PAL16L8AM, PAL16L8A-2M, PAL16R4AM, PAL16R4A-2M PAL16R6AM, PAL16R6A-2M, PAL16R8AM, PAL16R8A-2M STANDARD HIGH-SPEED *PAL*® 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 INPUTS	3-STATE O OUTPUTS	REGISTERED Q OUTPUTS	I/O PORT 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

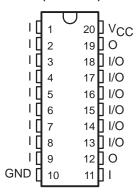
These programmable array logic devices feature high speed and a choice of either standard or half-power devices. They combine Advanced Low-Power Schottky technology with proven titanium-tungsten fuses. These devices will provide reliable, high-performance substitutes for conventional TTL logic. Their 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.

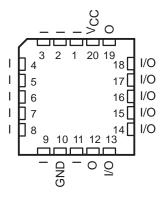
PAL16L8'
J OR W PACKAGE

(TOP VIEW)



PAL16L8' FK PACKAGE

(TOP VIEW)

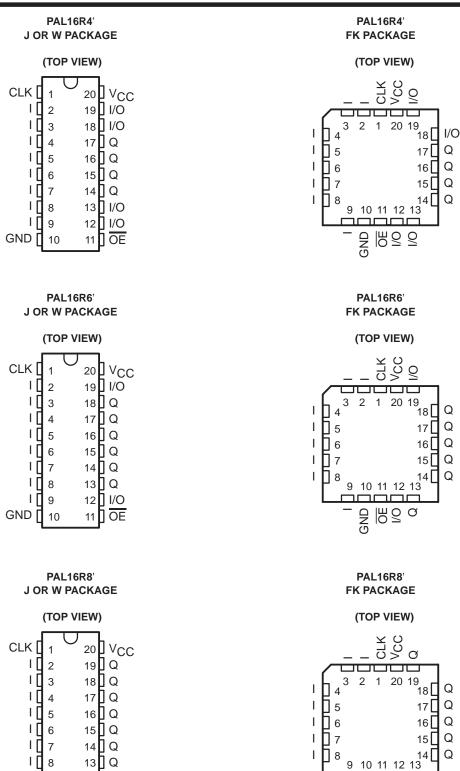


PAL is a registered trademark of Advanced Micro Devices Inc.

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PAL16R4AM, PAL16R4A-2M, PAL16R6AM, PAL16R6A-2M, PAL16R8AM, PAL16R8A-2M STANDARD HIGH-SPEED *PAL*® CIRCUITS

SRPS016 - D2705, FEBRUARY 1984 - REVISED MARCH 1992





GND Q Q Q

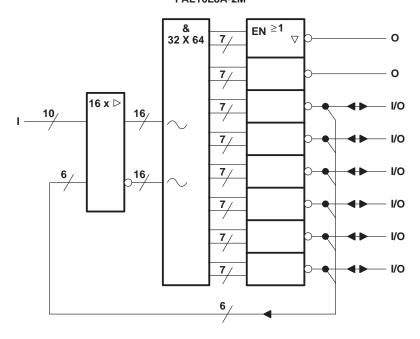
12 Q

11 OE

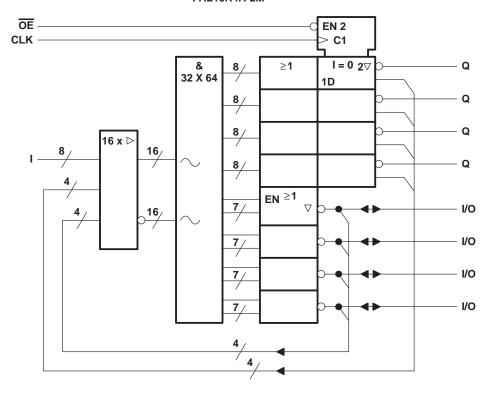
10

functional block diagrams (positive logic)

PAL16L8AM PAL16L8A-2M



PAL16R4AM PAL16R4A-2M



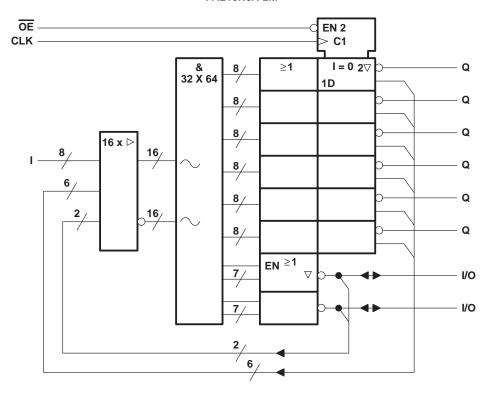
outputs denotes fused inputs



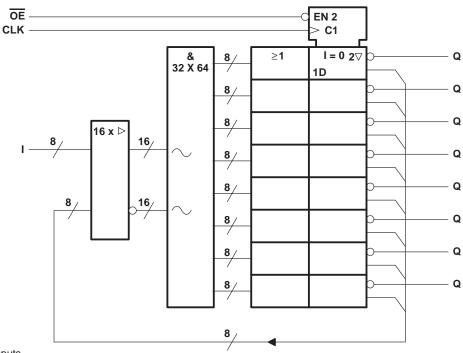
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functional block diagrams (positive logic)

PAL16R6AM PAL16R6A-2M



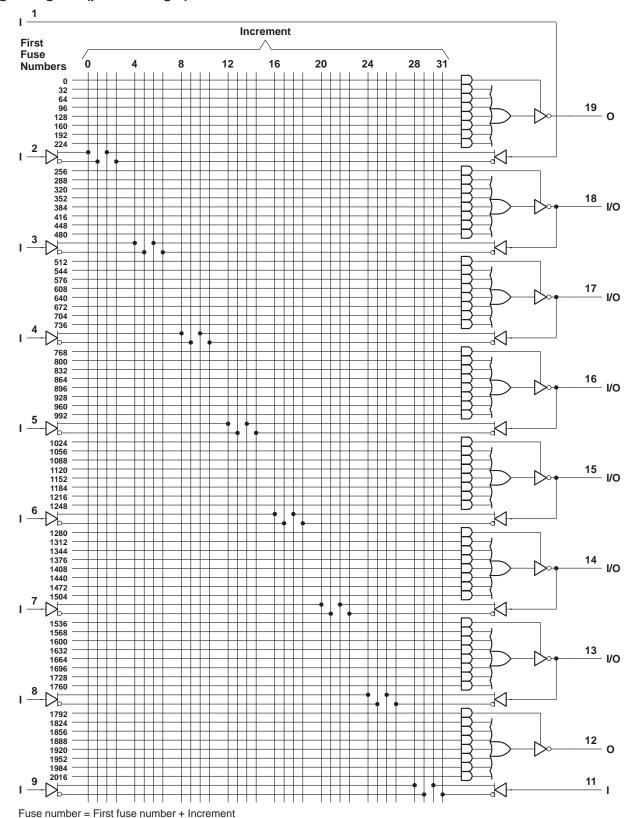
PAL16R8AM PAL16R8A-2M



 \sim denotes fused inputs

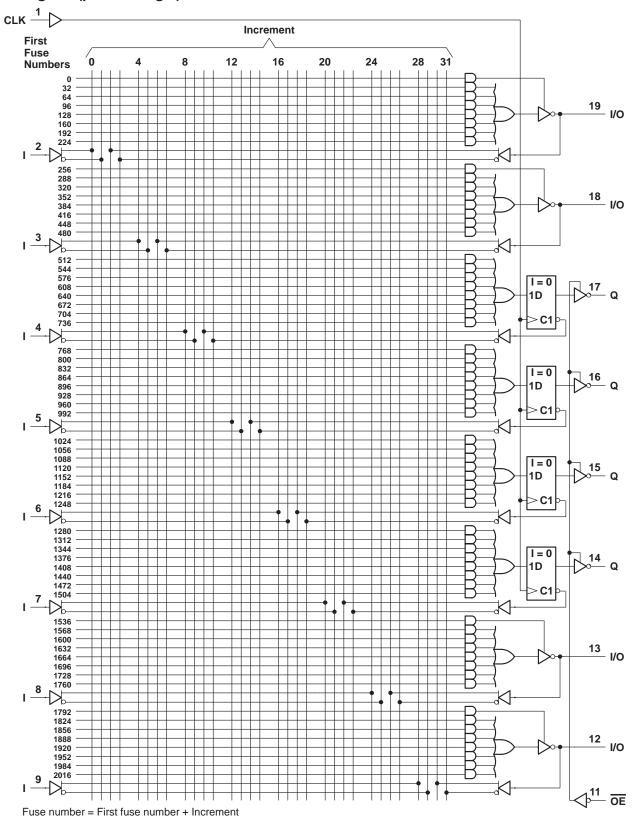


logic diagram (positive logic)

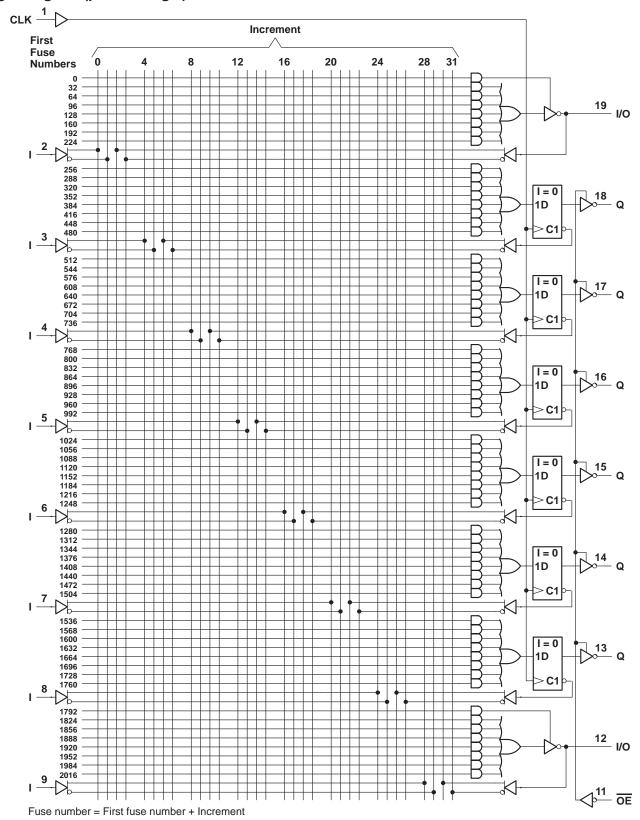


SRPS016 - D2705, FEBRUARY 1984 - REVISED MARCH 1992

logic diagram (positive logic)

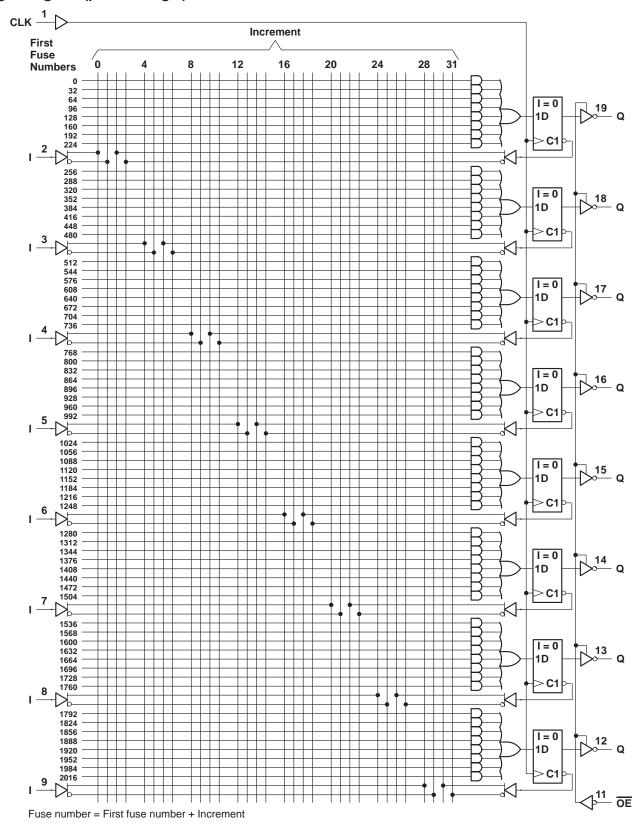


logic diagram (positive logic)



7

logic diagram (positive logic)





PAL16L8AM, PAL16L8A-2M, PAL16R4AM, PAL16R4A-2M PAL16R6AM, PAL16R6A-2M, PAL16R8AM, PAL16R8A-2M STANDARD HIGH-SPEED *PAL*® CIRCUITS

SRPS016 - D2705, FEBRUARY 1984 - REVISED MARCH 1992

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
VCC	Supply voltage	4.5	5	5.5	V
VIH	High-level input voltage	2		5.5	V
VIL	Low-level input voltage			0.8	V
IOH	High-level output current			-2	mA
lOL	Low-level output current			12	mA
TA	Operating free-air temperature	-55	25	125	°C

PAL16L8AM, PAL16R4AM, PAL16R6AM, PAL16R8AM STANDARD HIGH-SPEED PAL^{\circledR} CIRCUITS

SRPS016 - D2705, FEBRUARY 1984 - REVISED MARCH 1992

electrical characteristics over recommended operating free-air temperature range

PAR	RAMETER		TEST CONDITIONS	3	MIN	TYP [†]	MAX	UNIT
٧ıK		V _{CC} = 4.5 V,	$I_{I} = -18 \text{ mA}$				-1.5	V
Vон		$V_{CC} = 4.5 \text{ V},$	$I_{OH} = -2 \text{ mA}$		2.4	3.2		V
VOL		$V_{CC} = 4.5 \text{ V},$	$I_{OL} = 12 \text{ mA}$			0.25	0.4	V
1	Outputs	\/	V- 27V				20	^
lozh	I/O ports	$V_{CC} = 5.5 V,$	$V_0 = 2.7 \text{ V}$				100	μΑ
lo-	Outputs	\/ F.F.\/	V 0.4.V				-20	^
lozL	I/O ports	$V_{CC} = 5.5 V,$	$V_0 = 0.4 V$				-100	μΑ
lį		V _{CC} = 5.5 V,	V _I = 5.5 V				0.2	mA
I	I/O Ports	\/	V: 0.7.V				100	^
lΗ	All others	$V_{CC} = 5.5 V,$	$V_{ } = 2.7 V$				25	μΑ
	OE input	V 55V	V 0.4V				-0.2	0
I _Ι Γ	All others	$V_{CC} = 5.5 V,$	$V_1 = 0.4 \ V$				-0.1	mA
los [‡]	-	V _{CC} = 5.5 V,	V _O = 0.5 V		-30		-250	mA
Icc		V _{CC} = 5.5 V,	V _I = 0,	Outputs open		75	180	mA

timing requirements

			MIN	MAX	UNIT
fclock	Clock Frequency		0	25	MHz
t	Dulas duration (see Nata 2)	Clock high	15		
ιW	Pulse duration (see Note 2)	20		ns	
t _{su}	Setup time, input or feedback before CLK↑	25		ns	
t _h	Hold time, input or feedback after CLK↑		0		ns

NOTE 2: The total clock period of clock high and clock low must not exceed clock frequency, f_{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)

	FROM	T0					
PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITION	MIN	TYP [†]	MAX	UNIT
f _{max}				25	45		MHz
^t pd	I, I/O	O, I/O			15	30	ns
^t pd	CLK↑	Q	R1 = 390 Ω ,		10	20	ns
t _{en}	OE↓	Q	$R2 = 750 \Omega$,		15	25	ns
^t dis	OE↑	Q	See Figure 1		10	25	ns
t _{en}	I, I/O	O, I/O			14	30	ns
^t dis	I, I/O	O, I/O			13	30	ns

[†] All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^{\circ}\text{C}$.



[‡] 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

PAR	RAMETER		TEST CONDITIONS	3	MIN	TYP [†]	MAX	UNIT
VIK		$V_{CC} = 4.5 \text{ V},$	$I_1 = -18 \text{ mA}$				-1.5	V
Vон		$V_{CC} = 4.5 \text{ V},$	$I_{OH} = -2 \text{ mA}$		2.4	3.2		V
VOL		$V_{CC} = 4.5 \text{ V},$	$I_{OL} = 12 \text{ mA}$			0.25	0.4	V
1	Outputs	V 55V	V- 27V				20	^
lozh	I/O ports	$V_{CC} = 5.5 \text{ V},$	$V_0 = 2.7 \text{ V}$				100	μΑ
lo-	Outputs	V 55V	V 0.4V				-20	^
lozL	I/O ports	$V_{CC} = 5.5 \text{ V},$	$V_0 = 0.4 V$				-100	μА
II		V _{CC} = 5.5 V,	V _I = 5.5 V				0.2	mA
I.e.	I/O Ports	V 55V	V: 0.7.V				100	^
lН	All others	$V_{CC} = 5.5 \text{ V},$	$V_{I} = 2.7 V$				25	μА
	OE input	V 55V	V 0.4V				-0.2	^
ΊL	All others	$V_{CC} = 5.5 \text{ V},$	$V_{I} = 0.4 V$				-0.1	mA
los [‡]	-	V _{CC} = 5.5 V,	V _O = 0.5 V		-30		-250	mA
Icc		V _{CC} = 5.5 V,	V _I = 0,	Outputs open		75	90	mA

timing requirements

			MIN	MAX	UNIT
fclock	Clock Frequency		0	16	MHz
t	Dulas duration (see Nata 2)	Clock high	25		
τ _W	Pulse duration (see Note 2)	25		ns	
t _{su}	Setup time, input or feedback before CLK↑	35		ns	
t _h	Hold time, input or feedback after CLK↑		0		ns

NOTE 2: The total clock period of clock high and clock low must not exceed clock frequency, f_{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	MAX	UNIT
f _{max}				16	25		MHz
^t pd	I, I/O	O, I/O			25	40	ns
t _{pd}	CLK↑	Q	R1 = 390 Ω ,		11	25	ns
t _{en}	OE↓	Q	R2 = 750 Ω ,		20	25	ns
^t dis	OE↑	Q	See Figure 1		11	25	ns
t _{en}	I, I/O	O, I/O			25	40	ns
^t dis	I, I/O	O, I/O			25	35	ns

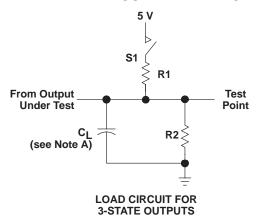
[†] All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^{\circ}\text{C}$.

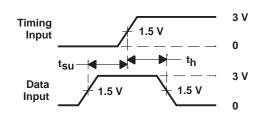


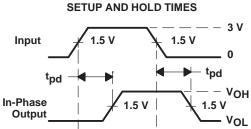
[‡] Not more than one output should be shorted at a time and the duration of the short circuit should not exceed one second. Set V_O at 0.5 V to avoid test equipment degradation.

SRPS016 - D2705, FEBRUARY 1984 - REVISED MARCH 1992

PARAMETER MEASUREMENT INFORMATION







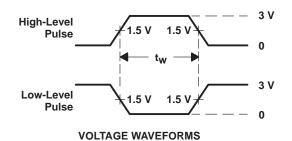
VOLTAGE WAVEFORMS

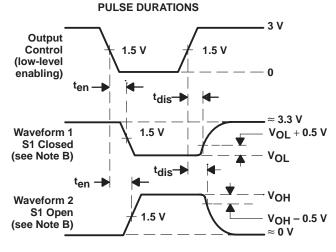


tpd

Output

Out-of-Phase





VOLTAGE WAVEFORMS ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS

NOTES: A. C_L includes probe and jig capacitance and is 50 pF for t_{pd} and t_{en} , 5 pF for t_{dis} .

tpd

1.5 V

Vон

VOI

- 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_{Γ} 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







6-Feb-2020

PACKAGING INFORMATION

Orderable Device	Status	Package Type		Pins		Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
	(1)		Drawing		Qty	(2)	(6)	(3)		(4/5)	
81036072A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	81036072A PAL16L8A MFKB	Samples
8103607RA	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8103607RA PAL16L8AMJB	Samples
8103607SA	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8103607SA PAL16L8AMWB	Samples
81036082A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	81036082A PAL16R8A MFKB	Samples
8103608RA	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8103608RA PAL16R8AMJB	Samples
81036092A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	81036092A PAL16R6A MFKB	Samples
8103609RA	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8103609RA PAL16R6AMJB	Samples
81036102A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	81036102A PAL16R4A MFKB	Samples
8103610RA	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8103610RA PAL16R4AMJB	Samples
8103610SA	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8103610SA PAL16R4AMWB	Samples
81036112A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	81036112A PAL16L8A- 2MFKB	Samples
8103611RA	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8103611RA PAL16L8A-2MJB	Samples
81036142A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	81036142A PAL16R4A- 2MFKB	Samples
PAL16L8A-2MFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	81036112A PAL16L8A- 2MFKB	Samples



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Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead/Ball Finish (6)	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
PAL16L8A-2MJ	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	PAL16L8A-2MJ	Samples
PAL16L8A-2MJB	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8103611RA PAL16L8A-2MJB	Samples
PAL16L8AMFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	81036072A PAL16L8A MFKB	Samples
PAL16L8AMJ	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	PAL16L8AMJ	Samples
PAL16L8AMJB	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8103607RA PAL16L8AMJB	Samples
PAL16L8AMWB	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8103607SA PAL16L8AMWB	Samples
PAL16R4A-2MFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	81036142A PAL16R4A- 2MFKB	Samples
PAL16R4A-2MJ	NRND	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	PAL16R4A-2MJ	
PAL16R4AMFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	81036102A PAL16R4A MFKB	Samples
PAL16R4AMJ	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	PAL16R4AMJ	Samples
PAL16R4AMJB	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8103610RA PAL16R4AMJB	Samples
PAL16R4AMWB	ACTIVE	CFP	W	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8103610SA PAL16R4AMWB	Samples
PAL16R6AMFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	81036092A PAL16R6A MFKB	Samples
PAL16R6AMJ	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	PAL16R6AMJ	Samples
PAL16R6AMJB	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8103609RA PAL16R6AMJB	Samples
PAL16R8AMFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	81036082A PAL16R8A MFKB	Samples
PAL16R8AMJ	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	PAL16R8AMJ	Samples



PACKAGE OPTION ADDENDUM

6-Feb-2020

Orderable Device	Status	Package Type	_	Pins	•	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
	(1)		Drawing		Qty	(2)	(6)	(3)		(4/5)	
PAL16R8AMJB	ACTIVE	CDIP	J	20	1	TBD	Call TI	N / A for Pkg Type	-55 to 125	8103608RA PAL16R8AMJB	Samples

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) RoHS: TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (CI) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

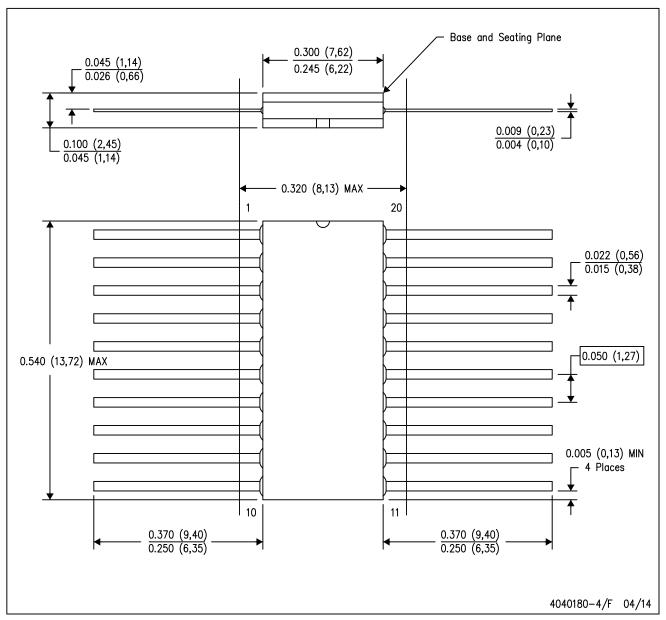
- (3) MSL, Peak Temp. The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.
- (4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.
- (5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.
- (6) Lead/Ball Finish Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



NOTES:

- A. All linear dimensions are in inches (millimeters).
- 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



FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



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 metal lid.
- D. Falls within JEDEC MS-004



14 LEADS SHOWN



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.

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