# Wireless Charging Transmitter Controller

## 1 Features

- **Supports the latest WPC standard**
  - ✧ Support Qi protocol BPP, EPP, QI2.0 MPP certification
- **Working voltage**
  - ✧ 4V ~ 20V
- **Support up to 30W applications**
- **Support 5~15W multiple applications**
  - ✧ Power backwards compatible
- **Integrated H-bridge drive**
- **Integrated internal voltage & current demodulation**
- **Support FOD foreign object detection function**
  - ✧ Static FOD detection
  - ✧ Dynamic FOD detection
- **Support external passive crystal oscillator**
- **Support CBB/NPO capacitors**
- **Support Q value detection**
- **Dynamic Power Management (DPM) for USB power supply with insufficient power supply**
- **Input overvoltage, overcurrent, undervoltage, NTC overtemperature protection function**
- **Integrated 32KB MTP to support repeated firmware upgrades**
- **Support PD3.0, as well as a variety of DP&DM fast charging protocols**
- **Package 5 mm × 5 mm 0.5pitch QFN32**

## 2 Applications

**Wireless charging base**

## 3 Description

IP6802 is a wireless charging transmitter control SOC chip with internal integration of 32-bit MCU, ADC, Timer, I2C, H-bridge driver, ASK demodulation & decoding and rich IO resources, which can customize various Qi protocol wireless charging solutions and pass certification tests.

IP6802 integrates multiple charging head fast charging protocols, can automatically apply high voltage, and supports wireless charging fast charging protocols.

IP6802 integrates rich IO resources and supports customization of indicator effects, and users can also customize the indicator through the PC upper computer.



 

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# 4 Reversion History

Note: The page number of the previous version may differ from the page number of the current version.

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| • First Release | 1 |

| Changes from Revision V1.0 (September 2024) to Revision V1.10 | Page |
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| • Add MPP description | 1 |
| • Added MPP schematic | 12 |

# 5 Pin Configuration And Function

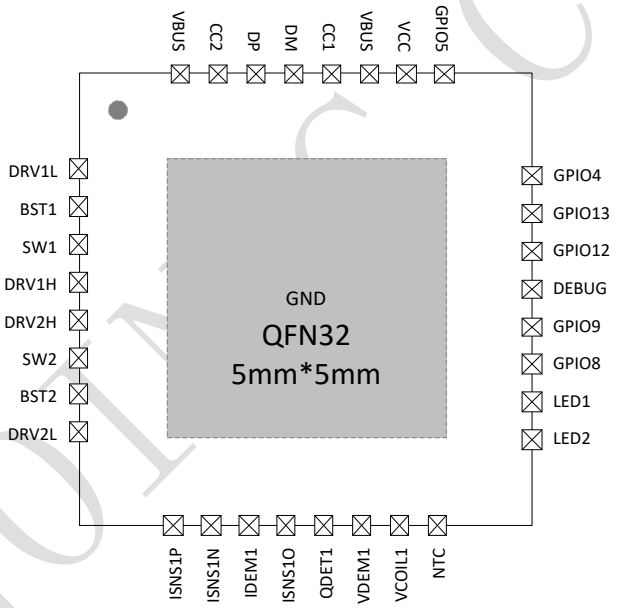



Figure 1 IP6802 Pin Diagram

## 5.1 Pin Description

| Pin No. | Pin Name | Description |
|---|---|---|
| 1 | DRV1L | DRV1 low-side drive |
| 2 | BST1 | DRV1 bootstraps, Series 47nF capacitors to SW1 |
| 3 | SW1 | DRV1 Half-bridge switch node |
| 4 | DRV1H | DRV1 high-side drive |
| 5 | DRV2H | DRV2 high-side drive |
| 6 | SW2 | DRV2 Half-bridge switch node |



| | | |
|---|---|---|
| 7 | BST2 | DRV2 bootstraps, Series 47nF capacitors to SW2 |
| 8 | DRV2L | DRV2 low-side drive |
| 9 | ISNS1P | VBUS current positive sense input |
| 10 | ISNS1N | VBUS current negative sense input |
| 11 | IDEM1 | ASK demodulate inputs |
| 12 | ISNS1O | Sample current amplified output |
| 13 | QDET | Q-value detection input |
| 14 | VDEM1 | ASK demodulate inputs |
| 15 | VCOIL1 | Coil voltage input pin |
| 16 | NTC | NTC input pin |
| 17 | LED2 | LED2 output |
| 18 | LED1 | LED1 output |
| 19 | GPIO8 | GPIO8 |
| 20 | GPIO9 | GPIO9 |
| 21 | GPIO10 | Debug Pin |
| 22 | GPIO12 | GPIO12 |
| 23 | GPIO13 | GPIO13 |
| 24 | GPIO4 | GPIO4 |
| 25 | GPIO5 | GPIO5 |
| 26 | VCC | Internal VCC supply, external 4.7uF capacitor to GND |
| 27 | VBUS | External input voltage |
| 28 | CC1 | Type_C detect pin CC1 |
| 29 | DM | USB DM |
| 30 | DP | USB DP |
| 31 | CC2 | Type_C detect pin CC2 |
| 32 | VBUS | External input voltage |
| 33 | GND | GND |



## 6 Functional Block Diagram

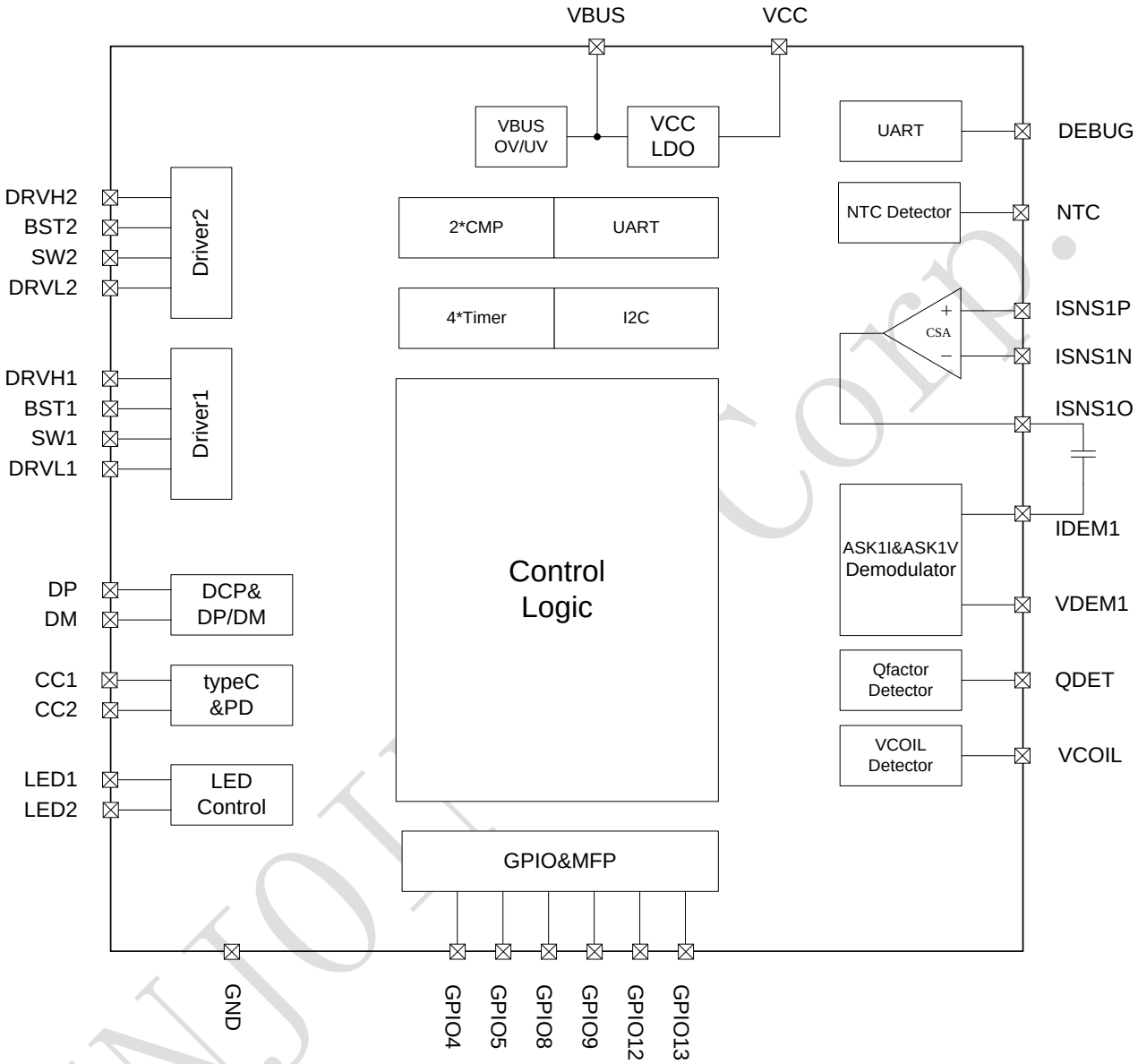



Figure 2 Functional Block Diagram



## 7 Absolute Maximum Ratings

| Parameters | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Input Voltage Range | VIN | -0.3 | 26 | V |
| | CC1, CC2 | -0.3 | 12 | |
| | DP, DM | -0.3 | 8 | |
| Junction Temperature Range | $T_J$ | -40 | 125 | ℃ |
| Storage Temperature Range | $T_{stg}$ | -60 | 125 | ℃ |
| Package Thermal Resistance（JunctionTemperature to environment） | $\theta_{JA}$ | 40 | | ℃/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.

## 8 Recommended Operating Conditions

| Parameters | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Input Voltage Range | $V_{IN}$ | 4.0 | 5/9/12 | 21.5 | V |
| I/O Voltage Range | IO4/5/8/9/12/13 | GND-0.3 | | $V_{CC}$+0.3 | V |
| | DP, DM,CC1,CC2 | GND-0.3 | | 5.5 | |
| | LED1,LED2 | GND-0.3 | | $V_{CC}$+0.3 | |
| | NTC | GND-0.3 | | $V_{CC}$+0.3 | |

*Devices' performance cannot be guaranteed when working beyond those Recommended Operating Conditions.

## 9 Electrical Characteristics

Unless otherwise specified, TA =25℃

| Parameters | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Input Voltage | $V_{IN}$ | | 4.0 | 5/9/12 | 21.5 | V |
| Internal power supply | $V_{CC}$ | | 3.0 | 3.6 | 5 | V |
| Input high level | $V_{IH}$ | | 0.7*$V_{CC}$ | | | V |
| Input low level | $V_{IL}$ | | | | 0.3*$V_{CC}$ | V |
| Input high level | $V_{OH}$ | | | $V_{CC}$ | | V |
| Input low level | $V_{OL}$ | | | GND | | V |
| LED Output current capability | Source current（LED1、LED2） | Source current to output high level is 0.8*VCC | | 2 | 4 | mA |



# 10 Function Description

## 10.1 Fast Charge Input Request

Built-in PD protocol input request module, apply fast charging voltage to PD adapter through CC1, CC2.

Built-in DP&DM input fast charging protocol request module, apply fast charging voltage to the adapter through DP&DM.

## 10.2 Full Bridge Drive and Digital Demodulation

The IP6802 has a built-in 4N full-bridge driver, and the peripheral circuit needs to build a full-bridge 4xNMOS to implement the wireless charging controller.

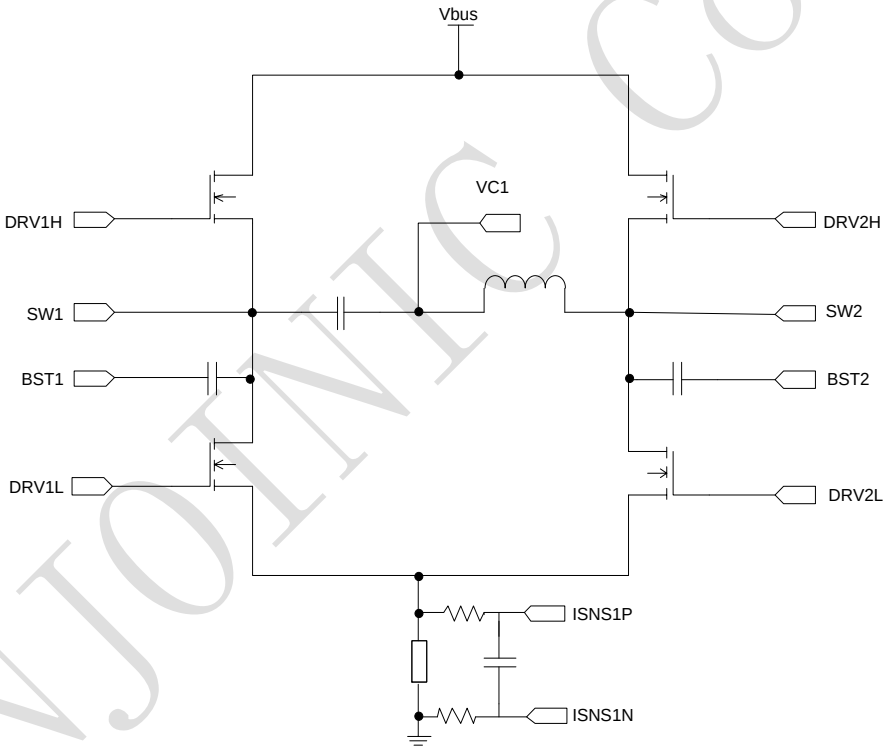



Figure 3 4xNMOS Full-Bridge Driver Application Circuit

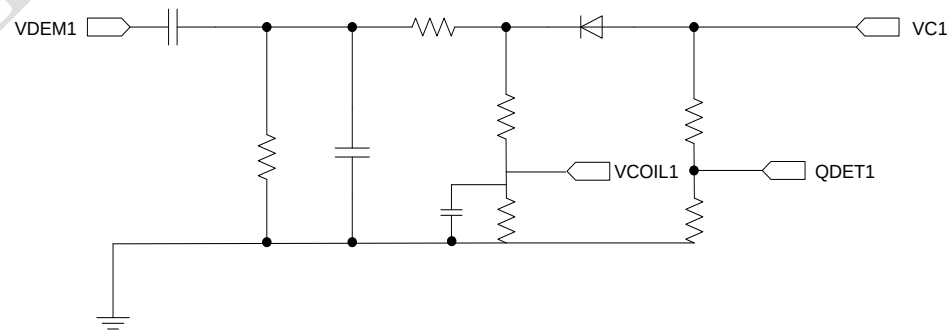



Figure 4 4xNMOS Voltage Decoder Circuit



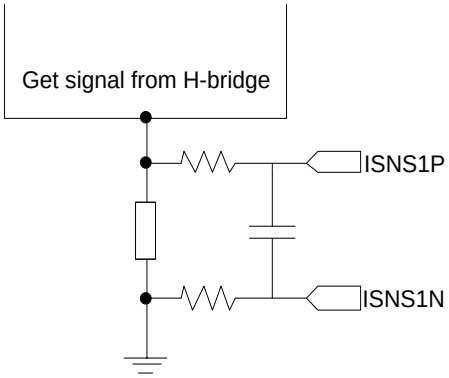



Figure 5 4xNMOS Current Decoder Circuit

## 10.3 DPM

For USB power supply with insufficient power supply capacity, it has dynamic power management function to keep the charging state uninterrupted. When the system detects that the input voltage is below 4.3V, the DPM function is activated to reduce the transmit power and hold it. When the input voltage returns to above 4.75V and the input current is reduced by 200mA compared to when it entered DPM, the system exits the DPM state.

## 10.4 FOD Parameter Adjustment

IP6802 supports static FOD foreign object detection and dynamic FOD foreign object detection.

Static FOD means that foreign objects on the coil can be detected when there is no wireless charging.

Dynamic FOD means being in the process of wireless charging and being able to detect foreign objects on the coil.

IP6802 can detect the Q value before entering charging to determine whether foreign objects exist, and can use the power loss method to determine whether foreign objects are present after entering charging.

## 10.5 NTC Thermal Protection

The NTC pin of IP6802 has a 20μA fixed output current, and the NTC PIN determines the NTC temperature by sampling the voltage of the NTC pin; this shutdown feature is to provide enhanced applications and is not limited to thermal shutdown. When the voltage of NTC pin is less than 0.5V, the system will enter NTC protection and end power transfer; after entering NTC protection, the NTC pin voltage is greater than 0.72V and normal charging resumes; if NTC application is not used, the pin is grounded through 100K resistor.

1.Refer to the NTC resistor data sheet to find the resistance - temperature relationship table

2.According to the protection temperature point, find the corresponding resistance value R_NTC



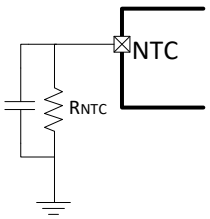



Figure 6 NTC Detection Circuit

Thermistor Recommended Parameters:$R_{NTC}$=100K@25℃ B=3950；

## 10.6 Charging Indicator

IP6802 built-in indicator model algorithm, support user-defined charging indicator (need to use the PC upper computer provided by the original factory), import the firmware to the upper computer software, configure the indicator effect on the software interface, and export the new firmware to get the required indicator effect.

The default firmware LEDs correspond to each state light display as follows:

| Charge Status | LED1 | LED2 |
|---|---|---|
| Power On | Blink 3 Times | Blink 3 Times |
| Standby | OFF | OFF |
| Charging | ON | OFF |
| FOD | OFF | Blink |
| Over Temperature | OFF | Blink |
| Overvoltage/Undervoltage | OFF | Blink |
| Charging Completed | OFF | ON |

Each charging status light display can be flexibly configured or customized to achieve, such as charging breathing light, abnormal flashing and other charging indicators.

## 10.7 Efficiency Curve Test

Using IDT P9221 solution for RX device, the relationship of efficiency and system output power

$$\eta_{\text{system}} = \frac{P_{\text{OL}}}{P_{\text{in}}}$$

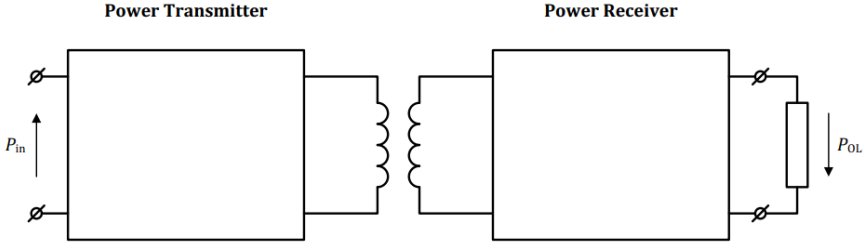



Figure 7 Wireless Charging Power Conversion Model

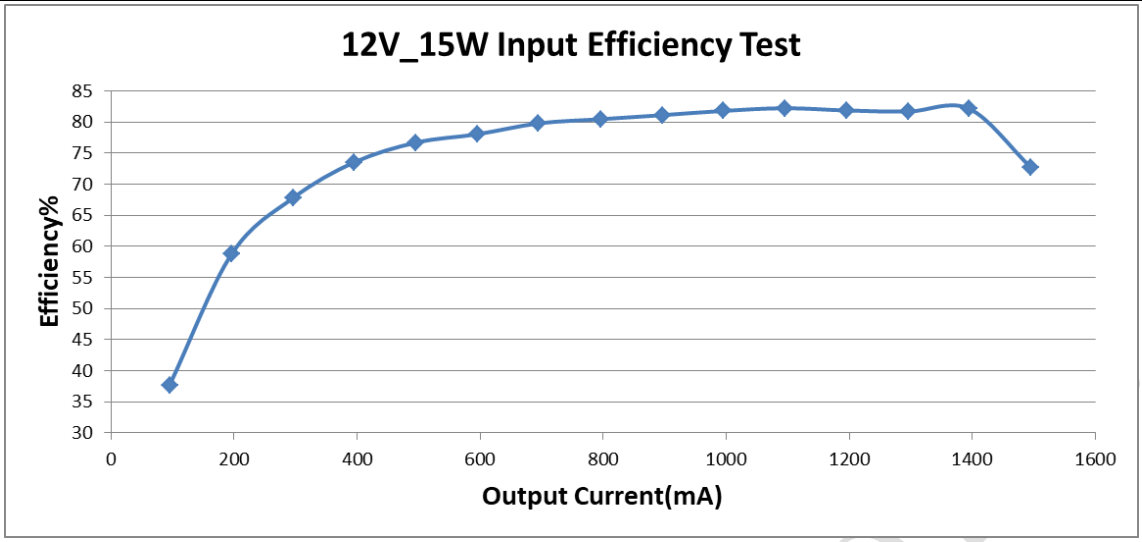



Figure 8 Loaded 15W Efficiency (Use IDT P9221_R RX)

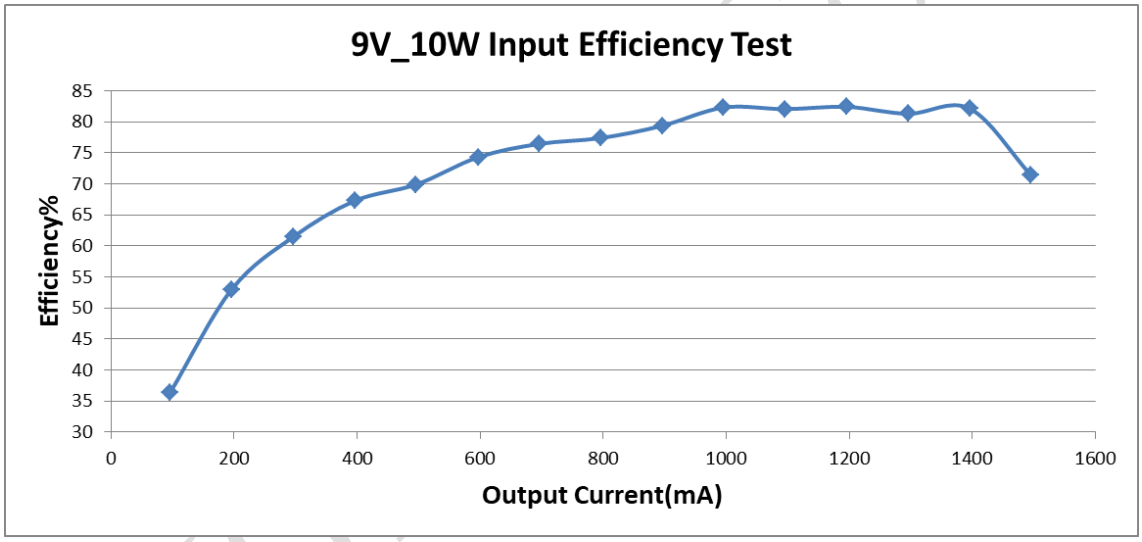



Figure 9 Loaded 10W Efficiency (Use IDT P9221_R RX)

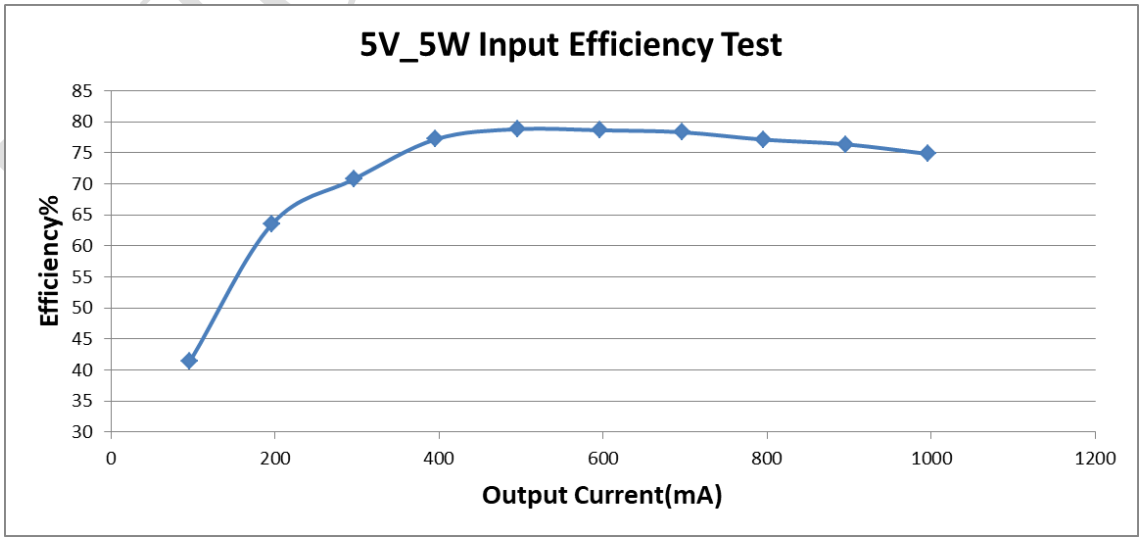



Figure 10 Loaded 5W Efficiency (Use IDT P9221_R RX)

## 11 Application Notes

IP6802 can be used with different transmitting coils and resonant capacitors to realize different power wireless charging solutions.

## 12 Firmware Upgrade Instructions

IP6802 integrates MTP ROM, supports multiple firmware upgrades, and the firmware download interface is DP/DM pins. The firmware download interface is DP/DM pin. To download the firmware, use the burner provided by the original manufacturer.



# 13 Typical Application Schematic

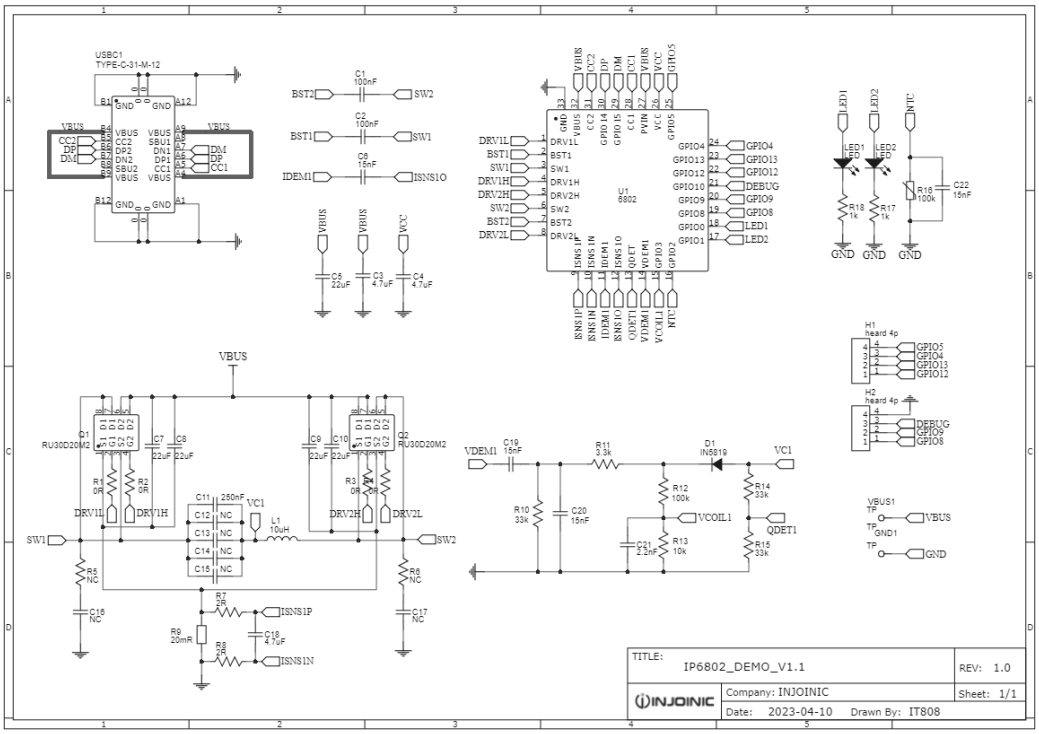



Figure 11 Typical Application Schematic

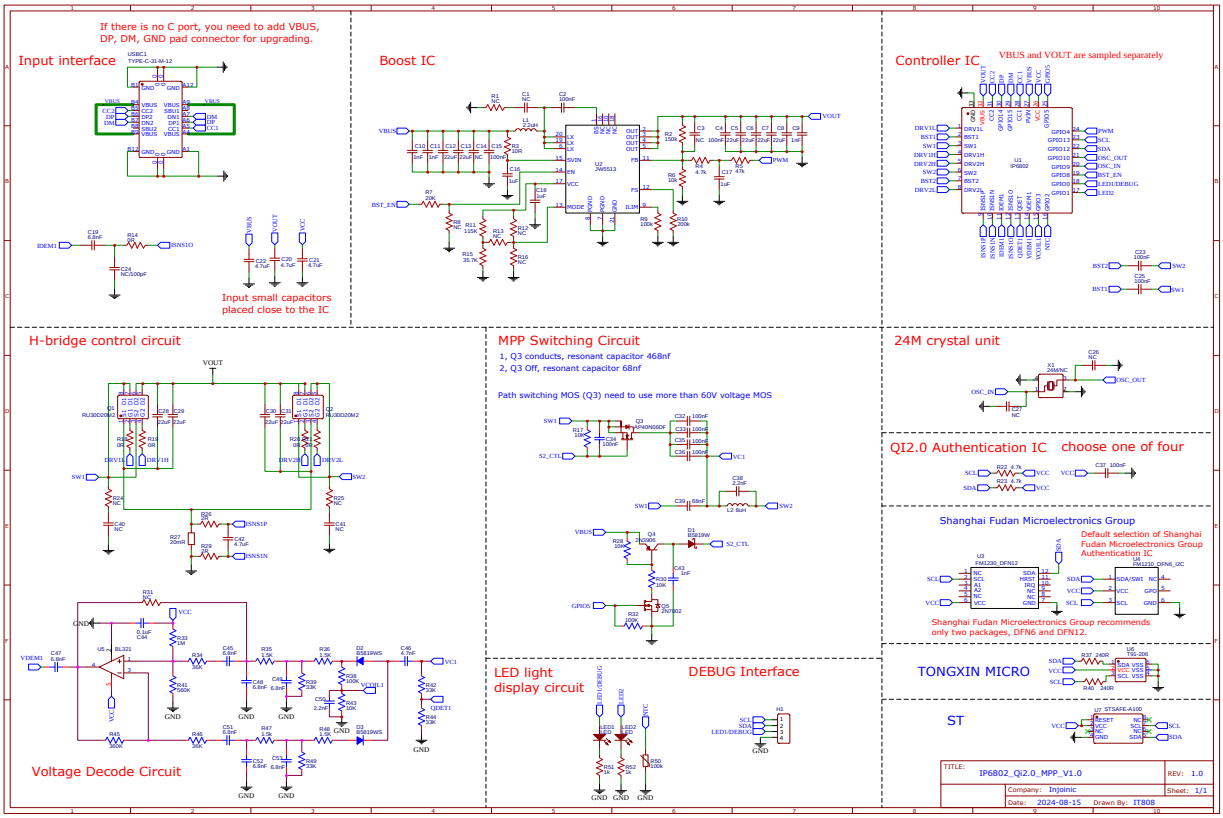
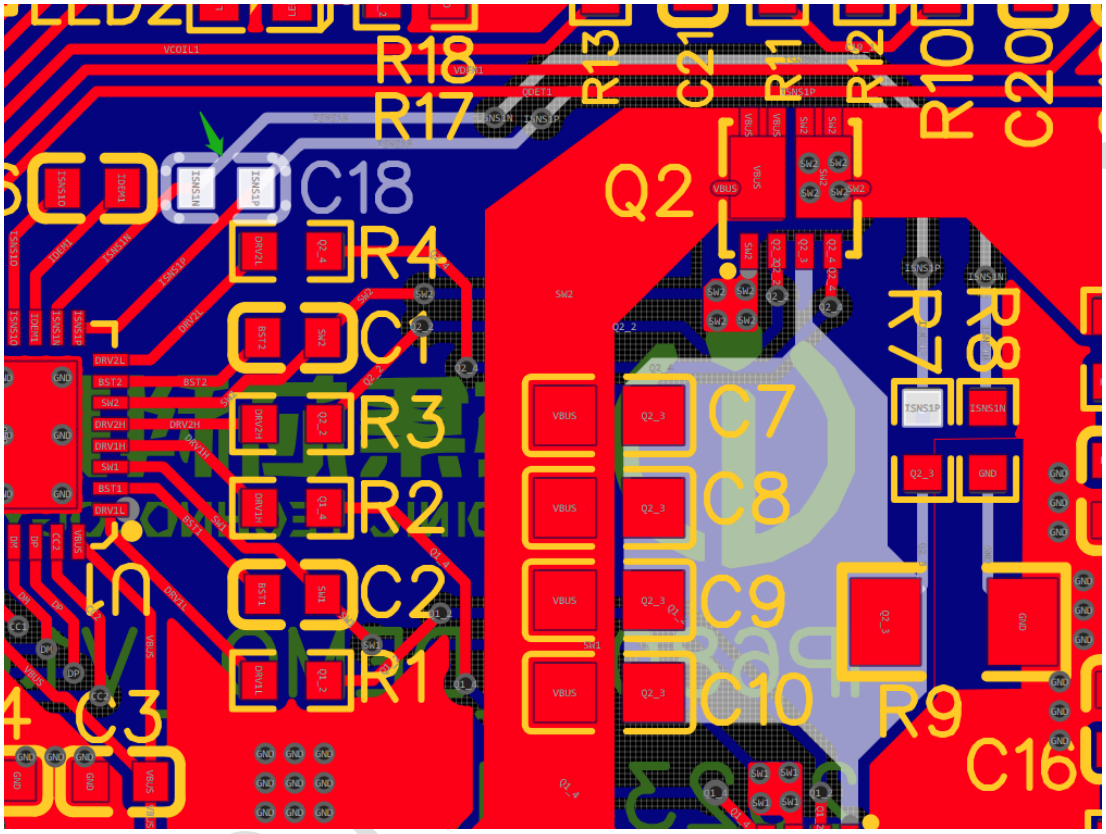



Figure 12 MPP Certification Schematic

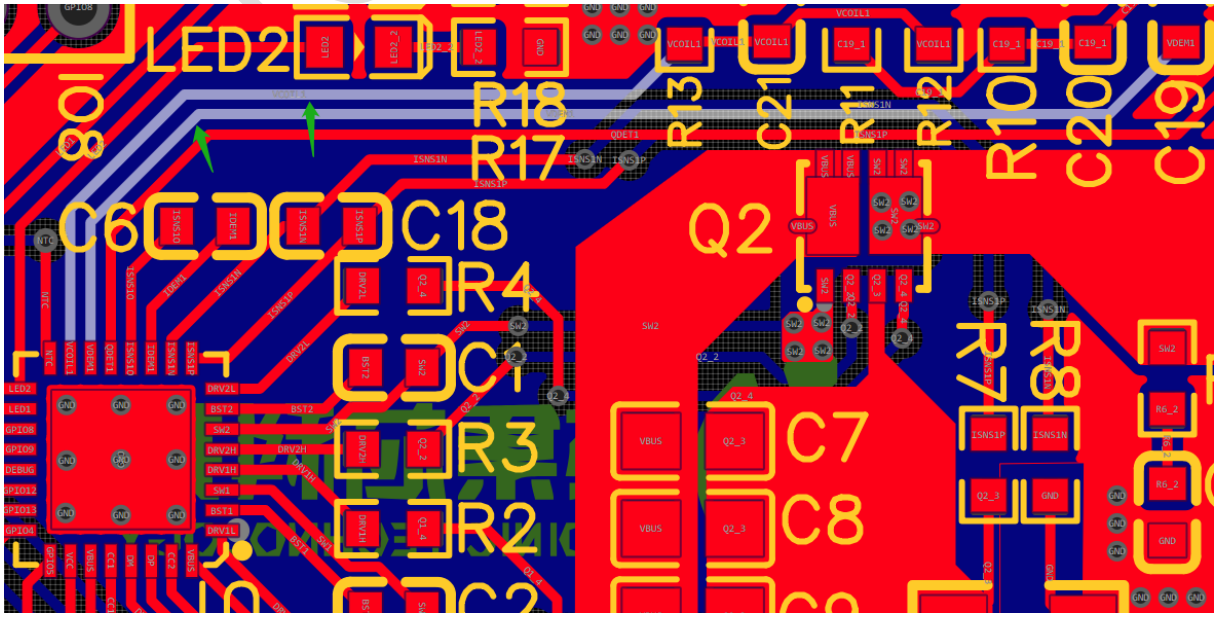
 

## 14 Layout Notes

As shown in the figure below: the positive pole and negative pole of the 20mR Jepsun Sampling resistor need to be individually defferential pair to the IC's ISNS1P and ISNS1N; and the routing of GND needs to be separated from the copper laying of GND, there can be no overlap.

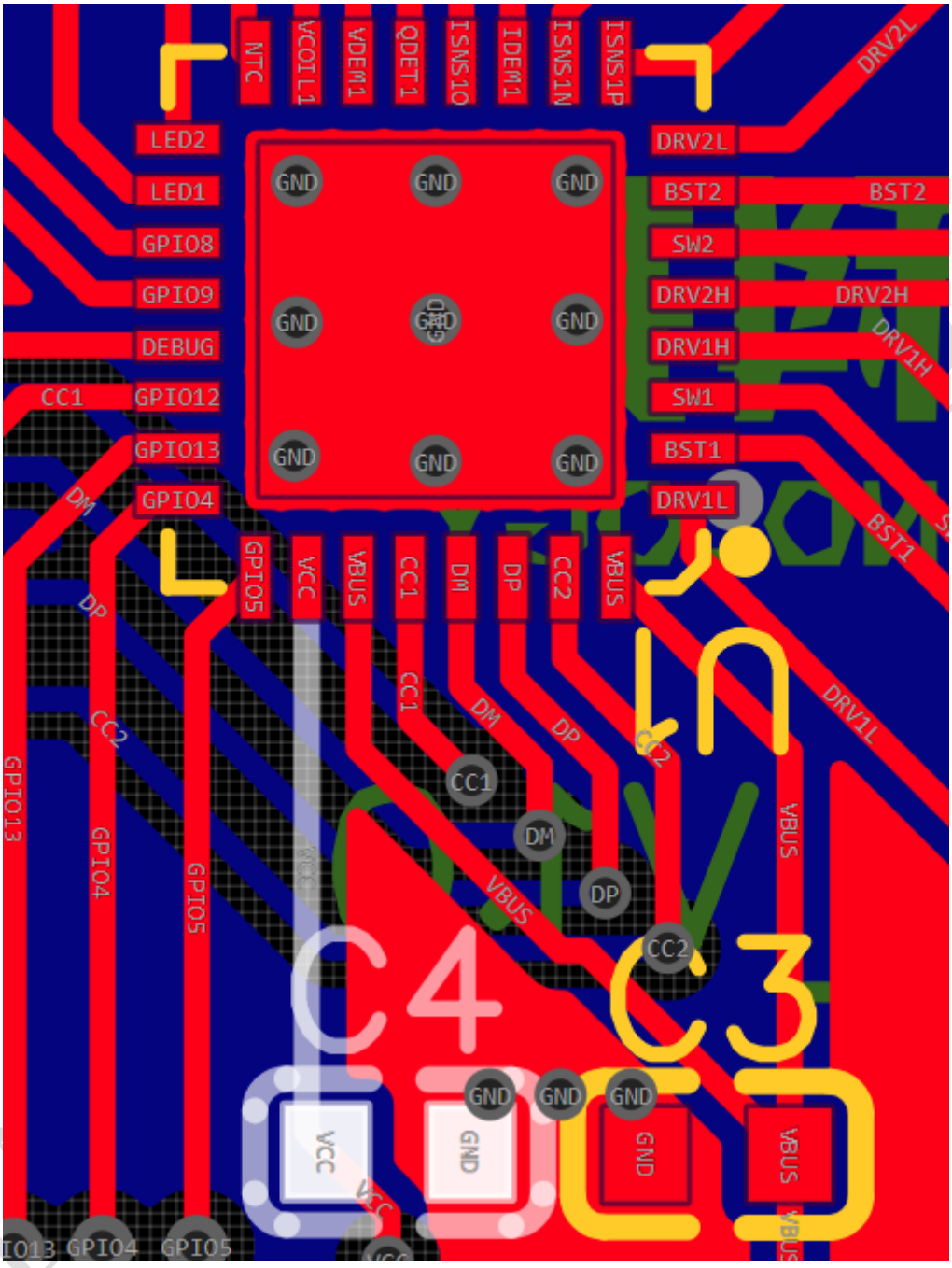



As shown in the figure below: the VCOIL and VDEM of IP6802 should be wrapped with ground treatment, as far as possible from resonant capacitors, coils and other power lines; including the drive signal of IP6802, it is best to do wrapped ground treatment, away from resonant capacitors and coils.



As shown in the figure below, the VCC capacitor of IP6802 needs to be placed close to the IC pin.

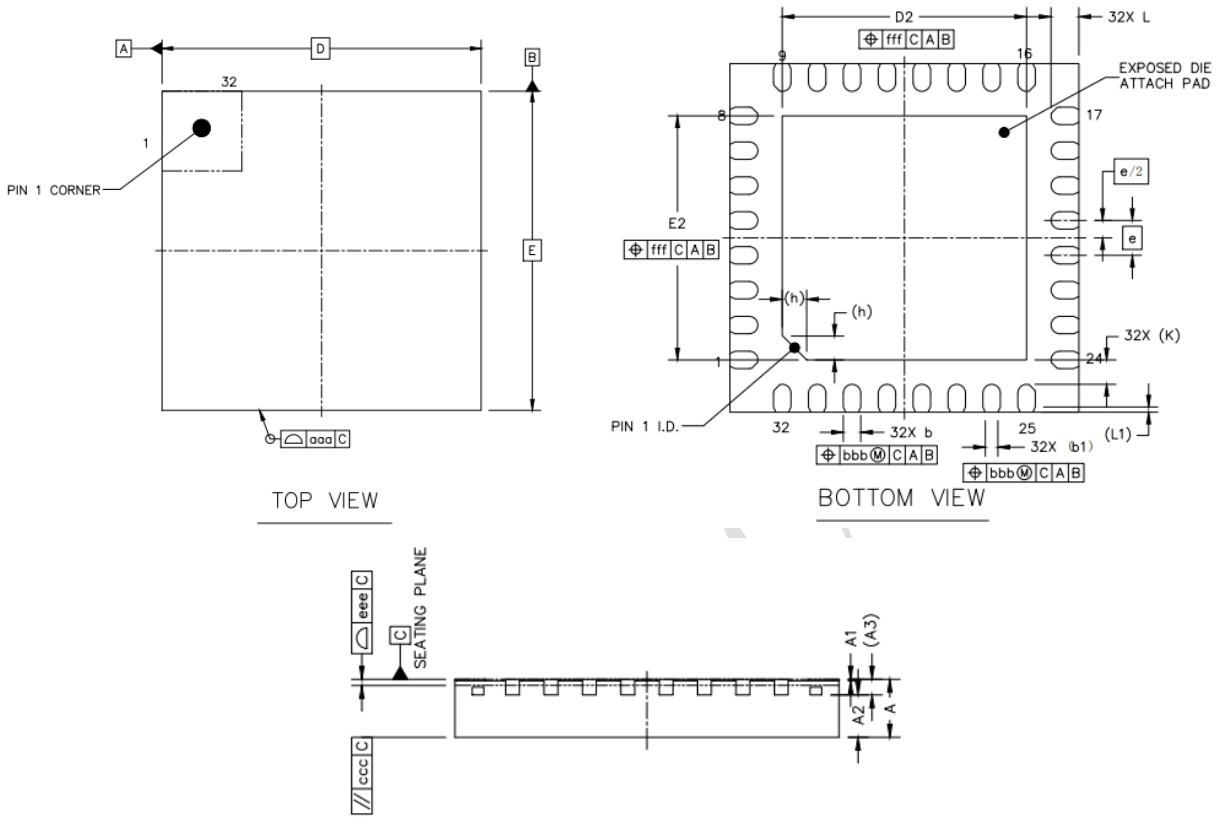


## 15 BOM

| Item | Part Name | Description&Specification | Description | Qty | Note |
|---|---|---|---|---|---|
| 1 | 100nF | C0603 | C1,C2 | 2 | |
| 2 | 4.7uF | C0603 | C3,C4,C18 | 3 | |
| 3 | 22uF | C0805 | C5,C7,C8,C9,C10 | 5 | |
| 4 | 15nF | C0603 | C6,C19,C20,C22 | 4 | |
| 5 | 250nF | CBB | C11 | 1 | |
| 6 | 2.2nF | C0603 | C21 | 1 | |
| 7 | IN5819 | SOD-123F | D1 | 1 | |
| 8 | 10uH | MP_A2 线圈 | L1 | 1 | |
| 9 | LED | LED0603 | LED1,LED2 | 2 | |
| 10 | RU30D20M2 | PDFN3333-8 | Q1,Q2 | 2 | |
| 11 | 0R | R0603 | R1,R2,R3,R4 | 4 | |
| 12 | 2R | R0603 | R7,R8 | 2 | |
| 13 | 20mR | R1206_1 | R9 | 1 | |
| 14 | 33k | R0603 | R10,R14,R15 | 3 | |
| 15 | 3.3k | R0603 | R11 | 1 | |
| 16 | 100k | R0603 | R12 | 1 | |
| 17 | 100k | R0603 100K@25℃ B=3950 | R16 | 1 | |
| 18 | 10k | R0603 | R13 | 1 | |
| 19 | 1k | R0603 | R17,R18 | 2 | |
| 20 | TYPE-C-31-M-12 | USB-C_SMD | USBC1 | 1 | |

## 16 Package




| | | SYMBOL | MIN | NOM | MAX |
|---|---|---|---|---|---|
| TOTAL THICKNESS | | A | 0.7 | 0.75 | 0.8 |
| STAND OFF | | A1 | 0 | 0.02 | 0.05 |
| MOLD THICKNESS | | A2 | --- | 0.55 | --- |
| L/F THICKNESS | | A3 | | 0.203 REF | |
| LEAD WIDTH | | b | 0.2 | 0.25 | 0.3 |
| | | b1 | | 0.18 REF | |
| Epad Chamfer Dimension | | h | | 0.35 REF | |
| BODY SIZE | X | D | | 5 BSC | |
| | Y | E | | 5 BSC | |
| LEAD PITCH | | e | | 0.5 BSC | |
| EP SIZE | X | D2 | 3.4 | 3.5 | 3.6 |
| | Y | E2 | 3.4 | 3.5 | 3.6 |
| LEAD LENGTH | | L | 0.35 | 0.4 | 0.45 |
| | | L1 | | 0.075 REF | |
| LEAD TIP TO EXPOSED PAD EDGE | | K | | 0.35 REF | |
| PACKAGE EDGE TOLERANCE | | aaa | | 0.1 | |
| MOLD FLATNESS | | ccc | | 0.1 | |
| COPLANARITY | | eee | | 0.08 | |
| LEAD OFFSET | | bbb | | 0.1 | |
| EXPOSED PAD OFFSET | | fff | | 0.1 | |

## 17 Silk Information



# 18 IMPORTANT NOTICE

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