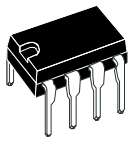
TDE1787

Interface circuit (relay and lamp driver)

Datasheet - production data



DIP-8

Features

- Open ground protection
- High output current
- Adjustable short-circuit protection
- Internal thermal protection with external reset
- Large supply voltage range
- Alarm output
- Input voltage can be higher than V_{CC}
- Output voltage can be lower than ground (V_{CC} - V_O ≤ $V_{CC[max.]}$)

Description

This device is a monolithic amplifier designed for high current and high voltage applications, specifically to drive lamps, relays, stepping motors. It is a blow-out proof device whose output is protected against overload and short-circuits. This output is low in open ground conditions and in case of overload and reset for high input, it switches on and off alternately until the overload is removed. The LED, driven by an alarm output, if referred to ground, flashes during an overload depending on the state of the reset input. The thermal shutdown prevents the IC from overheating, so if the internal dissipation becomes too high, the driver shuts down. The device works over a wide range of voltages from standard 15 V operational amplifier to the single +6 V or +48 V used for industrial electric systems.

Table 1: Device summary

Order code	Package	Packing
TDE1787ADP	DIP-8	Tube

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1 Pin connections

Figure 1: Pin connections (top view)

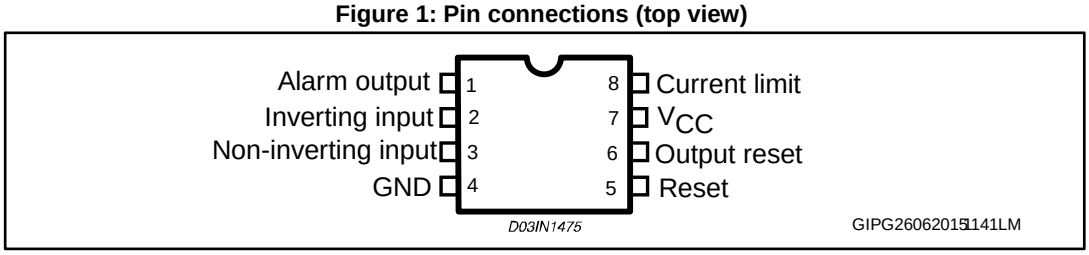


Table 2: Pin description

Pin	Function
1	Alarm output
2	Inverting input
3	Non-inverting input
4	GND
5	Reset
6	Output reset
7	V_{CC}
8	Current limit

2 Maximum ratings

Table 3: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	60	V
V_{ID}	Input differential voltage	60	V
V_I	Input voltage	-10 to +60	V
I_O	Output current	1.3	A
$V_{I\ (reset)}$	Reset input voltage	-0.5 to +60	V
I_{OA}	Alarm output current	-10 to 20	mA
P_{tot}	Power dissipation	Internally limited	mW
T_{oper}	Operating ambient temperature range	-25 to +85	°C
T_{stg}	Storage temperature range	-65 to +150	°C

Table 4: Thermal data

Symbol	Parameter	Value	Unit
$R_{th(JC)}$	Thermal resistance junction-case	30 max.	°C/W
$R_{th(JA)}$	Thermal resistance junction-ambient	80 max.	°C/W

The device is bonded on a 40 cm^2 glass-epoxy printed circuit, 0.15 cm thick with 4 cm^2 of copper.

3 Electrical characteristics

-25 °C ≤ T_A ≤ 85 °C, 6 V ≤ V_{CC} ≤ 55 V, T_J ≤ 150 °C, I_O ≤ 300 mA for R_{SC} = 330 mΩ and I_O ≤ 500 mA for R_{SC} = 220 mΩ, unless otherwise specified.

Table 5: Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{IO}	Input offset voltage	See note(1)		2	50	mV
I_{CC}	Power supply current	Measured on pin 4 Output high (T_A = 25 °C)		5.8	8	mA
		Output high V_{CC} = V_{CCmax}, (T_J = 150 °C)		5	7	mA
		Output low V_{CC} = V_{CCmax}, (T_A = 25 °C)		1.5	4	mA
I_{IB}	Input bias current			15	100	µA
V_{CM}	Common mode input voltage range		1		60	V
V_I	Input voltage range	V_{ref} ≥ 1 V, see note(2) and *Figure 1: "Pin connections (top view)"*	1		60	V
I_{SC}	Short-circuit output current	V_{CC} = 35 V, t = 10 ms R_{SC} = 0.22 Ω		700		mA
		R_{SC} = 0.33 Ω		380		
V_{sense}	Output limit sense voltage	V_O = V_{CC} -2 V, t = 10 ms	130	150	170	mV
		V_O = 0 V, t = 10 ms	120	140	165	
$V_{O(sat)}$	Output saturation voltage	Output high V_I^+ - V_I^- ≥ 50 mV; R_{SC} = 0; V_{CC} = 30 V T_J = 25 °C		1	1.1	V
		T_J = 150 °C		1.1	1.2	V
I_{OL}	Output leakage current	Output low			100	µA
I_A	Available alarm output current	Output source current V_{AH} = V_{CC} -2.5 V	-4	-5		mA
		Output sink current in thermal shutdown V_A = 1.4 V	5	10		mA
I_{reset}	Reset input current			2	40	µA
V_{th_reset}	Reset threshold			1.4		V
I_{LGND}	Output leakage current	Open ground		10		µA

Notes:

(1)The offset voltage given is the maximum value of different input voltage required to drive the output voltage within 2 V of ground or the supply voltage.

(2)Input voltage range is independent of the supply voltage.

4 Schematic diagram

Figure 2: Schematic diagram

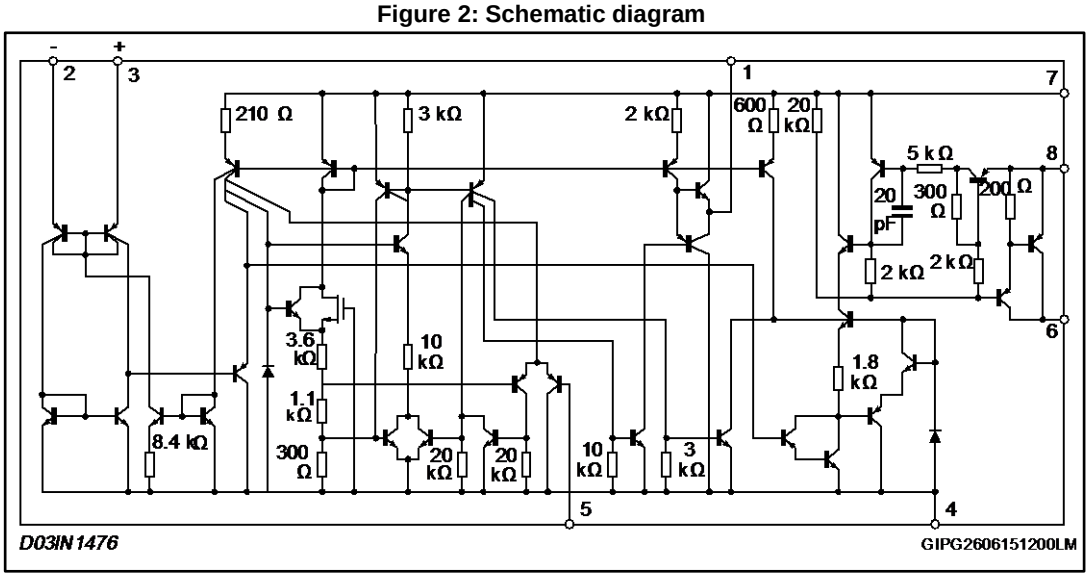
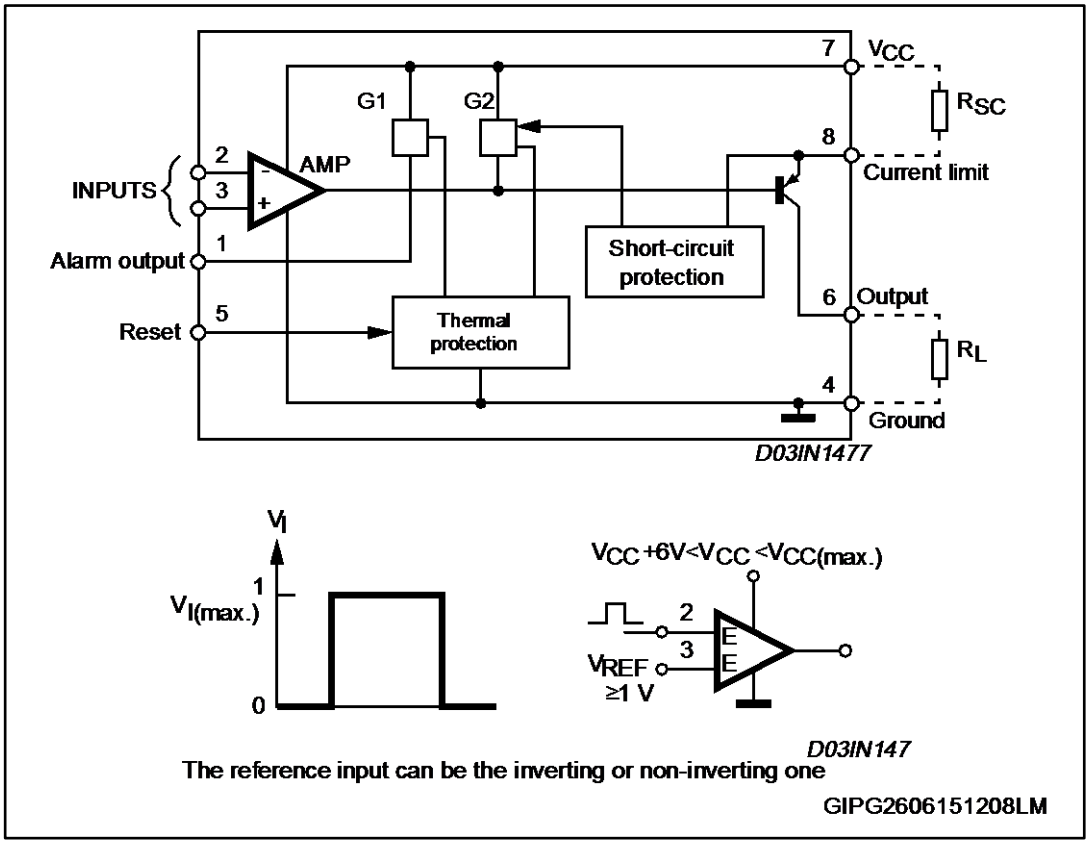


Figure 3: Equivalent diagram



5 Typical characteristics

Figure 4: Peak short-circuit vs. limiting resistor

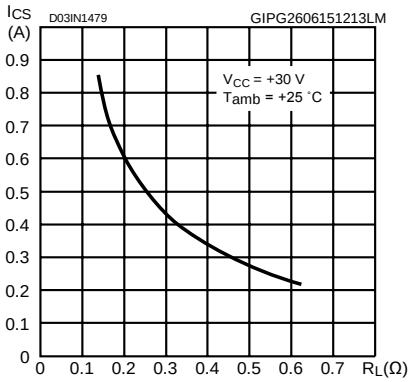


Figure 5: Available output current vs. limiting resistor

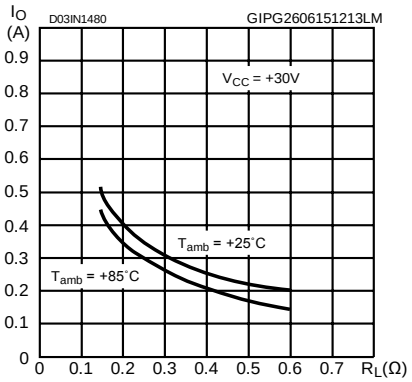


Figure 6: Power supply current (pin 4)

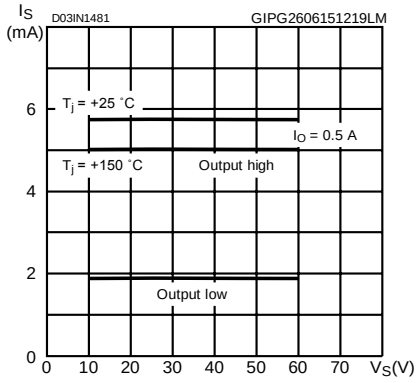


Figure 7: Output saturation voltage vs. output current

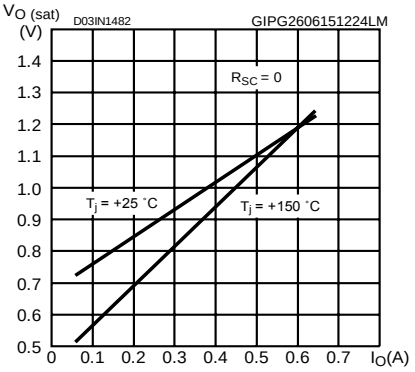


Figure 8: Output transistor safe operating area (pulsed)

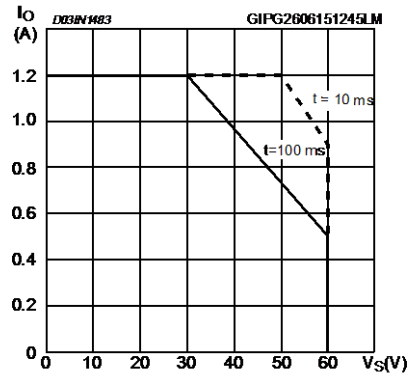


Figure 9: Normal operating area (short-circuit protected)

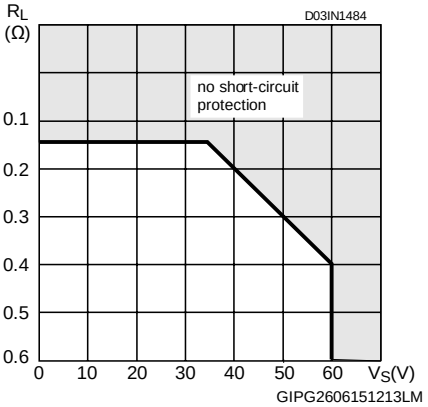


Figure 10: Current sinking

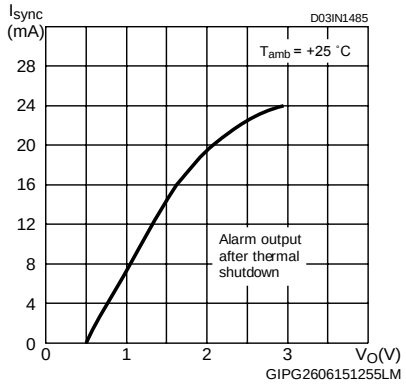


Figure 11: Current sourcing

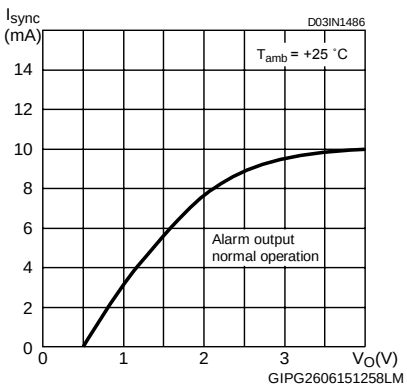


Figure 12: Response time

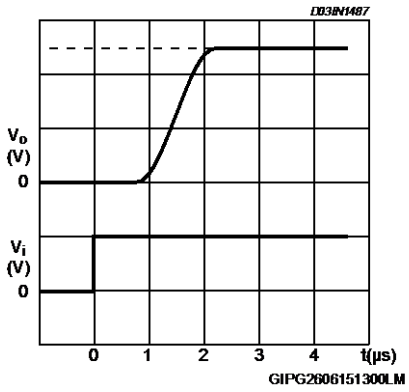
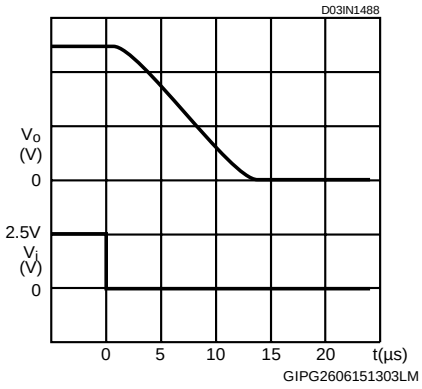


Figure 13: Response time (2.5 V)



6 Typical application

Figure 14: Test circuit

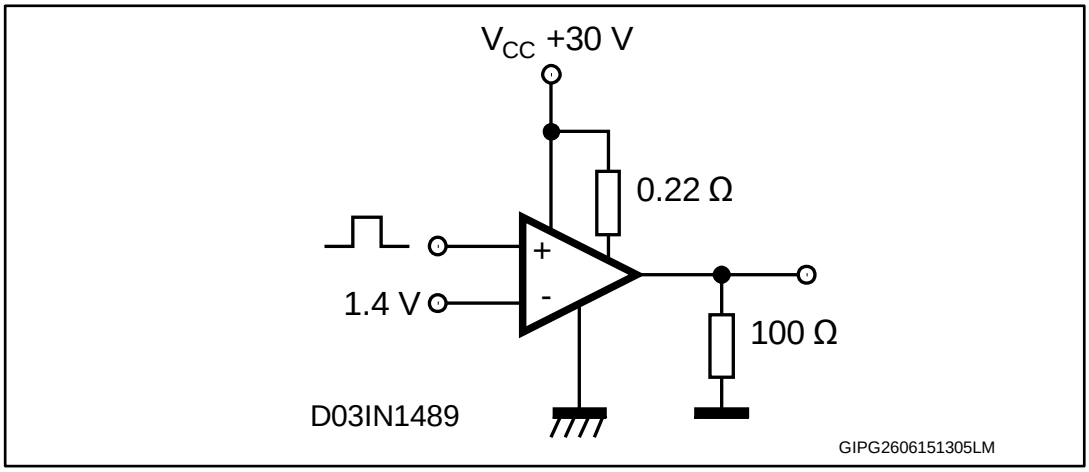


Figure 15: Open load detection 4

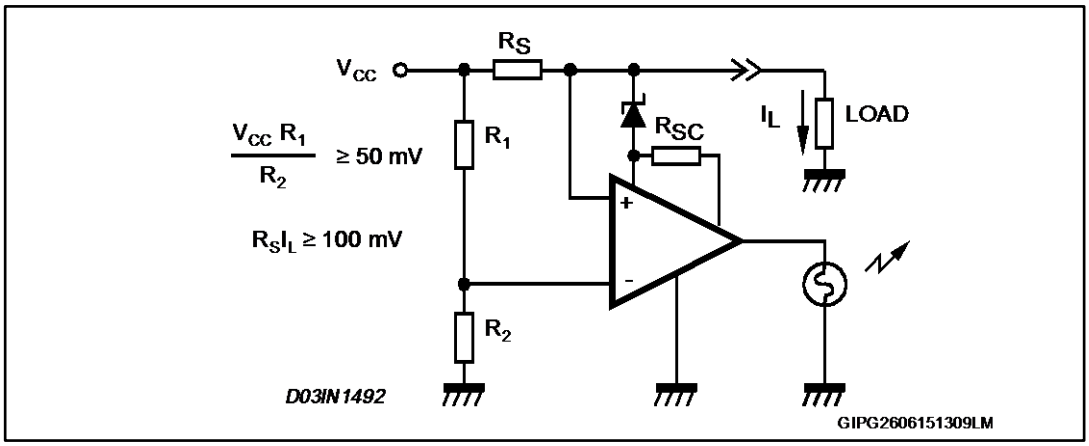


Figure 16: Driving lamps, relays

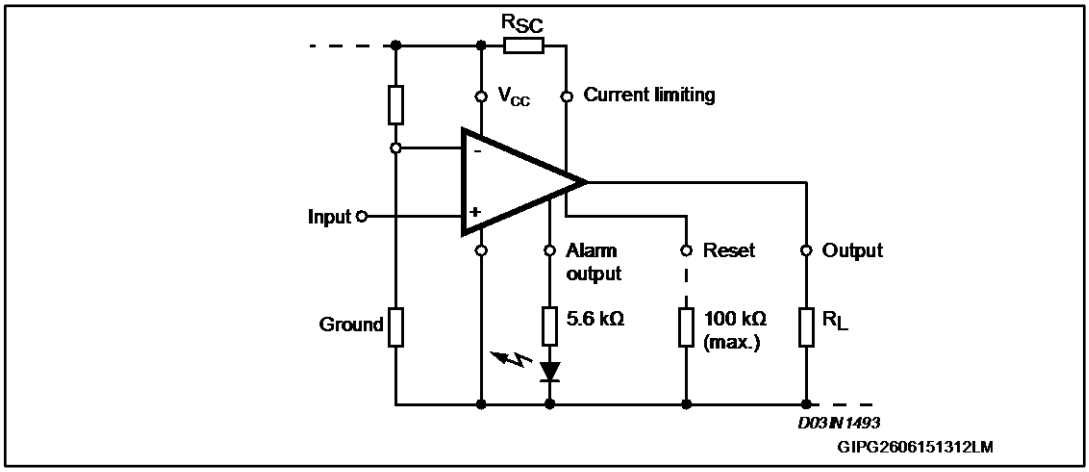


Figure 17: Common reset

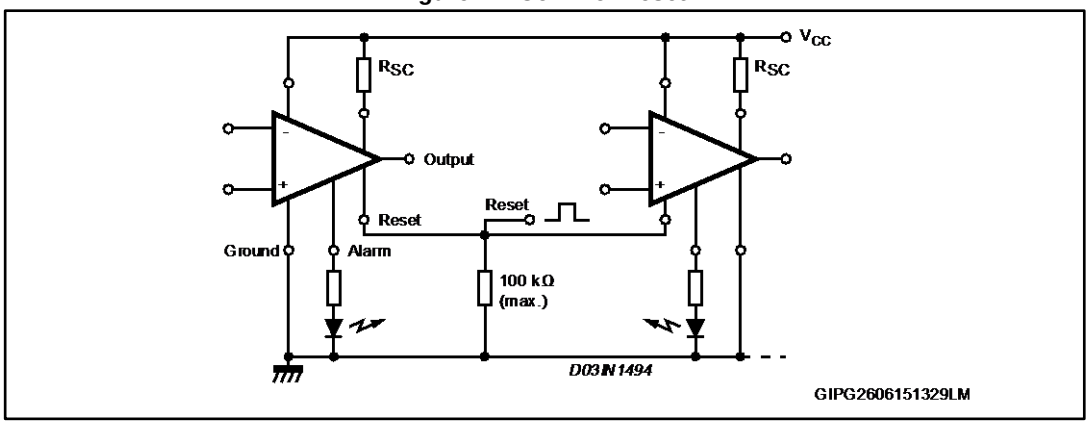
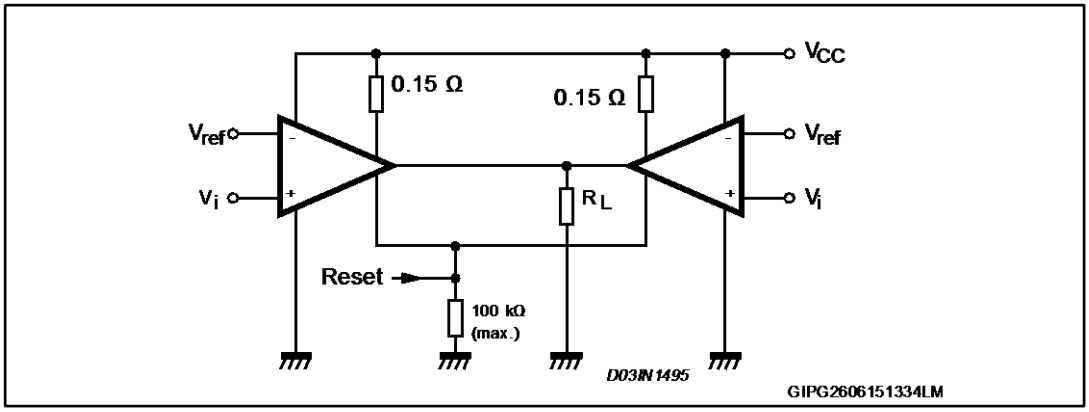


Figure 18: Parallel driving of loads up to 1 A



7 Using alarm output

Figure 19: Parallel output alarm

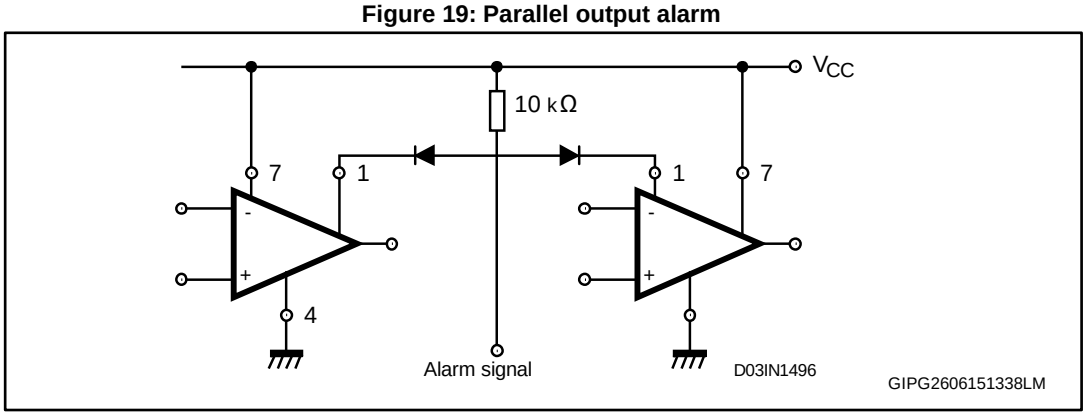


Figure 20: LED to V_{CC}

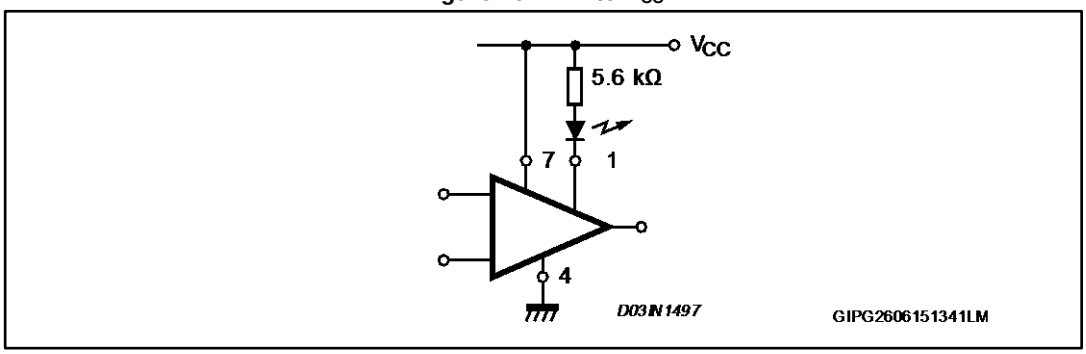


Figure 21: LED to ground

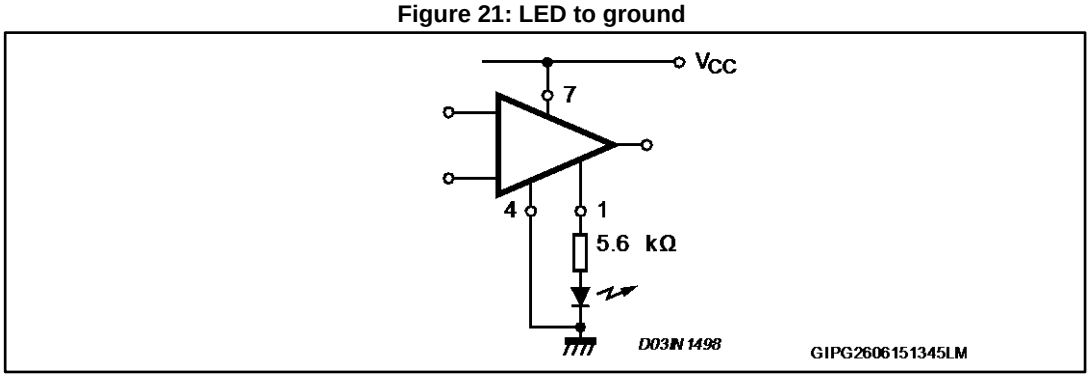


Figure 22: Interface between high voltage and low voltage system

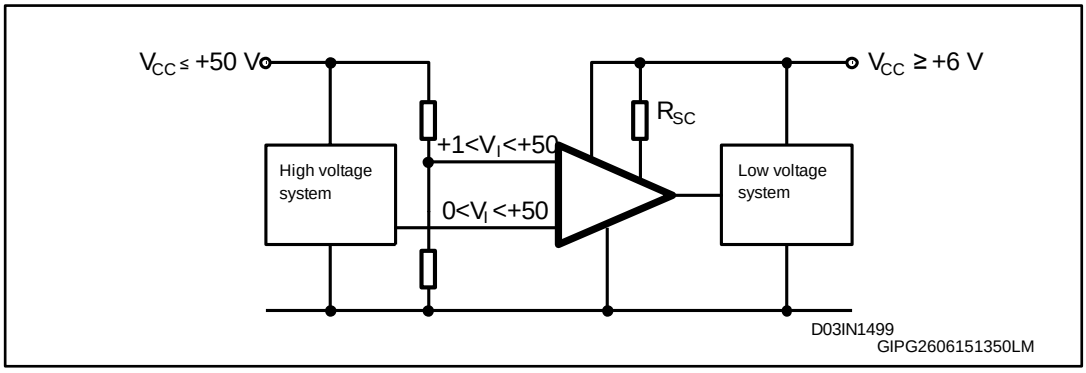
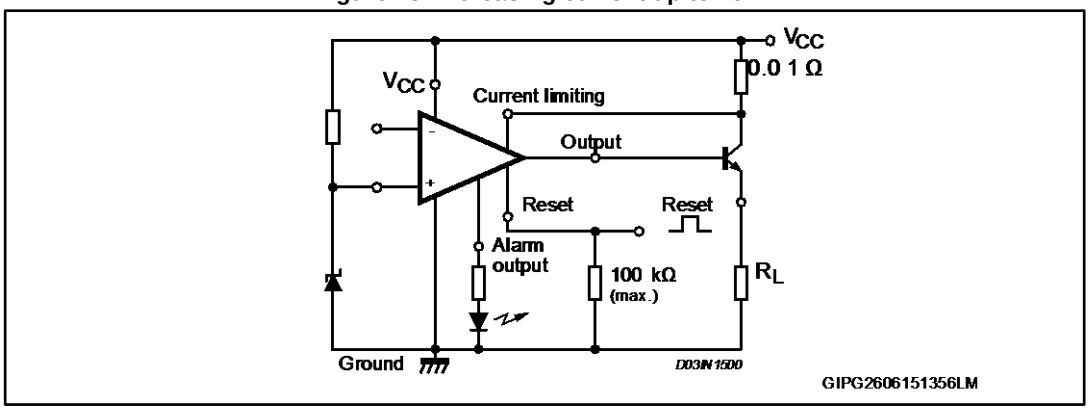


Figure 23: Increasing current up to 10 A



8 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: ***www.st.com***. ECOPACK® is an ST trademark.

8.1 DIP-8 package information

Figure 24: DIP-8 package outline

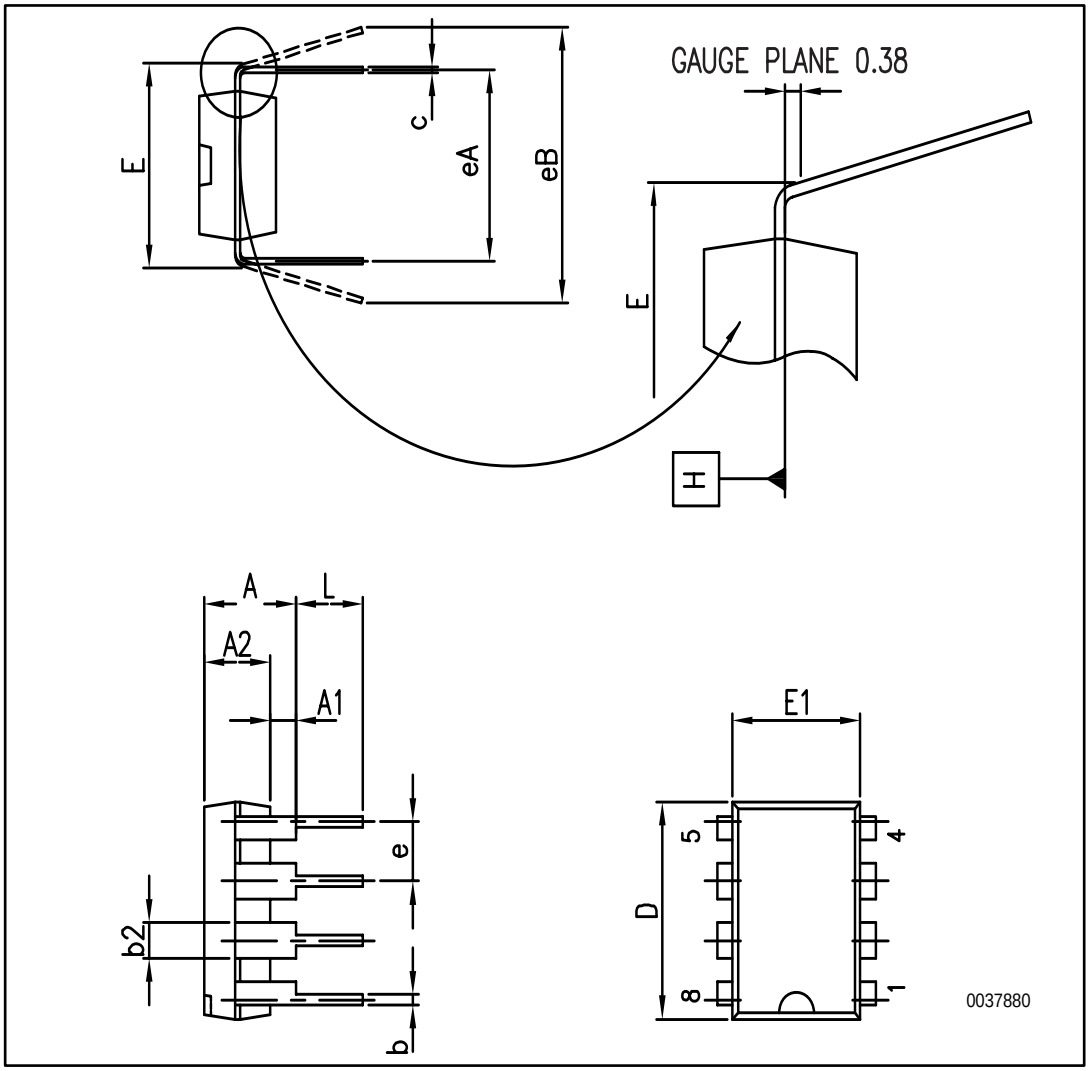


Table 6: DIP-8 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			5.33
A1	0.38		
A2	2.92	3.30	4.95
b	0.36	0.46	0.56
b2	1.14	1.52	1.78
c	0.20	0.25	0.36
D	9.02	9.27	10.16
E	7.62		15.75
E1	6.10	6.35	7.11
e		2.54	
eA		7.62	
eB			10.92
L	2.92	3.30	3.81

9 Revision history

Table 7: Document revision history

Date	Revision	Changes
20-Sep-2003	1	Initial release.
03-Mar-2007	2	Document reformatted, typo figure 1.
13-Jul-2015	3	The part numbers: TDE1767DP, TDE1767ADP, TDE1787DP have been moved to a separate datasheet.

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