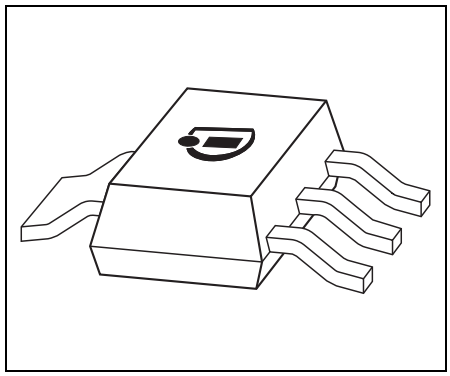
5-V Low Drop Fixed Voltage Regulator TLE 4264-2

AEC Qualified RoHS

Features



- Output voltage tolerance ≤ ±3% (±2% up to 50 mA)
- 150 mA current capability
- Low-drop voltage
- Very low current consumption: 40 µA
- Overtemperature protection
- Short-circuit proof
- Suitable for use in automotive electronics
- Reverse polarity proof
- Green Product (RoHS compliant)
- AEC Qualified

Functional Description

The TLE 4264-2 is a monolithic integrated low-drop fixed voltage regulator which can supply loads up to 150 mA. It is functional compatible to the TLE 4264, but has a reduced quiescent current of typ. 40 µA. The TLE 4264-2 is especially designed for all applications which require very low quiescent currents. The device is available in the small surface mounted PG-SOT223-4 package. The device is pin compatible to the TLE 4264. The regulator is designed to supply microprocessor systems under the severe condition of automotive applications and is therefore equipped with additional protection against overload, short-circuit and overtemperature. Of course the TLE 4264-2 can be used in all other applications, wherever a stabilized voltage is required.

An input voltage V_I in the range of 5.5 V < V_I < 45 V is regulated to $V_{Q,nom}$ = 5 V with an accuracy of ±3%. An accuracy of ±2% is kept for a load current range up to 50 mA.

The device operates in the temperature range of T_j = -40 to 150 °C.

Type	Package
TLE 4264-2 G	PG-SOT223-4

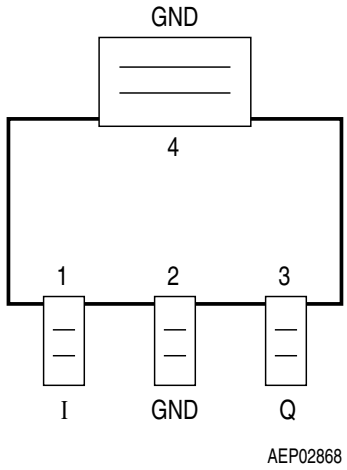


Figure 1 **Pin Configuration** (top view)

Table 1 **Pin Definitions and Functions**

Pin	Symbol	Function
1	I	**Input voltage;** block to ground directly with a ceramic capacitor
2, 4	GND	**Ground**
3	Q	**5-V output voltage;** block to ground with a capacitor $C_Q \geq 10\ \mu F$, ESR $\leq 4\ \Omega$

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 over-saturation of the power element. The IC is additionally protected against overload, overtemperature and reverse polarity.

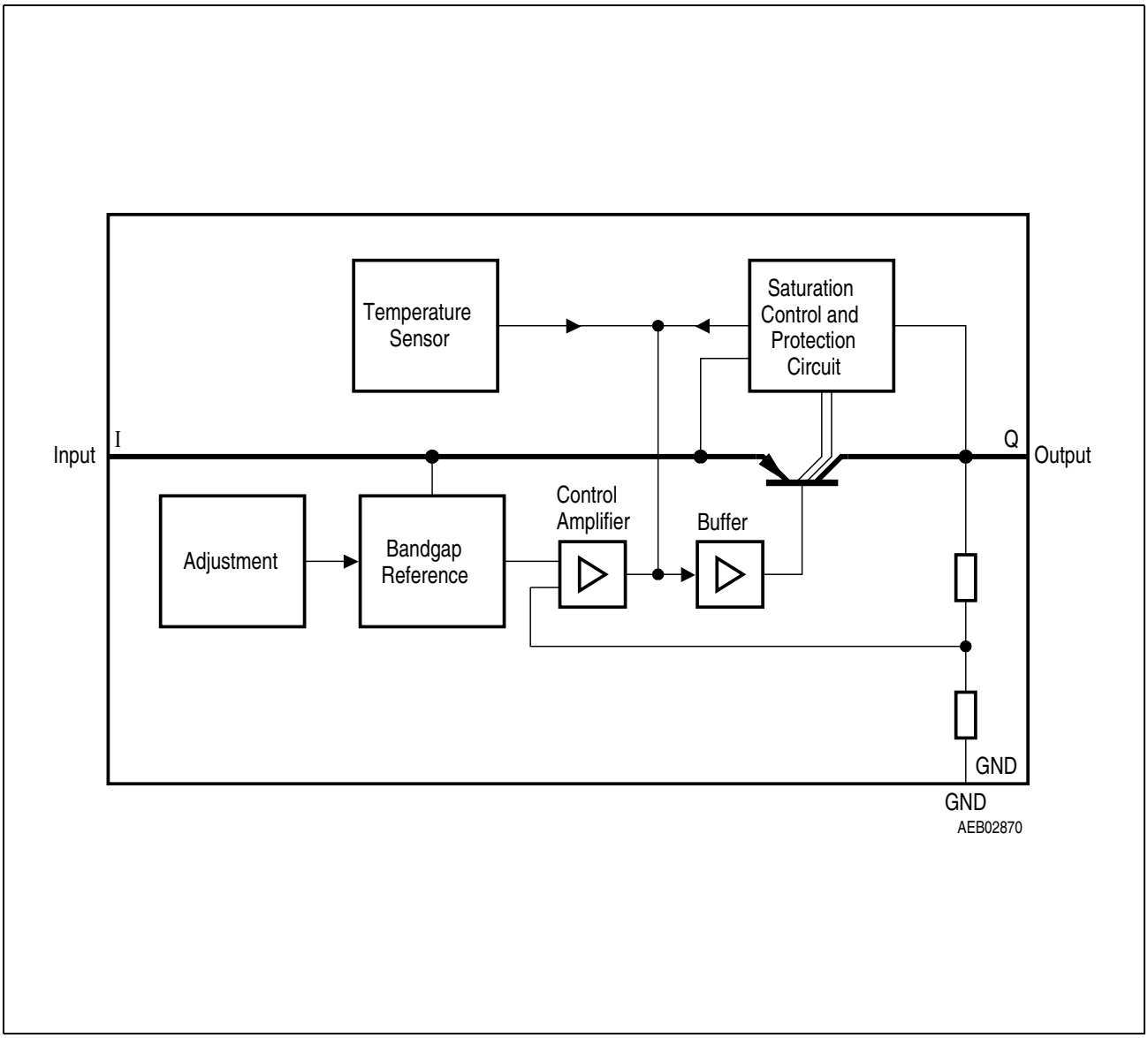


Figure 2 Block Diagram

Table 2 Absolute Maximum Ratings

Parameter	Symbol	Limit Values		Unit	Notes
		Min.	Max.		
Input I					
Input voltage	V_I	-42	45	V	–
Input current	I_I	–	–	–	limited internally
Output Q					
Output voltage	V_Q	-0.3	32	V	–
Output current	I_Q	–	–	–	limited internally
Ground GND					
Current	I_{GND}	50	–	mA	–
Temperatures					
Junction temperature	T_j	–	150	°C	–
Storage temperature	T_{stg}	-50	150	°C	–
Thermal Resistances					
Junction-ambient	$R_{thj\text{-}a}$	–	164	K/W	PG-SOT223-4[1)]
	$R_{thj\text{-}a}$	–	81	K/W	PG-SOT223-4, 300 mm^2 heat sink area
Junction-pin	$R_{thj\text{-}p}$	–	17	K/W	PG-SOT223-4[2)]
Operating Range					
Input voltage	V_I	5.5	45	V	–
Junction temperature	T_j	-40	150	°C	–

1) Package mounted on PCB 80 × 80 × 1.5mm^3; 35µ Cu; 5µ Sn; Footprint only; zero airflow.

2) Measured to pin 4.

Table 3 Characteristics

V_I = 13.5 V; -40 °C ≤ T_j ≤ 125 °C, unless specified otherwise

Parameter	Symbol	Limit Values			Unit	Test Conditions
		Min.	Typ.	Max.		
Output voltage	V_Q	4.85	5.0	5.15	V	5 mA ≤ I_Q ≤ 100 mA 6 V ≤ V_I ≤ 21 V
Output voltage	V_Q	4.9	5.0	5.1	V	5 mA ≤ I_Q ≤ 50 mA 9 V ≤ V_I ≤ 16 V
Output-current limiting	I_Q	150	200	500	mA	–
Current consumption $I_q = I_I - I_Q$	I_q	–	40	60	µA	I_Q = 100 µA, T_j ≤ 85 °C
		–	40	70	µA	I_Q = 100 µA,
Current consumption $I_q = I_I - I_Q$	I_q	–	1.7	4	mA	I_Q = 50 mA
Drop voltage	V_{dr}	–	0.22	0.5	V	I_Q = 100 mA[1)]
Load regulation	$\Delta V_{Q, lo}$	–	50	90	mV	I_Q = 1 to 100 mA V_I = 13.5 V
Line regulation	$\Delta V_{Q, li}$	–	5	30	mV	V_I = 6 to 28 V I_Q = 1 mA
Power Supply Ripple Rejection	$PSRR$	–	68	–	dB	f_r = 100 Hz V_r = 0.5 Vpp
Output Capacitor	C_Q	10	–	–	µF	ESR ≤ 4 Ω at 10 kHz

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 V)

Application Information

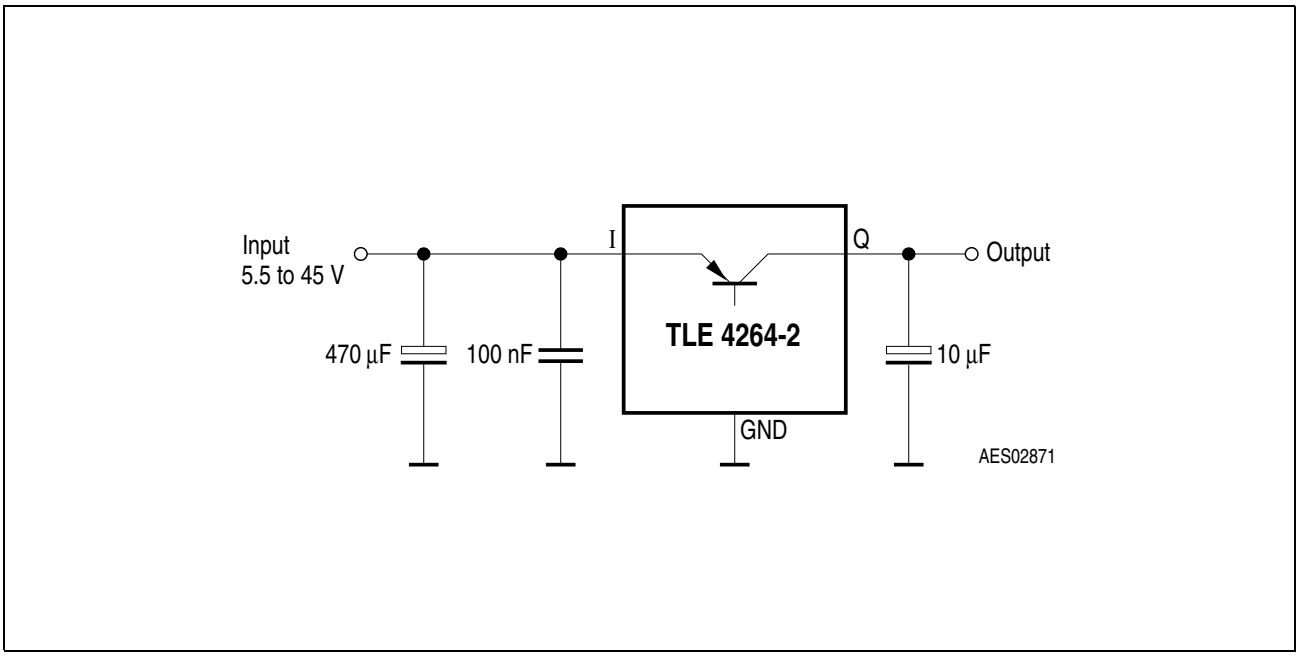


Figure 3 Application Circuit

In the TLE 4264-2 the output voltage is divided and compared to an internal reference of 2.5 V typical. The regulation loop controls the output to achieve an output voltage of 5 V with an accuracy of ±3% at an input voltage range of 5.5 V < V_I < 45 V.

Figure 4 shows a typical application circuit. For stability of the control loop the TLE 4264-2 output requires an output capacitor C_Q of at least 10 µF with a maximum permissible ESR of 4 Ω. Tantalum as well as multi layer ceramic capacitors are suitable.

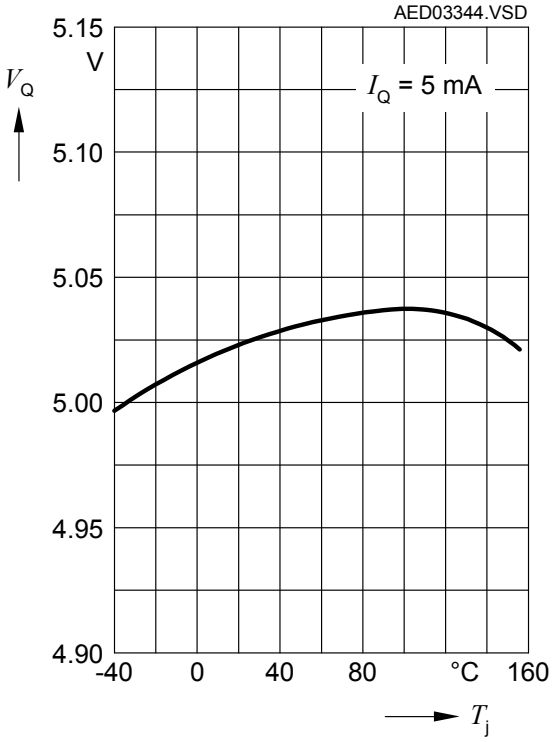
At the input of the regulator an input capacitor is necessary for compensating line influences (100 nF ceramic capacitor recommended). A resistor of approx. 1 Ω in series with C_I, can damp any oscillation occurring due the input inductivity and the input capacitor.

In the application circuit shown in **Figure 4** an additional electrolytic input capacitor of 470 µF is added in order to buffer supply line influences. This capacitor is recommended, if the device is sourced via long supply lines of several meters.

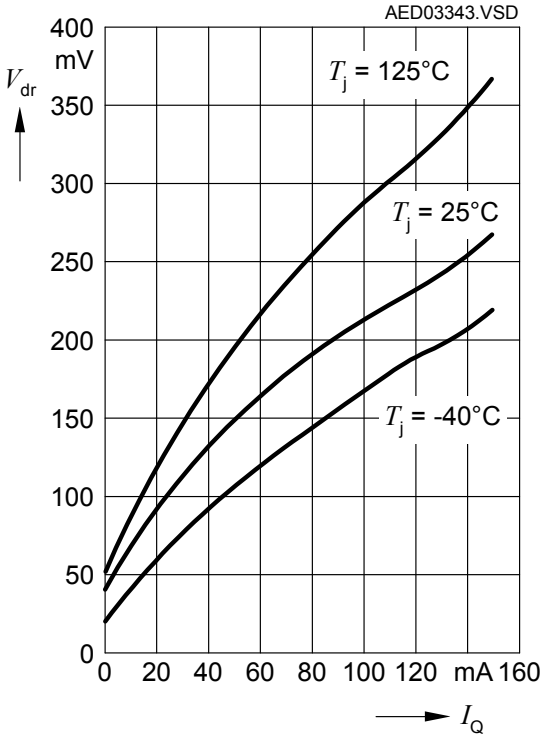
The TLE 4264-2 can supply up to 150 mA. However for protection for high input voltage above 25 V, the output current is reduced (SOA protection).

Typical Performance Characteristics

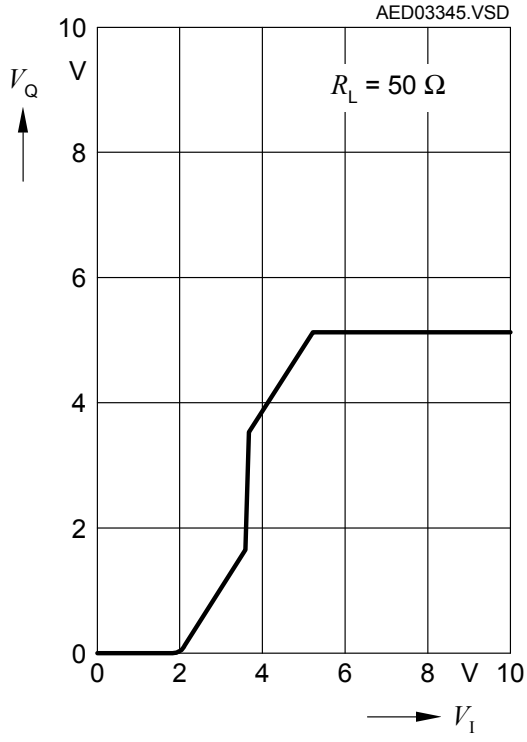
Output Voltage V_Q versus Temperature T_j



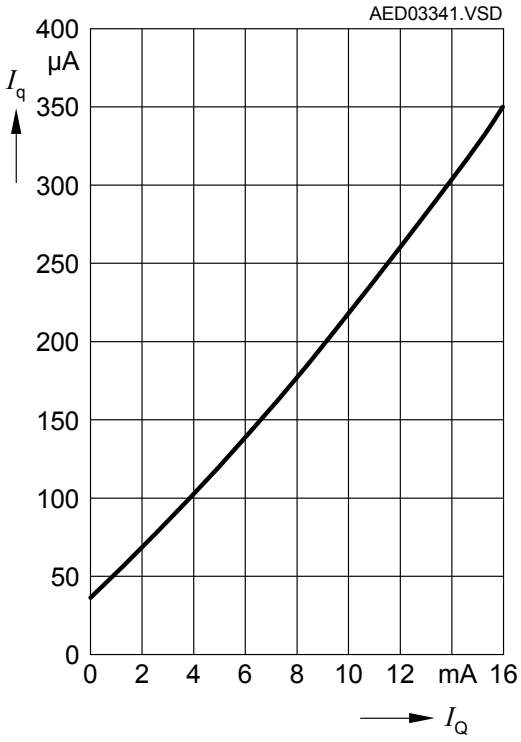
Drop Voltage V_{dr} versus Output Current I_Q



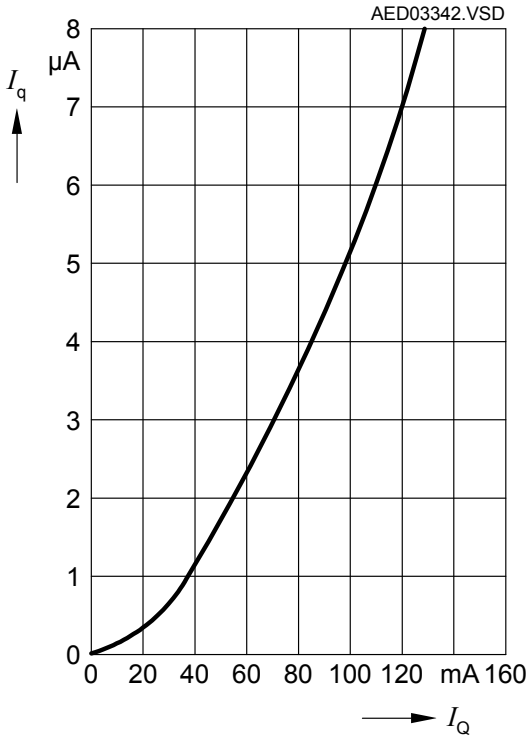
Output Voltage V_Q versus Input Voltage V_I



Current Consumption I_q versus Output Current I_Q



Current Consumption I_q versus Output Current I_Q



Package Outlines

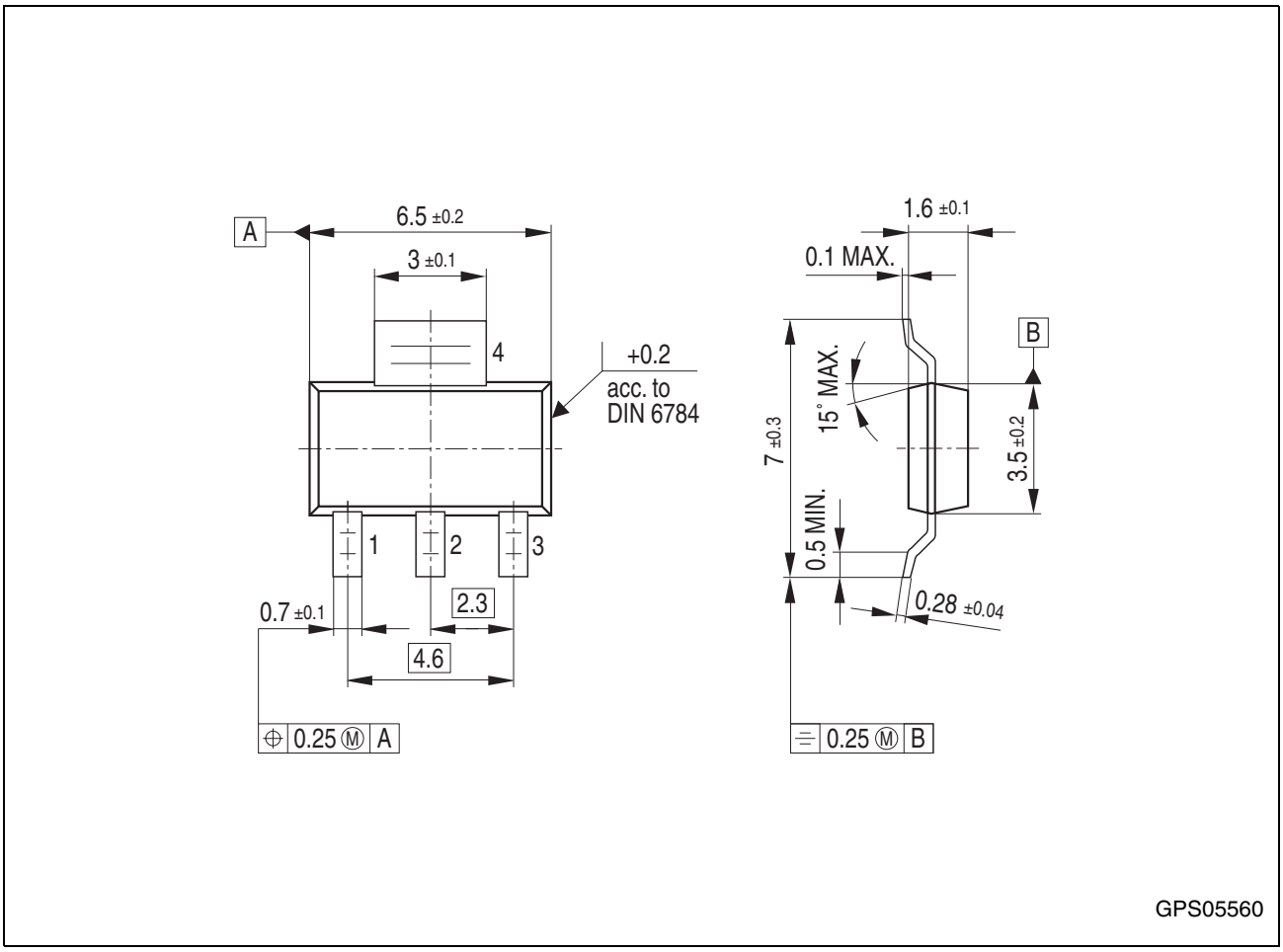


Figure 4 **PG-SOT223-4** (Plastic Small Outline Transistor)

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).

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SMD = Surface Mounted Device

Dimensions in mm

Revision History

Version	Date	Changes
Rev. 2.6	2008-03-10	Simplified package name to PG-SOT223-4. No modification of released product.
Rev. 2.5	2007-03-20	Initial version of RoHS-compliant derivate of TLE 4264-2 **Page 1**: AEC certified statement added **Page 1** and **Page 9**: RoHS compliance statement and Green product feature added **Page 1** and **Page 9**: Package changed to RoHS compliant version Legal Disclaimer updated

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