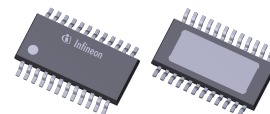


MOTIX™ TLE9321ES dual 600 mA motor control IC with stall detection for stepper motors**Features**

- Four full-bridges for maximum load current of 600 mA
- Path resistance of typical 1.6 Ω at 25°C
- Supply voltage range for normal operation from 6 V to 28 V
- Extended supply voltage range from 4.5 V to 28 V
- Programmable stepping mode up to 64 microstepping
- Programmable full-scale current
- Integrated current regulation
- Slew rate selection
- Auto decay mode
- Programmable stall detection
- Protection and diagnostics: overcurrent, undervoltage, overvoltage, overtemperature, open load detection, cross current protection, shorted load detection
- Error flag
- SPI interface
- PG-TSDSO-24 (8.65 mm x 6 mm)
- Green product (RoHS compliant)

**Potential applications**

- Automotive bipolar stepper motors
- 12 V automotive bipolar stepper motors for expansion valves in thermal management systems
- Head up display
- Display movement
- Grill shutter

Product validation

- Qualified for automotive applications
- Product validation according to AEC-Q100
- $T_j = -40^{\circ}\text{C}$ to 150°C (Grade - 1)

Product description

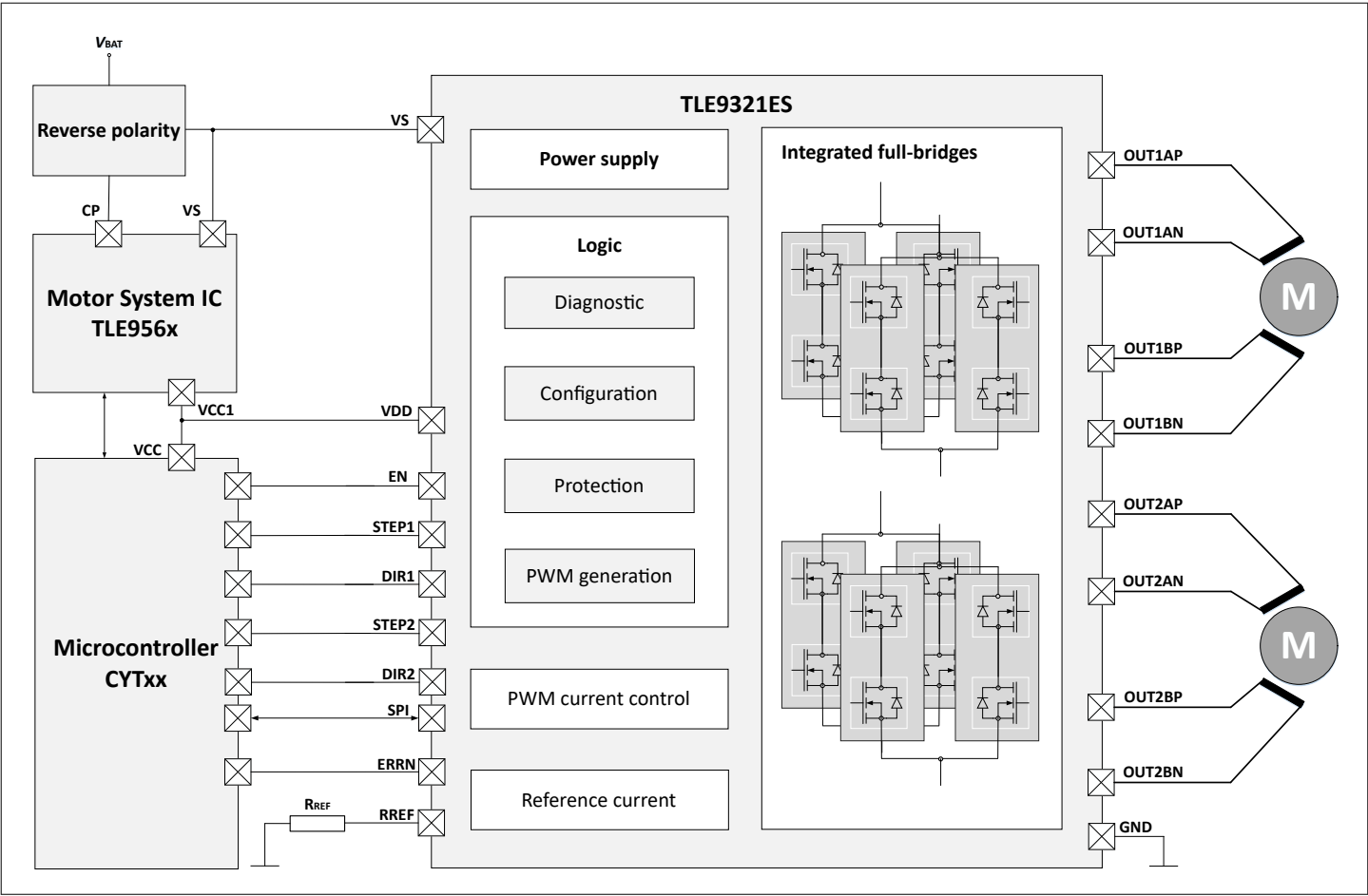
The TLE9321ES is an integrated dual stepper motor driver for automotive motor drive applications. This device is implemented in BCD technology, and assembled in PG-TSDSO-24 which has an exposed pad to ensure better thermal performance.

The device integrates two stepper drivers. Both drivers provide six step modes, and supports up to 600 mA full scale current with auto decay methods and advanced stall detection algorithm. An integrated SPI interface is used to configure the device after power up. The stepper motors can be controlled via dedicated pins or SPI. Besides the device integrates intelligent protection features against overtemperature, undervoltage, overcurrent, short circuit and cross current. Moreover, an error flag pin is provided to support the quick diagnostic.

TLE9321ES
Product overview



Product description



Product Name	Marking	Package
TLE9321ES	TLE9321	PG-TSDSO-24



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1 Functional block diagram

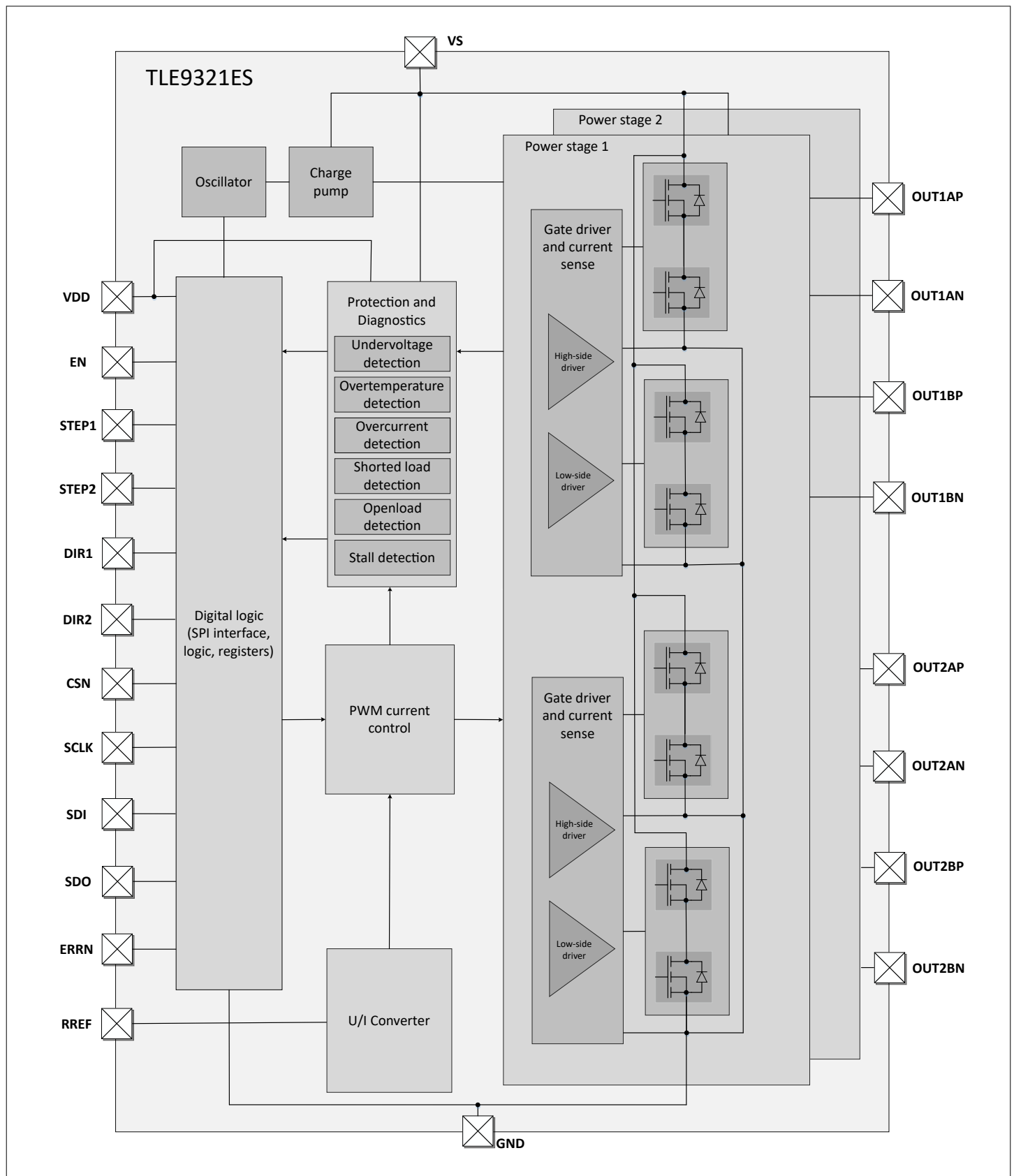


Figure 1 Block diagram

2 Pin configuration

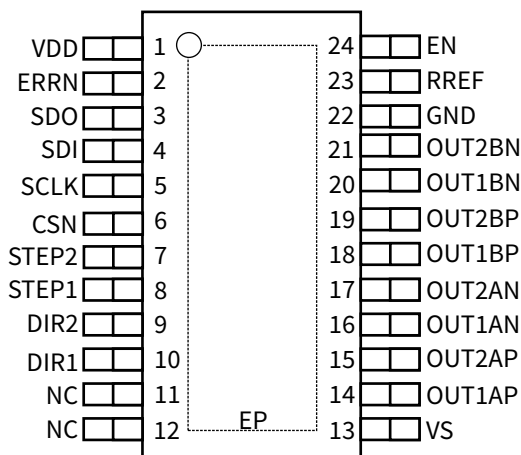


Figure 2 Pin configuration

Table 1 Pin definitions and functions

Pin	Symbol	Function
1	VDD	Logic supply voltage
2	ERRN	Error flag to indicate fault conditions with open drain
3	SDO	Serial data output with a tri-state output
4	SDI	Serial data input with an internal pull down resistor
5	SCLK	Serial clock input with an internal pull down resistor
6	CSN	Chip select input with an internal pull up resistor
7	STEP2	Step input for driver 2 with an internal pull down resistor
8	STEP1	Step input for driver 1 with an internal pull down resistor
9	DIR2	Direction input for driver 2 with an internal pull down resistor
10	DIR1	Direction input for driver 1 with an internal pull down resistor
11,12	NC	Not connected pin
13	VS	Power supply
14	OUT1AP	Power output P of the full-bridge A in stepper driver 1; Connect to GND with a pull down resistor when EN is low
15	OUT2AP	Power output P of the full-bridge A in stepper driver 2; Connect to GND with a pull down resistor when EN is low
16	OUT1AN	Power output N of the full-bridge A in stepper driver 1; Connect to GND with a pull down resistor when EN is low

(table continues...)

Table 1 (continued) Pin definitions and functions

Pin	Symbol	Function
17	OUT2AN	Power output N of the full-bridge A in stepper driver 2; Connect to GND with a pull down resistor when EN is low
18	OUT1BP	Power output P of the full-bridge B in stepper driver 1; Connect to GND with a pull down resistor when EN is low
19	OUT2BP	Power output P of the full-bridge B in stepper driver 2; Connect to GND with a pull down resistor when EN is low
20	OUT1BN	Power output N of the full-bridge B in stepper driver 1; Connect to GND with a pull down resistor when EN is low
21	OUT2BN	Power output N of the full-bridge B in stepper driver 2; Connect to GND with a pull down resistor when EN is low
22	GND	Ground connection
23	RREF	Reference resistor to generate reference current
24	EN	Enable input with an internal pull down resistor
EP	–	Exposed die pad. For cooling and EMC purposes only; Not usable as electrical ground; Electrical ground must be provided by pin 22; Recommend to connect EP to GND

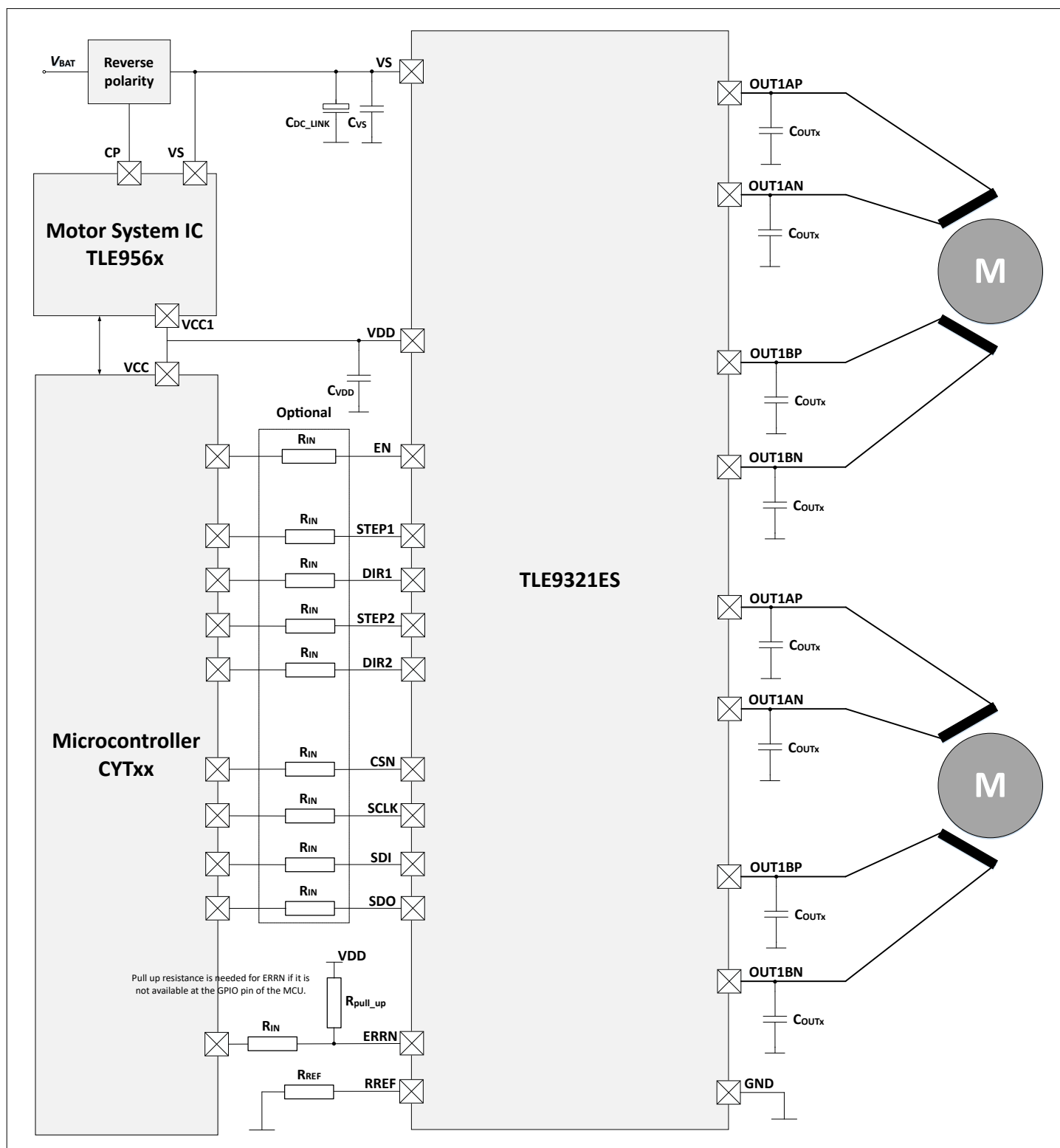


Figure 3 Simplified application diagram of the TLE9321ES

4 Package

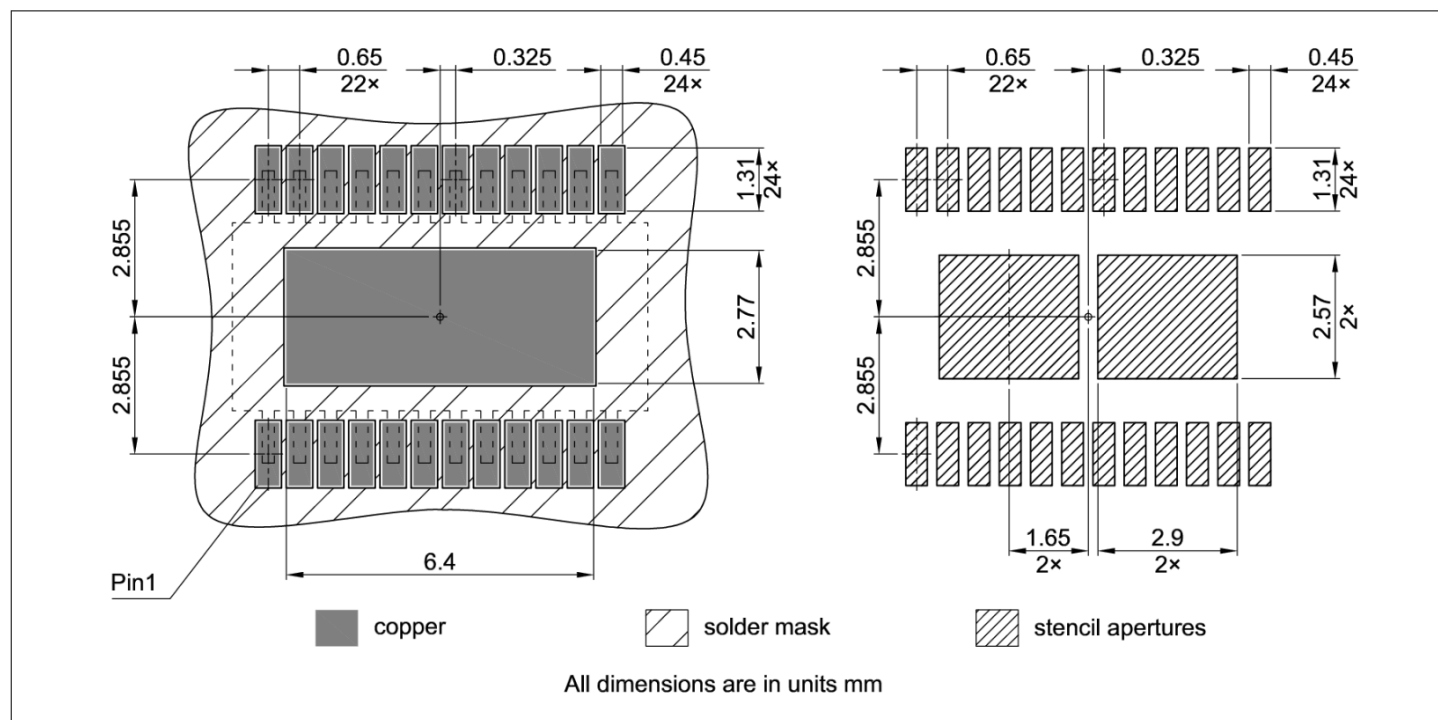


Figure 4 Footprint dimension of TLE9321ES (PG-TSDSO-24)

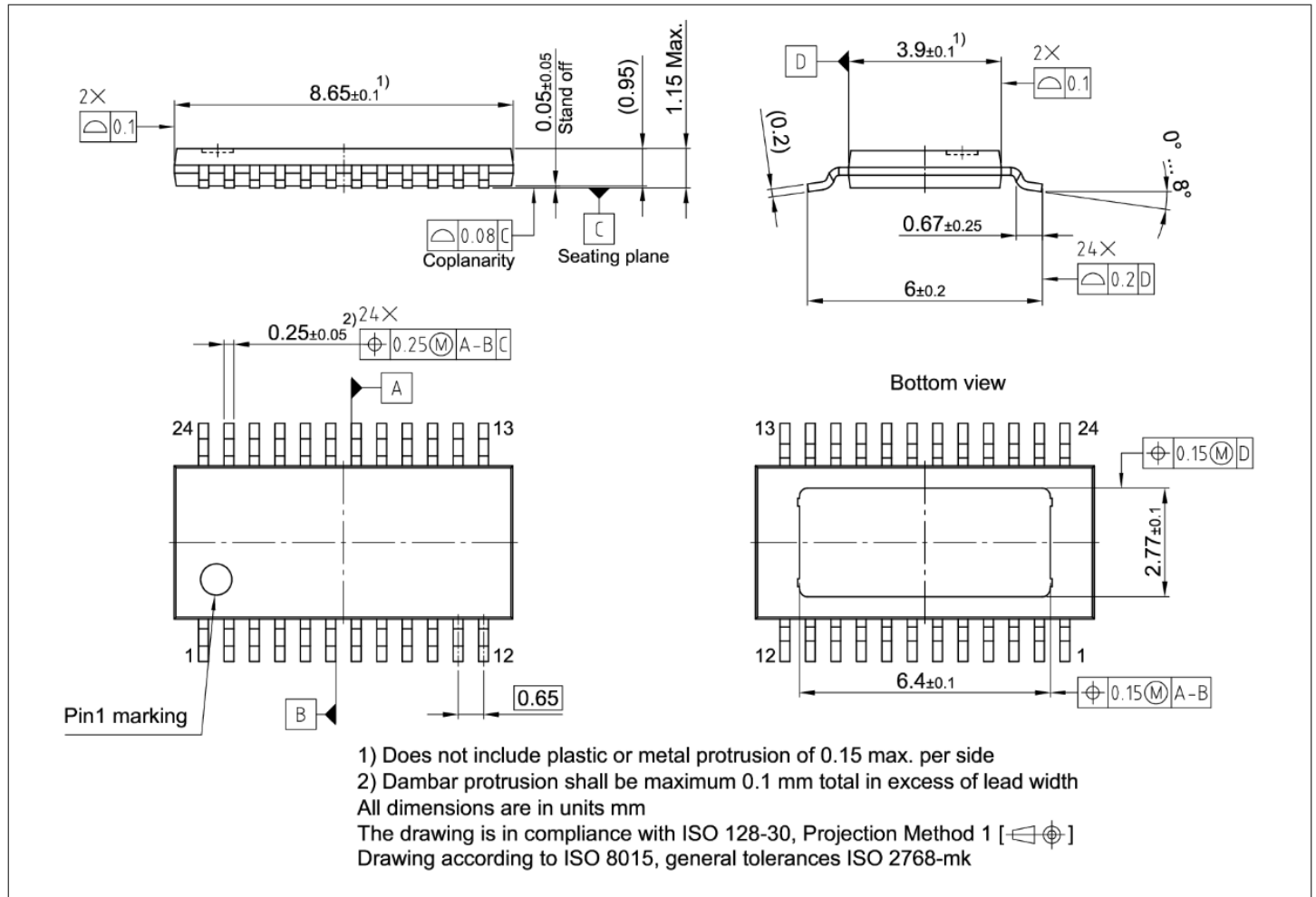


Figure 5 Package dimension of TLE9321ES (PG-TSDSO-24)

Revision history

Document version	Date of release	Description of changes
Rev. 1.00	2026-09-02	Product overview available

Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

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