

Wireless charging transmitter control SOC supporting qi certification

1 Features

- **WPC Qi compliant**
 - ◇ Supports BPP, PPDE, EPP protocols
 - ◇ Support BPP1.3 + PPDE authentication
- **Integrated 2P2N H-bridge driver**
 - ◇ External full-bridge power MOS
 - ◇ Support 5W~15W charging
- **Integrated ASK communication demodulation module**
- **Integrated DP&DM, PD fast charging**
 - ◇ Support DP/DM pin application adapter fast charging
 - ◇ Support PD3.0 fast charging protocol
 - ◇ Fast charging voltage support 5V/9V/12V gears
- **Built-in MTP ROM, support firmware upgrade**
- **Built-in comprehensive protection measures**
 - ◇ Support empty and loaded foreign object detection
 - ◇ Supports NTC temperature detection
 - ◇ Supports coil voltage maximum amplitude limitation
 - ◇ Support input overvoltage/undervoltage/overcurrent protection
- **Support CBB/NPO resonant capacitors**
- **Input power dynamic power management (DPM)**
 - ◇ Support 5V@500mA adapter power supply
 - ◇ Support PC USB interface power supply
- **System power consumption**
 - ◇ Operating standby power consumption 10mA
 - ◇ Power consumption less than 50uA in sleep mode
- **4mm x 4mm 0.5mm pitch QFN24 package**
QFN24-4mmx4mm

2 Applications

- **Wireless charging base**
- **Magnetic self-wake-up wireless charging mobile power**

3 Description

IP6823 is a highly integrated, WPC qi compliant wireless charging transmitter control chip. The chip internally integrates H-bridge driver module, ASK communication demodulation module, adapter fast charging Sink protocol and other necessary wireless charging resources.

IP6823 supports customisation of protocols, foreign object detection sensitivity, indicator lights and other functions.

IP6823 adopts QFN24 package, PIN pin function arrangement is optimised for wireless charging application, which is very convenient for PCB drawing.

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4 Reversion History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Change version V1.0 (January 2024)

●	First edition release	1
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5 Application Schematic

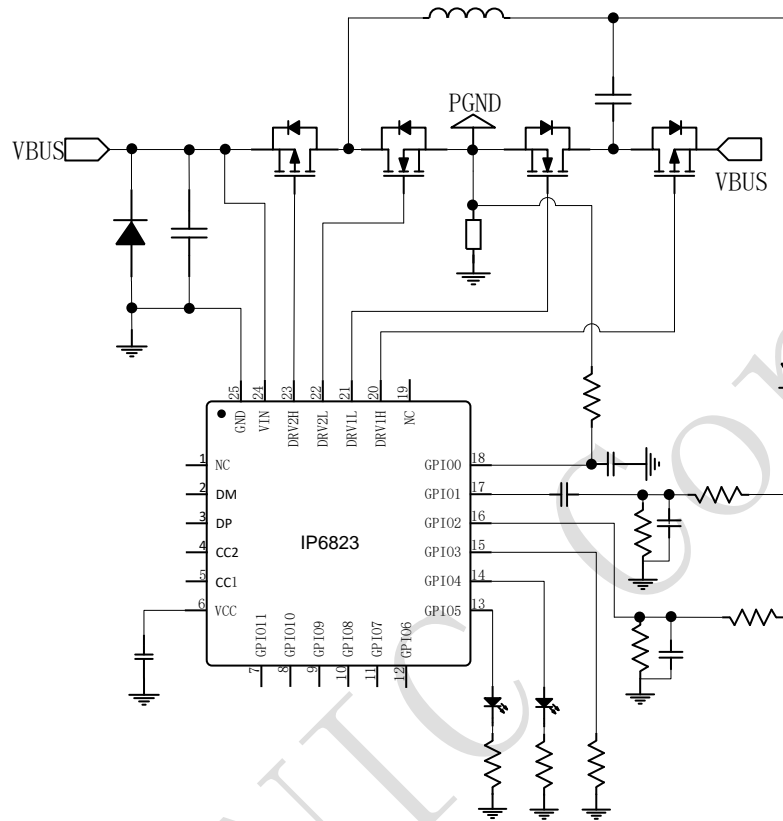


Figure 1 IP6823 Application Schematic

6 Pin Configuration And Function

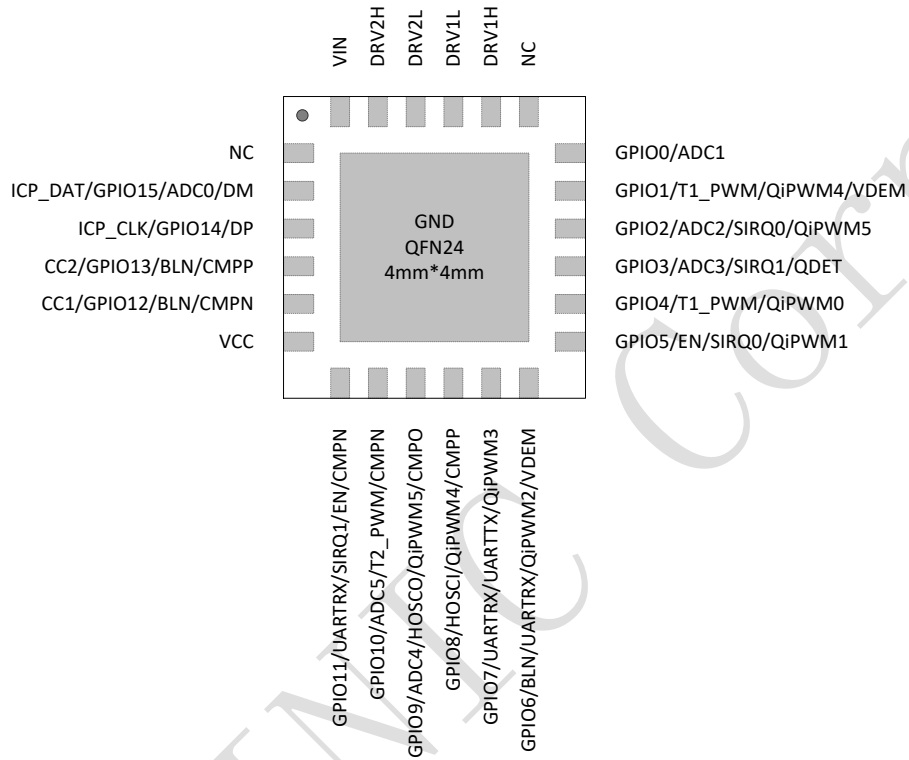


Figure 2 IP6823 Pin Diagram

Pin No.	Pin Name	I/O Properties	Description
1	NC	-	Floating
2	DM	I/O	USB DM
3	DP	I/O	USB DP
4	CC2	I/O	Type_C detection pin CC2
5	CC1	I/O	Type_C detection pin CC1
6	VCC	PO	Internal VCC power supply, output connected to 2.2 μ F capacitor to ground
7	GPIO11	I/O	GPIO
8	GPIO10	I/O	GPIO
9	GPIO9	I/O	GPIO
10	GPIO8	I/O	GPIO
11	GPIO7	I/O	GPIO
12	GPIO6	I/O	GPIO
13	GPIO5	I/O	Light display control pin
14	GPIO4	I/O	Lamp display and NTC detection pin
15	GPIO3	I/O	GPIO
16	GPIO2	I/O	Coil voltage detection pin
17	GPIO1	I/O	Voltage decoding input pin
18	GPIO0	I/O	Current sampling input pin
19	NC	-	Floating
20	DRV1H	I/O	DRV1 upper tube driver
21	DRV1L	I/O	DRV1 lower tube driver
22	DRV2L	I/O	DRV2 lower tube driver
23	DRV2H	I/O	DRV2 upper tube drive
24	VIN	PI	Power supply pin
25	GND	-	System Ground and Power Ground

7 Functional Block Diagram

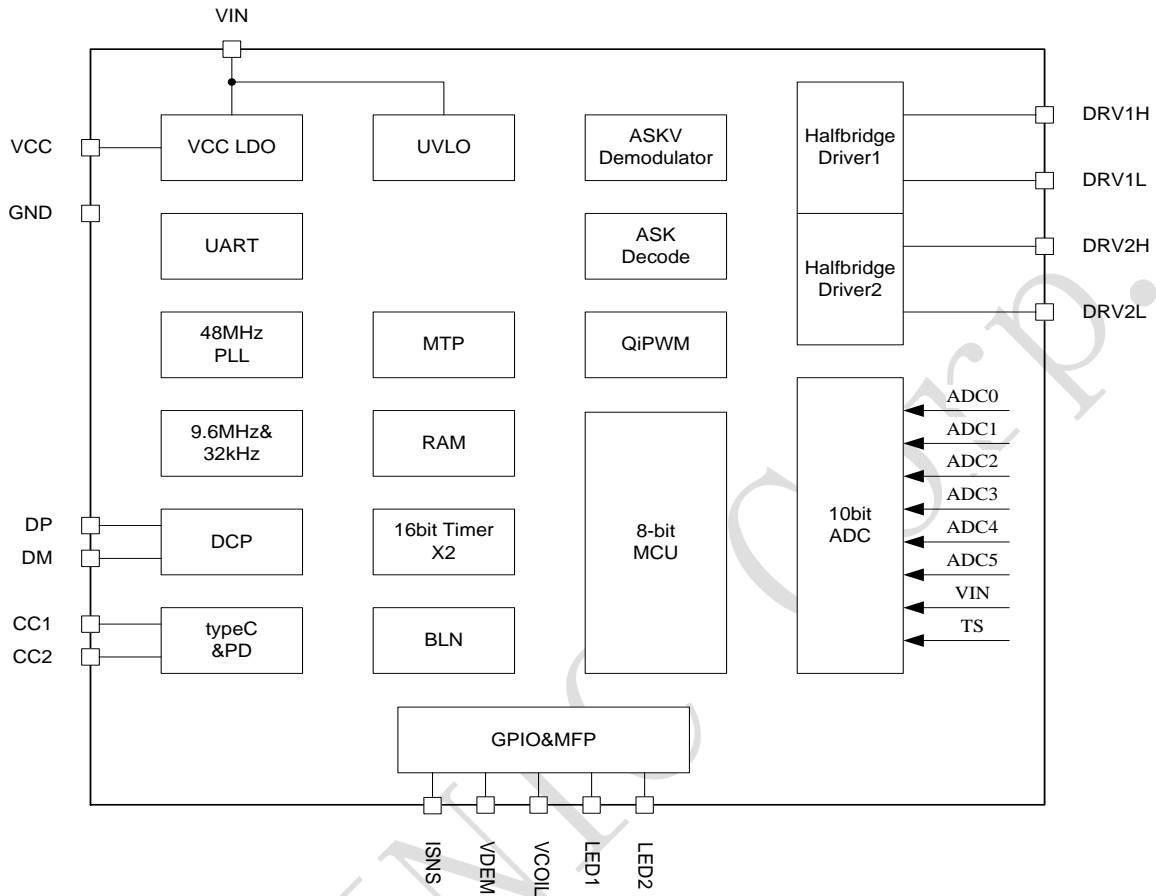


Figure 3 IP6823 Functional Block Diagram

8 Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)

Parameters	Symbol	Min	Max	Unit
Input Voltage	VIN, DRV1H, DRV2H	-0.3	15	V
	CC1, CC2	-0.3	8	V
	DP, DM	-0.3	8	V
	ISNS, VDEM, VCOIL	-0.3	8	V
	LED1, LED2	-0.3	8	V
Junction Temperature Range	T _J	-40	125	°C
Storage Temperature Range	T _{stg}	-55	150	°C
Package Thermal Resistance (Junction Temperature to environment)	θ _{JA}	124		°C/W
Human Body Model (HBM)	ESD	4		KV

* Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to Absolute Maximum Rated conditions for extended periods may affect device reliability.

9 Recommended Operating Conditions

Parameters	Symbol	Min	Typ	Max	Unit
VIN Supply voltage	VIN	4	5/9/12	13	V
GPIO input voltage	LED1, LED2	-0.3	-	VCC+0.3	V
	ISNS, VDEM, VCOIL	-0.3	-	VCC+0.3	V
Working environment temperature	TA	-20	-	85	°C

* Beyond these operating conditions, the device operating characteristics are not guaranteed.

10 Electrical Characteristics

Unless otherwise specified, TA=0°C ~85°C

Parameters	Symbol	Test conditions	Min	Typ	Max	Unit
VIN						
VIN operating voltage range	V _{IN}		4	-	13	V
VIN standby current	I _{Q_VIN}	V _{IN} =5V		10	15	mA
VIN sleep current	I _{SLEEP_VIN}	V _{IN} =3~5V	30	-	50	uA
System						
VCC voltage	V _{CC}	VIN = 5V		4.8		V
VCC load capacity I _{VCC}	I _{VCC}	VCC maximum load current			50	mA
Thermal shutdown junction temperature	T _{OTP}	Rise in temperature	130	140	150	°C
Thermal shutdown hysteresis	ΔT _{OTP}	Thermal shutdown recovery hysteresis	30	40	50	°C

11 Function Description

11.1 H Bridge Drive

The IP6823 integrates two symmetrical half-bridge driver modules to drive the external N+PMOS H-bridge. The dead time and drive strength of the driver modules can be software configured in different steps. During EMI EMC testing, the EMI margin can be improved by configuring the drive capability in lower gears, thus saving external RC devices.

The IP6823 uses a 20mΩ sampling resistor for low-side sampling of the H-bridge current, and the RC filter device for the sampled signal should be placed close to the IC to avoid noise interference.

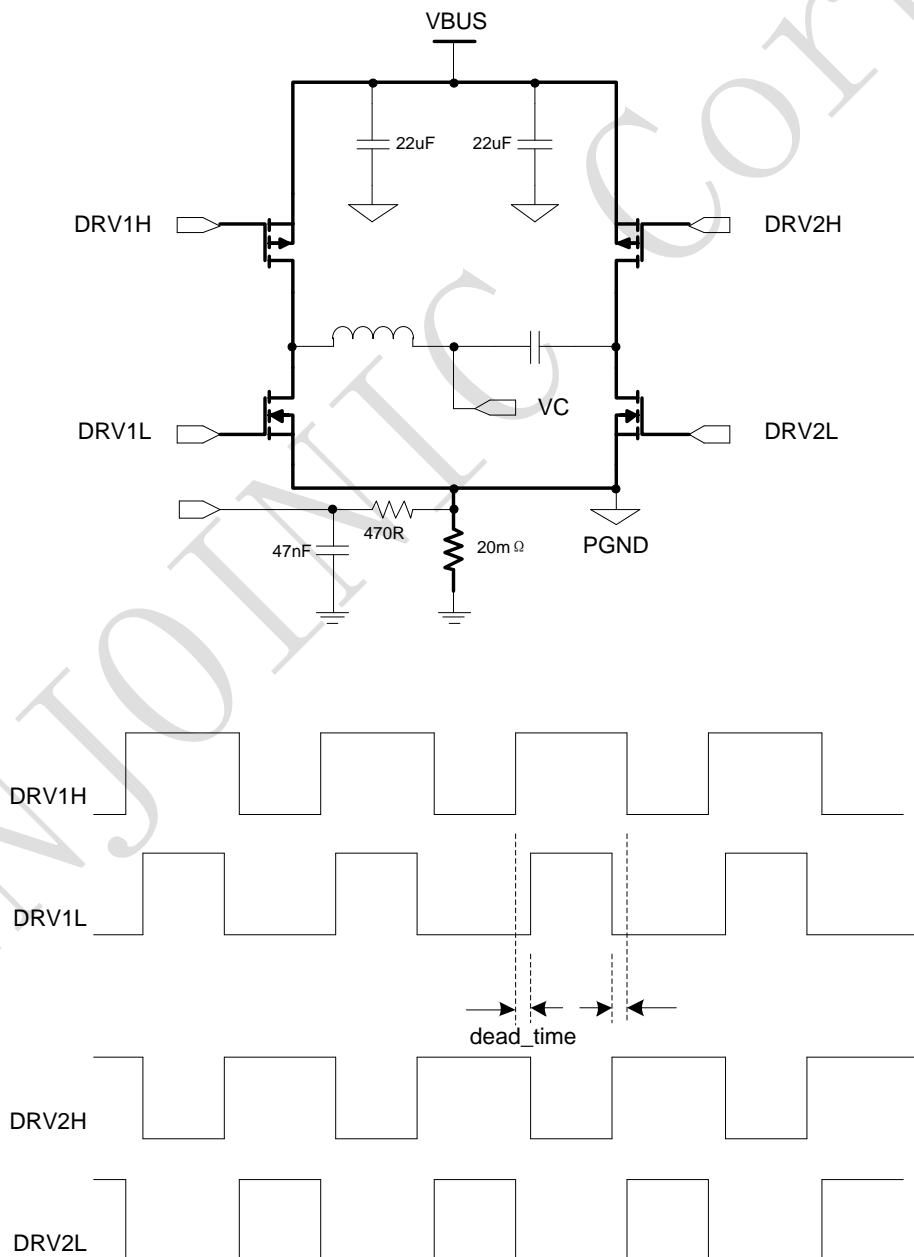


Figure 4 H-bridge drive schematic

11.2 ASK communication demodulation/FSK modulation

IP6823 has a built-in ASK demodulation module. For the ASK modulated signal from the receiving device, IP6823 collects the coil voltage and current respectively to demodulate and decode the ASK signal. The system realises the qi wireless charging protocol according to the ASK decoded data.

IP6823 built-in FSK modulation function, through FSK modulation, IP6823 can send information to the receiving device to achieve PPDE, EPP protocol.

11.3 Input Fast Charging

IP6823 has built-in USB PD protocol, applying voltage to PD adapter via CC1, CC2 pins.

IP6823 has built-in DP/DM class adapter fast charging protocol, applying voltage to the adapter through DP, DM pins.

11.4 NTC temperature protection

The IP6823's LED1 pin is time-multiplexed to realise the LED indicator and NTC detection function, and the recommended parameters for the NTC resistor are B=3950,100k.

The NTC detection pin of IP6823 can output 20uA constant current source, external 100k NTC resistor, 20uA constant current source forms voltage on NTC resistor, and the internal ADC of IC detects this voltage to achieve temperature protection. If the NTC function is not used, this pin is connected to 100K resistor to ground.

Users should follow the steps below when customising the NTC temperature protection threshold:

- 1、 Check the datasheet of NTC resistor to find the temperature-resistance relationship table;
- 2、 According to the protection temperature point, find the corresponding resistance value R_{NTC} , then the internal ADC detects the voltage for protection threshold:

$$V_{NTC} = R_{NTC} * 20\mu A \text{ (unit mV);}$$

- 3、 Use the parameters provided by the original factory to configure the host computer software, V_{NTC} configuration to the firmware, the new temperature protection threshold will take effect;
- 4、 The standard firmware NTC protection threshold is set to 75 °C (290mV), when the NTC voltage is detected to be lower than 290mV protection. NTC recovery threshold is set to 50 °C (700mV), when the NTC voltage is detected to be higher than 700mV to resume charging.

11.5 Charging Indicator

IP6823 supports user-defined charging indicator (need to use the PC uplink provided by the original manufacturer), import the firmware into the uplink software, configure the indicator effect on the software interface, export the new firmware to get the desired indicator effect.

Note: Only LED2 (PIN7) supports breathing light mode.

The standard firmware indicator status is as follows:

Charging status	LED1	LED2
Power-on	Alternating flashes, three times in total	
Standby	Off	Off
Charging	On	Off
FOD	Off	Flashing
Overheating	Off	Flashing
Overvoltage/undervoltage	Off	Flashing
Full charged	Off	On

11.6 Firmware Upgrade Instructions

IP6823 integrates MTP ROM and supports firmware upgrade, the firmware download interface is DP/DM pin. To download the firmware, you need to use the burner provided by the original manufacturer.

12 Typical Application Schematic

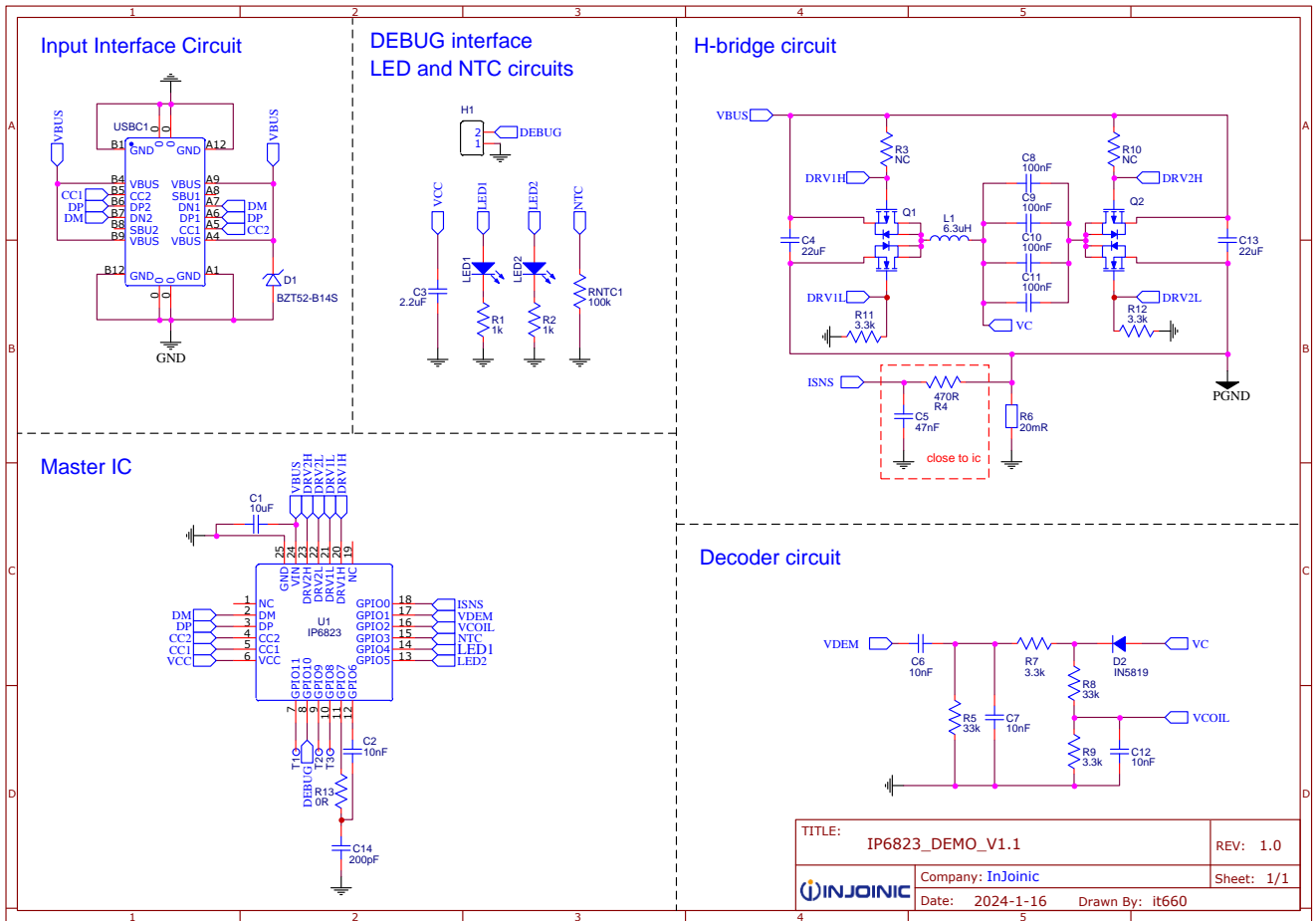


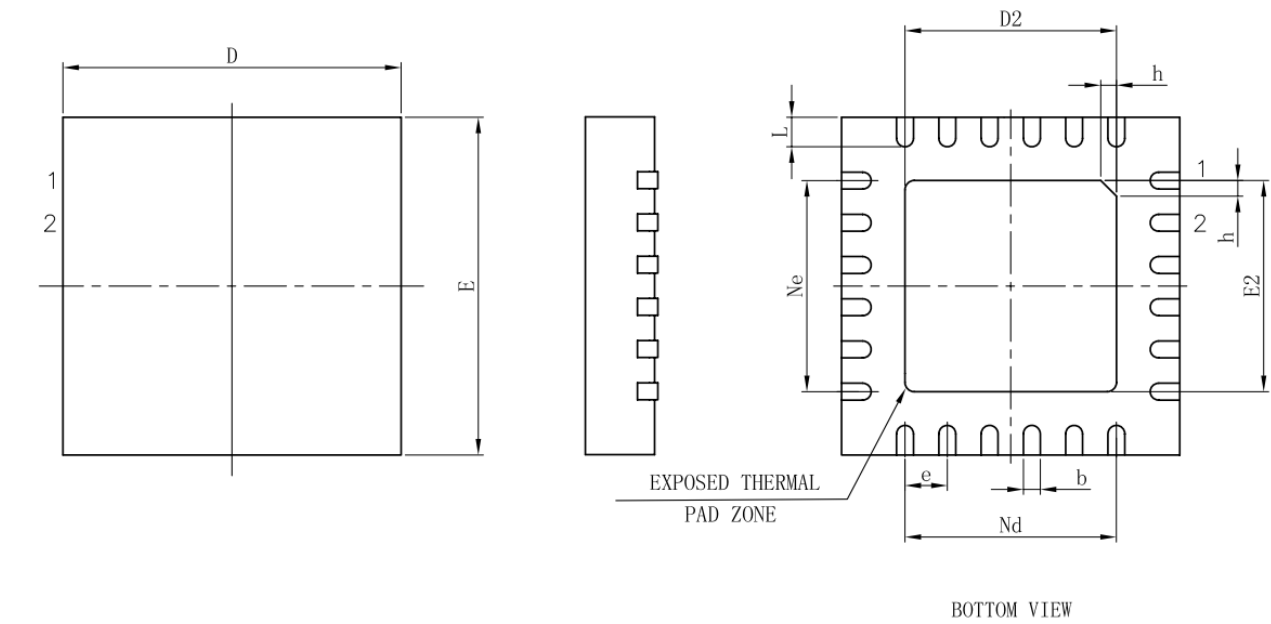
Figure 5 Typical Application Schematic

13 BOM

Item	Part Name	Description&Specification	Description	Qty
1	200pF	C14	C0603	1
2	10nF	C2,C6,C7,C12	C0603	4
3	47nF	C5	C0603	1
4	100nF	C8,C9,C10,C11	C1206	4
5	2.2uF	C3	C0603	1
6	10uF	C1	C0603	1
7	22uF	C4,C13	C0805	2
8	0R	R13	R0603	1
9	20mR	R6	R1206	1
10	470R	R4	R0603	1
11	1k	R1,R2	R0603	2
12	3.3k	R7,R9, R11,R12	R0603	4
13	33k	R5,R8	R0603	2
14	100k	RNTC1	R0603	1
15	AP20G02BDF	Q1,Q2	DFN-8_L3.1-W3.2-P0.65-BL-EP	2
16	BZT52-B14S	D1	SOD-323_L1.9-W1.3-LS2.5-RD-1	1
17	IN5819	D2	SOD-123_L2.7-W1.6-LS3.7-R-RD	1
18	6.3uH	L1	IND-SMD_L4.5-W3.0	1
19	LED	LED1	LED0603_RED	1
20	LED	LED2	LED0603_GREEN	1
21	IP6823	U1	QFN24_L4.0-W4.0-P0.5-TL-EP2.45	1
22	TYPE-C-31-M-12	USBC1	USB-C_SMD-TYPE-C-31-M-12	1

Note: The parameter of voltage regulator D1 must be a nominal regulated value of 14V with an accuracy of 2% (the regulated range is 13.72V~14.28V).

14 Package



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	—	0.02	0.05
b	0.18	0.25	0.30
c	0.18	0.20	0.25
D	3.90	4.00	4.10
D2	2.40	2.50	2.60
e	0.50BSC		
Ne	2.50BSC		
Nd	2.50BSC		
E	3.90	4.00	4.10
E2	2.40	2.50	2.60
L	0.35	0.40	0.45
h	0.30	0.35	0.40

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