



AC PnC V2G charging Management Module Specification 1.0.0

Model No. AT-DB2605



Table of Contents

Table of Contents	2
1 Overview	3
1.1 HomePlug Green PHY	3
1.2 Charge Software Stack	3
1.3 Hardware Security Module	3
1.4 Module Diagram	4
1.5 Host Interface	4
2 Module Information	5
2.1 General	5
2.2 Pin Definitions	5
2.3 Power on Configuration	7
2.4 Form Factor	7
2.5 Recommended Footprint	8
3 Electrical Characteristics	9
3.1 Recommended Operating Rating	9
3.2 Environment Storage Condition	9
3.3 DC Switching Thresholds	9
3.4 Power Dissipation	9
4 EV Charging applicaion	10
4.1 Pilot Signal managed by Host Module	10
4.2 Pilot Signal managed by AT-DB2605	10
5 AT-DB2605 Reference Design	11
5.1 Control Pilot Signal Generation	11
5.2 Control Pilot PWM Voltage Measurement	11
5.3 Proximity Pilot Generation and Measurement	12
5.4 Zero Cross Circuits	12
5.5 HPGP Coupler	12
6 Packaging Information	13
6.1 Reel	13
7 Order information	13



1 OVERVIEW

AT-DB2605 Module is core unit of Supply Equipment Communication Controller (SECC) that manages CCS AC high-level communication charging and basic charging to interface the EVs.

AT-DB2605 Module is equipped with Qualcomm QCA700X and a powerful MCU, which runs RTOS with complete ISO 15118-2/20 software stack and optional IEC 61851 stack.

1.1 HomePlug Green PHY

The module supports fully HomePlug Green PHY Spec 1.1(IEEE 1901). HPGP Features:

- Spectrum: 2-30MHz
- Max PHY Rate: 10Mbps
- Modulation: OFDM
- Subcarriers: 917
- Subcarrier Space: 24.414KHz
- ROBO: 4Mbps (5x Repeat Code) 5Mbps (4x Repeat Code) 10Mbps (2x Repeat Code)

1.2 Charge Software Stack

The module is compliant to below protocols:

- ISO 15118-3
- ISO 15118-2/20 AC EIM & PnC
- Bi-directional charging with security (ISO 15118-20)

1.3 Hardware Security Module

- Security certification: CC EAL4+ (HW+JCOP), FIPS 140-2 L3
- ECC Crypto curves: ECC NIST (192 to 521 bit)/ed448
- Secure key storage: up to 50k Bytes



1.4 Module Diagram

The block diagram in Figure 1 shows the module components in the gray box as well as the connections and external components that needed in addition.

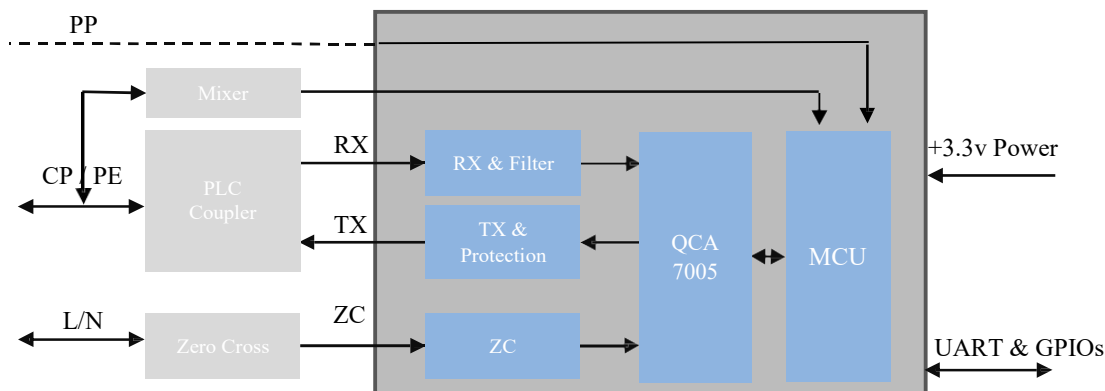


Figure 1: Block Diagram of AT-DB2605

All parts are located below a metal shield. Information about the module is printed on a high-temperature label on top of this shield.

1.5 Host Interface

AT-DB2605 module provides UART interface plus an interrupt pin and a BOOT pin to Host module.

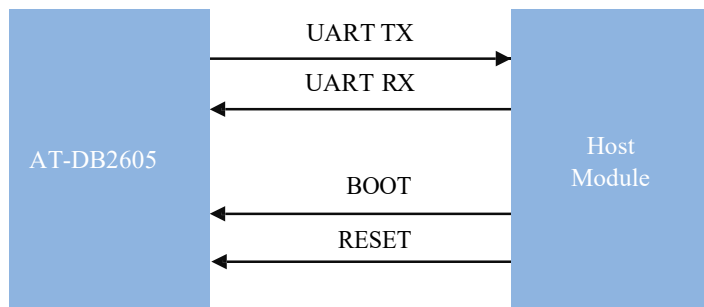


Figure 2: Block Diagram of UART Pins

Notes:

UART serial port Setting: 115200bps; 8-N-1



2 MODULE INFORMATION

2.1 General

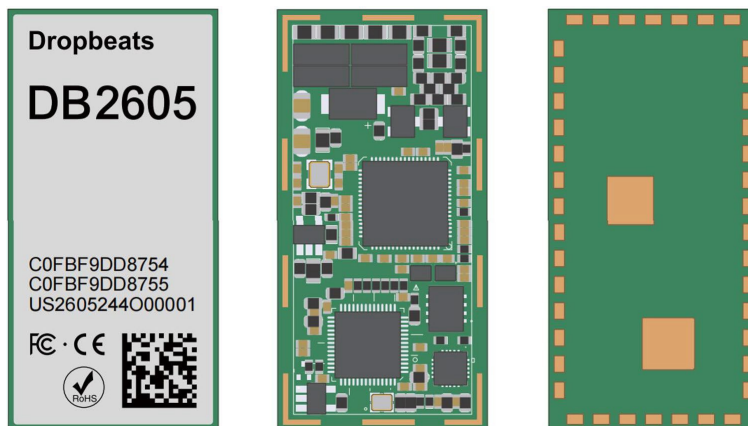


Figure 3: Image of AT-DB2605 module

2.2 Pin Definitions

Pin	Name	Type	Usage
1	GND	P	Module Ground
2	RX-	IA	Power Line Coupling Transformer Rx-
3	RX+	IA	Power Line Coupling Transformer Rx+
4	TX-	OA	Power Line Coupling Transformer Tx-
5	TX+	OA	Power Line Coupling Transformer Tx+
6	GND	P	Module Ground
7	ZC_IN	IA	Power Line Zero Cross in. Note: if not use, connect it to Ground
8	GND	P	Module Ground
9	PWM	O	PWM Output of Control Pilot (CP)
10	GND	P	Module Ground
11	ADC_CP	IA	Control Pilot ADC
12	ADC_CP	IA	Proximity Pilot ADC
13	GND	P	Module Ground
14	UART0_TX	O	UART0 TX



15	UART0_RX	I	UART0 RX
16	USB_DP	I/O	Reserved, USB DP
17	USB_DM	I/O	Reserved, USB DM
18	GP25	I/O	Reserved
19	GP26	I/O	Reserved
20	GP27	I/O	Reserved
21	GP28	I/O	Reserved
22	PSGD	I	Pilot Signal Generation/Detection Setting
23	GP30	I/O	Reserved
24	GP31	I/O	Reserved
25	GP32	I/O	Reserved
26	GP33	I/O	Reserved
27	GP34	I/O	Reserved
28	GND	P	Module Ground
29	Vdd	P	Power supply, 3.3V
30	GND	P	Module Ground
31	I2C0_SDA	I/O	Reserved
32	I2C0_SCL	I/O	Reserved
33	CAN_TX	I/O	Reserved
34	CAN_RX	I/O	Reserved
35	UART1_TX	O	UART1 TX
36	UART1_RX	I	UART1 RX
37	GND	P	Module Ground
38	/Reset	I	Power on Reset. Active low power-on-reset input.
39	BOOT	I	Boot mode setting
40	GND	P	Module Ground
41	GND	P	Module Ground
42	GND	P	Module Ground



2.3 Power on Configuration

The AT-DB2605 module comprise 2 pins which are read at boot time to get the desired configuration.

Pin	Function	Description
PSGD	Pilot Signal Generation/Detection Setting	High: Enable PWM generation and detection. Low: Disable
BOOT	Boot Mode	High: boot from UART0(Pin14/15), this mode is mainly used for Image Upgrading. Low: Launch application image from Flash.

2.4 Form Factor

Width*Length*Height: 20.32*40.64*4mm.

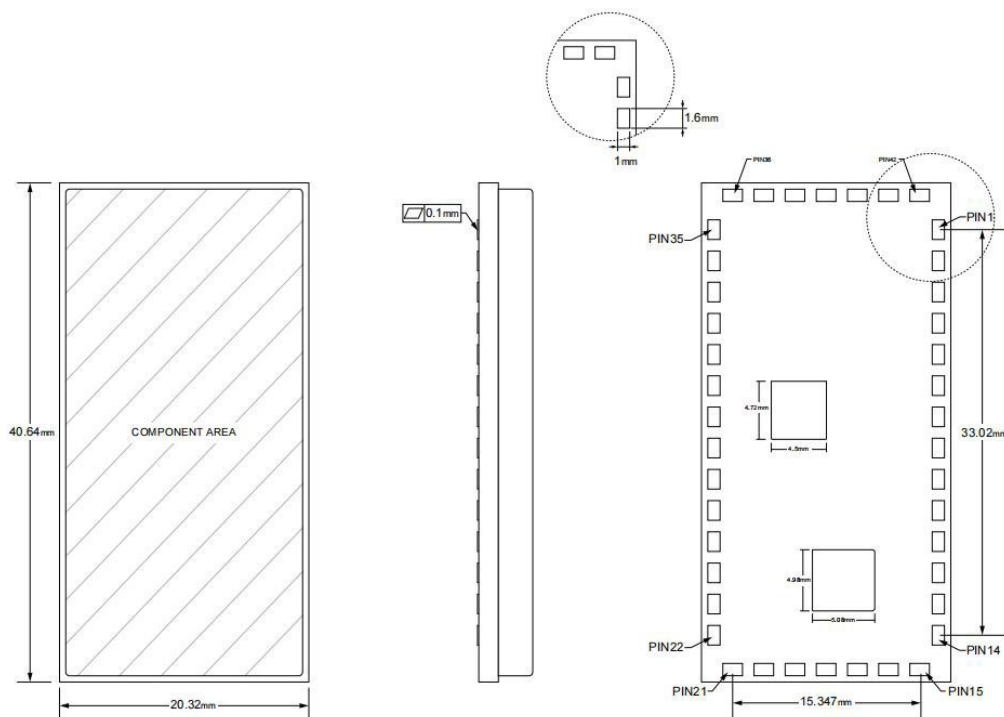


Figure 4: Form factor of AT-DB2605 module

2.5 Recommended Footprint

Recommended Footprint:

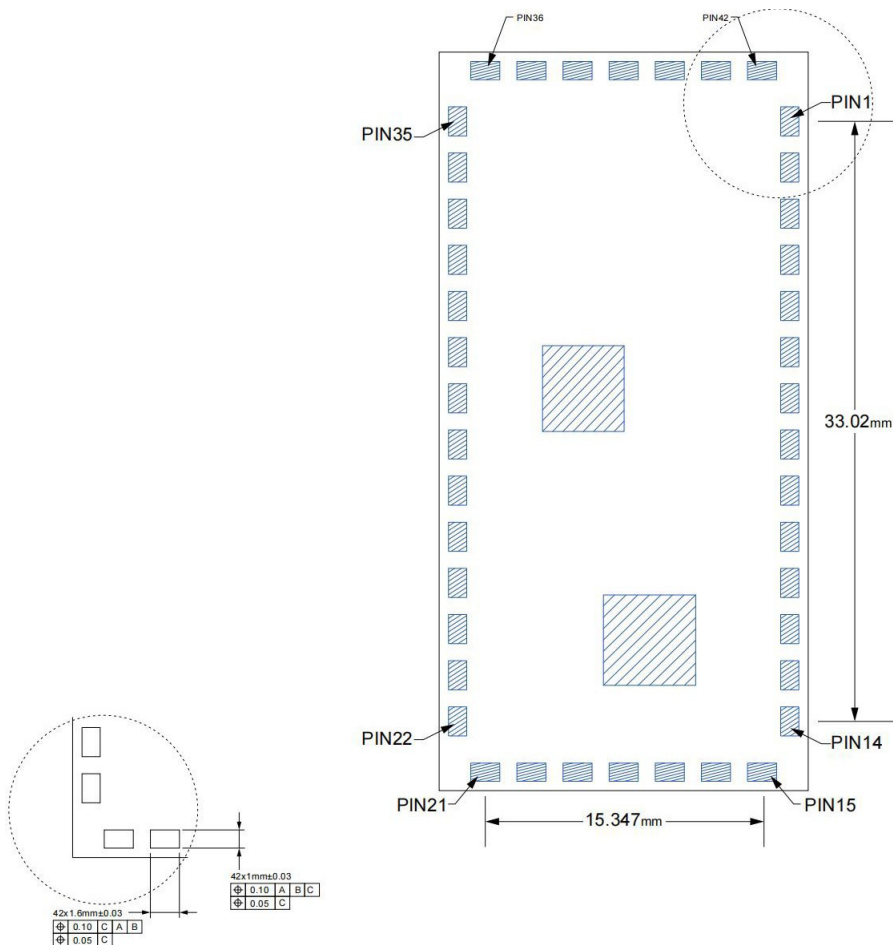


Figure 5: Recommended Footprint

Notes:

1. All dimensions are in mm; the height is about 4mm.
2. Pads are all of the same size.
3. Distances between pads are equal if not otherwise specified in the drawing.
4. The drawing shows the top view on the footprint (as if you look through the module).
5. The module outline shows the ideal measures - tolerance is not included.



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 Storage Condition

Environment condition	
Temperature	Operating Temperature: -40 deg.C ~85 deg.C
	Storage Temperature: -40 deg.C ~105 deg.C

3.3 DC Switching Thresholds

Symbol	Parameter	Test Conditions	Min	Max	Units
V _{IL}	Low-level input voltage		—	0.3*V _{dd}	V
V _{IH}	High-level input voltage		0.7*V _{dd}	—	V
V _{OL}	Low-level output voltage	I _{OL} = 4 mA, 12 mA ¹	—	0.4	V
V _{OH}	High-level output voltage	I _{OH} = -4 mA, -12 mA ²	2.4	—	V
I _{OZ}	High-impedance output current	Gnd ≤ V _I ≤ V _{dd}	-1	+1	μA

1. I_{OL} = 12 mA for all GPIOs
I_{OL} = 4 mA for all other interfaces
2. I_{OH} = -12 mA for all GPIOs.
I_{OH} = -4 mA for all other interfaces

3.4 Power Dissipation

Parameter	Value
Max Power Dissipation	400mA
Typical Power Dissipation	300mA



4 EV CHARGING APPLICAION

4.1 Pilot Signal managed by Host Module

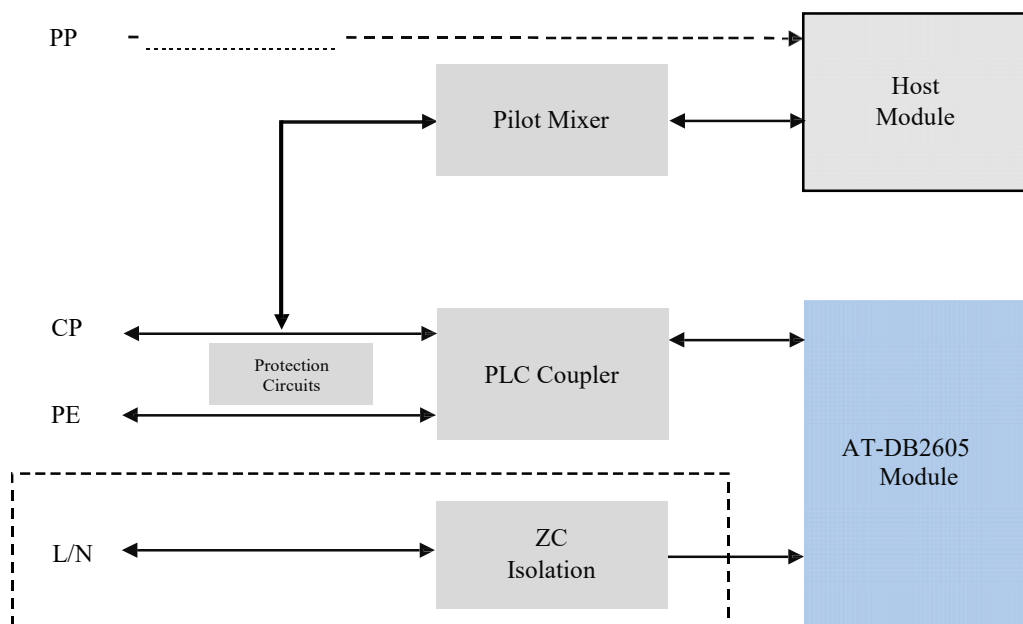


Figure 6: Pilot Signal managed by Host Module

Note: AC line zero cross detection requires an external optical coupler and filter circuits.

4.2 Pilot Signal managed by AT-DB2605

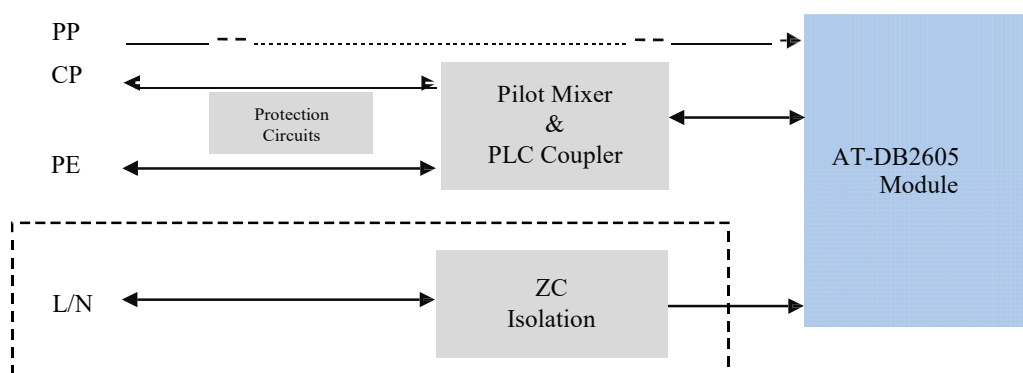


Figure 7: Pilot Signal managed by AT-DB2605



5 AT-DB2605 REFERENCE DESIGN

5.1 Control Pilot Signal Generation

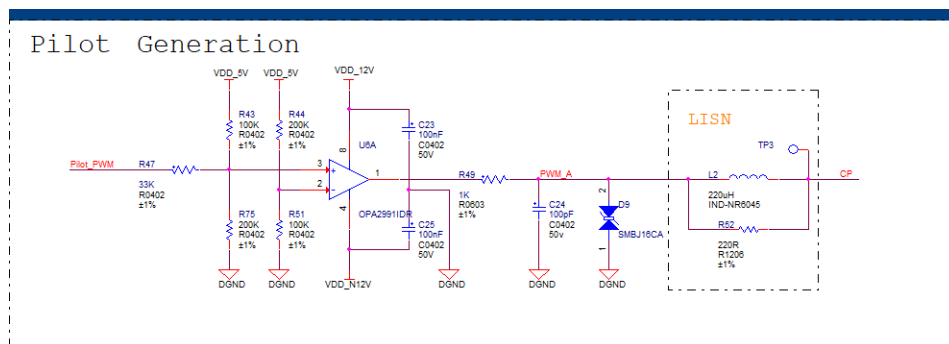


Figure 8: Pilot Signal Generation

5.2 Control Pilot PWM Voltage Measurement

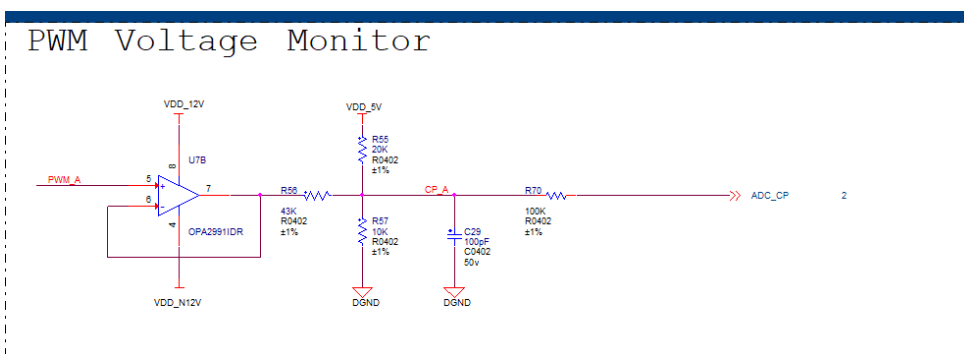


Figure 9: Pilot PWM Voltage Measurement



5.3 Proximity Pilot Generation and Measurement

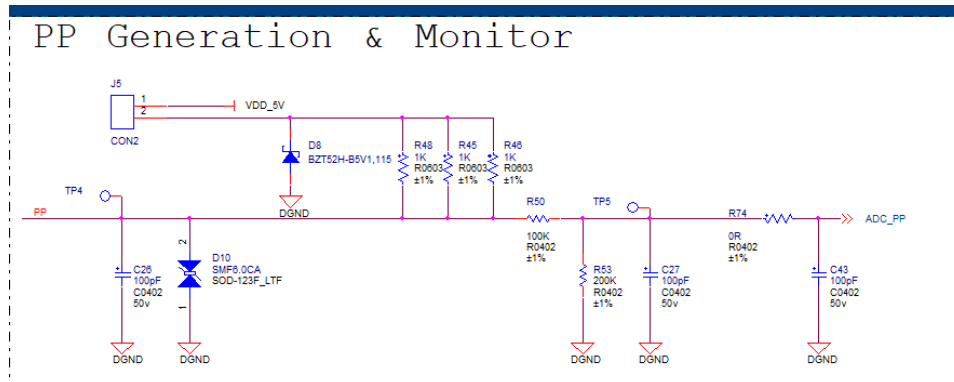


Figure 10: Proximity Pilot Generation and Measurement

Note: If Europe AC fast charging (mode 3) , +5V power may be inserted and monitored.

5.4 Zero Cross Circuits

Zero Cross function may be used to synchronize others PLC device for bandwidth managements.

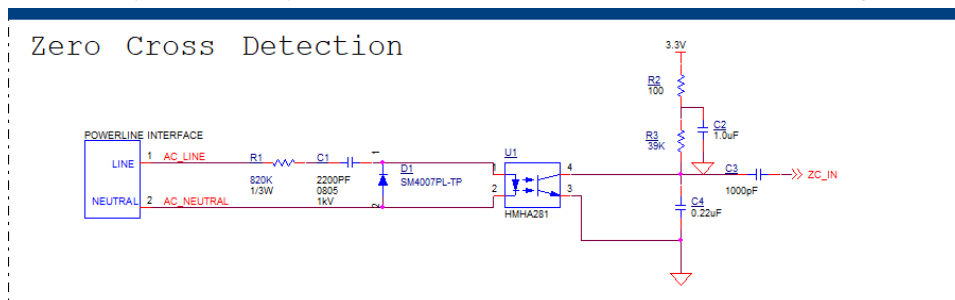


Figure 11: HPGP Zero Cross Circuits

5.5 HPGP Coupler

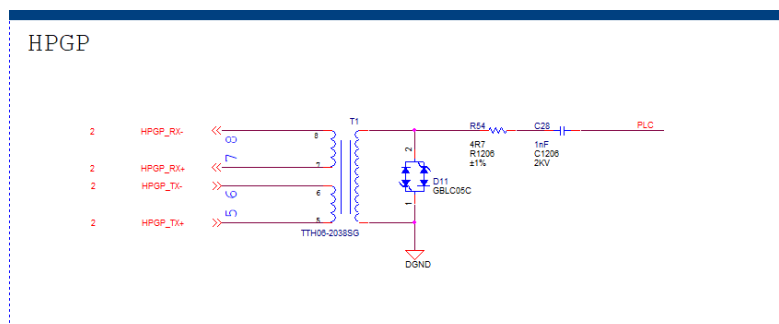


Figure 12: HPGP Coupler Circuit



An coupling capacitor blocks the DC voltages 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 . These current limiting resistor values may be adjusted slightly to trim the transmitter voltage output amplitude.

A TVS diode is placed between the DC blocking capacitors and isolation resistors and the PLC coupling transformer to isolate from the second stage circuitry and clamp the surge voltage to a more acceptable level for the AT-DB2605 module.

Recommended Coupler-Transformer

Part No.	Vendor	Features	Description
TTH06-2038SG	Dropbeats	Industrial	AC EVSE Application

6 PACKAGING INFORMATION

6.1 Reel

The CME tape & reel packing contains 200 modules per reel.

Material: Polystyrene

7 ORDER INFORMATION

Order Code	Chipset	Temperature Range	Interface	Applications
AT-DB2605-AC-EU-U-V110	QCA7005-AL33	-40 – 85 ⁰ C	UART	Europe AC EVSE
AT-DB2605-AC-US-U-V110	QCA7005-AL33	-40 – 85 ⁰ C	UART	US AC EVSE