

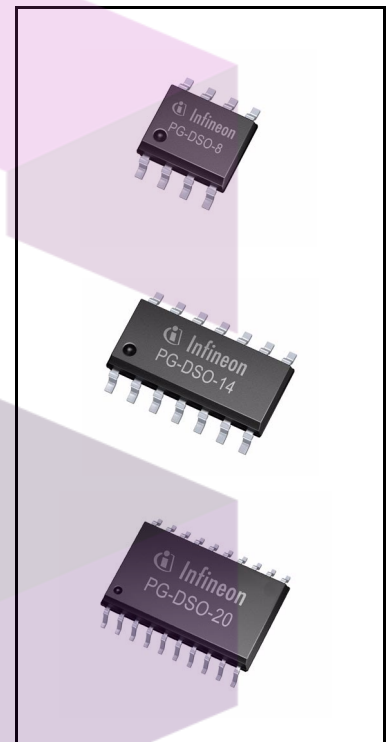
# OPTIREG™ Linear TLE4269

## 5 V low drop fixed voltage regulator



### Features

- Output voltage tolerance  $\leq \pm 2\%$
- 150 mA current capability
- Very low current consumption
- Early warning
- Reset output low down to  $V_Q = 1\text{ V}$
- Overtemperature protection
- Reverse polarity proof
- Adjustable reset threshold
- Very low drop voltage
- Wide temperature range
- Integrated pull-up resistor at logic outputs
- Green Product (RoHS compliant)



### Potential applications

General automotive applications.

### Product validation

Qualified for automotive applications. Product validation according to AEC-Q100/101.

### Description

The OPTIREG™ Linear TLE4269 is an automotive voltage regulator with a 5 V fixed output. The maximum operating voltage is 45 V. The output is able to drive 150 mA load. The device features short-circuit protection. The thermal shutdown feature switches the output off when the junction temperature exceeds 150°C to ensure the device is not damaged by overheating. A reset signal is generated when the output voltage drops below  $V_Q < 4.65\text{ V}$ . The reset threshold voltage can be decreased by an external connection of a voltage divider. The reset delay time can be set by an external capacitor. Reset and sense output have integrated pull-up resistors. If the integrated resistors are not required, the TLE4279 can be used instead. It is also possible to supervise the input voltage by using an integrated comparator to give a low voltage warning.

Type	Package	Marking
TLE4269G	PG-DSO-8	TLE 4269
TLE4269GM	PG-DSO-14	TLE 4269
TLE4269GL	PG-DSO-20	TLE 4269

## 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>2</b>
<b>1</b>	<b>Block diagram</b> .....	<b>3</b>
<b>2</b>	<b>Pin configuration</b> .....	<b>4</b>
<b>3</b>	<b>General product characteristics</b> .....	<b>7</b>
3.1	Absolute maximum ratings .....	7
3.2	Electrical characteristics .....	9
<b>4</b>	<b>Functional description</b> .....	<b>10</b>
<b>5</b>	<b>Application information</b> .....	<b>11</b>
5.1	Application diagram .....	11
5.2	Typical performance characteristics .....	13
<b>6</b>	<b>Package information</b> .....	<b>16</b>
<b>7</b>	<b>Revision history</b> .....	<b>18</b>

SKYTECH

تهیه و توزیع قطعات الکترونیک

Block diagram

1 Block diagram

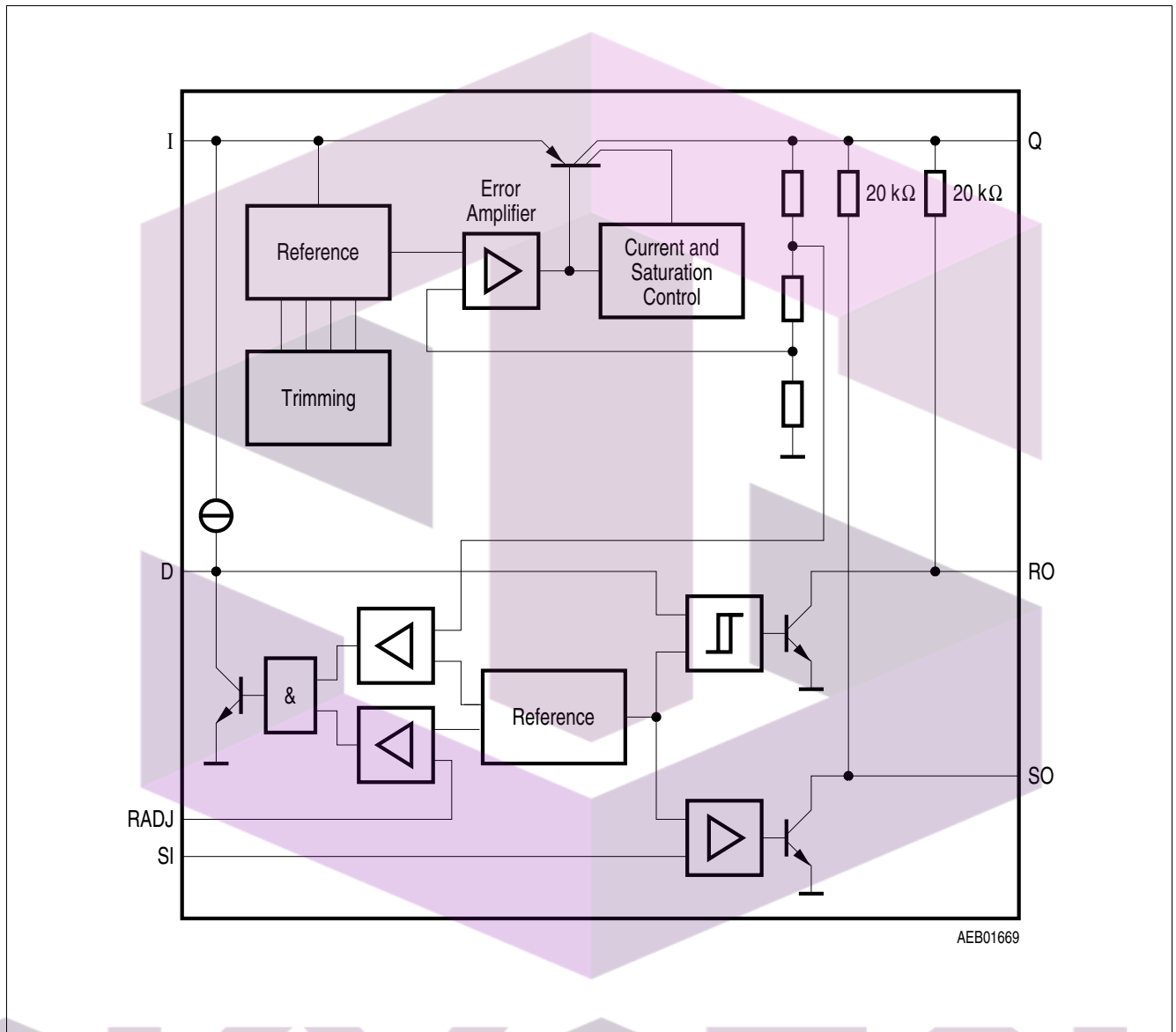


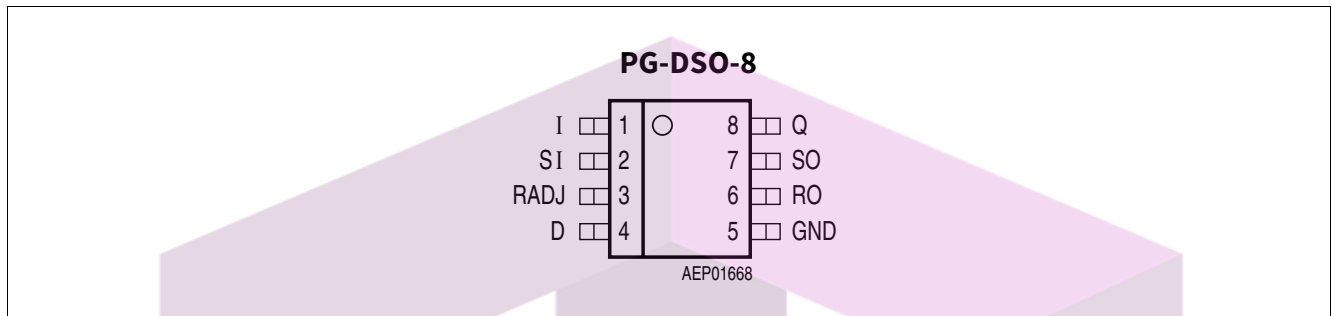
Figure 1 Block diagram

SKY↑TECH

تهیه و توزیع قطعات الکترونیک

**Pin configuration**

**2 Pin configuration**



**Figure 2** Pin configuration PG-DSO-8 (top view)

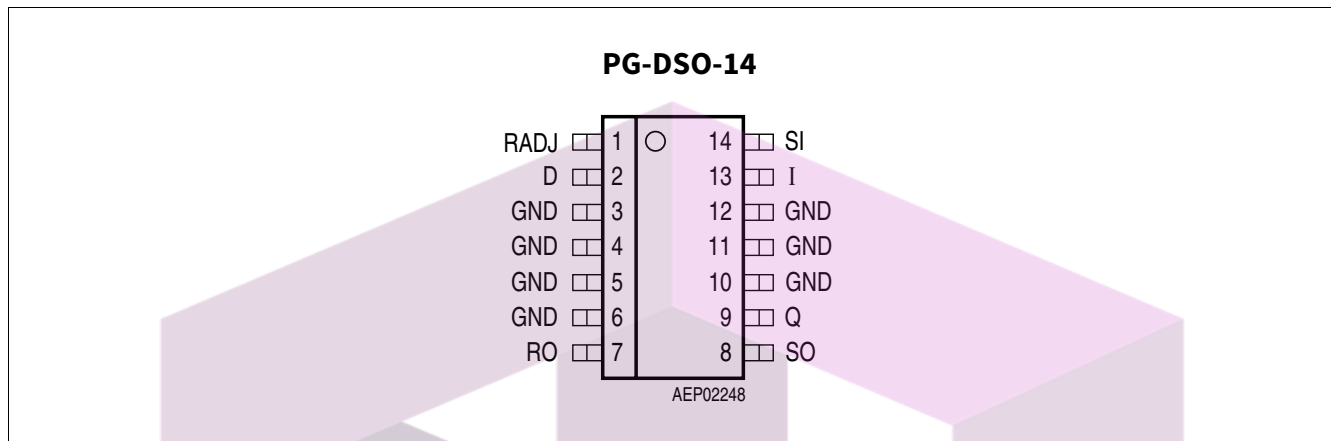
**Table 1** Pin definitions and functions (TLE4269G)

Pin No.	Symbol	Function
1	I	<b>Input</b> connected with a ceramic capacitor to GND directly at the IC.
2	SI	<b>Sense input</b> if not needed connect to Q.
3	RADJ	<b>Reset threshold adjust</b> if not needed connect to GND.
4	D	<b>Reset delay</b> to select delay time, connect to GND via capacitor.
5	GND	<b>Ground</b>
6	RO	<b>Reset output</b> the open collector output is connected to the 5 V output via an integrated 20 kΩ pull-up resistor; leave open if the reset function is not needed
7	SO	<b>Sense output</b> the open collector output is connected to the 5 V output via an integrated 20 kΩ pull-up resistor; leave open if the sense comparator is not needed.
8	Q	<b>5 V output</b> connect to GND with a 10 μF capacitor, ESR < 10 Ω

SKYTECH

تهیه و توزیع قطعات الکترونیک

**Pin configuration**



**Figure 3** Pin configuration PG-DSO-14 (top view)

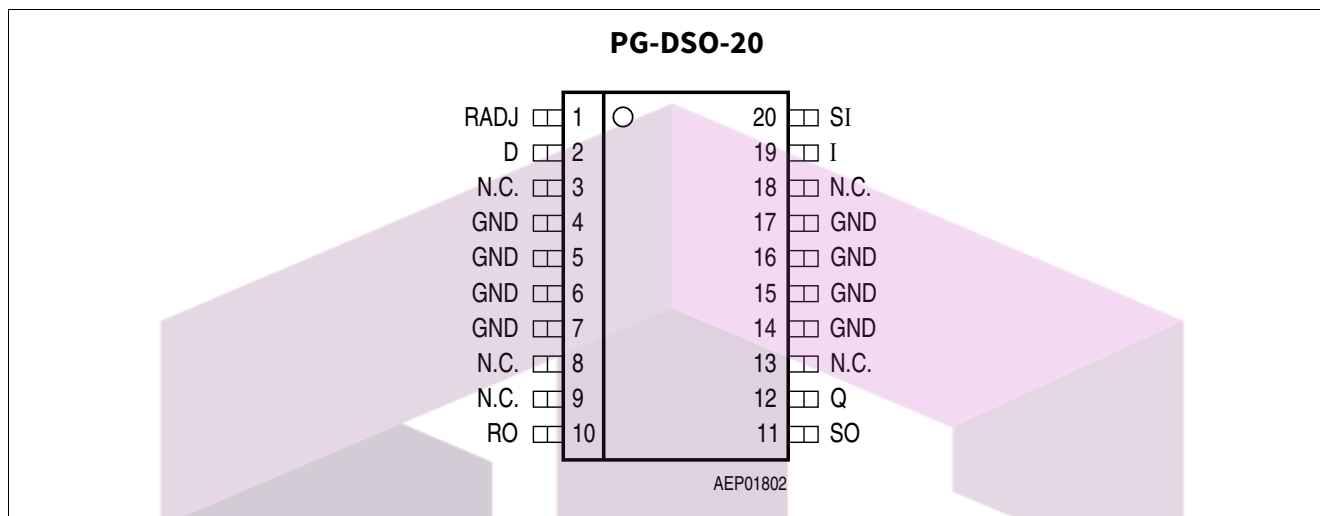
**Table 2** Pin definitions and functions (TLE4269GM)

Pin No.	Symbol	Function
1	RADJ	<b>Reset threshold adjust</b> if not needed connect to GND.
2	D	<b>Reset delay</b> to select delay time; connect to GND via capacitor.
3, 4, 5, 6	GND	<b>Ground</b>
7	RO	<b>Reset output</b> the open collector output is connected to the 5 V output via an integrated 20 kΩ pull-up resistor; leave open if the reset function is not needed
8	SO	<b>Sense output</b> the open collector output is connected to the 5 V output via an integrated 20 kΩ pull-up resistor; leave open if the sense comparator is not needed.
9	Q	<b>5 V Output</b> connect to GND with a 10 μF capacitor, ESR < 10 Ω.
10, 11, 12	GND	<b>Ground</b>
13	I	<b>Input</b> connected with a ceramic capacitor to GND directly at the IC.
14	SI	<b>Sense input</b> if not needed connect to Q.

SKYTECH

تهیه و توزیع قطعات الکترونیک

**Pin configuration**



**Figure 4** Pin configuration PG-DSO-20 (top view)

**Table 3** Pin definitions and functions (TLE4269GL)

Pin No.	Symbol	Function
1	RADJ	<b>Reset threshold adjust</b> if not needed connect to ground.
2	D	<b>Reset delay</b> to select delay time, connect to GND via external capacitor.
4 - 7, 14 - 17	GND	<b>Ground</b>
10	RO	<b>Reset output</b> the open collector output is connected to the 5 V output via an integrated 20 kΩ pull-up resistor; leave open if the reset function is not needed
11	SO	<b>Sense output</b> the open collector output is connected to the 5 V output via an integrated 20 kΩ pull-up resistor; leave open if the sense comparator is not needed.
12	Q	<b>Output</b> connect to GND with a 10 μF capacitor, ESR < 10 Ω.
19	I	<b>Input</b> connected with a ceramic capacitor to GND directly at the IC.
20	SI	<b>Sense input</b> if not needed connect to Q.

**General product characteristics**

### 3 General product characteristics

#### 3.1 Absolute maximum ratings

**Table 4 Absolute maximum ratings**

$T_j = -40^\circ\text{C}$  to  $150^\circ\text{C}$

Parameter	Symbol	Values			Unit	Note or Test Condition
		Min.	Typ.	Max.		
<b>Input</b>						
Input voltage	$V_I$	-40	-	45	V	-
Input current	$I_I$	-	-	-	-	Internal limited
<b>Sense input</b>						
Input voltage	$V_{SI}$	-40	-	45	V	-
Input current	$I_{SI}$	1	-	1	mA	-
<b>Reset threshold</b>						
Voltage	$V_{RADJ}$	-0.3	-	7	V	-
Current	$I_{RADJ}$	-10	-	10	mA	-
<b>Reset delay</b>						
Voltage	$V_D$	-0.3	-	7	V	-
Current	$I_D$	-	-	-	-	Internal limited
<b>Ground</b>						
Current	$I_{GND}$	50	-	-	mA	-
<b>Reset output</b>						
Voltage	$V_R$	-0.3	-	7	V	-
Current	$I_R$	-	-	-	-	Internal limited
<b>Sense output</b>						
Voltage	$V_{SO}$	-0.3	-	7	V	-
Current	$I_{SO}$	-	-	-	-	Internal limited
<b>5 V output</b>						
Output voltage	$V_Q$	-0.5	-	7	V	-
Output current	$I_Q$	-10	-	-	mA	-
<b>Temperature</b>						
Junction temperature	$T_j$	-	-	150	$^\circ\text{C}$	-
Storage temperature	$T_{Stg}$	-50	-	150	$^\circ\text{C}$	-
<b>Operating range</b>						
Input voltage	$V_I$	-	-	45	V	-
Junction temperature	$T_j$	-40	-	150	$^\circ\text{C}$	-

**General product characteristics**

**Table 4 Absolute maximum ratings (cont'd)**

$T_j = -40^\circ\text{C}$  to  $150^\circ\text{C}$

Parameter	Symbol	Values			Unit	Note or Test Condition
		Min.	Typ.	Max.		
<b>Thermal data</b>						
Junction-ambient	$R_{thja}$	-	-	200	K/W	PG-DSO-8
		-	-	70	K/W	PG-DSO-14
		-	-	70	K/W	PG-DSO-20
Junction-pin	$R_{thjp}$	-	-	30	K/W	PG-DSO-8 <sup>1)</sup>
		-	-	30	K/W	PG-DSO-14 <sup>2)</sup>
		-	-	30	K/W	PG-DSO-20 <sup>2)</sup>

1) Measured to pin 5.

2) Measured to pin 4.

**SKYTECH**

تهیه و توزیع قطعات الکترونیک



**General product characteristics**

**3.2 Electrical characteristics**

**Table 5 Electrical characteristics**

$V_I = 13.5\text{ V}$ ;  $-40^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$

Parameter	Symbol	Values			Unit	Note or Test Condition
		Min.	Typ.	Max.		
Output voltage	$V_Q$	4.90	5.00	5.10	V	$1\text{ mA} \leq I_Q \leq 100\text{ mA}$ , $6\text{ V} \leq V_I \leq 16\text{ V}$
Current limit	$I_Q$	150	200	500	mA	–
Current consumption; $I_q = I_1 - I_Q$	$I_q$	–	240	300	$\mu\text{A}$	$I_Q \leq 1\text{ mA}$ , $T_j < 85^\circ\text{C}$
Current consumption; $I_q = I_1 - I_Q$	$I_q$	–	250	700	$\mu\text{A}$	$I_Q = 10\text{ mA}$
Current consumption; $I_q = I_1 - I_Q$	$I_q$	–	2	8	mA	$I_Q = 50\text{ mA}$
Drop voltage	$V_{dr}$	–	0.25	0.5	V	$I_Q = 100\text{ mA}^{1)}$
Load regulation	$\Delta V_Q$	–	10	30	mV	$I_Q = 5\text{ mA}$ to $100\text{ mA}$
Line regulation	$\Delta V_Q$	–	10	40	mV	$V_I = 6\text{ V}$ to $26\text{ V}$ , $I_Q = 1\text{ mA}$

**Reset generator**

Switching threshold	$V_{RT}$	4.50	4.65	4.80	V	–
Reset adjust switching threshold	$V_{RADJ, TH}$	1.26	1.35	1.44	V	$V_Q > 3.5\text{ V}$
Reset pull-up	–	10	20	40	k $\Omega$	–
Saturation voltage	$V_{RO, SAT}$	–	0.1	0.4	V	$R_{intern}$
Upper delay switching threshold	$V_{UD}$	1.4	1.8	2.2	V	–
Lower delay switching threshold	$V_{LD}$	0.3	0.45	0.60	V	–
Saturation voltage delay capacitor	$V_{D, SAT}$	–	–	0.1	V	$V_Q < V_{RT}$
Charge current	$I_D$	3.0	6.5	9.5	$\mu\text{A}$	$V_D = 1\text{ V}$
Delay time L $\rightarrow$ H	$t_d$	17	28	–	ms	$C_D = 100\text{ nF}$
Delay time H $\rightarrow$ L	$t_t$	–	1	–	$\mu\text{s}$	$C_D = 100\text{ nF}$

**Input voltage sense**

Sense threshold high	$V_{SI, high}$	1.24	1.31	1.38	V	–
Sense threshold low	$V_{SI, low}$	1.16	1.20	1.28	V	–
Sense output low voltage	$V_{SO, low}$	–	0.1	0.4	V	$V_{SI} < 1.20\text{ V}$ ; $V_Q > 3\text{ V}$ , $R_{intern}$
Sense pull-up	–	10	20	40	k $\Omega$	–
Sense input current	$I_{SI}$	-1	0.1	1	$\mu\text{A}$	–

1) Drop voltage =  $V_I - V_Q$  measured when the output voltage has dropped 100 mV from the nominal value obtained at 13.5 V input.

## Functional description

### 4 Functional description

The control amplifier compares a reference voltage, made highly accurate by resistance balancing, with a voltage proportional to the output voltage and drives the base of the series PNP transistor via a buffer. Saturation control as a function of the load current prevents any over-saturation of the power element.

The reset output RO is in high-state if the voltage on the delay capacitor  $C_D$  is greater or equal  $V_{UD}$ . The delay capacitor  $C_D$  is charged with the current  $I_D$  for output voltages greater than the reset threshold  $V_{RT}$ . If the output voltage gets lower than  $V_{RT}$  ('reset condition') a fast discharge of the delay capacitor  $C_D$  sets in and as soon as  $V_D$  gets lower than  $V_{LD}$  the reset output RO is set to low-level.

The time gap for the delay capacitor discharge is the reset reaction time  $t_{RR}$ .

The reset threshold  $V_{RT}$  can be decreased via an external voltage divider connected to the pin RADJ. In this case the reset condition is reached if  $V_Q < V_{RT}$  and  $V_{RADJ} < V_{RAQDJ, TH}$ . Dimensioning the voltage divider (Figure 5) according to:

$$V_{THRES} = \frac{V_{RAD(J, TH)} \times (R_{ADJ1} + R_{ADJ2})}{R_{ADJ2}} \quad (4.1)$$

the reset threshold can be decreased down to 3.5 V. If the reset-adjust-option is not needed the RADJ-pin should be connected to GND causing the reset threshold to go to its default value (typ. 4.65 V).

A built in comparator compares the signal of the pin SI, normally fed by a voltage divider from the input voltage, with the reference and gives an early warning on the pin SO. It is also possible to superwise another voltage e.g. of a second regulator, or to build a watchdog circuit with few external components.

# SKYTECH

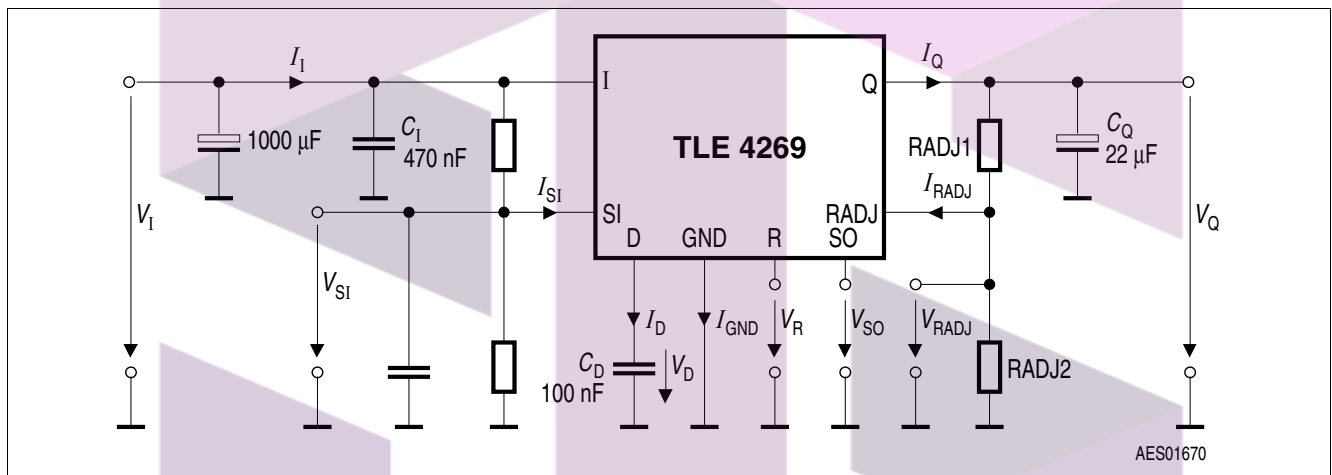
## تهیه و توزیع قطعات الکترونیک

**Application information**

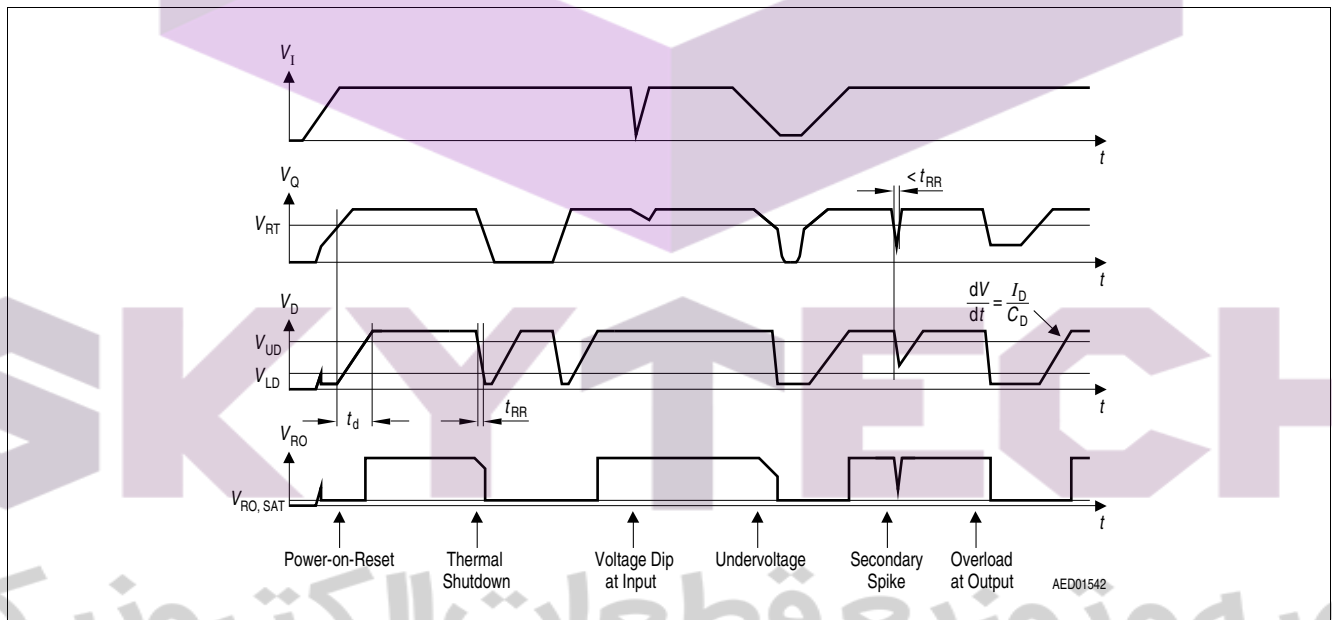
**5 Application information**

The input capacitor  $C_1$  is necessary for compensating line influences. Using a resistor of approx.  $1\ \Omega$  in series with  $C_1$ , the oscillating circuit consisting of input inductivity and input capacitance can be damped. The output capacitor  $C_Q$  is necessary for the stability of the regulating circuit. Stability is guaranteed at values  $\geq 10\ \mu\text{F}$  and an  $\text{ESR} \leq 10\ \Omega$  within the operating temperature range. For small tolerances of the reset delay the spread of the capacitance of the delay capacitor and its temperature coefficient should be noted.

**5.1 Application diagram**



**Figure 5 Measuring circuit**



**Figure 6 Reset timing diagram**

Application information

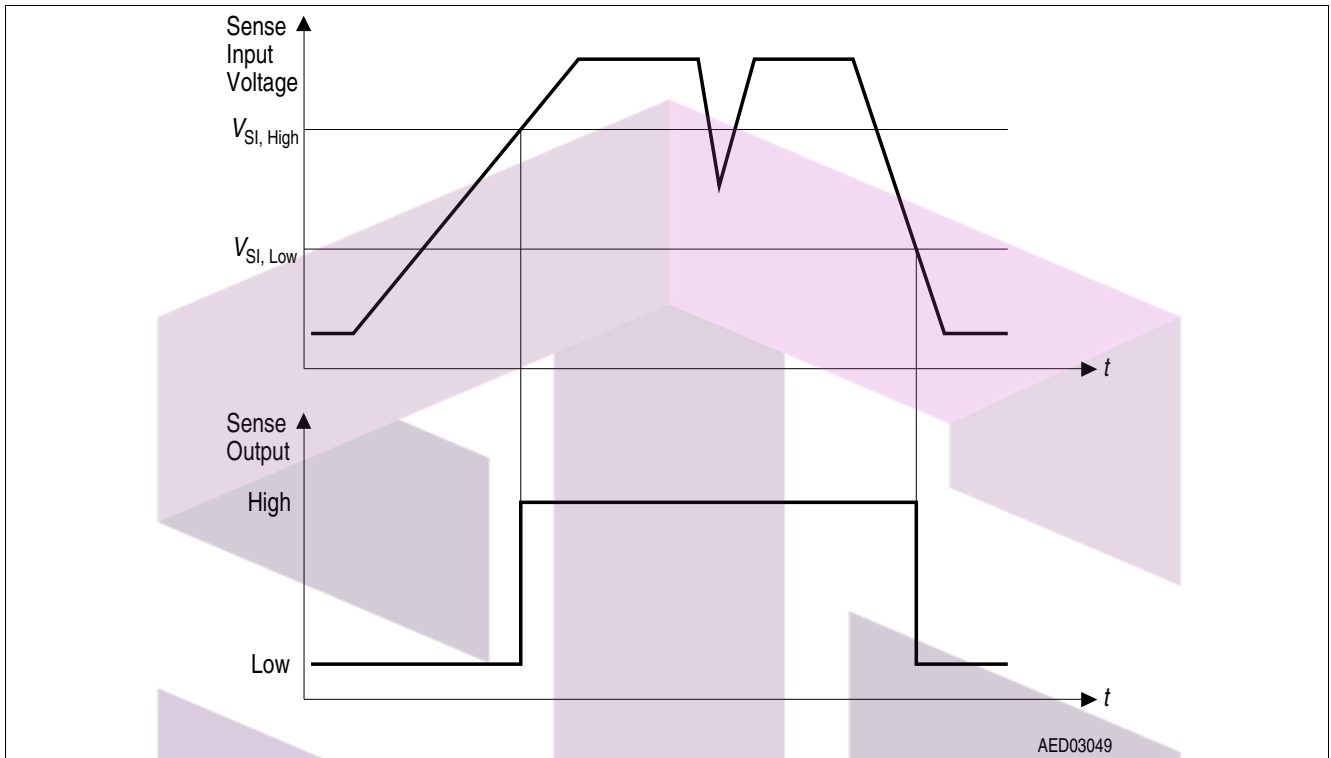


Figure 7 Sense timing diagram

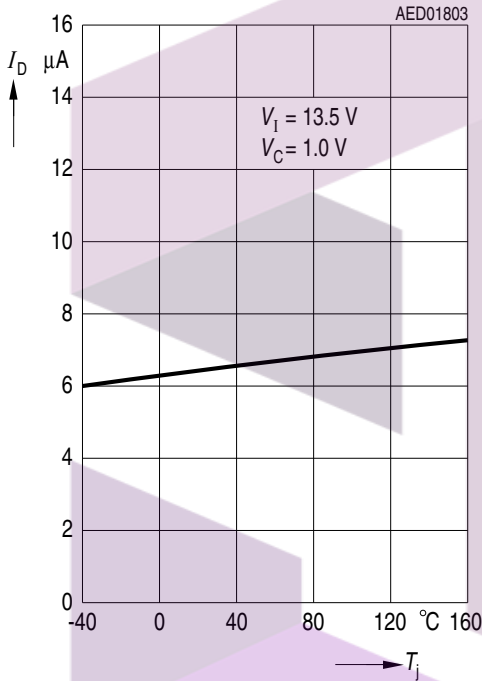
SKYTECH

تهیه و توزیع قطعات الکترونیک

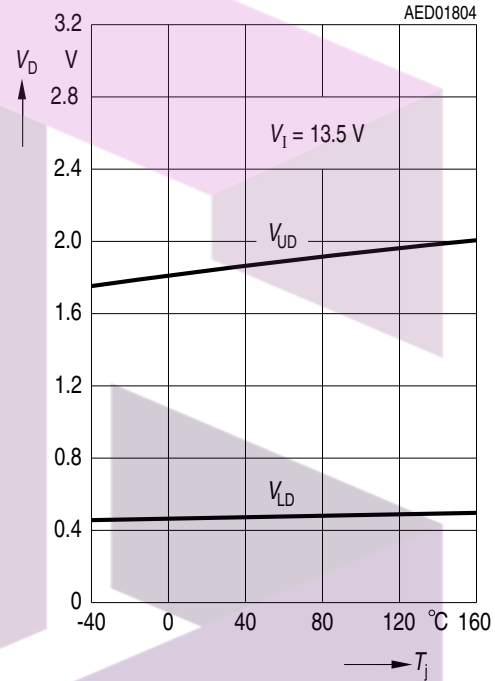
**Application information**

**5.2 Typical performance characteristics**

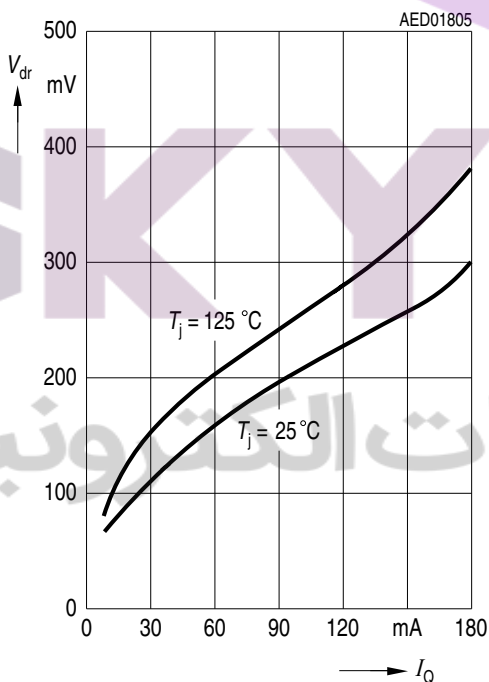
**Charge current  $I_D$  versus junction temperature  $T_j$**



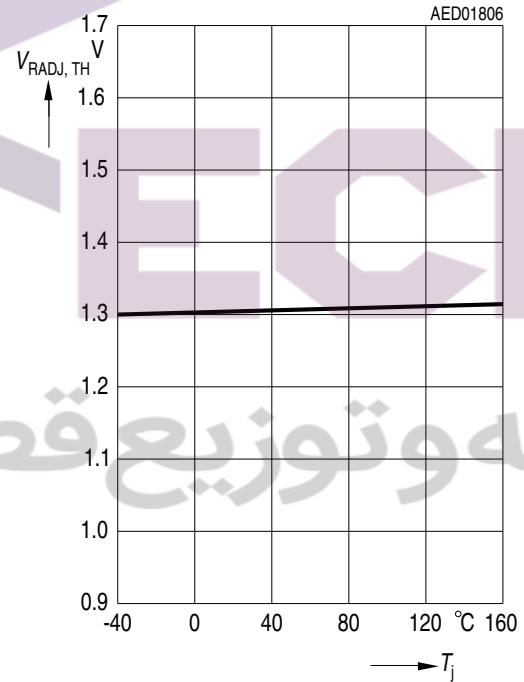
**Switching voltage  $V_{UD}$  and  $V_{LD}$  versus junction temperature  $T_j$**



**Drop voltage  $V_{dr}$  versus output current  $I_Q$**

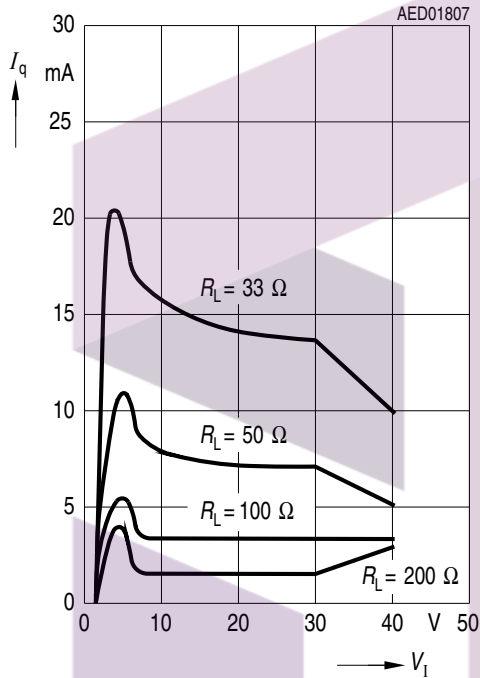


**Reset adjust switching threshold  $V_{RADJ,TH}$  versus junction temperature  $T_j$**

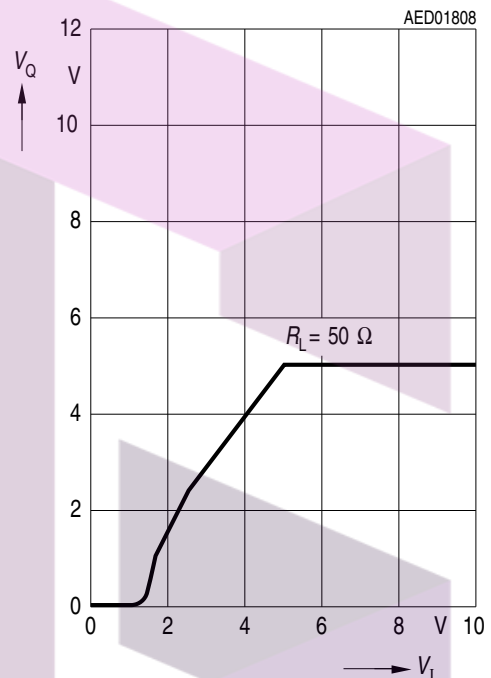


**Application information**

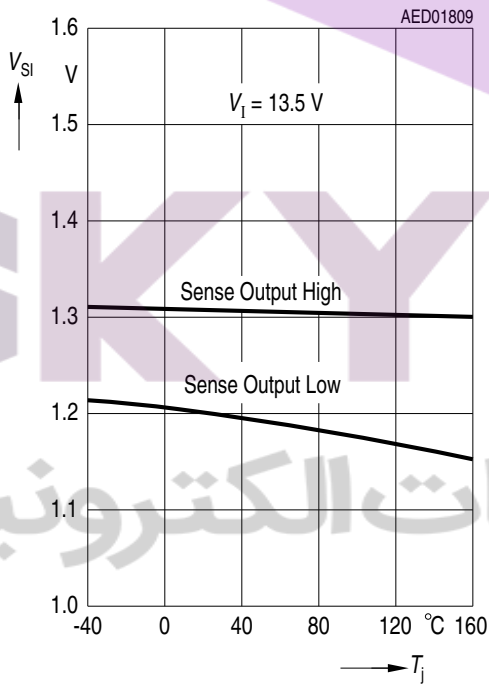
**Current consumption  $I_Q$  versus input voltage  $V_I$**



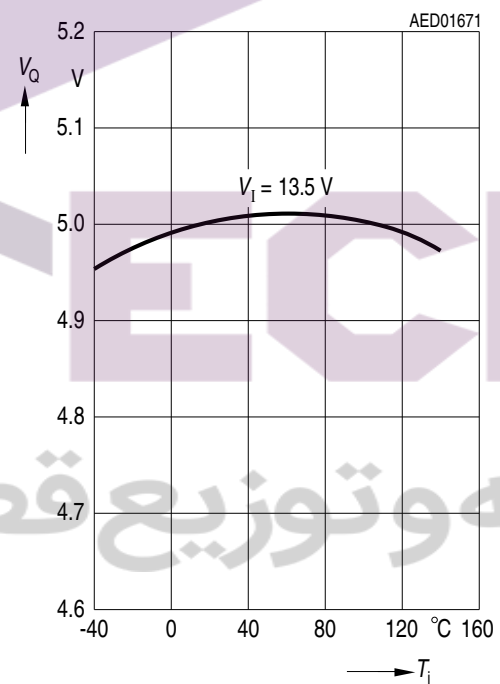
**Output voltage  $V_Q$  versus input voltage  $V_I$**



**Sense threshold  $V_{SI}$  versus junction temperature  $T_j$**

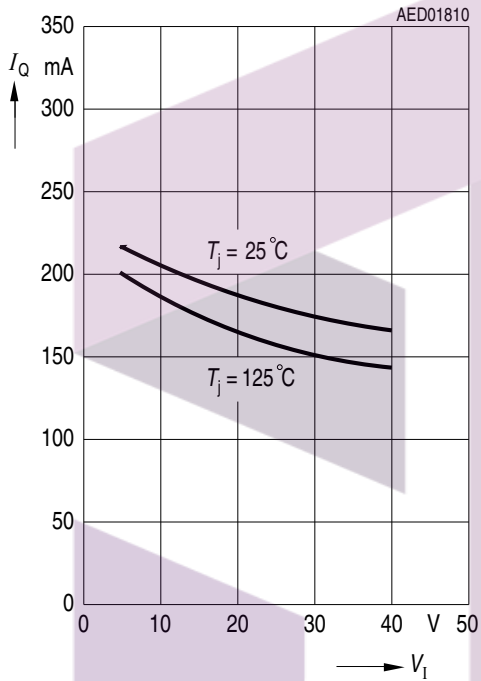


**Output voltage  $V_Q$  versus junction temperature  $T_j$**

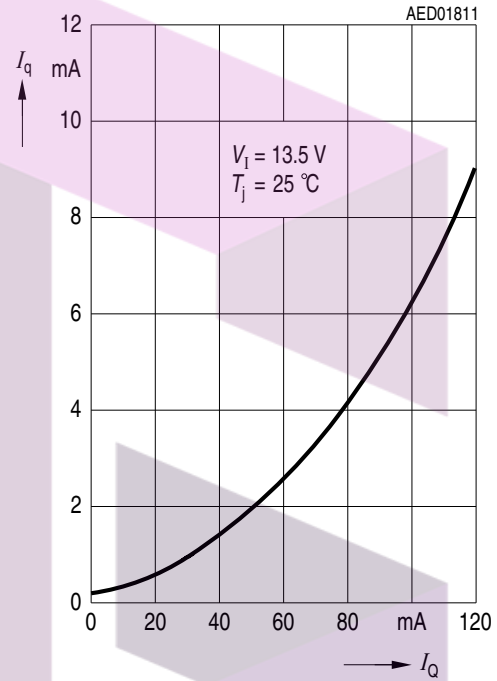


**Application information**

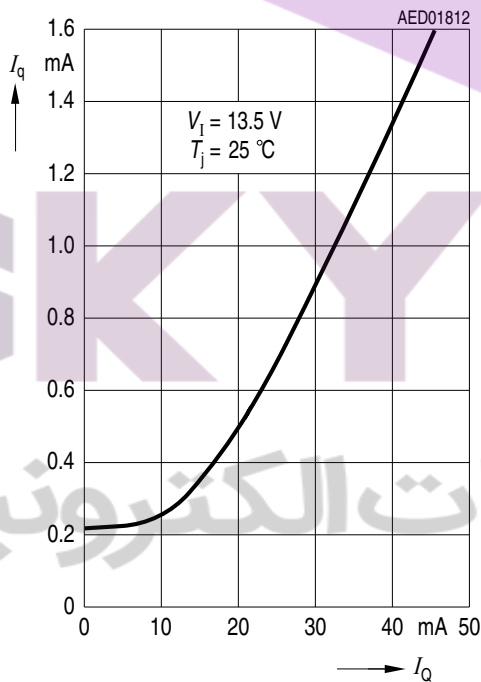
**Output current  $I_Q$  versus input voltage  $V_I$**



**Current consumption  $I_q$  versus output current  $I_Q$**

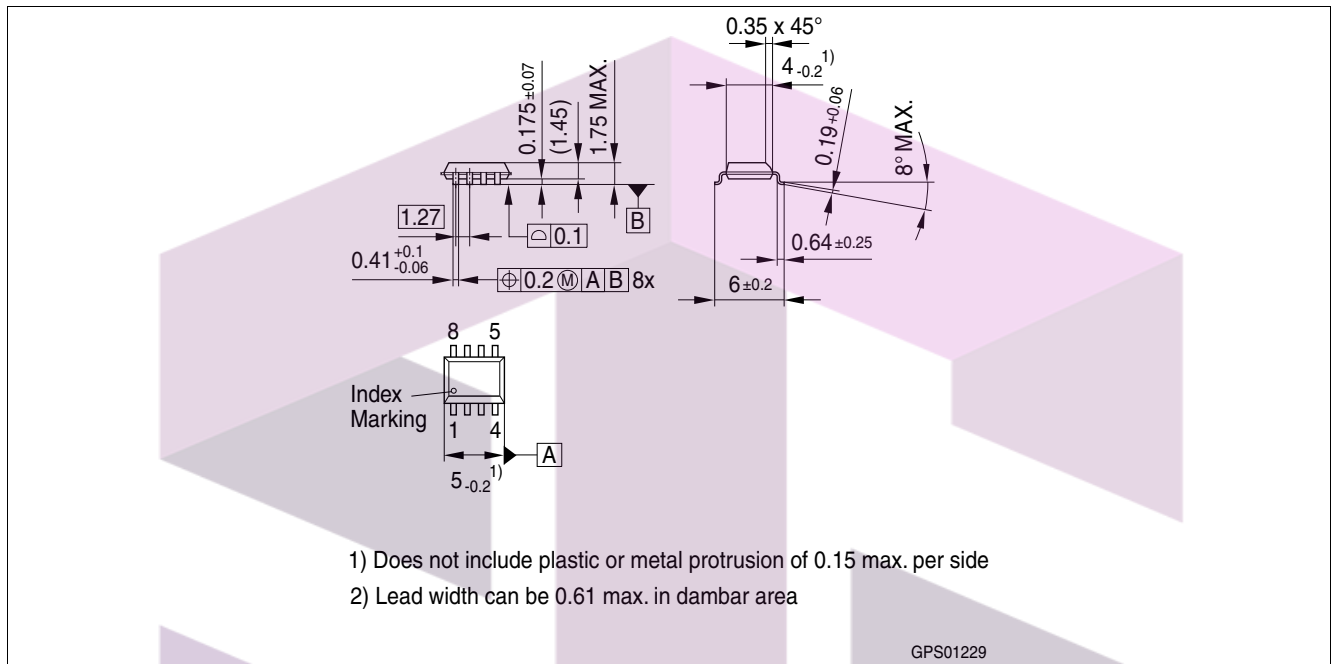


**Current consumption  $I_q$  versus output current  $I_Q$**

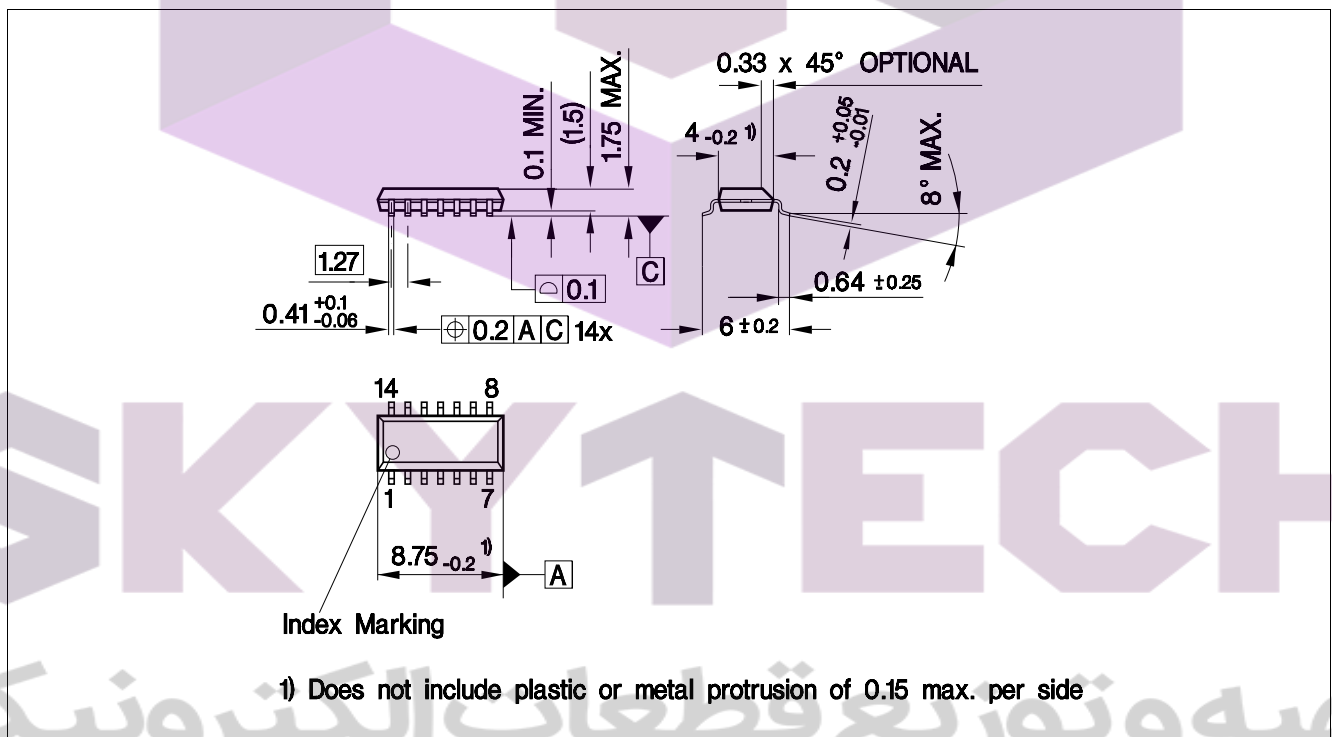


**Package information**

**6 Package information**



**Figure 8 PG-DSO-8<sup>1)</sup>**

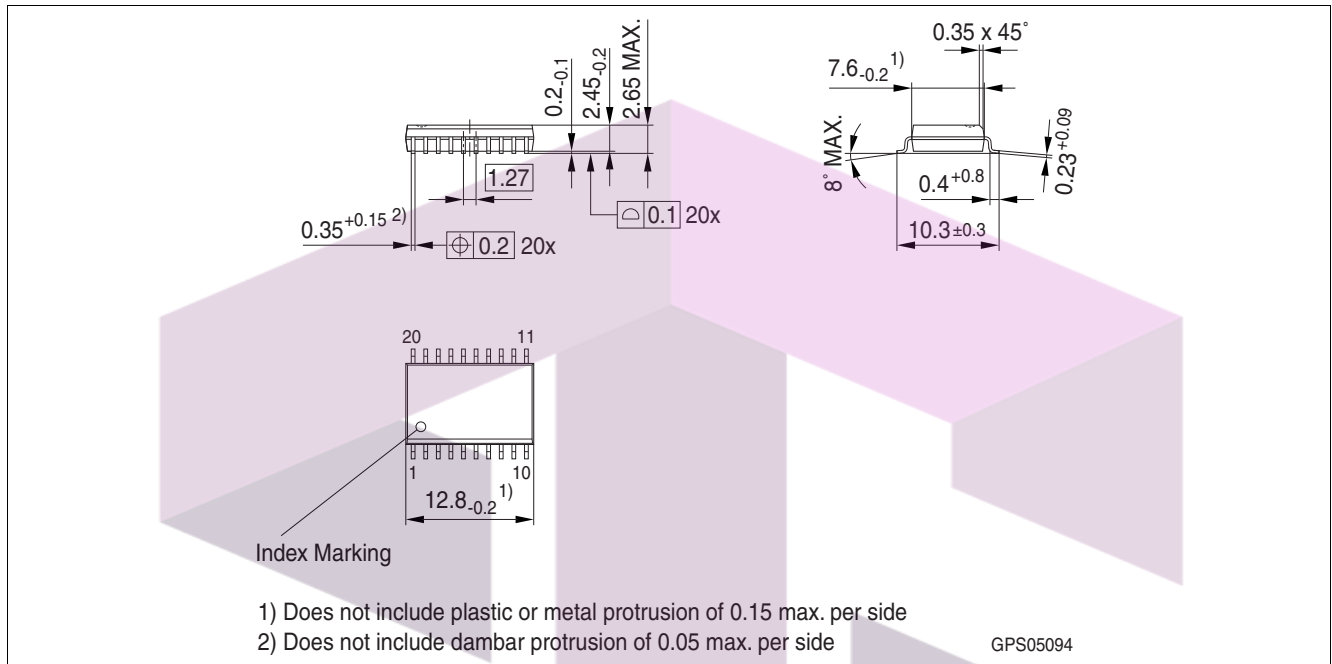


**Figure 9 PG-DSO-14<sup>1)</sup>**

1) Dimensions in mm



**Package information**



**Figure 10 PG-DSO-20<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>

**SKYTECH**

تهیه و توزیع قطعات الکترونیک

1) Dimensions in mm

Revision history

## 7 Revision history

Revision	Date	Changes
2.6	2018-11-20	Update layout and structure Updated packaged drawing “PG-DSO-14” Editorial changes
2.5	2013-11-25	Package version changed: - PG-DSO-20-35 to PG-DSO-20 Package naming harmonized according to Infineon standards: - PG-DSO-8-16 to PG-DSO-8 - PG-DSO-14-30 to PG-DSO-14
2.4	2007-03-20	Initial version of RoHS-compliant derivate of TLE4269 <b>Page 1</b> : AEC certified statement added <b>Page 1</b> and <b>Page 16</b> : RoHS compliance statement and Green product feature added <b>Page 1</b> and <b>Page 16</b> : Package changed to RoHS compliant version Legal Disclaimer updated
2.3	2004-01-01	

SKYTECH

تهیه و توزیع قطعات الکترونیک



#### Trademarks

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

**Edition 2018-11-20**

**Published by**

**Infineon Technologies AG**

**81726 Munich, Germany**

**© 2018 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**

**Z8F52238104**

#### 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.