

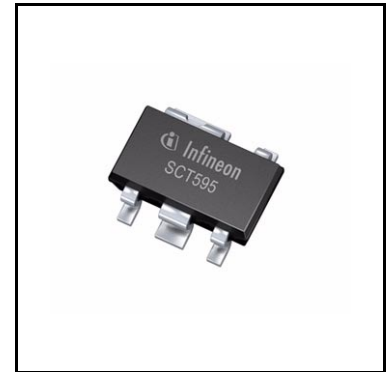
# OPTIREG™ linear TLE4295GV

## Low dropout voltage regulator



### Features

- Three versions: 3.0 V, 3.3 V, 5.0 V
- Output voltage tolerance  $\leq \pm 4\%$
- Very low drop voltage
- Output current: 30 mA
- Power fail output
- Low quiescent current consumption
- Wide operation range: up to 45 V
- Wide temperature range:  $T_j = -40^\circ\text{C}$  to  $+150^\circ\text{C}$
- Output protected against short circuit
- Overtemperature protection
- Reverse polarity proof
- Very small SMD package PG-SCT595-5
- Green Product (RoHS compliant)



### Potential applications

- General automotive applications

### Product validation

Qualified for automotive applications. Product validation according to AEC-Q100.

### Description

The OPTIREG™ linear TLE4295GV is a monolithic integrated low-drop voltage regulator in the very small SMD package PG-SCT595-5. It is designed to supply e.g. microcontroller 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  $V_{Q,nom} = 3.0\text{ V}$  (V30 version) 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. The power fail output (open collector) is switched to low in case of undervoltage overload or saturation of the output transistor.

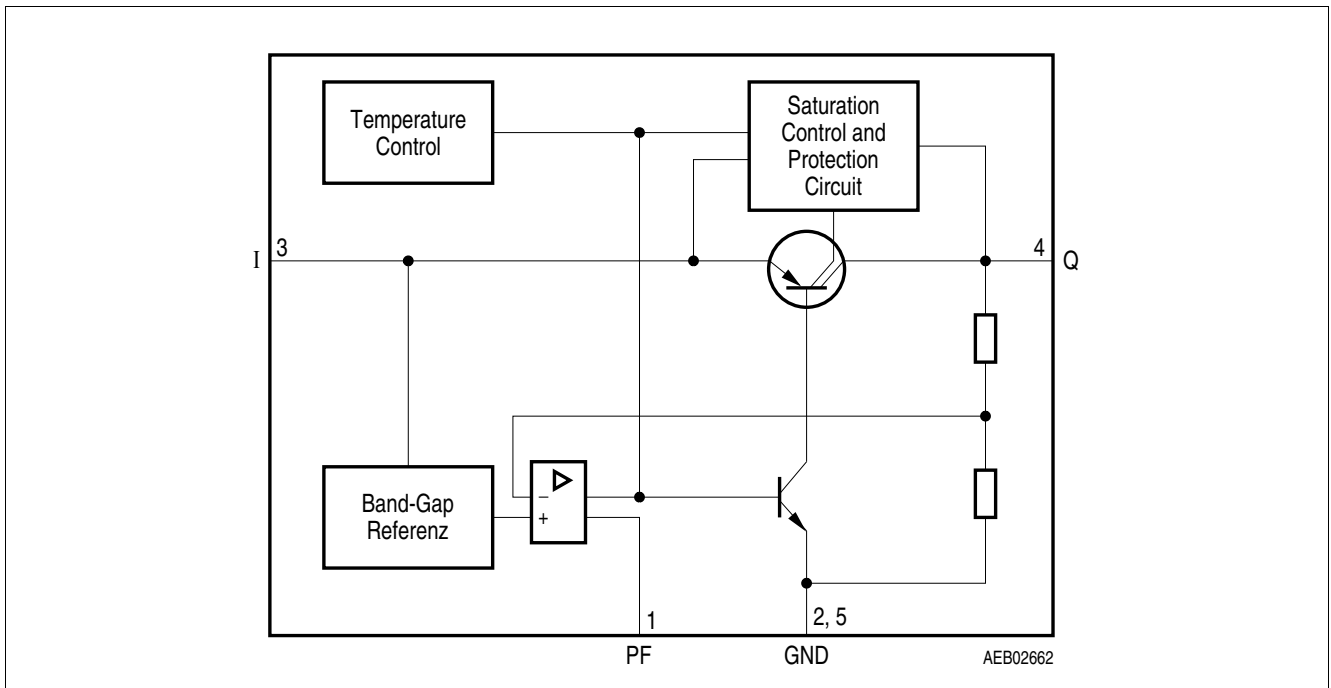
<b>Type</b>	<b>Package</b>	<b>Marking</b>
TLE4295GV50	PG-SCT595-5	D1
TLE4295GV33	PG-SCT595-5	D2
TLE4295GV30	PG-SCT595-5	D3

## Table of contents

	<b>Features</b> .....	<b>1</b>
	<b>Potential applications</b> .....	<b>1</b>
	<b>Product validation</b> .....	<b>1</b>
	<b>Description</b> .....	<b>1</b>
	<b>Table of contents</b> .....	<b>3</b>
<b>1</b>	<b>Block diagram</b> .....	<b>4</b>
<b>2</b>	<b>Pin configuration</b> .....	<b>5</b>
2.1	Pin assignment .....	5
2.2	Pin definitions and functions .....	5
<b>3</b>	<b>General product characteristics</b> .....	<b>6</b>
3.1	Absolute maximum ratings .....	6
3.2	Functional range .....	7
3.3	Thermal resistance .....	7
<b>4</b>	<b>Electrical characteristics</b> .....	<b>8</b>
4.1	Electrical characteristics voltage regulator .....	8
<b>5</b>	<b>Application information</b> .....	<b>10</b>
<b>6</b>	<b>Package information</b> .....	<b>11</b>
<b>7</b>	<b>Revision history</b> .....	<b>12</b>

**Block diagram**

**1 Block diagram**

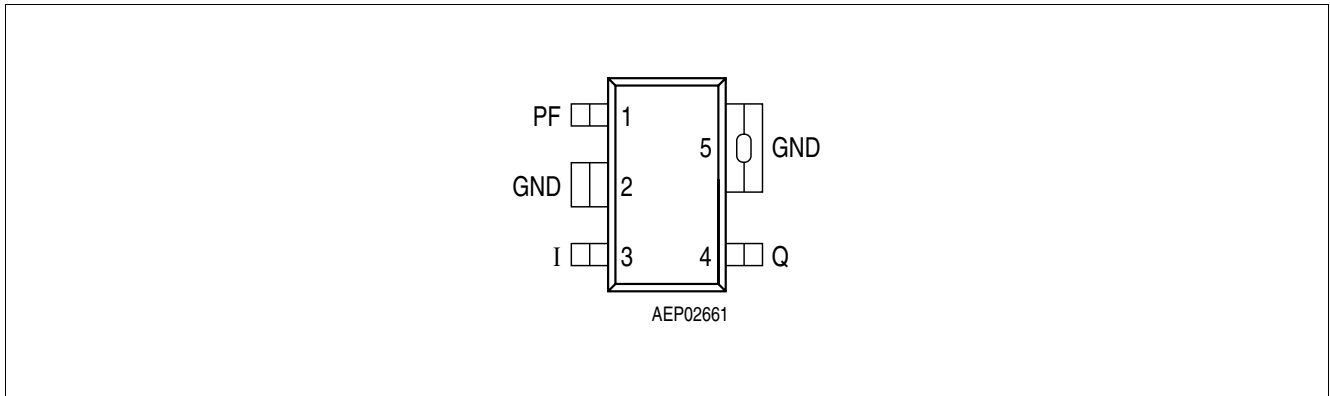


**Figure 1 Block diagram**

**Pin configuration**

**2 Pin configuration**

**2.1 Pin assignment**



**Figure 2 Pin configuration (top view)**

**2.2 Pin definitions and functions**

**Table 1 Pin definitions and functions**

Pin	Symbol	Function
1	PF	<b>Power fail</b> L for undervoltage.
2	GND	<b>Ground</b> Connected to pin 5.
3	I	<b>Input voltage</b>
4	Q	<b>Output voltage</b> Must be blocked by a capacitor $C_Q \geq 2.2 \mu\text{F}$ , $\text{ESR} \leq 5 \Omega$ to GND (Tantalum capacitor recommended as output capacitor).
5	GND	<b>Ground</b> Connected to pin 2.

General product characteristics

### 3 General product characteristics

#### 3.1 Absolute maximum ratings

**Table 2 Absolute maximum ratings**

$T_j = -40^\circ\text{C}$  to  $+150^\circ\text{C}$ ; all voltages with respect to ground, direction of currents as shown in [Figure 3](#) (unless otherwise specified)

Parameter	Symbol	Values			Unit	Note or Test Condition	Number
		Min.	Typ.	Max.			
<b>Input</b>							
Voltage	$V_I$	-42	–	45	V	–	P_3.1.1
Current	$I_I$	–	–	–	mA	<sup>1)</sup>	P_3.1.2
<b>Output</b>							
Voltage	$V_Q$	-6	–	30	V	–	P_3.1.3
Current	$I_Q$	–	–	<sup>1)</sup>	mA		P_3.1.4
<b>Power fail</b>							
Voltage	$V_{PF}$	-0.3	–	45	V	–	P_3.1.5
Current	$I_{PF}$	-500	–		$\mu\text{A}$	<sup>1)</sup>	P_3.1.6
<b>Temperatures</b>							
Junction temperature	$T_j$	-40	–	150	$^\circ\text{C}$	–	P_3.1.7
Storage temperature	$T_{stg}$	-50	–	150	$^\circ\text{C}$	–	P_3.1.8

1) Internally limited.

#### Notes

1. 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.
2. 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.

**General product characteristics**

**3.2 Functional range**

**Table 3 Functional range**

Parameter	Symbol	Values			Unit	Note or Test Condition	Number
		Min.	Typ.	Max.			
Input voltage	$V_I$	$V_{Q,nom} + 0.5 V$	–	45	V	–	P_3.2.1
Output current	$I_Q$	–	–	–	mA	1)	P_3.2.2
Junction temperature	$T_j$	-40	–	150	°C	–	P_3.2.3

1) Internally limited.

*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.

**3.3 Thermal resistance**

*Note:* This thermal data was generated in accordance with JEDEC JESD51 standards. For more information, go to [www.jedec.org](http://www.jedec.org).

**Table 4 Thermal resistance**

Parameter	Symbol	Values			Unit	Note or Test Condition	Number
		Min.	Typ.	Max.			
Junction to ambient <sup>1)</sup>	$R_{thJA}$	–	–	179	K/W	Zero airflow, zero heat sink area	P_3.3.1
Junction to soldering point	$R_{thJSP}$	–	–	30	K/W	Measured to pin 5	P_3.3.2

1) Worst case regarding peak temperature.

**Electrical characteristics**

**4 Electrical characteristics**

**4.1 Electrical characteristics**

**Table 5 Electrical characteristics**

$V_I = 13.5\text{ V}$ ;  $T_j = -40^\circ\text{C}$  to  $+150^\circ\text{C}$ ; all voltages with respect to ground, (unless otherwise specified)

Parameter	Symbol	Values			Unit	Note or Test Condition	Number
		Min.	Typ.	Max.			
<b>Output</b>							
Output voltage TLE4295GV30	$V_Q$	2.88	3.00	3.12	V	1 mA < $I_Q$ < 30 mA $V_I < 13.5\text{ V}$	P_4.1.1
	$V_Q$	2.88	3.00	3.12	V	$I_Q = 10\text{ mA}$ ; $4\text{ V} < V_I < 40\text{ V}$	P_4.1.2
Output voltage TLE4295GV33	$V_Q$	3.17	3.30	3.43	V	1 mA < $I_Q$ < 30 mA $V_I < 13.5\text{ V}$	P_4.1.3
	$V_Q$	3.17	3.30	3.43	V	$I_Q = 10\text{ mA}$ ; $4.3\text{ V} < V_I < 40\text{ V}$	P_4.1.4
Output voltage TLE4295GV50	$V_Q$	4.80	5.00	5.20	V	1 mA < $I_Q$ < 30 mA $V_I < 13.5\text{ V}$	P_4.1.5
	$V_Q$	4.80	5.00	5.20	V	$I_Q = 10\text{ mA}$ ; $6\text{ V} < V_I < 40\text{ V}$	P_4.1.6
Output current limitation	$I_Q$	30	–	–	mA	<sup>1)</sup>	P_4.1.7
Drop out voltage	$V_{dr}$	–	0.25	0.40	V	$I_Q = 20\text{ mA}$ <sup>1)</sup>	P_4.1.8
Output capacitor	$C_Q$	2.2	–	–	μF	ESR ≤ 5 Ω at 10kHz	P_4.1.9
<b>Current consumption</b>							
Current consumption $I_q = I_I - I_Q$	$I_q$	–	2	4	mA	$I_Q < 30\text{ mA}$	P_4.1.10
Current consumption $I_q = I_I - I_Q$	$I_q$	–	120	200	μA	$I_Q < 1\text{ mA}$	P_4.1.11
<b>Regulator performance</b>							
Load regulation	$ \Delta V_Q $	–	10	25	mV	1 mA < $I_Q$ < 25 mA; $T_j = 25^\circ\text{C}$ ;	P_4.1.12
Load regulation	$ \Delta V_Q $	–	10	30	mV	1 mA < $I_Q$ < 25 mA;	P_4.1.13
Line regulation	$ \Delta V_Q $	–	5	25	mV	$\Delta V_I = V_{I,\min}$ to 36 V; $I_Q = 5\text{ mA}$ ; $T_j = 25^\circ\text{C}$	P_4.1.14
Line regulation	$ \Delta V_Q $	–	10	30	mV	$\Delta V_I = V_{I,\min}$ to 36 V; $I_Q = 5\text{ mA}$ ;	P_4.1.15
Power supply ripple rejection	PSRR	–	60	–	dB	$f_r = 100\text{ Hz}$ ; $V_r = 0.5\text{ Vpp}$	P_4.1.16



**Electrical characteristics**

**Table 5 Electrical characteristics (cont'd)**

$V_I = 13.5\text{ V}$ ;  $T_j = -40^\circ\text{C}$  to  $+150^\circ\text{C}$ ; all voltages with respect to ground, (unless otherwise specified)

Parameter	Symbol	Values			Unit	Note or Test Condition	Number
		Min.	Typ.	Max.			
<b>Power fail output</b>							
Power fail threshold	$V_{QPF}$	-	4.86	-	V	TLE4295GV50	P_4.1.17
		-	3.20	-	V	TLE4295GV33	P_4.1.18
		-	2.91	-	V	TLE4295GV30	P_4.1.19
Power fail headroom	$V_{Qnom} - V_{QPF}$	50	140	300	mV	TLE4295GV50	P_4.1.20
		33	100	200	mV	TLE4295GV33	P_4.1.21
		30	90	180	mV	TLE4295GV30	P_4.1.22
Power fail low voltage	$V_{PFL}$	-	150	300	mV	$I_{PF} = 0.1\text{ mA}$	P_4.1.23
Pull-up resistor	$R_{PF}$	70	100	130	k $\Omega$	<sup>2)</sup>	P_4.1.24

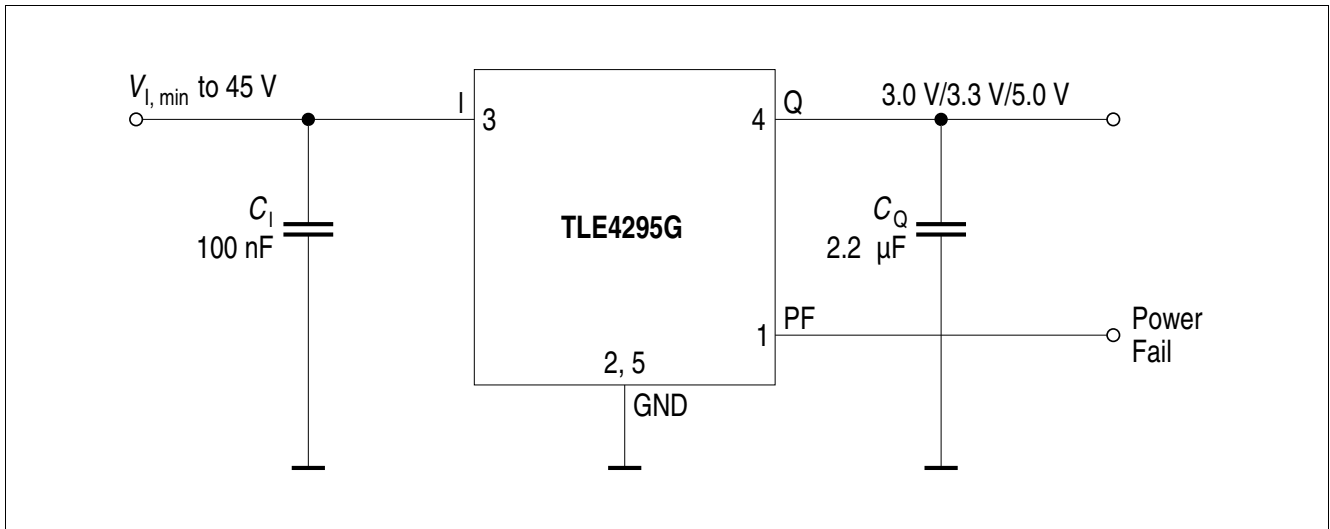
1) Measured when the output voltage  $V_Q$  has dropped 100 mV from the nominal value.

2) Internal connected to  $V_Q$ .

**Application information**

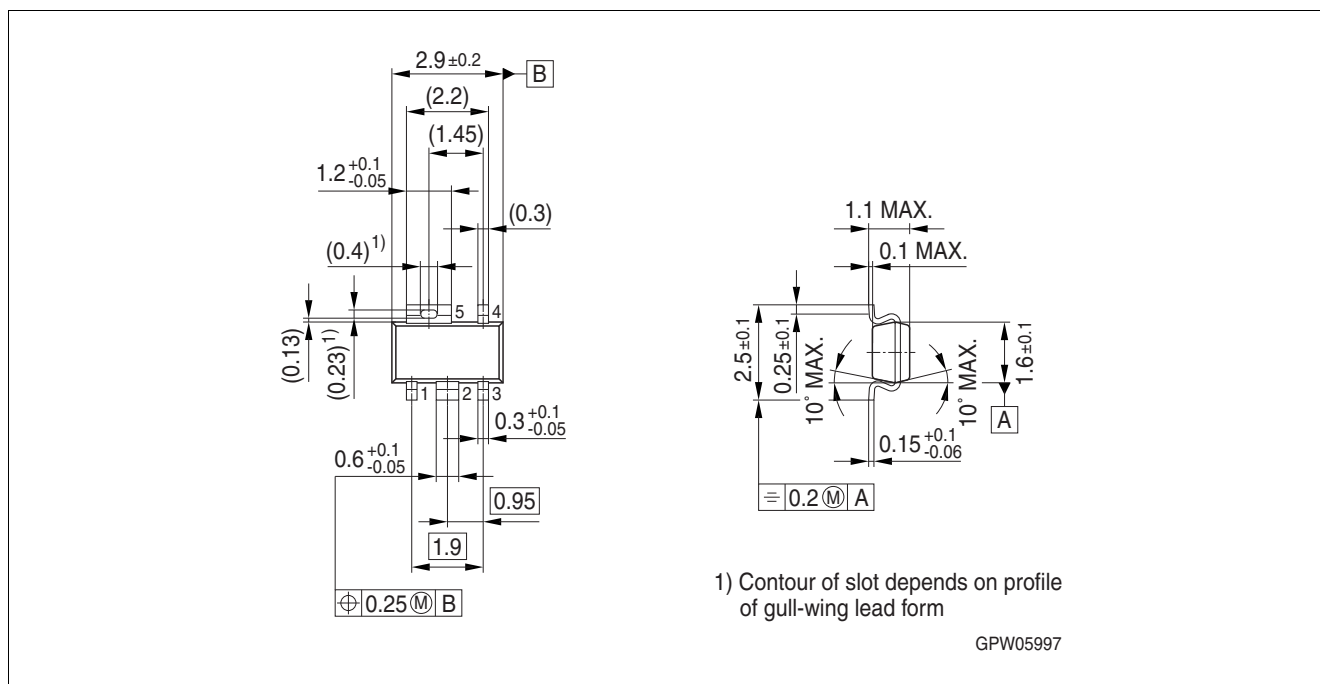
## 5 Application information

*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**

## 6 Package information



**Figure 4** PG-SCT595-5<sup>1)</sup>

### 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).

### Further information on packages

<https://www.infineon.com/packages>

1) Dimensions in mm

**Revision history**

## **7 Revision history**

<b>Revision</b>	<b>Date</b>	<b>Changes</b>
1.5	2021-04-21	Updated layout and structure Editorial changes Deleted 2.6 V version Page 7: added “Thermal resistance” added TOC
1.4	2008-04-21	Initial version of RoHS-compliant derivate of TLE4295GV. Page 1: AEC certified statement added. Marking information added. Page 1 and page 9: RoHS compliance statement and Green product feature added. Package changed to RoHS compliant version. Legal Disclaimer updated
1.3	2004-01-01	Initial release

## Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

**Edition 2021-04-21**

**Published by**

**Infineon Technologies AG**

**81726 Munich, Germany**

**© 2021 Infineon Technologies AG.**

**All Rights Reserved.**

**Do you have a question about any aspect of this document?**

**Email: [erratum@infineon.com](mailto:erratum@infineon.com)**

**Document reference**

**Z8F55129789**

## IMPORTANT NOTICE

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffheitsgarantie").

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

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

## WARNINGS

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.