Never stop thinking

TLE42364G

Low Dropout Linear Voltage Regulator

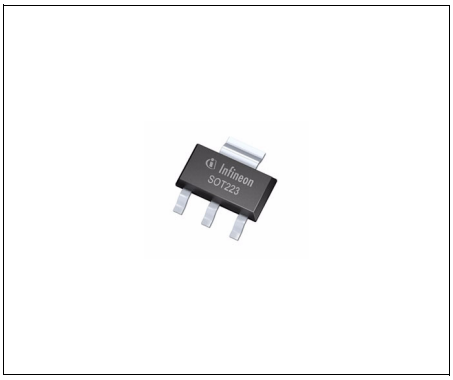
TLE42364G

Data Sheet

Rev. 1.0, 2010-02-08

Automotive Power

1 Overview



PG-SOT223-4

Features

- Output voltage 5 V
- Output voltage tolerance ≤ ±2%
- 100 mA current capability
- Very low current consumption
- Low dropout voltage
- Overtemperature shutdown
- Reverse polarity protection
- Output current limitation
- Wide temperature range
- Suitable for use in automotive electronics
- Enable
- Green Product (RoHS compliant)
- AEC Qualified

Functional Description

TLE42364G is a low dropout voltage regulator for 5 V supply in a PG-SOT223-4 SMD package. The IC regulates an input voltage V_I in the range of 5.5 V < V_I < 45 V to $V_{Q,nom}$ = 5 V. The maximum output current is more than 100 mA. The IC can be switched off via the enable input, which causes the current consumption to drop below 10 µA. The IC is protected against shortcircuit and overheat by the incorporated output current limitation and the overtemperature shutdown.

Choosing External Components

The input capacitor C_I is necessary for compensating line influences. The output capacitor C_Q is necessary for the stability of the regulating circuit. Stability is guaranteed at values C_Q ≥ 10 µF and an ESR ≤ 10 Ω within the whole operating temperature range.

Circuit Description

The device includes a precise reference voltage, which is very accurate due to resistor adjustment. A control amplifier compares the divided output voltage to this reference voltage and drives the base of the PNP series transistor through a buffer. Saturation control as a function of the load current prevents any oversaturation of the power element.

Type	Package	Marking
TLE42364G	PG-SOT223-4	42364

2 Block Diagram

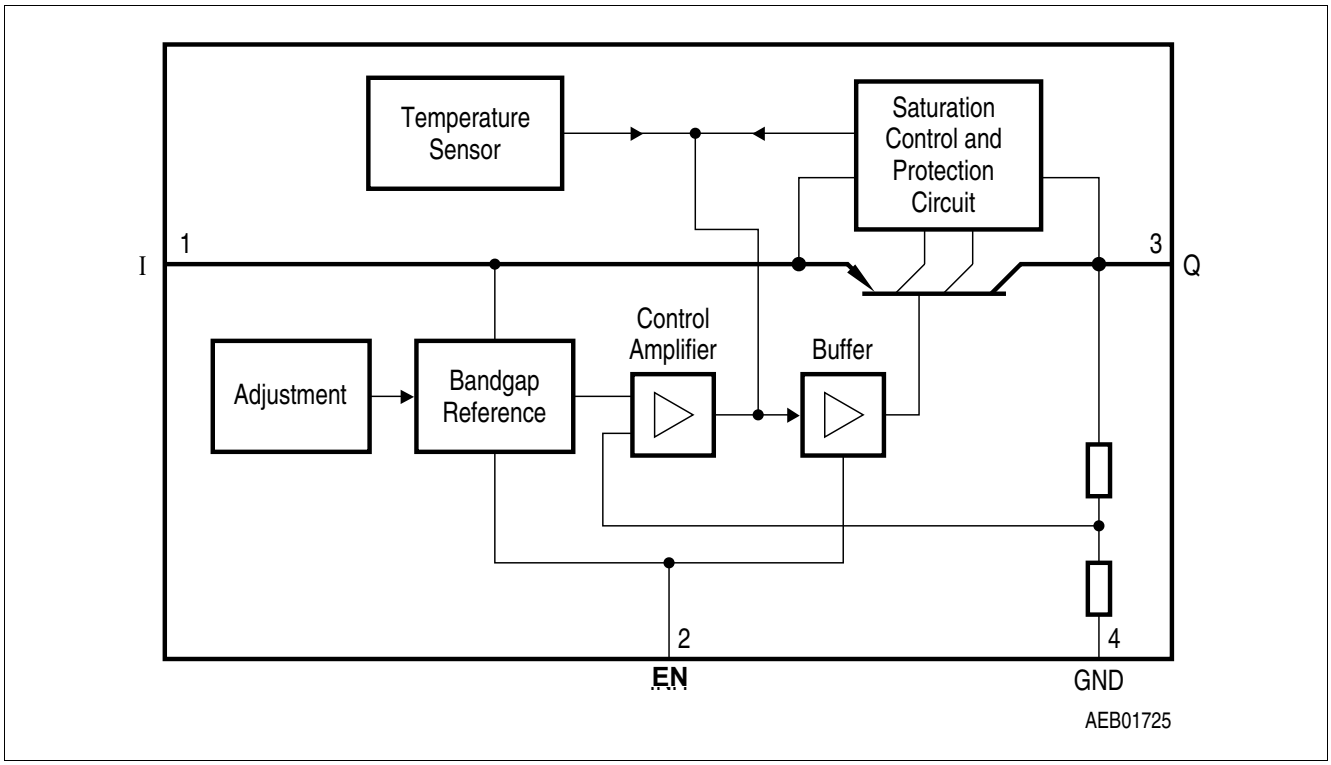


Figure 1 Block Diagram

3 Pin Configuration

3.1 Pin Assignment

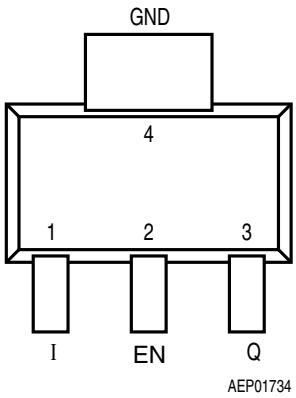


Figure 2 Pin Configuration

3.2 Pin Definitions and Functions

Pin	Symbol	Function
1	I	**Input voltage;** block to ground directly at the IC with a ceramic capacitor.
2	EN	**Enable;** connect to V_{batt} to enable the IC, connect to GND to disable the IC.
3	Q	**Output voltage;** block to ground with a capacitor $C_Q \geq 10\ \mu F$.
4	GND	**Ground**

4 General Product Characteristics

4.1 Absolute Maximum Ratings

Absolute Maximum Ratings [1)]

T_j = -40 °C to +150 °C; all voltages with respect to ground, positive current flowing into pin (unless otherwise specified)

Pos.	Parameter	Symbol	Limit Values		Unit	Conditions
			Min.	Max.		
Input, Enable						
4.1.1	Voltage	V_I, V_{EN}	-30	45	V	–
Output						
4.1.2	Voltage	V_Q	-1	32	V	–
Temperatures						
4.1.3	Junction Temperature	T_j	-40	150	°C	–
4.1.4	Storage Temperature	T_{stg}	-50	150	°C	–
ESD Susceptibility						
4.1.5	ESD Resistivity to GND	V_{ESD}	-4	4	kV	HBM[2)]
4.1.6	ESD Resistivity to GND	V_{ESD}	-1.5	1.5	kV	CDM[3)]

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

Note: 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.

Note: Integrated protection functions are designed to prevent IC destruction under fault conditions described in the data sheet. Fault conditions are considered as “outside” normal operating range. Protection functions are not designed for continuous repetitive operation.

4.2 Functional Range

Table 1 Functional Range

Pos.	Parameter	Symbol	Limit Values		Unit	Conditions
			Min.	Max.		
4.2.1	Input voltage	V_I	5.5	45	V	–
4.2.2	Junction temperature	T_j	-40	150	°C	–

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.

4.3 Thermal Resistance

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

Pos.	Parameter	Symbol	Limit Values			Unit	Conditions
			Min.	Typ.	Max.		
4.3.1	Junction to Case[1)]	R_{thJC}	–	17	–	K/W	measured to heat slug
4.3.2	Junction to Ambient[1)]	R_{thJA}	–	54	–	K/W	[2)]
4.3.3			–	139	–	K/W	footprint only[3)]
4.3.4			–	73	–	K/W	300 mm² heatsink area[3)]
4.3.5			–	64	–	K/W	600 mm² heatsink area[3)]

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+Package) was simulated on a 76.2 x 114.3 x 1.5 mm³ board with 2 inner copper layers (2 x 70µm Cu, 2 x 35µm 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+Package) was simulated on a $76.2 \times 114.3 \times 1.5$ mm^3 board with 1 copper layer (1 x 70µm Cu).

5 Electrical Characteristics

5.1 Electrical Characteristics Voltage Regulator

Electrical Characteristics:

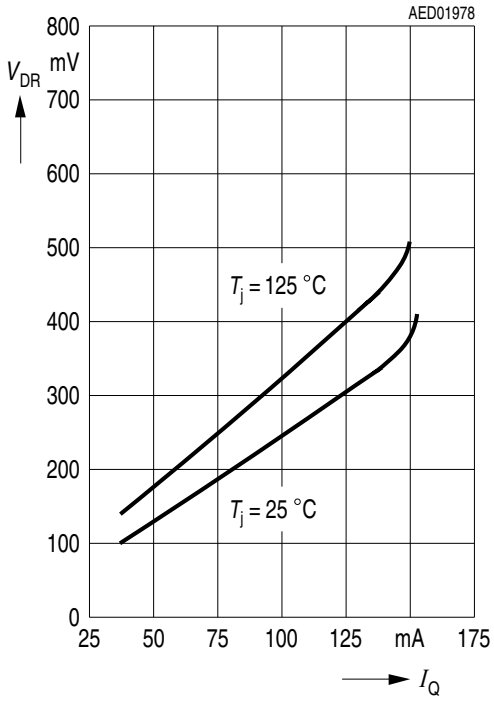
V_I = 13.5 V, T_j = -40 °C to +150 °C, all voltages with respect to ground, positive current flowing into pin (unless otherwise specified)

Pos.	Parameter	Symbol	Limit Values			Unit	Conditions
			Min.	Typ.	Max.		
5.1.1	Output voltage	V_Q	4.9	5.0	5.1	V	5 mA ≤ I_Q ≤ 100 mA 6 V ≤ V_I ≤ 28 V
5.1.2	Output current limitation	I_Q	120	150	–	mA	–
5.1.3	Current consumption $I_q = I_I - I_Q$	I_q	–	–	10	µA	V_{EN} = 0 V; T_j ≤ 100 °C
5.1.4	Current consumption $I_q = I_I - I_Q$	I_q	–	–	400	µA	I_Q = 1 mA Enable ON
5.1.5	Current consumption $I_q = I_I - I_Q$	I_q	–	10	15	mA	I_Q = 100 mA Enable ON
5.1.6	Dropout voltage	V_{dr}	–	0.25	0.5	V	I_Q = 100 mA[1)]
5.1.7	Load regulation	ΔV_{Q_load}	–	–	40	mV	I_Q = 5 to 100 mA V_I = 6 V
5.1.8	Line regulation	ΔV_{Q_line}	–	15	30	mV	V_I = 6 to 28 V I_Q = 5 mA
5.1.9	Power Supply ripple rejection	*PSRR*	–	54	–	dB	f_r = 100 Hz V_r = 0.5 Vpp
Enable							
5.1.10	Enable on voltage	$V_{EN, on}$	3.5	–	–	V	–
5.1.11	Enable off voltage	$V_{EN, off}$	–	–	0.8	V	–
5.1.12	Enable current	I_{EN}	5	15	25	µA	V_{EN} = 5 V

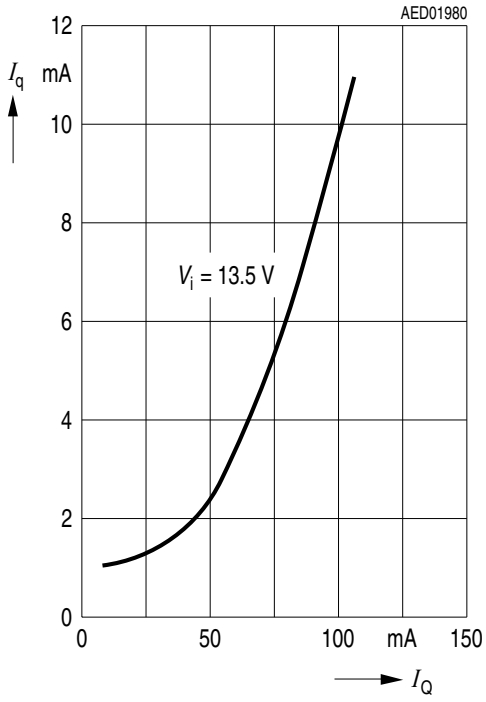
1) Dropout voltage = V_I - V_Q (measured when the output voltage V_Q has dropped 100 mV from the nominal value obtained at V_I = 13.5 V).

5.2 Typical Performance Characteristics Voltage Regulator

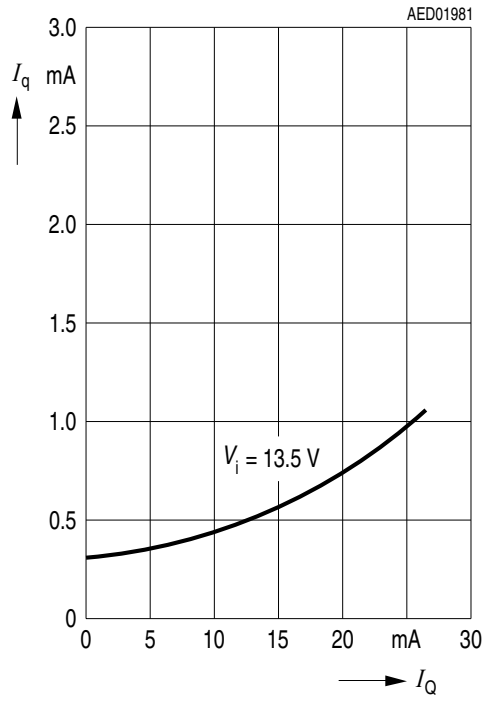
Dropout Voltage V_{DR} versus Output Current I_Q



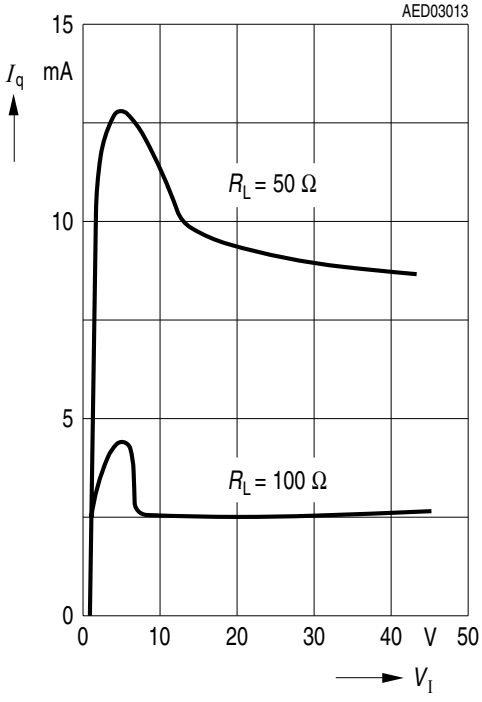
Current Consumption I_q versus Output Current I_Q



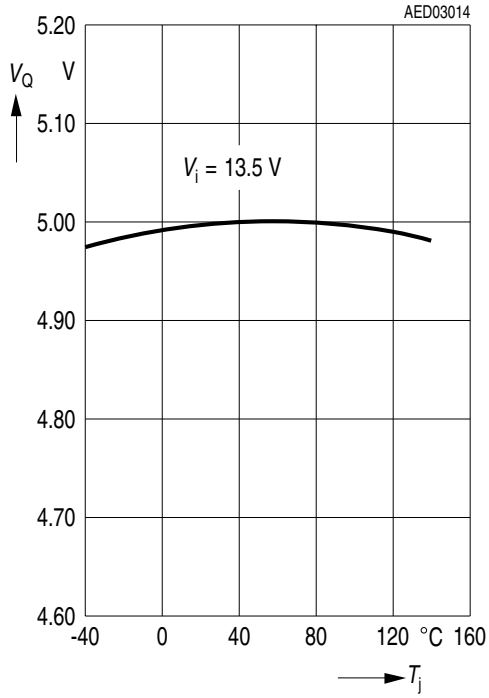
Current Consumption I_q versus Output Current I_Q



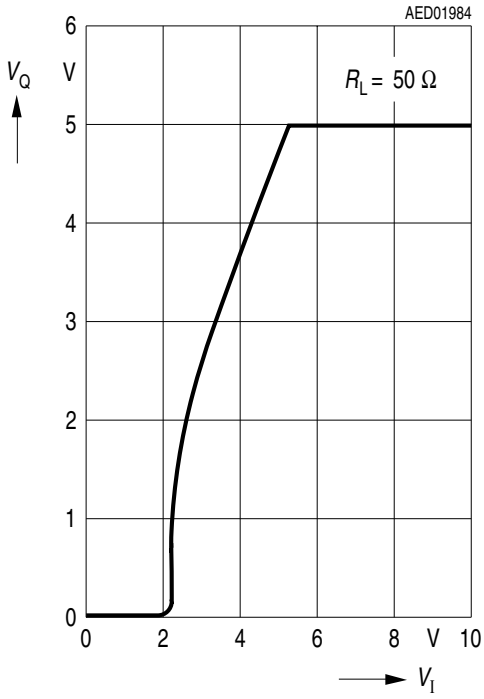
Current Consumption I_q versus Input Voltage V_I



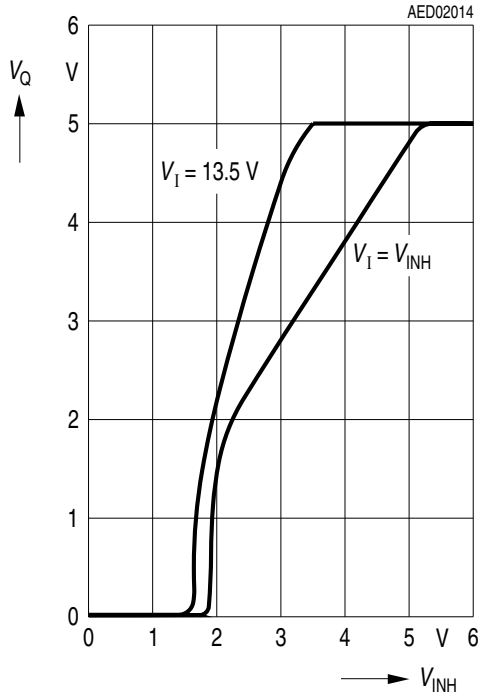
Output Voltage V_Q versus Temperature T_j



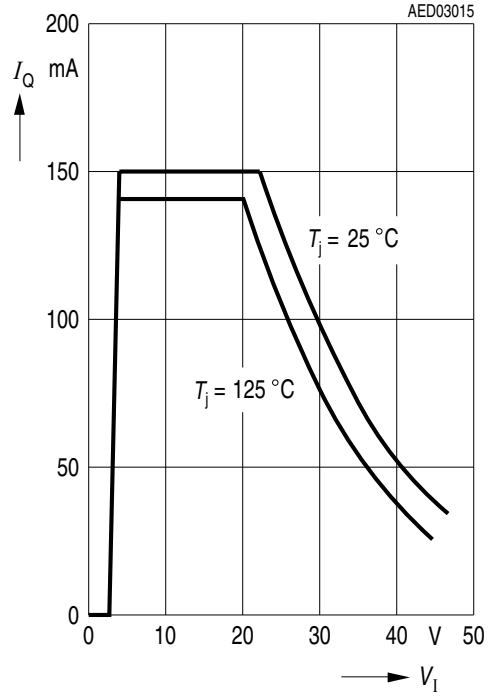
Output Voltage V_q versus Input Voltage V_I



Output Voltage V_q versus Enable Voltage V_{EN}



Output Current I_q versus Input Voltage V_I



6 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.

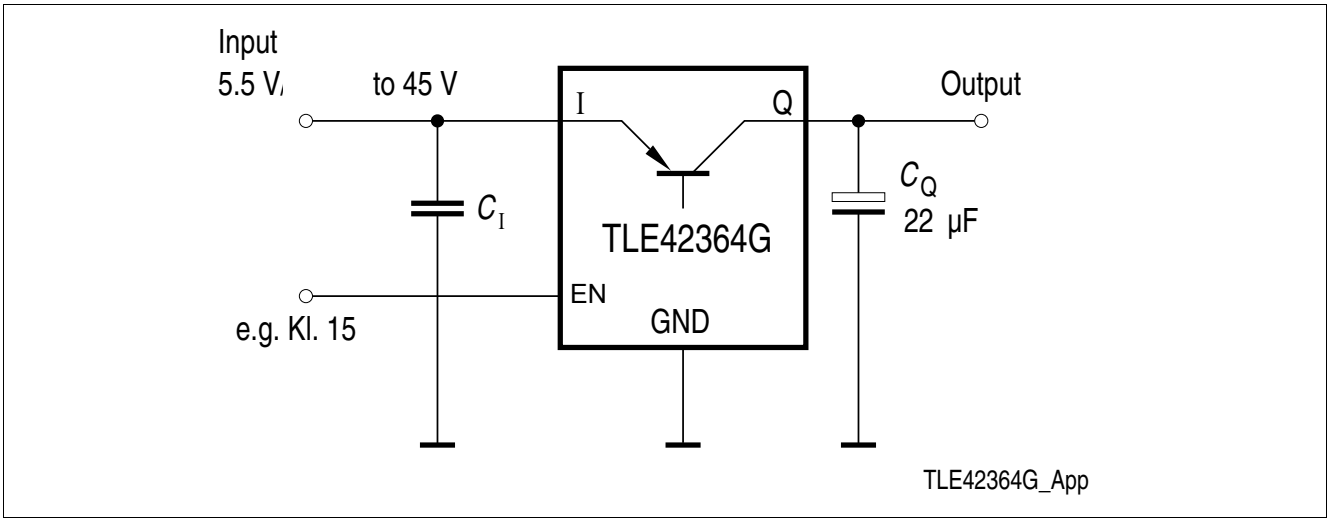


Figure 3 Application Diagram

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

6.1 Further Application Information

- For further information you may contact **http://www.infineon.com/**

7 Package Outlines

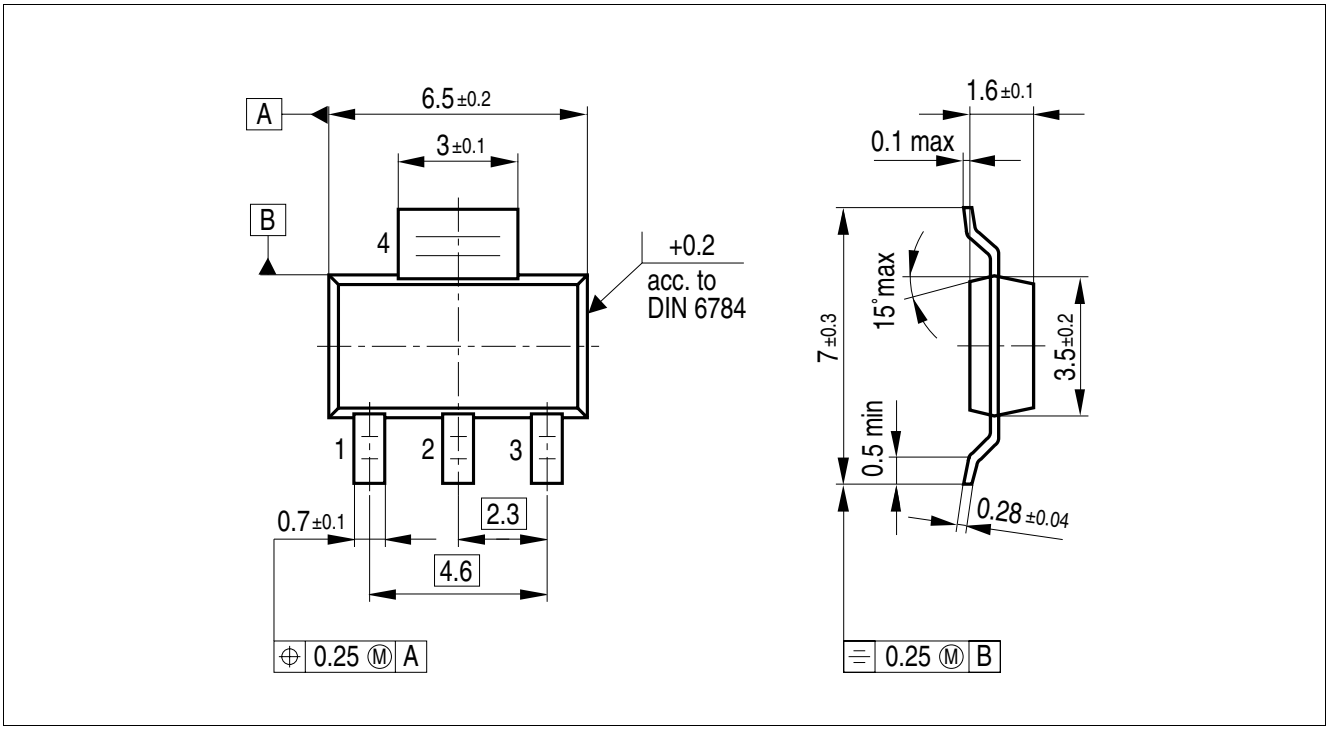


Figure 4 PG-SOT223-4 (Plastic Small Outline Transistor)

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 (i.e Pb-free finish on leads and suitable for Pb-free soldering according to IPC/JEDEC J-STD-020).

For further information on alternative packages, please visit our website:
http://www.infineon.com/packages.

Dimensions in mm

8 Revision History

Revision	Date	Changes
1.0	2010-02-08	Initial data sheet

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