

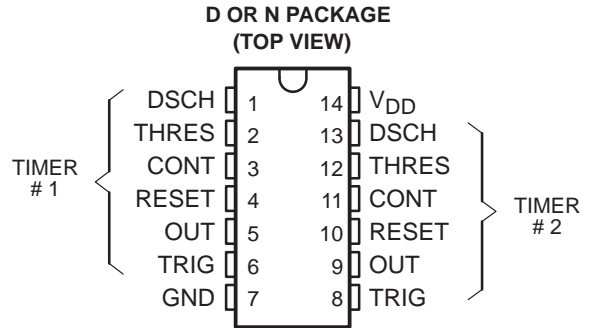
- **Very Low Power Consumption . . . 2 mW**
Typ at $V_{DD} = 5\text{ V}$
- **Capable of Operation in Astable Mode**
- **CMOS Output Capable of Swinging Rail to Rail**
- **High Output-Current Capability**
Sink 100 mA Typ
Source 10 mA Typ
- **Output Fully Compatible With CMOS, TTL, and MOS**
- **Low Supply Current Reduces Spikes During Output Transitions**
- **High-Impedance Inputs . . . $10^{12}\ \Omega$ Typ**
- **Single-Supply Operation From 1 V to 18 V**
- **Functionally Interchangeable With the NE556; Has Same Pinout**

description

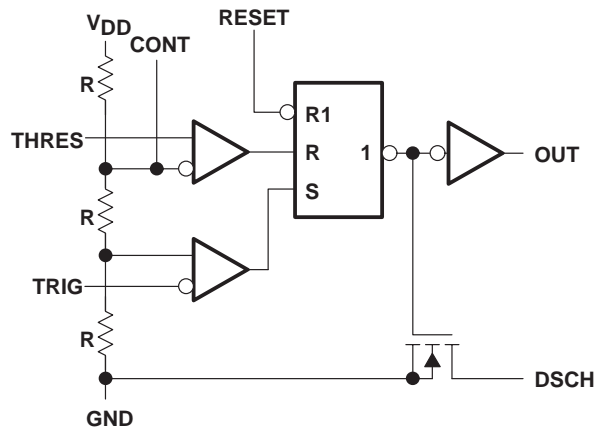
The TLC552 is a dual monolithic timing circuit fabricated using TI LinCMOS™ process, which provides full compatibility with CMOS, TTL, and MOS logic and operation at frequencies up to 2 MHz. Accurate time delays and oscillations are possible with smaller, less-expensive timing capacitors than the NE555 because of the high input impedance. Power consumption is low across the full range of power supply voltages.

Like the NE556, the TLC552 has a trigger level approximately one-third of the supply voltage and a threshold level approximately two-thirds of the supply voltage. These levels can be altered by use of the control voltage terminal. When the trigger input falls below the trigger level, the flip-flop is set and the output goes high. If the trigger input is above the trigger level and the threshold input is above the threshold level, the flip-flop is reset and the output is low. The reset input can override all other inputs and can be used to initiate a new timing cycle. If the reset input is low, the flip-flop is reset and the output is low. Whenever the output is low, a low-impedance path is provided between the discharge terminal and ground.

While the CMOS output is capable of sinking over 100 mA and sourcing over 10 mA, the TLC552 exhibits greatly reduced supply-current spikes during output transitions. This minimizes the need for the large decoupling capacitors required by the NE556.



functional block diagram (each timer)



RESET can override TRIG and THRES.
TRIG can override THRES.

AVAILABLE OPTIONS

| SYMBOLIZATION | | OPERATING TEMPERATURE RANGE | V_T max at 25°C |
|---------------|----------------|-----------------------------|-------------------|
| DEVICE | PACKAGE SUFFIX | | |
| TLC552C | D,N | 0°C to 70°C | 3.8 mV |

The D packages are available taped and reeled. Add the suffix R to the device type when ordering (i.e., TLC552CDR).

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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

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TLC552C DUAL LINCOS™ TIMER

SLFS046 – FEBRUARY 1984 – REVISED MAY 1988

description (continued)

These devices have internal electrostatic discharge (ESD) protection circuits that will prevent catastrophic failures at voltages up to 2000 V as tested under MIL-STD-883C, Method 3105.2. However, care should be exercised in handling these devices as exposure to ESD may result in a degradation of the device parametric performance.

All unused inputs should be tied to an appropriate logic level to prevent false triggering.

The TLC552C is characterized for operation from 0°C to 70°C.

FUNCTION TABLE

| RESET VOLTAGE† | TRIGGER VOLTAGE† | THRESHOLD VOLTAGE† | OUTPUT | DISCHARGE SWITCH |
|----------------|------------------|--------------------|---------------------------|------------------|
| < MIN | Irrelevant | Irrelevant | Low | On |
| > MAX | < MIN | Irrelevant | High | Off |
| > MAX | > MAX | > MAX | Low | On |
| > MAX | > MAX | < MIN | As previously established | |

† For conditions shown as MIN or MAX, use the appropriate value specified under electrical characteristics.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

| | |
|--|------------------------------|
| Supply voltage, V_{DD} (see Note 1) | 18 V |
| Input voltage range (any input) | -0.3 V to V_{DD} |
| Sink current, DSCH or OUT | 150 mA |
| Source current, OUT | 15 mA |
| Continuous total dissipation | See Dissipation Rating Table |
| Operating free-air temperature range | 0°C to 75°C |
| Storage temperature range | -65°C to 150°C |
| Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds | 260°C |

NOTES: 1. All voltage values are with respect to network ground terminal.

DISSIPATION RATING TABLE

| PACKAGE | POWER RATING | DERATING FACTOR | ABOVE T_A |
|---------|--------------|-----------------|-------------|
| D | 950 mW | 7.6 mW/°C | 25°C |
| N | 1150 mW | 9.2 mW/°C | 25°C |

recommended operating conditions

| | MIN | MAX | UNIT |
|---|-----|-----|------|
| Supply voltage, V_{DD} | 1 | 18 | V |
| Operating free-air temperature range, T_A | 0 | 70 | °C |



electrical characteristics at specified free-air temperature, $V_{DD} = 1\text{ V}$

| PARAMETER | TEST CONDITIONS | T_A † | MIN | TYP | MAX | UNIT |
|--|-----------------------------|------------|-------|-------|-------|---------------|
| Threshold voltage level | | 25°C | 0.475 | 0.67 | 0.85 | V |
| | | Full range | 0.45 | | 0.875 | |
| Threshold current | | 25°C | | 10 | | pA |
| | | MAX | | 75 | | |
| Trigger voltage level | | 25°C | 0.15 | 0.33 | 0.425 | V |
| | | Full range | 0.1 | | 1.45 | |
| Trigger current | | 25°C | | 10 | | pA |
| | | MAX | | 75 | | |
| Reset voltage level | | 25°C | 0.4 | 0.7 | 1 | V |
| | | Full range | 0.3 | | 1 | |
| Reset current | | 25°C | | 10 | | pA |
| | | MAX | | 75 | | |
| Control voltage (open-circuit) as a percentage of supply voltage | | MAX | | 66.7% | | |
| Discharge switch on-state voltage | $I_{OL} = 100\ \mu\text{A}$ | 25°C | | 0.02 | 0.15 | V |
| | | Full range | | | 0.2 | |
| Discharge switch off-state current | | 25°C | | 0.1 | | nA |
| | | MAX | | 0.5 | | |
| Low-level output voltage | $I_{OL} = 100\ \mu\text{A}$ | 25°C | | 0.03 | 0.2 | V |
| | | Full range | | | 0.25 | |
| High-level output voltage | $I_{OH} = -10\ \mu\text{A}$ | 25°C | 0.6 | 0.98 | | V |
| | | Full range | 0.6 | | | |
| Supply current | | 25°C | | 30 | 200 | μA |
| | | Full range | | | 300 | |

† Full range (MIN to MAX) is 0°C to 70°C.

TLC552C DUAL LINCMOS™ TIMER

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electrical characteristics at specified free-air temperature, $V_{DD} = 2\text{ V}$

| PARAMETER | TEST CONDITIONS | T_A † | MIN | TYP | MAX | UNIT |
|--|------------------------------------|------------|-------|------|------|---------------|
| Threshold voltage level | | 25°C | 0.95 | 1.33 | 1.65 | V |
| | | Full range | 0.85 | | 1.75 | |
| Threshold current | | 25°C | 10 | | | pA |
| | | MAX | 75 | | | |
| Trigger voltage level | | 25°C | 0.4 | 0.67 | 0.95 | V |
| | | Full range | 0.3 | | 1.05 | |
| Trigger current | | 25°C | 10 | | | pA |
| | | MAX | 75 | | | |
| Reset voltage level | | 25°C | 0.4 | 1.1 | 1.5 | V |
| | | Full range | 0.3 | | 1.8 | |
| Reset current | | 25°C | 10 | | | pA |
| | | MAX | 75 | | | |
| Control voltage (open-circuit) as a percentage of supply voltage | | MAX | 66.7% | | | |
| Discharge switch on-state voltage | $I_{OL} = 1\text{ mA}$ | 25°C | 0.03 | | 0.2 | V |
| | | Full range | 0.25 | | | |
| Discharge switch off-state current | | 25°C | 0.1 | | | nA |
| | | MAX | 0.5 | | | |
| Low-level output voltage | $I_{OL} = 1\text{ mA}$ | 25°C | 0.07 | | 0.3 | V |
| | | Full range | 0.35 | | | |
| High-level output voltage | $I_{OH} = -300\text{ }\mu\text{A}$ | 25°C | 1.5 | 1.9 | | V |
| | | Full range | 1.5 | | | |
| Supply current | | 25°C | 130 | | 500 | μA |
| | | Full range | 800 | | | |

† Full range (MIN to MAX) is 0°C to 70°C.

electrical characteristics at specified free-air temperature, $V_{DD} = 5\text{ V}$

| PARAMETER | TEST CONDITIONS | T_A^\dagger | MIN | TYP | MAX | UNIT |
|--|--------------------------|---------------|------|-------|------|---------------|
| Threshold voltage level | | 25°C | 2.8 | 3.3 | 3.8 | V |
| | | Full range | 2.7 | | 3.9 | |
| Threshold current | | 25°C | | 10 | | pA |
| | | MAX | | 75 | | |
| Trigger voltage level | | 25°C | 1.36 | 1.66 | 1.96 | V |
| | | Full range | 1.26 | | 2.06 | |
| Trigger current | | 25°C | | 10 | | pA |
| | | MAX | | 75 | | |
| Reset voltage level | | 25°C | 0.4 | 1.1 | 1.5 | V |
| | | Full range | 0.3 | | 1.8 | |
| Reset current | | 25°C | | 10 | | pA |
| | | MAX | | 75 | | |
| Control voltage (open-circuit) as a percentage of supply voltage | | MAX | | 66.7% | | |
| Discharge switch on-state voltage | $I_{OL} = 10\text{ mA}$ | 25°C | | 0.14 | 0.5 | V |
| | | Full range | | | 0.6 | |
| Discharge switch off-state current | | 25°C | | 0.1 | | nA |
| | | MAX | | 0.5 | | |
| Low-level output voltage | $I_{OL} = 8\text{ mA}$ | 25°C | | 0.21 | 0.4 | V |
| | | Full range | | | 0.5 | |
| | $I_{OL} = 5\text{ mA}$ | 25°C | | 0.13 | 0.3 | |
| | | Full range | | | 0.4 | |
| | $I_{OL} = 3.2\text{ mA}$ | 25°C | | 0.08 | 0.3 | |
| | | Full range | | | 0.35 | |
| High-level output voltage | $I_{OH} = -1\text{ mA}$ | 25°C | 4.1 | 4.8 | | V |
| | | Full range | 4.1 | | | |
| Supply current | | 25°C | | 340 | 700 | μA |
| | | Full range | | | 1000 | |

† Full range (MIN to MAX) is 0°C to 70°C.

TLC552C DUAL LINCMOS™ TIMER

SLFS046 – FEBRUARY 1984 – REVISED MAY 1988

electrical characteristics at specified free-air temperature, $V_{DD} = 15\text{ V}$

| PARAMETER | TEST CONDITIONS | T_A † | MIN | TYP | MAX | UNIT |
|--|--------------------------|------------|------|-------|-------|------|
| Threshold voltage level | | 25°C | 9.45 | 10 | 10.55 | V |
| | | Full range | 9.35 | | 10.65 | |
| Threshold current | | 25°C | | 10 | | pA |
| | | MAX | | 75 | | |
| Trigger voltage level | | 25°C | 4.65 | 5 | 5.35 | V |
| | | Full range | 4.55 | | 5.45 | |
| Trigger current | | 25°C | | 10 | | pA |
| | | MAX | | 75 | | |
| Reset voltage level | | 25°C | 0.4 | 1.1 | 1.5 | V |
| | | Full range | 0.3 | | 1.8 | |
| Reset current | | 25°C | | 10 | | pA |
| | | MAX | | 75 | | |
| Control voltage (open-circuit) as a percentage of supply voltage | | MAX | | 66.7% | | |
| Discharge switch on-state voltage | $I_{OL} = 100\text{ mA}$ | 25°C | | 0.77 | 1.7 | V |
| | | Full range | | | 1.8 | |
| Discharge switch off-state current | | 25°C | | 0.1 | | nA |
| | | MAX | | 0.5 | | |
| Low-level output voltage | $I_{OL} = 100\text{ mA}$ | 25°C | | 1.28 | 3.2 | V |
| | | Full range | | | 3.6 | |
| | $I_{OL} = 50\text{ mA}$ | 25°C | | 0.63 | 1 | |
| | | Full range | | | 1.3 | |
| | $I_{OL} = 10\text{ mA}$ | 25°C | | 0.12 | 0.3 | |
| | | Full range | | | 0.4 | |
| High-level output voltage | $I_{OH} = -10\text{ mA}$ | 25°C | 12.5 | 14.2 | V | |
| | | Full range | 12.5 | | | |
| | $I_{OH} = -5\text{ mA}$ | 25°C | 13.5 | 14.6 | | |
| | | Full range | 13.5 | | | |
| | $I_{OH} = -1\text{ mA}$ | 25°C | 14.2 | 14.9 | | |
| | | Full range | 14.2 | | | |
| Supply current | | 25°C | | 0.72 | 1.2 | mA |
| | | Full range | | | 1.6 | |

† Full range (MIN to MAX) is 0°C to 70°C.

electrical characteristics at specified free-air temperature, $V_{DD} = 18\text{ V}$

| PARAMETER | TEST CONDITIONS | T_A † | MIN | TYP | MAX | UNIT |
|--|--------------------------|------------|-------|------|------|------|
| Threshold voltage level | | 25°C | 11.4 | 12 | 12.6 | V |
| | | Full range | 10.9 | | 12.7 | |
| Threshold current | | 25°C | | 10 | | pA |
| | | MAX | | 75 | | |
| Trigger voltage level | | 25°C | 5.6 | 6 | 6.4 | V |
| | | Full range | 5.5 | | 6.5 | |
| Trigger current | | 25°C | | 10 | | pA |
| | | MAX | | 75 | | |
| Reset voltage level | | 25°C | 0.4 | 1.1 | 1.5 | V |
| | | Full range | 0.3 | | 1.8 | |
| Reset current | | 25°C | | 10 | | pA |
| | | MAX | | 75 | | |
| Control voltage (open-circuit) as a percentage of supply voltage | | MAX | 66.7% | | | |
| Discharge switch on-state voltage | $I_{OL} = 100\text{ mA}$ | 25°C | | 0.72 | 1.5 | V |
| | | Full range | | | 1.6 | |
| Discharge switch off-state current | | 25°C | | 0.1 | | nA |
| | | MAX | | 0.5 | | |
| Low-level output voltage | $I_{OL} = 3.2\text{ mA}$ | 25°C | | 0.04 | 0.3 | V |
| | | Full range | | | 0.35 | |
| High-level output voltage | $I_{OH} = -1\text{ mA}$ | 25°C | 17.3 | 17.9 | | V |
| | | Full range | 17.3 | | | |
| Supply current | | 25°C | | 0.84 | 1.2 | mA |
| | | Full range | | | 1.6 | |

† Full range (MIN to MAX) is 0°C to 70°C.

operating characteristics, $V_{DD} = 5\text{ V}$, $T_A = 25^\circ\text{C}$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|-----|-----|-----|------|
| Initial error of timing interval‡ | $V_{DD} = 5\text{ V to }15\text{ V}$, $C_T = 0.1\ \mu\text{F}$, See Note 2 | | 1% | 3% | |
| Supply voltage sensitivity of timing interval | | | 0.1 | 0.5 | %/V |
| Output pulse rise time | $R_L = 10\text{ M}\Omega$, $C_L = 10\text{ pF}$ | | 20 | 75 | ns |
| Output pulse fall time | | | 15 | 60 | |
| Maximum frequency in astable mode | $R_A = 470\ \Omega$, $C_T = 200\text{ pF}$, $R_B = 200\ \Omega$, See Note 2 | 1.2 | 2.8 | | MHz |

‡ Timing interval error is defined as the difference between the measured value and the nominal value of a random sample.

NOTE 2: R_A , R_B , and C_T are as defined in Figure 1.

APPLICATION INFORMATION

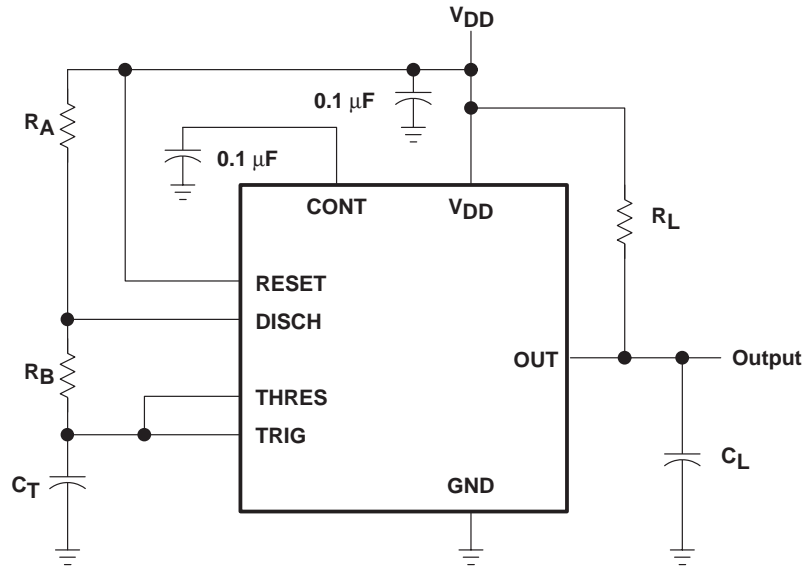


Figure 1. Circuit for Astable Operation

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| TLC552CD | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TLC552C | Samples |
| TLC552CDR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TLC552C | Samples |
| TLC552CN | ACTIVE | PDIP | N | 14 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TLC552CN | Samples |

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBsolete: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "-" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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TAPE AND REEL INFORMATION



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-----------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| TLC552CDR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|-----------|--------------|-----------------|------|------|-------------|------------|-------------|
| TLC552CDR | SOIC | D | 14 | 2500 | 350.0 | 350.0 | 43.0 |

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