# HIP9020

## Programmable Quad Buffer with Pre and Post Scaler Dividers

October 1993

### Features

- **Sine Wave Speedometer Input**
- **Input Limiting . . . . . ±0.25V to ±100V (with 40kΩ)**
- **Over Voltage Protection**
- **Current Limiting**
- **Programmable Prescaler 1, 6 - 11**
- **Post Scaler Frequency Divide by 1 or 2**
- **Drivers with 15mA/24V Capability**
- **Outputs 4 Separate Square Waves**
- **Internal Regulator and Bias Source**
- **0kHz to 6kHz Input Signal Range**
- **-40°C to +125°C Operating Temperature Range**

### Applications

- **Prescaler**
- **Buffer/Limiter**
- **Signal Interface**
- **Automotive Speedometer**
- **Automotive Speed Control**
- **Automotive Tachometer**

### Ordering Information

| PART NUMBER | TEMPERATURE RANGE | PACKAGE |
|---|---|---|
| HIP9020AP | -40°C to +125°C | 14 Lead Plastic DIP |
| HIP9020AB | -40°C to +125°C | 20 Lead Plastic SOIC (W) |

### Description

The HIP9020 is a Vehicle Speed Sensor ($V_{SS}$) Buffer IC. It receives sinusoidal vehicle speed information from a speedometer signal source. The signal is amplified and squared before frequency processing is done. The circuit provides pin programmable integer prescaler and postscaler dividers to scale the output frequencies. The prescaler divider output of the frequency doubler is mode selected for 1 and 6 through 11. The postscaler mode is selected to the Output 3 with a divide by 1 or 2. The four $V_{OX}$ outputs are open collector drivers.

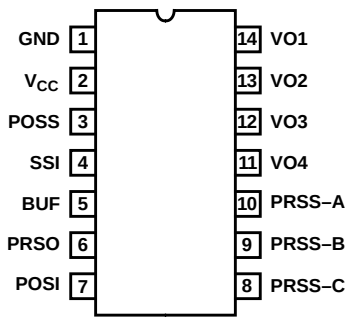
Speed Sensor Input (SSI) - When current limited with a 40kΩ source impedance from the vehicle speed sensor, the SSI input is capable of functioning over a wide range of input signal. The limiter and squaring action is derived from the zero crossing of the input signal. The signal is converted into a square wave with a controlled hysteresis squaring amplifier.

Power Supply - The power supply pin 2 input is intended to operate from a 5.0V ± 0.3V source. The internal reference sources are derived from a temperature stable bandgap; including an optional 5.7V shunt regulator which may be used as shown in Figure 2.

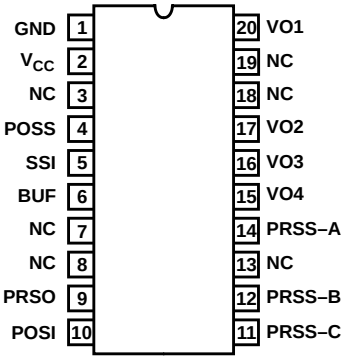
Output Drivers - Each output driver is an open NPN collector with a zener clamp level of typically 35V and short circuit current limiting. Each output is capable of sinking 15mA of current.

### Pinouts

**HIP9020 (PDIP)**
TOP VIEW




**HIP9020 (SOIC)**
TOP VIEW

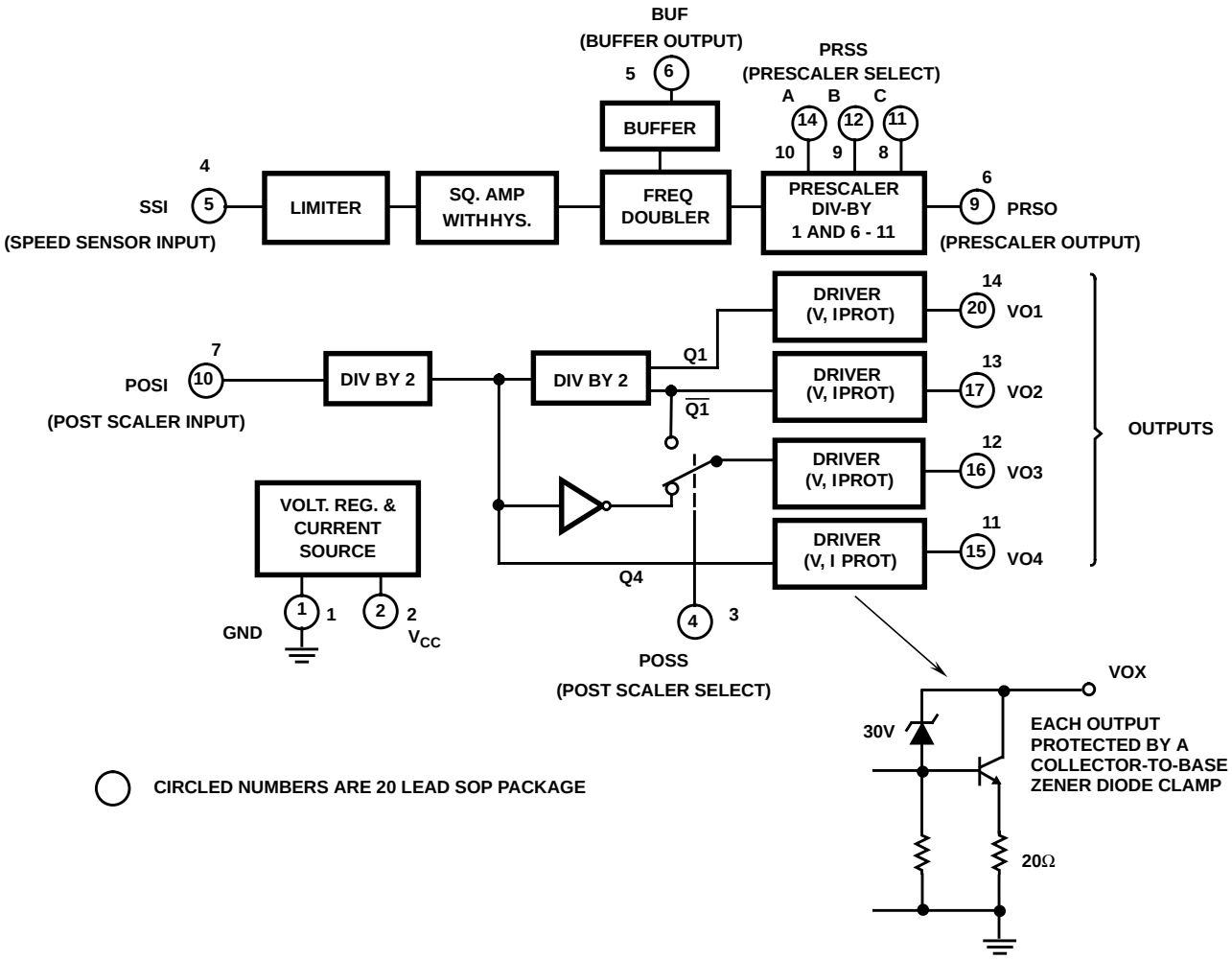



CAUTION: These devices are sensitive to electrostatic discharge; follow proper IC Handling Procedures.



File Number **2790.2**

## Programmable Quad Buffer Functional Block Diagram




**LOGIC SELECT FOR INPUT (SSI) TO OUTPUT (VOX) DIV-BY NUMBER**

| PRSS-A | PRSS-B | PRSS-C | VO1, VO2, VO3 (POSS HIGH) DIV-BY | VO4 (POSS HIGH) DIV-BY | VO1, VO2 (POSS LOW) DIV-BY | VO3, VO4 (POSS LOW) DIV-BY |
|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 2 | 1 | 2 | 1 |
| 0 | 0 | 1 | 12 | 6 | 12 | 6 |
| 0 | 1 | 0 | 14 | 7 | 14 | 7 |
| 0 | 1 | 1 | 16 | 8 | 16 | 8 |
| 1 | 0 | 0 | 18 | 9 | 18 | 9 |
| 1 | 0 | 1 | 20 | 10 | 20 | 10 |
| 1 | 1 | 0 | 22 | 11 | 22 | 11 |

## Absolute Maximum Ratings

Supply Voltage to Pin 2, $V_{CC}$ (Shunt Regulator) . . . . . +24$V_{DC}$ Max through 300Ω and a Series Diode (1N4005 or Equiv.) or +5.3V Max Direct Voltage Supply Source to $V_{CC}$
Output Voltage (Sustained) to V01,V02,V03,V04 . . . . . +24V
Output Load Current (Sink) . . . . . +15mA
Input Voltage (Through 40kΩ, See Figure 1) . . . . . ±100V

## Thermal Information

| Thermal Resistance | $\theta_{JA}$ |
|---|---|
| Plastic DIP and SOIC Package | 90°C/W |
| Maximum Package Power Dissipation up to +85°C | 720mW |
| Derate above 85°C | 11.1mW/°C |
| Operating Temperature Range | -40°C to +125°C |
| Storage Temperature Range | -65°C to +150°C |
| Maximum Junction Temperature | +150°C |
| Lead Temperature (Soldering 10s) | +265°C |

*CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.*

## Electrical Specifications

$T_A$ = -40°C to +125°C, $V_{CC}$ = 5V ± 0.3V, Unless Otherwise Specified

| PARAMETERS | SYMBOL | TEST CONDITIONS | MIN | MAX | UNITS |
|---|---|---|---|---|---|
| Power Supply ($V_{CC}$) | | | | | |
| Supply Current | $I_{CC}$ | | - | 12 | mA |
| SSI Input (Test Point - T.P.A., See Figure 1) | | | | | |
| Max. Operating Frequency | $f_{S(MAX)}$ | 40kΩ Source, 0.01µF Input Shunt | - | 6 | kHz |
| Input Signal Range | | 40kΩ Source, 0.01µF Input Shunt | ±0.25 | ±100 | V |
| Input Hysteresis | | 40kΩ Source, 0.01µF Input Shunt | 0.15 | 0.45 | V |
| Input Bias Current | | 40kΩ Source, 0.01µF Input Shunt | -0.5 | +0.5 | µA |
| Other Inputs (PRSS, POSS, POSI - See Function Block Diagram) | | | | | |
| Input Low Voltage | $V_{IL}$ | | - | 1.5 | V |
| Input High Voltage | $V_{IH}$ | | 3.5 | - | V |
| Input Current High | $I_{IH}$ | $V_{CC}$ = $V_{IN}$ = 4.7V | - | 10 | µA |
| Input Current Low | $I_{IL}$ | $V_{CC}$ = 5.3; $V_{IN}$ = 0.4V | -10 | - | µA |
| PRSO Output | | | | | |
| Output Voltage Low | $V_{OL}$ | $V_{CC}$ = 5V | - | 0.4 | V |
| Output Voltage High | $V_{OH}$ | $V_{CC}$ = 5V | 4.6 | - | V |
| Driver Outputs (V01, V02, V03, V04) | | | | | |
| Output Clamp Voltage | | $I_{CC}$ = 1mA | 24 | 45 | V |
| Output Current Limit | | $I_{SC}$ Current Pulsed | 15 | 30 | mA |
| Output Leakage | | $V_{OUT}$ = 24V | - | 30 | µA |
| Output Saturation Voltage | $V_{SAT}$ | $I_{OUT}$ = 15mA | - | 1 | V |
| | | $I_{OUT}$ = 1mA | - | 0.4 | V |

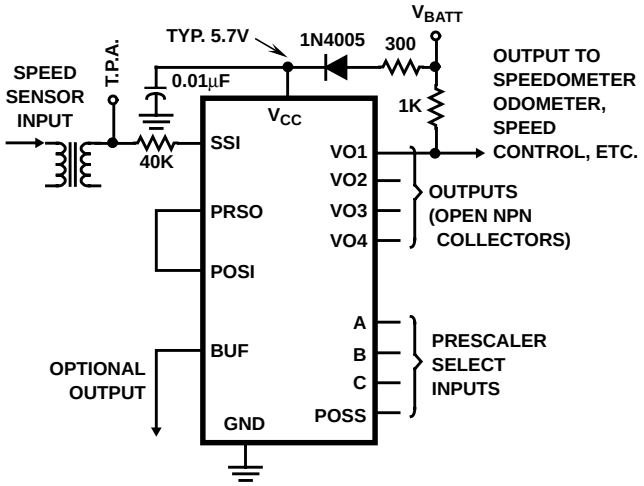



FIGURE 1. TYPICAL AUTOMOTIVE APPLICATION CIRCUIT

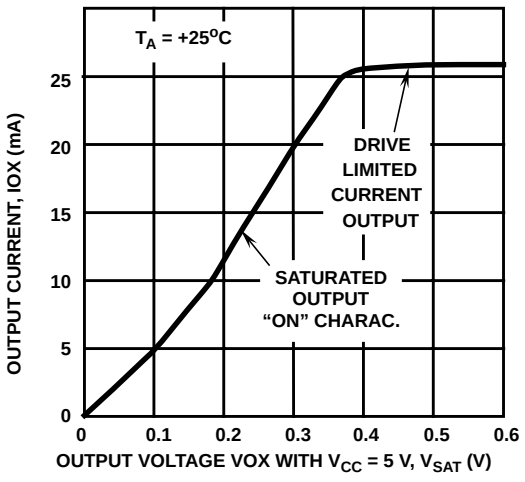



FIGURE 2. TYPICAL OUTPUT DRIVER SATURATED "ON" CHARACTERISTIC

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