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Never stop thinking

TLF2931

Low Dropout Linear Voltage Regulator

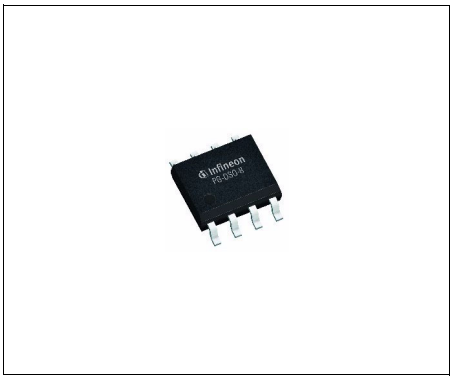
TLF2931GV50
TLF2931GV33

Data Sheet

Rev. 1.0, 2010-10-06

Automotive Power

1 Overview



PG-DSO-8

Features

- Very low Quiescent Current
- Output Current in Excess of 100mA
- Input-Output Differential Less than 0.6V for 5V-Version
- Reverse Battery Protection
- Output Current Limitation
- Overtemperature Shutdown
- Mirror-Image Insertion Protection
- Needs only small Output Capacitor C_{OUT} = 10 µF
- Green Product (RoHS compliant)
- AEC Qualified

General Description

The TLF2931 is a positive voltage regulator with a very low quiescent current of 1mA or less when supplying 10 mA loads. The TLF2931GV50 provides an extremely low dropout voltage of less than 0.2 V for output currents up to 10 mA. Therefore the TLF2931 is the ideal supply for standby power systems. It certainly can also be used for any system demanding as much as 100 mA of output current. The AEC qualified device is designed to withstand the harsh environment and operation conditions of automotive applications.

The TLF2931 is protected from reverse polarity condition and can withstand input voltages of 28 V continuously. The TLF2931 cannot be harmed by temporary mirror-image insertion. Additional protection features such as output current limitation and overtemperature shutdown are also implemented. The TLF2931 comes in an 8-lead SMD package (PG-DSO-8).

Type	Package	Marking
TLF2931GV50	PG-DSO-8	TLF2931
TLF2931GV33	PG-DSO-8	F931V33

2 Block Diagram

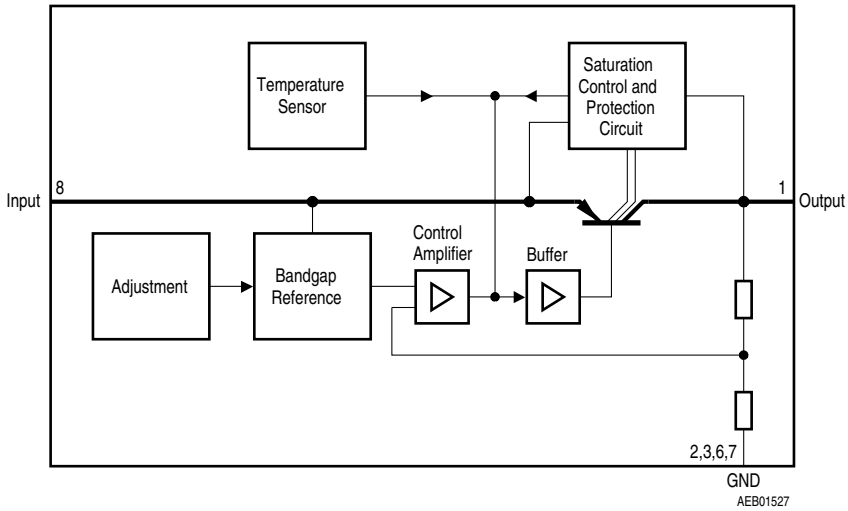


Figure 1 Block Diagram

3 Pin Configuration

3.1 Pin Assignment

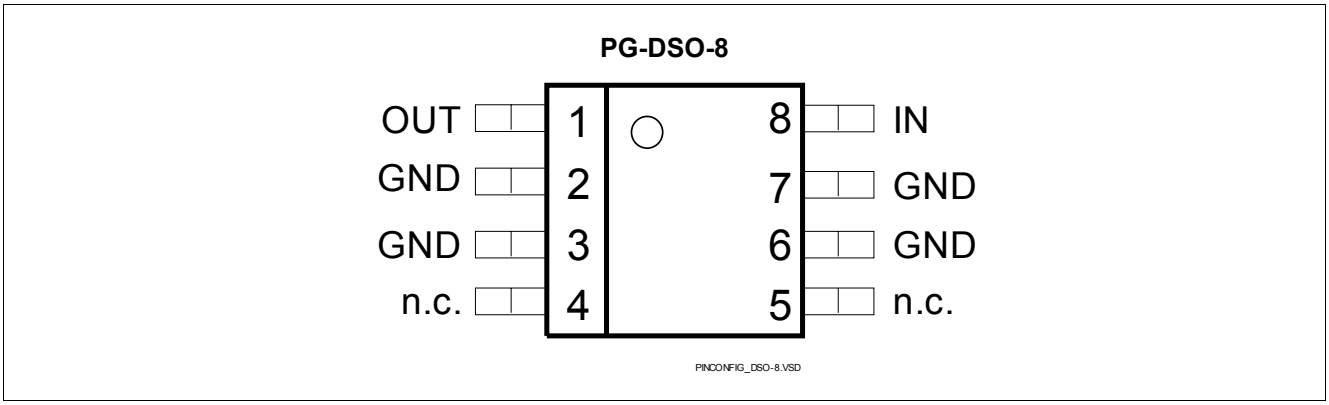


Figure 2 Pin Configuration

3.2 Pin Definitions and Functions TLF2931GV50, TLF2931GV33 (PG-DSO-8)

Pin	Symbol	Function
1	OUT	**Output** block to GND with a capacitor close to the IC terminals, respecting the values given for its capacitance C_{OUT} and ESR in **"Typical Performance Characteristics" on Page 9**
2,3,6,7	GND	**Ground**
4,5	n.c.	**not connected**
8	IN	**Input** for compensating line influences, a capacitor to GND close to the IC terminals is recommended

4 General Product Characteristics

4.1 Absolute Maximum Ratings

Absolute Maximum Ratings [1)]

T_j = -40 °C to 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						
4.1.1	Voltage	V_I	-30	42	V	–
Output						
4.1.2	Voltage	V_{OUT}	-0.3	28	V	–
Temperatures						
4.1.3	Junction Temperature	T_j	-40	125	°C	–
4.1.4	Storage Temperature	T_{stg}	-55	150	°C	–
ESD Susceptibility						
4.1.5	ESD Resistivity to GND	V_{ESD}	-2	2	kV	HBM[2)]
4.1.6	ESD Resistivity to GND	V_{ESD}	-1	1	kV	CDM[3)]

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

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

3) ESD susceptibility, Charged Device Model “CDM” 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	Conditions
			Min.	Max.		
4.2.1	Input Voltage	V_I	6	28	V	TLF2931GV50
4.2.2			4.4	26	V	TLF2931GV33
4.2.3	Junction Temperature	T_j	-40	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.

4.3 Thermal Resistance

Pos.	Parameter	Symbol	Limit Values			Unit	Conditions
			Min.	Typ.	Max.		
TLF2931GV50, TLF2931GV33 (PG-DSO-8)							
4.3.1	Junction to Soldering Point[1)]	R_{thJSP}	–	39	–	K/W	measured to group of pins 2, 3, 6, 7
4.3.2	Junction to Ambient[1)]	R_{thJA}	–	96	–	K/W	Footprint only[2)]
4.3.3			–	67	–	K/W	300mm^2 heatsink area on PCB[2)]
4.3.4			–	66	–	K/W	600mm^2 heatsink area on PCB[2)]

1) not subject to production test, specified by design

2) Specified R_{thJA} value is according to Jedec JESD51-2,-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).

5 Electrical Characteristics

5.1 Electrical Characteristics TLF2931GV50

Electrical Characteristics

V_I = 14 V, T_j = -40 °C to 125 °C, I_{OUT} = 10 mA, all voltages with respect to ground, positive current flowing into pin (unless otherwise specified)

Pos.	Parameter	Symbol	Limit Values			Unit	Conditions
			Min.	Typ.	Max.		
5.1.1	Output Voltage	V_{OUT}	4.75	5	5.25	V	T_j = 25 °C
			4.5	5	5.5	V	–
5.1.2	Line Regulation	$\Delta V_{OUT,line}$	–	2	10	mV	9 V < V_I < 16 V
5.1.3			–	4	30	mV	6 V < V_I < 26 V
5.1.4	Load Regulation	$\Delta V_{OUT,load}$	–	-14	-50	mV	5 mA < I_{OUT} < 100 mA
5.1.5	Output Impedance[1)]	Z_{OUT}	–	200	–	mΩ	I_{OUT} = 100 mA_{DC} and I_{OUT} = 10 mA_{rms} 100 Hz - 10 kHz
5.1.6	Current Consumption	I_q	–	0.4	1	mA	I_{OUT} = 10 mA 6 V < V_I < 26 V
5.1.7			–	9	15	mA	I_{OUT} = 100 mA
5.1.8	Output Noise Voltage[1)]	V_{noise}	–	500	–	μV_{rms}	100 Hz - 10 kHz C_{OUT} = 100 µF
5.1.9	Long Term Stability[1)]	$\Delta V_{OUT,1000h}$	–	20	–	mV /1000h	–
5.1.10	Ripple Rejection[1)]	$PSRR$	–	80	–	dB	f_{ripple} = 120 Hz
5.1.11	Dropout Voltage[2)]	V_{DR}	–	0.05	0.2	V	I_{OUT} = 10 mA
5.1.12	V_I - V_{OUT}		–	0.3	0.6	V	I_{OUT} = 100 mA

1) Not subject to production test, specified by design

2) Obtained when the output voltage has dropped 100mV below the nominal value

5.2 Electrical Characteristics TLF2931GV33

Electrical Characteristics

V_I = 14 V, T_j = -40 °C to 125 °C, I_{OUT} = 10 mA, all voltages with respect to ground, positive current flowing into pin (unless otherwise specified)

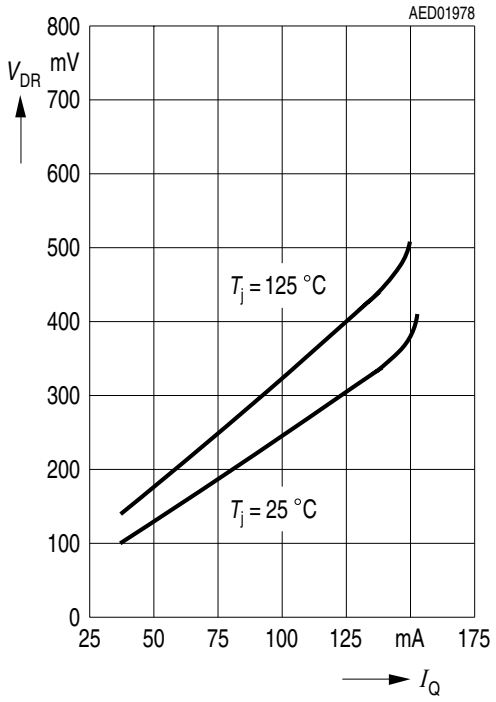
Pos.	Parameter	Symbol	Limit Values			Unit	Conditions
			Min.	Typ.	Max.		
5.2.1	Output Voltage	V_{OUT}	3.135	3.3	3.465	V	T_j = 25 °C
			2.97	3.3	3.63	V	4.4 V < V_I < 26 V I_{OUT} = 100 mA
5.2.2	Line Regulation	$\Delta V_{OUT,line}$	–	4	33	mV	4.4 V < V_I < 26 V T_j = 25 °C
5.2.3	Load Regulation	$\Delta V_{OUT,load}$	–	-10	-50	mV	5 mA < I_{OUT} < 100 mA T_j = 25 °C
5.2.4	Output Impedance[1)]	Z_{OUT}	–	200	–	mΩ	I_{OUT} = 100 mA_{DC} and I_{OUT} = 10 mA_{rms} 100 Hz - 10 kHz
5.2.5	Current Consumption	I_q	–	0.4	1	mA	I_{OUT} = 10 mA 4.4 V < V_I < 26 V
5.2.6			–	9	15	mA	I_{OUT} = 100 mA
5.2.7	Output Noise Voltage[1)]	V_{noise}	–	330	–	μV_{rms}	10 Hz - 100 kHz C_{OUT} = 100 µF
5.2.8	Long Term Stability[1)]	$\Delta V_{OUT,1000h}$	–	13	–	mV /1000h	–
5.2.9	Ripple Rejection[1)]	$PSRR$	–	80	–	dB	f_{ripple} = 120 Hz
5.2.10	Dropout Voltage[2)] V_I - V_{OUT}	V_{DR}	–	0.85	1.1	V	I_{OUT} = 100 mA, T_j = 25 °C

1) Not subject to production test, specified by design

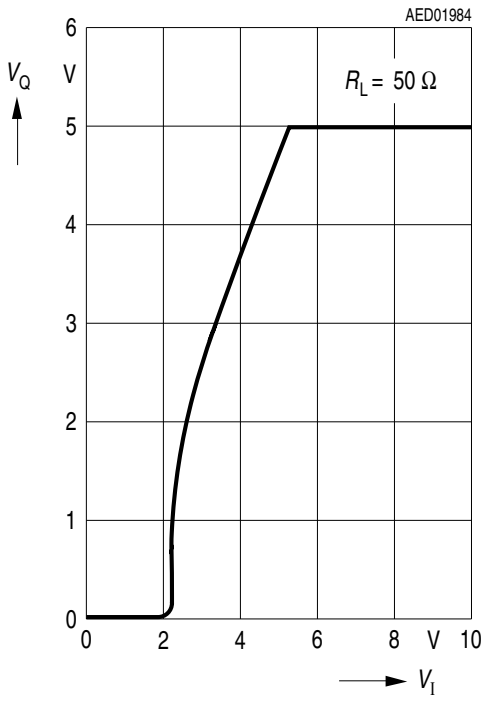
2) Obtained when the output voltage has dropped 100mV below the nominal value

5.3 Typical Performance Characteristics

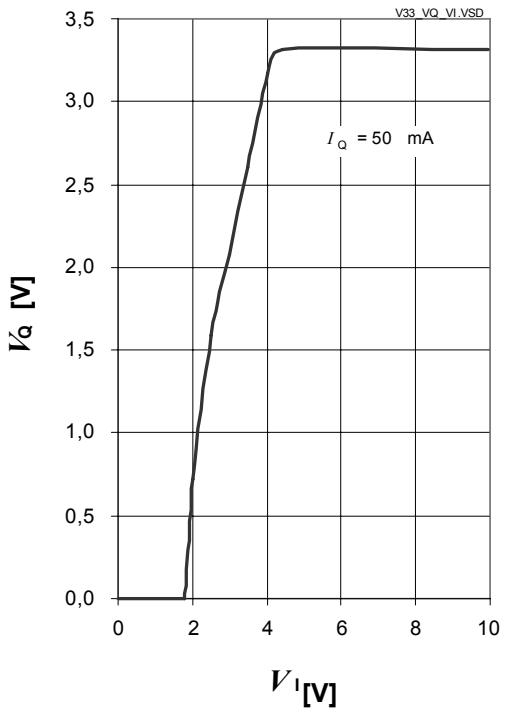
Dropout Voltage V_{DR} versus Output Current I_{OUT}



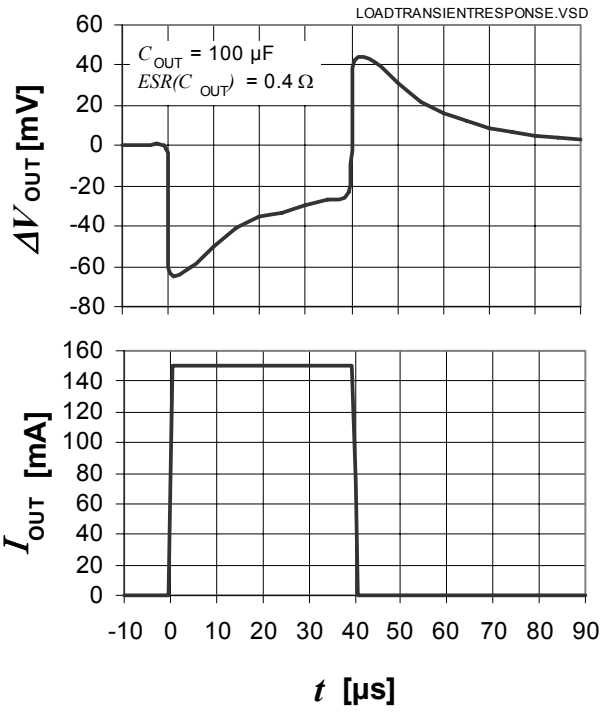
TLF2931GV50: Output Voltage V_{OUT} versus Input Voltage V_I



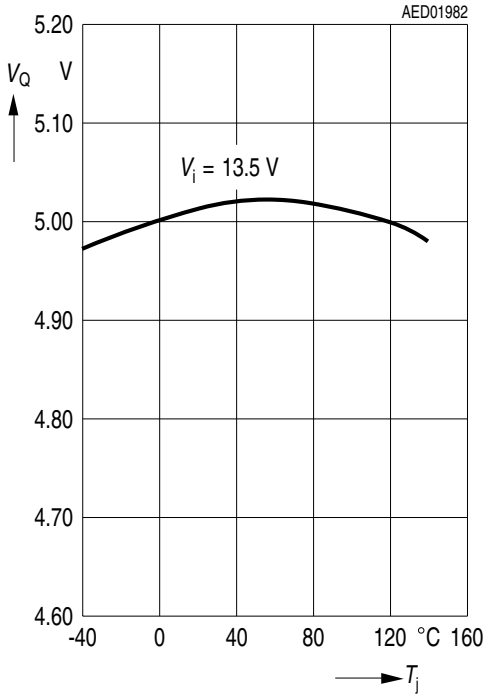
TLF2931GV33: Output Voltage V_{OUT} versus Input Voltage V_I



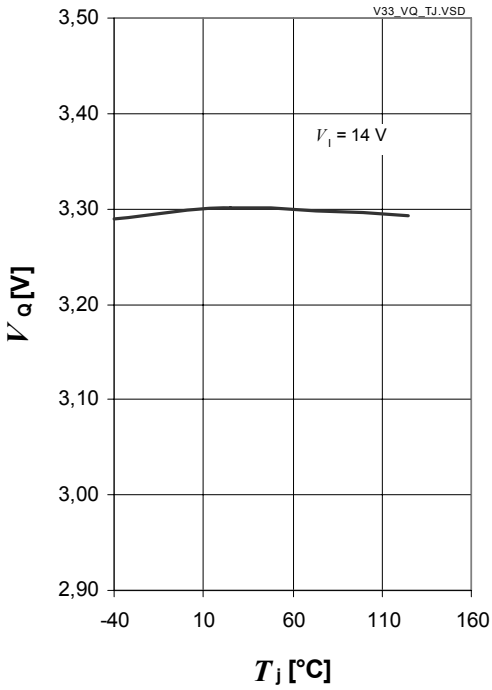
Load Transient Response



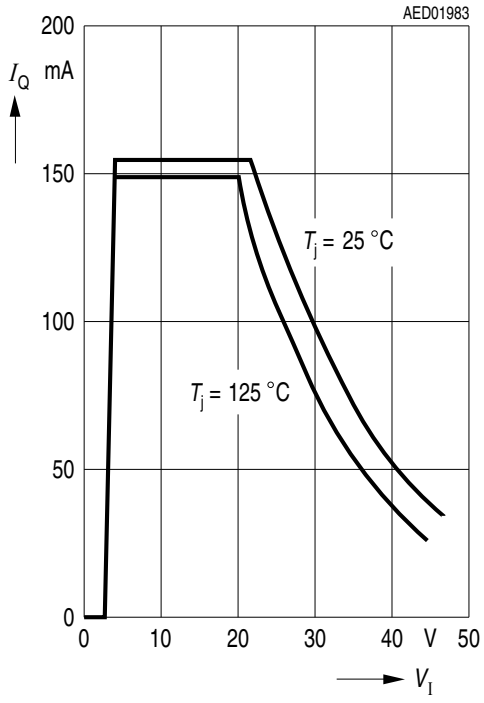
TLF2931GV50: Output Voltage V_{OUT} versus Junction Temperature T_j



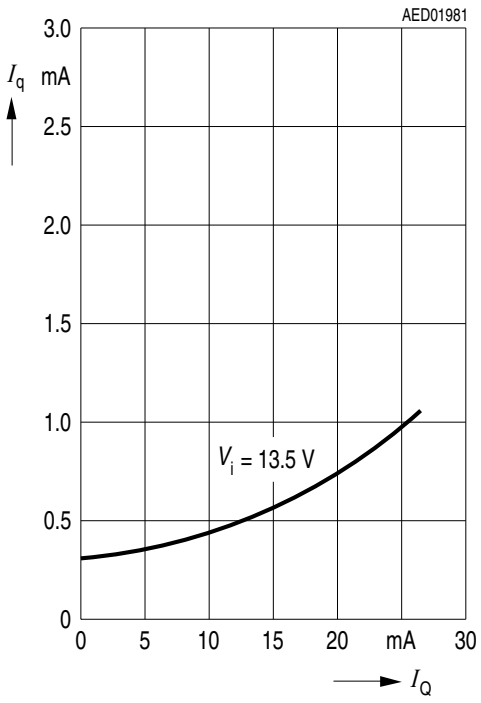
TLF2931GV33: Output Voltage V_{OUT} versus Junction Temperature T_j



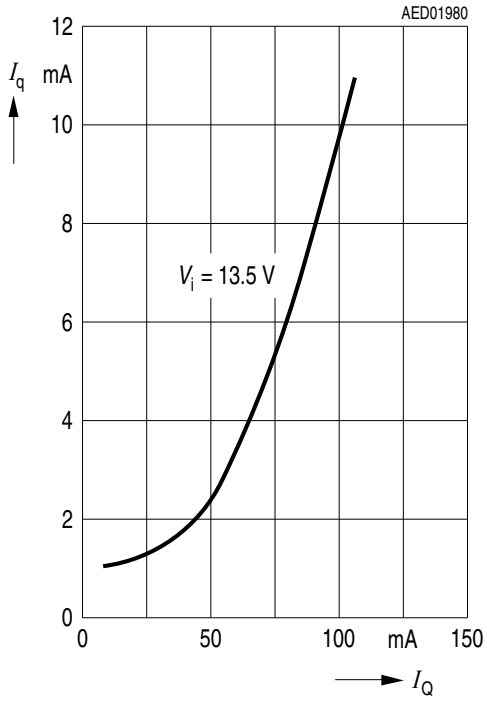
Output Current I_{OUT} versus Input Voltage V_I



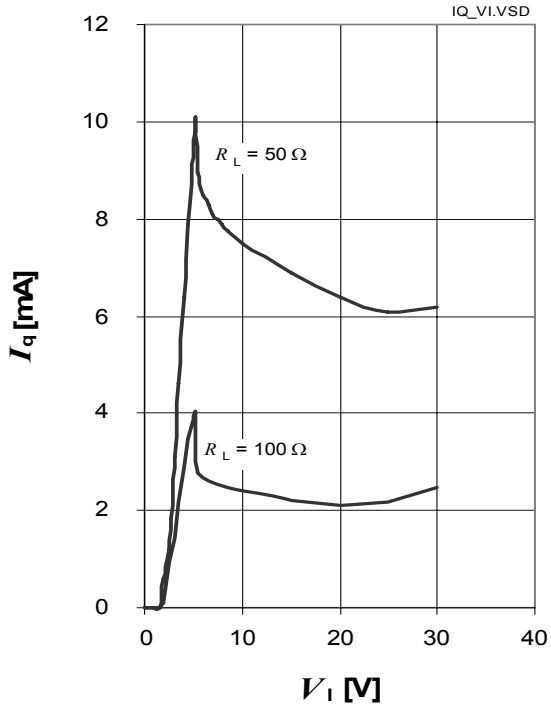
Current Consumption I_q versus Low Output Current I_{OUT}



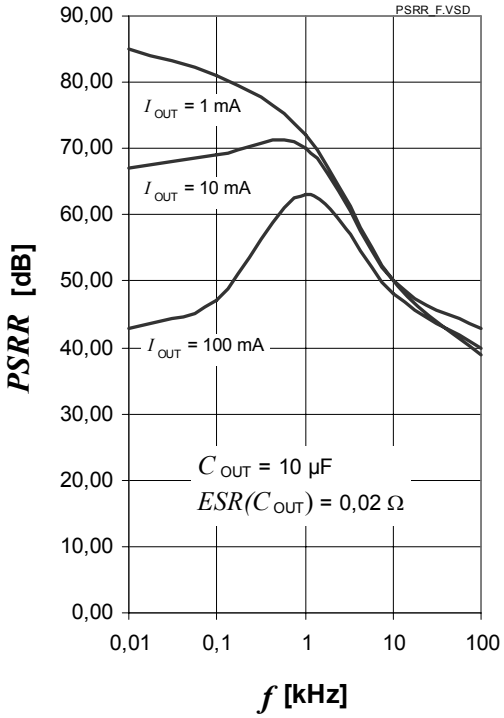
Current Consumption I_q versus Output Current I_{OUT}



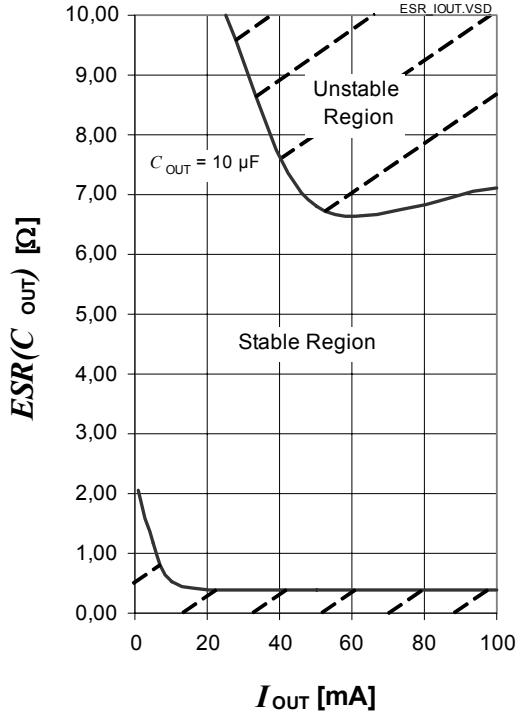
Current Consumption I_q versus Input Voltage V_I



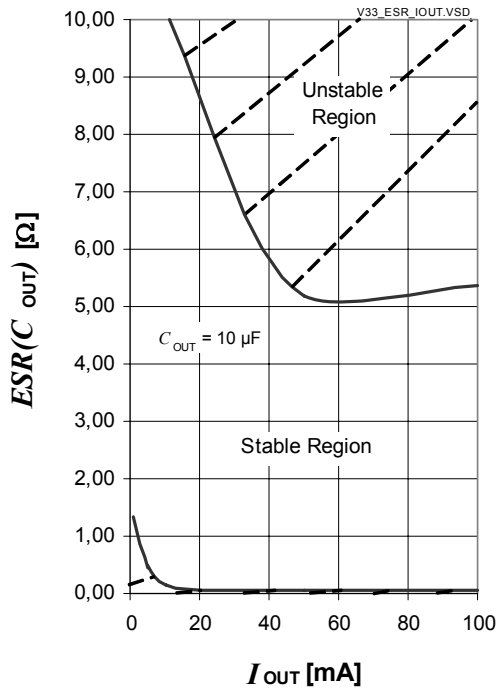
Power Supply Ripple Rejection *PSRR* versus Frequency *f*



TLF2931GV50: Output Capacitor's Equivalent Series Resistance $ESR(C_{OUT})$ versus Output Current I_{OUT}



TLF2931GV33: Output Capacitor's Equivalent Series Resistance $ESR(C_{OUT})$ versus Output Current I_{OUT}



6 Package Outlines

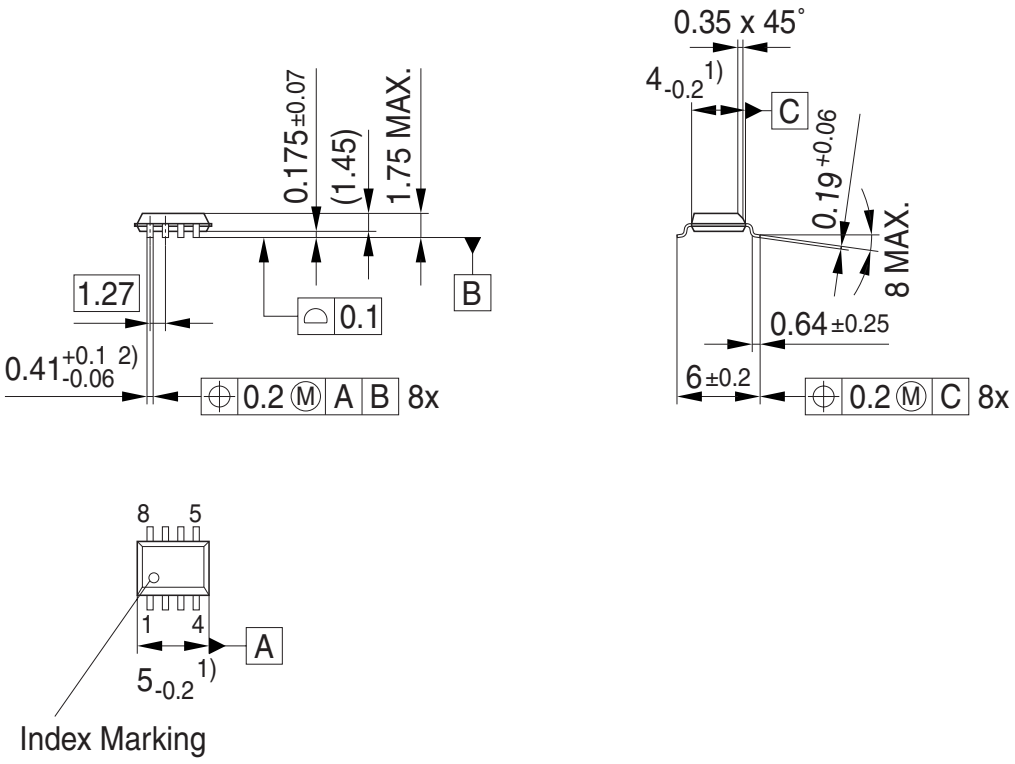


Figure 3 PG-DSO-8

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).

For further information on alternative packages, please visit our website:
http://www.infineon.com/packages.

Dimensions in mm

7 Revision History

Revision	Date	Changes
1.0	2010-10-06	Data Sheet

Edition 2010-10-06

Published by
Infineon Technologies AG
81726 Munich, Germany

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