

## 5-V Low-Drop Voltage Regulator

## TLE 4275

### Features

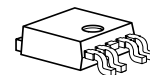
- Output voltage  $5\text{ V} \pm 2\%$
- Very low current consumption
- Power-on and undervoltage reset
- Reset low down to  $V_Q = 1\text{ V}$
- Very low-drop voltage
- Short-circuit-proof
- Reverse polarity proof
- Suitable for use in automotive electronics
- ESD protection  $> 4\text{ kV}$

Type	Ordering Code	Package
• TLE 4275 D	Q67006-A9354	P-TO252-5-1 (SMD)
• TLE 4275 G	Q67006-A9343	P-TO263-5-1 (SMD)
• TLE 4275	Q67000-A9342	P-TO220-5-11
• TLE 4275 S	Q67000-A9442	P-TO220-5-12

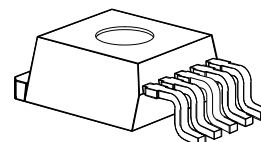
- New type

### Functional Description

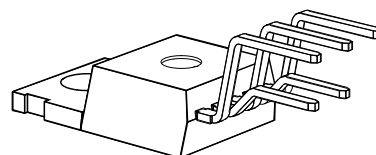
The TLE 4275 is a monolithic integrated low-drop voltage regulator in a 5 pin TO-package. An input voltage up to  $45\text{ V}$  is regulated to  $V_{Q,nom} = 5.0\text{ V}$ . The IC is able to drive loads up to  $450\text{ mA}$  and is short-circuit proof. At overtemperature the TLE 4275 is turned off by the incorporated temperature protection. A reset signal is generated for an output voltage  $V_{Q,rt}$  of typ.  $4.65\text{ V}$ . The delay time can be programmed by the external delay capacitor.



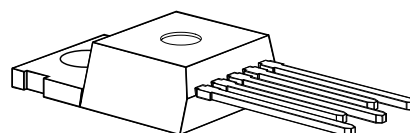
P-TO252-5-1



P-TO263-5-1



P-TO220-5-11



P-TO220-5-12

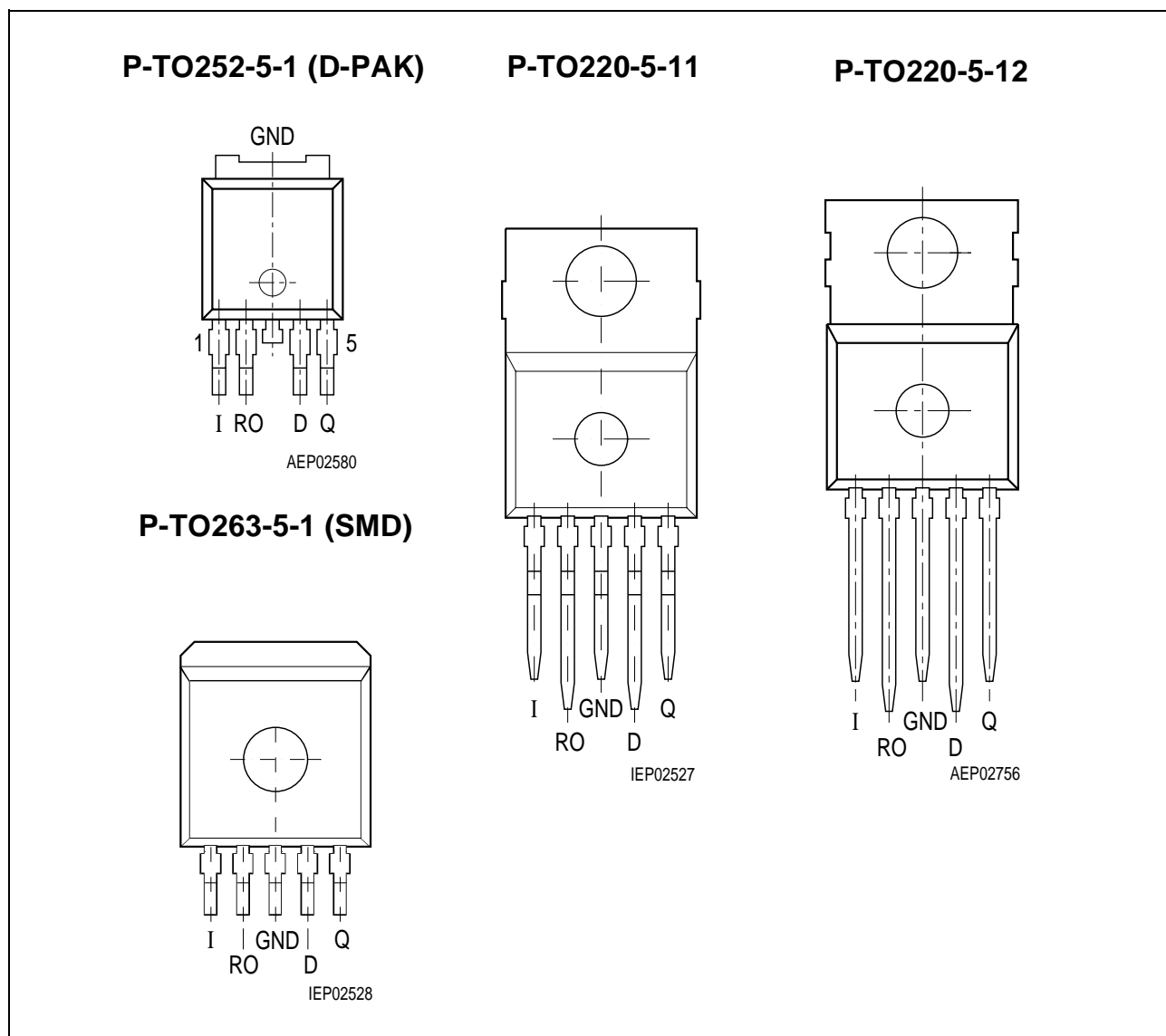
## Dimensioning Information on External Components

The input capacitor  $C_i$  is necessary for compensation of line influences. Using a resistor of approx.  $1\ \Omega$  in series with  $C_i$ , the oscillating of input inductivity and input capacitance can be damped. The output capacitor  $C_o$  is necessary for the stability of the regulation circuit. Stability is guaranteed at values  $C_o \geq 22\ \mu\text{F}$  and an ESR of  $\leq 5\ \Omega$  within the operating temperature range.

## Circuit Description

The control amplifier compares a reference voltage to a voltage that is proportional to the output voltage and drives the base of the series transistor via a buffer. Saturation control as a function of the load current prevents any oversaturation of the power element. The IC also incorporates a number of internal circuits for protection against:

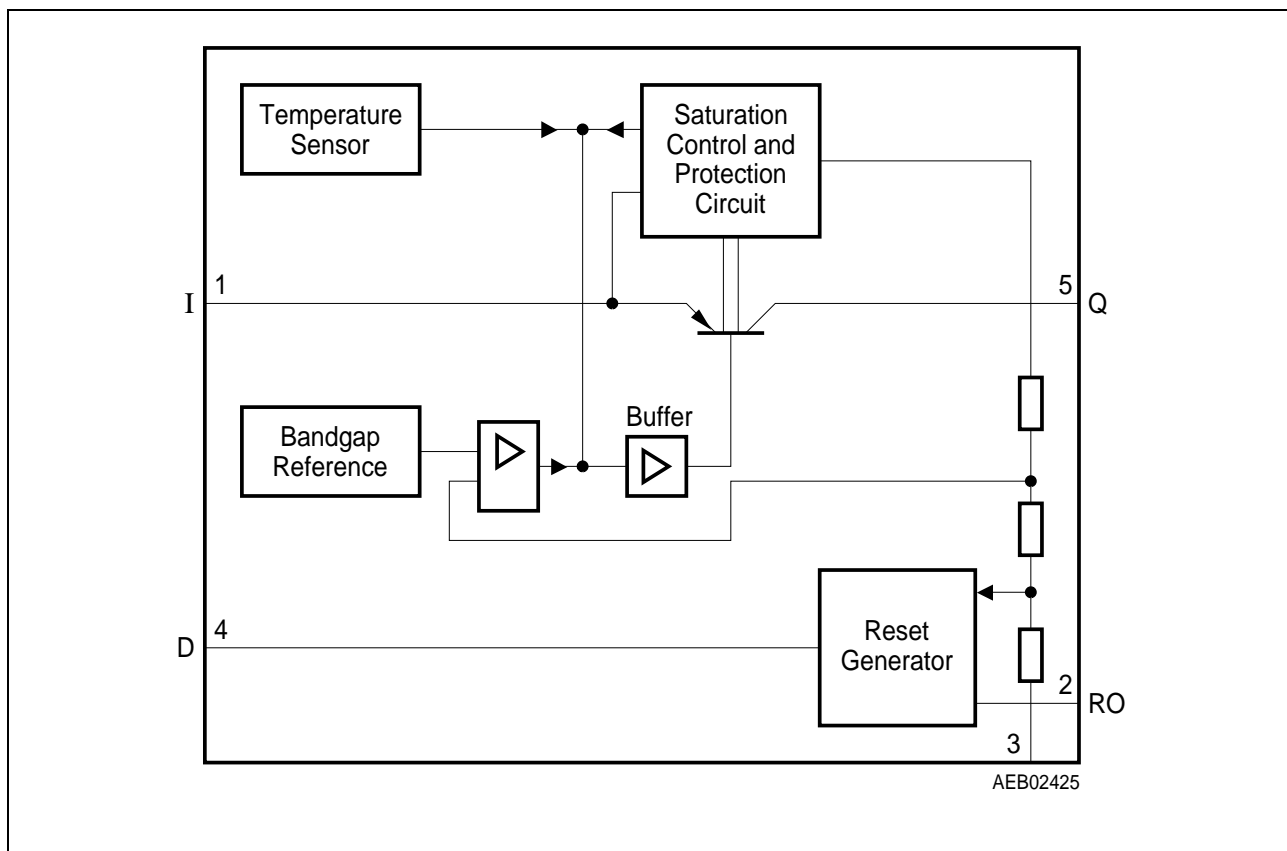
- Overload
- Over-temperature
- Reverse polarity



**Figure 1** Pin Configuration (top view)

## Pin Definitions and Functions

Pin No.	Symbol	Function
1	I	<b>Input</b> ; block to ground directly at the IC by a ceramic capacitor.
2	RO	<b>Reset Output</b> ; open collector output
3	GND	<b>Ground</b> ; Pin 3 internally connected to heatsink
4	D	<b>Reset Delay</b> ; connect capacitor to GND for setting delay time
5	Q	<b>Output</b> ; block to ground with a $\geq 22 \mu\text{F}$ capacitor, ESR $< 5 \Omega$ at 10 kHz.



**Figure 2**      **Block Diagram**

## Absolute Maximum Ratings

Parameter	Symbol	Limit Values		Unit	Test Condition
		min.	max.		

## Voltage Regulator

### Input

Voltage	$V_I$	– 42	45	V	–
Current	$I_I$	–	–	–	Internally limited

### Output

Voltage	$V_Q$	– 1.0	16	V	–
Current	$I_Q$	–	–	–	Internally limited

### Reset Output

Voltage	$V_{RO}$	– 0.3	25	V	–
Current	$I_{RO}$	– 5	5	mA	–

### Reset Delay

Voltage	$V_D$	– 0.3	7	V	–
Current	$I_D$	– 2	2	mA	–

## Temperature

Junction temperature	$T_j$	– 40	150	°C	–
Storage temperature	$T_{stg}$	– 50	150	°C	–

*Note: Maximum ratings are absolute ratings; exceeding any one of these values may cause irreversible damage to the integrated circuit.*

## Operating Range

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Input voltage	$V_I$	5.5	42	V	–
Junction temperature	$T_j$	– 40	150	°C	–

## Thermal Resistance

Junction case	$R_{thjc}$	–	4	K/W	–
Junction ambient	$R_{thja}$	–	53	K/W	TO263 <sup>1)</sup>
Junction ambient	$R_{thja}$	–	78	K/W	TO252 <sup>1)</sup>
Junction ambient	$R_{thja}$	–	65	K/W	TO220

1) Worst case, regarding peak temperature; zero airflow; mounted on a PCB FR4, 80 × 80 × 1.5 mm<sup>3</sup>, heat sink area 300 mm<sup>2</sup>

## Characteristics

$V_I = 13.5 \text{ V}$ ;  $-40 \text{ °C} < T_j < 150 \text{ °C}$  (unless otherwise specified)

Parameter	Symbol	Limit Values			Unit	Measuring Condition
		min.	typ.	max.		

## Output

Output voltage	$V_Q$	4.9	5.0	5.1	V	5 mA < $I_Q$ < 400 mA 6 V < $V_I$ < 28 V
Output voltage	$V_Q$	4.9	5.0	5.1	V	5 mA < $I_Q$ < 200 mA 6 V < $V_I$ < 40 V
Output current limitation <sup>1)</sup>	$I_Q$	450	700	–	mA	–
Current consumption; $I_q = I_I - I_Q$	$I_q$	–	150	200	μA	$I_Q = 1 \text{ mA}$ ; $T_j = 25 \text{ °C}$
Current consumption; $I_q = I_I - I_Q$	$I_q$	–	150	220	μA	$I_Q = 1 \text{ mA}$ ; $T_j \leq 85 \text{ °C}$
Current consumption; $I_q = I_I - I_Q$	$I_q$	–	5	10	mA	$I_Q = 250 \text{ mA}$
Current consumption; $I_q = I_I - I_Q$	$I_q$	–	12	22	mA	$I_Q = 400 \text{ mA}$

### Characteristics (cont'd)

$V_I = 13.5 \text{ V}$ ;  $-40 \text{ }^\circ\text{C} < T_j < 150 \text{ }^\circ\text{C}$  (unless otherwise specified)

Parameter	Symbol	Limit Values			Unit	Measuring Condition
		min.	typ.	max.		
Drop voltage <sup>1)</sup>	$V_{dr}$	–	250	500	mV	$I_Q = 300 \text{ mA}$ $V_{dr} = V_I - V_Q$
Load regulation	$\Delta V_Q$	–	15	30	mV	$I_Q = 5 \text{ mA to } 400 \text{ mA}$
Line regulation	$\Delta V_Q$	– 15	5	15	mV	$\Delta V_I = 8 \text{ V to } 32 \text{ V}$ $I_Q = 5 \text{ mA}$
Power supply ripple rejection	$PSRR$	–	60	–	dB	$f_r = 100 \text{ Hz}$ ; $V_r = 0.5 \text{ Vpp}$
Temperature output voltage drift	$\frac{dV_Q}{dT}$	–	0.5	–	mV/K	–

### Reset Timing D and Output RO

Reset switching threshold	$V_{Q,rt}$	4.5	4.65	4.8	V	–
Reset output low voltage	$V_{ROL}$	–	0.2	0.4	V	$R_{ext} \geq 5 \text{ k}\Omega$ ; $V_Q > 1 \text{ V}$
Reset output leakage current	$I_{ROH}$	–	0	10	$\mu\text{A}$	$V_{ROH} = 5 \text{ V}$
Reset charging current	$I_{D,c}$	3.0	5.5	9.0	$\mu\text{A}$	$V_D = 1 \text{ V}$
Upper timing threshold	$V_{DU}$	1.5	1.8	2.2	V	–
Lower timing threshold	$V_{DRL}$	0.2	0.4	0.7	V	–
Reset delay time	$t_{rd}$	10	16	22	ms	$C_D = 47 \text{ nF}$
Reset reaction time	$t_{rr}$	–	0.5	2	$\mu\text{s}$	$C_D = 47 \text{ nF}$

<sup>1)</sup> Measured when the output voltage  $V_Q$  has dropped 100 mV from the nominal value obtained at  $V_I = 13.5 \text{ V}$ .



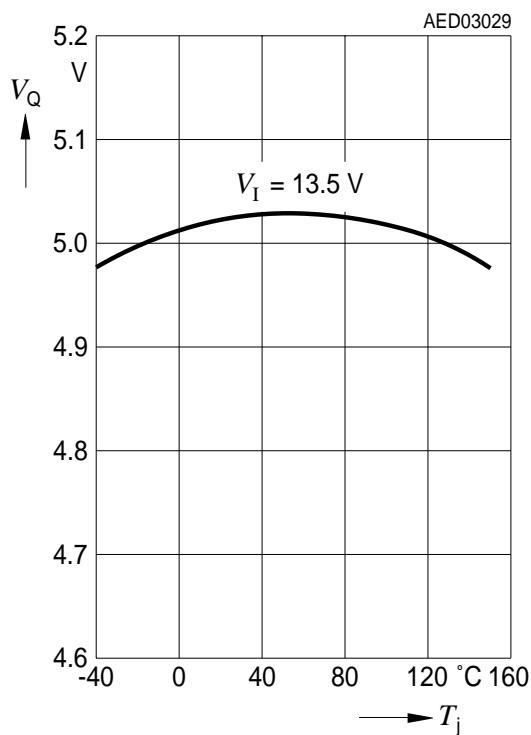
### Figure 3 Test Circuit



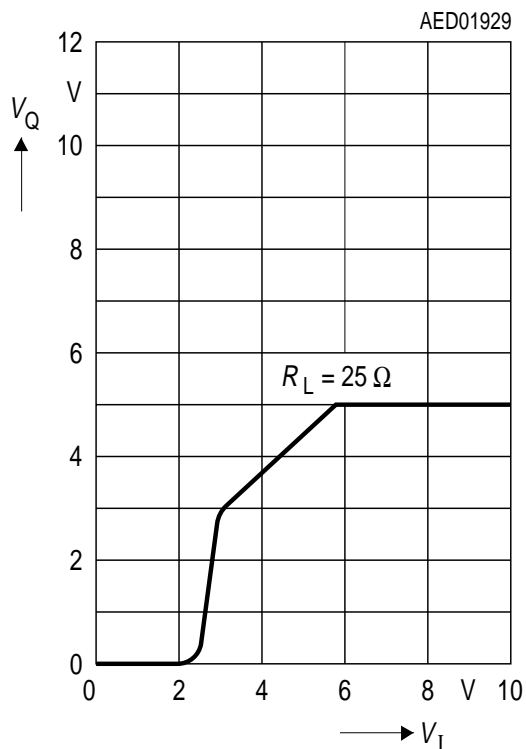
### Figure 4      Reset Timing



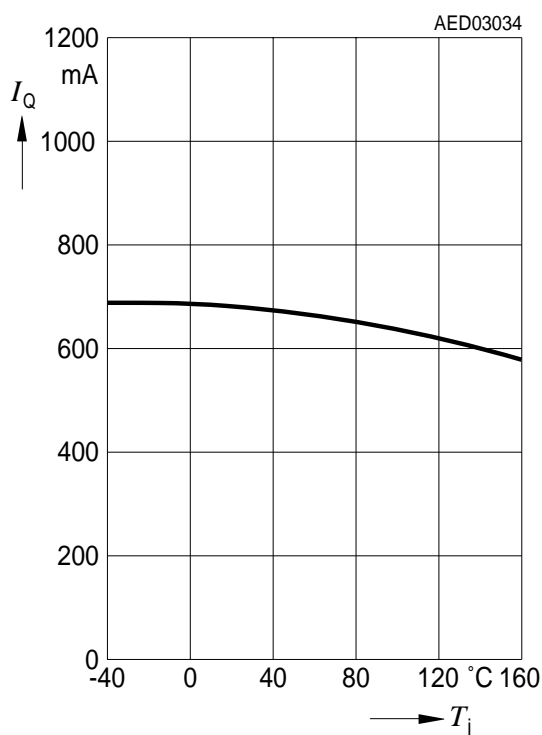
**Output Voltage  $V_Q$  versus Temperature  $T_j$**



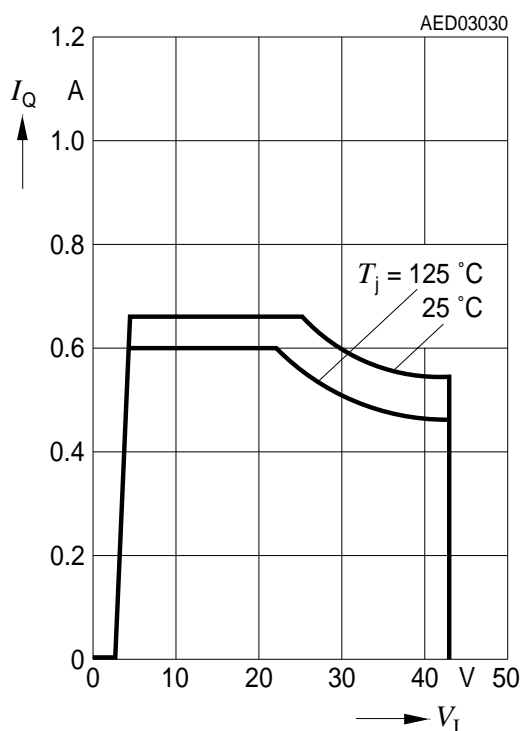
**Output Voltage  $V_Q$  versus Input Voltage  $V_I$**



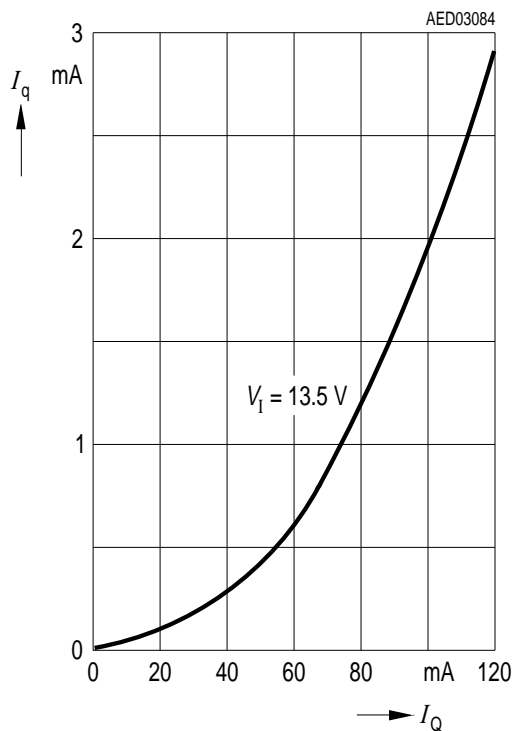
**Output Current  $I_Q$  versus Temperature  $T_j$**



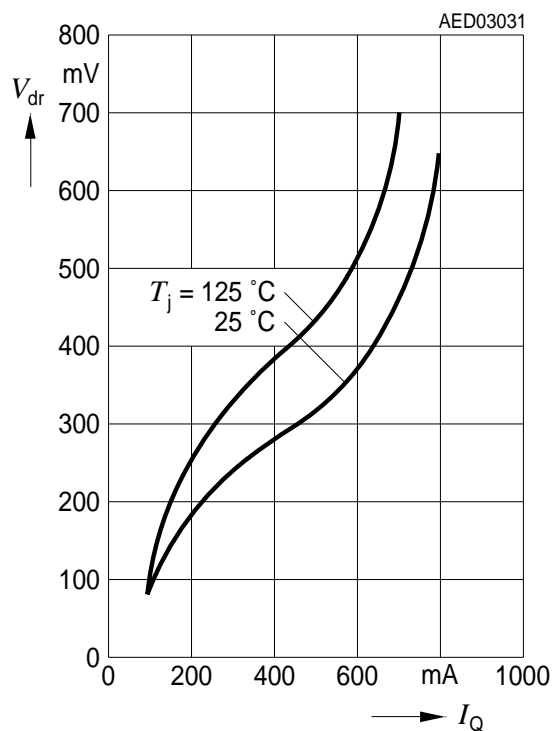
**Output Current  $I_Q$  versus Input Voltage  $V_I$**



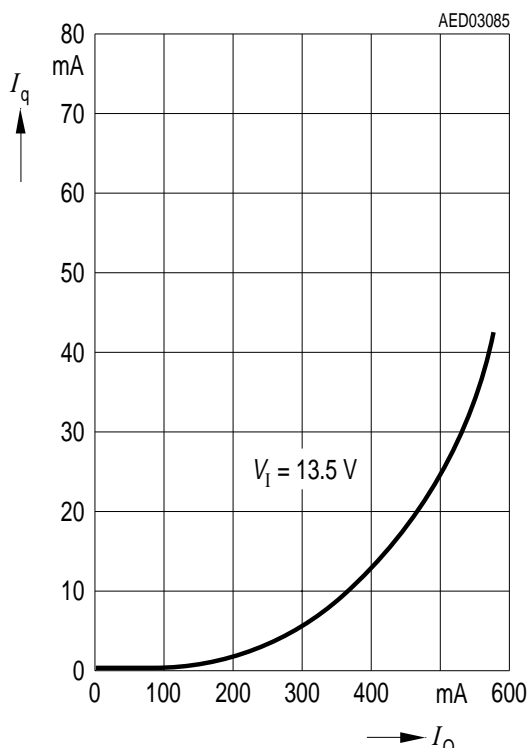
**Current Consumption  $I_q$   
versus Output Current  $I_Q$**



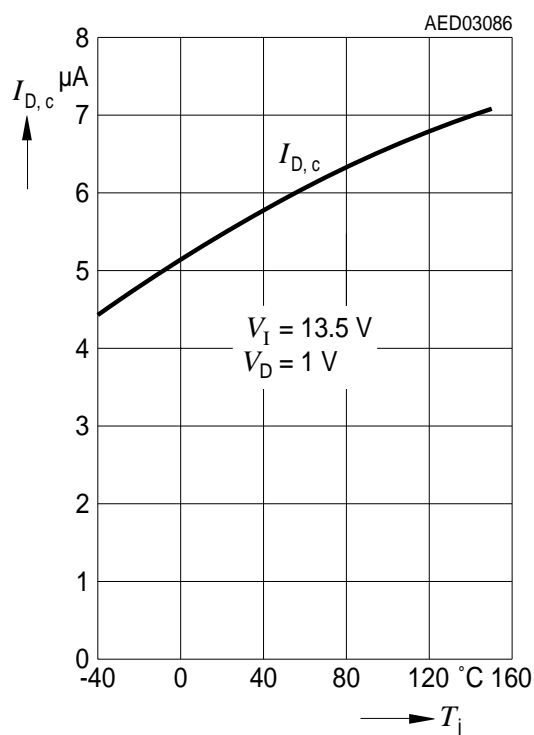
**Drop Voltage  $V_{dr}$  versus  
Output Current  $I_Q$**



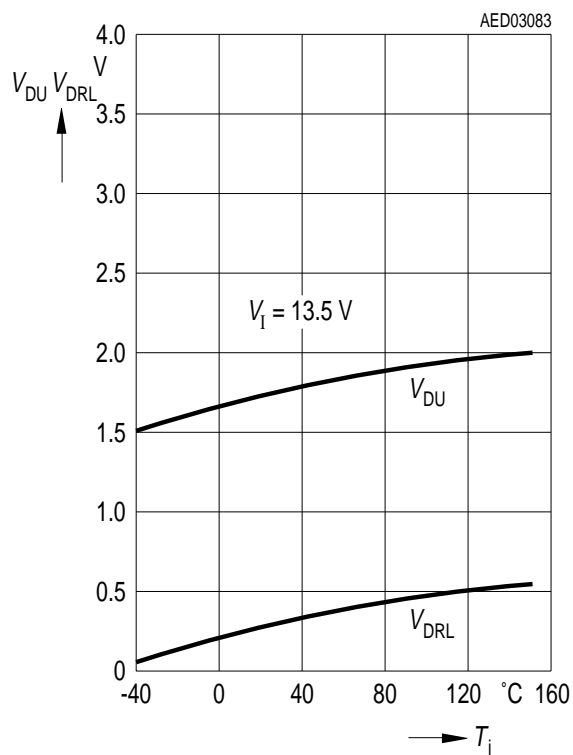
**Current Consumption  $I_q$   
versus Output Current  $I_Q$**



**Charge Current  $I_{D,c}$   
versus Temperature  $T_j$**

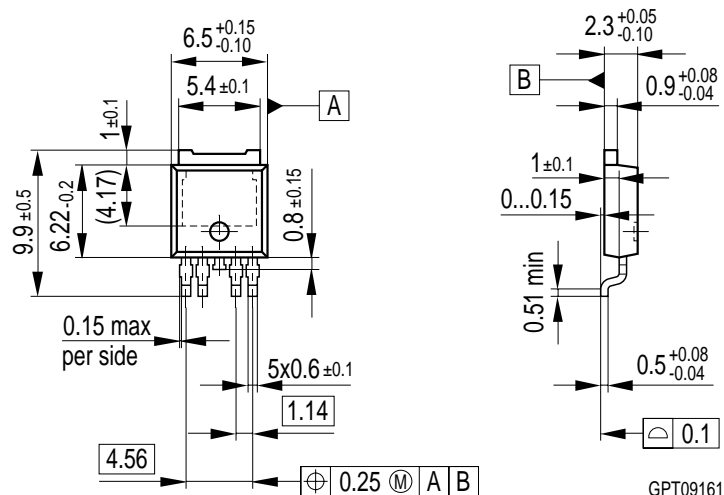


# Delay Switching Threshold $V_{DU}$ , $V_{DRL}$ versus Temperature $T_j$



## Package Outlines

### P-TO252-5-1 (D-PAK) (Plastic Transistor Single Outline)



All metal surfaces tin plated, except area of cut.

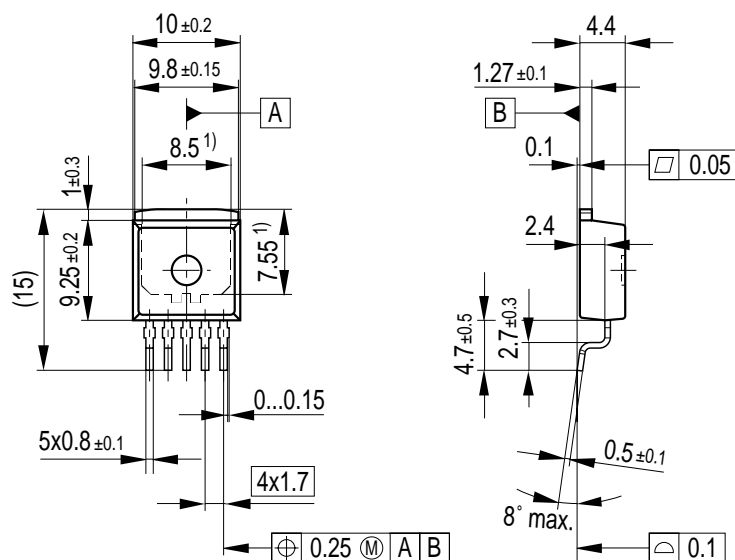
### Sorts of Packing

Package outlines for tubes, trays etc. are contained in our Data Book "Package Information".

SMD = Surface Mounted Device

Dimensions in mm

# P-TO263-5-1 (SMD) (Plastic Transistor Single Outline)



<sup>1)</sup> Typical

All metal surfaces tin plated, except area of cut.

GPT09113\_malac

## Sorts of Packing

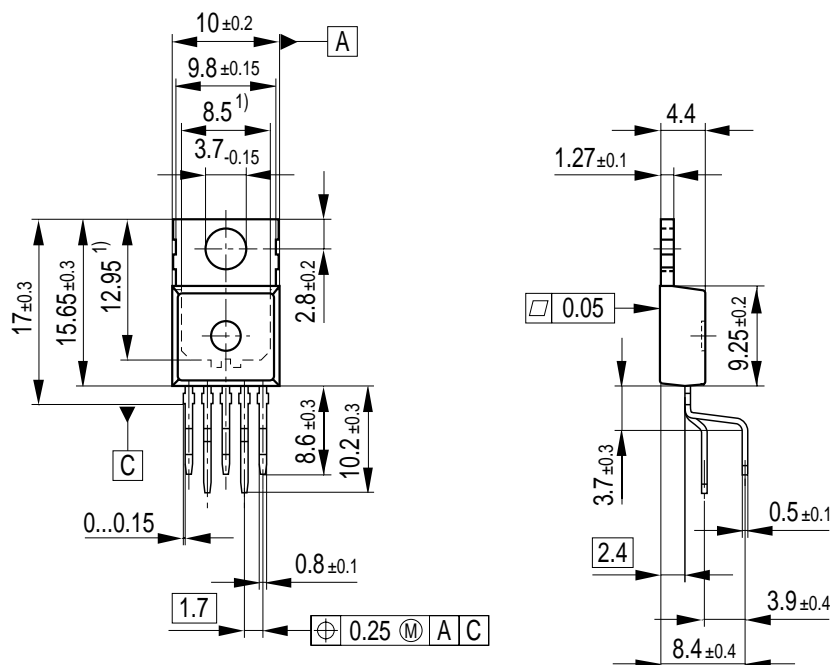
Package outlines for tubes, trays etc. are contained in our Data Book "Package Information".

SMD = Surface Mounted Device

Dimensions in mm

# P-TO220-5-11

(Plastic Transistor Single Outline)



<sup>1)</sup> Typical

All metal surfaces tin plated, except area of cut.

gpt09064\_ma

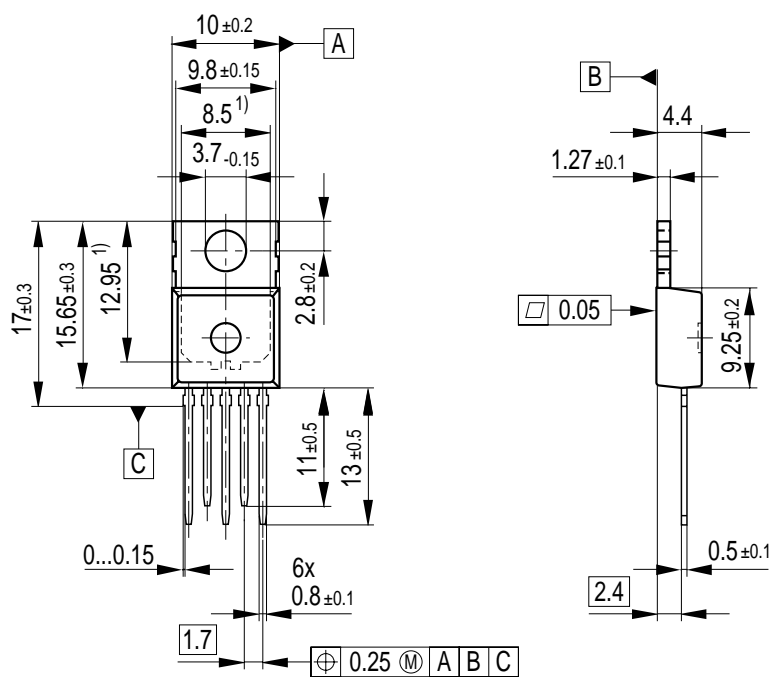
## Sorts of Packing

Package outlines for tubes, trays etc. are contained in our Data Book "Package Information".

Dimensions in mm

# P-TO220-5-12

(Plastic Transistor Single Outline)



## Sorts of Packing

Package outlines for tubes, trays etc. are contained in our Data Book "Package Information".

Dimensions in mm

**Edition 2001-04-24**

**Published by**  
**Infineon Technologies AG i. Gr.,**  
**St.-Martin-Strasse 53**  
**D-81541 München**

**© Infineon Technologies AG 1999**  
**All Rights Reserved.**

**Attention please!**

The information herein is given to describe certain components and shall not be considered as warranted characteristics.

Terms of delivery and rights to technical change reserved.

We hereby disclaim any and all warranties, including but not limited to warranties of non-infringement, regarding circuits, descriptions and charts stated herein.

Infineon Technologies is an approved CECC manufacturer.

**Information**

For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office in Germany or our Infineon Technologies Representatives worldwide (see address list).

**Warnings**

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

Infineon Technologies Components may only be used in life-support devices or systems with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.