

Low Drop Voltage Regulator

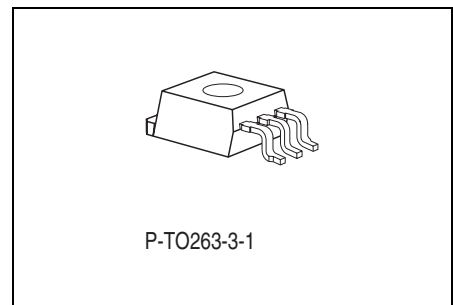
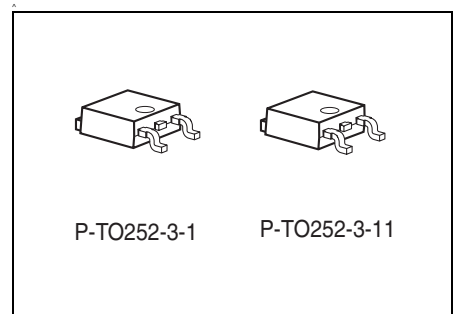
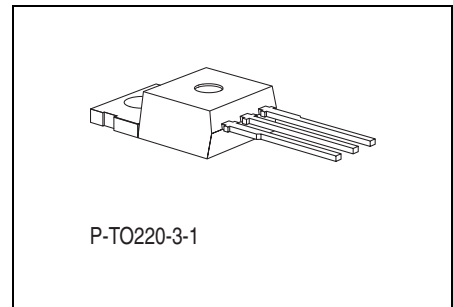
TLE 4274

Features

- Output voltage 5 V, 8.5 V or 10 V
- Output voltage tolerance $\leq \pm 4\%$
- Current capability 400 mA
- Low-drop voltage
- Very low current consumption
- Short-circuit proof
- Reverse polarity proof
- Suitable for use in automotive electronics

Functional Description

The TLE 4274 is a low drop voltage regulator available in a TO220, TO252 and TO263 package. The IC regulates an input voltage up to 40 V to $V_{Qrated} = 5.0 \text{ V (V50)}$, 8.5 V (V85) and 10 V (V10) . The maximum output current is 400 mA. The IC is short-circuit proof and incorporates temperature protection that disables the IC at overtemperature. A 3.3 V and 2.5 V version is also available. For information about the low output voltage types please refer to the data sheet TLE 4274 / 3.3 V; 2.5 V.



Type	Ordering Code	Package
TLE 4274 V10	Q67000-A9258	P-TO220-3-1
TLE 4274 V85	Q67000-A9257	P-TO220-3-1
TLE 4274 V50	Q67000-A9256	P-TO220-3-1
TLE 4274 DV50	Q67006-A9331	P-TO252-3-1, P-TO252-3-11
TLE 4274 GV10	Q67006-A9261	P-TO263-3-1
TLE 4274 GV50	Q67006-A9259	P-TO263-3-1
TLE 4274 GV85	Q67006-A9260	P-TO263-3-1

Dimensioning Information on External Components

The input capacitor C_I is necessary for compensating 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_Q is necessary for the stability of the regulation circuit. Stability is guaranteed at values $C_Q \geq 22\ \mu\text{F}$ and an ESR of $\leq 3\ \Omega$ 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 includes a number of internal circuits for protection against:

- Overload
- Overtemperature
- Reverse polarity

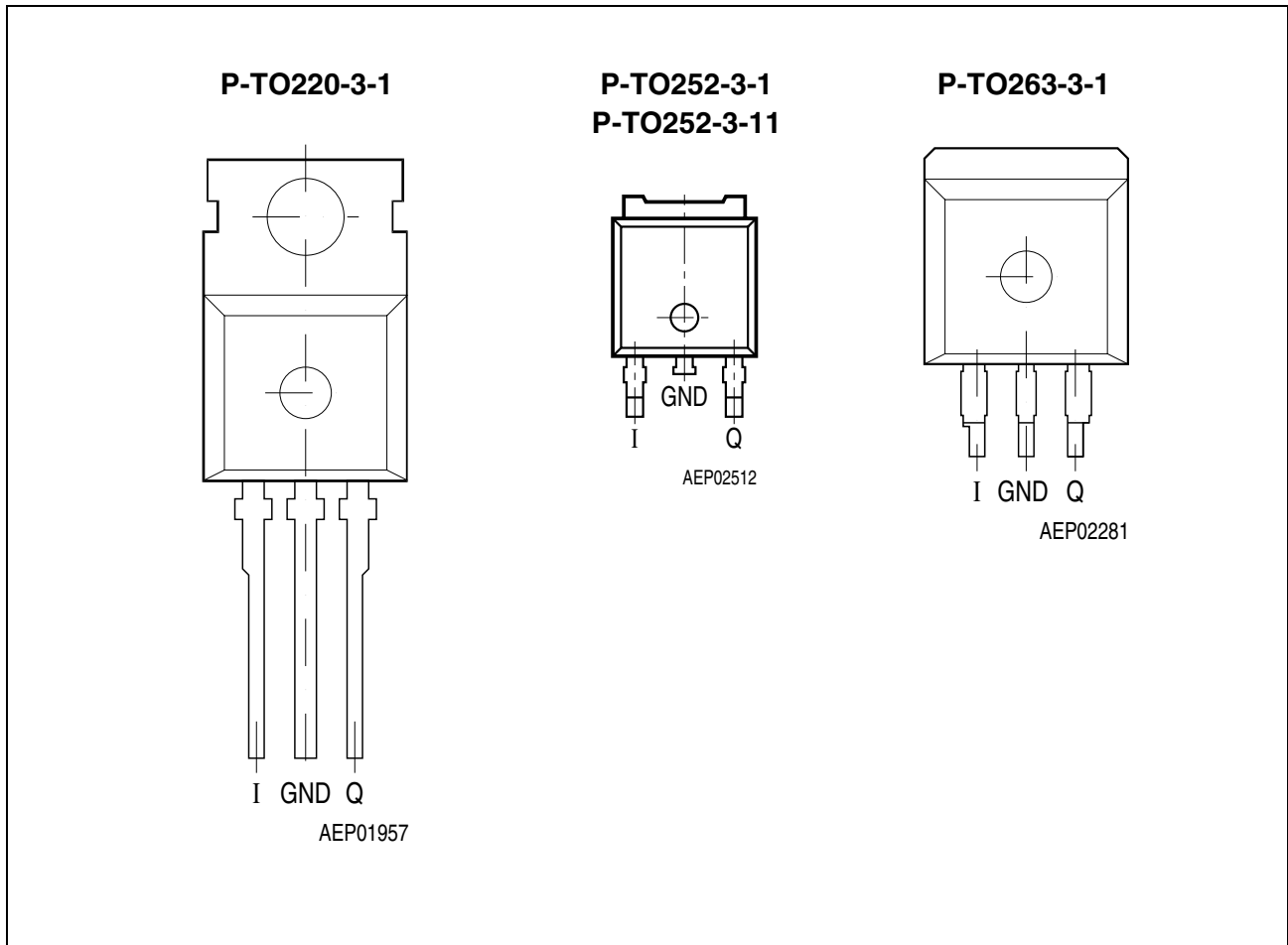


Figure 1 Pin Configuration (top view)

Table 1 Pin Definitions and Functions

Pin No.	Symbol	Function
1	I	Input; block to ground directly at the IC with a ceramic capacitor.
2	GND	Ground
3	Q	Output; block to ground with a $\geq 22 \mu\text{F}$ capacitor, $\text{ESR} \leq 3 \Omega$.

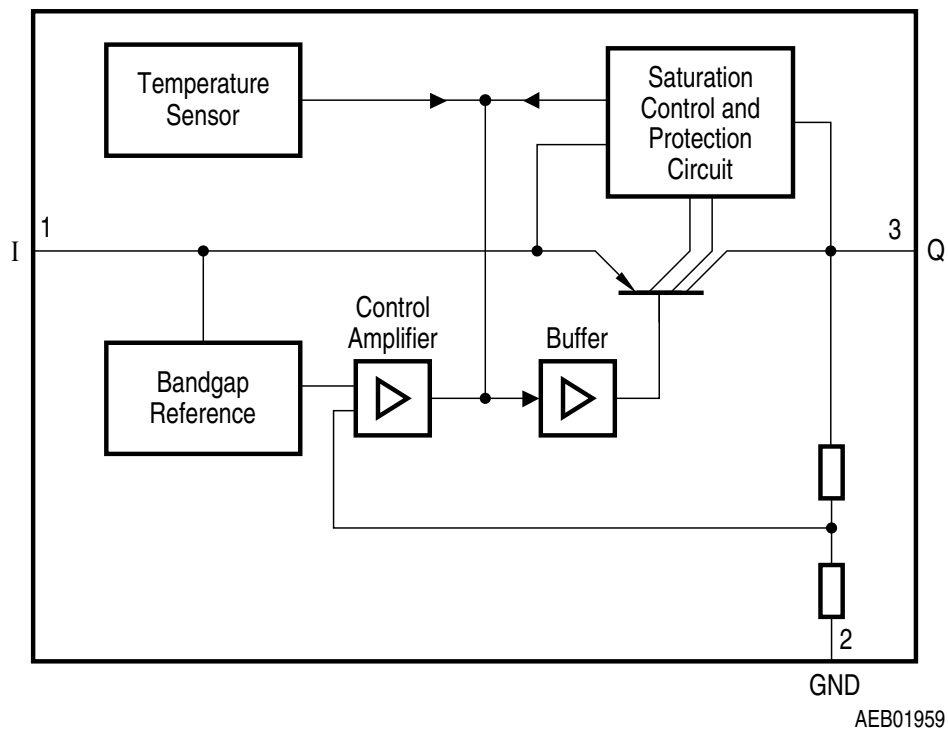


Figure 2 **Block Diagram**

Table 2 Absolute Maximum Ratings
 $T_j = -40 \text{ to } 150 \text{ }^{\circ}\text{C}$

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	40	V	–
Current	I_Q	–	–	–	Internally limited
Ground					
Current	I_{GND}	–	100	mA	–
Temperature					
Junction temperature	T_j	–	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; V50, DV50, GV50	V_I	5.5	40	V	–
Input voltage, V85, GV85	V_I	9.0	40	V	–
Input voltage, V10, GV10	V_I	10.5	40	V	–
Junction temperature	T_j	-40	150	$^{\circ}\text{C}$	–
Thermal Resistance					
Junction ambient	R_{thja}	–	65	K/W	TO220
Junction ambient	R_{thja}	–	78	K/W	TO252 ¹⁾
Junction ambient	R_{thja}	–	52	K/W	TO263 ¹⁾
Junction case	R_{thjc}	–	4	K/W	–

1) Worst case; regarding peak temperature, zero airflow mounted on PCB $80 \times 80 \times 1.5 \text{ mm}^3$, 300 mm^2 heat sink area.

Table 4 Characteristics
 $V_I = 13.5 \text{ V}; -40 \text{ }^\circ\text{C} < T_j < 150 \text{ }^\circ\text{C}$ (unless otherwise specified)

Parameter	Symbol	Limit Values			Unit	Measuring Conditions
		Min.	Typ.	Max.		
Output voltage V50-Version	V_Q	4.8	5	5.2	V	$5 \text{ mA} < I_Q < 400 \text{ mA}$ $6 \text{ V} < V_I < 28 \text{ V}$
Output voltage V50-Version	V_Q	4.8	5	5.2	V	$5 \text{ mA} < I_Q < 200 \text{ mA}$ $6 \text{ V} < V_I < 40 \text{ V}$
Output voltage V85-Version	V_Q	8.16	8.5	8.84	V	$5 \text{ mA} < I_Q < 400 \text{ mA}$ $9.5 \text{ V} < V_I < 28 \text{ V}$
Output voltage V85-Version	V_Q	8.16	8.5	8.84	V	$5 \text{ mA} < I_Q < 200 \text{ mA}$ $9.5 \text{ V} < V_I < 40 \text{ V}$
Output voltage V10-Version	V_Q	9.6	10	10.4	V	$5 \text{ mA} < I_Q < 400 \text{ mA}$ $11 \text{ V} < V_I < 28 \text{ V}$
Output voltage V10-Version	V_Q	9.6	10	10.4	V	$5 \text{ mA} < I_Q < 200 \text{ mA}$ $11 \text{ V} < V_I < 40 \text{ V}$
Output current limitation ¹⁾	I_Q	400	600	–	mA	–
Current consumption; $I_q = I_I - I_Q$	I_q	–	100	220	μA	$I_Q = 1 \text{ mA}$
Current consumption; $I_q = I_I - I_Q$	I_q	–	8	15	mA	$I_Q = 250 \text{ mA}$
	I_q	–	20	30	mA	$I_Q = 400 \text{ mA}$
Drop voltage ¹⁾	V_{dr}	–	250	500	mV	$I_Q = 250 \text{ mA}$ $V_{dr} = V_I - V_Q$
Load regulation	ΔV_Q	–	20	50	mV	$I_Q = 5 \text{ mA}$ to 400 mA
Line regulation	ΔV_Q	–	10	25	mV	$\Delta V_I = 12 \text{ V}$ to 32 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	dV_Q/dT	–	0.5	–	mV/K	–

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

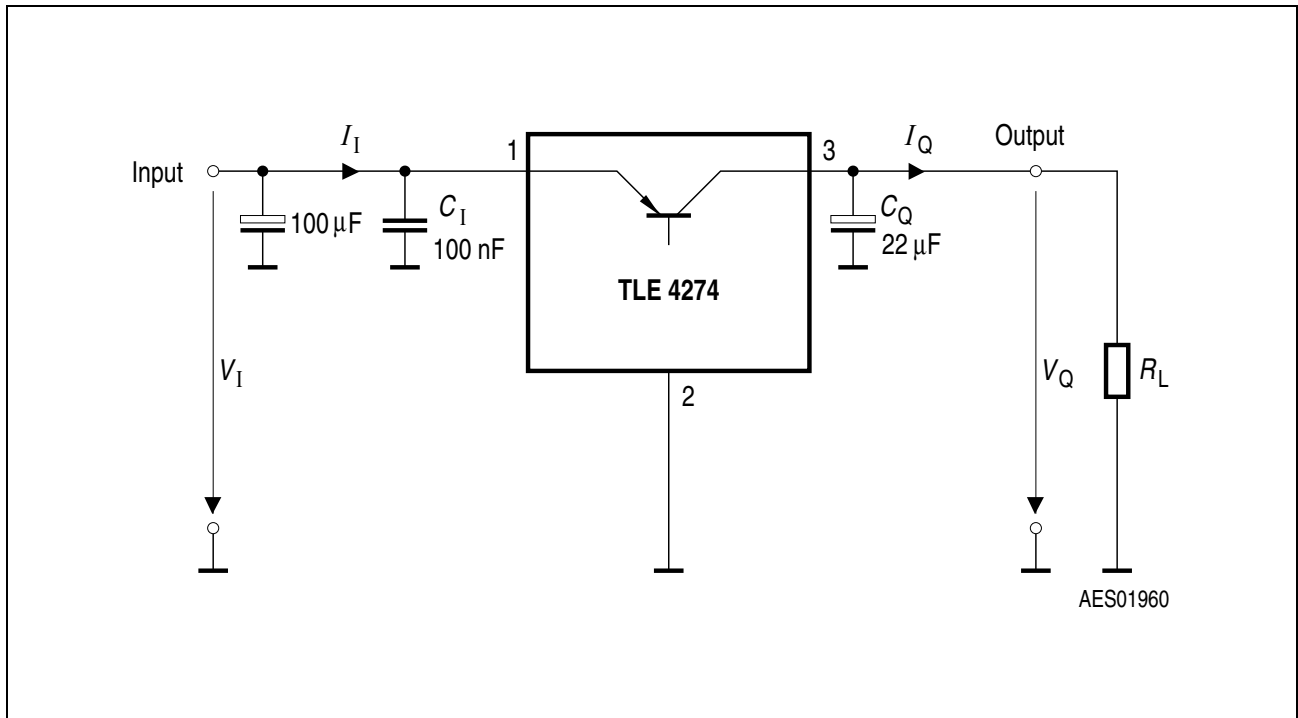


Figure 3 Measuring Circuit

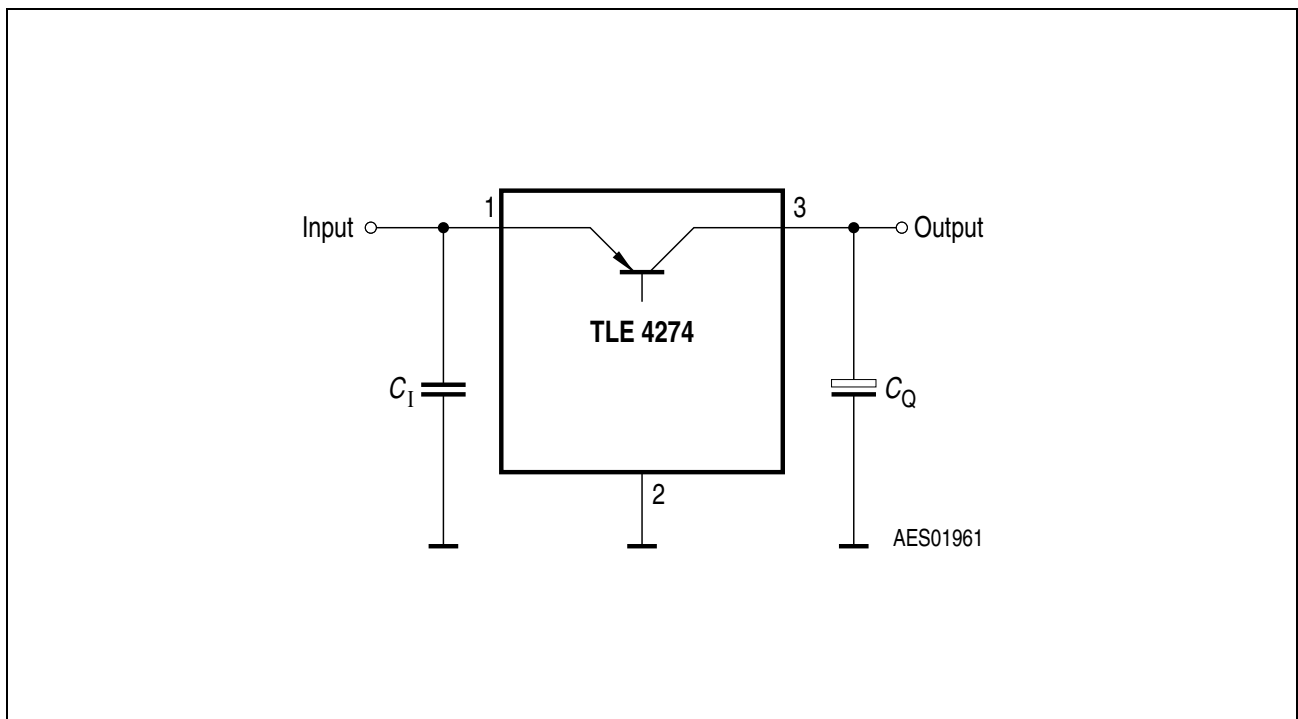
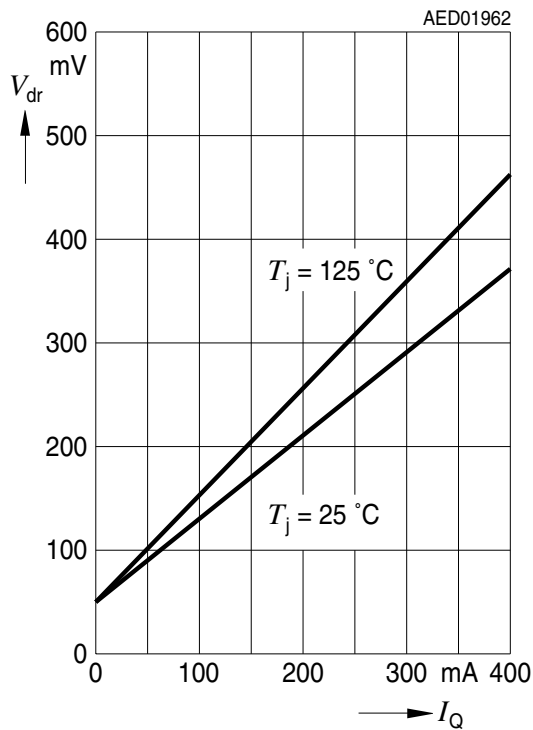


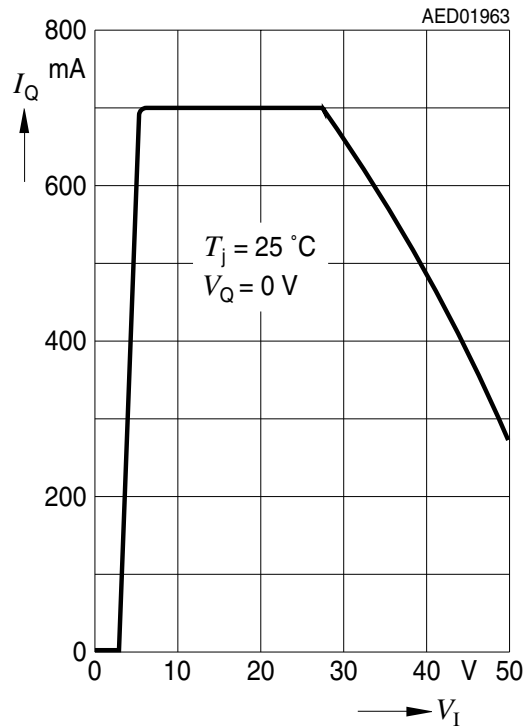
Figure 4 Application Circuit

Typical Performance Characteristics (V50, V85 and V10)

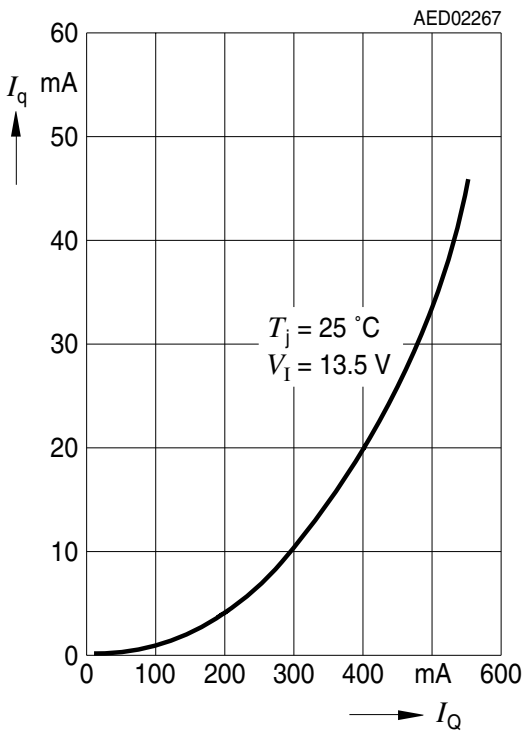
Drop Voltage V_{dr} versus Output Current I_Q



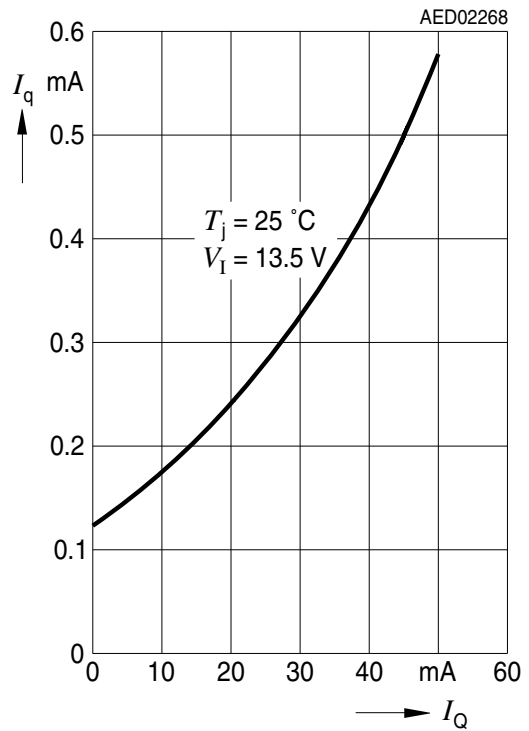
Output Current I_Q versus Input Voltage V_I



Current Consumption I_q versus Output Current I_Q (high load)

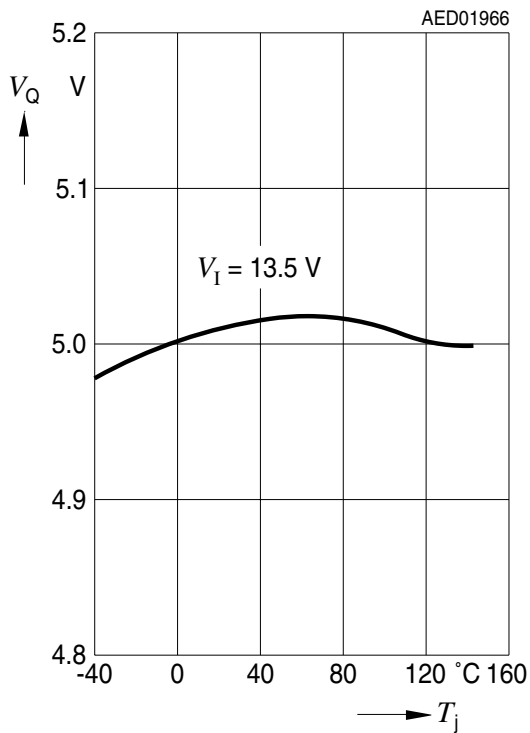


Current Consumption I_q versus Output Current I_Q (low load)

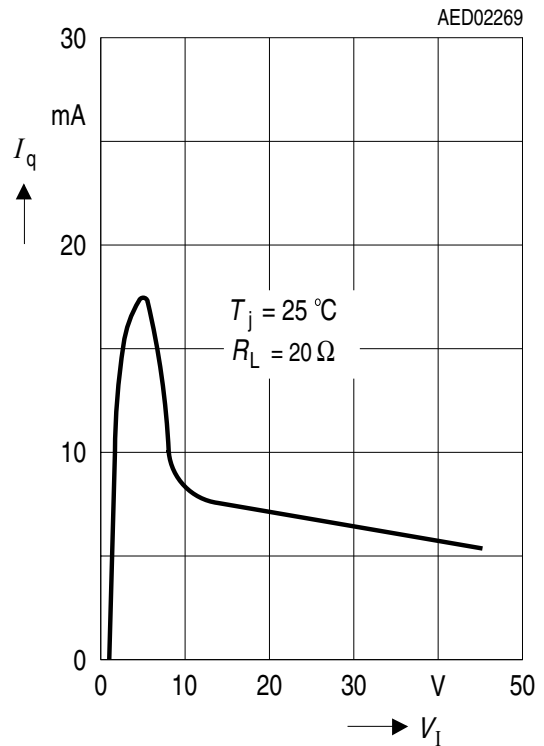


Typical Performance Characteristics (V50)

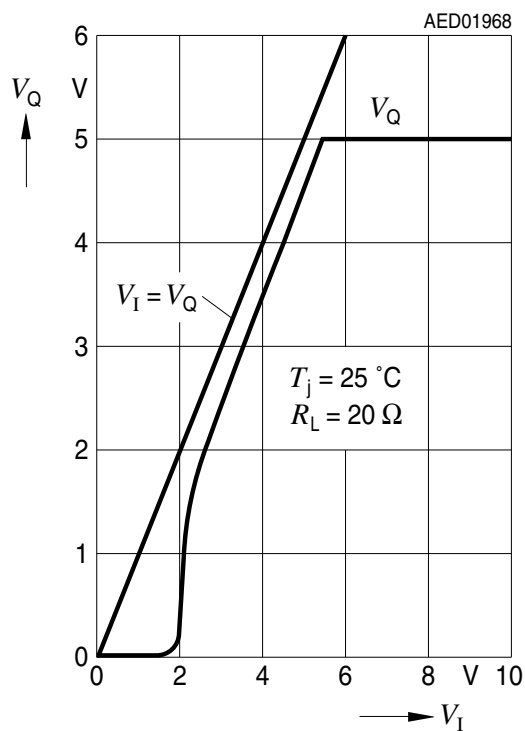
Output Voltage V_Q versus Junction Temperature T_j



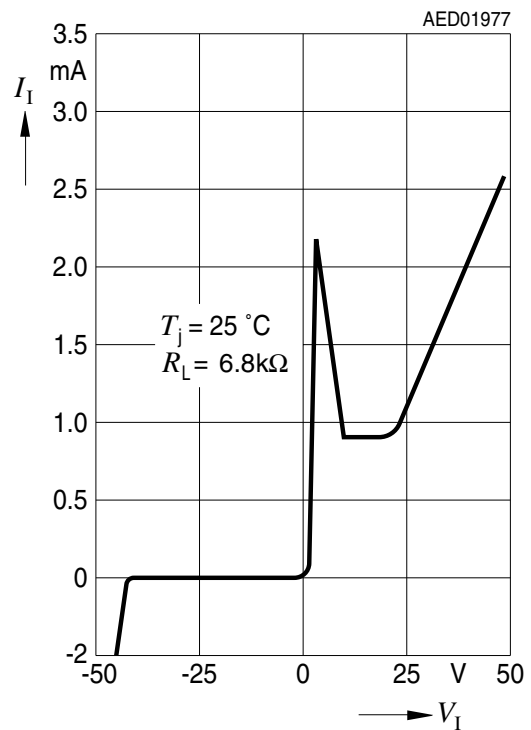
Current Consumption I_q versus Input Voltage V_I



Output Voltage V_Q versus Input Voltage V_I

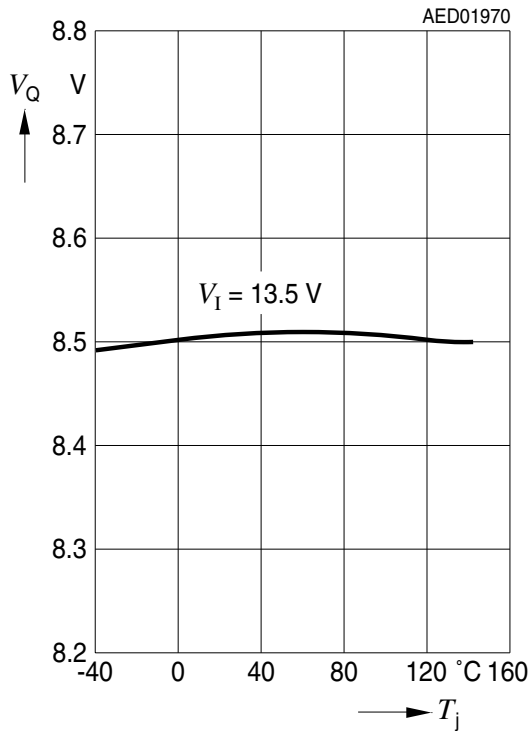


Input Current I_I versus Input Voltage V_I

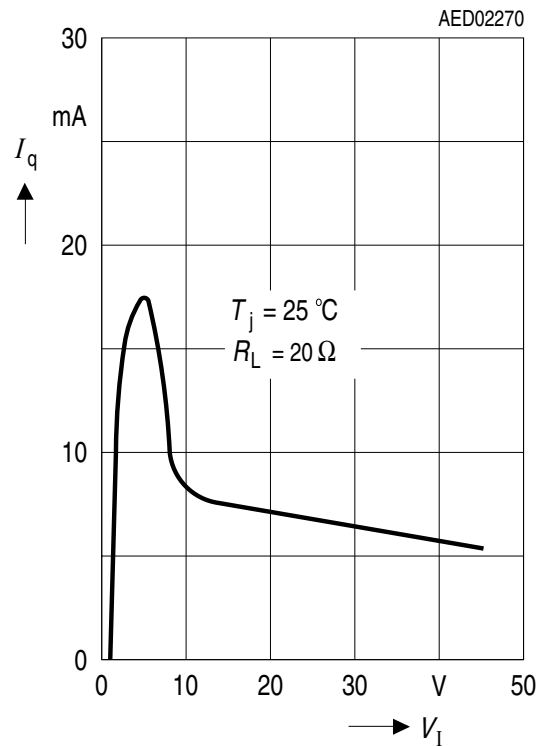


Typical Performance Characteristics for V85

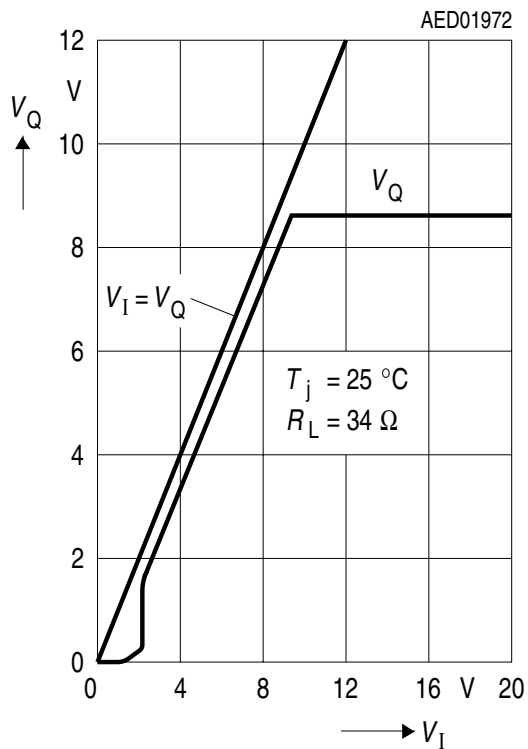
Output Voltage V_Q versus Junction Temperature T_j



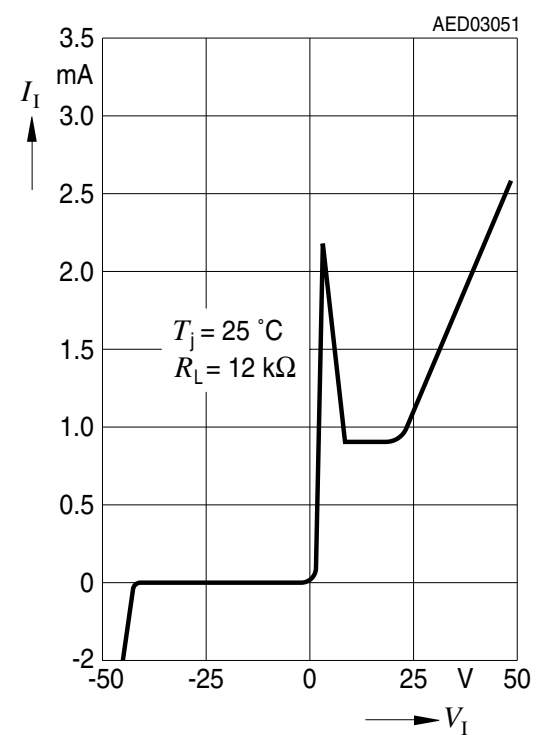
Current Consumption I_q versus Input Voltage V_I



Output Voltage V_Q versus Input Voltage V_I

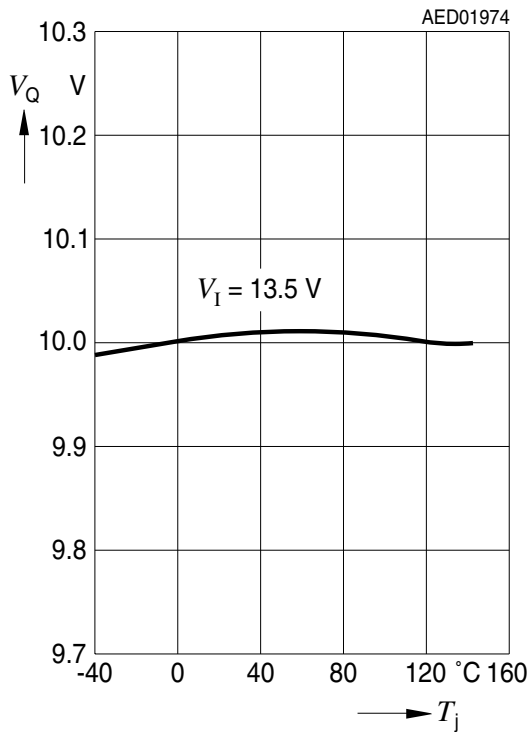


Input Current I_I versus Input Voltage V_I

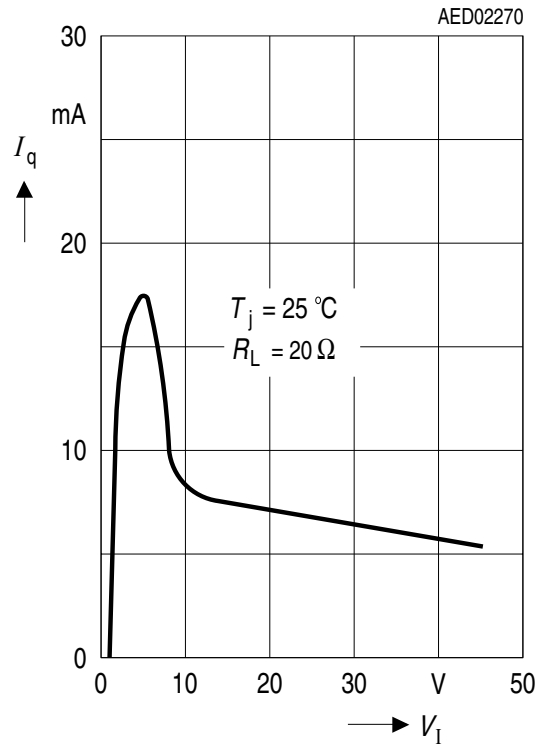


Typical Performance Characteristics for V10

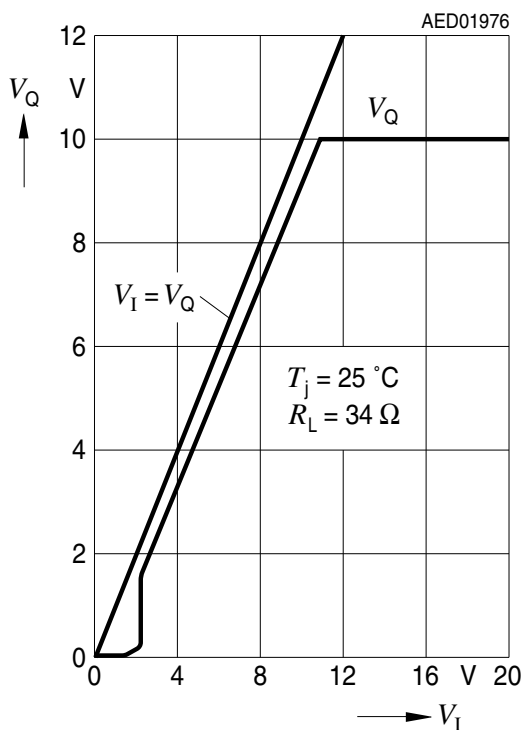
Output Voltage V_Q versus Junction Temperature T_j



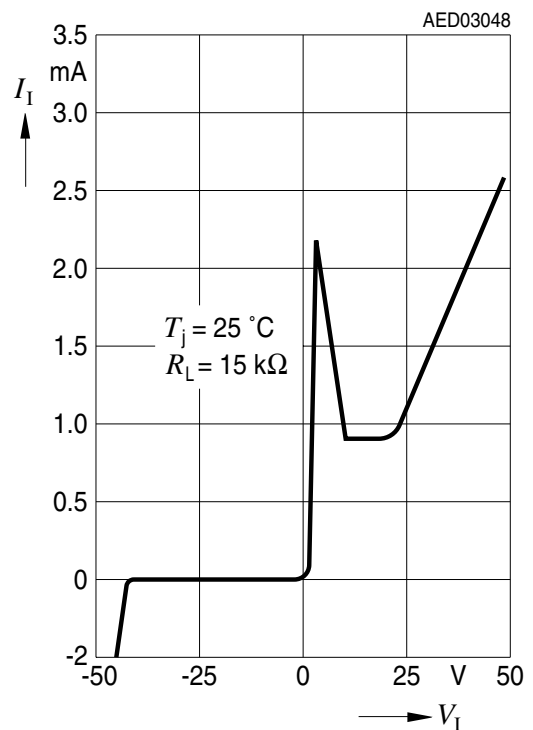
Current Consumption I_q versus Input Voltage V_I



Output Voltage V_Q versus Input Voltage V_I



Input Current I_I versus Input Voltage V_I



Package Outlines

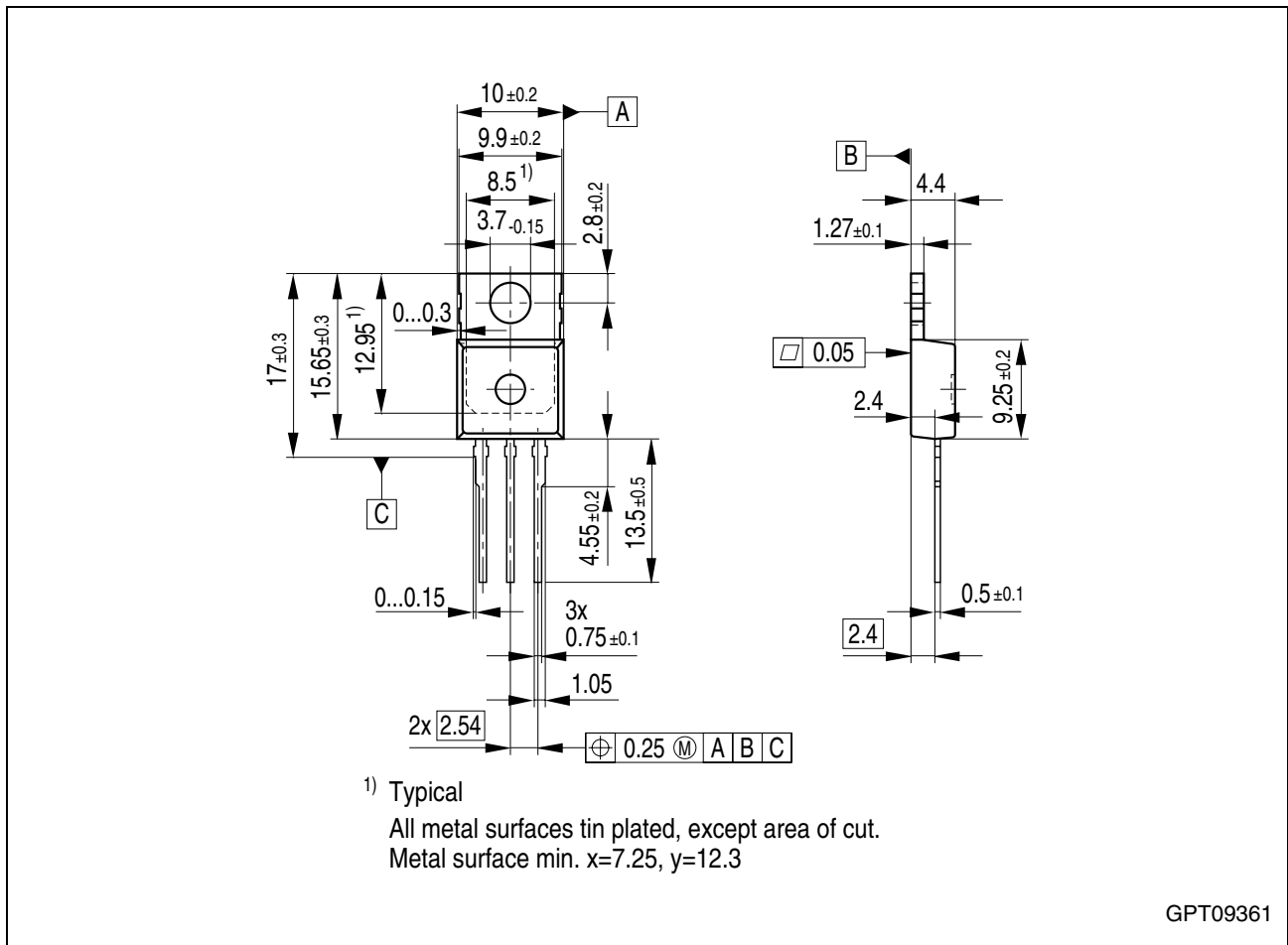
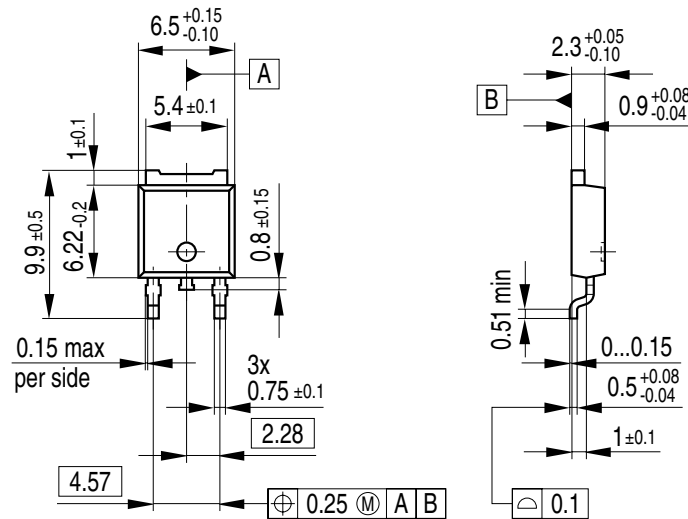


Figure 5 P-T0220-3-1 (Plastic Transistor Single Outline)

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SMD = Surface Mounted Device

Dimensions in mm



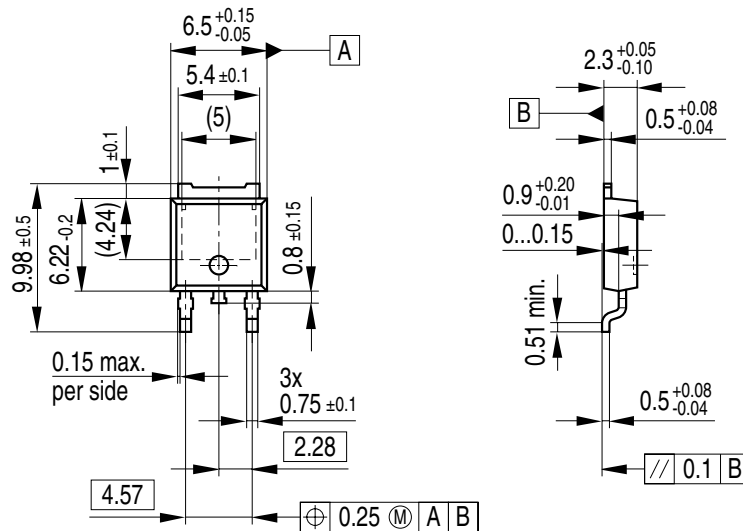
All metal surfaces tin plated, except area of cut.

Figure 6 P-T0252-3-1 (Plastic Transistor Single Outline)

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SMD = Surface Mounted Device

Dimensions in mm



All metal surfaces tin plated, except area of cut.

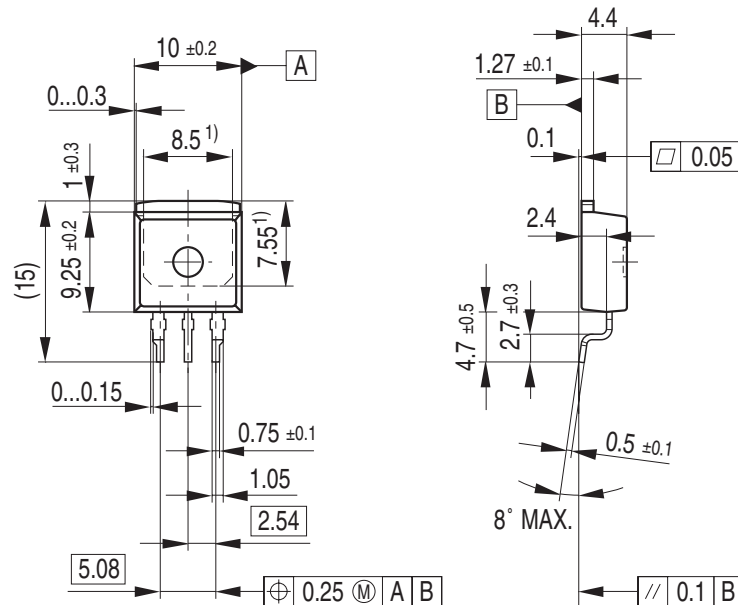
GPT09277

Figure 7 P-TO252-3-11 (Plastic Transistor Single Outline)

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SMD = Surface Mounted Device

Dimensions in mm



¹⁾ Typical

All metal surfaces: tin plated, except area of cut.
Metal surface min. $x=7.25$, $y=6.9$

GPT09362

Figure 8 P-T0263-3-1 (Plastic Transistor Single Outline)

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SMD = Surface Mounted Device

Dimensions in mm

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