



## HIGH SPEED 32K x 8 CMOS PROM/RPROM

### KEY FEATURES

- **Ultra-Fast Access Time**  
— 35 ns
- **Low Power Consumption**
- **Fast Programming**
- **Immune to Latch-UP**  
— Up to 200 mA
- **ESD Protection Exceeds 2000V**
- **Available in 300 Mil DIP and PLDCC**

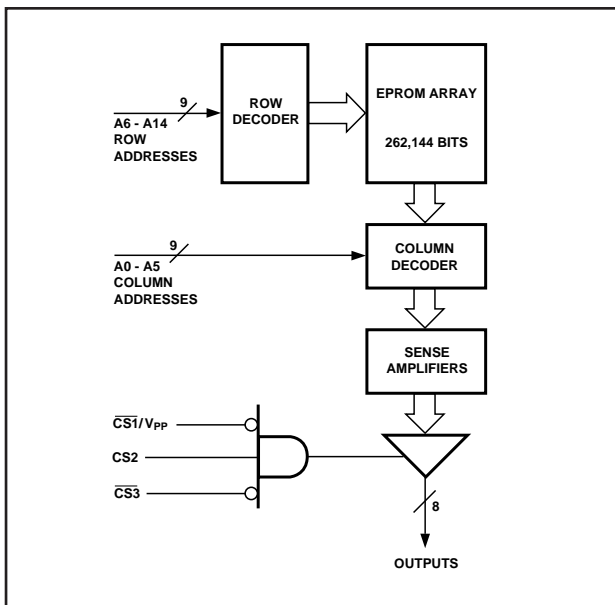
### GENERAL DESCRIPTION

The WS57C71C is a High Performance 256K UV Erasable Electrically Re-Programmable Read Only Memory (RPROM). It is manufactured in an advanced CMOS technology and utilizes WSI's patented self-aligned split gate EPROM cell.

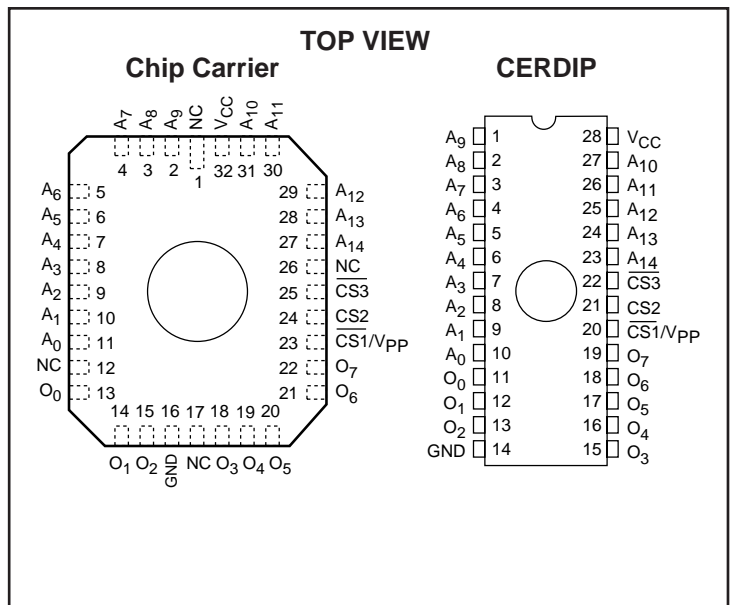
The industry standard PROM pin configuration of the WS57C71C provides an easy upgrade path from a 16K x 8 device.

This RPPROM is capable of operating at speeds as fast as 35 ns address access time, which enables it to be used directly with today's fast microprocessors and DSP processors without introducing any wait states. All inputs and outputs are TTL compatible. The WS57C71C is a low power device even when operated at its fastest speed. The DIP version is packaged in a 300 mil wide DIP package saving board space for the user.

### BLOCK DIAGRAM



### PIN CONFIGURATION



### PRODUCT SELECTION GUIDE

| PARAMETER                     | WS57C71C-35 | WS57C71C-45 | WS57C71C-55 | WS57C71C-70 |
|-------------------------------|-------------|-------------|-------------|-------------|
| Address Access Time (Max)     | 35 ns       | 45 ns       | 55 ns       | 70 ns       |
| CS to Output Valid Time (Max) | 15 ns       | 20 ns       | 20 ns       | 30 ns       |

**ABSOLUTE MAXIMUM RATINGS\***

Storage Temperature.....-65° to + 150°C

Voltage on any Pin with

Respect to Ground .....-0.6V to +7V

 $V_{PP}$  with Respect to Ground.....-0.6V to + 13V

ESD Protection.....&gt;2000V

**\*NOTICE:**

Stresses above 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 above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect device reliability.

**MODE SELECTION**

| <b>PINS<br/>MODE</b> | <b><math>\overline{CS1}/</math><br/><math>V_{PP}</math></b> | <b>CS2</b> | <b><math>\overline{CS3}</math></b> | <b><math>V_{CC}</math></b> | <b>OUTPUTS</b> |
|----------------------|-------------------------------------------------------------|------------|------------------------------------|----------------------------|----------------|
| Read                 | $V_{IL}$                                                    | $V_{IH}$   | $V_{IL}$                           | $V_{CC}$                   | $D_{OUT}$      |
| Output Disable       | $V_{IH}$                                                    | X          | X                                  | $V_{CC}$                   | High Z         |
| Output Disable       | X                                                           | $V_{IL}$   | X                                  | $V_{CC}$                   | High Z         |
| Output Disable       | X                                                           | X          | $V_{IH}$                           | $V_{CC}$                   | High Z         |
| Program              | $V_{PP}$                                                    | X          | $V_{IH}$                           | $V_{CC}$                   | $D_{IN}$       |
| Program Verify       | $V_{IL}$                                                    | $V_{IH}$   | $V_{IL}$                           | $V_{CC}$                   | $D_{OUT}$      |
| Program Inhibit      | $V_{PP}$                                                    | $V_{IH}$   | $V_{IL}$                           | $V_{CC}$                   | $D_{OUT}$      |

**OPERATING RANGE**

| <b>RANGE</b> | <b>TEMPERATURE</b> | <b><math>V_{CC}</math></b> |
|--------------|--------------------|----------------------------|
| Commercial   | 0°C to +70°C       | +5V $\pm$ 10%              |
| Industrial   | -40°C to +85°C     | +5V $\pm$ 10%              |
| Military     | -55°C to +125°C    | +5V $\pm$ 10%              |

**DC READ CHARACTERISTICS** Over Operating Range. (See Above)

| <b>SYMBOL</b> | <b>PARAMETER</b>               | <b>TEST CONDITIONS</b>                                                                        | <b>MIN</b> | <b>MAX</b>     | <b>UNITS</b> |
|---------------|--------------------------------|-----------------------------------------------------------------------------------------------|------------|----------------|--------------|
| $V_{IL}$      | Input Low Voltage              | (Note 3)                                                                                      | -0.1       | 0.8            | V            |
| $V_{IH}$      | Input High Voltage             | (Note 3)                                                                                      | 2.0        | $V_{CC} + 0.3$ | V            |
| $V_{OL}$      | Output Low Voltage             | $I_{OL} = 16$ mA                                                                              |            | 0.4            | V            |
| $V_{OH}$      | Output High Voltage            | $I_{OH} = -4$ mA                                                                              | 2.4        |                | V            |
| $I_{CC1}$     | $V_{CC}$ Active Current (CMOS) | $V_{CC} = 5.5$ V, $f = 0$ MHz (Note 1),<br>Output Not Loaded<br>Add 3 mA/MHz for AC Operation | Comm'l     | 30             | mA           |
|               |                                |                                                                                               | Industrial | 35             | mA           |
|               |                                |                                                                                               | Military   | 35             | mA           |
| $I_{CC2}$     | $V_{CC}$ Active Current (TTL)  | $V_{CC} = 5.5$ V, $f = 0$ MHz (Note 2),<br>Output Not Loaded<br>Add 3 mA/MHz for AC Operation | Comm'l     | 50             | mA           |
|               |                                |                                                                                               | Industrial | 60             | mA           |
|               |                                |                                                                                               | Military   | 60             | mA           |
| $I_{LI}$      | Input Leakage Current          | $V_{IN} = 5.5$ V or Gnd                                                                       | -10        | 10             | $\mu$ A      |
| $I_{LO}$      | Output Leakage Current         | $V_{OUT} = 5.5$ V or Gnd                                                                      | -10        | 10             | $\mu$ A      |

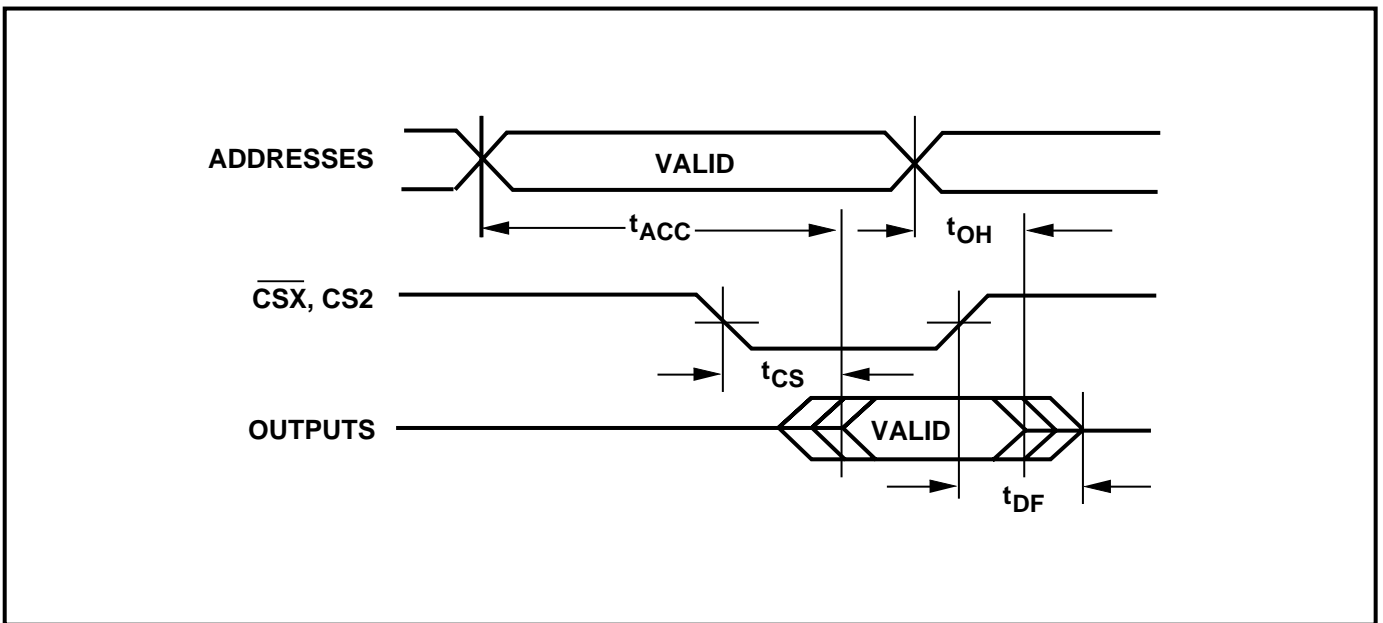
**NOTES:** 1. CMOS inputs: GND  $\pm$  0.3V or  $V_{CC} \pm$  0.3V.2. TTL inputs:  $V_{IL} \leq 0.8$  V,  $V_{IH} \geq 2.0$  V.

3. These are absolute voltages with respect to device ground pin and include all overshoots due to system and/or tester noise. Do not attempt to test these values without suitable equipment.

**AC READ CHARACTERISTICS** Over Operating Range. (See Above)

| PARAMETER                       | SYMBOL    | 57C71C-35 |     | 57C71C-45 |     | 57C71C-55 |     | 57C71C-70 |     | UNITS |
|---------------------------------|-----------|-----------|-----|-----------|-----|-----------|-----|-----------|-----|-------|
|                                 |           | MIN       | MAX | MIN       | MAX | MIN       | MAX | MIN       | MAX |       |
| Address to Output Delay         | $t_{ACC}$ |           | 35  |           | 45  |           | 55  |           | 70  | ns    |
| $\overline{CS}$ to Output Delay | $t_{CS}$  |           | 15  |           | 20  |           | 20  |           | 30  |       |
| Output Disable to Output Float* | $t_{DF}$  |           | 20  |           | 20  |           | 20  |           | 25  |       |
| Address to Output Hold          | $t_{OH}$  | 0         |     | 0         |     | 0         |     | 0         |     |       |

\* Sampled, Not 100% Tested.

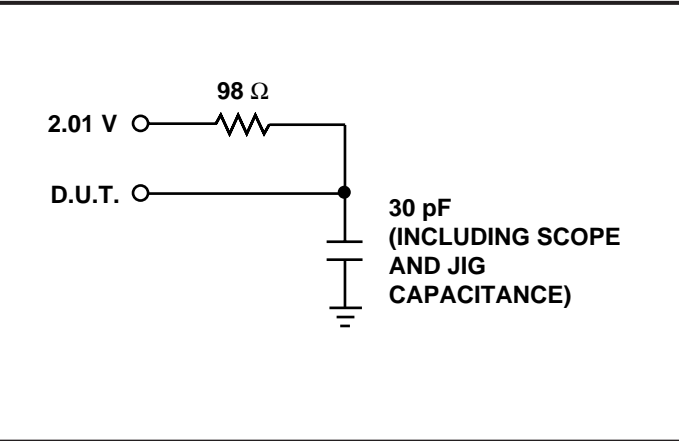
**AC READ TIMING DIAGRAM**

CAPACITANCE<sup>(4)</sup> T<sub>A</sub> = 25 °C, f = 1 MHz

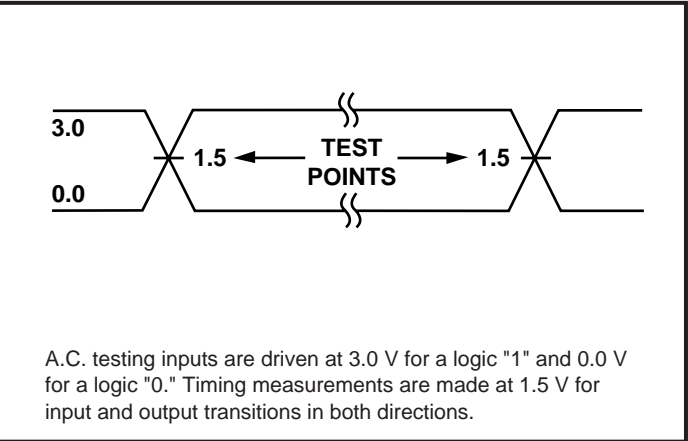
| SYMBOL           | PARAMETER                   | CONDITIONS            | TYP <sup>(5)</sup> | MAX | UNITS |
|------------------|-----------------------------|-----------------------|--------------------|-----|-------|
| C <sub>IN</sub>  | Input Capacitance           | V <sub>IN</sub> = 0V  | 4                  | 6   | pF    |
| C <sub>OUT</sub> | Output Capacitance          | V <sub>OUT</sub> = 0V | 8                  | 12  | pF    |
| C <sub>VPP</sub> | V <sub>PP</sub> Capacitance | V <sub>PP</sub> = 0 V | 18                 | 25  | pF    |

NOTES: 4. This parameter is only sampled and is not 100% tested.  
5. Typical values are for T<sub>A</sub> = 25°C and nominal supply voltages.

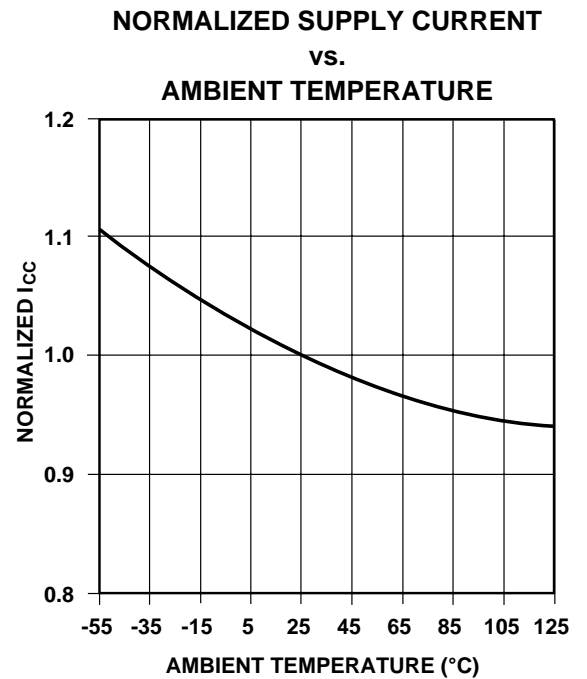
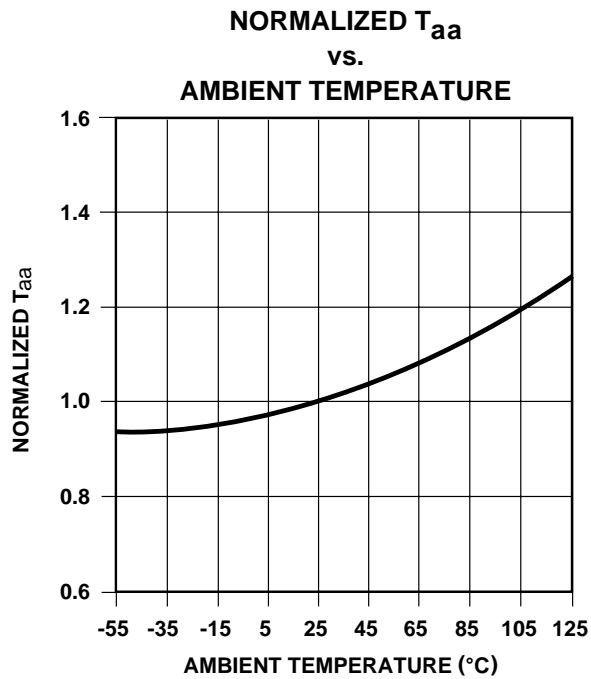
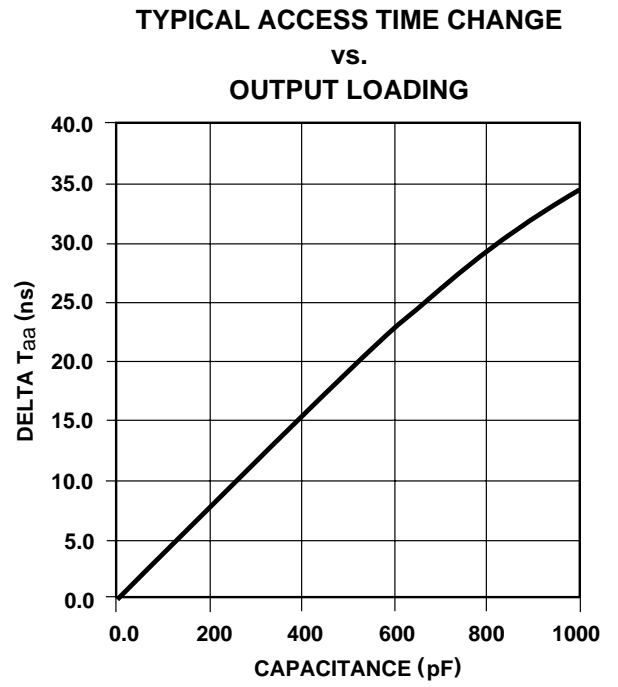
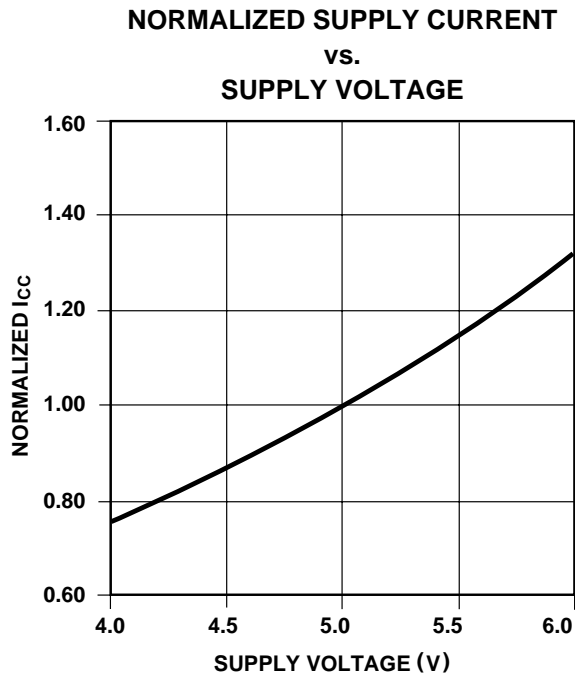
TEST LOAD (High Impedance Test Systems)



A.C. TESTING INPUT/OUTPUT WAVEFORM



NOTE: 6. Provide adequate decoupling capacitance as close as possible to this device to achieve the published A.C. and D.C. parameters. A 0.1 microfarad capacitor in parallel with a 0.01 microfarad capacitor connected between V<sub>CC</sub> and ground is recommended. Inadequate decoupling may result in access time degradation or other transient performance failures.



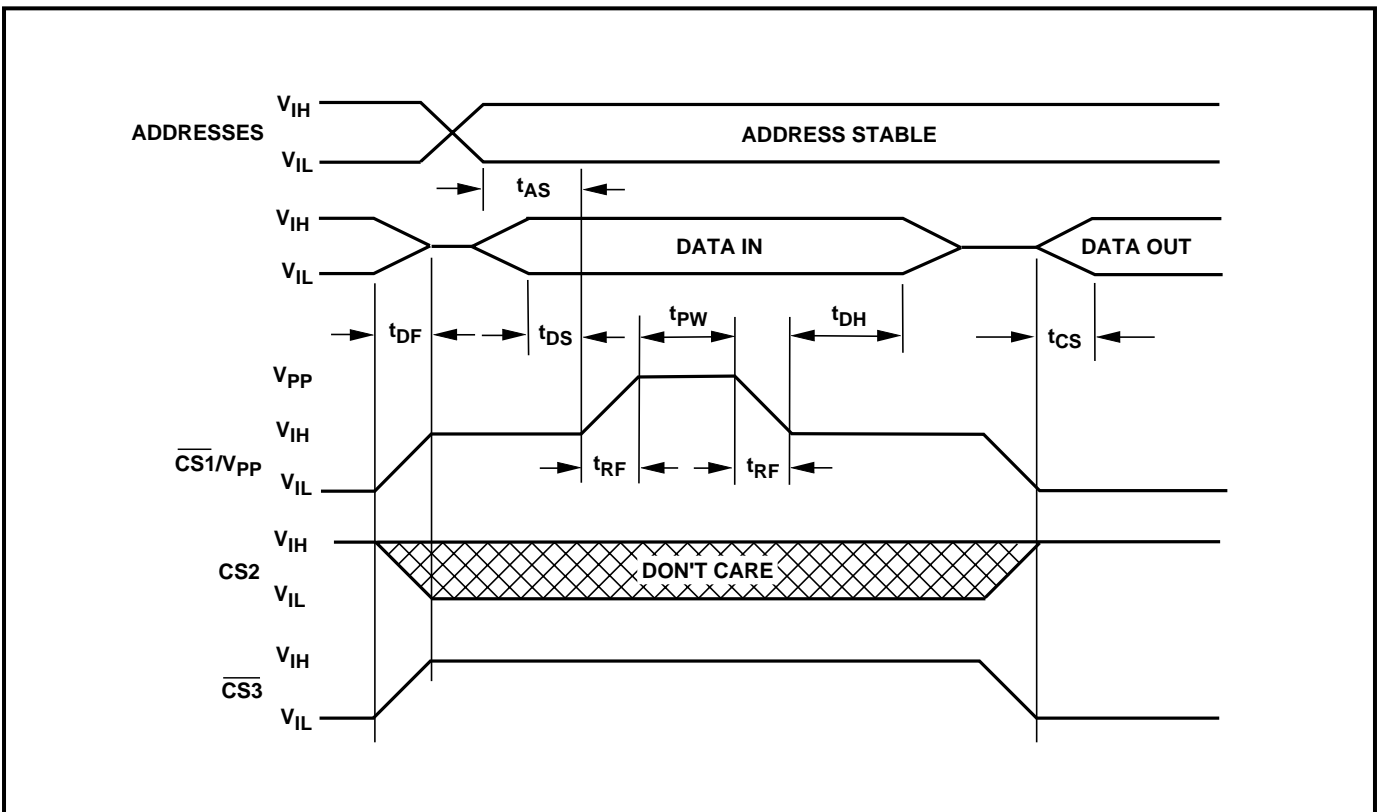
**PROGRAMMING INFORMATION****DC CHARACTERISTICS** ( $T_A = 25 \pm 5^\circ\text{C}$ ,  $V_{CC} = 6.25\text{ V} \pm 0.25\text{ V}$ ,  $V_{PP} = 12.75 \pm 0.25\text{ V}$ )

| SYMBOLS  | PARAMETER                                                        | MIN | MAX  | UNITS         |
|----------|------------------------------------------------------------------|-----|------|---------------|
| $I_{LI}$ | Input Leakage Current<br>( $V_{IN} = V_{CC}$ or Gnd)             | -10 | 10   | $\mu\text{A}$ |
| $I_{PP}$ | $V_{PP}$ Supply Current During<br>Programming Pulse              |     | 60   | mA            |
| $I_{CC}$ | $V_{CC}$ Supply Current                                          |     | 25   | mA            |
| $V_{OL}$ | Output Low Voltage During Verify<br>( $I_{OL} = 16\text{ mA}$ )  |     | 0.45 | V             |
| $V_{OH}$ | Output High Voltage During Verify<br>( $I_{OH} = -4\text{ mA}$ ) | 2.4 |      | V             |

**NOTE:** 7.  $V_{PP}$  must not be greater than 13 volts including overshoot.

**AC CHARACTERISTICS** ( $T_A = 25 \pm 5^\circ\text{C}$ ,  $V_{CC} = 6.25\text{ V} \pm 0.25\text{ V}$ ,  $V_{PP} = 12.75 \pm 0.25\text{ V}$ )

| SYMBOLS  | PARAMETER                   | MIN | TYP | MAX | UNITS         |
|----------|-----------------------------|-----|-----|-----|---------------|
| $t_{AS}$ | Address Setup Time          | 2   |     |     | $\mu\text{s}$ |
| $t_{DF}$ | Chip Disable Setup Time     |     |     | 30  | ns            |
| $t_{DS}$ | Data Setup Time             | 2   |     |     | $\mu\text{s}$ |
| $t_{PW}$ | Program Pulse Width         | 100 |     | 200 | $\mu\text{s}$ |
| $t_{DH}$ | Data Hold Time              | 2   |     |     | $\mu\text{s}$ |
| $t_{CS}$ | Chip Select Delay           |     |     | 30  | ns            |
| $t_{RF}$ | $V_{PP}$ Rise and Fall Time | 1   |     |     | $\mu\text{s}$ |

**PROGRAMMING WAVEFORM**

**ORDERING INFORMATION**

| PART NUMBER    | SPEED (ns) | PACKAGE TYPE        | PACKAGE DRAWING | OPERATING TEMPERATURE RANGE | WSI MANUFACTURING PROCEDURE |
|----------------|------------|---------------------|-----------------|-----------------------------|-----------------------------|
| WS57C71C-35J   | 35         | 32 Pin PLDCC        | J4              | Comm'l                      | Standard                    |
| WS57C71C-35L   | 35         | 32 Pin CLDCC        | L3              | Comm'l                      | Standard                    |
| WS57C71C-35T   | 35         | 28 Pin Cerdip, 0.3" | T2              | Comm'l                      | Standard                    |
| WS57C71C-45CI  | 45         | 32 Pad CLLCC        | C2              | Industrial                  | Standard                    |
| WS57C71C-45D   | 45         | 28 Pin Cerdip, 0.6" | D2              | Comm'l                      | Standard                    |
| WS57C71C-45J   | 45         | 32 Pin PLDCC        | J4              | Comm'l                      | Standard                    |
| WS57C71C-45T   | 45         | 28 Pin Cerdip, 0.3" | T2              | Comm'l                      | Standard                    |
| WS57C71C-45TMB | 45         | 28 Pin Cerdip, 0.3" | T2              | Military                    | MIL-STD-883C                |
| WS57C71C-55CMB | 55         | 32 Pad CLLCC        | C2              | Military                    | MIL-STD-883C                |
| WS57C71C-55D   | 55         | 28 Pin Cerdip, 0.6" | D2              | Comm'l                      | Standard                    |
| WS57C71C-55DMB | 55         | 28 Pin Cerdip, 0.6" | D2              | Military                    | MIL-STD-883C                |
| WS57C71C-55J   | 55         | 32 Pin PLDCC        | J4              | Comm'l                      | Standard                    |
| WS57C71C-55JI  | 55         | 32 Pin PLDCC        | J4              | Industrial                  | Standard                    |
| WS57C71C-55L   | 55         | 32 Pin CLDCC        | L3              | Comm'l                      | Standard                    |
| WS57C71C-55T   | 55         | 28 Pin Cerdip, 0.3" | T2              | Comm'l                      | Standard                    |
| WS57C71C-55TI  | 55         | 28 Pin Cerdip, 0.3" | T2              | Industrial                  | Standard                    |
| WS57C71C-55TMB | 55         | 28 Pin Cerdip, 0.3" | T2              | Military                    | MIL-STD-883C                |
| WS57C71C-70L   | 70         | 32 Pin CLDCC        | L3              | Comm'l                      | Standard                    |
| WS57C71C-70T   | 70         | 28 Pin Cerdip, 0.3" | T2              | Comm'l                      | Standard                    |
| WS57C71C-70TMB | 70         | 28 Pin Cerdip, 0.3" | T2              | Military                    | MIL-STD-883C                |

**NOTE:** 8. The actual part marking will not include the initials "WS."

**PROGRAMMING/ALGORITHMS/ERASURE/PROGRAMMERS**

**REFER TO  
PAGE 5-1**

The WS57C71C is programmed using Algorithm D shown on page 5-9.

