SIEMENS

2-A DC Motor Driver

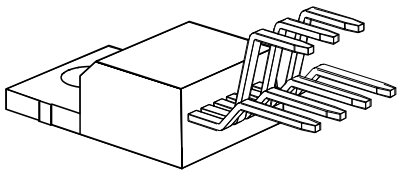
TLE 4202 B

Bipolar IC

Overview

Features

- Drives motors up to 2 A
- Integrated free-wheeling diodes 2.5 A
- Short-circuit proof to ground
- Overtemperature protection
- Low saturation voltages through bootstrap
- Wide temperature range
- Suitable for applications in automotive engineering



P-TO220-7-1

Type	Ordering Code	Package
TLE 4202 B	Q67000-A8225	P-TO220-7-1

Description

The two power comparators can switch magnets, motors or other loads either by being separated from each other or by being combined to a full-bridge circuit. The IC is designed for application in motor vehicles. It can be applied at package temperatures between – 40 °C and 130 °C.

The IC contains two amplifiers featuring a typical open-loop voltage gain of 80 dB at 500 Hz.

The input stages are PNP differential amplifiers thus resulting in a common-mode input voltage range from 0 V to approx. the value of V_S and in a maximum input differential voltage of V_S. To obtain low saturation voltages at the sink circuit, the drive circuit of the sink transistor is connected to the supply voltage. An SOA protective circuit protects the IC against ground short-circuits. At chip temperatures above approx. 160 °C the source transistors are turned off.

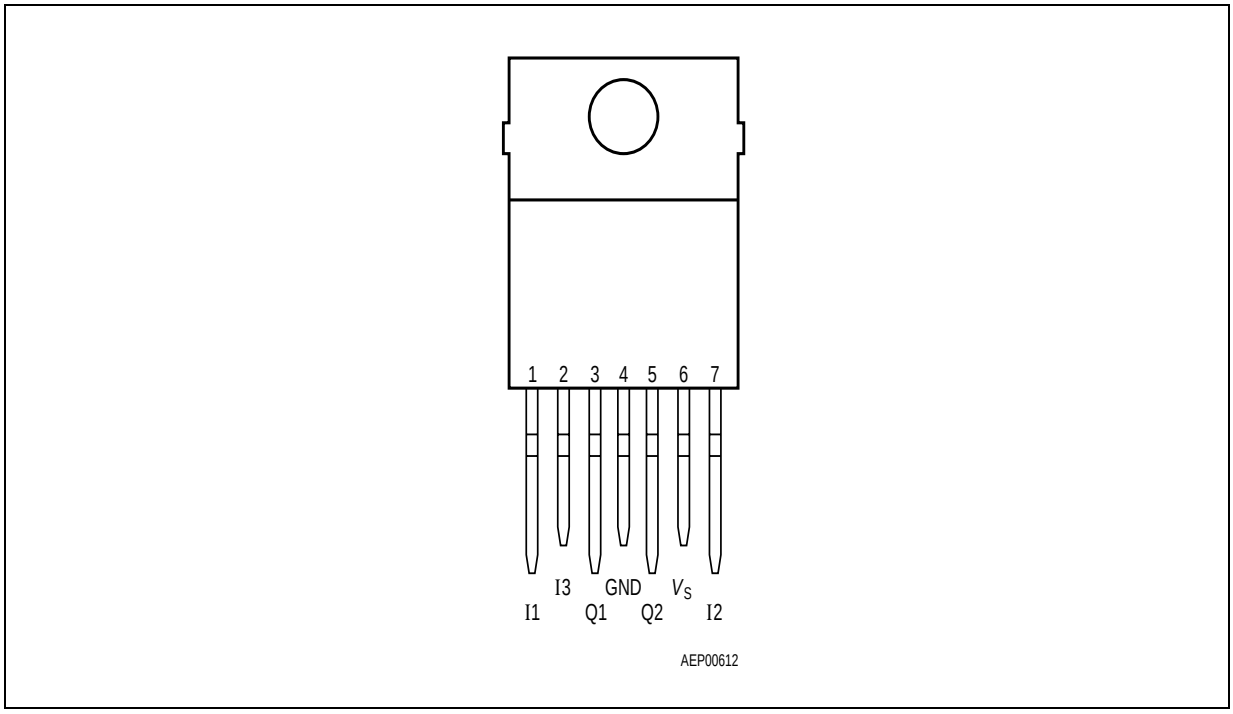


Figure 1 Pin Configuration (top view)

Pin Definitions and Functions

Pin No.	Symbol	Function
1	I1	**Input 1** Non-inverting input 1, to be connected to pin 2 and pin 3 according to general rules
2	I3	**Inverting input 3** Inverting inputs of the two comparators; internally connected to reference voltage across 50 kΩ (typ. 1.7 V)
3	Q1	**Output Q1** Push-pull output B DC-short-circuit proof to ground. Integrated free-wheel diodes to ground and to supply voltage
4	GND	**Ground**
5	Q2	**Output Q2,** see pin 3
6	V_S	**Supply voltage** Has to be blocked to ground with a ceramic capacitor of at least 100 nF directly at the pins of the ICs
7	I2	**Input 2** Non-inverting input 2; see pin 1

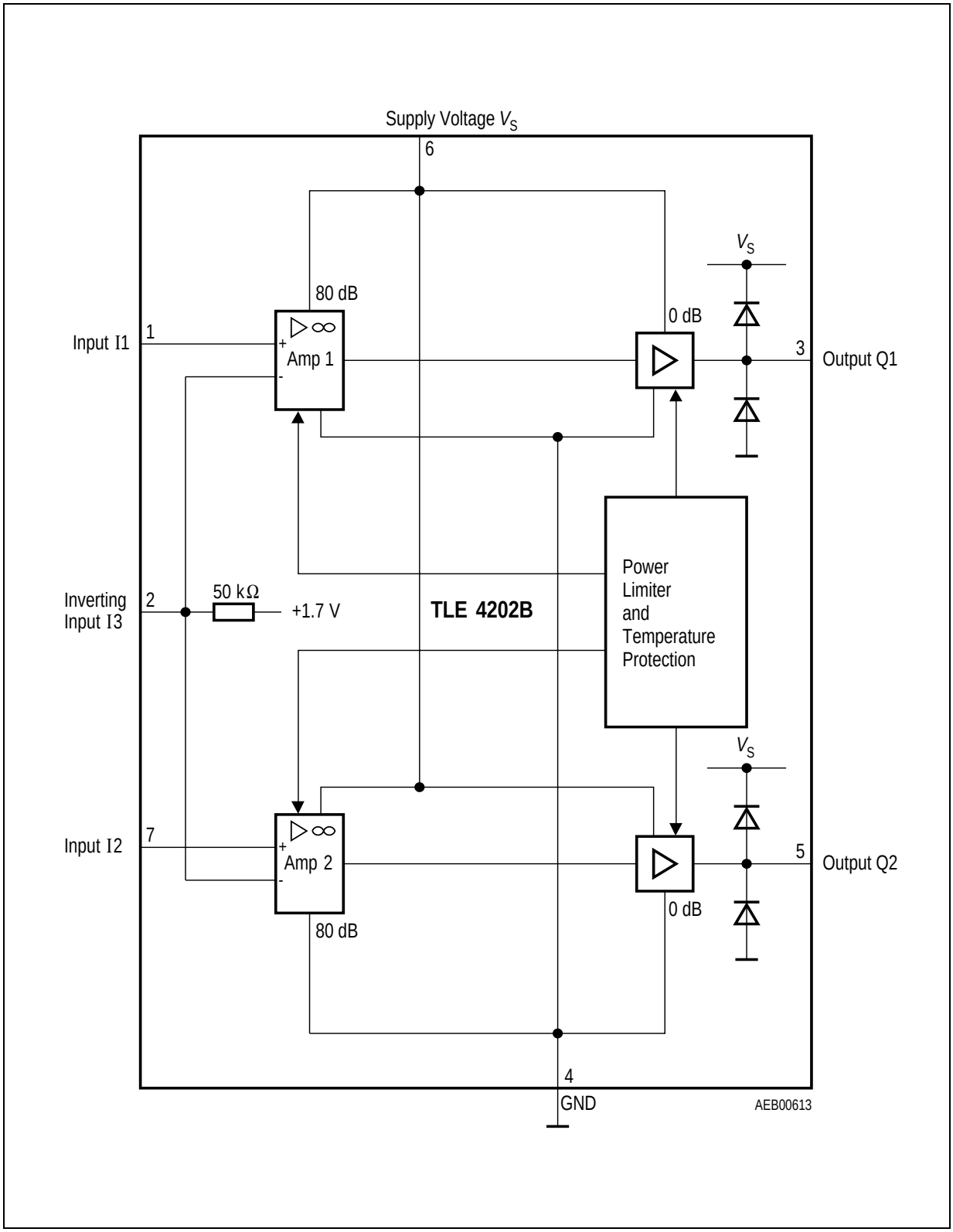


Figure 2 Block Diagram

Absolute Maximum Ratings

T_C = – 40 to 130 °C

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Supply voltage	V_S	–	40	V
Output current of sink transistors $T_C \leq 85$ °C	I_Q	–	2.5	A
Output current of source transistors internally limited	I_Q	–	–	–
Diode peak currents				
to + V_S	I_{F+}	–	2.5	A
to ground	I_{F-}	–	2.5	A
Voltage at pins I1, I2, I3	$V_{1, 2, 7}$	– 0.3	V_S	V
Voltage at pins Q1, Q2 [1]	$V_{3, 5}$	–	–	V
Junction temperature	T_j	–	150	°C
Storage temperature	T_{stg}	– 55	125	°C

Operating Range

Supply voltage	V_S	3.5	17	V
Case temperature during operation	T_C			
$R_L \geq 6\ \Omega$, V_S = 7 … 16 V		– 40	–	°C
$R_L \geq 9\ \Omega$, V_S = 16 V		–	130	°C
Voltage amplification (at negative feedback with external connection)	V_V	30	–	dB
Thermal resistance system - case	$R_{th\ SC}$	–	4	K/W

[1] The output voltages are kept within a permissible range by free-wheel diodes

Outputs Q1 and Q2 short-circuit proof to ground

R_L: Resistance between output 1 and output 2

Characteristics

V_S = 13 V; T_j = 25 °C

Parameter	Symbol	Limit Values			Unit	Test Condition	Test Circuit
		min.	typ.	max.			
General Data							
Quiescent current	I_S	–	15	25	mA	S = 1	1
Open-loop gain	G_{VO}	50	80	–	dB	f = 500 Hz $V_S \leq 7$ V ≤ 16 V T_C = – 40 °C to 110 °C	1
Input Characteristics							
Input current (pins I1, I2)	$I_{I\,1,\,7}$	–	1	3	µA	$V_{I\,1,\,12}$ = 0	2
Input current	$I_{I\,2}$	–	35	70	µA	$V_{I\,2}$ = 0; $V_{I\,1,\,7} = V_S$	1
	$-I_{I\,2}$	–	230	300	µA	$V_{I\,2} \leq V_S$; $V_{I\,1,\,7}$ = 0 V	–
Input resistance	$R_{I\,1,\,7}$	1	5	–	MΩ	f = 1 kHz	1
Input reference voltage	$V_{I\,2}$	1.4	1.7	2	V	I_2 = 0; $V_{I\,1,\,7}$ = 0 V	1
Input offset voltage	$V_{I\,0}$	– 20	–	20	mV	–	3

Characteristics (cont'd)
V_S = 13 V; T_j = 25 °C

Parameter	Symbol	Limit Values			Unit	Test Condition	Test Circuit
		min.	typ.	max.			
Output Characteristics							
Saturation voltages							
Source operation	V_{Sato}	–	0.9	1	V	I_Q = – 0.3 A; S1 = 1	2
measured to V_S	V_{Sato}	–	1.2	1.6	V	I_Q = – 1.0 A; S1 = 1	2
	V_{Sato}	–	1.5	2.1	V	I_Q = – 2 A; S1 = 1	2
Sink operation	V_{Satu}	–	0.25	0.4	V	I_Q = 0.3 A; S1 = 2	2
			0.5	0.75	V	I_Q = 1 A; S1 = 2	2
	V_{Satu}	–	1	1.3	V	I_Q = 2 A; S1 = 2	2
Short-circuit current	I_{SC}	–	1.25	1.6	A	V_Q = 0 V	2
Diode forward voltage to + V_S	V_{F+}	–	1	1.3	V	$I_F = I_Q$ = 1 A	2
to ground	V_{F-}	–	0.9	1.2	V	$I_F = I_Q$ = 1 A	2
Slew rate falling edge	SR	–	6	–	V/µs	–	1
Slew rate rising edge	SR	–	6	–	V/µs	–	1
Switching Times							
Rise time of V_Q	t_r	–	1.5	–	µs	–	1
Fall time of V_Q	t_f	–	1.5	–	µs	–	1
Switch-ON delay	t_{ON}	–	3	–	µs	–	1
Switch-OFF delay	t_{OFF}	–	1.5	–	µs	–	1
Quiescent current	I_S	–	15	30	mA	S = 1	1

Characteristics

$V_S \leq 7$ V to 17 V; T_C = – 40 to 110 °C

Parameter	Symbol	Limit Values			Unit	Test Condition	Test Circuit
		min.	typ.	max.			
Saturation Voltage							
Source operation measured to V_S	V_{Sato}	–	0.9	1.2	V	I_Q = – 0.3 A; S = 1	2
	V_{Sato}	–	1.2	1.8	V	I_Q = – 1 A; S = 1	2
	V_{Sato}	–	1.5	2.4	V	I_Q = – 2 A; S = 1	2
Sink operation	V_{Satu}	–	0.25	0.60	V	I_Q = 0.3 A; S1 = 2	2
	V_{Satu}	–	0.5	1.1	V	I_Q = 1 A; S1 = 2	2
	V_{Satu}	–	1.2	2	V	I_Q = 2 A; S1 = 2	2
Short-circuit current	$-I_{SC}$	–	–	3.5	V	V_Q = 0 V T_C = 25 °C to 110 °C	–

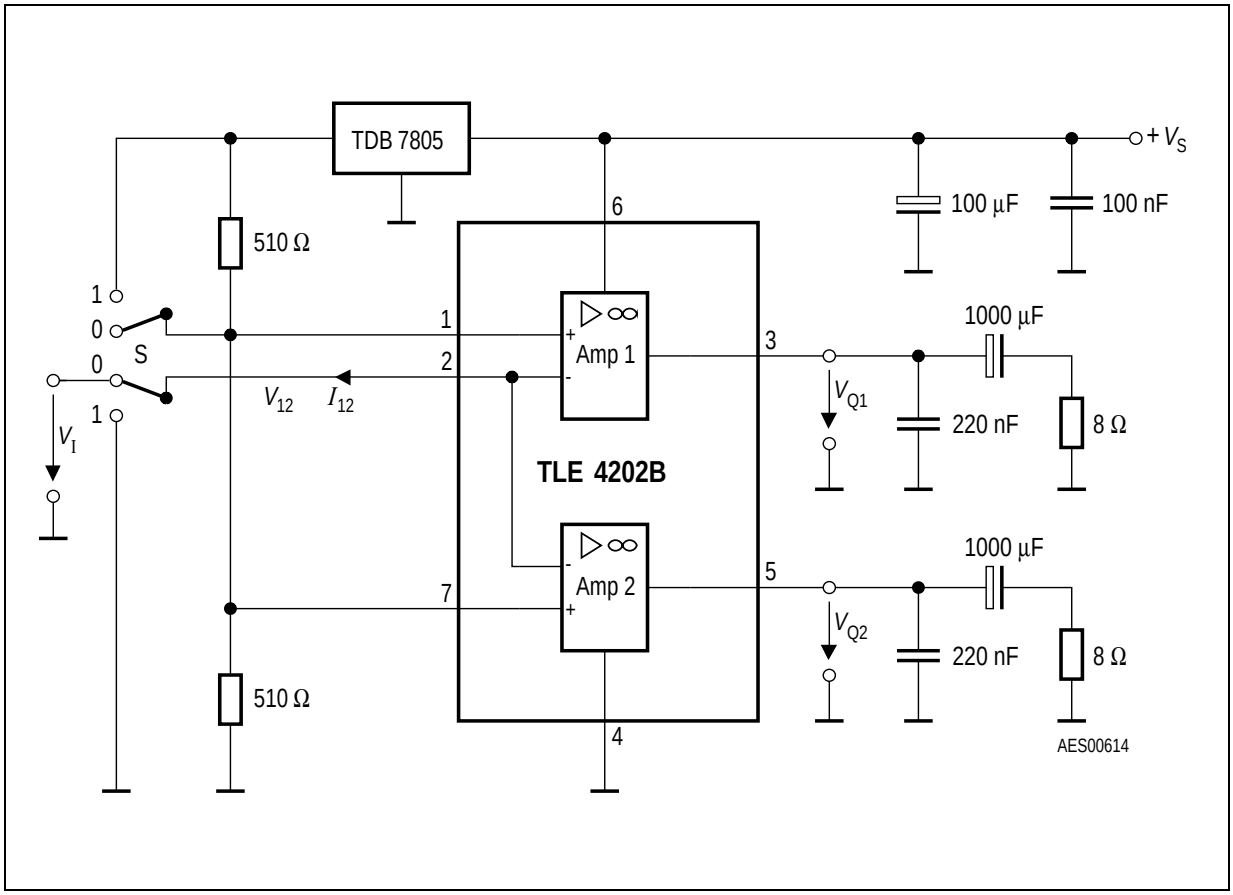


Figure 3 Test Circuit 1

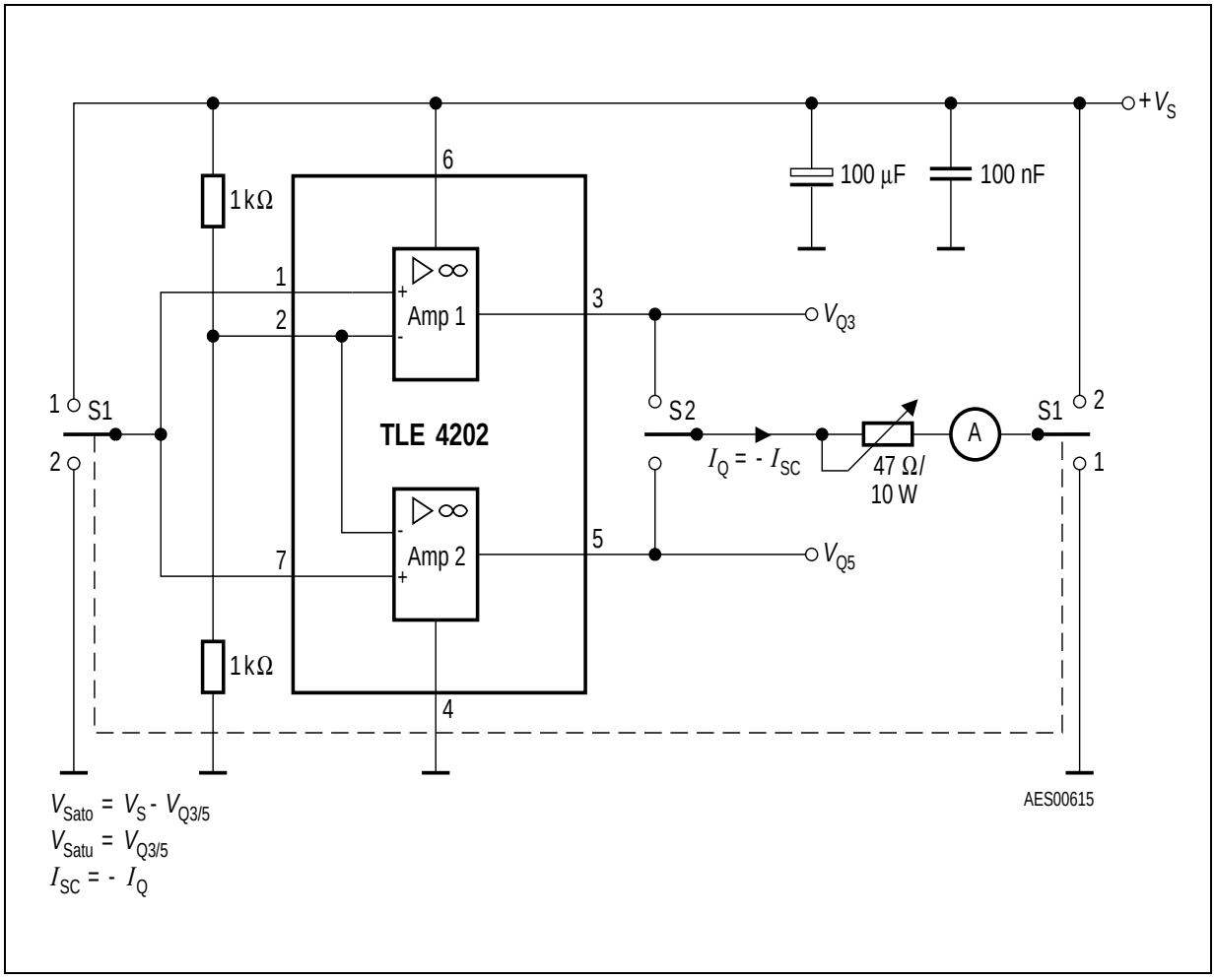


Figure 4 Test Circuit 2

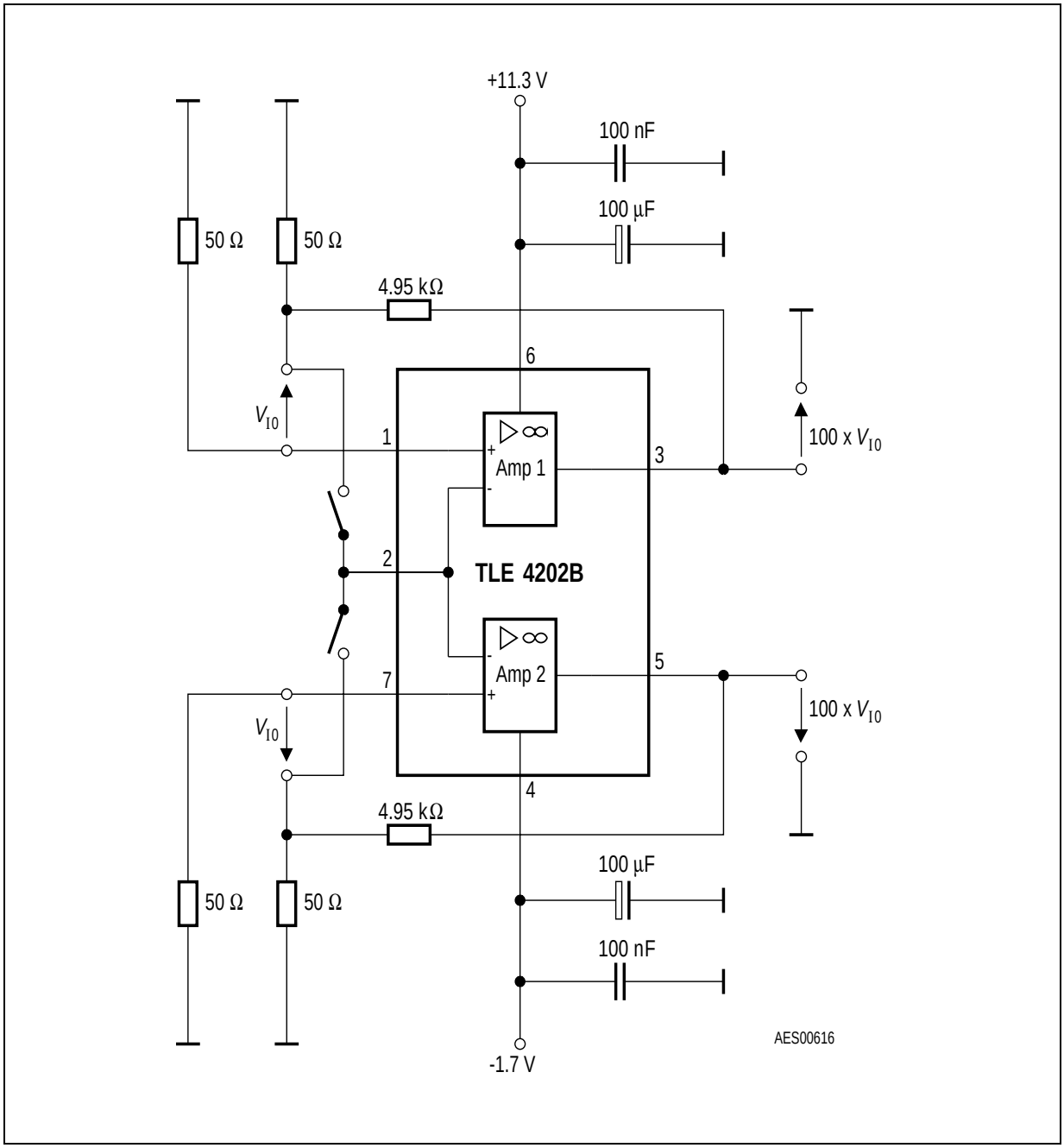


Figure 5 Test Circuit 3

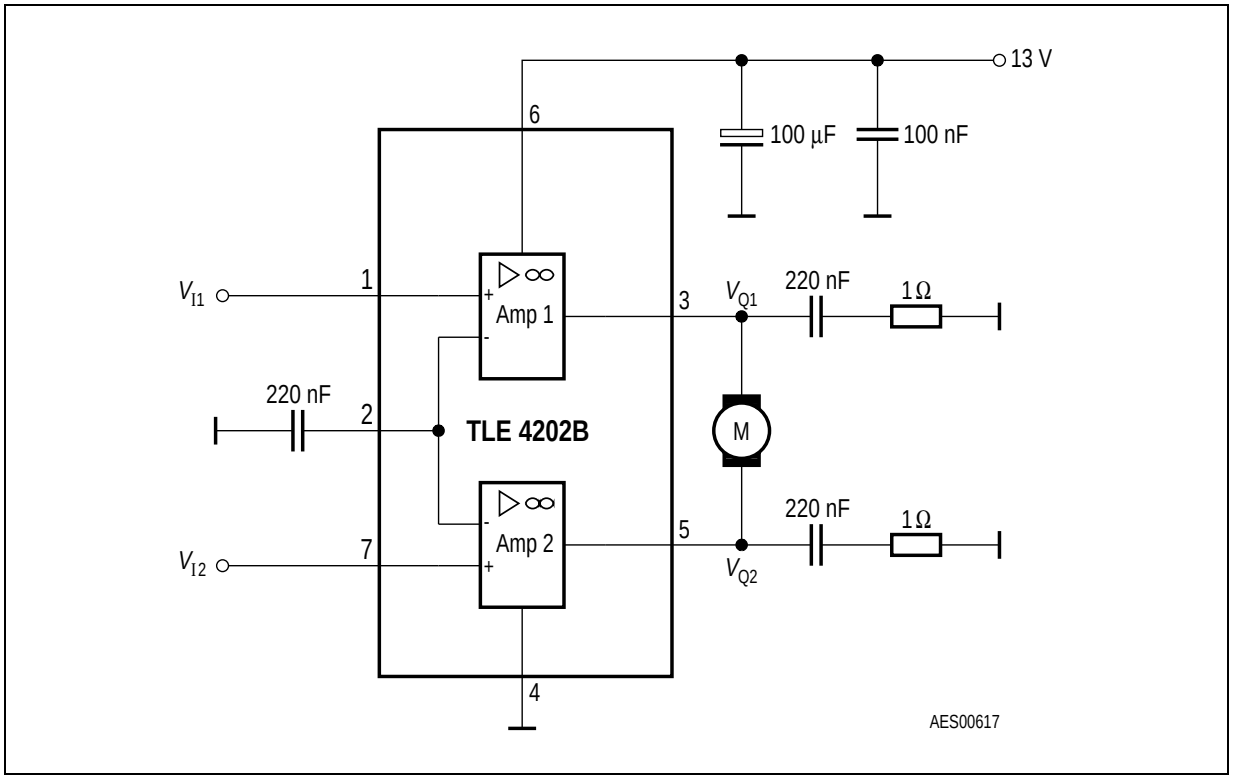


Figure 6 Application Circuit

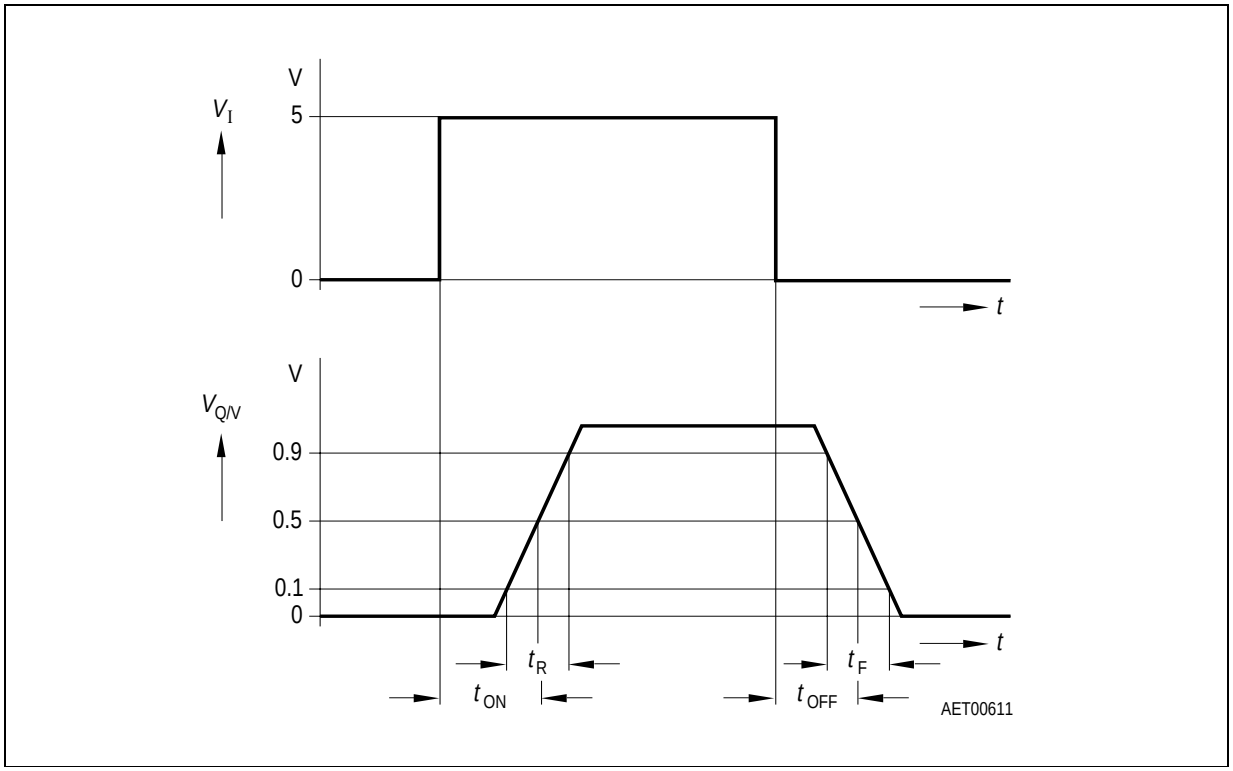
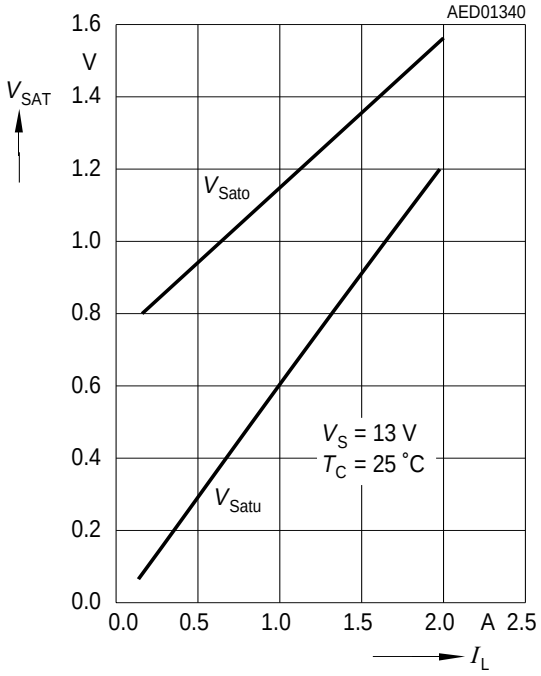
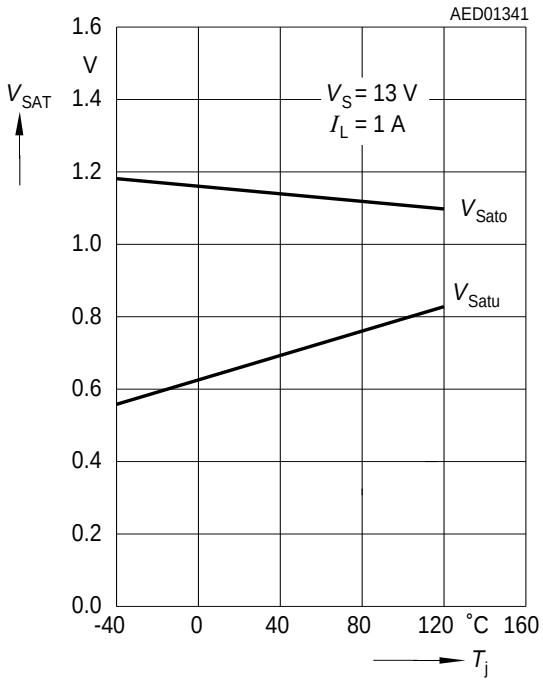


Figure 7 Diagrams

Saturation Voltage versus Output Current

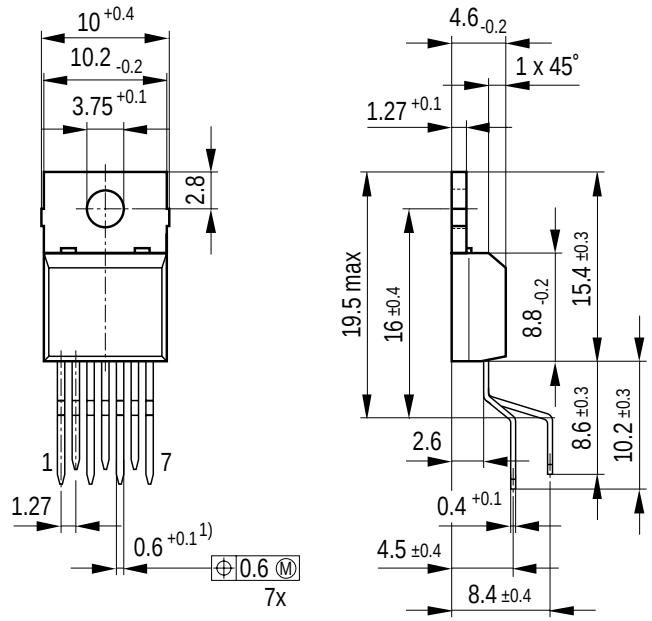


Saturation Voltage versus Temperature



Package Outlines

P-TO220-7-1
(Plastic Transistor Single Outline)



1) $0.75_{-0.15}$ at dam bar (max 1.8 from body)
1) $0.75_{-0.15}$ im Dichtstegbereich (max 1.8 vom Körper)

GPT05108

Sorts of Packing
Package outlines for tubes, trays etc. are contained in our Data Book “Package Information”.

Dimensions in mm