

# Nordic Product Guide

This handy summary describes all of Nordic's IoT solutions



Full product details at: [www.nordicsemi.com/Products](http://www.nordicsemi.com/Products)

## RF SoCs and SiP

		nRF9160	nRF5340	nRF52840	nRF52833	nRF52832	nRF52820	nRF52811	nRF52810	nRF52805
WIRELESS PROTOCOL	LTE-M	●								
	NB-IoT	●								
	GNSS	●								
	BLUETOOTH LOW ENERGY		●	●	●	●	●	●	●	●
	BLUETOOTH 5.3		●	●	●	●	●	●	●	●
	LE AUDIO		●							
	DIRECTION FINDING		●		●		●	●		
	2 Mbps		●	●	●	●	●	●	●	●
	LONG RANGE		●	●	●	●	●	●	●	●
	BLUETOOTH MESH		●	●	●	●	●	●	●	●
	THREAD		●	●	●	●	●	●	●	●
	MATTER		●	●	●	●	●	●	●	●
	ZIGBEE		●	●	●	●	●	●	●	●
	ANT		●	●	●	●	●	●	●	●
	2.4 GHz PROPRIETARY		●	●	●	●	●	●	●	●
NFC		●	●	●	●	●	●	●	●	
TYPE	SYSTEM-ON-CHIP (SoC)		●	●	●	●	●	●	●	●
	SYSTEM-IN-PACKAGE (SiP)	●								
CORE SYSTEM	CPU	64 MHz Arm Cortex-M33	128 MHz Arm Cortex-M33+64 MHz Arm Cortex-M33	64 MHz Arm Cortex-M4	64 MHz Arm Cortex-M4	64 MHz Arm Cortex-M4	64 MHz Arm Cortex-M4	64 MHz Arm Cortex-M4	64 MHz Arm Cortex-M4	64 MHz Arm Cortex-M4
	FPU	●	●	●	●	●	●	●	●	●
	DSP INSTRUCTION SET	●	●	●	●	●	●	●	●	●
	CACHE	●	●	●	●	●	●	●	●	●
	MEMORY	1MB Flash, 256 KB RAM	1MB Flash, 512 KB RAM +256 KB Flash, 64 KB RAM	1MB Flash, 256 KB RAM	512 KB Flash, 128 KB RAM	512 KB or 256 KB Flash, 64 KB or 32 KB RAM	256 KB Flash, 32 KB RAM	192 KB Flash, 24 KB RAM	192 KB Flash, 24 KB RAM	192 KB Flash, 24 KB RAM
	CLOCKS	64 MHz / 32 kHz	128 MHz / 64 MHz / 32 kHz	64 MHz / 32 kHz	64 MHz / 32 kHz	64 MHz / 32 kHz	64 MHz / 32 kHz	64 MHz / 32 kHz	64 MHz / 32 kHz	64 MHz / 32 kHz
	SECURITY	ARM TRUSTZONE	●	●	●	●	●	●	●	●
ARM CRYPTOCELL		310	312	310						
ROOT-OF-TRUST		●	●	●						
SECURE KEY STORAGE		●	●	●						
AES ENCRYPTION		●	●	●	●	●	●	●	●	●
RADIO	LTE-M/NB-IoT/GPS MODEM	●								
	CERTIFIED LTE BANDS	1-5, 8, 12-14, 17-20, 25-26, 28, 66								
	FREQUENCY	700-2200 MHz	2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz
	MAXIMUM TX POWER	23 dBm	3 dBm	8 dBm	8 dBm	4 dBm	8 dBm	4 dBm	4 dBm	4 dBm
PERIPHERALS	RX SENSITIVITY	-108 dBm (LTE-M), -114 dBm (NB-IoT), -155 dBm (GPS)	-98 dBm (1Mbps)	-95 dBm (1Mbps)	-96 dBm (1Mbps)	-96 dBm (1Mbps)	-95 dBm (1Mbps)	-97 dBm (1Mbps)	-96 dBm (1Mbps)	-97 dBm (1Mbps)
	ANTENNA INTERFACE	50 Ω single-ended	Single-ended	Single-ended	Single-ended	Single-ended	Single-ended	Single-ended	Single-ended	Single-ended
	HIGH SPEED SPI	●	●	●	●	●	●	●	●	●
	TWI, SPI, UART	4xTWI/SPI/UART	4xTWI/SPI/UART +TWI/SPI/UART	2xTWI/SPI, SPI, 2xUART	2xTWI/SPI, SPI, 2xUART	2xTWI/SPI, SPI, UART	2xTWI/SPI, UART	TWI/SPI, SPI, UART	TWI, SPI, UART	TWI, SPI, UART
	QSPI		●	●	●	●	●	●	●	●
	USB		●	●	●	●	●	●	●	●
	PWM	4	4	4	4	3		1	1	
	PDM	●	●	●	●	●	●	●	●	●
	I2S	●	●	●	●	●	●	●	●	●
	ADC, COMPARATOR	ADC	●	●	●	●	COMP	ADC, COMP	ADC, COMP	ADC
TIMER, RTC	3, 2	3, 2 + 3, 2	5, 3	5, 3	5, 3	4, 2	3, 2	3, 2	3, 2	
TEMPERATURE SENSOR	●	●	●	●	●	●	●	●	●	
CERTIFICATIONS	<a href="http://nordicsemi.com/9160cert">nordicsemi.com/9160cert</a>	CE, FCC	CE, FCC	CE, FCC	CE, FCC	CE, FCC	CE, FCC	CE, FCC	CE, FCC	
OPERATING TEMPERATURE	-40 to 85°C	-40 to 105°C	-40 to 85°C	-40 to 105°C	-40 to 85°C	-40 to 105°C	-40 to 85°C	-40 to 85°C	-40 to 85°C	
SUPPLY VOLTAGE RANGE	3.0 to 5.5 V	1.7 to 5.5 V	1.7 to 5.5 V	1.7 to 5.5 V	1.7 to 3.6 V	1.7 to 5.5 V	1.7 to 3.6 V	1.7 to 3.6 V	1.7 to 3.6 V	
DEVELOPMENT KITS	nRF9160 DK, Nordic Thingy:91	nRF5340 DK, nRF5340 Audio DK, Nordic Thingy:53	nRF52840 DK, nRF52840 Dongle	nRF52833 DK	nRF52820 DK, Nordic Thingy:52	nRF52833 DK	nRF52840 DK	nRF52811 DK	nRF52805 DK	
PACKAGES	10x16x1.04 mm LGA	7x7 mm aQFN94 (48 GPIOs), 4.4x4.0 mm WLCSP95 (48 GPIOs)	7x7 mm aQFN73 (48 GPIOs), 6x6 mm QFN48 (30 GPIOs), 3.5x3.6 mm WLCSP94 (48 GPIOs)	7x7 mm aQFN73 (42 GPIOs), 5x5 mm QFN40 (18 GPIOs), 3.2x3.2 mm WLCSP (42 GPIOs)	6x6 mm QFN48 (32 GPIOs), 3.0x3.2 mm WLCSP50 (32 GPIOs)	5x5 mm QFN40 (18 GPIOs), 2.53x2.53 mm WLCSP44 (18 GPIOs)	6x6 mm QFN48 (32 GPIOs), 5x5 mm QFN32 (17 GPIOs), 2.48x2.46 mm WLCSP33 (15 GPIOs)	6x6 mm QFN48 (32 GPIOs), 5x5 mm QFN32 (17 GPIOs), 2.48x2.46 mm WLCSP33 (15 GPIOs)	2.48x2.46 mm WLCSP28 (10 GPIOs)	

## Power Management ICs

		nPM FAMILY		
		nPM1300	nPM1100	nPM6001
FEATURES	PMIC	●	●	●
	BUCK REGULATOR	2	1	4
	BATTERY CHARGER	●	●	
	LDO	2		2
CHARGER	LOAD SWITCH	2		
	TERMINATION VOLTAGE	3.5 to 4.45 V	4.1 to 4.2 V or 4.25 to 4.65 V	
	MAX CHARGING CURRENT	800 mA	400 mA	
	POWER PATH MANAGEMENT	●	●	
POWER RAILS	THERMAL PROTECTION	●	●	
	BATTERY COMPATIBILITY	LiFePO4, Li-ion, LiPo	Li-ion, LiPo	
	INPUT VOLTAGE	4 to 5.5 V	4.1 to 6.7 V	3 to 5.5 V
	USB COMPLIANCE	Type-C	●	
SYSTEM MANAGEMENT	REGULATED OUTPUT VOLTAGE	1 to 3.3 V	1.8 to 3 V	0.5 to 3.3 V
	MAX CURRENT PER BUCK	200 mA, 200 mA	150 mA	550 mA, 200 mA, 150 mA, 150 mA
	ADC	10-bit		
	FUEL GAUGE	●		
CONTROL INTERFACE	HARD SYSTEM RESET	●		
	TIMED WAKE-UP	●		●
	WATCHDOG TIMER	●		●
	SHIP MODE / HYBERNATE	●	●	●
	BROWN-OUT DETECTOR	●	●	●
	LED DRIVERS, GPIOs	3, 5	2, 0	0, 3
	CONTROL INTERFACE	TWI	Pin-configurable	TWI
	REGULATORY COMPLIANCE	CE, JEITA, RoHS	CE, JEITA, RoHS	CE, RoHS
	OPERATING TEMPERATURE	-40 to 85°C	-40 to 105°C	-40 to 85°C
	EVALUATION KITS	nPM1300 EK	nPM1100 EK	nPM6001 EK
PACKAGE OPTIONS	5x5 mm QFN32, 3.1x2.4 mm WLCSP	4x4 mm QFN24, 2.1x2.1 mm WLCSP	2.2x3.6 mm WLCSP	

## Cloud Services

### nRF Cloud Services

**Description:** nRF Cloud Services are optimized for Nordic's low power IoT Devices. nRF Cloud Services support Device-to-Cloud or Cloud-to-Cloud use. In the former, the device connects directly to nRF Cloud. In the latter, connection is to a customer's Cloud that then connects to nRF Cloud's REST API.

**Services:** nRF Cloud Services are offered in nRF Cloud and include GPS, cell-based and Wi-Fi assisted locationing. The product supplies accurate, rapid location data for IoT devices. The A-GPS service reduces time-to-first-fix. The result is lower latency and lower power consumption. P-GPS downloads predictive data, extending the validity of assistance data. For Wi-Fi location, the device scans two or more Wi-Fi APs and sends network information to nRF Cloud, where the location is calculated. Cell based services use base stations to predict location. Each location feature has its advantages, so switching between different location services during operation can be useful.



### Tech Spec

**Location services**  
Assisted GPS (A-GPS), Predictive GPS (P-GPS), Single-Cell (SCELL), Multi-Cell (MCELL), Wi-Fi

**Additional features**  
Supports Cloud-to-Cloud use cases for devices provisioned to a different Cloud provider

**Supported products**  
nRF9160 SiP, nRF9160 DK, Nordic Thingy:91, nRF7002 companion IC

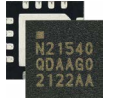
**Applications**  
Industrial, smart appliances, asset tracking, RTLS

## Range Extender

### nRF21540

**Description:** The nRF21540 is an RF front-end module (FEM) that improves range and connection robustness for Nordic nRF52 and nRF53 Series SoCs. The nRF21540 is a complementary device operating as a 'plug-and-play' range extender with the addition of just a few external components. The nRF21540's 13 dB RX gain and low noise figure of 2.7 dB, coupled with up to +21 dBm TX output power, ensure a superior link budget boosting the range of supported SoCs by between 6.3 and 10x. The RF FEM suits all applications that require increased range and/or robust coverage. In demanding RF environments, or where the application is operating close to the range limit, it can be more energy efficient to use the nRF21540 than continuously resend packets.

**Operation:** The nRF21540 supports Bluetooth LE, Bluetooth mesh, Thread, Zigbee and 2.4 GHz protocol applications. The RF FEM's TX output power is dynamically adjustable and can be set to comply across all geographical regions. The RF FEM can be used with Nordic's extended temperature-qualified nRF5340, nRF52833 and nRF52820 SoCs in industrial applications.



### Tech Spec

**Output power**  
Adjustable in small increments up to +21 dBm

**Receive gain and noise figure ratings**  
13 dB receive gain. 2.7 dB noise figure

**Input supply**  
1.7 to 3.6 V

**Package**  
4 by 4 mm QFN16

**Development bundle**  
nRF21540 DK and nRF21540 EK. The EK is a shield for use with nRF52 and nRF53 Series DKs

**Applications**  
Asset tracking, smart home, industrial, toys, audio

## Wi-Fi 6 Companion IC

### nRF7002

**Description:** The nRF7002 is a Wi-Fi 6 Companion IC for use in the 2.4 and 5 GHz bands. The product offers good coexistence with Bluetooth LE devices and features one Spatial Stream (SS), 20 MHz channel bandwidth, 64 QAM (MCS7), 86 Mbps PHY throughput and OFDMA (downlink and uplink).

**Operation:** The nRF7002 Wi-Fi 6 Companion IC is a low power and secure Wi-Fi device for IoT applications. It provides Wi-Fi connectivity and Wi-Fi-based locationing (using SSID sniffing of local Wi-Fi hubs). The nRF7002 incorporates Wi-Fi 6's Target Wake Time (TWT), a power-saving feature allowing the IC to negotiate a wake-up schedule with the access point (AP) to which it is connected. The nRF7002 accompanies Nordic's nRF52 and nRF53 Series Bluetooth LE SoCs, and the nRF91 Series cellular IoT SiPs. The nRF7002 can also be used as a companion IC in applications hosted by non-Nordic products. Development is supported through Nordic's nRF Connect SDK.



### Tech Spec

**Compliance**  
IEEE 802.11b (Wi-Fi 1)/a (Wi-Fi 2)/g (Wi-Fi 3)/n (Wi-Fi 4)/ac (Wi-Fi 5)/ax (Wi-Fi 6)

**Package**  
6 by 6 mm QFN

**Features**  
Low power, good coexistence with Bluetooth LE, TWT

**Development tools**  
nRF7002 DK, nRF Connect SDK

**Applications**  
Asset tracking, smart home, industrial