Never stop thinking

IFX8117

1A Low-Dropout Linear Voltage Regulator

IFX8117MEV
IFX8117MEV33
IFX8117MEV50

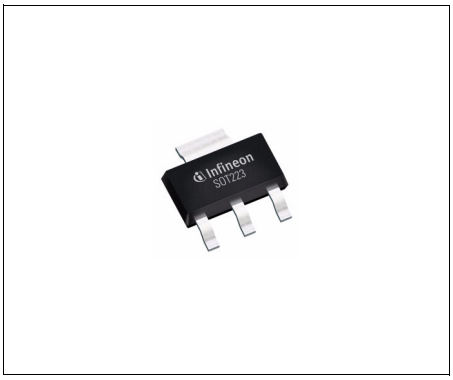
Data Sheet

Rev. 1.01, 2010-07-02

Standard Power

RoHS

1 Overview



PG-SOT223-4

Features

- 5 V, 3.3 V and Adjustable Voltage Versions
- SOT-223 Package
- Output Current Limitation and Overtemperature Shutdown
- Output Current up to 1A
- Temperature Range 0 °C to 125 °C
- Line Regulation max. 0.2 %
- Load Regulation max. 0.4 %
- “1117” and “8117” Pin Compatible
- Green Product (RoHS compliant)

Applications

- Post Regulator for Switching DC/DC Converter
- High Efficiency Linear Regulators
- Battery Charger
- Battery Powered Instrumentation
- 5 V to 3.3 V Linear Regulators
- USB Hubs
- Routers, ISDN/DSL Modems
- Active SCSI Terminators

General Description

The IFX8117 is a family of low dropout voltage regulators with a dropout voltage of 1.2 V at 1 A of load current. It is available as adjustable version (IFX8117MEV), providing output voltages from 1.25 V to 13.8 V, configured by two external resistors. Additionally, the IFX8117 is also available in two fixed voltages, 5 V (IFX8117MEV50) and 3.3 V (IFX8117MEV33).

The IFX8117 implements protection features such as output current limitation and overtemperature shutdown. A highly precise bandgap reference trimmed in production assures output voltage accuracy to within ±1 %.

The IFX8117 family comes in the PG-SOT223-4 package. To improve the transient response and the stability, a minimum of 10 µF tantalum capacitor is required at the output.

Type	Package	Marking
IFX8117MEV	PG-SOT223-4	8117AD
IFX8117MEV33	PG-SOT223-4	8117V3
IFX8117MEV50	PG-SOT223-4	8117V5

2 Typical Application

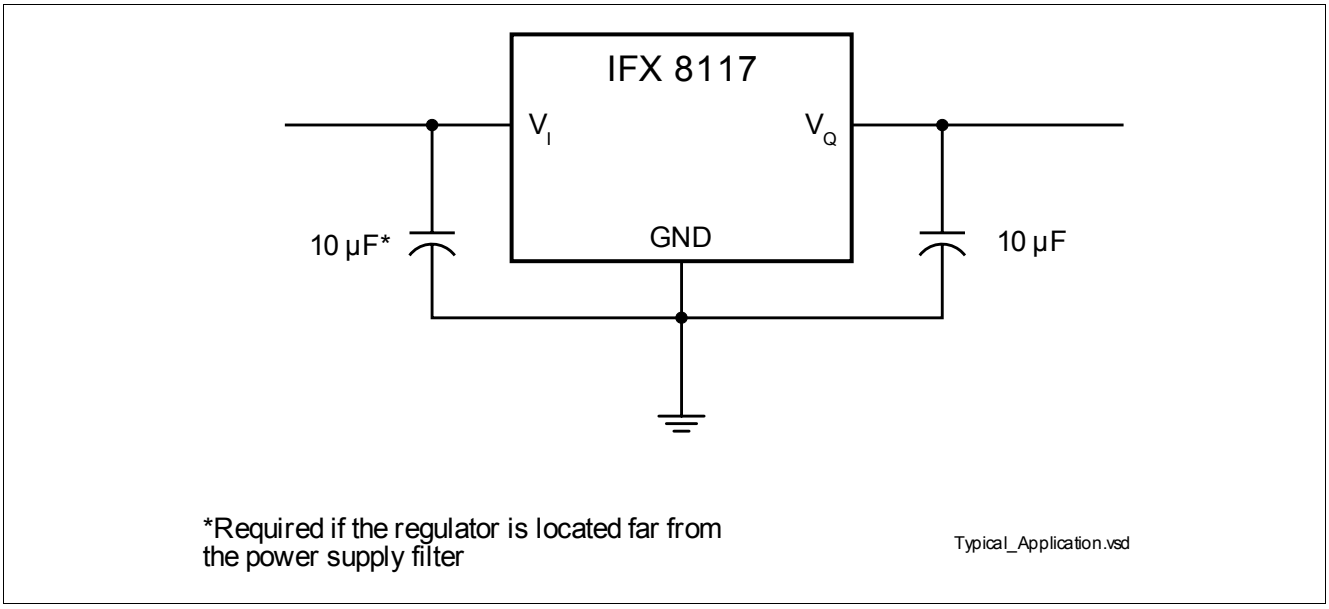


Figure 1 Typical Application

3 Block Diagram

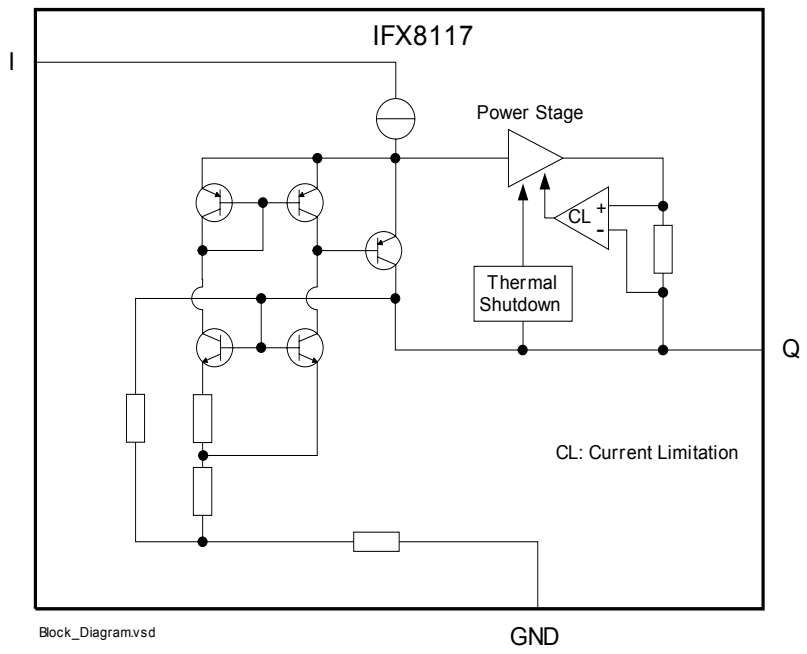


Figure 2 Block Diagram (fixed voltage versions IFX8117MEV33 and IFX8117MEV50)

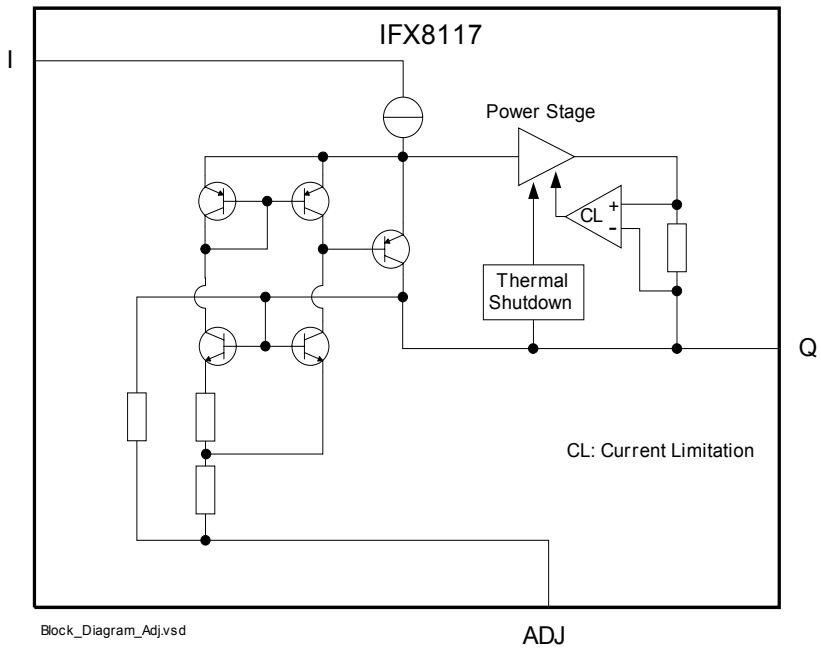


Figure 3 Block Diagram (adjustable voltage version IFX8117MEV)

4 Pin Configuration

4.1 Pin Assignment Fixed Voltage Versions IFX8117MEV33 and IFX8117MEV50

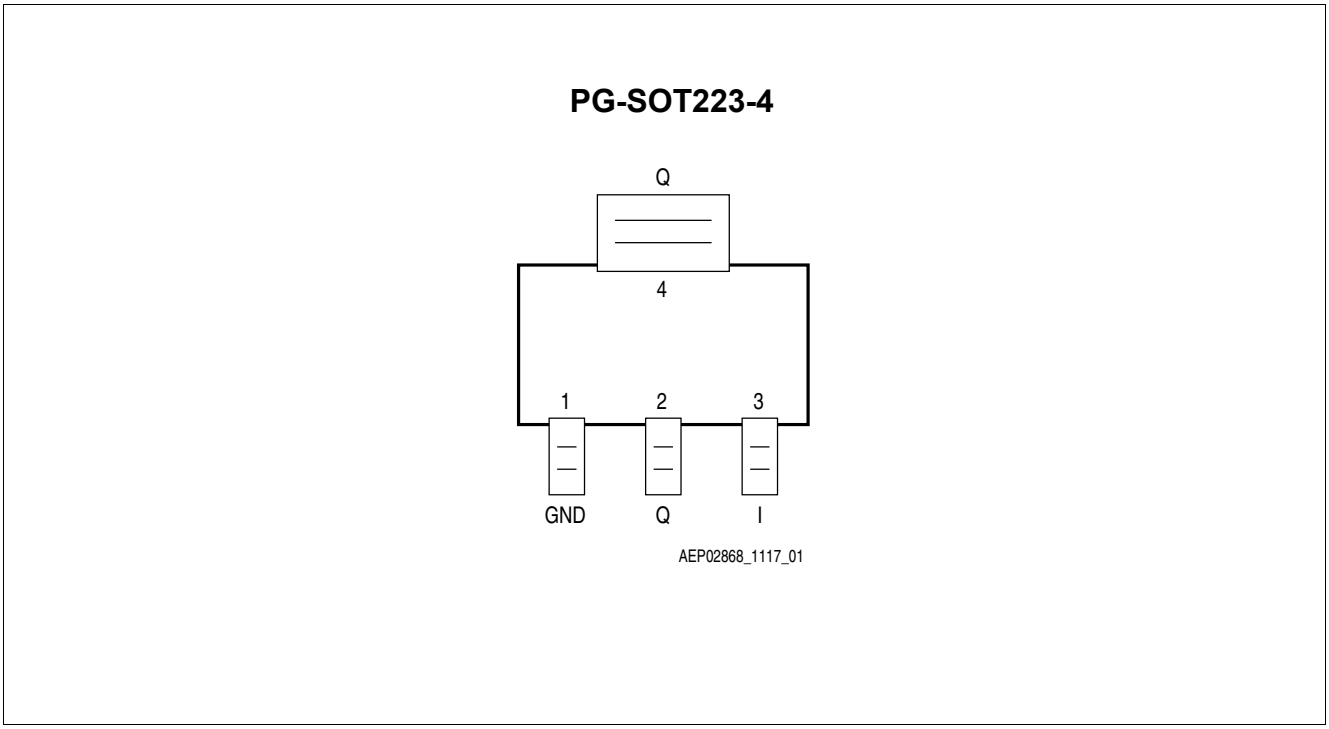


Figure 4 Pin Assignment IFX8117MEV33 and IFX8117MEV50 (top view)

4.2 Pin Definitions and Functions Fixed Voltage Versions IFX8117MEV33 and IFX8117MEV50

Pin	Symbol	Function
1	GND	**Ground**
2	Q	**Output** block to GND with a capacitor close to the IC terminals, respecting the values given for its capacitance C_Q and ESR in the table **"Functional Range" on Page 8**
3	I	**Input** for compensating line influences, a capacitor to GND close to the IC terminals is recommended
4 (Tab)	Q	**Output** connect to pin 2; connect to heatsink area

4.3 Pin Assignment Adjustable Voltage Version IFX8117MEV

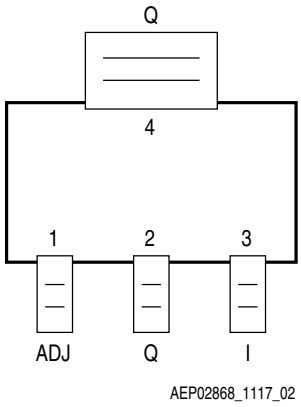


Figure 5 Pin Assignment IFX8117MEV (top view)

4.4 Pin Definitions and Functions Fixed Voltage Version IFX8117MEV

Pin	Symbol	Function
1	ADJ	**Adjust** connect to a voltage divider between Q and GND, see **“External Resistor Divider (Adjustable Version IFX8117MEV only)” on Page 16**
2	Q	**Output** block to GND with a capacitor close to the IC terminals, respecting the values given for its capacitance C_Q and ESR in the table **“Functional Range” on Page 8**
3	I	**Input** for compensating line influences, a capacitor to GND close to the IC terminals is recommended
4 (Tab)	Q	**Output** connect to pin 2; connect to heatsink area

5 General Product Characteristics

5.1 Absolute Maximum Ratings

Absolute Maximum Ratings [1)]

$0°C \leq T_j \leq 125\ °C$; all voltages with respect to ground, positive current flowing into pin (unless otherwise specified)

Pos.	Parameter	Symbol	Limit Values		Unit	Conditions
			Min.	Max.		
Input (fixed voltage version only)						
5.1.1	Voltage	V_I	-0.3	20	V	–
Input (adjustable voltage version only)						
5.1.2	Voltage	V_I - V_Q	-0.3	20	V	–
Output						
5.1.3	Voltage	V_Q	-0.3	20	V	IFX8117MEV33 IFX8117MEV50
5.1.4	Voltage	V_Q - V_{ADJ}	-0.3	6	V	IFX8117MEV
Temperature						
5.1.5	Junction Temperature	T_j	-40	150	°C	–
5.1.6	Storage Temperature	T_{stg}	-50	150	°C	–
Electrostatic Discharge ESD						
5.1.7	ESD	$V_{ESD,HBM}$	-3	3	kV	Human Body Model (HBM)[2)]
5.1.8		$V_{ESD,CDM}$	-1	1	kV	Charge Device Model (CDM)[3)]

1) Not subject to production test, specified by design.

2) ESD susceptibility, HBM according to EIA/JESD 22-A114B

3) ESD susceptibility, CDM EIA/JESD22-C101 or 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.

5.2 Functional Range

Pos.	Parameter	Symbol	Limit Values		Unit	Conditions
			Min.	Max.		
5.2.1	Input Voltage	V_I	$V_Q + V_{DR}$	15	V	IFX8117MEV
			4.55	15	V	IFX8117MEV33
			6.25	15	V	IFX8117MEV50
5.2.2	Output Capacitor's Requirements for Stability	C_Q	10	–	µF	–
		$ESR(C_Q)$	0.5	5	Ω	–
5.2.3	Junction Temperature	T_j	0	125	°C	–

Note: Within the functional range the IC operates as described in the circuit description. The electrical characteristics are specified within the conditions given in the related electrical characteristics table.

5.3 Thermal Resistance

Pos.	Parameter	Symbol	Limit Values			Unit	Conditions
			Min.	Typ.	Max.		
5.3.1	Junction to Soldering Point[1)]	R_{thSP}	–	15	–	K/W	measured to Pin 4 (Tab)
5.3.2	Junction to Ambient[1)]	R_{thJA}	–	51	–	K/W	[2)]
5.3.3			–	146	–	K/W	Footprint only[3)]
5.3.4			–	75	–	K/W	300mm^2 heatsink area on PCB[3)]
5.3.5			–	63	–	K/W	600mm^2 heatsink area on PCB[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 mm board with 2 inner copper layers (2 x 70µm Cu, 2 x 35µm Cu). Where applicable a thermal via array under the heat slug 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 mm^3 board with 1 copper layer (1 x 70µm Cu).

5.4 Electrical Characteristics

Electrical Characteristics Adjustable Version IFX8117MEV

0 °C ≤ T_j ≤ 125 °C, all voltages with respect to ground, positive current flowing into pin (unless otherwise specified)

Pos.	Parameter	Symbol	Limit Values			Unit	Conditions
			Min.	Typ.	Max.		
5.4.1	Reference Voltage	V_{Ref}	1.238	1.250	1.262	V	I_Q = 10 mA V_I - V_Q = 2 V T_J = 25 °C
			1.225	1.250	1.270	V	10 mA < I_Q < 1 A 1.4 V < V_I - V_Q < 10 V
5.4.2	Line Regulation[1]	$\Delta V_{Q,line}$	–	0.035	0.2	% of V_Q	I_Q = 10 mA 1.5 V < V_I - V_Q < 13.75 V
5.4.3	Load Regulation[1]	$\Delta V_{Q,load}$	–	0.2	0.4	% of V_Q	V_I - V_Q = 3 V 10 mA < I_Q < 1 A
5.4.4	Dropout Voltage[2] V_{dr} = V_I - V_Q	V_{dr}	–	1.1	1.15	V	I_Q = 100 mA
			–	1.15	1.2	V	I_Q = 500 mA
			–	1.2	1.25	V	I_Q = 1 A
5.4.5	Output Current Limitation	$I_{Q,max}$	1.0	1.4	1.9	A	V_I - V_Q = 5 V T_J = 25 °C
5.4.6	Minimum Load Current[3]	$I_{Q,min}$	–	0.4	5	mA	V_I = 15 V
5.4.7	Thermal Regulation	$\Delta V_{Q,power}$	–	0.01	0.1	% of V_Q per 1 W	T_A = 25 °C 30 ms pulse
5.4.8	Power Supply Ripple Rejection[4]	$PSRR$	60	75	–	dB	V_I - V_Q = 3 V f_{ripple} = 120 Hz V_{ripple} = 1 V_{pp}
5.4.9	Adjust Pin Current	I_{ADJ}	10	30	50	µA	–
5.4.10	Adjust Pin Current Change	ΔI_{ADJ}	–	0.2	5	µA	10 mA < I_Q < 1 A 1.4 V < V_I - V_Q < 10 V
5.4.11	Temperature Stability[4]	$\Delta V_{Q,temp}$	–	0.5	–	% of V_Q	–
5.4.12	Long Term Stability[4]	$\Delta V_{Q,1000h}$	–	0.3	–	% of V_Q	T_A = 125 °C 1000h
5.4.13	RMS Output Noise[4]	$V_{Q,RMS}$	–	0.003	–	% of V_Q	10 Hz < f < 10 kHz

1) Measured at constant junction temperature
2) Measured when the output voltage V_Q has dropped 100mV from the nominal value obtained at V_I = V_Q + 1.5 V
3) Minimum output current required to maintain regulation
4) Not subject to production test, specified by design

Electrical Characteristics 3.3 V Version IFX8117MEV33

0 °C ≤ T_j ≤ 125 °C, all voltages with respect to ground, positive current flowing into pin (unless otherwise specified)

Pos.	Parameter	Symbol	Limit Values			Unit	Conditions
			Min.	Typ.	Max.		
5.4.14	Output Voltage	V_Q	3.267	3.300	3.333	V	I_Q = 10 mA V_I = 5 V T_J = 25 °C
			3.235	3.300	3.365	V	0 mA < I_Q < 1 A 4.75 V < V_I < 10 V
5.4.15	Line Regulation[1]	$\Delta V_{Q,line}$	–	1	6	mV	I_Q = 0 mA 4.75 V < V_I < 15 V
5.4.16	Load Regulation[1]	$\Delta V_{Q,load}$	–	0.2	0.4	% of V_Q	V_I = 4.75 V 0 mA < I_Q < 1 A
5.4.17	Dropout Voltage[2] V_{dr} = V_I - V_Q	V_{dr}	–	1.1	1.15	V	I_Q = 100 mA
			–	1.15	1.2	V	I_Q = 500 mA
			–	1.2	1.25	V	I_Q = 1 A
5.4.18	Output Current Limitation	$I_{Q,max}$	1.0	1.4	1.9	A	V_I - V_Q = 5 V T_J = 25 °C
5.4.19	Quiescent Current	I_q	–	5	10	mA	V_I = 15 V
5.4.20	Thermal Regulation	$\Delta V_{Q,power}$	–	0.01	0.1	% of V_Q per 1 W	T_A = 25 °C 30 ms pulse
5.4.21	Power Supply Ripple Rejection[3]	$PSRR$	60	75	–	dB	V_I - V_Q = 3 V f_{ripple} = 120 Hz V_{ripple} = 1 V_{pp}
5.4.22	Temperature Stability[3]	$\Delta V_{Q,temp}$	–	0.5	–	% of V_Q	–
5.4.23	Long Term Stability[3]	$\Delta V_{Q,1000h}$	–	0.3	–	% of V_Q	T_A = 125 °C 1000h
5.4.24	RMS Output Noise[3]	$V_{Q,RMS}$	–	0.003	–	% of V_Q	10 Hz < f < 10 kHz

1) Measured at constant junction temperature

2) Measured when the output voltage V_Q has dropped 100mV from the nominal value obtained at V_I = V_Q + 1.5 V

3) Not subject to production test, specified by design

Electrical Characteristics 5 V Version IFX8117MEV50

0 °C ≤ T_j ≤ 125 °C, all voltages with respect to ground, positive current flowing into pin (unless otherwise specified)

Pos.	Parameter	Symbol	Limit Values			Unit	Conditions
			Min.	Typ.	Max.		
5.4.25	Output Voltage	V_Q	4.950	5.000	5.050	V	I_Q = 10 mA V_I = 7 V T_J = 25 °C
			4.900	5.000	5.100	V	0 mA < I_Q < 1 A 6.5 V < V_I < 10 V
5.4.26	Line Regulation[1]	$\Delta V_{Q,line}$	–	1	6	mV	I_Q = 0 mA 6.5 V < V_I < 15 V
5.4.27	Load Regulation[1]	$\Delta V_{Q,load}$	–	0.2	0.4	% of V_Q	V_I = 6.5 V 0 mA < I_Q < 1 A
5.4.28	Dropout Voltage[2] V_{dr} = V_I - V_Q	V_{dr}	–	1.1	1.15	V	I_Q = 100 mA
			–	1.15	1.2	V	I_Q = 500 mA
			–	1.2	1.25	V	I_Q = 1 A
5.4.29	Output Current Limitation	$I_{Q,max}$	1.0	1.4	1.9	A	V_I - V_Q = 5 V T_J = 25 °C
5.4.30	Quiescent Current	I_q	–	5	10	mA	V_I = 15 V
5.4.31	Thermal Regulation	$\Delta V_{Q,power}$	–	0.01	0.1	% of V_Q per 1 W	T_A = 25 °C 30 ms pulse
5.4.32	Power Supply Ripple Rejection[3]	$PSRR$	60	75	–	dB	V_I - V_Q = 3 V f_{ripple} = 120 Hz V_{ripple} = 1 V_{pp}
5.4.33	Temperature Stability[3]	$\Delta V_{Q,temp}$	–	0.5	–	% of V_Q	–
5.4.34	Long Term Stability[3]	$\Delta V_{Q,1000h}$	–	0.3	–	% of V_Q	T_A = 125 °C 1000h
5.4.35	RMS Output Noise[3]	$V_{Q,RMS}$	–	0.003	–	% of V_Q	10 Hz < f < 10 kHz

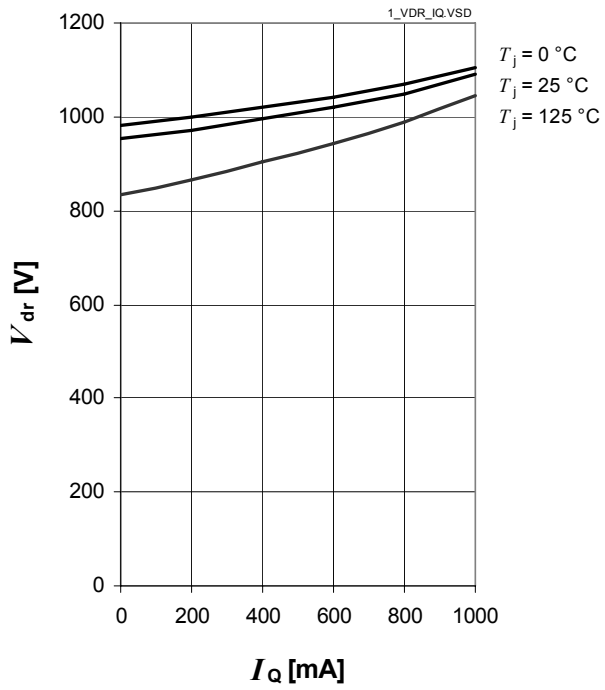
1) Measured at constant junction temperature

2) Measured when the output voltage V_Q has dropped 100mV from the nominal value obtained at V_I = V_Q + 1.5 V

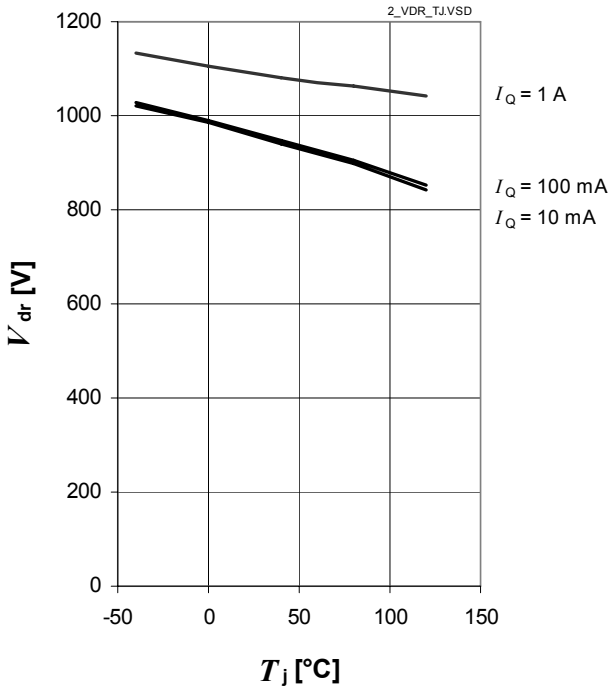
3) Not subject to production test, specified by design

5.5 Typical Performance Characteristics

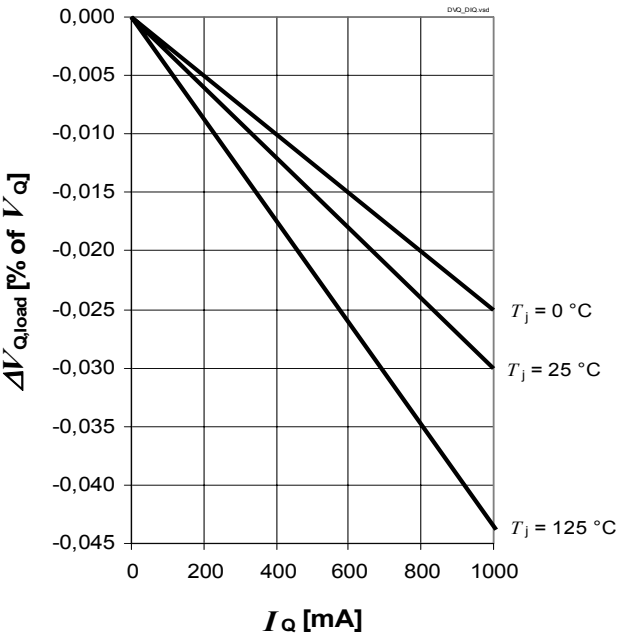
Dropout Voltage V_{dr} versus Output Current I_Q



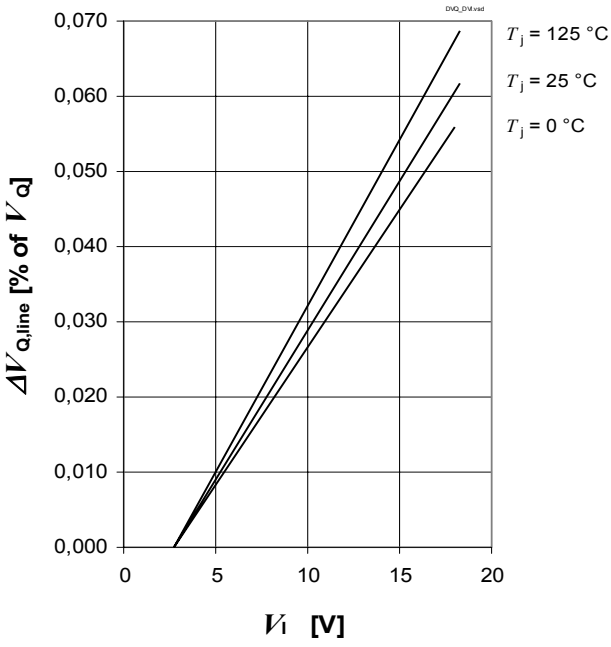
Dropout Voltage V_{dr} versus Junction Temperature T_j



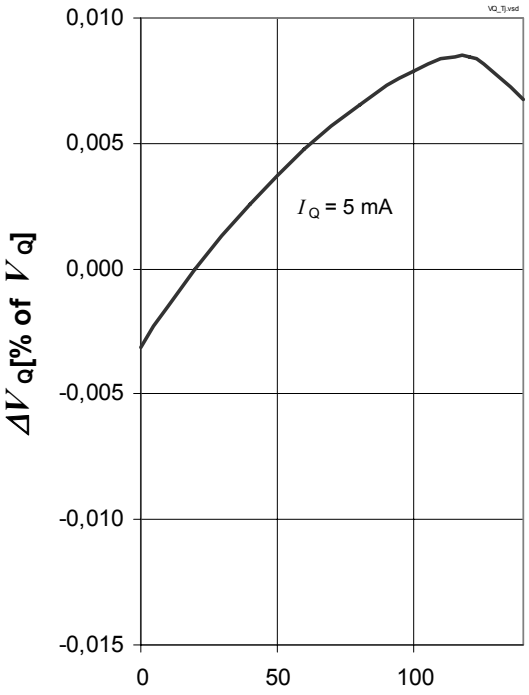
Load Regulation $\Delta V_{Q,load}$ versus ΔI_Q



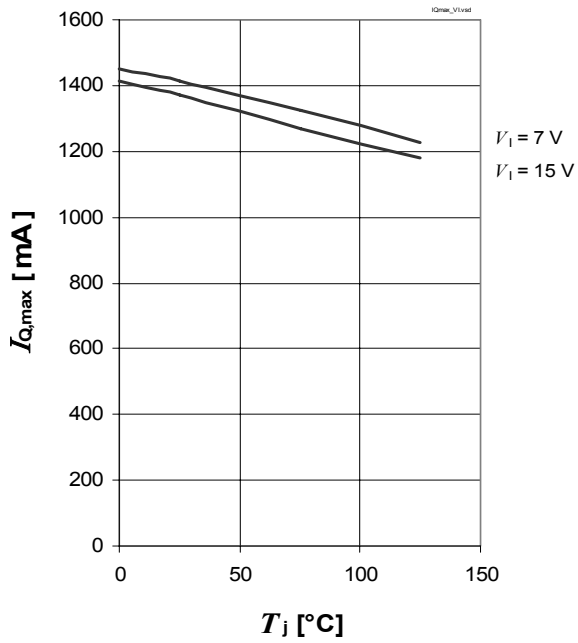
Line Regulation $\Delta V_{Q,line}$ versus ΔV_I



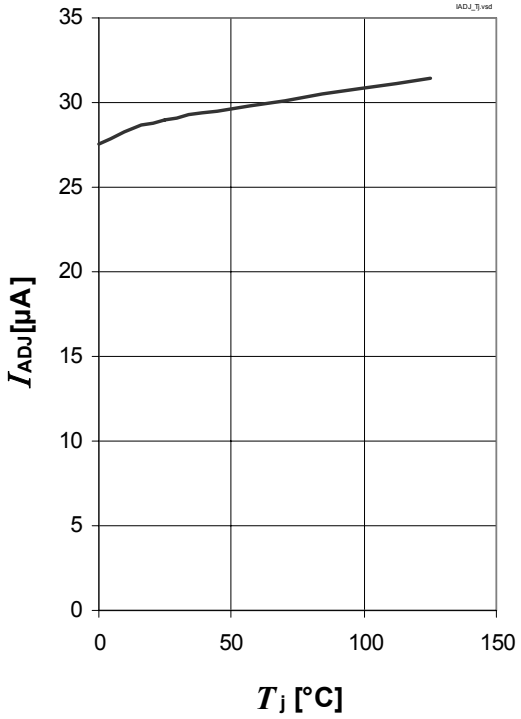
Temperature Stability
ΔV_Q versus T_j



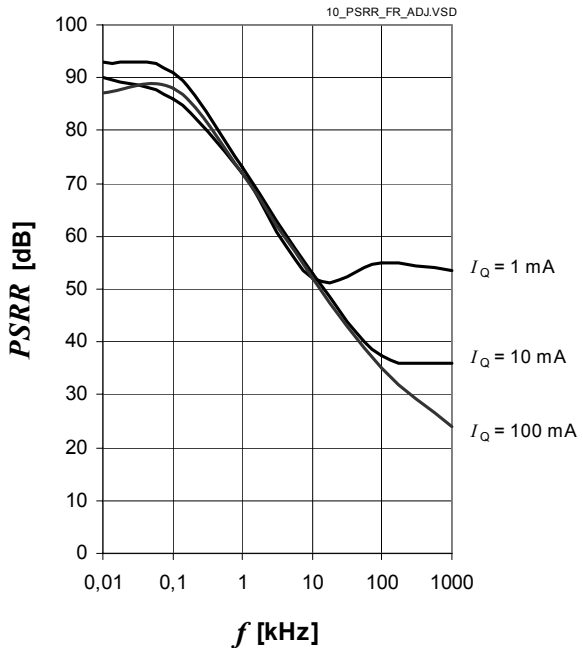
Current Limit
$I_{Q,max}$ versus V_I



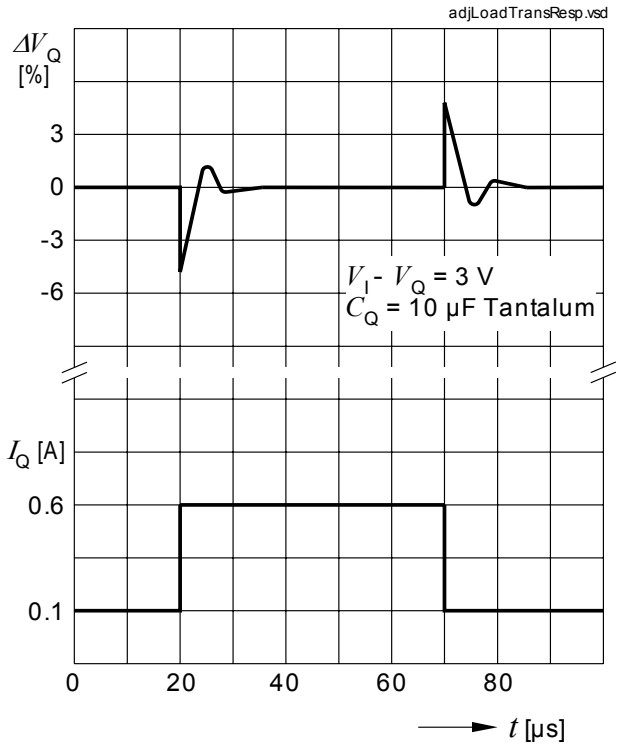
IFX8117MEV (adjustable) Adjust Pin Current
I_{ADJ} versus T_J



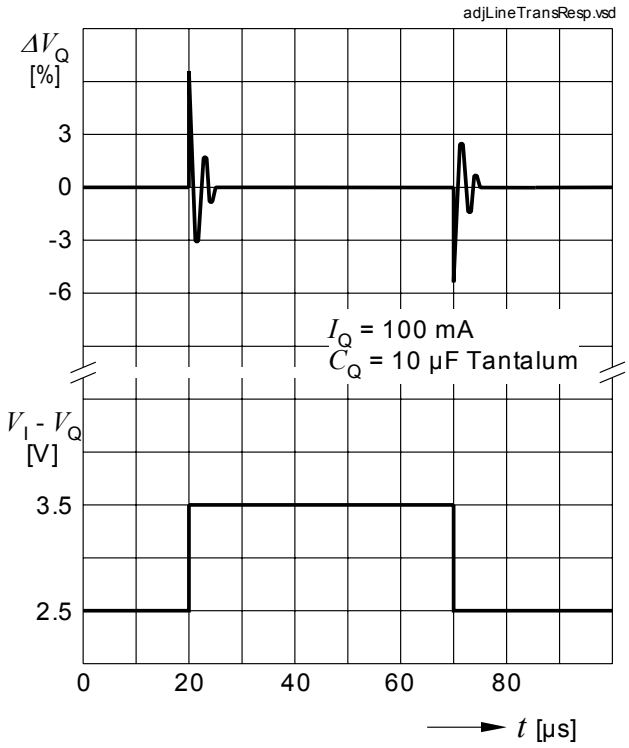
IFX8117MEV (adj.) Power Supply Ripple Rejection
$PSRR$ versus f_r



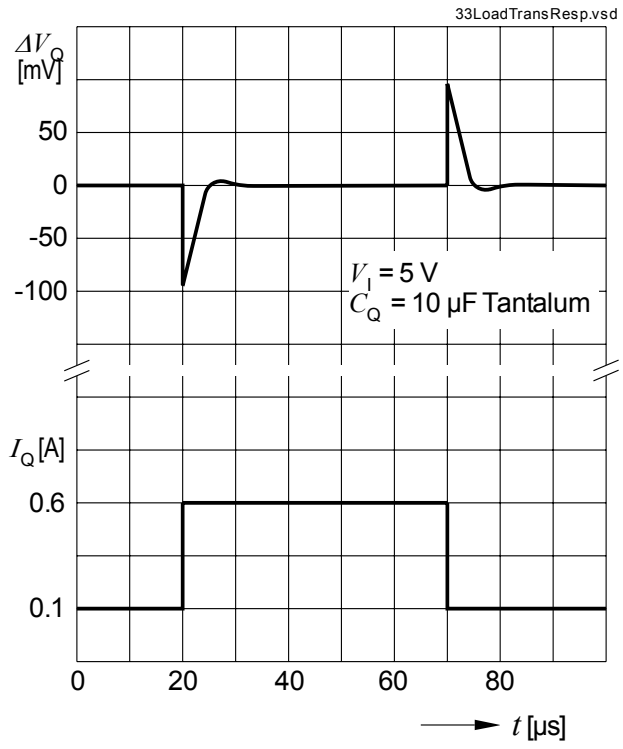
IFX8117MEV (adj.) Load Transient Response



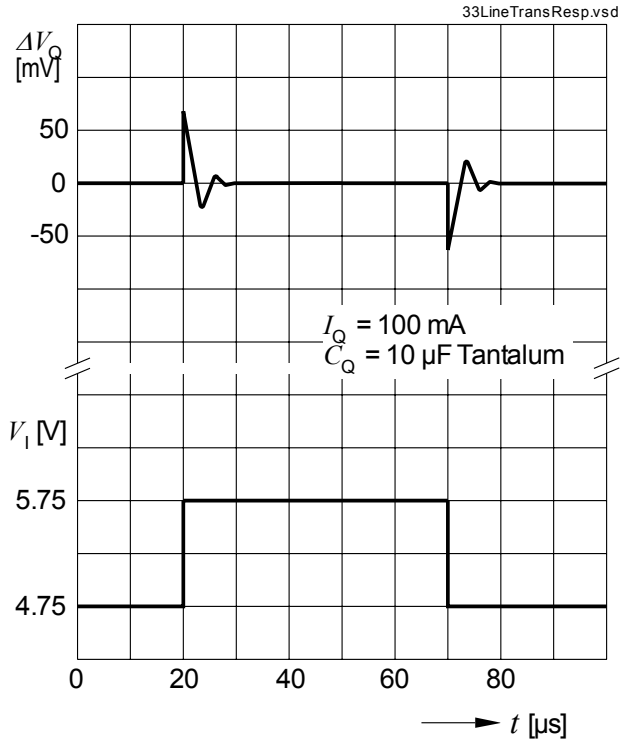
IFX8117MEV (adj.) Line Transient Response



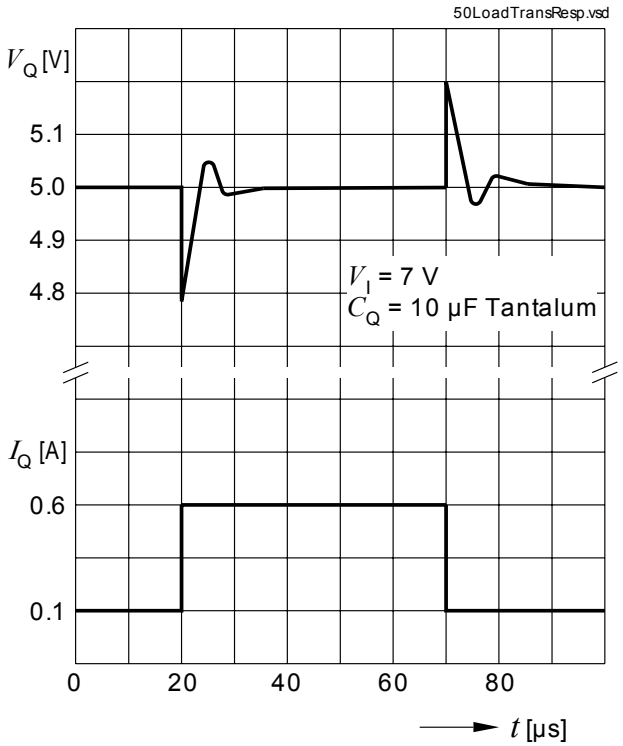
IFX8117MEV33 (3.3 V) Load Transient Response



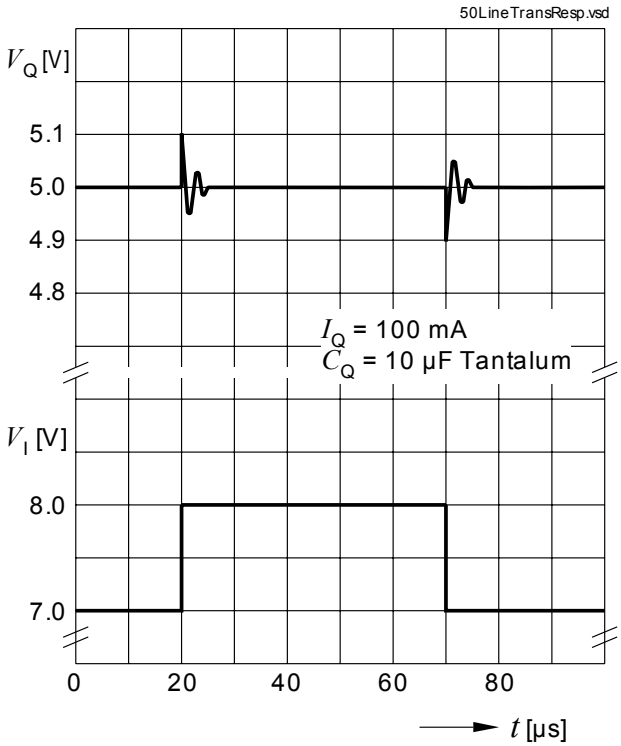
IFX8117MEV33 (3.3 V) Line Transient Response



IFX8117MEV50 (5 V) Load Transient Response



IFX8117MEV50 (5 V) Line Transient Response



6 Application Hints

6.1 External Components

Input Capacitor

An input capacitor is recommended to compensate line influences. As a minimum a 100 nF ceramic input capacitor should be used to filter high frequency noise. For buffering line transients a capacitance of 10µF is suggested.

Output Capacitor

The output capacitor is part of the regulation loop of the regulator and therefore important to maintain stability. It must meet the required conditions for minimum capacitance value and maximum value of equivalent series resistance (ESR) as given in **"Functional Range" on Page 8**. An increase of the output capacitance will improve the transient response and the loop stability. To achieve low voltage drops at load transients, tantalum capacitors are recommended.

External Resistor Divider (Adjustable Version IFX8117MEV only)

The IFX8117MEV adjustable version develops a 1.25 V reference voltage, V_{Ref}, between the output Q and the adjust terminal ADJ. As shown in **Figure 6**, this voltage is applied across resistor R_1 to generate a constant current I_1. The current I_{ADJ} from the adjust terminal could introduce error to the output. But since it is very small (50µA) compared to the I_1 and very constant with line and load changes, the error can be ignored. The constant current I_1 then flows through the output set resistor R_2 and sets the output voltage to the desired level.

At the fixed voltage devices IFX8117MEV33 and IFX8117MEV50 the resistor divider is integrated inside the device.

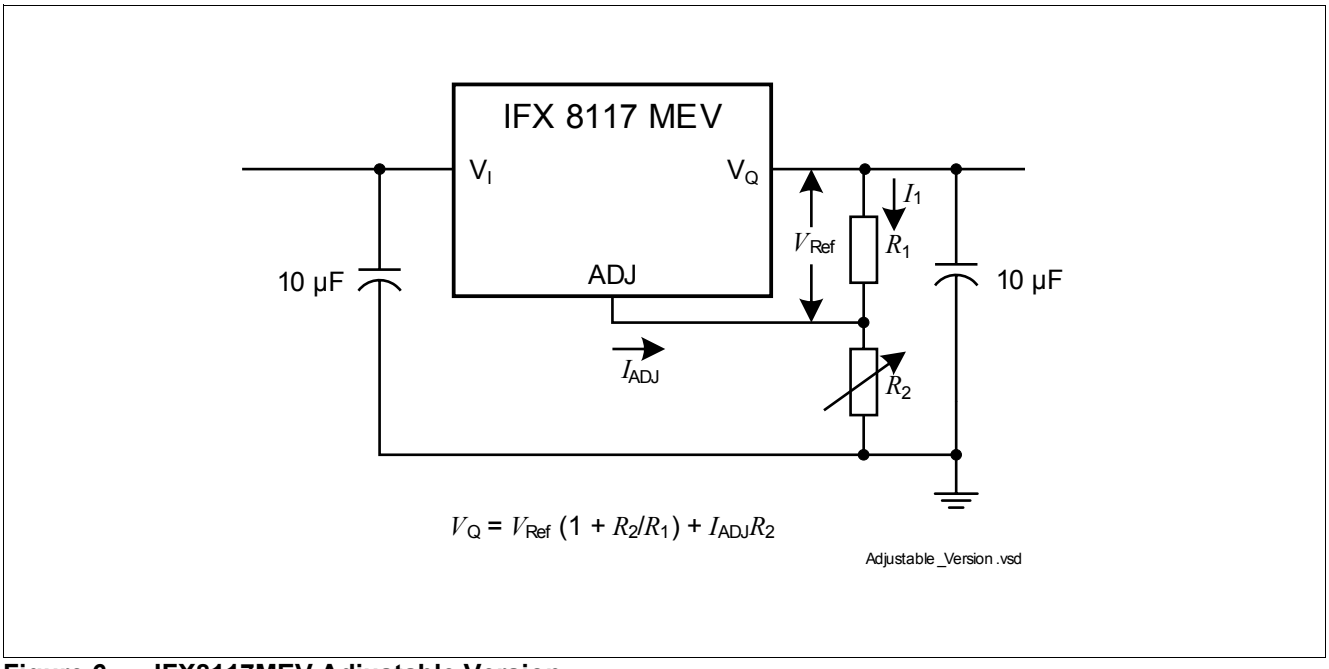


Figure 6 IFX8117MEV Adjustable Version

6.2 Protection Diodes

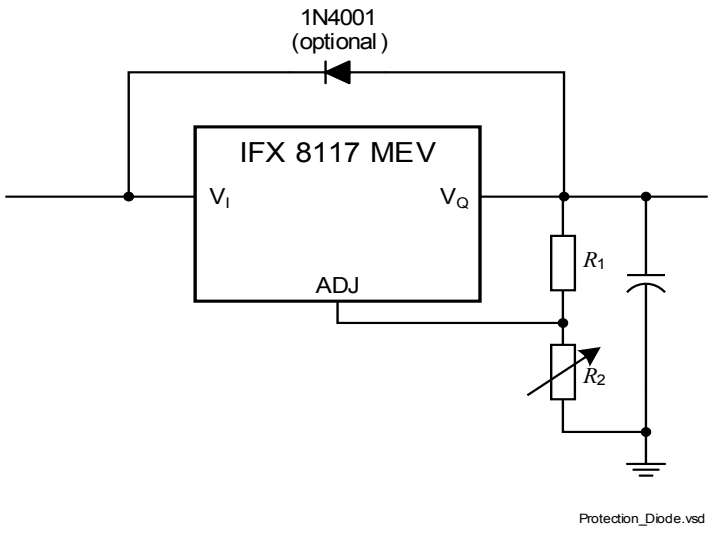


Figure 7 IFX8117MEV with Protection Diode

In normal operating conditions, no diodes are needed for protection of the device.

In case the input is shorted to GND and the output capacitor is still charged, a peak current can flow from the output to the input of the regulator. This peak current depends on the size and the equivalent series resistor (ESR) of the output capacitor. When the input is instantaneously shorted to GND, and with a large output capacitor with low ESR, the regulator risks to be damaged. For this environment it is recommended to add an external diode between the output and the input to protect the regulator as shown in **Figure 7**.

7 Package Outlines

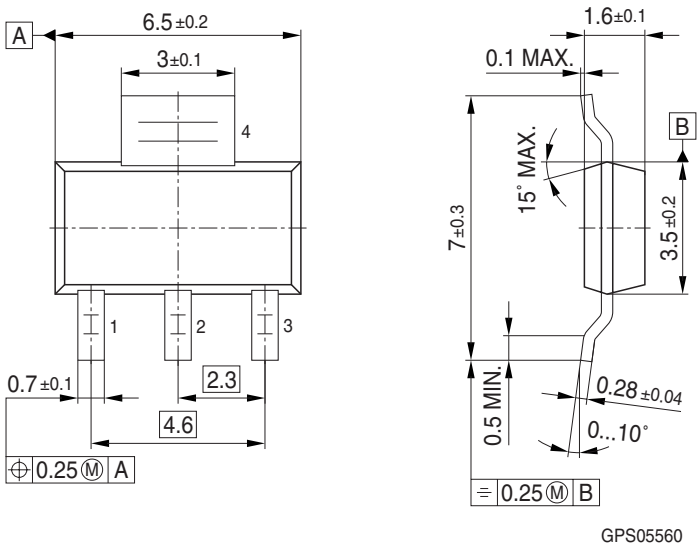


Figure 8 PG-SOT223-4

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**.

Dimensions in mm

8 Revision History

Version	Date	Changes
1.01	2010-07-02	data sheet Rev. 1.01 editorial changes

Edition 2010-07-02

Published by
Infineon Technologies AG
81726 Munich, Germany

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Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office (**www.infineon.com**).

Warnings

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

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