# IFX25001

## Low dropout voltage regulator

✓ RoHS

## Features

- Output voltages: 3.3 V, 5.0 V
- Output current up to 400 mA
- Low current consumption
- Wide input voltage functional range up to 40 V / max. rating 45 V
- Low dropout voltage
- Output current limitation
- Reverse polarity protection
- Overtemperature shutdown
- Wide temperature range, -40°C to 125°C
- Green product (RoHS compliant)

## Potential applications

- Manufacturing automation
- Appliances
- HDTV and game consoles
- Network routers

## Product validation

Qualified for industrial applications according to the relevant tests of JEDEC.

## Description

The IFX25001 is a low dropout linear voltage regulator available as 3.3 V and 5 V version. Capable of supplying continuous output currents up to 400 mA and offering a wide functional input voltage range up to 40 V the IFX25001 is suitable for a large variety of applications. In addition it is also protected against overload, short circuit and overtemperature conditions.

| Type | Package | Marking |
|---|---|---|
| IFX25001 ME V33 | PG-SOT223-4 | 25001B |
| IFX25001 TF V33 | PG-TO252-3 | 2500133 |
| IFX25001 TF V50 | PG-TO252-3 | 2500150 |
| IFX25001 TC V50 | PG-TO263-3 | 25001V50 |

# 1    Block diagram



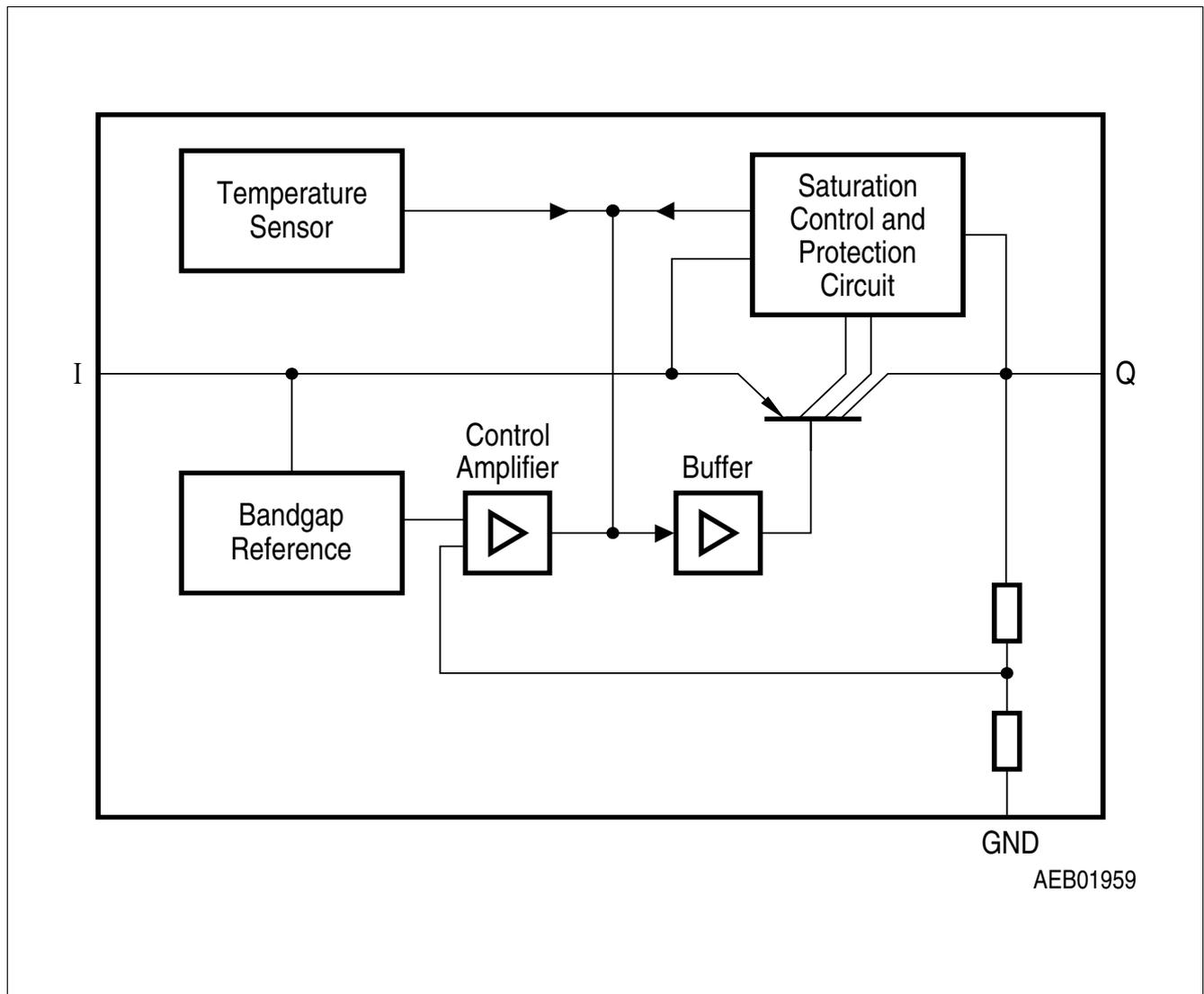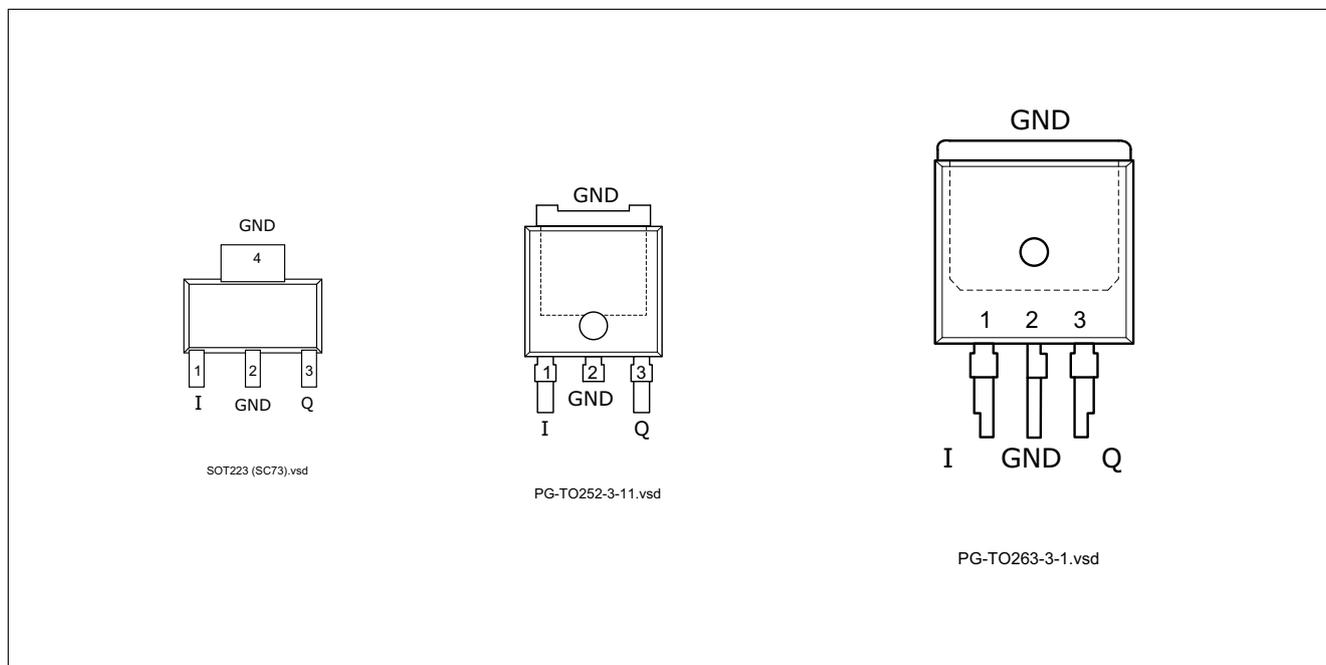**Figure 1    Block diagram**

# 2 Pin configuration

## 2.1 Pin assignment PG-SOT223-4, PG-TO252-3, PG-TO263-3



**Figure 2** Pin Configuration (top view)

## 2.2 Pin definitions and functions PG-SOT223-4, PG-TO252-3, PG-TO263-3

| Pin No. | Symbol | Function |
|---|---|---|
| 1 | I | **Input**<br>connect Input pin to positive DC voltage source (e.g. battery);<br>a small filter capacitor connected close to the Input pin and GND is recommended |
| 2 | GND | **Ground**<br>internally connected to heat slug pin |
| 3 | Q | **Output**<br>connect a capacitor close to the Output pin and GND according to the values specified in **"Functional range" on Page 4** |
| 4 / Heat slug | GND | **Heat Slug**<br>internally connected to GND pin;<br>connect to heatsink to improve thermal performance |

# 3 General product characteristics

## 3.1 Absolute maximum ratings

**Absolute maximum ratings[1]**
$T_j$ = -40 °C to 150 °C; all voltages with respect to ground, (unless otherwise specified)

| Pos. | Parameter | Symbol | Limit Values | | Unit | Test Condition |
|------|-----------|--------|------|------|------|----------------|
| | | | **Min.** | **Max.** | | |
| **Input I** | | | | | | |
| 3.1.1 | Voltage | $V_I$ | -42 | 45 | V | – |
| **Output Q** | | | | | | |
| 3.1.2 | Voltage | $V_Q$ | -1 | 40 | V | – |
| **Temperature** | | | | | | |
| 3.1.3 | Junction temperature | $T_j$ | -40 | 150 | °C | – |
| 3.1.4 | Storage temperature | $T_{stg}$ | -50 | 150 | °C | – |

1) not subject to production test, specified by design

*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.*

## 3.2 Functional range

| Pos. | Parameter | Symbol | Limit Values | | Unit | Remarks |
|------|-----------|--------|------|------|------|---------|
| | | | **Min.** | **Max.** | | |
| 3.2.1 | Input voltage | $V_I$ | 4.7 | 40 | V | IFX25001 ME V33<br>IFX25001 TF V33 |
| 3.2.2 | | $V_I$ | 5.5 | 40 | V | IFX25001 TF V50<br>IFX25001 TC V50 |
| 3.2.5 | Output capacitor's | $C_Q$ | 22 | – | µF | 1) |
| 3.2.6 | Requirements for stability | $ESR(C_Q)$ | – | 3 | Ω | 2) |
| 3.2.7 | Junction temperature | $T_j$ | -40 | 125 | °C | – |

1) the minimum output capacitance requirement is applicable for a worst case capacitance tolerance of 30%
2) relevant ESR value at $f$ = 10 kHz

*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***.*

| Pos. | Parameter | Symbol | Limit Values | | | Unit | Conditions |
|------|-----------|--------|------|------|------|------|------------|
| | | | Min. | Typ. | Max. | | |
| **PG-TO252-3** | | | | | | | |
| 3.3.1 | Junction to case[1] | $R_{thJC}$ | – | 4 | – | K/W | measured to heat slug |
| 3.3.2 | Junction to ambient[1] | $R_{thJA}$ | – | 27 | – | K/W | [2] |
| 3.3.3 | | $R_{thJA}$ | – | 57 | – | K/W | 300 mm² heatsink area[3] |
| 3.3.4 | | $R_{thJA}$ | – | 42 | – | K/W | 600 mm² heatsink area[3] |
| **PG-TO263-3** | | | | | | | |
| 3.3.5 | Junction to case[1] | $R_{thJC}$ | – | 4 | – | K/W | measured to heat slug |
| 3.3.6 | Junction to ambient[1] | $R_{thJA}$ | – | 22 | – | K/W | [2] |
| 3.3.7 | | $R_{thJA}$ | – | 42 | – | K/W | 300 mm² heatsink area[3] |
| 3.3.8 | | $R_{thJA}$ | – | 33 | – | K/W | 600 mm² heatsink area[3] |
| **PG-SOT223-4** | | | | | | | |
| 3.3.10 | Junction to case[1] | $R_{thJC}$ | – | 25 | – | K/W | measured to heat slug |
| 3.3.11 | Junction to ambient[2] | $R_{thJA}$ | – | 51 | – | K/W | [2] |
| 3.3.12 | | $R_{thJA}$ | – | 75 | – | K/W | 300 mm² heatsink area[3] |
| 3.3.13 | | $R_{thJA}$ | – | 63 | – | 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 × 114.3 × 1.5 mm³ board with 1 copper layer (1 x 70µm Cu).

# 4 Electrical characteristics

## 4.1 Electrical characteristics voltage regulator

**Electrical Characteristics**
$V_I$=13.5 V; $T_j$ = -40 °C to 125 °C; all voltages with respect to ground (unless otherwise specified)

| Pos. | Parameter | Symbol | Limit Values | | | Unit | Measuring Condition |
|------|-----------|--------|------|------|------|------|---------------------|
| | | | Min. | Typ. | Max. | | |
| **Output Q** | | | | | | | |
| 4.1.1 | Output voltage | $V_Q$ | 4.8 | 5.0 | 5.2 | V | IFX25001 TF V50 IFX25001 TC V50 5 mA < $I_Q$< 400 mA 6 V < $V_I$ < 28 V |
| 4.1.2 | Output voltage | $V_Q$ | 3.17 | 3.3 | 3.44 | V | IFX25001 ME V33, IFX25001 TF V33 5 mA < $I_Q$< 400 mA 4.7 V < $V_I$ < 28 V |
| 4.1.4 | Dropout voltage | $V_{dr}$ | – | 250 | 500 | mV | IFX25001 TF V50, IFX25001 TC V50, $I_Q$ = 250 mA $V_{dr} = V_I - V_Q$[1] |
| 4.1.5 | Dropout voltage | $V_{dr}$ | – | 0.7 | 1.2 | V | IFX25001 ME V33, IFX25001 TF V33; $I_Q$ = 300 mA $V_{dr} = V_I - V_Q$[1] |
| 4.1.7 | Load regulation | $\Delta V_{Q, lo}$ | – | 20 | 50 | mV | IFX25001 TF V50, IFX25001 TC V50, $I_Q$ = 5 mA to 400 mA $V_I$ = 6 V |
| 4.1.9 | Load regulation | $\Delta V_{Q, lo}$ | – | 40 | 70 | mV | IFX25001 ME V33, IFX25001 TF V33, $I_Q$ = 5 mA to 300 mA $V_I$ = 6 V |
| 4.1.10 | Line regulation | $\Delta V_{Q, li}$ | – | 10 | 25 | mV | $V_I$ = 12 V to 32 V $I_Q$ = 5 mA |
| 4.1.11 | Output current limitation | $I_Q$ | 400 | 600 | 1100 | mA | [1] |
| 4.1.12 | Power supply ripple rejection[2] | $PSRR$ | – | 60 | – | dB | $f_r$ = 100 Hz; $V_r$ = 0.5 Vpp |
| 4.1.13 | Temperature output voltage drift[2] | $\frac{dV_Q}{dT}$ | – | 0.5 | – | mV/K | – |
| 4.1.14 | Overtemperature shutdown threshold | $T_{j,sd}$ | 151 | – | 200 | °C | $T_j$ increasing[2] |
| **Current Consumption** | | | | | | | |
| 4.1.15 | Quiescent current $I_q = I_I - I_Q$ | $I_q$ | – | 100 | 220 | µA | $I_Q$ = 1 mA |

**Electrical characteristics**

**Electrical Characteristics**
$V_I$=13.5 V; $T_j$ = -40 °C to 125 °C; all voltages with respect to ground (unless otherwise specified)

| Pos. | Parameter | Symbol | Limit Values | | | Unit | Measuring Condition |
|------|-----------|--------|------|------|------|------|---------------------|
| | | | Min. | Typ. | Max. | | |
| 4.1.16 | Current consumption | $I_q$ | – | 8 | 15 | mA | $I_Q$ = 250 mA |
| 4.1.17 | $I_q = I_I - I_Q$ | $I_q$ | – | 20 | 30 | mA | $I_Q$ = 400 mA |

1) Measured when the output voltage $V_Q$ has dropped 100 mV from the nominal value obtained at $V_I$ = 13.5 V.
2) not subject to production test, specified by design

## 4.2 Typical performance characteristics voltage regulator (V50 variants)

**Dropout voltage $V_{dr}$ versus output current $I_Q$**
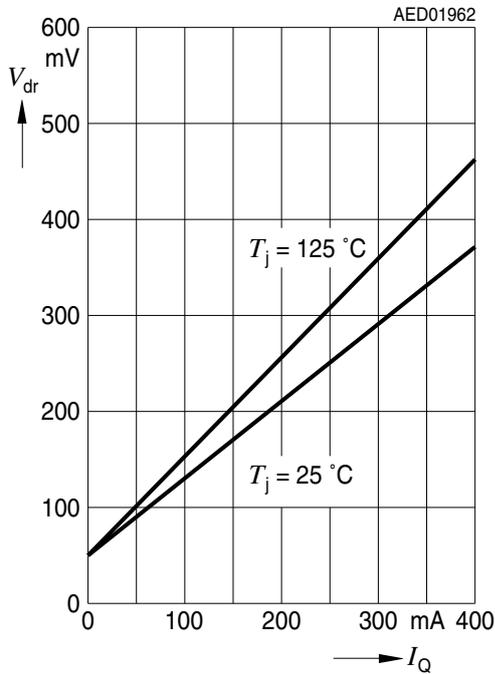


**Output current $I_Q$ versus input voltage $V_I$**
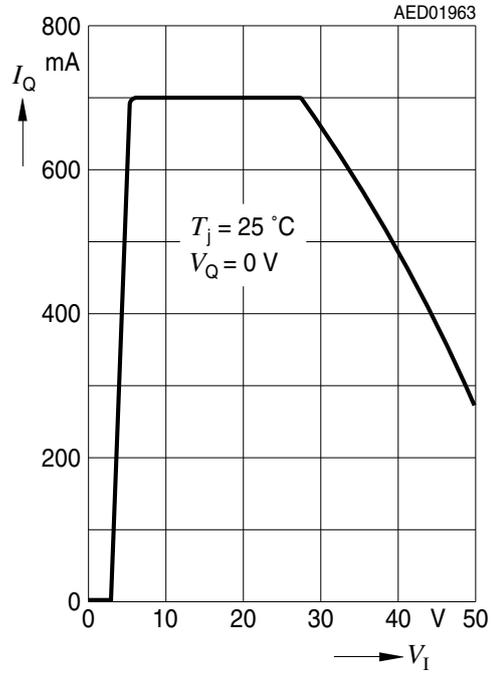


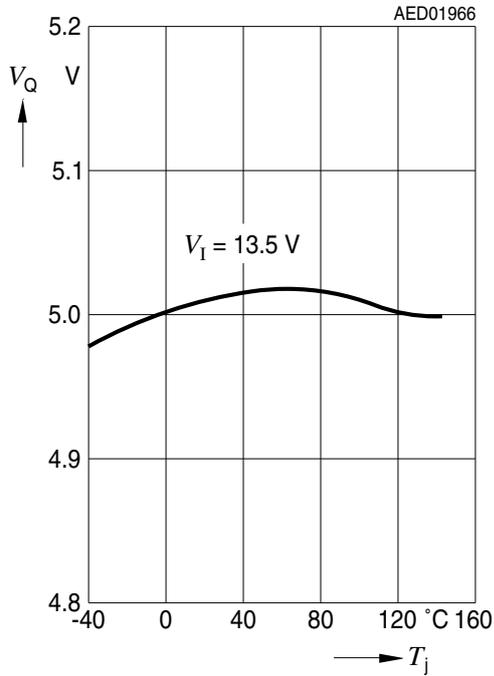**Current consumption $I_q$ versus output current $I_Q$ (high load)**
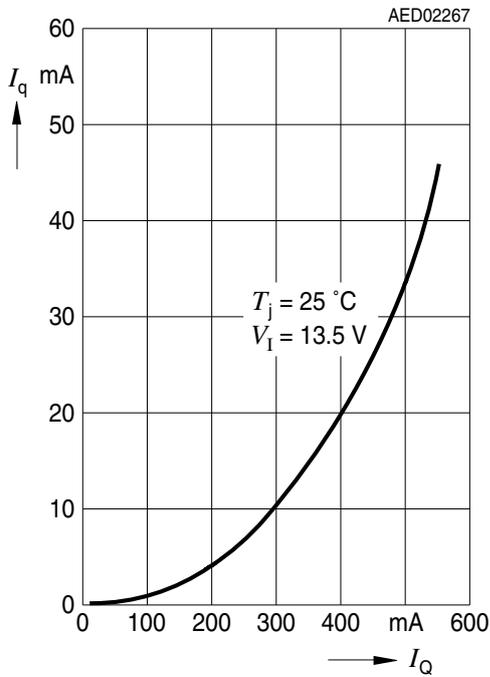


**Current consumption $I_q$ versus output current $I_Q$ (low load)**
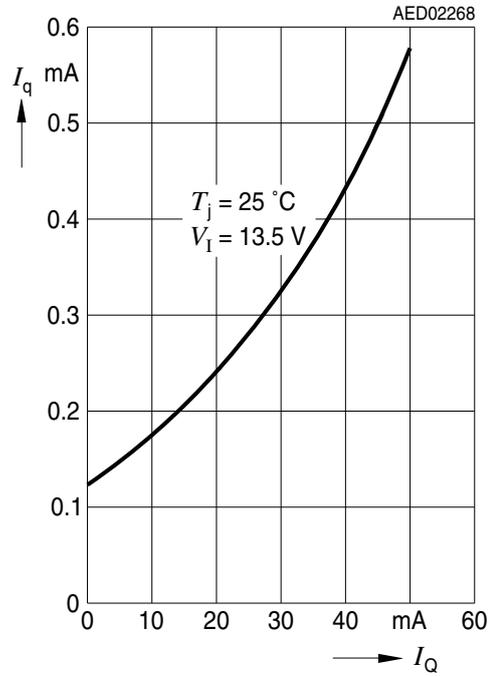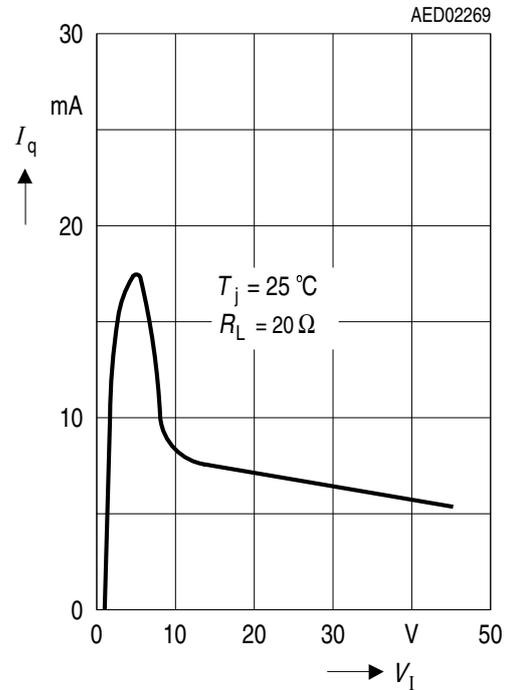
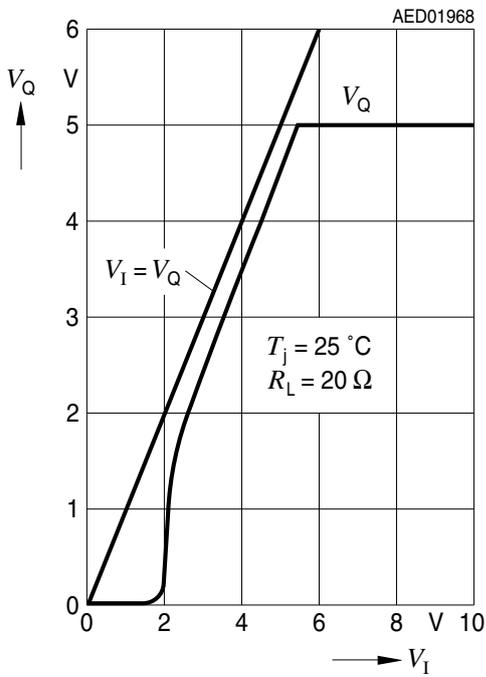## 4.2.1    Typical performance characteristics voltage regulator (V50 variants)

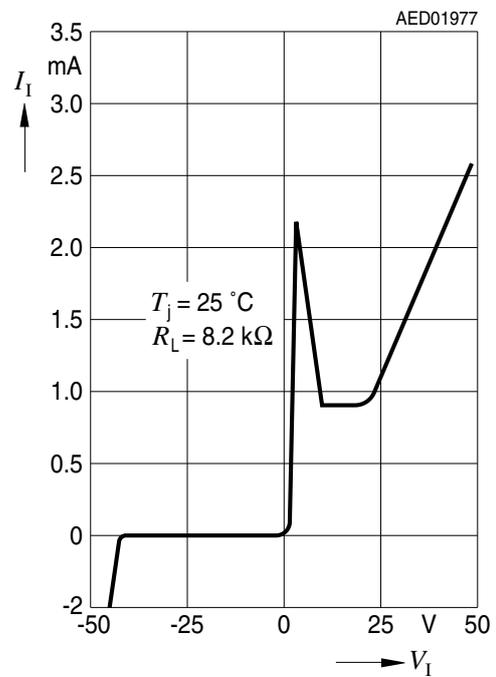**Output voltage $V_Q$ versus junction temperature $T_J$**



**Current consumption $I_q$ versus input voltage $V_I$**
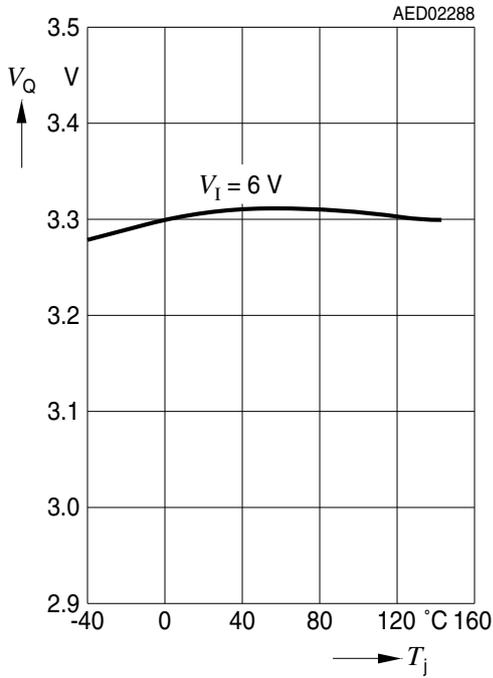


**Output voltage $V_Q$ versus input voltage $V_I$**



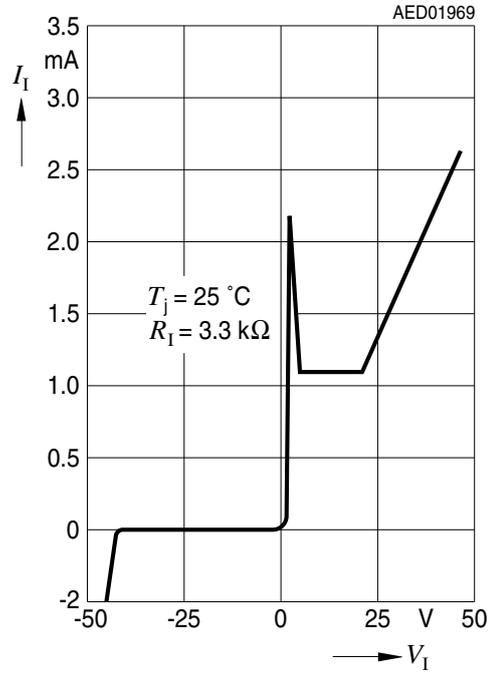**Input current $I_I$ versus input voltage $V_I$**

## 4.2.2 Typical performance characteristics voltage regulator (V33 variants)

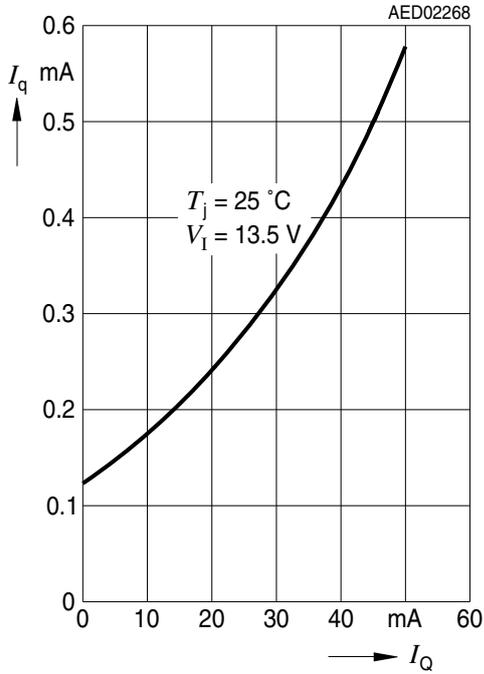**Output voltage $V_Q$ versus**
**junction temperature $T_J$**

AED02288

$V_Q$ V

$V_I = 6\ V$

$T_j$

**Input current $I_I$ versus**
**input voltage $V_I$**

AED01969

$I_I$ mA

$T_j = 25\ ^\circ C$
$R_I = 3.3\ k\Omega$

$V_I$
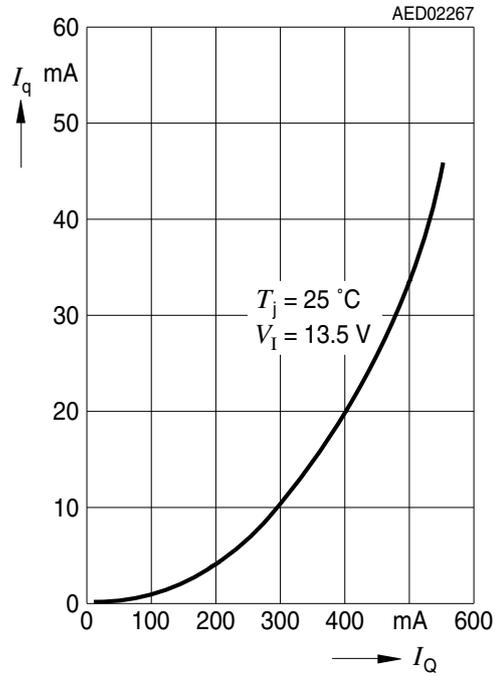
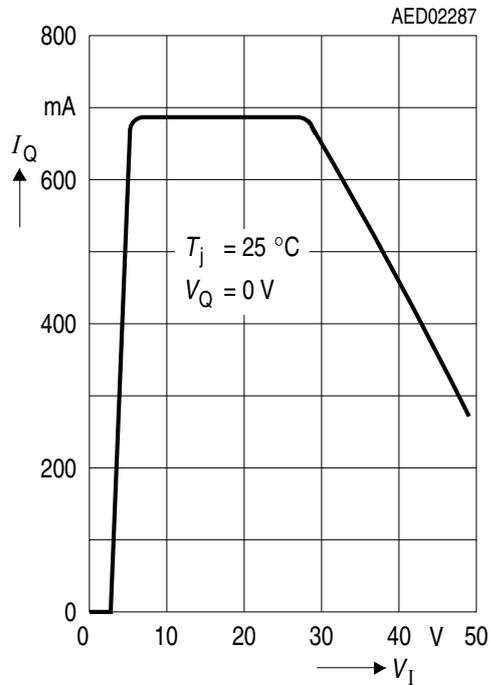## 4.2.3 Typical performance characteristics voltage regulator (V33 variants)

**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 $V_I$**

# 5    Package information



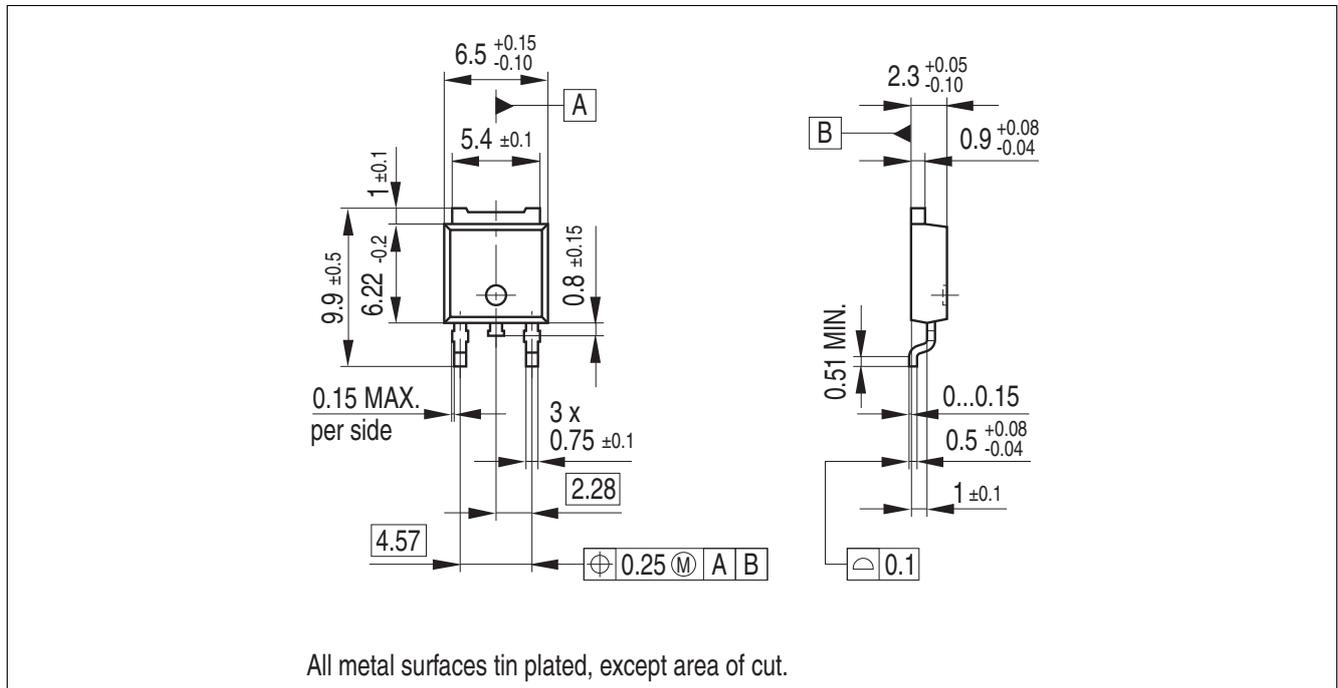All metal surfaces tin plated, except area of cut.

**Figure 3    PG-TO252-3 [1]**



1) Typical
All metal surfaces: tin plated, except area of cut.
Metal surface min. x=7.25, y=6.9

GPT09362

**Figure 4    PG-TO263-3 [1]**

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1)    Dimensions in mm

**Package information**



**Figure 5    PG-SOT223-4** [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 (i.e 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
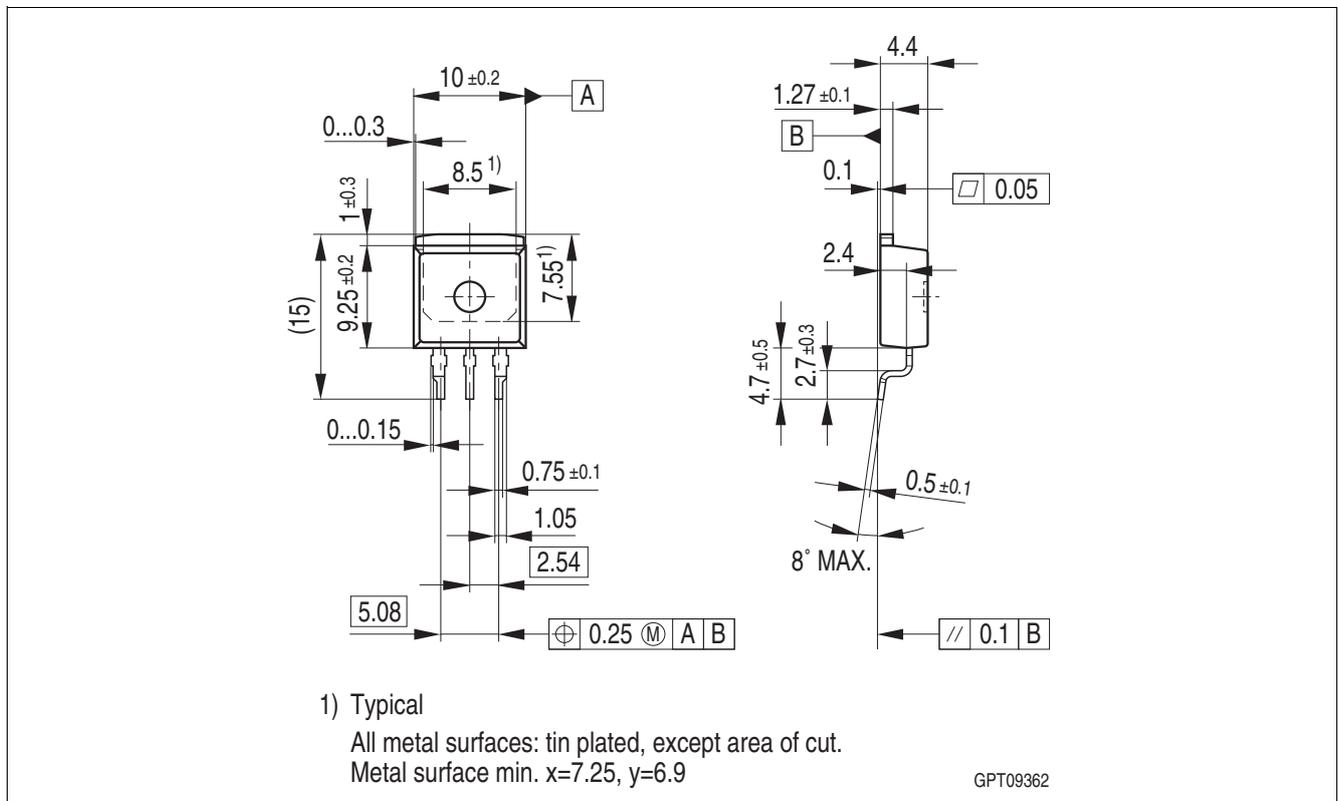
# 6 Revision history

**Table 1** **Revision history**

| Revision | Date | Changes |
|---|---|---|
| 1.10 | 2019-04-02 | - Discontinued product variants removed from data sheet<br>- Editiorial changes |
| 1.02 | 2009-05-20 | - Editorial change (fig. 2) |
| 1.01 | 2009-05 | - Coverpage changed<br>- Overview page: Inserted reference statement to TLE/TLF series |
| 1.00 | 2009-04-28 | - Initial release |

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