

## Voltage Regulator

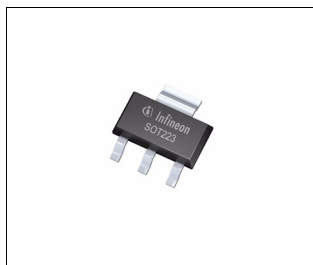
IFX1117

### Data Sheet



#### Features

- Output voltage 3.3 V or adjustable
- 1.0 A output current
- Low drop voltage < 1.2 V @ 800 mA
- Short circuit protected
- Overtemperature protected
- Operating range up to 15 V
- Industrial type
- Green Product (RoHS compliant)



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

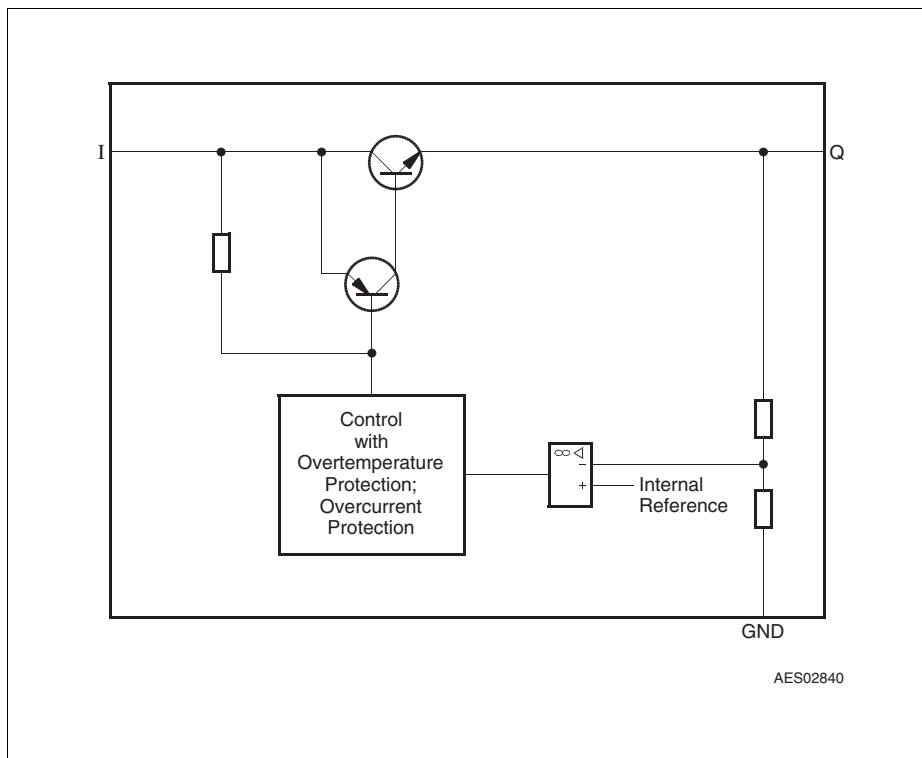
#### Functional Description

The IFX1117 is a monolithic integrated fixed NPN type voltage regulator that can supply loads up to 1.0 A. The device is housed in the small surface mounted SOT223 package. The IC is equipped with additional protection against overload, short circuit and over-temperature.

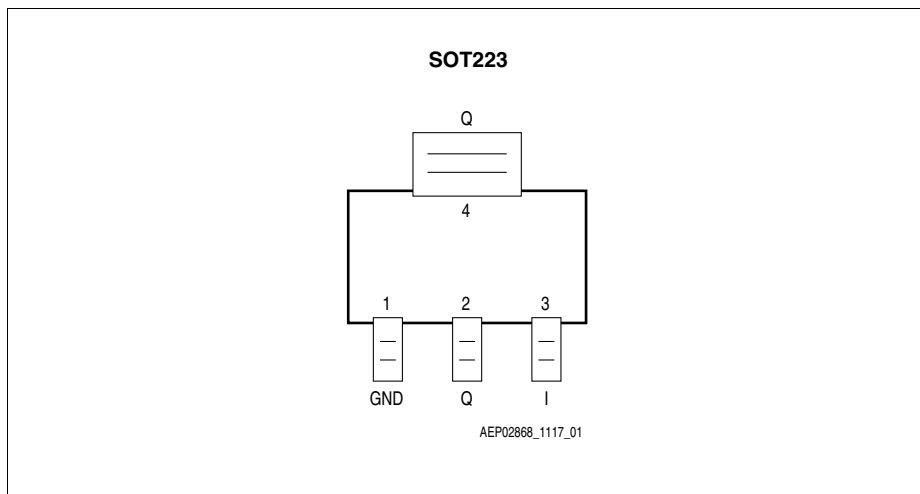
The IFX1117ME V33 supplies a regulated output voltage of 3.3 V ( $\pm 2\%$ ). The IFX1117ME V supplies an output voltage with  $\pm 2\%$  precision adjustable via an external voltage divider. The input voltage for the IFX1117ME V33 ranges from 4.5 V ( $= V_Q + V_{DR}$ ) to 15 V for a load current of 800 mA, for the maximum load current of 1.0 A a minimum input voltage of 4.7 V is required. The drop 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  $T_j = 0$  to 125 °C.

| Type          | Package   | Marking |
|---------------|-----------|---------|
| IFX1117ME V33 | PG-SOT223 | 111733  |
| IFX1117ME V   | PG-SOT223 | 1117V   |



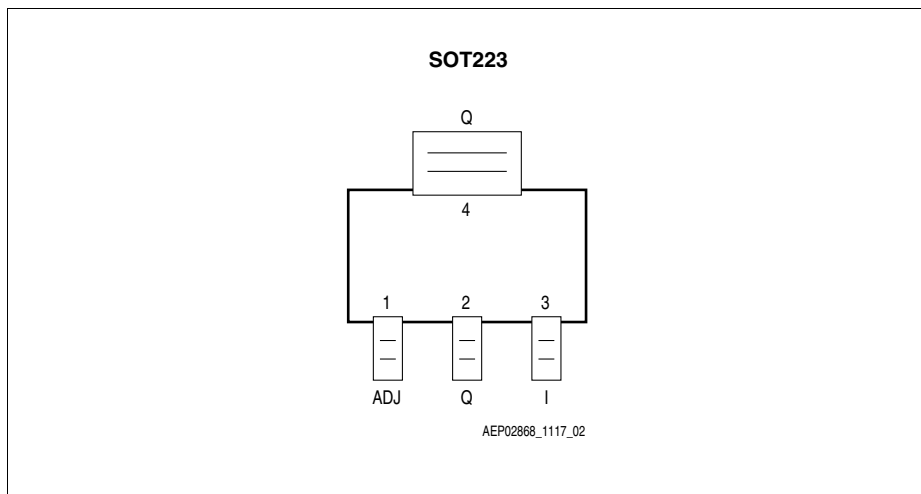
**Figure 1**      **Block Diagram for Fixed Output Voltage IFX1117ME V33**



**Figure 2** Pin Configuration IFX1117ME V33 (top view)

**Table 1** Pin Definitions and Functions IFX1117ME V33

| Pin No. | Symbol | Function                                                                                                                                                   |
|---------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | GND    | <b>Ground</b>                                                                                                                                              |
| 2       | Q      | <b>Output;</b> Connect output pin to GND via a capacitor $C_Q \geq 10 \mu\text{F}$ with $\text{ESR} \leq 20 \Omega$ (see also graph “Region of Stability”) |
| 3       | I      | <b>Input</b>                                                                                                                                               |
| 4 (TAB) | Q      | <b>Output;</b> Connect to pin 2 and heatsink area on PCB                                                                                                   |



**Figure 3 Pin Configuration IFX1117ME V (top view)**

**Table 2 Pin Definitions and Functions IFX1117ME V**

| Pin No. | Symbol | Function                                                                                                                                                    |
|---------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | ADJ    | <b>Adjust;</b> defines output voltage level by external voltage divider between Q, ADJ and GND.                                                             |
| 2       | Q      | <b>Output;</b> Connect output pin to GND via a capacitor $C_Q \geq 10 \mu\text{F}$ with $\text{ESR} \leq 20 \Omega$ (see also graph “Region of Stability”). |
| 3       | I      | <b>Input</b>                                                                                                                                                |
| 4 (TAB) | Q      | <b>Output;</b> Connect to pin 2 and heatsink area on PCB                                                                                                    |

**Table 3 Absolute Maximum Ratings**

| Parameter                                                | Symbol      | Limit Values |      | Unit | Test Condition     |
|----------------------------------------------------------|-------------|--------------|------|------|--------------------|
|                                                          |             | Min.         | Max. |      |                    |
| Input - Output Voltage Difference (variable device only) |             |              |      |      |                    |
| Voltage                                                  | $V_I - V_Q$ | -0.3         | 20   | V    | –                  |
| Input Voltage (fixed voltage version only)               |             |              |      |      |                    |
| Voltage                                                  | $V_I$       | -0.3         | 20   | V    | –                  |
| Output                                                   |             |              |      |      |                    |
| Voltage                                                  | $V_Q$       | -0.3         | 20   | V    | –                  |
| Current                                                  | $I_Q$       | –            | –    | –    | Internally limited |
| ESD Rating                                               |             |              |      |      |                    |
| Electrostatic discharge voltage                          | $V_{ESD}$   | -2           | 2    | kV   | Human Body Model   |
| Temperature                                              |             |              |      |      |                    |
| Storage temperature                                      | $T_{stg}$   | -50          | 150  | °C   | –                  |
| Junction temperature                                     | $T_j$       | -40          | 150  | °C   | –                  |

*Note: Stresses above those listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.*

**Table 4 Operating Range**

| Parameter            | Symbol | Limit Values   |      | Unit | Remarks |
|----------------------|--------|----------------|------|------|---------|
|                      |        | Min.           | Max. |      |         |
| Input Voltage        | $V_I$  | $V_Q + V_{DR}$ | 15   | V    | –       |
| Junction temperature | $T_j$  | 0              | 125  | °C   | –       |

**Table 5 Thermal Resistance**

|                  |            |   |     |     |                                               |
|------------------|------------|---|-----|-----|-----------------------------------------------|
| Junction ambient | $R_{thja}$ | – | 164 | K/W | PG-SOT223, footprint only.                    |
|                  |            | – | 81  | K/W | PG-SOT223, 300 mm <sup>2</sup> heat sink area |
| Junction case    | $R_{thjc}$ | – | 4   | K/W | –                                             |

*Note: In the operating range, the functions given in the circuit description are fulfilled.*

### Characteristics 3.3 V Fixed Output Voltage Device IFX1117ME V33

$0\text{ }^{\circ}\text{C} < T_j < 125\text{ }^{\circ}\text{C}$ ;  $V_I = 5\text{ V}$ ,  $I_Q = 10\text{ mA}$ ; unless otherwise specified.

| Parameter                                 | Symbol       | Limit Values |       |           | Unit | Measuring Conditions                                                                                        |
|-------------------------------------------|--------------|--------------|-------|-----------|------|-------------------------------------------------------------------------------------------------------------|
|                                           |              | min.         | typ.  | max.      |      |                                                                                                             |
| Output voltage                            | $V_Q$        | 3.23<br>5    | 3.300 | 3.36<br>5 | V    | $0\text{ mA} \leq I_Q \leq 800\text{ mA}$<br>$4.7\text{ V} \leq V_I \leq 10\text{ V}$                       |
| Output voltage                            | $V_Q$        | —            | 3.300 | —         | V    | $0\text{ mA} \leq I_Q \leq 1000\text{ mA}$ ;<br>$4.7\text{ V} \leq V_I \leq 15\text{ V}$                    |
| Line regulation                           | $\Delta V_Q$ | —            | 1     | 6         | mV   | $4.7\text{ V} \leq V_I \leq 15\text{ V}$                                                                    |
| Load regulation                           | $\Delta V_Q$ | —            | 1     | 10        | mV   | $0\text{ mA} \leq I_Q \leq 800\text{ mA}$ ; <sup>1)</sup>                                                   |
|                                           |              | —            | 2     | —         | mV   | $0\text{ mA} \leq I_Q \leq 1.0\text{ A}$ <sup>1)</sup>                                                      |
| Drop voltage                              | $V_{DR}$     | —            | 1.00  | 1.10      | V    | $I_Q = 100\text{ mA}$ <sup>2)</sup>                                                                         |
| Drop voltage                              | $V_{DR}$     | —            | 1.05  | 1.15      | V    | $I_Q = 500\text{ mA}$ <sup>2)</sup>                                                                         |
| Drop voltage                              | $V_{DR}$     | —            | 1.10  | 1.20      | V    | $I_Q = 800\text{ mA}$ <sup>2)</sup>                                                                         |
| Drop voltage                              | $V_{DR}$     | —            | 1.30  | 1.40      | V    | $I_Q = 1.0\text{ A}$ <sup>2)</sup>                                                                          |
| Current consumption;<br>$I_q = I_I - I_Q$ | $I_q$        | —            | 5     | 10        | mA   | $I_Q = 10\text{ mA}$                                                                                        |
| Temperature stability                     | $\Delta V_Q$ | —            | 16.5  | —         | mV   | <sup>3)</sup>                                                                                               |
| Long Term Stability                       | —            | —            | 0.3   | —         | %    | <sup>3)</sup>                                                                                               |
| Current limit                             | $I_{Qmax}$   | 1100         | —     | 2250      | mA   | $V_Q = 0.5\text{ V}$                                                                                        |
| 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>3)</sup> |
| Power Supply Ripple Rejection             | $PSRR$       | 60           | 65    | —         | dB   | $f_r = 120\text{ Hz}$ , $V_r = 1\text{ V}_{PP}$ <sup>3)</sup>                                               |

1) Measured at constant junction temperature

2) Drop voltage measured when the output voltage has dropped 100 mV from the nominal value obtained at  $V_I = 5.0\text{ V}$ .

3) Specified by design; not subject to production test.

### Characteristics Adjustable Output Voltage Device IFX1117ME V

0 °C < T<sub>j</sub> < 125 °C; V<sub>I</sub> = 5 V, I<sub>Q</sub> = 10 mA; unless otherwise specified.

| Parameter                          | Symbol            | Limit Values |       |           | Unit            | Measuring Conditions                                                                   |
|------------------------------------|-------------------|--------------|-------|-----------|-----------------|----------------------------------------------------------------------------------------|
|                                    |                   | min.         | typ.  | max.      |                 |                                                                                        |
| Reference voltage                  | V <sub>Q</sub>    | 1.22<br>5    | 1.250 | 1.27<br>0 | V               | 10 mA ≤ I <sub>Q</sub> ≤ 800 mA;<br>1.4 V ≤ (V <sub>I</sub> -V <sub>Q</sub> ) ≤ 10 V   |
| Output voltage                     | V <sub>Q</sub>    | —            | 1.250 | —         | V               | 10 mA ≤ I <sub>Q</sub> ≤ 1000 mA;<br>2.65 V ≤ V <sub>I</sub> ≤ 15 V                    |
| Line regulation                    | ΔV <sub>Q</sub>   | —            | 0.035 | 0.2       | % <sup>1)</sup> | 1.5 V ≤ (V <sub>I</sub> -V <sub>Q</sub> ) ≤ 13.75 V                                    |
| Load regulation                    | ΔV <sub>Q</sub>   | —            | 0.2   | 0.4       | % <sup>1)</sup> | 10 mA ≤ I <sub>Q</sub> ≤ 800 mA; <sup>2)</sup>                                         |
|                                    |                   | —            | 0.25  | —         | % <sup>1)</sup> | 10 mA ≤ I <sub>Q</sub> ≤ 1.0 A <sup>2)</sup>                                           |
| Drop voltage                       | V <sub>DR</sub>   | —            | 1.00  | 1.10      | V               | I <sub>Q</sub> = 100 mA <sup>3)</sup>                                                  |
| Drop voltage                       | V <sub>DR</sub>   | —            | 1.05  | 1.15      | V               | I <sub>Q</sub> = 500 mA <sup>3)</sup>                                                  |
| Drop voltage                       | V <sub>DR</sub>   | —            | 1.10  | 1.20      | V               | I <sub>Q</sub> = 800 mA <sup>3)</sup>                                                  |
| Drop voltage                       | V <sub>DR</sub>   | —            | 1.30  | 1.40      | V               | I <sub>Q</sub> = 1.0 A <sup>3)</sup>                                                   |
| Minimum Load Current <sup>4)</sup> | I <sub>q</sub>    | —            | 1.7   | 5.0       | mA              | V <sub>I</sub> = 15 V                                                                  |
| Adjust Current                     | I <sub>ADJ</sub>  | —            | 100   | 120       | μA              | I <sub>Q</sub> = 10 mA                                                                 |
| Adjust Current Change              | ΔI <sub>ADJ</sub> | —            | 2     | 5         | μA              | 1.4 V ≤ (V <sub>I</sub> -V <sub>Q</sub> ) ≤ 13.6 V;<br>10 mA ≤ I <sub>Q</sub> ≤ 800 mA |
| Temperature stability              | ΔV <sub>Q</sub>   | —            | 0.5   | —         | % <sup>1)</sup> | <sup>5)</sup>                                                                          |
| Long Term Stability                | —                 | —            | 0.3   | —         | % <sup>1)</sup> | <sup>5)</sup>                                                                          |
| Current limit                      | I <sub>Qmax</sub> | 1100         | —     | 2250      | mA              | V <sub>Q</sub> = 0.5 V                                                                 |
| RMS Output Noise                   | —                 | —            | 30    | —         | ppm             | ppm of V <sub>Q</sub> , T <sub>j</sub> = 25 °C<br>10 Hz ≤ f ≤ 10 kHz <sup>5)</sup>     |
| Power Supply Ripple Rejection      | PSRR              | 65           | 70    | —         | dB              | f <sub>r</sub> = 120 Hz, V <sub>r</sub> = 1 V <sub>pp</sub> <sup>5)</sup>              |

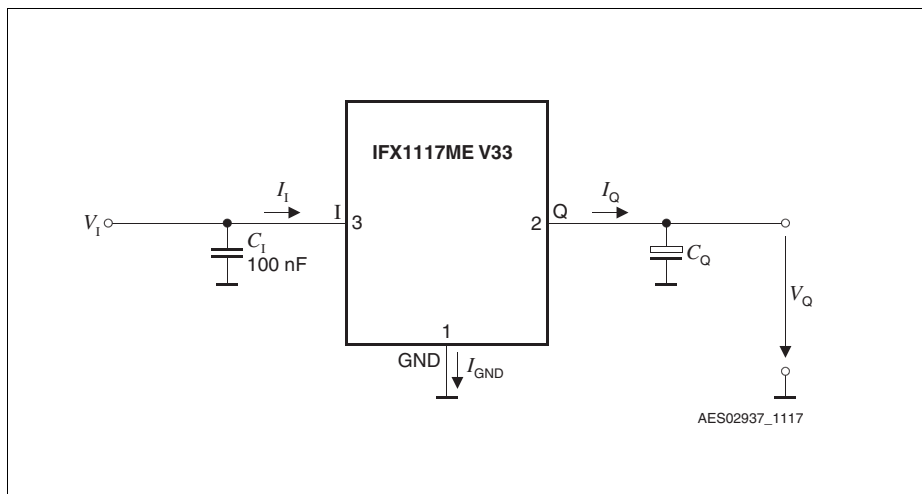
1) Related to V<sub>Q</sub>

2) Measured at constant junction temperature

3) Drop voltage measured when the output voltage has dropped 100 mV from the nominal value obtained at V<sub>I</sub> = 5.0 V.

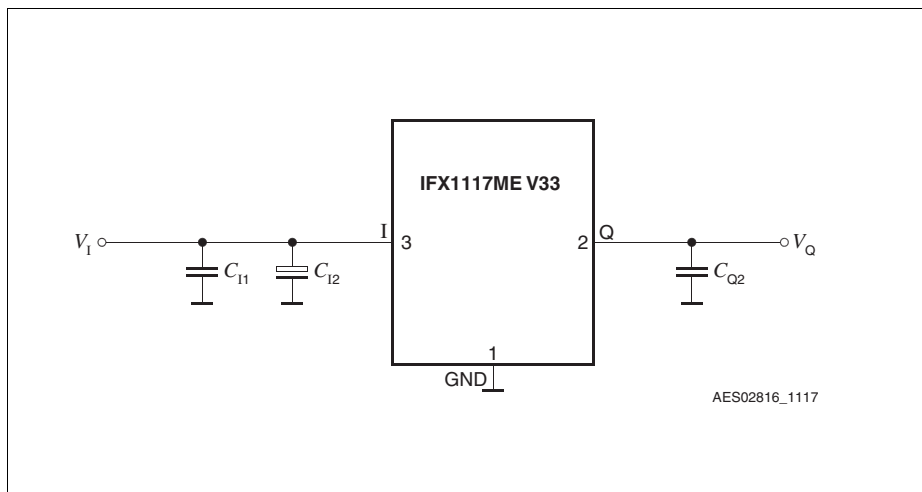
4) Minimum load current required to maintain regulation

5) Specified by design; not subject to production test.



**Figure 4 Measuring Circuit**

### Application Information



**Figure 5 Typical Application Circuit IFX1117ME V33**



## Output

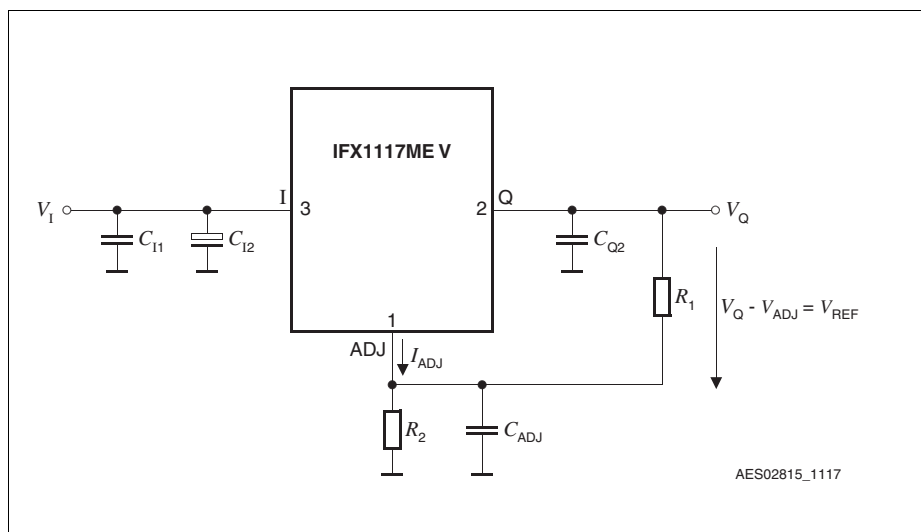
The IFX1117 requires a 10  $\mu\text{F}$  output capacitor with  $\text{ESR} \leq 20 \Omega$  for the stability of the regulation loop. The use of a tantalum output capacitor is recommended.

For the adjustable device IFX1117ME V the output voltage level can be defined by a voltage divider between Q, ADJ and GND.

The output voltage calculates:

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

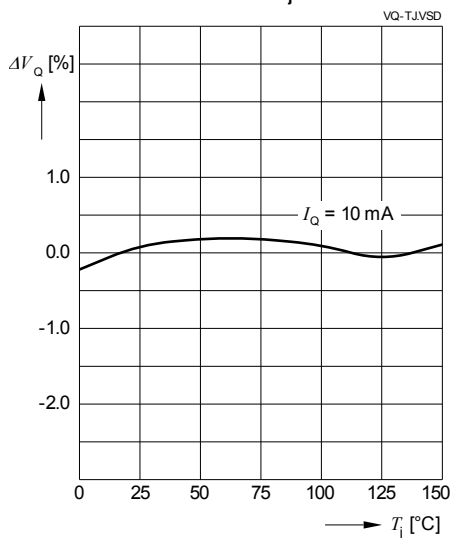
At the input of the regulator a capacitor is recommended to compensate line influences. As a minimum a 100 nF ceramic input capacitor should be used. If the regulator is used in an environment with long input lines an input capacitance of 10  $\mu\text{F}$  is suggested.



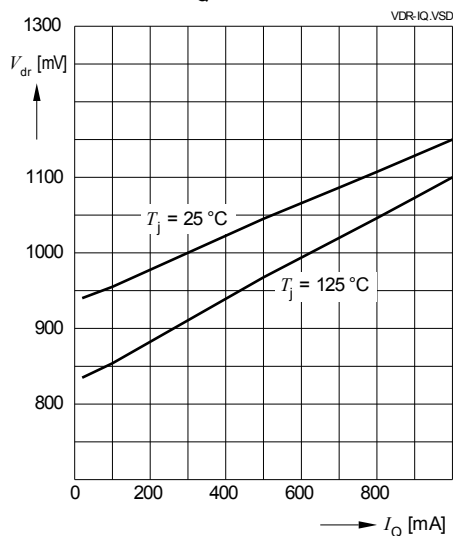
**Figure 6 Typical Application Circuit IFX1117ME V**

## Typical Performance Characteristics

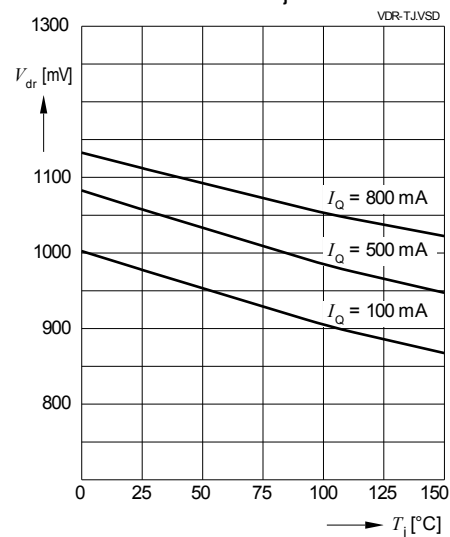
**Output Voltage  $V_O$  versus Junction Temperature  $T_j$**



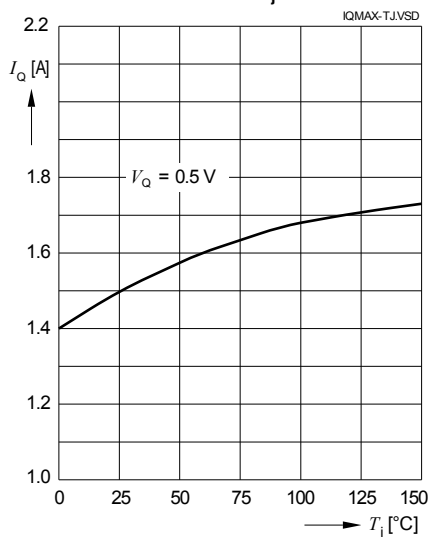
**Dropout Voltage  $V_{dr}$  versus Output Current  $I_Q$**



**Dropout Voltage  $V_{dr}$  versus Junction Temperature  $T_j$**

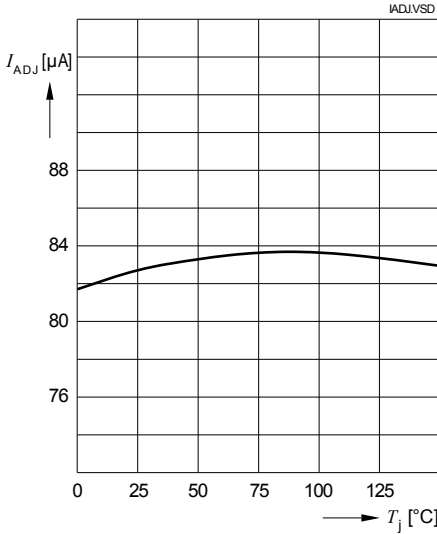


**Maximum Output Current  $I_Q$  versus Junction Temperature  $T_j$**

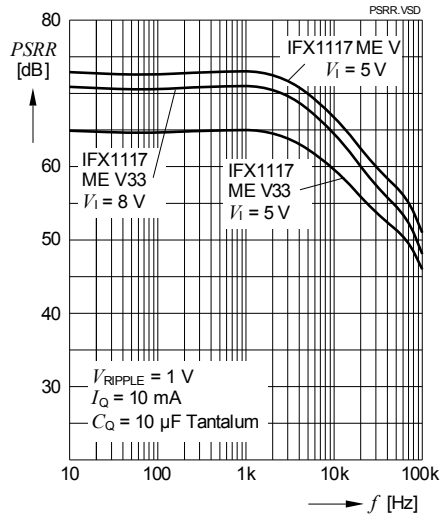


## Typical Performance Characteristics

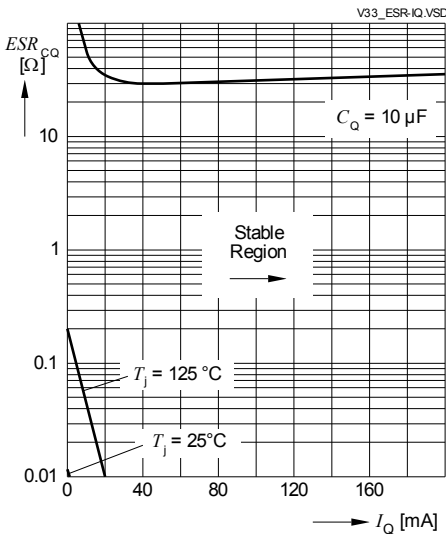
### Adjust Pin Current $I_{ADJ}$ versus Junction Temperature $T_j$



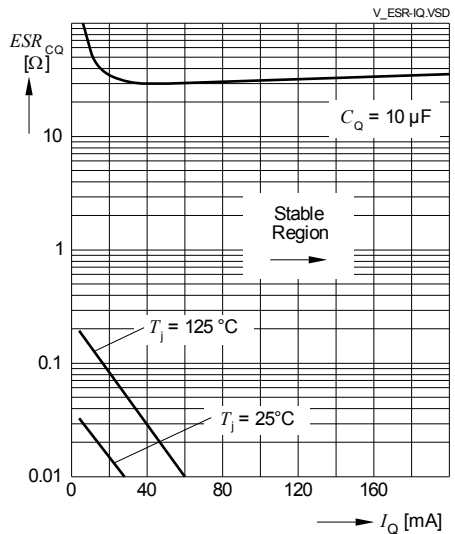
### Power Supply Ripple Rejection $PSRR$ versus Frequency $f$



### Region of Stability Version ME V33

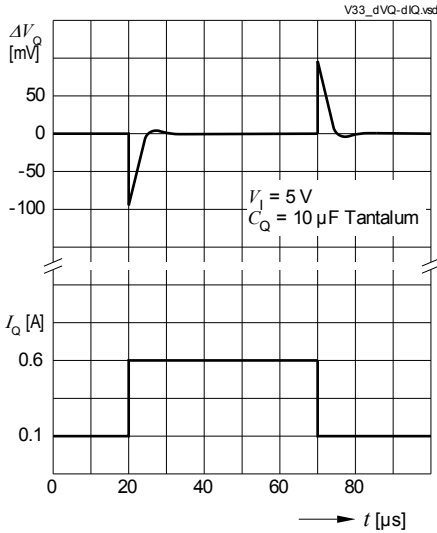


### Region of Stability Version ME V

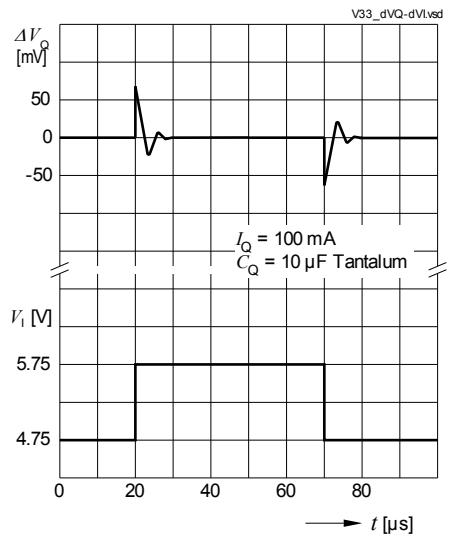


## Typical Performance Characteristics

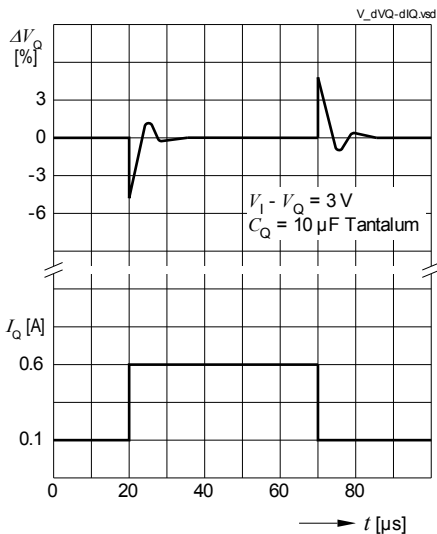
### Load Transient Response Version ME V33



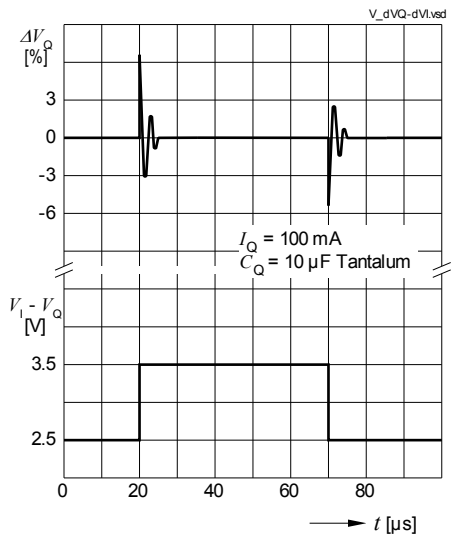
### Line Transient Response Version ME V33



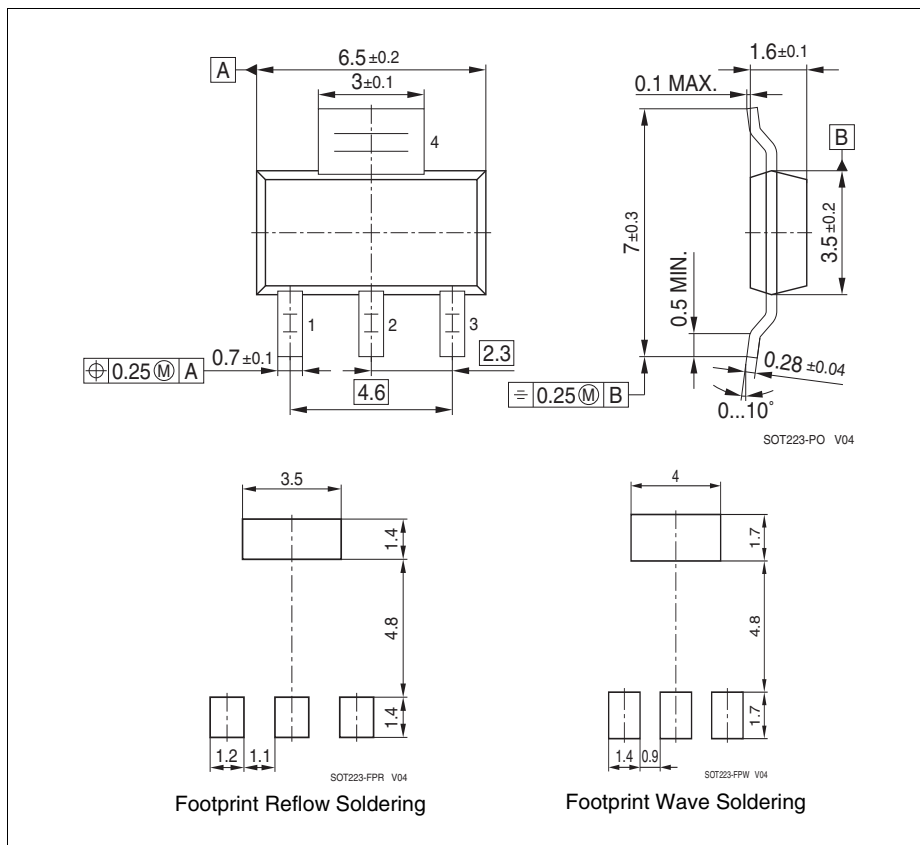
### Load Transient Response Version ME V



### Line Transient Response Version ME V



## Package Outline



**Figure 7 Outline and footprint PG-SOT223**

## 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).

You can find all of our packages, sorts of packing and others in our Infineon Internet Page "Products": <http://www.infineon.com/products>.

SMD = Surface Mounted Device

Dimensions in mm

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**Revision History**

| Version  | Date       | Changes    |
|----------|------------|------------|
| Rev. 1.0 | 2011-02-24 | Data Sheet |

**Edition 2011-02-24**

**Published by  
Infineon Technologies AG  
81726 Munich, Germany**

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