TLE4296-2

Low Drop Voltage Regulator

TLE4296-2GV33
TLE4296-2GV50

Data Sheet

Rev. 1.12, 2011-05-11

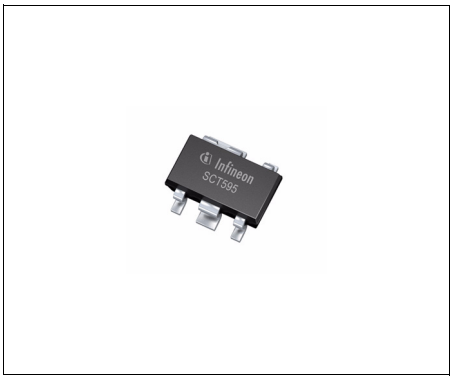
Automotive Power

Low Drop Voltage Regulator **TLE4296-2GV33**

TLE4296-2GV50

AEC Qualified RoHS

1 Overview



PG-SCT595

Features

- Two versions: 3.3 V, 5.0 V
- Output voltage tolerance ≤ ±4%
- Very low drop voltage
- Output current: 30 mA
- Inhibit input
- Low quiescent current consumption
- Wide operation range: up to 45 V
- Wide temperature range: T_j = -40 °C to +150 °C
- Output protected against short circuit
- Overtemperature protection
- Reverse polarity proof
- Very small SMD-Package PG-SCT595
- Green Product (RoHS compliant)
- AEC Qualified

Description

The TLE4296-2 is a monolithic integrated low-drop voltage regulator in the very small SMD package PG-SCT595. It is designed to supply e.g. microprocessor systems under the severe conditions of automotive applications. Therefore the device is equipped with additional protection functions against overload, short circuit and reverse polarity. At overtemperature the regulator is automatically turned off by the integrated thermal protection circuit.

Input voltages up to 40 V are regulated to $V_{Q,nom}$ = 3.3 V (V33 version) or 5.0 V (V50 version). The output is able to drive a load of more than 30 mA while it regulates the output voltage within a 4% accuracy. To save energy the device can be switched in stand-by mode via an inhibit input which causes the current consumption to drop below 5 µA.

Type	Package	Marking
TLE4296-2GV33	PG-SCT595	C5
TLE4296-2GV50	PG-SCT595	C4

2 Block Diagram

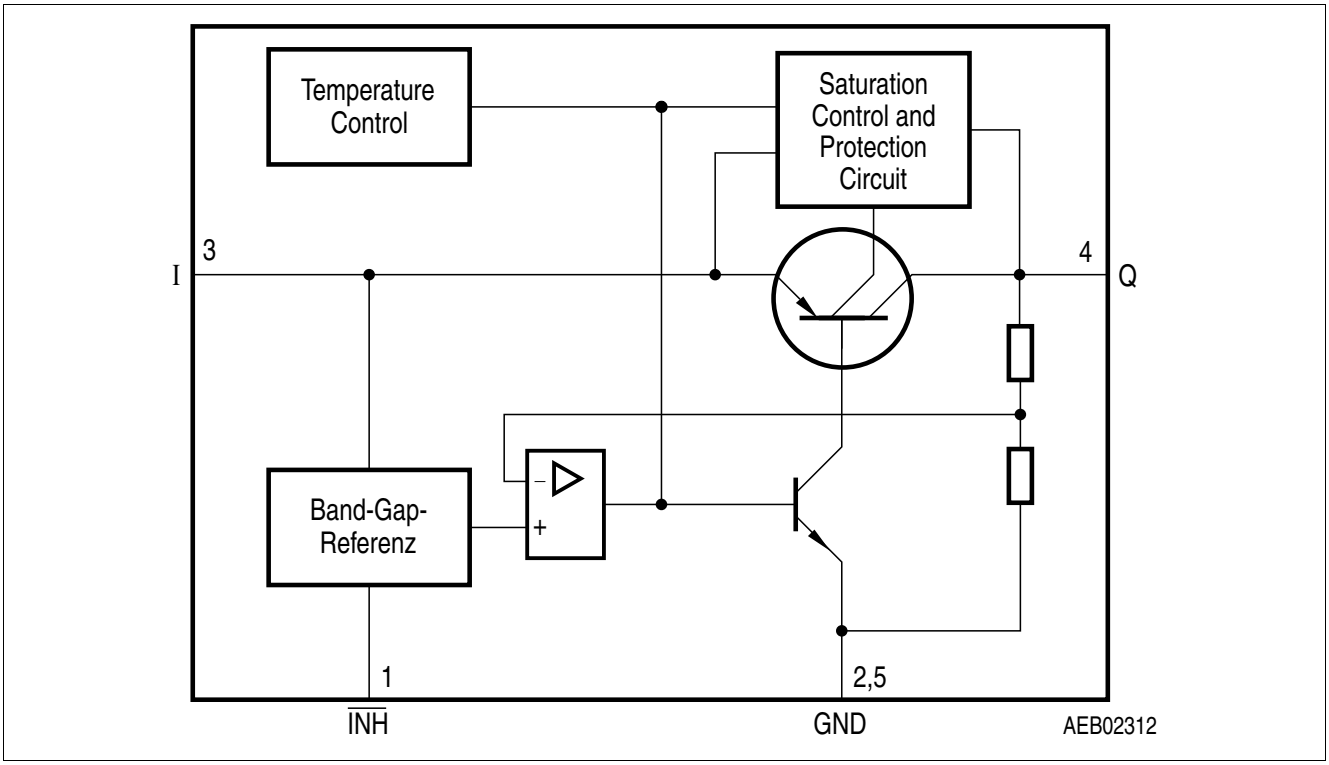


Figure 1 Block Diagram

3 Pin Configuration

3.1 Pin Assignment

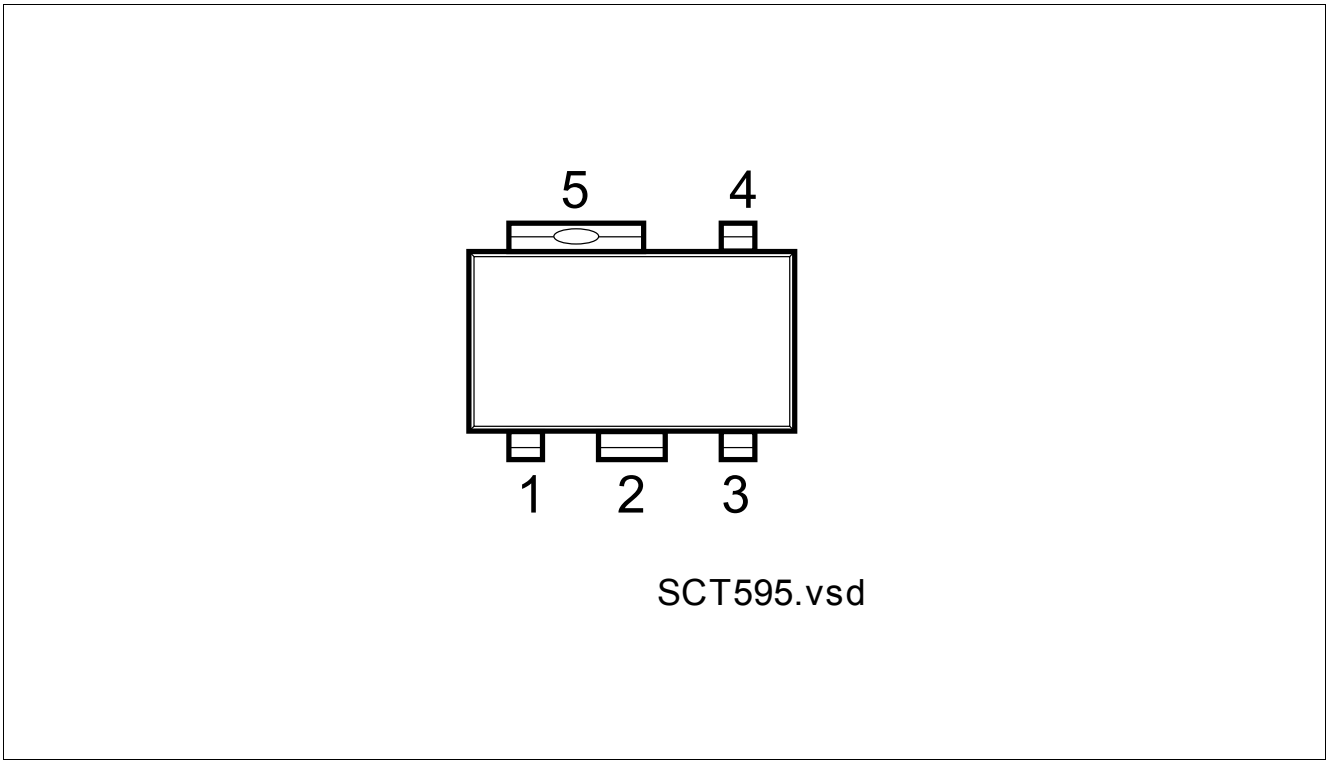


Figure 2 Pin Configuration (top view)

3.2 Pin Definitions and Functions

Pin	Symbol	Function
1	$\overline{\text{INH}}$	**Inhibit Input:** high level to turn on the IC
2	GND	**Ground:** connected to pin 5
3	I	**Input Voltage**
4	Q	**Output voltage:** must be blocked with a ceramic capacitor $C_Q \geq 3.3$ µF, ESR ≤ 2 Ω
5	GND	**Ground:** Connected to pin 2

4 General Product Characteristics

4.1 Absolute Maximum Ratings

Absolute Maximum Ratings [1)]

T_j = -40 °C to +150 °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	-42	45	V	–
4.1.2	Current	I_I	–	–	mA	2)
Output						
4.1.3	Voltage	V_Q	-0.3	30	V	–
4.1.4	Current	I_Q	–	–	mA	2)
Inhibit						
4.1.5	Voltage	$V_{\overline{INH}}$	-42	45	V	–
4.1.6	Current	$I_{\overline{INH}}$	-500	2)	A	–
4.1.7	Current	$I_{\overline{INH}}$	-5	5	mA	-0.3 V ≤ V_I ≤ 45 V ; t_p < 1 ms
Temperatures						
4.1.8	Junction Temperature	T_j	-40	150	°C	–
4.1.9	Storage Temperature	T_{stg}	-50	150	°C	–
Thermal Resistance						
4.1.10	Junction Pin	$R_{thj\text{-}pin}$	–	30	K/W	Measured to pin 5
4.1.11	Junction ambient[3)]	R_{thja}	–	179	K/W	Zero airflow ; zero heat sink area

1) Not subject to production test, specified by design.
2) Internally limited
3) Worst case regarding peak temperature

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

Table 1 Example 1 for Functional Range - use only for MOSFET and Voltage Linear Regulator

Pos.	Parameter	Symbol	Limit Values		Unit	Conditions
			Min.	Max.		
4.2.1	Input Voltage	V_I	4.0	45	V	TLE4296-2GV33
4.2.2			5.5	45	V	TLE4296-2GV50
4.2.3	Inhibit Voltage	$V_{\overline{INH}}$	-0.3	40	V	–
4.2.4	Junction Temperature	T_j	-40	150	°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.

5 Electrical Characteristics

5.1 Electrical Characteristics Voltage Regulator

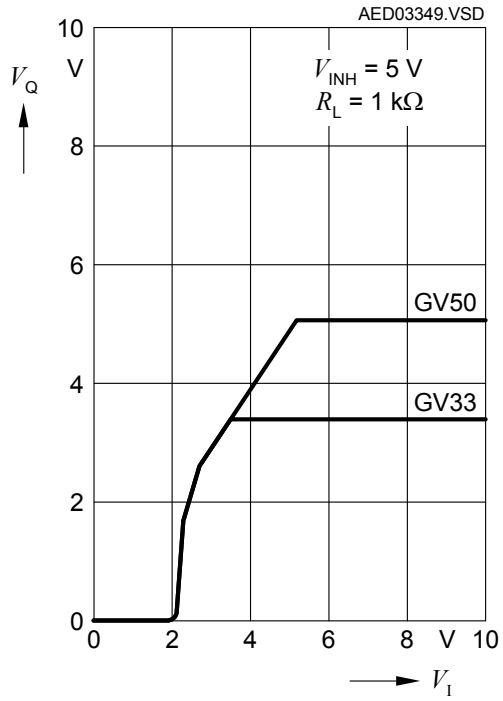
Electrical Characteristics
V_I = 13.5 V; $V_{\overline{INH}}$ > 2.5 V; T_j = -40 °C to +150 °C; all voltages with respect to ground (unless otherwise specified)

Pos.	Parameter	Symbol	Limit Values			Unit	Measuring Condition
			Min.	Typ.	Max.		
5.1.1	Output Voltage TLE4296-2GV33	V_Q	3.17	3.3	3.43	V	1 mA ≤ I_Q ≤ 30 mA
5.1.2			3.17	3.3	3.43	V	I_Q = 10 mA ; 4.3 V ≤ V_I ≤ 40 V
5.1.1	Output Voltage TLE4296-2GV50	V_Q	4.80	5.00	5.20	V	1 mA ≤ I_Q ≤ 30 mA
5.1.2			4.80	5.00	5.20	V	I_Q = 10 mA ; 6 V ≤ V_I ≤ 40 V
5.1.3	Output Current Limitation	I_Q	30	–	–	mA	1)
5.1.4	Dropout Voltage 1)	V_{dr}	–	250	300	mV	I_Q = 20 mA
5.1.5	Output capacitor	C_Q	3.3	–	–	µF	ESR ≤ 2 Ω at 10 kHz
5.1.6	Current Consumption $I_q = I_I - I_Q$	I_q	–	2	5.2	mA	I_Q < 30 mA
5.1.7			–	130	170	µA	I_Q < 0.1 mA ; T_j < 85 °C
5.1.8	Quiescent Current (stand-by) $I_q = I_I - I_Q$	I_q	–	–	1	µA	$V_{\overline{INH}}$ = 0.4 V ; T_j < 85 °C
5.1.9			–	–	5	µA	$V_{\overline{INH}}$ = 0.4 V
5.1.10	Load Regulation	ΔV_Q	–	17	50	mV	1 mA < I_Q < 25 mA ; T_j = 25 °C ; TLE4296-2GV50
5.1.11			–	14	40	mV	1 mA < I_Q < 25 mA ; T_j = 25 °C ; TLE4296-2GV33
5.1.12	Line Regulation	ΔV_Q	–	10	25	mV	V_I = ($V_{Q,nom}$ + 0.5 V) to 36 V ; I_Q = 1 mA ; T_j = 25 °C
5.1.13	Power Supply Ripple Rejection	PSRR	–	60	–	dB	f_r = 100 kHz ; V_r = 0.5 Vpp
Logic Inhibit Input							
5.1.14	Inhibit, Turn-on voltage	$V_{\overline{INH},high}$	–	–	2.2	V	V_Q > 0.95*$V_{Q,nom}$
5.1.15	Inhibit, Turn-off voltage	$V_{\overline{INH},low}$	0.4	–	–	V	V_Q < 0.1 V
5.1.16	H-input current	$I_{\overline{INH},high}$	–	8	12	µA	$V_{\overline{INH}}$ = 5 V
5.1.17	L-input current	$I_{\overline{INH},low}$	-2	–	2	µA	$V_{\overline{INH}}$ = 0 V

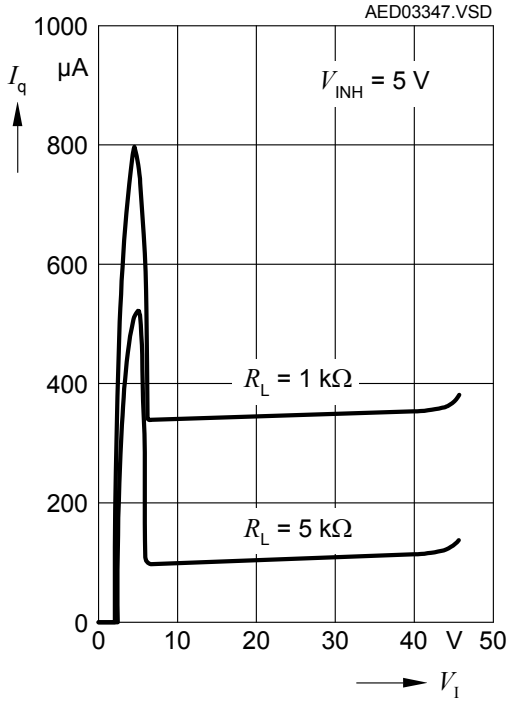
1) Measured when the output voltage V_Q has dropped 100 mV from the nominal value.

5.2 Typical Performance Characteristics Voltage Regulator

**Output Voltage V_Q vs.
Input Voltage V_I**



**Current Consumption I_q vs.
Input Voltage V_I**



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.

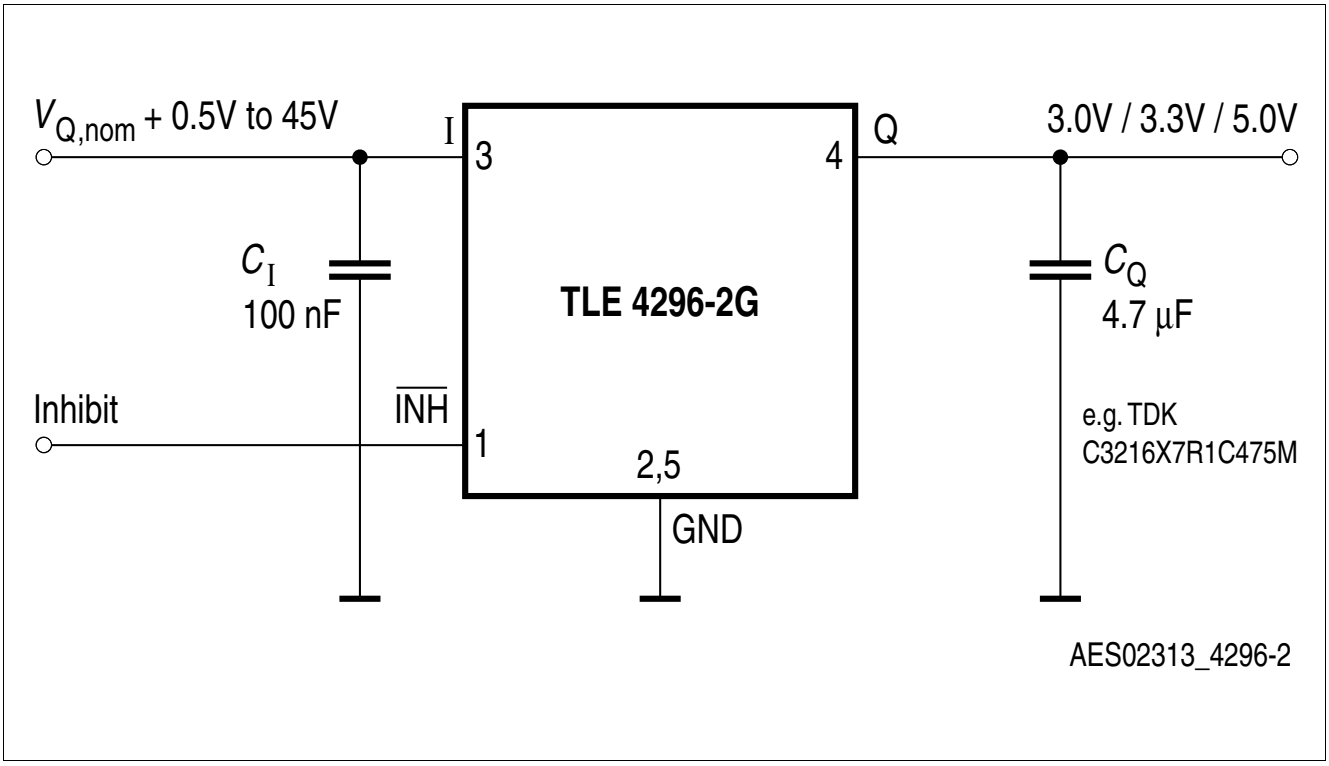


Figure 3 Application Diagram

In the TLE4296-2 the output voltage is divided and compared to an internal reference of 2.5 V typical. The regulation loop controls the output to achieve a stabilized output voltage.

Figure 3 shows a typical application circuit. In order to maintain the stability of the control loop the TLE4296-2 output requires an output capacitor C_Q of at least 3.3 µF with a maximum permissible ESR of 2 Ω. It is recommended to use a multi layer ceramic capacitor for C_Q, e.g. the TDK C3216X7R1C475M with a nominal capacitance of 4.7 µF. Aluminum electrolytic as well as tantalum capacitors do not cover the required ESR range over the full operating temperature range of T_j = -40 °C to +150 °C.

At the input of the regulator an input capacitor is necessary for compensating line influences (100 nF ceramic capacitor recommended). A resistor of approx. 1 Ω in series with C_I, can damp any oscillation occurring due the input inductivity and the input capacitor. If the regulator is sourced via long input lines of several meters it is recommended to place an additional electrolytic capacitor ≥ 47 µF at the input.

7 Package Outlines

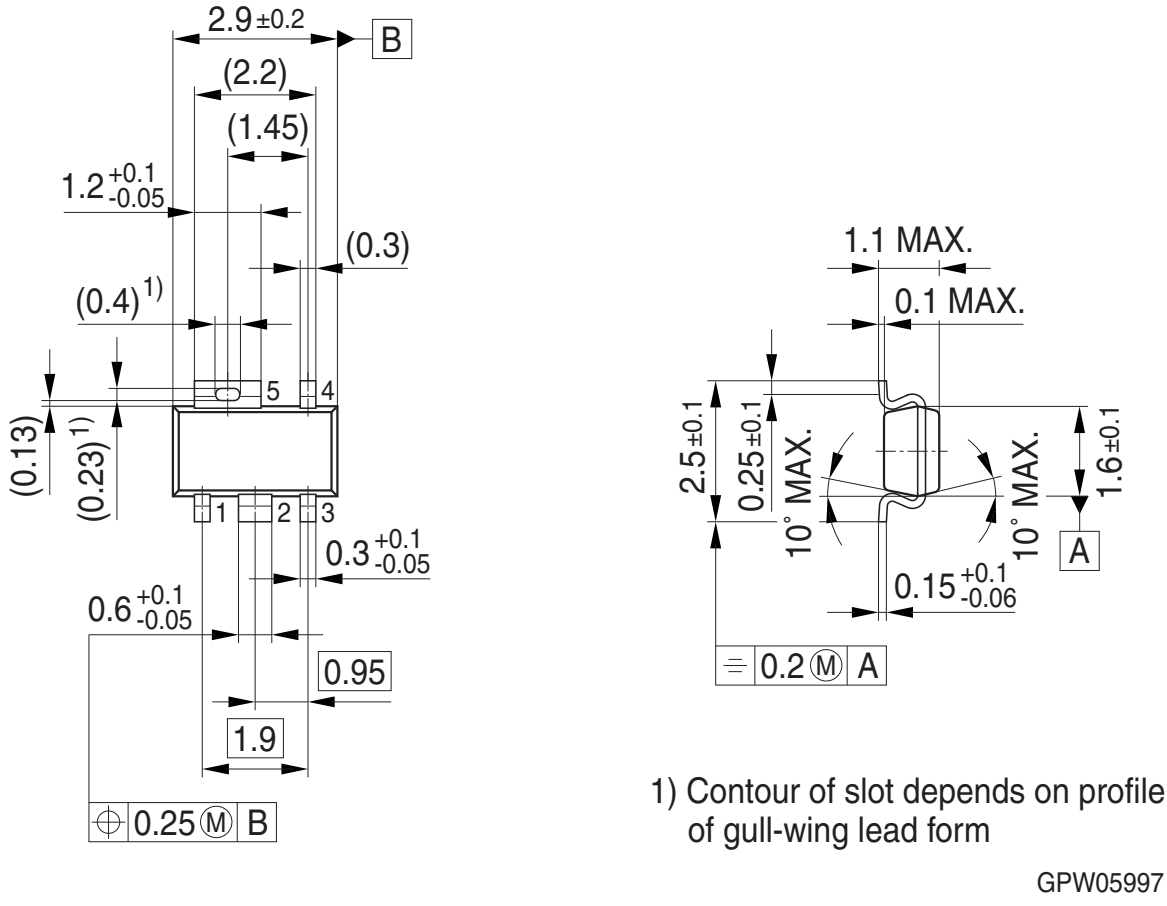


Figure 4 PG-SCT595 (Plastic Small Outline)

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

8 Revision History

Revision	Date	Changes
Rev. 1.12	2011-05-11	**Page 2**: Current Consumption in Standby corrected from 5mA to 5µA in the Functional Description. Value in Electrical Characteristics is still correct.
Rev. 1.11	2011-02-10	**Page 2**: Marking added. **Page 1**: Coverpage added. All Pages: New Infineon Data Sheet Layout applied.
Rev. 1.1	2008-01-28	Initial version of RoHS-compliant derivate of TLE 4296-2 **Page 2**: AEC certified statement added. **Page 2** and **Page 10**: RoHS compliance statement and Green product feature added. **Page 2** and **Page 10**: Package changed to RoHS compliant version. Legal Disclaimer updated
Rev. 1.0	2004-01-01	Final Data Sheet

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