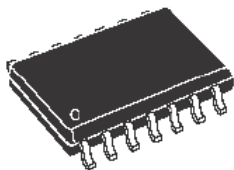


## Interface circuit - relay and lamp-driver


**SO14**

### Features

- Open ground protection
- High output current
- Adjustable short-circuit protection to ground
- Thermal protection with hysteresis to avoid the intermediate output levels
- Large supply voltage range: + 8 V to +45 V
- Short-circuit protection to  $V_{CC}$

### Applications

- Industrial PC peripheral input/output
- Interface circuit
- Relay and lamp driver
- Stepping-motor driver

### Description

TDE1747 is a monolithic comparator designed for high current and high voltage applications, specifically to drive lamps, relays, stepping motors.

This device is essentially blow-out proof. Current limiting is available to limit the peak output current to safe values.

Adjustment only requires one external resistor. In addition, thermal shut down is provided to keep the IC from overheating. If internal dissipation becomes too high, the driver will shut down to prevent excessive heating. TDE1747 has an open ground protection. The output is also protected from shortcircuits with the positive power supply.

The device operates over a wide range of supply voltages from standard  $\pm 15$  V operational amplifier supplies down to the single +12 V or +24 V used for industrial electronic systems.

#### Product status link

[TDE1747](#)

#### Product label



# 1 Maximum ratings

**Table 1. Absolute maximum ratings**

| Symbol            | Parameter                                  | Value              | Unit |
|-------------------|--|--------------------|------|
| V <sub>CC</sub>   | Supply voltage                             | 50 <sup>(1)</sup>  | V    |
| V <sub>I</sub>    | Input voltage                              | 50                 | V    |
| V <sub>ID</sub>   | Differential input voltage                 | 50                 | V    |
| I <sub>O</sub>    | Output current                             | 1                  | A    |
| P <sub>tot</sub>  | Power dissipation (T <sub>A</sub> = 25 °C) | Internally Limited | W    |
| T <sub>oper</sub> | Operating free-air temperature range       | -25 to 85          | °C   |
| T <sub>STG</sub>  | Storage temperature range                  | -65 to 150         | °C   |

Note: (1)  
60 V, t ≤ 10 ms

**Table 2. Thermal data**

| Symbol              | Description   | Value | Unit |
|---------------------|---|-------|------|
| R <sub>th(JA)</sub> | Thermal resistance junction-ambient   | 120   | °C/W |
| R <sub>th(JC)</sub> | Thermal resistance junction-case  | 50    |      |
| R <sub>th</sub>     | Junction-ceramic substrate (case glued to substrate)  | 90    |      |
| R <sub>th</sub>     | Junction-ceramic Substrate (case glued to substrate, substrate temperature maintained constant) | 65    |      |

## 2 Electrical characteristics

$V_{CC} = 8$  to  $45$  V,  $T_J = -25$  to  $85$  °C, unless otherwise specified (note 1)

**Table 3. Electrical characteristics**

| Symbol         | Parameter   | Min. | Typ. | Max.       | Unit |
|----------------|---|------|------|------------|------|
| $V_{IO}$       | Input offset voltage (2)  | -    | 2    | 50         | mV   |
| $I_{IB}$       | Input bias current  | -    | 0.1  | 1.5        | mA   |
| $I_{CC}$       | Supply current ( $V_{CC} = 24$ V, $I_O = 0$ mA); High level   | -    | 4    | 6          | mA   |
|                | Supply current ( $V_{CC} = 24$ V, $I_O = 0$ mA); Low level  | -    | 2    | 4          | mA   |
| $V_{I(max)}$   | Common-mode input voltage range   | 2    | -    | $V_{CC}-2$ | V    |
| $I_{SC}$       | Short-circuit current limit ( $T_A = 25$ °C, $V_{CC} = 24$ V);<br>$R_{SC} = 1.5$ Ω  | -    | 480  | -          | mA   |
|                | Short-circuit current limit ( $T_A = 25$ °C, $V_{CC} = 24$ V);<br>$R_{SC} = \infty$                                       | -    | 35   | 50         | mA   |
| $V_{CC} - V_O$ | Output saturation voltage (output low),<br>( $V_{I^+} - V^- \geq 50$ mV, $R_{SC} = 0$ , $I_O = 300$ mA);<br>$T_J = 25$ °C | -    | 1.15 | 1.4        | V    |
|                | Output saturation voltage (output low),<br>( $V_{I^+} - V^- \geq 50$ mV, $R_{SC} = 0$ , $I_O = 300$ mA);<br>$T_A = 25$ °C | -    | 1.05 | 1.3        | V    |
| $I_{OL}$       | Output leakage current (output high), $V_O = 0$ V, $V_{CC} = 24$ V, $T_A = 25$ °C)  | -    | 0.01 | 10         | μA   |

**Note:** (1)  
 For operating at high temperature, the TDE1747, must be derated based on 150 °C maximum junction temperature and junction-ambient thermal resistance of 100 °C/W.

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

### 3 Pin connection and schematic diagram

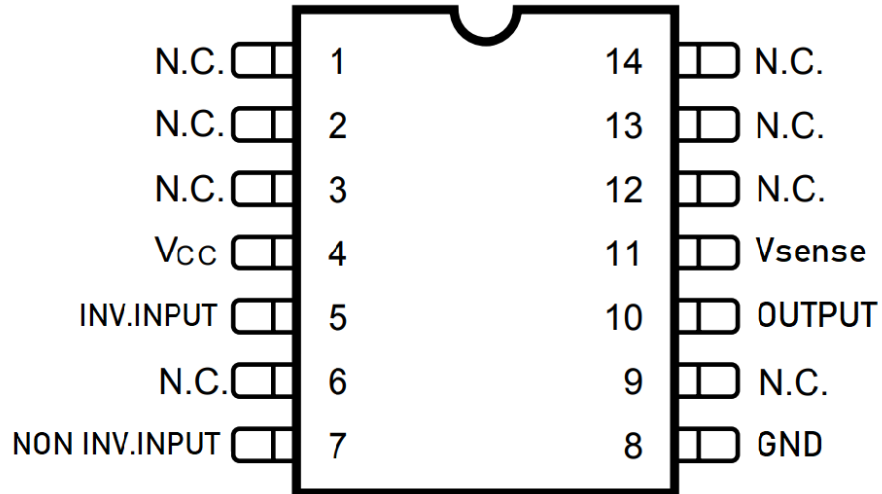
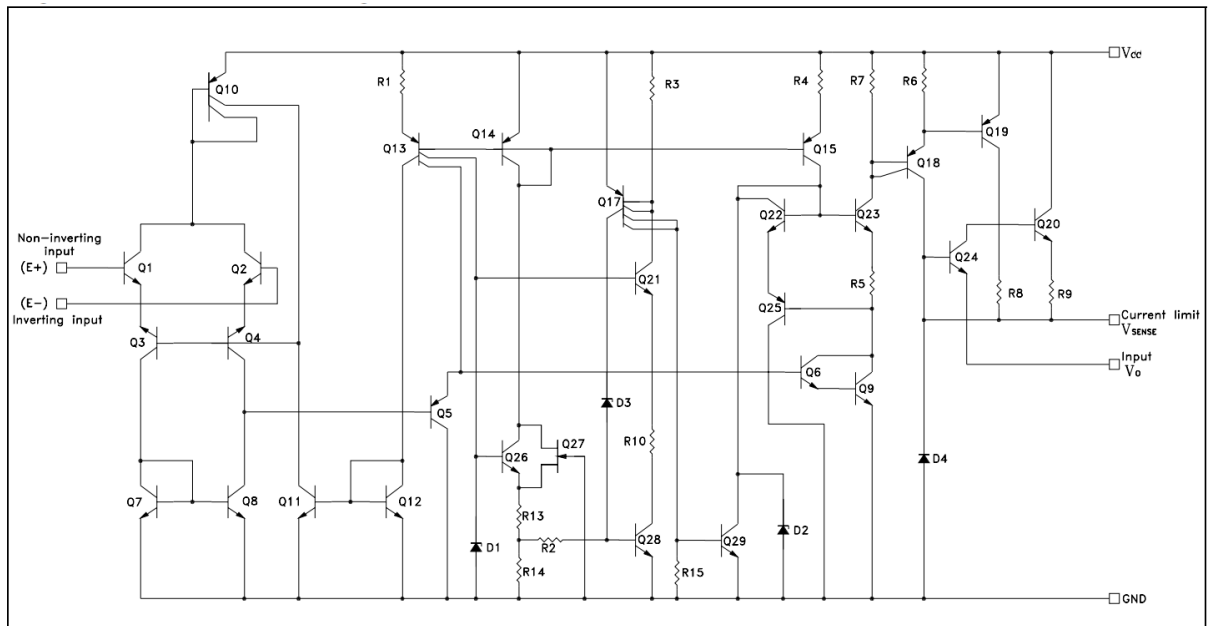
**Figure 1. Pin connections (top view)**

**Figure 2. Schematic diagram**


Figure 3. Test circuit

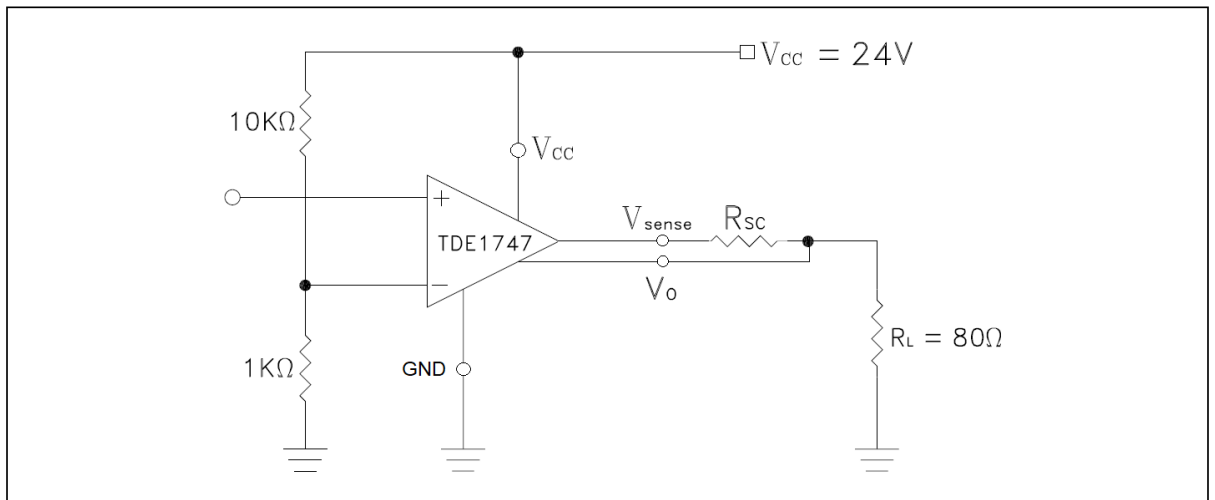
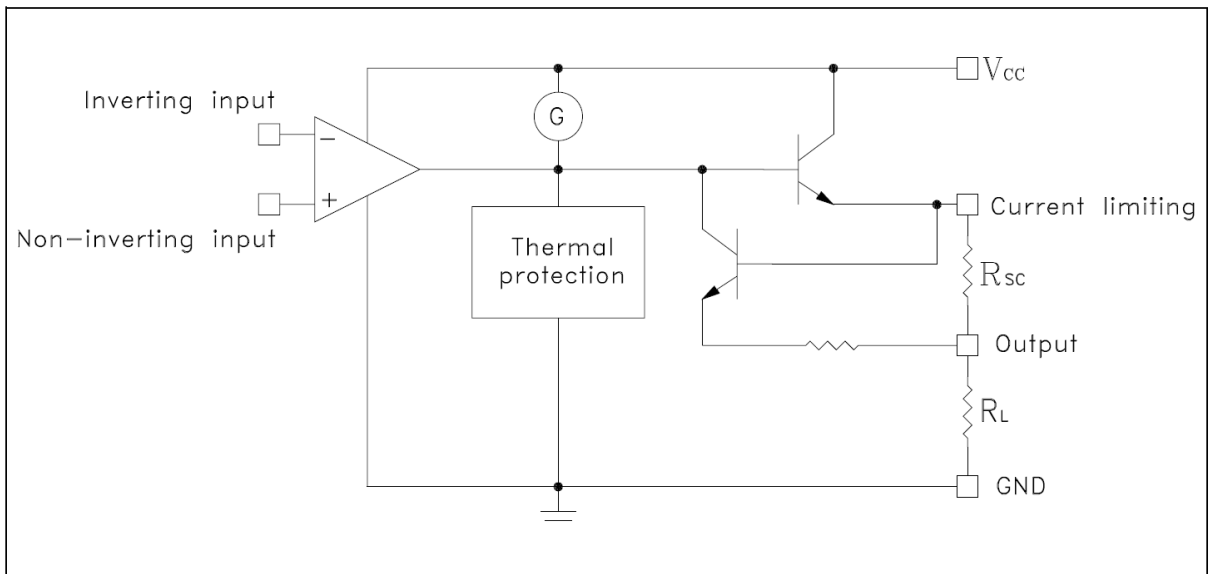


Figure 4. Simplified schematic



## 4 Typical characteristics

Figure 5. Available output current vs limiting resistors

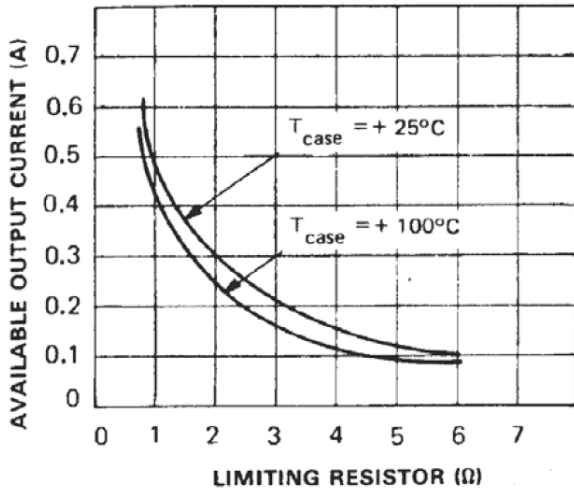


Figure 6. Peak short-circuit vs limiting resistor

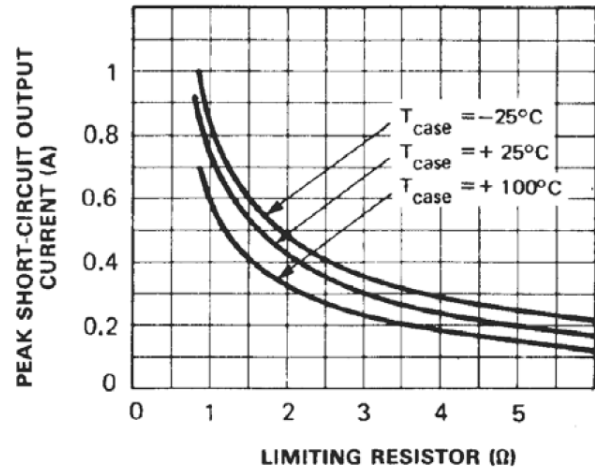


Figure 7. Short-circuit current vs case temperature

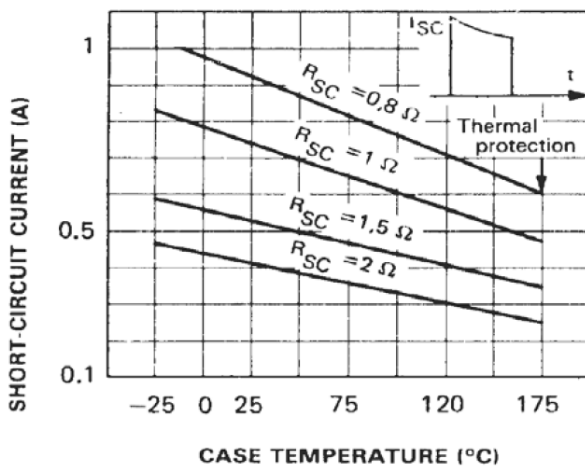


Figure 8. Minimum limiting resistor value vs supply voltage

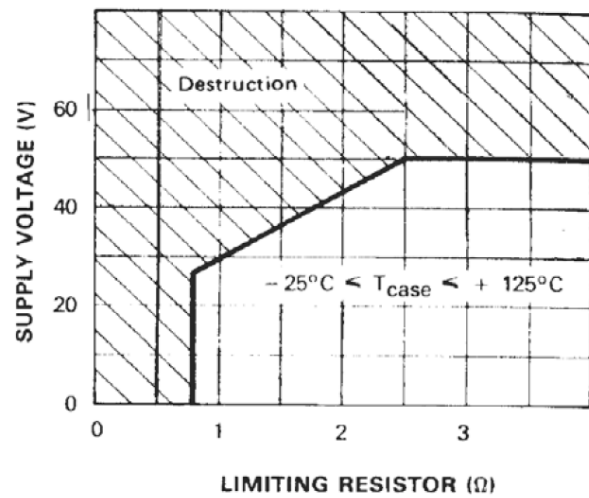


Figure 9. Output current vs output saturation voltage

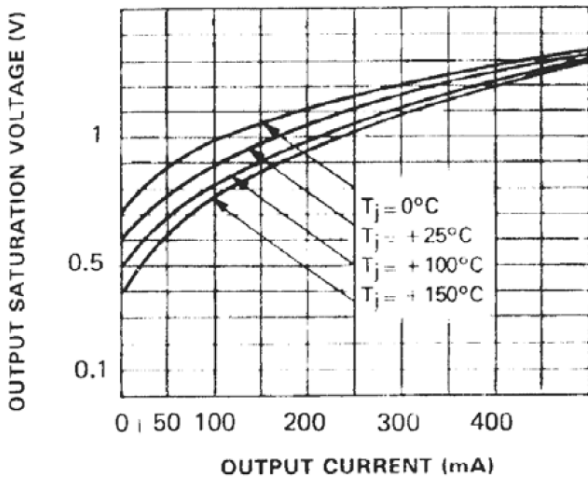


Figure 10. Supply current vs supply voltage

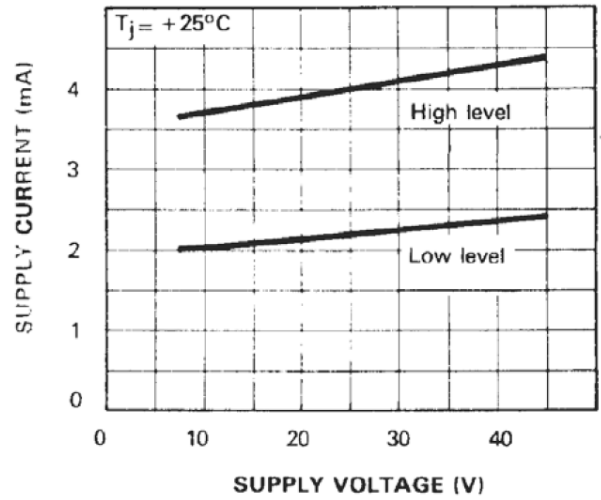


Figure 11. Supply current vs junction temperature

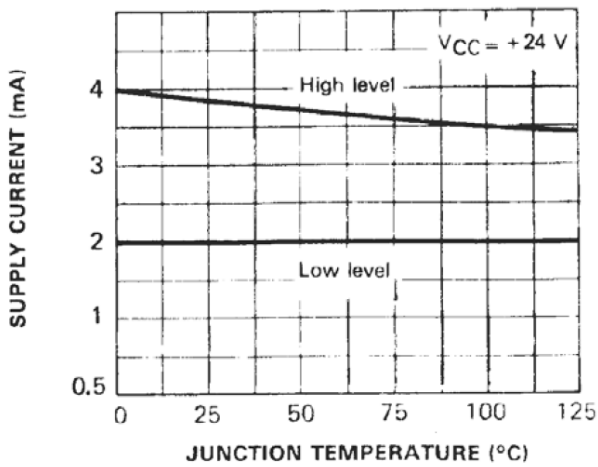


Figure 12. Safe operating area (not repetitive surge)

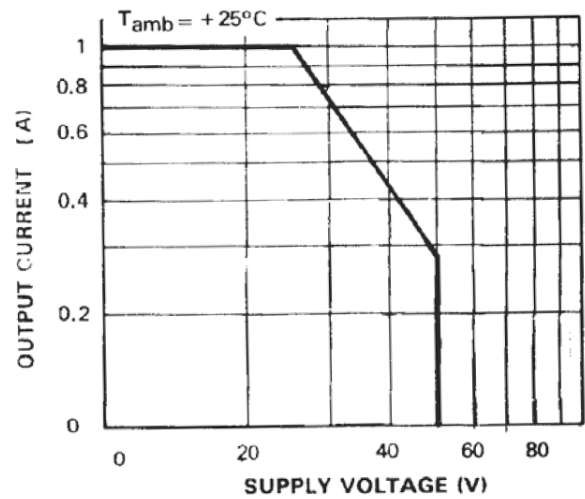
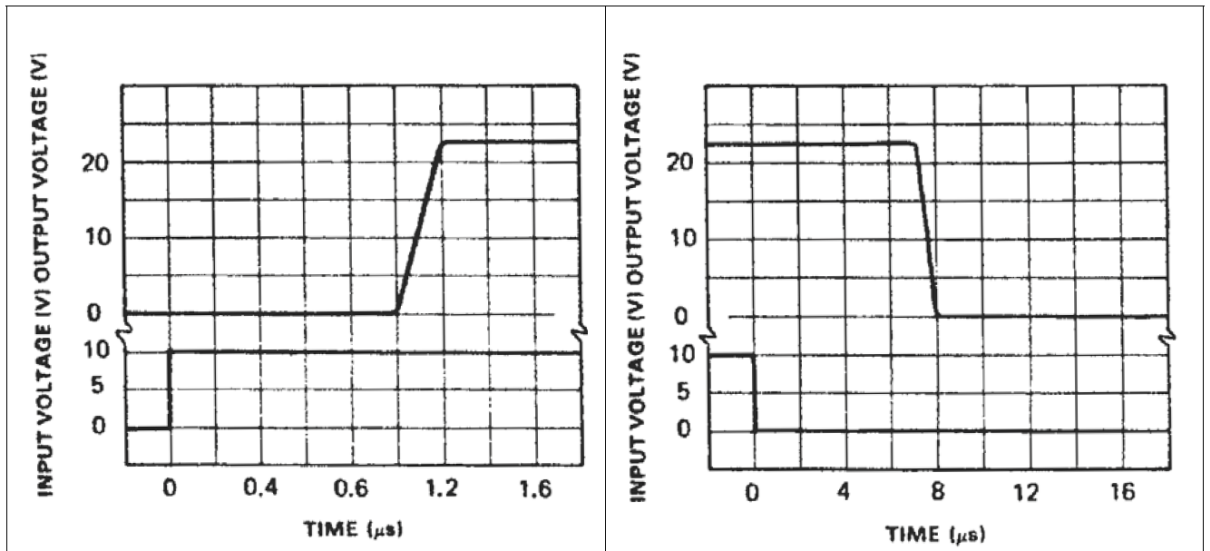


Figure 13. Response time





## 5 Typical applications

Figure 14. Base circuit

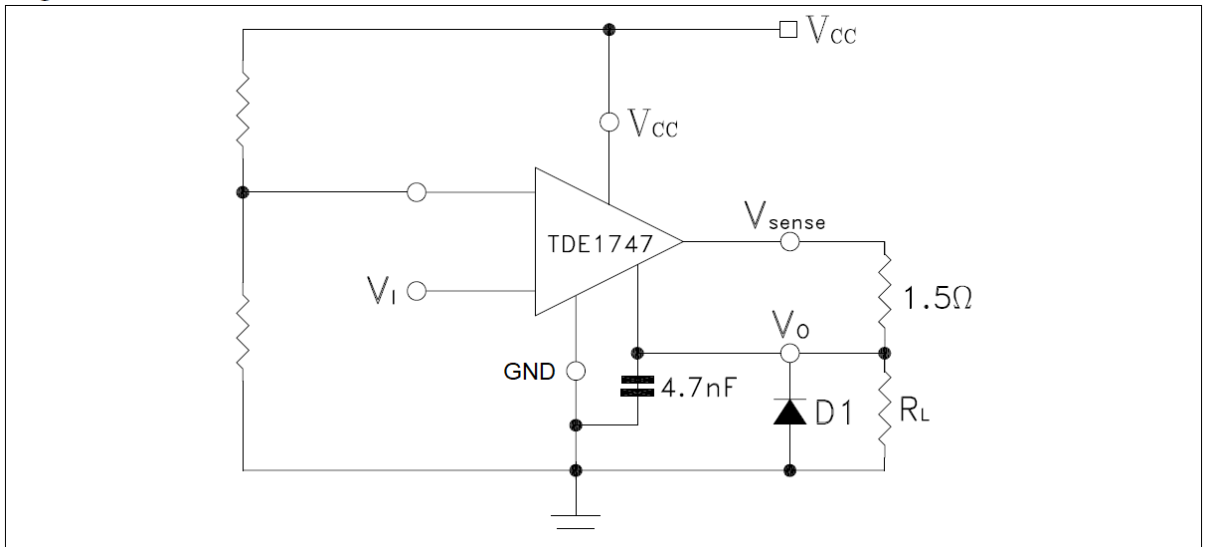


Figure 15. Output current extension (5A)

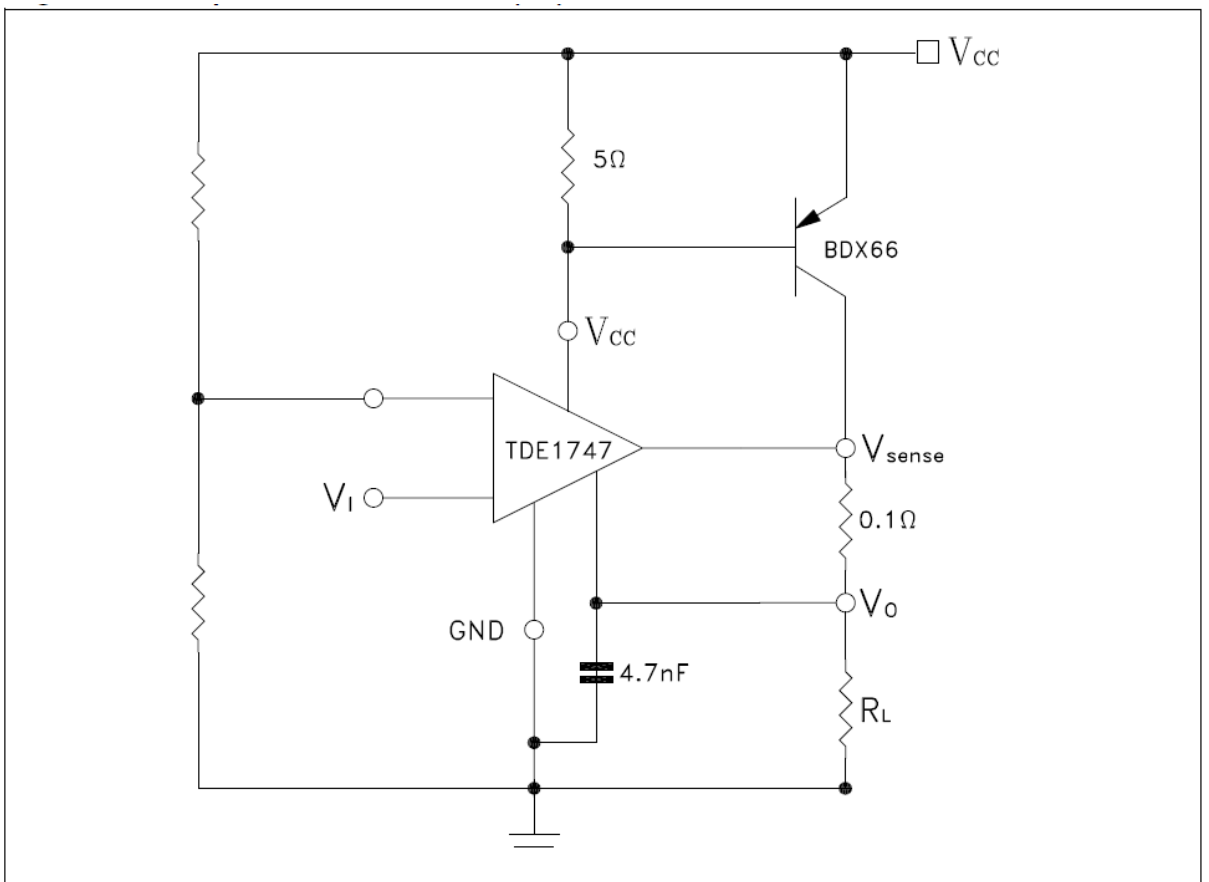
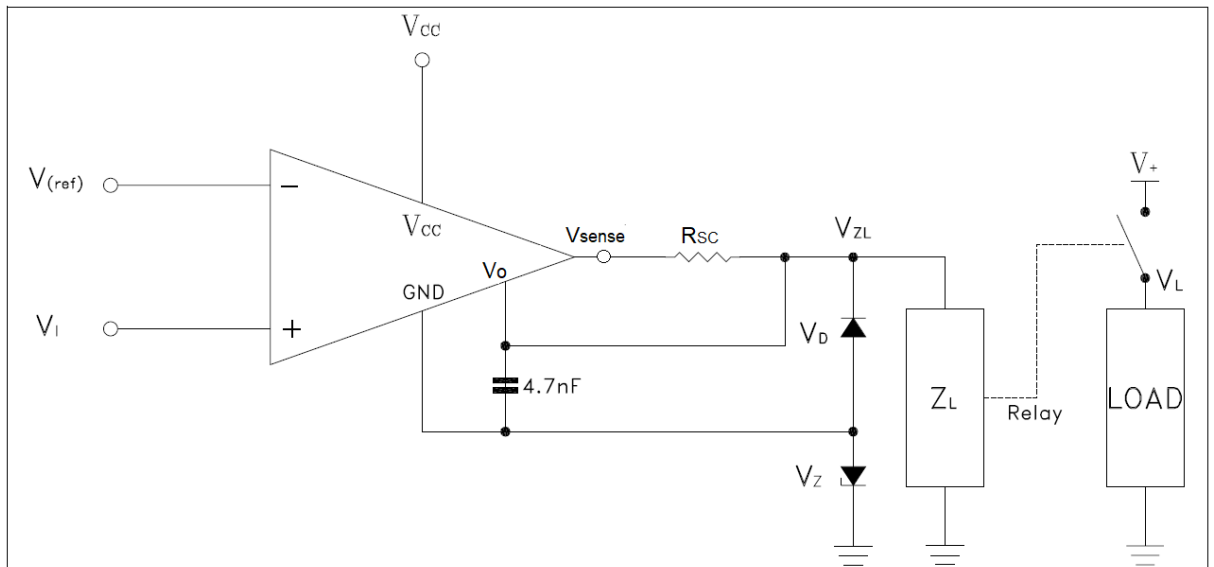


Figure 16. Driving low impedance relays ( $I_O = 300\text{mA}$ )



## 6 Waveforms

Figure 17. Input current vs time

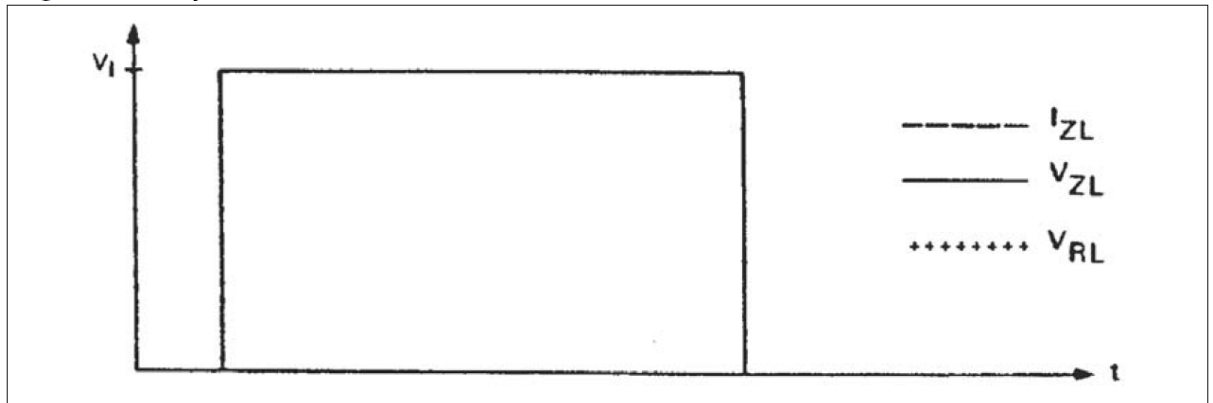


Figure 18. Response time with zener diode

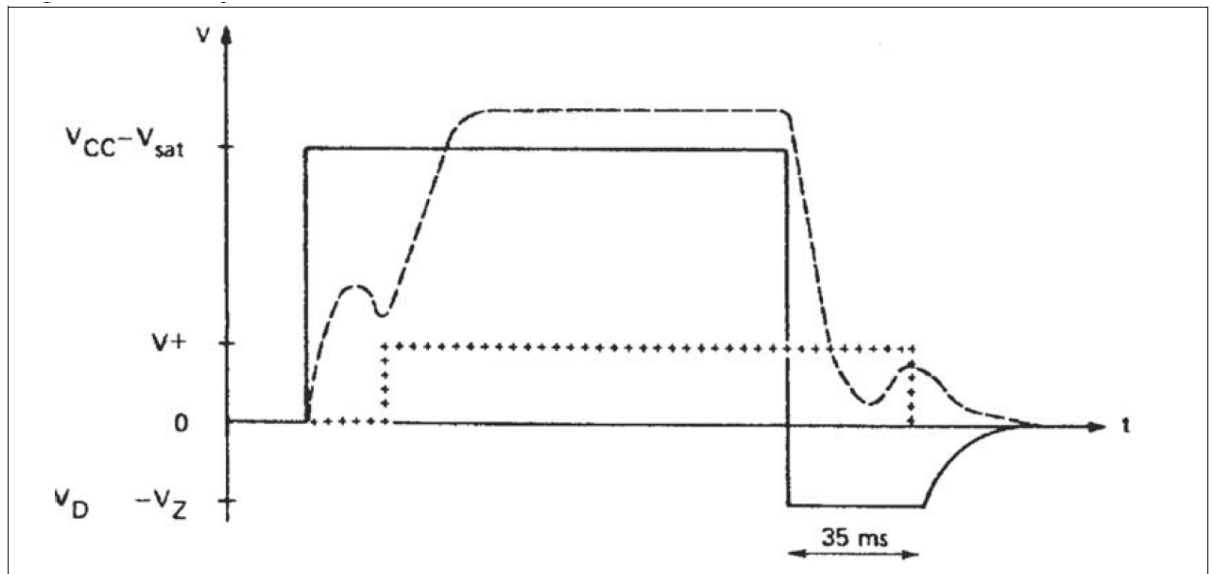
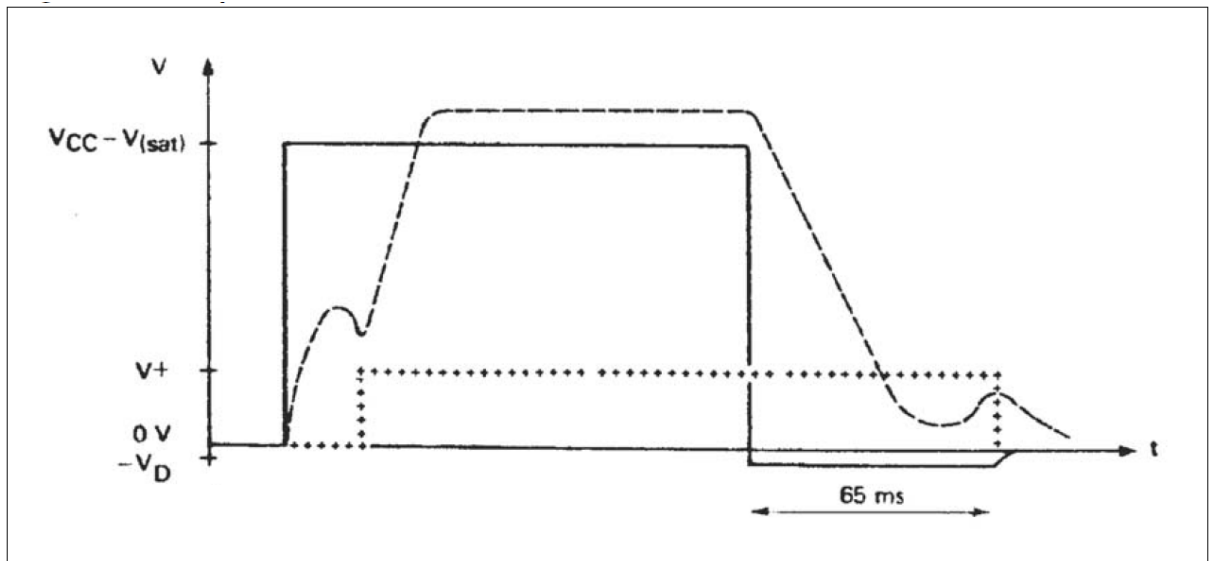


Figure 19. Response time without zener diode



## 7 Package information

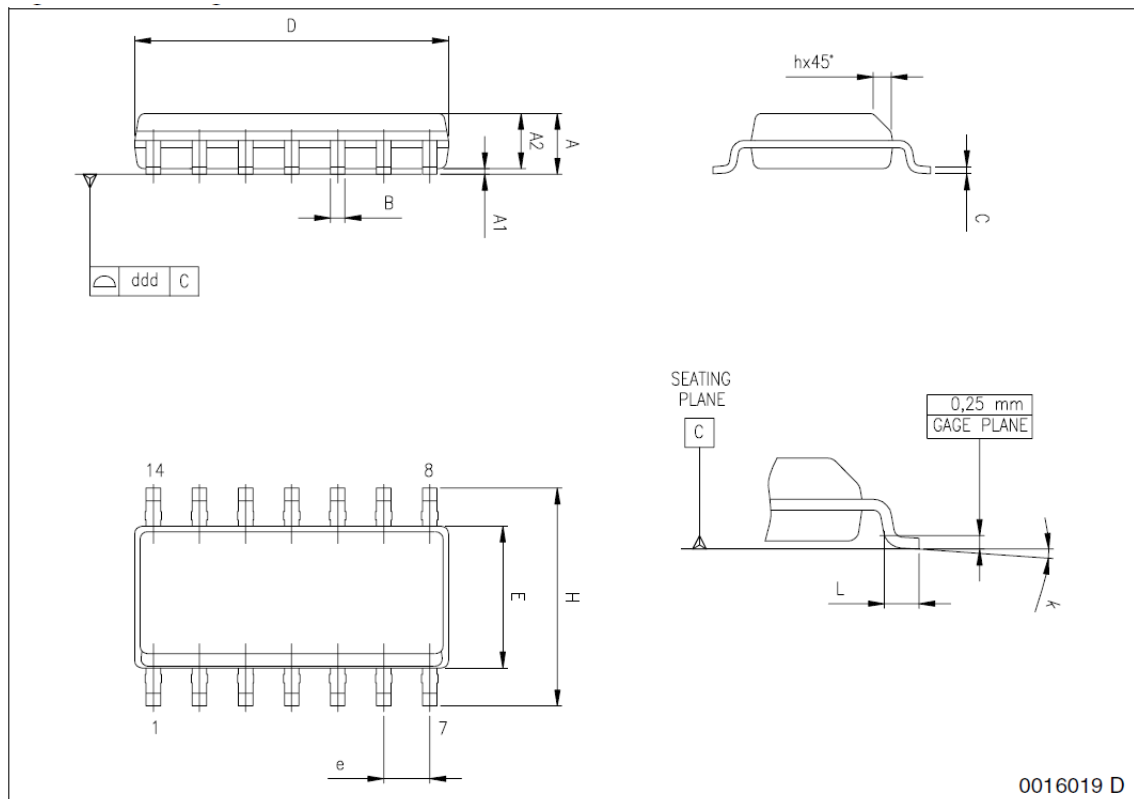
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**Table 4. SO14 mechanical data**

| Dim.             | mm                 |      |      | inch  |       |       |
|------------------|--------------------|------|------|-------|-------|-------|
|                  | Min.               | Typ. | Max. | Min.  | Typ.  | Max.  |
| A                | 1.35               |      | 1.75 | 0.053 |       | 0.069 |
| A1               | 0.10               |      | 0.30 | 0.004 |       | 0.012 |
| A2               | 1.10               |      | 1.65 | 0.043 |       | 0.065 |
| B                | 0.33               |      | 0.51 | 0.013 |       | 0.020 |
| C                | 0.19               |      | 0.25 | 0.007 |       | 0.01  |
| D <sup>(1)</sup> | 8.55               |      | 8.75 | 0.337 |       | 0.344 |
| E                | 3.80               |      | 4.0  | 0.150 |       | 0.157 |
| e                |                    | 1.27 |      |       | 0.050 |       |
| H                | 5.8                |      | 6.20 | 0.228 |       | 0.244 |
| h                | 0.25               |      | 0.50 | 0.01  |       | 0.02  |
| L                | 0.40               |      | 1.27 | 0.016 |       | 0.050 |
| k                | 0° (min), 8° (max) |      |      |       |       |       |
| ddd              |                    |      | 0.10 |       |       | 0.004 |

*Note:* (1) "D" dimension does not include mold flash, protusions or gate burrs. Mold flash, protusions or gate burrs shall not exceed 0.15mm per side.

**Figure 20. SO14 Package dimensions**



## 8 Ordering information

**Table 5. Ordering information**

| Order code | Package | Packing       |
|------------|---------|---------------|
| TDE1747FP  | SO14    | Tube          |
| TDE1747FPT |         | Tape and reel |

## Revision history

**Table 6. Document revision history**

| Date        | Version | Changes  |
|-------------|---------|--|
| 20-Sep-2006 | 1       | Initial release.   |
| 10-Dec-2021 | 2       | Deleted PN TDE1747DP (DIP-8); added "Applications" in front page; changed fig. 3,14,15,16; some other minor changes. |



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