

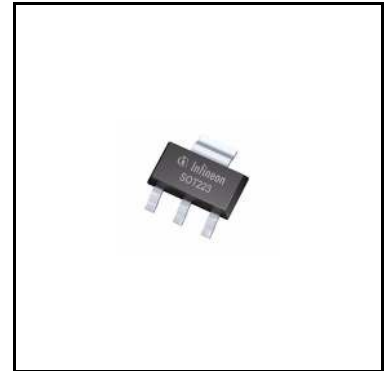
OPTIREG™ linear TLE42344G

Low-dropout linear voltage regulator



Features

- Output voltage tolerance $\leq \pm 2\%$
- Low dropout voltage
- Output current up to 100 mA
- Very low current consumption
- Overtemperature shutdown
- Output current limitation
- Suitable for use in automotive electronics
- Reverse polarity protection
- Green Product (RoHS compliant)



Potential applications

General automotive applications.

Product validation

Qualified for automotive applications. Product validation according to AEC-Q100.

Description

The TLE42344G is a 5-V low-dropout fixed-voltage regulator in a PG-SOT223-4 package. The IC regulates an input voltage V_I in the range $5.5\text{ V} < V_I < 45\text{ V}$ to $V_{Q_{rated}} = 5.0\text{ V}$. The maximum output current is more than 100 mA. This IC is protected against short circuit and overheating by the integrated output current limitation and the overtemperature shutdown.

| Type | Package | Marking |
|-----------|-------------|---------|
| TLE42344G | PG-SOT223-4 | 42344 |

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Block diagram

1 Block diagram

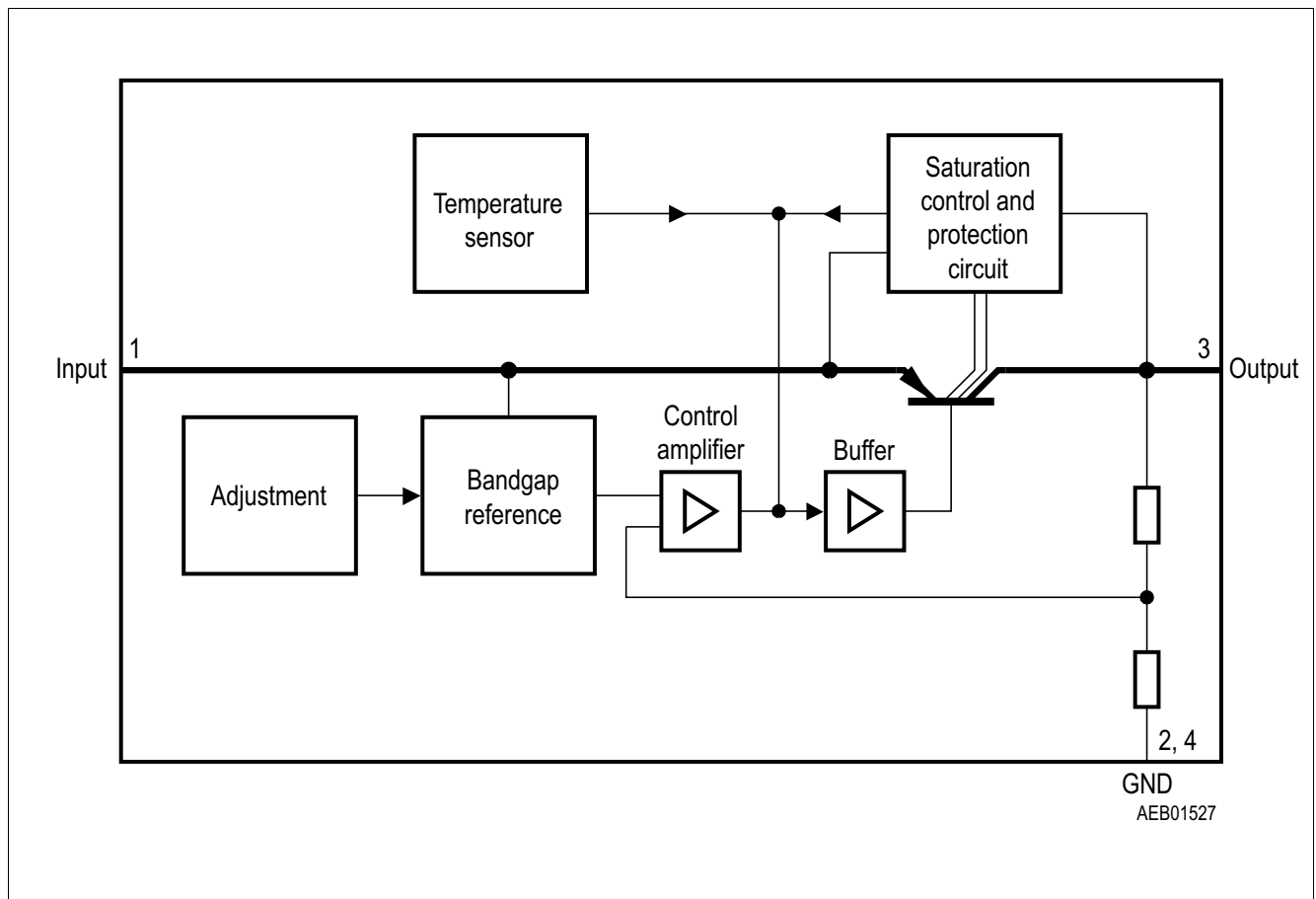


Figure 1 Block diagram

Pin configuration

2 Pin configuration

2.1 Pin assignment

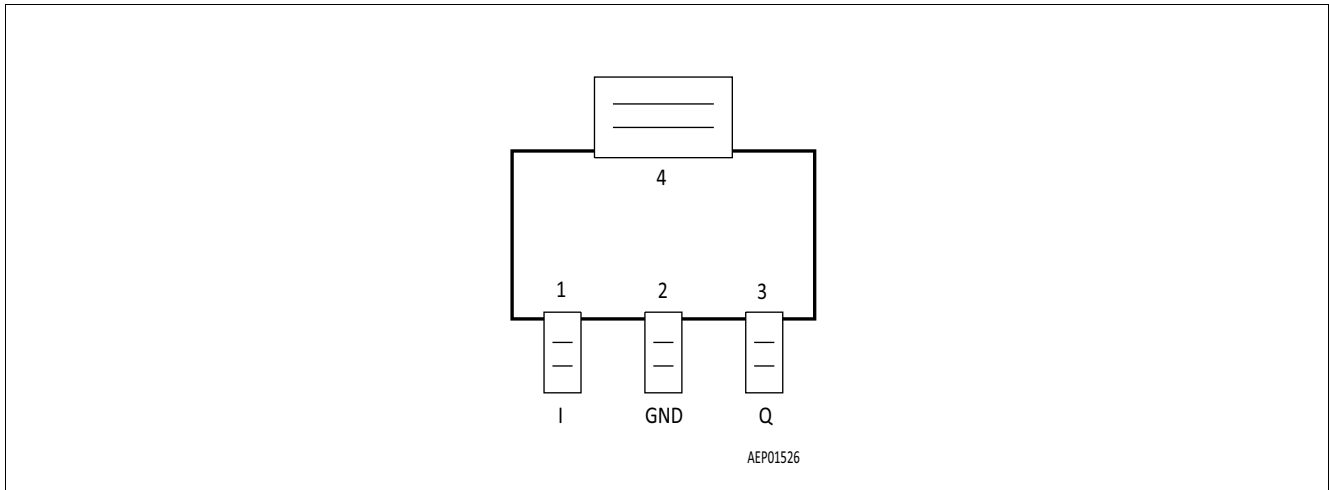


Figure 2 Pin configuration

2.2 Pin definitions and functions

Table 1 Pin definitions and functions

| Pin | Symbol | Function |
|------|--------|---|
| 1 | I | Input voltage Block to ground directly on the IC with ceramic capacitor |
| 2, 4 | GND | Ground |
| 3 | Q | 5-V output voltage Block to ground with capacitor $\geq 10 \mu\text{F}$, $\text{ESR} \leq 10 \Omega$ |

General product characteristics

3 General product characteristics

3.1 Absolute maximum ratings

Table 2 Absolute maximum ratings¹⁾

$T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$; all voltages with respect to ground, positive current flowing into pin (unless otherwise specified)

| Parameter | Symbol | Values | | | Unit | Note or Test Condition | Number |
|---------------------------|------------------|--------|------|------|------|------------------------|---------|
| | | Min. | Typ. | Max. | | | |
| Input | | | | | | | |
| Input voltage | V_I | -30 | – | 45 | V | – | P_4.1.1 |
| Output | | | | | | | |
| Output voltage | V_Q | -1 | – | 32 | V | – | P_4.1.2 |
| Temperatures | | | | | | | |
| Junction temperature | T_j | -40 | – | 150 | °C | – | P_4.1.3 |
| Storage temperature | T_{stg} | -50 | – | 150 | °C | – | P_4.1.4 |
| ESD susceptibility | | | | | | | |
| ESD resistivity to GND | V_{ESD} | -4 | – | 4 | kV | ²⁾ HBM | P_4.1.5 |
| ESD resistivity to GND | V_{ESD} | -1.5 | – | 1.5 | kV | ³⁾ CDM | P_4.1.6 |

1) Not subject to production test, specified by design.

2) ESD susceptibility, HBM according to EIA/JESD 22-A114B.

3) ESD susceptibility, Charged Device Model “CDM” EIA/JESD22-C101 or ESDA STM5.3.1.

Notes

1. Stresses above the ones listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
2. Integrated protection functions are designed to prevent IC destruction under fault conditions described in the datasheet. Fault conditions are considered as “outside” normal operating range. Protection functions are not designed for continuous repetitive operation.

General product characteristics

3.2 Functional range

Table 3 Functional range

| Parameter | Symbol | Values | | | Unit | Note or Test Condition | Number |
|----------------------|--------|--------|------|------|------|------------------------|---------|
| | | Min. | Typ. | Max. | | | |
| Input voltage | V_I | 5.5 | – | 45 | V | – | P_4.2.1 |
| Junction temperature | T_j | -40 | – | 150 | °C | – | P_4.2.2 |

Note: Within the functional or operating range, the IC operates as described in the circuit description. The electrical characteristics are specified within the conditions given in the electrical characteristics table.

3.3 Thermal resistance

Note: This thermal data was generated in accordance with JEDEC JESD51 standards. For more information, go to www.jedec.org.

Table 4 Thermal resistance

| Parameter | Symbol | Values | | | Unit | Note or Test Condition | Number |
|---------------------|------------|--------|------|------|------|---|---------|
| | | Min. | Typ. | Max. | | | |
| Junction to case | R_{thJC} | – | 17 | – | K/W | ¹⁾ Measured to heat slug | P_4.3.1 |
| Junction to ambient | R_{thJA} | – | 54 | – | K/W | ¹⁾²⁾ | P_4.3.2 |
| Junction to ambient | R_{thJA} | – | 139 | – | K/W | ¹⁾³⁾ Footprint only | P_4.3.3 |
| Junction to ambient | R_{thJA} | – | 73 | – | K/W | ¹⁾³⁾ 300 mm ² heatsink area | P_4.3.4 |
| Junction to ambient | R_{thJA} | – | 64 | – | K/W | ¹⁾³⁾ 600 mm ² heatsink area | P_4.3.5 |

- 1) Not subject to production test, specified by design.
- 2) Specified R_{thJA} value is according to Jedec JESD51-2,-5,-7 at natural convection on FR4 2s2p board. The product (chip and package) was simulated on a 76.2 × 114.3 × 1.5 mm³ board with 2 inner copper layers (2 × 70 μm Cu, 2 × 35 μm Cu). Where applicable, a thermal via array under the exposed pad contacted the first inner copper layer.
- 3) Specified R_{thJA} value is according to Jedec JESD 51-3 at natural convection on FR4 1s0p board. The product (chip and package) was simulated on a 76.2 × 114.3 × 1.5 mm³ board with 1 copper layer (1 × 70 μm Cu).

4 Circuit description

The control amplifier compares a reference voltage, which is kept highly precise by resistance adjustment, to a voltage that is proportional to the output voltage and drives the base of the series transistor via a buffer. Saturation control, working as a function of load current, prevents any oversaturation of the power element.

Dimensioning information on external components

The input capacitor C_i is necessary for compensating line influences. The output capacitor C_o is necessary for the stability of the regulating circuit. Stability is guaranteed at values $C_o \geq 10 \mu\text{F}$ and an $\text{ESR} \leq 10 \Omega$ within the operating temperature range.

Electrical characteristics

5 Electrical characteristics

5.1 Electrical characteristics voltage regulator

Table 5 Electrical characteristics

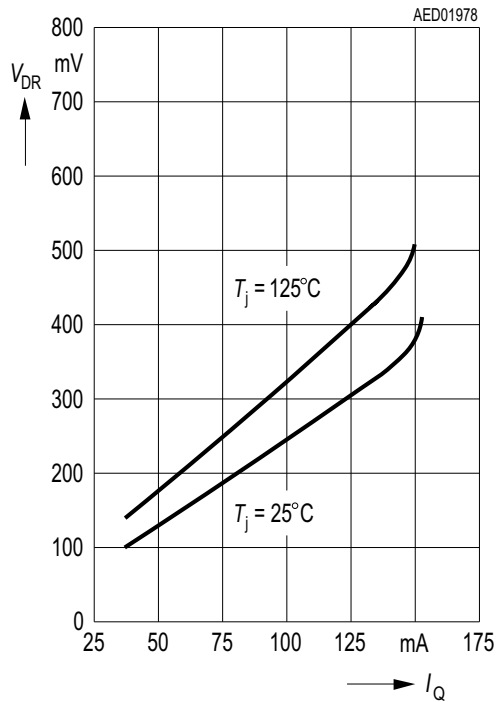
$T_j = -40^\circ\text{C}$ to $+150^\circ\text{C}$; $V_I = 13.5\text{ V}$; all voltages with respect to ground, positive current flowing into pin (unless otherwise specified)

| Parameter | Symbol | Values | | | Unit | Note or Test Condition | Number |
|--|--------------|--------|------|------|---------------|---|---------|
| | | Min. | Typ. | Max. | | | |
| Output voltage | V_Q | 4.9 | 5.0 | 5.1 | V | $5\text{ mA} \leq I_Q \leq 100\text{ mA}$ $6\text{ V} \leq V_I \leq 28\text{ V}$ | P_5.1.1 |
| Output current limitation | I_Q | 120 | 160 | – | mA | – | P_5.1.2 |
| Current consumption $I_q = I_I - I_Q$ | I_q | – | – | 400 | μA | $I_Q = 1\text{ mA}$ | P_5.1.3 |
| Current consumption $I_q = I_I - I_Q$ | I_q | – | 9 | 15 | mA | $I_Q = 100\text{ mA}$ | P_5.1.4 |
| Drop voltage | V_{dr} | – | 0.25 | 0.5 | V | ¹⁾ $I_Q = 100\text{ mA}$ | P_5.1.5 |
| Load regulation | ΔV_Q | – | – | 40 | mV | $I_Q = 5\text{ to }100\text{ mA}$ $V_I = 6\text{ V}$ | P_5.1.6 |
| Line regulation | ΔV_Q | – | 15 | 30 | mV | $V_I = 6\text{ to }28\text{ V}$ $I_Q = 5\text{ mA}$ | P_5.1.7 |
| Power supply ripple rejection | $PSRR$ | – | 54 | – | dB | $f_r = 100\text{ Hz}$ $V_r = 0.5\text{ Vpp}$ | P_5.1.8 |

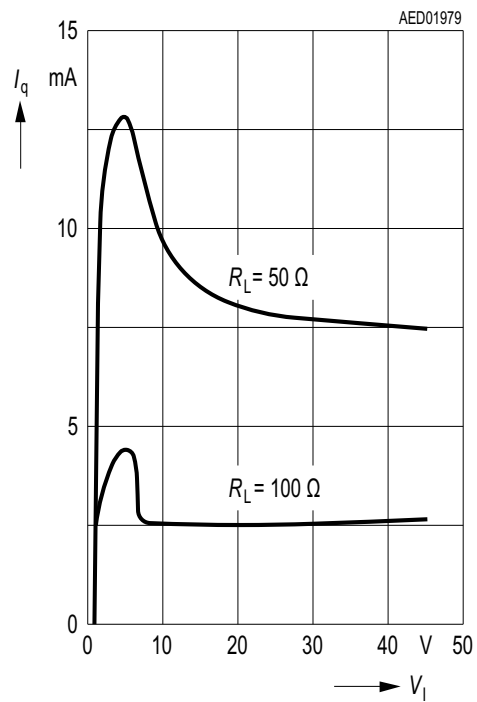
1) Drop voltage = $V_I - V_Q$ (measured where V_Q has dropped 100 mV from the nominal value obtained at $V_I = 13.5\text{ V}$).

6 Typical performance characteristics voltage regulator

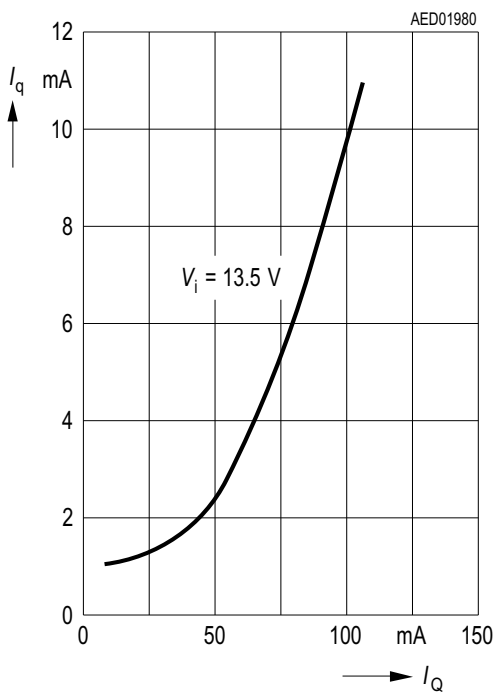
Dropout voltage V_{DR} versus output current I_Q



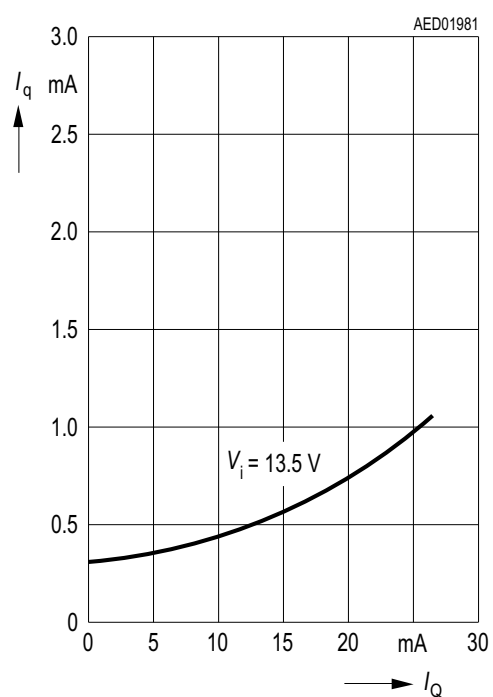
Current consumption I_q versus input voltage V_I



Current consumption I_q versus output current I_Q

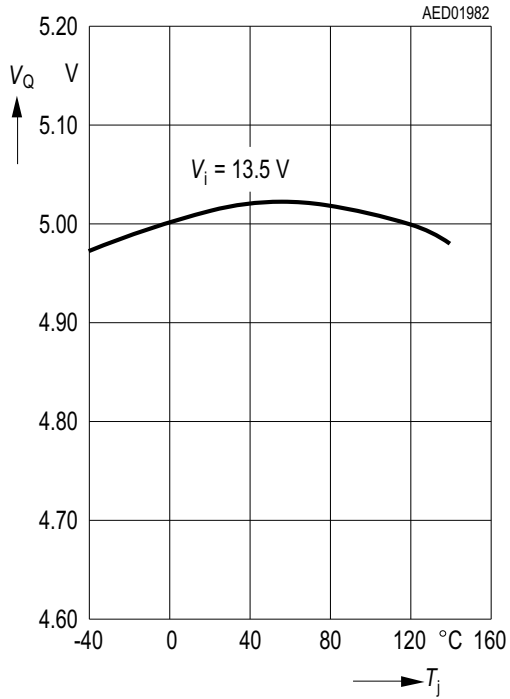


Current consumption I_q versus output current I_Q

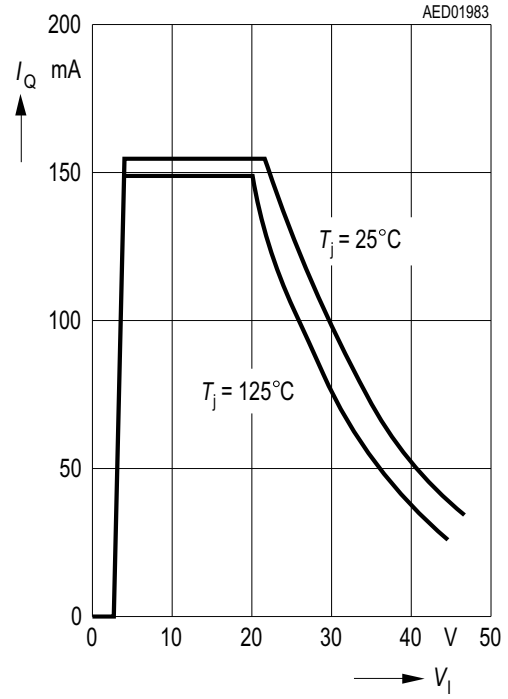


Typical performance characteristics voltage regulator

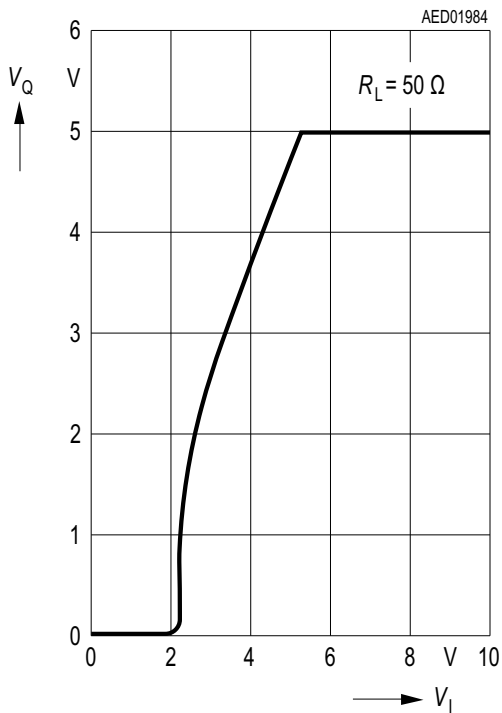
Output voltage V_Q versus temperature T_j



Output current I_Q versus input voltage V_I



Output voltage V_Q versus input voltage V_I



Application information

7 Application information

Note: The following information is given as a hint for the implementation of the device only and shall not be regarded as a description or warranty of a certain functionality, condition or quality of the device.

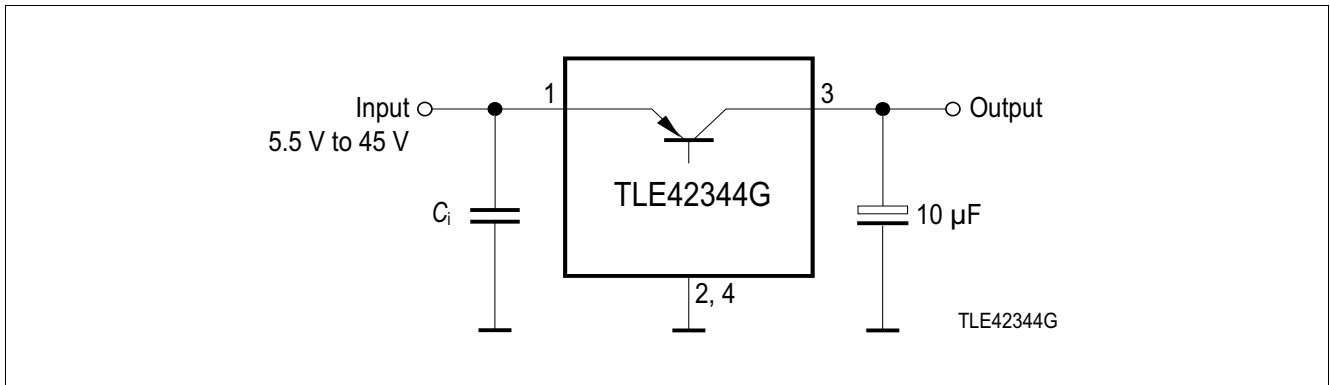


Figure 3 Application diagram

Note: This is a very simplified example of an application circuit. The function must be verified in the real application.

7.1 Further application information

For further information you may contact <https://www.infineon.com/>

8 Package information

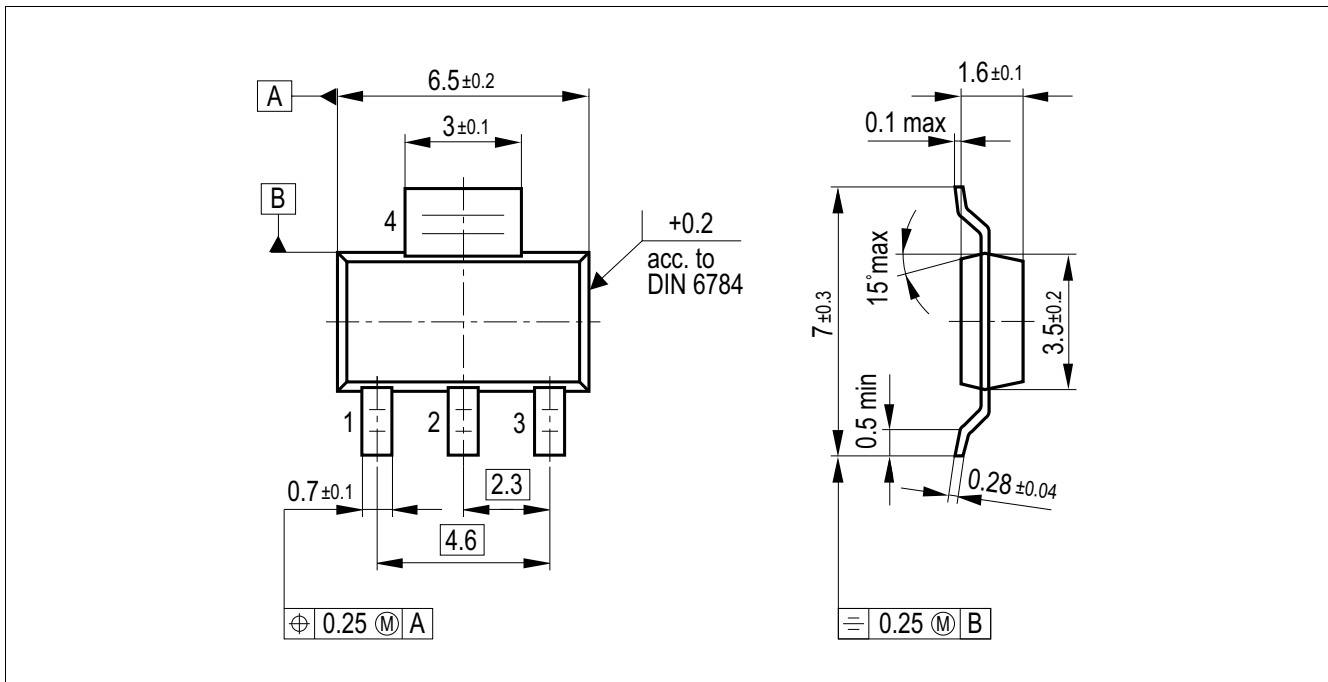


Figure 4 PG-SOT223-4 (plastic small-outline transistor)¹⁾

Green Product (RoHS compliant)

To meet the world-wide customer requirements for environmentally friendly products and to be compliant with government regulations the device is available as a Green Product. Green Products are RoHS compliant (Pb-free finish on leads and suitable for Pb-free soldering according to IPC/JEDEC J-STD-020).

Further information on packages

<https://www.infineon.com/packages>

1) Dimensions in mm

Revision history

9 Revision history

| Revision | Date | Changes |
|-----------------|-------------|-------------------|
| Rev. 1.1 | 2023-05-22 | Editorial changes |
| Rev. 1.0 | 2010-02-08 | Initial datasheet |

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