National Semiconductor

June 1986

# DS8627/DS8628 130/225 MHz Low Power Prescalers

## General Description

The DS8627 and DS8628 are low power fixed ratio prescalers which divide by 24 and 20, respectively. The inputs can be driven either single or double-ended and they are buffered, providing 40/100 mVrms input sensitivity. The output provided is open-collector and is capable of interfacing with TTL and CMOS.

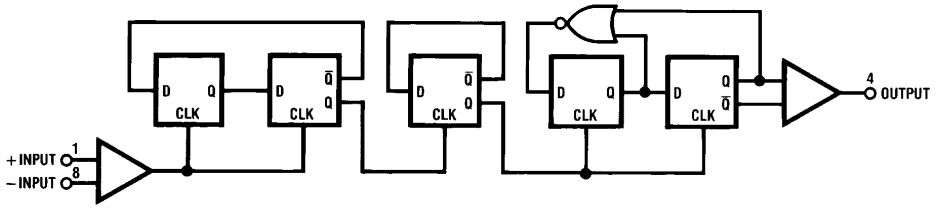
The device can be used in phase-locked loop applications such as FM radio or other communications bands to prescale the input frequency down to a more usable level. A digital frequency display system can also be derived separately or in conjunction with a phase-locked loop, and it can extend the useful range of many inexpensive frequency counters to 225 MHz.

## Features

- Input frequency: 130 MHz (-4, -3); 225 mHz (-2, std)
- Low power: 10 mA (-4, -2); 7 mA (-3, std)
- Input sensitivity: 100 mVrms (-4, -3); 40 mVrms (-2, std)

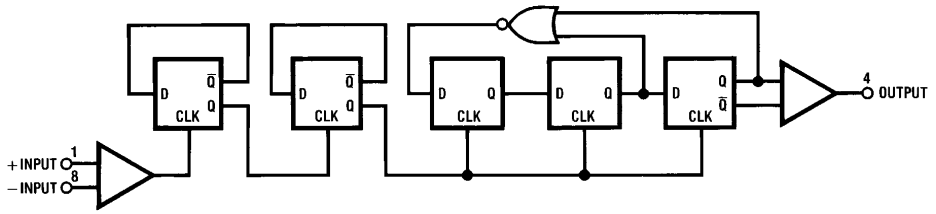
## Logic and Connection Diagrams

**DS8627 (÷ 24)**



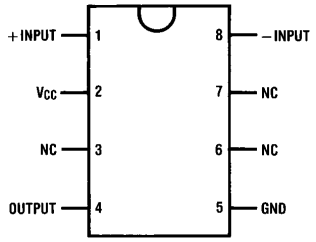

TL/F/5009–1

**DS8628 (÷ 20)**




TL/F/5009–2

**Dual-In-Line Package**




TL/F/5009–3

**Top View**
**Order Number DS8627N or DS8628N (-4, -3, -2)**
**See NS Package Number N08E**

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## Absolute Maximum Ratings (Note 1)

**If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.**

| | |
|---|---|
| $V_{CC}$ Supply Voltage | 7V |
| $V_{IN}$ Input Voltage | $< V_{CC}$ |
| Open-Collector Output Voltage | 7V |
| Operating Free Air Temperature Range | −30°C to +70°C |
| Storage Temperature Range | −65°C to +150°C |

## Recommended Operating Conditions

| Symbol | Parameter | Conditions | DS8627-4 DS8628-4 | | DS8627-3 DS8628-3 | | DS8627-2 DS8628-2 | | DS8627 DS8628 | | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Max | Min | Max | Min | Max | Min | Max | |
| $V_{CC}$ | Supply Voltage | | 4.5 | 5.5 | 4.5 | 5.5 | 4.5 | 5.5 | 4.5 | 5.5 | V |
| $f_{MAX}$ | Toggle Frequency | $V_{IN}$ = 100 mVrms | 20 | 130 | 20 | 130 | 20 | 225 | 20 | 225 | MHz |
| $V_{IN}$ | Input Signal Amplitude | | 100 | 300 | 100 | 300 | 40 | 300 | 40 | 300 | mVrms |
| $V_{SLW}$ | Slew Rate | | 20 | | 20 | | 20 | | 20 | | V/μs |
| $I_{OL}$ | Low Level Output Current | | | 3 | | 3 | | | | 3 | mA |

## DC Electrical Characteristics (Notes 2 and 3)

| Symbol | Parameter | Conditions | DS8627-4 DS8628-4 | | DS8627-3 DS8628-3 | | DS8627-2 DS8628-2 | | DS8627 DS8628 | | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Max | Min | Max | Min | Max | Min | Max | |
| $I_{CEX}$ | Open-Collector High Level Output | Output = 5.5V | | 100 | | 100 | | 100 | | 100 | μA |
| $V_{OL}$ | Low Level Output Voltage | $V_{CC}$ = 4.5V, $I_{OL}$ = 3 mA | | 0.4 | | 0.4 | | 0.4 | | 0.4 | V |
| $I_{CC}$ | Supply Current | $V_{CC}$ = 5.5V | | 10 | | 7 | | 10 | | 7 | mA |

## AC Electrical Characteristics $V_{CC}$ = 5V ±10%, $T_A$ = −30°C to +70°C

| Symbol | Parameter | Conditions | Min | Max | Units |
|---|---|---|---|---|---|
| $R_{IN}$ | AC Input Resistance | $V_{IN}$ = 100 MHz and 50 mVrms | 1.0 | | kΩ |
| $C_{IN}$ | Input Capacitance | | 3 | 10 | pF |

**Note 1:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

**Note 2:** Unless otherwise specified min/max limits apply across the −30°C to +70°C temperature range.

**Note 3:** All currents into device pins are shown as positive, out of device pins as negative, all voltages referenced to ground unless otherwise noted. All values shown as max or min on absolute value basis.

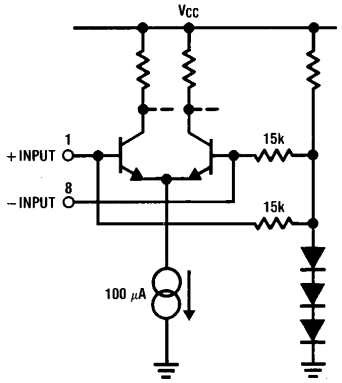
## Application Hints

### OPERATING NOTES

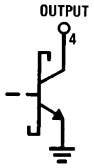
The signal source is usually capacitively coupled to the input. At higher frequencies a 0.001 $\mu$F input capacitor is usually sufficient, with larger values used at the lower frequencies. If the input signal is likely to be interrupted, it may be desirable to connect a 100 k$\Omega$ resistor between one input and ground to stabilize the device. In the single-ended mode, it is preferable to connect the resistor to the unused input. In the differential mode, the resistor can be connected to either input. The addition of the 100 k$\Omega$ pull-down resistor causes a loss of input sensitivity, but prevents circuit oscillations under no signal (open circuit) conditions. In addition, in the single ended mode, a capacitor of 0.001 $\mu$F should be connected between the unused input and the ground plane to provide a good high frequency bypass. The capacitor should be made larger for lower frequencies.

The input waveform may be sinusoidal, but below about 20 MHz the operation of the circuit becomes dependent on the slew rate of the input rather than amplitude. A square wave input with a slew rate of greater than 20 V/$\mu$s will permit correct operation down to lower frequencies, provided the proper input coupling capacitor is provided.

## Schematic Diagrams

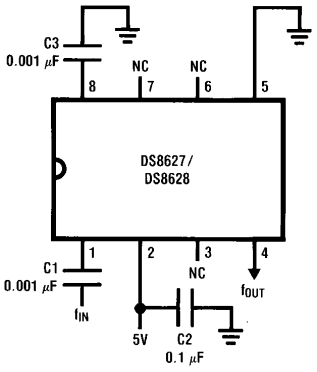



TL/F/5009–4



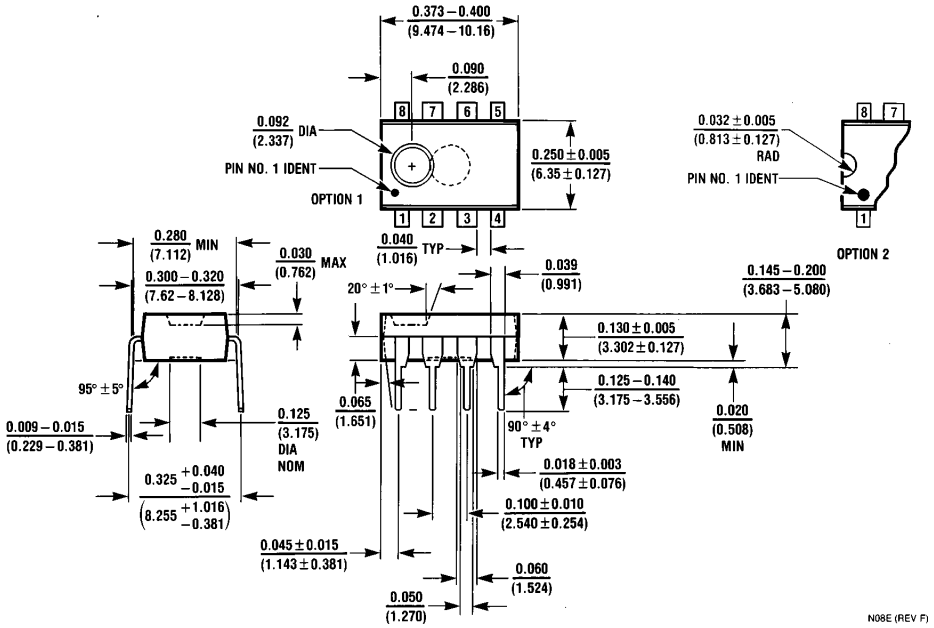

TL/F/5009–5

## Typical Application




TL/F/5009–6

## Physical Dimensions inches (millimeters)




**Molded Dual-In-Line Package (N)**
**Order Number DS8627N or DS8628N (-4, -3, -2)**
**NS Package Number N08E**

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