



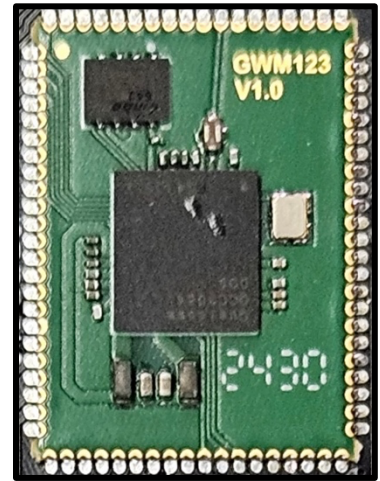
K-Solution Consulting Company Ltd.

GWM123x module Specifications (ver 1.0)

1. GENERAL INTRODUCTION

GWM123x is a Bluetooth 5.4 dual-mode audio module based on the Qualcomm's latest QCC3083/ QCC3084/ QCC3095 series chips. The module has integrated most of the peripheral components as RF filter and matching network, 32MHz Crystal, DC/DC inductor, thus make it easy to be used in the application circuit without knowing the RF design technics. It's also built-in with 64M-bit SPI Flash.

The QCC3083/ QCC3084/ QCC3095 is a system on-chip (SoC) with on-chip Bluetooth, audio and programmable application processor. It includes high-performance, analog, and digital audio codecs, Class-AB and Class-D audio drivers, advanced power management, Li-ion battery charger, light-emitting diode (LED) drivers, and flexible interfaces including inter-integrated



Circuit sound (I²S), inter-integrated circuit interface (I²C), universal asynchronous receiver transmitter (UART), and programmable input/output (PIO).

The flexibility provided by the fully programmable applications processor plus the ability to configure and program the audio processors enables manufacturers to easily differentiate products with new features.

The module is driven by a flexible, software platform with powerful integrated development environment (IDE) support. This enables rapid time-to-market deployment for a broad range of consumer electronic products, including audio, wireless speaker, TWS, and broadcast audio for stereo speaker arrangements.

This is a pre-approved module. It reduces the work and cost for a range of qualifications and let our customers to delivery their products to market more efficiently.

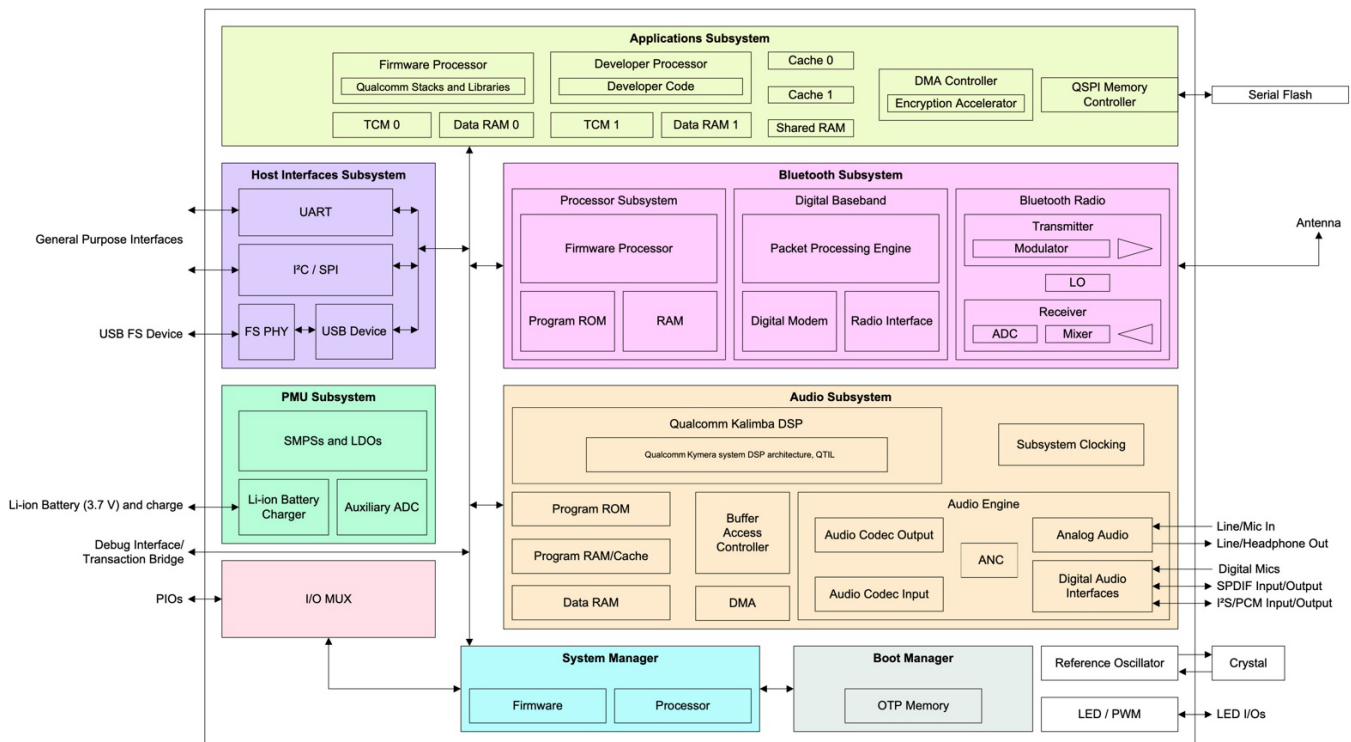
2. APPLICATIONS

- Bluetooth Speakers/Headphones
- True Wireless Stereo Earbuds/ Speakers
- Bluetooth Audio Dongles
- Bluetooth Microphone
- Bluetooth Sound-bar with wireless subwoofer

3. FEATURES

- Qualified to Bluetooth® v5.4 specification
- Dual 240 MHz Qualcomm® Kalimba™ audio DSPs
- 32/80 MHz Developer Processor for applications
- Firmware Processor for system
- Flexible QSPI flash programmable platform
- Advanced audio algorithms
- High-performance 24-bit stereo audio interface
- Digital and analog microphone interfaces
- Active Noise Cancellation: Feedforward, Feedback or Hybrid
- Serial interfaces: UART, Bit Serializer (I²C/SPI), USB 2.0
- Integrated PMU: Dual SMPS for system/digital circuits, Integrated Li-ion battery Charger
- 48 PIOs, 6 LED pads with PWM
- 134-ball 6.7 mm x 7.4 mm x 1.0mm, 0.5 mm pitch VFBGA

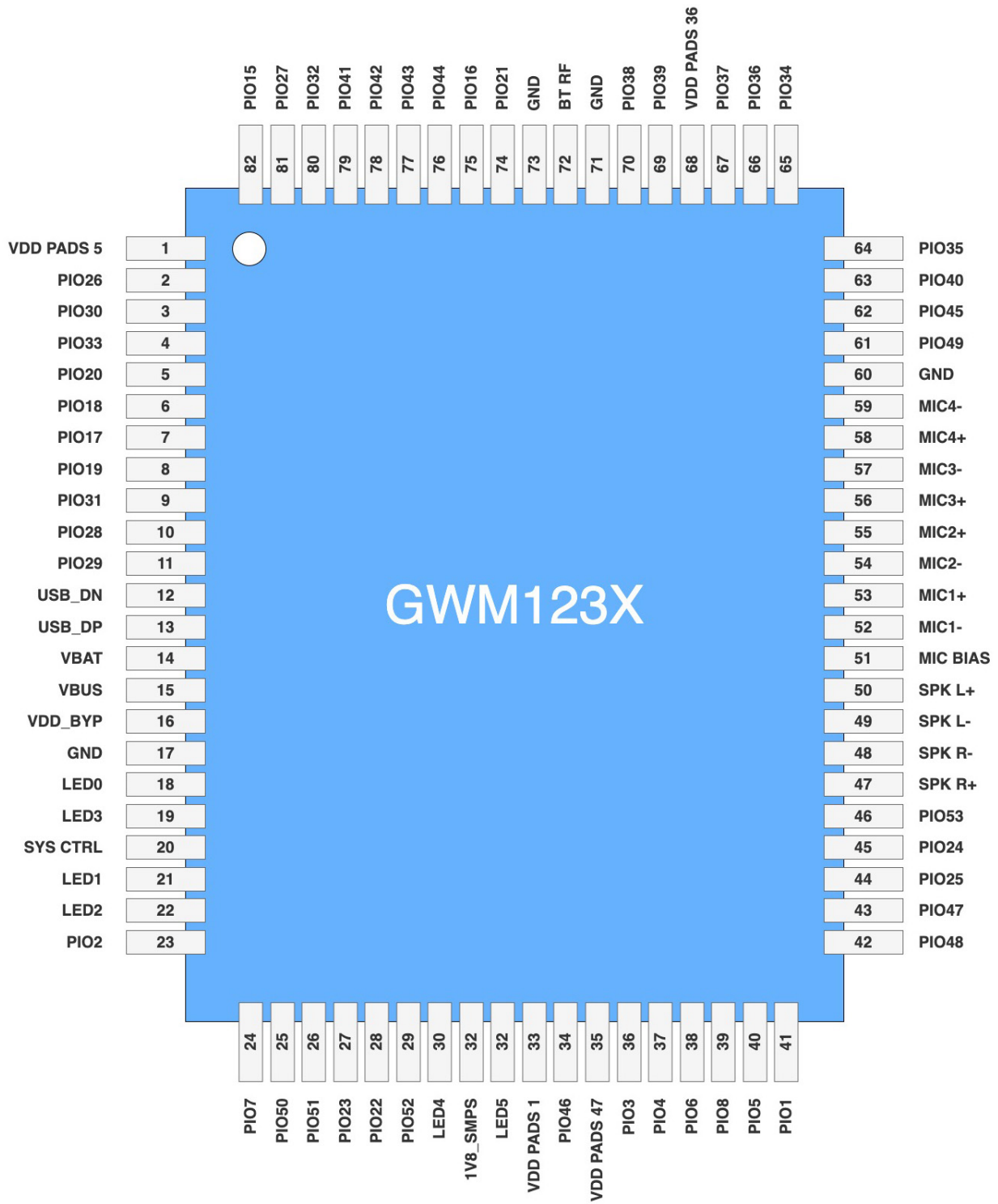
4. BLOCK DIAGRAM



5. TECHNICAL SPECIFICATIONS

Category	Description	Typical
General	VBUS	+5 V
	VBAT	+2.8 V ~ 4.6 V DC
	Antenna	External. (Optional PCB or i-pex for external)
	Digital I/O	UART / USB / SPI / I2C / GPIO / PWM / I2S / SPDIF
	Physical Size	6.7 mm x 7.4 mm x 1.0 mm
	Operation temperature	-40 ~ +85 °C
Power Consumption	Power Off	2 uA
	500 ms Bluetooth Sniff four slot no retries AFH on Sink App running Audio off	0.64 mA
	A2DP, SBC, EDR2, Headset	4.98mA
	Qualcomm TrueWireless Mirroring 1 A-Mic Wide Band (SBC) Headset LP DAC 2EV3 SCO cVc Passthrough	6.24 mA
Bluetooth	Bluetooth Version	Bluetooth V5.4
RF	Frequency Band	2.4GHz ISM (2.402 – 2.480GHz)
	Modulation Method	GFSK, PI/4 DQPSK, 8 DPSK
	Maximum Data Rate	6Mbps
	TX Power	+10 dBm, Class 1
	RX Sensitivity	-97 dBm
	RF Range (indoor)	10m
Audio	ADC General	Channels: Stereo
		Bit-depth: 24bit
		Sample rate: 44.1 / 48 / 88.2 / 96 KHz
	ADC Single-ended	SNR: 99.1 dB
		Dynamic Range: 99.7 dB
		THD+N: -91.4dB
	ADC Differential	SNR: 99.2dB
		Dynamic Range: 99.9 dB
		THD+N: -95.0dB
	DAC General	Channels: Stereo
		Bit-depth: 24bit
		Sample rate: 44.1 / 48 / 88.2 / 96 / 176.4 /192 /384 kHz
	DAC Class-D Mode	SNR: 105.1dB
		Dynamic Range: 101.6dB
		THD+N: -90.1 dB
	DAC Class-AB Mode	SNR: 104.8 dB
		Dynamic Range: 105 dB
		THD+N: -91.1 dB
	I2S interface	24bit I2S,
		3 input channels
		3 output channels
	SPDIF	2 configurable as input or output
	Frequency Response	20~20KHz

6. PIN ASSIGNMENT



Pin#	Pin name	Pin Type	Description
1	VDD_PADSS	Power input	1.8 V/3.3 V PIO supply.
2	PIO26	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 26.
3	PIO30	Digital: Bidirectional with programmable, strength internal pullup/pulldown	Programmable I/O line 30.
4	PIO33	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 33.
5	PIO20	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 20. Alternative function: PCM_DOUT[1]
6	PIO18	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 18. Alternative function: PCM_DOUT[0]
7	PIO17	Digital: Bidirectional with programmable, strength internal pullup/pulldown	Programmable I/O line 17. Alternative function: PCM_SYNC
8	PIO19	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 19. Alternative function: PCM_DIN[0]
9	PIO31	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 31.
10	PIO28	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 28.
11	PIO29	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 29.
12	USB_DN	Digital I/O	USB Full Speed device D- I/O. IEC-61000-4-2 (device level) ESD Protection
13	USB_DP	Digital I/O	USB Full Speed device D+ I/O. IEC-61000-4-2 (device level) ESD Protection
14	VBTA	Power input	Power input of module
15	VBUS	Analog input	Power input of module
16	VDD_BYP	Power output	Power output of module(3.3v)
17	GND	Ground	Ground
18	AIO[0]/ LED[0]	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
19	AIO[3]/ LED[3]	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
20	SYS_CTRL	Digital input	Typically connected to an ON/OFF push button. If power is present from the battery and/or charger, and

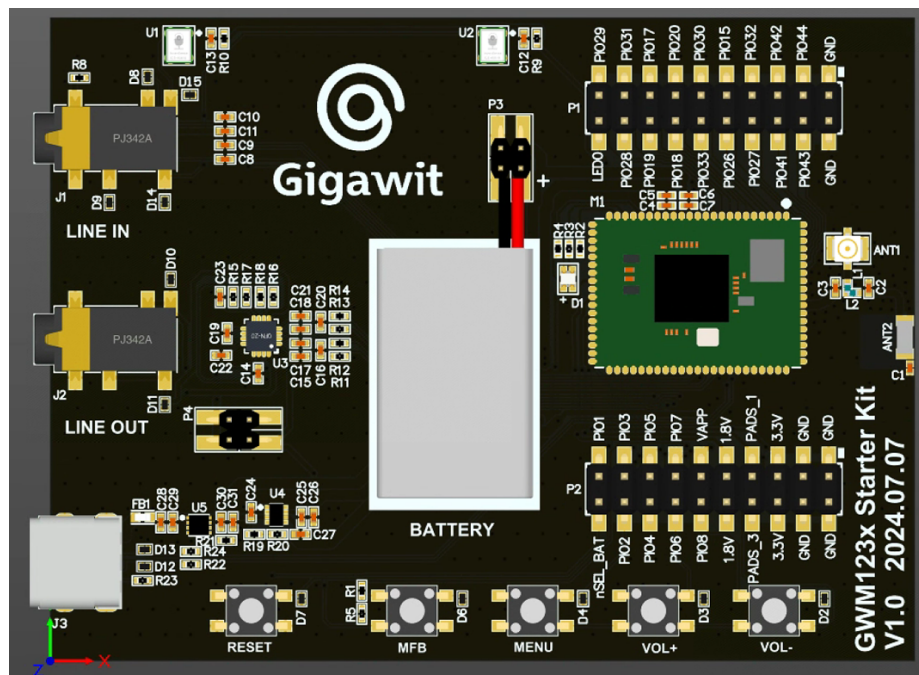
			software has placed the device in the OFF or DORMANT state, a button press boots the device. Also usable as a digital input in normal operation. No pull. Additional function: PIO[0] input only
21	AIO[1]/ LED[1]	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
22	AIO[2]/ LED[2]	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
23	PIO2	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 2. Alternative function: TRB_MSIO[3]
24	PIO7	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 7. Alternative function: TRB_MISO[0]
25	PIO50	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 50.
26	PIO51	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 55.
27	PIO23	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 23. Alternative function: PCM_DIN[2]
28	PIO22	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 22. Alternative function: PCM_DIN[1]
29	PIO52	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 52.
30	AIO[4]/ LED[4]	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
31	1V8_SMPS	Power output	Inductor connection for 1.8 VSMPS.
32	AIO[5]/ LED[5]	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
33	VDD_PADS_1	Supply	1.8 V/3.3 V PIO supply.
34	PIO46	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 46.
35	VDD_PADS_47	Supply	1.8 V/3.3 V PIO supply.
36	PIO3	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 3. Alternative function: TRB_MISO[2]
37	PIO4	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 4. Alternative function: TRB_MOSI[2]
38	PIO6	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 6. Alternative function: TRB_MOSI[0]

39	PIO8	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 8. Alternative function: TRB_CLK
40	PIO5	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 5. Alternative function: TRB_MISO[1]
41	PIO1	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Automatically defaults to RESET# mode when the device is unpowered, or in off modes. Reconfigurable as a PIO after boot. Alternative function: Programmable I/O line 1
42	PIO48	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 48.
43	PIO47	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 47.
44	PIO25	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 25.
45	PIO24	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 24.
46	PIO53	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 53.
47	SPK_R+	Analog Output	Headphone/speaker differential right output, positive. Alternative function: Differential right line output, positive.
48	SPK_R-	Analog Output	Headphone/speaker differential right output, negative. Alternative function: Differential right line output, negative.
49	SPK_L-	Analog Output	Headphone/speaker differential left output, positive. Alternative function: Differential right line output, positive.
50	SPK_L+	Analog Output	Headphone/speaker differential left output, negative. Alternative function: Differential right line output, negative.
51	MIC_BIAS	Analog	Mic bias output.
52	MIC1-	Analog	Microphone differential 1 input, negative. Alternative function: Differential audio line input left, negative
53	MIC1+	Analog	Microphone differential 1 input, positive. Alternative function: Differential audio line input left, positive
54	MIC2-	Analog	Microphone differential 2 input, negative. Alternative function: Differential audio line input left, negative
55	MIC2+	Analog	Microphone differential 2 input, positive. Alternative function: Differential audio line input left, positive

56	MIC3+	Analog	Microphone differential 3 input, positive. Alternative function: Differential audio line input left, positive
57	MIC3-	Analog	Microphone differential 3 input, negative. Alternative function: Differential audio line input left, negative
58	MIC4-	Analog	Microphone differential 4 input, negative. Alternative function: Differential audio line input left, negative
59	MIC4+	Analog	Microphone differential 4 input, positive. Alternative function: Differential audio line input left, positive
60	GND	Ground	Ground
61	PIO49	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 49.
62	PIO45	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 45.
63	PIO40	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 40.
64	PIO35	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 35. Alternative function: QSPI2_CLK
65	PIO34	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 34. Alternative function: QSPI2_IO[0]
66	PIO36	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 36. Alternative function: QSPI2_IO[2]
67	PIO37	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 37. Alternative function: QSPI2_IO[1]
68	VDD_PADS_36	Supply	1.8 V/3.3 V PIO supply.
69	PIO39	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 39. Alternative function: QSPI2_IO[3]
70	PIO38	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 38. Alternative function: QSPI2_CS#0
71	GND	Ground	Ground
72	BT_RF	BT_RF	Bluetooth transmit/receive.
73	GND	Ground	Ground
74	PIO21	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 21. Alternative function: PCM_DOUT[2]
75	PIO16	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 16. Alternative function: PCM_CLK

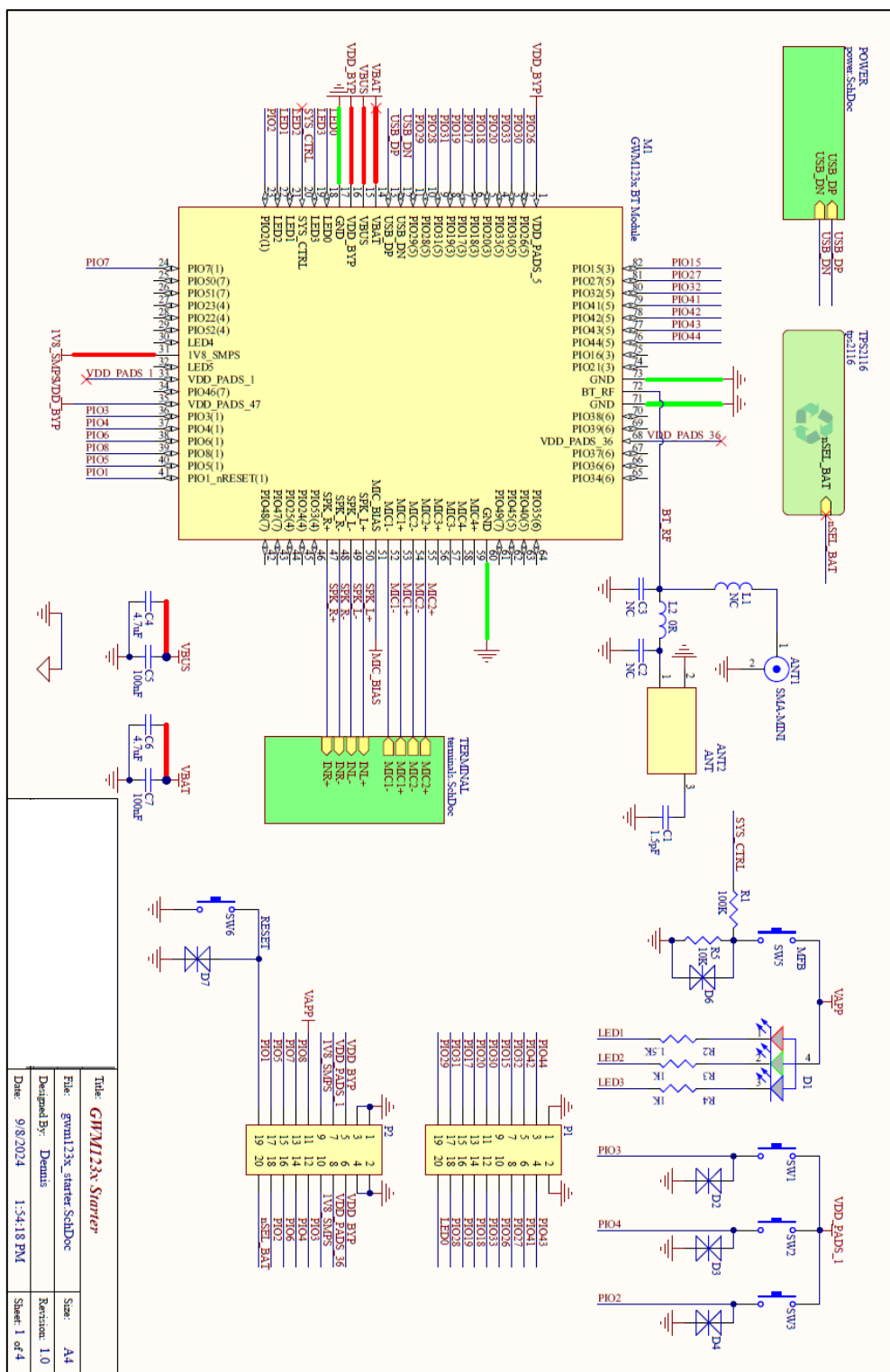
76	PIO44	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 44.
77	PIO43	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 43.
78	PIO42	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 42.
79	PIO41	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 41.
80	PIO32	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 32.
81	PIO27	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 27.
82	PIO15	Digital: Bidirectional with programmable strength internal pull-up/pull-down	Programmable I/O line 15. Alternative function: MCLK_OUT

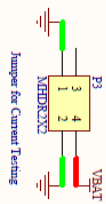
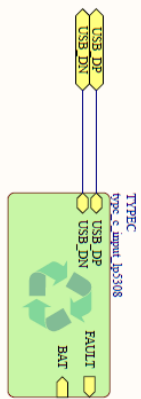
7. DEMO BOARD



GWM123x demo board provides a complete application circuit where customer can evaluate each feature of the standard firmware, or any customized firmware.

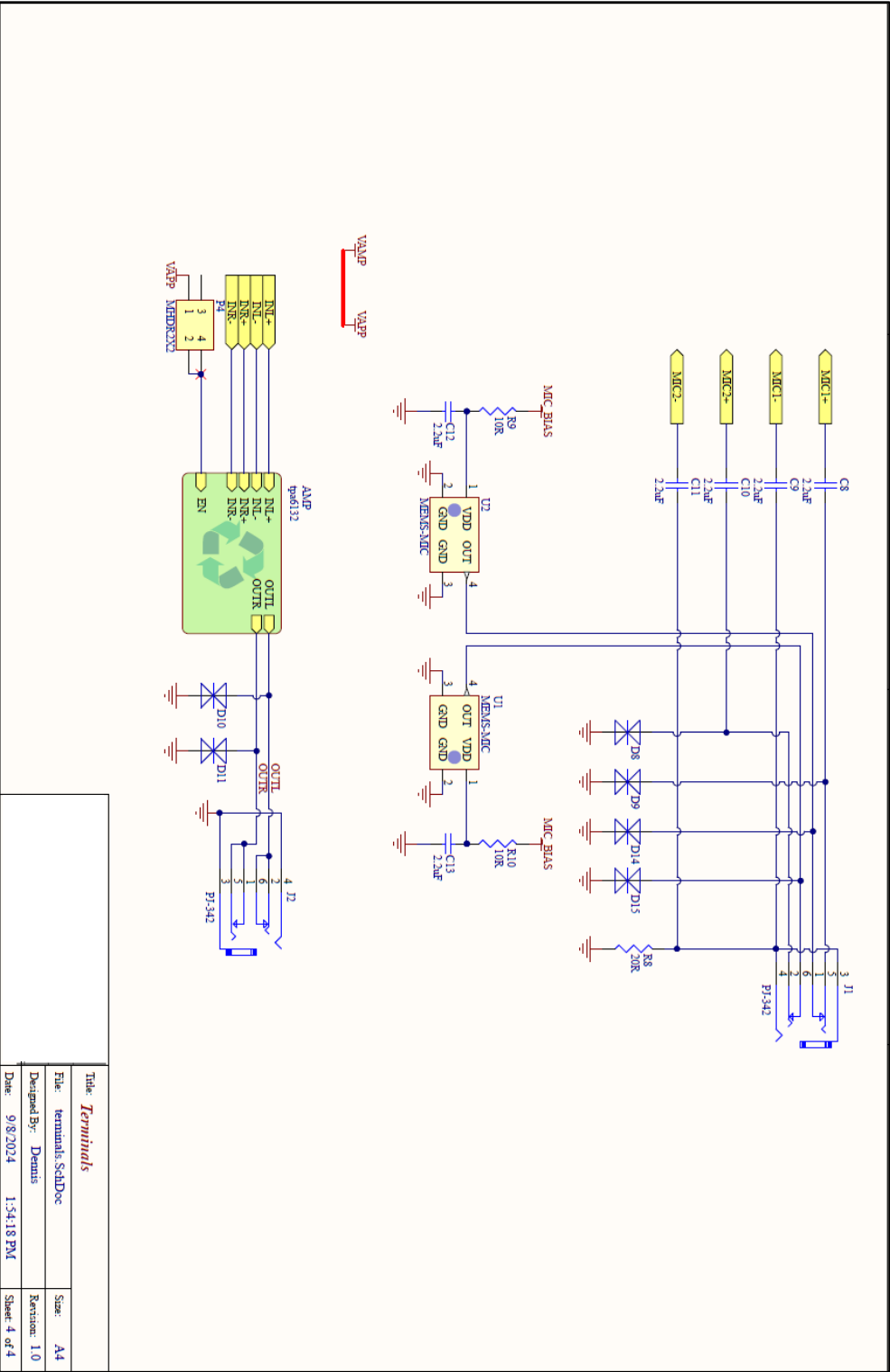
8. DEMO BOARD SCHEMATICS

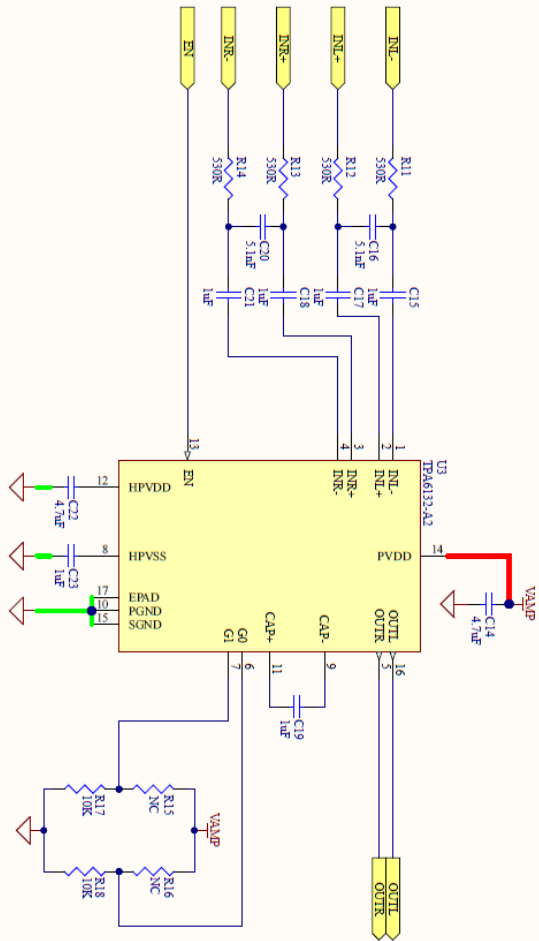




Jumpers for Current Testing

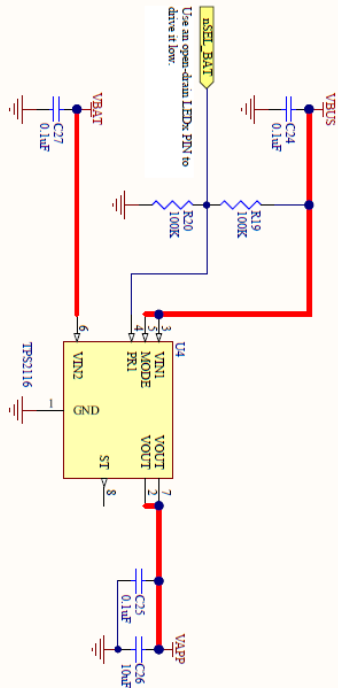
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G0 VOLTAGE	G1 VOLTAGE	AMPLIFIER GAIN
$\leq 0.5\text{ V}$	$\leq 0.5\text{ V}$	-6 dB
$\geq 1.3\text{ V}$	$\geq 0.5\text{ V}$	0 dB
$\leq 0.5\text{ V}$	$\geq 1.3\text{ V}$	3 dB
$\geq 1.3\text{ V}$	$\geq 1.3\text{ V}$	6 dB

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7.3.1 Truth Table

The below table shows the expected behavior of the TPS2116. For Priority mode, VIN1 is connected to PRI1 through a resistor divider.

MODE	VIN1	VIN2	PRI1	ST	VOUT
VIN1 (Priority mode)	High (VIN1 > 1.6V)	X	VIN1 through resistor divider	High	VIN1
	Low (VIN1 < 1.6V)	≥ 1.5 V		Low	VIN2
External Bias ≥ 1 V (Manual mode)	≥ 1.5 V	X		High	VIN1
	X	≥ 1.5 V		Low	VIN2
External Bias < 0.25 V (Manual mode)	X	X		High	VIN2
	X	> VIN1		Low	VIN1

TPS2116
INSTRUMENTS

TPS2116 1.6 V to 5.5 V, 2.5-A Low I_Q Power Mux with Manual and Priority Switchover

TPS2116
SILICON
JANUARY 2011 – REVISION 000/000

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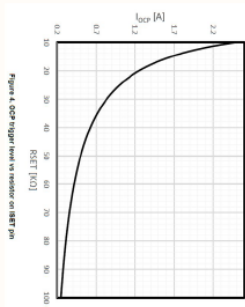
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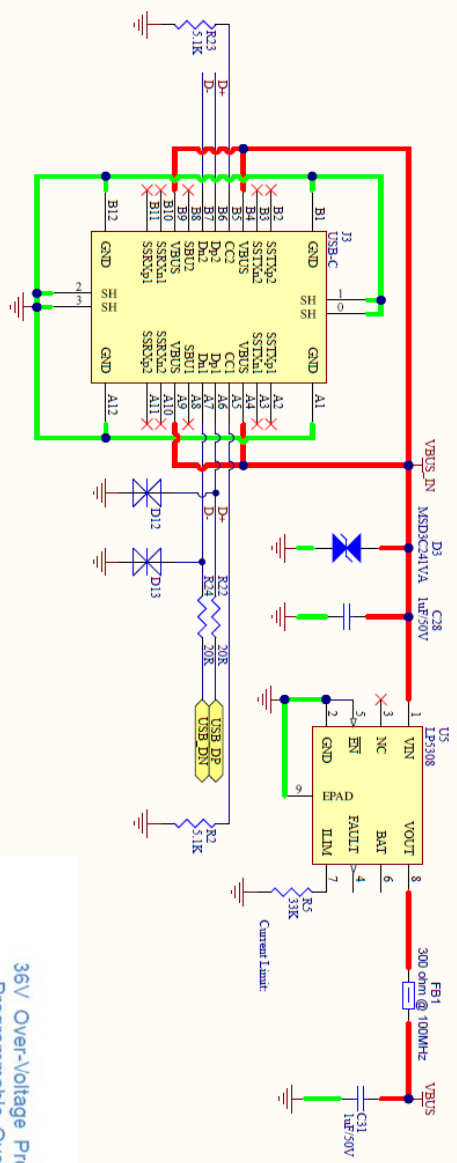
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LP5308 36V Over-Voltage Protection Switch with Programmable Over-Current Protection

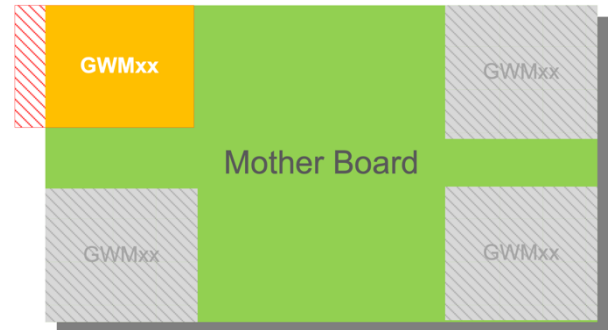


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9. MOUNTING REQUIREMENTS

GWM123x is a sensitive RF part; it needs to be mounted at the corner of the mother circuit board and reserve some keep out space to the components on the mother board. Try to keep them away with metal components like Speakers, Transformers, Batteries, Big Aluminum Capacitors, Heat Sinks and Metal Panels.

The figure illustrates how to mount the GWM123x module. Improper mounting will decrease the RF performance dramatically.



10. PHYSICAL DIMENSIONS

