

Current-Monitoring IC

TLE 4951

Preliminary Data

Bipolar IC

Features

- Input currents max 25 μ A, protective resistors can be connected in series
- Effective protection against destruction by excessive voltages such as load dump pulses occurring in cars
- Supply voltage range from 4.5 to 32 V
- Input voltage range up to 32 V, independent of supply voltage
- Switching threshold of comparators dependent on supply voltage, corresponding to the characteristic of light bulbs
- Temperature range: – 40 to 125 °C

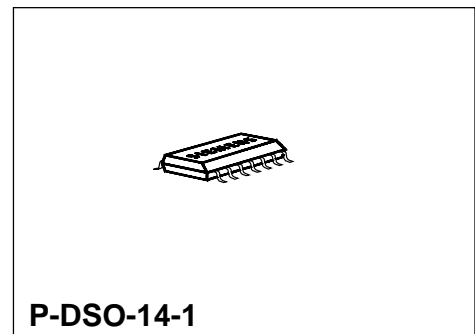
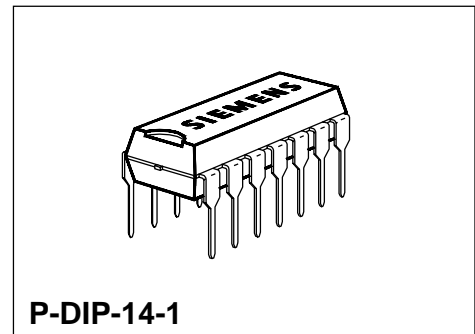
Applications

Current monitoring of

- light bulbs
- electric motors
- relays
- glow plugs
- circuits

especially suitable for:

- automotive electronics
- industrial plants



Type	Ordering code	Package
■ TLE 4951	Q67000-A8266	P-DIP-14-1
■ TLE 4951 G	Q67000-A8267	P-DSO-14-1 (SMD)

Not for new design

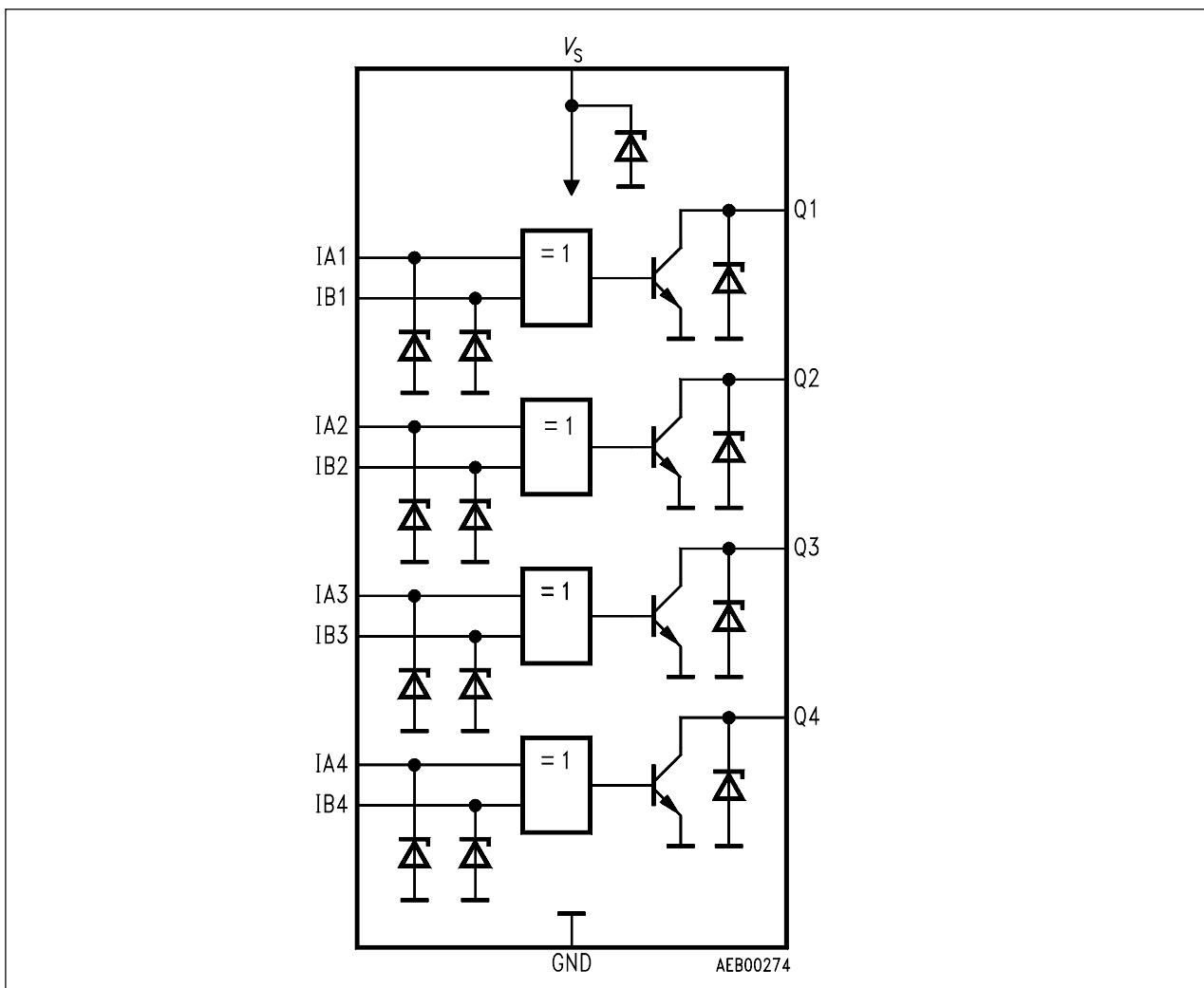
The TLE 4951 is designed to monitor the correct function of circuits, in particular those of light bulbs in cars. The IC comprises four identical comparator stages, the logic function of which corresponds to an exclusive-OR gate. With each comparator, pairs of lamps or single lamps can be monitored by means of the voltage drops across shunt resistors (R_{sh}) in the positive supply line (see **application circuits 1 and 2**).

Due to small differential input currents it is possible to connect protective resistors (R_s) in series. This provides a high degree of **protection against destruction** by interfering voltages occurring in automobiles.

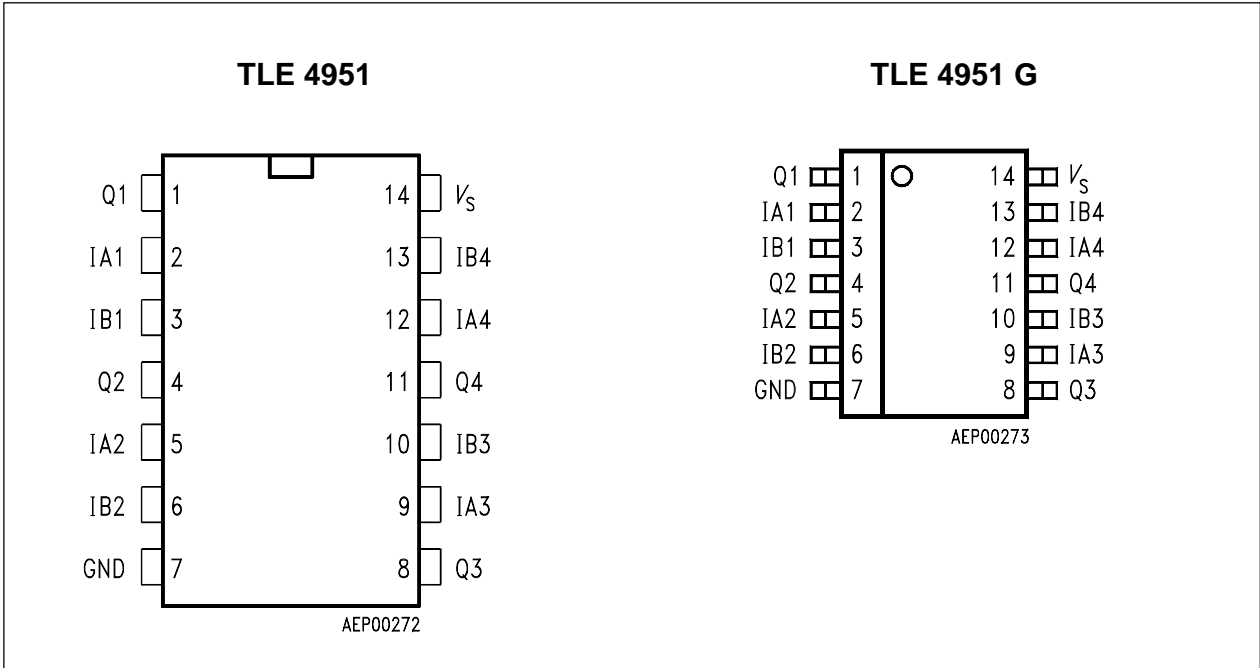
Functional Description

The component incorporates four identical comparator circuits. Each of these functional units has two equivalent inputs and one open-collector output Q. If the voltages differ by more than approx. 15 mV, the switching state changes from H (OFF-state) to L (ON-state).

For an input voltage < 4.5 V at both the inputs, the output can switch to H independently of the differential input voltage. For an input voltage < 2.0 V the output is reliably OFF-state.



Block Diagram



Pin Configurations
(top view)

Pin Definitions and Functions

Pin	Symbol	Function
1	Q1	Output 1
2	IA1	Input A1
3	IB1	Input B1
4	Q2	Output 2
5	IA2	Input A2
6	IB2	Input B2
7	0 s	GND
8	Q3	Output 3
9	IA3	Input A3
10	IB3	Input B3
11	Q4	Output 4
12	IA4	Input A4
13	IB4	Input B4
14	V s	Supply voltage

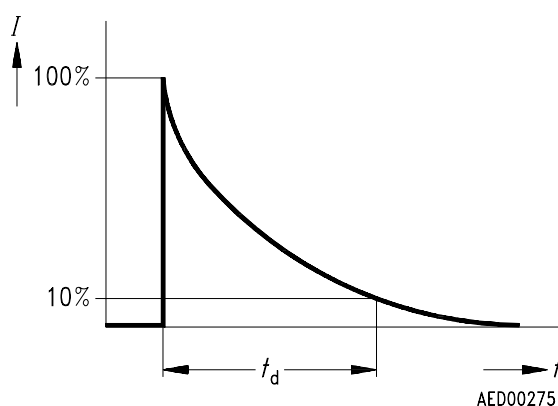
Absolute Maximum Ratings

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Supply voltage	V_S	– 0.5	32	V	
Input voltages	$V_{A, B}$	– 45	45	V	
Output voltage	V_Q	– 0.5	32	V	
Output current	I_Q		40	mA	
Current through protecting structures at the supply terminal	I_S	– 600	600	mA	$t_d < 2 \text{ ms}$
at the outputs Q	I_{SQ}	– 400	400	mA	$t_d < 2 \text{ ms}$
Thermal resistance					
system - air TLE 4951	$R_{th SA}$		75	K/W	
system - air TLE 4951 G	$R_{th SA}$		125	K/W ¹⁾	

1) 75 K/W ceramic substrate

Operating Range

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Supply voltage	V_S	4.5	32	V
Ambient temperature	T_A	– 40	125	°C
Common-mode input voltage range independent of V_S	V_{IC}	4.5	32	V
Differential input voltage	V_{ID}		100	mV



Permissible short-term overvoltages with series resistors R_S :

$$+ V(V_{S;Q}) = I_{S;Q} \times R_V(V_{S;Q}) + 32 \text{ V}$$

$$- V(V_{S;Q}) = - I_{S;Q} \times R_V(V_{S;Q})$$

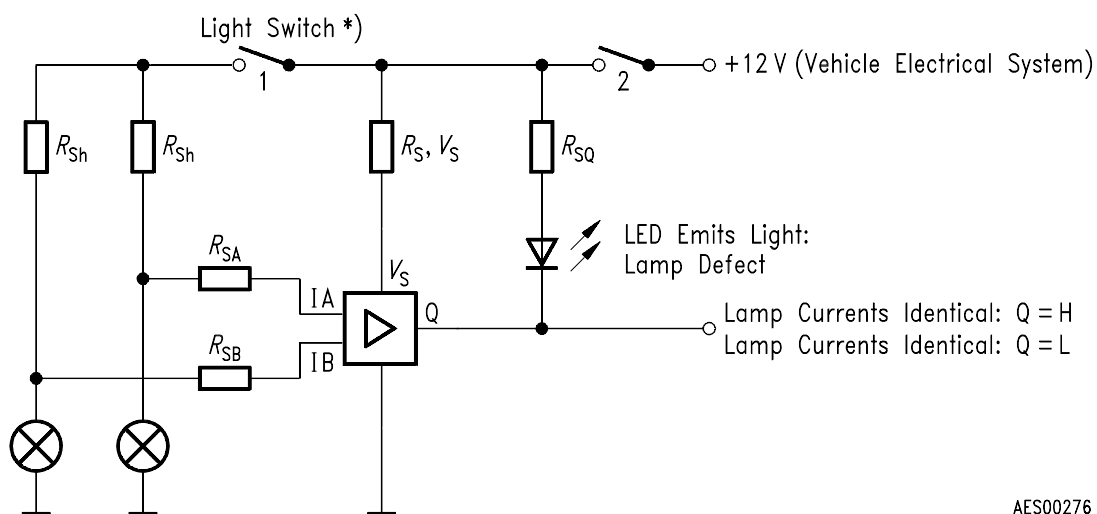
Characteristics

$T_A = -30$ to 110 °C; $V_S = 10$ to 16 V

Parameter	Symbol	Limit Values			Unit	Test Condition	Test Circuit
		min.	typ.	max.			
Current consumption	I_S			3 8	mA mA	Q1 = Q2 = Q3 = Q4 = H Q1 = Q2 = Q3 = Q4 = L	1
Switching threshold with $R_{SA, B}$	$V_{Diff}^{1)}$	7	14	20	mV	$V_S = 13.5$ V, $R_S = 1$ k Ω	2
without $R_{SA, B}$	$V_{Diff}^{1)}$	4	8	12	mV	$V_S = 13.5$ V	1
with $R_{SA, B}$	V_{Diff}	2		14	mV	4.5 V < V_S < 5.5 V, $R_S = 1$ k Ω	2
without $R_{SA, B}$	V_{Diff}	1.5		8	mV	4.5 V < V_S < 5.5 V	1
Input current	$I_{A, B}$			25	μ A	$V_A = V_B$	1
Output saturation voltage	V_{QL}			0.4	V	$I_Q = 30$ mA	1
Output reverse current	I_{QH}			10	μ A	$V_{QH} = 32$ V	1

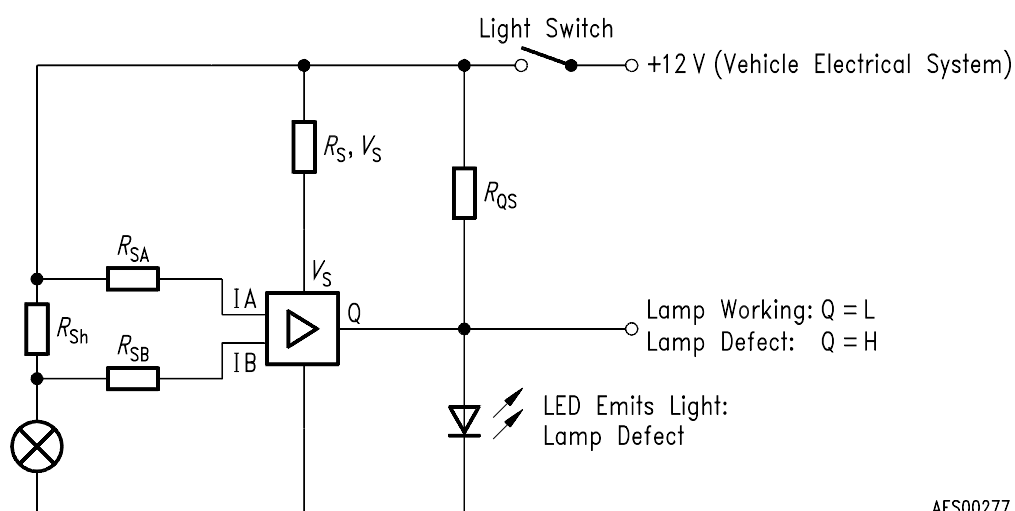
1) $V_{Diff} = |V_A - V_B|$

1. Differential measurement



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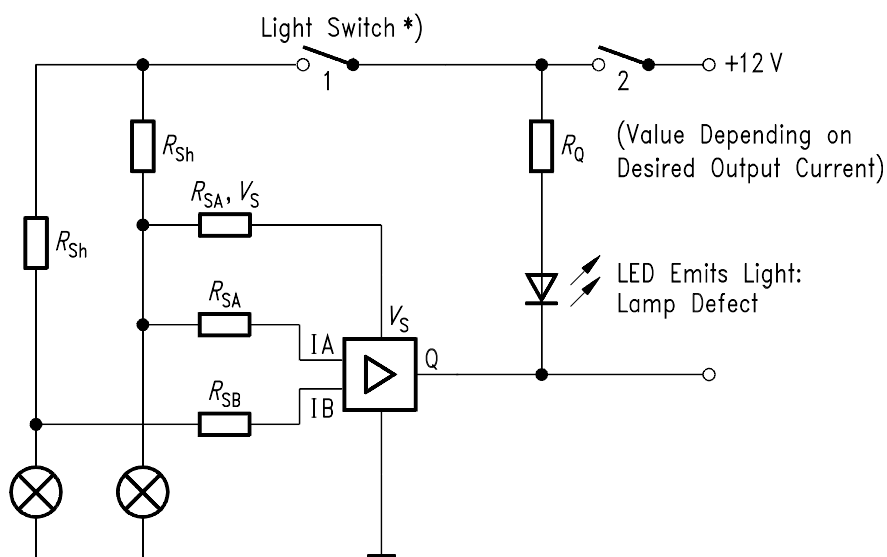
2. Absolute-value measurement



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Application Circuits

3. Supply from shunt resistor (function as "1": Differential measurement)

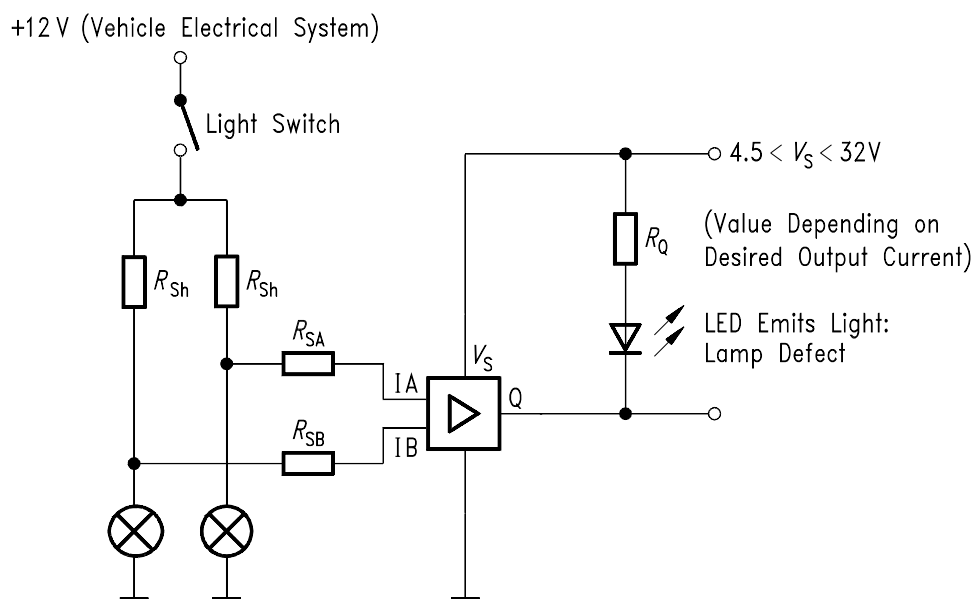


*) Position of Light Switch at 1 or 2

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Recommended Protective Resistors: $R_{SA,B} = 1\text{ k}\Omega$
 $R_{SA}, V_S = 100\ \Omega$

4. Voltage supply separated from vehicle electrical system (function as "1": Differential measurement)



Recommended Protective Resistors: $R_{SA,B} = 1\text{ k}\Omega$

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Applications Circuits (cont'd)

The diagram shows a two-port network. The input port on the left has a voltage source V_{IC} in series with a node. From this node, a branch with a current source I_B goes to the bottom input terminal IB . Another branch with a current source I_A goes to the top input terminal IA . The output port on the right has a node Q connected to the top output terminal. A current source I_Q is connected between Q and the bottom output terminal, which is grounded. A voltage source V_Q is also connected between Q and ground. A dependent current source I_S is connected between the top output terminal and the top input terminal IA . A voltage source V_S is connected between the top output terminal and ground. The bottom input terminal IB and the bottom output terminal are both connected to a common ground labeled GND . The entire circuit is enclosed in a dashed rectangular box.

The diagram shows a two-port network enclosed in a dashed box. The input port has terminals IA and IB. The output port has terminals Q and GND. Inside the network, there is a dependent current source represented by a circle with a triangle inside, connected between IA and IB. The current source is controlled by a voltage source VS connected between Q and GND. The current source is labeled with a current IS. The voltage source VS is also labeled with a voltage VS. The current source is also labeled with a current IS. The voltage source VS is also labeled with a voltage VS. The current source is also labeled with a current IS. The voltage source VS is also labeled with a voltage VS.

Differential Switching Voltage versus Supply Voltage

Parameters: protective resistors at the inputs $R_{SA, B}$

