

# IFX27001

Linear Voltage Regulator

IFX27001TFV15  
IFX27001TFV18  
IFX27001TFV26  
IFX27001TFV33

## Data Sheet

Rev. 1.01, 2009-10-19

Standard Power



## 1 Overview

### Features

- 1.5V, 1.8V, 2.6V, 3.3 V, 5.0V or Adj. output voltage
- 1.0 A output current
- Low dropout voltage, 1 V (typ.)
- Short circuit protection
- Overtemperature protection
- Input Voltage up to 40 V
- Wide temperature range of  $T_j = -40$  to  $125\text{ }^{\circ}\text{C}$
- Green Product (RoHS compliant)

### Applications

- Manufacturing Automation
- Appliances
- HDTV Televisions
- Game Consoles
- Network Routers



**PG-TO252-3**

For automotive and transportation applications, please refer to the Infineon TLE and TLF voltage regulator series

### Description

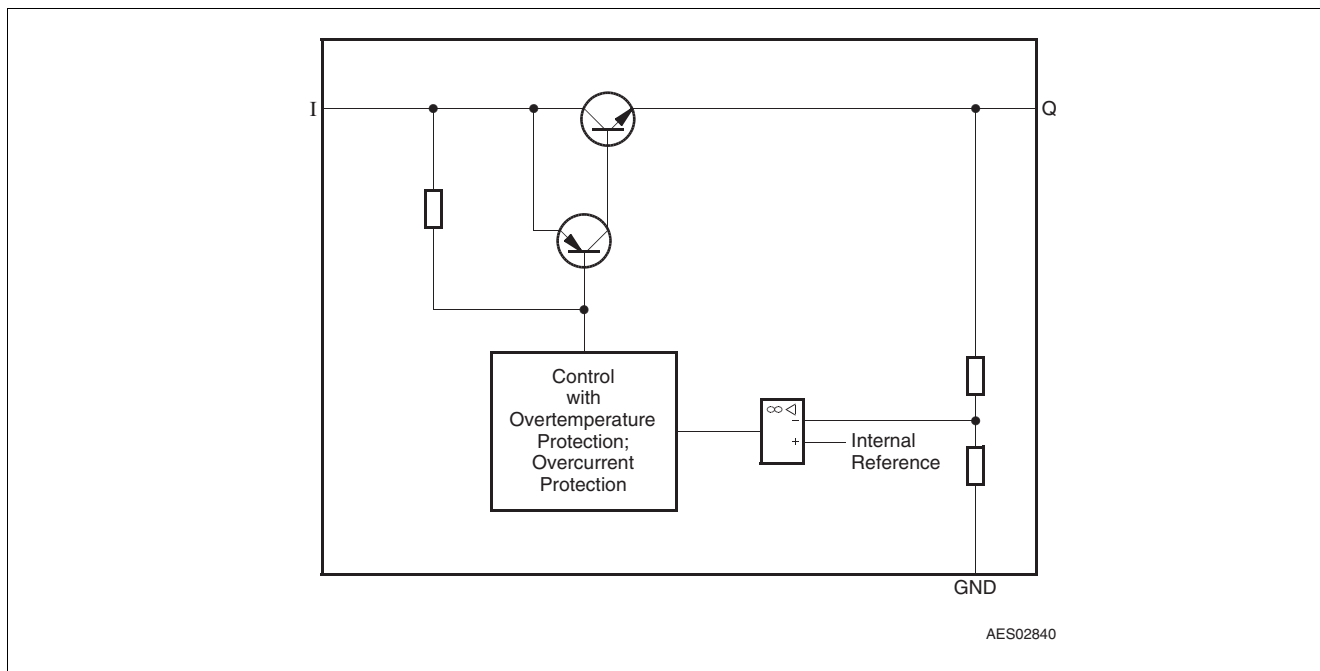
The IFX27001 is a monolithic integrated NPN type voltage regulator that can supply loads up to 1.0 A. The chip is housed in a surface mount PG-TO252-3 package (DPAK). It is designed to supply microprocessor systems or other loads under the severe conditions and therefore it is equipped with additional protection against overload, short circuit and overtemperature.

An large input voltage  $V_I$  in the range of  $(V_Q + V_{DR}) < V_I < 40\text{ V}$  is regulated to  $V_Q$ . The dropout voltage  $V_{DR}$  ranges from 1.1 V to 1.4 V depending on the load current level.

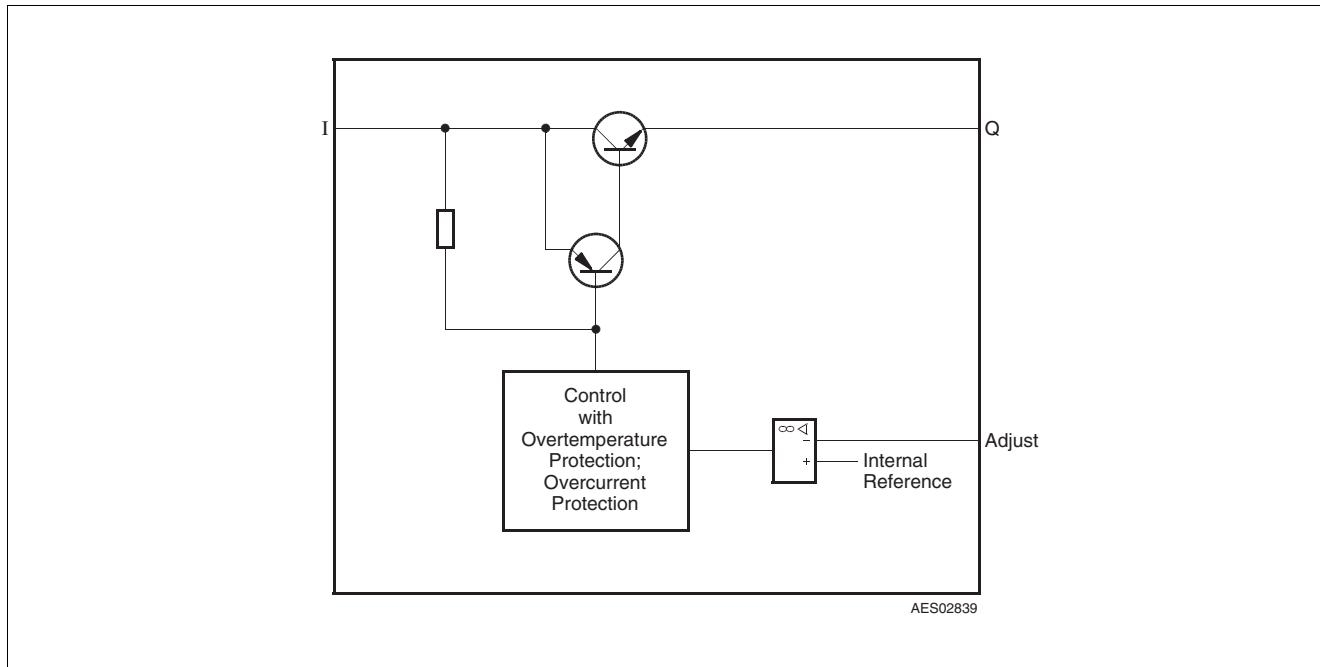
The device operates in the temperature range of  $T_j = -40$  to  $125\text{ }^{\circ}\text{C}$ .

| Type          | Package    | Marking |
|---------------|------------|---------|
| IFX27001TFV15 | PG-TO252-3 | 2700115 |
| IFX27001TFV18 | PG-TO252-3 | 2700118 |
| IFX27001TFV26 | PG-TO252-3 | 2700126 |
| IFX27001TFV33 | PG-TO252-3 | 2700133 |
| IFX27001TFV50 | PG-TO252-3 | 2700150 |
| IFX27001TFV   | PG-TO252-3 | 27001V  |

## 2 Block Diagram



**Figure 1 Block Diagram for Fixed Output Voltage (1.5V, 1.8V, 2.6V, 3.3V, 5.0V)**



**Figure 2 Block Diagram for Adjustable Output Voltage**

## 3 Pin Configuration

### 3.1 Pin Assignment

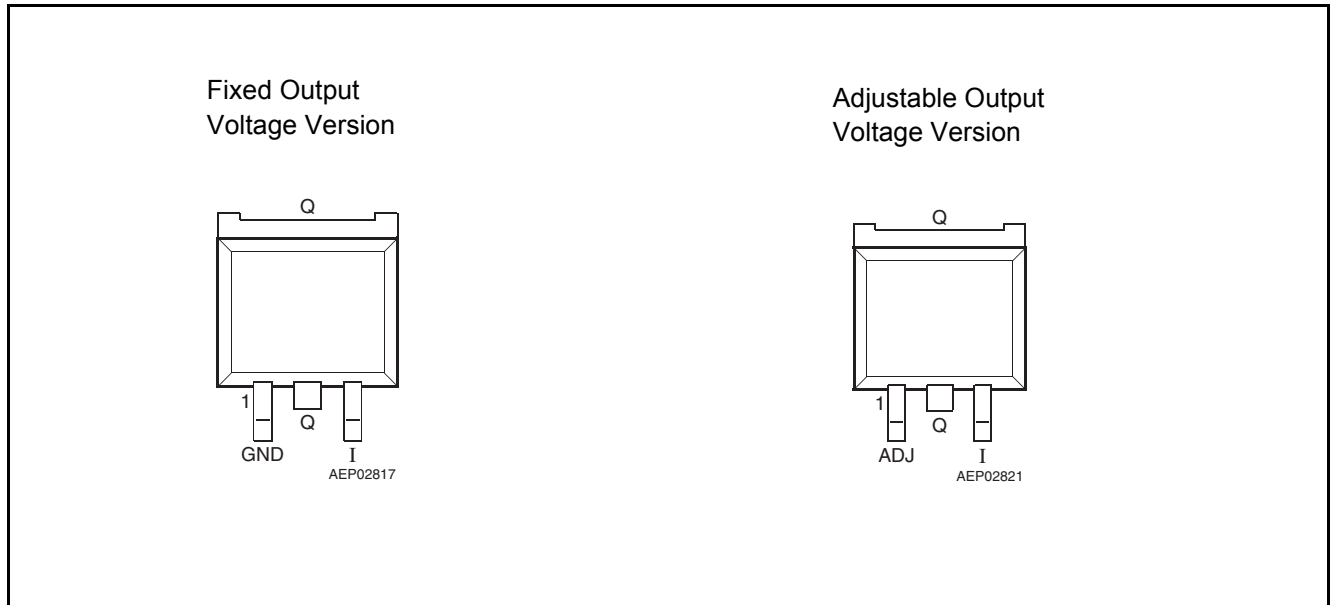


Figure 3 Pin Configuration (top view)

### 3.2 Pin Definitions and Functions

Table 1 Pin Definitions and Functions Fixed Output Voltage Versions

| Pin No. | Symbol | Function                                                                                                                            |
|---------|--------|-------------------------------------------------------------------------------------------------------------------------------------|
| 1       | GND    | <b>Ground</b>                                                                                                                       |
| 2, Tab  | Q      | <b>Output;</b> Connect a capacitor $C_Q \geq 10 \mu F$ with $ESR \leq 10 \Omega$ between pin Q and GND<br>Connect to heatsink area. |
| 3       | I      | <b>Input</b>                                                                                                                        |

Table 2 Pin Definitions and Functions Adjustable Output Version

| Pin No. | Symbol | Function                                                                                                                                                                                                                           |
|---------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | ADJ    | <b>Adjust;</b> defines output voltage by external voltage divider between Q, ADJ and GND.                                                                                                                                          |
| 2, Tab  | Q      | <b>Output;</b> the output voltage is defined by the external voltage divider between Q, Adjust and Ground.<br>Connect a capacitor $C_Q \geq 10 \mu F$ with $ESR \leq 10 \Omega$ between pin Q and GND<br>Connect to heatsink area. |
| 3       | I      | <b>Input</b>                                                                                                                                                                                                                       |

## 4 General Product Characteristics

### 4.1 Absolute Maximum Ratings

#### Absolute Maximum Ratings<sup>1)</sup>

$T_j = -40\text{ °C to }150\text{ °C}$ ; all voltages with respect to ground, (unless otherwise specified)

| Pos.                                                                            | Parameter            | Symbol               | Limit Values |      | Unit | Test Condition                                         |
|---------------------------------------------------------------------------------|----------------------|----------------------|--------------|------|------|--------------------------------------------------------|
|                                                                                 |                      |                      | Min.         | Max. |      |                                                        |
| Input I                                                                         |                      |                      |              |      |      |                                                        |
| 4.1.1                                                                           | Voltage              | $V_I$                | -0.3         | 40   | V    | –                                                      |
| Input - Output Voltage Differential (Applies to Adjustable Output Version Only) |                      |                      |              |      |      |                                                        |
| 4.1.2                                                                           | Voltage              | $V_I - V_Q$          | -0.3         | 40   | V    | –                                                      |
| Output Q                                                                        |                      |                      |              |      |      |                                                        |
| 4.1.3                                                                           | Voltage              | $V_Q$                | -0.3         | 40   | V    | –                                                      |
| Temperature                                                                     |                      |                      |              |      |      |                                                        |
| 4.1.4                                                                           | Junction temperature | $T_j$                | -40          | 150  | °C   | –                                                      |
| 4.1.5                                                                           | Storage temperature  | $T_{\text{stg}}$     | -50          | 150  | °C   | –                                                      |
| ESD Susceptibility                                                              |                      |                      |              |      |      |                                                        |
| 4.1.6                                                                           | ESD Absorption       | $V_{\text{ESD,HBM}}$ | -2           | 2    | kV   | Human Body Model (HBM) <sup>2)</sup>                   |
| 4.1.7                                                                           |                      | $V_{\text{ESD,CDM}}$ | -500         | 500  | V    | Charge Device Model (CDM) <sup>3)</sup>                |
| 4.1.8                                                                           |                      |                      | -750         | 750  | V    | Charge Device Model (CDM) <sup>3)</sup> at corner pins |

1) not subject to production test, specified by design

2) ESD susceptibility Human Body Model "HBM" according to AEC-Q100-002 - JESD22-A114

3) ESD susceptibility Charged Device Model "CDM" according to 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

| Pos.  | Parameter            | Symbol | Limit Values   |      | Unit | Remarks |
|-------|----------------------|--------|----------------|------|------|---------|
|       |                      |        | Min.           | Max. |      |         |
| 4.2.1 | Input voltage        | $V_I$  | $V_I + V_{DR}$ | 40   | V    |         |
| 4.2.2 | Junction temperature | $T_j$  | -40            | 125  | °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](http://www.jedec.org).

| Pos.       | Parameter                         | Symbol            | Limit Values |      |      | Unit | Conditions                                      |
|------------|-----------------------------------|-------------------|--------------|------|------|------|-------------------------------------------------|
|            |                                   |                   | Min.         | Typ. | Max. |      |                                                 |
| PG-TO252-3 |                                   |                   |              |      |      |      |                                                 |
| 4.3.1      | Junction to Case <sup>1)</sup>    | R <sub>thJC</sub> | —            | 4    | —    | K/W  | measured to heat slug                           |
| 4.3.2      | Junction to Ambient <sup>1)</sup> | R <sub>thJA</sub> | —            | 27   | —    | K/W  | <sup>2)</sup>                                   |
| 4.3.3      |                                   | R <sub>thJA</sub> | —            | 57   | —    | K/W  | 300 mm <sup>2</sup> heatsink area <sup>3)</sup> |
| 4.3.4      |                                   | R <sub>thJA</sub> | —            | 42   | —    | K/W  | 600 mm <sup>2</sup> heatsink area <sup>3)</sup> |

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 mm<sup>3</sup> 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 x 114.3 x 1.5 mm<sup>3</sup> board with 1 copper layer (1 x 70µm Cu).

## 5 Electrical Characteristics

### 5.1 Electrical Characteristics Voltage Regulator

**Table 3** Electrical Characteristics IFX27001TFV DV (adjustable output voltage)  
 $-40\text{ }^{\circ}\text{C} < T_j < 125\text{ }^{\circ}\text{C}$ ;  $V_I - V_Q = 13.5\text{ V}$ ,  $I_Q = 10\text{ mA}$ ; unless otherwise specified

| Parameter                                | Symbol           | Limit Values |      |      | Unit            | Measuring Conditions                                                                                                  |
|------------------------------------------|------------------|--------------|------|------|-----------------|-----------------------------------------------------------------------------------------------------------------------|
|                                          |                  | min.         | typ. | max. |                 |                                                                                                                       |
| Reference voltage                        | $V_{REF}^{1)}$   | 1.20         | 1.25 | 1.30 | V               | —                                                                                                                     |
| Line regulation                          | $\Delta V_Q$     | —            | 0.5  | 1.50 | % <sup>2)</sup> | $3\text{ V} \leq (V_I - V_Q) \leq 40\text{ V}$                                                                        |
| Load regulation                          | $\Delta V_Q$     | —            | 0.2  | 0.4  | % <sup>2)</sup> | $10\text{ mA} \leq I_Q \leq 800\text{ mA}$ ; <sup>4)</sup><br>$V_I = 3.0\text{ V}$ ; $V_Q = V_{REF}$                  |
|                                          |                  | —            | 0.25 | 0.5  | % <sup>2)</sup> | $10\text{ mA} \leq I_Q \leq 1.0\text{ A}$ ; <sup>4)</sup><br>$V_I = 3.0\text{ V}$ ; $V_Q = V_{REF}$                   |
| Dropout voltage                          | $V_{DR}$         | —            | 1.00 | 1.20 | V               | $I_Q = 100\text{ mA}$ <sup>3)</sup>                                                                                   |
|                                          |                  | —            | 1.05 | 1.30 | V               | $I_Q = 500\text{ mA}$ <sup>3)</sup>                                                                                   |
|                                          |                  | —            | 1.10 | 1.35 | V               | $I_Q = 800\text{ mA}$ <sup>3)</sup>                                                                                   |
|                                          |                  | —            | 1.30 | 1.40 | V               | $I_Q = 1.0\text{ A}$ <sup>3)</sup>                                                                                    |
| Current consumption<br>$I_q = I_I - I_Q$ | $I_q$            | —            | 100  | 120  | $\mu\text{A}$   | $I_Q = 10\text{ mA}$ ;                                                                                                |
| Adjust current                           | $I_{ADJ}$        | —            | 75   | 120  | $\mu\text{A}$   | $I_Q = 10\text{ mA}$                                                                                                  |
| Adjust current change                    | $\Delta I_{ADJ}$ | —            | 2    | 5    | $\mu\text{A}$   | $I_Q = 10\text{ mA}$<br>$3\text{ V} \leq (V_I - V_Q) \leq 40\text{ V}$ <sup>4)</sup>                                  |
|                                          |                  | —            | 2    | 5    | $\mu\text{A}$   | $10\text{ mA} \leq I_Q \leq 200\text{ mA}$ ;<br>$V_I - V_Q = 3\text{ V}$ <sup>4)</sup>                                |
| Temperature stability                    | —                | —            | 0.6  | —    | %               | <sup>5)</sup>                                                                                                         |
| Minimum load current <sup>6)</sup>       | $I_Q$            | —            | 1    | 5    | mA              | $V_I < 40\text{ V}$ ;<br>$V_Q = V_{REF}$                                                                              |
| Current limit                            | $I_{Qmax}$       | 1000         | —    | 2200 | mA              | $1.4\text{ V} < V_I - V_Q < 18\text{ V}$ ;<br>$V_Q = V_{nom} - 100\text{ mV}$                                         |
|                                          |                  | 50           | 200  | —    | mA              | $V_I = 40\text{ V}$ ;<br>$V_Q = V_{nom} - 100\text{ mV}$<br>$T_j = 25\text{ }^{\circ}\text{C}$                        |
| RMS Output Noise                         | —                | —            | 30   | —    | ppm             | ppm of $V_Q$ ; $T_j = 25\text{ }^{\circ}\text{C}$ ;<br>$10\text{ Hz} \leq f \leq 10\text{ kHz}$ <sup>5)</sup>         |
| Power Supply Ripple Rejection            | $PSRR$           | —            | 65   | —    | dB              | $V_Q = 10\text{ V}$ , $f_r = 120\text{ Hz}$ ,<br>$V_r = 0.5 V_{PP}$ , $C_{ADJ} = 0\text{ }\mu\text{F}$ <sup>5)</sup>  |
|                                          |                  | —            | 65   | —    | dB              | $V_Q = 10\text{ V}$ , $f_r = 120\text{ Hz}$ ,<br>$V_r = 0.5 V_{PP}$ , $C_{ADJ} = 10\text{ }\mu\text{F}$ <sup>5)</sup> |

1)  $V_{REF} = V_Q - V_{ADJ}$

2) Related to  $V_Q$ , measured at constant junction Temperature

3) Dropout voltage measured when the output voltage has dropped 100 mV from the nominal value obtained at  $V_Q = V_{REF}$ .

4) Constant Junction Temperature

5) Not subject to production test - specified by design.

6) Minimum Output Current to maintain regulation

## Electrical Characteristics

**Table 4** Electrical Characteristics IFX27001TFV15 DV15 (1.5 V fixed output voltage)

 $-40\text{ }^{\circ}\text{C} < T_j < 125\text{ }^{\circ}\text{C}$ ;  $V_I = 13.5\text{ V}$ ,  $I_Q = 10\text{ mA}$ ; unless otherwise specified

| Parameter                                | Symbol       | Limit Values |      |      | Unit | Measuring Conditions                                                                                        |
|------------------------------------------|--------------|--------------|------|------|------|-------------------------------------------------------------------------------------------------------------|
|                                          |              | min.         | typ. | max. |      |                                                                                                             |
| Output voltage                           | $V_Q$        | 1.45         | 1.5  | 1.55 | V    | $10\text{ mA} \leq I_Q \leq 1000\text{ mA}$ ;<br>$2.9\text{ V} \leq V_I \leq 16\text{ V}$                   |
|                                          |              | –            | 1.5  | –    | V    | $10\text{ mA} \leq I_Q \leq 1000\text{ mA}$ ;<br>$16\text{ V} \leq V_I \leq 40\text{ V}$ <sup>1)</sup>      |
| Line regulation                          | $\Delta V_Q$ | –            | 4.8  | 22.5 | mV   | $2.9\text{ V} \leq V_I \leq 40\text{ V}$                                                                    |
| Load regulation                          | $\Delta V_Q$ | –            | 2.6  | 5.2  | mV   | $10\text{ mA} \leq I_Q \leq 800\text{ mA}$ ; <sup>2)</sup><br>$V_I = V_{Qnom} + V_{DR}$                     |
|                                          |              | –            | 3.1  | 6.25 | mV   | $10\text{ mA} \leq I_Q \leq 1.0\text{ A}$ <sup>2)</sup><br>$V_I = V_{Qnom} + V_{DR}$                        |
| Dropout voltage                          | $V_{DR}$     | –            | 1.00 | 1.20 | V    | $I_Q = 100\text{ mA}$ <sup>3)</sup>                                                                         |
|                                          |              | –            | 1.05 | 1.30 | V    | $I_Q = 500\text{ mA}$ <sup>3)</sup>                                                                         |
|                                          |              | –            | 1.10 | 1.35 | V    | $I_Q = 800\text{ mA}$ <sup>3)</sup>                                                                         |
|                                          |              | –            | 1.30 | 1.40 | V    | $I_Q = 1.0\text{ A}$ <sup>3)</sup>                                                                          |
| Current consumption<br>$I_q = I_I - I_Q$ | $I_q$        | –            | 0.8  | 1.6  | mA   | $I_Q = 10\text{ mA}$                                                                                        |
| Temperature stability                    | –            | –            | 8.8  | –    | mV   | <sup>4)</sup>                                                                                               |
| Current limit                            | $I_{Qmax}$   | 1000         | –    | 2200 | mA   | $V_I - V_Q < 18\text{ V}$ ;<br>$V_Q = V_{nom} - 100\text{ mV}$                                              |
|                                          |              | 50           | 200  | –    | mA   | $V_I = 40\text{ V}$ ;<br>$V_Q = V_{nom} - 100\text{ mV}$<br>$T_j = 25\text{ }^{\circ}\text{C}$              |
| RMS Output Noise                         | –            | –            | 30   | –    | ppm  | ppm of $V_Q$ , $T_j = 25\text{ }^{\circ}\text{C}$<br>$10\text{ Hz} \leq f \leq 10\text{ kHz}$ <sup>4)</sup> |
| Power Supply Ripple Rejection            | PSRR         | –            | 65   | –    | dB   | $f_r = 120\text{ Hz}$ , $V_r = 0.5\text{ V}_{PP}$ ,<br>$C_{ADJ} = 0\text{ }\mu\text{F}$ <sup>4)</sup>       |
|                                          |              | –            | 65   | –    | dB   | $f_r = 120\text{ Hz}$ , $V_r = 0.5\text{ V}_{PP}$ ,<br>$C_{ADJ} = 10\text{ }\mu\text{F}$ <sup>4)</sup>      |

- 1) Device is usable within given range without destruction, but the accuracy of the output voltage can only be guaranteed in the range specified in the line above.
- 2) Measured at constant junction temperature
- 3) Dropout voltage measured when the output voltage has dropped 100 mV from the nominal value.
- 4) Not subject to production test - specified by design.

## Electrical Characteristics

**Table 5 Electrical Characteristics IFX27001TFV18 DV18 (1.8 V fixed output voltage)**
 $-40\text{ }^{\circ}\text{C} < T_j < 125\text{ }^{\circ}\text{C}$ ;  $V_I = 13.5\text{ V}$ ,  $I_Q = 10\text{ mA}$ ; unless otherwise specified

| Parameter                                | Symbol       | Limit Values |      |      | Unit | Measuring Conditions                                                                                        |
|------------------------------------------|--------------|--------------|------|------|------|-------------------------------------------------------------------------------------------------------------|
|                                          |              | min.         | typ. | max. |      |                                                                                                             |
| Output voltage                           | $V_Q$        | 1.75         | 1.8  | 1.85 | V    | $10\text{ mA} \leq I_Q \leq 1000\text{ mA}$ ;<br>$3.2\text{ V} \leq V_I \leq 16\text{ V}$                   |
|                                          |              | –            | 1.8  | –    | V    | $10\text{ mA} \leq I_Q \leq 1000\text{ mA}$ ;<br>$16\text{ V} \leq V_I \leq 40\text{ V}$ <sup>1)</sup>      |
| Line regulation                          | $\Delta V_Q$ | –            | 7.2  | 27   | mV   | $3.2\text{ V} \leq V_I \leq 40\text{ V}$                                                                    |
| Load regulation                          | $\Delta V_Q$ | –            | 3.4  | 7.6  | mV   | $10\text{ mA} \leq I_Q \leq 800\text{ mA}$ <sup>2)</sup><br>$V_I = V_{Qnom} + V_{DR}$                       |
|                                          |              | –            | 4.8  | 9    | mV   | $10\text{ mA} \leq I_Q \leq 1.0\text{ A}$ <sup>2)</sup><br>$V_I = V_{Qnom} + V_{DR}$                        |
| Dropout voltage                          | $V_{DR}$     | –            | 1.00 | 1.20 | V    | $I_Q = 100\text{ mA}$ <sup>3)</sup>                                                                         |
|                                          |              | –            | 1.05 | 1.30 | V    | $I_Q = 500\text{ mA}$ <sup>3)</sup>                                                                         |
|                                          |              | –            | 1.10 | 1.35 | V    | $I_Q = 800\text{ mA}$ <sup>3)</sup>                                                                         |
|                                          |              | –            | 1.30 | 1.40 | V    | $I_Q = 1.0\text{ A}$ <sup>3)</sup>                                                                          |
| Current consumption<br>$I_q = I_I - I_Q$ | $I_q$        | –            | 0.8  | 1.6  | mA   | $I_Q = 10\text{ mA}$                                                                                        |
| Temperature stability                    | –            | –            | 11   | –    | mV   | <sup>4)</sup>                                                                                               |
| Current limit                            | $I_{Qmax}$   | 1000         | –    | 2200 | mA   | $V_I - V_Q < 18\text{ V}$ ;<br>$V_Q = V_{nom} - 100\text{ mV}$                                              |
|                                          |              | 50           | 200  | –    | mA   | $V_I = 40\text{ V}$ ;<br>$V_Q = V_{nom} - 100\text{ mV}$<br>$T_j = 25\text{ }^{\circ}\text{C}$              |
| RMS Output Noise                         | –            | –            | 30   | –    | ppm  | ppm of $V_Q$ , $T_j = 25\text{ }^{\circ}\text{C}$<br>$10\text{ Hz} \leq f \leq 10\text{ kHz}$ <sup>4)</sup> |
| Power Supply Ripple Rejection            | $PSRR$       | –            | 65   | –    | dB   | $f_r = 120\text{ Hz}$ ; $V_r = 0.5\text{ V}_{PP}$<br>$C_{ADJ} = 0\text{ }\mu\text{F}$ <sup>4)</sup>         |
|                                          |              | –            | 65   | –    | dB   | $f_r = 120\text{ Hz}$ ; $V_r = 0.5\text{ V}_{PP}$ ,<br>$C_{ADJ} = 10\text{ }\mu\text{F}$ <sup>4)</sup>      |

- 1) Device is usable within given range without destruction, but the accuracy of the output voltage can only be guaranteed in the range specified in the line above.
- 2) Measured at constant junction temperature
- 3) Dropout voltage measured when the output voltage has dropped 100 mV from the nominal value.
- 4) Not subject to production test - specified by design.

## Electrical Characteristics

**Table 6** Electrical Characteristics IFX27001TFV26 DV26 (2.6 V fixed output voltage)

 $-40\text{ }^{\circ}\text{C} < T_j < 125\text{ }^{\circ}\text{C}$ ;  $V_I = 13.5\text{ V}$ ,  $I_Q = 10\text{ mA}$ ; unless otherwise specified

| Parameter                                 | Symbol       | Limit Values |      |      | Unit | Measuring Conditions                                                                                        |
|-------------------------------------------|--------------|--------------|------|------|------|-------------------------------------------------------------------------------------------------------------|
|                                           |              | min.         | typ. | max. |      |                                                                                                             |
| Output voltage                            | $V_Q$        | 2.52         | 2.60 | 2.68 | V    | $10\text{ mA} \leq I_Q \leq 1000\text{ mA}$ ;<br>$4.0\text{ V} \leq V_I \leq 16\text{ V}$                   |
|                                           |              | –            | 2.60 | –    | V    | $10\text{ mA} \leq I_Q \leq 1000\text{ mA}$ ;<br>$16\text{ V} \leq V_I \leq 40\text{ V}$ <sup>1)</sup>      |
| Line regulation                           | $\Delta V_Q$ | –            | 11   | 40   | mV   | $4.0\text{ V} \leq V_I \leq 40\text{ V}$                                                                    |
| Load regulation                           | $\Delta V_Q$ | –            | 5    | 11   | mV   | $10\text{ mA} \leq I_Q \leq 800\text{ mA}$ ; <sup>2)</sup><br>$V_I = V_{Qnom} + V_{DR}$                     |
|                                           |              | –            | 7    | 13   | mV   | $10\text{ mA} \leq I_Q \leq 1.0\text{ A}$ <sup>2)</sup><br>$V_I = V_{Qnom} + V_{DR}$                        |
| Dropout voltage                           | $V_{DR}$     | –            | 1.00 | 1.20 | V    | $I_Q = 100\text{ mA}$ <sup>3)</sup>                                                                         |
|                                           |              | –            | 1.05 | 1.30 | V    | $I_Q = 500\text{ mA}$ <sup>3)</sup>                                                                         |
|                                           |              | –            | 1.10 | 1.35 | V    | $I_Q = 800\text{ mA}$ <sup>3)</sup>                                                                         |
|                                           |              | –            | 1.30 | 1.40 | V    | $I_Q = 1.0\text{ A}$ <sup>3)</sup>                                                                          |
| Current consumption;<br>$I_q = I_I - I_Q$ | $I_q$        | –            | 0.8  | 1.6  | mA   | $I_Q = 10\text{ mA}$                                                                                        |
| Temperature stability                     | –            | –            | 16   | –    | mV   | <sup>4)</sup>                                                                                               |
| Current limit                             | $I_{Qmax}$   | 1000         | –    | 2200 | mA   | $V_I - V_Q < 18\text{ V}$ ;<br>$V_Q = V_{nom} - 100\text{ mV}$                                              |
|                                           |              | 50           | 200  | –    | mA   | $V_I = 40\text{ V}$ ;<br>$V_Q = V_{nom} - 100\text{ mV}$<br>$T_j = 25\text{ }^{\circ}\text{C}$              |
| RMS Output Noise                          | –            | –            | 30   | –    | ppm  | ppm of $V_Q$ , $T_j = 25\text{ }^{\circ}\text{C}$<br>$10\text{ Hz} \leq f \leq 10\text{ kHz}$ <sup>4)</sup> |
| Power Supply Ripple Rejection             | $PSRR$       | –            | 65   | –    | dB   | $f_r = 120\text{ Hz}$ , $V_r = 0.5 V_{PP}$ ,<br>$C_{ADJ} = 0\text{ }\mu\text{F}$ <sup>4)</sup>              |
|                                           |              | –            | 65   | –    | dB   | $f_r = 120\text{ Hz}$ , $V_r = 0.5 V_{PP}$ ,<br>$C_{ADJ} = 10\text{ }\mu\text{F}$ <sup>4)</sup>             |

- 1) Device is usable within given range without destruction, but the accuracy of the output voltage can only be guaranteed in the range specified in the line above.
- 2) Measured at constant junction temperature
- 3) Dropout voltage measured when the output voltage has dropped 100 mV from the nominal value.
- 4) Not subject to production test - specified by design.

## Electrical Characteristics

**Table 7 Electrical Characteristics IFX27001TFV33 DV33 (3.3 V fixed output voltage)**

$-40\text{ }^{\circ}\text{C} < T_j < 125\text{ }^{\circ}\text{C}$ ;  $V_I = 13.5\text{ V}$ ,  $I_Q = 10\text{ mA}$ ; unless otherwise specified

| Parameter                                | Symbol       | Limit Values |      |      | Unit | Measuring Conditions                                                                                          |
|------------------------------------------|--------------|--------------|------|------|------|---------------------------------------------------------------------------------------------------------------|
|                                          |              | Min.         | Typ. | Max. |      |                                                                                                               |
| Output voltage                           | $V_Q$        | 3.20         | 3.3  | 3.40 | V    | $10\text{ mA} \leq I_Q \leq 1000\text{ mA}$ ; $4.7\text{ V} \leq V_I \leq 16\text{ V}$                        |
|                                          |              | –            | 3.3  | –    | V    | $10\text{ mA} \leq I_Q \leq 1000\text{ mA}$ ; $16\text{ V} \leq V_I \leq 40\text{ V}$ <sup>1)</sup>           |
| Line regulation                          | $\Delta V_Q$ | –            | 15   | 50   | mV   | $4.7\text{ V} \leq V_I \leq 40\text{ V}$                                                                      |
| Load regulation                          | $\Delta V_Q$ | –            | 6    | 13   | mV   | $10\text{ mA} \leq I_Q \leq 800\text{ mA}$ <sup>2)</sup><br>$V_I = V_{Qnom} + V_{DR}$                         |
|                                          |              | –            | 8    | 16   | mV   | $10\text{ mA} \leq I_Q \leq 1.0\text{ A}$ <sup>2)</sup><br>$V_I = V_{Qnom} + V_{DR}$                          |
| Dropout voltage                          | $V_{DR}$     | –            | 1.00 | 1.20 | V    | $I_Q = 100\text{ mA}$ <sup>3)</sup>                                                                           |
|                                          |              | –            | 1.05 | 1.30 | V    | $I_Q = 500\text{ mA}$ <sup>3)</sup>                                                                           |
|                                          |              | –            | 1.10 | 1.35 | V    | $I_Q = 800\text{ mA}$ <sup>3)</sup>                                                                           |
|                                          |              | –            | 1.30 | 1.40 | V    | $I_Q = 1.0\text{ A}$ <sup>3)</sup>                                                                            |
| Current consumption<br>$I_q = I_I - I_Q$ | $I_q$        | –            | 0.8  | 1.6  | mA   | $I_Q = 10\text{ mA}$                                                                                          |
| Temperature stability                    | –            | –            | 20   | –    | mV   | <sup>4)</sup>                                                                                                 |
| Current limit                            | $I_{Qmax}$   | 1000         | –    | 2200 | mA   | $V_I - V_Q < 18\text{ V}$ ;<br>$V_Q = V_{nom} - 100\text{ mV}$                                                |
|                                          |              | 50           | 200  | –    | mA   | $V_I = 40\text{ V}$ ;<br>$V_Q = V_{nom} - 100\text{ mV}$<br>$T_j = 25\text{ }^{\circ}\text{C}$                |
| RMS Output Noise                         | –            | –            | 30   | –    | ppm  | ppm of $V_Q$ ; $T_j = 25\text{ }^{\circ}\text{C}$ ;<br>$10\text{ Hz} \leq f \leq 10\text{ kHz}$ <sup>4)</sup> |
| Power Supply Ripple Rejection            | $PSRR$       | –            | 65   | –    | dB   | $f_r = 120\text{ Hz}$ ; $V_r = 0.5\text{ Vpp}$ ;<br>$C_{ADJ} = 0\text{ }\mu\text{F}$ <sup>4)</sup>            |
|                                          |              | –            | 65   | –    | dB   | $f_r = 120\text{ Hz}$ ; $V_r = 0.5\text{ Vpp}$ ;<br>$C_{ADJ} = 10\text{ }\mu\text{F}$ <sup>4)</sup>           |

- 1) Device is usable within given range without destruction, but the accuracy of the output voltage can only be guaranteed in the range specified in the line above.
- 2) Measured at constant junction temperature.
- 3) Dropout voltage measured when the output voltage has dropped 100 mV from the nominal value.
- 4) Not subject to production test - specified by design.

## Electrical Characteristics

**Table 8 Electrical Characteristics IFX27001TFV50 DV50 (5.0 V fixed output voltage)**
 $-40\text{ }^{\circ}\text{C} < T_j < 125\text{ }^{\circ}\text{C}$ ;  $V_I = 13.5\text{ V}$ ,  $I_Q = 10\text{ mA}$ ; unless otherwise specified

| Parameter                                | Symbol       | Limit Values |      |      | Unit | Measuring Conditions                                                                                        |
|------------------------------------------|--------------|--------------|------|------|------|-------------------------------------------------------------------------------------------------------------|
|                                          |              | min.         | typ. | max. |      |                                                                                                             |
| Output voltage                           | $V_Q$        | 4.85         | 5.00 | 5.15 | V    | $10\text{ mA} \leq I_Q \leq 1000\text{ mA}$ ;<br>$6.4\text{ V} \leq V_I \leq 16\text{ V}$                   |
|                                          |              | –            | 5.00 | –    | V    | $10\text{ mA} \leq I_Q \leq 1000\text{ mA}$ ;<br>$16\text{ V} \leq V_I \leq 40\text{ V}$ <sup>1)</sup>      |
| Line regulation                          | $\Delta V_Q$ | –            | 20   | 75   | mV   | $6.4\text{ V} \leq V_I \leq 40\text{ V}$                                                                    |
| Load regulation                          | $\Delta V_Q$ | –            | 9    | 20   | mV   | $10\text{ mA} \leq I_Q \leq 800\text{ mA}$ <sup>2)</sup><br>$V_I = V_{Qnom} + V_{DR}$                       |
|                                          |              | –            | 12   | 24   | mV   | $10\text{ mA} \leq I_Q \leq 1.0\text{ A}$ <sup>2)</sup><br>$V_I = V_{Qnom} + V_{DR}$                        |
| Dropout voltage                          | $V_{DR}$     | –            | 1.00 | 1.20 | V    | $I_Q = 100\text{ mA}$ <sup>3)</sup>                                                                         |
|                                          |              | –            | 1.05 | 1.30 | V    | $I_Q = 500\text{ mA}$ <sup>3)</sup>                                                                         |
|                                          |              | –            | 1.10 | 1.35 | V    | $I_Q = 800\text{ mA}$ <sup>3)</sup>                                                                         |
|                                          |              | –            | 1.30 | 1.40 | V    | $I_Q = 1.0\text{ A}$ <sup>3)</sup>                                                                          |
| Current consumption<br>$I_q = I_I - I_Q$ | $I_q$        | –            | 0.8  | 1.6  | mA   | $I_Q = 10\text{ mA}$                                                                                        |
| Temperature stability                    | –            | –            | 30   | –    | mV   | <sup>4)</sup>                                                                                               |
| Current limit                            | $I_{Qmax}$   | 1000         | –    | 2200 | mA   | $V_I - V_Q < 18\text{ V}$ ;<br>$V_Q = V_{nom} - 100\text{ mV}$                                              |
|                                          |              | 50           | 200  | –    | mA   | $V_I = 40\text{ V}$ ;<br>$V_Q = V_{nom} - 100\text{ mV}$<br>$T_j = 25\text{ }^{\circ}\text{C}$              |
| RMS Output Noise                         | –            | –            | 30   | –    | ppm  | ppm of $V_Q$ , $T_j = 25\text{ }^{\circ}\text{C}$<br>$10\text{ Hz} \leq f \leq 10\text{ kHz}$ <sup>4)</sup> |
| Power Supply Ripple Rejection            | $PSRR$       | –            | 65   | –    | dB   | $f_r = 120\text{ Hz}$ , $V_r = 0.5 V_{PP}$ ,<br>$C_{ADJ} = 0\text{ }\mu\text{F}$ <sup>4)</sup>              |
|                                          |              | –            | 65   | –    | dB   | $f_r = 120\text{ Hz}$ , $V_r = 0.5 V_{PP}$ ,<br>$C_{ADJ} = 10\text{ }\mu\text{F}$ <sup>4)</sup>             |

- 1) Device is usable within given range without destruction, but the accuracy of the output voltage can only be guaranteed in the range specified in the line above.
- 2) Measured at constant junction temperature
- 3) Dropout voltage measured when the output voltage has dropped 100 mV from the nominal value.
- 4) Not subject to production test - specified by design.

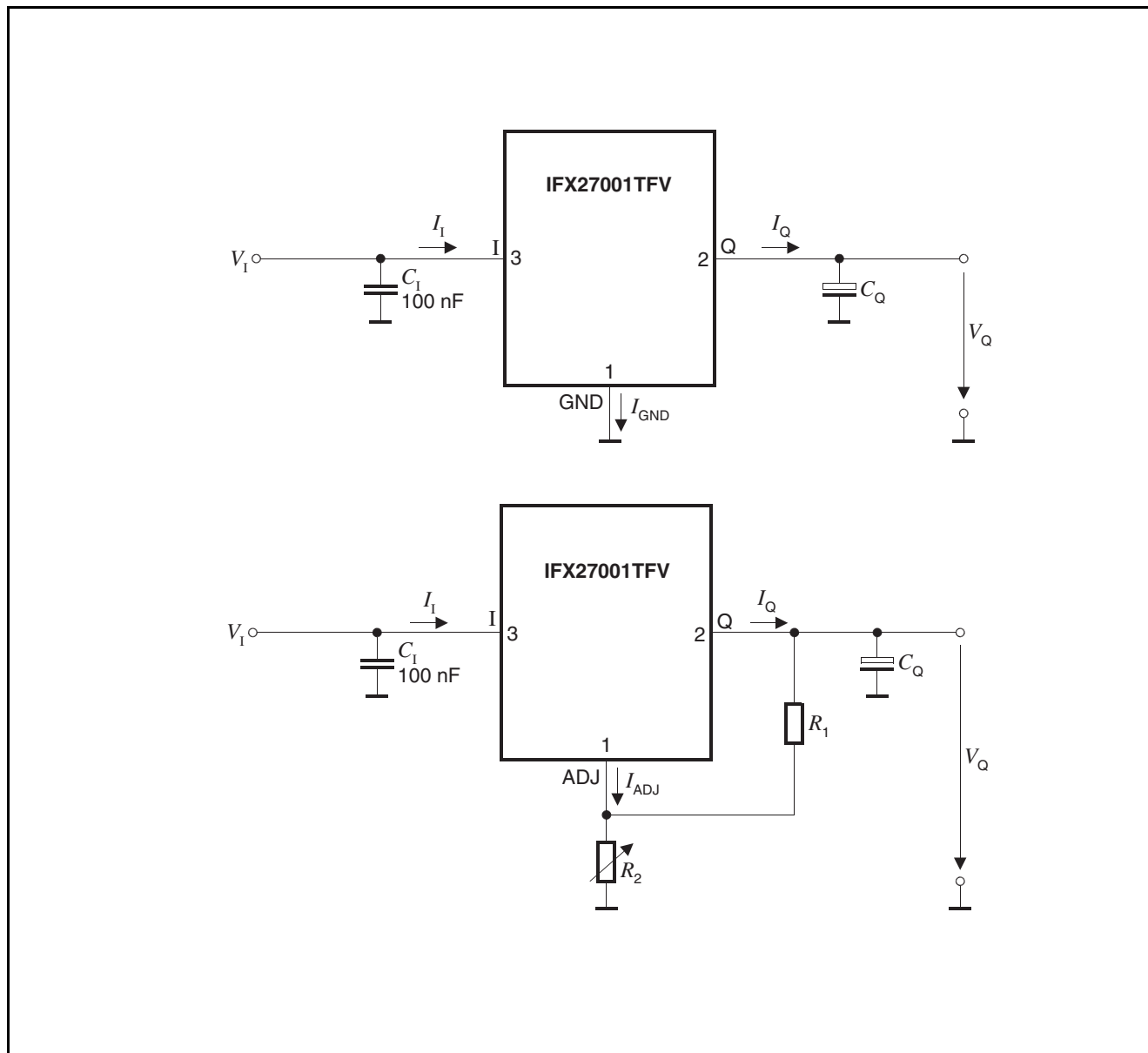
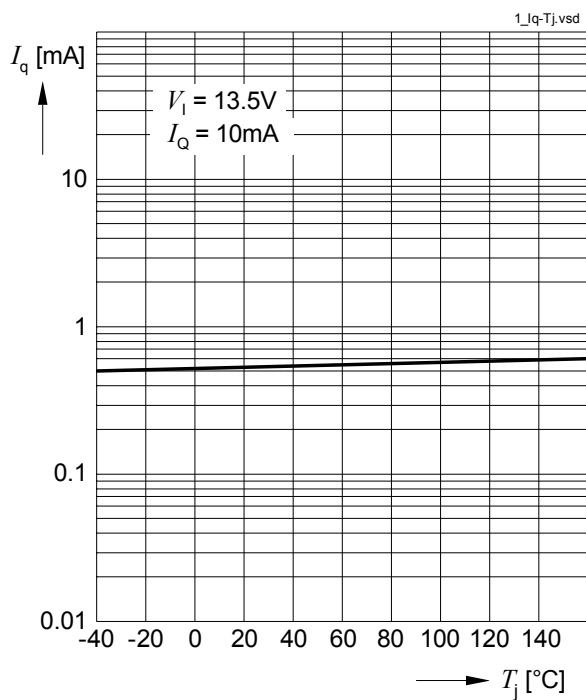


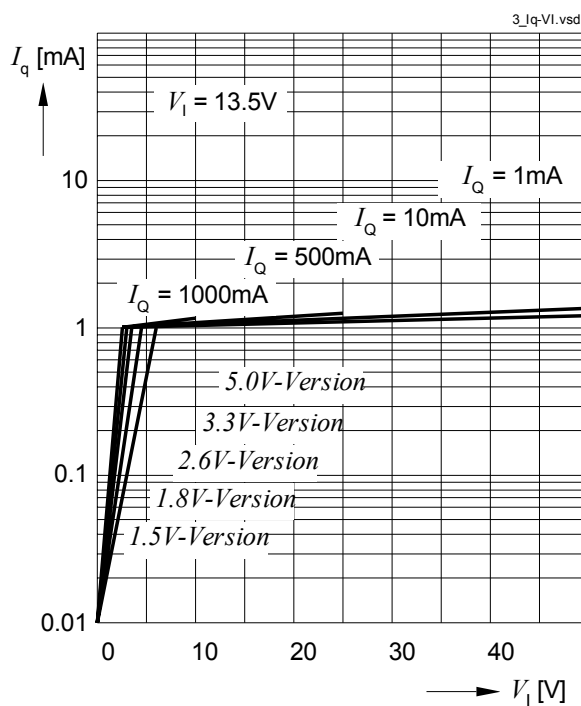
Figure 4 Measuring Circuit of fixed output voltage versions and adjustable output voltage version

## 5.2 Typical Performance Characteristics Voltage Regulator

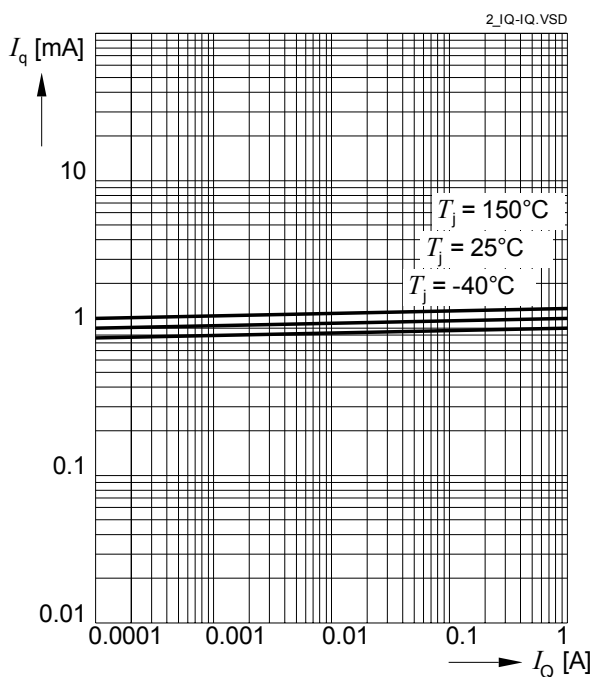
Current Consumption  $I_q$  versus Junction Temperature  $T_j$



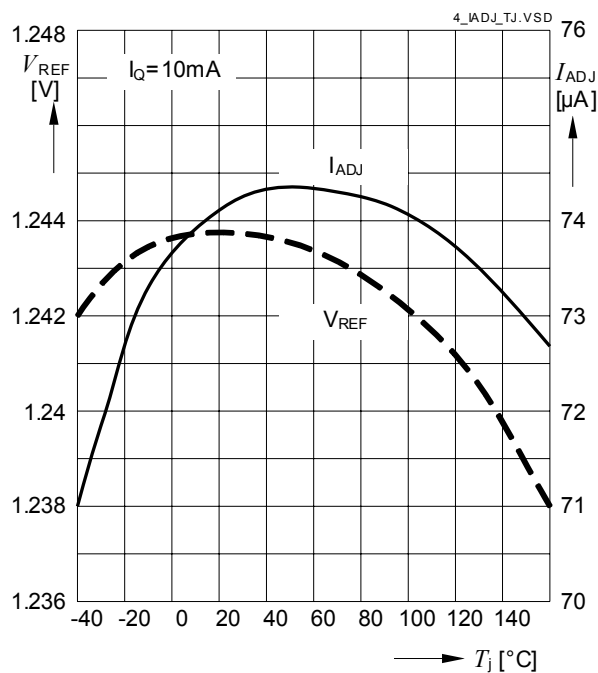
Current Consumption  $I_q$  versus Input Voltage  $V_1$



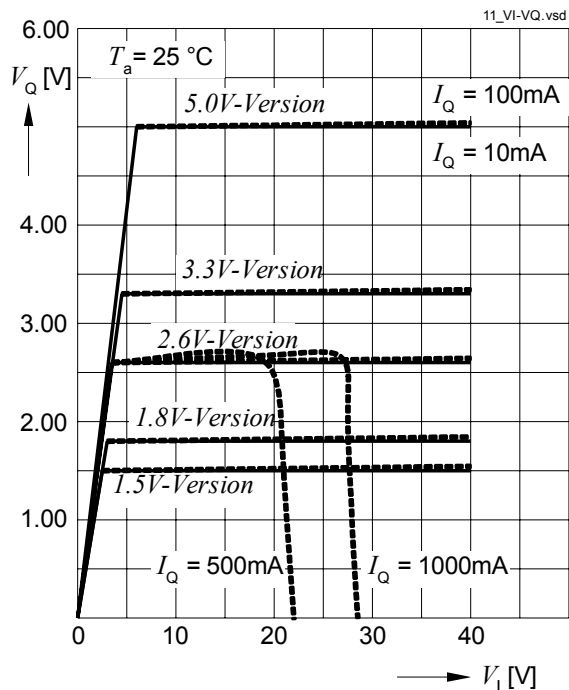
Current Consumption  $I_q$  versus Output Current  $I_Q$



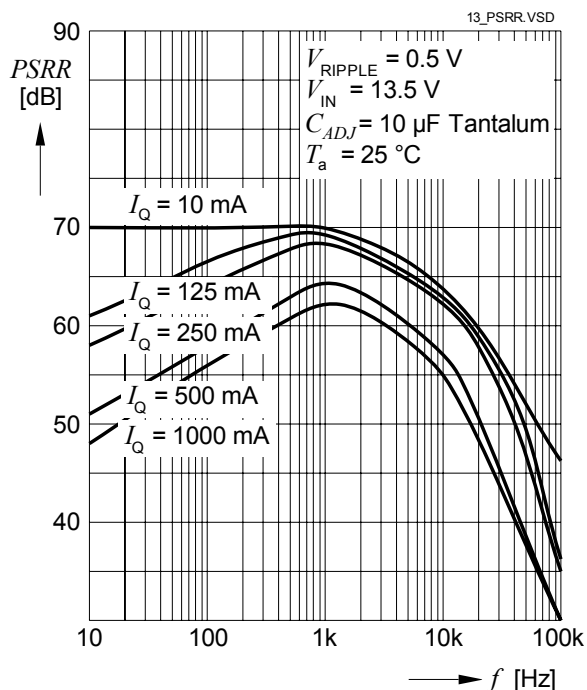
Adjust Current  $I_{ADJ}$  and Reference Voltage  $V_{REF}$  versus Junction Temperature  $T_j$



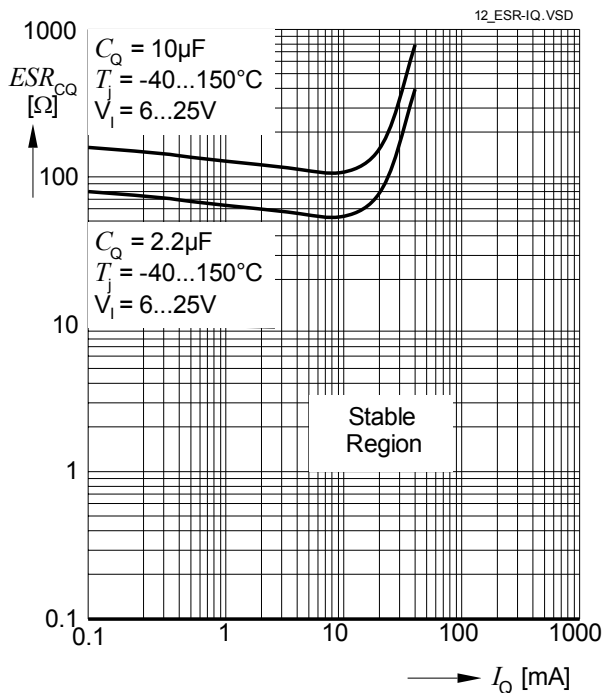
Output Voltage  $V_Q$  versus Input Voltage  $V_I$



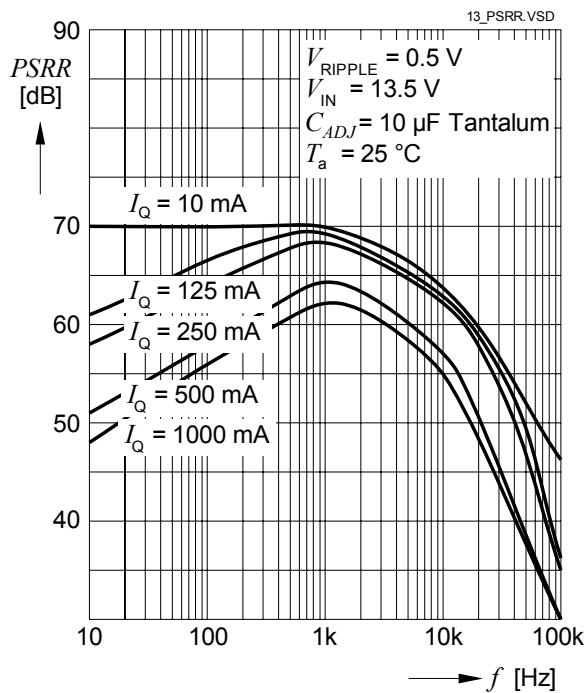
Power Supply Ripple Rejection versus Frequency



Stability Region: Equivalent Serial Resistor ESR versus Output Current  $I_Q$

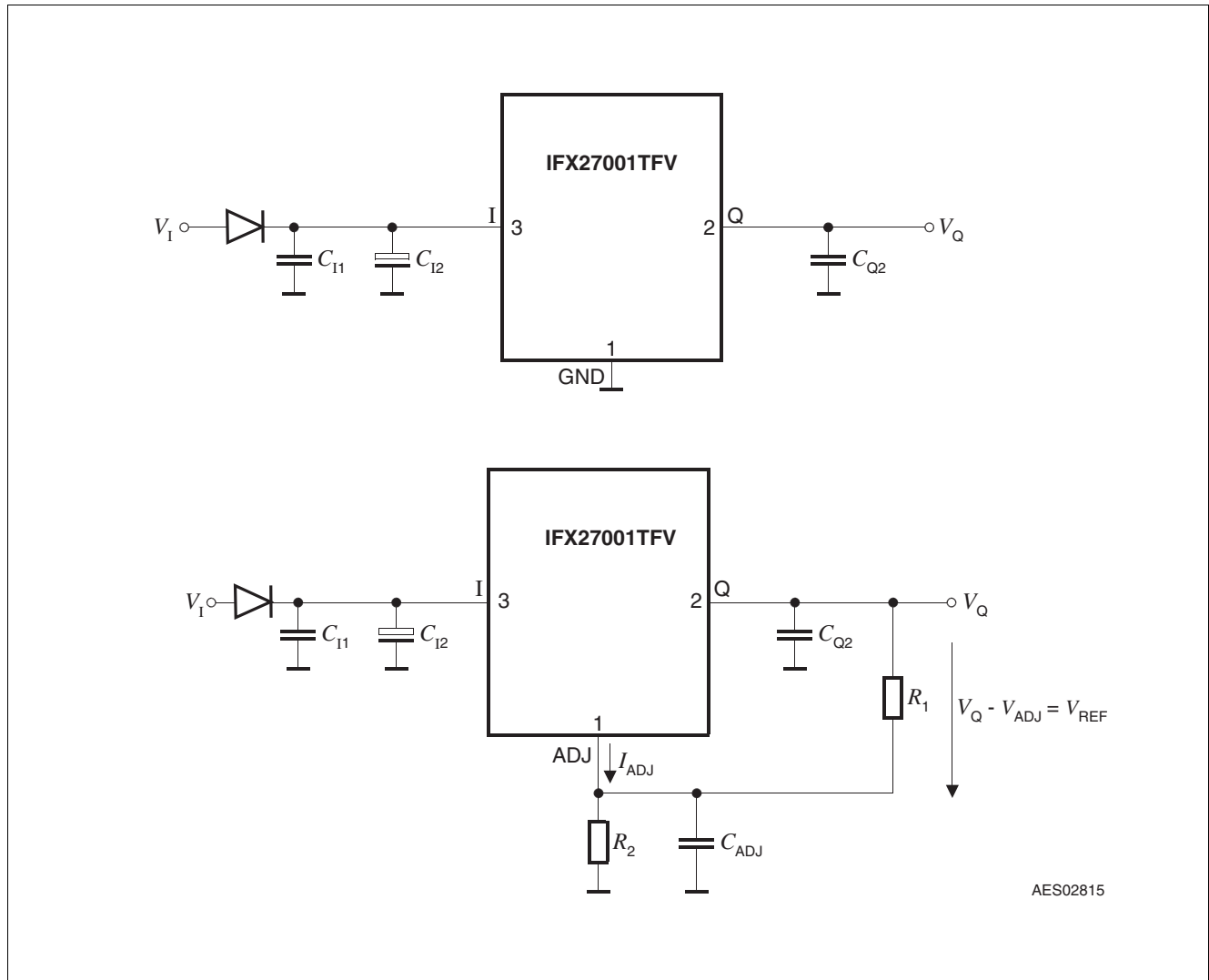


Power Supply Ripple Rejection versus Frequency



## 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 5 Application Diagram**

### Application Hints

#### Adjustable Version

At the fixed voltage IFX27001 devices, the output voltage is divided internally and compared to an internal reference of 1.25 V typical. The regulation loop controls the output voltage to achieve the output voltage of 5 V, 3.3 V, 2.6 V, 1.8V or 1.5V. The variable version compares the voltage difference between the adjust pin ADJ and the output pin Q to the internal reference of typically 1.25 V. The output voltage is adjusted by an external voltage divider between Q, ADJ and GND and calculates:

$$V_Q = V_{REF} \times \left(1 + \frac{R_2}{R_1}\right) + I_{ADJ} \times R_2$$

For the variable regulator IFX27001TFV, a minimum load current of 5 mA is necessary in order to keep the output voltage regulated. If the application does not assure this minimum load requirement, the output voltage divider should be dimensioned sufficiently low-ohmic:  $R_1 \leq 240 \Omega$ .

For the variable voltage type an additional decoupling capacitor  $C_{ADJ}$  at the adjust pin improves the ripple rejection ratios. Placing  $C_{ADJ}$  requires an increased output capacitance of  $C_Q \geq 22 \mu F$ .

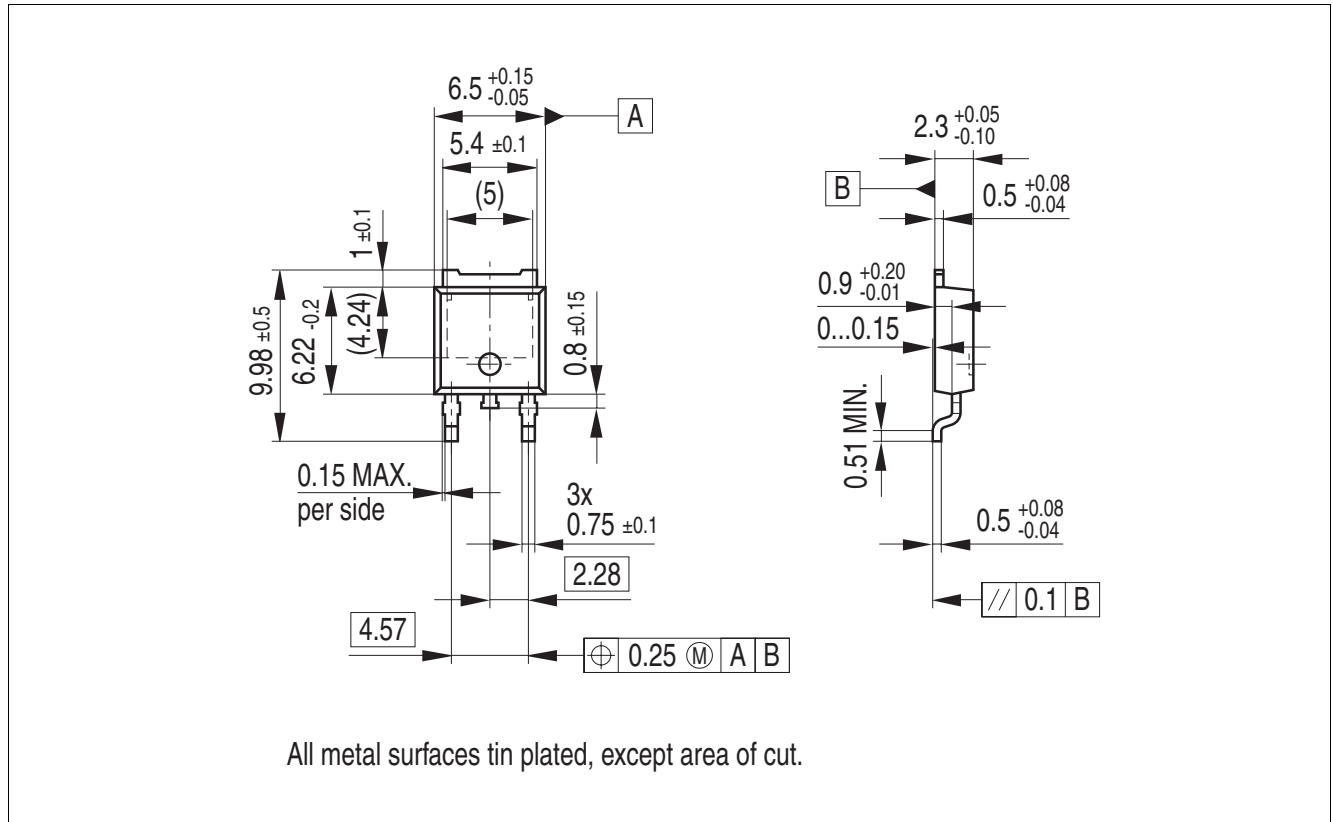
### Output

The output current limitation is reduced as a function of the input voltage for high input voltages above 25 V.

The IFX27001 requires a 10  $\mu F$  output capacitor with  $0.1 \Omega \leq ESR \leq 10 \Omega$  for the stability of the regulation loop.

At the input of the regulator a capacitor is necessary for compensation of line influences. A series diode should be used to eliminate negative voltages from the input. As a minimum, a 100 nF ceramic input capacitor should be used. If the regulator is used in an environment with long input lines, an input capacitance of 10  $\mu F$  is recommended.

## 7 Package Outlines



**Figure 6 PG-T0252-3**

### 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).

## 8 Revision History

| Revision | Date       | Changes                                                                             |
|----------|------------|-------------------------------------------------------------------------------------|
| 1.01     | 2009-10-19 | Coverpage changed<br>Overview page: Inserted reference statement to TLE/TLF series. |
| 1.0      | 2009-04-28 | Initial Release                                                                     |

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