART1_CTS_N_A	CTS_N				A1	
UART1_RTS_N_A	RTS_N				A0	
UART1_RXD	RXD		SDA			
UART1_TXD	TXD		SCL			
WAKE_A10					A10	
SPI_IRQ_A11					A11	
JTAG_TMS_A2				DO	A2	JTAG_TMS
JTAG_TCK_A3				DI	A3	JTAG_TCK
JTAG_TDI_A4				CLK	A4	JTAG_TDI
JTAG_TDO_A5				WS	A5	JTAG_TDO

* I2C, I2S Not supported yet

6. Mechanical Specification
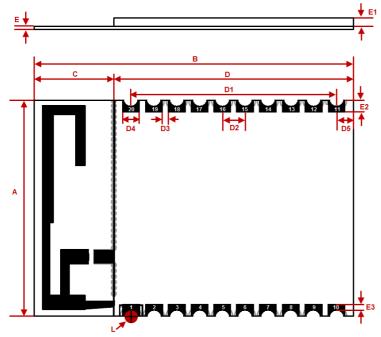
6.1 General View

Figure 6.1 : DS640 General view

6.2 Mechanical Dimension

The following paragraphs provide the requirements for the size.
Dimension (LxWxH) (+/- 0.25mm) : 21 x 19 x 2 mm^3
: 28 x 19 x 2 mm^3 (with PCB Antenna)

Symbol	Dimension in mm			Dimension in inch		
	MIN	NOM	MAX	MIN	NOM	MAX
A	18.75	19.00	19.25	7.382	7.480	7.579
B	27.75	28.00	28.25	10.925	11.024	11.122
C	6.75	7.00	7.25	2.657	2.756	2.854
D	20.75	21.00	21.25	8.169	8.268	8.366
E	0.57	0.60	0.63	0.224	0.236	0.248
D1		18.00			7.087	
D2		2.00			0.787	
D3		0.40			0.157	
D4		1.52			0.600	
D5		1.40			0.551	
E1		2.00			0.787	
E2		1.10			0.433	
E3		0.68			0.266	
L		0.85			0.335	

Figure 6.2. DS640 Recommended Footprint (Top View)

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6.3 Recommended Reflow Profile
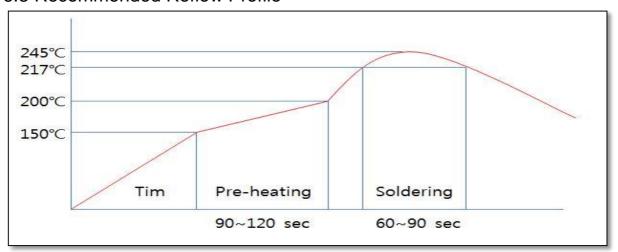
Figure 6.3 : DS640 Recommended Reflow Profile

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7. Revision history

Table 7.1 : Release History

Version	Description of modifications	Modified by	Reviewer	Time	Department
V1.0	1st release			2015/04/	

8. Technical Support Contact

Contact us: http://www.damosys.com

9. Certification statements & Marking

9.1 Label

9.1.1 Box Label

9.1.2 Product Label

9.2 CE Mark

CE Marking: CE2200

9.3 FCC statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

Caution: Changes or modifications not expressly approved by the party responsible for compliance

could void the user's authority to operate the equipment.

※This appliance and its antenna must not be co-located or operation in conjunction with any other antenna or transmitter.

A minimum separation distance of 20 ㎝ must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

9.4 LABELING REQUIREMENTS:
The Original Equipment Manufacturer (OEM) must ensure that FCC labelling requirements are met.
This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate DAMOSYS Inc., FCC identifier for this product as well as the FCC Notice above. The FCC identifier is FCC ID: 2AGMTDS640.
In any case the end product must be labeled exterior with "Contains FCC ID: 2AGMTDS640"

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