## Features

- **Interval Pause: 4s to 20s**
- **After-wiping Time: 2s to 20s**
- **Wiper Motor's Park Switch**
- **0.6s Prewash Delay**
- **Wipe/Wash Mode Priority**
- **One External Capacitor Determines All Time Sequences**
- **Relay Driver with Z-diode**
- **Interference Protection According to VDE 0839 or ISO/TR 7637/1**
- **Load-dump Protected**

## 1. Description

The U641B is a bi-polar integrated circuit designed for the wiper application in the automotive market. It includes wipe, wash and internal mode.
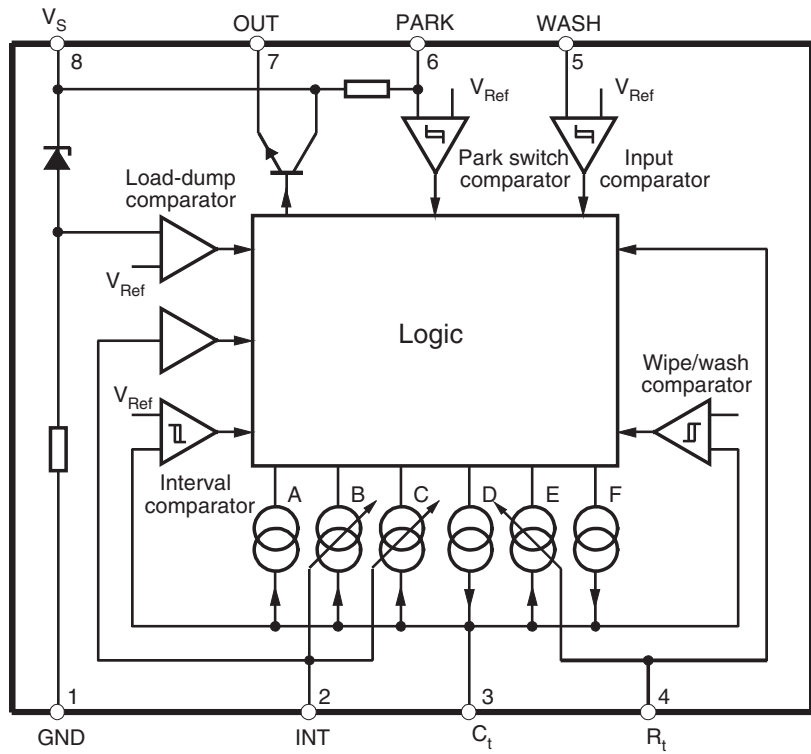
## 2. Functional Description

As a convenience feature of the windshield wiper, intermittent and wipe/wash operation functions are implemented in most of the automobiles. The U641B is a cost-effective solution for an accurate timing function control. Wipe/wash mode has priority over interval mode. Interval pause and after-wiping time can be set to fixed values by using resistors in a broad time range. Added value can be provided with an individual, continuous adjustment of the interval pause by a potentiometer which may be built into the stalk. For proper operation, it is mandatory to feed the signal of the wiper motor's park switch into the U641B.

**Interval and Wipe/Wash Wiper Control IC with Delay**

**U641B**

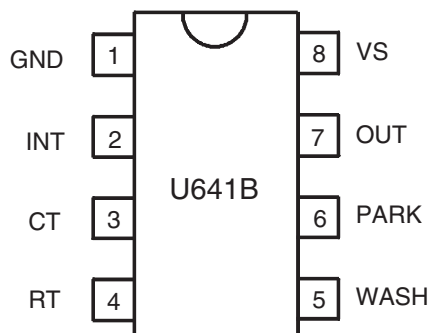**Figure 2-1.** Block Diagram

# 3. Pin Configuration

**Figure 3-1.** Pinning



**Table 3-1.** Pin Description

| Pin | Symbol | Function |
|-----|--------|----------|
| 1 | GND | Ground |
| 2 | INT | Interval switch |
| 3 | CT | Timing capacitor $C_2$ |
| 4 | RT | After-wiping time resistance |
| 5 | WASH | Wipe/wash switch |
| 6 | PARK | Park switch for wiper motor |
| 7 | OUT | Relay control output |
| 8 | VS | Supply voltage terminal 15 |

# 4. Circuit Description

## 4.1 Interval Function, Pin 2

By closing the interval switch, $S_2$, to supply voltage, $V_{Batt}$, the relay is activated. The internal current source (pin 3) which holds the capacitor $C_2$ in charged state is switched-off. As soon as there is a positive potential at the park switch ($S_1$), current source F (see Figure 2-1 on page 2) charges the capacitor $C_2$ very quickly. After the wiper operation is finished, $S_1$ is again at ground potential, the relay is in the off position - interval pause begins - the capacitor $C_2$ is discharged through the current source C, till the voltage at pin 3 is below the threshold of 2V. Interval pause can be adjusted between 4 s to 20 s with the help of potentiometer $R_3$. Now the relay switches on and the next interval cycle begins. Opening switch $S_2$ causes current source A to discharge $C_2$ immediately and current sources C and F are switched off.

## 4.2 Wipe/Wash (WIWA) Operation, Pin 5

By closing the WIWA switch, $S_3$, to supply voltage, $V_{Batt}$, the water pump starts spraying the water on the windshield. During this function, the current source A is switched-off which keeps the capacitor $C_2$ in a discharged state. Now the capacitor is charged through the current source F. If (after a time interval of approximately 600 ms) the voltage at the capacitor is greater than 6.1V, the relay is turned on as long as the switch WIWA is closed.

The after-wiping time begins when the switch is open, the sources D and F are switched off and the source E is activated. Source E discharges the capacitor until the voltage is less than 2.2V. The relay is off and the wiper-motor is supplied via the park switch until the park position is reached. The after-wiping time is determined by the current source E which can be regulated with the external resistor $R_{Time}$. When the after-wiping time has elapsed, the source A discharges the capacitor. The relay switch is independent of the park switch $S_1$.

## 4.3 Interval and WIWA Functions

The interval function is interrupted immediately when the switch $S_2$ is activated. The current source A discharges the capacitor to a value of 2V, afterwards, the normal wash function starts.

Interval wiping starts immediately when the after-wipe time is over. The switching delays are slightly shorter, because the capacitor is already charged to a value of 2V.

The Wipe/Wash function is not interrupted when the interval switch $S_2$ is activated. The interval function begins after the WIWA function has elapsed.

**Figure 4-1.** Application Circuit with Interval and Wipe/Wash Operation
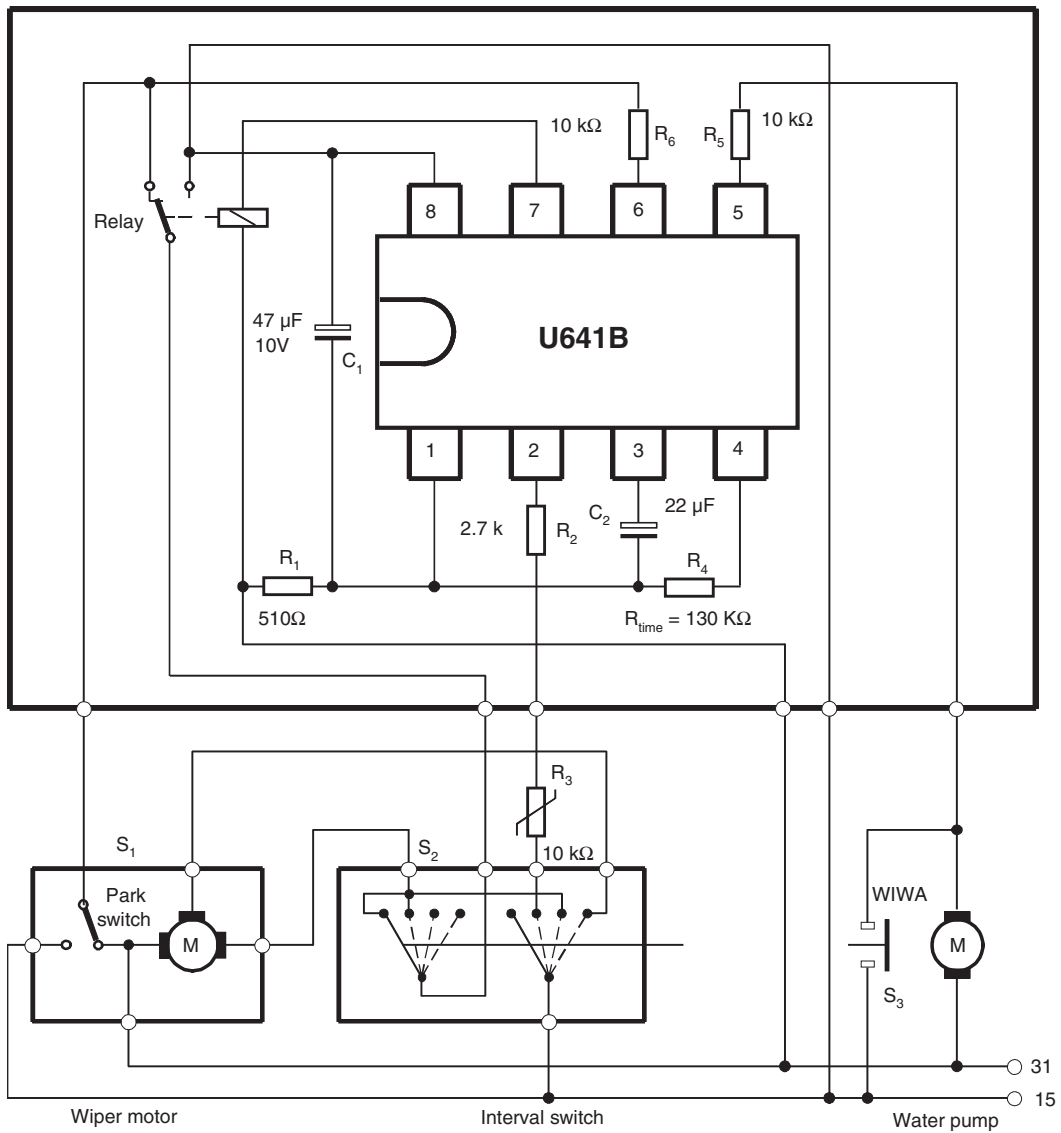
## 5. Absolute Maximum Ratings

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

| Parameters | Pin | Symbol | Value | Unit |
|---|---|---|---|---|
| Supply voltage t = 60s, terminal 15 | 8 | $V_{Batt}$ | 28 | V |
| Supply current<br>t = 2 ms<br>t = 200 ms | 8 | $I_8$<br>$I_8$ | 1.5<br>150 | A<br>mA |
| Relay control output current (DC)<br>t = 200 ms | 7 | $I_7$<br>$I_7$ | 200<br>1.2 | mA<br>A |
| **Pulse Current (Control Inputs) t = 200 ms** | | | | |
| Park switch, $S_1$<br>Wipe/Wash switch, $S_3$<br>Interval switch, $S_2$ | 6<br>5<br>2 | $I_6$<br>$I_5$<br>$I_2$ | 50<br>50<br>50 | mA |
| Power dissipation $T_{amb}$ = 90°C | | $P_{tot}$ | 500 | mW |
| Storage temperature range | | $T_{stg}$ | −55 to +125 | °C |
| Ambient temperature range | | $T_{amb}$ | −40 to +85 | °C |

## 6. Thermal Resistance

| Parameters | | Symbol | Value | Unit |
|---|---|---|---|---|
| Junction ambient | DIP8 | $R_{thJA}$ | 120 | K/W |
| | SO8 | $R_{thJA}$ | 160 | K/W |

# 7. Electrical Characteristics

$V_{Batt}$ = 12V, $T_{amb}$ = 25°C, reference point is pin 8 (see Figure 4-1 on page 5) unless otherwise specified.

| Parameters | Test Conditions | Pin | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Supply voltage | | | $V_{Batt}$ | 9 | | 16.5 | V |
| Supply current | | 8 | $I_8$ | | 10 | | mA |
| Z-diode limitation | | | $V_1$ | | 7.6 | | V |
| **Overvoltage** | | | | | | | |
| Threshold current | | | I1 | | −50 | | mA |
| Threshold voltage | | | $V_{Batt}$ | | 35 | | V |
| **Relay Control Output** | | 7 | | | | | |
| Saturation voltage | $I_7$ = 100 mA $I_7$ = 200 mA | | $V_7$ | | | −1.0 −1.5 | V |
| Leakage current | | | $I_7$ | | 100 | | µA |
| **Park Switch** | | 6 | | | | | |
| Internal pull-up resistance | $R_6$ = 10 kΩ | | $R_6$ | | 50 | | kΩ |
| Switching threshold voltage | | | $V_6$ | | −3.3 | | V |
| Protection diode | $I_6$ = −10 mA $I_6$ = 10 mA | | $V_6$ $V_6$ | | −0.8 7.6 | | V V |
| **Input $C_t$** | | 3 | | | | | |
| Internal resistance | | | $R_3$ | | 100 | | Ω |
| **Interval Input** | $R_2$ = 2.7 to 30 kΩ | 2 | | | | | |
| Protection diode | $I_2$ = −10 mA $I_2$ = 30 mA/10 ms | | $V_2$ | | −0.8 7.6 | | V |
| **WASH Input** | $R_5$ = 10 kΩ | 5 | | | | | |
| Switching threshold/ Hysteresis | | | $V_5$ | | −1.4/ −5.4 | | V |
| Protection diode | $I_5$ = −10 mA $I_5$ = 10 mA | | V | | −0.8 7.6 | | V |
| **Switching Characteristics** | $R_4$ = 47 kΩ to 300 kΩ, $I_4$ = −150 µA | | | | | | |
| Interval time | $R_3$ = 0 kΩ $R_3$ = 10 kΩ | | $t_2$ | 3.6 10.8 | 4 12 | 4.4 13.2 | s |
| Prewash delay | | | $t_{del}$ | | 600 | | ms |
| After-wipe-time | $R_4$ = 130 kΩ | 5 | $t_5$ | 4.75 | 5.25 | 5.75 | s |

# 8. Diagrams

**Figure 8-1.** Interval Pause = f (T); $C_t$ = 22 µF
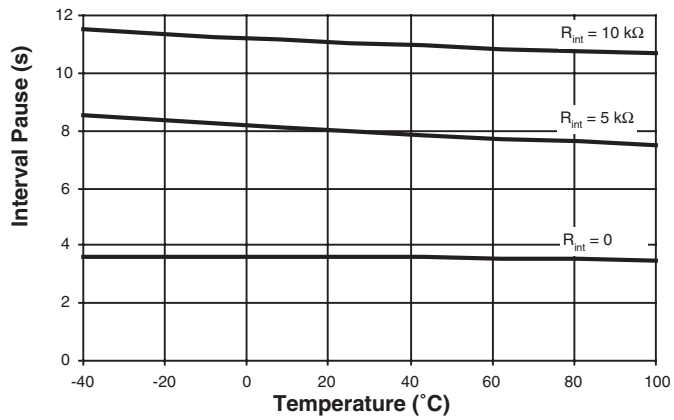


**Figure 8-2.** After-wiping Time = f (T); $C_t$ = 22 µF; $V_{Batt}$ = 8V
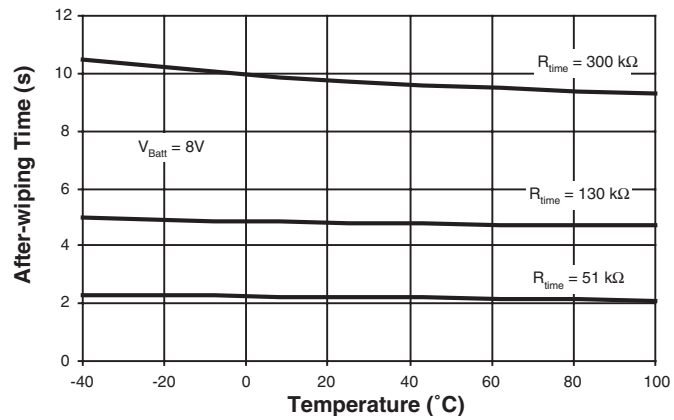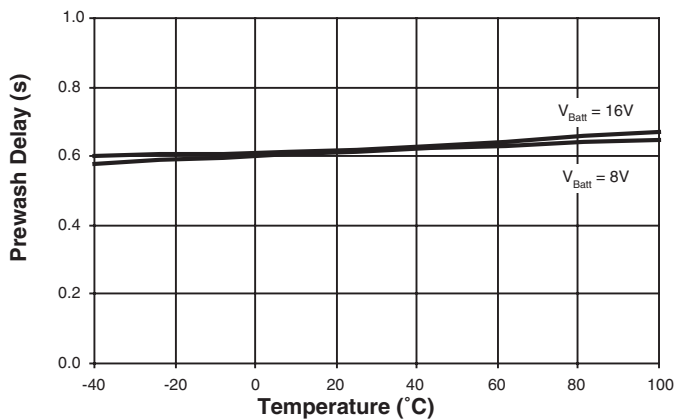


**Figure 8-3.** Prewash Time = f (T); $C_t$ = 22 µF

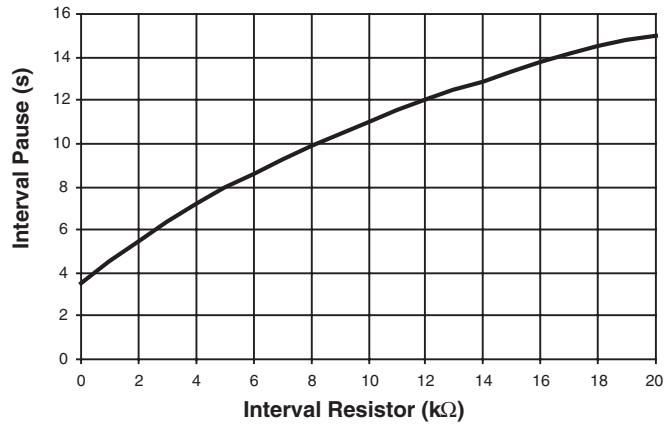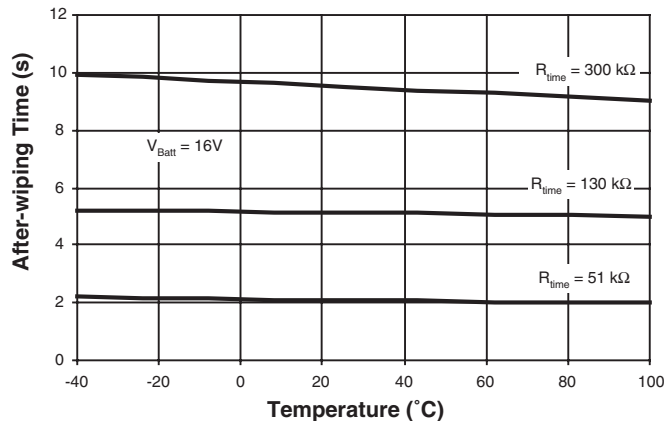**Figure 8-4.** Interval Pause = f ($R_{INT}$); $C_t$ = 22 µF



**Figure 8-5.** After-wiping Time = f (T); $C_t$ = 22 µF; $V_{Batt}$ = 16 V

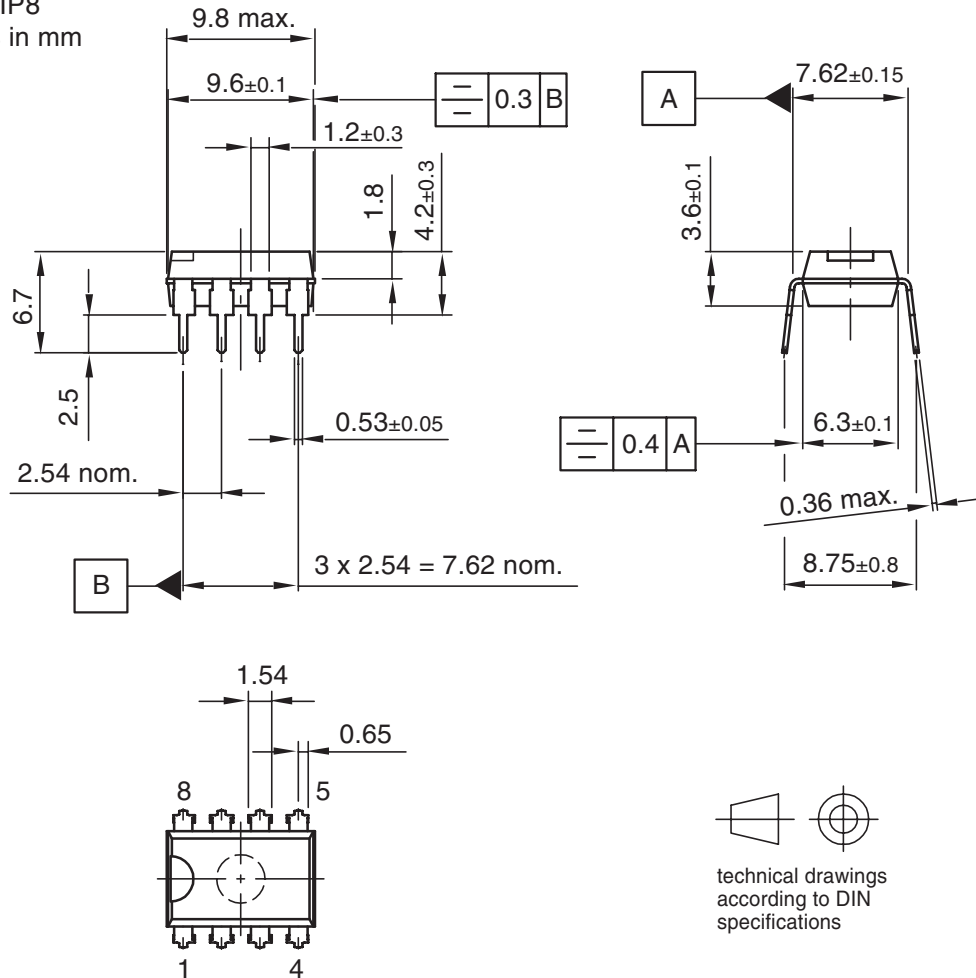## 9. Ordering Information

| Extended Type Number | Package | Remarks |
|---|---|---|
| U641B-MY | DIP8 | Pb-free |
| U641B-MFPY | SO8 | Tubed, Pb-free |
| U641B-MFPG3Y | SO8 | Taped and reeled, Pb-free |

## 10. Package Information

Package: DIP8
Dimensions in mm



Drawing-No.: 6.543-5040.01-4

Issue: 1;  16.01.02

technical drawings according to DIN specifications

Package: SO 8

Dimensions in mm
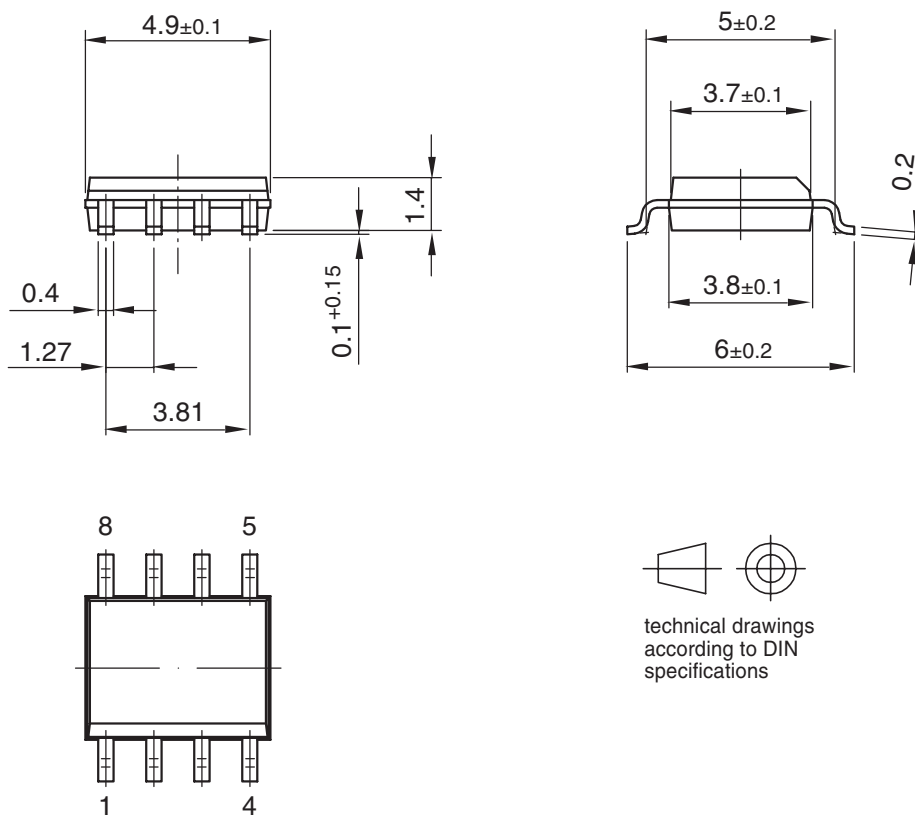


Drawing-No.: 6.541-5031.01-4

Issue: 1;  15.08.06

# 11. Revision History

Please note that the following page numbers referred to in this section refer to the specific revision mentioned, not to this document.

| Revision No. | History |
|---|---|
| 4773C-AUTO-10/07 | • Put datasheet in a new template<br>• Pb-free logo on page 1 deleted<br>• Figure 8-1 "Interval Pause = f (T); $C_t$ = 22 µF" on page 8 changed<br>• Figure 8-2 "After-wiping Time = f (T); $C_t$ = 22 µF; $V_{Batt}$ = 8V" on page 8 changed<br>• Figure 8-3 "After-wiping Time = f (T); $C_t$ = 22 µF; $V_{Batt}$ = 16V" on page 9 changed |
| 4773B-AUTO-09/05 | • Put datasheet in a new template<br>• Pb-free logo on page 1 added<br>• Ordering Information on page 10 changed |

![ATMEL logo]

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