

Data Sheet

Product	BLE Module
Solution	Nordic nRF52833 aQFN Package
Model NO.	DK9177B (u.FL Connector)

1. Overall Introduction

Dexatek's DK-9177B is a BT 5 stack (Bluetooth low energy or BLE) module designed based on Nordic nRF52833 SoC solution, which incorporates: GPIO, SPI, UART, I2C, I2S, PMD, PWM, ADC, NFC and USB interfaces for connecting peripherals and sensors.

Ideal solution for designs requiring Bluetooth 5 functionality or 802.15.4-based Thread networking and Zigbee. Enhanced integration with built-in USB and 5.5 V compatible DC/DC power supplies reduces design complexity and BOM cost while expanding possible applications.

Provides ultra-low power consumption and excellent wireless range with +8 dBm transmission Power and long range (encoded physical layer) Bluetooth 5 capabilities. New circuits are added TX power and reduces sleep current for perfect power management.

1.1 Application

- Lighting products
- Home application
- Internet of things (IoT)
- Medical devices
- Factory automation
- IoT Sensors
- HVAC Controllers
- Industrial IoTsensors and Controllers
- Remote controls
- Smart Eenergy management
- Advanced Wearables
- Education entertainment devices
- Agriculture Application

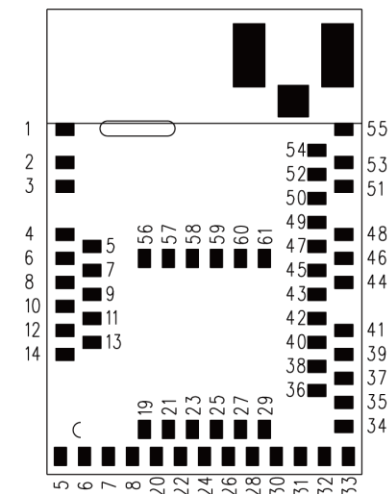
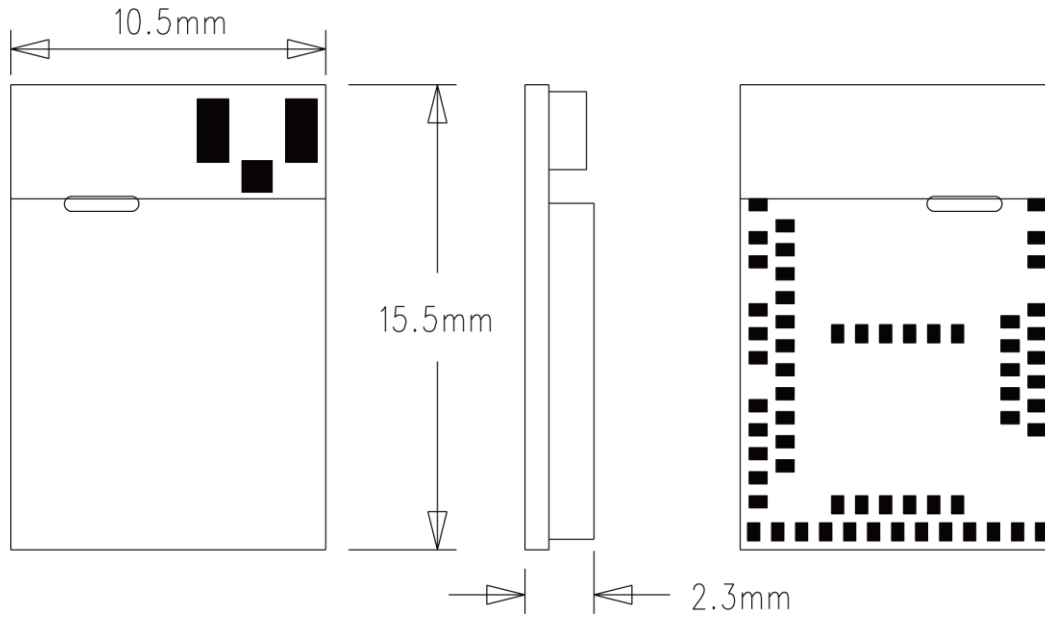
1.2 Product Specification

- Bluetooth[®] 5.3 IEEE 802.15.4-2006, 2.4 GHz transceiver,
- LE 2M PHY, LE 1M PHY, LE Coded PHY (Long Range)
 - 2 Mbps, 1 Mbps, 500 kbps, and 125 kbps
 - IEEE 802.15.4-2006 – 250 kbps
 - Proprietary 2.4 GHz – 2 Mbps, 1 Mbps
- nRF52833, ARM[®] Cortex[®] M4 32-bit processor with FPU, 64 MHz
- 512kB Flash and 128 kB RAM
- Radio
 - GFSK at 1 Mbps and 2 Mbps, QPSK at 250 Kbps
 - -96 dBm sensitivity in 1 Mbps Bluetooth[®] low energy mode -103 dBm sensitivity in 125 kbps Bluetooth[®] low energy mode (long range)
 - -20 to +8 dBm TX power, configurable in 4 dB steps
 - On-air compatible with nRF52, nRF51, nRF24L, and nRF24AP Serie
- Power Management
 - 1.7 V to 5.5 V supply voltage range
- Security features
 - 128-bit AES/ECB/CCM/AAR co-processor
- Peripheral interface / Hardware
 - USB 2.0 full speed (12 Mbps) controller
 - High-speed 32 MHz SPI
 - Type 2 NFC-A tag with wake-on field
 - Touch-to-pair support
 - Programmable peripheral interconnect (PPI)
 - 42 general purpose I/O pins (GPIO)
 - EasyDMA automated data transfer between memory and peripherals
 - Nordic SoftDevice ready with support for concurrent multiprotocol
 - 12-bit, 200 ksps ADC – 8 configurable channels with programmable gain
 - 64 level comparator
 - 15 level low-power comparator with wake-up from System OFF mode
 - 4x4 channel PWM unit with EasyDMA
 - Audio peripherals – I2S, digital microphone interface (PDM)
 - 5x 32-bit timer with counter mode
 - Up to 4x SPI master/3x SPI slave with EasyDMA
 - Up to 2x I2C compatible two-wire master/slave
 - 2x UART (CTS/RTS) with EasyDMA
 - Quadrature decoder (QDEC)

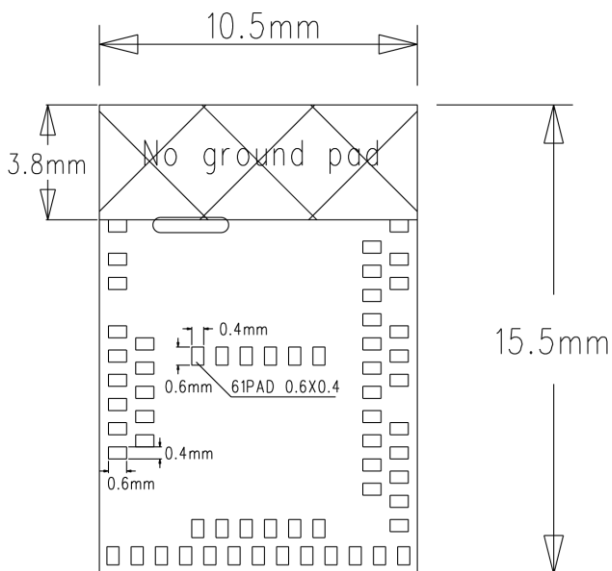
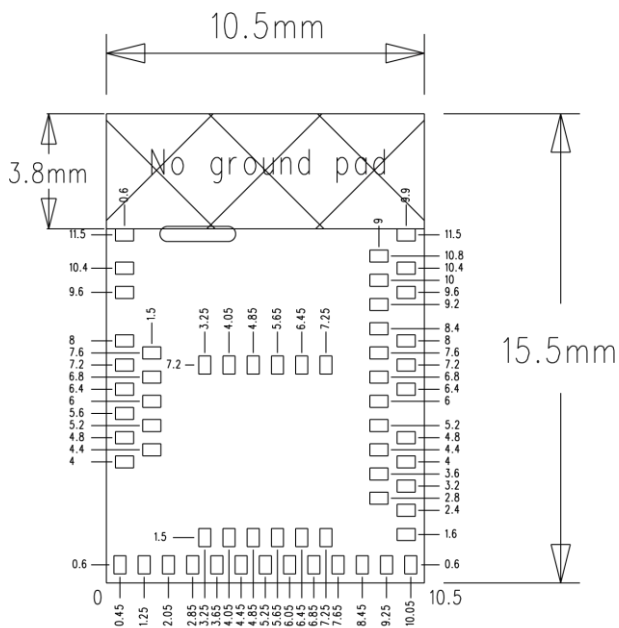
- 3x real-time counter (RTC)
- Operation Temperature: -40 °C to 85 °C

2. Product Dimension

2.1. PCB Dimensions & Pin Indication



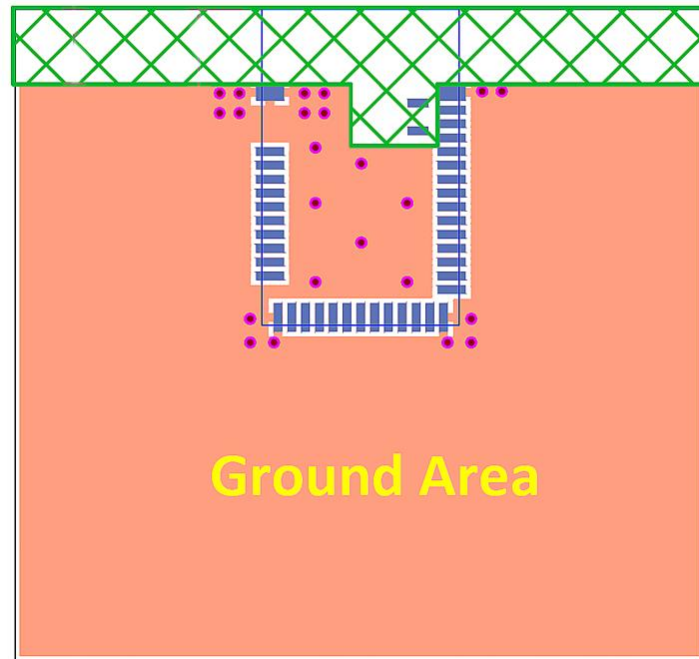
2.2. Recommended Layout of Solder Pad



2.3. RF Layout Suggestion (aka Keep-Out Area)

Please follow below instruction to avoid from having Ground Pad in the area of our RF test pad. Otherwise, it may cause shortage to the module

 **No Ground-Pad Area**



Top View

2.4 Pin Assignment

Pin	Name	Function	Description
1	GND	Power	Ground
2	GND	Power	Ground
3	P1.10	Digital I/O	General purpose I/O (standard drive, low frequency I/O only)
4	P1.11	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
5	P1.12	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
6	P1.13	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
7	P1.14	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
8	P1.15	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
9	P0.03	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
	AIN1	Analog input	Analog input
10	P0.29	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
	AIN5	Analog input	Analog input
11	P0.02	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
	AIN0	Analog input	Analog input
12	P0.31	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
	AIN7	Analog input	Analog input
13	P0.28	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
	AIN4	Analog input	Analog input
14	P0.30	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
	AIN6	Analog input	Analog input
15	GND	Power	Ground
16	P0.27	Digital I/O	General purpose I/OGeneral purpose I/O

17	P0.00	Digital I/O	General purpose I/OGeneral purpose I/O
	XL1	Analog input	Connection for 32.768 kHz crystal
18	P0.01	Digital I/O	General purpose I/OGeneral purpose I/O
	XL2	Analog input	Connection for 32.768 kHz crystal
19	P0.26	Digital I/O	General purpose I/OGeneral purpose I/O
20	P0.04	Digital I/O	General purpose I/OGeneral purpose I/O
	AIN2	Analog input	Analog input
21	P0.05	Digital I/O	General purpose I/OGeneral purpose I/O
	AIN3	Analog input	Analog input
22	P0.06	Digital I/O	General purpose I/OGeneral purpose I/O
23	P0.07	Digital I/O	General purpose I/OGeneral purpose I/O
	TRACECLK	Trace clock	Trace buffer clock
24	P0.08	Digital I/O	General purpose I/OGeneral purpose I/O
25	P1.08	Digital I/O	General purpose I/OGeneral purpose I/O
26	P1.09	Digital I/O	General purpose I/OGeneral purpose I/O
	TRACEDATA(3)	Trace data	Trace buffer TRACEDATA [3].
27	P0.11	Digital I/O	General purpose I/OGeneral purpose I/O
	TRACEDATA(2)	Trace data	Trace buffer TRACEDATA [2].
28	VDD	Power	Power supply
29	P0.12	General purpose I/OGeneral	General purpose I/OGeneral purpose I/O
	TRACEDATA(1)	Trace data	Trace buffer TRACEDATA [1].
30	VDDH	Power	High voltage power supply
31	DCCH	Power	DC/DC converter output
32	VBUS	Power	5V input for USB 3.3V regulator
33	GND	Power	Ground
34	D-	Digital I/O	USB D-
35	D+	Digital I/O	USB D+
36	P0.14	Digital I/O	General purpose I/OGeneral purpose I/O
37	P0.13	Digital I/O	General purpose I/OGeneral purpose I/O
38	P0.16	Digital I/O	General purpose I/OGeneral purpose I/O

39	P0.15	Digital I/O	General purpose I/OGeneral purpose I/O
40	P0.18	Digital I/O	General purpose I/OGeneral purpose I/O (recommended usage: QSPI / CSN))
	nRESET		Configurable as system reset
41	P0.17	Digital I/O	General purpose I/OGeneral purpose I/O
42	P0.19	Digital I/O	General purpose I/OGeneral purpose I/O (recommended usage: (QSPI / SCK))
43	P0.21	Digital I/O	General purpose I/OGeneral purpose I/O (recommended usage: QSPI)
44	P0.20	Digital I/O	General purpose I/OGeneral purpose I/O
45	P0.23	Digital I/O	General purpose I/OGeneral purpose I/O (recommended usage: QSPI)
46	P0.22	Digital I/O	General purpose I/OGeneral purpose I/O (recommended usage: QSPI)
47	P1.00	Digital I/O	General purpose I/OGeneral purpose I/O (recommended usage: QSPI)
	TRACEDATA(0)	Trace data	Trace buffer TRACEDATA [0].
48	P0.24	Digital I/O	General purpose I/OGeneral purpose I/O
49	P0.25	Digital I/O	General purpose I/OGeneral purpose I/O
50	P1.02	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
51	SWDIO	Debug	Serial wire debug I/O for debug and programming
52	P0.09	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
	NFC1	NFC input	NFC antenna connection
53	SWDCLK	Debug	Serial wire debug clock input for debug and programming
54	P0.10	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
	NFC2	NFC input	NFC antenna connection
55	GND	Power	Ground
56	P1.04	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
57	P1.06	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
58	P1.07	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
59	P1.05	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
60	P1.03	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)
61	P1.01	Digital I/O	General purpose I/OGeneral purpose I/O (standard drive, low frequency I/O only)

3. Main Chip Solution

RF IC	Crystal Frequency
Nordic NRF52833	32MHZ

32MHz crystal and RF (VDD) DC/DC inductor (Reg1) are already inside the module.

4. Shipment Packaging Information

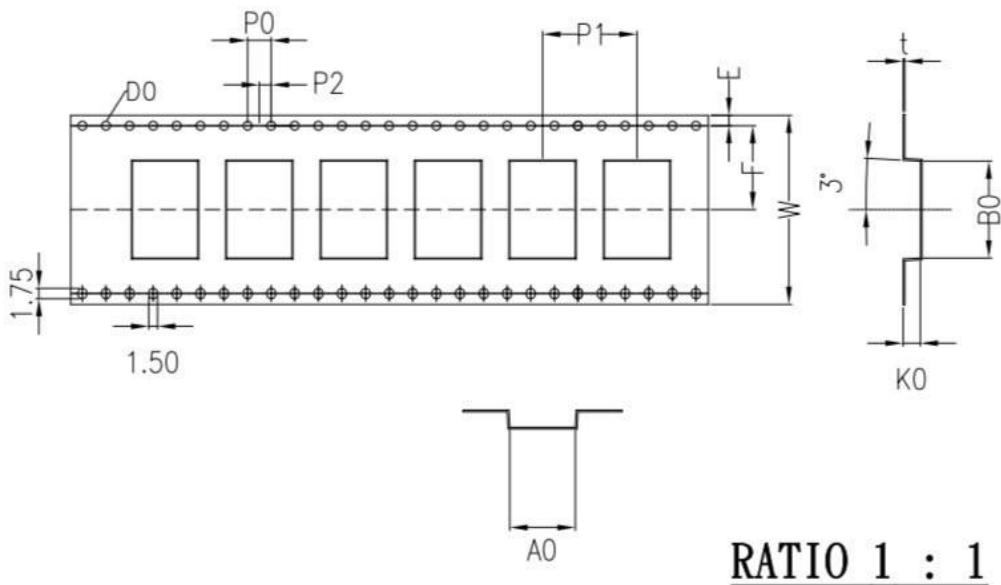
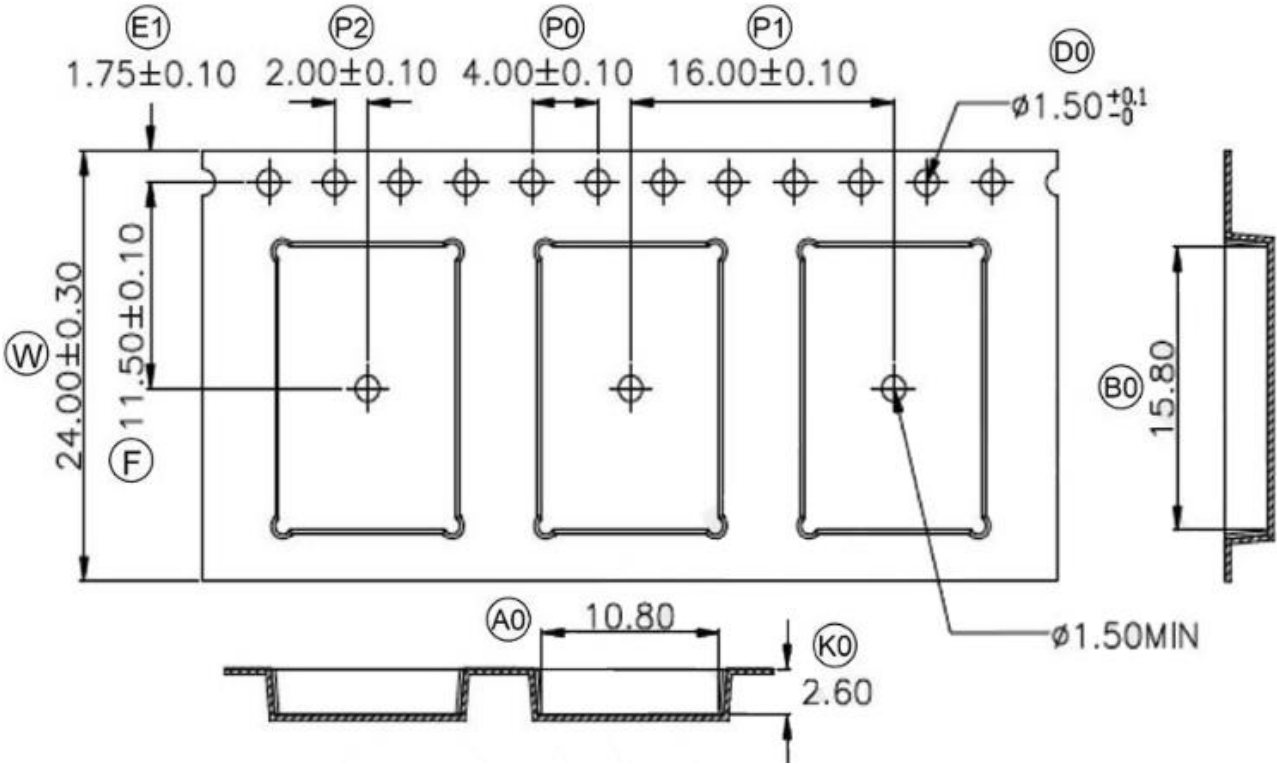
Model	Antenna	Photo
DK9177B	u.FL Connector	

※Unit Weight of Module: 0.68g (±0.02g)

※Packaging Type: Anti-static Tape & Reel

	Tape & Reel
MPQ (Min. Package Qty)	600 pcs per reel
Carton Contents (per Carton)	600 pcs
Carton Dimension L*W*H cm	37*36*6
Gross Weight	About 1.9kgs

4.1. Tape & Reel Packaging



RATIO 1 : 1

ITEM	SPEC
W	32.00 ^{+0.30} _{-0.30}
Ao	11.10 ^{+0.10} _{-0.10}
Bo	16.40 ^{+0.10} _{-0.10}
Ko	2.90 ^{+0.10} _{-0.10}
P1	16.00 ^{+0.10} _{-0.10}
F	14.20 ^{+0.15} _{-0.15}
E	1.75 ^{+0.10} _{-0.10}
D0	1.50 ^{+0.10} _{-0.00}
D1	0.00 ^{+0.10} _{-0.00}
Po	4.00 ^{+0.10} _{-0.10}
P2	2.00 ^{+0.15} _{-0.15}
t	0.40 ^{+0.05} _{-0.05}

DEXATEK

DEVICE: DK91xxB



QTY : 600



D / C: 24xx

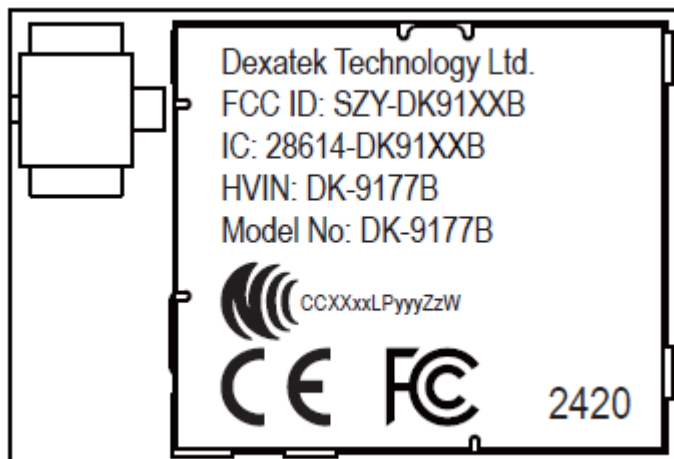


MSL1

Part Number	DK91xxB
Quantity	600 pcs
Date Code	24xx

4.2. Marking on Metal Shield

4.2.1. Label



5. Specification

Any technical spec shall refer to Nordic's official documents as final reference.

5.1. Absolute Maximum Ratings

	Note	Min.	Max.	Unit
Supply voltages				
VDD		-0.3	+3.9	V
VDDH		-0.3	+5.8	V
VBUS		-0.3	+5.8	V
VSS			0	V
I/O pin voltage				
$V_{I/O}$, VDD $\leq$ 3.6 V		-0.3	VDD + 0.3	V
$V_{I/O}$, VDD > 3.6 V		-0.3	3.9	V
NFC antenna pin current				
$I_{NFC1/2}$			80	mA
Environmental aQFN™ package				
Storage temperature		-40	+125	°C
MSL	Moisture Sensitivity Level		2	
ESD HBM	Human Body Model		4	kV
ESD HBM Class	Human Body Model Class		3A	
ESD CDM	Charged Device Model		500	V
Flash memory				
Endurance		10 000		Write/erase cycles
Retention		10 years at 40°C		

5.2. Operating Conditions

Symbol	Parameter	Notes	Min.	Nom.	Max.	Units
VDD	VDD supply voltage, independent of DCDC enable		1.7	3.0	3.6	V
VDD _{POR}	VDD supply voltage needed during power-on reset		1.75			V
VDDH	VDDH supply voltage		2.5	3.7	5.5	V
VBUS	VBUS USB supply voltage		4.35	5.0	5.5	V
t_{R_VDD}	Supply rise time (0 V to 1.7 V)				60	ms
t_{R_VDDH}	Supply rise time (0 V to 3.7 V)				100	ms
TA	Operating temperature		-40	25	85	°C
TA _{EXT}	Extended operating temperature		85		105	°C

5.3. Electrical Specifications

5.3.1. General Radio Characteristics

Symbol	Description	Min.	Typ.	Max.	Units
f_{OP}	Operating frequencies	2360		2500	MHz
$f_{PLL,CH,SP}$	PLL channel spacing		1		MHz
$f_{\Delta,1M}$	Frequency deviation @ 1 Mbps		± 170		kHz
$f_{\Delta,BLE,1M}$	Frequency deviation @ BLE 1 Mbps		± 250		kHz
$f_{\Delta,2M}$	Frequency deviation @ 2 Mbps		± 320		kHz
$f_{\Delta,BLE,2M}$	Frequency deviation @ BLE 2 Mbps		± 500		kHz
f_{skBps}	On-the-air data rate	125		2000	kbps
$f_{chip, IEEE 802.15.4}$	Chip rate in IEEE 802.15.4 mode		2000		kchip, s

5.3.2. Radio Current Consumption (Transmitter)

Symbol	Description	Min.	Typ.	Max.	Units
$I_{TX,PLUS8dBm,DCDC}$	TX only run current (DC/DC, 3 V) $P_{RF} = +8$ dBm		14.8		mA
$I_{TX,PLUS8dBm}$	TX only run current $P_{RF} = +8$ dBm		32.7		mA
$I_{TX,PLUS4dBm,DCDC}$	TX only run current (DC/DC, 3 V) $P_{RF} = +4$ dBm		9.6		mA
$I_{TX,PLUS4dBm}$	TX only run current $P_{RF} = +4$ dBm		21.4		mA
$I_{TX,0dBm,DCDC}$	TX only run current (DC/DC, 3 V) $P_{RF} = 0$ dBm		4.8		mA
$I_{TX,0dBm}$	TX only run current $P_{RF} = 0$ dBm		10.6		mA
$I_{TX,MINUS4dBm,DCDC}$	TX only run current DC/DC, 3 V $P_{RF} = -4$ dBm		3.1		mA
$I_{TX,MINUS4dBm}$	TX only run current $P_{RF} = -4$ dBm		8.1		mA
$I_{TX,MINUS8dBm,DCDC}$	TX only run current DC/DC, 3 V $P_{RF} = -8$ dBm		3.3		mA
$I_{TX,MINUS8dBm}$	TX only run current $P_{RF} = -8$ dBm		7.2		mA
$I_{TX,MINUS12dBm,DCDC}$	TX only run current DC/DC, 3 V $P_{RF} = -12$ dBm		3.0		mA
$I_{TX,MINUS12dBm}$	TX only run current $P_{RF} = -12$ dBm		6.4		mA
$I_{TX,MINUS16dBm,DCDC}$	TX only run current DC/DC, 3 V $P_{RF} = -16$ dBm		2.8		mA
$I_{TX,MINUS16dBm}$	TX only run current $P_{RF} = -16$ dBm		6.0		mA
$I_{TX,MINUS20dBm,DCDC}$	TX only run current DC/DC, 3 V $P_{RF} = -20$ dBm		2.7		mA
$I_{TX,MINUS20dBm}$	TX only run current $P_{RF} = -20$ dBm		5.6		mA
$I_{TX,MINUS40dBm,DCDC}$	TX only run current DC/DC, 3 V $P_{RF} = -40$ dBm		2.3		mA
$I_{TX,MINUS40dBm}$	TX only run current $P_{RF} = -40$ dBm		4.6		mA
$I_{START,TX,DCDC}$	TX start-up current DC/DC, 3 V, $P_{RF} = 4$ dBm		5.2		mA
$I_{START,TX}$	TX start-up current, $P_{RF} = 4$ dBm		11.0		mA

5.3.3. Radio Current Consumption (Receiver)

Symbol	Description	Min.	Typ.	Max.	Units
I _{RX,1M,DCDC}	RX only run current (DC/DC, 3 V) 1 Mbps/1 Mbps BLE		4.6		mA
I _{RX,1M}	RX only run current (LDO, 3 V) 1 Mbps/1 Mbps BLE		9.6		mA
I _{RX,2M,DCDC}	RX only run current (DC/DC, 3 V) 2 Mbps/2 Mbps BLE		5.1		mA
I _{RX,2M}	RX only run current (LDO, 3 V) 2 Mbps/2 Mbps BLE		10.7		mA
I _{START,RX,1M,DCDC}	RX start-up current (DC/DC, 3 V) 1 Mbps/1 Mbps BLE		3.7		mA
I _{START,RX,1M}	RX start-up current 1 Mbps/1 Mbps BLE		6.7		mA

5.3.4. Transmitter Specification

Symbol	Description	Min.	Typ.	Max.	Units
P _{RF}	Maximum output power		8.0		dBm
P _{RFC}	RF power control range		28.0		dB
P _{RFRCR}	RF power accuracy			±4	dB
P _{RF1,1}	1st Adjacent Channel Transmit Power 1 MHz (1 Mbps)		-24.8		dBc
P _{RF2,1}	2nd Adjacent Channel Transmit Power 2 MHz (1 Mbps)		-54.0		dBc
P _{RF1,2}	1st Adjacent Channel Transmit Power 2 MHz (2 Mbps)		-25.0		dBc
P _{RF2,2}	2nd Adjacent Channel Transmit Power 4 MHz (2 Mbps)		-54.0		dBc
E _{vm}	Error vector magnitude IEEE 802.15.4		8		%rms
P _{harm2nd, IEEE 802.15.4}	2nd harmonics in IEEE 802.15.4 mode		-51.0		dBm
P _{harm3rd, IEEE 802.15.4}	3rd harmonics in IEEE 802.15.4		-48.0		dBm

5.3.5. RSSI Specification

Symbol	Description	Min.	Typ.	Max.	Units
RSSI _{ACC}	RSSI accuracy valid range -90 to -20 dBm		±2		dB
RSSI _{RESOLUTION}	RSSI resolution		1		dB
RSSI _{PERIOD}	RSSI sampling time from RSSI_START task		0.25		μs
RSSI _{SETTLE}	RSSI settling time after signal level change		15		μs

5.3.6. Receiver Operation

Symbol	Description	Min.	Typ.	Max.	Units
P _{RX,MAX}	Maximum received signal strength at < 0.1% PER		0		dBm
P _{SENS,IT,1M}	Sensitivity, 1 Mbps nRF mode ideal transmitter ¹⁵		-93		dBm
P _{SENS,IT,2M}	Sensitivity, 2 Mbps nRF mode ideal transmitter ¹⁶		-89		dBm
P _{SENS,IT,SP,1M,BLE}	Sensitivity, 1 Mbps BLE ideal transmitter, packet length ≤ 37 bytes BER=1E-3 ¹⁷		-95		dBm
P _{SENS,IT,LP,1M,BLE}	Sensitivity, 1 Mbps BLE ideal transmitter, packet length ≥ 128 bytes BER=1E-4 ¹⁸		-94		dBm
P _{SENS,IT,SP,2M,BLE}	Sensitivity, 2 Mbps BLE ideal transmitter, packet length ≤ 37 bytes		-92		dBm
P _{SENS,IT,BLE LE125k}	Sensitivity, 125 kbps BLE mode		-103		dBm
P _{SENS,IT,BLE LE500k}	Sensitivity, 500 kbps BLE mode		-98		dBm
P _{SENS,IEEE 802.15.4}	Sensitivity in IEEE 802.15.4 mode		-99		dBm

1. Typical sensitivity applies when ADDR0 is used for receiver address correlation. When ADDR[1...7] are used for receiver address correlation, the typical sensitivity for this mode is degraded by 3 dB.
2. Same as remark 1.
3. As defined in the Bluetooth Core Specification v4.0 Volume 6: Core System Package (Low Energy Controller Volume).
4. Equivalent BER limit < 10E-04.

5.3.7. RX Selectivity

Symbol	Description	Min.	Typ.	Max.	Units
$C/I_{1M,co-channel}$	1Mbps mode, Co-Channel interference		10		dB
$C/I_{1M,-1MHz}$	1 Mbps mode, Adjacent (-1 MHz) interference		-5		dB
$C/I_{1M,+1MHz}$	1 Mbps mode, Adjacent (+1 MHz) interference		-14		dB
$C/I_{1M,-2MHz}$	1 Mbps mode, Adjacent (-2 MHz) interference		-26		dB
$C/I_{1M,+2MHz}$	1 Mbps mode, Adjacent (+2 MHz) interference		-44		dB
$C/I_{1M,-3MHz}$	1 Mbps mode, Adjacent (-3 MHz) interference		-41		dB
$C/I_{1M,+3MHz}$	1 Mbps mode, Adjacent (+3 MHz) interference		-47		dB
$C/I_{1M,\pm 6MHz}$	1 Mbps mode, Adjacent (≥ 6 MHz) interference		-50		dB
$C/I_{1MBLE,co-channel}$	1 Mbps BLE mode, Co-Channel interference		6		dB
$C/I_{1MBLE,-1MHz}$	1 Mbps BLE mode, Adjacent (-1 MHz) interference		-2		dB
$C/I_{1MBLE,+1MHz}$	1 Mbps BLE mode, Adjacent (+1 MHz) interference		-10		dB
$C/I_{1MBLE,-2MHz}$	1 Mbps BLE mode, Adjacent (-2 MHz) interference		-24		dB
$C/I_{1MBLE,+2MHz}$	1 Mbps BLE mode, Adjacent (+2 MHz) interference		-45		dB
$C/I_{1MBLE,>3MHz}$	1 Mbps BLE mode, Adjacent (≥ 3 MHz) interference		-50		dB
$C/I_{1MBLE,image}$	Image frequency interference		-24		dB
$C/I_{1MBLE,image,1MHz}$	Adjacent (1 MHz) interference to in-band image frequency		-37		dB
$C/I_{2M,co-channel}$	2 Mbps mode, Co-Channel interference		10		dB
$C/I_{2M,-2MHz}$	2 Mbps mode, Adjacent (-2 MHz) interference		-4		dB
$C/I_{2M,+2MHz}$	2 Mbps mode, Adjacent (+2 MHz) interference		-16		dB
$C/I_{2M,-4MHz}$	2 Mbps mode, Adjacent (-4 MHz) interference		-20		dB
$C/I_{2M,+4MHz}$	2 Mbps mode, Adjacent (+4 MHz) interference		-46		dB
$C/I_{2M,-6MHz}$	2 Mbps mode, Adjacent (-6 MHz) interference		-41		dB
$C/I_{2M,+6MHz}$	2 Mbps mode, Adjacent (+6 MHz) interference		-48		dB
$C/I_{2M,\geq 12MHz}$	2 Mbps mode, Adjacent (≥ 12 MHz) interference		-50		dB
$C/I_{2MBLE,co-channel}$	2 Mbps BLE mode, Co-Channel interference		7		dB
$C/I_{2MBLE,\pm 2MHz}$	2 Mbps BLE mode, Adjacent (± 2 MHz) interference				dB
$C/I_{2MBLE,\pm 4MHz}$	2 Mbps BLE mode, Adjacent (± 4 MHz) interference		-46		dB
$C/I_{2MBLE,\geq 6MHz}$	2 Mbps BLE mode, Adjacent (≥ 6 MHz) interference		-48		dB
$C/I_{2MBLE,image}$	Image frequency interference		-26		dB
$C/I_{2MBLE,image,2MHz}$	Adjacent (2 MHz) interference to in-band image frequency		-35		dB
$C/I_{125k BLE LR,co-channel}$	125 kbps BLE LR mode, Co-Channel interference		3		dB
$C/I_{125k BLE LR,-1MHz}$	125 kbps BLE LR mode, Adjacent (-1 MHz) interference		-8		dB
$C/I_{125k BLE LR,+1MHz}$	125 kbps BLE LR mode, Adjacent (+1 MHz) interference		-16		dB
$C/I_{125k BLE LR,-2MHz}$	125 kbps BLE LR mode, Adjacent (-2 MHz) interference		-30		dB
$C/I_{125k BLE LR,+2MHz}$	125 kbps BLE LR mode, Adjacent (+2 MHz) interference		-54		dB
$C/I_{125k BLE LR,>3MHz}$	125 kbps BLE LR mode, Adjacent (≥ 3 MHz) interference		-47		dB
$C/I_{125k BLE LR,image}$	Image frequency interference		-30		dB
$C/I_{IEEE 802.15.4,-5MHz}$	IEEE 802.15.4 mode, Adjacent (-5 MHz) rejection	..	..	..	dB
$C/I_{IEEE 802.15.4,+5MHz}$	IEEE 802.15.4 mode, Adjacent (+5 MHz) rejection	..	..	..	dB
$C/I_{IEEE 802.15.4,10MHz}$	IEEE 802.15.4 mode, Alternate (10 MHz) rejection	..	..	..	dB

1. Desired signal level at PIN = -67 dBm. One interferer is used, having equal modulation as the desired signal. The input power of the interferer where the sensitivity equals BER = 0.1% is presented.

5.3.8. RX Intermodulation

Symbol	Description	Min.	Typ.	Max.	Units
$P_{\text{IMD,5TH,1M}}$	IMD performance, 1 Mbps, 5th offset channel, packet length ≤ 37 bytes		-34		dBm
$P_{\text{IMD,5TH,1M,BLE}}$	IMD performance, BLE 1 Mbps, 5th offset channel, packet length ≤ 37 bytes		-31		dBm
$P_{\text{IMD,5TH,2M}}$	IMD performance, 2 Mbps, 5th offset channel, packet length ≤ 37 bytes		-33		dBm
$P_{\text{IMD,5TH,2M,BLE}}$	IMD performance, BLE 2 Mbps, 5th offset channel, packet length ≤ 37 bytes		-32		dBm

5.3.9. Radio Timing

Symbol	Description	Min.	Typ.	Max.	Units
$t_{TXEN,BLE,1M}$	Time between TXEN task and READY event after channel FREQUENCY configured (1 Mbps BLE and 150 μ s TIFS)	140		140	μ s
$t_{TXEN,FAST,BLE,1M}$	Time between TXEN task and READY event after channel FREQUENCY configured (1 Mbps BLE with fast ramp-up and 150 μ s TIFS)	40		40	μ s
$t_{TXDIS,BLE,1M}$	When in TX, delay between DISABLE task and DISABLED event for MODE = Nrf_1Mbit and MODE = Ble_1Mbit	6		6	μ s
$t_{RXEN,BLE,1M}$	Time between the RXEN task and READY event after channel FREQUENCY configured (1 Mbps BLE)	140		140	μ s
$t_{RXEN,FAST,BLE,1M}$	Time between the RXEN task and READY event after channel FREQUENCY configured (1 Mbps BLE with fast ramp-up)	40		40	μ s
$t_{RXDIS,BLE,1M}$	When in RX, delay between DISABLE task and DISABLED event for MODE = Nrf_1Mbit and MODE = Ble_1Mbit	0		0	μ s
$t_{TXDIS,BLE,2M}$	When in TX, delay between DISABLE task and DISABLED event for MODE = Nrf_2Mbit and MODE = Ble_2Mbit	4		4	μ s
$t_{RXDIS,BLE,2M}$	When in RX, delay between DISABLE task and DISABLED event for MODE = Nrf_2Mbit and MODE = Ble_2Mbit	0		0	μ s
$t_{TXEN,IEEE\ 802.15.4}$	Time between TXEN task and READY event after channel FREQUENCY configured (IEEE 802.15.4)	130		130	μ s
$t_{TXEN,FAST,IEEE\ 802.15.4}$	Time between TXEN task and READY event after channel FREQUENCY configured (IEEE 802.15.4 with fast ramp-up)	40		40	μ s
$t_{TXDIS,IEEE\ 802.15.4}$	When in TX, delay between DISABLE task and DISABLED event (IEEE 802.15.4)	21		21	μ s
$t_{RXEN,IEEE\ 802.15.4}$	Time between the RXEN task and READY event after channel FREQUENCY configured (IEEE 802.15.4)	130		130	μ s
$t_{RXEN,FAST,IEEE\ 802.15.4}$	Time between the RXEN task and READY event after channel FREQUENCY configured (IEEE 802.15.4 with fast ramp-up)	40		40	μ s
$t_{RXDIS,IEEE\ 802.15.4}$	When in RX, delay between DISABLE task and DISABLED event (IEEE 802.15.4)	0.5		0.5	μ s
$t_{RX-to-TX\ turnaround}$	Maximum TX-to-RX or RX-to-TX turnaround time in IEEE 802.15.4 mode		40		μ s

5.3.10. CPU

Symbol	Description	Min.	Typ.	Max.	Units
I _{CPU0}	CPU running CoreMark @64 MHz from flash, Clock = HFXO, Regulator = DC/DC		3.7		mA
I _{CPU1}	CPU running CoreMark @64 MHz from flash, Clock = HFXO		6.7		mA
I _{CPU2}	CPU running CoreMark @64 MHz from RAM, Clock = HFXO, Regulator = DC/DC		3.2		mA
I _{CPU3}	CPU running CoreMark @64 MHz from RAM, Clock = HFXO		5.6		mA
I _{CPU4}	CPU running CoreMark @64 MHz from flash, Clock = HFINT, Regulator = DC/DC		3.2		mA

5.3.11. Power Management

Symbol	Description	Min.	Typ.	Max.	Units
I _{ON_RAMOFF_EVENT}	System ON, no RAM retention, wake on any event		1.1		μA
I _{ON_RAMON_EVENT}	System ON, full 128 kB RAM retention, wake on any event		1.8		μA
I _{ON_RAMON_POF}	System ON, full 128 kB RAM retention, wake on any event, power-fail comparator enabled		1.8		μA
I _{ON_RAMON_GPIOTE}	System ON, full 128 kB RAM retention, wake on GPIOTE input (event mode)		16.9		μA
I _{ON_RAMON_GPIOTEPORT}	System ON, full 128 kB RAM retention, wake on GPIOTE PORT event		1.9		μA
I _{ON_RAMOFF_RTC}	System ON, no RAM retention, wake on RTC (running from LFRC clock)		1.6		μA
I _{ON_RAMON_RTC}	System ON, full 128 kB RAM retention, wake on RTC (running from LFRC clock)		2.4		μA
I _{OFF_RAMOFF_RESET}	System OFF, no RAM retention, wake on reset		0.6		μA
I _{OFF_RAMOFF_LPCOMP}	System OFF, no RAM retention, wake on LPCOMP		1.0		μA
I _{OFF_RAMON_RESET}	System OFF, full 128 kB RAM retention, wake on reset		1.3		μA
I _{ON_RAMOFF_EVENT_5V}	System ON, no RAM retention, wake on any event, 5 V supply on VDDH, REG0 output = 3.3 V		1.4		μA
I _{OFF_RAMOFF_RESET_5V}	System OFF, no RAM retention, wake on reset, 5 V supply on VDDH, REG0 output = 3.3 V		1.1		μA

6. Antenna

Below chart shows a few options of external antenna which has been tested and approved to use with DK9177B

#	Photo	Model No.	Type	Supplier	Gain	Certification
1		ANTX100 ETHAB24553	External	Yageo	≤ 2 dBi	FCC, IC, NCC, CE
2		ANTX100 P011B24003	PCB	Yageo	≤ 2.2 dBi	FCC, IC, NCC, CE
3		ANTX100 P111B24003	PCB	Yageo	≤ 3.3 dBi	FCC, IC, NCC, CE

7. Notes and Cautions

1. Follow the conditions written in this specification, especially the control signals of this module.
2. The supply voltage should abide by the maximum ratings and must to supply within range of specification.
4. This module should not be mechanically stressed when installed.
5. Keep this module away from heat. Heat is the major cause of decreasing the life time of these modules.
6. Avoid assembly and use of the target equipment in conditions where the module temperature may exceed the maximum tolerance.
7. Keep this module away from other high frequency circuits.
8. Refer to the recommended pattern when designing a board.
9. Do not expose modules under direct sunlight for long duration. Modules should be kept away from humid and salty air conditions, and any corrosive gasses or substances. Store it within -40°C to $+125^{\circ}\text{C}$ before and after installation.

8. Basic Facts for nRF52 Family

Below chart shows basic spec for Nordic nRF52 family, which is helpful to understand the differences between each SoC. Any discrepancy shall refer to Nordic's technical document as final reference.

Solution	Nordic 52840	Nordic 52833	Nordic 52832	Nordic 52810
Antenna	Ipex		Ipex	
Antenna Vendor	X		X	
RAM (KB)	256KB	128KB	64KB	24KB
Internal Flash	1MB	512KB	512KB	192KB
External flash	X	X	X	X
PIN OUT	48	42	32	32
Shielding Case	O	O	O	O
Package	6x6mm QFN48	7x7mm aQFN™ 73	6x6mm QFN48	6x6mm QFN48
RF	BT5.3	BT5.3	BT5.3	BT5.3
PA	X	X	X	X
Operating Temp	-40~85C	-40~105C	-40~85C	-40~85C
Tx Power(MAX)	8dBm	8dBm	4dBm	4dBm
Supply Voltage	1.7V~5.5V	1.7V~5.5V	1.7V~3.6V	1.7V~3.6V

9. Useful Links

- Nordic Infocenter: [Nordic Semiconductor Infocenter](#)
- Nordic DevZone: [Nordic Devzone Q&A](#)
- Nordic Document: [Nordic Techdoc](#)
- Nordic Academy : [Nordic DevAcademy](#)
- nRF52833 Product Specification: [Bluetooth 5 SoC - nRF52833 Product Infomation](#)

Full List of DEXATEK's BLE Modules

Nordic Solution	DEXATEK NO.	Antenna	RAM	Flash Memory
nRF52840	DK9177A	IPEX	256 kB	1 MB
nRF52832	DK9178C	IPEX	64 kB	512 kB
nRF52832	DK9180C	PCB	64 kB	512 kB
nRF52840	DK9181A	PCB	256 kB	1 MB
nRF52832	DK9182C	CHIP	64 kB	512 kB
nRF52840	DK9183A	CHIP	256 kB	1 MB
nRF52833	DK9177B	IPEX	128 kB	512 kB
nRF52810	DK9178D	IPEX	24 kB	192 kB
nRF52810	DK9180D	PCB	24 kB	192 kB
nRF52833	DK9181B	PCB	128 kB	512 kB
nRF52810	DK9182D	CHIP	24 kB	192 kB
nRF52833	DK9183B	CHIP	128 kB	512 kB

10. Statement

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.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and a human body.

If the identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module, Contains FCC ID: **SZY-DK91XXB**.

Co-location of this module with other transmitters that operate simultaneously are required to be evaluated using the multi-transmitter procedures.

The host integrator must follow the integration instructions provided in this document and ensure that the composite-system end product complies with the requirements by a technical assessment or evaluation to the rules and to KDB Publication 996369.

The host integrator installing this module into their product must ensure that the final composite product complies with the requirements by a technical assessment or evaluation to the rules, including the transmitter operation and should refer to guidance in KDB 996369.

ISED Statement:

This device contains licence-exempt transmitter(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) this device may not cause interference,
- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) L'appareil ne doit pas produire de brouillage;
- (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and a human body.

Cet équipement est conforme aux limites d'exposition aux rayonnements de la ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et un corps humain.

If the identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module, Contains IC: **28614-DK91XXB**.

Si le numéro d'identification n'est pas visible lorsque le module est installé à l'intérieur d'un autre appareil, alors l'extérieur de l'appareil dans lequel le module est installé doit également afficher une étiquette faisant référence au module fourni, Contient IC : **28614-DK91XXB**.

This device for operation in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.

cet appareil destiné à fonctionner dans la bande 5 150-5 250 MHz est uniquement destiné à une utilisation en intérieur afin de réduire le risque d'interférence nuisible aux systèmes par satellite mobiles co-canaux.

Radiation Exposure Statement:

This equipment complies with FCC/ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and a human body.

The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

IMPORTANT NOTE: In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC/ISED authorization is no longer considered valid and the FCC/ISED ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

If the identification number is not visible when the module is installed inside another device, then the outside of the device into

which the module is installed must also display a label referring to the enclosed module, Contains FCC ID: **SZY-DK91XXB**.

The grantee's FCC ID can be used only when all FCC/ISED compliance requirements are met.

The host integrator must follow the integration instructions provided in this document and ensure that the composite-system end product complies with the requirements by a technical assessment or evaluation to the rules and to KDB Publication 996369.

The host integrator installing this module into their product must ensure that the final composite product complies with the requirements by a technical assessment or evaluation to the rules, including the transmitter operation and should refer to guidance in KDB 996369.

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

Déclaration d'exposition aux radiations :

Cet équipement est conforme aux limites d'exposition aux rayonnements FCC/ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et un corps humain.

Le module émetteur ne doit pas être colocalisé avec un autre émetteur ou antenne.

Tant que les 2 conditions ci-dessus sont remplies, aucun test supplémentaire de l'émetteur ne sera nécessaire. Cependant, l'intégrateur OEM est toujours responsable de tester son produit final pour toute exigence de conformité supplémentaire requise avec ce module installé.

REMARQUE IMPORTANTE : Dans le cas où ces conditions ne peuvent être remplies (par exemple certaines configurations d'ordinateur portable ou colocalisation avec un autre émetteur), alors l'autorisation FCC/ISED n'est plus considérée comme valide et l'identifiant FCC/ISED ne peut pas être utilisé sur le dernier émetteur produit. Dans ces circonstances, l'intégrateur OEM sera responsable de réévaluer le produit final (y compris le transmetteur) et d'obtenir une autorisation FCC distincte.

Si le numéro d'identification n'est pas visible lorsque le module est installé à l'intérieur d'un autre appareil, alors l'extérieur de l'appareil dans lequel le module est installé doit également afficher une étiquette faisant référence au module fourni, contenant l'ID FCC : **SZY-DK91XXB**.

L'identifiant FCC du bénéficiaire ne peut être utilisé que lorsque toutes les exigences de conformité FCC/ISED sont respectées.

L'intégrateur hôte doit suivre les instructions d'intégration fournies dans ce document et s'assurer que le produit final du système composite est conforme aux exigences par une évaluation technique ou une évaluation des règles et de la publication KDB 996369.

L'intégrateur hôte installant ce module dans son produit doit s'assurer que le produit composite final est conforme aux exigences par une évaluation technique ou une évaluation des règles, y compris le fonctionnement de l'émetteur et doit se référer aux directives du KDB 996369.

Informations manuelles destinées à l'utilisateur final

L'intégrateur OEM doit veiller à ne pas fournir d'informations à l'utilisateur final sur la manière d'installer ou de retirer ce module RF dans le manuel d'utilisation du produit final qui intègre ce module. Le manuel de l'utilisateur final doit inclure toutes les informations/avertissements réglementaires requis, comme indiqué dans ce manuel.

NCC statement:

低功率射頻器材技術規範

「取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前述合法通信，指依電信管理法規定作業之無線電通信。低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。」

For module:

此模組於取得認證後將依規定於模組本體標示審驗合格標籤，並要求平台廠商於平台上標示本產品內含發射器模組  CCXXxxLPyyZzW