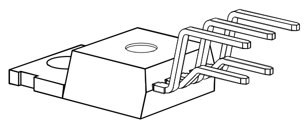
5-V Low Drop Fixed Voltage Regulator

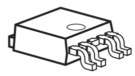
TLE 4275

Features

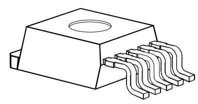
- Output voltage 5 V ± 2%
- Very low current consumption
- Power-on and undervoltage reset
- Reset low down to V_Q = 1 V
- Very low-drop voltage
- Short-circuit-proof
- Reverse polarity proof
- Suitable for use in automotive electronics
- ESD protection > 4 kV
- Green Product (RoHS compliant) version of TLE 4275
- AEC qualified



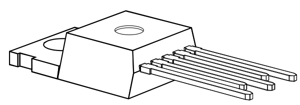
PG-TO220-5-11



PG-TO252-11



PG-TO263-5-1



PG-TO220-5-12

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 V is regulated to $V_{Q,nom}$ = 5.0 V. The IC is able to drive loads up to 450 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 V. The delay time can be programmed by the external delay capacitor.

Type	Package
TLE 4275	PG-TO220-5-11 (RoHS compliant)
TLE 4275 D	PG-TO252-5-11 (RoHS compliant)
TLE 4275 G	PG-TO263-5-1 (RoHS compliant)
TLE 4275 S	PG-TO220-5-12 (RoHS compliant)

Dimensioning Information on External Components

The input capacitor C_I is necessary for compensation of line influences. Using a resistor of approx. 1 Ω in series with C_I, the oscillating of input inductivity and input capacitance can be damped. The output capacitor C_Q is necessary for the stability of the regulation circuit. Stability is guaranteed at values $C_Q \geq 22$ µF and an ESR of ≤ 5 Ω 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
- Overtemperature
- Reverse polarity

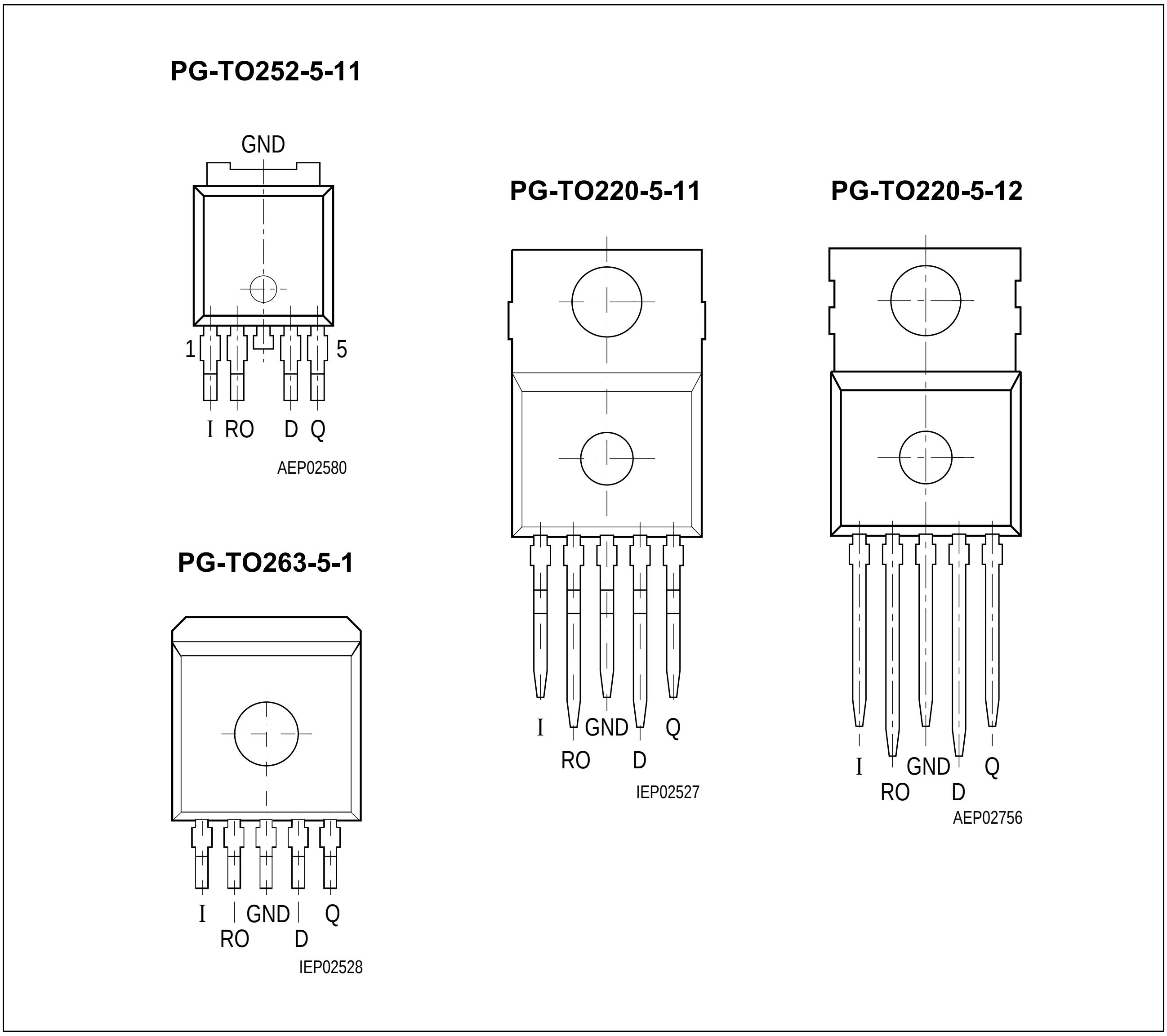


Figure 1 **Pin Configuration** (top view)

Table 1 **Pin Definitions and Functions**

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

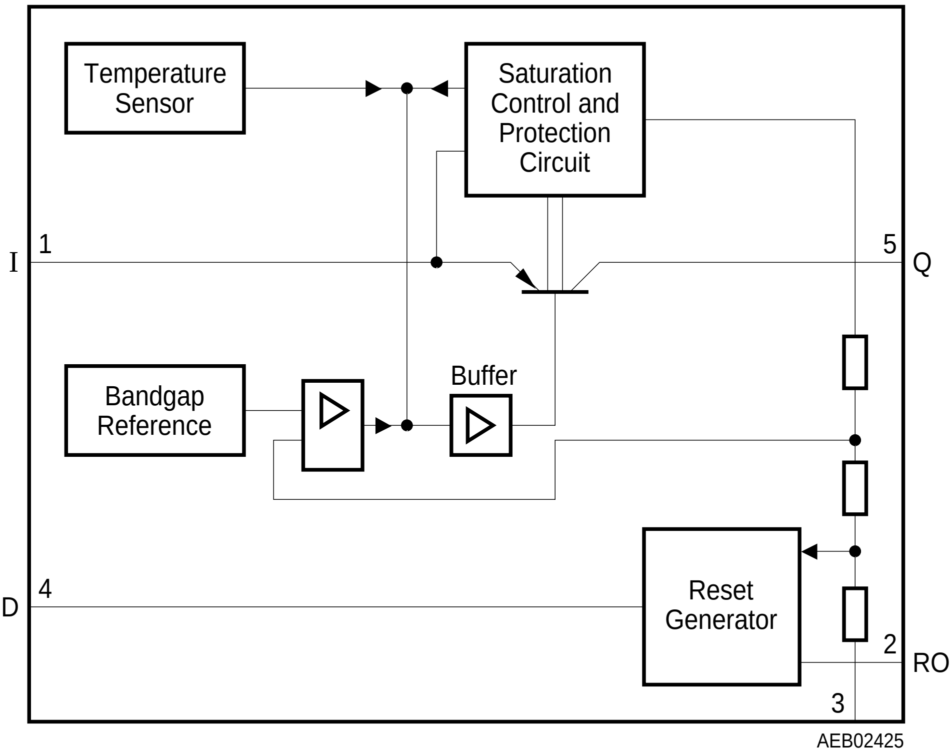


Figure 2 Block Diagram

Table 2 Absolute Maximum Ratings

Parameter	Symbol	Limit Values		Unit	Test Condition
		Min.	Max.		
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.

Table 3 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_{thj-a}	–	53	K/W	TO263[1)]
Junction ambient	R_{thj-a}	–	78	K/W	TO252[1)]
Junction ambient	R_{thj-a}	–	65	K/W	TO220

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

Table 4 Characteristics

V_I = 13.5 V; -40 °C < T_j < 150 °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[1]	I_Q	450	700	–	mA	–
Current consumption; $I_q = I_I - I_Q$	I_q	–	150	200	µA	I_Q = 1 mA; T_j = 25 °C
Current consumption; $I_q = I_I - I_Q$	I_q	–	150	220	µA	I_Q = 1 mA; $T_j \leq$ 85 °C
Current consumption; $I_q = I_I - I_Q$	I_q	–	5	10	mA	I_Q = 250 mA
Current consumption; $I_q = I_I - I_Q$	I_q	–	12	22	mA	I_Q = 400 mA
Drop voltage[1]	V_{dr}	–	250	500	mV	I_Q = 300 mA; $V_{dr} = V_I - V_Q$
Load regulation	ΔV_Q	–	15	30	mV	I_Q = 5 mA to 400 mA
Line regulation	ΔV_Q	-15	5	15	mV	ΔV_I = 8 V to 32 V I_Q = 5 mA
Power supply ripple rejection	$PSRR$	–	60	–	dB	f_r = 100 Hz; V_r = 0.5 Vpp
Temperature output voltage drift	dV_Q/dT	–	0.5	–	mV/K	–

Table 4 Characteristics (cont'd)

V_I = 13.5 V; -40 °C < T_j < 150 °C (unless otherwise specified)

Parameter	Symbol	Limit Values			Unit	Measuring Condition
		Min.	Typ.	Max.		
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	$R_{ext} \geq 5\ k\Omega$; V_Q > 1 V
Reset output leakage current	I_{ROH}	–	0	10	µA	V_{ROH} = 5 V
Reset charging current	$I_{D,c}$	3.0	5.5	9.0	µA	V_D = 1 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 nF
Reset reaction time	t_{rr}	–	0.5	2	µs	C_D = 47 nF

1) Measured when the output voltage V_Q has dropped 100 mV from the nominal value obtained at V_I = 13.5 V.

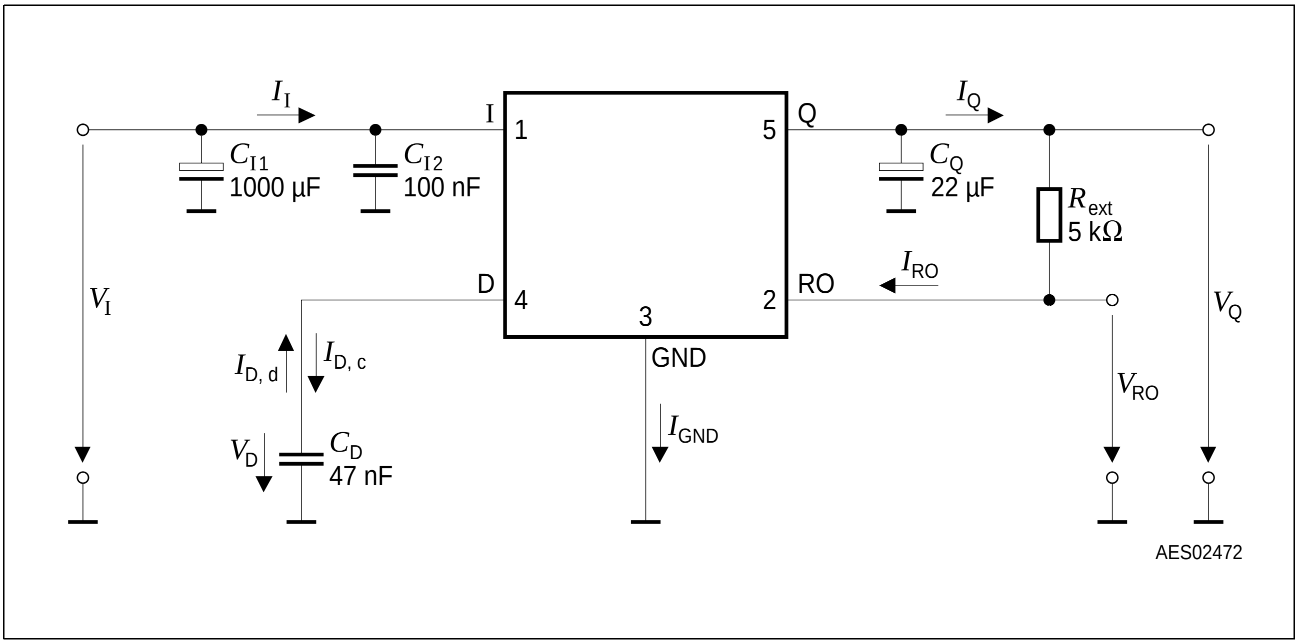


Figure 3 Test Circuit

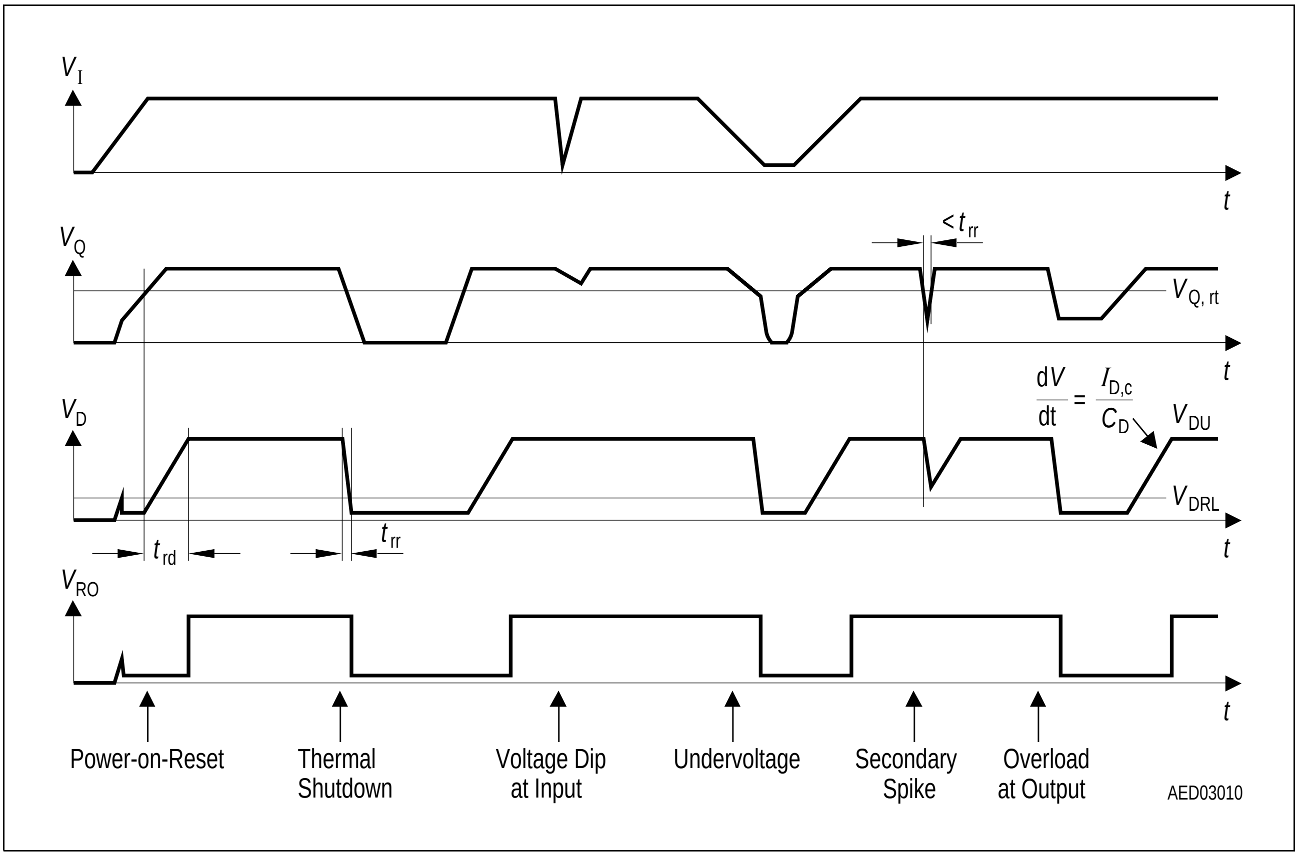
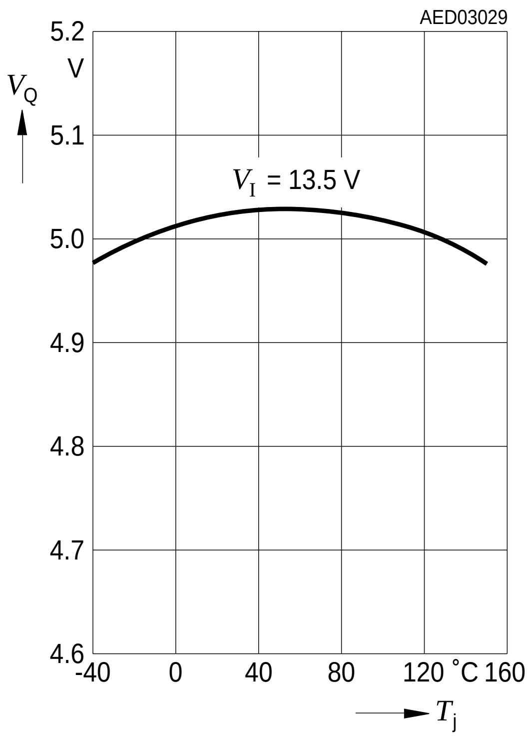
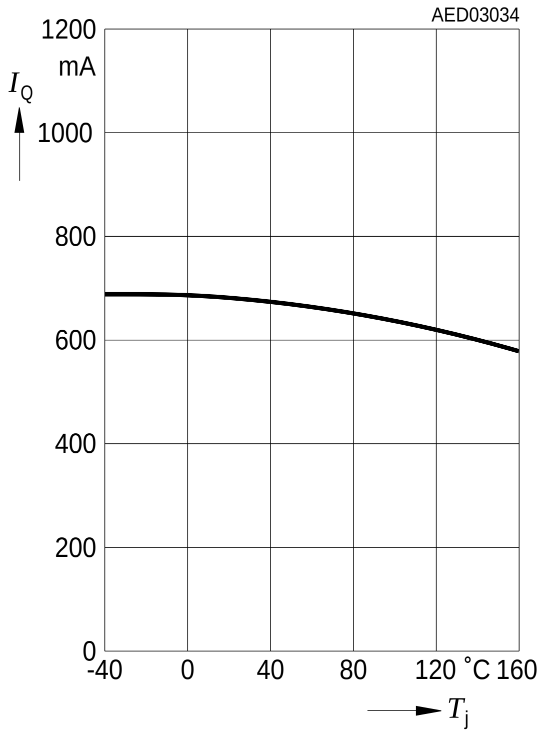


Figure 4 Reset Timing

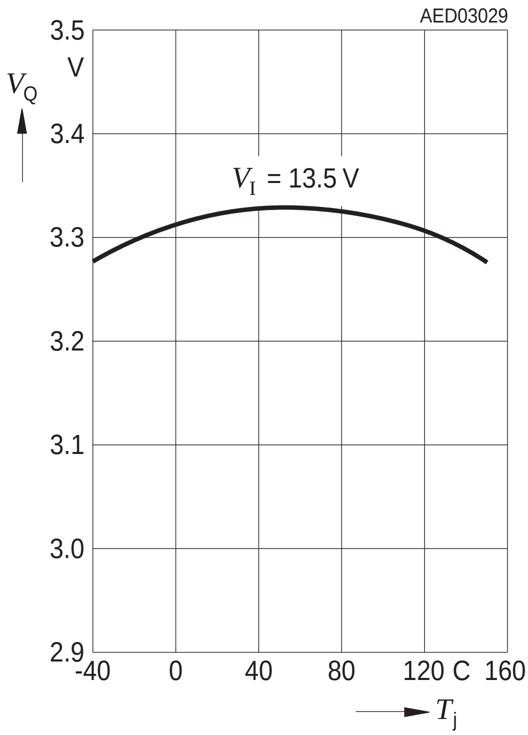
Output Voltage V_Q versus Temperature T_j



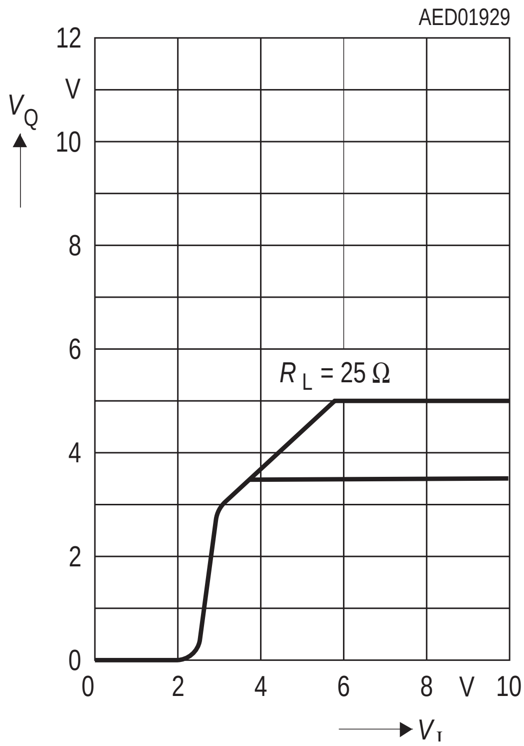
Output Current I_Q versus Temperature T_j



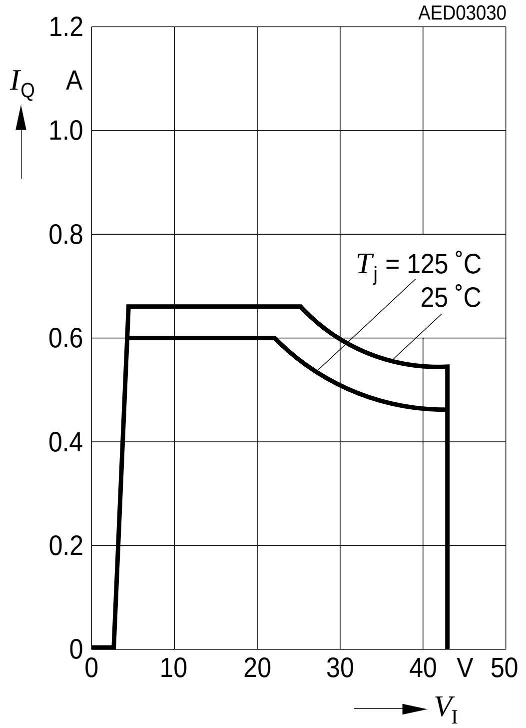
Output Voltage V_Q versus Temperature T_j



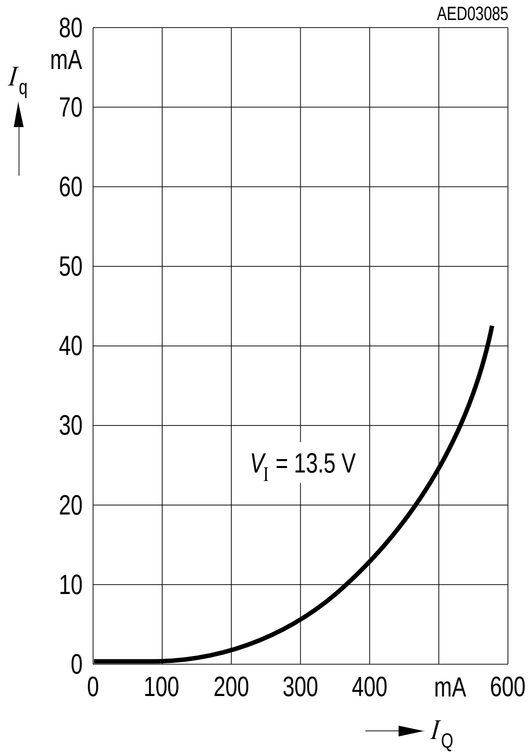
Output Voltage V_Q versus Input Voltage V_I



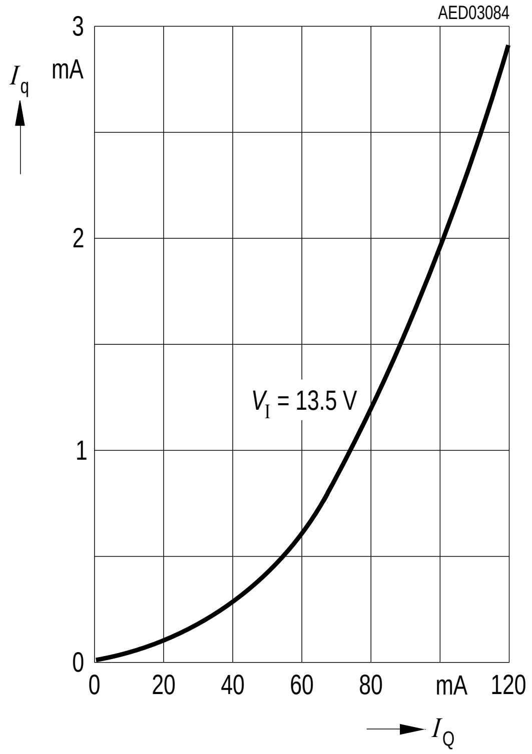
Output Current I_Q versus Input Voltage V_I



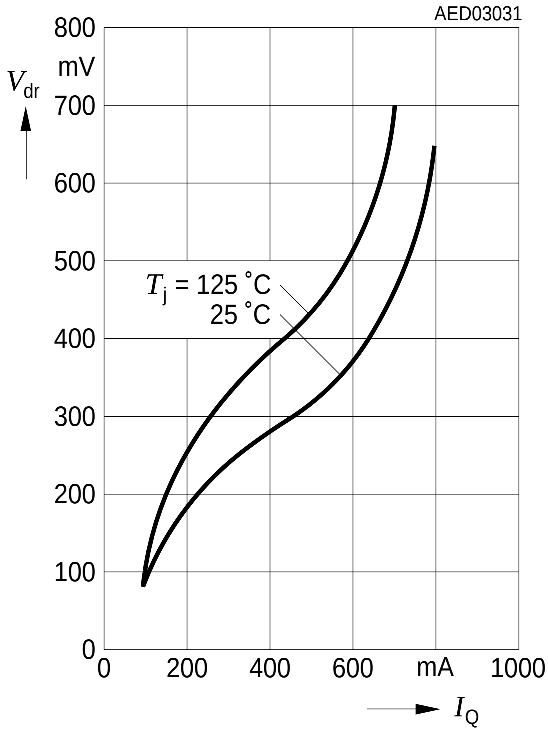
Current Consumption I_q versus Output Current I_Q



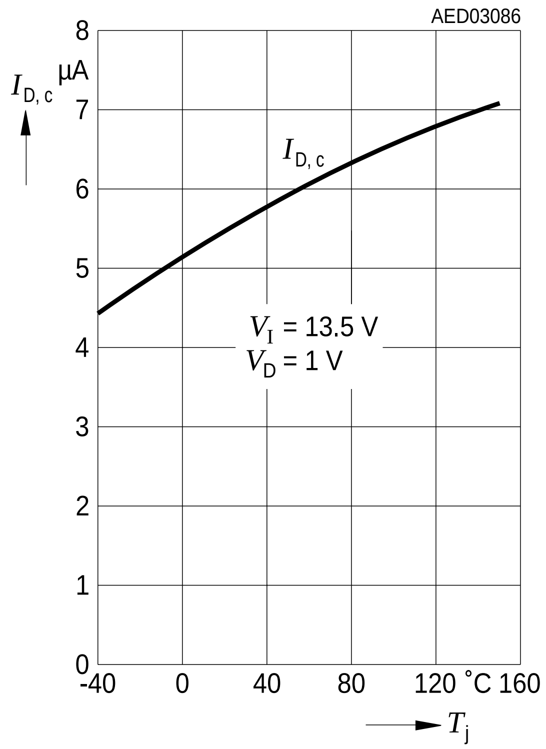
Current Consumption I_q versus Output Current I_Q



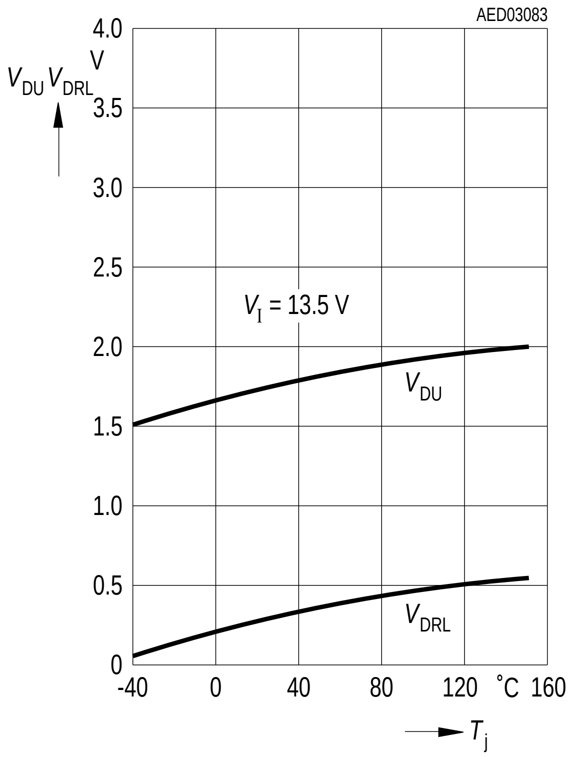
Drop Voltage V_{dr} versus Output Current I_Q



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



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



Package Outlines

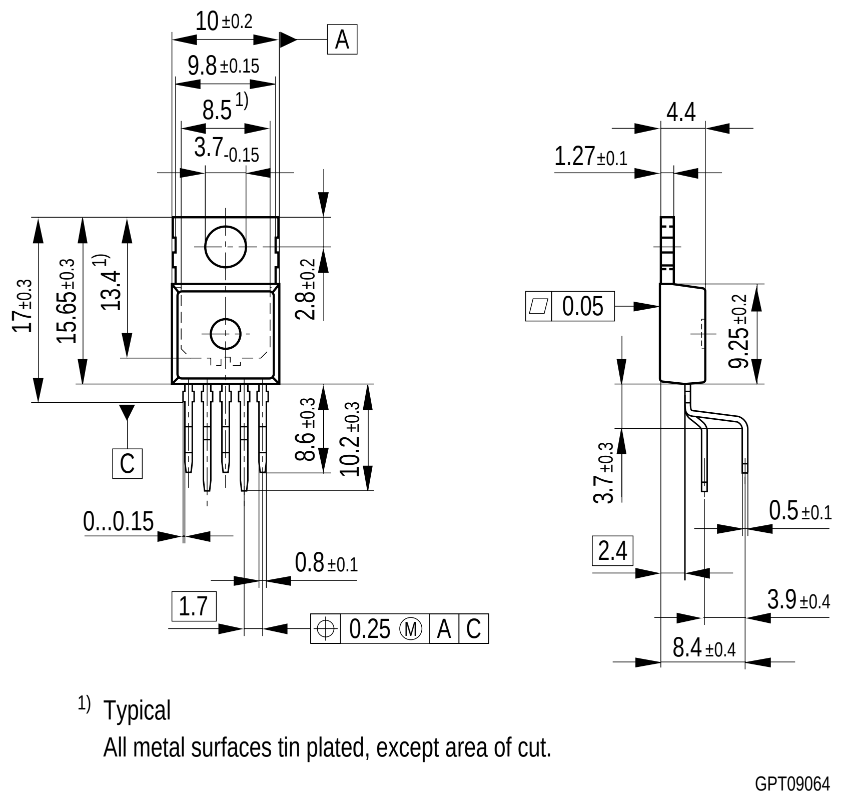


Figure 5 **PG-TO220-5-11** (Plastic Transistor Single Outline)

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).

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SMD = Surface Mounted Device

Dimensions in mm

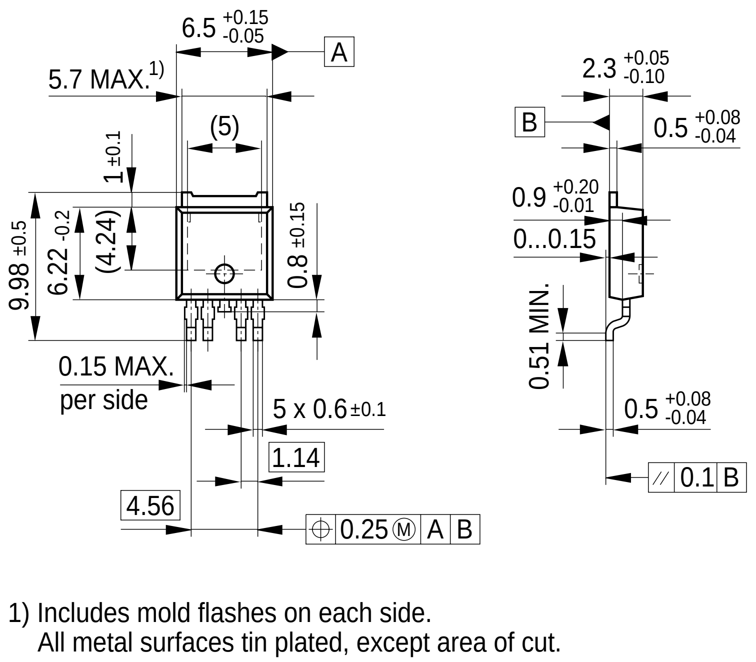

Figure 6 **PG-TO252-5-11** (Plastic Transistor Single Outline)

Green Product (RoHS compliant)

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SMD = Surface Mounted Device

Dimensions in mm

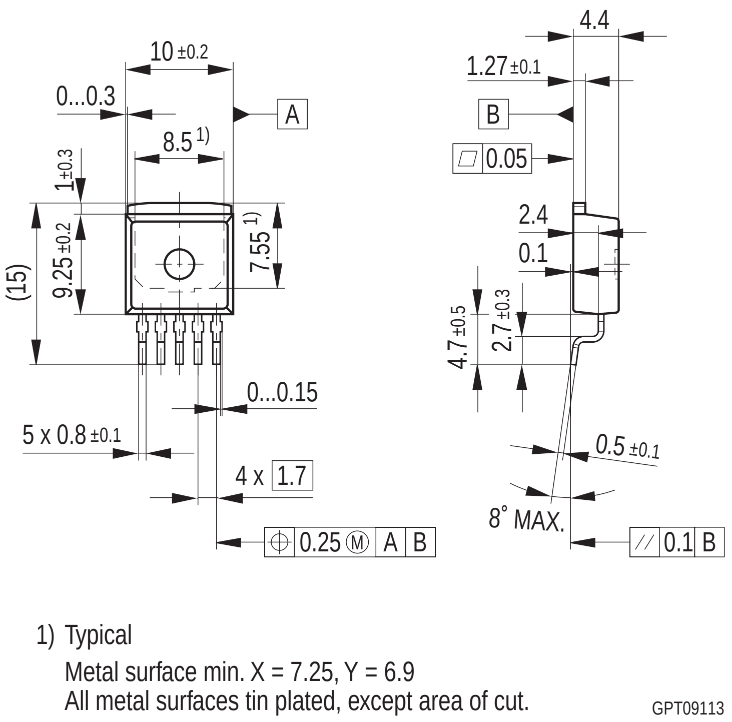

Figure 7 **PG-TO263-5-1** (Plastic Transistor Single Outline)

Green Product (RoHS compliant)

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SMD = Surface Mounted Device

Dimensions in mm

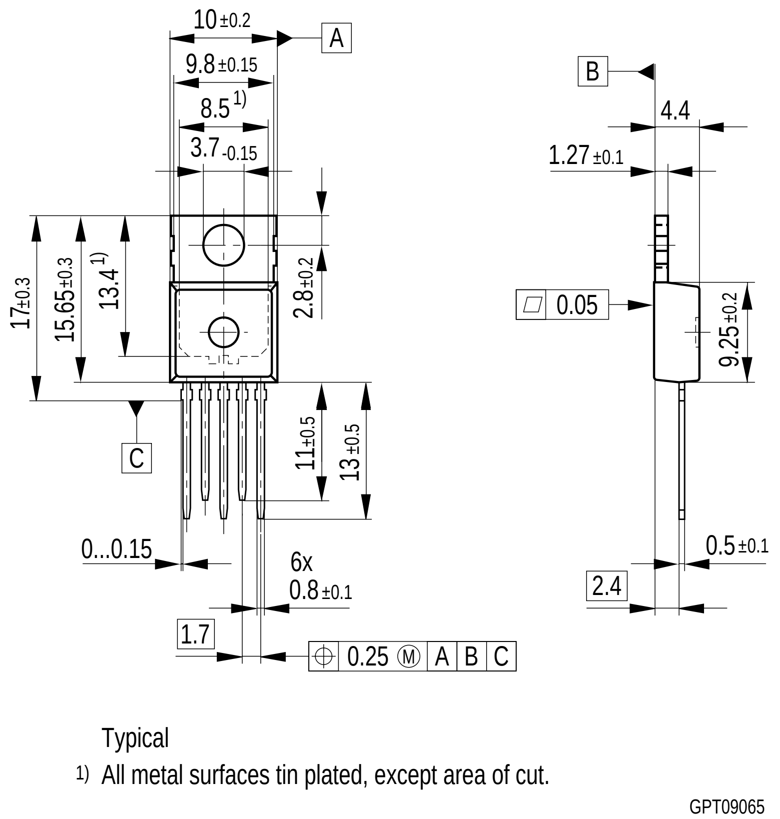

Figure 8 **PG-TO220-5-12** (Plastic Transistor Single Outline)

Green Product (RoHS compliant)

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SMD = Surface Mounted Device

Dimensions in mm

TLE 4275

Revision History:	**2007-02-19**	Rev. 1.7
Previous Version:	1.6	

Page	**Subjects (major changes since last revision)**
general	Removed all information related to the TLE4275v33 Product Proposal. (See separate datasheet for the TLE4275v33)
general	Updated Infineon logo
#1	Added “AEC” and “Green” logo
#1	Added “Green Product” and “AEC qualified” to the feature list
#1	Updated Package Names to “PG-xxx”
general	Removed leadframe variant “P-TO-252-1”
#12 to #15	Added “Green Product” remark
#17	Disclaimer Update

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