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**Interface circuit (relay and lamp driver)**

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**Features**

- High output current
- Adjustable short-circuit protection to ground
- Internal thermal protection with hysteresis to avoid the intermediate output levels
- Large supply voltage range: 8 to 30V
- Short-circuit protection to  $V_{CC}$
- Open ground protection

**Description**

The TDE3247 is a monolithic amplifier designed for high current and high voltage applications, specifically to drive lamps, relays and stepping motors.

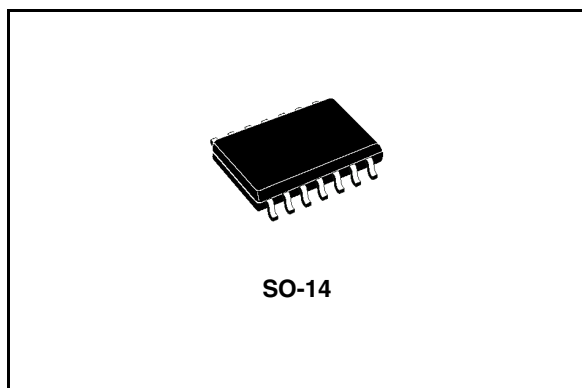
The Device is essentially blow-out proof. Current limiting is available to limit the peak output current to a safe value, the adjustment only required an external resistor.

In addition, thermal shut-down is provided to keep the IC from overheating.

If external dissipation becomes too high, the driver will shut-down to prevent excessive heating.

The output is also protected against short-circuit with the positive power supply.

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

**Order codes**

| Part number | Package | Packaging   |
|-------------|---------|-------------|
| TDE3247FP   | SO-14   | Tube        |
| TDE3247FPT  | SO-14   | Tape & Reel |

## Contents

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# 1 Schematic diagram and pin connections

Figure 1. Schematic diagram

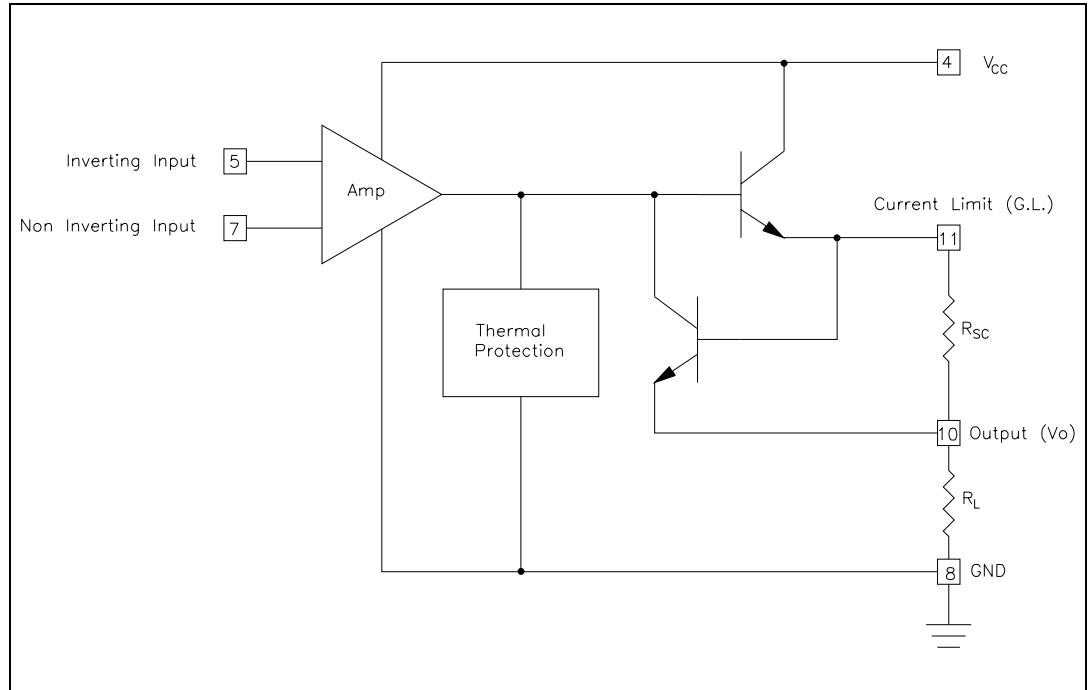
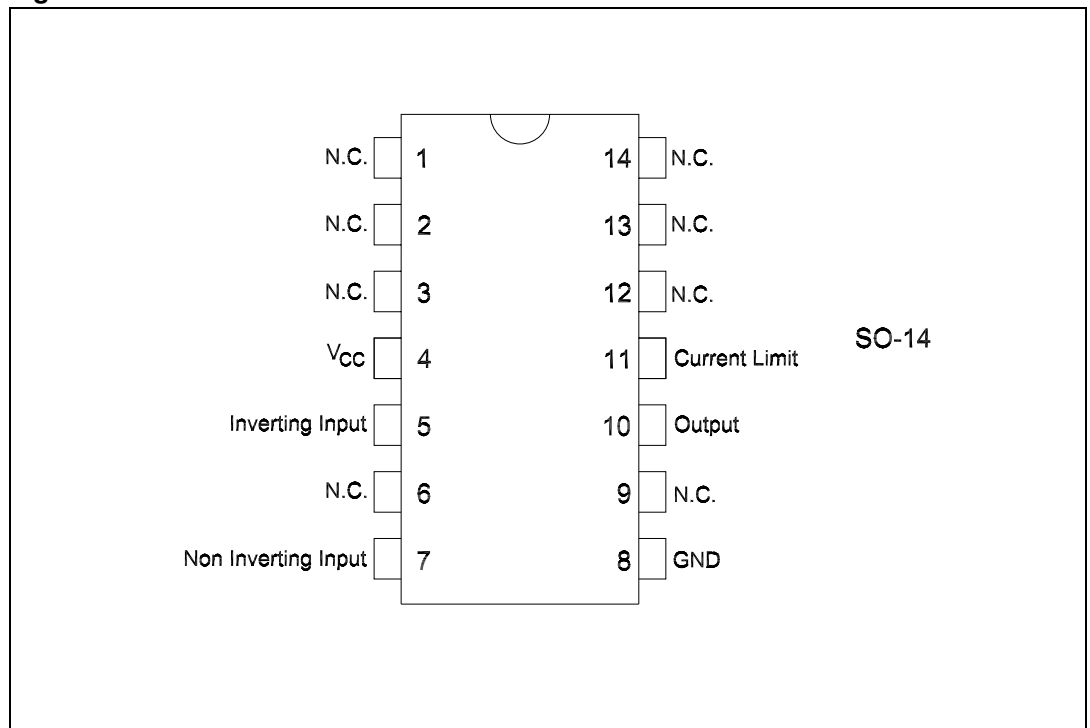


Figure 2. Pin connections



## 2 Electrical ratings

**Table 1. Absolute maximum ratings**

| Symbol     | Parameter                  | Value              | Unit |
|------------|----------------------------|--------------------|------|
| $V_{CC}$   | Supply Voltage             | 36                 | V    |
| $V_O$      | Differential Input Voltage | 36                 | V    |
| $V_I$      | Input Voltage              | 36                 | V    |
| $I_O$      | Output Current             | 300                | mA   |
| $P_{TOT}$  | Power Dissipation          | Internally limited | W    |
| $T_{oper}$ | Ambient Temperature Range  | -25 to 85          | °C   |
| $T_{STG}$  | Storage Temperature Range  | -65 to +150        | °C   |

**Table 2. Thermal data**

|          |  |    |      |
|----------|--|----|------|
| $R_{th}$ | Junction-ceramic Substrate<br>(case glued to substrate)<br>For SO-14   | 90 | °C/W |
| $R_{th}$ | Junction-ceramic Substrate<br>(case glued to substrate, substrate<br>temperature maintained constant)<br>For SO-14 | 65 | °C/W |

### 3 Electrical characteristics

( $-25^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ ,  $8\text{V} \leq V_{CC} \leq 30\text{V}$ ,  $I_O \leq 150\text{mA}$ ,  $T_J \leq 150^{\circ}\text{C}$ , unless otherwise specified) *Note: 1*

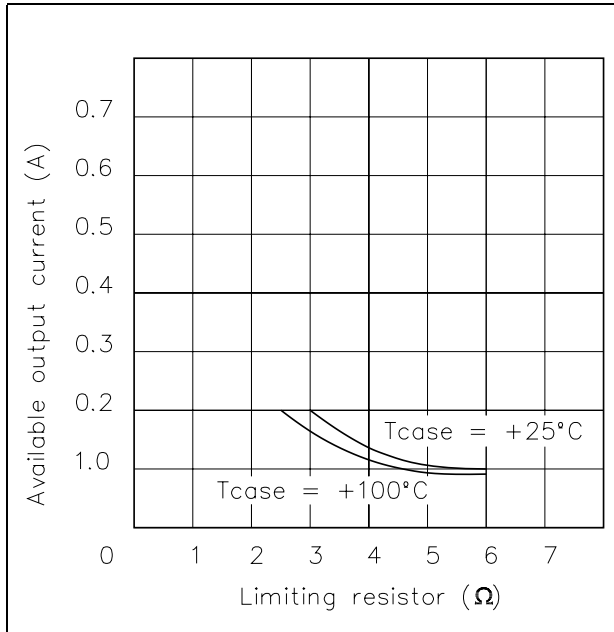
**Table 3. Electrical characteristics**

| Symbol         | Parameter                               | Test Conditions   | Min. | Typ. | Max.       | Unit          |
|----------------|---|---|------|------|------------|---------------|
| $V_{IO}$       | Input Offset Voltage                    | <i>Note 2</i>   |      | 2    | 50         | mV            |
| $I_{IB}$       | Input Bias Current                      |   |      | 0.1  | 1.5        | $\mu\text{A}$ |
| $I_{CC}$       | Supply Current                          | $V_{CC} = 24\text{V}$ , $I_O = 0\text{A}$ ,<br>$T_{\text{amb}} = 25^{\circ}\text{C}$                        |      |      |            |               |
|                |   | High Level  |      | 4    | 10         | mA            |
|                |   | Low Level   |      | 2    |            | mA            |
| $V_{CM}$       | Common Mode Input Voltage Range         |   | 2    |      | $V_{CC}-2$ | V             |
| $I_{SC}$       | Short-circuit Current                   | $V_{CC} = 24\text{V}$ , $T_{\text{amb}} = 25^{\circ}\text{C}$<br>$R_{SC} = 3.3\Omega$                       |      | 250  |            | mA            |
| $V_{CC} - V_O$ | Output Saturation Voltage (Output High) | $(V_{I^+} - V_{I^-}) \leq 50\text{mV}$<br>$I_O = 150\text{mA}$ , $R_{SC} = 0$<br>$T_J = 25^{\circ}\text{C}$ |      | 1.2  | 1.8        | V             |
| $I_{OL}$       | Output Leakage Current (Output Low)     | $V_O = 0\text{V}$ , $V_{CC} = 24\text{V}$   |      |      |            |               |
|                |   | $T_J = 25^{\circ}\text{C}$  |      | 1    | 100        | $\mu\text{A}$ |
|                |   | $T_J = 85^{\circ}\text{C}$  |      |      | 500        | $\mu\text{A}$ |
| $I_{OS}$       | Minimum Short-current Output Current    | $T_{\text{amb}} = 25^{\circ}\text{C}$ , $V_{CC} = 24\text{V}$<br>$R_{SC} = \infty$                          |      | 50   |            | mA            |

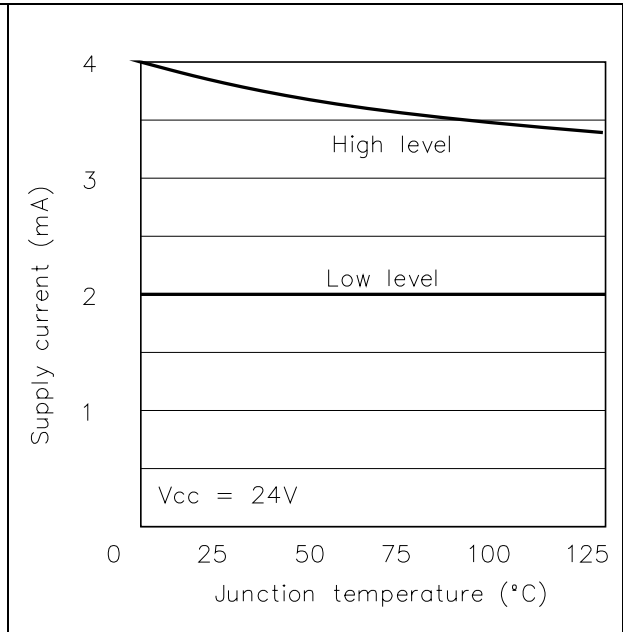
- Note:*
- 1 For operating at high temperatures, the device must be derated based on a  $150^{\circ}\text{C}$  maximum junction and a junction to ambient thermal resistance of  $110^{\circ}\text{C}/\text{W}$
  - 2 The offset voltage given in the maximum value of input voltage required to drive the output voltage within 2V of the ground or the supply voltage.

### 3.1 Electrical characteristics (curves)

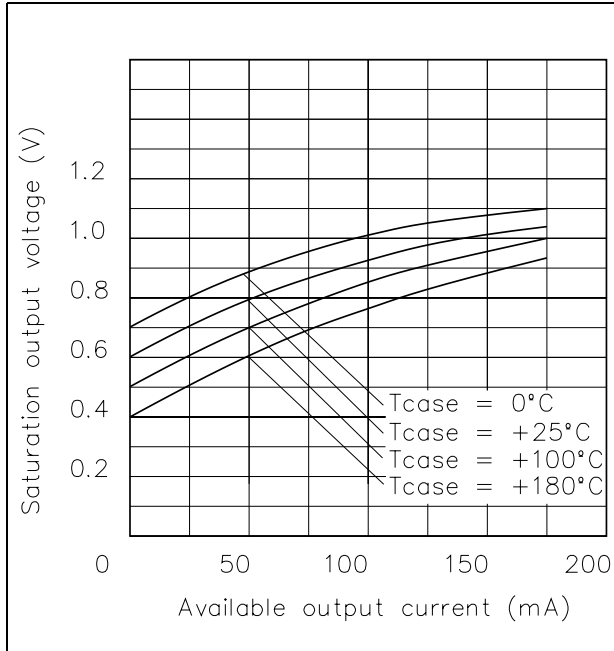
**Figure 3. Available output current vs. limiting resistor**



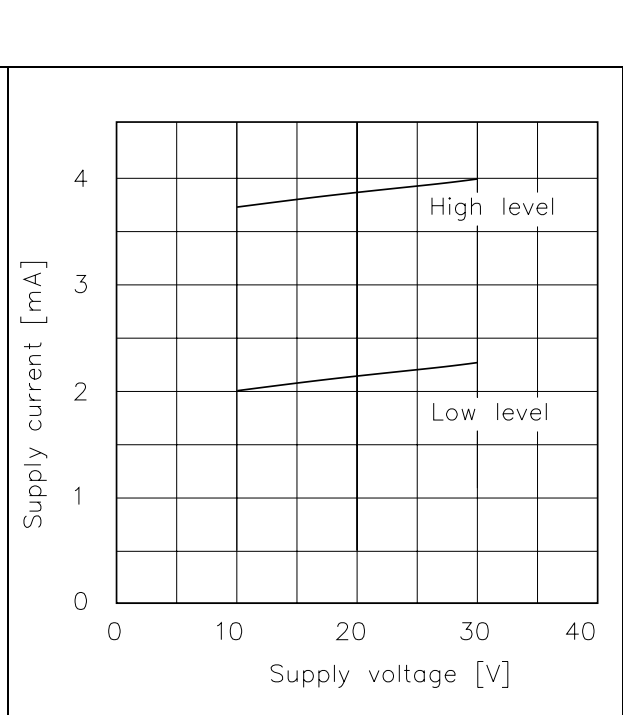
**Figure 4. Supply current vs. junction temperature**



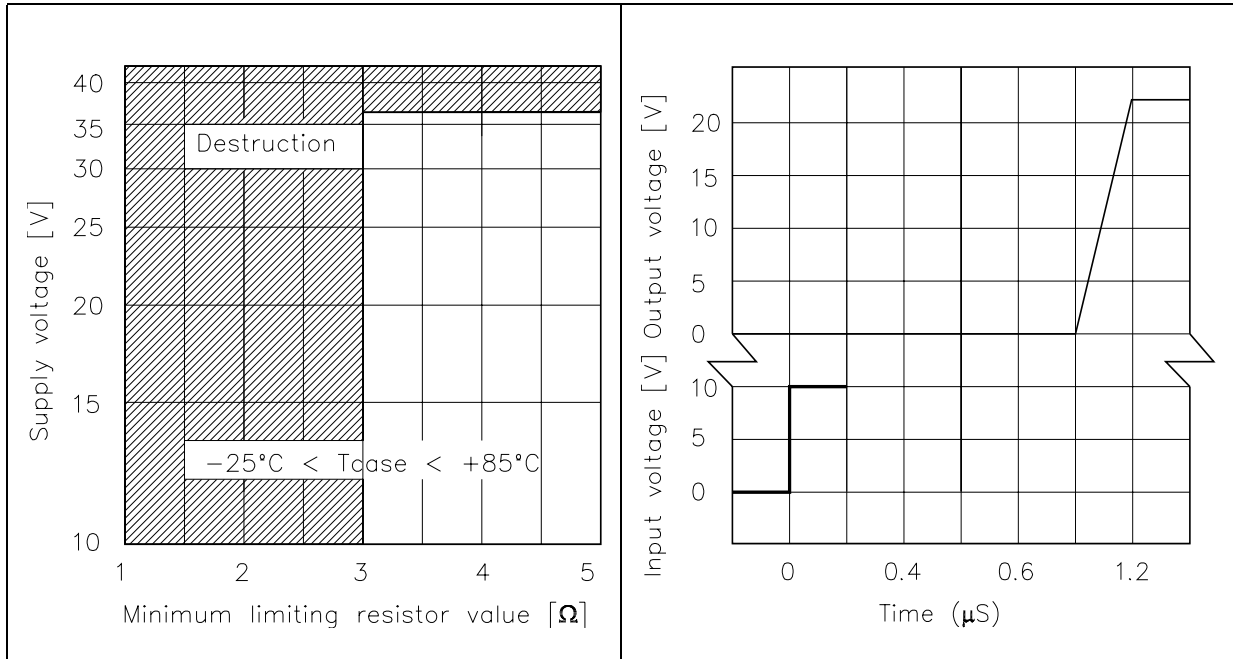
**Figure 5. Saturation output voltage vs. case temperature and available output current**



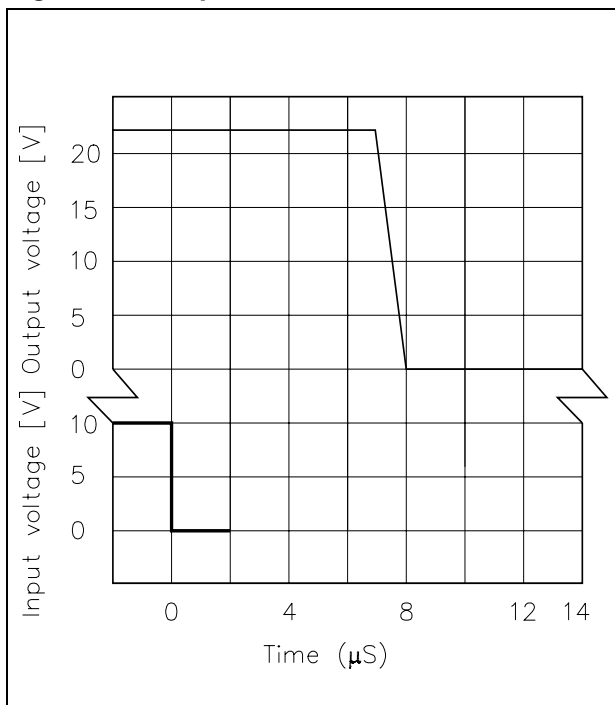
**Figure 6. Supply current vs. supply voltage**



**Figure 7. Supply voltage vs. minimum limiting resistor value** **Figure 8. Response time**



**Figure 9. Response time**



# 4 Application circuit

Figure 10. Basic application circuit

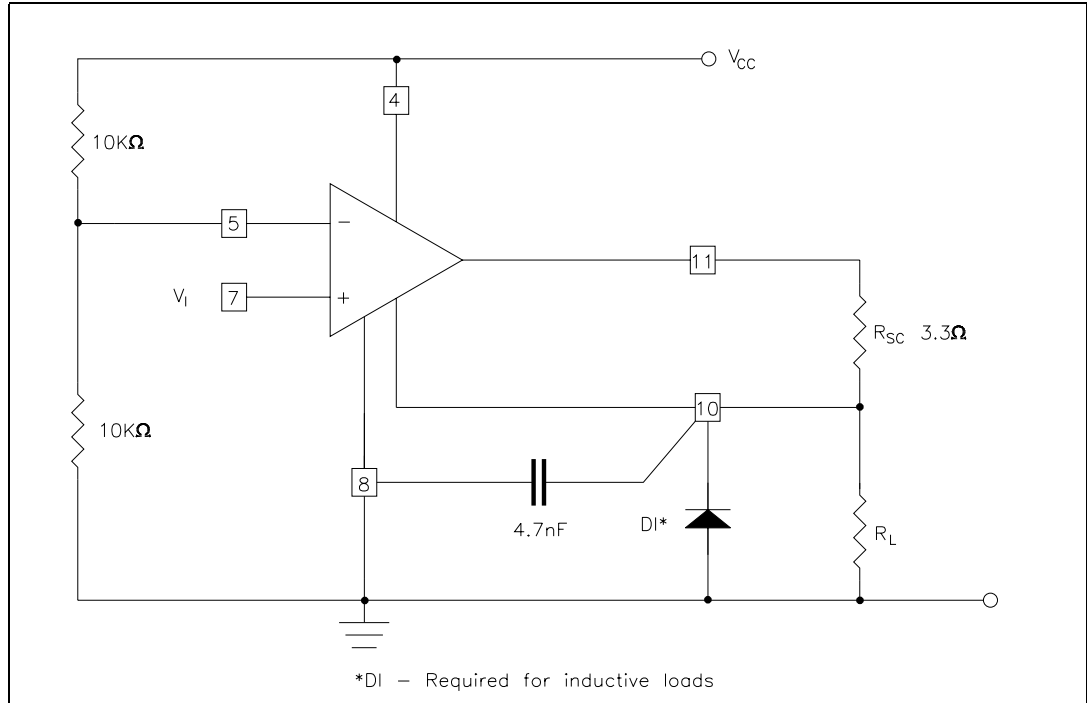
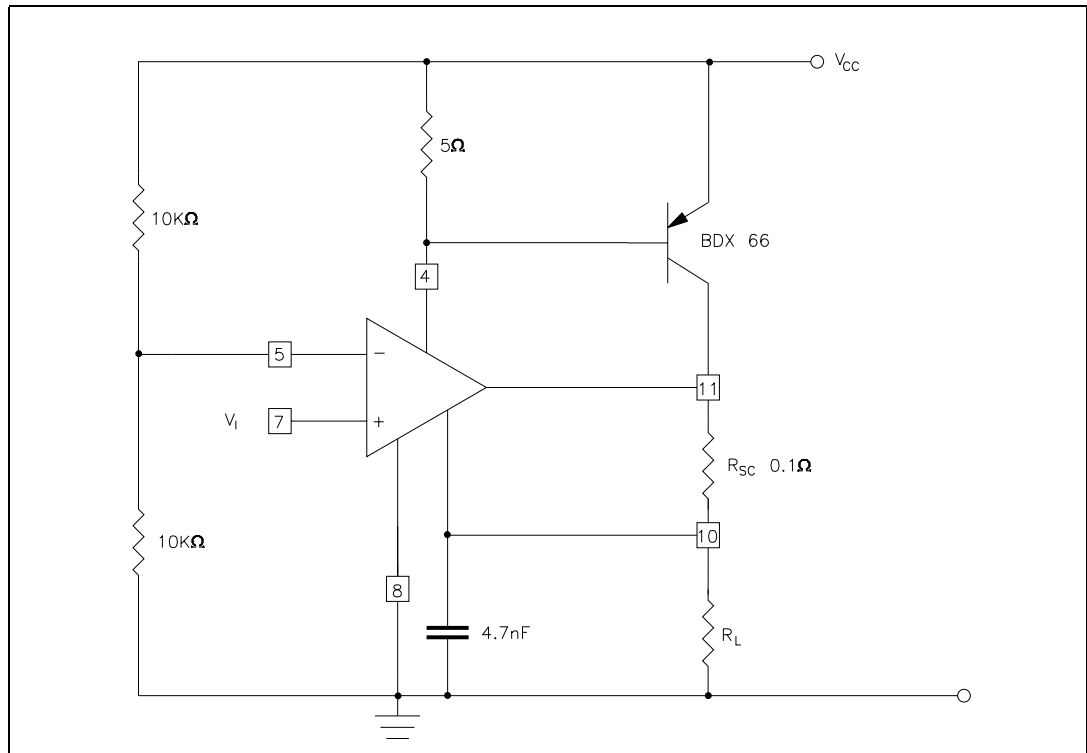


Figure 11. Output current boosting (5A)





## 5 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com)

Table 4. SO-14 Mechanical data

| Dim. | mm.        |      |      | inch  |       |       |
|------|------------|------|------|-------|-------|-------|
|      | Min.       | Typ  | Max. | Min.  | Typ.  | Max.  |
| A    |            |      | 1.75 |       |       | 0.068 |
| a1   | 0.1        |      | 0.2  | 0.003 |       | 0.007 |
| a2   |            |      | 1.65 |       |       | 0.064 |
| b    | 0.35       |      | 0.46 | 0.013 |       | 0.018 |
| b1   | 0.19       |      | 0.25 | 0.007 |       | 0.010 |
| C    |            | 0.5  |      |       | 0.019 |       |
| c1   | 45° (typ.) |      |      |       |       |       |
| D    | 8.55       |      | 8.75 | 0.336 |       | 0.344 |
| E    | 5.8        |      | 6.2  | 0.228 |       | 0.244 |
| e    |            | 1.27 |      |       | 0.050 |       |
| e3   |            | 7.62 |      |       | 0.300 |       |
| F    | 3.8        |      | 4.0  | 0.149 |       | 0.157 |
| G    | 4.6        |      | 5.3  | 0.181 |       | 0.208 |
| L    | 0.5        |      | 1.27 | 0.019 |       | 0.050 |
| M    |            |      | 0.68 |       |       | 0.026 |
| S    | 8° (max.)  |      |      |       |       |       |

Figure 12. Package dimensions

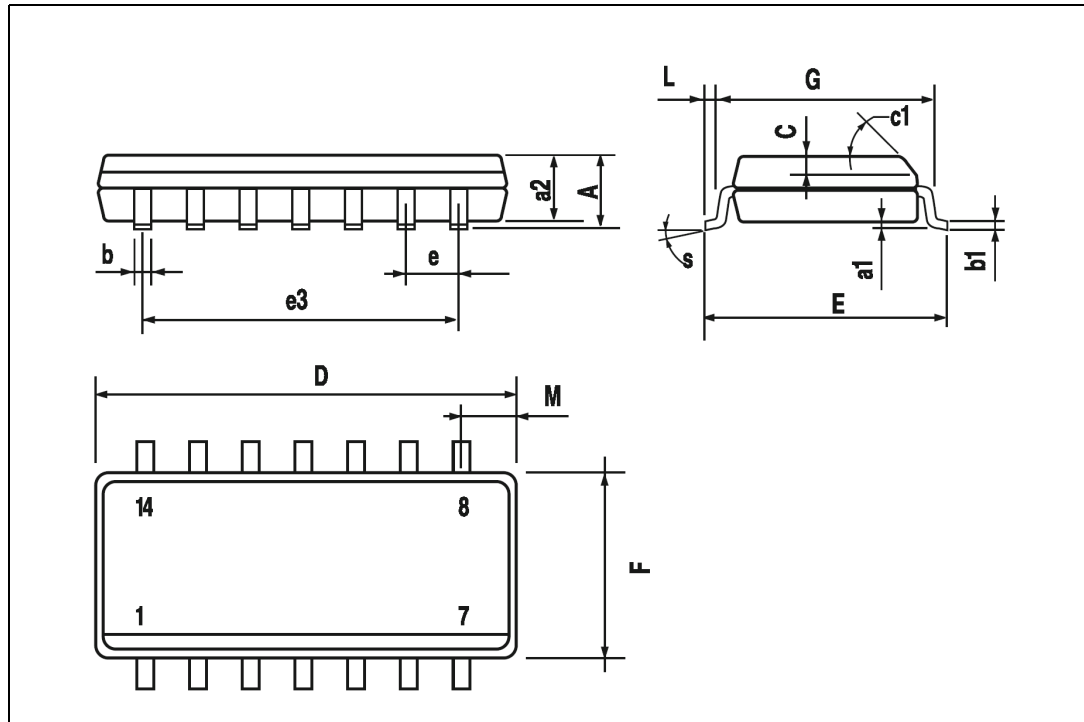


Table 5. Tube shipment information

| Tube mechanical data |            |              |
|----------------------|------------|--------------|
|                      | mm.        | inch.        |
| A                    | 6.60 ±0.10 | 0.260 ±0.004 |
| B                    | 1.90 ±0.10 | 0.075 ±0.004 |
| C                    | 0.60 ±0.10 | 0.024 ±0.004 |
| D                    | 7.80 ±0.10 | 0.307 ±0.004 |
| E                    | 4.30 ±0.10 | 0.169 ±0.004 |
| BASE QUANTITY        | 100 pcs.   |              |
| BULK QUANTITY        | 2000 pcs.  |              |

Figure 13. Tube dimension

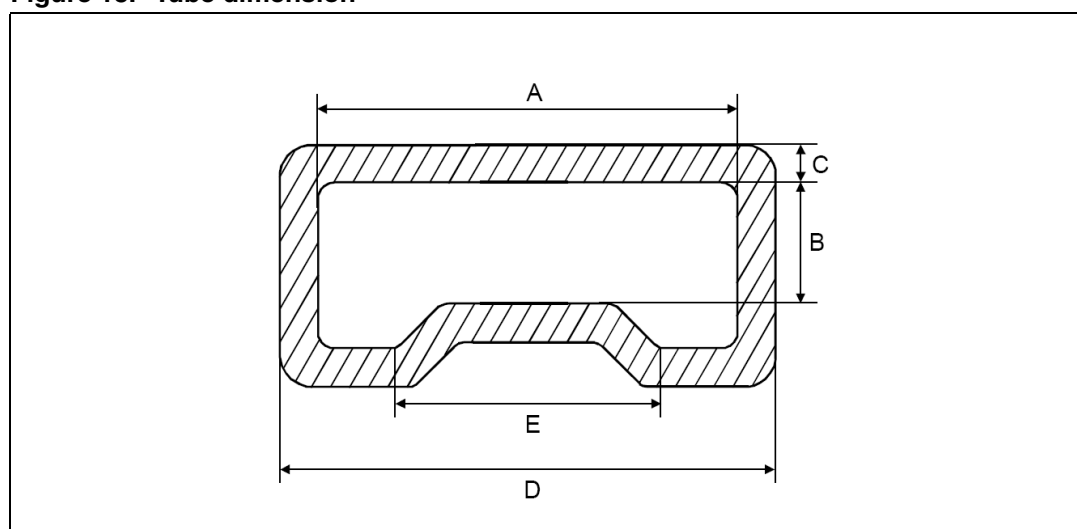


Table 6. Tape & reel shipment information

| Tape mechanical data |                       |                         |
|----------------------|-----------------------|-------------------------|
|                      | mm.                   | inch                    |
| D                    | 1.50 +0.1/0           | 0.059 +0.004/0          |
| E                    | 1.75 ±0.1             | 0.069 ±0.004            |
| Po                   | 4.00 ±0.1             | 0.157 ±0.004            |
| T max.               | 0.40                  | 0.016                   |
| D1 min.              | 1.50                  | 0.059                   |
| F                    | 7.5 ±0.05             | 0.295 ±0.002            |
| K max.               | 6.50                  | 0.256                   |
| P2                   | 2.00 ±0.05            | 0.079 ±0.002            |
| R                    | 40                    | 1.575                   |
| W                    | 16.00 ±0.30           | 0.630 ±0.012            |
| P1                   | 12.00                 | 0.472                   |
| Ao, Bo, Ko           | 0.05 min to 0.90 max. | 0.002 min to 0.035 max. |

Figure 14. Tape specification

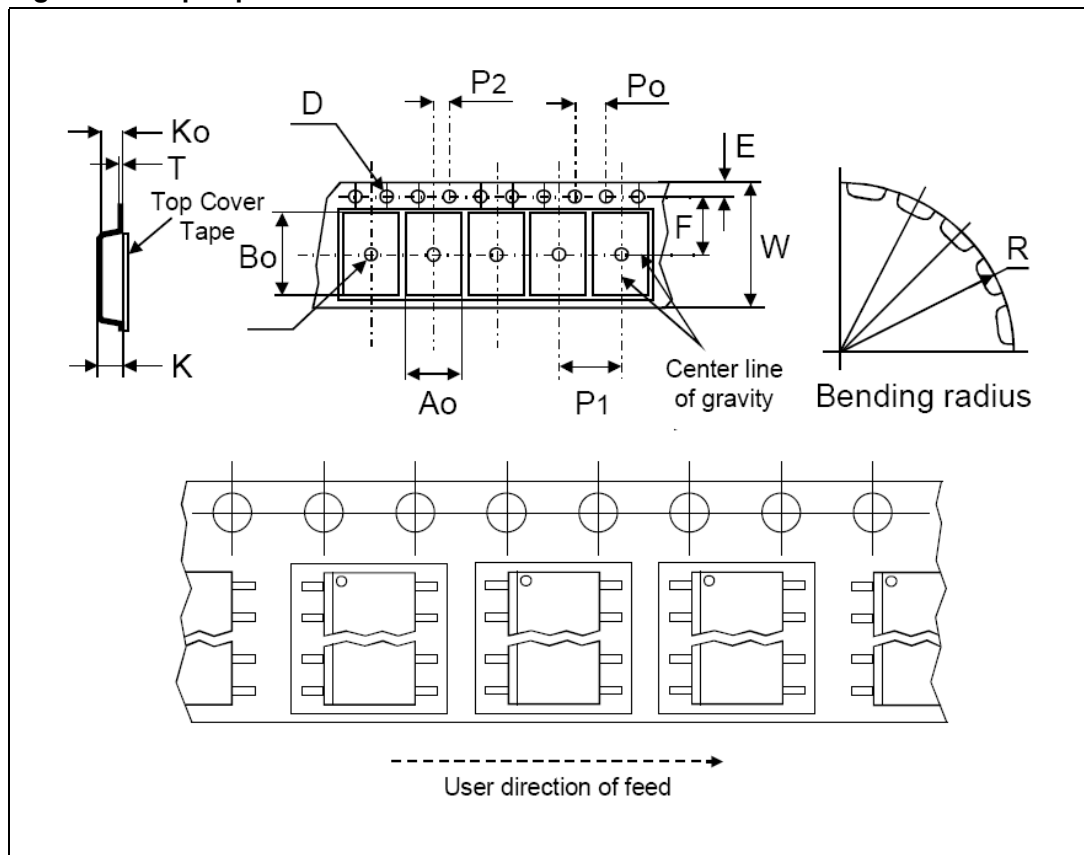
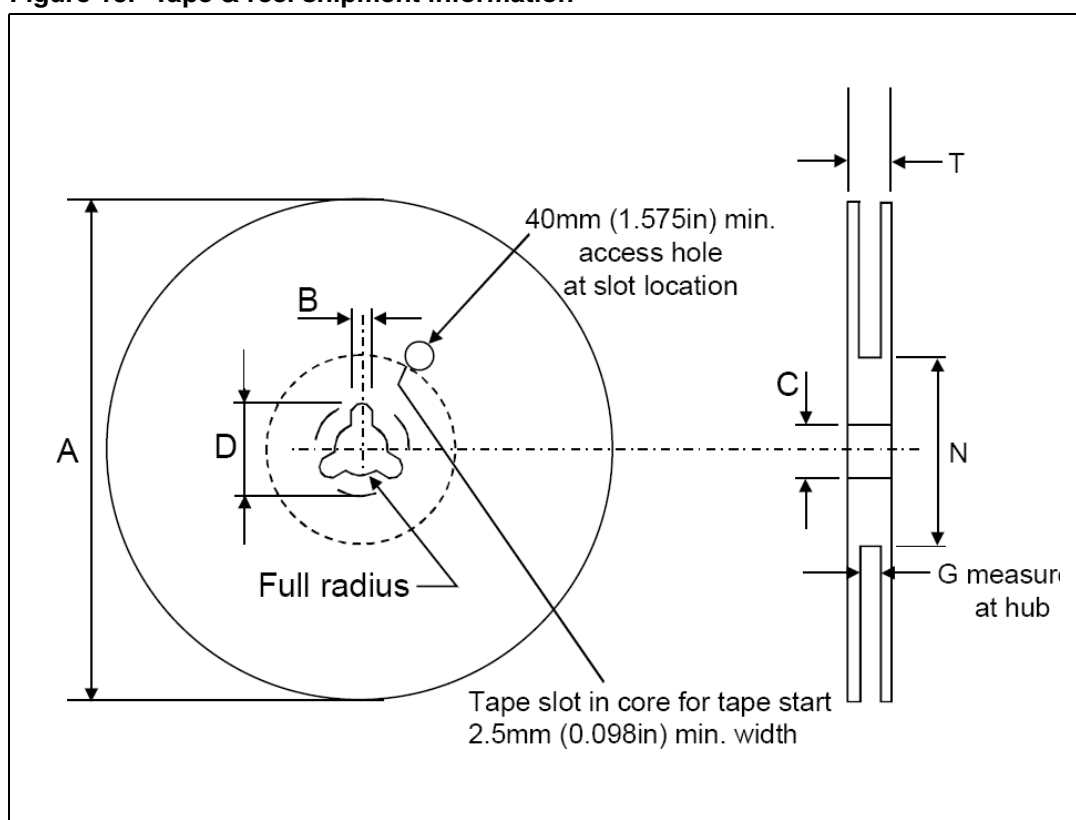


Table 7. Reel mechanical data

|           | mm.        | inch            |
|-----------|------------|-----------------|
| Tape size | 16.0 ±0.30 | 0.630 ±0.012    |
| A max.    | 330.0      | 12.992          |
| B min.    | 1.5        | 0.059           |
| C         | 13.0 ±0.20 | 0.512 ±0.008    |
| D min.    | 20.2       | 0.795           |
| N min.    | 60         | 2.362           |
| G         | 16.4 +2/-0 | 0.646 +0.079/-0 |
| T max.    | 22.4       | 0.882           |

Figure 15. Tape &amp; reel shipment information



## 6 Revision history

**Table 8. Revision history**

| <b>Date</b> | <b>Revision</b> | <b>Changes</b>     |
|-------------|-----------------|--------------------|
| 20-Apr-2006 | 1               | First release      |
| 27-Jun-2006 | 2               | Typo in cover page |

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