

# PAL16L8AM, PAL16L8A-2M, PAL16R4AM, PAL16R4A-2M PAL16R6AM, PAL16R6A-2M, PAL16R8AM, PAL16R8A-2M STANDARD HIGH-SPEED PAL<sup>®</sup> CIRCUITS

SRPS016 – D2705, FEBRUARY 1984 – REVISED MARCH 1992

- **Choice of Operating Speeds**  
High-Speed, A Devices . . . 25 MHz Min  
Half-Power, A-2 Devices . . . 16 MHz Min
- **Choice of Input/Output Configuration**
- **Package Options Include Both Ceramic DIP and Chip Carrier in Addition to Ceramic Flat Package**

| DEVICE  | I<br>INPUTS | 3-STATE<br>O OUTPUTS | REGISTERED<br>Q OUTPUTS | I/O<br>PORT<br>S |
|---------|-------------|----------------------|-------------------------|------------------|
| PAL16L8 | 10          | 2                    | 0                       | 6                |
| PAL16R4 | 8           | 0                    | 4 (3-state buffers)     | 4                |
| PAL16R6 | 8           | 0                    | 6 (3-state buffers)     | 2                |
| PAL16R8 | 8           | 0                    | 8 (3-state buffers)     | 0                |

## description

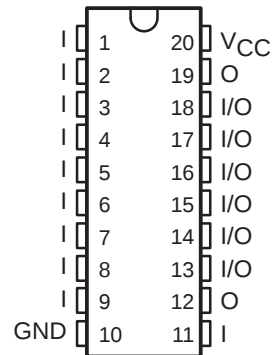
These programmable array logic devices feature high speed and a choice of either standard or half-power devices. They combine Advanced Low-Power Schottky technology with proven titanium-tungsten fuses. These devices will provide reliable, high-performance substitutes for conventional TTL logic. Their easy programmability allow for quick design of "custom" functions and typically results in a more compact circuit board. In addition, chip carriers are available for further reduction in board space.

The Half-Power versions offer a choice of operating frequency, switching speeds, and power dissipation. In many cases, these Half-Power devices can result in significant power reduction from an overall system level.

The PAL16' M series is characterized for operation over the full military temperature range of –55°C to 125°C.

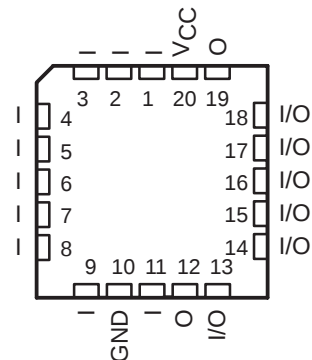
**PAL16L8'  
J OR W PACKAGE**

(TOP VIEW)



**PAL16L8'  
FK PACKAGE**

(TOP VIEW)



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



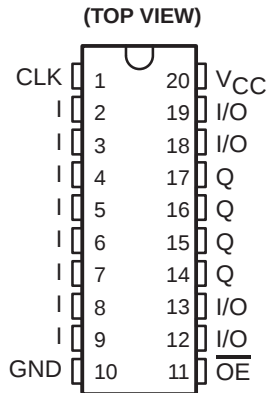
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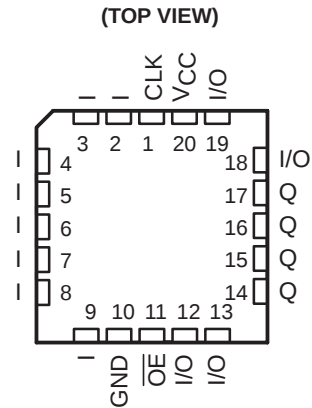
# PAL16R4AM, PAL16R4A-2M, PAL16R6AM, PAL16R6A-2M, PAL16R8AM, PAL16R8A-2M STANDARD HIGH-SPEED PAL<sup>®</sup> CIRCUITS

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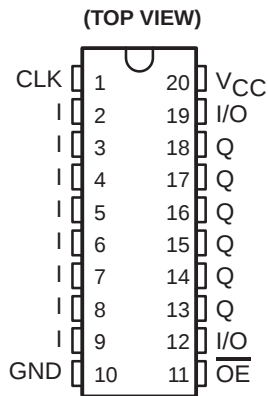
**PAL16R4'**  
J OR W PACKAGE



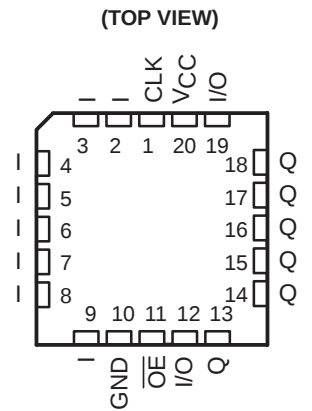
**PAL16R4'**  
FK PACKAGE



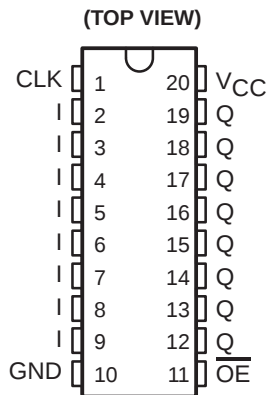
**PAL16R6'**  
J OR W PACKAGE



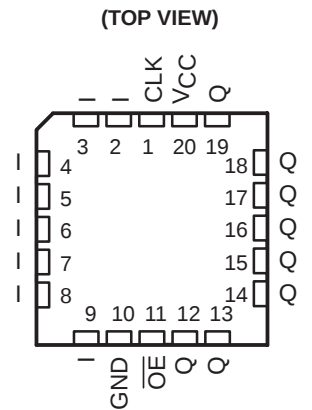
**PAL16R6'**  
FK PACKAGE



**PAL16R8'**  
J OR W PACKAGE



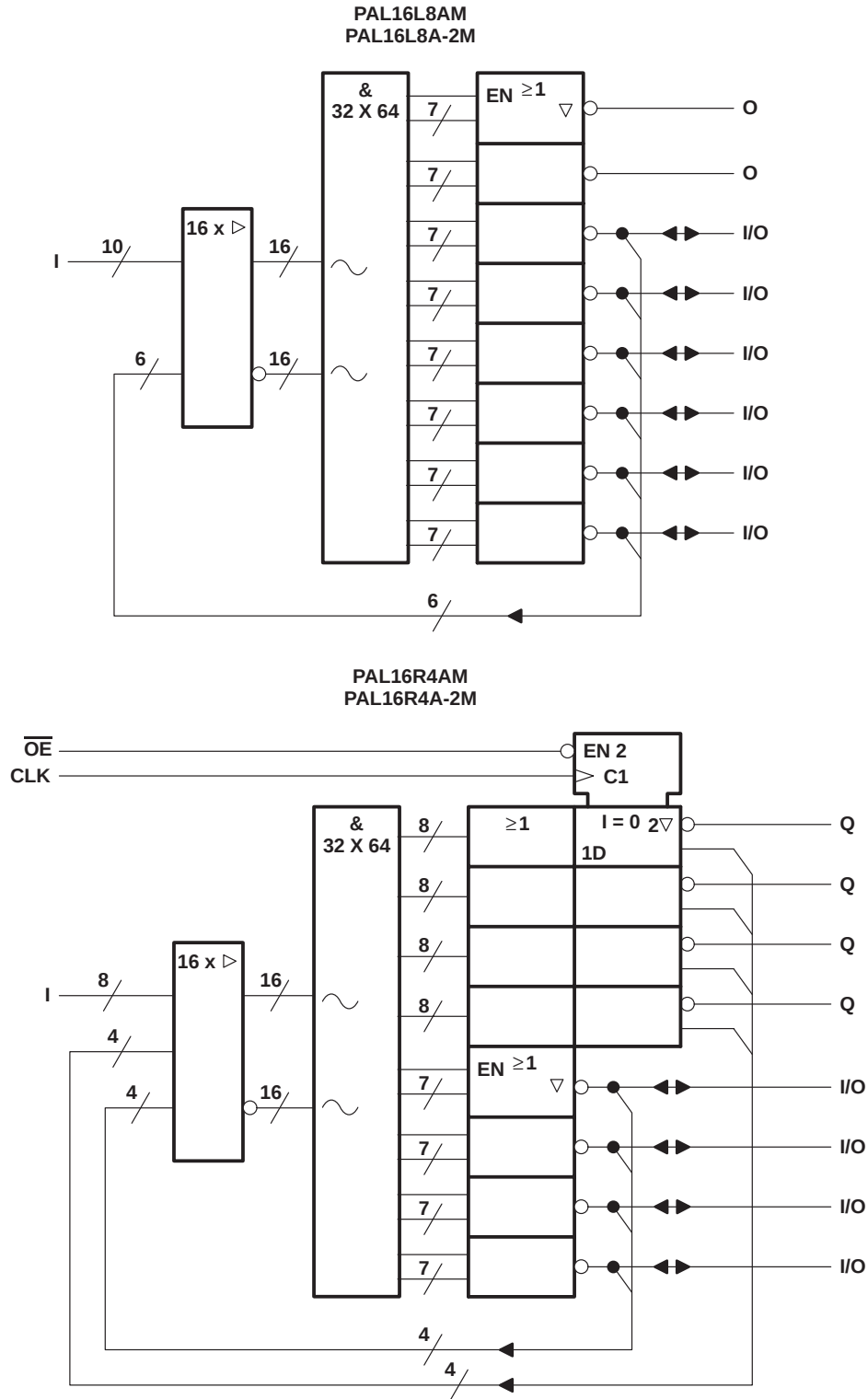
**PAL16R8'**  
FK PACKAGE



# PAL16L8AM, PAL16L8A-2M, PAL16R4AM, PAL16R4A-2M STANDARD HIGH-SPEED PAL<sup>®</sup> CIRCUITS

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## functional block diagrams (positive logic)

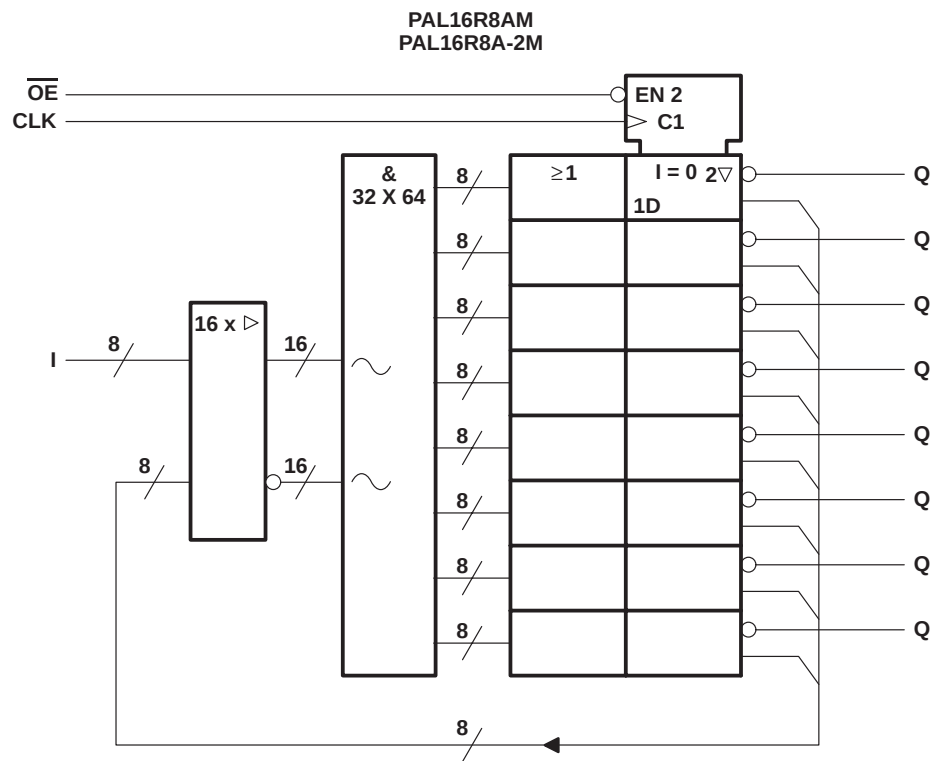
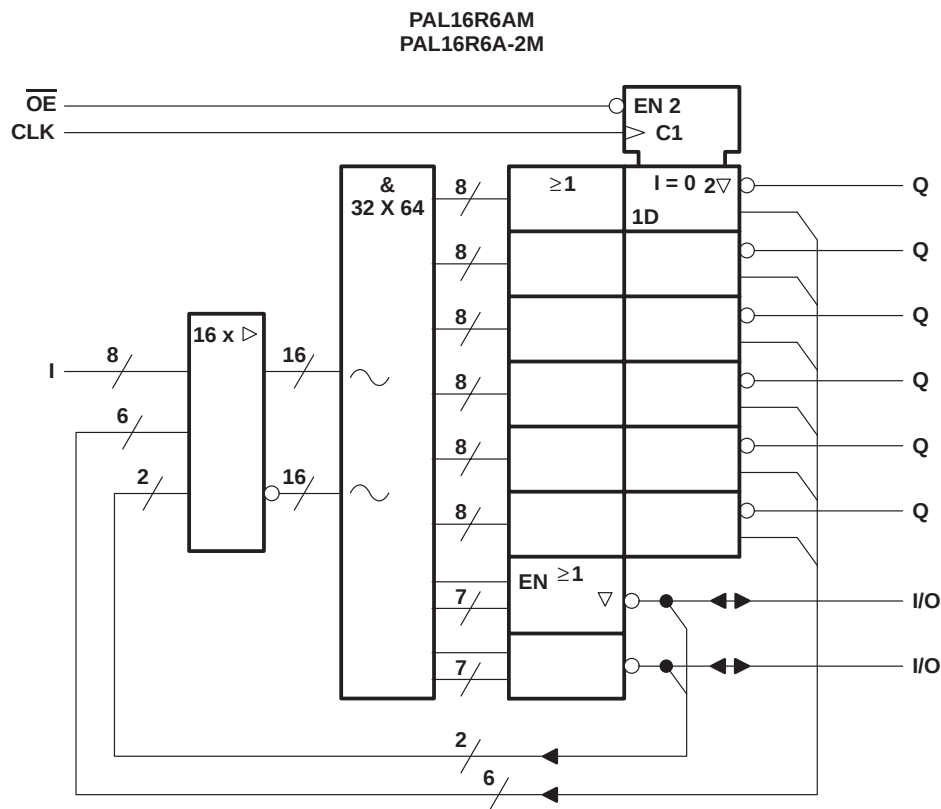


~ denotes fused inputs

# PAL16R6AM, PAL16R6A-2M, PAL16R8AM, PAL16R8A-2M STANDARD HIGH-SPEED PAL<sup>®</sup> CIRCUITS

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## functional block diagrams (positive logic)

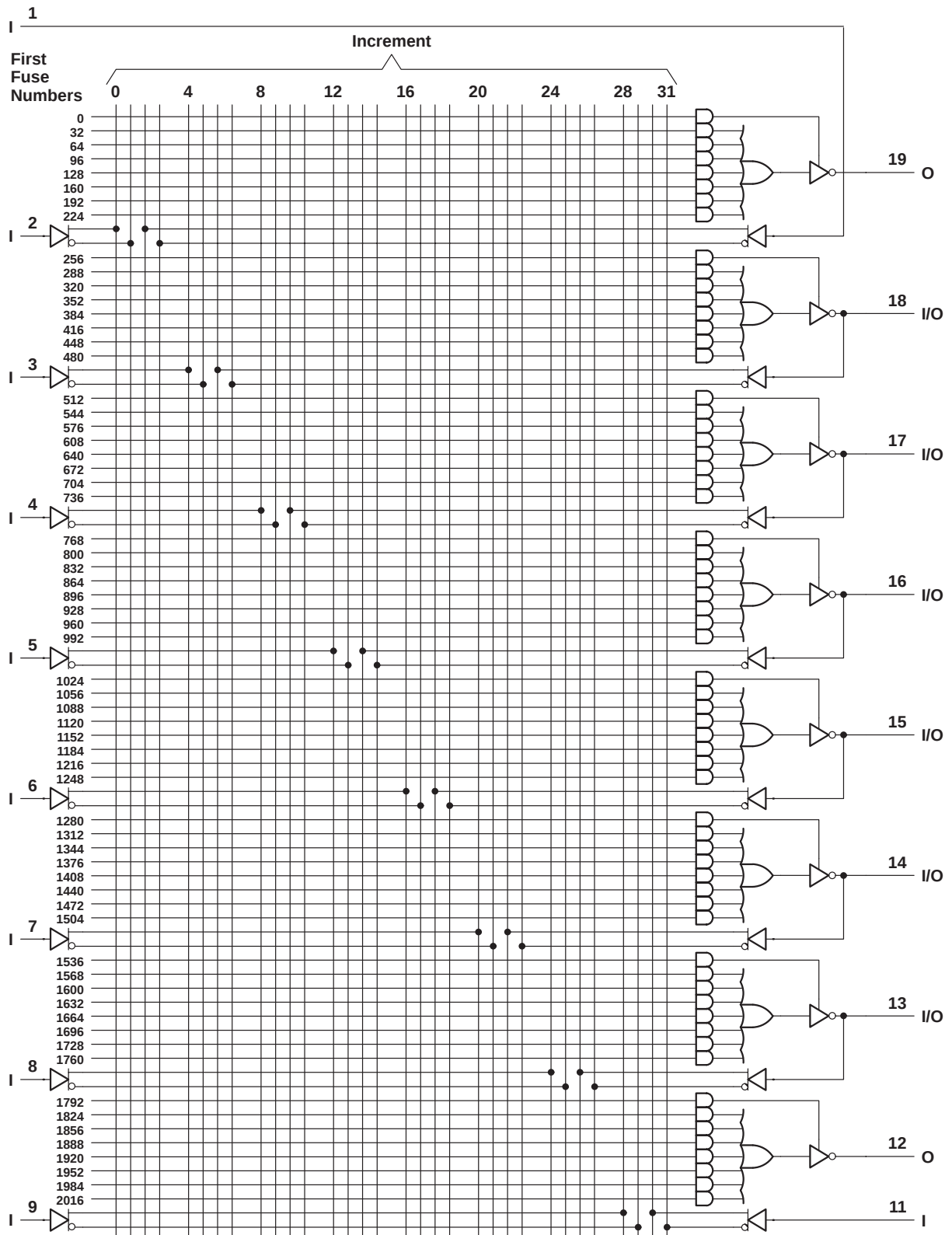


~ denotes fused inputs

**TEXAS  
INSTRUMENTS**

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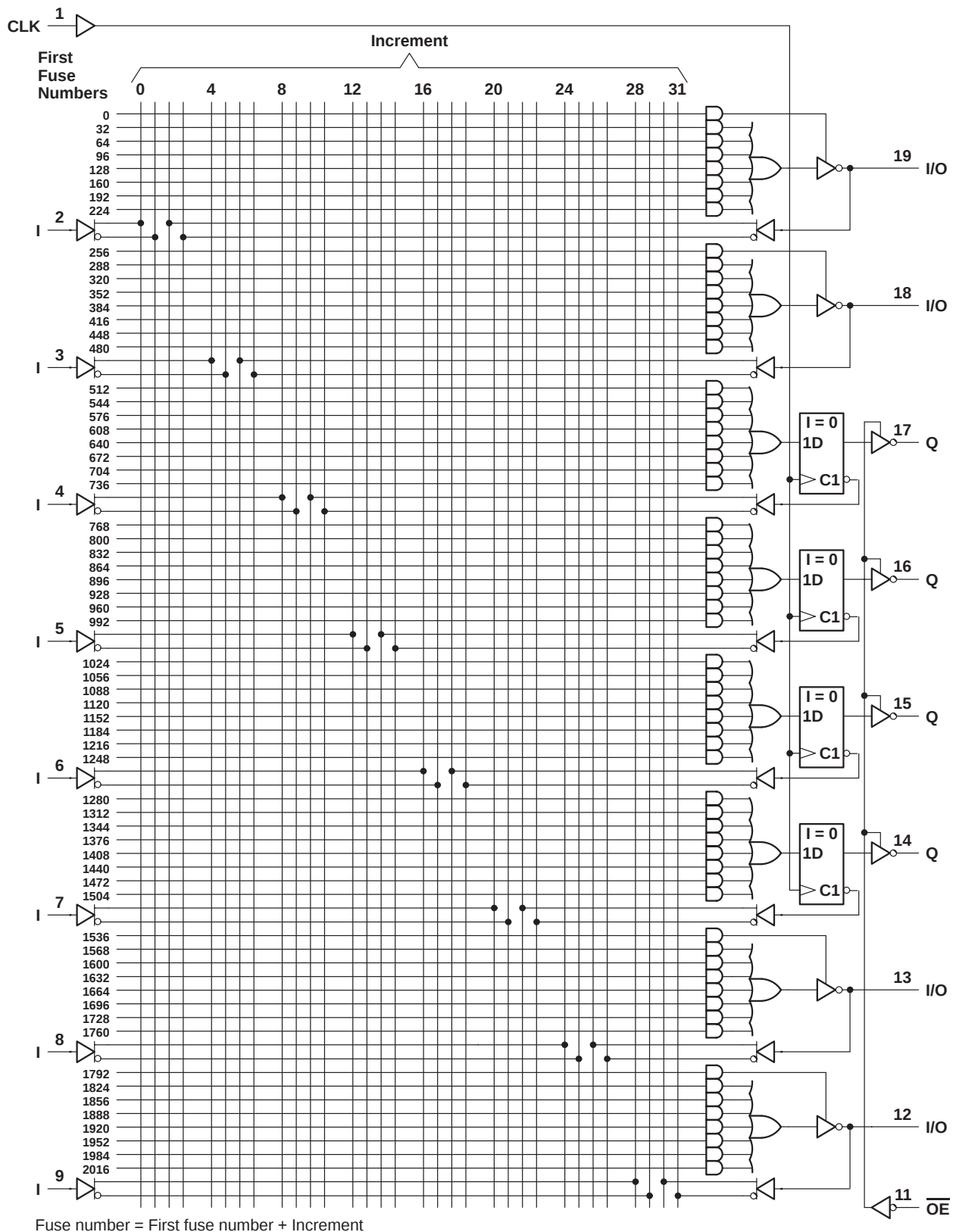
logic diagram (positive logic)



# PAL16R4AM, PAL16R4A-2M STANDARD HIGH-SPEED PAL<sup>®</sup> CIRCUITS

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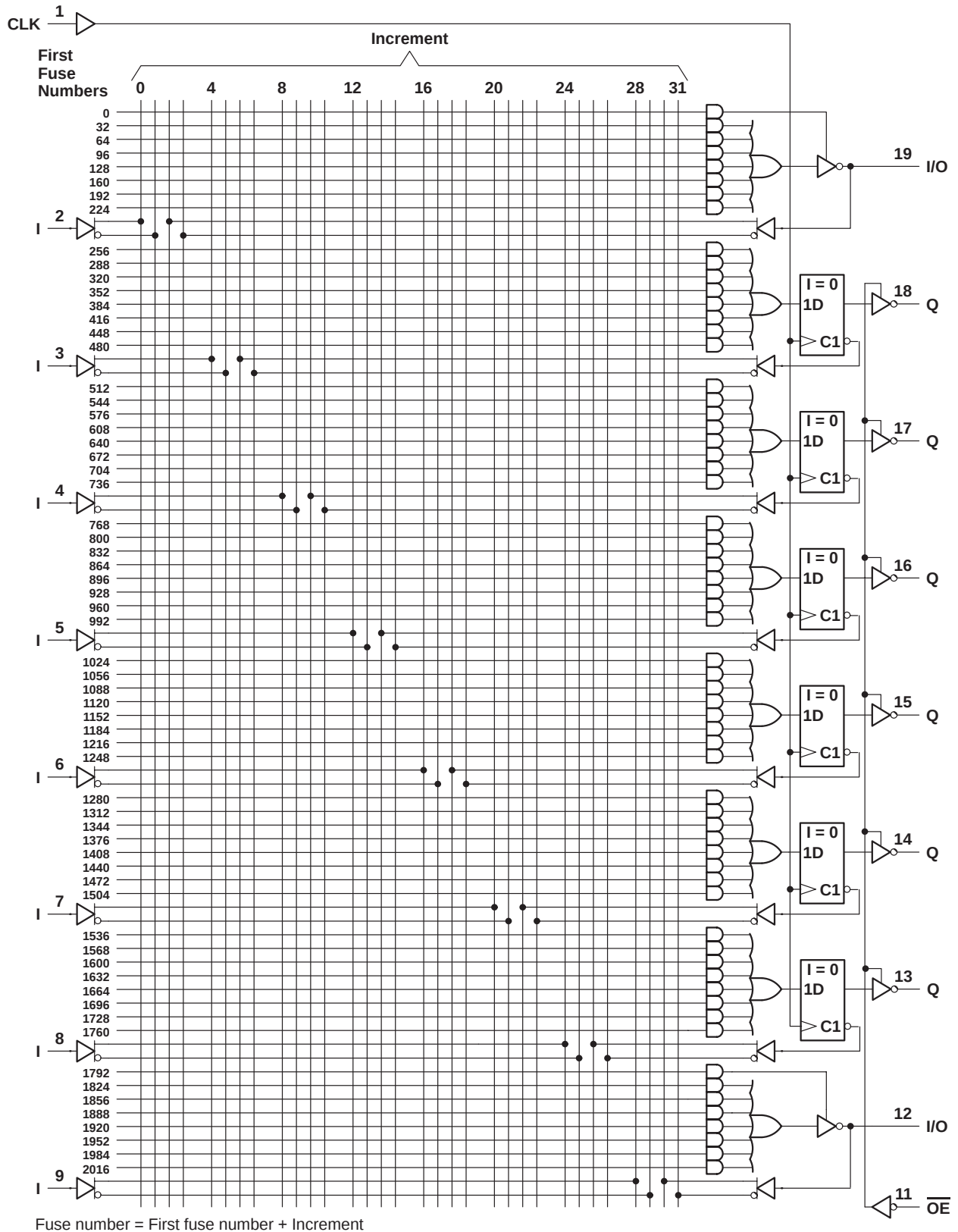
## logic diagram (positive logic)



# PAL16R6AM, PAL16R6A-2M STANDARD HIGH-SPEED PAL® CIRCUITS

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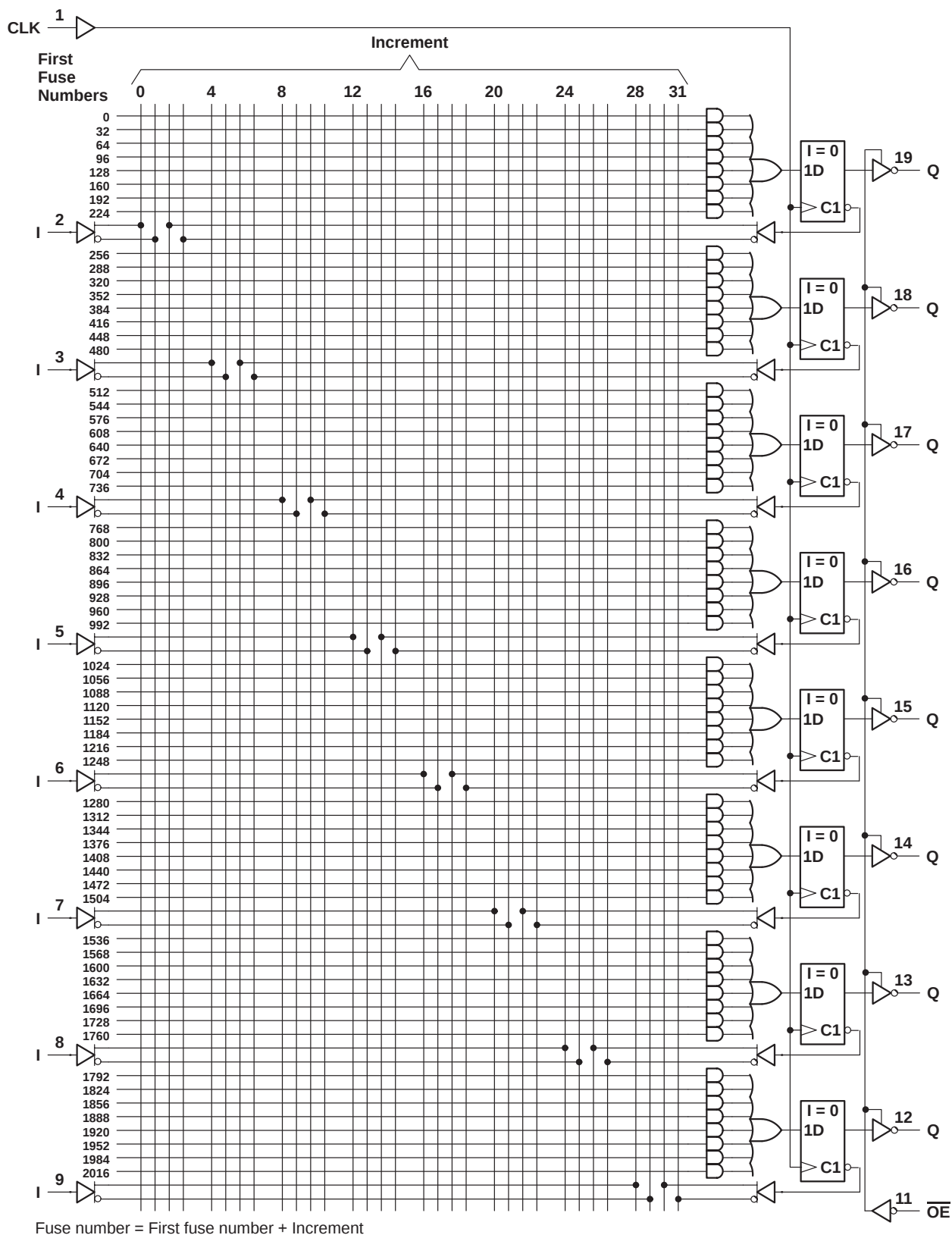
## logic diagram (positive logic)



# PAL16R8AM, PAL16R8A-2M STANDARD HIGH-SPEED PAL<sup>®</sup> CIRCUITS

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## logic diagram (positive logic)



## programming information

Texas Instruments programmable logic devices can be programmed using widely available software and inexpensive device programmers.

Complete programming specifications, algorithms, and the latest information on hardware, software, and firmware are available upon request. Information on programmers capable of programming Texas Instruments programmable logic is also available, upon request, from the nearest TI field sales office, local authorized TI distributor, or by calling Texas Instruments at (214) 997-5666.

## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

|                                                 |                |
|-------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$ (see Note 1)           | 7 V            |
| Input voltage (see Note 1)                      | 5.5 V          |
| Voltage applied to disabled output (see Note 1) | 5.5 V          |
| Operating free-air temperature range            | –55°C to 125°C |
| Storage temperature range                       | –65°C to 150°C |

NOTE 1: These ratings apply except for programming pins during a programming cycle.

## recommended operating conditions

|          |                                | MIN | NOM | MAX | UNIT |
|----------|--------------------------------|-----|-----|-----|------|
| $V_{CC}$ | Supply voltage                 | 4.5 | 5   | 5.5 | V    |
| $V_{IH}$ | High-level input voltage       | 2   |     | 5.5 | V    |
| $V_{IL}$ | Low-level input voltage        |     |     | 0.8 | V    |
| $I_{OH}$ | High-level output current      |     |     | –2  | mA   |
| $I_{OL}$ | Low-level output current       |     |     | 12  | mA   |
| $T_A$    | Operating free-air temperature | –55 | 25  | 125 | °C   |

# PAL16L8AM, PAL16R4AM, PAL16R6AM, PAL16R8AM STANDARD HIGH-SPEED PAL<sup>®</sup> CIRCUITS

SRPS016 – D2705, FEBRUARY 1984 – REVISED MARCH 1992

## electrical characteristics over recommended operating free-air temperature range

| PARAMETER           |                              | TEST CONDITIONS           |                             | MIN | TYP <sup>†</sup> | MAX  | UNIT          |
|---------------------|------------------------------|---------------------------|-----------------------------|-----|------------------|------|---------------|
| $V_{IK}$            |                              | $V_{CC} = 4.5\text{ V}$ , | $I_I = -18\text{ mA}$       |     |                  | -1.5 | V             |
| $V_{OH}$            |                              | $V_{CC} = 4.5\text{ V}$ , | $I_{OH} = -2\text{ mA}$     | 2.4 | 3.2              |      | V             |
| $V_{OL}$            |                              | $V_{CC} = 4.5\text{ V}$ , | $I_{OL} = 12\text{ mA}$     |     | 0.25             | 0.4  | V             |
| $I_{OZH}$           | Outputs                      | $V_{CC} = 5.5\text{ V}$ , | $V_O = 2.7\text{ V}$        |     |                  | 20   | $\mu\text{A}$ |
|                     | I/O ports                    |                           |                             |     |                  | 100  |               |
| $I_{OZL}$           | Outputs                      | $V_{CC} = 5.5\text{ V}$ , | $V_O = 0.4\text{ V}$        |     |                  | -20  | $\mu\text{A}$ |
|                     | I/O ports                    |                           |                             |     |                  | -100 |               |
| $I_I$               |                              | $V_{CC} = 5.5\text{ V}$ , | $V_I = 5.5\text{ V}$        |     |                  | 0.2  | mA            |
| $I_{IH}$            | I/O Ports                    | $V_{CC} = 5.5\text{ V}$ , | $V_I = 2.7\text{ V}$        |     |                  | 100  | $\mu\text{A}$ |
|                     | All others                   |                           |                             |     |                  | 25   |               |
| $I_{IL}$            | $\overline{\text{OE}}$ input | $V_{CC} = 5.5\text{ V}$ , | $V_I = 0.4\text{ V}$        |     |                  | -0.2 | mA            |
|                     | All others                   |                           |                             |     |                  | -0.1 |               |
| $I_{OS}^{\ddagger}$ |                              | $V_{CC} = 5.5\text{ V}$ , | $V_O = 0.5\text{ V}$        | -30 |                  | -250 | mA            |
| $I_{CC}$            |                              | $V_{CC} = 5.5\text{ V}$ , | $V_I = 0$ ,<br>Outputs open |     | 75               | 180  | mA            |

## timing requirements

|                    |                                                           |            | MIN | MAX | UNIT |
|--------------------|-----------------------------------------------------------|------------|-----|-----|------|
| $f_{\text{clock}}$ | Clock Frequency                                           |            | 0   | 25  | MHz  |
| $t_w$              | Pulse duration (see Note 2)                               | Clock high | 15  |     | ns   |
|                    |                                                           | Clock low  | 20  |     |      |
| $t_{\text{su}}$    | Setup time, input or feedback before $\text{CLK}\uparrow$ |            | 25  |     | ns   |
| $t_h$              | Hold time, input or feedback after $\text{CLK}\uparrow$   |            | 0   |     | ns   |

NOTE 2: The total clock period of clock high and clock low must not exceed clock frequency,  $f_{\text{clock}}$ . The minimum pulse durations specified are only for clock high or low, but not for both simultaneously.

## switching characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

| PARAMETER        | FROM (INPUT)                     | TO (OUTPUT) | TEST CONDITION                                             | MIN | TYP <sup>†</sup> | MAX | UNIT |
|------------------|----------------------------------|-------------|------------------------------------------------------------|-----|------------------|-----|------|
| $f_{\text{max}}$ |                                  |             | R1 = 390 $\Omega$ ,<br>R2 = 750 $\Omega$ ,<br>See Figure 1 | 25  | 45               |     | MHz  |
| $t_{\text{pd}}$  | I, I/O                           | O, I/O      |                                                            |     | 15               | 30  | ns   |
| $t_{\text{pd}}$  | $\text{CLK}\uparrow$             | Q           |                                                            |     | 10               | 20  | ns   |
| $t_{\text{en}}$  | $\overline{\text{OE}}\downarrow$ | Q           |                                                            |     | 15               | 25  | ns   |
| $t_{\text{dis}}$ | $\overline{\text{OE}}\uparrow$   | Q           |                                                            |     | 10               | 25  | ns   |
| $t_{\text{en}}$  | I, I/O                           | O, I/O      |                                                            |     | 14               | 30  | ns   |
| $t_{\text{dis}}$ | I, I/O                           | O, I/O      |                                                            |     | 13               | 30  | ns   |

<sup>†</sup> All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

<sup>‡</sup> Not more than one output should be shorted at a time and the duration of the short circuit should not exceed one second. Set  $V_O$  at 0.5 V to avoid test equipment degradation.

# PAL16L8A-2M, PAL16R4A-2M, PAL16R6A-2M, PAL16R8A-2M STANDARD HIGH-SPEED PAL® CIRCUITS

SRPS016 – D2705, FEBRUARY 1984 – REVISED MARCH 1992

## electrical characteristics over recommended operating free-air temperature range

| PARAMETER           |                       | TEST CONDITIONS           |                             | MIN | TYP <sup>†</sup> | MAX  | UNIT          |
|---------------------|-----------------------|---------------------------|-----------------------------|-----|------------------|------|---------------|
| $V_{IK}$            |                       | $V_{CC} = 4.5\text{ V}$ , | $I_I = -18\text{ mA}$       |     |                  | -1.5 | V             |
| $V_{OH}$            |                       | $V_{CC} = 4.5\text{ V}$ , | $I_{OH} = -2\text{ mA}$     | 2.4 | 3.2              |      | V             |
| $V_{OL}$            |                       | $V_{CC} = 4.5\text{ V}$ , | $I_{OL} = 12\text{ mA}$     |     | 0.25             | 0.4  | V             |
| $I_{OZH}$           | Outputs               | $V_{CC} = 5.5\text{ V}$ , | $V_O = 2.7\text{ V}$        |     |                  | 20   | $\mu\text{A}$ |
|                     | I/O ports             |                           |                             |     |                  | 100  |               |
| $I_{OZL}$           | Outputs               | $V_{CC} = 5.5\text{ V}$ , | $V_O = 0.4\text{ V}$        |     |                  | -20  | $\mu\text{A}$ |
|                     | I/O ports             |                           |                             |     |                  | -100 |               |
| $I_I$               |                       | $V_{CC} = 5.5\text{ V}$ , | $V_I = 5.5\text{ V}$        |     |                  | 0.2  | mA            |
| $I_{IH}$            | I/O Ports             | $V_{CC} = 5.5\text{ V}$ , | $V_I = 2.7\text{ V}$        |     |                  | 100  | $\mu\text{A}$ |
|                     | All others            |                           |                             |     |                  | 25   |               |
| $I_{IL}$            | $\overline{OE}$ input | $V_{CC} = 5.5\text{ V}$ , | $V_I = 0.4\text{ V}$        |     |                  | -0.2 | mA            |
|                     | All others            |                           |                             |     |                  | -0.1 |               |
| $I_{OS}^{\ddagger}$ |                       | $V_{CC} = 5.5\text{ V}$ , | $V_O = 0.5\text{ V}$        | -30 |                  | -250 | mA            |
| $I_{CC}$            |                       | $V_{CC} = 5.5\text{ V}$ , | $V_I = 0$ ,<br>Outputs open |     | 75               | 90   | mA            |

## timing requirements

|                    |                                                           |            | MIN | MAX | UNIT |
|--------------------|-----------------------------------------------------------|------------|-----|-----|------|
| $f_{\text{clock}}$ | Clock Frequency                                           |            | 0   | 16  | MHz  |
| $t_w$              | Pulse duration (see Note 2)                               | Clock high | 25  |     | ns   |
|                    |                                                           | Clock low  | 25  |     |      |
| $t_{\text{su}}$    | Setup time, input or feedback before $\text{CLK}\uparrow$ |            | 35  |     | ns   |
| $t_h$              | Hold time, input or feedback after $\text{CLK}\uparrow$   |            | 0   |     | ns   |

NOTE 2: The total clock period of clock high and clock low must not exceed clock frequency,  $f_{\text{clock}}$ . The minimum pulse durations specified are only for clock high or low, but not for both simultaneously.

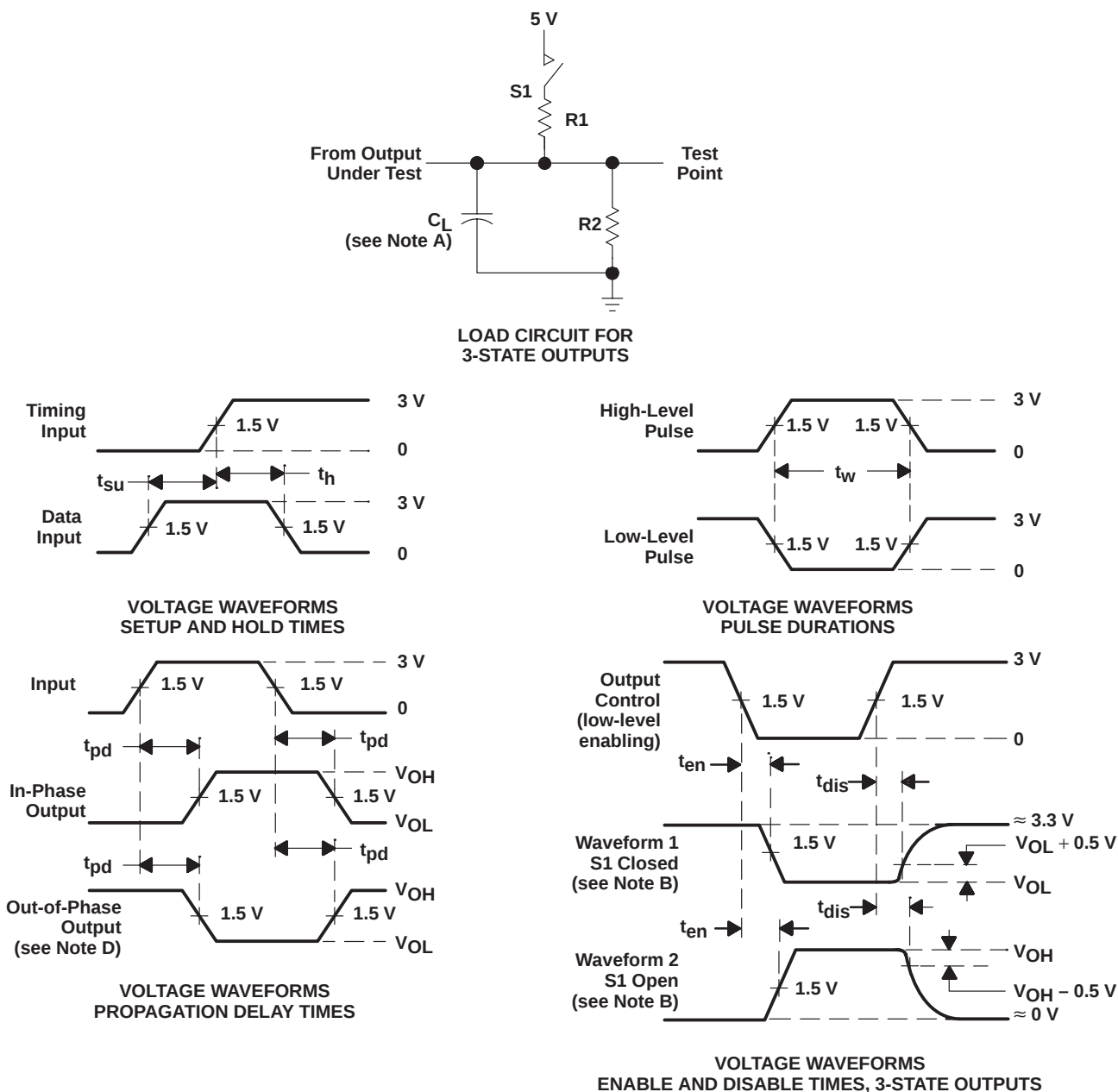
## switching characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

| PARAMETER        | FROM (INPUT)              | TO (OUTPUT) | TEST CONDITION                                             | MIN | TYP <sup>†</sup> | MAX | UNIT |
|------------------|---------------------------|-------------|------------------------------------------------------------|-----|------------------|-----|------|
| $f_{\text{max}}$ |                           |             | R1 = 390 $\Omega$ ,<br>R2 = 750 $\Omega$ ,<br>See Figure 1 | 16  | 25               |     | MHz  |
| $t_{\text{pd}}$  | I, I/O                    | O, I/O      |                                                            |     | 25               | 40  | ns   |
| $t_{\text{pd}}$  | $\text{CLK}\uparrow$      | Q           |                                                            |     | 11               | 25  | ns   |
| $t_{\text{en}}$  | $\overline{OE}\downarrow$ | Q           |                                                            |     | 20               | 25  | ns   |
| $t_{\text{dis}}$ | $\overline{OE}\uparrow$   | Q           |                                                            |     | 11               | 25  | ns   |
| $t_{\text{en}}$  | I, I/O                    | O, I/O      |                                                            |     | 25               | 40  | ns   |
| $t_{\text{dis}}$ | I, I/O                    | O, I/O      |                                                            |     | 25               | 35  | ns   |

<sup>†</sup> All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

<sup>‡</sup> Not more than one output should be shorted at a time and the duration of the short circuit should not exceed one second. Set  $V_O$  at 0.5 V to avoid test equipment degradation.

## PARAMETER MEASUREMENT INFORMATION



- NOTES: A.  $C_L$  includes probe and jig capacitance and is 50 pF for  $t_{pd}$  and  $t_{en}$ , 5 pF for  $t_{dis}$ .  
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.  
 C. All input pulses have the following characteristics:  $PRR \leq 10$  MHz,  $t_r$  and  $t_f \leq 2$  ns, duty cycle = 50%  
 D. When measuring propagation delay times of 3-state outputs, switch S1 is closed.  
 E. Equivalent loads may be used for testing.

Figure 1. Load Circuit and Voltage Waveforms

**PACKAGING INFORMATION**

| Orderable part number     | Status<br>(1) | Material type<br>(2) | Package   Pins | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6)             |
|---------------------------|---------------|----------------------|----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------------------|
| <a href="#">81036072A</a> | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036072A<br>PAL16L8A<br>MFKB   |
| <a href="#">8103607RA</a> | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103607RA<br>PAL16L8AMJB        |
| <a href="#">8103607SA</a> | Active        | Production           | CFP (W)   20   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103607SA<br>PAL16L8AMWB        |
| <a href="#">81036082A</a> | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036082A<br>PAL16R8A<br>MFKB   |
| <a href="#">8103608RA</a> | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103608RA<br>PAL16R8AMJB        |
| <a href="#">81036092A</a> | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036092A<br>PAL16R6A<br>MFKB   |
| <a href="#">8103609RA</a> | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103609RA<br>PAL16R6AMJB        |
| <a href="#">81036102A</a> | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036102A<br>PAL16R4A<br>MFKB   |
| <a href="#">8103610RA</a> | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103610RA<br>PAL16R4AMJB        |
| <a href="#">8103610SA</a> | Active        | Production           | CFP (W)   20   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103610SA<br>PAL16R4AMWB        |
| <a href="#">81036112A</a> | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036112A<br>PAL16L8A-<br>2MFKB |
| <a href="#">8103611RA</a> | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103611RA<br>PAL16L8A-2MJB      |
| <a href="#">81036142A</a> | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036142A<br>PAL16R4A-<br>2MFKB |

| Orderable part number          | Status<br>(1) | Material type<br>(2) | Package   Pins | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6)             |
|--------------------------------|---------------|----------------------|----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------------------|
| <a href="#">PAL16L8A-2MFKB</a> | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036112A<br>PAL16L8A-<br>2MFKB |
| PAL16L8A-2MFKB.A               | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036112A<br>PAL16L8A-<br>2MFKB |
| <a href="#">PAL16L8A-2MJ</a>   | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | PAL16L8A-2MJ                    |
| PAL16L8A-2MJ.A                 | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | PAL16L8A-2MJ                    |
| <a href="#">PAL16L8A-2MJB</a>  | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103611RA<br>PAL16L8A-2MJB      |
| PAL16L8A-2MJB.A                | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103611RA<br>PAL16L8A-2MJB      |
| <a href="#">PAL16L8AMFKB</a>   | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036072A<br>PAL16L8A<br>MFKB   |
| PAL16L8AMFKB.A                 | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036072A<br>PAL16L8A<br>MFKB   |
| <a href="#">PAL16L8AMJ</a>     | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | PAL16L8AMJ                      |
| PAL16L8AMJ.A                   | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | PAL16L8AMJ                      |
| <a href="#">PAL16L8AMJB</a>    | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103607RA<br>PAL16L8AMJB        |
| PAL16L8AMJB.A                  | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103607RA<br>PAL16L8AMJB        |
| <a href="#">PAL16L8AMWB</a>    | Active        | Production           | CFP (W)   20   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103607SA<br>PAL16L8AMWB        |
| PAL16L8AMWB.A                  | Active        | Production           | CFP (W)   20   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103607SA<br>PAL16L8AMWB        |
| <a href="#">PAL16R4A-2MFKB</a> | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036142A<br>PAL16R4A-<br>2MFKB |
| PAL16R4A-2MFKB.A               | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036142A<br>PAL16R4A-<br>2MFKB |
| PAL16R4A-2MJ                   | NRND          | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | PAL16R4A-2MJ                    |

| Orderable part number        | Status<br>(1) | Material type<br>(2) | Package   Pins | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6)           |
|------------------------------|---------------|----------------------|----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|-------------------------------|
| PAL16R4A-2MJ.A               | NRND          | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | PAL16R4A-2MJ                  |
| <a href="#">PAL16R4AMFKB</a> | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036102A<br>PAL16R4A<br>MFKB |
| PAL16R4AMFKB.A               | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036102A<br>PAL16R4A<br>MFKB |
| <a href="#">PAL16R4AMJ</a>   | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | PAL16R4AMJ                    |
| PAL16R4AMJ.A                 | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | PAL16R4AMJ                    |
| <a href="#">PAL16R4AMJB</a>  | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103610RA<br>PAL16R4AMJB      |
| PAL16R4AMJB.A                | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103610RA<br>PAL16R4AMJB      |
| <a href="#">PAL16R4AMWB</a>  | Active        | Production           | CFP (W)   20   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103610SA<br>PAL16R4AMWB      |
| PAL16R4AMWB.A                | Active        | Production           | CFP (W)   20   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103610SA<br>PAL16R4AMWB      |
| <a href="#">PAL16R6AMFKB</a> | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036092A<br>PAL16R6A<br>MFKB |
| PAL16R6AMFKB.A               | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036092A<br>PAL16R6A<br>MFKB |
| <a href="#">PAL16R6AMJ</a>   | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | PAL16R6AMJ                    |
| PAL16R6AMJ.A                 | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | PAL16R6AMJ                    |
| <a href="#">PAL16R6AMJB</a>  | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103609RA<br>PAL16R6AMJB      |
| PAL16R6AMJB.A                | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103609RA<br>PAL16R6AMJB      |
| <a href="#">PAL16R8AMFKB</a> | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036082A<br>PAL16R8A<br>MFKB |
| PAL16R8AMFKB.A               | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 81036082A<br>PAL16R8A<br>MFKB |

| Orderable part number       | Status<br>(1) | Material type<br>(2) | Package   Pins | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6)      |
|-----------------------------|---------------|----------------------|----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|--------------------------|
| <a href="#">PAL16R8AMJ</a>  | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | PAL16R8AMJ               |
| PAL16R8AMJ.A                | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | PAL16R8AMJ               |
| <a href="#">PAL16R8AMJB</a> | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103608RA<br>PAL16R8AMJB |
| PAL16R8AMJB.A               | Active        | Production           | CDIP (J)   20  | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 8103608RA<br>PAL16R8AMJB |

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

<sup>(5)</sup> **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

<sup>(6)</sup> **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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**OTHER QUALIFIED VERSIONS OF PAL16L8A-2M, PAL16L8AM, PAL16R6AM, PAL16R8AM :**

- Catalog : [PAL16L8A-2](#), [PAL16L8A](#), [PAL16R6A](#), [PAL16R8A](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

## TUBE



\*All dimensions are nominal

| Device           | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|------------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| 81036072A        | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| 8103607SA        | W            | CFP          | 20   | 25  | 506.98 | 26.16  | 6220   | NA     |
| 81036082A        | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| 81036092A        | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| 81036102A        | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| 8103610SA        | W            | CFP          | 20   | 25  | 506.98 | 26.16  | 6220   | NA     |
| 81036112A        | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| 81036142A        | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| PAL16L8A-2MFKB   | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| PAL16L8A-2MFKB.A | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| PAL16L8AMFKB     | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| PAL16L8AMFKB.A   | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| PAL16L8AMWB      | W            | CFP          | 20   | 25  | 506.98 | 26.16  | 6220   | NA     |
| PAL16L8AMWB.A    | W            | CFP          | 20   | 25  | 506.98 | 26.16  | 6220   | NA     |
| PAL16R4A-2MFKB   | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| PAL16R4A-2MFKB.A | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| PAL16R4AMFKB     | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| PAL16R4AMFKB.A   | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| PAL16R4AMWB      | W            | CFP          | 20   | 25  | 506.98 | 26.16  | 6220   | NA     |
| PAL16R4AMWB.A    | W            | CFP          | 20   | 25  | 506.98 | 26.16  | 6220   | NA     |
| PAL16R6AMFKB     | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| PAL16R6AMFKB.A   | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| PAL16R8AMFKB     | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| PAL16R8AMFKB.A   | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |

J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



| PINS **<br>DIM | 14                     | 16                     | 18                     | 20                     |
|----------------|------------------------|------------------------|------------------------|------------------------|
| A              | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC |
| B MAX          | 0.785<br>(19,94)       | .840<br>(21,34)        | 0.960<br>(24,38)       | 1.060<br>(26,92)       |
| B MIN          | —                      | —                      | —                      | —                      |
| C MAX          | 0.300<br>(7,62)        | 0.300<br>(7,62)        | 0.310<br>(7,87)        | 0.300<br>(7,62)        |
| C MIN          | 0.245<br>(6,22)        | 0.245<br>(6,22)        | 0.220<br>(5,59)        | 0.245<br>(6,22)        |



4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

## GENERIC PACKAGE VIEW

**FK 20**

**LCCC - 2.03 mm max height**

8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

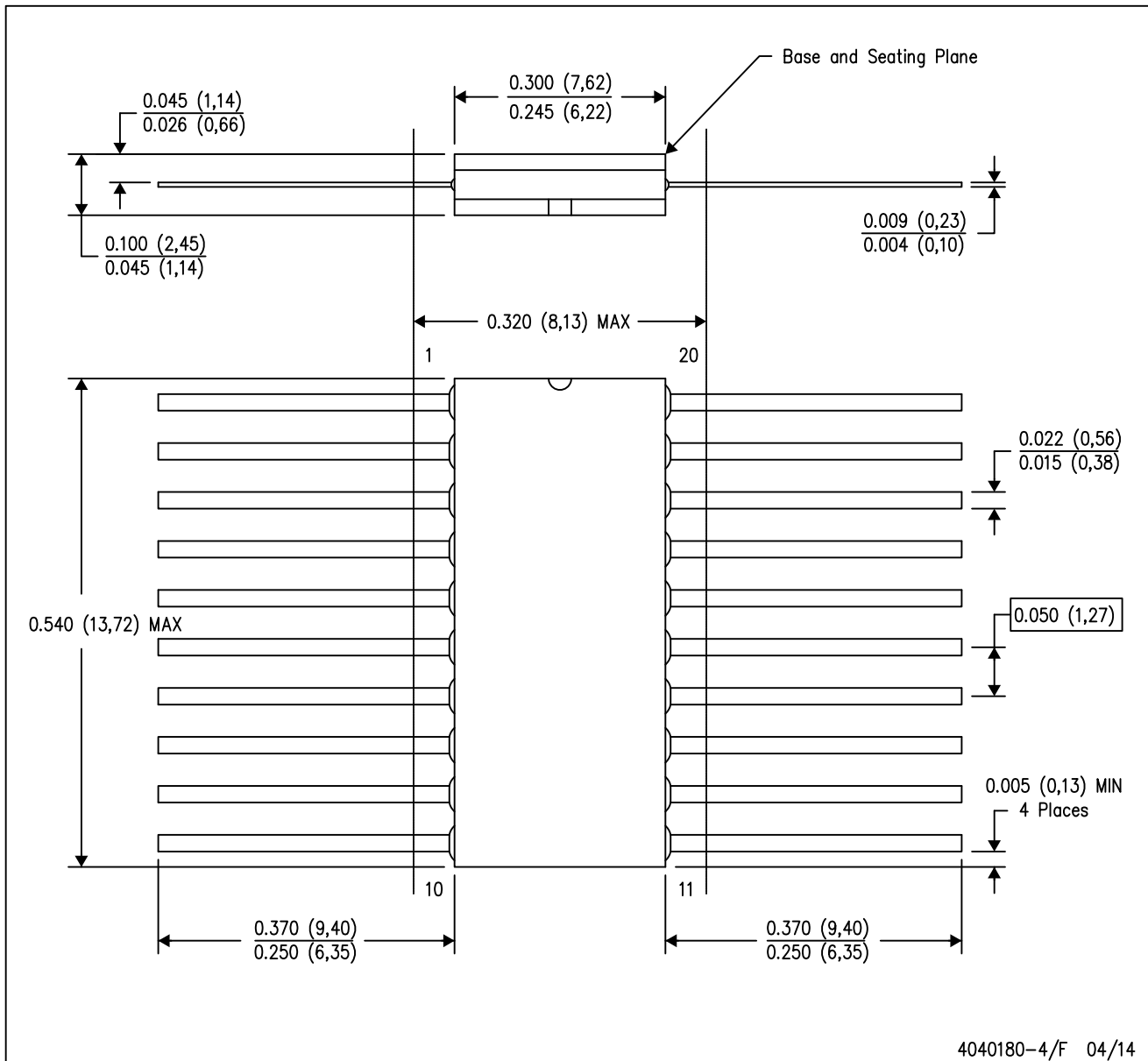
This image is a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.



4229370VA\

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only.
  - E. Falls within Mil-Std 1835 GDFP2-F20

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