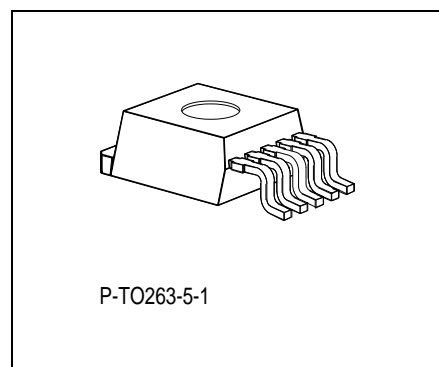
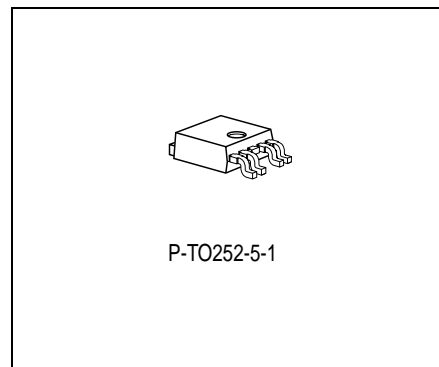


## Features

- Output tracking tolerance  $\leq \pm 0.2\%$
- 400 mA output current capability
- Enable Function
- Very low current consumption in OFF mode
- Wide operation range: up to 40 V
- Wide temperature range:  $-40\text{ }^{\circ}\text{C} \leq T_j \leq 150\text{ }^{\circ}\text{C}$
- Output protected against short circuit
- Overtemperature protection
- Reverse polarity proof

Type	Ordering Code	Package
TLE 4251 D	Q67006-A9439	P-TO252-5-1
TLE 4251 G	Q67006-A9529	P-TO263-5-1



## Functional Description

The **TLE 4251** is a monolithic integrated low-drop voltage tracker in the very small SMD package P-TO252-5-1. It is designed to supply e.g. sensors under the severe conditions of automotive applications. Therefore the device is equipped with additional protection functions against over load, short circuit and reverse polarity.

Supply voltages up to 40 V are tracked to a reference voltage given to the adjust input via an external resistor.

The output is able to drive loads up to 400 mA while it follows e.g. the 5 V output of a main voltage regulator within an accuracy of 0.5%. For loads up to 300 mA the tracking accuracy is 0.2%.

The **TLE 4251** can be switched in stand-by mode via the enable EN input which causes the current consumption to drop to very low values. This feature makes the IC suitable for low power battery applications.

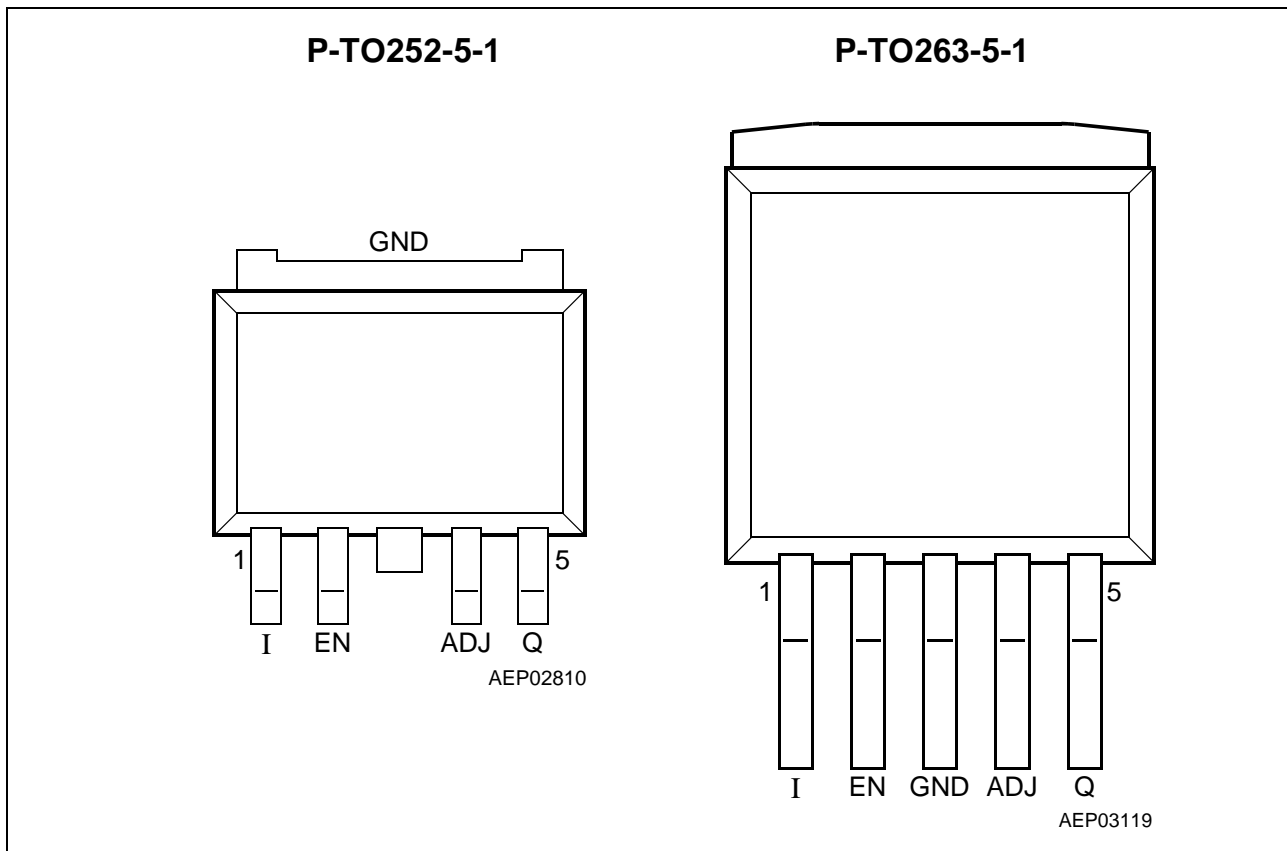
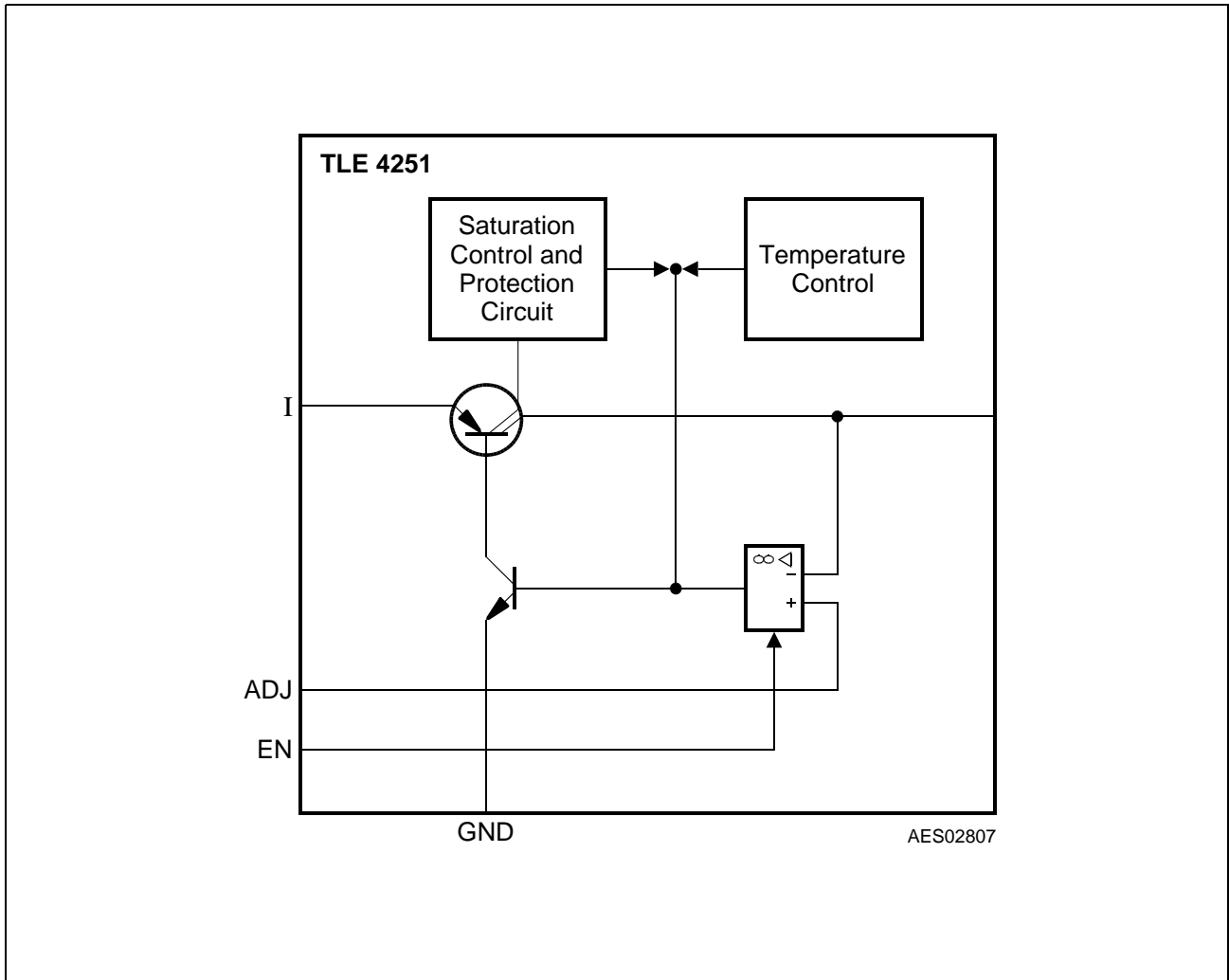


Figure 1 Pin Configuration (top view)

Pin No.	Symbol	Function
1	I	<b>Input voltage</b>
2	EN	<b>Enable</b> , high-active input
3	GND	<b>Ground</b>
4	ADJ	<b>Adjust</b> ; connect to the reference voltage via ext. resistor or micro-controller port
5	Q	<b>Output voltage</b> ; must be blocked by a capacitor $C_Q \geq 22 \mu\text{F}$ , $\text{ESR} \leq 3 \Omega$ to GND



**Figure 2**    **Block Diagram**

**Absolute Maximum Ratings**
 $-40\text{ °C} < T_j < 150\text{ °C}$ 

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		

**Input**

Voltage	$V_I$	- 42	45	V	-
Current	$I_I$	-	-	mA	internally limited

**Output**

Voltage	$V_Q$	- 2	45	V	-
Current	$I_Q$	-	-	mA	internally limited

**Adjust**

Voltage	$V_{ADJ}$	- 42	45	V	-
Current	$I_{ADJ}$	-	-	$\mu\text{A}$	internally limited

**Enable**

Voltage	$V_{EN}$	- 42	45	V	-
Current	$I_{EN}$	-	-	$\mu\text{A}$	internally limited

**Temperatures**

Junction temperature	$T_j$	- 40	150	$^{\circ}\text{C}$	-
Storage temperature	$T_{stg}$	- 50	150	$^{\circ}\text{C}$	-

**Thermal Resistances**

Junction case	$R_{thjc}$	-	4	K/W	TLE 4251 D
Junction ambient	$R_{thja}$	-	78	K/W	TLE 4251 D <sup>1)</sup>
Junction case	$R_{thjc}$	-	3	K/W	TLE 4251 G
Junction ambient	$R_{thja}$	-	52	K/W	TLE 4251 G <sup>1)</sup>

<sup>1)</sup> Worst case, regarding peak temperature; zero airflow; mounted on a PCB  $80 \times 80 \times 1.5\text{ mm}^3$ , heat sink area  $300\text{ mm}^2$ .

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

**Operating Range**

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Input voltage	$V_I$	4 <sup>1)</sup>	40	V	–
Adjust input voltage	$V_{ADJ}$	2.5	40	V	–
Adjust input voltage	$V_{ADJ}$	0	2.5	V	$V_Q \leq V_{ADJ} + \Delta V_Q$
Enable input voltage	$V_{EN}$	0	40	V	–
Junction temperature	$T_j$	– 40	150	°C	–

1)  $V_I > V_{ADJ} + V_{DR}$

**Electrical Characteristics**

$V_I = 13.5 \text{ V}$ ;  $2.5 \text{ V} \leq V_{ADJ} \leq V_I - 0.5 \text{ V}$ ;  $-40 \text{ °C} < T_j < 150 \text{ °C}$ ; unless otherwise specified

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		

**Output**

Output voltage tracking accuracy $\Delta V_Q = V_{ADJ} - V_Q$	$\Delta V_Q$	– 10	–	10	mV	$V_I < 13.5 \text{ V}$ ; $-40 \text{ °C} < T_j < 125 \text{ °C}$ ; $1 \text{ mA} < I_Q < 300 \text{ mA}$
Output voltage tracking accuracy	$\Delta V_Q$	– 10	–	10	mV	$6 \text{ V} < V_I < 40 \text{ V}$ $5 \text{ mA} < I_Q < 200 \text{ mA}$
Output voltage tracking accuracy	$\Delta V_Q$	– 25	–	25	mV	$6 \text{ V} < V_I < 28 \text{ V}$ $1 \text{ mA} < I_Q < 300 \text{ mA}$
Drop voltage	$V_{dr}$	–	280	520	mV	$I_Q = 300 \text{ mA}$ ; $V_{ADJ} > 4 \text{ V}$ ; Enable ON; <sup>1)</sup>
Output current	$I_Q$	400	450	800	mA	$T_j \leq 125 \text{ °C}$ <sup>1)</sup>
Output capacitor	$C_Q$	22	–	–	μF	$\text{ESR} \leq 3 \text{ } \Omega$ at 10 kHz
Current consumption $I_q = I_I - I_Q$	$I_q$	–	10	20	mA	$I_Q = 300 \text{ mA}$
Current consumption $I_q = I_I - I_Q$	$I_q$	–	230	300	μA	$I_Q < 1 \text{ mA}$ $T_j < 85 \text{ °C}$ $V_{EN}$ in ON state

**Electrical Characteristics (cont'd)**
 $V_I = 13.5 \text{ V}; 2.5 \text{ V} \leq V_{ADJ} \leq V_I - 0.5 \text{ V}; -40 \text{ }^\circ\text{C} < T_j < 150 \text{ }^\circ\text{C};$  unless otherwise specified

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Quiescent current (stand-by) $I_q = I_I - I_Q$	$I_q$	–	0	10	$\mu\text{A}$	$V_{EN} = 0 \text{ V}$ $T_j < 85 \text{ }^\circ\text{C}$

**Regulator Performance**

Load regulation	$\Delta V_Q$	– 35	$\pm 5$	35	mV	$5 \text{ mA} < I_Q < 300 \text{ mA};$ $V_I = 6 \text{ V}, V_{ADJ} = 5 \text{ V}$
Line regulation	$\Delta V_Q$	– 25	$\pm 10$	25	mV	$12 \text{ V} < V_I < 32 \text{ V}$ $I_Q = 5 \text{ mA}$
Power-Supply-Ripple-Rejection	$PSRR$	60	–	–	dB	$f_r = 100 \text{ Hz};$ $V_r = 5 \text{ V}_{PP}$

**Adjust Input**

Input biasing current	$I_{ADJ}$	–	0.1	0.5	$\mu\text{A}$	$V_{ADJ} = 5 \text{ V}$
-----------------------	-----------	---	-----	-----	---------------	-------------------------

**Enable**

Enable on voltage range	$V_{EN\ ON}$	2	–	–	V	$V_Q \text{ ON}$
Enable off voltage range	$V_{EN\ OFF}$	–	–	0.5	V	$V_Q \leq 0.1 \text{ V}$
Input current	$I_{EN}$	5	40	70	$\mu\text{A}$	$V_{EN} = 5 \text{ V}$

<sup>1)</sup> Measured when the output voltage  $V_Q$  has dropped 100 mV from the nominal value.

Application Information

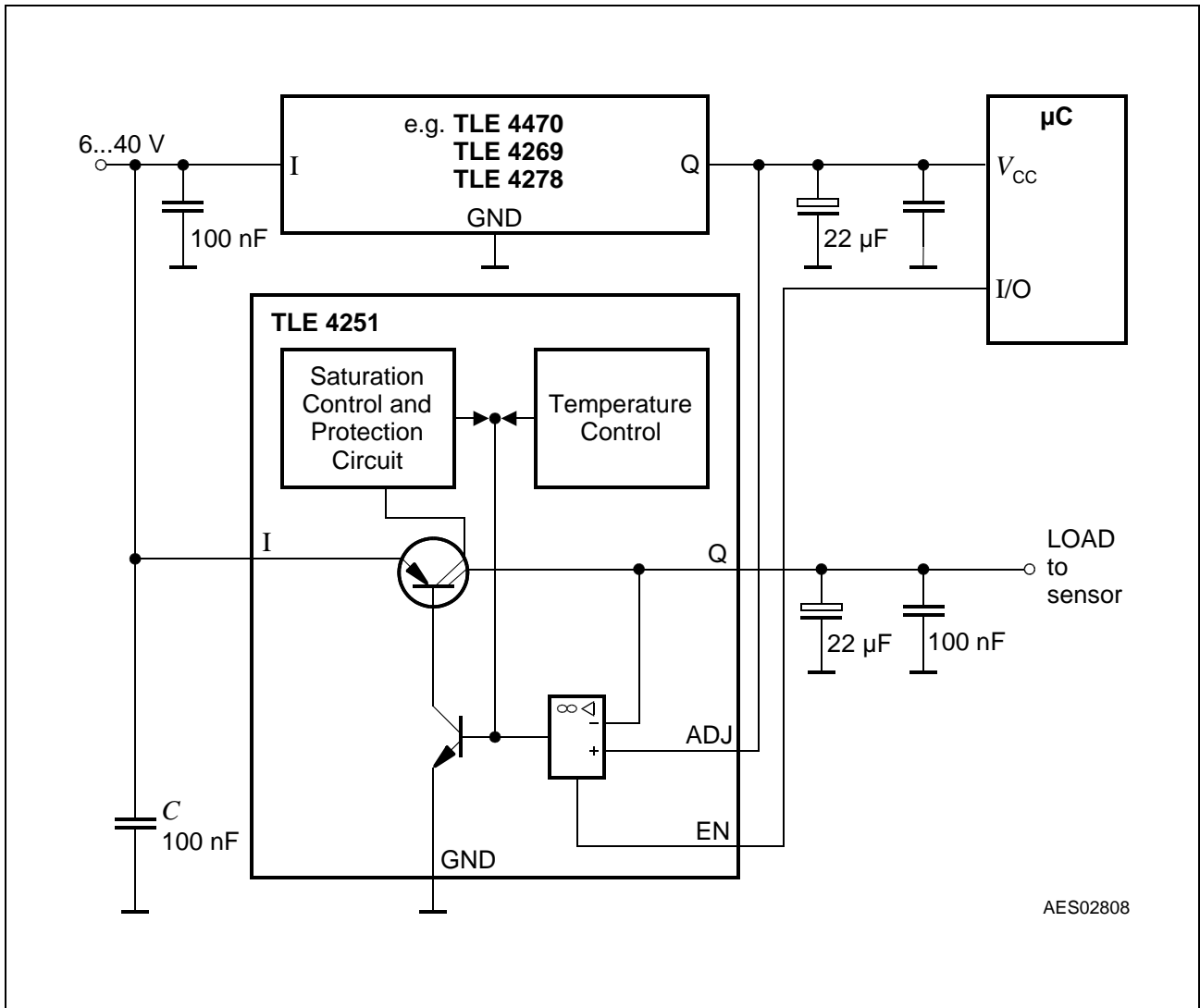
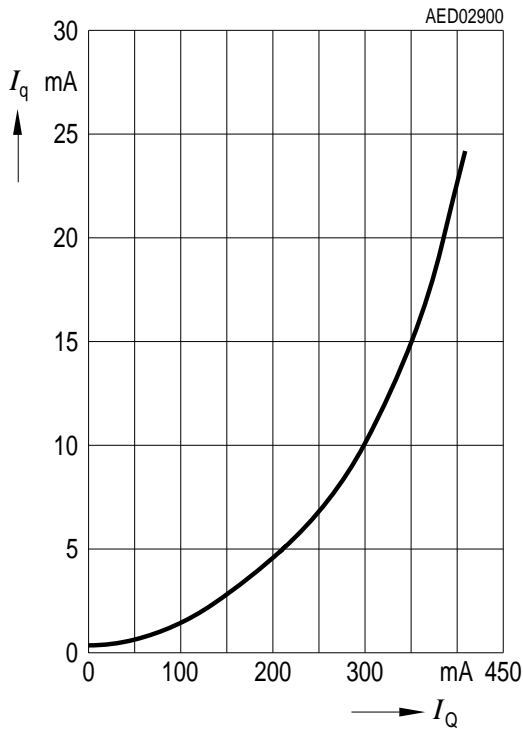
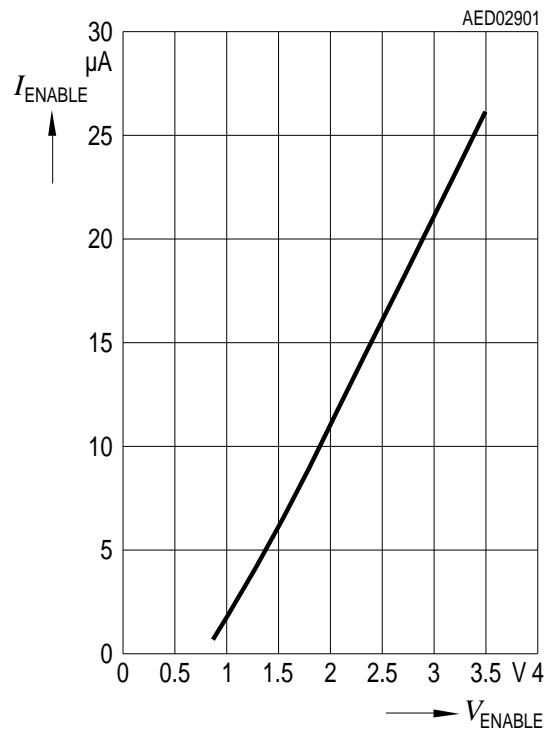


Figure 3 Application Circuit

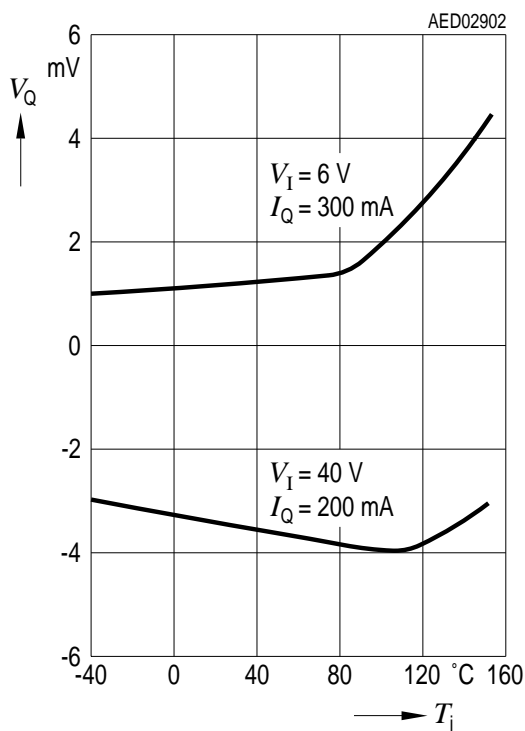
**Quiescent Current  $I_q$  versus Output Current  $I_Q$**



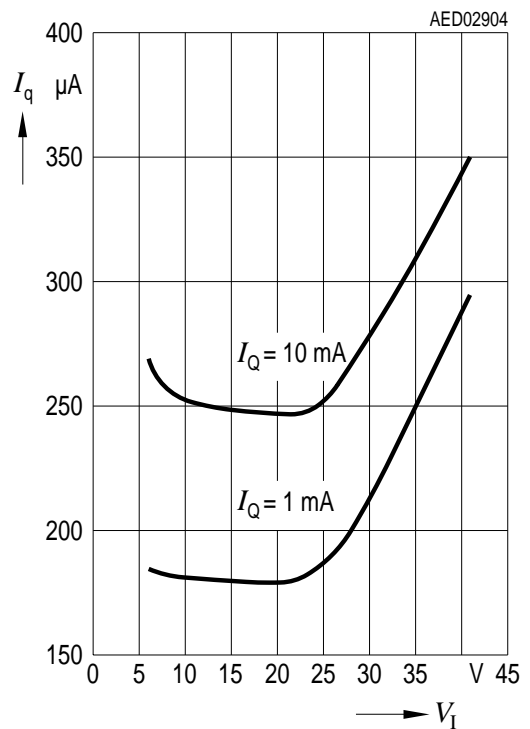
**Enable Current  $I_{EN}$  versus Enable Voltage  $V_{EN}$**



**Tracking Accuracy  $\Delta V_Q$  versus Temperature  $T_j$ ,  $V_{ADJ} = 5 V$**

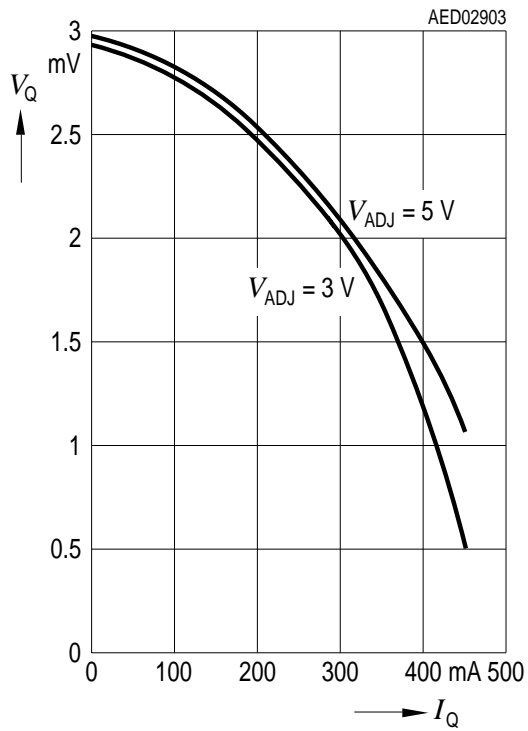


**Current Consumption  $I_q$  versus Input Voltage  $V_I$ ,  $V_{ADJ} = 5 V$**



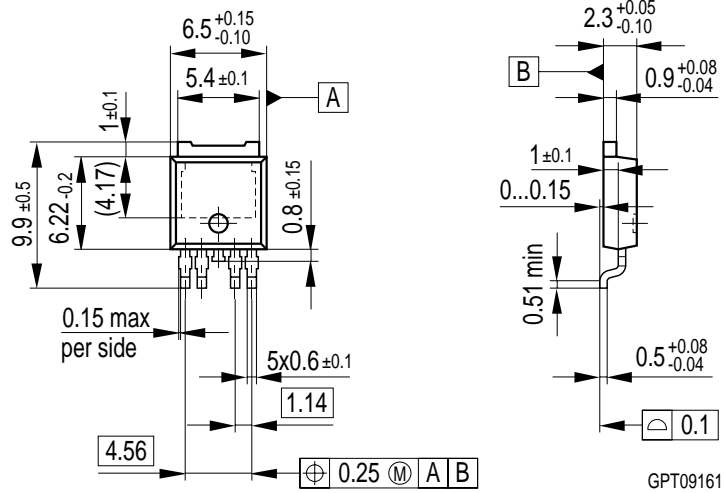


**Tracking Accuracy  $\Delta V_Q$  versus Output Current  $I_Q$**



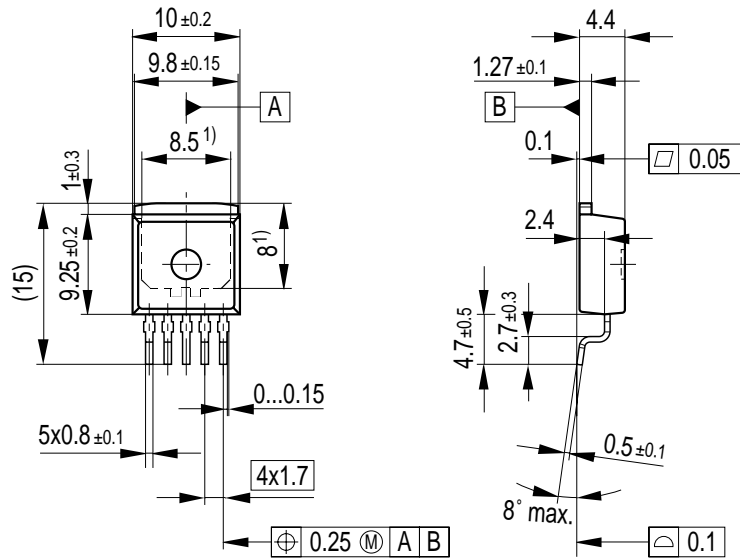
Package Outlines

**P-TO252-5-1**  
(Plastic Transistor Single Outline)



All metal surfaces tin plated, except area of cut.

**P-TO263-5-1**  
(Plastic Transistor Single Outline)



1) Typical  
All metal surfaces tin plated, except area of cut.

GPT09113

**Sorts of Packing**

Package outlines for tubes, trays etc. are contained in our Data Book "Package Information".

SMD = Surface Mounted Device

Dimensions in mm

**Edition 2001-05-07**

**Published by Infineon Technologies AG,  
St.-Martin-Strasse 53,  
D-81541 München**

**© Infineon Technologies AG 2001.  
All Rights Reserved.**

**Attention please!**

The information herein is given to describe certain components and shall not be considered as warranted characteristics.

Terms of delivery and rights to technical change reserved.

We hereby disclaim any and all warranties, including but not limited to warranties of non-infringement, regarding circuits, descriptions and charts stated herein.

Infineon Technologies is an approved CECC manufacturer.

**Information**

For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office in Germany or our Infineon Technologies Representatives worldwide (see address list).

**Warnings**

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies Office.

Infineon Technologies Components may only be used in life-support devices or systems with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.