TLE 4267-2

5-V Low Drop Voltage Regulator

Data Sheet

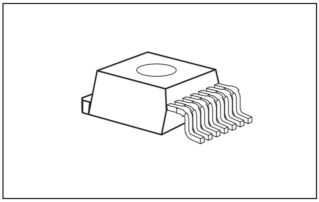
Rev. 1.0, 2012-04-03

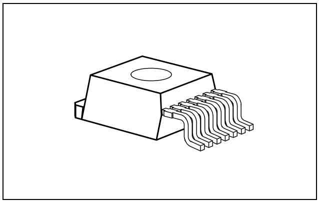
Automotive Power

5-V Low Drop Voltage Regulator **TLE 4267-2**

Features

- Output voltage tolerance ≤ ±2%
- 400 mA output current capability
- Low-drop voltage
- Very low standby current consumption
- Input voltage up to 40 V
- Overvoltage protection up to 60 V (≤ 400 ms)
- Reset function down to 1 V output voltage
- ESD protection up to 2000 V
- Adjustable reset time
- On/off logic
- Overtemperature protection
- Reverse polarity protection
- Short-circuit proof
- Wide temperature range
- Suitable for use in automotive electronics
- Green Product (RoHS compliant)
- AEC Qualified





Functional Description

The TLE 4267-2 G is a 5-V low drop voltage regulator for automotive applications in a PG-TO220-7-4 package. It supplies an output current of > 400 mA. The IC is shortcircuit-proof and has an overtemperature protection circuit.

Type	Package
TLE 4267-2 G	PG-TO220-7-4
TLE 4267-2 G	PG-TO263-7-1

Application

The IC regulates an input voltage V_I in the range of 5.5 V < V_I < 40 V to a nominal output voltage of V_Q = 5.0 V. A reset signal is generated for an output voltage of $V_Q < V_{RT}$. The reset delay can be set with an external capacitor. The device has two logic inputs. A voltage of V_{E2} > 4.0 V given to the E2-pin (e.g. by ignition) turns the device on. Depending on the voltage on pin E6 the IC may be hold in active-state even if V_{E2} goes to low level. This makes it simple to implement a self-holding circuit without external components. When the device is turned off, the output voltage drops to 0 V and current consumption tends towards 0 µA.

Design Notes for External Components

The input capacitor C_I is necessary for compensation of line influences. The resonant circuit consisting of lead inductance and input capacitance can be damped by a resistor of approx. 1 Ω in series with C_I. The output capacitor is necessary for the stability of the regulating circuit. Stability is guaranteed at values of ≥ 22 µF and an ESR of ≤ 3 Ω within the operating temperature range.

Circuit Description

The control amplifier compares a reference voltage, which is kept highly accurate by resistance adjustment, 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 over-saturating 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 capacitance 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} a fast discharge of the delay capacitor C_D sets in and as soon as V_{CD} gets lower than V_{LD} the reset output RO is set to low-level (see **Figure 5**). The reset delay can be set within wide range by dimensioning the capacitance of the external capacitor.

Table 1 Truth Table for Turn-ON/Turn-OFF Logic

E2, Inhibit	E6, Hold	V_Q	Remarks
L	X	OFF	Initial state
H	X	ON	Regulator switched on via Inhibit, by ignition for example
H	L	ON	Hold clamped active to ground by controller while Inhibit is still high
X	L	ON	Previous state remains, even ignition is shut off: self-holding state
L	L	ON	Ignition shut off while regulator is in self-holding state
L	H	OFF	Regulator shut down by releasing of Hold while Inhibit remains Low, final state. No active clamping required by external self-holding circuit (μC) to keep regulator in off-state.

Inhibit: E2 Enable function, active High
Hold: E6 Hold and release function, active Low

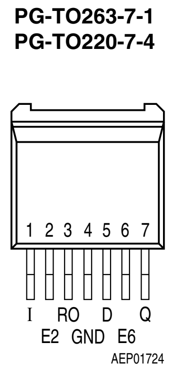


Figure 1 **Pin Configuration** (top view)

Table 2 **Pin Definitions and Functions**

Pin	Symbol	Function
1	I	**Input;** block to ground directly at the IC by a ceramic capacitor
2	E2	**Inhibit;** device is turned on by High signal on this pin; internal pull-down resistor of 100 kΩ
3	RO	**Reset Output;** open-collector output internally connected to the output via a resistor of 30 kΩ
4	GND	**Ground;** connected to rear of chip
5	D	**Reset Delay;** connect via capacitor to GND
6	E6	**Hold;** see Table 1 for function; this input is connected to output voltage via a pull-up resistor of 50 kΩ
7	Q	**5-V Output;** block to GND with 22-µF capacitor, ESR < 3 Ω

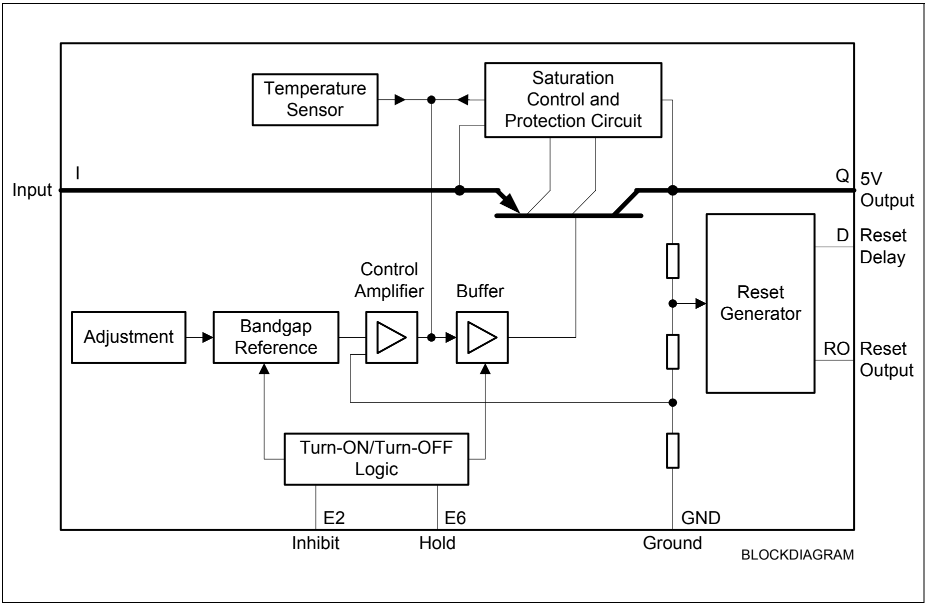


Figure 2 Block Diagram

Table 3 Absolute Maximum Ratings

T_J = -40 to 150 °C

Parameter	Symbol	Limit Values		Unit	Notes
		Min.	Max.		
Input					
Voltage	V_I	-42	42	V	–
Voltage	V_I	–	60	V	$t \leq$ 400 ms
Current	I_I	–	–	–	internally limited
Reset Output					
Voltage	V_{RO}	-0.3	7	V	–
Current	I_{RO}	–	–	–	internally limited
Reset Delay					
Voltage	V_D	-0.3	42	V	–
Current	I_D	–	–	–	–
Output					
Voltage	V_Q	-0.3	7	V	–
Current	I_Q	–	–	–	internally limited
Inhibit					
Voltage	V_{E2}	-42	42	V	–
Current	I_{E2}	-5	5	mA	$t \leq$ 400 ms
Hold					
Voltage	V_{E6}	-0.3	7	V	–
Current	I_{E6}	–	–	mA	internally limited
GND					
Current	I_{GND}	-0.5	–	A	–
Temperatures					
Junction temperature	T_J	–	150	°C	–
Storage temperature	T_{stg}	-50	150	°C	–

Table 4 Operating Range

Parameter	Symbol	Limit Values		Unit	Notes
		Min.	Max.		
Input voltage	V_I	5.5	40	V	see diagram
Junction temperature	T_J	-40	150	°C	–
Thermal Resistance					
Junction ambient	R_{thja}	–	65	K/W	PG-TO220-7-4 package
Junction-case	R_{thjc}	–	6	K/W	PG-TO220-7-4 package
Junction-case	Z_{thjc}	–	2	K/W	$T < 1$ ms PG-TO220-7-4 package
Junction ambient	R_{thja}	–	70	K/W	PG-TO263-7-1 (SMD) package
Junction-case	R_{thjc}	–	6	K/W	PG-TO263-7-1 (SMD) package
Junction-case	Z_{thjc}	–	2	K/W	$T < 1$ ms PG-TO263-7-1 (SMD) package

Table 5 Characteristics

V_I = 13.5 V; -40 °C < T_J < 125 °C; V_{E2} > 4 V (unless specified otherwise)

Parameter	Symbol	Limit Values			Unit	Test Condition
		Min.	Typ.	Max.		
Output voltage	V_Q	4.9	5	5.1	V	5 mA ≤ I_Q ≤ 400 mA 6 V ≤ V_I ≤ 26 V
Output voltage	V_Q	4.9	5	5.1	V	5 mA ≤ I_Q ≤ 150 mA 6 V ≤ V_I ≤ 40 V
Output current limiting	I_Q	500	–	–	mA	T_J = 25 °C
Current consumption $I_q = I_I - I_Q$	I_q	–	–	50	µA	IC turned off
Current consumption $I_q = I_I - I_Q$	I_q	–	1.0	10	µA	T_J = 25 °C IC turned off
Current consumption $I_q = I_I - I_Q$	I_q	–	1.3	4	mA	I_Q = 5 mA IC turned on
Current consumption $I_q = I_I - I_Q$	I_q	–	–	60	mA	I_Q = 400 mA
Current consumption $I_q = I_I - I_Q$	I_q	–	–	80	mA	I_Q = 400 mA V_I = 5 V
Drop voltage	V_{Dr}	–	0.3	0.6	V	I_Q = 400 mA[1)]
Load regulation	ΔV_Q	–	–	50	mV	5 mA ≤ I_Q ≤ 400 mA
Supply-voltage regulation	ΔV_Q	–	15	25	mV	V_I = 6 to 36 V; I_Q = 5 mA
Supply-voltage rejection	SVR	–	54	–	dB	f_r = 100 Hz; V_r = 0.5 Vpp
Longterm stability	ΔV_Q	–	0	–	mV	1000 h
Reset Generator						
Switching threshold	V_{RT}	4.5	4.65	4.8	V	V_Q decreasing
Reset High level	–	4.5	–	–	V	$R_{ext} = \infty$
Saturation voltage	$V_{RO,SAT}$	–	0.1	0.4	V	R_R = 4.7 kΩ [2)]
Internal Pull-up resistor	R_{RO}	–	30	–	kΩ	–
Saturation voltage	$V_{D,SAT}$	–	50	100	mV	$V_Q < V_{RT}$
Charge current	I_D	8	15	25	µA	V_D = 1.5 V
Upper delay switching threshold	V_{UD}	2.6	3	3.3	V	–

Table 5 Characteristics (cont'd)

V_I = 13.5 V; -40 °C < T_J < 125 °C; V_{E2} > 4 V (unless specified otherwise)

Parameter	Symbol	Limit Values			Unit	Test Condition
		Min.	Typ.	Max.		
Delay time	t_D	–	20	–	ms	C_d = 100 nF
Lower delay switching threshold	V_{LD}	–	0.43	–	V	–
Reset reaction time	t_{RR}	–	2	–	µs	C_d = 100 nF
Inhibit						
Turn on voltage	$V_{U,INH}$	–	3	4	V	IC turned on
Turn off voltage	$V_{L,INH}$	2	–	–	V	IC turned off
Pull-down resistor	R_{INH}	50	100	200	kΩ	–
Hysteresis	ΔV_{INH}	0.2	0.5	0.8	V	–
Input current	I_{INH}	–	35	100	µA	V_{INH} = 4 V
Hold voltage	$V_{U,HOLD}$	30	35	40	%	Referred to V_Q
Turn off voltage	$V_{L,HOLD}$	60	70	80	%	Referred to V_Q
Pull-up resistor	R_{HOLD}	20	50	100	kΩ	–
Overvoltage Protection						
Turn off voltage	$V_{I,OV}$	42	44	46	V	V_I increasing
Turn on voltage	$V_{I,turn on}$	36	–	–	V	V_I decreasing after turn off

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

2) The reset output is Low for 1 V < V_Q < V_{RT}

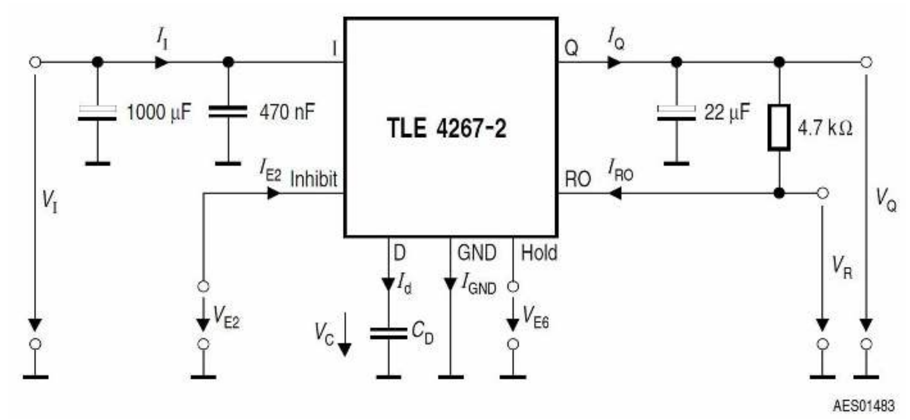


Figure 3 Test Circuit

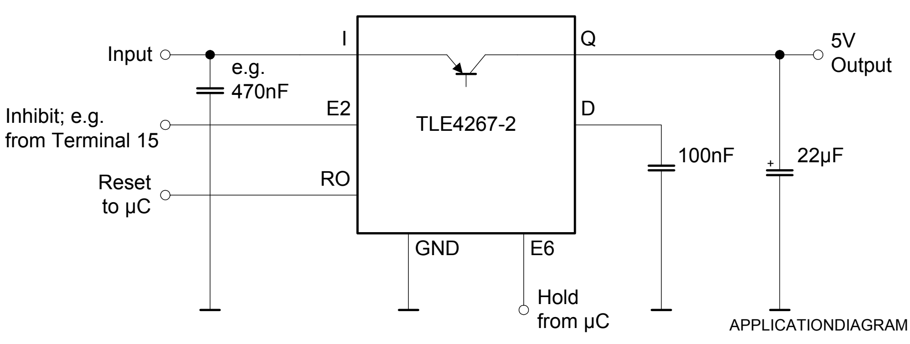


Figure 4 Application Circuit

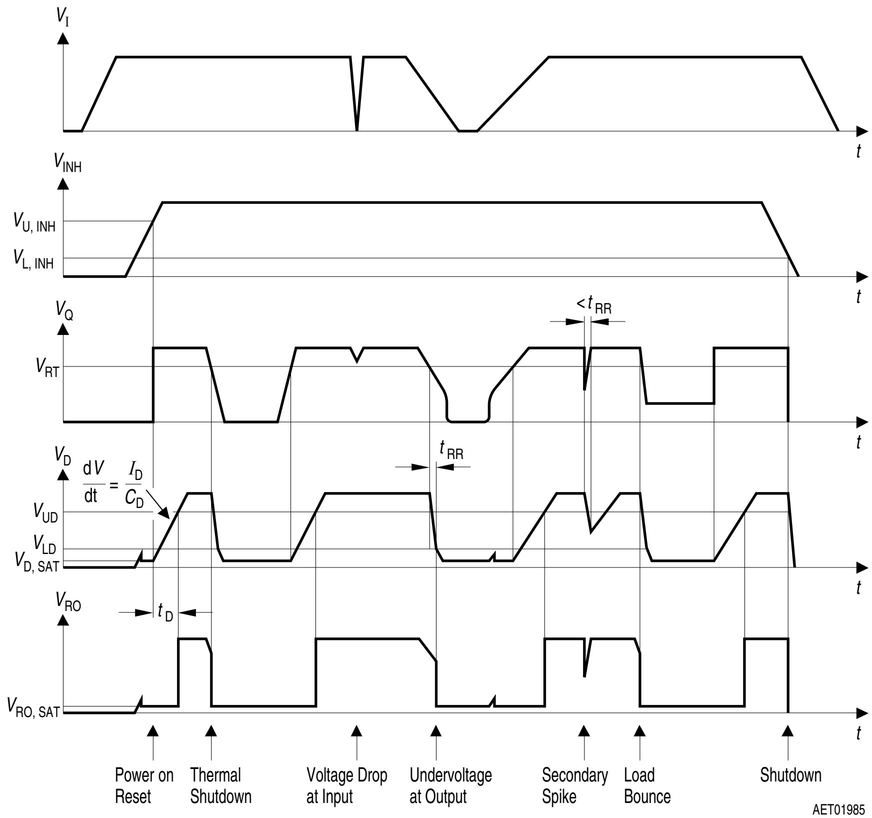


Figure 5 Time Response

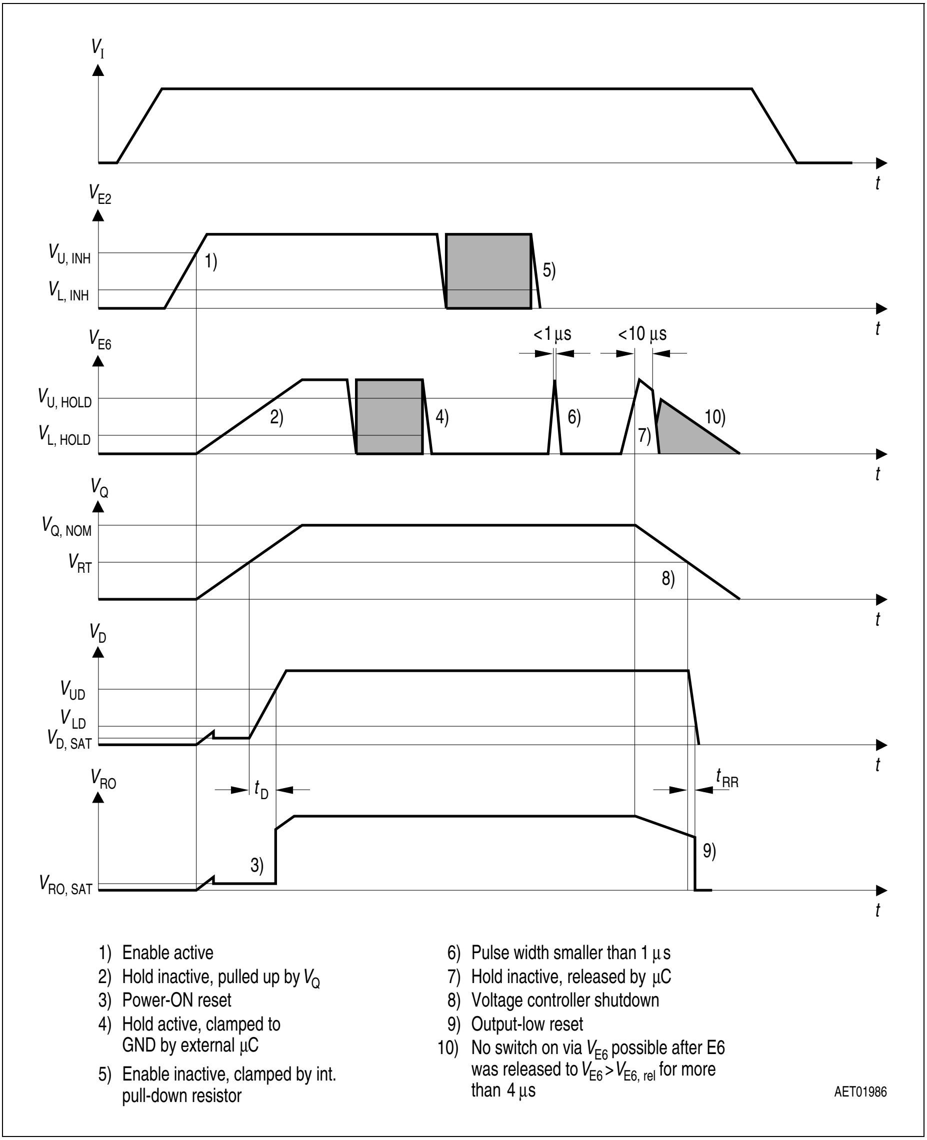
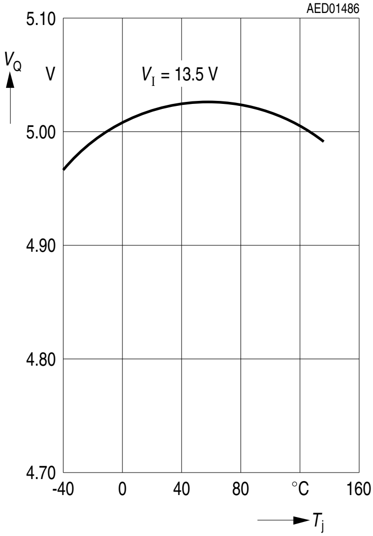
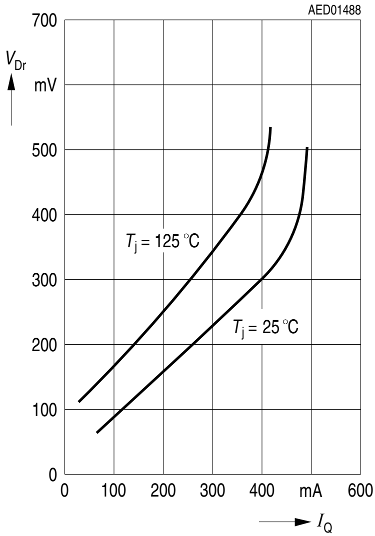


Figure 6 Enable and Hold Behavior

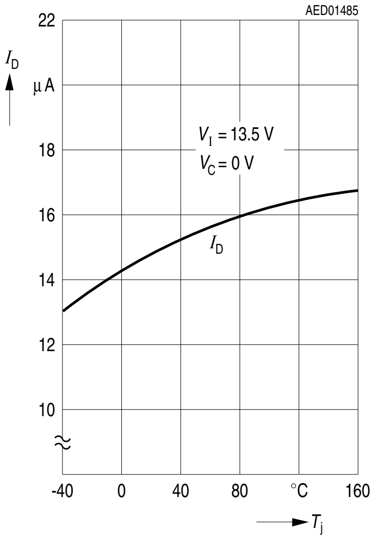
Output Voltage V_Q versus Temperature T_j



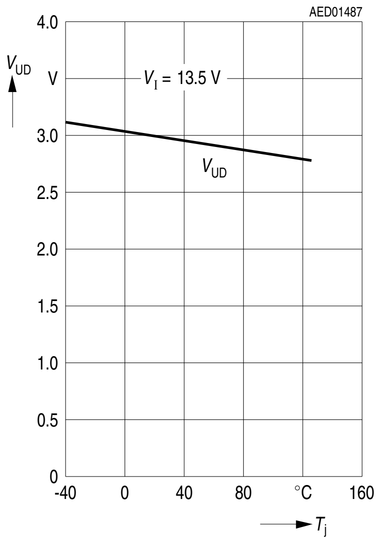
Drop Voltage V_{Dr} versus Output Current I_Q



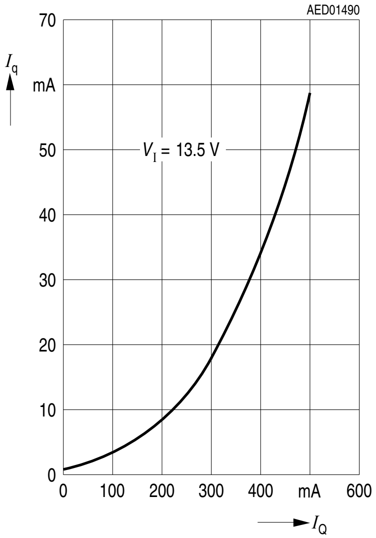
Charge Current I_D versus Temperature T_j



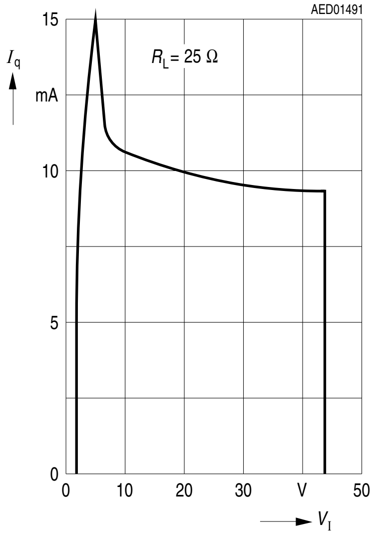
Delay Switching Threshold V_{UD} versus Temperature T_j



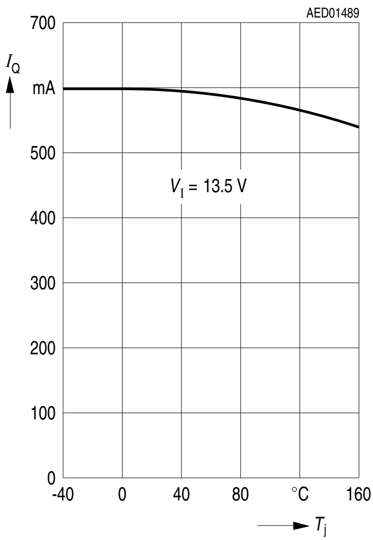
Current Consumption I_q versus Output Current I_Q



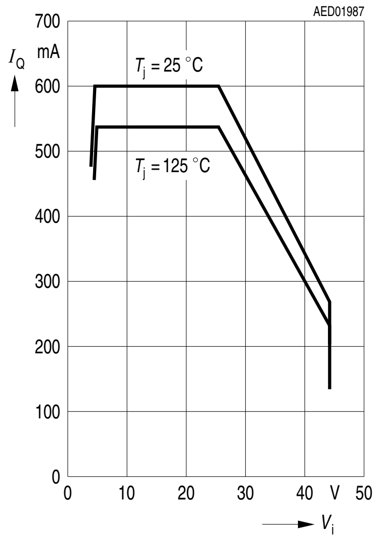
Current Consumption I_q versus Input Voltage V_I



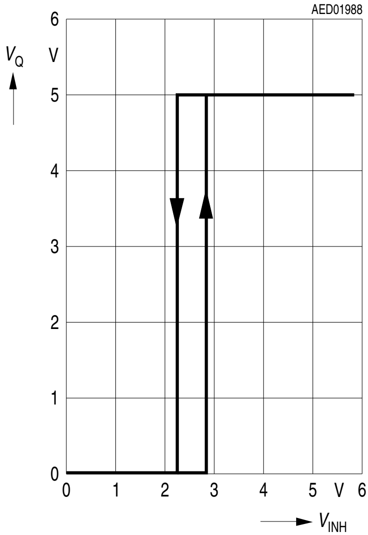
Output Current Limiting I_Q versus Temperature T_j



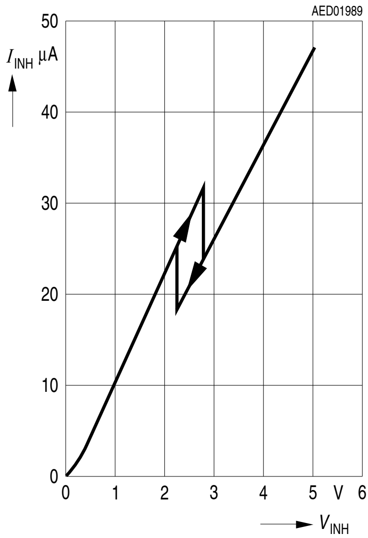
Output Current Limiting I_Q versus Input Voltage V_I



Output Voltage V_Q versus Inhibit Voltage V_{INH}



Inhibit Current I_{INH} versus Inhibit Voltage V_{INH}



Package Outlines

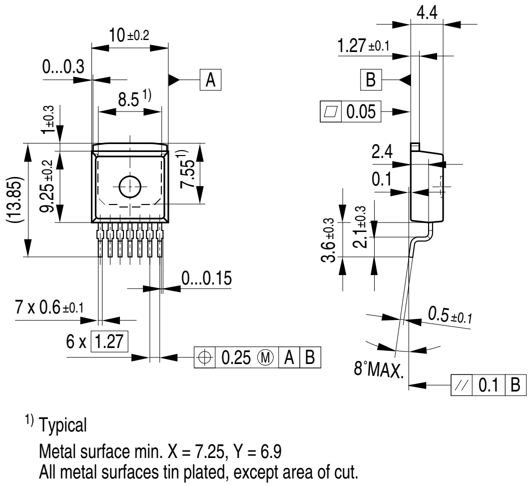


Figure 7 **PG-TO220-7-4** (Plastic Transistor Single Outline)

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).

Find all of our packages, sorts of packing and others in our Infineon Internet Page "Products": **http://www.infineon.com/packages**.

SMD = Surface Mounted Device

Dimensions in mm

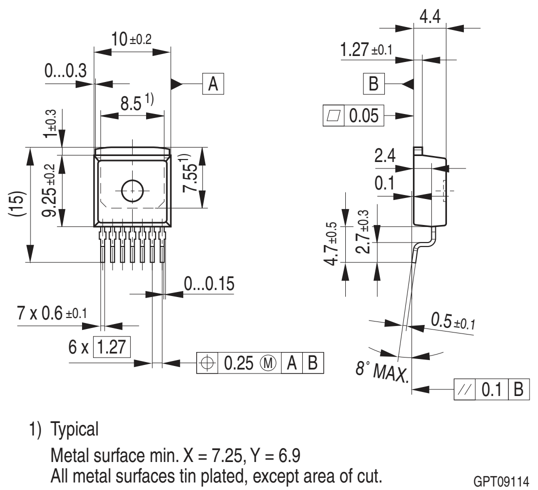


Figure 8 **PG-TO263-7-1** (Plastic Transistor Single Outline)

Green Product (RoHS compliant)

[1] 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).

Find all of our packages, sorts of packing and others in our
Infineon Internet Page "Products": **http://www.infineon.com/packages**.

SMD = Surface Mounted Device

Dimensions in mm

Revision History

Version	Date	Changes
Rev. 1.0	2012-04-03	Initial datasheet for TLE4267-2

Edition 2012-04-03

Published by
Infineon Technologies AG
81726 Munich, Germany

Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, 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.

Information

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

Warnings

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

Infineon Technologies components may be used in life-support devices or systems only 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.