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# NC7SV74

## TinyLogic® ULP-A D-Type Flip-Flop with Preset and Clear

### Features

- Space-saving US8 surface-mount package
- MicroPak™ Pb-free leadless package
- 0.9V to 3.6V  $V_{CC}$  supply operation
- 3.6V over-voltage tolerant I/Os at  $V_{CC}$  from 0.9V to 3.6V
- Extremely High Speed  $t_{PD}$ 
  - 1.0 ns typ for 2.7V to 3.6V  $V_{CC}$
  - 1.2 ns typ for 2.3V to 2.7V  $V_{CC}$
  - 1.9 ns typ for 1.65V to 1.95V  $V_{CC}$
  - 3.2 ns typ for 1.4V to 1.6V  $V_{CC}$
  - 6.0 ns typ for 1.1V to 1.3V  $V_{CC}$
  - 13.0 ns typ for 0.9V  $V_{CC}$
- Power-off high-impedance inputs and outputs
- High static drive ( $I_{OH}/I_{OL}$ )
  - ±24.0 mA @ 3.00V  $V_{CC}$
  - ±18.0 mA @ 2.30V  $V_{CC}$
  - ±6.0 mA @ 1.65V  $V_{CC}$
  - ±4.0 mA @ 1.4V  $V_{CC}$
  - ±2.0 mA @ 1.1V  $V_{CC}$
  - ±0.1 mA @ 0.9V  $V_{CC}$
- Ultra low dynamic power

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### General Description

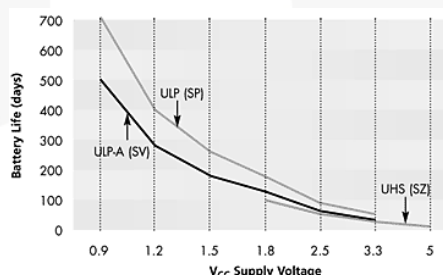
The NC7SV74 is a single D-type CMOS flip-flop with preset and clear from Fairchild's Ultra Low Power-A (ULP-A) series of TinyLogic products, in space-saving US8 and MicroPak™ packages. ULP-A is ideal for applications that require extreme high speed, high drive, and low power.

This product is designed for a wide low-voltage operating range (0.9V to 3.6V  $V_{CC}$ ) and applications that require more drive and speed than the TinyLogic ULP series, but still require low power consumption.

The NC7SV74 is uniquely designed for optimized power and speed, and is fabricated with an advanced CMOS technology to achieve high-speed operation while maintaining low CMOS power dissipation.

The signal level applied to the D input is transferred to the Q output during the positive-going transition of the CLK pulse.

### Battery Life vs. $V_{CC}$ Supply Voltage



TinyLogic ULP and ULP-A with up to 50% less power consumption can extend your battery life significantly.

$$\text{Battery Life} = (V_{\text{battery}} * I_{\text{battery}} * 9) / (P_{\text{device}}) / 24 \text{hrs/day}$$

$$\text{where: } P_{\text{device}} = (I_{CC} * V_{CC}) + (C_{PD} + C_L) * V_{CC}^2 * f$$

Assumes ideal 3.6V Lithium Ion battery with current rating of 900mAh and derated 90% and device frequency at 10MHz, with  $C_L$  = 15 pF load.

### Ordering Information

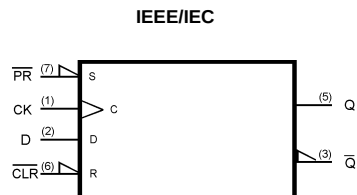
| Order Number | Package Number | Product Code Top Mark | Package Description                               | Supplied As               |
|--------------|----------------|-----------------------|---------------------------------------------------|---------------------------|
| NC7SV74K8X   | MAB08A         | V74                   | 8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide | 3k Units on Tape and Reel |
| NC7SV74L8X   | MAC08A         | Z4                    | Pb-Free 8-Lead MicroPak, 1.6 mm Wide              | 5k Units on Tape and Reel |

Pb-Free package per JEDEC J-STD-020B.

## Pin Descriptions

| Pin Names    | Description         |
|--------------|---------------------|
| D            | Data Input          |
| CK           | Clock Pulse Input   |
| CLR          | Direct Clear Input  |
| Q, $\bar{Q}$ | Flip-Flop Output    |
| PR           | Direct Preset Input |

## Logic Symbol/s



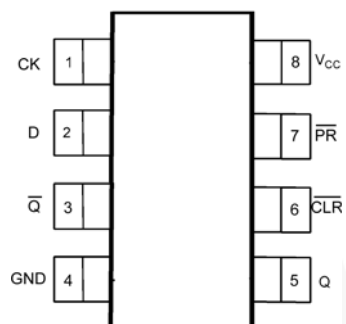
## Truth Table/s

| Inputs |    |   |    | Outputs |           | Function  |
|--------|----|---|----|---------|-----------|-----------|
| CLR    | PR | D | CK | Q       | $\bar{Q}$ |           |
| L      | H  | X | X  | L       | H         | Clear     |
| H      | L  | X | X  | H       | L         | Preset    |
| L      | L  | X | X  | H       | H         | —         |
| H      | H  | L | -  | L       | H         | —         |
| H      | H  | H | -  | H       | L         | —         |
| H      | H  | X | —  | $Q_n$   | $Q_n$     | No Change |

H = HIGH Logic Level  
 L = LOW Logic Level  
 $Q_n$  = No change in data  
 X = Immaterial  
 Z = High Impedance  
 - = Rising Edge  
 — = Falling edge

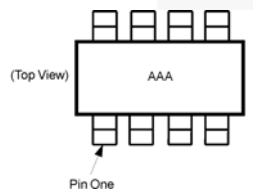
## Connection Diagram/s

Pin Assignments for US8



(Top View)

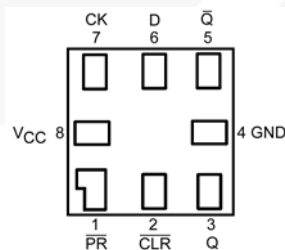
Pin One Orientation Diagram



AAA represents Product Code Top Mark - see ordering info

**Note:** Orientation of Top Mark determines Pin One location. Read the top product code mark left to right, Pin One is the lower left pin (see diagram).

Pad Assignments for MicroPak



(Top Through View)

## Absolute Maximum Ratings

Absolute Maximum Ratings: are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.  $I_O$  Absolute Maximum Rating must be observed.

|                                                   |                          |
|---------------------------------------------------|--------------------------|
| Supply Voltage ( $V_{CC}$ )                       | -0.5V to +4.6V           |
| DC Input Voltage ( $V_{IN}$ )                     | -0.5V to +4.6V           |
| DC Output Voltage ( $V_{OUT}$ )                   |                          |
| HIGH or LOW State                                 | -0.5V to $V_{CC} + 0.5V$ |
| $V_{CC} = 0V$                                     | -0.5V to +4.6V           |
| DC Input Diode Current ( $I_{IK}$ ) $V_{IN} < 0V$ | $\pm 50$ mA              |
| DC Output Diode Current ( $I_{OK}$ )              |                          |
| $V_{OUT} < 0V$                                    | -50 mA                   |
| $V_{OUT} > V_{CC}$                                | +50 mA                   |
| DC Output Source/Sink Current ( $I_{OH}/I_{OL}$ ) | $\pm 50$ mA              |
| DC $V_{CC}$ or Ground Current per                 |                          |
| Supply Pin ( $I_{CC}$ or Ground)                  | $\pm 50$ mA              |
| Storage Temperature Range ( $T_{STG}$ )           | -65°C to +150°C          |

## Recommended Operating Conditions

Unused inputs must be held HIGH or LOW. They may not float.

|                                          |                |
|------------------------------------------|----------------|
| Power Supply                             | 0.9V to 3.6V   |
| Input Voltage ( $V_{IN}$ )               | 0V to 3.6V     |
| Output Voltage ( $V_{OUT}$ )             |                |
| $V_{CC} = 0.0V$                          | 0V to 3.6V     |
| HIGH or LOW State                        | 0V to $V_{CC}$ |
| Output Current in $I_{OH}/I_{OL}$        |                |
| $V_{CC} = 3.0V$ to 3.6V                  | $\pm 24.0$ mA  |
| $V_{CC} = 2.3V$ to 2.7V                  | $\pm 18.0$ mA  |
| $V_{CC} = 1.65V$ to 1.95V                | $\pm 6.0$ mA   |
| $V_{CC} = 1.4V$ to 1.6V                  | $\pm 4.0$ mA   |
| $V_{CC} = 1.1V$ to 1.3V                  | $\pm 2.0$ mA   |
| $V_{CC} = 0.9V$                          | $\pm 0.1$ mA   |
| Free Air Operating Temperature ( $T_A$ ) | -40°C to +85°C |
| Minimum Input Edge Rate ( $dt/dv$ )      |                |
| $V_{IN} = 0.8V$ to 2.0V, $V_{CC} = 3.0V$ | 10 ns/V        |

## DC Electrical Characteristics

| Symbol           | Parameter                    | V <sub>CC</sub><br>(V)                                                                                                                                                    | T <sub>A</sub> = +25°C                                                                                             |                                                                                          | T <sub>A</sub> = -40°C to +85°C                                                                                    |                                                                                          | Units | Conditions                                    |
|------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------|-----------------------------------------------|
|                  |                              |                                                                                                                                                                           | Min.                                                                                                               | Max.                                                                                     | Min.                                                                                                               | Max.                                                                                     |       |                                               |
| V <sub>IH</sub>  | HIGH Level<br>Input Voltage  | 0.90<br>1.10 ≤ V <sub>CC</sub> ≤ 1.30<br>1.40 ≤ V <sub>CC</sub> ≤ 1.60<br>1.65 ≤ V <sub>CC</sub> ≤ 1.95<br>2.30 ≤ V <sub>CC</sub> ≤ 2.70<br>2.70 ≤ V <sub>CC</sub> ≤ 3.60 | 0.65 x V <sub>CC</sub><br>0.65 x V <sub>CC</sub><br>0.65 x V <sub>CC</sub><br>0.65 x V <sub>CC</sub><br>1.6<br>2.0 |                                                                                          | 0.65 x V <sub>CC</sub><br>0.65 x V <sub>CC</sub><br>0.65 x V <sub>CC</sub><br>0.65 x V <sub>CC</sub><br>1.6<br>2.0 |                                                                                          | V     |                                               |
| V <sub>IL</sub>  | LOW Level<br>Input Voltage   | 0.90<br>1.10 ≤ V <sub>CC</sub> ≤ 1.30<br>1.40 ≤ V <sub>CC</sub> ≤ 1.60<br>1.65 ≤ V <sub>CC</sub> ≤ 1.95<br>2.30 ≤ V <sub>CC</sub> ≤ 2.70<br>2.70 ≤ V <sub>CC</sub> ≤ 3.60 |                                                                                                                    | 0.35 x V <sub>CC</sub><br>0.35 x V <sub>CC</sub><br>0.35 x V <sub>CC</sub><br>0.7<br>0.8 |                                                                                                                    | 0.35 x V <sub>CC</sub><br>0.35 x V <sub>CC</sub><br>0.35 x V <sub>CC</sub><br>0.7<br>0.8 | V     |                                               |
| V <sub>OH</sub>  | HIGH Level<br>Output Voltage | 0.90                                                                                                                                                                      | V <sub>CC</sub> - 0.1                                                                                              |                                                                                          | V <sub>CC</sub> - 0.1                                                                                              |                                                                                          | V     | I <sub>OH</sub> = -100 mA                     |
|                  |                              | 1.10 ≤ V <sub>CC</sub> ≤ 1.30                                                                                                                                             | V <sub>CC</sub> - 0.1                                                                                              |                                                                                          | V <sub>CC</sub> - 0.1                                                                                              |                                                                                          |       | I <sub>OH</sub> = -2.0 mA                     |
|                  |                              | 1.40 ≤ V <sub>CC</sub> ≤ 1.60                                                                                                                                             | V <sub>CC</sub> - 0.2                                                                                              |                                                                                          | V <sub>CC</sub> - 0.2                                                                                              |                                                                                          |       | I <sub>OH</sub> = -4.0 mA                     |
|                  |                              | 1.65 ≤ V <sub>CC</sub> ≤ 1.95                                                                                                                                             | V <sub>CC</sub> - 0.2                                                                                              |                                                                                          | V <sub>CC</sub> - 0.2                                                                                              |                                                                                          |       | I <sub>OH</sub> = -6.0 mA                     |
|                  |                              | 2.30 ≤ V <sub>CC</sub> ≤ 2.70                                                                                                                                             | V <sub>CC</sub> - 0.2                                                                                              |                                                                                          | V <sub>CC</sub> - 0.2                                                                                              |                                                                                          |       | I <sub>OH</sub> = -12.0 mA                    |
|                  |                              | 2.70 ≤ V <sub>CC</sub> ≤ 3.60                                                                                                                                             | V <sub>CC</sub> - 0.2                                                                                              |                                                                                          | V <sub>CC</sub> - 0.2                                                                                              |                                                                                          |       | I <sub>OH</sub> = -18.0 mA                    |
|                  |                              | 1.10 ≤ V <sub>CC</sub> ≤ 1.30                                                                                                                                             | 0.75 x V <sub>CC</sub>                                                                                             |                                                                                          | 0.75 x V <sub>CC</sub>                                                                                             |                                                                                          |       | I <sub>OH</sub> = -24.0 mA                    |
|                  |                              | 1.40 ≤ V <sub>CC</sub> ≤ 1.60                                                                                                                                             | 0.75 x V <sub>CC</sub>                                                                                             |                                                                                          | 0.75 x V <sub>CC</sub>                                                                                             |                                                                                          |       |                                               |
|                  |                              | 1.65 ≤ V <sub>CC</sub> ≤ 1.95                                                                                                                                             | 1.25                                                                                                               |                                                                                          | 1.25                                                                                                               |                                                                                          |       |                                               |
|                  |                              | 2.30 ≤ V <sub>CC</sub> ≤ 2.70                                                                                                                                             | 2.0                                                                                                                |                                                                                          | 2.0                                                                                                                |                                                                                          |       |                                               |
|                  |                              | 2.70 ≤ V <sub>CC</sub> ≤ 3.60                                                                                                                                             | 2.2                                                                                                                |                                                                                          | 2.2                                                                                                                |                                                                                          |       |                                               |
|                  |                              | 2.30 ≤ V <sub>CC</sub> ≤ 2.70                                                                                                                                             | 1.7                                                                                                                |                                                                                          | 1.7                                                                                                                |                                                                                          |       |                                               |
|                  |                              | 2.70 ≤ V <sub>CC</sub> ≤ 3.60                                                                                                                                             | 2.4                                                                                                                |                                                                                          | 2.4                                                                                                                |                                                                                          |       |                                               |
|                  |                              | 2.70 ≤ V <sub>CC</sub> ≤ 3.60                                                                                                                                             | 2.2                                                                                                                |                                                                                          | 2.2                                                                                                                |                                                                                          |       |                                               |
| V <sub>OL</sub>  | LOW Level<br>Output Voltage  | 0.90                                                                                                                                                                      |                                                                                                                    | 0.1                                                                                      |                                                                                                                    | 0.1                                                                                      | V     | I <sub>OL</sub> = 100 mA                      |
|                  |                              | 1.10 ≤ V <sub>CC</sub> ≤ 1.30                                                                                                                                             |                                                                                                                    | 0.1                                                                                      |                                                                                                                    | 0.1                                                                                      |       | I <sub>OL</sub> = 2.0 mA                      |
|                  |                              | 1.40 ≤ V <sub>CC</sub> ≤ 1.60                                                                                                                                             |                                                                                                                    | 0.2                                                                                      |                                                                                                                    | 0.2                                                                                      |       | I <sub>OL</sub> = 4.0 mA                      |
|                  |                              | 1.65 ≤ V <sub>CC</sub> ≤ 1.95                                                                                                                                             |                                                                                                                    | 0.2                                                                                      |                                                                                                                    | 0.2                                                                                      |       | I <sub>OL</sub> = 6.0 mA                      |
|                  |                              | 2.30 ≤ V <sub>CC</sub> ≤ 2.70                                                                                                                                             |                                                                                                                    | 0.2                                                                                      |                                                                                                                    | 0.2                                                                                      |       | I <sub>OL</sub> = 12.0 mA                     |
|                  |                              | 2.70 ≤ V <sub>CC</sub> ≤ 3.60                                                                                                                                             |                                                                                                                    | 0.2                                                                                      |                                                                                                                    | 0.2                                                                                      |       | I <sub>OL</sub> = 18.0 mA                     |
|                  |                              | 1.10 ≤ V <sub>CC</sub> ≤ 1.30                                                                                                                                             |                                                                                                                    | 0.25 x V <sub>CC</sub>                                                                   |                                                                                                                    | 0.25 x V <sub>CC</sub>                                                                   |       | I <sub>OL</sub> = 24.0 mA                     |
|                  |                              | 1.40 ≤ V <sub>CC</sub> ≤ 1.60                                                                                                                                             |                                                                                                                    | 0.25 x V <sub>CC</sub>                                                                   |                                                                                                                    | 0.25 x V <sub>CC</sub>                                                                   |       |                                               |
|                  |                              | 1.65 ≤ V <sub>CC</sub> ≤ 1.95                                                                                                                                             |                                                                                                                    | 0.3                                                                                      |                                                                                                                    | 0.3                                                                                      |       |                                               |
|                  |                              | 2.30 ≤ V <sub>CC</sub> ≤ 2.70                                                                                                                                             |                                                                                                                    | 0.4                                                                                      |                                                                                                                    | 0.4                                                                                      |       |                                               |
|                  |                              | 2.70 ≤ V <sub>CC</sub> ≤ 3.60                                                                                                                                             |                                                                                                                    | 0.4                                                                                      |                                                                                                                    | 0.4                                                                                      |       |                                               |
|                  |                              | 2.30 ≤ V <sub>CC</sub> ≤ 2.70                                                                                                                                             |                                                                                                                    | 0.6                                                                                      |                                                                                                                    | 0.6                                                                                      |       |                                               |
|                  |                              | 2.70 ≤ V <sub>CC</sub> ≤ 3.60                                                                                                                                             |                                                                                                                    | 0.4                                                                                      |                                                                                                                    | 0.4                                                                                      |       |                                               |
|                  |                              | 2.70 ≤ V <sub>CC</sub> ≤ 3.60                                                                                                                                             |                                                                                                                    | 0.55                                                                                     |                                                                                                                    | 0.55                                                                                     |       |                                               |
| I <sub>IN</sub>  | Input Leakage Current        | 0.90 to 3.60                                                                                                                                                              |                                                                                                                    | ±0.1                                                                                     |                                                                                                                    | ±0.5                                                                                     | mA    | 0 ≤ V <sub>I</sub> ≤ 3.6V                     |
| I <sub>OFF</sub> | Power Off Leakage Current    | 0                                                                                                                                                                         |                                                                                                                    | 0.5                                                                                      |                                                                                                                    | 0.5                                                                                      | mA    | 0 ≤ (V <sub>I</sub> , V <sub>O</sub> ) ≤ 3.6V |
| I <sub>CC</sub>  | Quiescent Supply Current     | 0.90 to 3.60                                                                                                                                                              |                                                                                                                    | 0.9                                                                                      |                                                                                                                    | 0.9                                                                                      | mA    | V <sub>I</sub> = V <sub>CC</sub> or GND       |
|                  |                              | 0.90 to 3.60                                                                                                                                                              |                                                                                                                    |                                                                                          |                                                                                                                    | ±0.9                                                                                     |       | V <sub>CC</sub> ≤ V <sub>I</sub> ≤ 3.6V       |

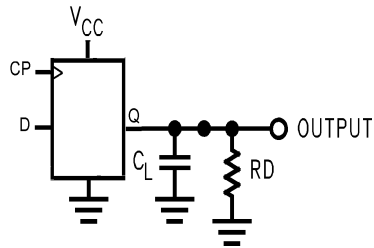
## AC Electrical Characteristics

| Symbol                        | Parameter                                                               | V <sub>CC</sub><br>(V)        | T <sub>A</sub> = +25°C |      |      | T <sub>A</sub> = -40°C to +85°C |                                                  | Units | Conditions                                       | Figure<br>Number     |
|-------------------------------|-------------------------------------------------------------------------|-------------------------------|------------------------|------|------|---------------------------------|--------------------------------------------------|-------|--------------------------------------------------|----------------------|
|                               |                                                                         |                               | Min.                   | Typ. | Max. | Min.                            | Max.                                             |       |                                                  |                      |
| f <sub>MAX</sub>              | Maximum Clock<br>Frequency                                              | 0.90                          | 50                     |      |      |                                 |                                                  | MHz   | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 1 MΩ | Figure 1<br>Figure 5 |
|                               |                                                                         | 1.10 ≤ V <sub>CC</sub> ≤ 1.30 | 150                    |      |      | 150                             |                                                  |       | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 2 kΩ |                      |
|                               |                                                                         | 1.40 ≤ V <sub>CC</sub> ≤ 1.60 | 200                    |      |      | 200                             |                                                  |       | C <sub>L</sub> = 30 pF<br>R <sub>L</sub> = 500Ω  |                      |
|                               |                                                                         | 1.65 ≤ V <sub>CC</sub> ≤ 1.95 | 200                    |      |      | 200                             |                                                  |       |                                                  |                      |
|                               |                                                                         | 2.30 ≤ V <sub>CC</sub> ≤ 2.70 | 200                    |      |      | 200                             |                                                  |       |                                                  |                      |
| 2.70 ≤ V <sub>CC</sub> ≤ 3.60 | 200                                                                     |                               |                        | 200  |      |                                 |                                                  |       |                                                  |                      |
| t <sub>PLH</sub>              | Propagation Delay                                                       | 0.90                          | 13.0                   |      |      |                                 |                                                  | ns    | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 1 MΩ | Figure 1<br>Figure 3 |
| t <sub>PHL</sub>              | CK to Q, $\overline{Q}$                                                 | 1.10 ≤ V <sub>CC</sub> ≤ 1.30 | 3.0                    | 6.0  | 9.9  | 1.0                             | 14.6                                             |       | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 2 kΩ |                      |
|                               |                                                                         | 1.40 ≤ V <sub>CC</sub> ≤ 1.60 | 1.0                    | 3.2  | 6.0  | 1.0                             | 7.2                                              |       | C <sub>L</sub> = 30 pF<br>R <sub>L</sub> = 500 Ω |                      |
|                               |                                                                         | 1.65 ≤ V <sub>CC</sub> ≤ 1.95 | 1.0                    | 1.9  | 4.5  | 1.0                             | 5.3                                              |       |                                                  |                      |
|                               |                                                                         | 2.30 ≤ V <sub>CC</sub> ≤ 2.70 | 0.8                    | 1.2  | 3.0  | 0.7                             | 3.7                                              |       |                                                  |                      |
| 2.70 ≤ V <sub>CC</sub> ≤ 3.60 | 0.7                                                                     | 1.0                           | 2.8                    | 0.6  | 3.2  |                                 |                                                  |       |                                                  |                      |
| t <sub>PLH</sub>              | Propagation Delay                                                       | 0.90                          | 14.0                   |      |      |                                 |                                                  | ns    | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 1 MΩ | Figure 1<br>Figure 3 |
| t <sub>PHL</sub>              | $\overline{\text{CLR}}$ , $\overline{\text{PR}}$ , to Q, $\overline{Q}$ | 1.10 ≤ V <sub>CC</sub> ≤ 1.30 | 3.0                    | 6.5  | 10.5 | 1.0                             | 15.1                                             |       | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 2 kΩ |                      |
|                               |                                                                         | 1.40 ≤ V <sub>CC</sub> ≤ 1.60 | 1.0                    | 3.2  | 6.0  | 1.0                             | 7.2                                              |       | C <sub>L</sub> = 30 pF<br>R <sub>L</sub> = 500 Ω |                      |
|                               |                                                                         | 1.65 ≤ V <sub>CC</sub> ≤ 1.95 | 1.0                    | 1.9  | 4.5  | 1.0                             | 5.3                                              |       |                                                  |                      |
|                               |                                                                         | 2.30 ≤ V <sub>CC</sub> ≤ 2.70 | 0.8                    | 1.2  | 3.0  | 0.7                             | 3.7                                              |       |                                                  |                      |
| 2.70 ≤ V <sub>CC</sub> ≤ 3.60 | 0.7                                                                     | 1.0                           | 2.8                    | 0.6  | 3.2  |                                 |                                                  |       |                                                  |                      |
| t <sub>S</sub>                | Setup Time,<br>CK to D                                                  | 0.90                          | 6.5                    |      |      | 6.5                             |                                                  | ns    | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 1 MΩ | Figure 1<br>Figure 4 |
|                               |                                                                         | 1.10 ≤ V <sub>CC</sub> ≤ 1.30 | 3.5                    |      |      | 3.5                             | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 2 kΩ |       |                                                  |                      |
|                               |                                                                         | 1.40 ≤ V <sub>CC</sub> ≤ 1.60 | 2.0                    |      |      | 2.0                             | C <sub>L</sub> = 30 pF<br>R <sub>L</sub> = 500 Ω |       |                                                  |                      |
|                               |                                                                         | 1.65 ≤ V <sub>CC</sub> ≤ 1.95 | 1.5                    |      |      | 1.5                             |                                                  |       |                                                  |                      |
|                               |                                                                         | 2.30 ≤ V <sub>CC</sub> ≤ 2.70 | 2.0                    |      |      | 2.0                             |                                                  |       |                                                  |                      |
| 2.70 ≤ V <sub>CC</sub> ≤ 3.60 | 1.5                                                                     |                               |                        | 1.5  |      |                                 |                                                  |       |                                                  |                      |
| t <sub>H</sub>                | Hold Time,<br>CK to D                                                   | 0.90                          | 0.5                    |      |      | 0.5                             |                                                  | ns    | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 1 MΩ | Figure 1<br>Figure 4 |
|                               |                                                                         | 1.10 ≤ V <sub>CC</sub> ≤ 1.30 | 0.5                    |      |      | 0.5                             | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 2 kΩ |       |                                                  |                      |
|                               |                                                                         | 1.40 ≤ V <sub>CC</sub> ≤ 1.60 | 0.5                    |      |      | 0.5                             | C <sub>L</sub> = 30 pF<br>R <sub>L</sub> = 500 Ω |       |                                                  |                      |
|                               |                                                                         | 1.65 ≤ V <sub>CC</sub> ≤ 1.95 | 0.5                    |      |      | 0.5                             |                                                  |       |                                                  |                      |
|                               |                                                                         | 2.30 ≤ V <sub>CC</sub> ≤ 2.70 | 0.5                    |      |      | 0.5                             |                                                  |       |                                                  |                      |
| 2.70 ≤ V <sub>CC</sub> ≤ 3.60 | 0.5                                                                     |                               |                        | 0.5  |      |                                 |                                                  |       |                                                  |                      |
| t <sub>W</sub>                | Pulse Width,<br>CK, $\overline{\text{PR}}$ , $\overline{\text{CLR}}$    | 0.90                          | 7.0                    |      |      | 7.0                             |                                                  | ns    | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 1 MΩ | Figure 1<br>Figure 5 |
|                               |                                                                         | 1.10 ≤ V <sub>CC</sub> ≤ 1.30 | 4.0                    |      |      | 4.0                             | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 2 kΩ |       |                                                  |                      |
|                               |                                                                         | 1.40 ≤ V <sub>CC</sub> ≤ 1.60 | 3.0                    |      |      | 3.0                             | C <sub>L</sub> = 30 pF<br>R <sub>L</sub> = 500Ω  |       |                                                  |                      |
|                               |                                                                         | 1.65 ≤ V <sub>CC</sub> ≤ 1.95 | 3.0                    |      |      | 3.0                             |                                                  |       |                                                  |                      |
|                               |                                                                         | 2.30 ≤ V <sub>CC</sub> ≤ 2.70 | 3.0                    |      |      | 3.0                             |                                                  |       |                                                  |                      |
| 2.70 ≤ V <sub>CC</sub> ≤ 3.60 | 3.0                                                                     |                               |                        | 3.0  |      |                                 |                                                  |       |                                                  |                      |
| t <sub>REC</sub>              | Recover Time<br>$\overline{\text{CLR}}$ , $\overline{\text{PR}}$ to CK  | 0.90                          | 8.0                    |      |      | 8.0                             |                                                  | ns    | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 1 MΩ | Figure 1<br>Figure 4 |
|                               |                                                                         | 1.10 ≤ V <sub>CC</sub> ≤ 1.30 | 4.5                    |      |      | 4.5                             | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 2 kΩ |       |                                                  |                      |
|                               |                                                                         | 1.40 ≤ V <sub>CC</sub> ≤ 1.60 | 3.0                    |      |      | 3.0                             | C <sub>L</sub> = 30 pF<br>R <sub>L</sub> = 500Ω  |       |                                                  |                      |
|                               |                                                                         | 1.65 ≤ V <sub>CC</sub> ≤ 1.95 | 3.0                    |      |      | 3.0                             |                                                  |       |                                                  |                      |
|                               |                                                                         | 2.30 ≤ V <sub>CC</sub> ≤ 2.70 | 3.0                    |      |      | 3.0                             |                                                  |       |                                                  |                      |
| 2.70 ≤ V <sub>CC</sub> ≤ 3.60 | 3.0                                                                     |                               |                        | 3.0  |      |                                 |                                                  |       |                                                  |                      |

## Capacitance

| Symbol           | Parameter                     | Typ. | Max. | Units | Conditions                                         |
|------------------|-------------------------------|------|------|-------|----------------------------------------------------|
| C <sub>IN</sub>  | Input Capacitance             | 2.0  |      | pF    | V <sub>CC</sub> = 0V                               |
| C <sub>OUT</sub> | Output Capacitance            | 4.5  |      | pF    | V <sub>CC</sub> = 0V                               |
| C <sub>PD</sub>  | Power Dissipation Capacitance | 20.0 |      | pF    | V <sub>I</sub> = V <sub>CC</sub> or 0V, f = 10 MHz |

## AC Loading and Waveforms

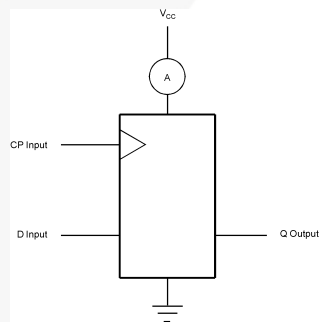


$C_L$  includes load and stray capacitance

Input PRR = 1.0 MHz;  $t_w = 500$  ns

**AC Test Circuit**

| Test                  | Switch                                                                 |
|-----------------------|------------------------------------------------------------------------|
| $t_{PLH}$ , $t_{PHL}$ | Open                                                                   |
| $t_{PZL}$ , $t_{PLZ}$ | 6V at $V_{CC} = 3.3V \pm 0.3V$<br>$V_{CC} \times 2$ at $V_{CC} < 3.0V$ |
| $t_{PZH}$ , $t_{PHZ}$ | GND                                                                    |

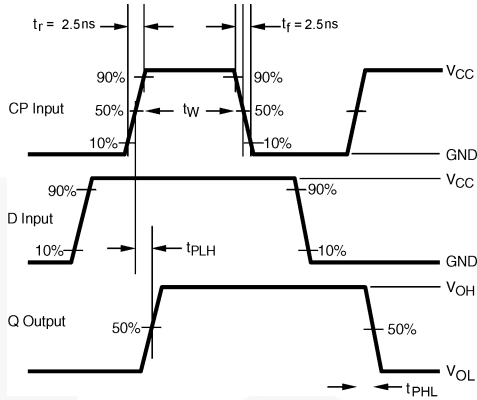


CP Input = AC Waveform;  $t_r = t_f = 2.5$  ns;

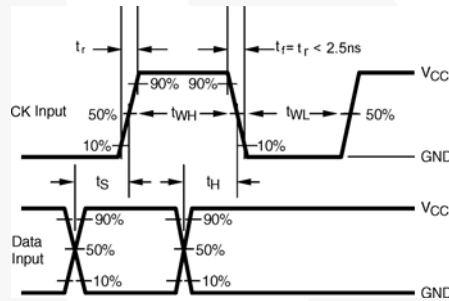
CP Input PRR = 10 MHz; Duty Cycle = 50%

D Input PRR = 5MHz; Duty Cycle = 50%

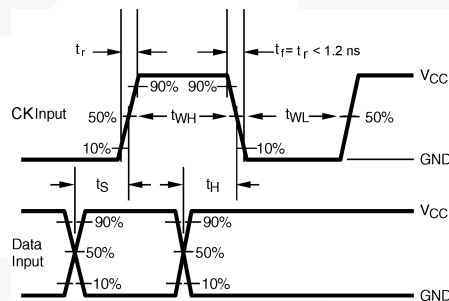
$I_{CCD}$  Test Circuit



**AC Waveforms**



**AC Waveforms**

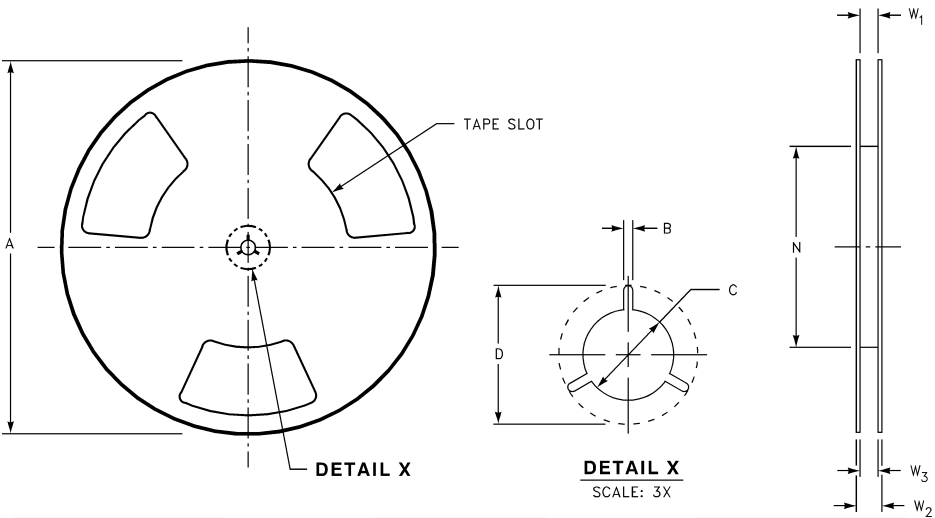


**AC Waveforms**



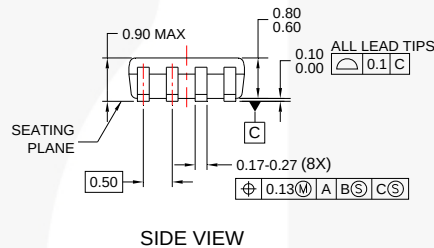
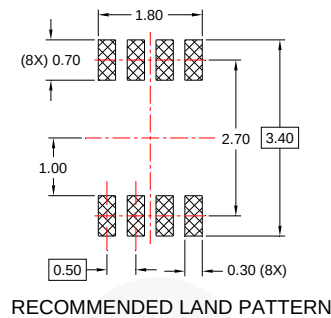
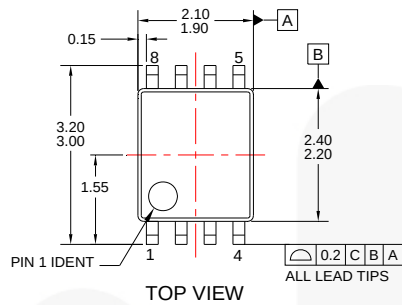


REEL DIMENSIONS inches (millimeters)



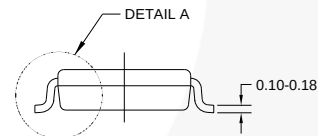
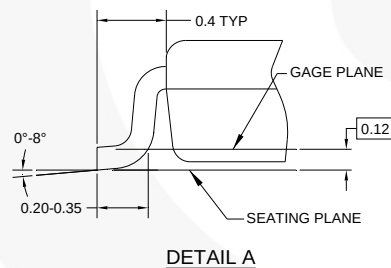
| Tape Size | A              | B               | C                | D                | N                | W1                                          | W2               | W3                                     |
|-----------|----------------|-----------------|------------------|------------------|------------------|---------------------------------------------|------------------|----------------------------------------|
| 8 mm      | 7.0<br>(177.8) | 0.059<br>(1.50) | 0.512<br>(13.00) | 0.795<br>(20.20) | 2.165<br>(55.00) | 0.331 + 0.059/-0.000<br>(8.40 + 1.50/-0.00) | 0.567<br>(14.40) | W1 + 0.078/-0.039<br>(W1 + 2.00/-1.00) |

## Physical Dimensions



### NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-187
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1994.
- E. FILE DRAWING NAME : MKT-MAB08Arev4

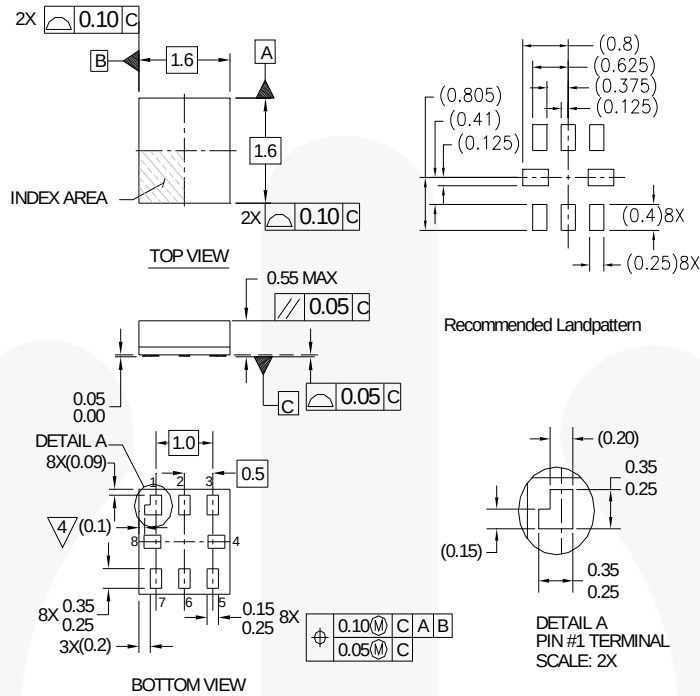


8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide  
Package Number MAB08A

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## Physical Dimensions



### Notes:

1. PACKAGE CONFORMS TO JEDEC MO-255 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y.14M-1994
4. PIN 1 FLAG, END OF PACKAGE OFFSET
5. DRAWING FILE NAME: MKT-MAC08AREV4

MAC08AREV4

**Pb-Free 8-Lead MicroPak, 1.6 mm Wide**  
**Package Number MAC08A**

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| Build it Now™            | GreenBridge™                                   | QFET®                                 | TinyBuck®        |
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