DATA SHEET

GPMQ8018A,GPMQ8012A
GPMQ8012A_3C,GPMQ8005A

QI Compliant Wireless Power Transmitter Series

Preliminary

OCT. 11, 2012

Version 0.1

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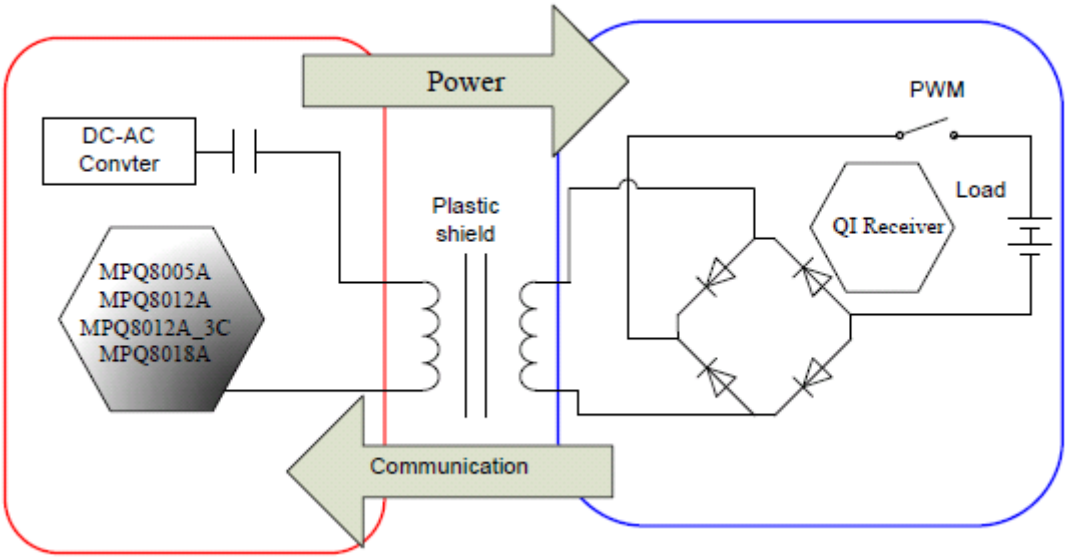
QI Compliant Wireless Power Transmitter Series

1.1.1.1. GENERAL DESCRIPTION

GPMQ80XXA series are high integrated solution for QI Compliant Wireless Power Transmitter. XX means the DC supply voltage. In this series, we support 5V, 12V and 18V solutions. This series are intelligent to monitor the QI Compliant Mobile Device , Voltage , Current and Environment Temperature and do the right control. 2 LED indicates the condition happens in system. In general QI format, the Wireless Power Transfer Transmitter should monition all the communication from Mobile device and adjust the power applies to the power coil.

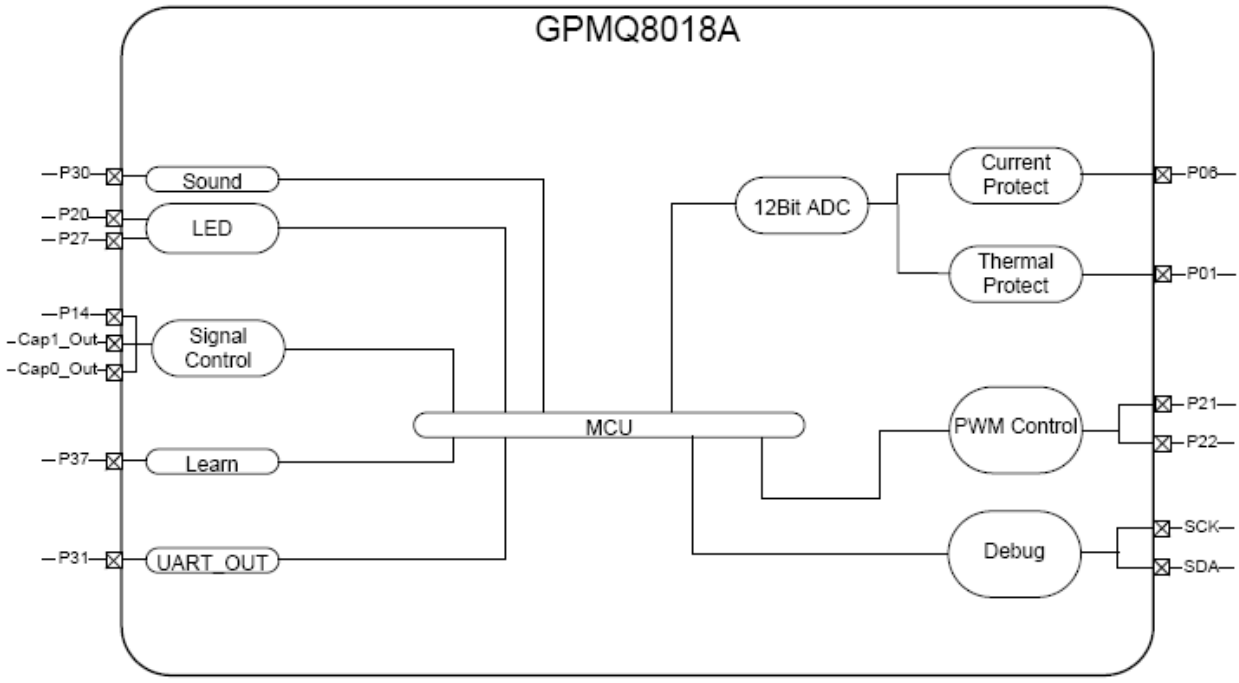


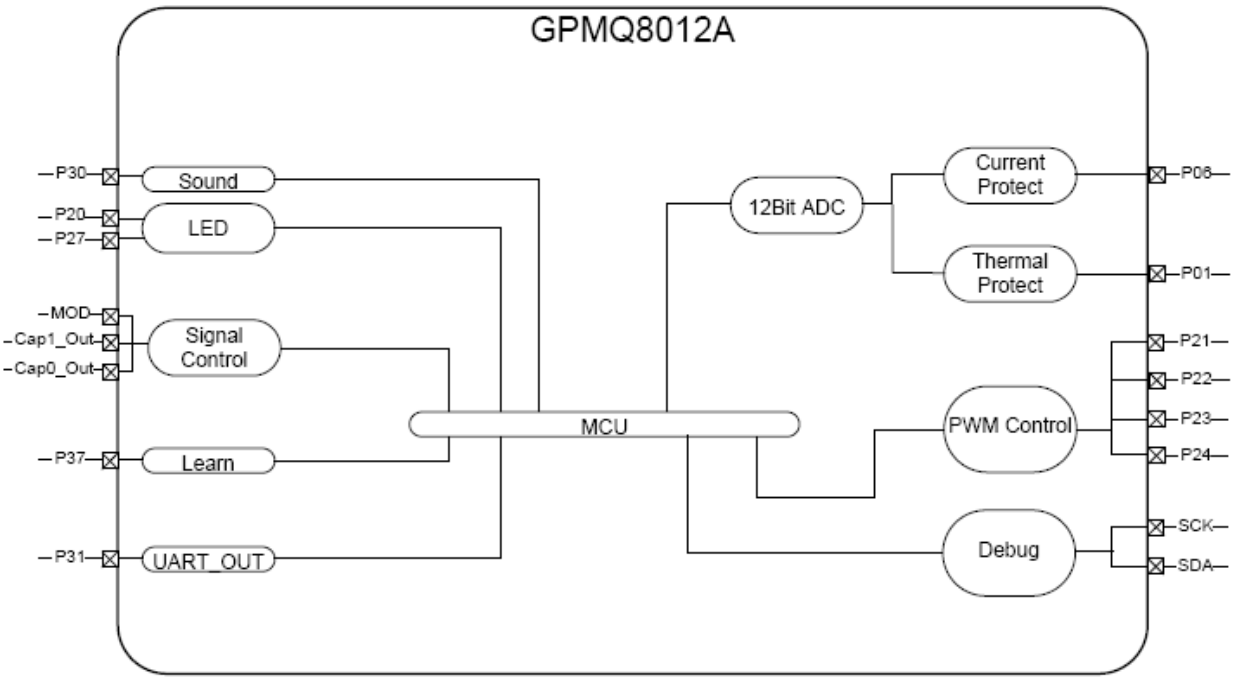
1.1.1.2. FEATURES

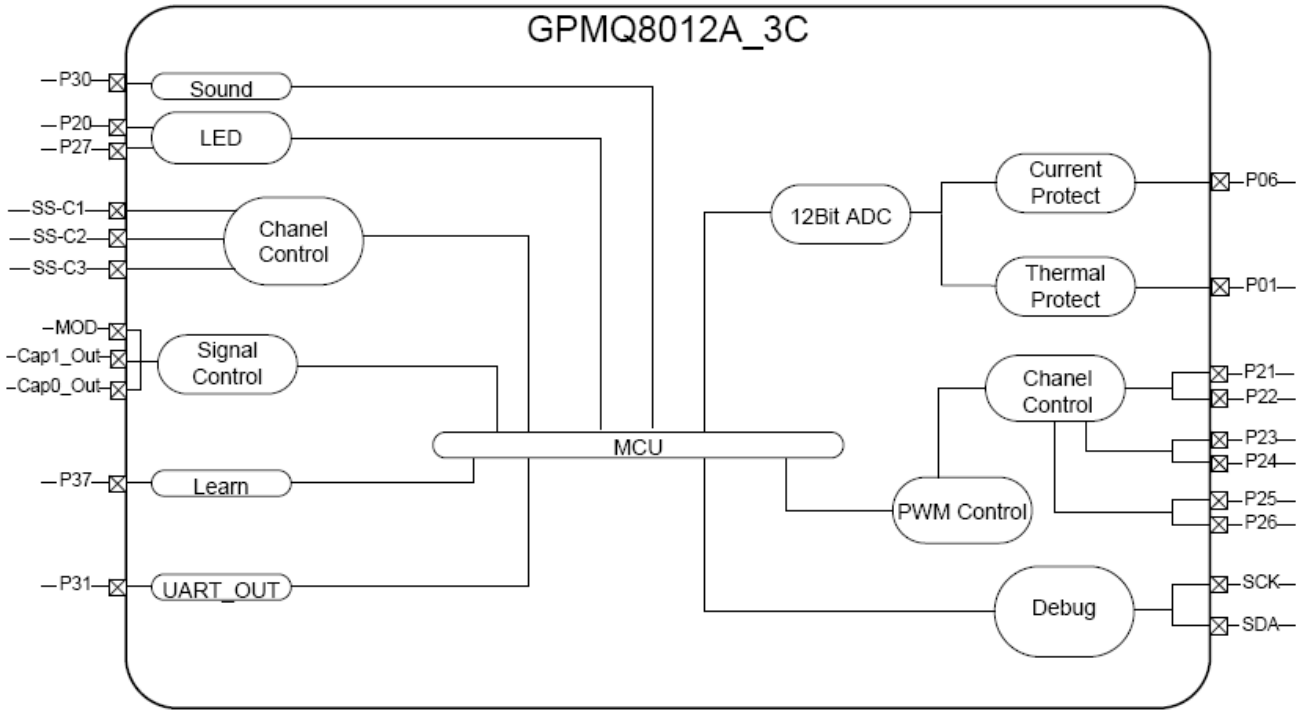
- Conform to the Wireless Power Consortium (WPC) Wireless Power Transfer Transmitter V1.0.3 Specification.
- Different type supply voltage
  - GPMQ8018A: 18V DC supply system. It uses QI Transmitter A1 type coil and capacitor to build.
  - GPMQ8012A: 12V DC supply system. It uses QI Transmitter A1 type coil and modify capacitor to build.
  - GPMQ8012A_3C: 12V DC supply system. It uses QI Transmitter A6 type coil and capacitor to build.
  - GPMQ8005A: 5V DC supply system. It uses QI Transmitter A5 type coil and capacitor to build.
- High performance at signal demodulation.
- Status Indicator.
  - Charge complete
  - Charging
  - Error (Transmitter over current , QI standard error message)
  - Standby
  - Sound alarm
- Auto detecting the object put on and take off.
- Over Temperature protection.
- Over current protection.

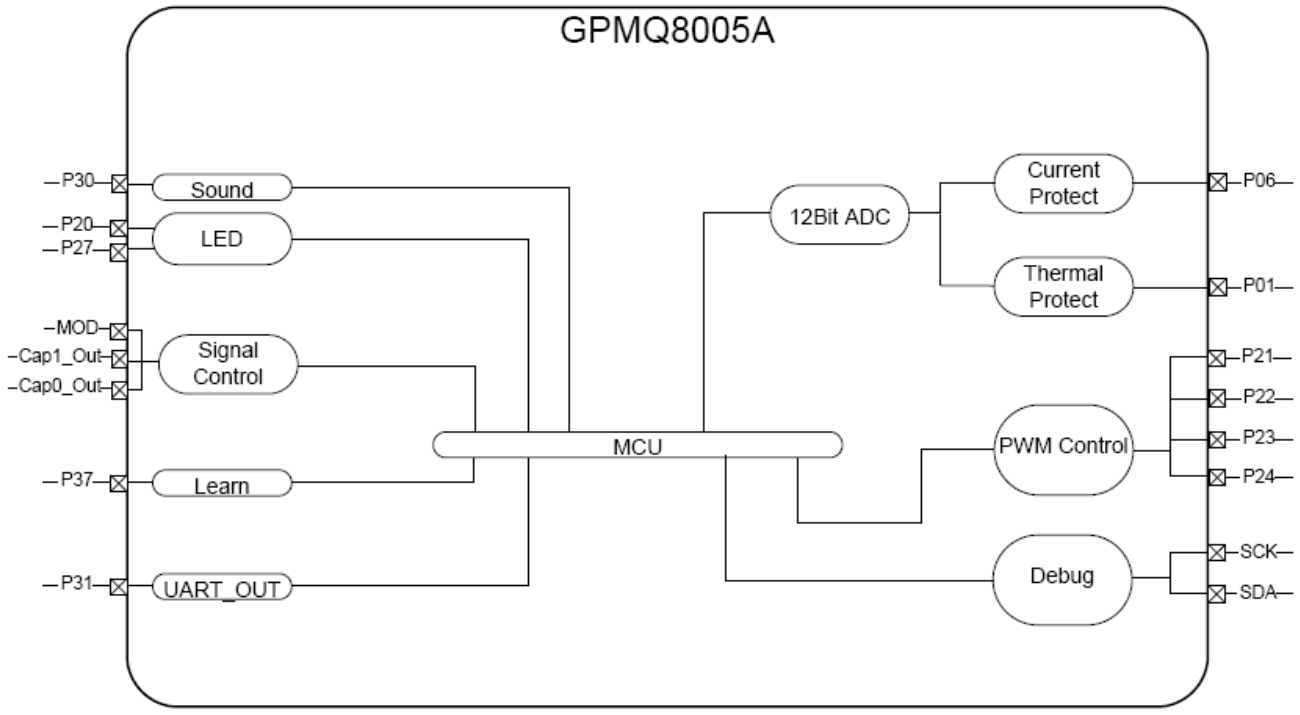
- Learning function when the coil is changed.
- Package: LQFP 44
- Chip are 5v input.

1.1.1.3. BLOCK DIAGRAM

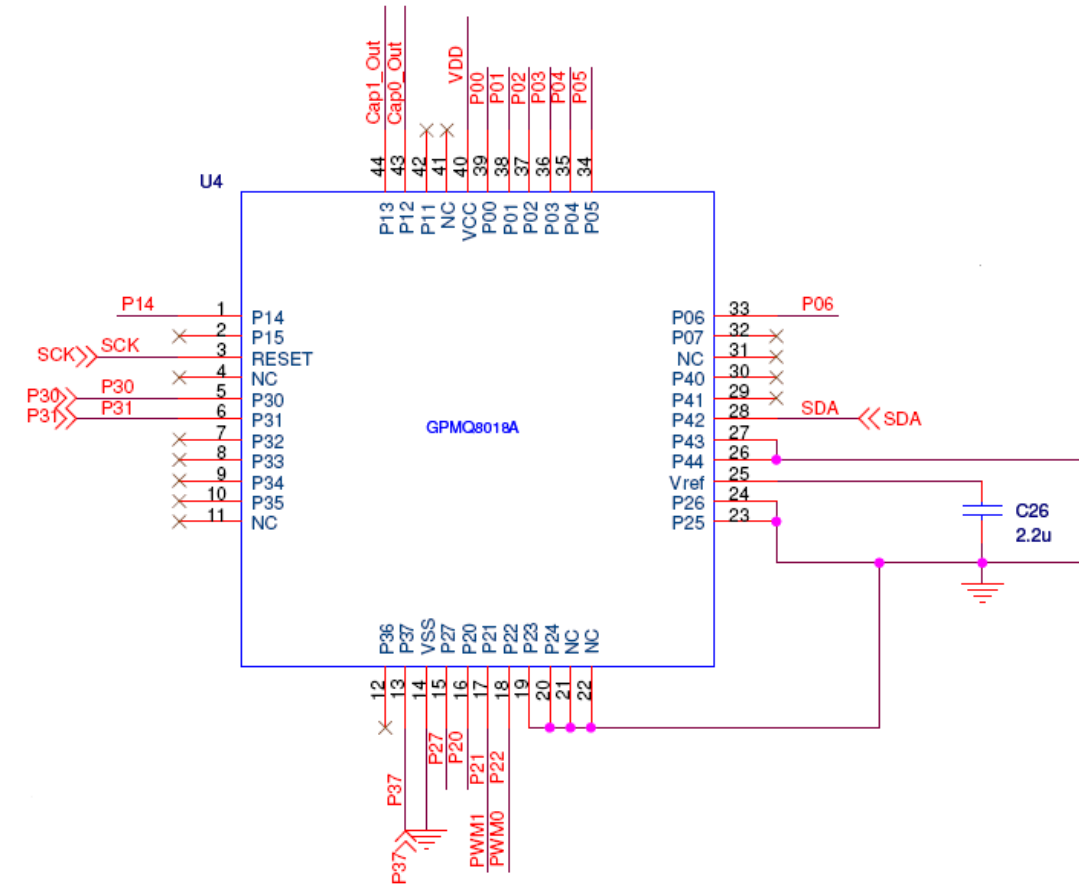


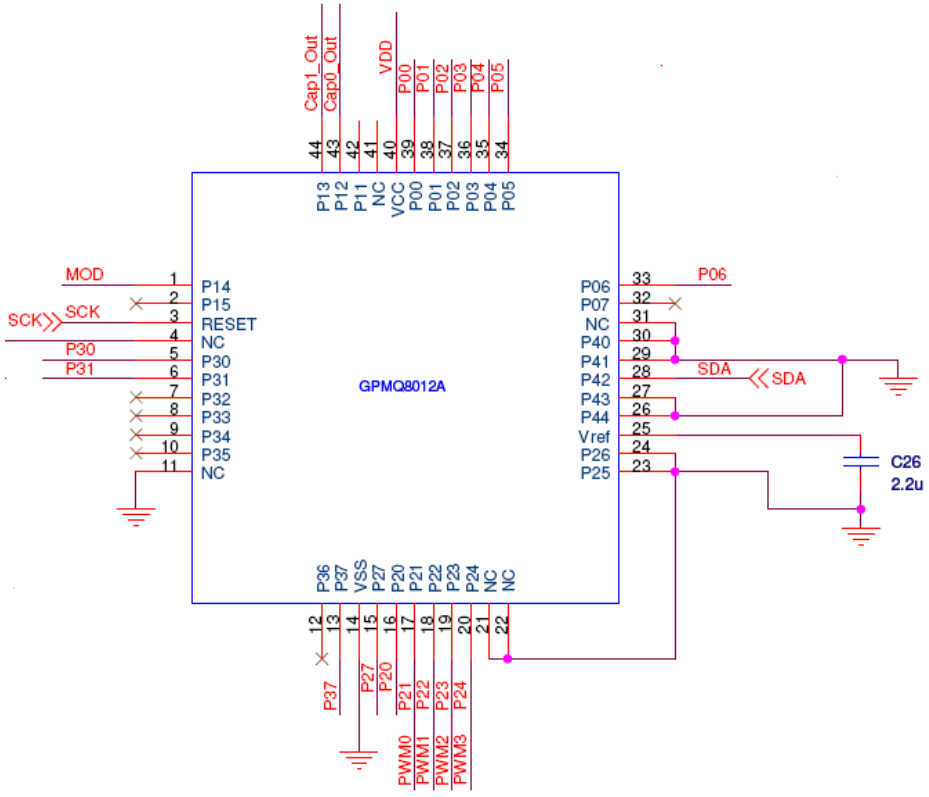


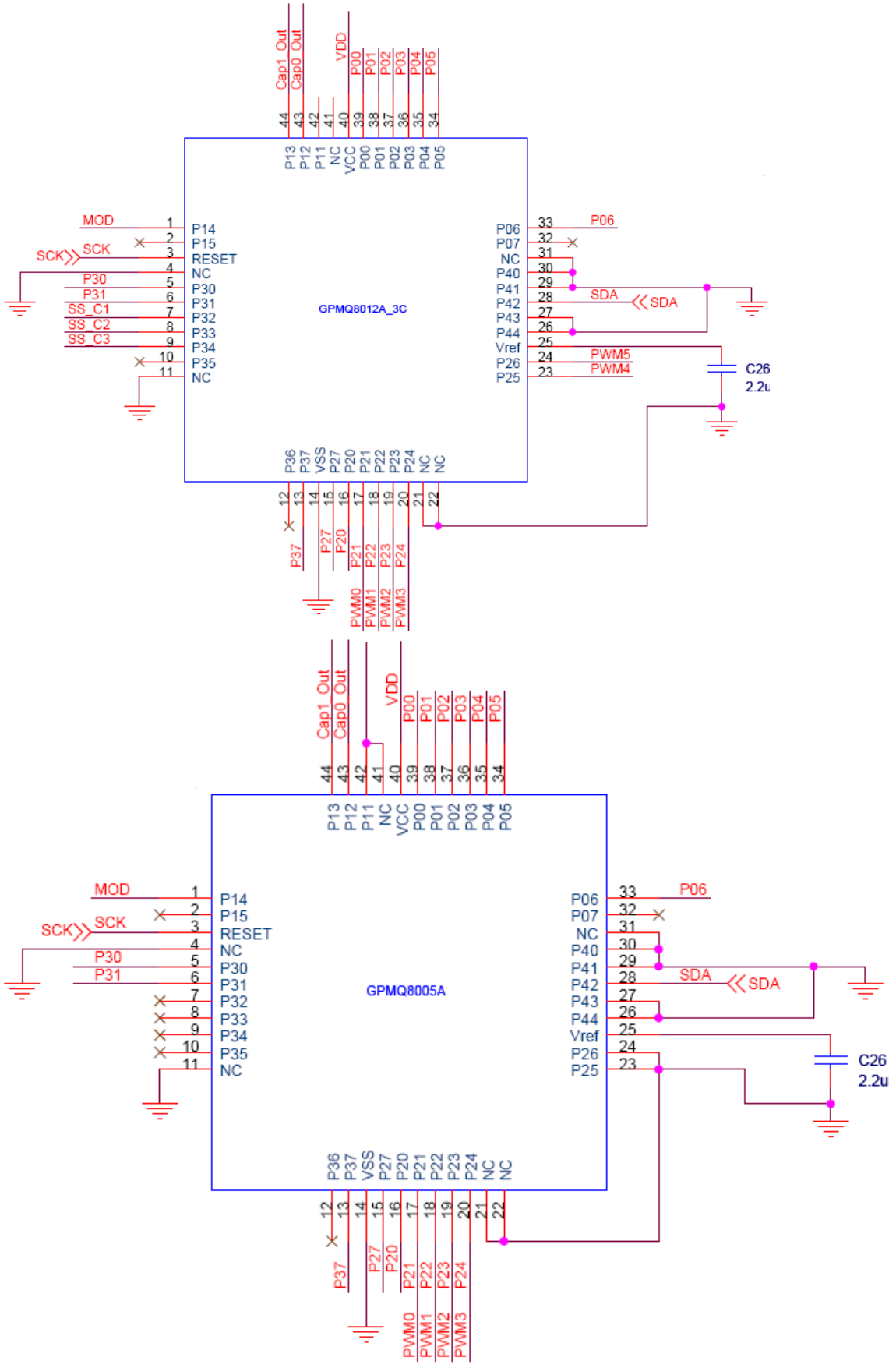




2. SIGNAL DESCRIPTIONS







Pin No.		I/O	GPMQ 8018A	GPMQ 8012A	GPMQ 8012A_3C	GPMQ 8005A	Description
1	P14/Mod	I	●	●	●	●	Packet Demodulation input2
2	NC	-	-	-	-	-	NC
3	SCK	-	●	●	●	●	Debug communication Clock.
4	NC	-	-	-	-	-	NC
5	P30	O	●	●	●	●	Sound alarm. High active
6	P31	O	●	●	●	●	UART TX. Send the information from Transmitter
7	NC	-	-	-	-	-	NC
8	NC	-	-	-	-	-	NC
9	NC	-	-	-	-	-	NC
10	NC	-	-	-	-	-	NC
11	NC	-	-	-	-	-	NC
12	NC	-	-	-	-	-	NC
13	P37	I	●	●	●	●	Learning when P37 is low level after reset.
14	GND	S	●	●	●	●	Ground.
15	P27	O	●	●	●	●	LED Indicator. Output low when active.
16	P20	O	●	●	●	●	LED Indicator. Output low when active.
17	P21	O	●	●	●	●	PWM Control Output /PWM0
18	P22	O	●	●	●	●	PWM Control Output /PWM1
19	P23	O	-	●	●	●	PWM Control Output /PWM2
20	P24	O	-	●	●	●	PWM Control Output /PWM3
21	NC	-	-	-	-	-	NC
22	NC	-	-	-	-	-	NC
23	P25	O	-	-	●	-	PWM Control Output /PWM4
24	P26	O	-	-	●	-	PWM Control Output /PWM5
25	Vref	-	●	●	●	●	Regulator output, needs 2.2uF Cap.
26	NC	-	-	-	-	-	NC
27	NC	-	-	-	-	-	NC
28	SDA		●	●	●	●	Debug communication Data.
29	NC	-	-	-	-	-	NC
30	NC	-	-	-	-	-	NC
31	NC	-	-	-	-	-	NC
32	NC	-	-	-	-	-	NC
33	P06	I	●	●	●	●	Current Detect Pin.
34	NC	-	-	-	-	-	NC
35	NC	-	-	-	-	-	NC
36	NC	-	-	-	-	-	NC
37	NC	-	-	-	-	-	NC
38	P01	I	●	●	●	●	Thermal Detect Pin.
39	NC	-	-	-	-	-	NC
40	VDD	S	●	●	●	●	Power 5V input
41	NC	-	-	-	-	-	NC
42	NC	-	-	-	-	-	NC
43	Cap0_Out	I	●	●	●	●	Packet Demodulation input0
44	Cap1_Out	I	●	●	●	●	Packet Demodulation input1

3. FUNCTIONAL DESCRIPTIONS

QI Compliant wireless transmitter 1.0.3 Specification.

Conform the QI standard of version 1.0.3. QI system now supports up to 5W.

Strong Demodulation for QI packet

Demodulation is very import for QI transmitter. GPMQ80XXA uses flexible process to solve this problem. They have high performance at demodulation.

Thermal Protection

The system will protect and show the alarm message when the thermal pin(p01) reach the alarm voltage.

Chip	Thermal Pin Protect Voltage	Unit
GPMQ8018A	3.86	V
GPMQ8012A	3.86	V
GPMQ8012A_3C	3.86	V
GPMQ8005A	3.86	V

User can modify the differential voltage of NTC and resister to modify the over temperature protect point.

Over Current Protection

The system will protect and show the alarm message when the current pin(P06) detect the alarm voltage.

Chip	Current Pin Protect Voltage	Unit	Current amplifier resister
GPMQ8018A	3.52	V	R55
GPMQ8012A	3.52	V	R63
GPMQ8012A_3C	3.52	V	R63
GPMQ8005A	3.52	V	R63

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

LED Indicate

LED Pin is P20 and P27. The output low sink current are 20mA.

Low(0): LED ON

High(1): LED OFF

Condition	**P20**	**P27**	**Description**
Standby	Keep OFF	Keep OFF	When the transmitter 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.
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 2. When the transmitter detects the over current condition or Over temperature condition.
Learning	Keep ON	Keep ON	When Learning PIN(P37) shorts to GND after reset.

Sound alarm

P30 is the sound alarm pin. When P30 output high, the sound ON, otherwise it is OFF.

High(1): Sound ON

Low(0): Sound OFF

Condition	Content	Description
PUT ON Alarm	B	The QI Mobile Device is identified.
Error Alram	B-B-B	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

Learning Function

P37 is the learning Pin. When system change the resonant coil or capacitor, it needs to learn again.

1. Remove the power supply VPP.
2. Check the Coil has no receiver or any other things on it.
3. Short P37 to ground.
4. Check the LED indicator(P20,P27) both on.
5. Wait and See the LED only one on.(P20 off , P27 ON)
6. Finished. Remove the P37 short pin and reset again.

If learning fail, the LED indicator will keep both on.

4. ELECTRICAL SPECIFICATIONS

4.1. Absolute Maximum Rating

Characteristics	Symbol	Ratings
DC Supply Voltage	V_+	5V
Input Voltage Range	V_{IN}	-0.3V to V_+ + 0.3V
Operating Temperature	T_A	-40℃ to +85℃
VDD Total MAX Current	I_{VDDM}	100mA
VSS Total MAX Current	I_{VSSM}	150mA

4.2. DC Characteristics (TA = 25℃)

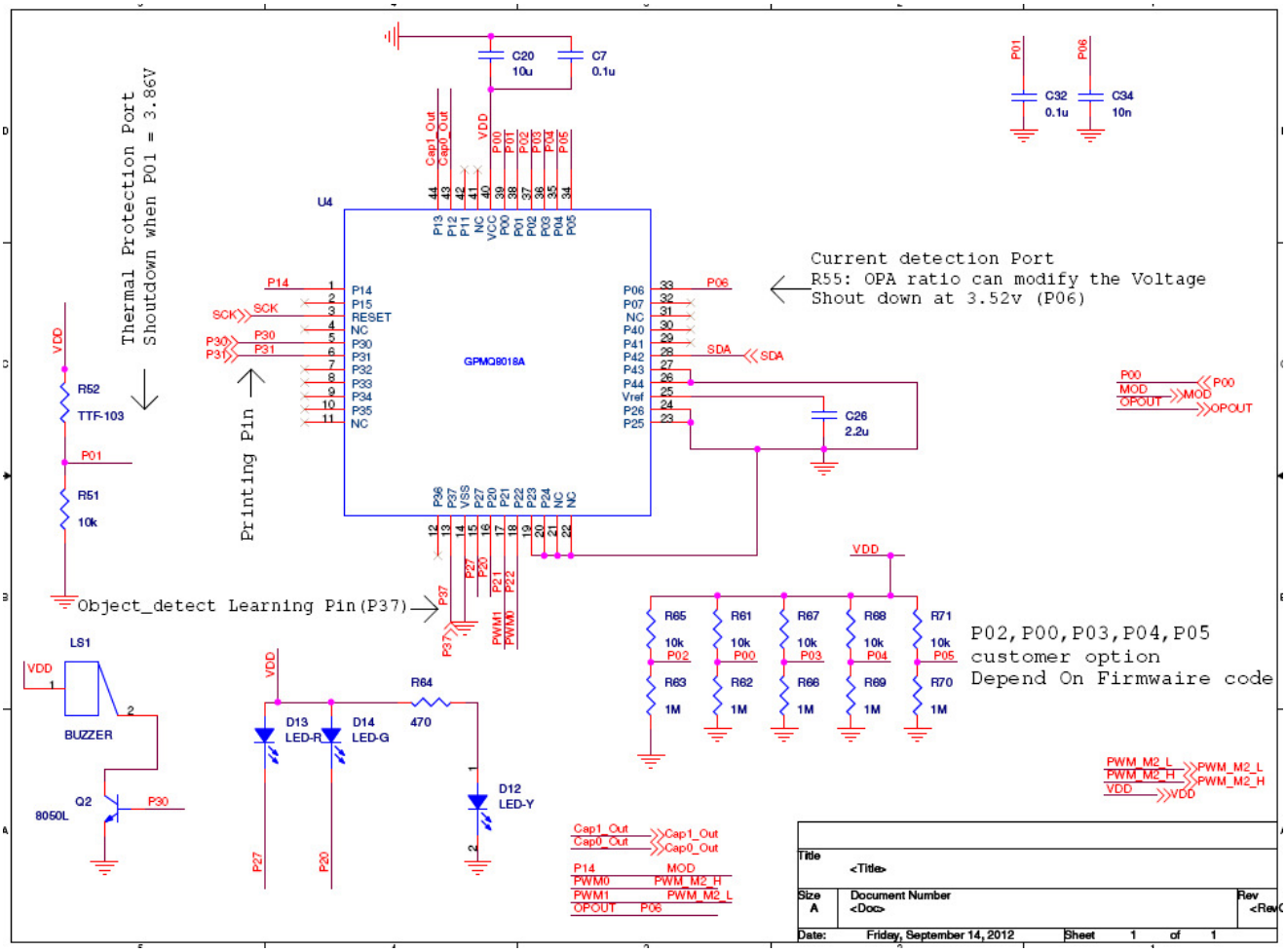
Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
Operating Voltage	VDD	2.4	3.3	5.5	V	
Operating Current	I_{OP}	-	-	10.0	mA	SYSCLK= 24.5MHz @ 5.0V, no load
Standby Current	I_{STBY}	-	-	5.0	uA	VDD = 5.5V
Input High Level	V_{IH}	0.7VDD	-	-	V	VDD = 5.0V
Input Low Level	V_{IL}	-	-	0.3VDD	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 1	R_{PH1}	30	50	70	KΩ	Pn_R_SEL=0 (n=0.1.2.3.4) @VDD=5.0V
Input Pull High Resistor 1	R_{PL1}	30	50	70	KΩ	Pn_R_SEL=0 (n=0.1.2.3.4) @VDD = 5.0V
Input Pull High Resistor 2	R_{PH2}	1	2	3	KΩ	Pn_R_SEL=1 (n=0.1.2.3.4) @VDD=5.0V
Input Pull High Resistor 2	R_{PL2}	1	2	3	KΩ	Pn_R_SEL=1 (n=0.1.2.3.4) @VDD = 5.0V
Low Voltage Reset	V_{LVR}	2.2×(1-5%)	2.2	2.2×(1+5%)	V	

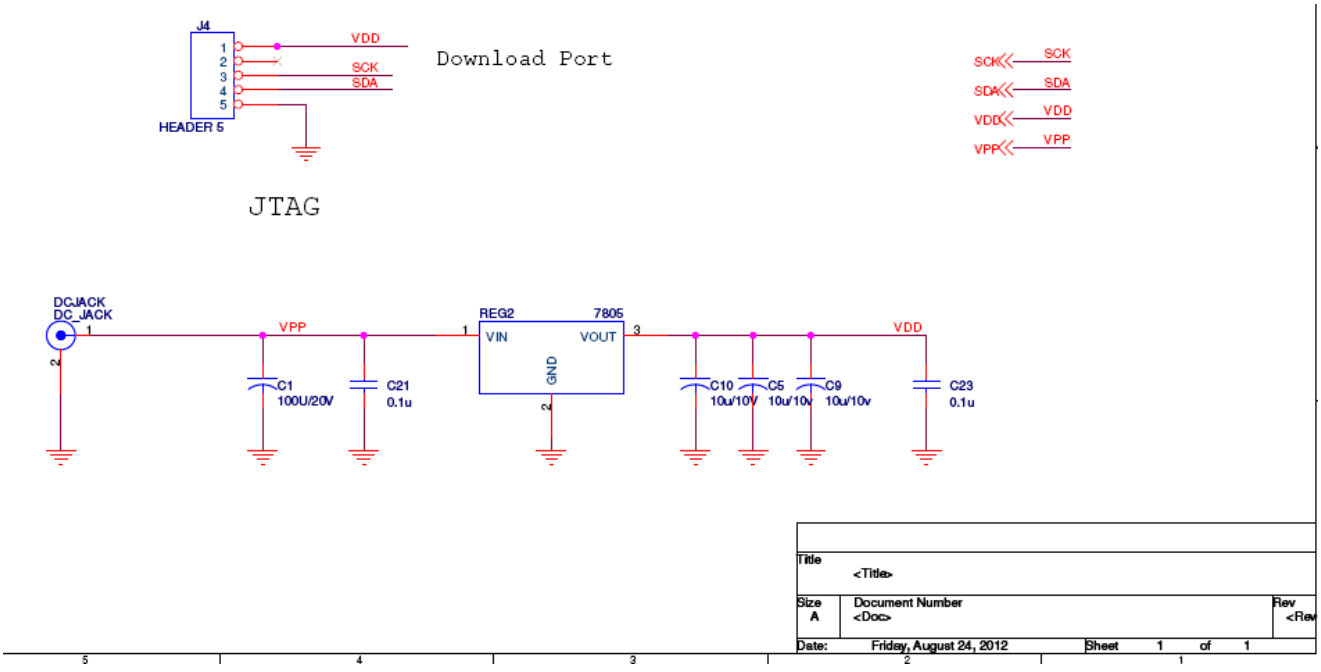
4.3. ADC Characteristics (TA = 25℃) 12bit

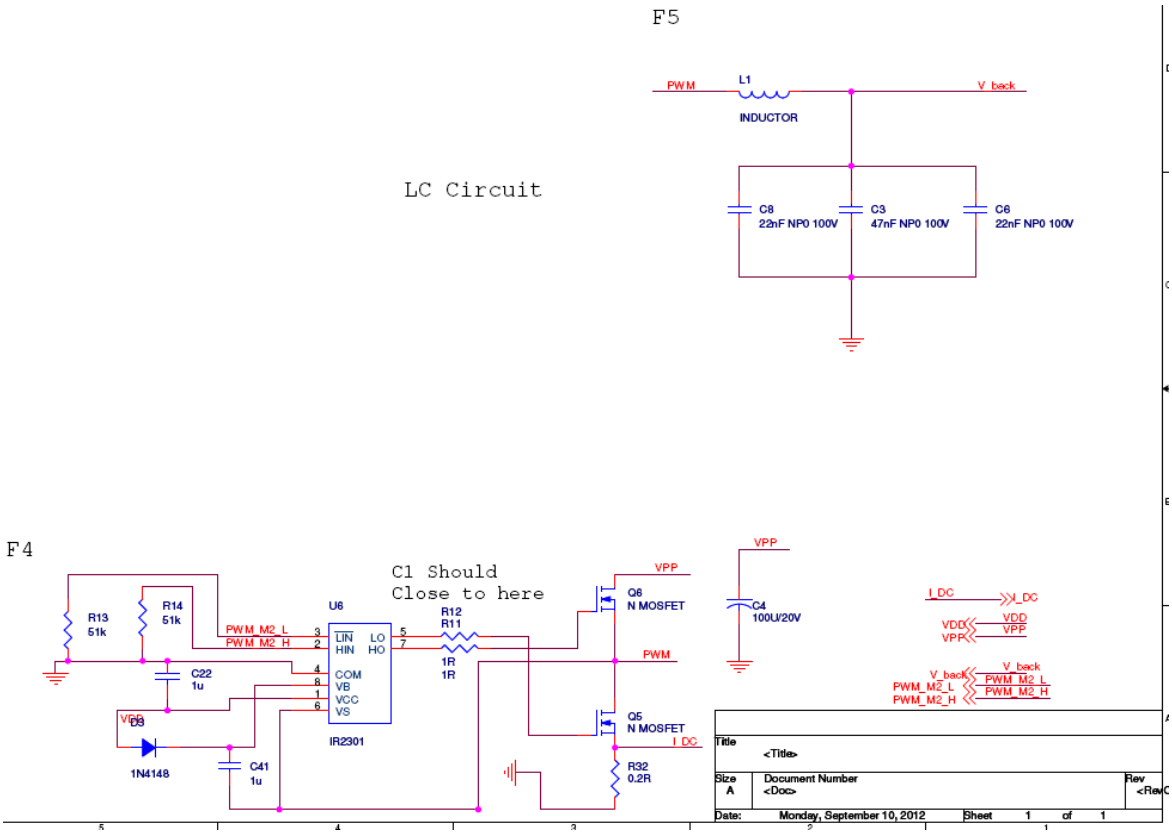
Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
Operating Voltage	VDD	2.4	-	5.5	V	
ADC Input Voltage Range	V_{ADCIN}	0	-	VDD	V	
ADC Clock Period	T_{AD}	0.3265	-	-	us	ADCLKmax=24.5MHz/8
Input Channel		-	-	8	channel	
Resolution		12			Bit	
No Missing Code		10			bits	
ADC Conversion Time	T_{CON}	5.224	-	-	us	ADCLK*16@ADCFG[1:0]=2'b00
Integral Linearity Error	E_{INL}	-	±2	±3	LSB	
Differential Linearity Error	E_{DNL}	-	-1~+2	-1~+3	LSB	

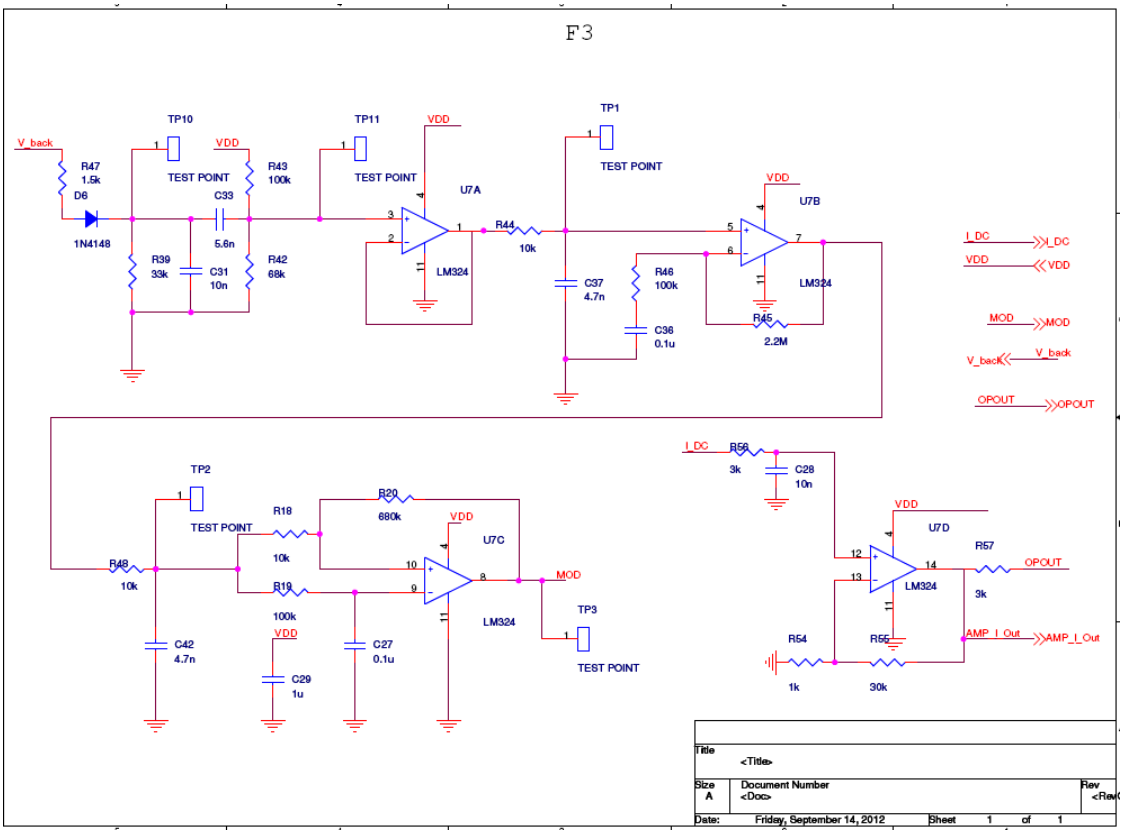
5. APPLICATION CIRCUITS

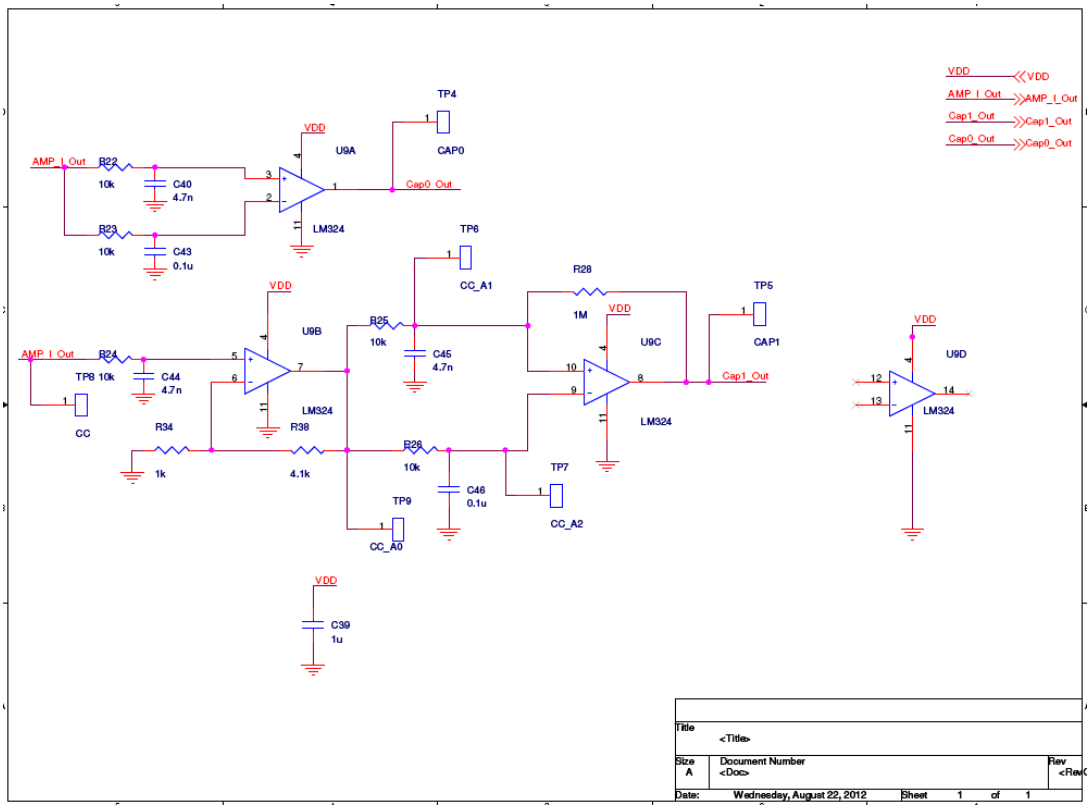
GPMQ8018A 18V application.











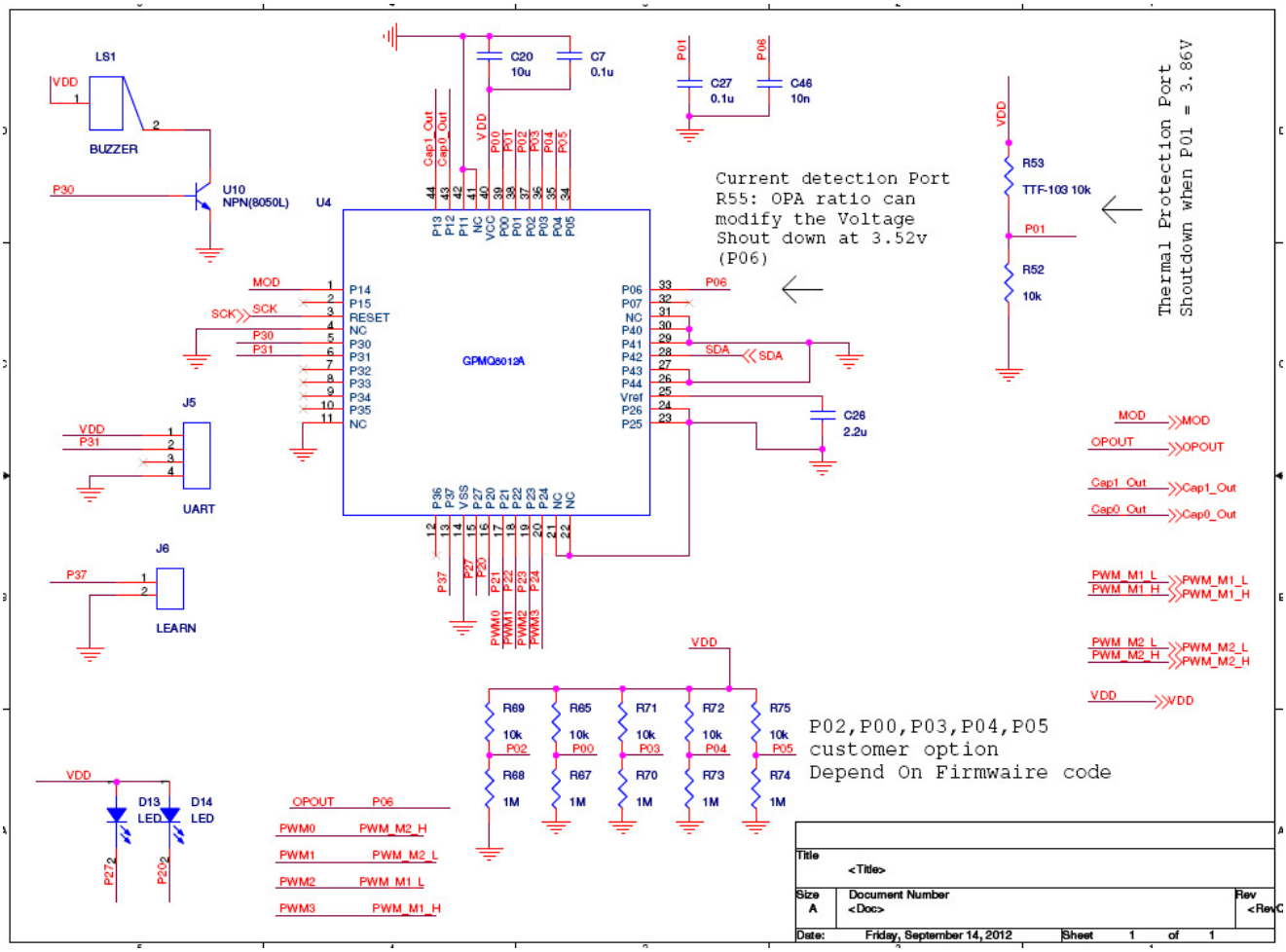
序号	名称	位置	参数	用量	备注
1	陶瓷电容	C1,C4	SMD 1210 100uF/25V 20%	2	
2	陶瓷电容	C3	47nF NP0,C0G 100V	1	注释①
3	陶瓷电容	C6	33nF NP0,C0G 100V	1	注释①
4	陶瓷电容	C8	10nF NP0,C0G 100V	1	注释①
5	陶瓷电容	C7,C21,C23,C27,C32,C36,C43,C46	SMD 0805 0.1uF 10%	7	
6	陶瓷电容	C5,C9,C10	SMD 1206 10uF 20%	3	
7	陶瓷电容	C20	SMD 0805 10uF 20%	1	
8	陶瓷电容	C22,C29,C39,C41	SMD 0805 1uF 20%	4	
9	陶瓷电容	C26	SMD 0805 2.2uF 20%	1	
10	陶瓷电容	C28,C31,C34	SMD 0805 10nF 10%	3	
11	陶瓷电容	C33	SMD 0805 5.6nF 10%	1	
12	陶瓷电容	C37,C40,C42,C44,C45	SMD 0805 4.7nF 10%	5	
13	二极管	D3,D6	SMD 1206 1N4148	2	
14	LED(红)	D13	LED-1206	1	
15	LED(綠)	D14	LED-1206	1	

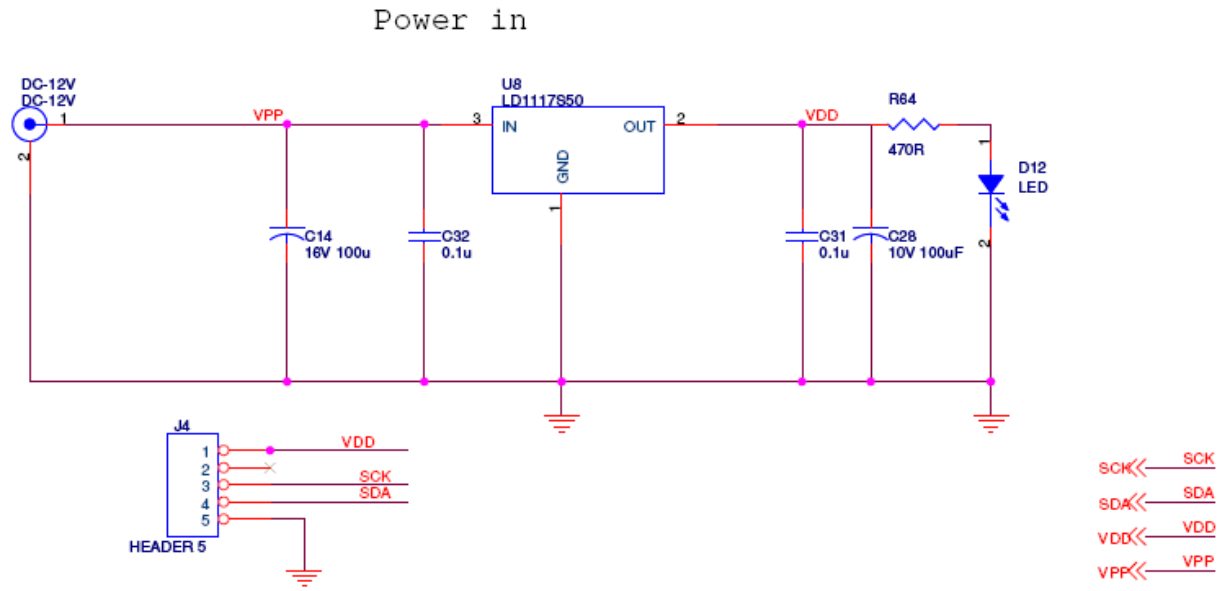
16	LED(黄)	D12	LED-1206	1	
17	发射线圈	L1	INDUCTOR	1	注释②
18	NMOS管	Q5,Q6	SOT-23 SI2302	2	可自选
19	稳压IC	REG2	SMD 7805	1	20==>5 V regulator
20	电阻	R11,R12	SMD 0805 1R 1/16W 5%	2	
21	电阻	R13,R14	SMD 0805 51k 1/16W 5%	2	
22	电阻	R18,R22,R23,R24,R25,R26, R44,R48,R51,R61,R65,R67, R68,R71	SMD 0805 10k 1/16W 5%	14	
23	电阻	R19,R43,R46	SMD 0805 100k 1/16W 5%	3	
24	电阻	R20	SMD 0805 680k 1/16W 5%	1	
25	电阻	R28,R62,R63,R66,R69,R70	SMD 0805 1M 1/16W 5%	6	
26	电阻	R32	SMD 1206 0.2R 1/2W 1%	1	
27	电阻	R34,R54	SMD 0805 1k 1/16W 5%	2	
28	电阻	R47	SMD 0805 1.5k 1/16W 5%	2	
29	电阻	R38	SMD 0805 4.1k 1/16W 5%	1	
30	电阻	R39	SMD 0805 33k 1/16W 5%	1	
31	电阻	R45	SMD 0805 2.2M 1/16W 5%	1	
32	电阻	R56,R57	SMD 0603 3k 1/16W 5%	2	
33	电阻	R42	SMD 0603 68k 1/16W 5%	1	
34	电阻	R55	SMD 0603 30k 1/16W 5%	1	
35	电阻	R64	SMD 0603 470R 1/16W 5%	1	
36	热敏电阻	R52	SMD 10k TTF-103	1	可自选
37	MCU	U4	GPMQ8018A	1	
38	MOS驱动IC	U6	IR2301	1	可自选
39	峰鸣器	LS1	Buzzer(5V)	1	
40	BJT	Q2	8050L(NPN)	1	
41	运放	U7,U9	LM324	2	

① NP0,C0G 100V Level

② Qi Transmitter A1 type coil

GPMQ8012A 12V application.





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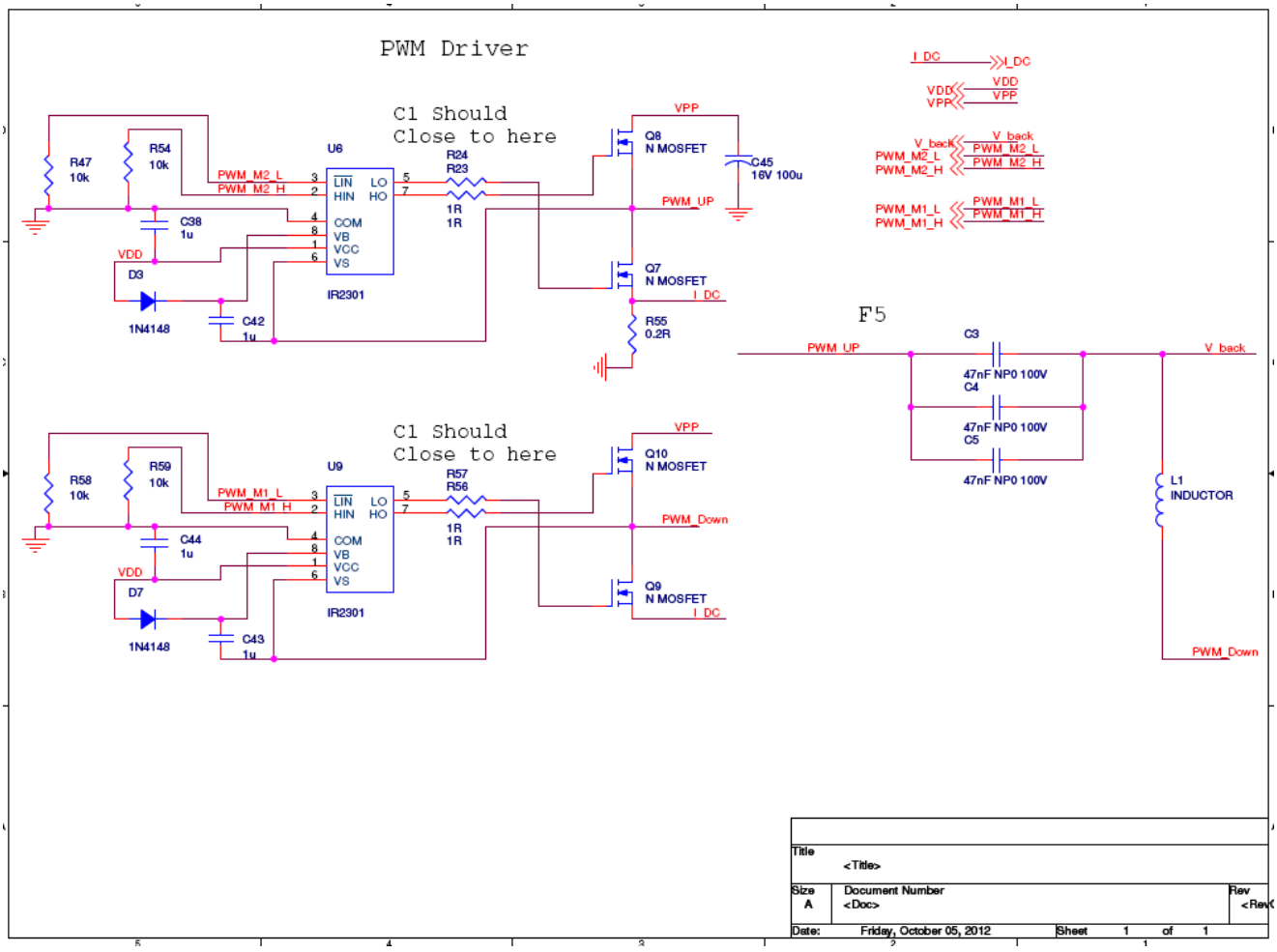
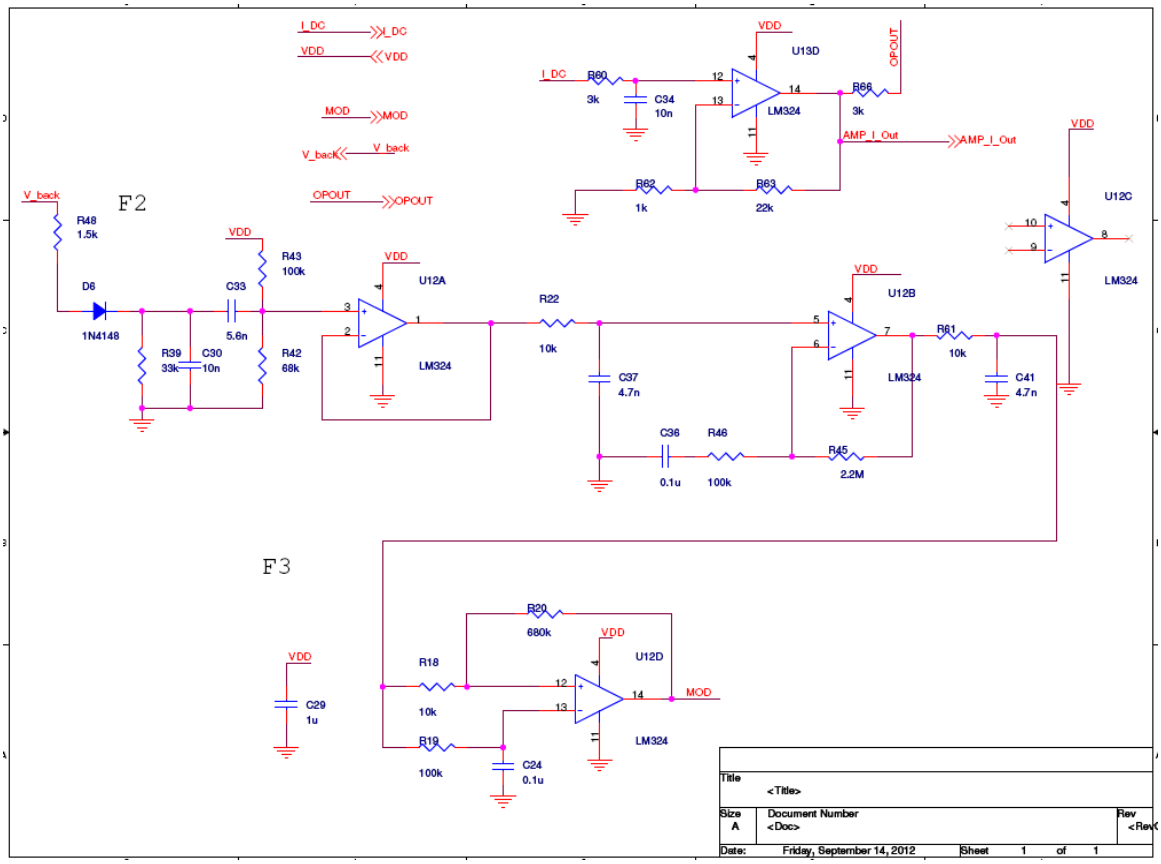
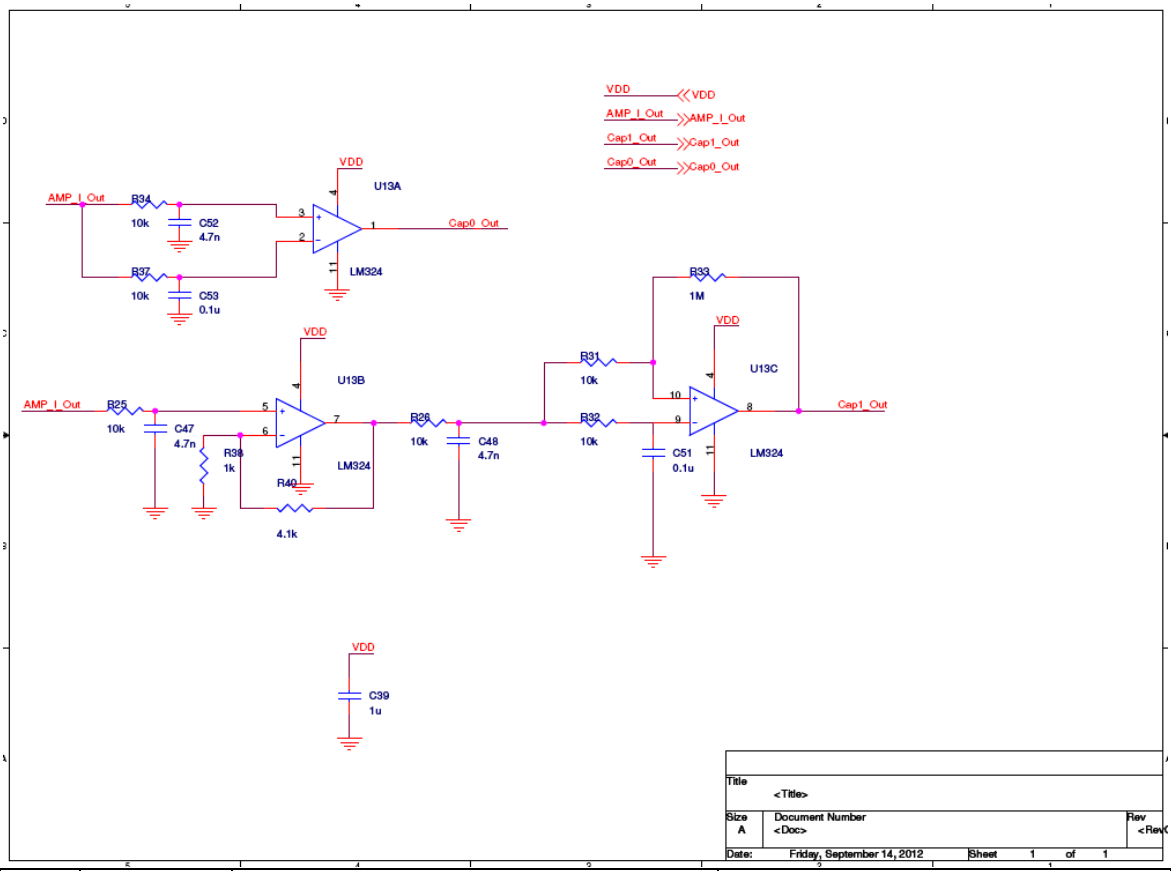






序号	名称	位置	参数	用量	备注

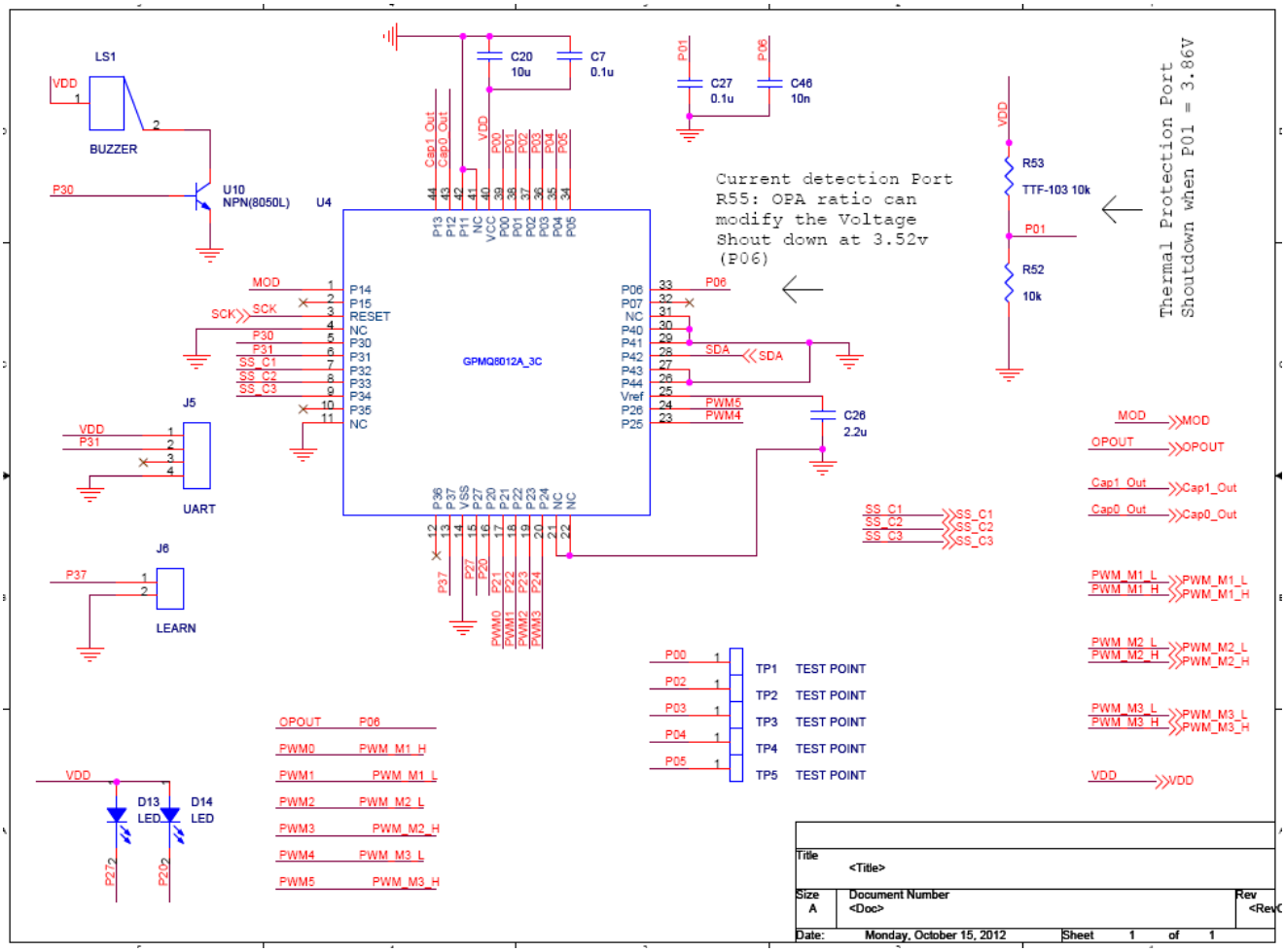
1	穩壓電容	C14,C45	SMD 100uF/16V	2	可自选
2	穩壓電容	C28	SMD 100uF/10V	1	可自选
3	陶瓷电容	C3,C4,C5	SMD 1210 47nF/100V NP0 , C0G	3	
4	陶瓷电容	C7,C24,C27,C31,C32,C36,C51,C53	SMD 0603 0.1uF 20%	8	
5	陶瓷电容	C20	SMD 1206 10uF 20%	1	
6	陶瓷电容	C29,C38,C39,C42,C43,C44	SMD 0805 1uF 20%	6	
7	陶瓷电容	C26	SMD 0805 2.2uF 20%	1	
8	陶瓷电容	C30,C34,C46	SMD 0805 10nF 10%	3	
9	陶瓷电容	C48	SMD 0603 47nF 10%	1	
10	陶瓷电容	C33	SMD 0603 5.6nF 10%	1	
11	陶瓷电容	C37,C41,C47,C48,C52	SMD 0603 4.7nF 10%	5	
12	二极管	D3,D6,D7	SMD 1206 1N4148	3	
13	LED(黃)	D12	LED-Y	1	
14	LED(綠)	D13	LED-G	1	
15	LED(紅)	D14	LED-R	1	
16	发射线圈	L1	INDUCTOR	1	注释②
17	NMOS管	Q7,Q8,Q9,Q10	SOT-23 SI2302	4	可自选
18	稳压IC	U8	LD1117S50	1	15==>5V regulator
19	电阻	R23,R24,R56,R57	SMD 0603 1R 1/16W 5%	4	
20	电阻	R18,R22,R25,R26,R31,R32,R34,R37,R47,R52,R54,R58,R59,R61,R63,R65,R69,R71,R72,R75	SMD 0603 10k 1/16W 5%	20	
21	电阻	R19,R43,R46	SMD 0603 100k 1/16W 5%	3	
22	电阻	R20	SMD 0603 680k 1/16W 5%	1	
23	电阻	R55	SMD 1206 0.2R 1/2W 1%	1	
24	电阻	R38,R62	SMD 0603 1k 1/16W 5%	2	

25	电阻	R48	SMD 0603 1.5k 1/16W 5%	2	
26	电阻	R60,R66	SMD 0603 3k 1/16W 5%	2	
27	电阻	R39	SMD 0603 33k 1/16W 5%	1	
28	电阻	R40	SMD 0603 4.7k 1/16W 5%	1	
29	电阻	R42	SMD 0603 68k 1/16W 5%	1	
30	电阻	R45	SMD 0603 2.2M 1/16W 5%	1	
31	电阻	R33,R67,R68,R70,R73,R74	SMD 0603 1M 1/16W 5%	6	
32	电阻	R64	SMD 0603 470R 1/16W 5%	1	
33	热敏电阻	R53	SMD 10k TTF-103	1	可自选
34	MCU	U4	GPMQ8012A	1	
35	MOS驱动 IC	U6,U9	IR2301	2	可自选
36	运放	U12,U13	LM324	2	
37	BJT	U38	NPN BJT(8050)	1	可自选
38	Buzzer	LS1	Buzzer	1	可自选

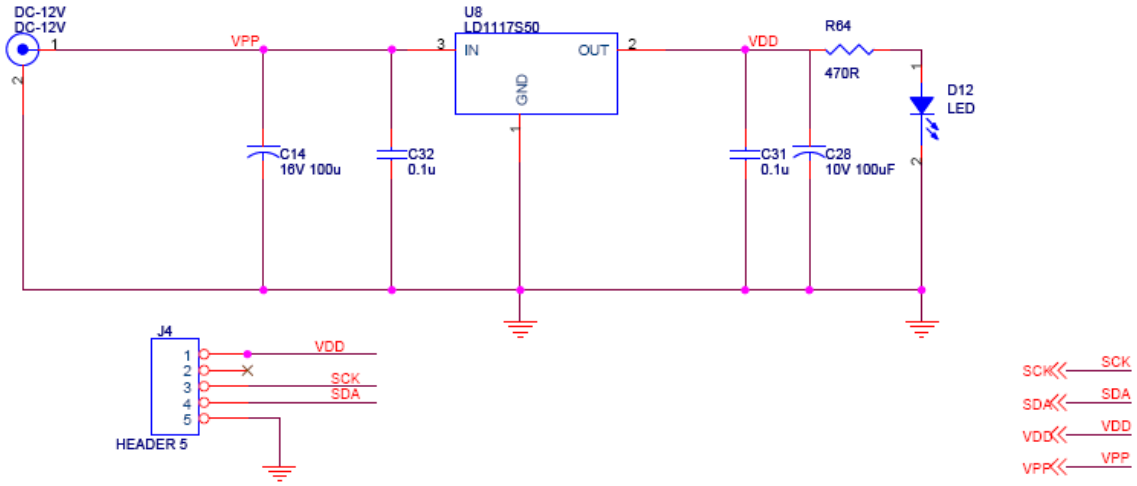
①NP0,C0G 100V Level

② Qi Transmitter A1 type coil

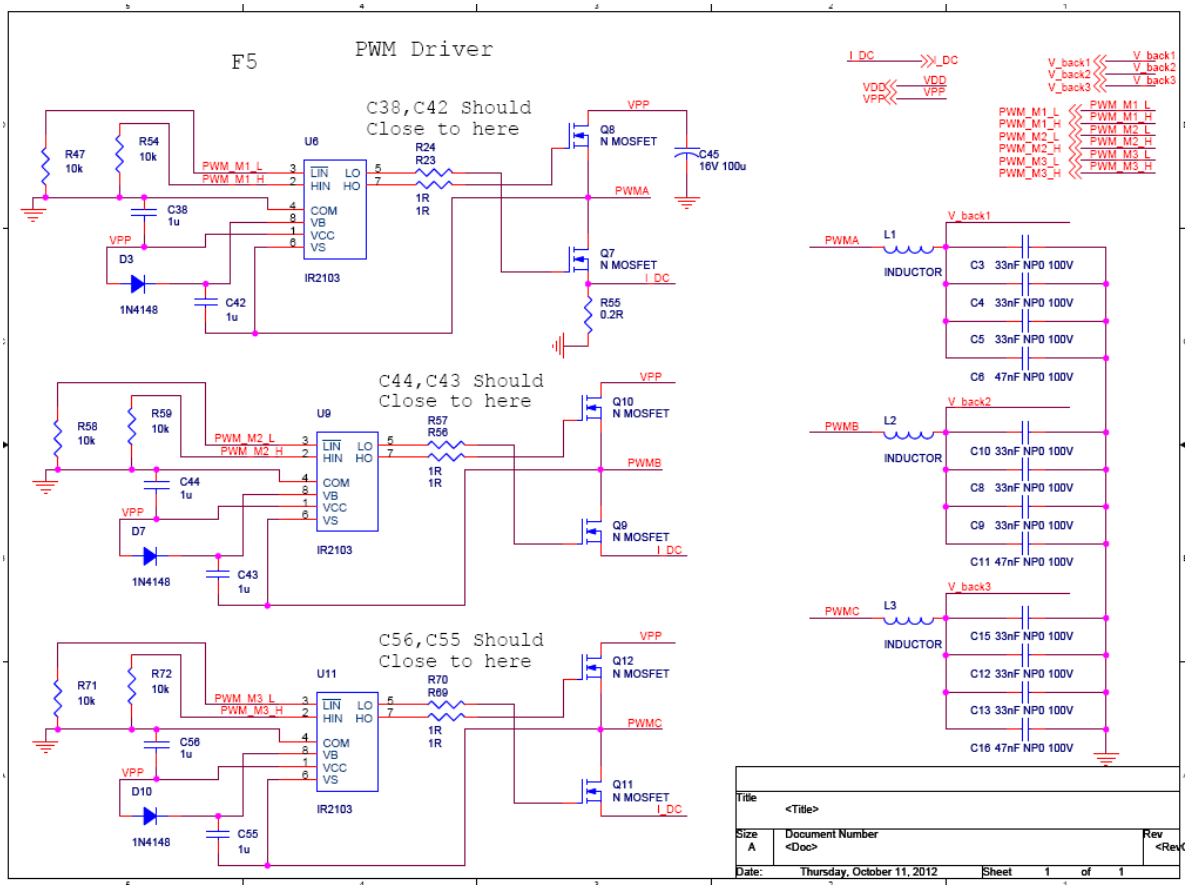
GPMQ8012A _3C 12V 3coil application.

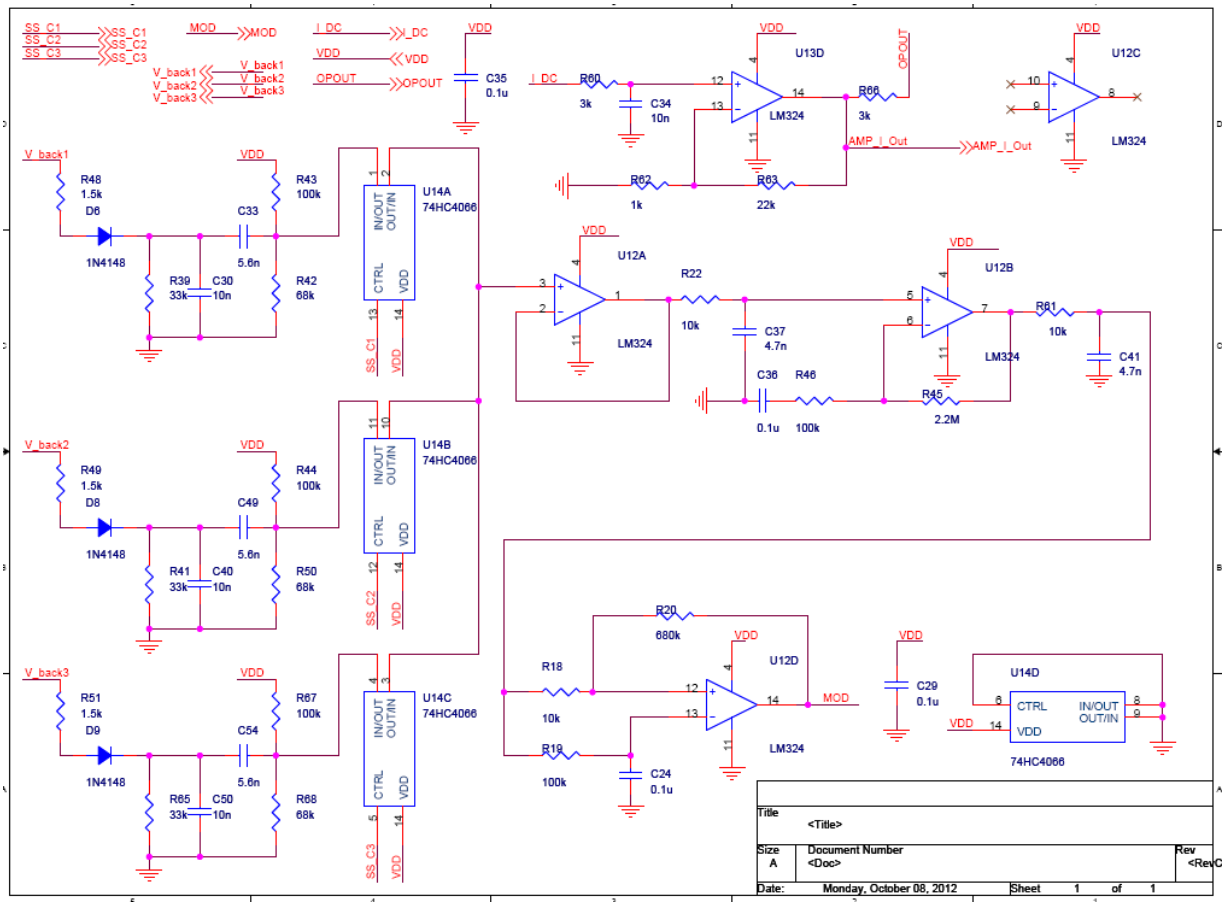


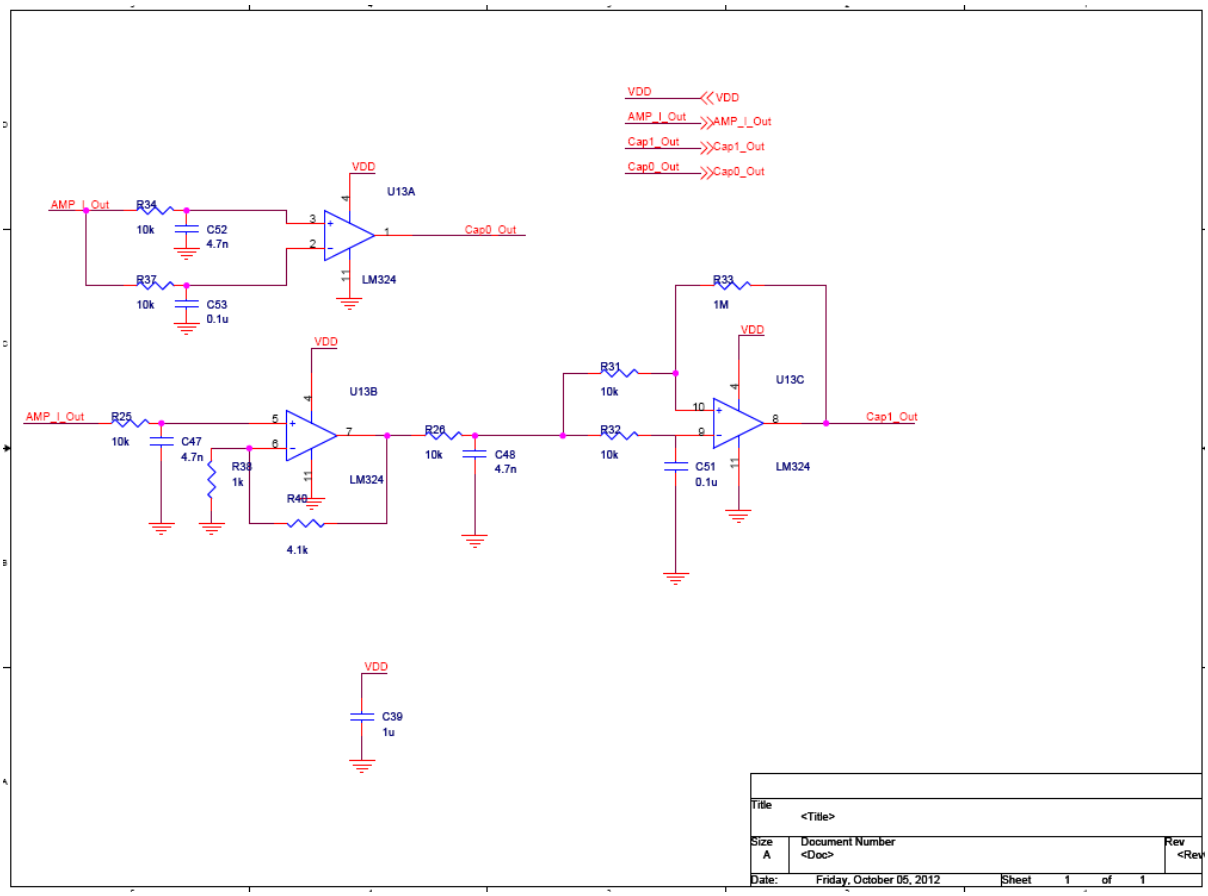
Power in



JTAG



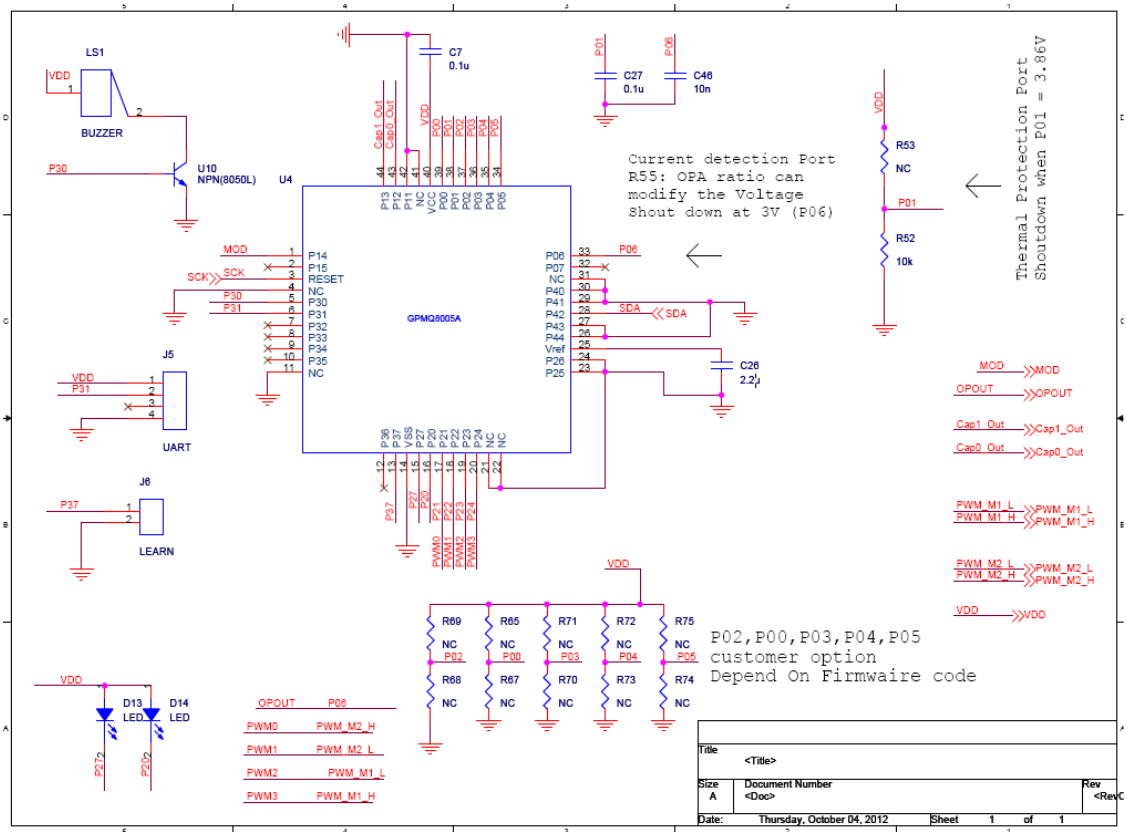




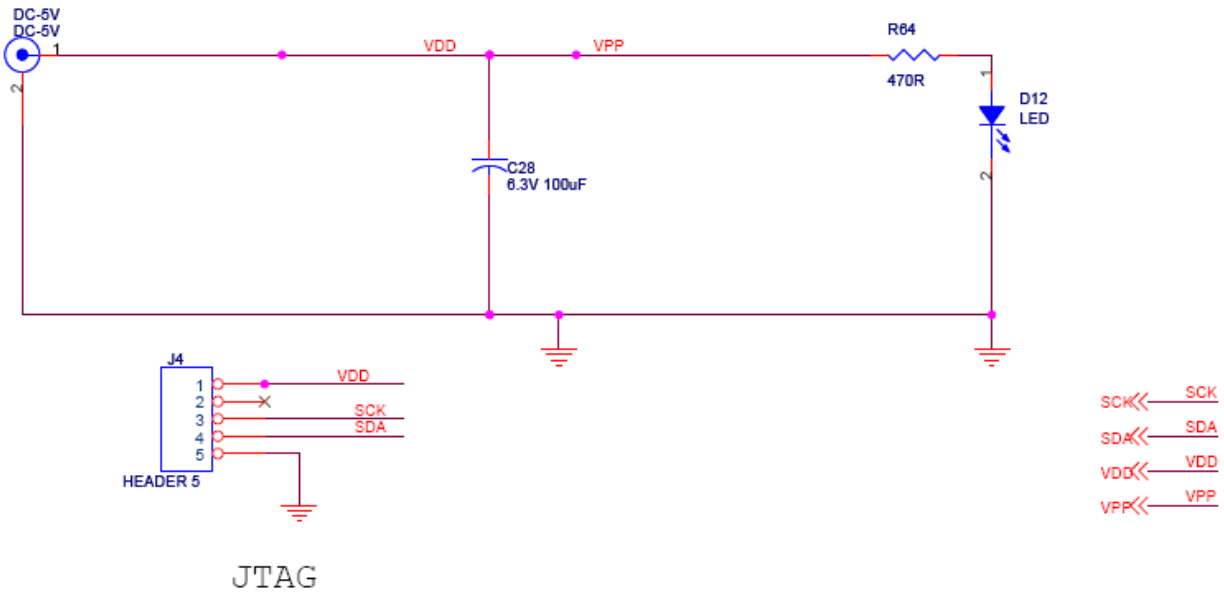
①NP0, C0G 100V Level

② Qi Transmitter A6 type coil with 3 coil array

GPMQ8005A 5V application



Power in



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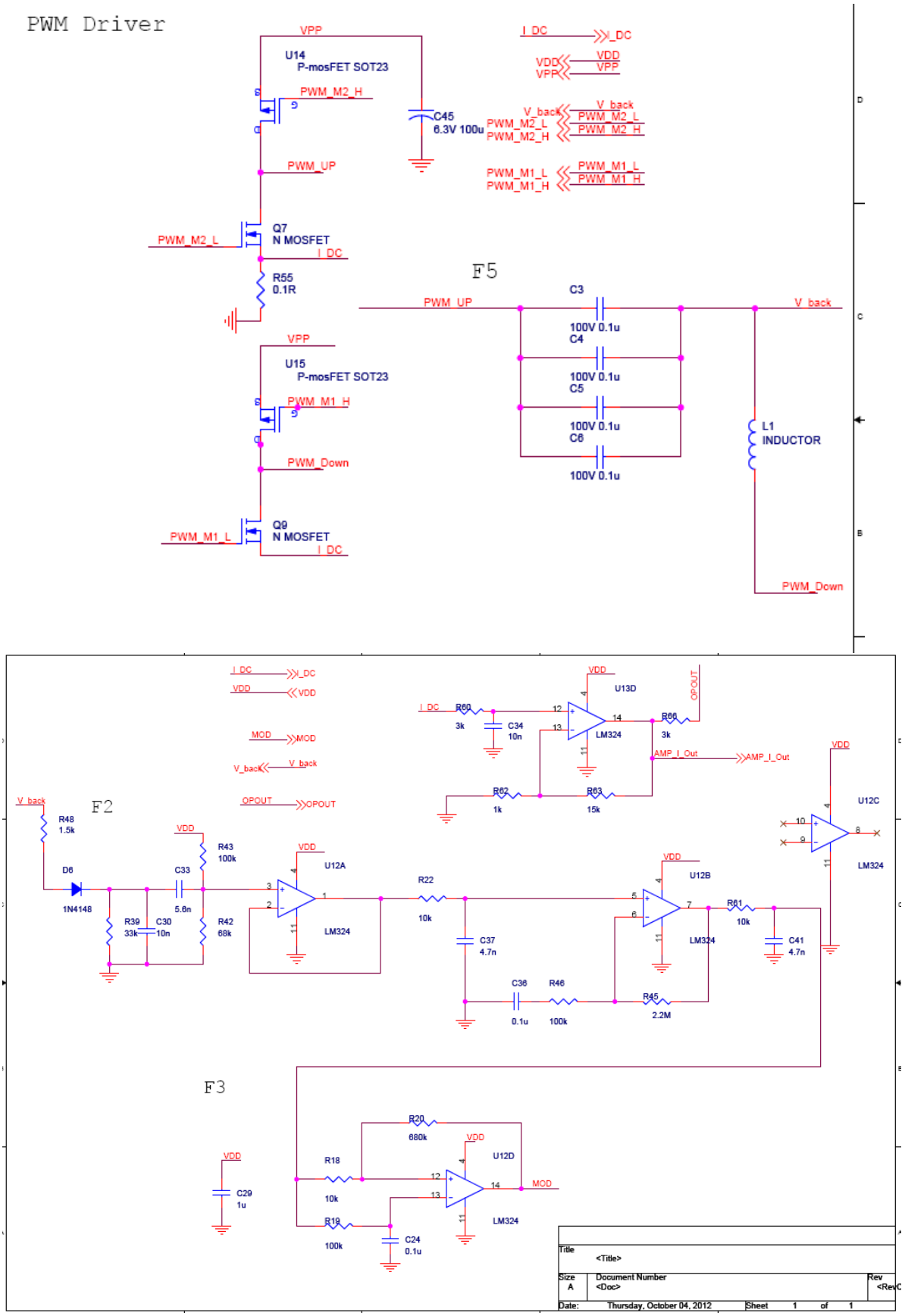
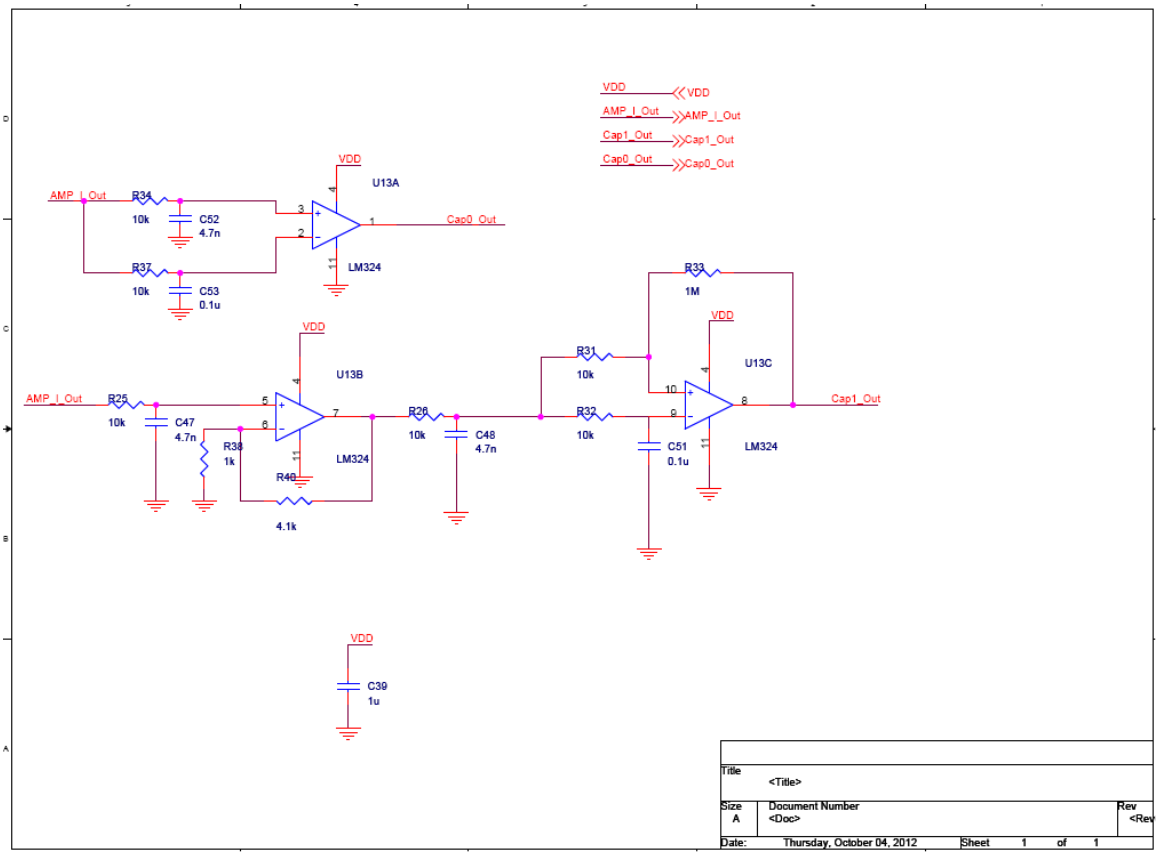
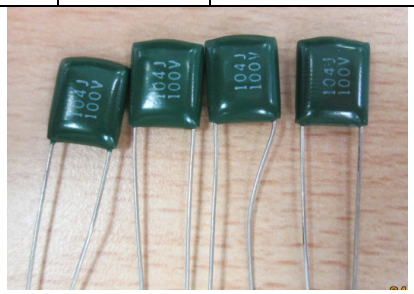




BOM Table

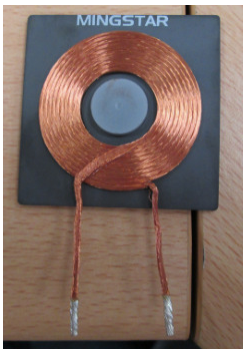
序号	名称	位置	参数	用量	备注
1	穩壓電容	C28,C45	SMD 100uF/6.3V	1	可自选
2	陶瓷电容	C3,C4,C5,C6	100V 0.1u Plastic cap	4	
3	陶瓷电容	C7,C24,C27,C36,C51,C53	SMD 0603 0.1uF 20%	6	
4	陶瓷电容	C29,C39	SMD 0805 1uF 20%	2	
5	陶瓷电容	C26	SMD 0805 2.2uF 20%	1	
6	陶瓷电容	C30,C34,C46	SMD 0805 10nF 10%	3	
7	陶瓷电容	C48	SMD 0603 47nF 10%	1	
8	陶瓷电容	C33	SMD 0603 5.6nF 10%	1	
9	陶瓷电容	C37,C41,C47,C48,C52	SMD 0603 4.7nF 10%	5	
10	二极管	D6	SMD 1206 1N4148	1	
11	LED(黃)	D12	LED-Y	1	
12	LED(綠)	D13	LED-G	1	
13	LED(紅)	D14	LED-R	1	
14	发射线圈	L1	INDUCTOR	1	注释②
15	NMOS管	Q7,Q9	SOT-23 SI2302	2	可自选

16	PMOS管	Q14,Q15	SOT-23 SI2301	2	可自选
17	电阻	R23,R24,R56,R57	SMD 0603 1R 1/16W 5%	4	
18	电阻	R18,R22,R25,R26,R31,R32,R34,R37,R47,R52,R61	SMD 0603 10k 1/16W 5%	11	
19	电阻	R19,R43,R46	SMD 0603 100k 1/16W 5%	3	
20	电阻	R20	SMD 0603 680k 1/16W 5%	1	
21	电阻	R55	SMD 1206 0.1R 1/2W 1%	1	
22	电阻	R38,R62	SMD 0603 1k 1/16W 5%	2	
23	电阻	R48	SMD 0603 1.5k 1/16W 5%	1	
24	电阻	R60,R66	SMD 0603 3k 1/16W 5%	2	
25	电阻	R39	SMD 0603 33k 1/16W 5%	1	
26	电阻	R63	SMD 0603 15k 1/16W 5%	1	
27	电阻	R40	SMD 0603 4.1k 1/16W 5%	1	
28	电阻	R42	SMD 0603 68k 1/16W 5%	1	
29	电阻	R45	SMD 0603 2.2M 1/16W 5%	1	
30	电阻	R33	SMD 0603 1M 1/16W 5%	1	
31	电阻	R64	SMD 0603 470R 1/16W 5%	1	
32	MCU	U4	GPMQ8005A	1	
33	运放	U12,U13	LM324	2	
34	BJT	U38	NPN BJT(8050)	1	可自选
35	Buzzer	LS1	Buzzer	1	可自选



① **100V 10% 104 Plastic Cap.**

② **QI transmitter A5 type coil.**



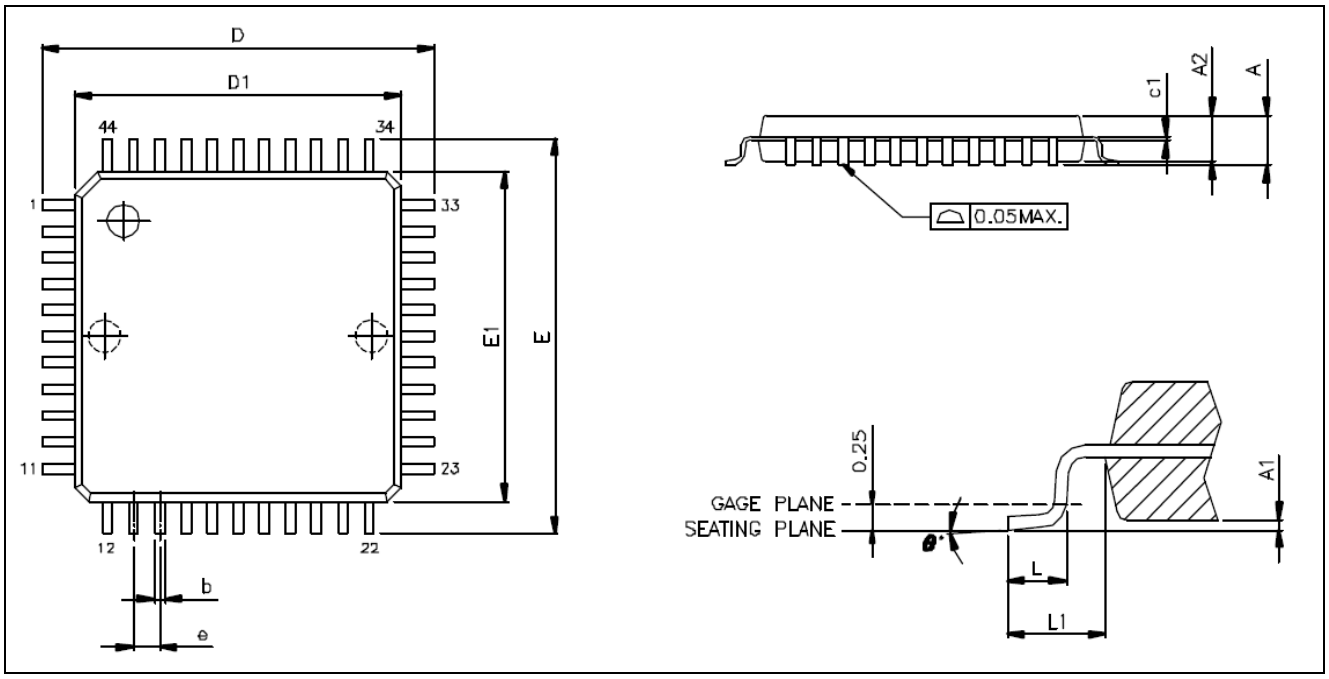
6. PACKAGE/PAD LOCATIONS

6.1. Ordering Information

Product Number	Package Type
GPMQ8018A	Halogen Free Package
GPMQ8012A	Halogen Free Package
GPMQ8012A_3C	Halogen Free Package
GPMQ8005A	Halogen Free Package

6.2. Package Information

6.3. LQFP 44



符号	尺寸单位 mm		
	Min.	Nom.	Max.
A	-	-	1.60
A1	0.05	-	0.15
A2	1.35	1.40	1.45
c1	0.09	-	0.16
D		12.00 BSC	
D1		10.00 BSC	
E		12.00 BSC	
E1		10.00 BSC	
e		0.80 BSC	
b	0.30	0.37	0.45
L	0.45	0.60	0.75
L1		1.00 REF	
θ °	0 °	3.5 °	7 °

7. DISCLAIMER

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8. REVISION HISTORY

Date	Revision #	Description	Page
OCT. 11, 2012	0.1	Original	31