

### **Voltage Regulator**

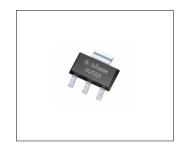
IFX1117

### **Data Sheet**



### **Features**

- Output voltage 3.3 V or adjustable
- 1.0 A output current
- Low drop voltage < 1.2 V @ 800 mA</li>
- 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 overtemperature.

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 (=  $V_{\rm Q} + V_{\rm DR}$ ) 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  $V_{\rm DR}$  ranges from 1.1 V to 1.4 V depending on the load current level.

The device operates in the temperature range of  $T_i = 0$  to 125 °C.

Туре	Package	Marking
IFX1117ME V33	PG-SOT223	111733
IFX1117ME V	PG-SOT223	1117V

Data Sheet 1 Rev. 1.0, 2011-02-24



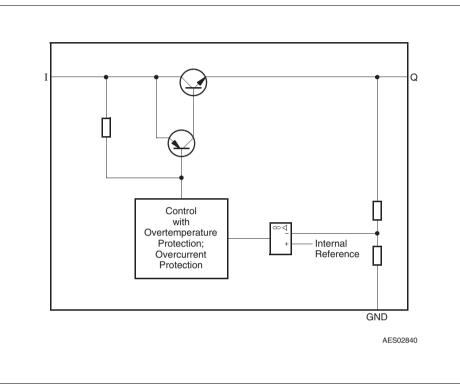


Figure 1 Block Diagram for Fixed Output Voltage IFX1117ME V33



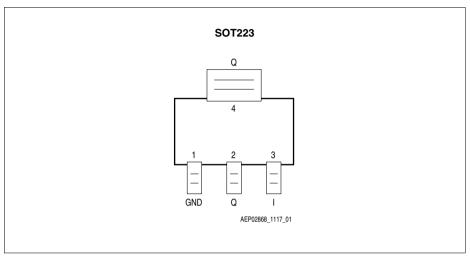


Figure 2 Pin Configuration IFX1117ME V33 (top view)

Table 1 Pin Definitions and Functions IFX1117ME V33

Pin No.	Symbol	Function
1	GND	Ground
2	Q	<b>Output;</b> Connect output pin to GND via a capacitor $C_{\rm Q} \ge 10~\mu{\rm F}$ with ESR $\le 20~\Omega$ (see also graph "Region of Stability")
3	I	Input
4 (TAB)	Q	Output; Connect to pin 2 and heatsink area on PCB



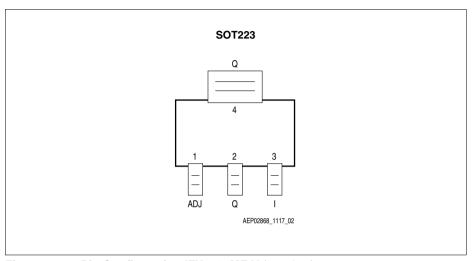


Figure 3 Pin Configuration IFX1117ME V (top view)

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 $C_Q \ge 10 \mu F$ with ESR $\le 20 \Omega$ (see also graph "Region of Stability").
3	I	Input
4 (TAB)	Q	Output; 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 Voltag	e Differen	ce (varial	ole device	only)	
Voltage	$V_{I}$ - $V_{Q}$	-0.3	20	V	_
Input Voltage (fixed v	oltage ve	rsion only	y)		
Voltage	$V_{I}$	-0.3	20	٧	_
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	$T_{\mathrm{stg}}$	-50	150	°C	_
Junction temperature	$T_{\rm j}$	-40	150	°C	_
Temperature Storage temperature				_	  -  -

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	٧	_
Junction temperature	$T_{j}$	0	125	°C	_
Table 5 Thermal	Resistance	е			
Junction ambient	$R_{\rm thja}$	_	164	K/W	PG-SOT223, footprint only.
		_	81	K/W	PG-SOT223, 300 mm² heat sink area
Junction case	$R_{ m thjc}$	_	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 °C <  $T_{\rm i}$  < 125 °C;  $V_{\rm i}$  = 5 V,  $I_{\rm Q}$  = 10 mA; unless otherwise specified.

Parameter	Symbol	Limit Values			Unit	Measuring Conditions
		min.	typ.	max.		
Output voltage	$V_{Q}$	3.23 5	3.300	3.36 5	٧	$0 \text{ mA} \le I_{\text{Q}} \le 800 \text{ mA} $ $4.7 \text{ V} \le V_{\text{I}} \le 10 \text{ V}$
Output voltage	$V_{Q}$	_	3.300	_	V	0 mA $\leq I_{\rm Q} \leq$ 1000 mA; 4.7 V $\leq V_{\rm I} \leq$ 15V
Line regulation	$\Delta V_{Q}$	_	1	6	mV	$4.7 \text{ V} \le V_{\text{I}} \le 15 \text{V}$
Load regulation	$\Delta V_{Q}$	_	1	10	mV	$0 \text{ mA} \le I_Q \le 800 \text{ mA};^{1)}$
		_	2	_	mV	$0 \text{ mA} \le I_{Q} \le 1.0 \text{ A}^{1)}$
Drop voltage	$V_{DR}$	_	1.00	1.10	V	$I_{\rm Q}$ = 100 mA <sup>2)</sup>
Drop voltage	$V_{DR}$	_	1.05	1.15	٧	$I_{\rm Q}$ = 500 mA <sup>2)</sup>
Drop voltage	$V_{DR}$	_	1.10	1.20	٧	$I_{\rm Q}$ = 800 mA <sup>2)</sup>
Drop voltage	$V_{DR}$	_	1.30	1.40	٧	$I_{\rm Q}$ = 1.0 A <sup>2)</sup>
Current consumption; $I_{q} = I_{l} - I_{Q}$	$I_{q}$	_	5	10	mA	$I_{\rm Q}$ = 10 mA
Temperature stability	$\Delta V_{Q}$	_	16.5	_	mV	3)
Long Term Stability	_	_	0.3	_	%	3)
Current limit	$I_{Qmax}$	1100	_	2250	mA	$V_{\rm Q} = 0.5 \; { m V}$
RMS Output Noise	_	_	30	_	ppm	ppm of $V_{\rm Q}$ , $T_{\rm j}$ = 25 °C 10 Hz $\leq$ $f$ $\leq$ 10 kHz <sup>3)</sup>
Power Supply Ripple Rejection	PSRR	60	65	_	dB	$f_{\rm r}$ = 120 Hz, $V_{\rm r}$ = 1 $V_{\rm PP}^{3)}$

<sup>1)</sup> Measured at constant junction temperature

<sup>2)</sup> Drop voltage measured when the output voltage has dropped 100 mV from the nominal value obtained at  $V_{\rm I} = 5.0$  V.

<sup>3)</sup> Specified by design; not subject to production test.



# Characteristics Adjustable Output Voltage Device IFX1117ME V 0 °C < $T_{\rm i}$ < 125 °C; $V_{\rm i}$ = 5 V, $I_{\rm Q}$ = 10 mA; unless otherwise specified.

Parameter	Symbol	Limit Values			Unit	Measuring Conditions
		min.	typ.	max.		
Reference voltage	$V_Q$	1.22 5	1.250	1.27 0	٧	10 mA $\leq I_{\rm Q} \leq$ 800 mA; 1.4 V $\leq (V_{\rm   ^{\rm -}}V_{\rm Q}) \leq$ 10 V
Output voltage	$V_Q$	_	1.250	_	٧	10 mA $\leq I_{\rm Q} \leq$ 1000 mA; 2.65 V $\leq V_{\rm I} \leq$ 15 V
Line regulation	$\Delta V_Q$	_	0.035	0.2	% <sup>1)</sup>	$1.5 \text{ V} \le (V_{\text{I}} - V_{\text{Q}}) \le 13.75 \text{ V}$
Load regulation	$\Delta V_Q$	_	0.2	0.4	% <sup>1)</sup>	10 mA $\leq I_Q \leq$ 800 mA; <sup>2)</sup>
		_	0.25	_	% <sup>1)</sup>	10 mA $\leq$ $I_{\rm Q}$ $\leq$ 1.0 A $^{2)}$
Drop voltage	$V_{DR}$	_	1.00	1.10	٧	$I_{\rm Q}$ = 100 mA <sup>3)</sup>
Drop voltage	$V_{DR}$	_	1.05	1.15	٧	$I_{\rm Q}$ = 500 mA <sup>3)</sup>
Drop voltage	$V_{DR}$	_	1.10	1.20	٧	$I_{\rm Q}$ = 800 mA <sup>3)</sup>
Drop voltage	$V_{DR}$	_	1.30	1.40	٧	$I_{\rm Q}$ = 1.0 A $^{3)}$
Minimum Load Current <sup>4)</sup>	$I_q$	_	1.7	5.0	mA	V <sub>I</sub> = 15 V
Adjust Current	$I_{ADJ}$	_	100	120	μΑ	$I_{\rm Q}$ = 10 mA
Adjust Current Change	$\Delta I_{ADJ}$	_	2	5	μΑ	1.4 V $\leq$ ( $V_{\rm l}$ - $V_{\rm Q}$ ) $\leq$ 13.6 V; 10 mA $\leq$ $I_{\rm Q}$ $\leq$ 800 mA
Temperature stability	$\Delta V_Q$	_	0.5	_	%1)	5)
Long Term Stability	_	_	0.3	_	% <sup>1)</sup>	5)
Current limit	$I_{Qmax}$	1100	_	2250	mA	$V_{\rm Q} = 0.5 \; {\rm V}$
RMS Output Noise	_	_	30	_	ppm	ppm of $V_{\rm Q}$ , $T_{\rm j}$ = 25 °C 10 Hz $\leq$ $f$ $\leq$ 10 kHz $^{5)}$
Power Supply Ripple Rejection	PSRR	65	70	_	dB	$f_{\rm r}$ = 120 Hz, $V_{\rm r}$ = 1 $V_{\rm PP}$ 5)

<sup>1)</sup> Related to  $V_{\rm O}$ 

<sup>2)</sup> Measured at constant junction temperature

<sup>3)</sup> Drop voltage measured when the output voltage has dropped 100 mV from the nominal value obtained at  $V_{\rm I}$  = 5.0 V.

<sup>4)</sup> Minimum load current required to maintain regulation

<sup>5)</sup> Specified by design; not subject to production test.



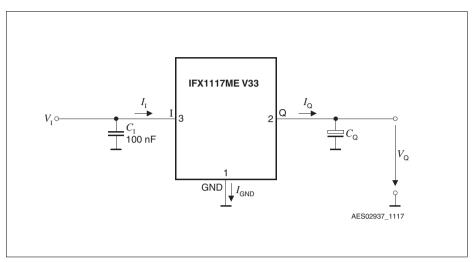


Figure 4 Measuring Circuit

## **Application Information**

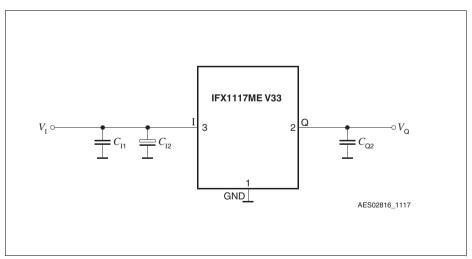


Figure 5 Typical Application Circuit IFX1117ME V33



### Output

The IFX1117 requires a 10  $\mu$ F output capacitor with 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:

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

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  $\mu$ F is suggested.

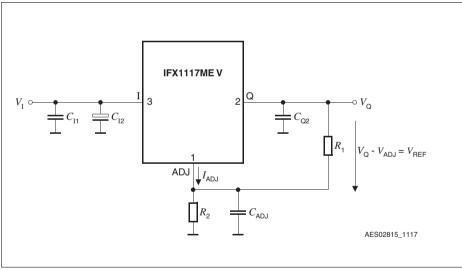
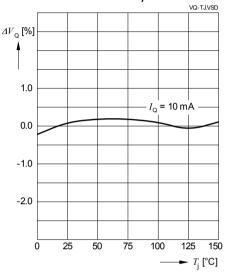


Figure 6 Typical Application Circuit IFX1117ME V

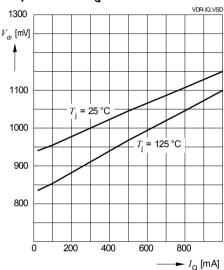


### **Typical Performance Characteristics**

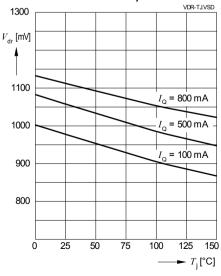
# Output Voltage $V_{\rm Q}$ versus Junction Temperature $T_{\rm i}$



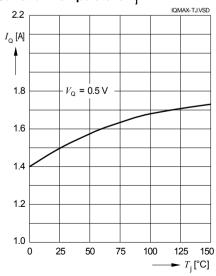
## Dropout Voltage $V_{\mathrm{dr}}$ versus Output Current $I_{\mathrm{O}}$



# Dropout Voltage $V_{ m dr}$ versus Junction Temperature $T_{ m i}$



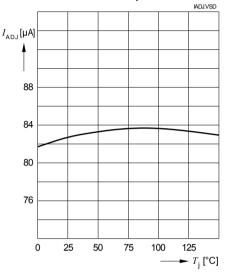
# $\begin{tabular}{ll} {\bf Maximum~Output~Current~$I_{\rm Q}$ versus} \\ {\bf Junction~Temperature~$T_{\rm i}$} \end{tabular}$



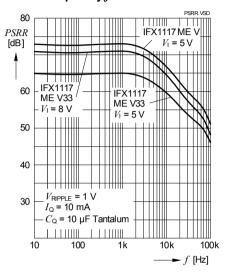


### **Typical Performance Characteristics**

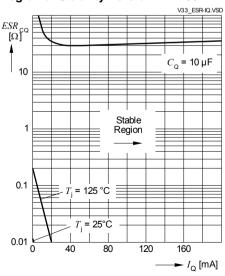
# Adjust Pin Current $I_{\mathrm{ADJ}}$ versus Junction Temperature $T_{\mathrm{i}}$



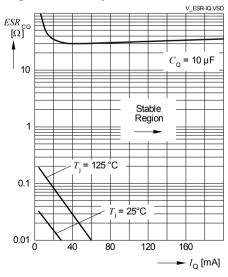
## Power Supply Ripple Rejection PSRR versus Frequency f



### Region of Stability Version ME V33



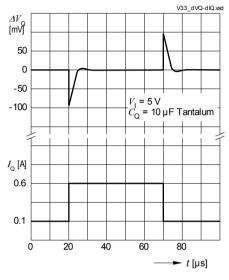
### Region of Stability Version ME V



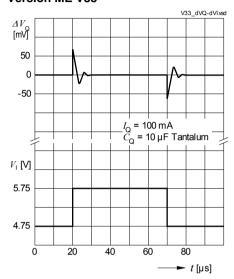


### **Typical Performance Characteristics**

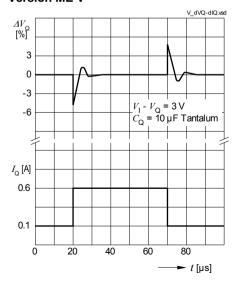
### Load Transient Response Version ME V33



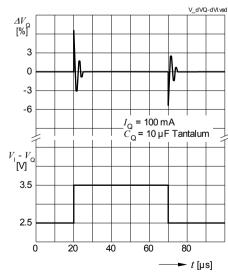
### Line Transient Response Version ME V33



### Load Transient Response Version ME V



### Line Transient Response Version ME V





### **Package Outline**

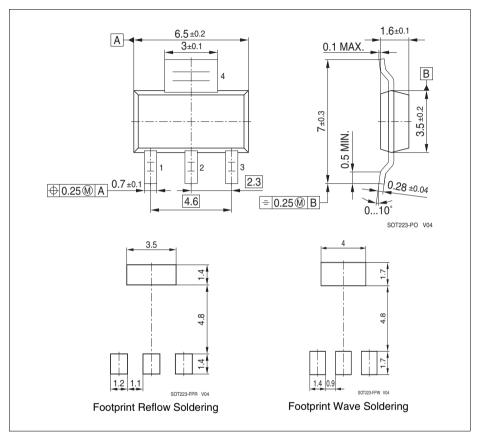


Figure 7 Outline and footprint PG-SOT223

### **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



## **Revision History**

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

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