DATA SHEET

GPMQ8205B

QI Compliant Wireless Power Transmitter and Receiver the same coil

Preliminary

Jun. 16, 2017

Version 0.1

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1. GENERAL DESCRIPTION

GPMQ8205B is high integrated solution for QI Compliant Wireless Power Transmitter & Receiver. GPMQ8205B is the power of 5 watts of transmitter & receiver chip, ,which can support the Qi TX and RX 2 kinds of specifications. In QI TX mode, contains ASK demodulation and ASK modulation function, the Wireless Power Transfer Transmitter should monitor all the communication from Mobile device and adjust the power applies to the power coil. In QI RX mode, the Wireless Power Transfer Receiver should adjust the communication to control the power of the coil. TX / RX funtion can be controlled by external I/O switching mode, when the external switching mode I/O no signal will start the sleep mode, save battery power.

2. FEATURES

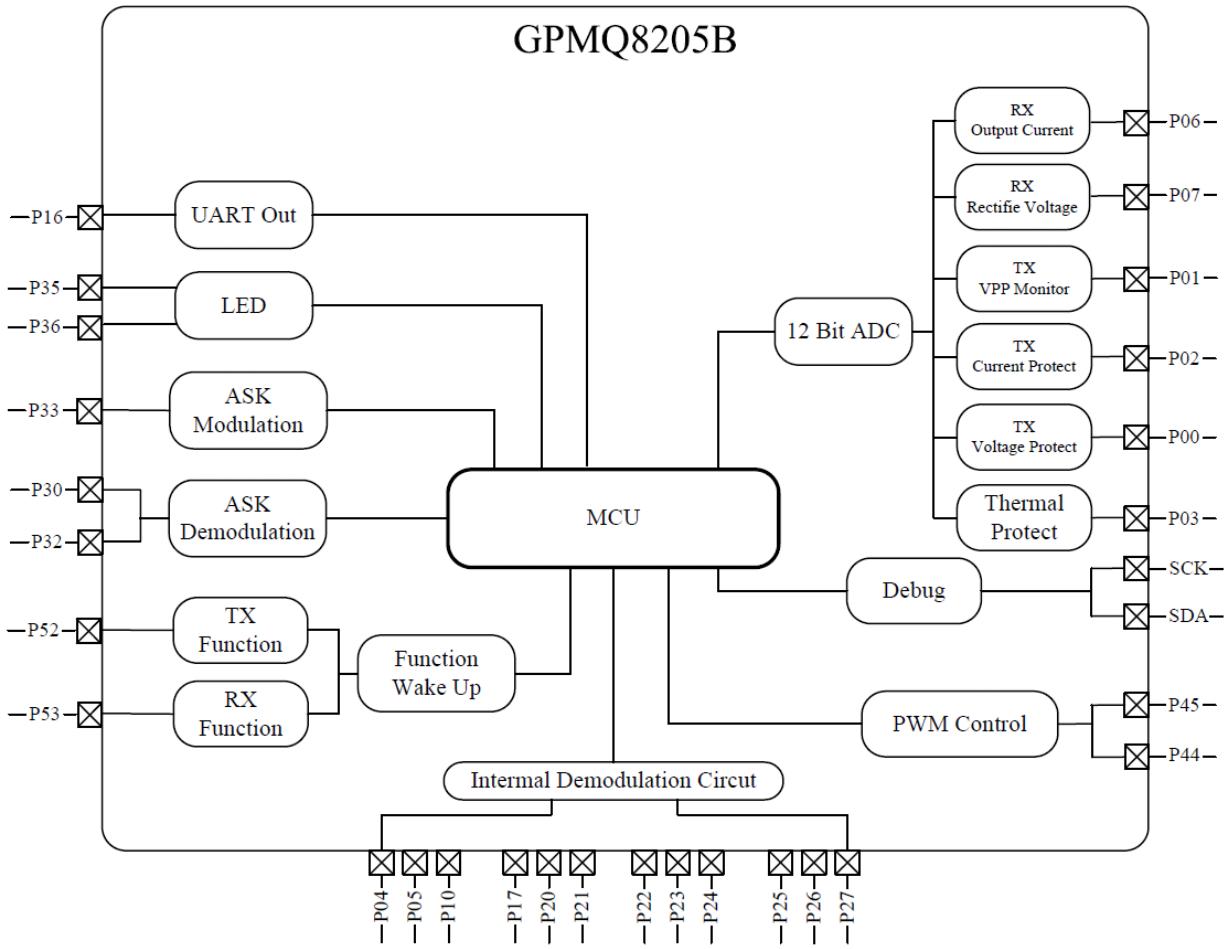
2.1 TX MODE FEATURES

- Conform to the Wireless Power Consortium (WPC) V1.2.2 Specification
- Status Indicator.
  - Charge complete
  - Charging
  - Error (Transmitter over current , QI standard error message)
  - Standby
- Auto detecting the object put on and take off.
- Over Temperature protection.
- Over Voltage protection.
- Over Current protection.
- Low power input protection.
- Learning function when the coil is changed.
- charging efficiency greater than 70%
- Package: LQFP 48
- System input is 5.3v/2.4A.

2.2 RX MODE FEATURES

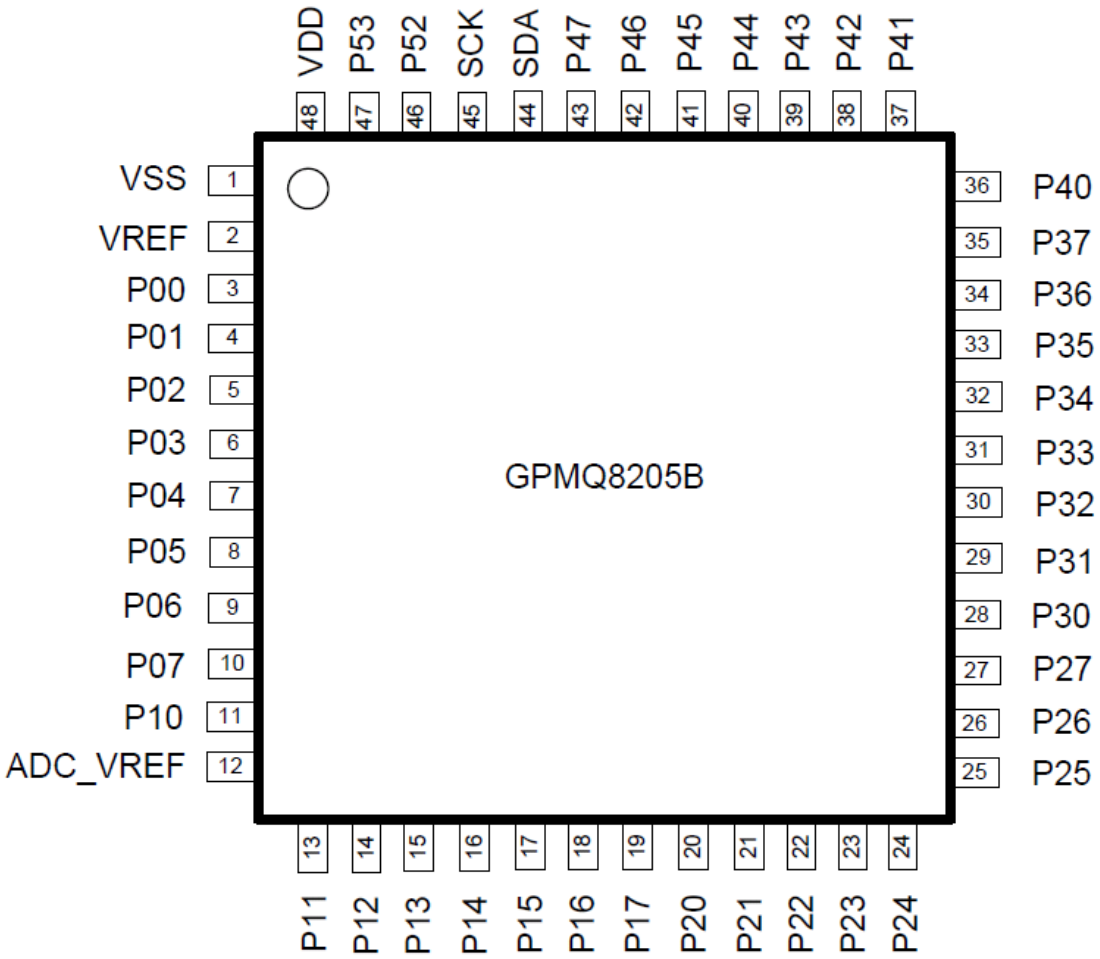
- Conform to the Wireless Power Consortium (WPC) V1.2.2 Specification
- High precision rectified voltage control
- Supports 5V/1A Output

3. BLOCK DIAGRAM



4. SIGNAL DESCRIPTIONS

4.1 GPMQ8205B Package Pin Sequence (LQFP48)



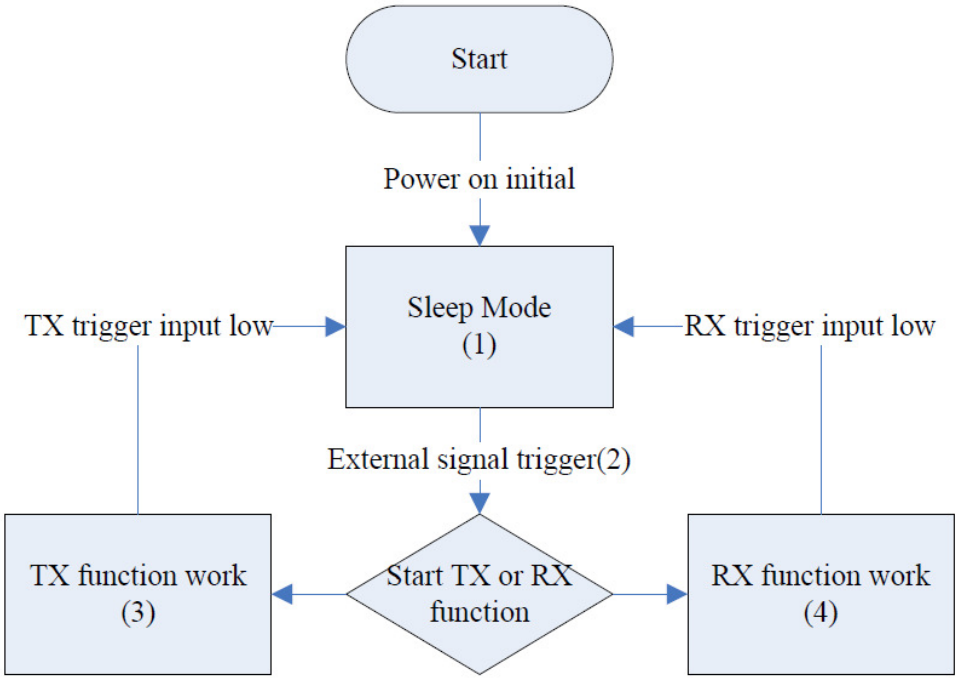
4.2 GPMQ8205B Pin descriptor

No.	I/O	Name	I/O	Description
1	VSS	VSS	I	Ground.
2	VREF	VREF	-	-
3	P00	VDET	I	TX mode, VPP voltage protect.
4	P01	VOVP	I	TX mode, Coil AC point over voltage protect.
5	P02	VOCP	I	TX mode, over current protect.
6	P03	VOTP	I	Over temperature protection.
7	P04	OP0_Out	O	Internal De-modulation Circuit0
8	P05	OP0_N	I	Internal De-modulation Circuit0
9	P06	I_Sen	I	RX module, current sensor pin.
10	P07	V_Sen	I	RX module, rectified voltage sensor pin.
11	P10	OP0_P	I	Internal De-modulation Circuit0
12	ADC_REF	ADC_REF	-	-
13	P11	Saving	O	Sleep mode, power saving PIN
14	P12	NC	-	NC
15	P13	NC	-	NC
16	P14	NC	-	NC
17	P15	NC	-	NC
18	P16	TXD	O	UART TX.
19	P17	OP1_Out	I	Internal De-modulation Circuit1
20	P20	OP1_N	I	Internal De-modulation Circuit1
21	P21	OP1_P	I	Internal De-modulation Circuit1
22	P22	OP2_Out	I	Internal De-modulation Circuit2
23	P23	OP2_N	I	Internal De-modulation Circuit2
24	P24	OP2_P	I	Internal De-modulation Circuit2
25	P25	OP3_Out	I	Internal De-modulation Circuit3
26	P26	OP3_N	I	Internal De-modulation Circuit3
27	P27	OP3_P	I	Internal De-modulation Circuit3
28	P30	CAP0	I	TX mode, Internal Demodulator0.
29	P31	NC	-	NC
30	P32	CAP2	I	TX mode, Internal Demodulator2.
31	P33	COMM	O	RX mode, ASK modulator output.
32	P34	NC	-	NC
33	P35	LED1	O	TX / RX LED Indicator 1. Output low when active.
34	P36	LED2	O	TX / RX LED Indicator 2. Output low when active.
35	P37	NC	-	NC
36	P40	NC	-	NC
37	P41	IO1	I/O	General I / O PIN.
38	P42	IO2	I/O	General I / O PIN.
39	P43	IO3	I/O	General I / O PIN.
40	P44	PWM1	I	PWM Output 1
41	P45	PWM2	I	PWM Output 2
42	P46	ST	-	TX & RX mode is enabled, when loaded is pulled high.
43	P47	IO4	I/O	General I / O PIN.
44	SDA	SDA	I/O	SDA(2 wire serial bus data input/output line)

45	SCK	SCK	I	SCK (2 wire serial bus data input/output line)
46	P52	TXWP	I	Sleep mode, input high wake up TX mode (When in the TX mode, Intput low to sleep mode).
47	P53	RXWP	I	Sleep mode, input high wake up RX mode (When in the RX mode, Intput low to sleep mode).
48	VDD	VDD	I	Power 5V input

5. FUNCTIONAL DESCRIPTIONS

5.1 GPMQ8205B Flow Diagram



5.1.1 Sleep Mode(1)

System power on to complete the initialization state will start the sleep state, the status works with low power, continue waiting for external signal input. In the TX or RX operating state can also enter the sleep mode from the IO state, Sleep mode standby current <10mA, Can be used with battery application.

5.1.2 External signal trigger(2)

The external input signal wakes up the MCU to operate, GPMQ8205B has two wake-up PINs respectively for TX & RX wake-up. Triggered in sleep mode, the trigger source is rising edge, the signal rises need to remain high, but the signal is low, the system into sleep mode.

Chip	Trigger PIN	Set Function	H/L Trigger Level	Unit
GPMQ8205B	P52	TX mode	1/2 Vcc	V
GPMQ8205B	P53	RX mode	1/2 Vcc	V

5.1.3 TX function work(3)

The GPMQ8205B initiates the transmitter mode via an external trigger, this mode is compatible with the QI1.2.2 5W protocol, Enable PWM function, can be observed by the P46 state of charge, If the receiver power is provided that is pulled high, remove the receiver pull low, provided to the external management IC control status.

IO1~IO4 in the transmitter, the logic output is as follows:

Chip	PIN	Name	Output	Unit
GPMQ8205B	P41	IO1	5	V
GPMQ8205B	P42	IO2	5	V
GPMQ8205B	P43	IO3	5	V
GPMQ8205B	P47	IO4	0	V

5.1.3.1 QI Compliant Wireless Transmitter 1.2.2 Specification.

Conforms the QI standard of version 1.2.2. , QI system now supporting up to 5W.

5.1.3.2 Strong Demodulation for QI Packet

Demodulation is very important for QI transmitter. GPMQ8205B uses flexible process to resolve this problem. They have high performance at demodulating the PACKET. This method is now patent pending in many countries. GPMQ8205B uses the same method and builds in the circuit inside. The components outside are less than GPMQ80XXA

5.1.3.3 Over Voltage Protection

The system will protect and show the alarm message when the voltage pin (P01) detects the alarm voltage. System will not stop and keep the current limit charging.

Chip	Voltage Pin Protect Voltage	Unit	AC Voltage detect resister
GPMQ8205B	1.6	V	R1,R4

User can modify the Dividing resistor to modify the over voltage protection level.

5.1.3.4 Over Current Protection

The system will protect and show FOD message when the current pin (P02) detects the alarm voltage. System will not stop and keep the current limit charging.

Chip	Current Pin Protect Voltage	Unit	Current amplifier resister
GPMQ8205B	2.4	V	GPMD5130A current sensor output

User can modify the current amplifier resister to modify the over current protection level.

5.1.3.5 LED INDICATE

LED Pin is P35 and P36. The output low sink current is 20mA.

Low(0): LED ON

High(1): LED OFF

GPMQ8205B

Condition	P35	P36	Description
Standby	Keep OFF	Keep OFF	When the transmitter does not detect any Qi Mobile device.
Charging	Keep OFF	Keep ON	When the transmitter receives Qi mobile device.
Charge Complete	Keep ON	Keep OFF	When the transmitter receives the charge complete packet. System stops charge and wait 5 minutes. After 5 minutes, system will restart again. After restarting for 3 times, system will stop until user removes the RX from the surface of TX.
Error	Keep OFF	Flashing	1. When the transmitter receives QI Error Code list as below. - D_QI_EndPowerTransfer_InternalFault - D_QI_EndPowerTransfer_OverVoltage - D_QI_EndPowerTransfer_OverCurrent - D_QI_EndPowerTransfer_BatteryFailure - D_QI_EndPowerTransfer_Unkown - D_QI_EndPowerTransfer_NoResponse - Thermal Protection: If the thermal protection occurs, an error message shows up. 2. When the system receives the package, system will stop and restart again right away. After receiving 5 times of error message, system will stop until user removes the RX from the surface of TX.
FOD/USB warning	P35 ON , P36 OFF(0.5s) ➔ P35 ON , P36 OFF(0.5s) ➔Close Both(0.5s) ➔Repeating		1. USB Power not enough. 2. Foreigner Object detection. 3. Power(Current) Limit

5.1.4 RX function work(4)

The GPMQ8205B initiates the receiver mode via an external trigger, this mode is compatible with the QI1.2.2 5W protocol, the maximum current can be output 1A supply battery power, in this state the P46 provides output load observations, when output current > 200mA, When the output current> 200mA, P46 will pull high, provided to the external management IC control status. Enable RX mode, LED2 always ON.

IO1~IO4 in the transmitter, the logic output is as follows:

Chip	PIN	Name	Output	Unit
GPMQ8205B	P41	IO1	0	V
GPMQ8205B	P42	IO2	0	V
GPMQ8205B	P43	IO3	0	V
GPMQ8205B	P47	IO4	5	V

5.1.4.1 QI Compliant Wireless Receiver 1.2.2 Specification.

Accord the QI standard of version 1.2.2. , QI system now supporting to 5W.

5.1.4.2 ASK Modulation for QI Packet

ASK modulation is the core of the wireless charging receiver. GPMQ8205B uses standard QI communication protocol,He can be compatible with all QI protocol launchers, Through the ASK modulation can control the transmitter output power, and thus achieve the effect of stable control

6. ELECTRICAL SPECIFICATIONS

Absolute Maximum Rating

Characteristics	Symbol	Ratings
DC Supply Voltage	V_+	-0.3V ~ 6.0V
Input Voltage Range	V_{IN}	-0.3V to V_+ + 0.3V
Operating Temperature	T_A	-40℃ to +85℃
Operation Current	Iop	10mA

DC Characteristics (TA = 25℃)

Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
Operating Voltage	VDD	-	5.0	-	V	
Operating Current	I_{OP}	-	-	15.0	mA	
Standby Current	I_{STBY}	-	-	10.0	uA	
Input High Level	V_{IH}	0.7VDD	-	-	V	VDD = 5.0V
Input Low Level	V_{IL}	-	-	0.3VDD	V	VDD = 5.0V
Output High Level	V_{OH}	0.8VDD	-	-	V	I_{OH} = -8mA at VDD = 5.0V
Output Low Level	V_{OL}	-	-	0.2VDD	V	I_{OL} = 20mA at VDD = 5.0V
Input Pull High Resistor	R_{PH1}	30	50	70	KΩ	
Input Pull Low Resistor	R_{PL1}	30	50	70	KΩ	

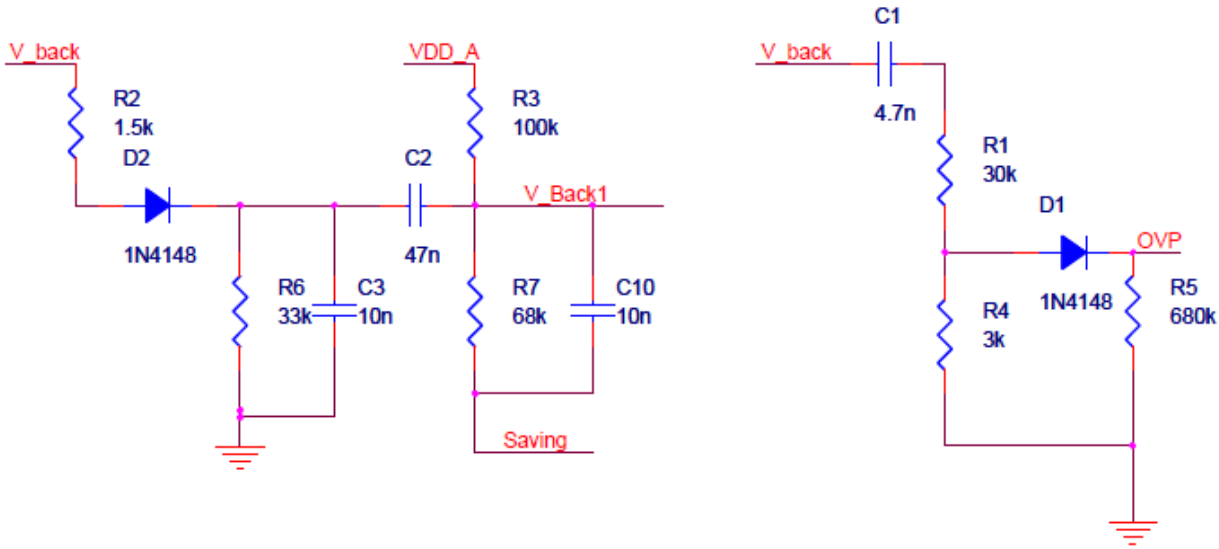
ADC Characteristics (TA = 25℃) 12bit

Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
Operating Voltage	VDD	-	5.0	-	V	
ADC Input Voltage Range	V_{ADCIN}	0	-	VDD	V	
ADC Clock Period	T_{AD}	-	0.5	-	us	ADCLK=2MHz
Resolution		12			Bit	
No Missing Code		10			bits	
ADC Conversion Time	T_{CON}	-	4	-	us	
Integral Linearity Error	E_{INL}	-	±2	±3	LSB	
Differential Linearity Error	E_{DNL}	-	-1~+2	-1~+3	LSB	

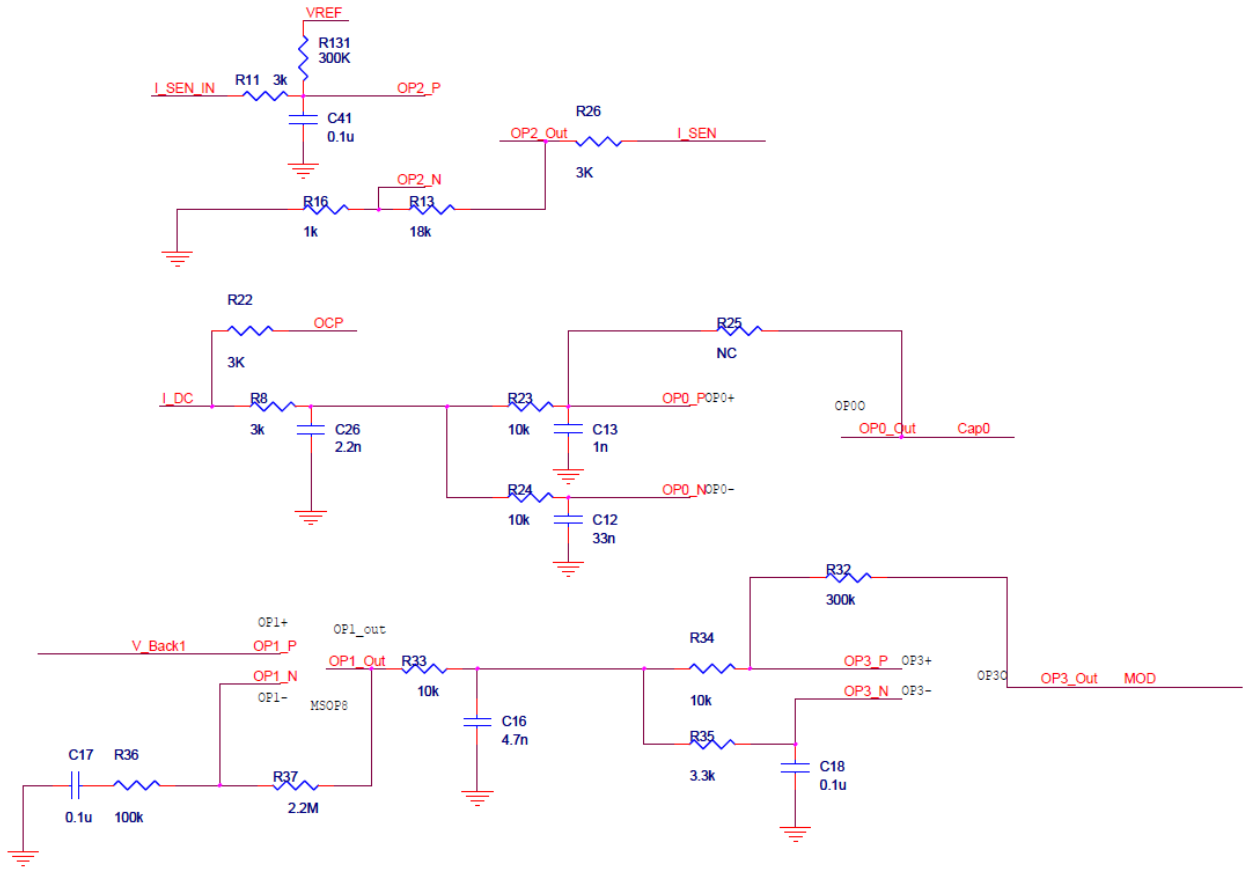
7. APPLICATION CIRCUITS

7.1 GPMQ8205B application

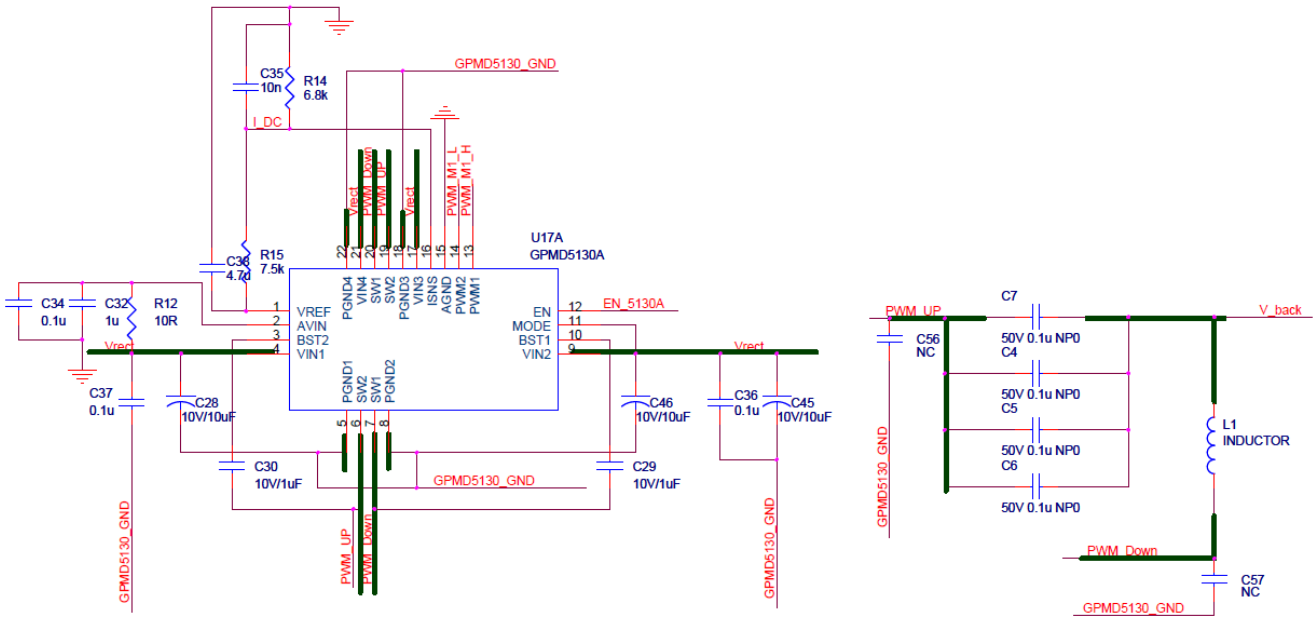
7.1.1 Feedback



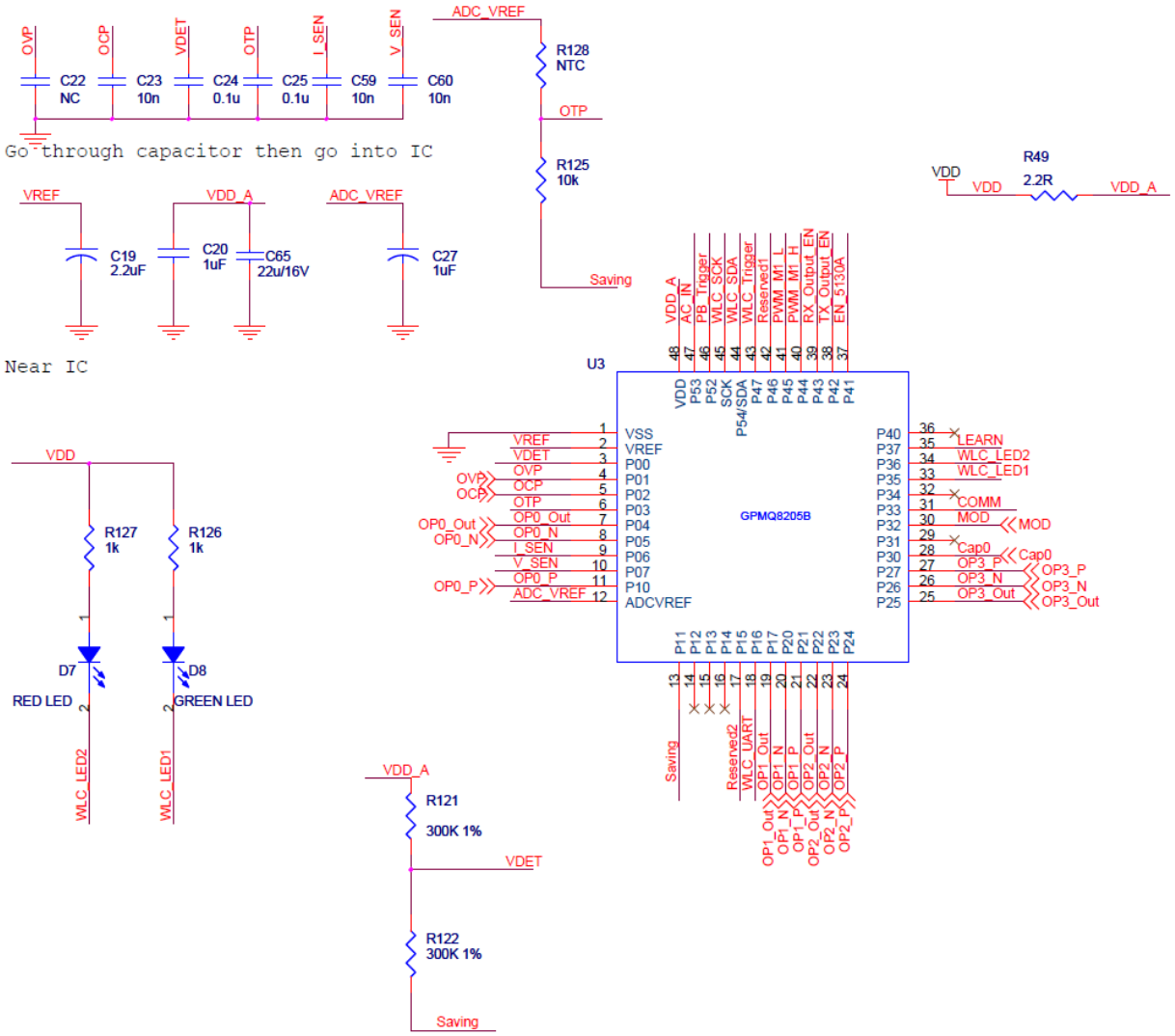
7.1.2 Feedback2



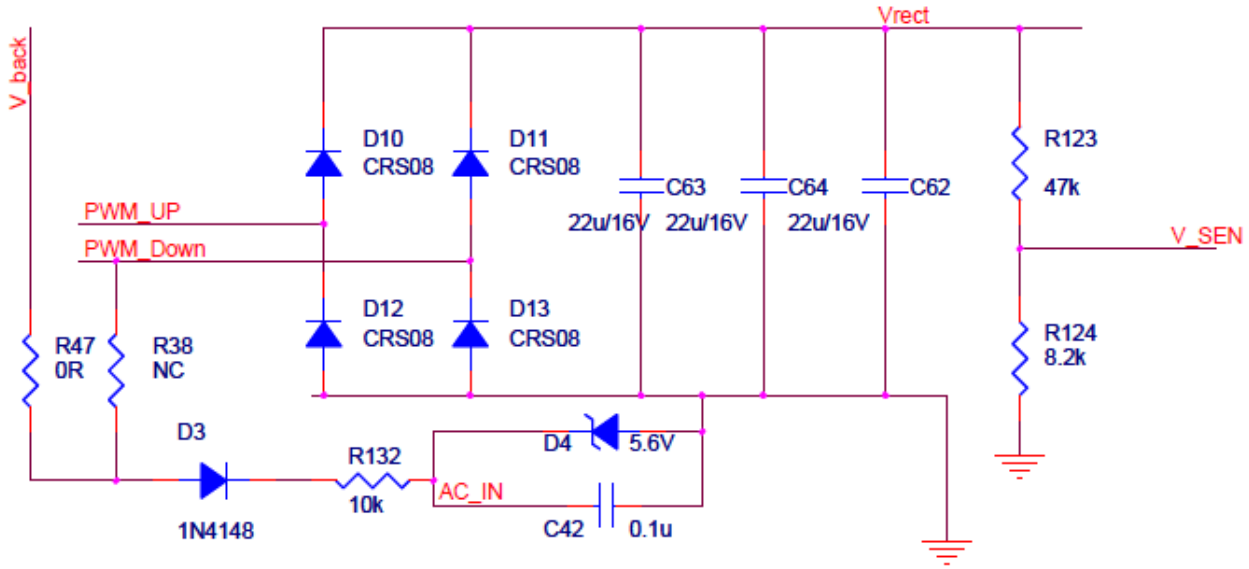
7.1.3 Full Bridge

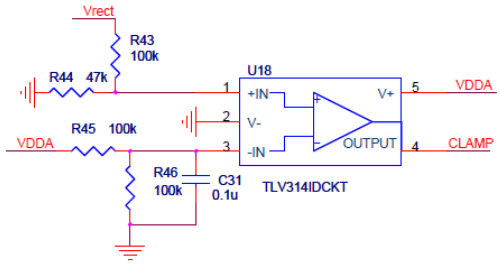


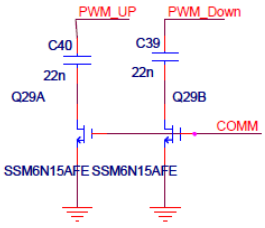
7.1.4 MCU

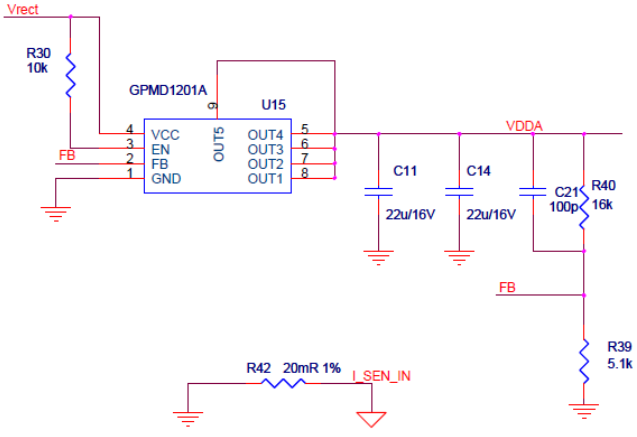

OVP
OCP
VDET
OTP
I_SEN
V_SEN
C22 NC
C23 10n
C24 0.1u
C25 0.1u
C59 10n
C60 10n
ADC_VREF
R128 NTC
OTP
R125 10k
Saving
Go through capacitor then go into IC
VREF
VDD_A
ADC_VREF
C19 2.2uF
C20 1uF
C65 22u/16V
C27 1uF
Near IC
R49 2.2R
VDD
VDD_A
U3
GPMQ8205B
VSS
VREF
P00
P01
P02
P03
P04
P05
P06
P07
P10
ADCVREF
P40
P37
P36
P35
P34
P33
P32
P31
P30
P27
P26
P25
LEARN
WLC_LED2
WLC_LED1
COMM
MOD
Cap0
OP3_P
OP3_N
OP3_Out
VDD_A
AC_IN
PB_Trigger
WLC_SCK
WLC_SDA
WLC_Trigger
Resened1
PWM_M1_L
PWM_M1_H
RX_Output_EN
TX_Output_EN
EN_5130A
R127 1k
R126 1k
D7
D8
RED LED
GREEN LED
WLC_LED2
WLC_LED1
R121 300K 1%
R122 300K 1%
VDET
Saving
Resened2
WLC_UART
OP1_Out
OP1_N
OP1_P
OP2_Out
OP2_N
OP2_P

7.1.5 **Bridge** Rectifier**&** LDO









7.2 BOM

Item	Quantity	Reference	Part	PCB Footprint
1	2	C1,C16	4.7n	C-0603
2	1	C2	47n	C-0603
3	6	C3,C10,C23,C35,C59,C60	10n	C-0603
4	4	C4,C5,C6,C7	50V 0.1u NP0	C-1206
5	6	C11,C14,C62,C63,C64,C65	22u/16V	C-0805
6	1	C12	33n	C-0603
7	4	C13,C44,C48,C61	1n	C-0603
8	7	C15,C33,C43,C47,C51,C52,C53	10u/6.3V	C-0603
9	11	C17,C18,C24,C25,C31,C34,C36,C37,C41,C42,C55	0.1u	C-0603
10	1	C19	2.2uF	C-0603
11	2	C20,C27	1uF	C-0603
12	1	C21	100p	C-0603
13	4	C22,C50,C56,C57	NC	C-0603
14	1	C26	2.2n	C-0603
15	3	C28,C45,C46	10V/10uF	C-0603
16	2	C29,C30	10V/1uF	C-0603
17	1	C32	1u	C-0603
18	1	C38	4.7u	C-0603
19	2	C39,C40	22n	C-0603
20	2	C49,C58	0.22u	C-0603
21	1	C54	22u	C-0805
22	3	D1,D2,D3	1N4148	D-0805
23	1	D4	5.6V	DIODE-SOD523
24	4	D5,D6,D14,D15	LED	D-0603
25	1	D7	RED LED	LED-0603
26	1	D8	GREEN LED	LED-0603
27	4	D10,D11,D12,D13	CRS08	D-1206
28	1	L1	INDUCTOR	L-SMD-6.0
29	1	L2	4.7uH/4A	L-SMD-4.3
30	1	Q1	NPN(8050L)	SOT-23-1
31	1	Q28	SSM6N55NU	UDFN6
32	1	Q29	SSM6N15AFE	SSM6N15AFE
33	1	R1	30k	R-0603
34	1	R2	1.5k	R-0603
35	5	R3,R36,R43,R45,R46	100k	R-0603
36	5	R4,R8,R11,R22,R26	3K	R-0603
37	1	R5	680k	R-0603
38	1	R6	33k	R-0603
39	1	R7	68k	R-0603
40	9	R9,R19,R23,R24,R30,R33,R34,R125,R132	10k	R-0603

Item	Quantity	Reference	Part	PCB Footprint
41	4	R10,R16,R126,R127	1k	R-0603
42	1	R12	10R	R-0603
43	1	R13	18k	R-0603
44	1	R14	6.8k	R-0603
45	1	R15	7.5k	R-0603
46	1	R17	24k	R-0603
47	1	R18	2.2R	R-0603
48	3	R20,R21,R48	51k	R-0603
49	2	R25,R38	NC	R-0603
50	1	R27	1M	R-0603
51	1	R28	200k 1%	R-0603
52	1	R29	390k	R-0603
53	1	R31	100k 1%	R-0603
54	2	R32,R131	300K	R-0603
55	1	R35	3.3k	R-0603
56	1	R37	2.2M	R-0603
57	1	R39	5.1k	R-0603
58	1	R40	16k	R-0603
59	2	R41,R50	10mR 1%	R-1206
60	1	R42	20mR 1%	R-1206
61	2	R44,R123	47k	R-0603
62	1	R47	0R	R-0603
63	1	R49	2.2R	R-0805
64	2	R121,R122	300K 1%	R-0603
65	1	R124	8.2k	R-0603
66	1	R128	NTC	R-0805
67	1	SW2	TACK	SW-TACT-SR
68	1	USB1	USB_IN	USBMICRO
69	1	USB2	USB_OUT	USB-1F-3
70	1	U3	GPMQ8205B	QFP48-0.5
71	5	U6,U7,U11,U13,U16	3401	SOT-23-1
72	2	U9,U12	8205-SOT-23-6	SOT-23-6
73	2	U10,U14	3400	SOT-23-1
74	1	U15	GPMD1201A	DFN8-0.65-3X3
75	1	U17	GPMD5130A	QFN-16-N-A
76	1	U18	TLV314IDCKT	SOT-353
77	1	U19	GPM8P2204B_SSOP20	DIP20-SSOP150
78	1	U20	XB8089G	DIP8-SOP150B

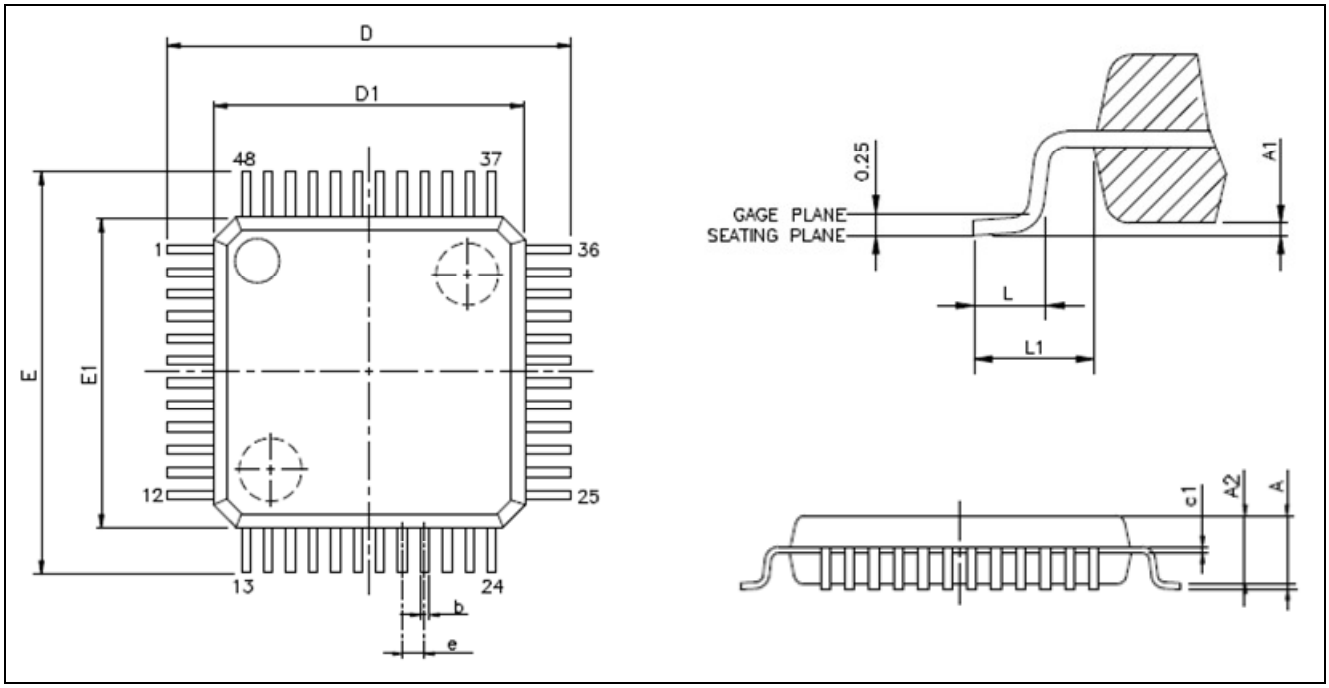
8. PACKAGE/PAD LOCATIONS

8.1 Ordering Information

Product Number	Package Type
GPMQ8205B-xxxA-QL23x	LQFP48

8.2 Package Information

8.3 LQFP 48



Symbol	Millimeter		
	Min.	Nom.	Max.
A	-	-	1.60
A1	0.05	-	0.15
A2	1.35	-	1.45
c1	0.09	-	0.16
D	9.00 BSC		
D1	7.00 BSC		
E	9.00 BSC		
E1	7.00 BSC		
e	0.50 BSC		
b	0.17	-	0.27
L	0.45	-	0.75
L1	1.00 REF		

9. DISCLAIMER

The information appearing in this publication is believed to be accurate.

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10. REVISION HISTORY

Date	Revision #	Description	Page
Jun. 16, 2017	1.0	Original	-