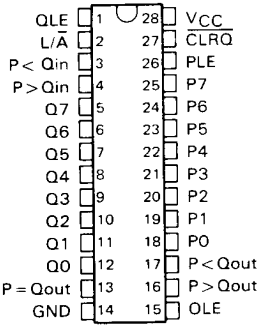
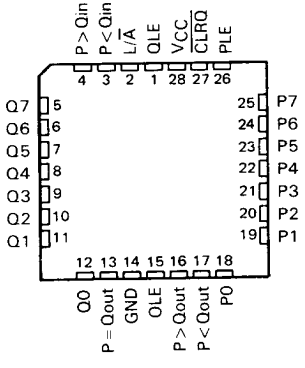
D2661, DECEMBER 1982—REVISED MAY 1986

- **Package Options Include Plastic "Small Outline" Packages, Both Plastic and Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs**
- **Input and Output Latches with Active-High Enables**
- **Fast Compare to Zero**
- **Arithmetic and Logical Comparison**
- **Open-Collector P = Q Output**
- **Dependable Texas Instruments Quality and Reliability**

SN54AS866 . . . JD PACKAGE
SN74AS866 . . . N PACKAGE
(TOP VIEW)



SN54AS866 . . . FK PACKAGE
SN74AS866 . . . FN PACKAGE
(TOP VIEW)



description

These Advanced Schottky devices are capable of performing high-speed arithmetic or logical comparisons on two 8-bit binary or two's complement words. Three fully decoded decisions about words P and Q are externally available at the outputs. These devices are fully expandable to any word length by connecting the totem pole P>Q and P<Q outputs of each stage to the P>Q and P<Q inputs of the next higher-order stage. The cascading paths are implemented with only a two-gate-level delay to reduce overall comparison times for long words. The open-collector P=Q output may be wire-ANDed together.

Both input words P and Q plus all three outputs (P>Q, P<Q, and P=Q) are equipped with latches to provide the designer with temporary data storage for avoiding race conditions. The enable circuitry is implemented with minimal delay times to enhance performance when the devices are cascaded for longer word lengths. Each latch is transparent when the appropriate latch enable, PLE, QLE, or OLE is high.

The enable inputs PLE and QLE and data inputs P and Q utilize p-n-p input transistors to reduce the low-level input current requirement to typically −0.25 mA, which minimizes loading effects.

The Q register may be cleared to zero for a fast comparison of the P word to zero.

The SN54AS866 is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74AS866 is characterized for operation from 0°C to 70°C.

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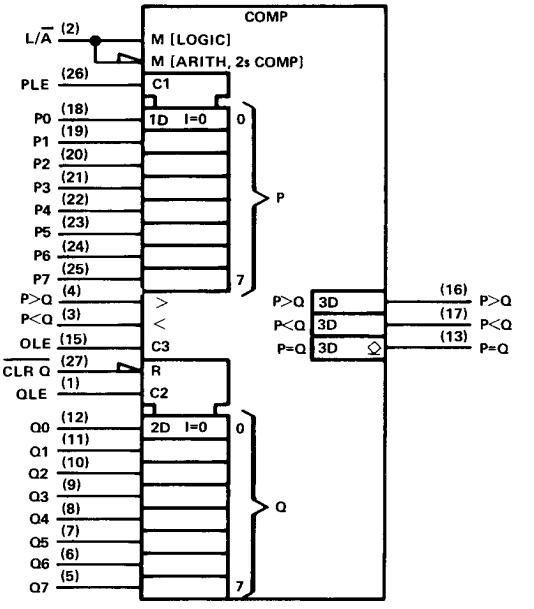
logic symbol†



†This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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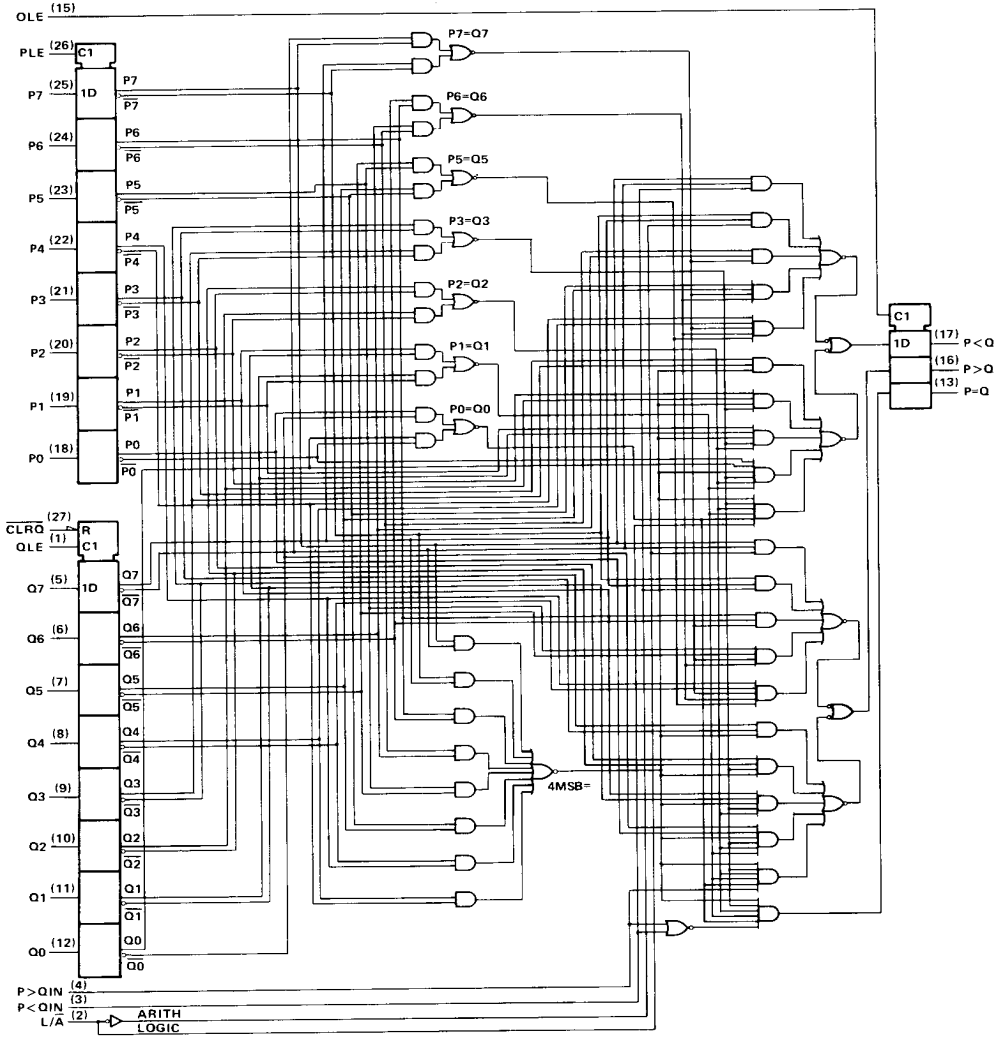
logic diagram (positive logic)



FUNCTION TABLE

COMPARISON	L/$\overline{A}$	DATA INPUTS P0-P7, Q0-Q7	INPUTS		OUTPUTS		
			P > Q	P < Q	P > Q	P < Q	P = Q
Logical	H	P > Q	X	X	H	L	L
Logical	H	P < Q	X	X	L	H	L
Logical	H	P = Q	L	L	L	L	H
Logical	H	P = Q	L	H	L	H	L
Logical	H	P = Q	H	L	H	L	L
Logical	H	P = Q	H	H	H	H	L
Arithmetic	L	P AG Q	X	X	H	L	L
Arithmetic	L	Q AG P	X	X	L	H	L
Arithmetic	L	P = Q	L	L	L	L	H
Arithmetic	L	P = Q	L	H	L	H	L
Arithmetic	L	P = Q	H	L	H	L	L
Arithmetic	L	P = Q	H	H	H	H	L

AG = arithmetically greater than

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

Supply voltage, V_{CC} . . . . . 7 V
Input voltage . . . . . 7 V
Off-state output voltage, P = Q output . . . . . 7 V
Operating free-air temperature range: SN54AS866 . . . . . −55°C to 125°C
SN74AS866 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

recommended operating conditions

	PARAMETER	SN54AS866			SN74AS866			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V_{IH}	High-level input voltage	2			2			V
V_{IL}	Low-level input voltage			0.8			0.8	V
I_{OH}	High-level output current, all outputs except P = Q			−2			−2	mA
V_{OH}	High-level output voltage, P = Q output			5.5			5.5	V
I_{OL}	Low-level output current			20			20	mA
t_{su}	Setup time to PLE, QLE, OLE↓	2			2			ns
t_h	Hold time after PLE, QLE, OLE↓	4			4			ns
T_A	Operating free-air temperature	−55		125	0		70	°C

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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		SN54AS866			SN74AS866			UNIT
				MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{IK}		V_{CC} = 4.5 V,	I_I = −18 mA			−1.2			−1.2	V
V_{OH}	P > Q, P < Q	V_{CC} = 4.5 V to 5.5 V,	I_{OH} = −2 mA	V_{CC} − 2			V_{CC} − 2			
I_{OH}	P = Q only	V_{CC} = 4.5 V,	V_{OH} = 5.5 V			0.25			0.25	mA
V_{OL}		V_{CC} = 4.5 V,	I_{OL} = 20 mA		0.35	0.5		0.35	0.5	V
I_I		V_{CC} = 5.5 V,	V_I = 7 V			0.1			0.1	mA
I_{IH}	L/$\overline{A}$, OLE	V_{CC} = 5.5 V,	V_I = 2.7 V			40			40	μA
	Others					20			20	
I_{IL}	L/$\overline{A}$, OLE, P > Qin, P < Qin	V_{CC} = 5.5 V,	V_I = 0.4 V			−4			−4	mA
	$\overline{CLRQ}$					−2			−2	
	P, Q, PLE, QLE				−0.25	−1		−0.25	−1	
I_O‡		V_{CC} = 5.5 V,	V_O = 2.25 V	−20		−112	−20		−112	mA
I_{CC}		V_{CC} = 5.5 V,	See Note 1		160	240		160	240	mA

†All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡The output conditions have been chosen to produce a current that closely approximates one-half of the true short-circuit, I_{OS}.
NOTE 1: I_{CC} is measured with all inputs high except L/A, which is low.

switching characteristics (see Note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_L = 500 Ω, T_A = MIN to MAX						UNIT
			SN54AS866			SN74AS866			
			MIN	TYP†	MAX	MIN	TYP†	MAX	
t_{PLH}	L/$\overline{A}$	P < Q, P > Q	1	8.5	14	1	8.5	13	ns
t_{PHL}			1	7.5	14	1	7.5	13	
t_{PLH}	P < Q, P > Q		1	5	10	1	5	8	ns
t_{PHL}			1	5.5	10	1	5.5	8	
t_{PLH}	Any P or Q Data Input		1	13.5	21	1	13.5	17.5	ns
t_{PHL}			1	10	17	1	10	15	
t_{PLH}	$\overline{CLRQ}$		1	16	21	1	16	20	ns
t_{PHL}			1	12	17	1	12	16	

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, T_A = 280 Ω, T_A = MIN to MAX						UNIT
			SN54AS866			SN74AS866			
			MIN	TYP†	MAX	MIN	TYP†	MAX	
t_{PLH}	P < Q, P > Q	P = Q	1	6.5	12	1	6.5	11	ns
t_{PHL}			1	8	14	1	8	13	
t_{PLH}	Any P or Q Data Input	P = Q	1	10	15	1	10	14	ns
t_{PHL}			1	9	14	1	9	13	
t_{PLH}	$\overline{CLRQ}$	P = Q	1	12	17	1	12	16	ns
t_{PHL}			1	13	18	1	13	17	

†All typical values are at V_{CC} = 5 V, T_A = 25°C.
NOTE 2: Load circuit and voltage waveforms are shown in Section 1.

TYPICAL APPLICATION DATA

This sequence of comparisons illustrates how the $\overline{CLRQ}$ function can be used to perform dual comparisons of the varying P terms (P0, P1, etc.). When $\overline{CLRQ}$ is high, the P term is compared to the Q term. When $\overline{CLRQ}$ is taken low, the P term is compared to zero. This or similar sequences can enhance performance and reduce package count to perform value range checks.

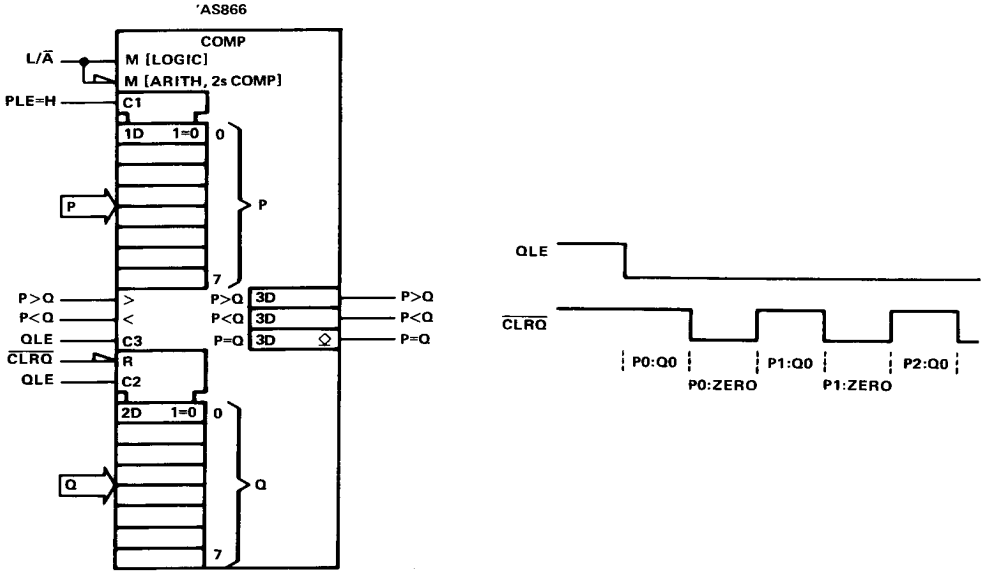

FIGURE 1. MAGNITUDE COMPARISONS COMBINED WITH QUICK COMPARISONS TO ZERO (RANGE VERIFICATIONS)

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