

December 1994

## DESCRIPTION

The SSI 32R2320/21/22/23/24 are BiCMOS monolithic integrated circuit designed for use with two-terminal recording heads. They provide a low noise read amplifier, write current control, and data protection circuitry for up to four channels. This family of devices has been designed to support servo bank write, TTL or ECL write data input, and write unsafe output through various bond options. In addition, versions of the devices are available with or without internal damping resistors. When configured with damping resistors, the resistors are switched in during write mode and switched out during read mode. Power supply fault protection is provided by disabling the write current generator during power sequencing. System write to read recovery time is significantly improved by making the read channel outputs high impedance.

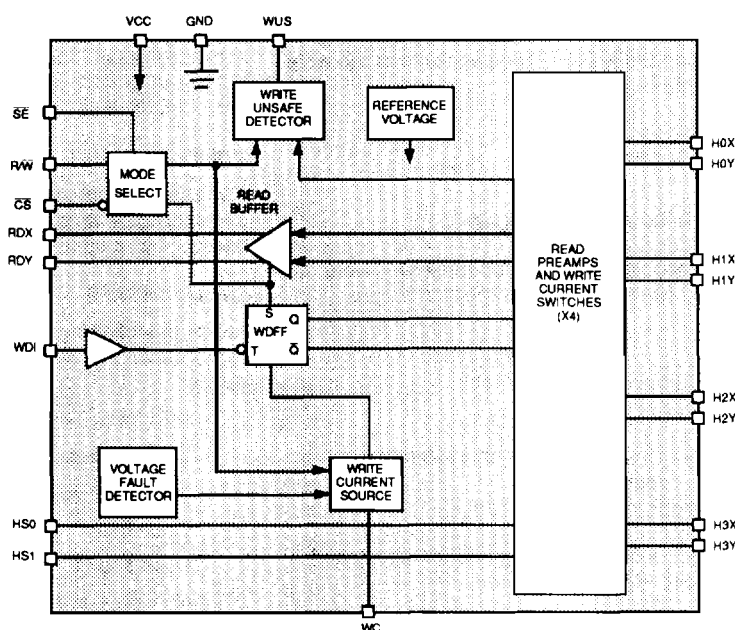
The SSI 32R2320/21/22/23/24 require a single 3 to 5.5V power supply and are available in a variety of packages. They are hardware compatible with the SSI 32R4610A and SSI 32R2020R read/write devices.

## FEATURES

- **+3V - 5.5V voltage supply**
- **Low power**
  - PD = 73 mW read mode (Nom) (@3.3V supply)
  - PD = 75  $\mu$ W Idle (Max @ Vcc = 3.3V)
- **High Performance:**
  - Read mode gain = 250 V/V
  - Input noise = 0.5 nV/ $\sqrt{\text{Hz}}$  (Nom)
  - Input capacitance = 9 pF (Nom)
  - Write current range = 2-30 mA
- **Bond options for:**
  - Self switching damping resistance
  - Servo bank write
  - TTL or ECL write data input
  - Write unsafe detection
- **Power supply fault protection**

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## BLOCK DIAGRAM



# SSI 32R2320/21/22/23/24

## 3V, 5V, 4-Channel

## 2-Terminal Read/Write Device

### FUNCTIONAL DESCRIPTION

The SSI 32R2320/21/22/23/24 have the ability to address up to 4 two-terminal heads and provide write drive or read amplification. Mode control and head selection are described in Tables 1 and 2. The TTL inputs  $\overline{R/W}$ ,  $\overline{CS}$  and DMP have internal pull-up resistors. The TTL inputs HS0 and HS1 have internal pull down resistors.

**TABLE 1: Mode Select**

| $\overline{CS}$ | $\overline{R/W}$ | $\overline{SE}$ | Mode        |
|-----------------|------------------|-----------------|-------------|
| 0               | 0                | 1               | Write       |
| 0               | 1                | X               | Read        |
| 1               | 0                | X               | Idle        |
| 1               | 1                | X               | Idle        |
| 0               | 0                | 0               | Servo Write |

### WRITE MODE

Taking both  $\overline{CS}$  and  $\overline{R/W}$  low selects write mode which configures the device as a current switch and activates the Write Unsafe (WUS) detector circuitry. Head current is toggled between the X and Y side of the selected head on each high to low transition of the Write Data Input (WDI). Note that a preceding read to write transition or idle to write transition initializes the write Data Flip-Flop to pass write current into the "X" side of the device. In this case, the Y side is higher potential than the X side. The magnitude of the write current (0-pk) is given by:

$$I_w = A_w \cdot \frac{V_{wc}}{R_{wc}} = \frac{K}{R_{wc}}$$

where  $A_w$  is the write current gain.

$R_{wc}$  is connected from pin WC to GND. Note the actual head current  $I_x, y$  is given by:

$$I_{x, y} = \frac{I_w}{1 + R_h/R_d}$$

where:

$R_h$  = Head resistance plus external wire resistance

$R_d$  = Damping resistance

In write mode a 350Ω damping resistor is switched in across the  $H_x, H_y$  ports.

**TABLE 2: Head Select**

| HS1 | HS0 | Head |
|-----|-----|------|
| 0   | 0   | 0    |
| 0   | 1   | 1    |
| 1   | 0   | 2    |
| 1   | 1   | 3    |

### SERVO WRITE MODE

This mode allows for writing to multiple channels at once, which is useful during servo formatting. When this mode is activated the write driver will drive all channels simultaneously.

The servo write mode can be enabled by either using the  $\overline{SE}/SE$  logic input or the WUS/SE bi-directional pin depending on the device option (table 1). Both the  $\overline{CS}$  and  $\overline{R/W}$  inputs have to be low to activate servo bank write. When using the WUS/SE pin to enable servo write, the pin voltage is driven to 1.5V (nom) above VCC. The  $\overline{SE}$  is a TTL active low input; the SE is a TTL active high input. The WUS/SE pin voltage should not exceed VCC + 2V or +7V, whichever is greater. The servo enable delay is about 1μs typical.

### VOLTAGE FAULT

A voltage fault detection circuit improves data security by disabling the write current generator during a voltage fault or power startup in read or write mode.

### WRITE UNSAFE

Any of the following conditions will be indicated as a high level on the Write Unsafe, WUS, open collector output.

- WDI frequency too low
- Device in read mode
- Device not selected
- Open head
- Head short to ground
- No write current

# SSI 32R2320/21/22/23/24

## 3V, 5V, 4-Channel

### 2-Terminal Read/Write Device

WUS is valid in the write current/head characteristic region defined by  $5 < I_h \cdot L_h < 50 \text{ mA} \cdot \mu\text{H}$ , and  $1 < R_h < 1.25/I_h$ . After the fault condition is removed, one negative transition on WDI is required to clear WUS.

#### READ MODE

The read mode configures the SSI 32R2320RZ as a low noise differential amplifier and deactivates the write current generator. The damping resistor is switched out of the circuit allowing a high impedance input to the read amplifier. The RDX and RDY output are driven by emitter followers. They should be AC coupled to the load. The HnX, HnY inputs are non-inverting to the RDX, RDY outputs.

Note that in idle or write mode, the read amplifier is deactivated and RDX, RDY outputs become high impedance. This facilitates multiple R/W applications (wired-OR RDX, RDY) and minimizes voltage change when switching from write to read mode. Note also that the write current source is deactivated for both the read and idle mode.

#### IDLE MODE

Taking  $\overline{\text{CS}}$  high selects the idle mode which switches the RDX and RDY outputs into a high impedance state and deactivates the device. Power consumption in this mode is held to a minimum at  $\overline{\text{CS}}$ , input is greater than ( $V_{cc} - 0.3V$ ).

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#### PIN DESCRIPTION

| NAME                           | TYPE | DESCRIPTION                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HS0, HS1 †                     | I    | Head Select: selects one of four heads                                                                                                                                                                                                                                                                                                                   |
| $\overline{\text{CS}}$         | I    | Chip Select: a high inhibits the chip                                                                                                                                                                                                                                                                                                                    |
| R/W †                          | I    | Read/Write: a high selects read mode                                                                                                                                                                                                                                                                                                                     |
| WUS †                          | O    | Write Unsafe: a high indicates an unsafe writing condition                                                                                                                                                                                                                                                                                               |
| WDI/ $\overline{\text{WDI}}$ † | I    | Write Data Input: On TTL versions, a negative transition on WDI changes the direction of the current in the recording head. On ECL versions, a positive transition on the WDI (negative transition on $\overline{\text{WDI}}$ ) changes the direction of the current in the recording head. $\overline{\text{WDI}}$ is only present on the ECL versions. |
| H0X - H3X;<br>H0Y - H3Y        | I/O  | X, Y Head Connections                                                                                                                                                                                                                                                                                                                                    |
| RDX, RDY†                      | O    | X, Y Read Data: differential read data output                                                                                                                                                                                                                                                                                                            |
| WC                             |      | Write Current: used to set the magnitude of the write current                                                                                                                                                                                                                                                                                            |
| VCC                            | I    | Power Supply                                                                                                                                                                                                                                                                                                                                             |
| GND                            | I    | Ground                                                                                                                                                                                                                                                                                                                                                   |
| $\overline{\text{SE}}$ /SE     | I    | Servo Enable: A low input on $\overline{\text{SE}}$ , or a high input on SE (32R2322 only) enables the servo bank write mode when $\overline{\text{CS}}$ and R/W are both low.                                                                                                                                                                           |
| WUS/SE                         | I    | Write Unsafe/Servo Enable (32R2323/24 only): Under normal operation, a high level output on this pin indicates a write unsafe condition. When this pin is driven externally above VCC and $\overline{\text{CS}}$ and R/W are both low, servo write mode is activated.                                                                                    |
| DMP                            | I    | Damping Resistor Enable (32R2322 only): A high (or open) level on this input enables the switchable damping resistor. A low level on this input disables the damping resistor.                                                                                                                                                                           |

† When more than one R/W device is used, signals can be wire OR'ed

# SSI 32R2320/21/22/23/24

## 3V, 5V, 4-Channel

## 2-Terminal Read/Write Device

### ELECTRICAL SPECIFICATIONS

Recommended conditions apply unless otherwise specified.

### ABSOLUTE MAXIMUM RATINGS

Operation above maximum ratings may permanently damage the device.

| PARAMETER                |                  | RATING                |
|--------------------------|------------------|-----------------------|
| DC Supply Voltage        | VCC              | -0.3 to +7 VDC        |
| Write Current            | I <sub>w</sub>   | 30 mA                 |
| Digital Input Voltage    | V <sub>in</sub>  | -0.3 to VCC1 +0.3 VDC |
| Head Port Voltage        | V <sub>H</sub>   | -0.3 to VCC2 +0.3 VDC |
| WUS pin Voltage          | V <sub>wus</sub> | +7 VDC                |
| Output Current: RDX, RDY | I <sub>O</sub>   | -10 mA                |
|                          | WUS              | +8 mA                 |
| Storage Temperature      | T <sub>stg</sub> | -55 to +150°          |

### RECOMMENDED OPERATING CONDITIONS

| PARAMETER                                            |                | RATING               |
|------------------------------------------------------|----------------|----------------------|
| DC Supply Voltage                                    |                | 3.3 ±10%, 5 ±10% VDC |
| Recommended Head Load Range                          | L <sub>h</sub> | 0.3 - 5 μH           |
| WUS Operating Range, I <sub>w</sub> • L <sub>h</sub> |                | 5 - 50 mA • μH       |
| Head Differential Load Capacitance                   |                | 15 pF max            |
| Ambient Operating Temperature*                       | T <sub>a</sub> | 0 - 70°C             |

\* Derating is required when in Servo write mode.

### DC CHARACTERISTICS

Recommended operating conditions apply unless otherwise specified.

| PARAMETER          | CONDITIONS                      | MIN | NOM                    | MAX                     | UNIT |
|--------------------|---------------------------------|-----|------------------------|-------------------------|------|
| VCC Supply Current | Vcc = 3.3V ±10% read            |     | 22                     | 30                      | mA   |
|                    | Vcc = 3.3V ±10% write           |     | 5+1.2 • I <sub>w</sub> | 9+1.4 • I <sub>w</sub>  | mA   |
|                    | Vcc = 3.3V ±10% servo           |     | 6+4.5 • I <sub>w</sub> | 11+4.7 • I <sub>w</sub> | mA   |
|                    | Vcc = 3.3V ±10% idle, CS = Vcc  |     | 3                      | 20                      | μA   |
|                    | Vcc = 3.3V ±10% idle, CS = 2.7V |     | 30                     | 200                     | μA   |
| Power Dissipation  | Vcc = 3.3V ±10% read            |     | 73                     | 110                     | mW   |
|                    | Vcc = 3.3V ±10% write           |     | 17+4 • I <sub>w</sub>  | 33+5 • I <sub>w</sub>   | mW   |
|                    | Vcc = 3.3V ±10% servo           |     | 20+15 • I <sub>w</sub> | 40+17 • I <sub>w</sub>  | mW   |
|                    | Vcc = 3.3V ±10% idle, CS = Vcc  |     | 9                      | 75                      | μW   |
|                    | Vcc = 3.3V ±10% idle, CS = 2.7V |     | 100                    | 730                     | μW   |

**SSI 32R2320/21/22/23/24**  
**3V, 5V, 4-Channel**  
**2-Terminal Read/Write Device**

**DC CHARACTERISTICS (CONTINUED)**

| PARAMETER          | CONDITIONS                                 | MIN | NOM        | MAX         | UNIT |
|--------------------|--------------------------------------------|-----|------------|-------------|------|
| VCC Supply Current | Vcc = 5V ±10% read                         |     | 23         | 32          | mA   |
|                    | Vcc = 5V ±10% write                        |     | 6+1.2 • Iw | 10+1.3 • Iw | mA   |
|                    | Vcc = 5V ±10% servo                        |     | 7+4.4 • Iw | 12+4.7 • Iw | mA   |
|                    | Vcc = 5V ±10% idle, $\overline{CS}$ = Vcc  |     | 5          | 30          | μA   |
|                    | Vcc = 5V ±10% idle, $\overline{CS}$ = 2.7V |     | 250        | 450         | μA   |
| Power Dissipation  | Vcc = 5V ±10% read                         |     | 115        | 180         | mW   |
|                    | Vcc = 5V ±10% write                        |     | 30+6 • Iw  | 55+7 • Iw   | mW   |
|                    | Vcc = 5V ±10% servo                        |     | 35+22 • Iw | 66+26 • Iw  | mW   |
|                    | Vcc = 5V ±10% idle, $\overline{CS}$ = Vcc  |     | 0.03       | 0.17        | mW   |
|                    | Vcc = 5V ±10% idle, $\overline{CS}$ = 2.7V |     | 1.25       | 2.5         | mW   |

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**DIGITAL INPUTS**

|                        |     |                                                                                                         |        |       |          |     |
|------------------------|-----|---------------------------------------------------------------------------------------------------------|--------|-------|----------|-----|
| Input Low voltage      | VIL | $\overline{CS}$ , $\overline{R/\overline{W}}$ , $\overline{WDI}$ , $\overline{HSn}$ and $\overline{SE}$ |        |       | 0.8      | VDC |
| Input High Voltage     | VIH | $\overline{CS}$ , $\overline{R/\overline{W}}$ , $\overline{WDI}$ , $\overline{HSn}$ and $\overline{SE}$ | 2      |       |          | VDC |
| Input Low Current      |     | VIL = 0.4 Vcc = 3.6V                                                                                    | -0.4   | -0.09 |          | mA  |
|                        |     | $\overline{CS}$ , $\overline{R/\overline{W}}$ , $\overline{WDI}$ , $\overline{SE}$ Vcc = 5.5V           | -0.4   | -0.13 |          | mA  |
| Input High Current     |     | VIH = 2.7V $\overline{CS}$ , $\overline{R/\overline{W}}$ , $\overline{WDI}$ , $\overline{SE}$           |        | 0     | 20       | mA  |
| WUS Output Low Voltage | VOL | Iol = 2 mA max                                                                                          |        | 0.35  | 0.5      | VDC |
| Input Low Current      |     | $\overline{HSn}$ and $\overline{SE}$ VIL = 0.4V                                                         |        | 10    | 40       | μA  |
| Input High Current     |     | $\overline{HSn}$ and $\overline{SE}$ VIH = 2.7V                                                         |        | 100   | 400      | μA  |
| Input Low Voltage      |     | $\overline{WD}$ , $\overline{WD}$                                                                       | Vcc -1 |       | Vcc -0.4 | V   |
| Input High Voltage     |     | $\overline{WD}$ , $\overline{WD}$                                                                       | Vcc -2 |       | Vcc -0.8 | V   |
| Δ VIN                  |     | $\overline{WD}$ - $\overline{WD}$                                                                       | 0.4    | 0.8   |          | V   |
| Input Low Current      |     | $\overline{WD}$ , $\overline{WD}$ Vcc = 5V<br>VIH = Vcc - 0.8V                                          |        | 100   | 200      | μA  |
| Input High Current     |     | $\overline{WD}$ , $\overline{WD}$ Vcc = 5V<br>VIL = Vcc - 1.6V                                          |        | 75    | 150      | μA  |

# SSI 32R2320/21/22/23/24

## 3V, 5V, 4-Channel

## 2-Terminal Read/Write Device

### ELECTRICAL SPECIFICATIONS (continued)

#### WRITE CHARACTERISTICS

Recommended operating conditions apply unless otherwise specified.

| PARAMETER                               | CONDITIONS                                                | MIN  | NOM  | MAX  | UNIT     |
|-----------------------------------------|-----------------------------------------------------------|------|------|------|----------|
| VCC Fault Voltage                       | $I_w < 0.2 \text{ mA}$                                    |      | 2.5  | 2.75 | VDC      |
| Write Current Gain $A_w$                | $I_w = 2\text{-}5 \text{ mAVcc} = 3.3\text{V} \pm 10\%$   | 20   | 24   | 29   | mA/mA    |
|                                         | $I_w = 5\text{-}30 \text{ mAVcc} = 3.3\text{V} \pm 10\%$  | 19   | 22   | 25   | mA/mA    |
|                                         | $I_w = 2\text{-}5 \text{ mAVcc} = 5.0\text{V} \pm 10\%$   | 21   | 25   | 30   | mA/mA    |
|                                         | $I_w = 5\text{-}30 \text{ mAVcc} = 5.0\text{V} \pm 10\%$  | 20   | 23   | 26   | mA/mA    |
| Write Current Error                     | $R_{wc} = 2 \text{ k}\Omega$ , head to head @ write mode* | -5   |      | +5   | %        |
|                                         | $R_{wc} = 2 \text{ k}\Omega$ , head to head @ servo mode* | -5   |      | +5   | %        |
|                                         | $R_{wc} = 2 \text{ k}\Omega$ , write to servo             | -7   |      | +7   | %        |
| Write Current Voltage $V_{WC}$          |                                                           | 1.2  | 1.3  | 1.4  | V        |
| Differential Head Voltage Swing         | open head, $\overline{SE} = 1$                            | 4    | 4.8  |      | Vp-p     |
|                                         | open head, $V_{cc} = 5\text{V}$ , $\overline{SE} = 0$     | 4    | 4.8  |      | Vp-p     |
|                                         | open head, $V_{cc} = 3.3\text{V}$ , $\overline{SE} = 0$   | 3.4  | 4.8  |      | Vp-p     |
| Unselected Head Current                 | AC                                                        |      |      | 1    | mA (pk)  |
|                                         | DC                                                        |      |      | 0.1  | mA       |
| Head Differential Load Resistance $R_d$ | R version                                                 | 300  | 400  | 500  | $\Omega$ |
|                                         | non-R version                                             | 2400 | 3000 | 3600 | $\Omega$ |
| WDI Pulse Width                         | $V_{il} \leq 0.8\text{V}$ , $V_{ih} \geq 2\text{V}$ PWH   | 5    |      |      | ns       |
|                                         | $t_i = t_f = 1 \text{ ns}$ PWL                            | 10   |      |      | ns       |
| Write Current Range $I_w$               |                                                           | 2    |      | 30   | mA       |

\* Error from average of the four heads.

#### SERVO WRITE CHARACTERISTICS

|                     |                                                              |           |    |         |               |
|---------------------|--------------------------------------------------------------|-----------|----|---------|---------------|
| WUS/SE Voltage      | servo bank write enabled                                     | VCC + 1.5 |    | VCC + 2 | V             |
| WUS/SE Sink Current | servo bank write enabled<br>$V_{wus} = V_{CC} + 1.5\text{V}$ |           | 70 | 200     | $\mu\text{A}$ |

# SSI 32R2320/21/22/23/24

## 3V, 5V, 4-Channel

### 2-Terminal Read/Write Device

#### READ CHARACTERISTICS

Recommended operating conditions apply unless otherwise specified. CL (RDX, RDY) < 20 pF, RL (RDX, RDY) = 1 kΩ.

| PARAMETER                           | CONDITIONS                                                                         | MIN   | NOM      | MAX     | UNIT   |
|-------------------------------------|------------------------------------------------------------------------------------|-------|----------|---------|--------|
| Differential Voltage Gain           | Vin = 1 mVp-p @1 MHz                                                               | 200   | 250      | 300     | V/V    |
| Voltage BW                          | -1 dB                                                                              | 20    | 40       |         | MHz    |
|                                     | -3 dB                                                                              | 40    | 80       |         | MHz    |
| Input Noise Voltage                 | BW = 15 MHz, Lh = 0, Rh = 0                                                        |       | 0.5      | 0.75    | nV/√Hz |
| Differential Input Capacitance      | Vin = 1 mVp-p, f = 5 MHz                                                           |       | 9        | 14      | pF     |
| Differential Input Resistance       | Vin = 1 mVp-p, f = 5 MHz                                                           | 500   | 750      | 1800    | Ω      |
| Dynamic Range                       | AC input voltage where gain falls to 90% of its small signal gain value, f = 5 MHz | 2     | 5        |         | mVp-p  |
| Common Mode Rejection Ratio         | Vin = 0 VDC + 100 mVp-p @ 5 MHz                                                    | 45    | 60       |         | dB     |
| Power Supply RejectionRatio         | 100 mVp-p @ 5 MHz on VCC                                                           | 40    | 70       |         | dB     |
| Channel Separation                  | Unselected channels driven with Vin = 0 VDC + 100 mVp-p                            | 45    | 60       |         | dB     |
| Output Offset Voltage               | Head shorted                                                                       | -250  |          | +250    | mV     |
|                                     | Head loaded 200Ω                                                                   | -400  |          | +400    | mV     |
| Single Ended Output Resistance      | f = 5 MHz                                                                          |       | 60       | 100     | Ω      |
| Output Current                      | AC coupled load, RDX to RDY                                                        | 1     | 2        |         | mA     |
| RDX, RDY Common Mode Output Voltage |                                                                                    | Vcc-1 | Vcc-1.35 | Vcc-1.7 | VDC    |

# SSI 32R2320/21/22/23/24

## 3V, 5V, 4-Channel

### 2-Terminal Read/Write Device

#### SWITCHING CHARACTERISTICS

Recommended operating conditions apply unless otherwise specified.  $R_{wc} = 2k\Omega$ ,  $L_h = 1.0 \mu H$ ,  $R_h = 30\Omega$   
 $f(\text{Data}) = 5 \text{ MHz}$ .

| PARAMETER         |                    | CONDITIONS                                                                          | MIN  | NOM | MAX | UNIT |
|-------------------|--------------------|-------------------------------------------------------------------------------------|------|-----|-----|------|
| R/W               | Read to Write      | R/W to 90% of write current;<br>WUS valid                                           |      | 0.3 | 1   | μs   |
|                   | Write to Read      | R/W to 90% of<br>100 mV Read signal envelope                                        |      | 0.4 | 1   | μs   |
| CS                | Unselect to Select | CS to 90% of 100 mV 10 MHz<br>Read signal envelope                                  |      | 0.6 | 2   | μs   |
|                   | Select to Unselect | CS to 10% of write current                                                          |      | 0.4 | 1   | μs   |
| HS0,1 to any Head |                    | To 90% of 100 mV 10 MHz<br>Read signal envelope                                     |      | 0.2 | 1   | μs   |
| WUS*              | Safe to Unsafe TD1 | Write mode, loss of WDI<br>transitions; Defines max WDI<br>period for WUS operation | 0.6  | 2   | 3.6 | μs   |
|                   | Unsafe to Safe TD2 | Fault cleared: from first<br>negative WDI transition                                |      | 0.2 | 1   | μs   |
| WDI               | Frequency Range    | Valid WUS                                                                           | 1.67 |     | 25  | MHz  |
| Head Current      | WDI to Ix - Iy TD3 | Lh = 0, Rh = 0<br>from 50% points                                                   |      | 25  | 40  | ns   |
|                   | Asymmetry          | WDI has 1 ns rise/fall time                                                         |      |     | 1.5 | ns   |
|                   | Rise/fall Time     | 10% to 90% points<br>Rwc = 2 kΩ, Rh = 0, Lh = 0                                     |      | 2   | 9   | ns   |
|                   |                    | Rwc = 2 kΩ, Rh = 30Ω, Lh = 1μH                                                      |      | 14  | 18  | ns   |

\*  $5 < I_w \cdot L_h < 50 \text{ mA} \cdot \mu H$ ,  $1 < R_h \leq 1.25/I_w$ , WUS available in bonding option.



# SSI 32R2320/21/22/23/24

## 3V, 5V, 4-Channel

### 2-Terminal Read/Write Device

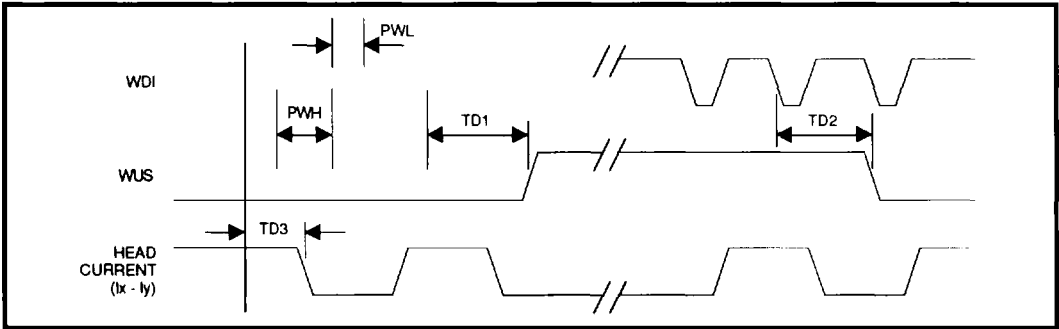


FIGURE 1: Write Mode Timing Diagram

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TABLE 3: Device Option Summary

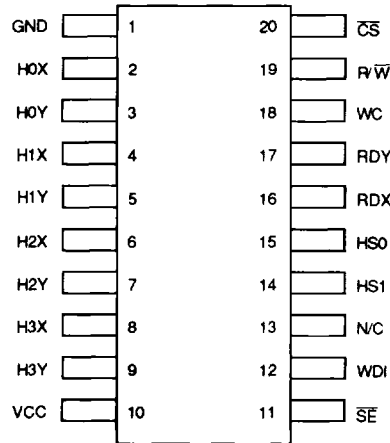
| DEVICE #  | WDI TYPE | SERVO ENABLE    | DAMPING RESISTOR | WUS |
|-----------|----------|-----------------|------------------|-----|
| 32R2320W  | TTL      | $\overline{SE}$ | No               | No  |
| 32R2320RW | TTL      | $\overline{SE}$ | 350Ω             | No  |
| 32R2321W  | ECL      | $\overline{SE}$ | No               | No  |
| 32R2321RW | ECL      | $\overline{SE}$ | 350Ω             | No  |
| 32R2322RW | TTL      | SE              | DMP pin          | Yes |
| 32R2323W  | TTL      | WUS/SE          | No               | Yes |
| 32R2323RW | TTL      | WUS/SE          | 350Ω             | Yes |
| 32R2324W  | ECL      | WUS/SE          | No               | Yes |
| 32R2324RW | ECL      | WUS/SE          | 350Ω             | Yes |

# SSl 32R2320/21/22/23/24 3V, 5V, 4-Channel 2-Terminal Read/Write Device

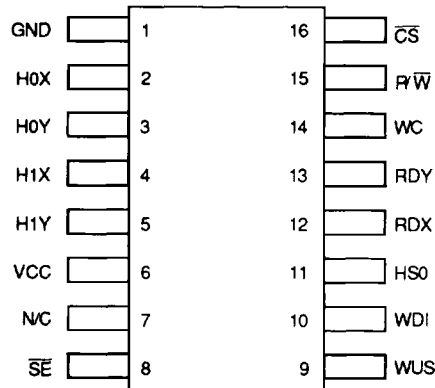
## PACKAGE PIN DESIGNATIONS (Top View)

CAUTION: Use handling procedures necessary  
for a static sensitive component.

### 32R2320 Package Options

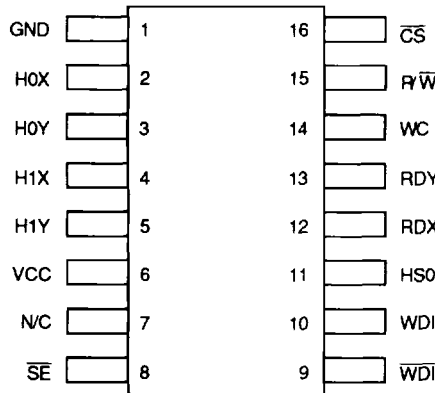


20-Lead SOL, VSOP, VTSOP

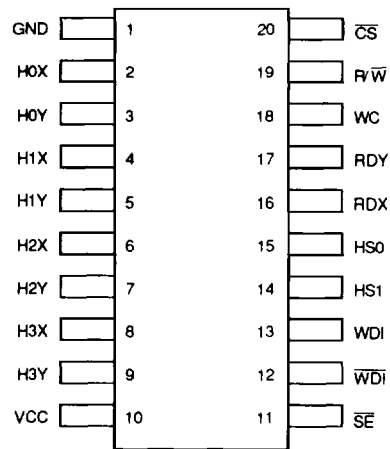


16-Lead SOL, SON

### 32R2321 Package Options



16-Lead SOL, SON



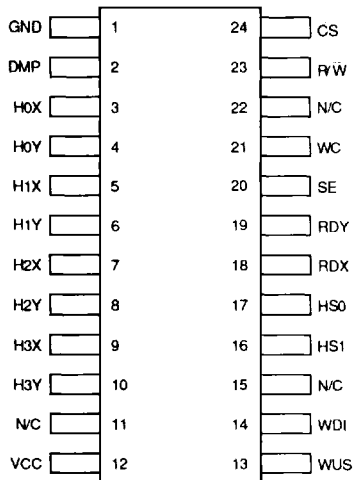
20-Lead SOL, VSOP, VTSOP

# SSI 32R2320/21/22/23/24

## 3V, 5V, 4-Channel

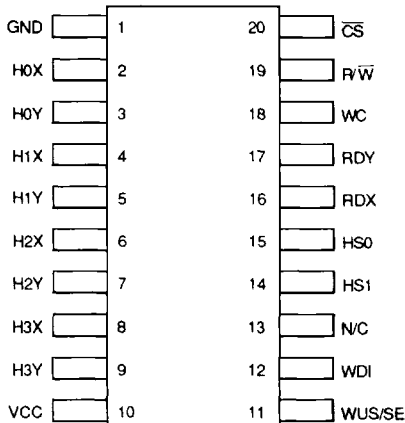
### 2-Terminal Read/Write Device

#### 32R2322 Package Option



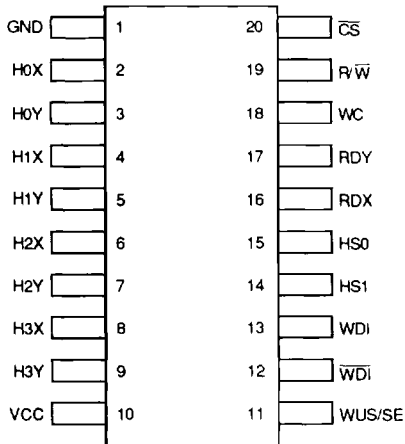
24-Lead VTSOP

#### 32R2323 Package Option



20-Lead VSOP

#### 32R2324 Package Option



20-Lead VSOP

# SSI 32R2320/21/22/23/24

## 3V, 5V, 4-Channel

### 2-Terminal Read/Write Device

#### ORDERING INFORMATION

| PART DESCRIPTION                                  |               | ORDER NUMBER   | PACKAGE MARK |
|---------------------------------------------------|---------------|----------------|--------------|
| <b>SSI 32R2320R</b><br>2-Channel<br><br>4-Channel | 16-Lead SOL   | 32R2320RW-2CL  | 32R2320RW    |
|                                                   | 16-Lead SON   | 32R2320RW-2CN  | 32R2320RW    |
|                                                   | 20-Lead SOL   | 32R2320RW-4CL  | 32R2320RW    |
|                                                   | 20-Lead VSOP  | 32R2320RW-4CV  | 32R2320RW    |
|                                                   | 20-Lead VTSOP | 32R2320RW-4CVT | 32R2320RW    |
|                                                   |               |                |              |
| <b>SSI 32R2321R</b><br>2-Channel<br><br>4-Channel | 16-Lead SOL   | 32R2321RW-2CL  | 32R2321RW    |
|                                                   | 16-Lead SON   | 32R2321RW-2CN  | 32R2321RW    |
|                                                   | 20-Lead SOL   | 32R2321RW-4CL  | 32R2321RW    |
|                                                   | 20-Lead VSOP  | 32R2321RW-4CV  | 32R2321RW    |
|                                                   | 20-Lead VTSOP | 32R2321RW-4CVT | 32R2321RW    |
|                                                   |               |                |              |
| <b>SSI 32R2322R</b><br>4-Channel                  | 24-Lead VTSOP | 32R2322RW-4CVT | 32R2322RW    |
| <b>SSI 32R2323R</b><br>4-Channel                  | 20-Lead VSOP  | 32R2323RW-4CV  | 32R2323RW    |
| <b>SSI 32R2324R</b><br>4-Channel                  | 24-Lead VSOP  | 32R2324RW-4CV  | 32R2324RW    |

NOTE: These devices can be ordered with and without damping resistors. To specify devices without damping resistors, remove the "R" suffix: e.g., 32R2324W-4CV.

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