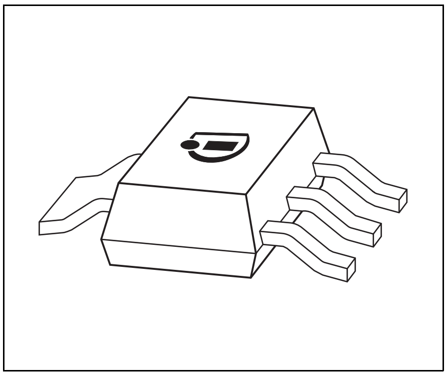
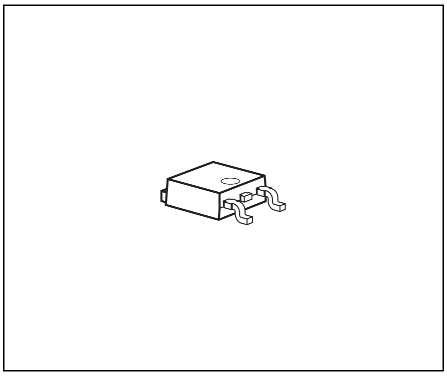
**Voltage Regulator** **TLE 4274 / 3.3V;2.5V**

## Features

- Output voltage: 3.3 V/2.5 V ± 4%
- Current capability 400 mA
- Very low current consumption
- Short-circuit proof
- Reverse polarity proof
- Suitable for use in automotive electronics
- Green Product (RoHS compliant)
- AEC Qualified





## Functional Description

The TLE 4274 / 3.3V;2.5V is a voltage regulator available in a SOT223 and TO252 package. The IC regulates an input voltage up to 40 V to $V_{Qrated}$ = 3.3 V/2.5 V. The maximum output current is 400 mA. The IC is short-circuit proof and has a shutdown circuit protecting it against overtemperature. The TLE 4274 is also available as 5 V, 8.5 V and 10 V version. Please refer to the data sheet TLE 4274.

## Dimensioning Information on External Components

The input capacitor $C_I$ is necessary for compensating line influences. Using a resistor of approx. 1 Ω in series with $C_I$, the oscillating of input inductivity and input capacitance can be damped. The output capacitor $C_Q$ is necessary for the stability of the regulation circuit. Stability is guaranteed for capacities $C_Q \geq 10\ \mu F$ with an ESR of ≤ 2.5 Ω within the operating temperature range.

| Type | Package |
|---|---|
| TLE 4274 GSV33 | PG-SOT223-4 |
| TLE 4274 DV33 | PG-TO252-3-11 |
| TLE 4274 GSV25 | PG-SOT223-4 |

## Circuit Description

The control amplifier compares a reference voltage to a voltage that is proportional to the output voltage and drives the base of the series transistor via a buffer. Saturation control as a function of the load current prevents any oversaturation of the power element. The IC also includes a number of internal circuits for protection against:

- Overload
- Overtemperature
- Reverse polarity

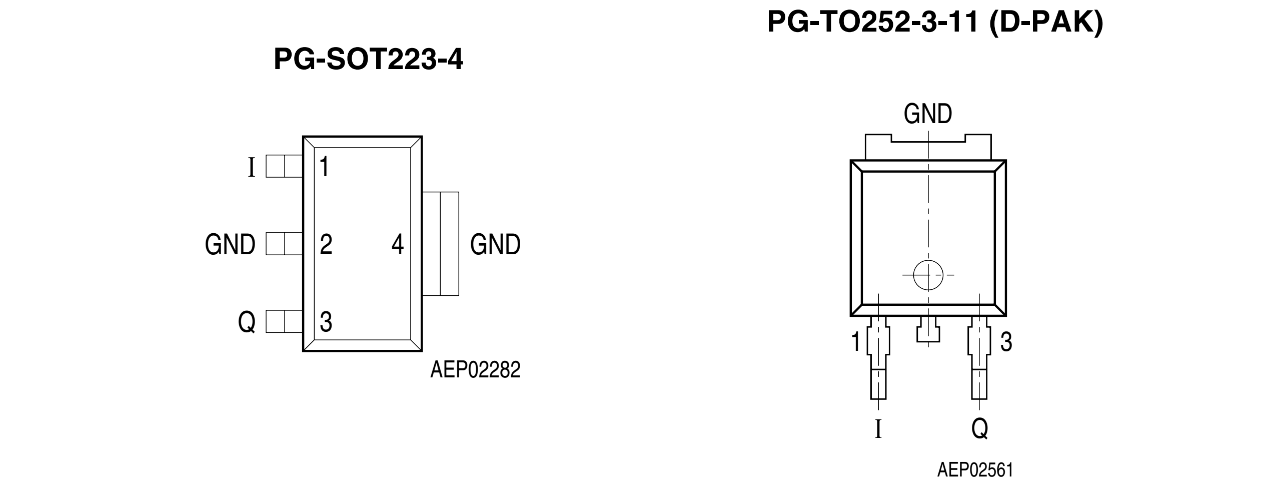



**Figure 1 Pin Configuration** (top view)

**Table 1 Pin Definitions and Functions**

| Pin No. | Symbol | Function |
|---|---|---|
| 1 | I | **Input;** block to ground directly at the IC with a ceramic capacitor. |
| 2, 4 | GND | **Ground;** PG-TO252-3-11: internally connected to heatsink |
| 3 | Q | **Output;** block to ground with capacitor $C_Q \geq 10\ \mu F$, ESR $\leq 2.5\ \Omega$ |

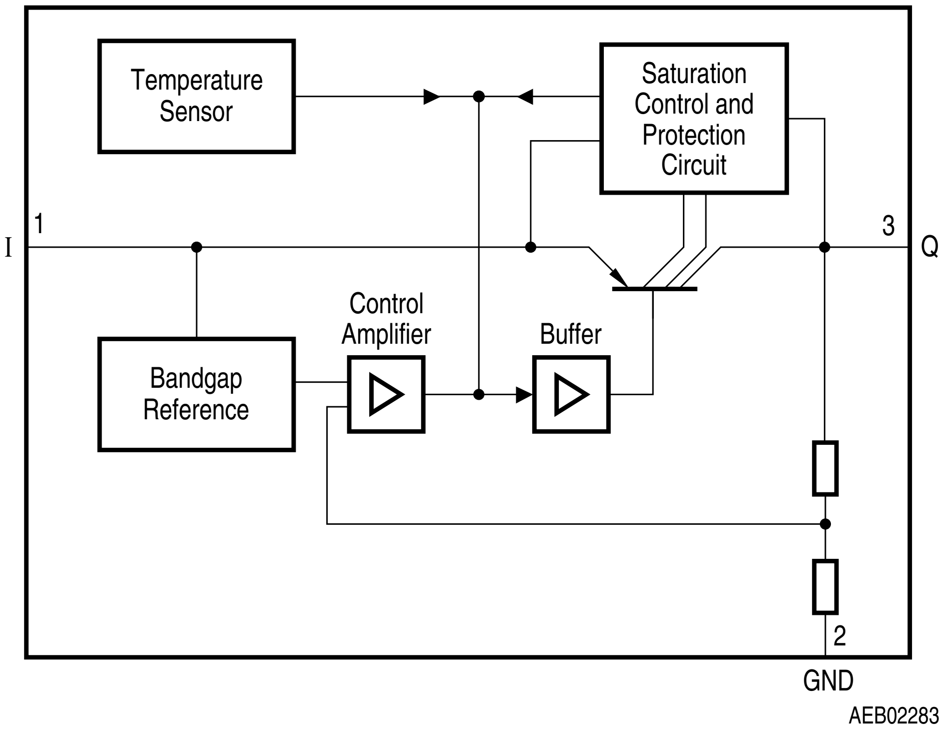



**Figure 2 Block Diagram**

**Table 2 Absolute Maximum Ratings**

$T_j$ = -40 to 150 °C

| Parameter | Symbol | Limit Values | | Unit | Test Condition |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| **Input** | | | | | |
| Voltage | $V_I$ | -42 | 45 | V | – |
| Current | $I_I$ | – | – | – | Internally limited |
| **Output** | | | | | |
| Voltage | $V_Q$ | -1.0 | 40 | V | – |
| Current | $I_Q$ | – | – | – | Internally limited |
| **Ground** | | | | | |
| Current | $I_{GND}$ | – | 100 | mA | – |
| **Temperature** | | | | | |
| Junction temperature | $T_j$ | – | 150 | °C | – |
| Storage temperature | $T_{stg}$ | -50 | 150 | °C | – |

*Note: Maximum ratings are absolute ratings; exceeding any one of these values may cause irreversible damage to the integrated circuit.*

**Table 3 Operating Range**

| Parameter | Symbol | Limit Values | | Unit | Remarks |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Input voltage | $V_I$ | 4.7 | 40 | V | – |
| Junction temperature | $T_j$ | -40 | 150 | °C | – |
| **Thermal Resistance** | | | | | |
| Junction ambient | $R_{thja}$ | – | 100 | K/W | SOT223[1)] |
| Junction ambient | $R_{thja}$ | – | 70 | K/W | TO252[2)] |
| Junction case | $R_{thjc}$ | – | 25 | K/W | SOT223 |
| Junction case | $R_{thjc}$ | – | 4 | K/W | TO252 |

1) Soldered in, 1 $cm^2$ copper area at pin 4, FR4

2) Soldered in, minimal footprint, FR4

**Table 4 Characteristics**

$V_I$ = 6 V; -40 °C < $T_j$ < 150 °C (unless otherwise specified)

| Parameter | Symbol | Limit Values | | | Unit | Measuring Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Output voltage V33-Version | $V_Q$ | 3.17 | 3.3 | 3.44 | V | 5 mA < $I_Q$ < 400 mA<br>4.7 V < $V_I$ < 28 V |
| Output voltage V33-Version | $V_Q$ | 3.17 | 3.3 | 3.44 | V | 5 mA < $I_Q$ < 200 mA<br>4.7 V < $V_I$ < 40 V |
| Output voltage V25-Version | $V_Q$ | 2.4 | 2.5 | 2.6 | V | 5 mA < $I_Q$ < 400 mA<br>4.7 V < $V_I$ < 28 V |
| Output voltage V25-Version | $V_Q$ | 2.4 | 2.5 | 2.6 | V | 5 mA < $I_Q$ < 200 mA<br>4.7 V < $V_I$ < 40 V |
| Output current limitation[1)] | $I_Q$ | 400 | 600 | – | mA | – |
| Current consumption; $I_q = I_I - I_Q$ | $I_q$ | – | 100 | 220 | µA | $I_Q$ = 1 mA |
| Current consumption; $I_q = I_I - I_Q$ | $I_q$ | – | 8 | 15 | mA | $I_Q$ = 250 mA |
| Current consumption; $I_q = I_I - I_Q$ | $I_q$ | – | 20 | 30 | mA | $I_Q$ = 400 mA |
| Drop voltage[1)] V33-Version | $V_{dr}$ | – | 0.7 | 1.2 | V | $I_Q$ = 300 mA<br>$V_{dr} = V_I - V_Q$ |
| Drop voltage[1)] V25-Version | $V_{dr}$ | – | 1.0 | 2.0 | V | $I_Q$ = 300 mA<br>$V_{dr} = V_I - V_Q$ |
| Load regulation | $\Delta V_Q$ | – | 40 | 70 | mV | $I_Q$ = 5 mA to 300 mA;<br>$V_I$ = 6 V |
| Line regulation | $\Delta V_Q$ | – | 10 | 25 | mV | $\Delta V_I$ = 12 V to 32 V<br>$I_Q$ = 5 mA |
| Power supply ripple rejection | $PSRR$ | – | 60 | – | dB | $f_r$ = 100 Hz;<br>$V_r$ = 0.5 Vpp |
| Temperature output voltage drift | $dV_Q/dT$ | – | 0.5 | – | mV/K | – |

1) Measured when the output voltage $V_Q$ has dropped 100 mV from the nominal value obtained at $V_I$ = 6 V.

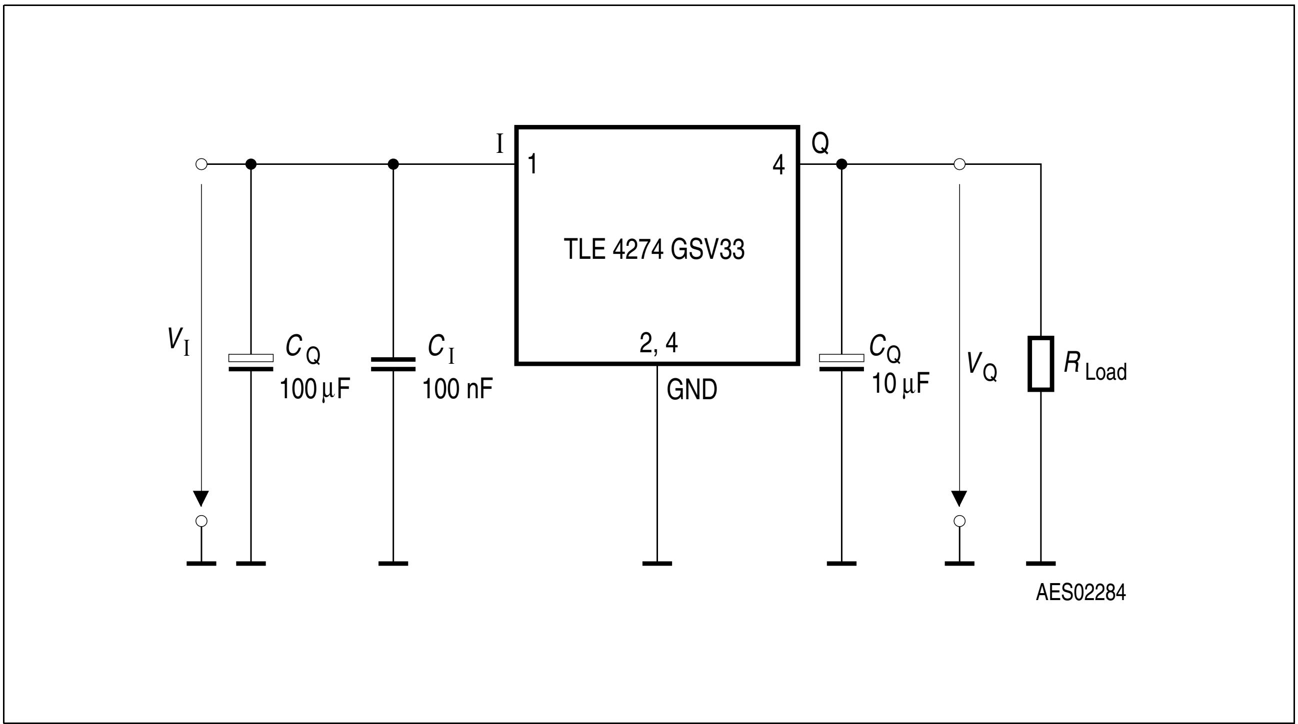



**Figure 3 Measuring Circuit**

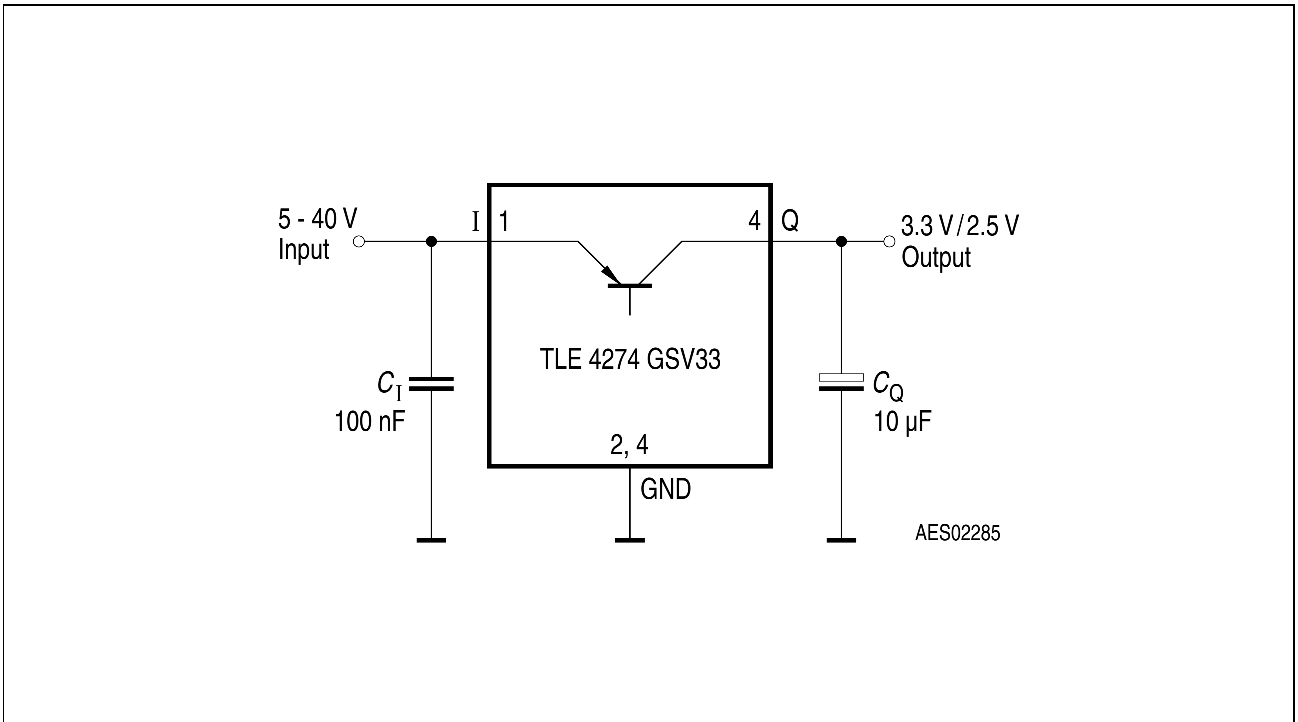



**Figure 4 Application Circuit**

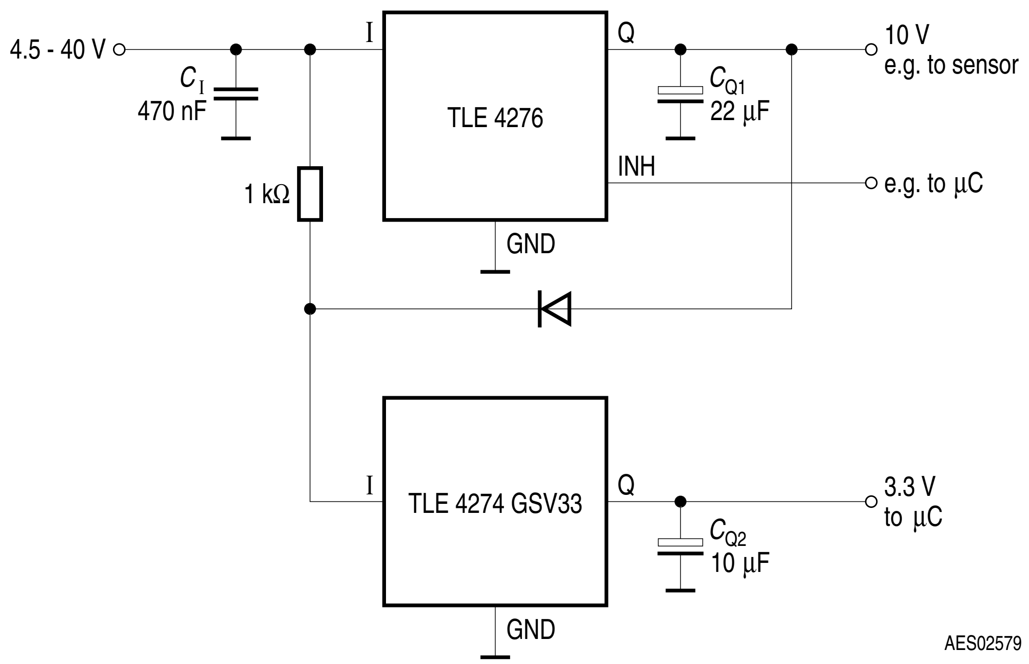
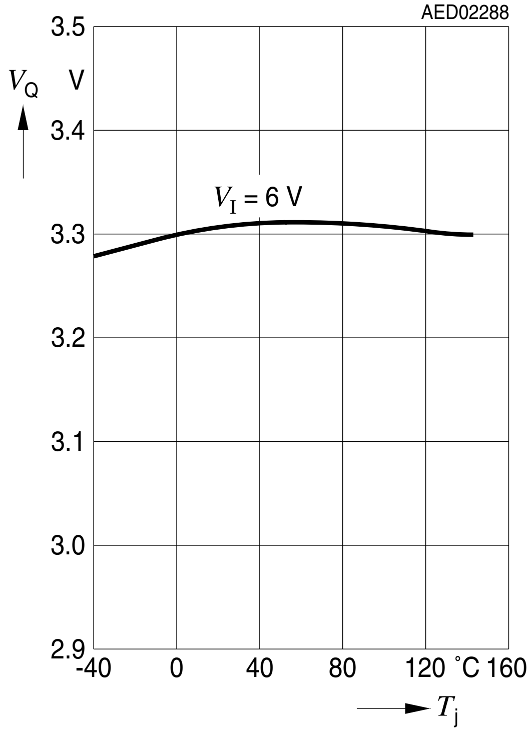


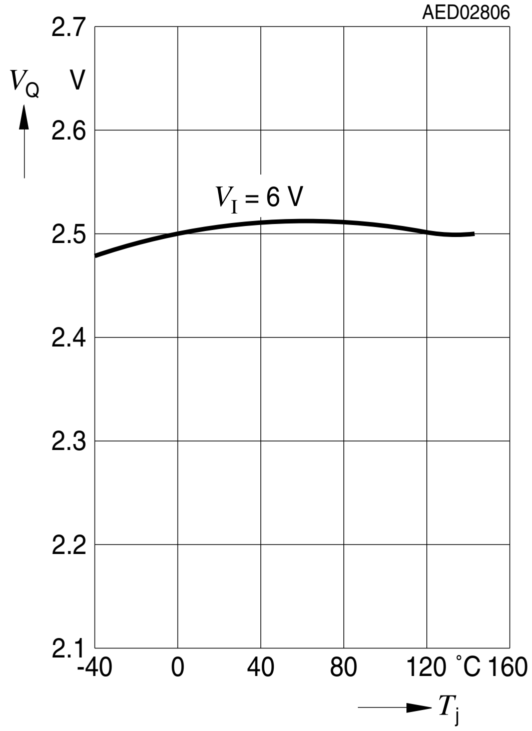

**Figure 5 Application Example**

## Typical Performance Characteristics

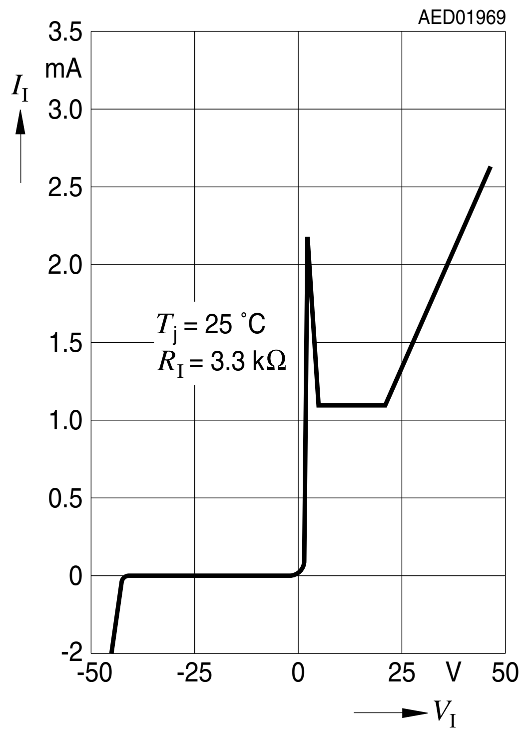
### Output Voltage $V_Q$ versus Junction Temperature $T_j$ (V33-Version)



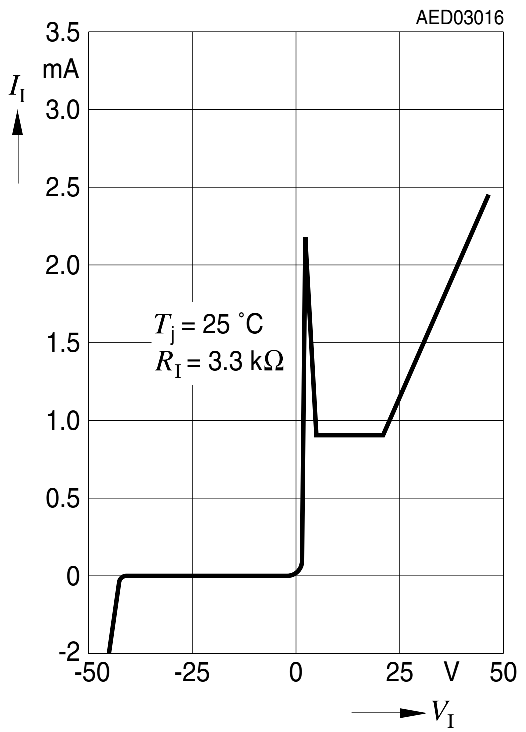

### Output Voltage $V_Q$ versus Junction Temperature $T_j$ (V25-Version)



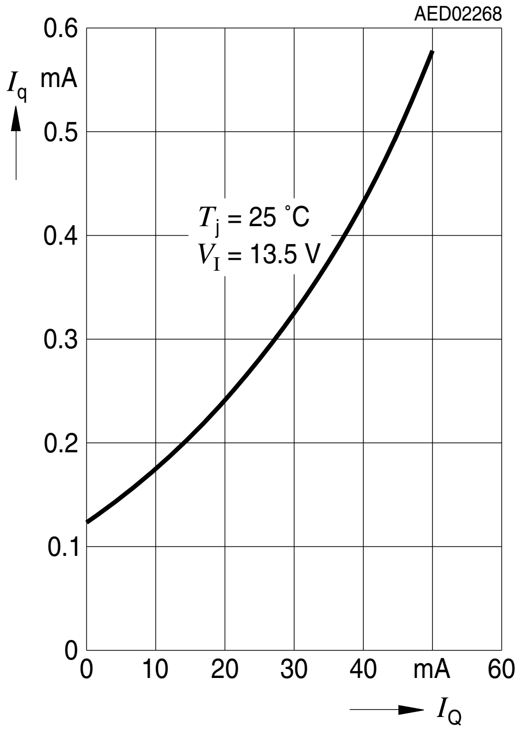

### Input Current $I_q$ versus Input Voltage $V_I$ (V33-Version)



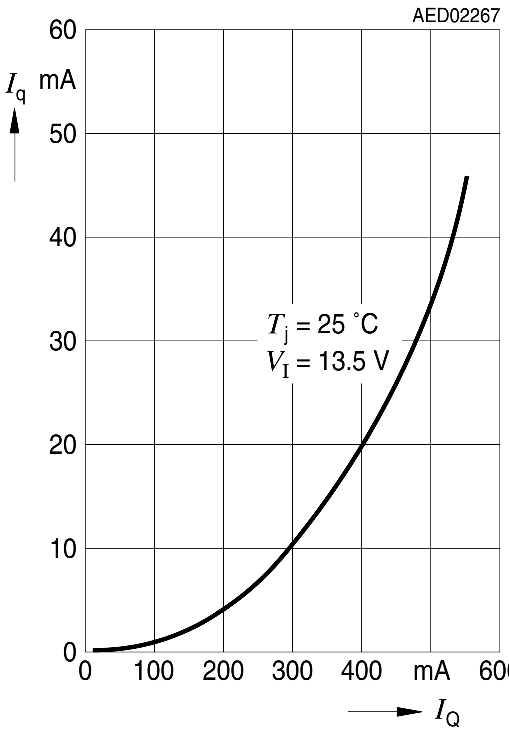

### Input Current $I_q$ versus Input Voltage $V_I$ (V25-Version)



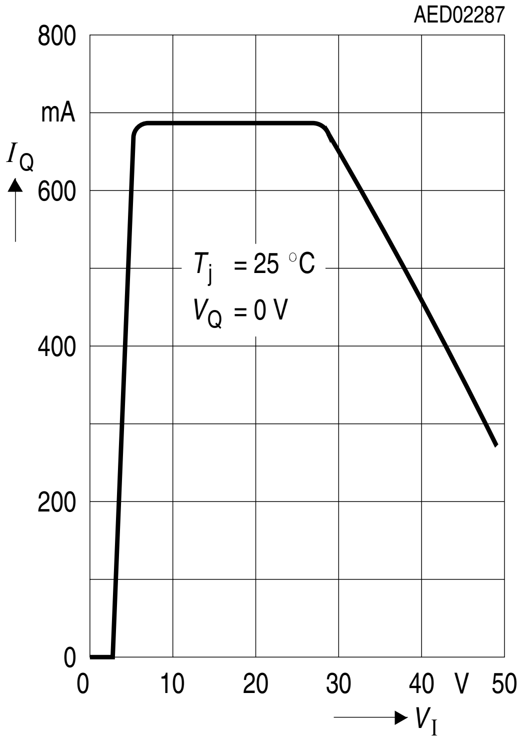
**Current Consumption $I_q$ versus Output Current $I_Q$ (low load)**



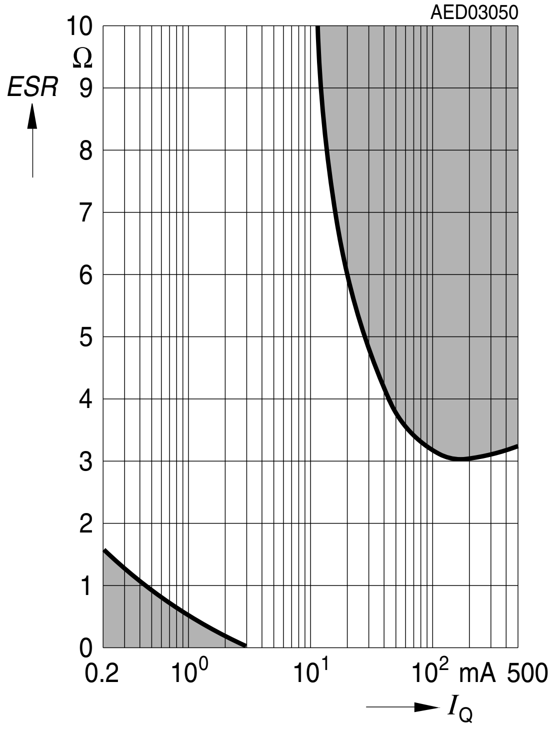

**Current Consumption $I_q$ versus Output Current $I_Q$ (high load)**




**Output Current $I_Q$ versus Input Voltage $V_I$**




**Region of Stability for $C_Q$ = 10 µF**



## Package Outlines

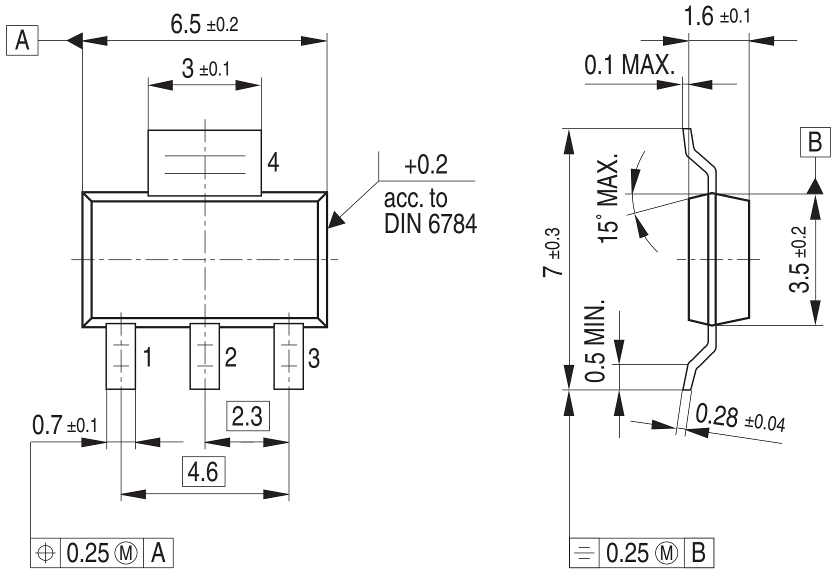



**Figure 6** **PG-SOT223-4** (Plastic Small Outline Transistor)

**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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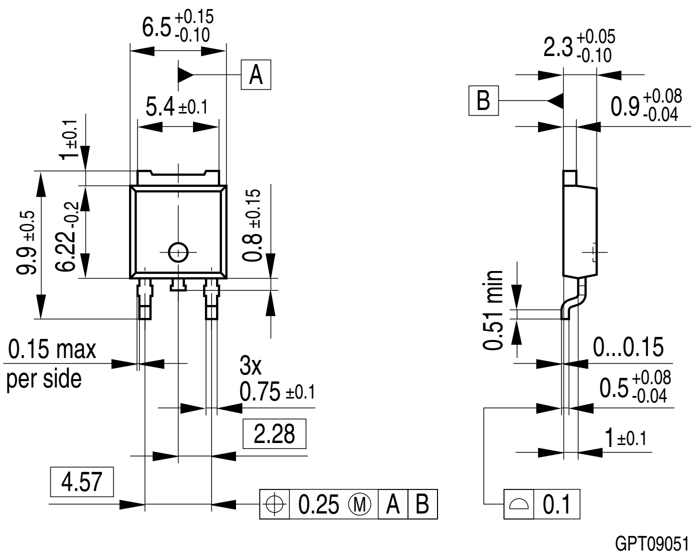
SMD = Surface Mounted Device

Dimensions in mm




All metal surfaces tin plated, except area of cut.

**Figure 7** **PG-TO252-3-11** (Plastic Transistor Single Outline)

**Green Product** (RoHS compliant)

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SMD = Surface Mounted Device

Dimensions in mm

| Version | Date | Changes |
|---|---|---|
| Rev. 2.3 | 2008-03-10 | Simplified package name to PG-SOT223-4.<br>No modification of released product. |
| Rev. 2.2 | 2007-03-20 | Initial version of RoHS-compliant derivate of TLE 4274 / 3.3V;2.5V<br>**Page 1**: AEC certified statement added<br>**Page 1** and **Page 10**: RoHS compliance statement and Green product feature added<br>**Page 1** and **Page 10**: Package changed to RoHS compliant version<br>Legal Disclaimer updated |

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