

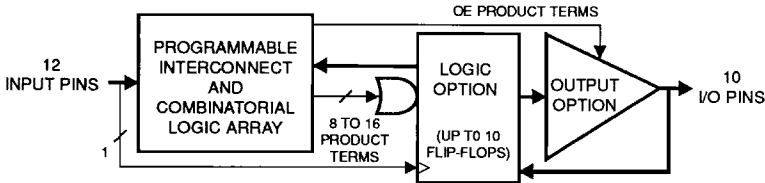
**Features**

- High Speed Electrically Erasable Programmable Logic Device  
7.5 ns Max Propagation Delay  
5 V ±10% Operation
- Low Power ATF22V10BL - 10 mA Standby
- CMOS and TTL Compatible Inputs and Outputs  
150 µA Leakage Maximum
- Reprogrammable - 100% Tested
- High Reliability CMOS Technology  
2000 V ESD Protection  
200 mA Latchup Immunity
- Full Military, Commercial and Industrial Temperature Ranges
- Dual-In-Line and Surface Mount Packages in Standard Pinouts

High Performance Flash PLD

2

**Logic Diagram**



**Description**

The ATF22V10B and ATF22V10BL are high performance CMOS (Electrically Erasable) Programmable Logic Devices (PLDs) which utilize Atmel's proven electrically erasable Flash memory technology. Speeds down to 7.5 ns and power dissipation as low as 10 mA are offered. All speed ranges are specified over the full 5 V ±10% range for military and industrial temperature ranges, and 5V ±5% for commercial ranges.

The ATF22V10BL provides the fastest low power CMOS PLD solution, with low DC power (5.0 mA typical). The ATF22V10BL significantly reduces total system power and enhances system reliability.

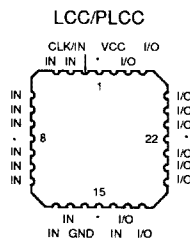
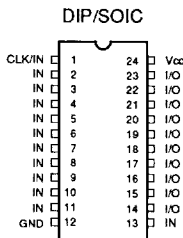
The ATF22V10B and ATF22V10BL incorporate a variable product term architecture. Each output is allocated from eight to 16 product terms, which allows highly complex logic functions to be realized.

Two additional product terms are included to provide synchronous preset and asynchronous reset. These terms are common to all 10 registers. All registers are automatically cleared upon power up.

Register Preload simplifies testing. A Security Fuse prevents unauthorized copying of programmed fuse patterns.

**Pin Configurations**

| Pin Name | Function               |
|----------|------------------------|
| CLK/IN   | Clock and Logic Input  |
| IN       | Logic Inputs           |
| I/O      | Bidirectional Buffers  |
| *        | No Internal Connection |
| VCC      | +5 V Supply            |



## Absolute Maximum Ratings\*

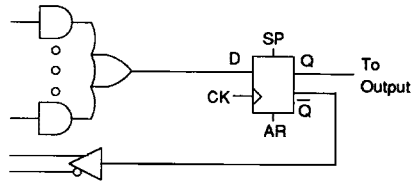
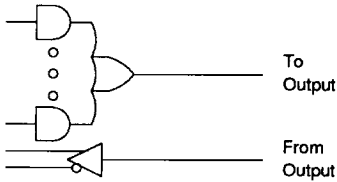
|  |                                  |
|--|----------------------------------|
| Temperature Under Bias.....  | -55°C to +125°C                  |
| Storage Temperature.....   | -65°C to +150°C                  |
| Voltage on Any Pin with<br>Respect to Ground.....                          | -2.0 V to +7.0 V <sup>(1)</sup>  |
| Voltage on Input Pins<br>with Respect to Ground<br>During Programming..... | -2.0 V to +14.0 V <sup>(1)</sup> |
| Programming Voltage with<br>Respect to Ground.....                         | -2.0 V to +14.0 V <sup>(1)</sup> |

\*NOTICE: Stresses beyond 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 beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

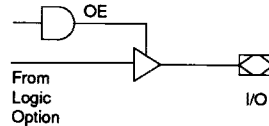
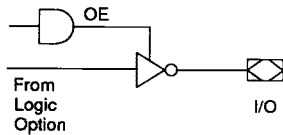
Note:

1. Minimum voltage is -0.6 V dc which may undershoot to -2.0 V for pulses of less than 20 ns. Maximum output pin voltage is  $V_{CC}+0.75$  V dc which may overshoot to +7.0 V for pulses of less than 20 ns.

## Logic Options



## Output Options



## D.C. and A.C. Operating Conditions

|                              | Commercial<br>ATF22V10B/L<br>-7, -10, -15, -25 | Industrial<br>ATF22V10B/L<br>-10, -15, -25 | Military<br>ATF22V10B/L<br>-10, -15, -25 |
|------------------------------|--|--|--|
| Operating Temperature (Case) | 0°C - 70°C                                     | -40°C - 85°C                               | -55°C - 125°C                            |
| V <sub>CC</sub> Power Supply | 5 V ± 5%                                       | 5 V ± 10%                                  | 5 V ± 10%                                |

## D.C. Characteristics

| Symbol         | Parameter                         | Condition  | Min                     | Typ          | Max           | Units   |    |
|----------------|-----------------------------------|--|-------------------------|--------------|---------------|---------|----|
| $I_{LI}$       | Input or I/O Low Leakage Current  | $0 \leq V_{IN} \leq V_{IL}(MAX)$                   |                         |              | 150           | $\mu A$ |    |
| $I_{LO}$       | Input or I/O High Leakage Current | $3.5 \leq V_{IN} \leq V_{CC}$                      |                         |              | 10            | $\mu A$ |    |
| $I_{CC}$       | Power Supply Current              | $V_{CC} = MAX,$<br>$V_{IN} = MAX,$<br>Outputs Open | ATF22V10B               | Com.         | 90            | 120     | mA |
|                |                                   |  |                         | Ind., Mil.   | 100           | 130     | mA |
|                |                                   |  | ATF22V10BL              | Com.         | 5.0           | 10      | mA |
|                |                                   |  |                         | Ind., Mil.   | 10            | 15      | mA |
| $I_{CC2}$      | Clocked Power Supply Current      | $V_{CC} = MAX,$ Outputs Open, $f = 1$ MHz          | ATF22V10BL              | Com.         | 15            | mA      |    |
|                |                                   |  |                         | Ind., Mil.   | 20            | mA      |    |
| $I_{OS}^{(1)}$ | Output Short Circuit Current      | $V_{OUT} = 0.5$ V                                  |                         |              | -130          | mA      |    |
| $V_{IL}$       | Input Low Voltage                 |  | -0.5                    |              | 0.8           | V       |    |
| $V_{IH}$       | Input High Voltage                |  | 2.0                     |              | $V_{CC}+0.75$ | V       |    |
| $V_{OL}$       | Output Low Voltage                | $V_{IN} = V_{IH}$ or $V_{IL},$<br>$V_{CC} = MIN$   | $I_{OL} = 16$ mA        | Com., Ind.   | 0.5           | V       |    |
|                |                                   |  | $I_{OL} = 12$ mA        | Mil.         | 0.5           | V       |    |
|                |                                   |  | $I_{OL} = 24$ mA        | Com.         | 0.8           | V       |    |
| $V_{OH}$       | Output High Voltage               | $V_{IN} = V_{IH}$ or $V_{IL},$<br>$V_{CC} = MIN$   | $I_{OH} = -100$ $\mu A$ | $V_{CC}-0.3$ |               | V       |    |
|                |                                   |  | $I_{OH} = -4.0$ mA      | 2.4          |               | V       |    |

Notes: 1. Not more than one output at a time should be shorted. Duration of short circuit test should not exceed 30 sec.

## A.C. Characteristics, Commercial

| Symbol           | Parameter   | ATF22V10B<br>-7 |     | ATF22V10B/L<br>-10 |     | ATF22V10B/L<br>-15 |     | ATF22V10B/L<br>-25 |     | Units |
|------------------|---|-----------------|-----|--------------------|-----|--------------------|-----|--------------------|-----|-------|
|                  |   | Min             | Max | Min                | Max | Min                | Max | Min                | Max |       |
| t <sub>PD</sub>  | Input or I/O to Combinatorial Output  | 3               | 7.5 | 3                  | 10  | 3                  | 15  | 3                  | 25  | ns    |
| t <sub>CO</sub>  | Clock to Output Delay   | 2               | 5   | 2                  | 7   | 2                  | 8   | 2                  | 15  | ns    |
| t <sub>CF</sub>  | Clock to Feedback Delay   |                 | 2.5 |                    | 2.5 |                    | 2.5 |                    | 13  | ns    |
| t <sub>SU1</sub> | Setup Time, Input or Feedback Before Clock  | 6.5             |     | 7                  |     | 10                 |     | 15                 |     | ns    |
| t <sub>SU2</sub> | Setup Time, SP Before Clock   | 10              |     | 10                 |     | 10                 |     | 15                 |     | ns    |
| t <sub>H</sub>   | Hold Time, Input or Feedback After Clock  | 0               |     | 0                  |     | 0                  |     | 0                  |     | ns    |
| F <sub>MAX</sub> | Maximum Clock Frequency with External Feedback 1/(t <sub>SU</sub> +t <sub>CO</sub> )  | 87              |     | 71.4               |     | 55.5               |     | 33.3               |     | MHz   |
|                  | Maximum Clock Frequency with Internal Feedback 1/(t <sub>SU</sub> + t <sub>CF</sub> ) | 111             |     | 105                |     | 80                 |     | 35.7               |     | MHz   |
|                  | Maximum Clock Frequency with No Feedback  | 111             |     | 105                |     | 83.3               |     | 38.5               |     | MHz   |
| t <sub>WH</sub>  | Clock Pulse Duration, High  | 4               |     | 4                  |     | 6                  |     | 13                 |     | ns    |
| t <sub>WL</sub>  | Clock Pulse Duration, Low   | 4               |     | 4                  |     | 6                  |     | 13                 |     | ns    |
| t <sub>EA</sub>  | Input or I/O to Output Enable   | 3               | 8   | 3                  | 10  | 3                  | 15  | 3                  | 25  | ns    |
| t <sub>ER</sub>  | Input or I/O to Output Disable  | 3               | 8   | 3                  | 9   | 3                  | 15  | 3                  | 25  | ns    |
| t <sub>AP</sub>  | Input or I/O to Asynchronous Reset of Register  | 3               | 13  | 3                  | 13  | 3                  | 20  | 3                  | 25  | ns    |
| t <sub>AW</sub>  | Asynchronous Reset Width  | 8               |     | 8                  |     | 15                 |     | 25                 |     | ns    |
| t <sub>AR</sub>  | Asynchronous Reset Recovery Time  | 8               |     | 8                  |     | 10                 |     | 25                 |     | ns    |
| t <sub>SPR</sub> | Synchronous Preset to Clock Recovery Time   | 10              |     | 10                 |     | 10                 |     | 15                 |     | ns    |

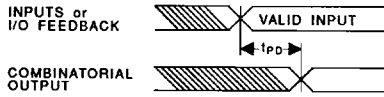
## A.C. Characteristics, Industrial and Military

| Symbol           | Parameter   | ATF22V10B<br>-10 |     | ATF22V10B/L<br>-15 |     | ATF22V10B/L<br>-25 |     | Units |
|------------------|---|------------------|-----|--------------------|-----|--------------------|-----|-------|
|                  |   | Min              | Max | Min                | Max | Min                | Max |       |
| t <sub>PD</sub>  | Input or I/O to Combinatorial Output  | 3                | 10  | 3                  | 15  |                    | 25  | ns    |
| t <sub>CO</sub>  | Clock to Output Delay   | 2                | 7   | 2                  | 8   |                    | 15  | ns    |
| t <sub>CF</sub>  | Clock to Feedback Delay   |                  | 2.5 |                    | 5   |                    | 13  | ns    |
| t <sub>SU1</sub> | Setup Time, Input or Feedback Before Clock  | 7                |     | 10                 |     | 15                 |     | ns    |
| t <sub>SU2</sub> | Setup Time, SP Before Clock   | 10               |     | 12                 |     | 15                 |     | ns    |
| t <sub>H</sub>   | Hold Time, Input or Feedback After Clock  | 0                |     | 0                  |     | 0                  |     | ns    |
| F <sub>MAX</sub> | Maximum Clock Frequency with External Feedback 1/(t <sub>SU</sub> +t <sub>CO</sub> )  | 71.4             |     | 55.5               |     | 33.3               |     | MHz   |
|                  | Maximum Clock Frequency with Internal Feedback 1/(t <sub>SU</sub> + t <sub>CF</sub> ) | 105              |     | 66.6               |     | 35.7               |     | MHz   |
|                  | Maximum Clock Frequency with No Feedback  | 105              |     | 66.6               |     | 38.5               |     | MHz   |
| t <sub>WH</sub>  | Clock Pulse Duration, High  | 5                |     | 6                  |     | 13                 |     | ns    |
| t <sub>WL</sub>  | Clock Pulse Duration, Low   | 5                |     | 6                  |     | 13                 |     | ns    |
| t <sub>EA</sub>  | Input or I/O to Output Enable   | 3                | 10  | 3                  | 15  |                    | 25  | ns    |
| t <sub>ER</sub>  | Input or I/O to Output Disable  | 3                | 9   | 3                  | 15  |                    | 25  | ns    |
| t <sub>AP</sub>  | Input or I/O to Asynchronous Reset of Register  | 3                | 13  | 3                  | 20  |                    | 25  | ns    |
| t <sub>AW</sub>  | Asynchronous Reset Width  | 8                |     | 15                 |     | 25                 |     | ns    |
| t <sub>AR</sub>  | Asynchronous Reset Recovery Time  | 8                |     | 10                 |     | 25                 |     | ns    |
| t <sub>SPR</sub> | Synchronous Preset to Clock Recovery Time   | 10               |     | 12                 |     | 15                 |     | ns    |

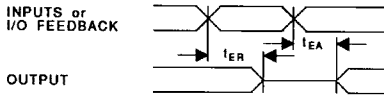
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## A.C. Waveforms

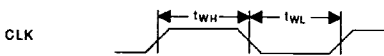
### Combinatorial Output



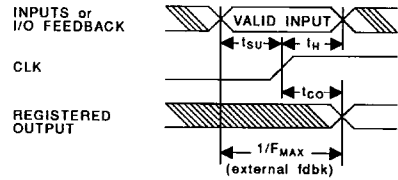
### Input or I/O to Output Enable/Disable



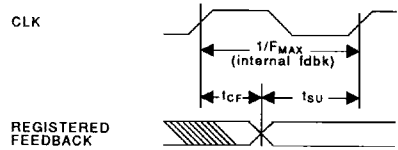
### Clock Width



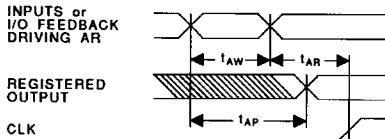
### Registered Output



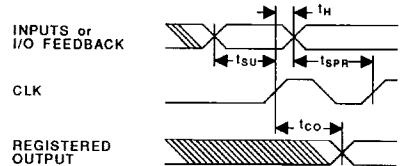
### fMAX with Feedback



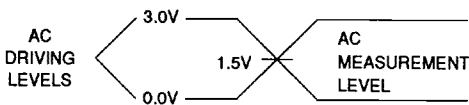
### Asynchronous Reset



### Synchronous Preset

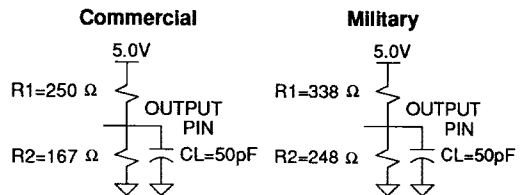


## Input Test Waveforms and Measurement Levels

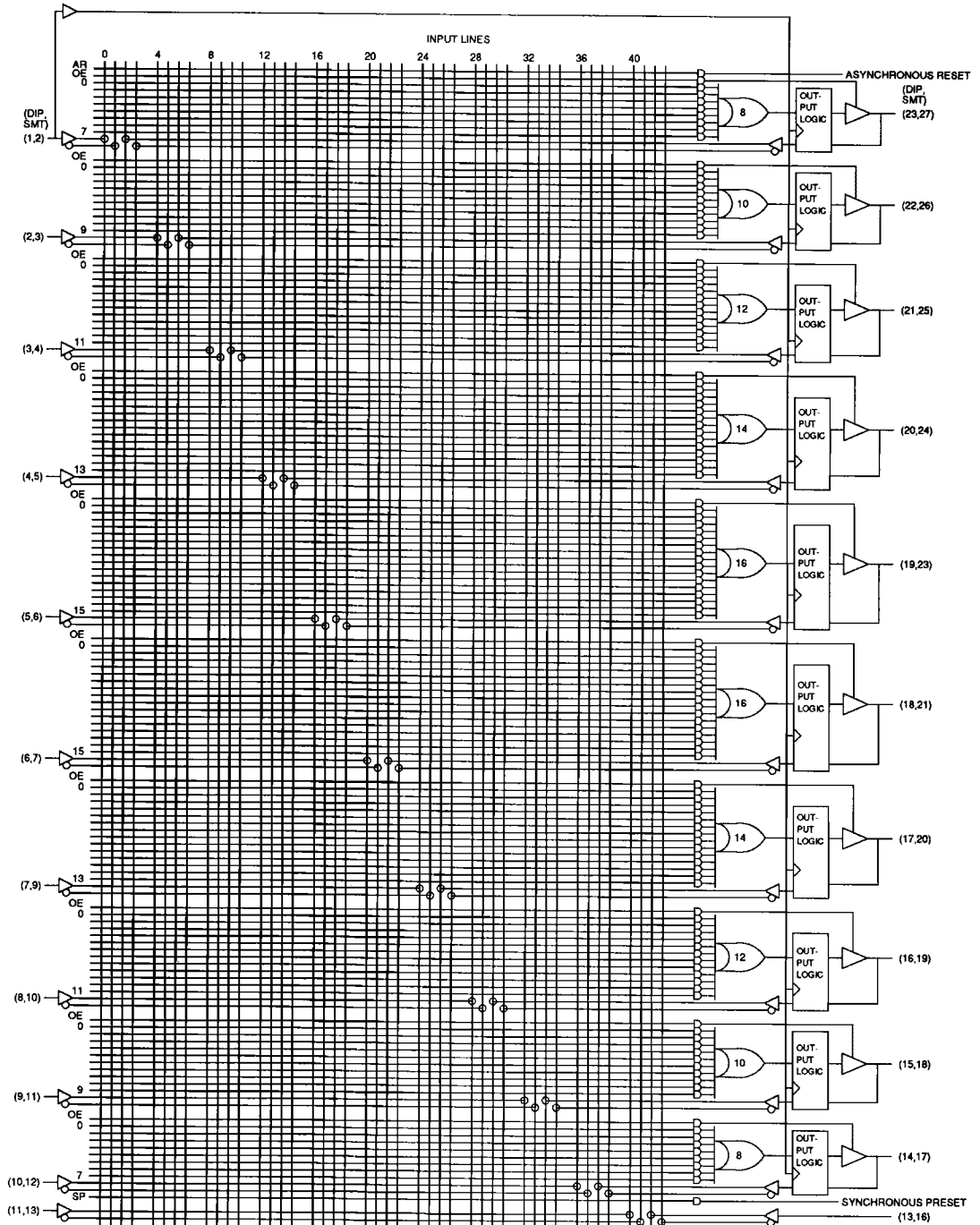


$t_R, t_F < 3 \text{ ns}$  (10% to 90%)

## Output Test Loads:



Functional Logic Diagram ATF22V10B/L



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## Preload of Registered Outputs

When testing state machine designs, all possible states and state transitions must be verified in the design, not just those required in the normal machine operations. This is because certain events may occur during system operation that throw the logic into an illegal state (power-up, line voltage glitches, brown-outs, etc.). To test a design for proper treatment of these conditions, a way must be provided to break the feedback paths, and force any desired (i.e., illegal) state into the registers. Then the machine

can be sequenced and the outputs tested for correct next state conditions.

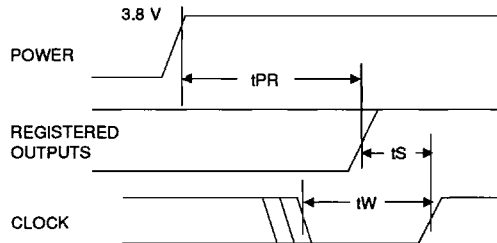
The ATF22V10B/L device includes circuitry that allows each registered output to be synchronously set either high or low. Thus, any present state condition can be forced for test sequencing. If necessary, approved programmers capable of executing test vectors perform output register preload automatically.

## Power Up Reset

The registers in the ATF22V10B and ATF22V10BL are designed to reset during power up. At a point delayed slightly from VCC crossing 3.8 V, all registers will be reset to the low state. The output state will depend on the polarity of the output buffer.

This feature is critical for state machine initialization. However, due to the asynchronous nature of reset and the uncertainty of how VCC actually rises in the system, the following conditions are required:

- 1) The VCC rise must be monotonic,
- 2) After reset occurs, all input and feedback setup times must be met before driving the clock pin high, and
- 3) The clock must remain stable during t<sub>PR</sub>.



| Parameter       | Description         | Min | Typ | Max  | Units |
|-----------------|---------------------|-----|-----|------|-------|
| t <sub>PR</sub> | Power-Up Reset Time |     | 600 | 1000 | ns    |

## Pin Capacitance (f = 1 MHz, T = 25°C) <sup>(1)</sup>

|                  | Typ | Max | Units | Conditions             |
|------------------|-----|-----|-------|------------------------|
| C <sub>IN</sub>  | 5   | 8   | pF    | V <sub>IN</sub> = 0 V  |
| C <sub>OUT</sub> | 6   | 8   | pF    | V <sub>OUT</sub> = 0 V |

Note: 1. Typical values for nominal supply voltage. This parameter is only sampled and is not 100% tested.

## Device Programming

ATF22V10B/L devices are programmed using an Atmel-approved logic programmer, available from a number of manufacturers. Complete programming of the device takes only a few

seconds. Erasing of the device is transparent to the user, and is done automatically as part of the programming cycle.



Ordering Information

| tpd (ns)           | ts (ns) | tco (ns)  | Ordering Code  | Package                       | Operation Range               |
|--------------------|---------|---|----------------|-------------------------------|-------------------------------|
| 7.5                | 6.5     | 5   | ATF22V10B-7GC  | 24D3                          | Commercial<br>(0°C to 70°C)   |
|                    |         |   | ATF22V10B-7JC  | 28J                           |                               |
|                    |         |   | ATF22V10B-7NC  | 28L                           |                               |
|                    |         |   | ATF22V10B-7PC  | 24P3                          |                               |
|                    |         |   | ATF22V10B-7SC  | 24S                           |                               |
| 10                 | 7       | 7   | ATF22V10B-10GC | 24D3                          | Commercial<br>(0°C to 70°C)   |
|                    |         |   | ATF22V10B-10JC | 28J                           |                               |
|                    |         |   | ATF22V10B-10NC | 28L                           |                               |
|                    |         |   | ATF22V10B-10PC | 24P3                          |                               |
|                    |         | ATF22V10B-10SC  | 24S            | Industrial<br>(-40°C to 85°C) |                               |
|                    |         | ATF22V10B-10GI  | 24D3           |                               |                               |
|                    |         | ATF22V10B-10JI  | 28J            |                               |                               |
|                    |         | ATF22V10B-10NI  | 28L            |                               |                               |
|                    |         | ATF22V10B-10PI  | 24P3           |                               |                               |
|                    |         | ATF22V10B-10SI  | 24S            | Military<br>(-55°C to 125°C)  |                               |
|                    |         | ATF22V10B-10GM  | 24D3           |                               |                               |
|                    |         | ATF22V10B-10NM  | 28L            |                               |                               |
|                    |         | ATF22V10B-10GM/883  | 24D3           |                               |                               |
| ATF22V10B-10NM/883 | 28L     | Military/883C<br>(-55°C to 125°C)<br>Class B, Fully Compliant |                |                               |                               |
| 15                 | 10      | 8   | ATF22V10B-15GC | 24D3                          | Commercial<br>(0°C to 70°C)   |
|                    |         |   | ATF22V10B-15JC | 28J                           |                               |
|                    |         |   | ATF22V10B-15NC | 28L                           |                               |
|                    |         |   | ATF22V10B-15PC | 24P3                          |                               |
|                    |         |   | ATF22V10B-15SC | 24S                           | Industrial<br>(-40°C to 85°C) |
|                    |         |   | ATF22V10B-15GI | 24D3                          |                               |
|                    |         |   | ATF22V10B-15JI | 28J                           |                               |
|                    |         |   | ATF22V10B-15NI | 28L                           |                               |
|                    |         | ATF22V10B-15PI  | 24P3           |                               |                               |
|                    |         | ATF22V10B-15SI  | 24S            | Military<br>(-55°C to 125°C)  |                               |
|                    |         | ATF22V10B-15GM  | 24D3           |                               |                               |
|                    |         | ATF22V10B-15NM  | 28L            |                               |                               |
|                    |         | ATF22V10B-15GM/883  | 24D3           |                               |                               |
| ATF22V10B-15NM/883 | 28L     | Military/883C<br>(-55°C to 125°C)<br>Class B, Fully Compliant |                |                               |                               |
| 25                 | 15      | 15  | ATF22V10B-25GC | 24D3                          | Commercial<br>(0°C to 70°C)   |
|                    |         |   | ATF22V10B-25JC | 28J                           |                               |
|                    |         |   | ATF22V10B-25NC | 28L                           |                               |
|                    |         |   | ATF22V10B-25PC | 24P3                          |                               |
|                    |         |   | ATF22V10B-25SC | 24S                           |                               |

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## Ordering Information

| t <sub>PD</sub><br>(ns) | t <sub>s</sub><br>(ns) | t <sub>CO</sub><br>(ns) | Ordering Code  | Package                           | Operation Range   |
|-------------------------|------------------------|-------------------------|--|-----------------------------------|---|
| 25                      | 15                     | 15                      | ATF22V10B-25GI<br>ATF22V10B-25JI<br>ATF22V10B-25NI<br>ATF22V10B-25PI<br>ATF22V10B-25SI | 24D3<br>28J<br>28L<br>24P3<br>24S | Industrial<br>(-40°C to 85°C)                                 |
|                         |                        |                         | ATF22V10B-25GM<br>ATF22V10B-25NM   | 24D3<br>28L                       | Military<br>(-55°C to 125°C)                                  |
|                         |                        |                         | ATF22V10B-25GM/883<br>ATF22V10B-25NM/883   | 24D3<br>28L                       | Military/883C<br>(-55°C to 125°C)<br>Class B, Fully Compliant |

## Ordering Information

| t <sub>PD</sub><br>(ns) | t <sub>s</sub><br>(ns) | t <sub>CO</sub><br>(ns)                                       | Ordering Code   | Package                       | Operation Range             |
|-------------------------|------------------------|---|-----------------|-------------------------------|-----------------------------|
| 10                      | 7                      | 7   | ATF22V10BL-10GC | 24D3                          | Commercial<br>(0°C to 70°C) |
|                         |                        |   | ATF22V10BL-10JC | 28J                           |                             |
|                         |                        |   | ATF22V10BL-10NC | 28L                           |                             |
|                         |                        |   | ATF22V10BL-10PC | 24P3                          |                             |
|                         |                        |   | ATF22V10BL-10SC | 24S                           |                             |
| 15                      | 10                     | 8   | ATF22V10BL-15GC | 24D3                          | Commercial<br>(0°C to 70°C) |
|                         |                        |   | ATF22V10BL-15JC | 28J                           |                             |
|                         |                        |   | ATF22V10BL-15NC | 28L                           |                             |
|                         |                        |   | ATF22V10BL-15PC | 24P3                          |                             |
|                         |                        | ATF22V10BL-15SC   | 24S             |                               |                             |
|                         |                        | ATF22V10BL-15GI   | 24D3            | Industrial<br>(-40°C to 85°C) |                             |
|                         |                        | ATF22V10BL-15JI   | 28J             |                               |                             |
|                         |                        | ATF22V10BL-15NI   | 28L             |                               |                             |
|                         |                        | ATF22V10BL-15PI   | 24P3            |                               |                             |
|                         |                        | ATF22V10BL-15SI   | 24S             |                               |                             |
|                         |                        | ATF22V10BL-15GM   | 24D3            | Military<br>(-55°C to 125°C)  |                             |
|                         |                        | ATF22V10BL-15NM   | 28L             |                               |                             |
| ATF22V10BL-15GM/883     | 24D3                   | Military/883C<br>(-55°C to 125°C)<br>Class B, Fully Compliant |                 |                               |                             |
| ATF22V10BL-15NM/883     | 28L                    |   |                 |                               |                             |
| 25                      | 15                     | 15  | ATF22V10BL-25GC | 24D3                          | Commercial<br>(0°C to 70°C) |
|                         |                        |   | ATF22V10BL-25JC | 28J                           |                             |
|                         |                        |   | ATF22V10BL-25NC | 28L                           |                             |
|                         |                        |   | ATF22V10BL-25PC | 24P3                          |                             |
|                         |                        | ATF22V10BL-25SC   | 24S             |                               |                             |
|                         |                        | ATF22V10BL-25GI   | 24D3            | Industrial<br>(-40°C to 85°C) |                             |
|                         |                        | ATF22V10BL-25JI   | 28J             |                               |                             |
|                         |                        | ATF22V10BL-25NI   | 28L             |                               |                             |
|                         |                        | ATF22V10BL-25PI   | 24P3            |                               |                             |
|                         |                        | ATF22V10BL-25SI   | 24S             |                               |                             |
|                         |                        | ATF22V10BL-15GM   | 24D3            | Military<br>(-55°C to 125°C)  |                             |
|                         |                        | ATF22V10BL-15NM   | 28L             |                               |                             |
| ATF22V10BL-25GM/883     | 24D3                   | Military/883C<br>(-55°C to 125°C)<br>Class B, Fully Compliant |                 |                               |                             |
| ATF22V10BL-25NM/883     | 28L                    |   |                 |                               |                             |

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| Package Type |  |
|--------------|--|
| <b>24D3</b>  | 24 Lead, 0.300" Wide, Ceramic Dual Inline Package (Cerdip)   |
| <b>28J</b>   | 28 Lead, Plastic J-Leaded Chip Carrier (PLCC)                |
| <b>28L</b>   | 28 Pad, Ceramic Leadless Chip Carrier (LCC)                  |
| <b>24P3</b>  | 24 Lead, 0.300" Wide, Plastic Dual Inline Package (PDIP)     |
| <b>24S</b>   | 24 Lead, 0.300" Wide, Plastic Gull Wing Small Outline (SOIC) |



