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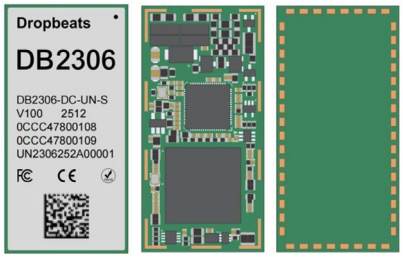
EV Charging Controller (EVCC)
Model No.:AT-2306



Features

1. EVCC controller supporting CCS / MCS high-voltage charging
2. Compliance with DIN 70121, ISO 15118, IEC 61851 standards
3. Integrated Home Plug Green PHY communication
4. Supports Plug & Charge and bidirectional charging
5. Built-in Hardware Security Module (HSM)
6. Provides SPI / UART host interfaces
7. Operating voltage 3.3 V, current approx. 300–400 mA
8. Metal-shielded module, size 22.9 × 45.7 × 4.4 mm
9. Operating temperature –40 °C to +85 °C
10. Suitable for CCS and MCS charging applications

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 Home Plug Green PHY

The DB2306 fully supports Home Plug 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
- ISO 15118-2/20 DC EIM and PnC (support planned by the end of 2025)

- ISO 15118-20 Bidirectional charging with security
- DIN 70121

1.3 Hardware Security Module

- ECC crypto curves: ECC NIST (up to 521 bit) / ed448
- Secure key storage: up to 256k bytes

1.4 Diagram

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

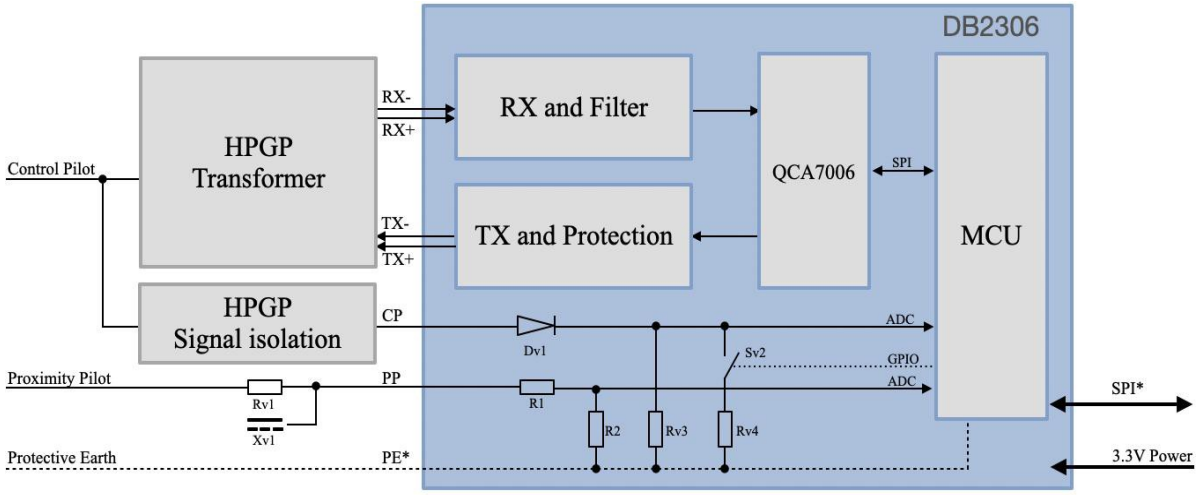


Figure 1 – DB2306 Block Diagram

Notes：

1 The terms(Dv1, Rv3, Rv4, Sv2, Rv1, and Xv1) follow the definitions of IEC 61851.

Dv1: Diode

Rv3: 2.74kΩ resistor

Rv4: 270Ω resistor

Sv2: 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.

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1.5 Host Interface

The DB2306 connects to a host module via a SPI interface, a reset pin, and a interrupt pin, and optional UART interface.

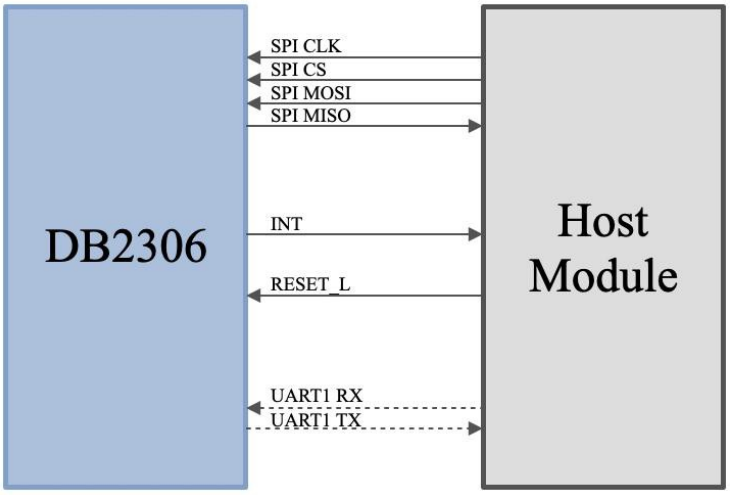

Figure 2 – Host Interface

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

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2 Information

2.1 General

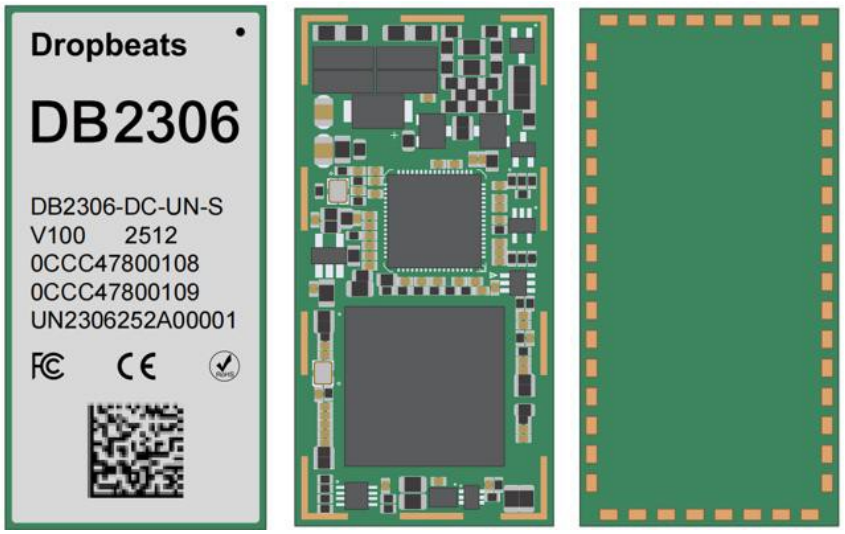

Figure 3 – Images of DB2306 EV Charging Controller

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
19	T1S_SPI_CLK①	O	SPI clock signal for 10Base-T1S Ethernet Controller

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Pin	Name	Type	Usage
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:

①Leave unconnected if no MCS applications

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

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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

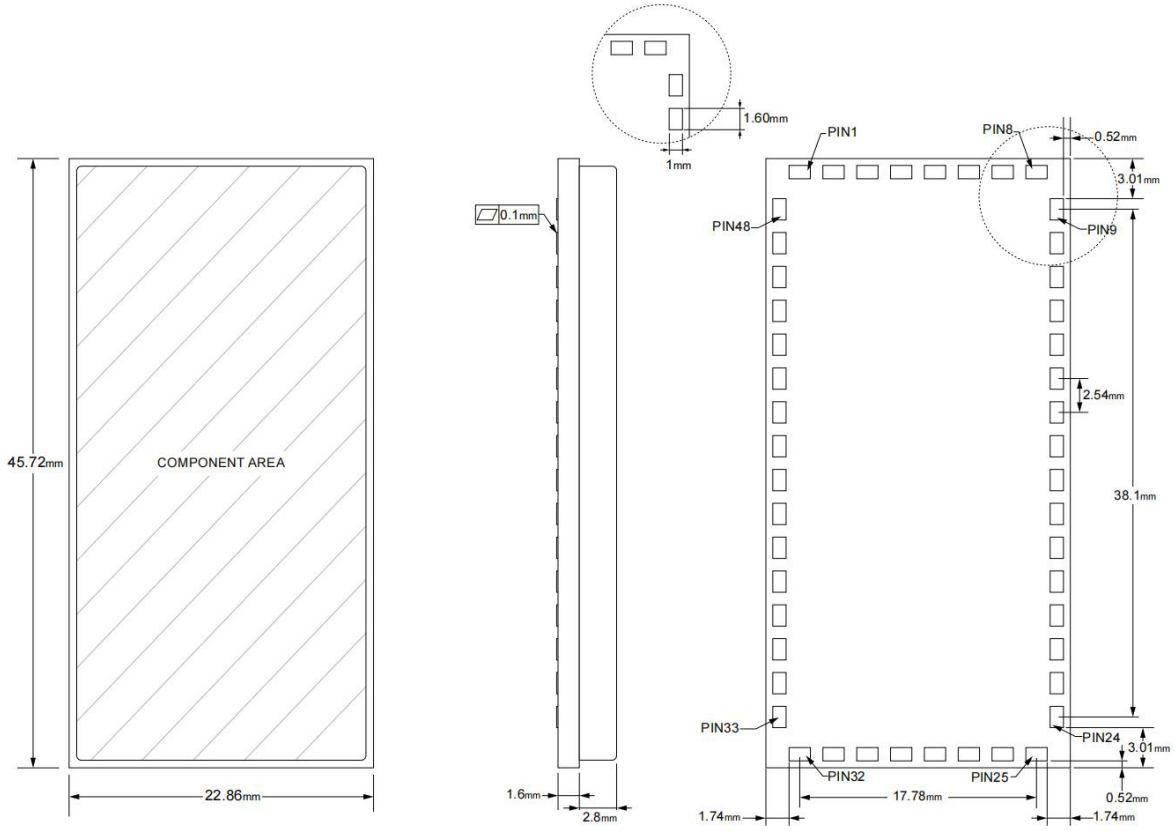

Figure 4 – DB2306 Form Factor

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2.5 Recommended Footprint

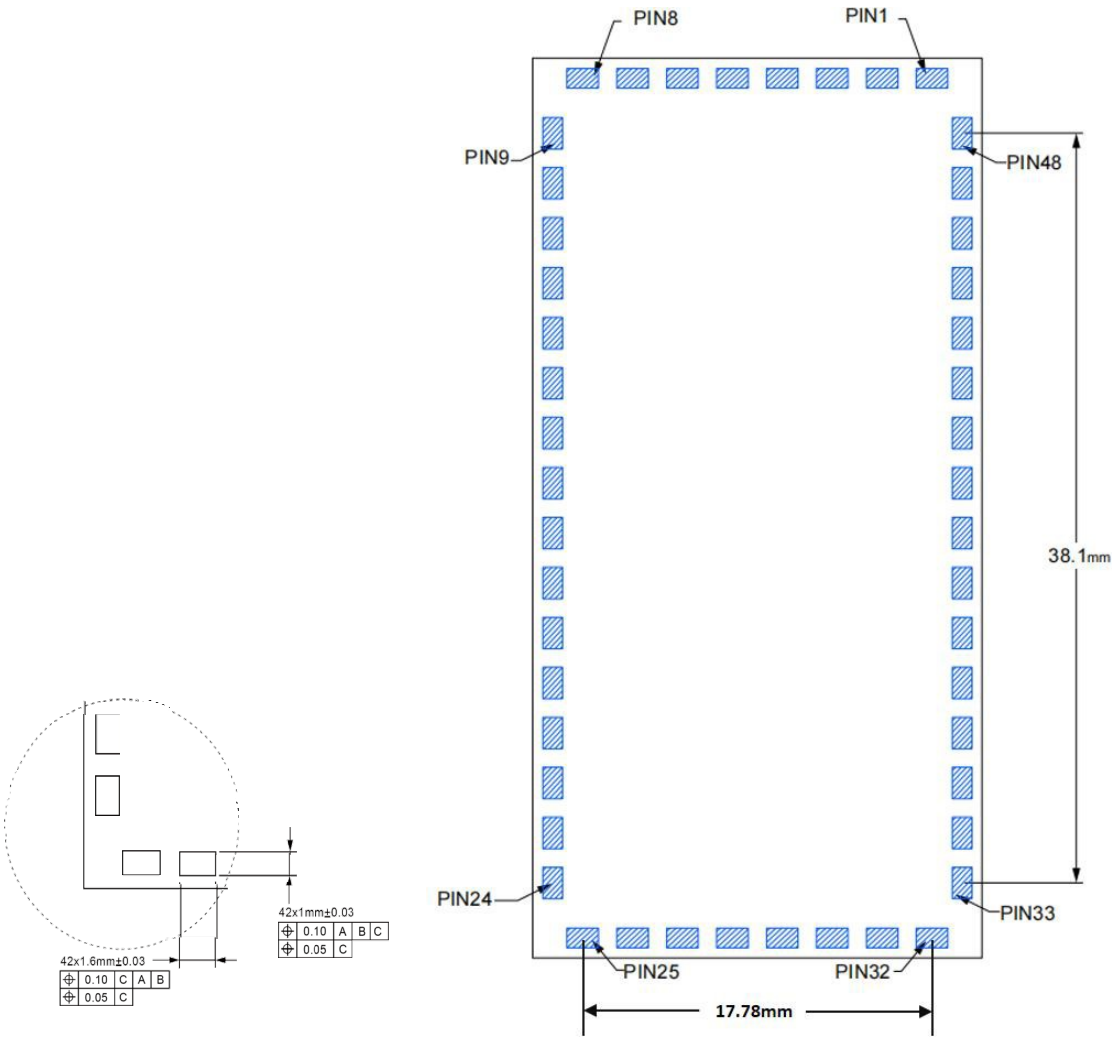

Figure 5 – Recommended Footprint

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

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2.6 Recommended Solder Paste Footprint

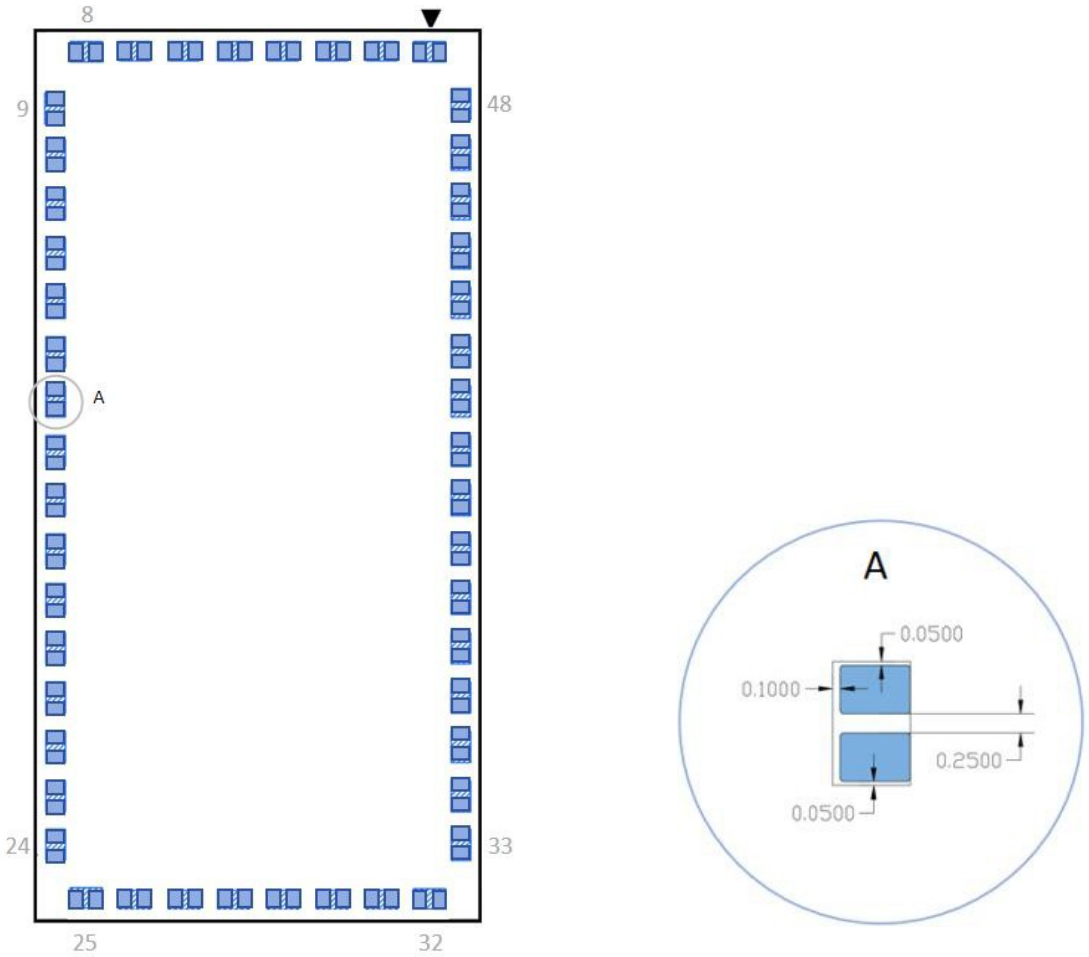

Figure 6 – Recommended Solder Paste Footprint

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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:

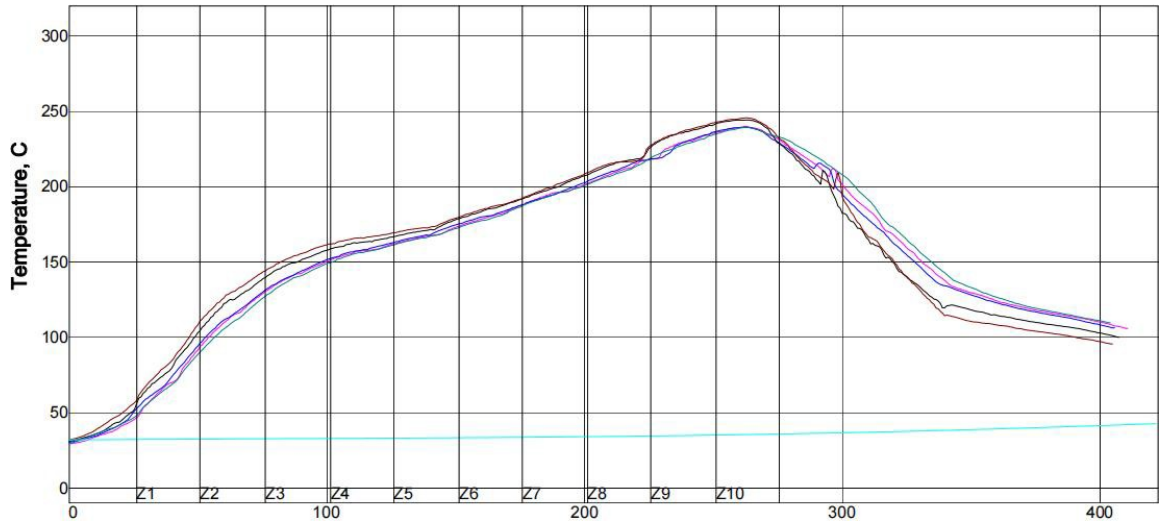

Figure 7 – Reflow Profile Example

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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	Test Conditions	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	IOL= 4 mA, 12 mA[1]	—	0.4	V
VOH	High-level output voltage	IOH = -4 mA, -12 mA[2]	2.4	—	V
IOZ	High-impedance output current	Gnd ≤ VI ≥ Vdd	-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

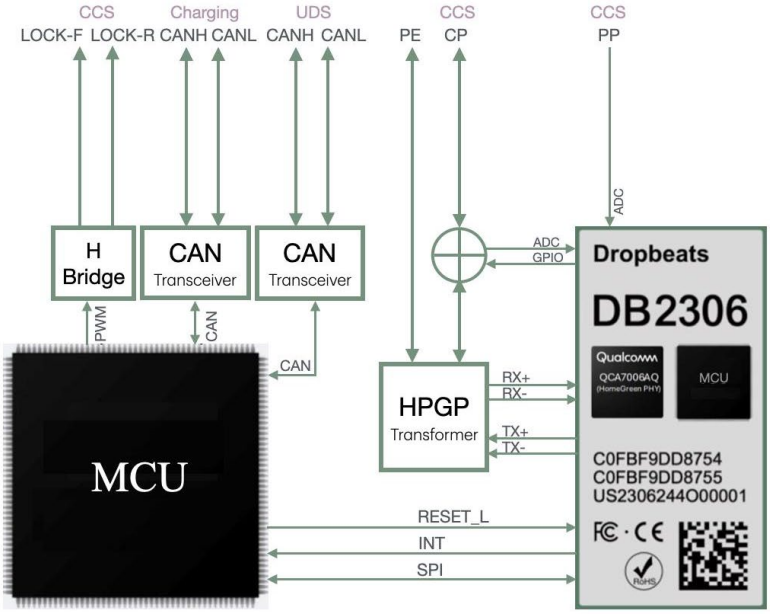

Figure 8 – CCS Charging

4.2 CCS and MCS Charging

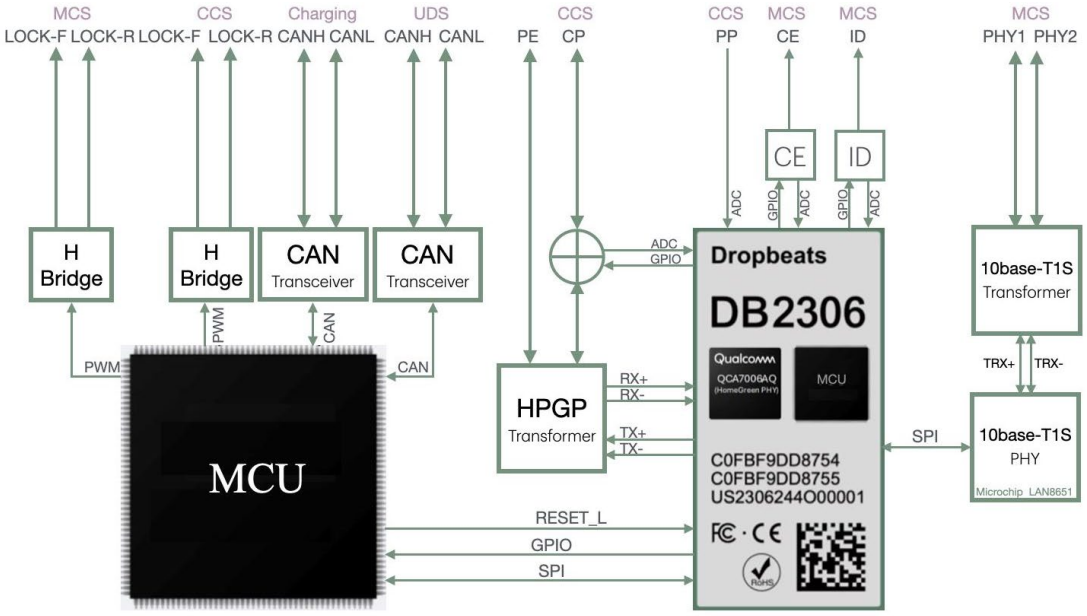

Figure 9 – CCS & MCS Charging

Notes:

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

5 Reference Designs

5.1 CCS Control Pilot Circuit

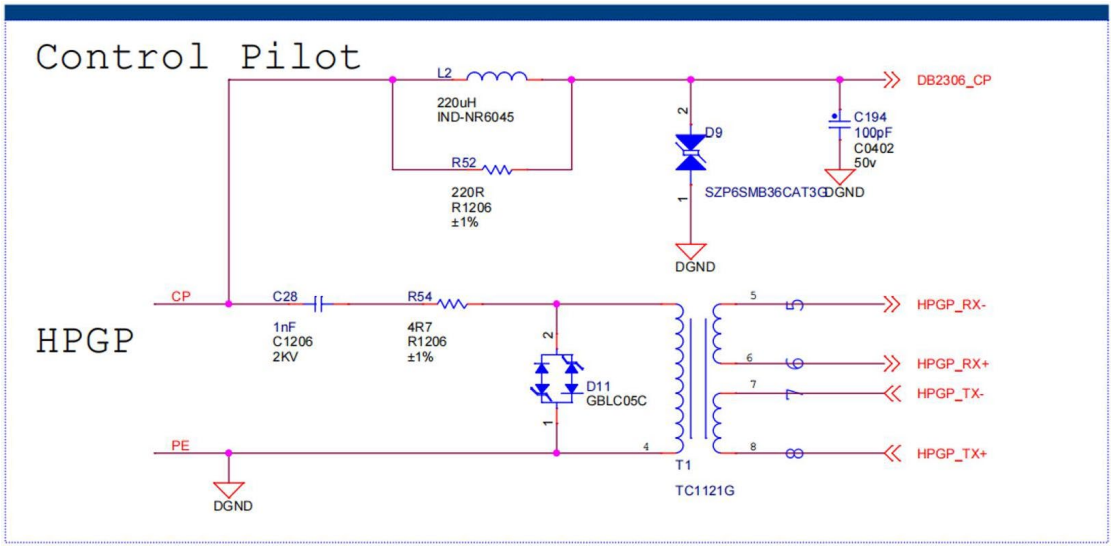

Figure 10 – Control Pilot Circuit

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 4.7**Ω** series resistor limit transient current and set the output impedance to about 6**Ω**. 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

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5.2 CCS Proximity Pilot Circuit

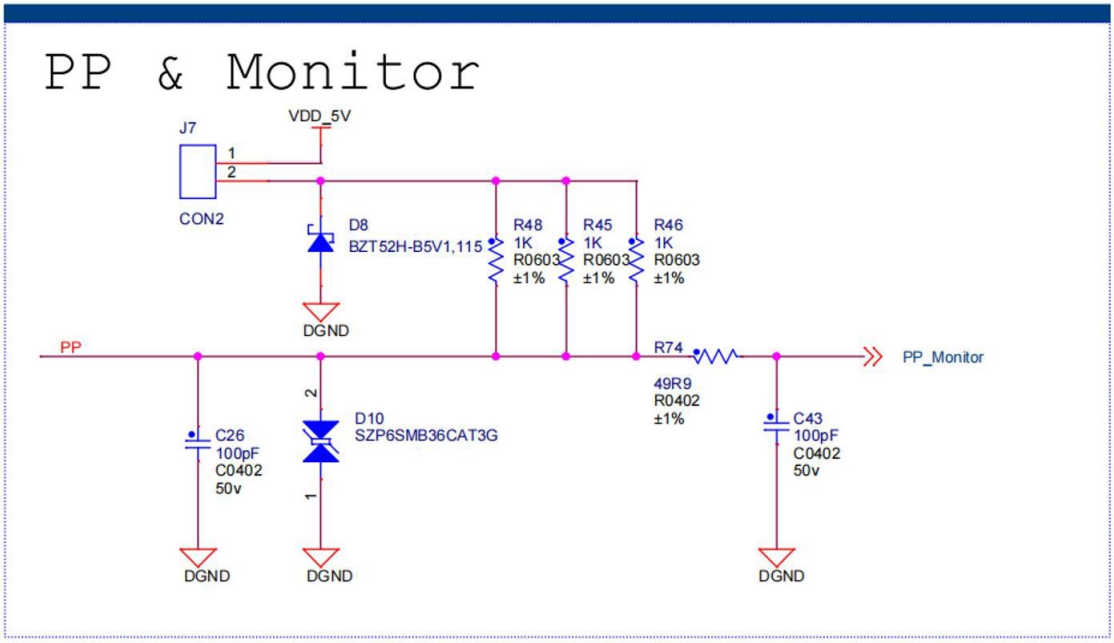

Figure 11 – Proximity Pilot Circuit

5.3 MCS ID Circuit

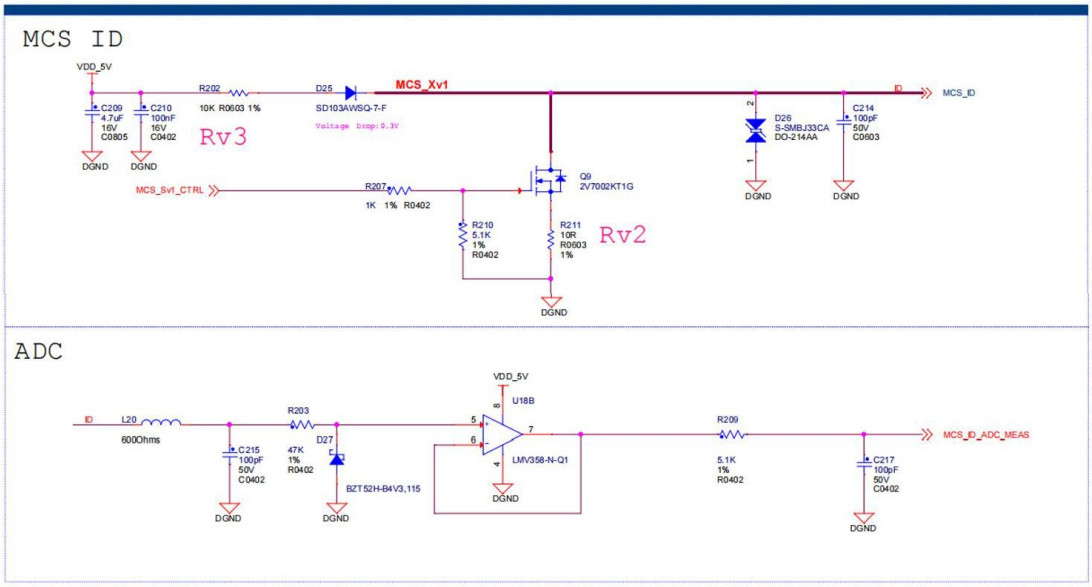

Figure 12 – MCS ID Circuit

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5.4 MCS CE Circuit

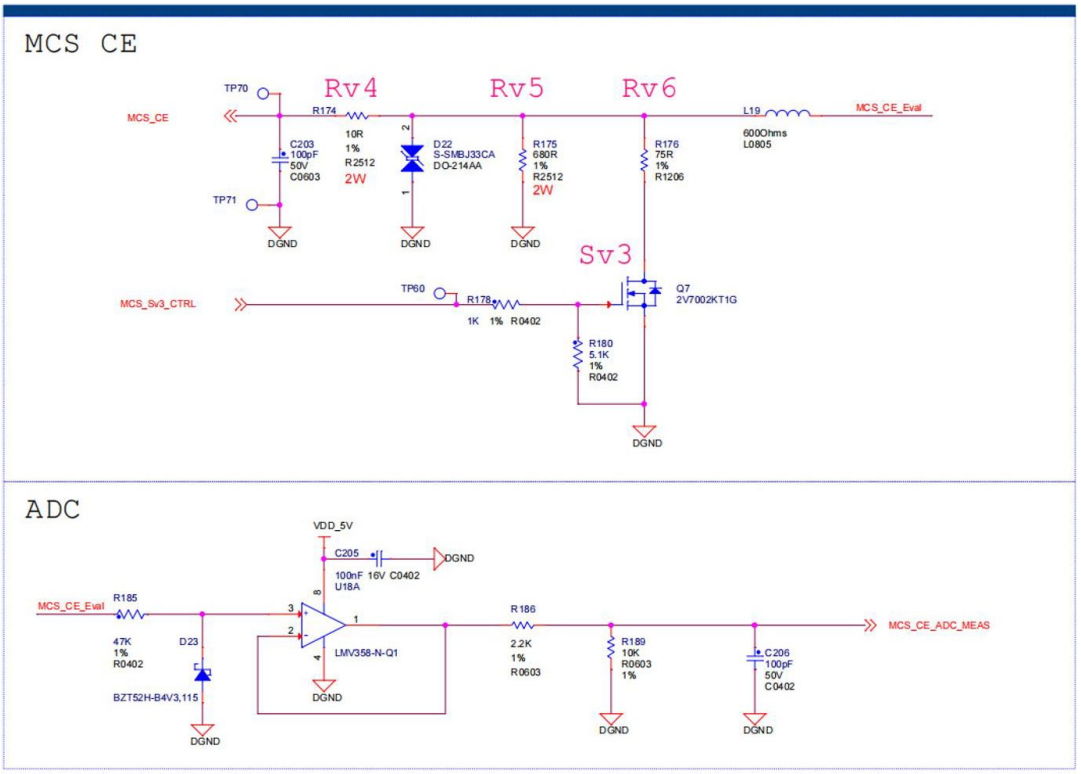

Figure 13 – MCS CE Circuit

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.

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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-V100	QCA7006AQ	-40 – 105°C	SPI	EVCC