

# TLE4294GV50

Low Drop Out Voltage Regulator

Automotive Power



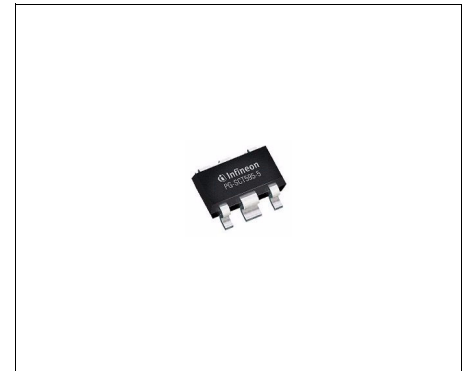
Never stop thinking



## 1 Overview

### Features

- Output voltage tolerance  $\leq \pm 4\%$
- Very low drop out voltage
- Output current: 30 mA
- Low quiescent current consumption
- Wide operation range: up to 45 V
- Wide temperature range:  $T_j = -40\text{ °C}$  to  $+150\text{ °C}$
- Output protected against short circuit
- Overtemperature protection
- Reverse polarity protection
- Very small SMD-Package PG-SCT595-5
- Green Product (RoHS compliant)
- AEC Qualified



PG-SCT595-5

### Description

The TLE4294 is a monolithic integrated low drop out voltage regulator in the very small SMD package PG-SCT595-5. 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  $V_{Q,nom} = 5.0\text{ V}$ . The output is able to drive a load of more than 30 mA, while it regulates the output voltage within a 4% accuracy.

Type	Package	Marking
TLE4294GV50	PG-SCT595-5	F1

## 2 Block Diagram

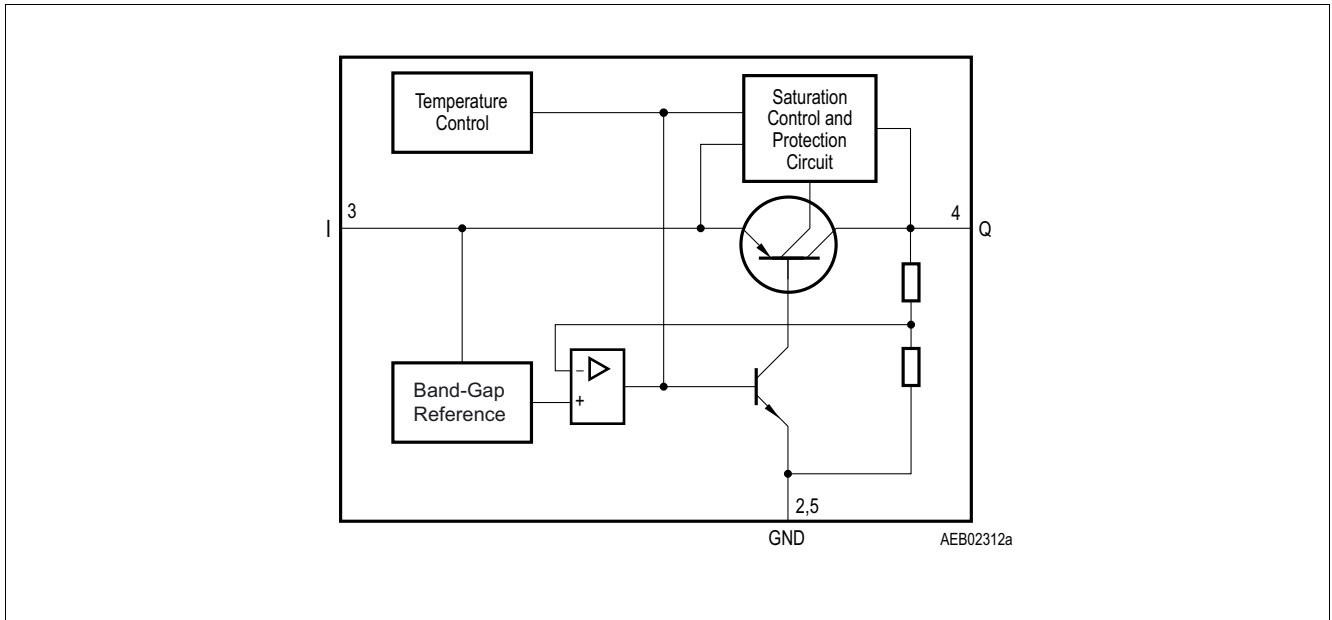


Figure 1 Block Diagram

### 3 Pin Configuration

#### 3.1 Pin Assignment

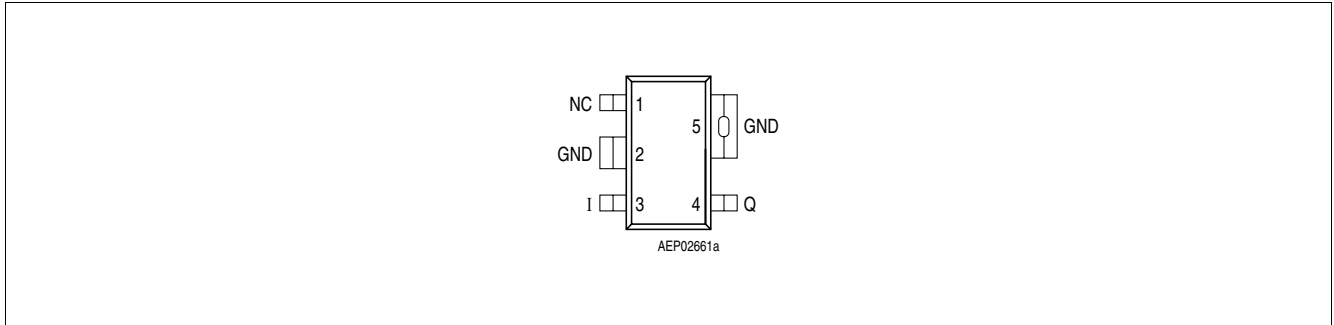


Figure 2 Pin Configuration (top view)

#### 3.2 Pin Definitions and Functions

Table 1 Pin Definitions and Functions

Pin No.	Symbol	Function
1	N.C.	<b>Not connected</b> Internally not connected. Connect to GND
2	GND	<b>Ground reference</b> Connected to pin 5
3	I	<b>Input voltage</b> For compensating line influences, a capacitor to GND close to the IC terminals is recommended
4	Q	<b>Output voltage</b> Block to GND with a capacitor close to the IC terminals, respecting the values given for its capacitance CQ and ESR in the <a href="#">Table 4.2 “Functional Range” on Page 5</a> (Tantalum capacitor recommended as output capacitor)
5	GND	<b>Ground reference</b> Connect to heatsink area; Connected to pin 2

## 4 General Product Characteristics

### 4.1 Absolute Maximum Ratings

#### Absolute Maximum Ratings <sup>1)</sup>

$T_j = -40\text{ °C}$  to  $+150\text{ °C}$ , all voltages with respect to ground, direction of currents as shown in **Figure 3 “Application Circuit” on Page 7** (unless otherwise specified)

Pos.	Parameter	Symbol	Limit Values		Unit	Conditions
			Min.	Max.		
<b>Input</b>						
4.1.1	Voltage	$V_I$	-42	45	V	–
4.1.2	Current	$I_I$	–	–	mA	Internally limited
<b>Output</b>						
4.1.3	Voltage	$V_Q$	-6	30	V	–
4.1.4	Current	$I_Q$	–	–	mA	Internally limited
<b>Temperatures</b>						
4.1.5	Junction temperature	$T_j$	-40	150	°C	–
4.1.6	Storage temperature	$T_{stg}$	-50	150	°C	–
<b>ESD Susceptibility</b>						
4.1.7	ESD Resistivity	$V_{ESD}$	-2	2	kV	HBM <sup>2)</sup>
4.1.8	ESD Resistivity to GND	$V_{ESD}$	-750	750	V	CDM <sup>3)</sup>

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

2) ESD susceptibility, Human Body Model “HBM” according to EIA/JESD 22-A114B

3) ESD susceptibility, Charged Device Model “CDM” according to 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.*

### 4.2 Functional Range

Pos.	Parameter	Symbol	Limit Values		Unit	Conditions
			Min.	Max.		
4.2.1	Input Voltage	$V_I$	5.5	45	V	–
4.2.2	Output Capacitor Requirements	$C_Q$	2.2	–	μF	–
4.2.3		$ESR_{CQ}$	1.5	8	Ω	<sup>1)</sup>
4.2.4	Junction Temperature	$T_j$	-40	150	°C	–

1) Equivalent series resistance measured at a frequency of 10 kHz

*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.		
4.3.1	Junction to Ambient <sup>1)</sup>	$R_{thJA}$	–	179	–	K/W	Footprint only <sup>2)</sup>
4.3.2			–	99	–	K/W	300mm <sup>2</sup> heatsink area on PCB <sup>2)</sup>
4.3.3			–	87	–	K/W	600mm <sup>2</sup> heatsink area on PCB <sup>2)</sup>
4.3.4			–	80	–	K/W	2s2p PCB <sup>3)</sup>
4.3.5	Junction to Soldering Point <sup>1)</sup>	$R_{thJSP}$	–	26	–	K/W	Measured to pin 5

1) Not subject to production test, specified by design

2) EIA/JESD 52\_2, FR4, 80 × 80 × 1.5 mm; 35μ Cu, 5μ Sn

3) 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).

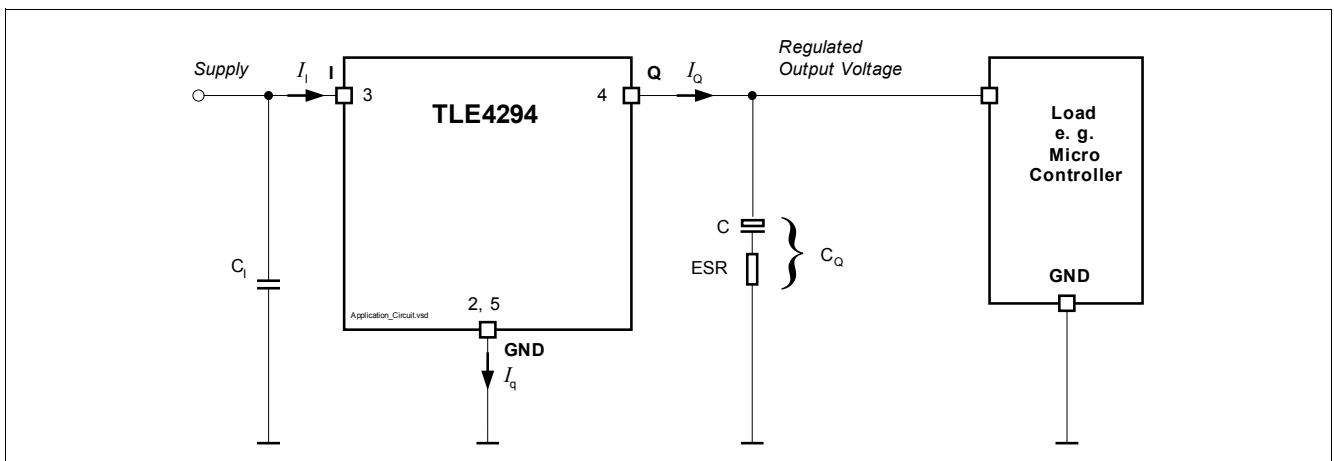
## 5 Electrical Characteristics

**Table 2 Electrical Characteristics**

$V_I = 13.5\text{ V}$ ,  $T_j = -40\text{ }^\circ\text{C}$  to  $+150\text{ }^\circ\text{C}$ , all voltages with respect to ground, direction of currents as shown in **Figure 3** "Application Circuit" on Page 7 (unless otherwise specified)

Pos.	Parameter	Symbol	Limit Values			Unit	Conditions
			Min.	Typ.	Max.		
<b>Output</b>							
5.0.1	Output voltage	$V_Q$	4.80	5.00	5.20	V	$1\text{ mA} < I_Q < 30\text{ mA}$ $V_I = 13.5\text{ V}$
5.0.2	Output voltage	$V_Q$	4.80	5.00	5.20	V	$I_Q = 10\text{ mA}$ $6\text{ V} < V_I < 40\text{ V}$
5.0.3	Output current limitation	$I_Q$	30	–	–	mA	<sup>1)</sup>
5.0.4	Drop out voltage	$V_{dr}$	–	0.25	0.40	V	$I_Q = 20\text{ mA}^{1)}$
<b>Current Consumption</b>							
5.0.5	Current consumption $I_q = I_I - I_Q$	$I_q$	–	2	4	mA	$I_Q < 30\text{ mA}$
5.0.6	Current consumption $I_q = I_I - I_Q$	$I_q$	–	120	200	$\mu\text{A}$	$I_Q < 1\text{ mA}$
<b>Regulator Performance</b>							
5.0.7	Load regulation	$ \Delta V_Q $	–	10	25	mV	$1\text{ mA} < I_Q < 25\text{ mA}$ ; $T_j = 25\text{ }^\circ\text{C}$
5.0.8	Load regulation	$ \Delta V_Q $	–	10	30	mV	$1\text{ mA} < I_Q < 25\text{ mA}$
5.0.9	Line regulation	$ \Delta V_Q $	–	5	25	mV	$\Delta V_I = V_{I, \text{min}}$ to $36\text{ V}$ ; $I_Q = 5\text{ mA}$ ; $T_j = 25\text{ }^\circ\text{C}$
5.0.10	Line regulation	$ \Delta V_Q $	–	10	30	mV	$\Delta V_I = V_{I, \text{min}}$ to $36\text{ V}$ ; $I_Q = 5\text{ mA}$
5.0.11	Power Supply Ripple Rejection	$PSRR$	–	60	–	dB	$f_r = 100\text{ Hz}$ ; $V_r = 0.5\text{ Vpp}$

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



**Figure 3 Application Circuit**

## 6 Package Outlines

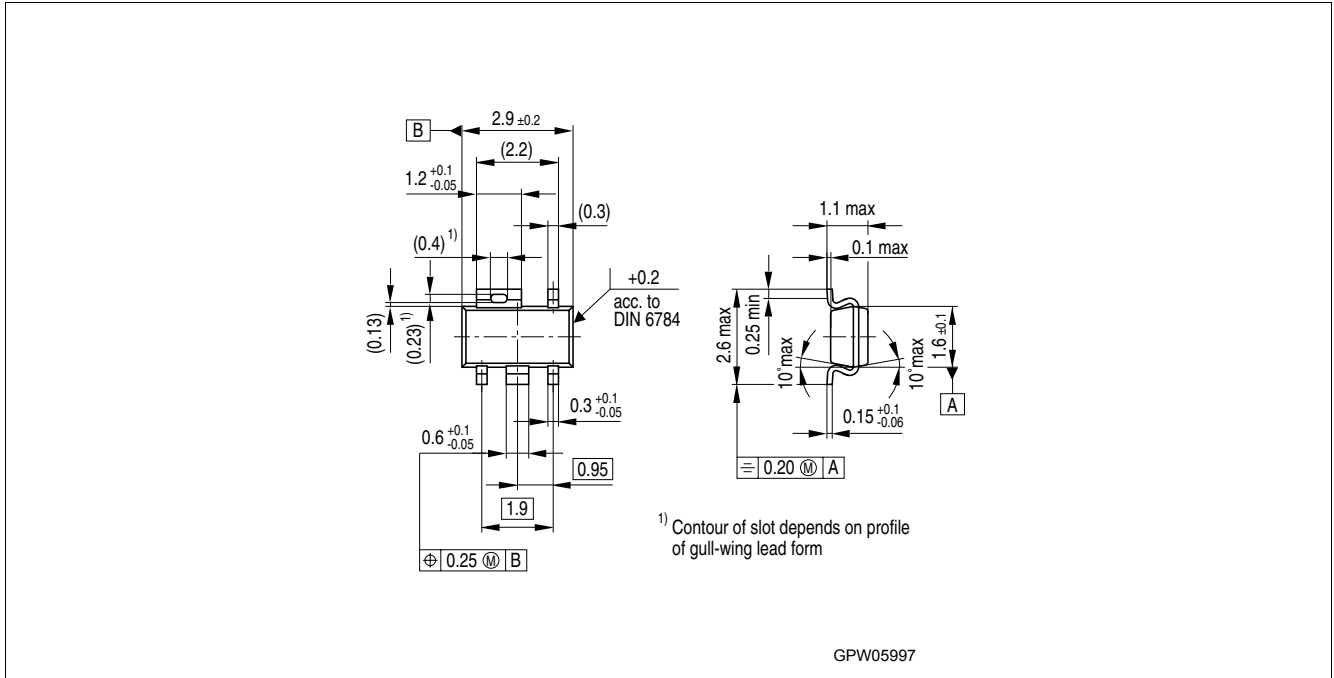


Figure 4 PG-SCT595-5 (Plastic Small Outline)

### 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



## 7 Revision History

Revision	Date	Changes
1.1	2008-02-26	Device marking changed to F1
1.0	2007-08-10	Initial Data sheet

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