

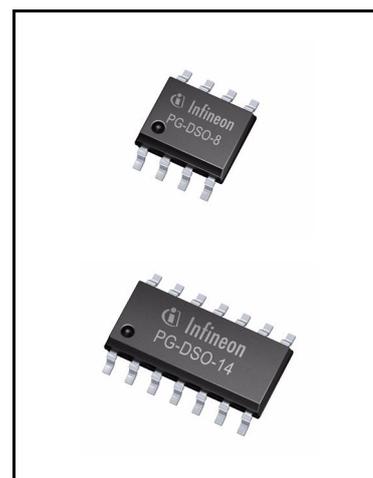
OPTIREG™ Linear TLE4279

5V 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
- 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 TLE4279 is an automotive voltage regulator with a 5 V fixed output, in a PG-DSO-8 or PG-DSO-14 package. 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. If the application requires pull-up resistors at the logic outputs (Reset, Sense Out) the TLE4269 with integrated resistors can be used. It is also possible to supervise the input voltage by using an integrated comparator to give a low voltage warning.

| Type | Package | Marking |
|-----------|-----------|----------|
| TLE4279G | PG-DSO-8 | TLE4279 |
| TLE4279GM | PG-DSO-14 | TLE 4279 |

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Block diagram

1 Block diagram

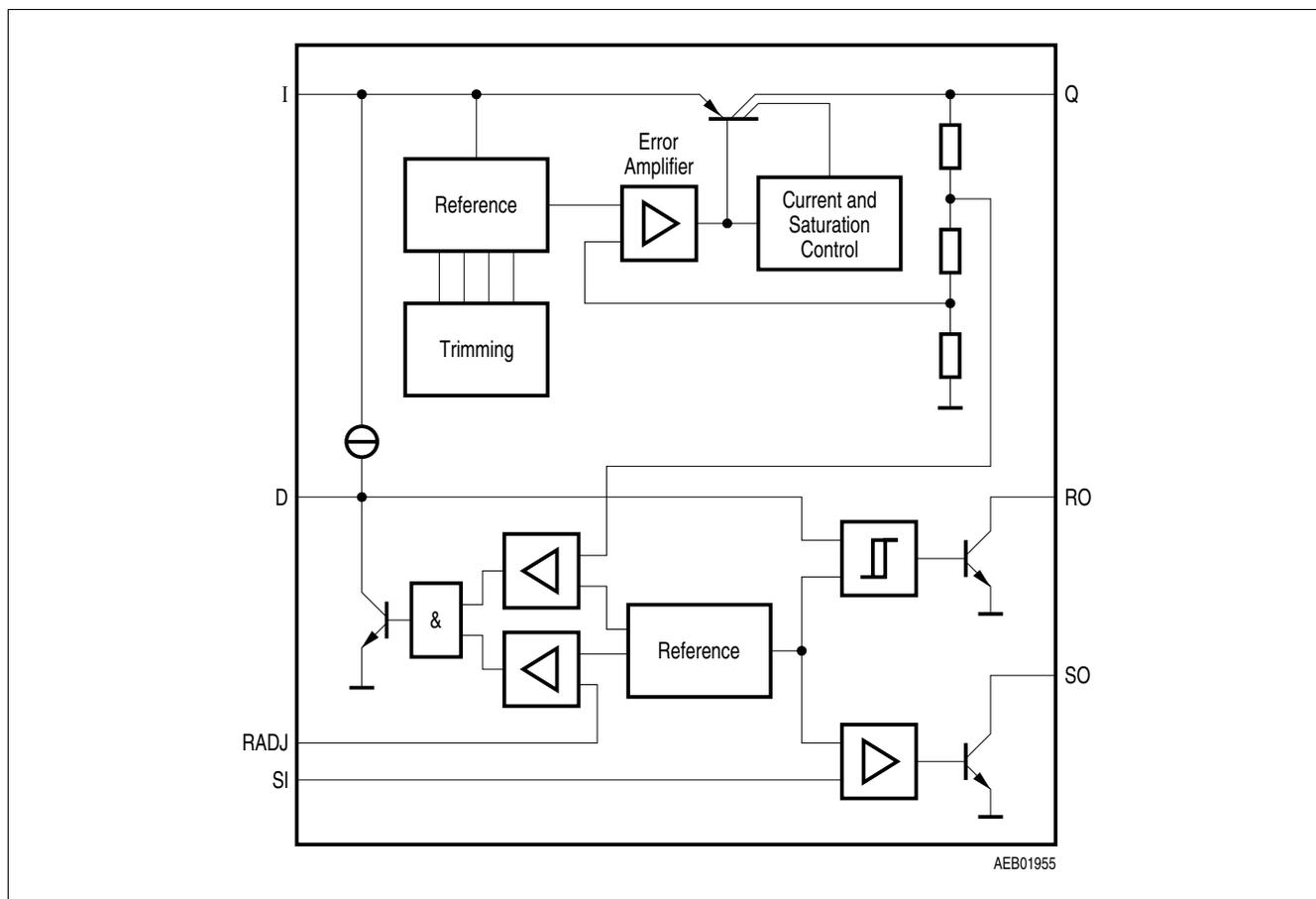


Figure 1 Block diagram

Pin configuration

2 Pin configuration

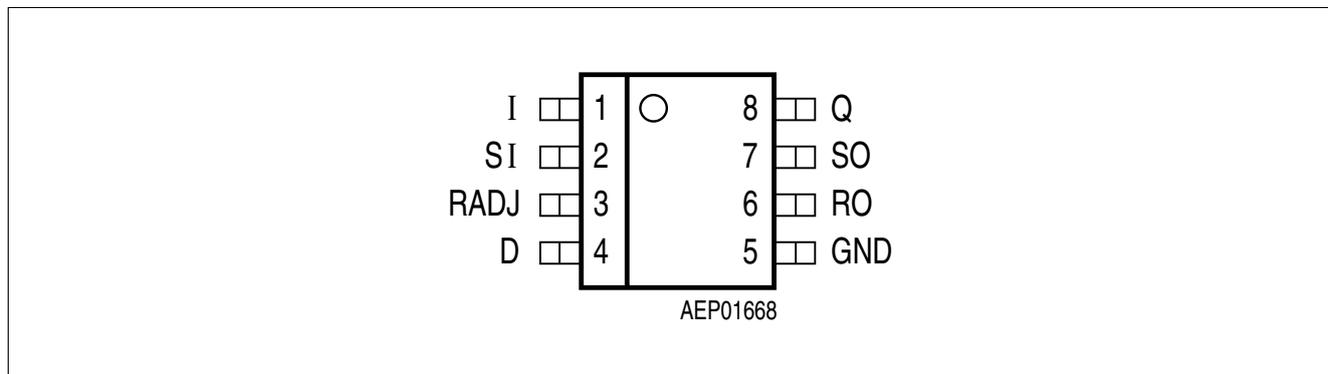


Figure 2 Pin configuration PG-DSO-8 (top view)

Table 1 Pin definitions and functions (TLE4279G)

| Pin No. | Symbol | Function |
|---------|--------|---|
| 1 | I | Input; block to GND directly at the IC with a ceramic capacitor |
| 2 | SI | Sense input; if not needed connect to Q |
| 3 | RADJ | Reset threshold adjust; if not needed connect to ground |
| 4 | D | Reset delay; to select the delay time, connect to GND via external capacitor |
| 5 | GND | Ground |
| 6 | RO | Reset output; open-collector output. Keep open, if not needed |
| 7 | SO | Sense output; open-collector output. Keep open, if not needed |
| 8 | Q | 5-V output; connect to GND with a 10 μF capacitor, ESR < 10 Ω |

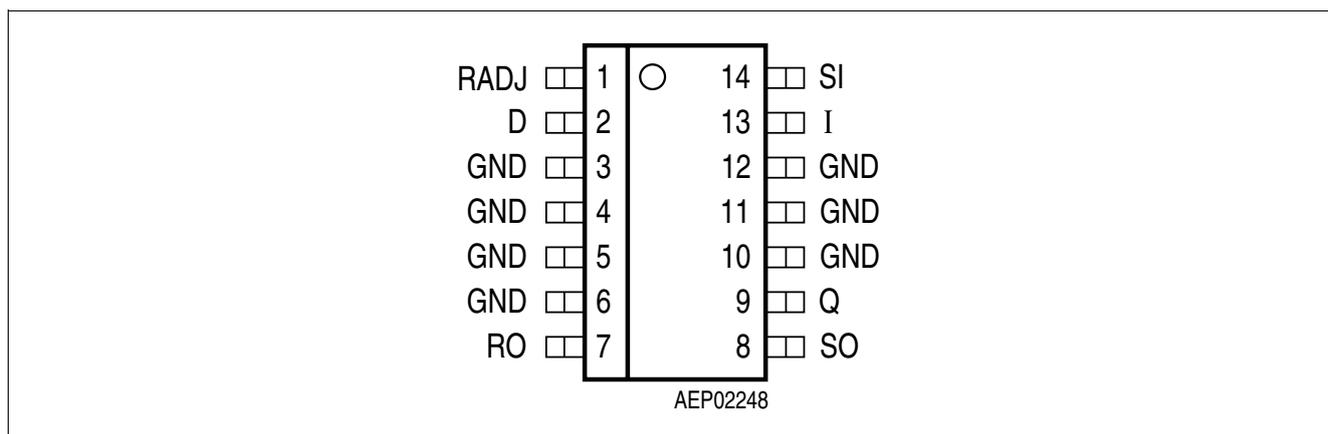


Figure 3 Pin configuration PG-DSO-14 (top view)

Table 2 Pin definitions and functions (TLE4279GM)

| Pin No. | Symbol | Function |
|------------|--------|--|
| 1 | RADJ | Reset threshold adjust; if not needed connect to GND |
| 2 | D | Reset delay; connect to GND via external delay capacitor for setting delay time |
| 3, 4, 5, 6 | GND | Ground |

Pin configuration

Table 2 Pin definitions and functions (TLE4279GM) (cont'd)

| Pin No. | Symbol | Function |
|----------------|---------------|---|
| 7 | RO | Reset output; open-collector output. Keep open, if not needed |
| 8 | SO | Sense output; open-collector output. Keep open, if not needed |
| 9 | Q | 5-V output; connect to GND via 10 μ F capacitor, ESR < 10 Ω |
| 10, 11, 12 | GND | Ground |
| 13 | I | Input; block to GND directly at the IC by a ceramic capacitor |
| 14 | SI | Sense input; if not needed connect to Q |

General product characteristics

3 General product characteristics

3.1 Absolute maximum ratings

Table 3 Absolute maximum ratings

$T_j = -40$ to 150 °C

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

General product characteristics

Table 3 Absolute maximum ratings (cont'd)

$T_j = -40$ to 150 °C

| Parameter | Symbol | Values | | | Unit | Note or Test Condition |
|------------------------|------------|--------|------|------|------|-------------------------|
| | | Min. | Typ. | Max. | | |
| Operating range | | | | | | |
| Input voltage | V_I | – | – | 45 | V | – |
| Junction temperature | T_j | -40 | – | 150 | °C | – |
| Thermal data | | | | | | |
| Junction-ambient | R_{thja} | – | – | 200 | K/W | PG-DSO-8 |
| | | – | – | 70 | K/W | PG-DSO-14 |
| Junction-pin | R_{thjp} | – | – | 30 | K/W | PG-DSO-14 ¹⁾ |

1) measured to Pin 4

General product characteristics

3.2 Electrical characteristics

Table 4 Electrical characteristics

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

| 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; $I_q = I_I - I_Q$ | I_q | – | 150 | 300 | μA | $I_Q \leq 1 \text{ mA}, T_j < 85 \text{ °C}$ |
| Current consumption; $I_q = I_I - I_Q$ | I_q | – | 250 | 700 | μA | $I_Q = 10 \text{ mA}$ |
| Current consumption; $I_q = I_I - I_Q$ | 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 | ΔV_Q | – | 10 | 30 | mV | $I_Q = 5 \text{ mA to } 100 \text{ mA}$ |
| Line regulation | ΔV_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 voltage | $V_{RADJ,TH}$ | 1.26 | 1.35 | 1.44 | V | $V_Q > 3.5 \text{ V}$ |
| Reset low voltage | $V_{RO,SAT}$ | – | 0.1 | 0.4 | V | $R_{\text{extern}} = 20 \text{ k}\Omega$ |
| 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 | – |
| Reset delay low voltage | $V_{D,SAT}$ | – | – | 0.1 | V | $V_Q < V_{RT}$ |
| Charge current | I_D | 3.0 | 6.5 | 9.5 | μA | $V_D = 1 \text{ V}$ |
| Delay time L → H | t_d | 17 | 28 | – | ms | $C_D = 100 \text{ nF}$ |
| Delay time H → L | t_t | – | 1 | – | μs | $C_D = 100 \text{ nF}$ |

Input voltage sense

| | | | | | | |
|--------------------------|-----------------------|------|------|------|---------------|--|
| Sense threshold high | $V_{SI, \text{high}}$ | 1.24 | 1.31 | 1.38 | V | – |
| Sense threshold low | $V_{SI, \text{low}}$ | 1.16 | 1.20 | 1.28 | V | – |
| Sense output low voltage | $V_{SO, \text{low}}$ | – | 0.1 | 0.4 | V | $V_{SI} < 1.20 \text{ V};$ $V_Q > 3 \text{ V};$ $R_{\text{extern}} = 20 \text{ k}\Omega$ |
| Sense input current | I_{SI} | -1 | 0.1 | 1 | μA | – |

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 (see **Figure 4**) according to:

(4.1)

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

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.

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. Both reset output and sense output are open collector outputs and have to be connected to 5 V output via external pull-up resistors $\geq 10\ \text{k}\Omega$. For small tolerances of the reset delay the spread of the capacitance of the delay capacitor and its temperature coefficient should be noted.

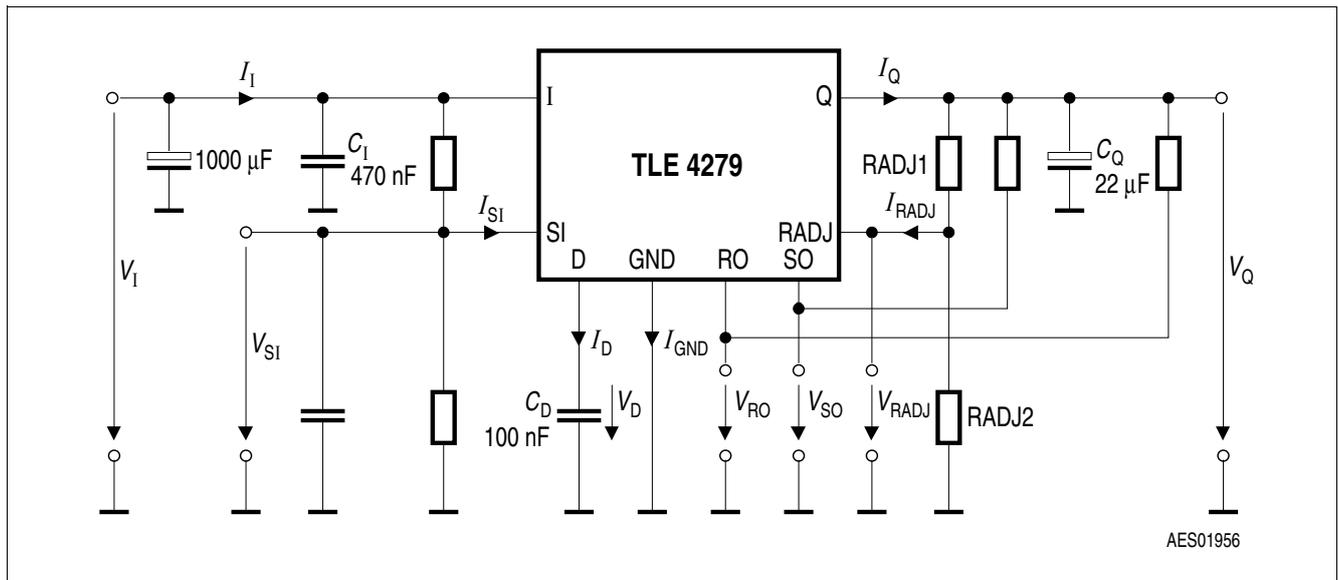


Figure 4 Measuring circuit

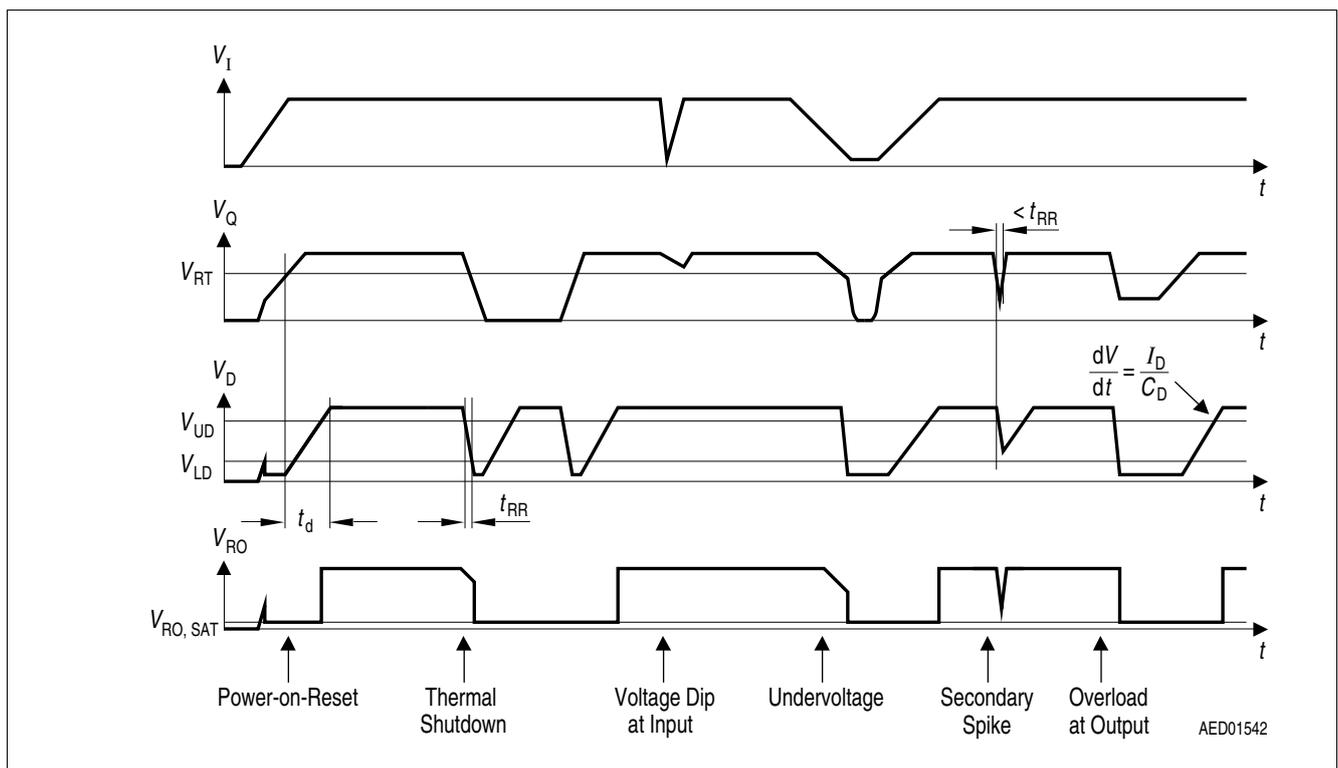


Figure 5 Reset timing diagram

Application information

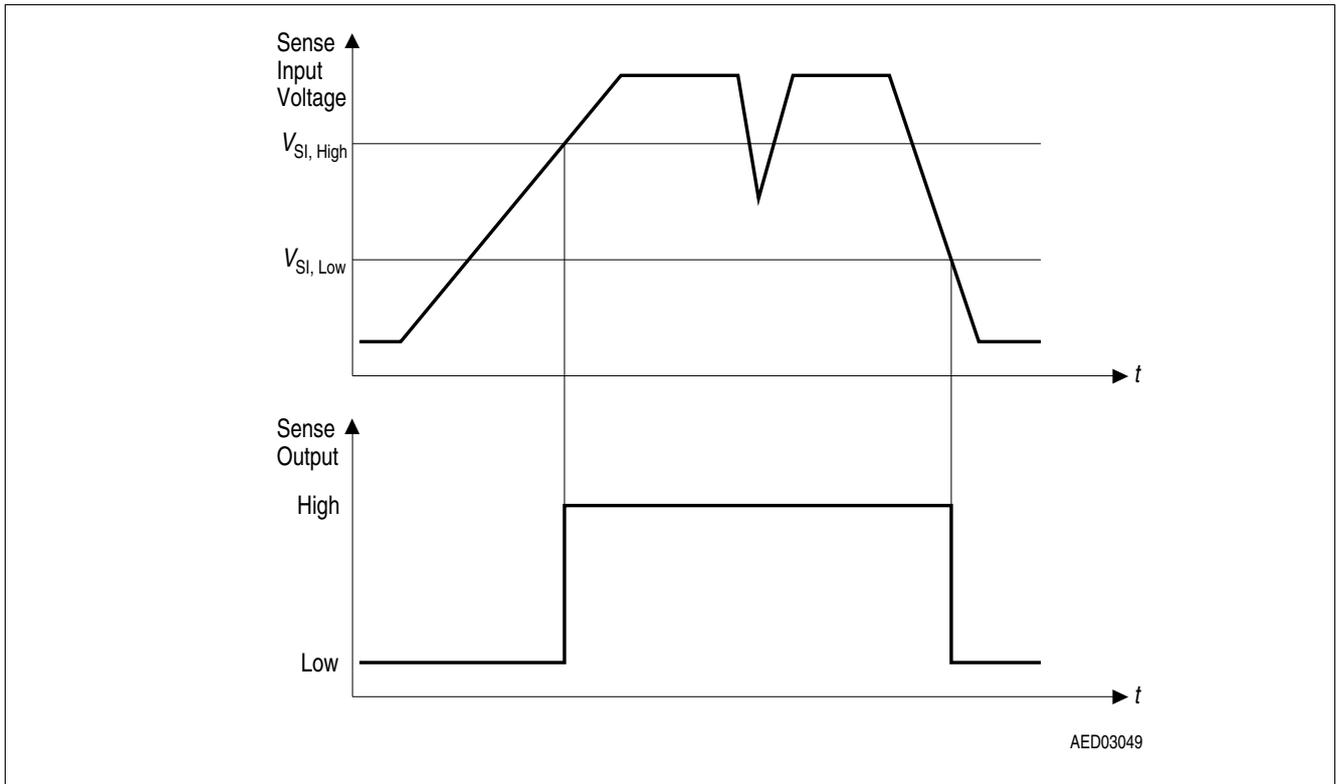
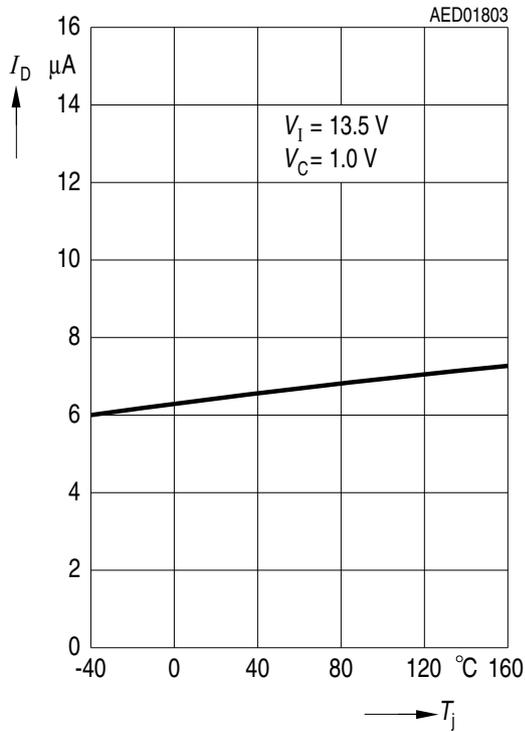


Figure 6 Sense input timing diagram

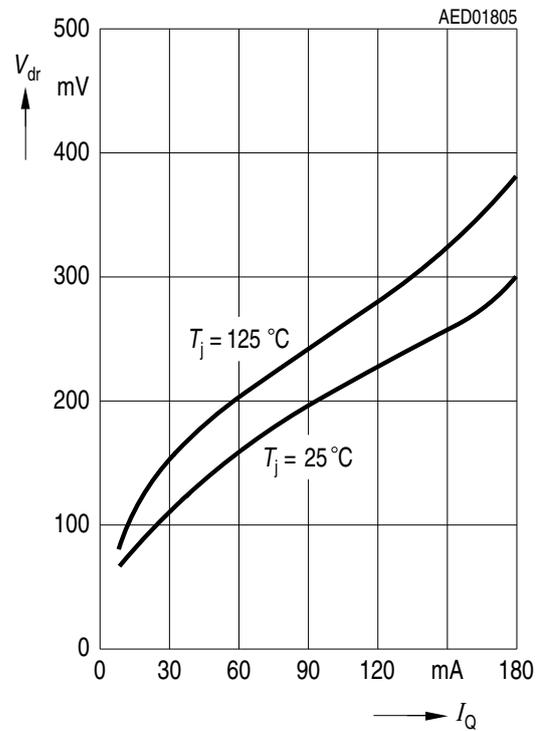
Application information

5.1 Typical performance characteristics

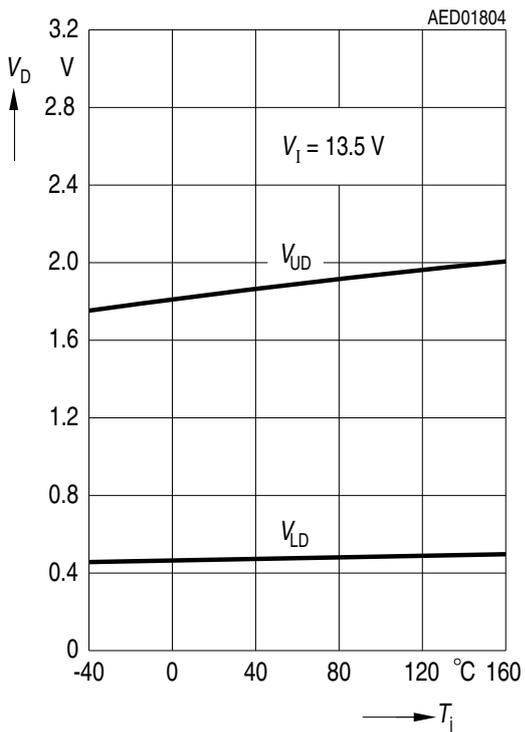
Charge current I_D versus temperature T_j



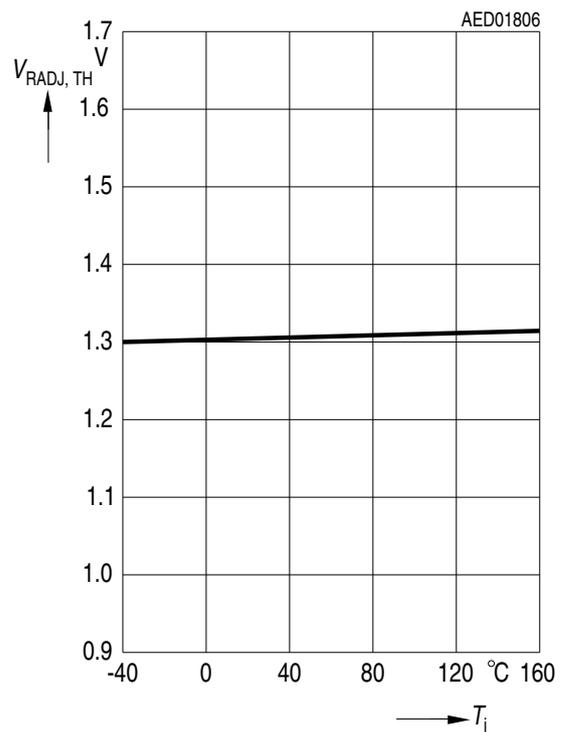
Drop voltage V_{dr} versus output current I_Q



Switching voltage V_{UD} and V_{LD} versus temperature T_j

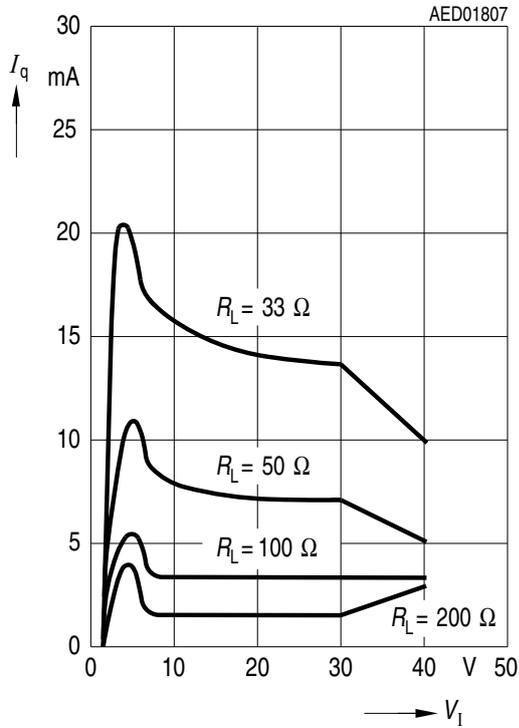


Reset adjust switching threshold $V_{RADJ,TH}$ versus temperature T_j

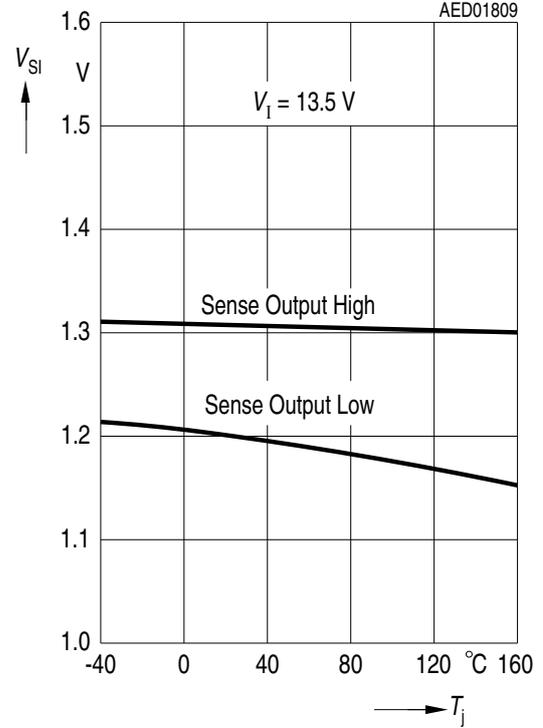


Application information

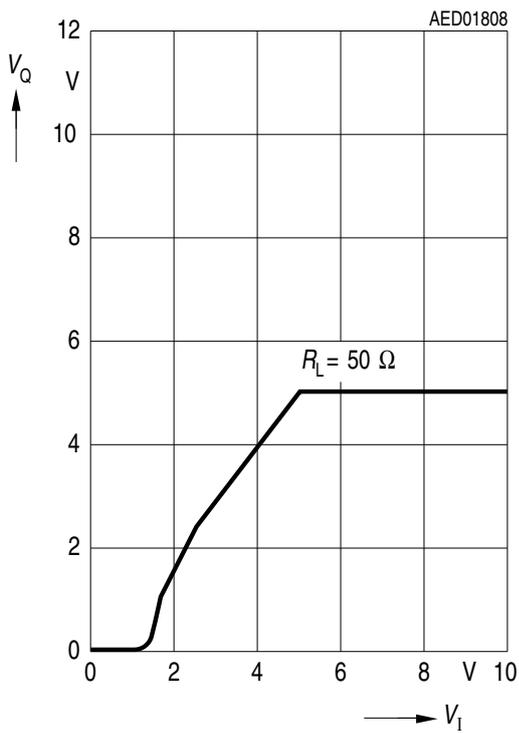
Current consumption I_Q versus input voltage V_I



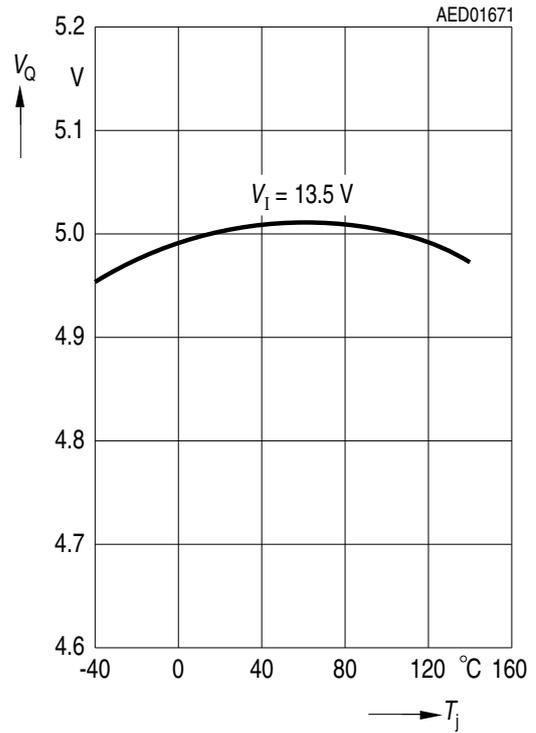
Sense threshold V_{SI} versus temperature T_j



Output voltage V_Q versus input voltage V_I

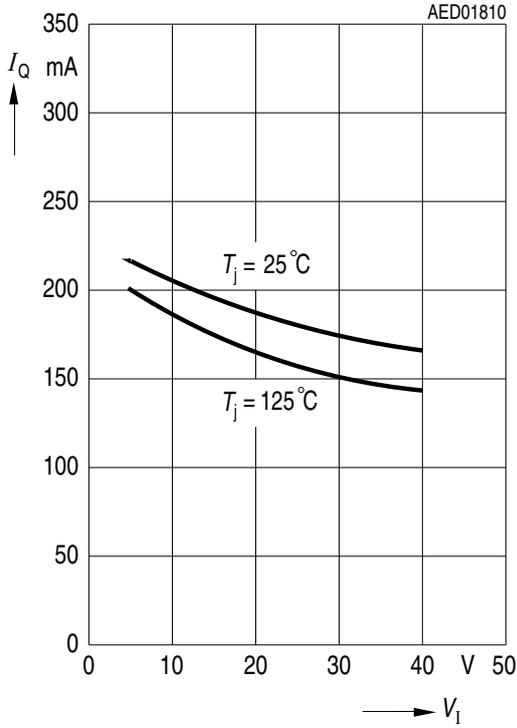


Output voltage V_Q versus temperature T_j

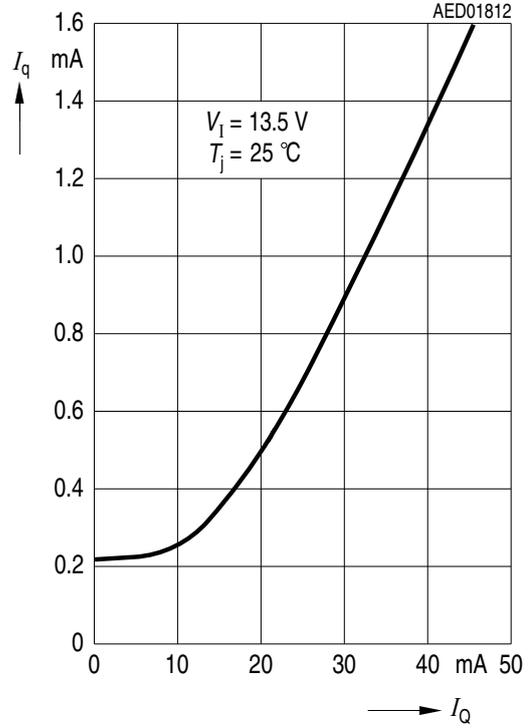


Application information

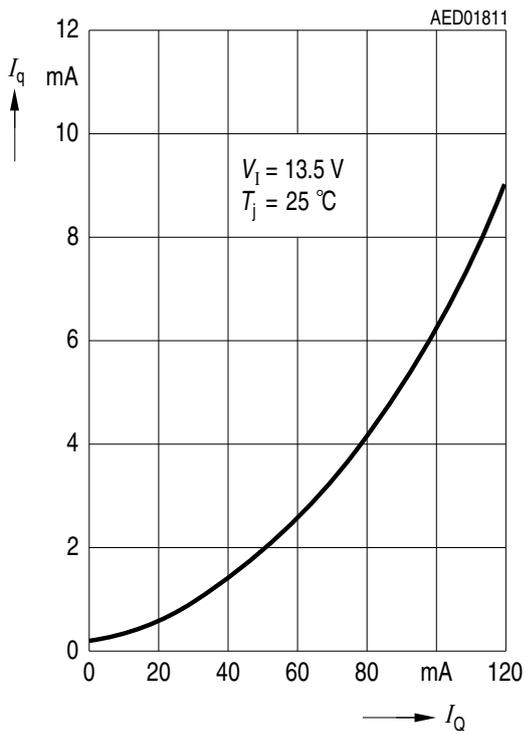
Output current I_Q versus input voltage V_I



Current consumption I_q versus output current I_Q



Current consumption I_q versus output current I_Q



Package information

6 Package information

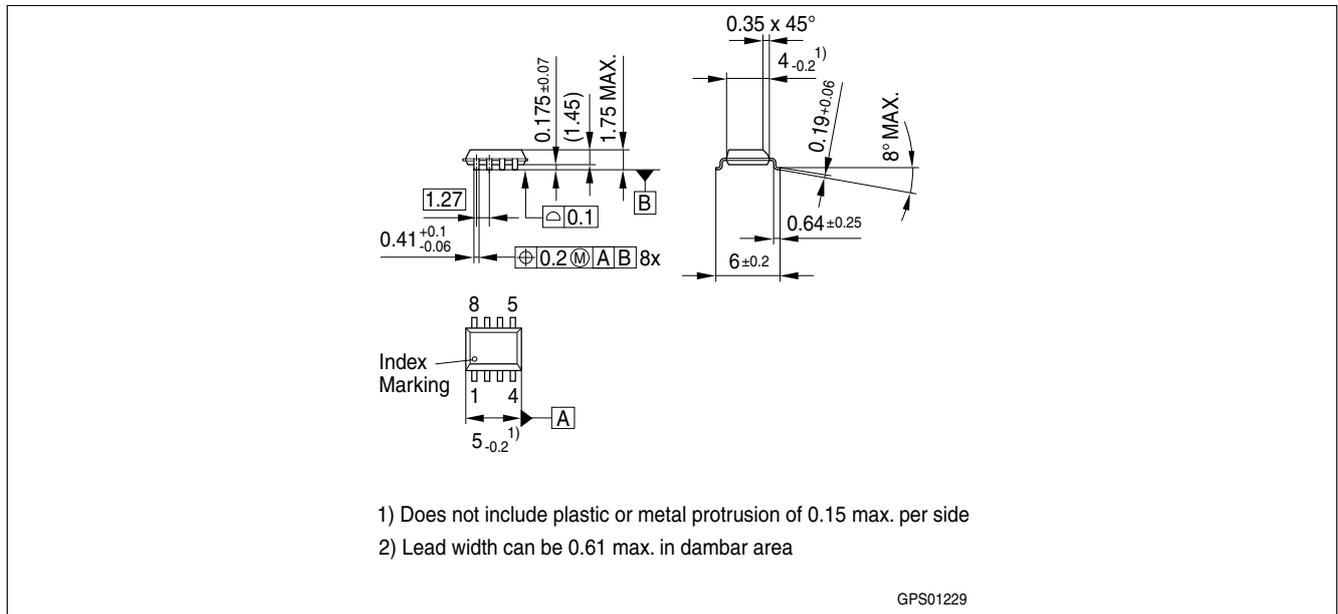


Figure 7 PG-DSO-8 (Plastic Dual Small Outline)¹⁾

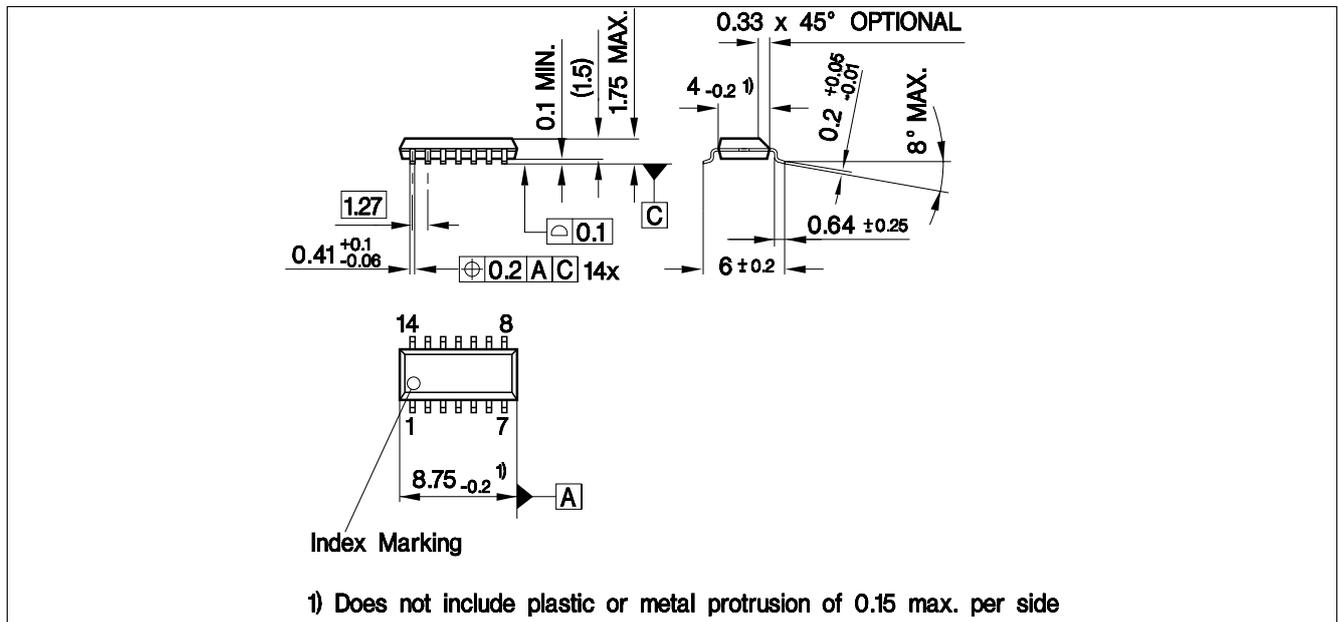


Figure 8 PG-DSO-14

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

| Revision | Date | Changes |
|-----------------|-------------|--|
| 2.5 | 2018-11-19 | Updated package drawing “PG-DSO-14” Editorial changes |
| 2.4 | 2007-03-20 | Initial version of RoHS-compliant derivate of TLE4279 Page 1: AEC certified statement added Page1 and 15: RoHS compliance statement and Green product feature added Package changed to RoHS compliant version Legal disclaimer updated |

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Edition 2018-11-19

Published by

Infineon Technologies AG

81726 Munich, Germany

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Document reference

Z8F55294584

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