

YC1061

High Performance Low Power BR/BLE 5.2 SoC

Preliminary Datasheet

General Descriptions

The YC1061 is a high performance, low power System-on-Chip (SoC) integrating a Bluetooth® 5.2 compliant 2.4-GHz transceiver, 24 MHz proprietary 32 bit MCU with a RAM of 16 KB and a One-Time Programmable (OTP) memory of 8KB .

The YC1061 supports Bluetooth Basic Rate, Bluetooth Low Energy and Bluetooth 5.2 features including high-throughput 2 Mbps, Long Range and the Direction Finding. It can be paired through HCI interface with a more powerful MCU for applications requiring advanced wireless connectivity.

The fully-featured multiprotocol radio, +10 dBm output power, -99 dBm sensitivity and extended temperature range of -40 to 110°C makes it suitable for lighting applications.

The YC1061 features built-in USB, proprietary 32-bit MCU clocked at 24 MHz, integrated capless LDOs supporting 2.1-5.5V supply range, making it a perfect microcontroller for cost-sensitive applications such as mouse devices, toys and disposables.

Key Features

- MCU subsystems
 - 24 MHz 32-bit proprietary MCU for system control and PHY/link layer management
 - AES128 HW encryption
 - Serial wire debug
- Memories
 - 8 KB OTP with internal 6.5V charge pump
 - 16 KB data RAM
 - 8 KB RAM supporting retention mode
- Radio transceiver
 - BR/Bluetooth 5.2/Long Range
 - +10 dBm TX power in 1dB/steps
 - -99 dBm RX sensitivity @ BLE 1 Mbps
 - -96 dBm RX sensitivity @ BLE 2 Mbps
 - Integrated balun with single-ended output and direct connection to antenna
 - 6.3 mA RX system current @ BLE 1 Mbps -99 dBm sensitivity (3V ideal DC-DC converter)
 - 5.9 mA RX system current @ BLE 1 Mbps -97 dBm sensitivity (3V ideal DC-DC converter)
 - 9.5 mA TX system current (3V ideal DC-DC converter, 0 dBm)
- Power management
 - Always-On (AON) supply: 2.1~ 5.5V
 - Main supply: 1.5 ~ 5.5V supporting external DCDC through a dedicated wakeup pin
 - Integrated LDOs requiring no external decoupling capacitors
 - 3.3V capless LDO
- 1.3 μ A in sleep mode (wake on RTC, no RAM retention)
- 2 μ A in sleep mode (wake on RTC, 4 KB RAM retention)
- Clock generation
 - Dedicated PLL to support 16M/24Mcrystals
 - Crystal trimming
 - 28 MHz RC oscillator for fast wakeup
 - Low jitter low power 32 KHz RC oscillator
- 10-channel 10-bit ADC
- Digital peripherals
 - Up to 23 GPIOs w/ functions fully multiplexed
 - 8 x PWMs up to 48 Mbps
 - Two-wire master (I²C compatible) up to 600 kbps
 - 2 x UART(RTS/CTS) with HCI-H5 protocol up to 3.25 Mbps
 - 2 x SPI Master up to 24 Mbps
 - 1-axis Quadrature Decoder
 - 12 Mbps Full Speed USB 2.0
- Temperature range: -40°C to +110°C

Applications

- Mouse devices
- Toys
- Lightning applications
- Disposables
- Commercial and industrial applications requiring advanced connectivity

Key Benefits

- Best-in-class sensitivity and output power for RF-demanding applications
- BR for enhanced interoperability
- Lowest system cost for cost-oriented designs

Revision History

Version	Date	Owner	Note
0.1	5/9/2022		Initial version
0.2			
0.3			

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1 Block Diagram

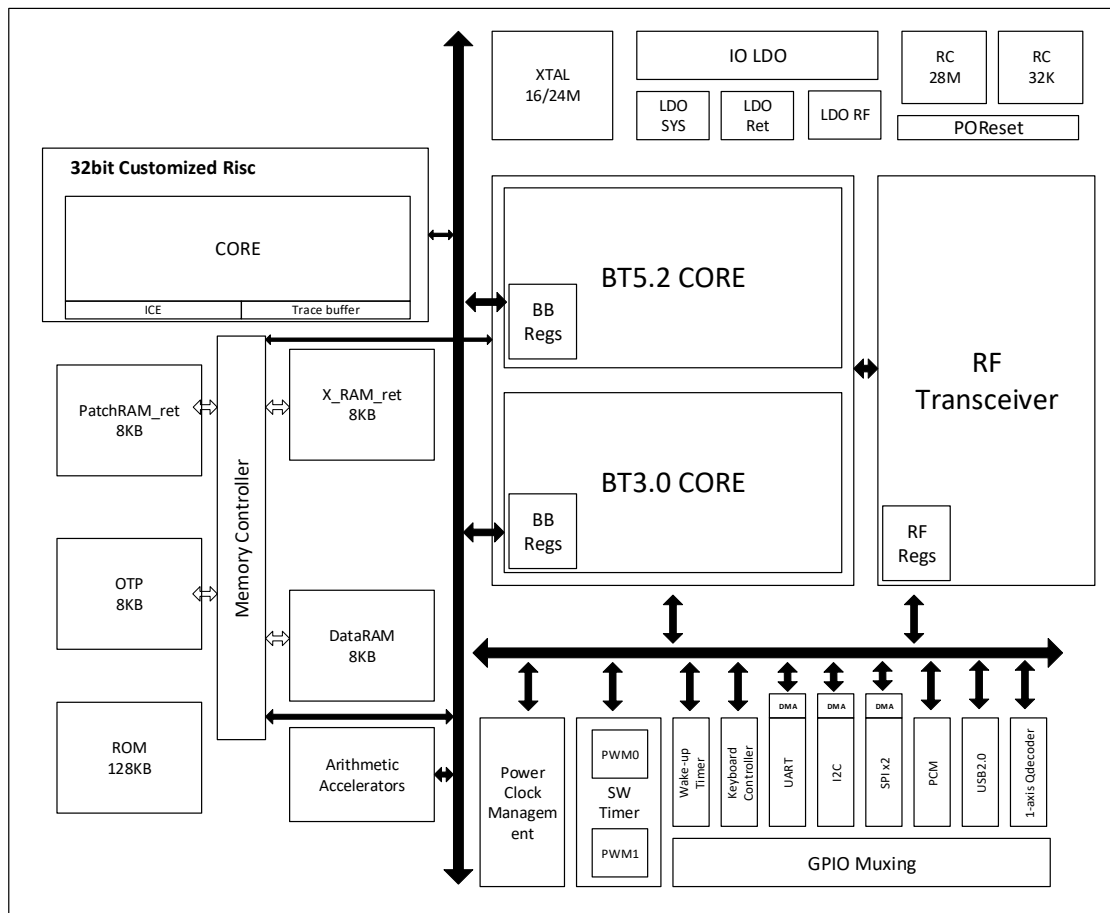


Figure 1-1 Block diagram

2 Pinout Information

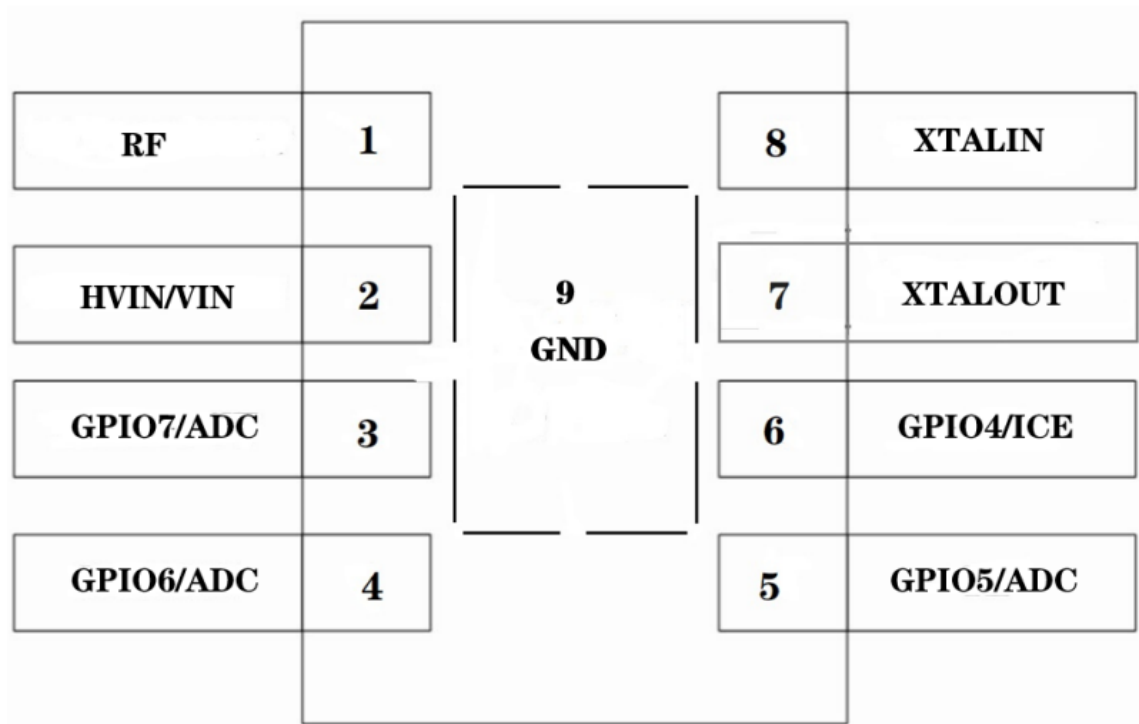


Figure 2-1 Pinout top view (ESOP8 package)

Abbreviations:

PWR: Power pin

AIO: Analog IO pin

DIO: Digital IO pin

RF: RF IO pin

Table 2-1 Pinout Information

Pin Number	Type	Name	Description
ESOP8			
1	RF	RF	ANT port
2	PWR	HVIN/VIN	Main power input, 2.2~5.5V, 1μF bypass cap
3	DIO	GPIO7/ADC	General purpose I/O/SARADC input
4	DIO	GPIO6/ADC	General purpose I/O/SARADC input
5	DIO	GPIO5/ADC	General purpose I/O/SARADC input
6	DIO	GPIO4/GPIO19/ICE	General purpose I/O/SARADC input; or debug port, Tx & Rx
7	AIO	XTALOUT	XTAL port, or external reference clock input
8	AIO	XTALIN	XTAL port

Note 1 : Drive capability of GPIO[22:2] is up to **15mA**, GPIO[1:0] internal pullup & pulldown resistance is 30K~50Kohm, Drive capability of VIO is up to **150mA**.

Note 2 : GPIO[22] is by default not gpio function, and is in output high level status after por, which is used as external BUCK enable signal. GPIO[22] will restore gpio function by setting lpm_ctrl[52] to 0.

Note 3 : GPIO[22] can not used as lpm wakeup source.

Note 4 : GPIO[19] is by default in pullup status as ice function after por. GPIO[19] will restore gpio function by setting ice_mode to 0.

Table 2-2 GPIO Multiplexing

Pin Name	boot function	function-analog
GPIO[0]		
GPIO[1]		
GPIO[2]		
GPIO[3]		
GPIO[4]		saradc [0]
GPIO[5]		saradc [1]
GPIO[6]		saradc [2]
GPIO[7]		saradc [3]
GPIO[8]		
GPIO[9]		saradc [4]
GPIO[10]		saradc [5]
GPIO[11]		saradc [6]
GPIO[12]		saradc [7]
GPIO[13]		
GPIO[14]		
GPIO[15]		
GPIO[16]		
GPIO[17]		
GPIO[18]		
GPIO[19]	ICE	
GPIO[20]		
GPIO[21]		
GPIO[22]	EXEN	

3 Specifications

3.1 Recommended Operating Conditions

Table 3-1 Recommended Operation Condition

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage for pin VBAT	V _{BAT}		2.1		5.5	V
Supply voltage for pin VDCDC	V _{DCDC}		1.5		5.5	V
Supply voltage for pin VIO	V _{IO}	VIO supplied by a host chip not VDD33	1.8		3.6	V
Ambient temperature	T _A		-40		110	°C

3.2 Power Consumption

Table 3-2 Power Consumption Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Sleep						
Current through pin VIN	I _{VIN_SLEEP}	V _{VIN} = 3.3V		1.3		μA
	I _{VIN_SLEEP_4KB_RET}			2		μA
Current of pin VIN with ideal DC-DC converter	I _{VDCDC_SLEEP}	V _{DCDC} = 1.2V		20.0		nA
RX mode 1 Mbps BLE @ -99 dBm sensitivity						
Current through pin VIN	I _{VIN_RX}	V _{VIN} = 3.3V	10	11.0	13	mA
Current of pin VIN with ideal DC-DC converter	I _{VDCDC_RX}	V _{DCDC} = 1.2V	5.8	6.3	7.2	mA
RX mode 1 Mbps BLE @ -97 dBm sensitivity						
Current through pin VIN	I _{VIN_RX}	V _{VIN} = 3.3V	9.5	10.2	12.5	mA
Current through pin VDCDC	I _{VDCDC_RX}	V _{DCDC} = 1.2V	5.6	5.9	7	mA
TX mode 0 dBm						
Current through pin VIN	I _{VIN_TX}	V _{VIN} = 3.3V	17.5	18.0	19.5	mA
Current of pin VIN with ideal DC-DC converter	I _{VDCDC_TX}	V _{DCDC} = 1.2V	9.2	9.5	10.2	mA

3.3 Radio

All parameters are referred to chip port and measured on the condition of V_{VIN} = 3.3V if not stated otherwise.

Table 3-3 Transmitter Specification

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Frequency range	f _{TX}		2402		2480	MHz
Output power	P _{out}		-20		10	dBm

Power control step	P _{step}	For part-to-part power calibrations		1		dB
Spurious emissions (@ 0 dBm)	P _{spur}	30 MHz to 1000 MHz		-47		dBm
		1 GHz to 12.75 GHz		-31		dBm
		47 MHz to 74 MHz		-75		dBm
		87.5 MHz to 108 MHz		-75		dBm
		174 MHz to 230 MHz		-75		dBm
		470 MHz to 862 MHz		-47		dBm

Table 3-4 Receiver Specification

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Frequency range	f _{RX}		2402		2480	MHz
Out-of-band blocking	OOB	30 MHz – 2000 MHz	-30			dBm
		2003 – 2399 MHz	-35			dBm
		2484 – 2997 MHz	-35			dBm
		3000 MHz – 12.75 GHz	-30			dBm
Basic Rate						
RX sensitivity	P _{SENS_BR}	0.1 % BER		-95		dBm
C/I co-channel	C/I _{CO_BR}	0.1 % BER		7		dB
C/I 1 MHz adjacent channel	C/I _{1_1M}	0.1 % BER		-9		dB
C/I 2 MHz adjacent channel	C/I _{2_1M}	0.1 % BER		-38		dB
C/I ≥3 MHz adjacent channel	C/I _{3_1M}	0.1 % BER		-44		dB
C/I image channel	C/I _{im_1M}	0.1 % BER		-26		dB
C/I image channel + 1MHz	C/I _{im+1_1M}	0.1 % BER		-39		dB
Maximum input signal level	P _{IN_MAX_1M}	0.1 % BER		0		dBm
1 Mbps BLE						
RX sensitivity	P _{SENS_1M}	30.8% PER		-99		dBm
C/I co-channel	C/I _{CO_1M}	30.8% PER		3		dB
C/I 1 MHz adjacent channel	C/I _{1_1M}	30.8% PER		-23		dB
C/I 2 MHz adjacent channel	C/I _{2_1M}	30.8% PER		-26		dB
C/I ≥3 MHz adjacent channel	C/I _{3_1M}	30.8% PER		-37		dB
C/I image channel	C/I _{im_1M}	30.8% PER		-16		dB
C/I image channel + 1MHz	C/I _{im+1_1M}	30.8% PER		-19		dB
Maximum input signal level	P _{IN_MAX_1M}	30.8% PER		0		dBm
2 Mbps BLE						
RX sensitivity	P _{SENS_1M}	30.8% PER		-95		dBm
C/I co-channel	C/I _{CO_2M}	30.8% PER		4		dB
C/I 2 MHz adjacent channel	C/I _{2_2M}	30.8% PER		-40		dB
C/I 4 MHz adjacent channel	C/I _{4_2M}	30.8% PER		-47		dB

C/I ≥ 6 MHz adjacent channel	$C/I_{6,2M}$	30.8% PER		-49		dB
C/I image channel	$C/I_{im,2M}$	30.8% PER		-17		dB
C/I image channel + 2MHz	$C/I_{im+2,2M}$	30.8% PER		-20		dB
Maximum input signal level	$P_{IN_MAX,2M}$	30.8% PER		0		dBm

3.4 24 MHz Crystal Oscillator

Table 3-5 24 MHz Crystal Oscillator Characteristic

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Crystal frequency	f_{XTAL}		16	24		MHz
Crystal frequency tolerance	Δf_{XTAL}		-20		20	ppm
Load capacitance	C_{L_INN}	Programmable via registers		9	12	pF

3.5 LDO Characteristics

Table 3-6 LDO Specification

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input voltage range	V_{IN}				5.5	V
Output voltage	V_{OUT_SLEEP}	$I_{LOAD}=20$ mA, when input voltage below 3.3V, output equals input		3.35		V
	V_{OUT_ACTIVE}	$I_{LOAD}=100$ μ A, when input voltage below 3.3V, output equals input		3.35		V
Maximum load current	I_{LOAD}	Active mode			100	mA
Output load capacitance	C_L		0		1	μ F
Quiescent current	I_{Q_SLEEP}	doze mode		50		nA
	I_{Q_ACTIVE}	active mode		150		μ A

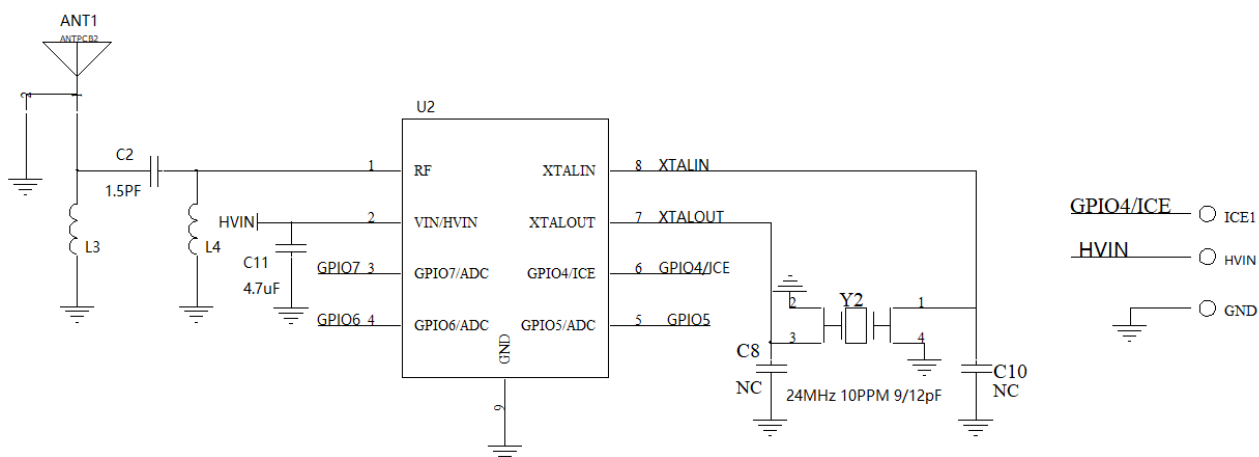
3.6 Reset Characteristics

Reset voltage is monitored on pin VBAT_HIGH.

Table 3-7 Reset Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Reset voltage threshold	V_{POR}	rising edge	1.55	1.70	2.2	V
	V_{PDR}	falling edge	1.50	1.65	2.15	V
POR stretch time	T_{POR}			20.00		mS
PDR stretch time	T_{PDR}			20		μ S

4 Application Schematic



5 Package Information

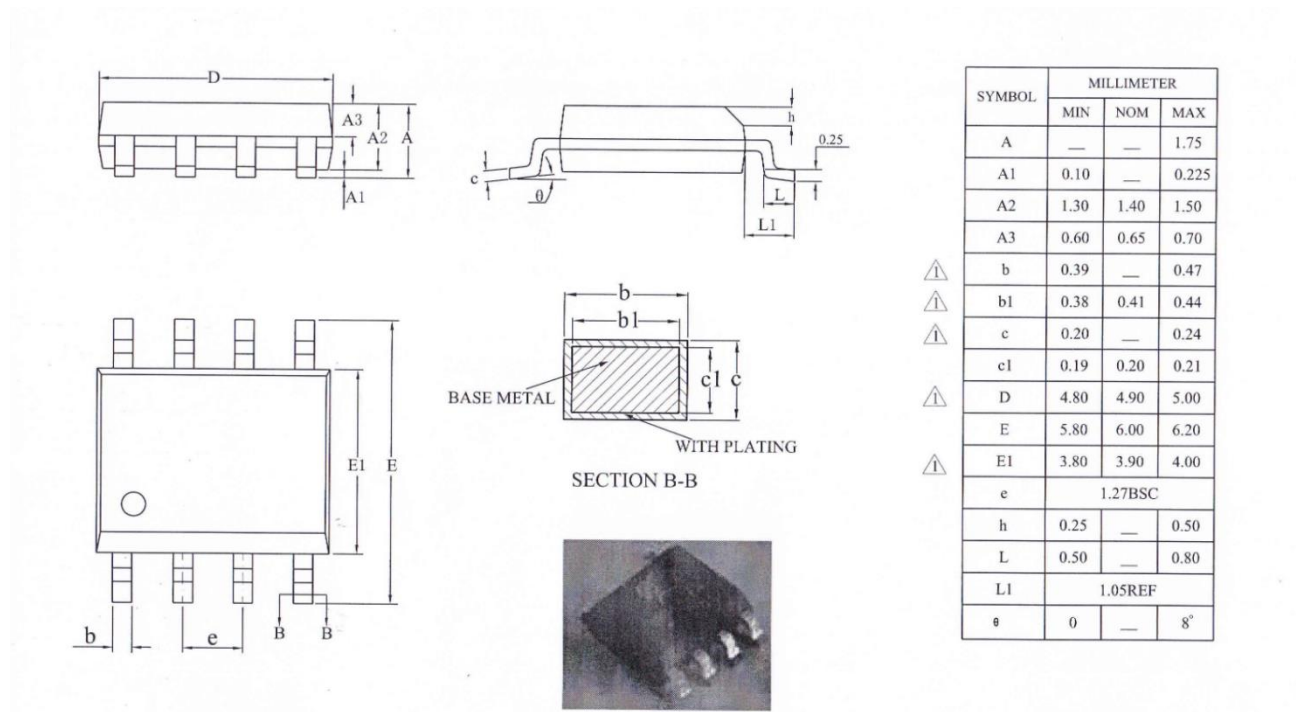


Figure 5-2 ESOP8 package dimensions