Table 3. Recommended BoM for Systems where VBAT ≤ 2.4 V

Item	Qty	CY Part Number	Reference	Description	Manufacturer	Mfr Part Number
1	1	NA	ANT1	2.5 GHZ H-STUB WIGGLE ANTENNA FOR 63 MIL PCB	NA	NA
2	1	NA	BH1	BATTERY CLIPS 2AA CELL		
3	1	730-10012	C1	CAP 15 PF 50 V CERAMIC NPO 0402	Panasonic	ECJ-0EC1H150J
4	1	730-11955	C3	CAP 2.0 PF 50 V CERAMIC NPO 0402	Kemet	C0402C209C5GACTU
5	1	730-11398	C4	CAP 1.5 PF 50 V CERAMIC NPO 0402 SMD	PANASONIC	ECJ-0EC1H1R5C
6	2	730R-13322	C5, C17	CAP CER 0.47 UF 6.3 V X5R 0402	Murata	GRM155R60J474KE19D
7	2	730-13037	C12, C7	CAP CERAMIC 10 UF 6.3 V X5R 0805	Kemet	C0805C106K9PACTU
8	1	730-13400	C8	CAP 1 uF 6.3 V CERAMIC X5R 0402	Panasonic	ECJ-0EB0J105M
9	6	730-13404	C9, C10, C11, C13, C15, C16	CAP 0.047 uF 16 V CERAMIC X5R 0402	AVX	0402YD473KAT2A
10	1	710-13201	C18	CAP 100 UF 10 V ELECT FC	Panasonic - ECG	EEU-FC1A101S
11	2	730-10794	C20,C19	CAP 10000 PF 16 V CERAMIC 0402 SMD	Panasonic - ECG	ECJ-0EB1C103K
12	1	800-13317	D1	DIODE SCHOTTKY 0.5 A 40 V SOT23	DIODES INC	BAT400D-7-F
13	1	NA	J1	PCB COPPER PADS	NONE	
14	1	420-11496	J2	CONN HDR BRKWAY 5POS STR AU PCB	AMP Division of TYCO	103185-5
15	1	420-11964	J3	HEADER 1 POS 0.230 HT MODII .100 CL	AMP/Tyco	103185-1
16	1	800-13401	L1	INDUCTOR 22 NH 2% FIXED 0603 SMD	Panasonic - ECG	ELJ-RE22NGF2
17	1	800-11651	L2	INDUCTOR 1.8 NH +/-.3 NH FIXED 0402 SMD	Panasonic - ECG	ELJ-RF1N8DF
18	1	800-10594	L3	COIL 10 UH 1100MA CHOKE 0805	Newark	30K5421
19	1	630-11356	R2	RES 1.00 OHM 1/8 W 1% 0805 SMD	Yageo	9C08052A1R00FKHFT
20	1	610-13402	R3	RES 47 OHM 1/16 W 5% 0402 SMD	Panasonic - ECG	ERJ-2GEJ470X
21	1	800-13368	S1	LT SWITCH 6 MM 100 GF H = 7 MM TH	Panasonic - ECG	EVQ-PAC07K
22	1	CYRF6936-40LFC	U1	IC, LP 2.4 GHz RADIO SoC QFN-40	Cypress Semiconductor	CYRF6936 Rev A5
23	1	CY7C60123-PVXC	U2	IC WIRELESS EnCore II CONTROLLER SSOP48	Cypress Semiconductor	CY7C60123-PVXC
24	1	800-13259	Y1	CRYSTAL 12.00 MHZ HC49 SMD	eCERA	GF-1200008
25	1	PDC-9265-*B	PCB	PRINTED CIRCUIT BOARD	Cypress Semiconductor	PDC-9265-*B
26	1	920-11206	LABEL1	Serial Number		
27	1	920-26504 *A	LABEL2	PCA #		121-26504 *A

Table 3. Recommended BoM for Systems where VBAT ≤ 2.4 V (continued)

Item	Qty	CY Part Number	Reference	Description	Manufacturer	Mfr Part Number
No Load Components - Do Not Install						
28	1	730-13403	C6	CAP 47UF 6.3 V CERAMIC X5R 1210	Panasonic	ECJ-4YB0J476M
29	1	630-10242	R2	RES CHIP 0.0 OHM 1/10W 5% 0805 SMD	Phycomp USA Inc	9C08052A0R00JLHFT
30	1	730-13404	C7	CAP 0.047 uF 50 V CERAMIC X5R 0402	AVX	0402YD473KAT2A
31	1	420-10921	J4	HEADER 3POS FRIC STRGHT MTA 100	AMP/Tyco	644456-3
32	1	620-10519	R1	RES ZERO OHM 1/16W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEY0R00V

Figure 9. Recommended Circuit for Systems where V_{BAT} is 2.4 V–3.6 V (PMU Disabled)

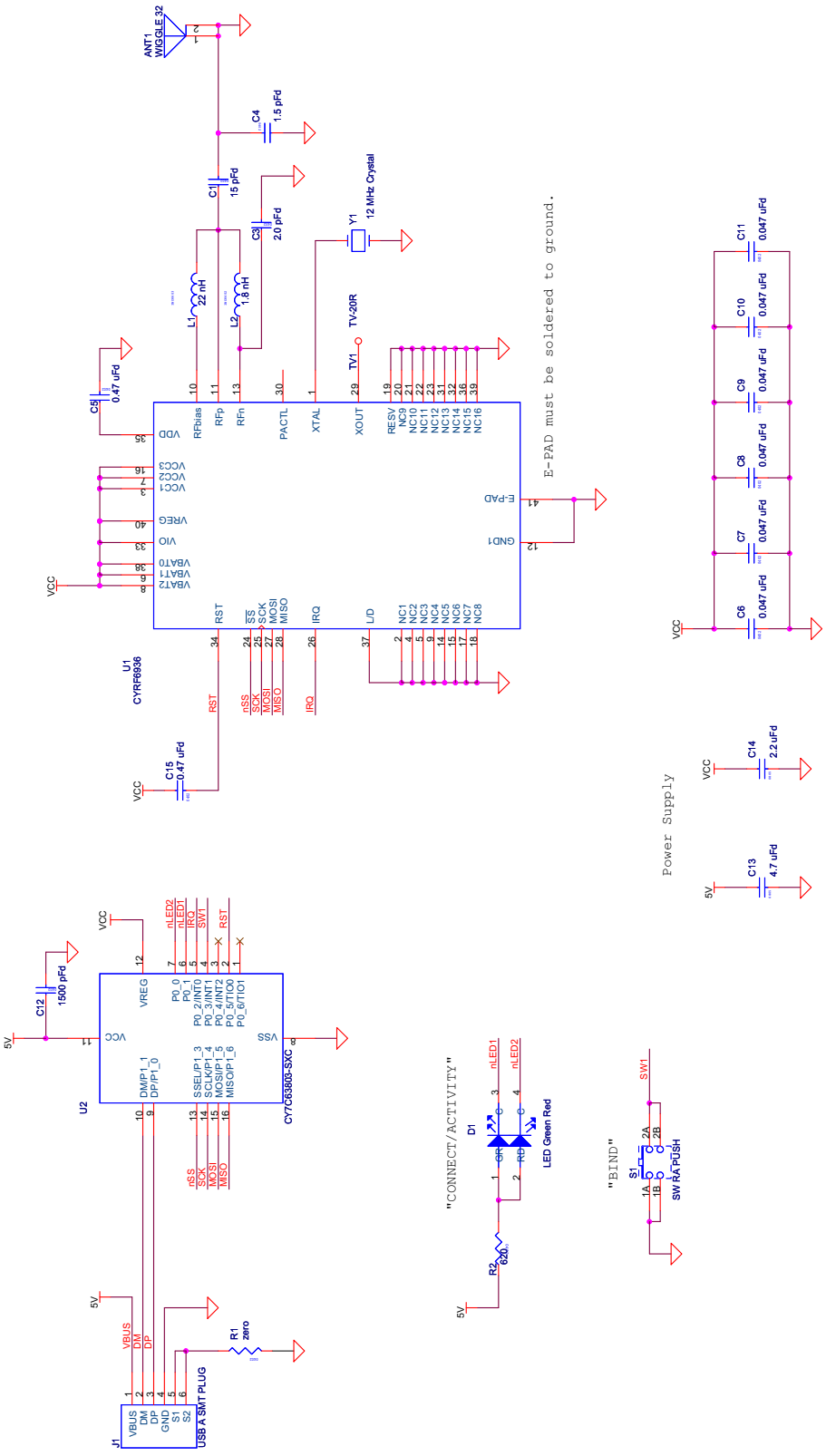


Table 4. Recommended BoM for Systems where V_{BAT} is 2.4 V–3.6 V (PMU disabled)

Item	Qty	CY Part Number	Reference	Description	Manufacturer	Mfr Part Number
1	1	NA	ANT1	2.5 GHZ H-STUB WIGGLE ANTENNA FOR 32MIL PCB	NA	NA
2	1	730-10012	C1	CAP 15 PF 50 V CERAMIC NPO 0402	Panasonic	ECJ-0EC1H150J
3	1	730-11955	C3	CAP 2.0 PF 50 V CERAMIC NPO 0402	Kemet	C0402C209C5GACTU
4	1	730-11398	C4	CAP 1.5 PF 50 V CERAMIC NPO 0402 SMD	PANASONIC	ECJ-0EC1H1R5C
5	1	730-13322	C5, C15	CAP 0.47 uF 6.3 V CERAMIC X5R 0402	Murata	GRM155R60J474KE19D
6						
7	6	730-13404	C6, C7, C8, C9, C10, C11	CAP 0.047 uF 16 V CERAMIC X5R 0402	AVX	0402YD473KAT2A
8	1	730-11953	C12	CAP 1500 PF 50 V CERAMIC X7R 0402	Kemet	C0402C152K5RACTU
9	1	730-13040	C13	CAP CERAMIC 4.7 UF 6.3 V XR5 0805	Kemet	C0805C475K9PACTU
10	1	730-12003	C14	CAP CER 2.2 UF 10 V 10% X7R 0805	Murata Electronics North America	GRM21BR71A225KA01L
11	1	800-13333	D1	LED GREEN/RED BICOLOR 1210 SMD	LITEON	LTST-C155KGJRKT
12	1	420-13046	J1	CONN USB PLUG TYPE A PCB SMT	ACON	UAR72-4N5J10
13	1	800-13401	L1	INDUCTOR 22NH 2% FIXED 0603 SMD	Panasonic - ECG	ELJ-RE22NGF2
14	1	800-11651	L2	INDUCTOR 1.8 NH +/-.3 NH FIXED 0402 SMD	Panasonic - ECG	ELJ-RF1N8DF
15	1	610-10343	R1	RES ZERO OHM 1/16W 0402 SMD	Panasonic - ECG	ERJ-2GE0R00X
16	1	610-13472	R2	RES CHIP 620 OHM 1/16W 5% 0402 SMD	Panasonic - ECG	ERJ-2GEJ621X
17	1	200-13471	S1	SWITCH LT 3.5 MM X 2.9 MM 160 GF SMD	Panasonic - ECG	EVQ-P7J01K
18	1	CYRF6936-40LFC	U1	IC, LP 2.4 GHz RADIO SoC QFN-40	Cypress Semiconductor	CYRF6936 Rev A5
19	1	CY7C63803-SXC	U2	IC LOW SPEED USB ENCORE II CONTROLLER SOIC16	Cypress Semiconductor	CY7C63803-SXC
20	1	800-13259	Y1	CRYSTAL 12.00 MHZ HC49 SMD	eCERA	GF-1200008
21	1	PDC-9263-*B	PCB	PRINTED CIRCUIT BOARD	Cypress Semiconductor	PDC-9263-*B
22	1		LABEL1	Serial Number	XXXXXX	
23	1		LABEL2	PCA #	121-26305 **	

Registers

All registers are read and writable, except where noted. Registers may be written to or read from individually or in sequential groups.[1, 2]

Table 5. Register Map Summary

Address	Mnemonic	b7	b6	b5	b4	b3	b2	b1	b0	Default[1]	Access[1]
0x00	CHANNEL_ADR	Not Used	Channel							-1001000	-bbbbbbb
0x01	TX_LENGTH_ADR	TX Length								00000000	bbbbbbbb
0x02	TX_CTRL_ADR	TX GO	TX CLR	TXB15 IRQEN	TXB8 IRQEN	TXB0 IRQEN	TXBERR IRQEN	TXC IRQEN	TXE IRQEN	00000011	bbbbbbbb
0x03	TX_CFG_ADR	Not Used	Not Used	DATA CODE LENGTH	DATA MODE		PA SETTING			--000101	--bbbbbb
0x04	TX_IRQ_STATUS_ADR	OS IRQ	LV IRQ	TXB15 IRQ	TXB8 IRQ	TXB0 IRQ	TXBERR IRQ	TXC IRQ	TXE IRQ	--------	rrrrrrrr
0x05	RX_CTRL_ADR	RX GO	RSVD	RXB16 IRQEN	RXB8 IRQEN	RXB1 IRQEN	RXBERR IRQEN	RXC IRQEN	RXE IRQEN	00000111	bbbbbbbb
0x06	RX_CFG_ADR	AGC EN	LNA	ATT	HILO	FAST TURN EN	Not Used	RXOW EN	VLD EN	10010-10	bbbbb-bb
0x07	RX_IRQ_STATUS_ADR	RXOW IRQ	SOPDET IRQ	RXB16 IRQ	RXB8 IRQ	RXB1 IRQ	RXBERR IRQ	RXC IRQ	RXE IRQ	--------	brrrrrrr
0x08	RX_STATUS_ADR	RX ACK	PKT ERR	EOP ERR	CRC0	Bad CRC	RX Code	RX Data Mode		--------	rrrrrrrr
0x09	RX_COUNT_ADR	RX Count								00000000	rrrrrrrr
0x0A	RX_LENGTH_ADR	RX Length								00000000	rrrrrrrr
0x0B[1]	PWR_CTRL_ADR	PMU EN	LVIRQ EN	PMU Mode Force	PFET disable[3]	LVI TH		PMU OUTV		10100000	bbbbbbbb
0x0C	XTAL_CTRL_ADR	XOUT FN		XSIRQ EN	Not Used	Not Used	FREQ			000--100	bbb--bbb
0x0D	IO_CFG_ADR	IRQ OD	IRQ POL	MISO OD	XOUT OD	PACTL OD	PACTL GPIO	SPI 3PIN	IRQ GPIO	00000000	bbbbbbbb
0x0E	GPIO_CTRL_ADR	XOUT OP	MISO OP	PACTL OP	IRQ OP	XOUT IP	MISO IP	PACTL IP	IRQ IP	0000----	bbbbrrrr
0x0F	XACT_CFG_ADR	ACK EN	Not Used	FRC END	END STATE			ACK TO		1-000000	b-bbbbbb
0x10	FRAMING_CFG_ADR	SOP EN	SOP LEN	LEN EN	SOP TH					10100101	bbbbbbbb
0x11	DATA32_THOLD_ADR	Not Used	Not Used	Not Used	Not Used	TH32				----0100	----bbbb
0x12	DATA64_THOLD_ADR	Not Used	Not Used	Not Used	TH64					---01010	---bbbbb
0x13	RSSI_ADR	SOP	Not Used	LNA	RSSI					0-100000	r-rrrrrr
0x14	EOP_CTRL_ADR[4]	HEN	HINT		EOP					10100100	bbbbbbbb
0x15	CRC_SEED_LSB_ADR	CRC SEED LSB								00000000	bbbbbbbb
0x16	CRC_SEED_MSB_ADR	CRC SEED MSB								00000000	bbbbbbbb
0x17	TX_CRC_LSB_ADR	CRC LSB								--------	rrrrrrrr
0x18	TX_CRC_MSB_ADR	CRC MSB								--------	rrrrrrrr
0x19	RX_CRC_LSB_ADR	CRC LSB								11111111	rrrrrrrr
0x1A	RX_CRC_MSB_ADR	CRC MSB								11111111	rrrrrrrr
0x1B	TX_OFFSET_LSB_ADR	STRIM LSB								00000000	bbbbbbbb
0x1C	TX_OFFSET_MSB_ADR	Not Used	Not Used	Not Used	Not Used	STRIM MSB				----0000	----bbbb
0x1D	MODE_OVERRIDE_ADR	RSVD	RSVD	FRC SEN	FRC AWAKE		Not Used	Not Used	RST	00000--0	wwwww--w
0x1E	RX_OVERRIDE_ADR	ACK RX	RXTX DLY	MAN RXACK	FRC RXDR	DIS CRC0	DIS RXCRC	ACE	Not Used	0000000-	bbbbbbb-
0x1F	TX_OVERRIDE_ADR	ACK TX	FRC PRE	RSVD	MAN TXACK	OVRD ACK	DIS TXCRC	RSVD	TX INV	00000000	bbbbbbbb
0x26	XTAL_CFG_ADR	RSVD	RSVD	RSVD	RSVD	START DLY	RSVD	RSVD	RSVD	00000000	wwwwwwww
0x27	CLK_OVERRIDE_ADR	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD	RXF	RSVD	00000000	wwwwwwww
0x28	CLK_EN_ADR	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD	RXF	RSVD	00000000	wwwwwwww
0x29	RX_ABORT_ADR	RSVD	RSVD	ABORT EN	RSVD	RSVD	RSVD	RSVD	RSVD	00000000	wwwwwwww
0x32	AUTO_CAL_TIME_ADR	AUTO_CAL_TIME								00000011	wwwwwwww
0x35	AUTO_CAL_OFFSET_ADR	AUTO_CAL_OFFSET								00000000	wwwwwwww
0x39	ANALOG_CTRL_ADR	RSVD	RSVD	RSVD	RSVD	RSVD	RSVD	RX INV	ALL SLOW	00000000	wwwwwwww
Register Files											
0x20	TX_BUFFER_ADR	TX Buffer File								--------	wwwwwwww
0x21	RX_BUFFER_ADR	RX Buffer File								--------	rrrrrrrr
0x22	SOP_CODE_ADR	SOP Code File								Note 5	bbbbbbbb
0x23	DATA_CODE_ADR	Data Code File								Note 6	bbbbbbbb
0x24	PREAMBLE_ADR	Preamble File								Note 7	bbbbbbbb
0x25	MFG_ID_ADR	MFG ID File								NA	rrrrrrrr

Notes

1. b = read/write; r = read only; w = write only; '-' = not used, default value is undefined.
2. Registers must be configured or accessed only when the radio is in IDLE or SLEEP mode. The PMU, GPIOs, and RSSI registers can be accessed in Active Tx and Rx mode.
3. PFET Bit: Setting this bit to "1" disables the FET, therefore safely allowing Vbat to be connected to a separate reference from Vcc when the PMU is disabled to the radio.
4. EOP_CTRL_ADR[6:4] must never have the value of "000", that is, EOP Hint Symbol count must never be "0"
5. SOP_CODE_ADR default = 0x17FF9E213690C782.
6. DATA_CODE_ADR default = 0x02F9939702FA5CE3012BF1DB0132BE6F.
7. PREAMBLE_ADR default = 0x333302. The count value must be great than 4 for DDR and greater than 8 for SDR.

Absolute Maximum Ratings

Exceeding maximum ratings may shorten the useful life of the device. User guidelines are not tested.

Storage Temperature ..... –65 °C to +150 °C

Ambient Temperature with Power Applied ..... –55 °C to +125 °C

Supply Voltage on any power supply pin relative to V_{SS} .....–0.3 V to +3.9 V

DC Voltage to Logic Inputs [8] .....–0.3 V to $V_{I/O}$ +0.3 V

DC Voltage applied to Outputs in High-Z State .....–0.3 V to $V_{I/O}$ +0.3 V

Static Discharge Voltage (Digital) [9] .....>2000 V

Static Discharge Voltage (RF) [9] ..... 1100 V

Latch Up Current .....+200 mA, –200 mA

Operating Conditions

V_{CC} .....2.4 V to 3.6 V

$V_{I/O}$ .....1.8 V to 3.6 V

V_{BAT} .....1.8 V to 3.6 V

T_A (Ambient Temperature Under Bias) ..... 0 °C to +70 °C

Ground Voltage ..... 0 V

F_{OSC} (Crystal Frequency) ..... 12 MHz ± 30 ppm

DC Characteristics

(T = 25°C, V_{BAT} = 2.4 V, PMU disabled, f_{OSC} = 12.000000 MHz)

Parameter	Description	Conditions	Min	Typ	Max	Unit
V_{BAT}	Battery Voltage	0 °C–70 °C	1.8	–	3.6	V
V_{REG}[10]	PMU Output Voltage	2.4 V mode	2.4	2.43	–	V
V_{REG}[10]	PMU Output Voltage	2.7 V mode	2.7	2.73	–	V
$V_{I/O}$[11]	$V_{I/O}$ Voltage		1.8	–	3.6	V
V_{CC}	V_{CC} Voltage	0 °C–70 °C	2.4[12]	–	3.6	V
V_{OH1}	Output High Voltage Condition 1	At I_{OH} = –100.0 µA	$V_{I/O}$ – 0.2	$V_{I/O}$	–	V
V_{OH2}	Output High Voltage Condition 2	At I_{OH} = –2.0 mA	$V_{I/O}$ – 0.4	$V_{I/O}$	–	V
V_{OL}	Output Low Voltage	At I_{OL} = 2.0 mA	–	0	0.45	V
V_{IH}	Input High Voltage		0.7 $V_{I/O}$	–	$V_{I/O}$	V
V_{IL}	Input Low Voltage		0	–	0.3 $V_{I/O}$	V
I_{IL}	Input Leakage Current	0 < V_{IN} < $V_{I/O}$	–1	0.26	+1	µA
C_{IN}	Pin Input Capacitance	except XTAL, RF_N, RF_P, RF_{BIAS}	–	3.5	10	pF
I_{CC} (GFSK)[13]	Average TX I_{CC}, 1 Mbps, slow channel	PA = 5, 2 way, 4 bytes/10 ms	–	0.87	–	mA
I_{CC} (32-8DR)[13]	Average TX I_{CC}, 250 kbps, fast channel	PA = 5, 2 way, 4 bytes/10 ms	–	1.2	–	mA
I_{SB}[14]	Sleep Mode I_{CC}		–	0.8	10	µA
I_{SB}[14]	Sleep Mode I_{CC}	PMU enabled	–	31.4	–	µA
IDLE I_{CC}	Radio off, XTAL Active	XOUT disabled	–	1.0	–	mA

Notes

8. It is permissible to connect voltages above $V_{I/O}$ to inputs through a series resistor limiting input current to 1 mA. AC timing not guaranteed.
9. Human Body Model (HBM).
10. V_{REG} depends on battery input voltage.
11. In sleep mode, the I/O interface voltage reference is V_{BAT}.
12. In sleep mode, V_{CC} min. can be as low as 1.8 V.
13. Includes current drawn while starting crystal, starting synthesizer, transmitting packet (including SOP and CRC16), changing to receive mode, and receiving ACK handshake. Device is in sleep except during this transaction.
14. ISB is not guaranteed if any I/O pin is connected to voltages higher than $V_{I/O}$.

DC Characteristics (continued)

($T = 25°C$, $V_{BAT} = 2.4$ V, PMU disabled, $f_{OSC} = 12.000000$ MHz)

Parameter	Description	Conditions	Min	Typ	Max	Unit
I_{synth}	I_{CC} during Synth Start		–	8.4	–	mA
TX I_{CC}	I_{CC} during Transmit	PA = 5 (–5 dBm)	–	20.8	–	mA
TX I_{CC}	I_{CC} during Transmit	PA = 6 (0 dBm)	–	26.2	–	mA
TX I_{CC}	I_{CC} during Transmit	PA = 7 (+4 dBm)	–	34.1	–	mA
RX I_{CC}	I_{CC} during Receive	LNA off, ATT on	–	18.4	–	mA
RX I_{CC}	I_{CC} during Receive	LNA on, ATT off	–	21.2	–	mA
Boost Eff	PMU Boost Converter Efficiency	$V_{BAT} = 2.5$ V, $V_{REG} = 2.73$ V, $I_{LOAD} = 20$ mA	–	81	–	%
I_{LOAD_EXT}[8]	Average PMU External Load current	$V_{BAT} = 1.8$ V, $V_{REG} = 2.73$ V, 0 °C–50 °C, RX Mode	–	–	15	mA
I_{LOAD_EXT}[8]	Average PMU External Load current	$V_{BAT} = 1.8$ V, $V_{REG} = 2.73$ V, 50 °C–70 °C, RX Mode	–	–	10	mA

Note

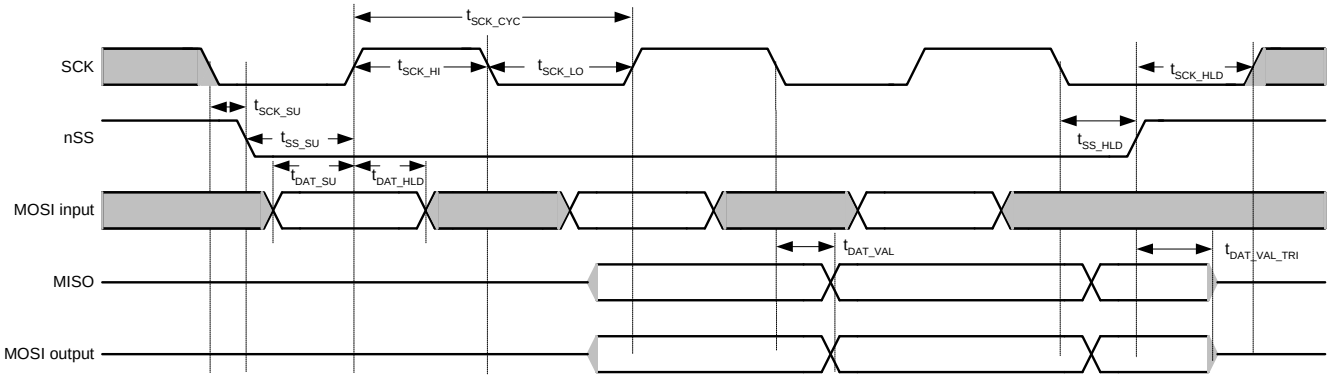
8. I_{LOAD_EXT} is dependent on external components and this entry applies when the components connected to L/D are SS12 series diode and DH53100LC inductor from Sumida.

AC Characteristics

SPI Interface

Parameter [9, 10]	Description	Min	Typ	Max	Unit
t_{SCK_CYC}	SPI Clock Period	238.1	–	–	ns
t_{SCK_HI}	SPI Clock High Time	100	–	–	ns
t_{SCK_LO}	SPI Clock Low Time	100	–	–	ns
t_{DAT_SU}	SPI Input Data Setup Time	25	–	–	ns
t_{DAT_HLD}	SPI Input Data Hold Time	10	–	–	ns
t_{DAT_VAL}	SPI Output Data Valid Time	0	–	50	ns
$t_{DAT\_VAL\_TRI}$	SPI Output Data Tri-state (MOSI from Slave Select Deassert)	–	–	20	ns
t_{SS_SU}	SPI Slave Select Setup Time before first positive edge of SCK[11]	10	–	–	ns
t_{SS_HLD}	SPI Slave Select Hold Time after last negative edge of SCK	10	–	–	ns
t_{SS_PW}	SPI Slave Select Minimum Pulse Width	20	–	–	ns
t_{SCK_SU}	SPI Slave Select Setup Time	10	–	–	ns
t_{SCK_HLD}	SPI SCK Hold Time	10	–	–	ns
t_{RESET}	Minimum RST Pin Pulse Width	10	–	–	ns

Figure 10. SPI Timing



Notes
9. AC values are not guaranteed if voltage on any pin exceeding $V_{I/O}$.
10. C_{LOAD} = 30 pF
11. SCK must start low at the time $\overline{SS}$ goes LOW, otherwise the success of SPI transactions are not guaranteed.

RF Characteristics

Radio Parameters

Parameter Description	Conditions	Min	Typ	Max	Unit
RF Frequency Range	Note 12	2.400	–	2.497	GHz
Receiver ($T = 25°C$, $V_{CC} = V_{BAT} = 3.0$ V, $f_{OSC} = 12.000000$ MHz, BER < 1E-3)					
Sensitivity 125 kbps 64-8DR	BER 1E-3	–	–97	–	dBm
Sensitivity 250 kbps 32-8DR	BER 1E-3	–	–93	–	dBm
Sensitivity	CER 1E-3	–80	–87	–	dBm
Sensitivity GFSK	BER 1E-3, ALL SLOW = 1	–	–84	–	dBm
LNA Gain		–	22.8	–	dB
ATT Gain		–	–31.7	–	dB
Maximum Received Signal	LNA On	–15	–6	–	dBm
RSSI Value for PWR_{in} –60 dBm [13]	LNA On	–	21	–	Count
RSSI Slope		–	1.9	–	dB/Count
Interference Performance (CER 1E-3)					
Co-channel Interference rejection Carrier-to-Interference (C/I)	C = –60 dBm	–	9	–	dB
Adjacent (±1 MHz) channel selectivity C/I 1 MHz	C = –60 dBm	–	3	–	dB
Adjacent (±2 MHz) channel selectivity C/I 2 MHz	C = –60 dBm	–	–30	–	dB
Adjacent ($\geq$ 3 MHz) channel selectivity C/I $\geq$ 3 MHz	C = –67 dBm	–	–38	–	dB
Out-of-Band Blocking 30 MHz–12.75 MHz [14]	C = –67 dBm	–	–30	–	dBm
Intermodulation	C = –64 dBm, Δf = 5, 10 MHz	–	–36	–	dBm
Receive Spurious Emission					
800 MHz	100 kHz ResBW	–	–79	–	dBm
1.6 GHz	100 kHz ResBW	–	–71	–	dBm
3.2 GHz	100 kHz ResBW	–	–65	–	dBm

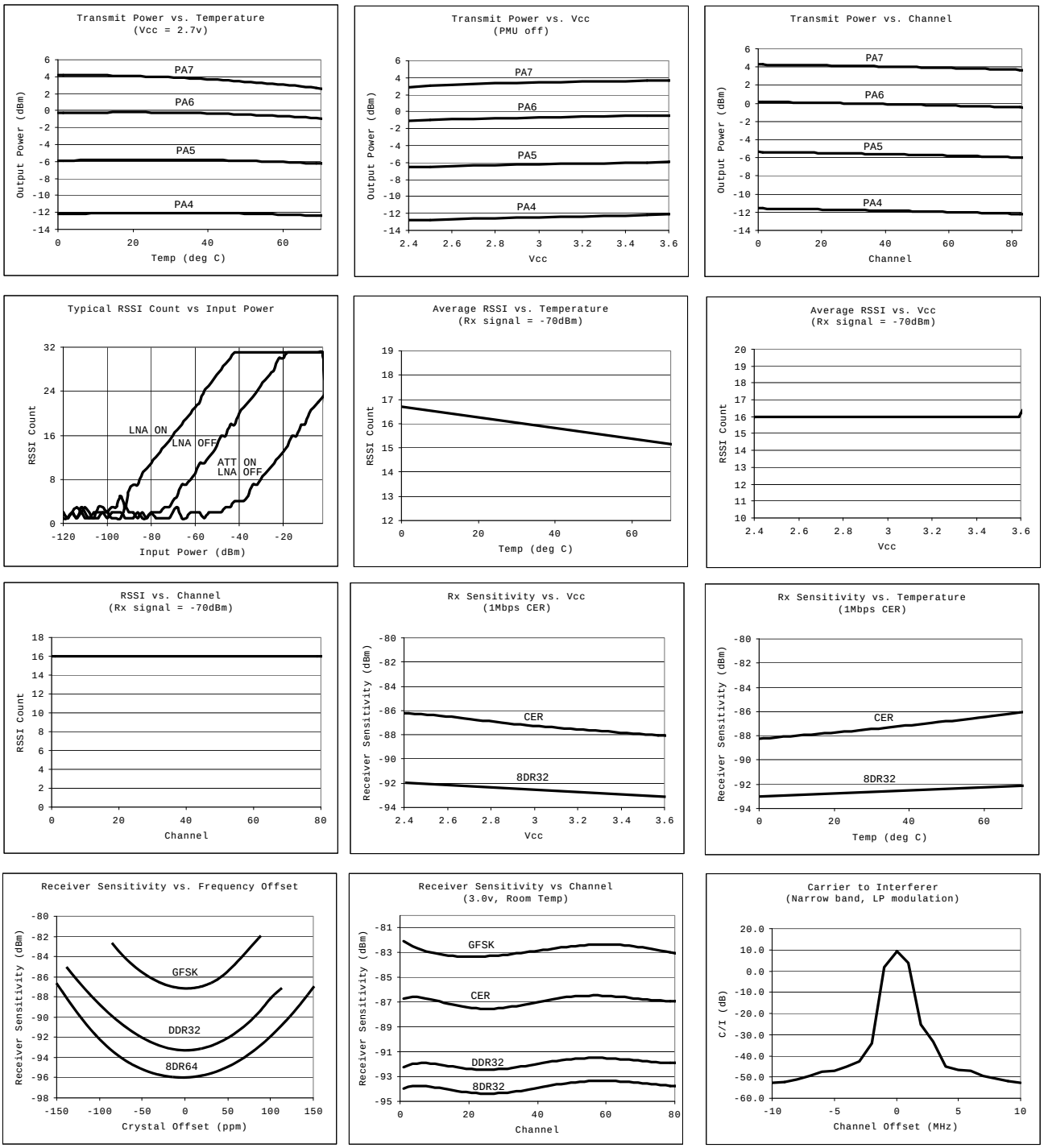
Notes
12. Subject to regulation.
13. RSSI value is not guaranteed. Extensive variation from part to part.
14. Exceptions F/3 & 5C/3.

Radio Parameters (continued)

Parameter Description	Conditions	Min	Typ	Max	Unit
Transmitter (T = 25°C, V_{CC} = 3.0 V)					
Maximum RF Transmit Power	PA = 7	+2	4	+6	dBm
Maximum RF Transmit Power	PA = 6	–2	0	+2	dBm
Maximum RF Transmit Power	PA = 5	–7	–5	–3	dBm
Maximum RF Transmit Power	PA = 0	–	–35	–	dBm
RF Power Control Range		–	39	–	dB
RF Power Range Control Step Size	Seven steps, monotonic	–	5.6	–	dB
Frequency Deviation Min	PN Code Pattern 10101010	–	270	–	kHz
Frequency Deviation Max	PN Code Pattern 11110000	–	323	–	kHz
Error Vector Magnitude (FSK error)	>0 dBm	–	10	–	%rms
Occupied Bandwidth	–6 dBc, 100 kHz ResBW	500	876	–	kHz
Transmit Spurious Emission (PA = 7)					
In-band Spurious Second Channel Power (±2 MHz)		–	–38	–	dBm
In-band Spurious Third Channel Power (≥3 MHz)		–	–44	–	dBm
Non-Harmonically Related Spurs (800 MHz)		–	–38	–	dBm
Non-Harmonically Related Spurs (1.6 GHz)		–	–34	–	dBm
Non-Harmonically Related Spurs (3.2 GHz)		–	–47	–	dBm
Harmonic Spurs (Second Harmonic)		–	–43	–	dBm
Harmonic Spurs (Third Harmonic)		–	–48	–	dBm
Fourth and Greater Harmonics		–	–59	–	dBm
Power Management (Crystal PN# eCERA GF-1200008)					
Crystal Start to 10ppm		–	0.7	1.3	ms
Crystal Start to IRQ	XSIRQ EN = 1	–	0.6	–	ms
Synth Settle	Slow channels	–	–	270	µs
Synth Settle	Medium channels	–	–	180	µs
Synth Settle	Fast channels	–	–	100	µs
Link Turnaround Time	GFSK	–	–	30	µs
Link Turnaround Time	250 kbps	–	–	62	µs
Link Turnaround Time	125 kbps	–	–	94	µs
Link Turnaround Time	<125 kbps	–	–	31	µs
Max Packet Length	<60 ppm crystal-to-crystal all modes except 64-DDR and 64-SDR	–	–	40	bytes
Max Packet Length	<60 ppm crystal-to-crystal 64-DDR and 64-SDR	–	–	16	bytes

Typical Operating Characteristics

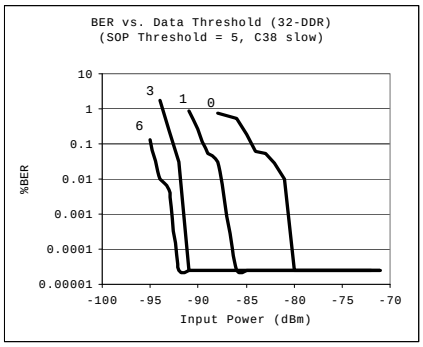
Figure 11. Typical Operating Characteristics [15]

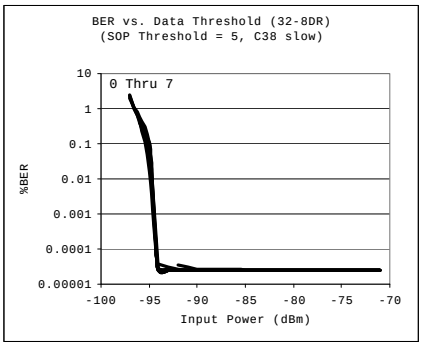


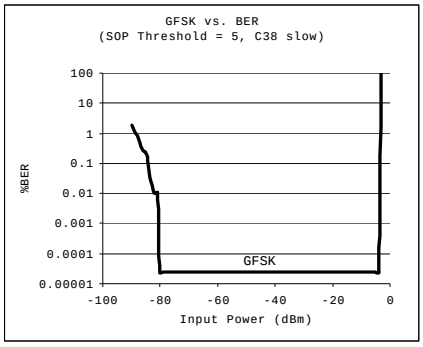
Note

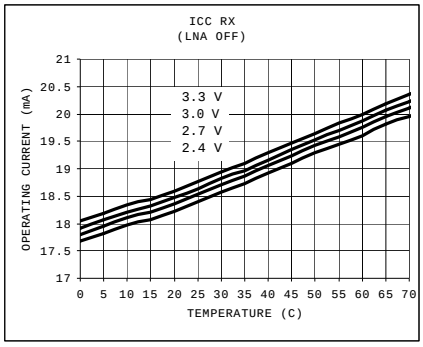
15. With LNA on, ATT off, above -2dBm erroneous RSSI values may be read. Cross-checking RSSI with LNA off/on is recommended for accurate readings.

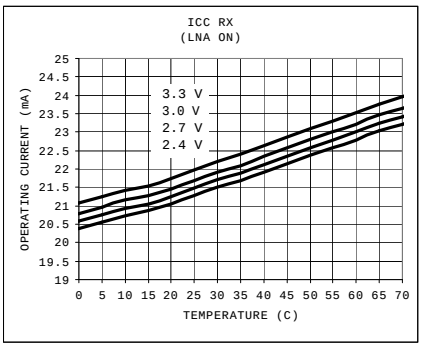
Typical Operating Characteristics (continued)

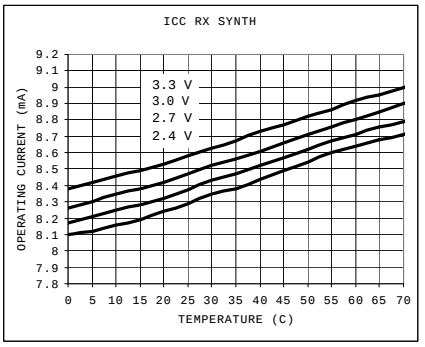


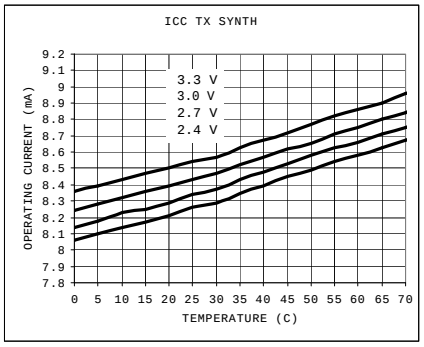


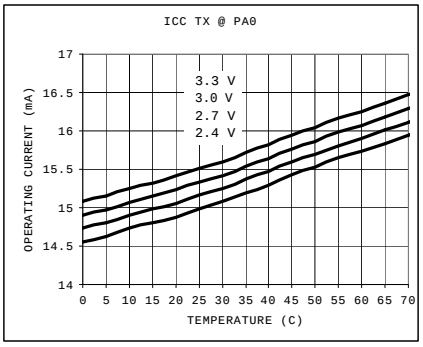


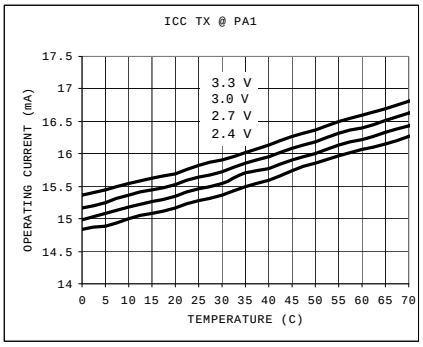


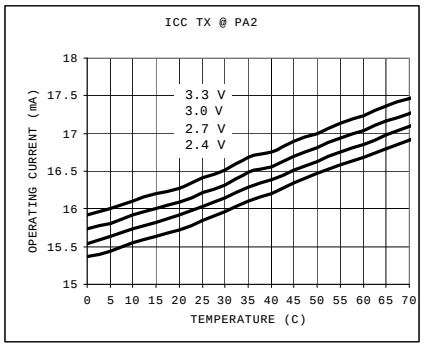


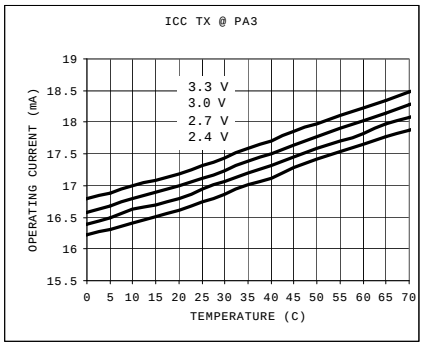


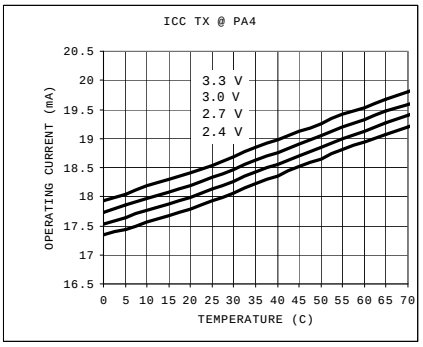




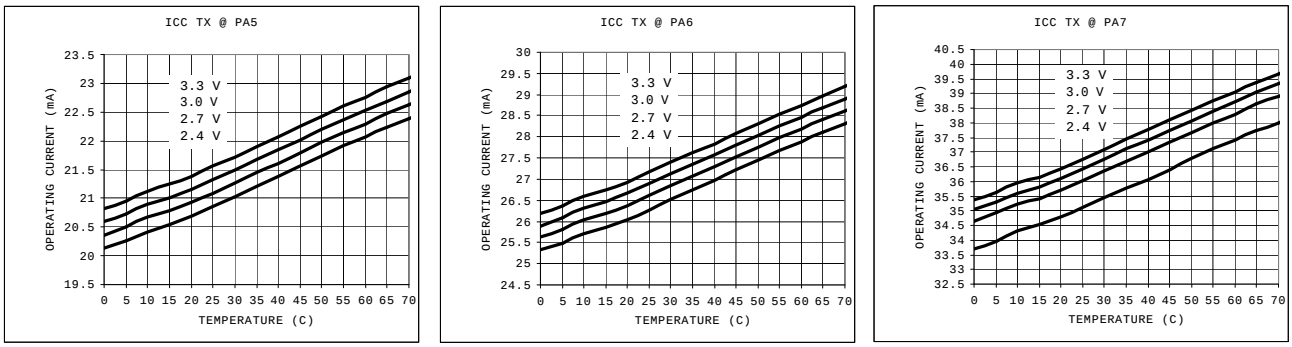








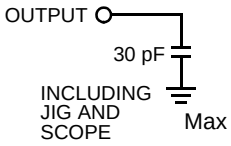
Typical Operating Characteristics (continued)

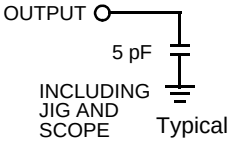


AC Test Loads and Waveforms for Digital Pins

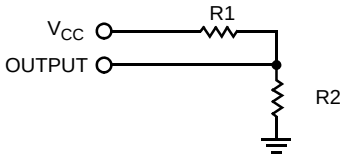
Figure 12. AC Test Loads and Waveforms for Digital Pins

AC Test Loads

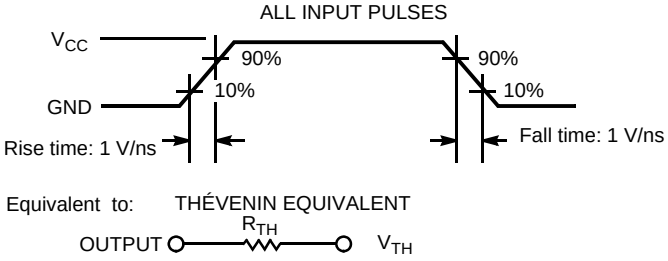




DC Test Load



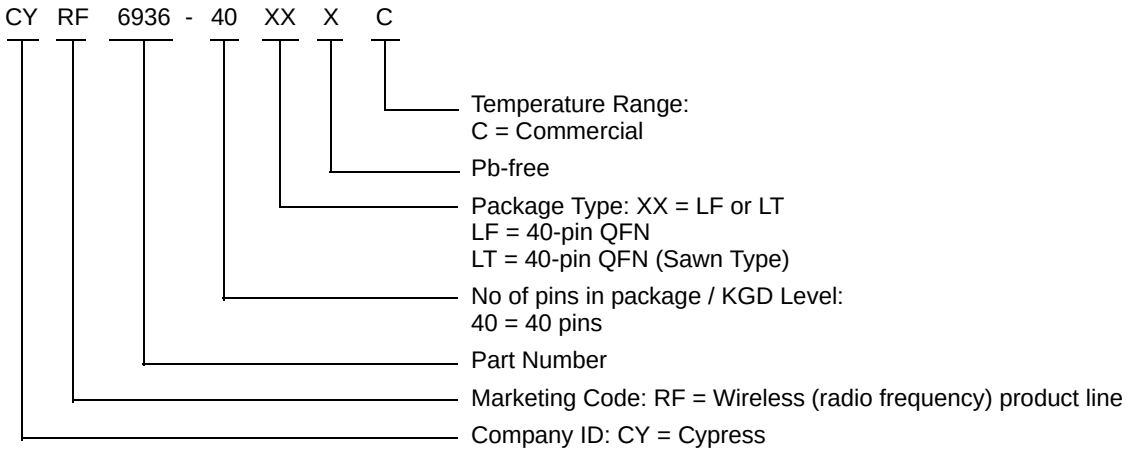
Parameter		Unit
R1	1071	Ω
R2	937	Ω
R_{TH}	500	Ω
V_{TH}	1.4	V
V_{CC}	3.00	V



Ordering Information

Part Number	Radio	Package Name	Package Type	Operating Range
CYRF6936-40LTXC	Transceiver	40-pin QFN	40-pin QFN (Sawn type)	Commercial

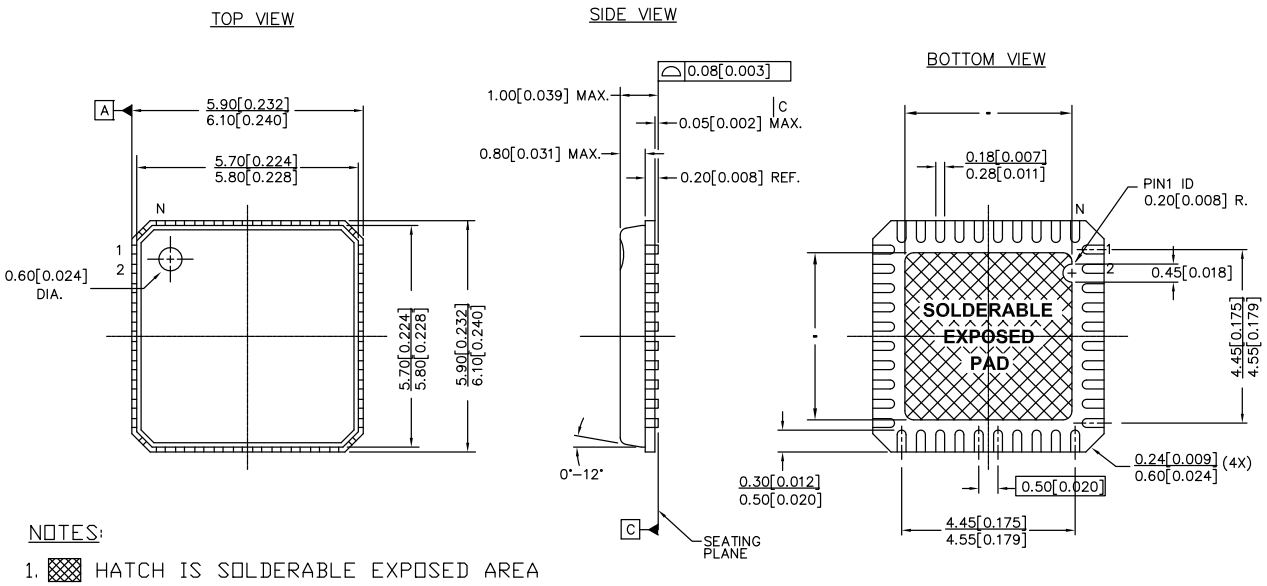
Ordering Code Definitions



Package Diagrams

The recommended dimension of the PCB pad size for the E-PAD underneath the QFN is 3.5 mm × 3.5 mm (width × length).

Figure 13. 40-pin QFN (6 × 6 × 1.0 mm) 3.5 × 3.5 E-Pad (Subcon Punch Type Package) Package Outline, 001-12917



NOTES:

1. HATCH IS SOLDERABLE EXPOSED AREA
2. REFERENCE JEDEC#: MO-220
3. PACKAGE WEIGHT: 0.086g
4. ALL DIMENSIONS ARE IN MM [MIN/MAX]
5. PACKAGE CODE

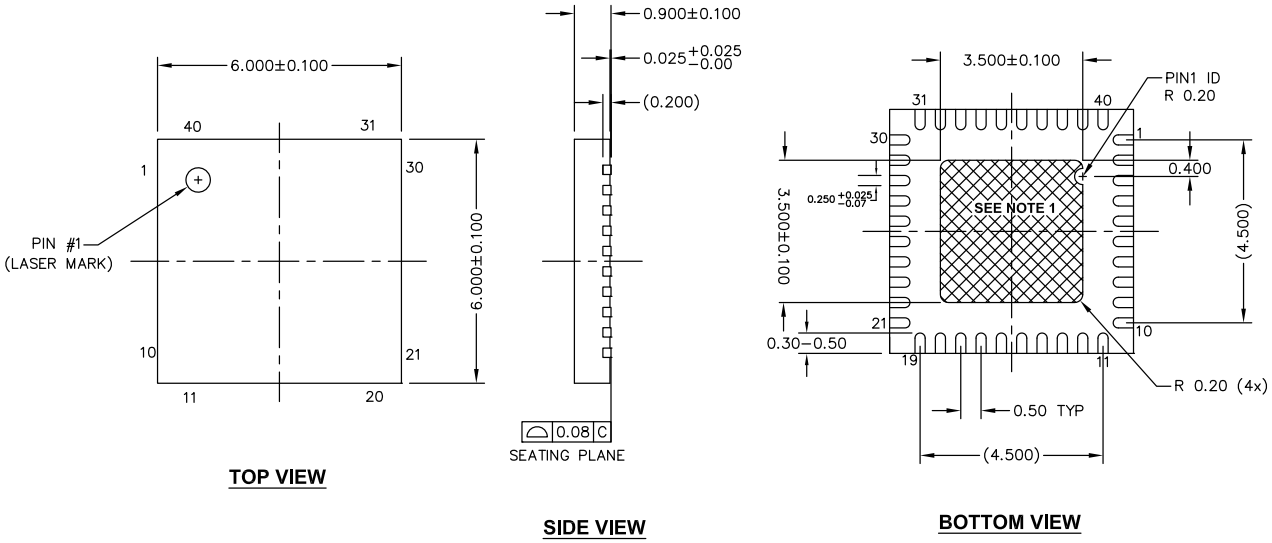
PART #	DESCRIPTION
LF40A	STANDARD
LY40A	PB-FREE

001-12917 *D

Package Diagrams (continued)

The recommended dimension of the PCB pad size for the E-PAD underneath the QFN is 3.5 mm × 3.5 mm (width × length).

Figure 14. 40-pin QFN (6 × 6 × 0.90 mm) 3.5 × 3.5 E-Pad (Sawn) Package Outline, 001-44328



NOTES:

1. HATCH IS SOLDERABLE EXPOSED AREA.
2. REFERENCE JEDEC #: MO–220
3. PACKAGE WEIGHT: 0.086g
4. ALL DIMENSIONS ARE IN MILLIMETERS

001-44328 *G

Acronyms

Table 6. Acronyms Used in this Document

Acronym	Description
ACK	Acknowledge (packet received, no errors)
BER	Bit Error Rate
BOM	Bill Of Materials
CMOS	Complementary Metal Oxide Semiconductor
CRC	Cyclic Redundancy Check
GFSK	Gaussian Frequency-Shift Keying
HBM	Human Body Model
ISM	Industrial, Scientific, and Medical
IRQ	Interrupt Request
MCU	Microcontroller Unit
QFN	Quad Flat No-leads
RSSI	Received Signal Strength Indication
RF	Radio Frequency
Rx	Receive
Tx	Transmit

Document Conventions

Units of Measure

Table 7. Units of Measure

Symbol	Units of Measure
dB	decibel
dBc	decibel relative to carrier
dBm	decibel-milliwatt
°C	degree Celsius
Hz	hertz
KB	1024 bytes
Kbit	1024 bits
kHz	kilohertz
kΩ	kilohm
MHz	megahertz
MΩ	megaohm
µA	microampere
µs	microsecond
µV	microvolt
µVrms	microvolts root-mean-square
µW	microwatt
mA	milliampere
ms	millisecond
mV	millivolt
nA	nanoampere
ns	nanosecond
nV	nanovolt
Ω	ohm
pp	peak-to-peak
ppm	parts per million
ps	picosecond
V	volt

Document History Page

Description Title: CYRF6936, WirelessUSB™ LP 2.4 GHz Radio SoC Document Number: 38-16015				
Revision	**ECN**	**Orig. of Change**	**Submission Date**	**Description of Change**
**	307437	TGE	See ECN	New data sheet
*A	377574	TGE	See ECN	Preliminary release– - updated Section 1.0 - Features - updated Section 2.0 - Applications - added Section 3.0 - Applications Support - updated Section 4.0 - Functional Descriptions - updated Section 5.0 - Pin Description - added Figure 5-1 - updated Section 6.0 - Functional Overview - added Section 7.0 - Functional Block Overview - added Section 9.0 - Register Descriptions - updated Section 10.0 - Absolute Maximum Ratings - updated Section 11.0 - Operating Conditions - updated Section 12.0 - DC Characteristics - updated Section 13.0 - AC Characteristics - updated Section 14.0 - RF Characteristics - added Section 16.0 - Ordering Information
*B	398756	TGE	See ECN	ES-10 update- - changed part no. - updated Section 9.0 - Register Descriptions - updated Section 12.0 - DC Characteristics - updated Section 14.0 - RF Characteristics
*C	412778	TGE	See ECN	ES-10 update- - updated Section 4.0 - Functional Descriptions - updated Section 5.0 - Pin Descriptions - updated Section 6.0 - Functional Overview - updated Section 7.0 - Functional Block Overview - updated Section 9.0 - Register Descriptions - updated Section 10.0 - Absolute Maximum Ratings - updated Section 11.0 - Operating Conditions - updated Section 14.0 - RF Characteristics
*D	435578	TGE	See ECN	- updated Section 1.0 - Features - updated Section 5.0 - Pin Descriptions - updated Section 6.0 - Functional Overview - updated Section 7.0 - Functional Block Overview - updated Section 9.0 - Register Descriptions - added Section 10.0 - Recommended Radio Circuit Schematic - updated Section 11.0 - Absolute Maximum Ratings - updated Section 12.0 - Operating Conditions - updated Section 13.0 - DC Characteristics - updated Section 14.0 - AC Characteristics - updated Section 15.0 - RF Characteristics
*E	460458	BOO	See ECN	Final data sheet - removed “Preliminary” notation

Document History Page (continued)

Description Title: CYRF6936, WirelessUSB™ LP 2.4 GHz Radio SoC Document Number: 38-16015				
Revision	**ECN**	**Orig. of Change**	**Submission Date**	**Description of Change**
*F	487261	TGE	See ECN	- updated Section 1.0 - Features - updated Section 5.0 - Pin Descriptions - updated Section 6.0 - Functional Overview - updated Section 7.0 - Functional Block Overview - updated Section 8.0 - Application Example - updated Section 9.0 - Register Descriptions - updated Section 12.0 - DC Characteristics - updated Section 13.0 - AC Characteristics - updated Section 14.0 - RF Characteristics - added Section 15.0 - Typical Operating Characteristics
*G	778236	OYR / ARI	See ECN	- modified radio function register descriptions - changed L/D pin description - footnotes added - changed RST Capacitor from 0.1uF to 0.47 uF - updated Figure 9, Recommended Circuit for Systems - updated Table 3, Recommended bill of materials for systems - updated package diagram from ** to *A
*H	2640987	VNY / OYR / TGE / AESA	02/20/2009	- Removed range values in features description - Bit level register details removed and appended to the Wireless LP and PRoC TRM - updated register summary table 4 - updated pin description diagram (figure 1) - updated the schematic of the radio (figure 10). - Removed Backward Compatibility section. - Removed Table 2 - Updated RF table characteristics for Payload size - Added pkg diagram 001-12917 - Updated BOM Table 3 on page 11. - Updated Table on page 19 with Receiver information (T = 25°C, V_{CC} = V_{BAT} = 3.0 V, f_{OSC} = 12.000000 MHz, BER < 1E-3)
*I	2673333	TGE / PYRS	03/13/2009	Corrected Figure 9 on page 13 Updated packaging and ordering information for 40 QFN (sawn) package
*J	3232571	JCJC	04/18/2011	Added section Receive Spurious Response on page 9. Added note # 13 and referred in Table on page 19. Added Ordering Code Definitions under Ordering Information. Updated Package Diagrams: spec 001-12917 – Changed revision from *A to *C. spec 001-44328 – Changed revision from *C to *D. Added Acronyms and Units of Measure. Updated to new template.
*K	4359286	DEJO	04/24/2014	Updated Package Diagrams: spec 001-12917 – Changed revision from *C to *D. spec 001-44328 – Changed revision from *D to *F. Updated to new template. Completing Sunset Review.
*L	5742403	SGUP	05/19/2017	Added watermark “Not recommended for new designs” across the document. Updated Ordering Information: Updated part numbers. Updated Package Diagrams: spec 001-44328 – Changed revision from *F to *G. Updated to new template.

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