DB2306 EV Charging Controller

Datasheet

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1 Overview

The DB2306 EV Charging Controller is the core unit of an Electric Vehicle Communication Controller (EVCC), responsible for managing high-level charging in the EV Combined Charging System (CCS) and Megawatt Charging System (MCS) .

It features a Qualcomm QCA7006AQ and a powerful automotive MCU running an RTOS, supporting a complete DIN 70121, ISO 15118-2/20 software stack, as well as an IEC 61851 stack.

1.1 HomePlug Green PHY

The DB2306 fully supports HomePlug Green PHY Spec 1.1 (IEEE 1901). HPGP features:

- Spectrum: 2 – 30 MHz
- Max PHY rate: 10Mbps
- Modulation: OFDM
- Subcarriers: 917
- Subcarrier space: 24.414kHz
- ROBO: 4Mpbs (5x repeat code), 5Mbps (4x repeat code), 10Mpbs (2x repeat code)

1.2 Charging Software Stack

The DB2306 complies with

- ISO 15118-3
- ISO 15118-10 with external Ethernet Controller
- DIN 70121
- ISO 15118-2/20 DC EIM and PnC (support planned by the end of 2025)
- ISO 15118-20 Bidirectional charging with security

1.3 Hardware Security Module

- High performance Security System with dedicated core, firmware, memory
- ECC crypto curves: ECC NIST (up to 521 bit) / ed448
- Miyaguchi-Preneel SHA-2/SHA3 (up to 512b)
- TRNG & PRNG (AIS & NIST compliant)
- Secure key storage: up to 256k bytes

1.4 Diagram

Figure 1 shows controller components as well as necessary connections and external components.

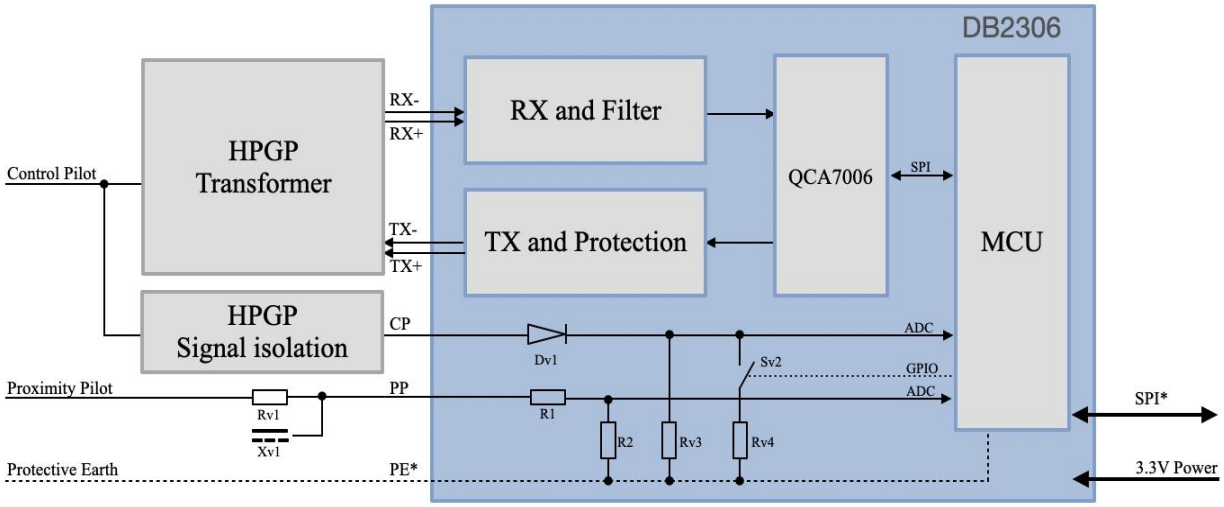

Figure 1 – DB2306 Block Diagram

Notes:

1. The terms(Dv1, Rv3, Rv4, Sv2, Rv1, and Xv1) follow the definitions of IEC 61851.
   - Dv1: Diode
   - Rv3: 2.74kΩ resistor
   - Rv4: 1.3kΩ resistor
   - Sv2: S2 Switch
   - Rv1：330Ω resistor
   - Xv1: Proximity pilot regulated voltage source (5 VDC)
2. Rv3: If module pin 47 is connected to Ground, Rv3 will be connected to the control pilot circuit; if left open, Rv3 will not be connected.
3. R1=100kΩ；R2=200kΩ；

   The Xv1 power source (5 VDC) can be applied directly to the module input.
4. SPI*：Slave mode with one interrupt out
5. PE*：Module Ground

All DB2306 components are protected by a metal shield. Information about the controller is laser-engraved on the shield.

1.5 Host Interface

The DB2306 connects to a host module via a standard 4-wire SPI with an additional interrupt line, a reset pin, and a notification pin, and optional UART interface.

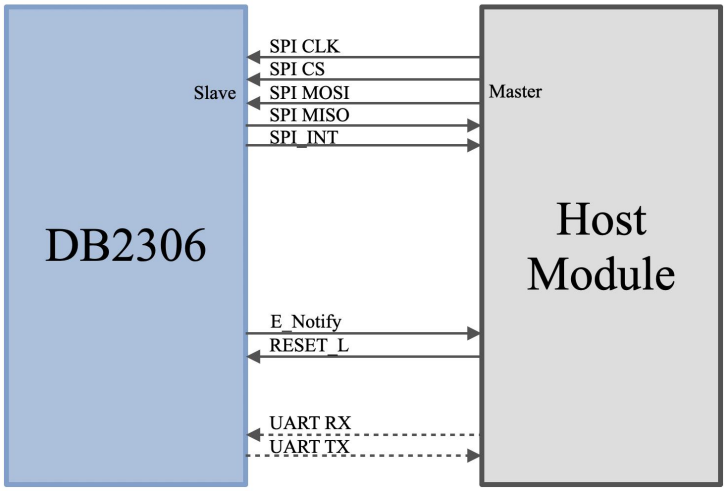

Figure 2 – Host Interface

Notes:
1. SPI: Slave, max. 10 MHz, main communication channel with host module
2. SPI_INT: interrupt to host module
3. E_Notify: Emergency notify to host module
4. RESET_L: puts DB2306 into reset status, active low
5. UART: optional, reserved, 115200bps; 8-N-1

2 Information

2.1 General

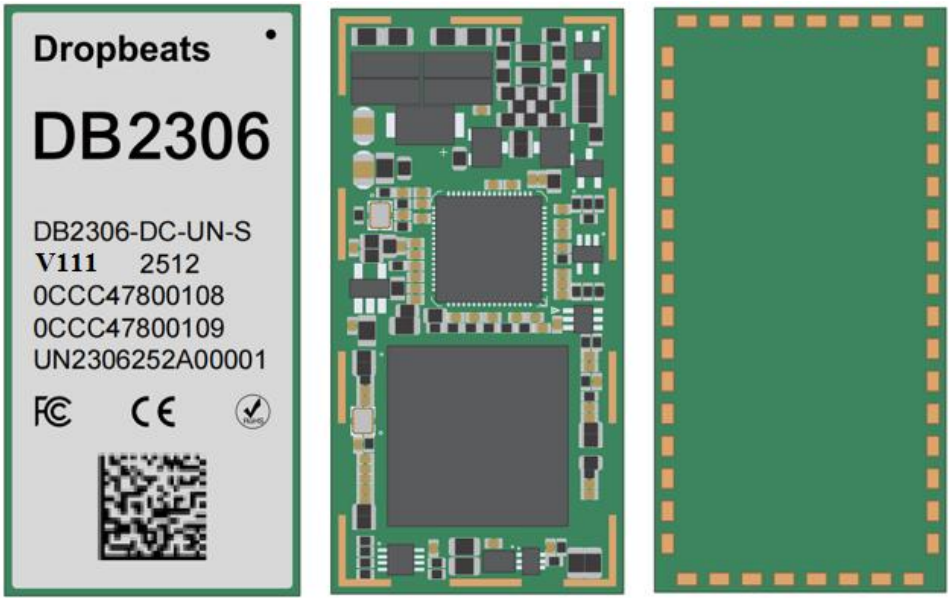

Figure 3 – Images of DB2306 EV Charging Controller

2.2 Pin Definitions

Pin	Name	Type	Usage
1	CP	IA	Control Pilot signal input
2	GND	P	Ground
3	HPGP_RX-	IA	Power line coupling transformer Rx-
4	HPGP_RX+	IA	Power line coupling transformer Rx+
5	HPGP_TX-	OA	Power line coupling transformer Tx-
6	HPGP_TX+	OA	Power line coupling transformer Tx+
7	GND	P	Ground
8	RSVD_01		Reserved, leave open
9	RSVD_02		Reserved, leave open
10	RSVD_03		Reserved, leave open
11	HW_STRAP2	I	Module bootstrap 2
12	RESET_L	I	Power-on reset. Active low power-on-reset input.
13	GND	P	Ground
14	RSVD_04		Reserved, leave open
15	RSVD_05		Reserved, leave open
16	RSVD_06		Reserved, leave open
17	RSVD_07		Reserved, leave open
18	T1S_SPI_CS①	O	SPI Chip Select signal 10BASE-T1S Ethernet Controller

Pin	Name	Type	Usage
19	T1S_SPI_CLK①	O	SPI clock signal for 10Base-T1S Ethernet Controller
20	T1S_SPI_MISO①	I	SPI Master-In-Slave-Out signal from 10Base-T1S Ethernet Controller to DB2306
21	T1S_SPI_MOSI①	O	SPI Master-Out-Slave-In signal from DB2306 to 10Base-T1S Ethernet Controller
22	GND	P	Ground
23	RSVD_08		Reserved, leave open
24	RSVD_09		Reserved, leave open
25	UART1_TX	O	UART1 TX
26	UART1_RX	I	UART1 RX
27	GND	P	Ground
28	COMM_SPI_MISO	O	SPI Master-In-Slave-Out signal from DB2306 to Host module
29	COMM_SPI_MOSI	I	SPI Master-Out-Slave-In signal from Host module to DB2306
30	COMM_SPI_CS	I	SPI Chip Select signal from Host module to DB2306
31	COMM_SPI_CLK	I	SPI clock signal from Host module to DB2306
32	COMM_INT	O	Interrupt signal from DB2306 to Host module
33	Vdd	P	Power supply, 3.3V
34	GND	P	Ground
35	GND	P	Ground
36	T1S_IRQ①	I	Interrupt signal from 10Base-T1S Ethernet Controller
37	T1S_RESET①	O	Reset 10Base-T1S Ethernet Controller, active low
38	MCS_ID_ADC_MEAS①	IA	ADC measurement for MCS ID signal
39	MCS_Xv2_Sv2_EN①②	O	Control signal for Sv2 of MCS Xv2
40	MCS_Sv1_CTRL①	O	Control signal for Sv1 of MCS
41	MCS_CE_ADC_MEAS①	IA	ADC measurement for MCS CE signal
42	MCS_Sv4_CTRL①②	O	Control signal for Sv4 of MCS
43	MCS_Sv3_CTRL①	O	Control signal for Sv3 of MCS
44	GND	P	Ground
45	HW_STRAP1	I	Module bootstrap 1
46	HW_STRAP0	I	Module bootstrap 0
47	2K74	I	If connected to Ground, Rv3, 2.74K resistor, will be connected to the control pilot circuit; if left open, Rv3 will not be connected.
48	PP_MONITOR	I	Monitor the proximity pilot voltage

Notes:

① Leave unconnected if no MCS applications

② Leave unconnected if no auxiliary power is required in MCS applications.

2.3 Power-on Configuration

Three pins of the DB2306 are read at boot time to get the desired configuration.

Pin	Function	Description
HW_STRAP0	Reserved	Reserved, connect to ground
HW_STRAP1	Reserved	Reserved, connect to ground
HW_STRAP2	Reserved	Reserved, connect to ground

2.4 Form Factor

Width * Length * Height: 22.86 * 45.72 * 4.4 mm

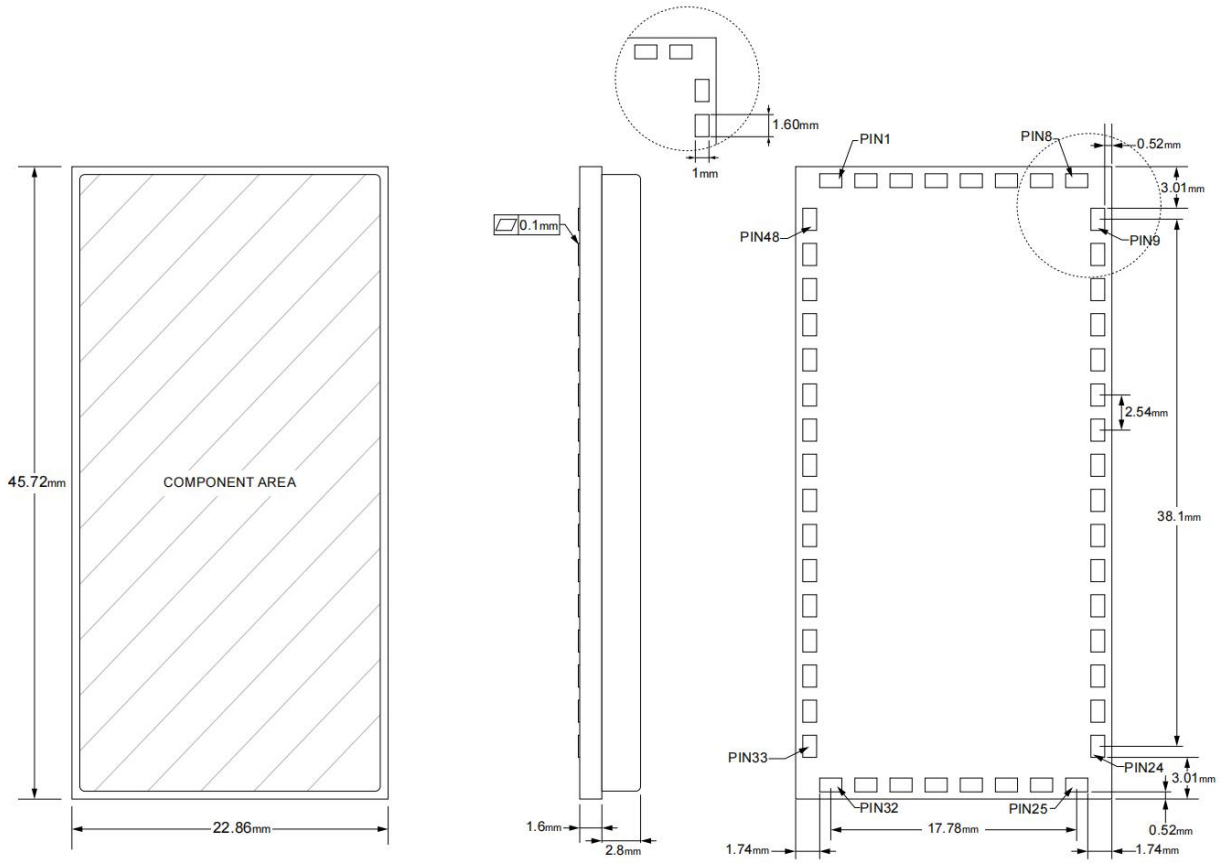

Figure 4 – DB2306 Form Factor

2.5 Recommended Footprint

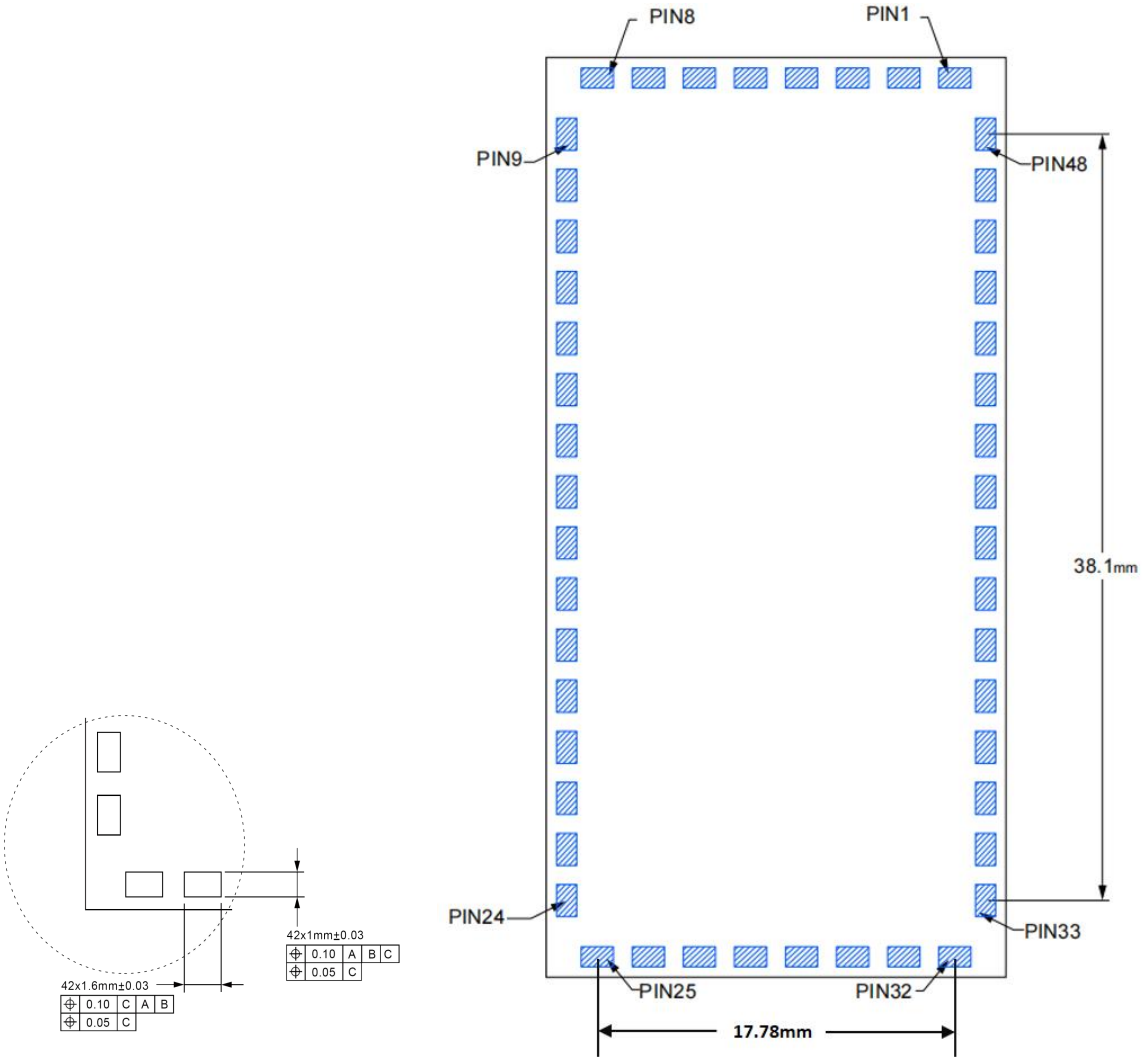

Figure 5 – Recommended Footprint

Notes:
1. Top view of footprint, looking through the DB2306 from above
2. DB2306 outline shows nominal dimensions; tolerance is not included
3. All dimensions in mm
4. Pads are all the same size
5. Distances between pads are equal

2.6 Recommended Solder Paste Footprint

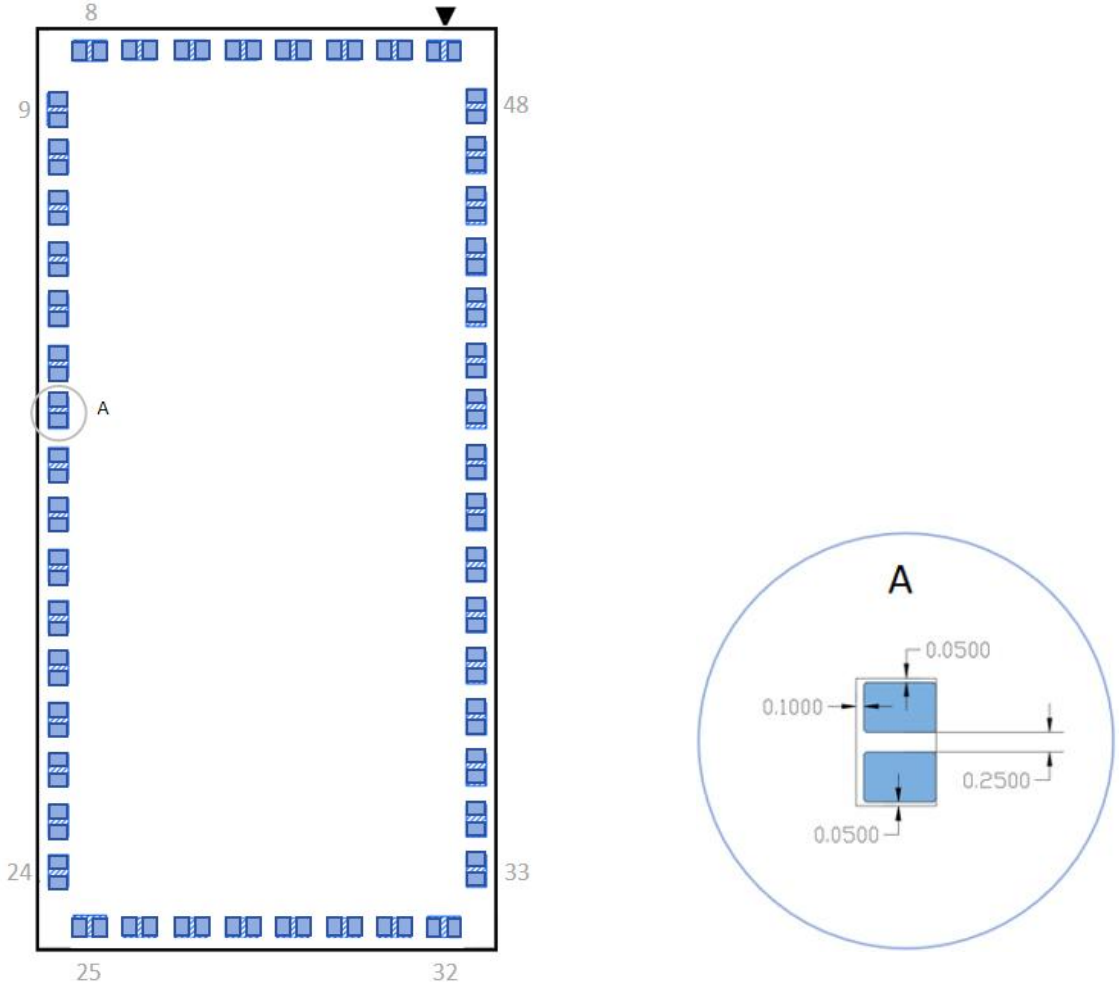

Figure 6 – Recommended Solder Paste Footprint

2.7 Recommended Reflow Information

	Low Limit	High Limit	Units
Max Rising Slope (Target=2.5)	1	5	Degrees/Second
Slope1 (Target=2.3)	0.5	4	Degrees/Second
Between 180.0 and 220.0			
Max Falling Slope	-3	-1	Degrees/Second
Soak Time 150-180C	60	100	Seconds
Time Above Reflow - 220C	30	90	Seconds
Peak Temperature	235	250	Degrees Celsius

Reflow Profile Setting Example:

Degree Celsius										
Zone	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
	150	**160**	**180**	**180**	**180**	**180**	**200**	**220**	**235**	**260**
Conveyor Speed (cm/min):						**90**				

Reflow Profile Example:

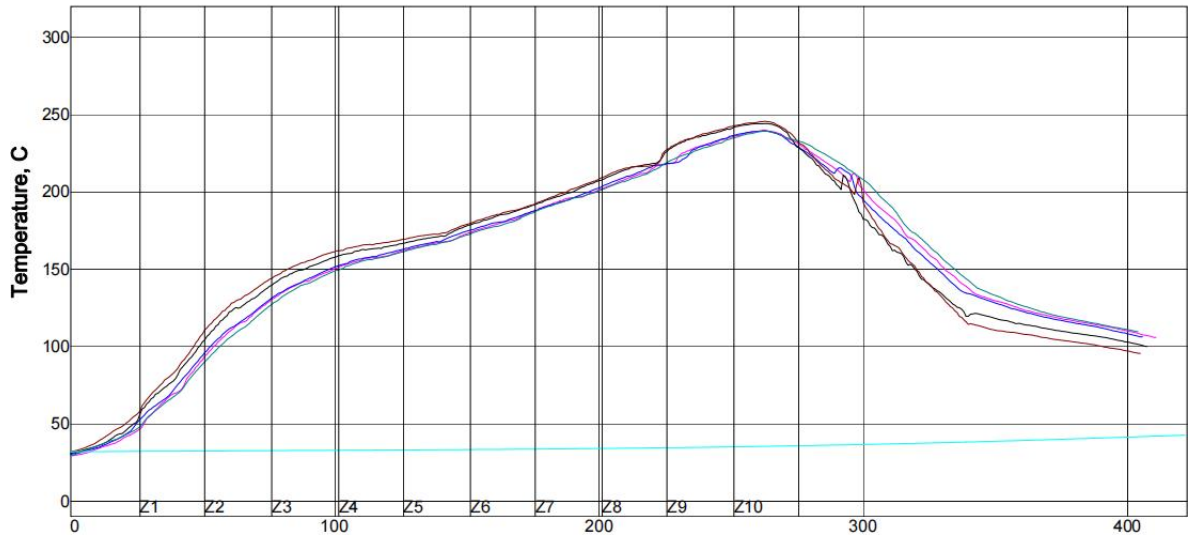

Figure 7 – Reflow Profile Example

3 Electrical Characteristics

3.1 Recommended Operating Rating

Symbol	Parameter	Min	Typ	Max	Units
Vdd	Power Supply	3.13	3.3	3.46	V

3.2 Environment

Environmental Condition	
Operating Temperature	-40 – 85 °C
Storage Temperature	-40 – 105 °C

3.3 DC Switching Thresholds

Symbol	Parameter	Min	Max	Units
VIL	Low-level input voltage	—	0.3*Vdd	V
VIH	High-level input voltage	0.7*Vdd	—	V
VOL	Low-level output voltage	—	0.4	V
VOH	High-level output voltage	2.4	—	V
IOZ	High-impedance output current	-1	+1	µA

[1] IOL = 12 mA for all GPIOs

IOL = 4 mA for all other interfaces

[2] IOH = -12 mA for all GPIOs

IOH = -4 mA for all other interfaces

3.4 Current Consumption

Parameter	Value
Max current dissipation	400mA
Typical current dissipation	300mA

4 Applications

4.1 CCS Charging

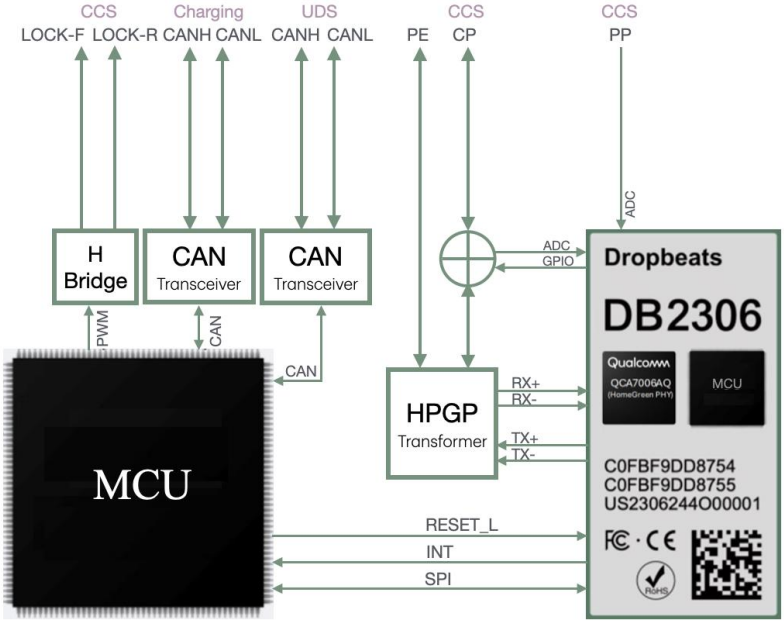

Figure 8 – CCS Charging

4.2 CCS and MCS Charging

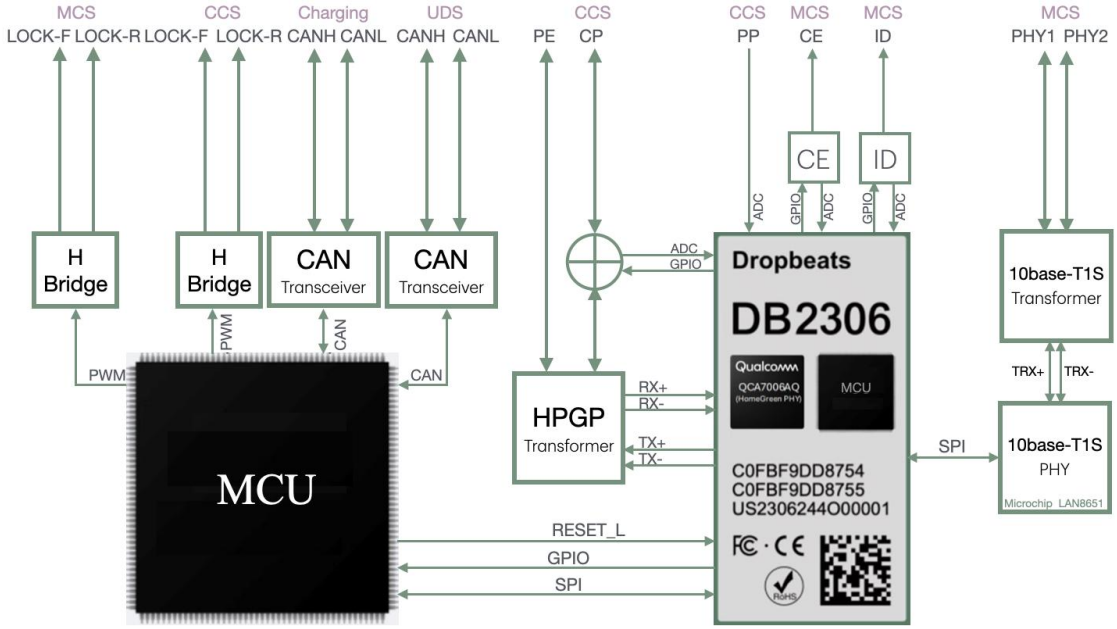

Figure 9 – CCS & MCS Charging

Notes:

Supports CCS or MCS charging, with automatic single-mode selection.

5 Reference Designs

5.1 CCS Control Pilot Circuit

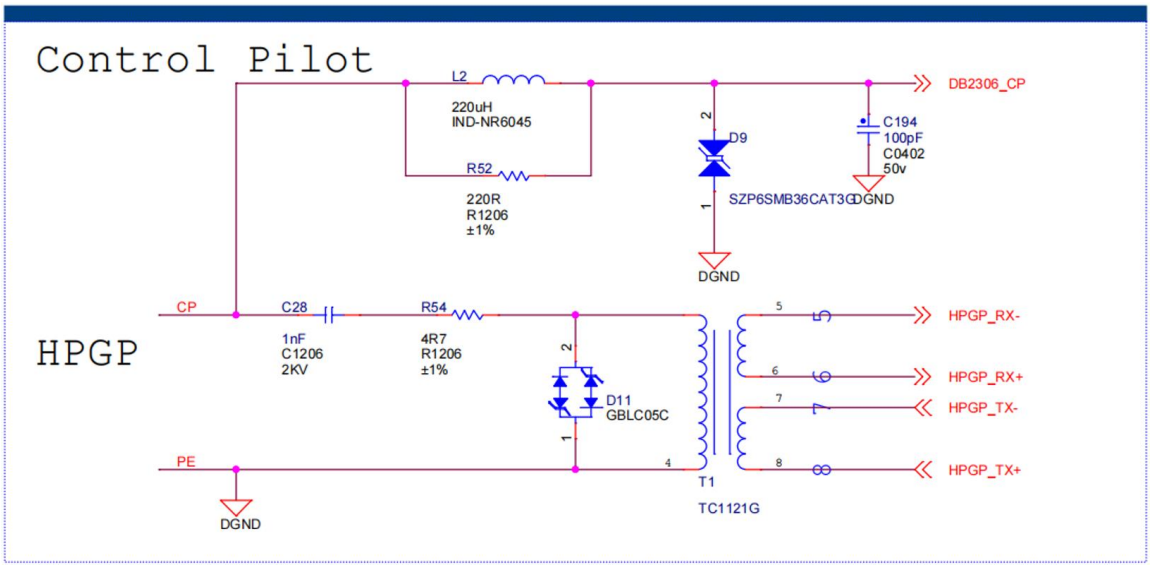

Figure 10 – Control Pilot Circuit

Notes:

A coupling capacitor blocks the DC voltage present on the pilot wire. The component values may change after component optimization.

A 1:1:1 turn ratio transformer and a 4.7Ω series resistor limit transient current and set the output impedance to about 6Ω. This current-limiting resistor value may be adjusted slightly to trim the transmitter output voltage amplitude.

A TVS diode is placed across the PLC coupling transformer to isolate the second stage circuitry and clamp surge voltage to a more acceptable level for the DB2306.

Recommended HPGP Transformer:

Part No.	Vendor	Features	Description
TC1121G	Dropbeats	AEC-Q200	EVCC

5.2 CCS Proximity Pilot Circuit

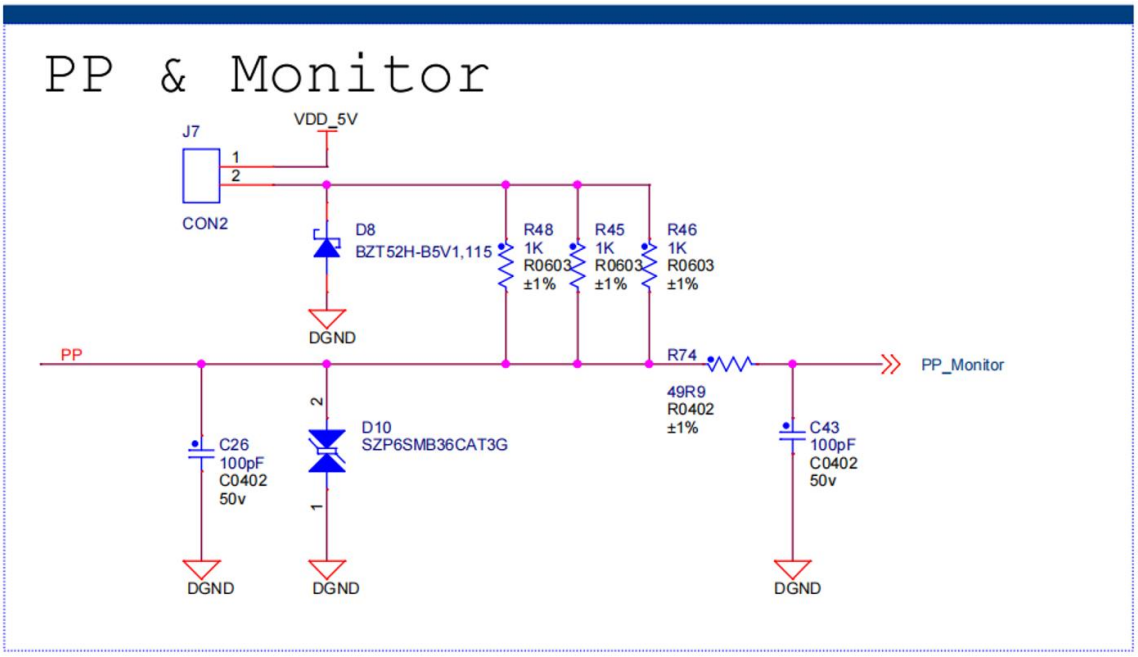

Figure 11 – Proximity Pilot Circuit

5.3 MCS ID Circuit

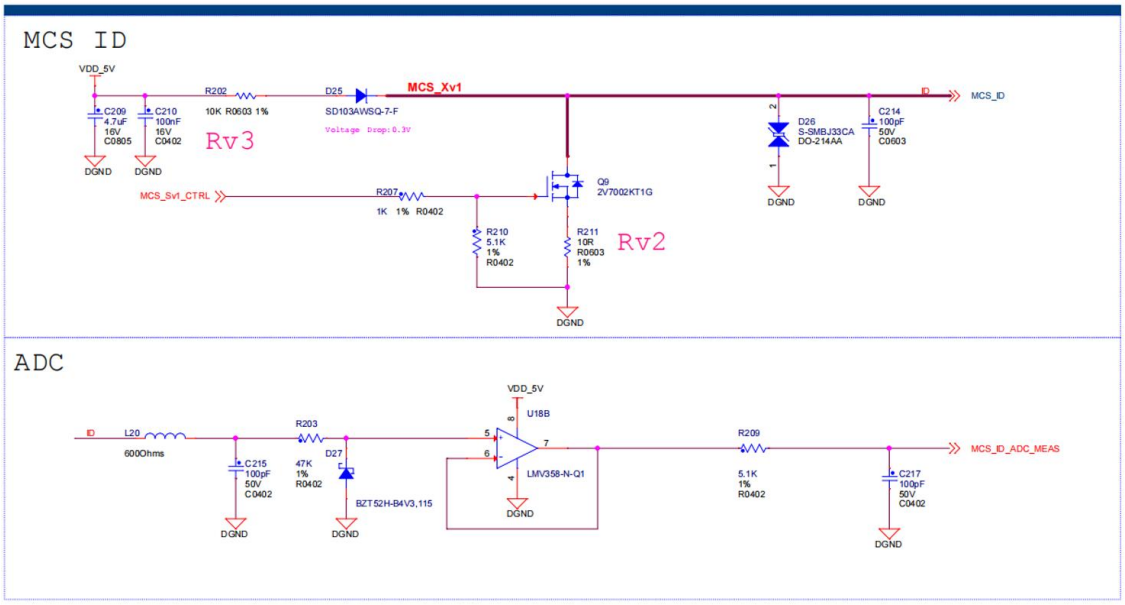

Figure 12 – MCS ID Circuit

5.4 MCS CE Circuit

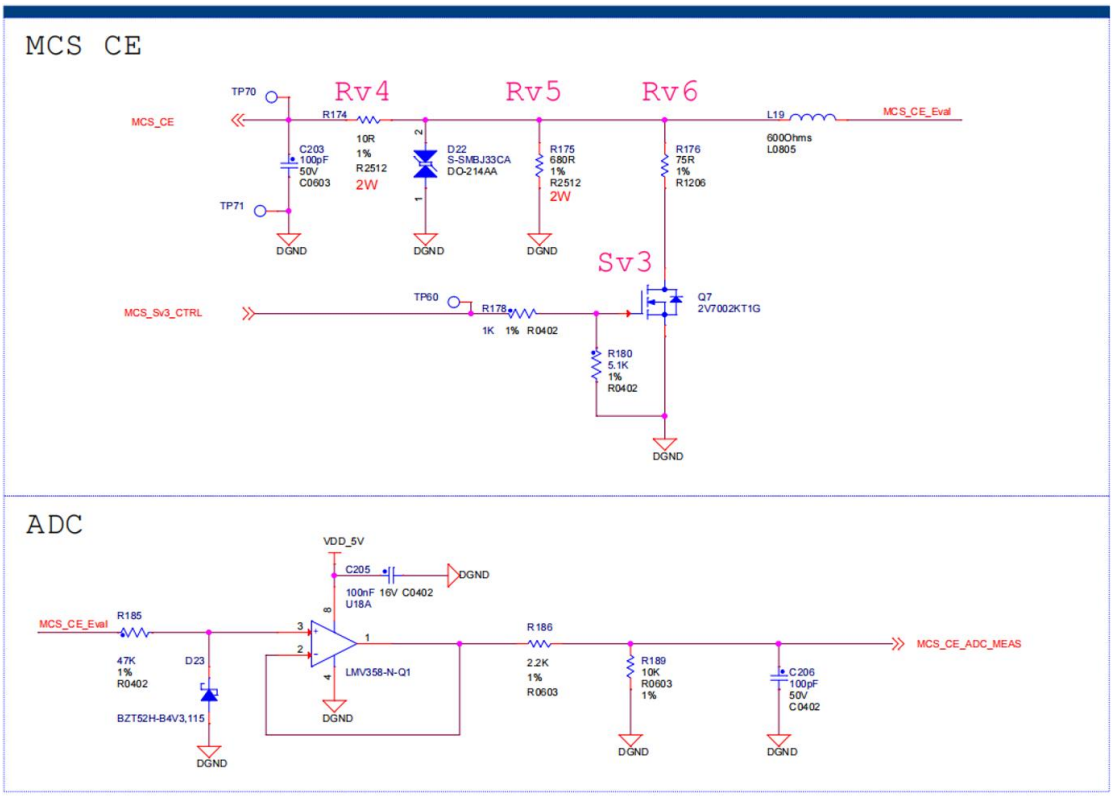

Figure 13 – MCS CE Circuit

5.5 MCS 10Base-T1S Ethernet Controller Circuit

The 10Base-T1S Ethernet Controller, Microchip LAN8651, is supported. For reference designs, please contact Dropbeats or our partners.

6 Packaging Information

The polystyrene carrier tape package contains 200 DB2306 per reel.

7 Marking

Each Controller is marked with the following data:

- Dropbeats brand
- Controller identifier DB2306
- Product Name
- Product Hardware Version and Manufacture Date(MFD)
- HPGP Modem MAC address
- HOST MCU MAC address
- Serial Number
- Certification logos
- QR code with HPGP Modem MAC address

8 Ordering

Order Code	Chipset	Temperature Range	Interface	Applications
DB2306-DC-UN-S-V111	QCA7006AQ	-40 – 105°C	SPI	EVCC

Legal Information

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Contacting Dropbeats Technology

Dropbeats Technology
123 Juli Road, Building 4, Shanghai, China
Tel: +86 (21) 5085-0752
Fax: +86 (21) 5085-0753
Document Information: document@drop-beats.com
Corporate Information: info@drop-beats.com
Technical Support: apps@drop-beats.com
Web Site: https://www.drop-beats.com

Revision History

Revision	Date	Descriptions
1.0.0	2025.9.12	Initial.
1.0.1	2025.10.20	Deleted the test conditions in Section 3.3.
1.0.2	2025.10.21	Fixed some typo.
1.0.3	2026.5.21	Updated Rv4.
1.0.4	2026.8.24	Updated Version to 1.1.1