

SN54S484A, SN74S484A, BCD-TO-BINARY CONVERTERS  
SN54S485A, SN74S485A BINARY-TO-BCD CONVERTERS

- Significant Savings in Package Count Compared with SN54184, SN54185A, SN74184, or SN74185A (Over Half in Many Applications)
- Three-State Outputs

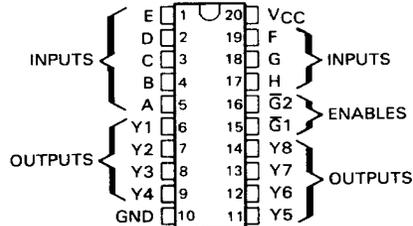
description

These monolithic converters are derived from the TBP28L22 factory-programmed read-only memories. Both of these converters comprehend that the least-significant bits (LSB) of the binary and BCD are logically equal, and in each case, the LSB bypasses the converter as shown in the typical applications. This means that a nine-bit converter is produced in each case. The devices are cascadable to N bits.

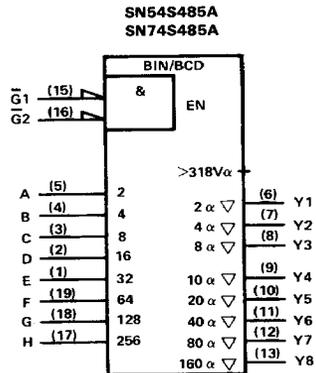
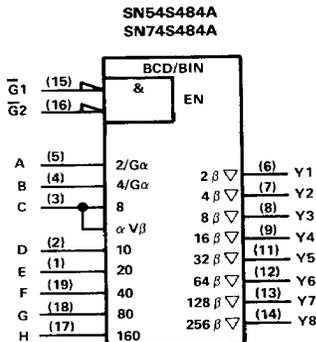
The three-state outputs offer the convenience of open-collector outputs with the speed of totem-pole outputs: they can be bus-connected to other similar outputs yet they retain the fast rise-time characteristic of totem-pole outputs. A high logic level at either enable ( $\bar{G}$ ) input causes the outputs to be in high-impedance state.

In many applications these converters can, by including 3 more bits than the SN54184/SN74184 or SN54185A/SN74185A, reduce power consumption significantly and package count by more than half as shown in the tables below.

SN54S484A, SN54S485A . . . J PACKAGE  
SN54S484A, SN54S485A . . . J OR N PACKAGE  
(TOP VIEW)



logic symbols



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RAMS

**SN54S484A, SN54S485A, SN74S484A, SN74S485A  
BCD-TO-BINARY AND BINARY-TO-BCD CONVERTERS**

**SN54S484A/SN74S484A vs SN54184/SN74184**

DECADES	PACKAGE COUNT		MAXIMUM SUPPLY CURRENT (A)		TYPICAL ACCESS TIME @ T <sub>A</sub> = 25°C (ns)	
	'S484A	'184	'S484A	'184	'S484A	'184
3	3	6	0.41	0.59	117	135
4	5	11	0.72	1.09	180	189
5	8	18	1.18	1.78	270	270
6	12	27	1.75	2.67	342	351
7	16	38	2.37	3.76	405	405
8	21	49	3.14	4.85	495	485
9	27	62	4.02	6.14	567	540

**SN54S485A/SN74S485A vs SN54185A/SN74185A**

BINARY BITS	PACKAGE COUNT		MAXIMUM SUPPLY CURRENT (A)		TYPICAL ACCESS TIME @ T <sub>A</sub> = 25°C (ns)	
	'S485A	'185A	'485A	'185A	'S485A	'185A
8	2	3	0.25	0.30	72	81
16	8	16	1.12	1.58	252	216
24	19	40	2.67	3.96	459	351
32	33	74	4.78	5.45	612	486

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**RAMS**



# SN54S484A, SN54S485A, SN74S484A, SN74S485A BCD-TO-BINARY AND BINARY-TO-BCD CONVERTERS

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

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage	5.5 V
Off-state output voltage	5.5 V
Operating free-air temperature range: SN54S484A, SN54S485A	-55°C to 125°C
SN74S484A, SN74S485A	0°C to 70°C
Storage temperature range	-65°C to 150°C

## recommended operating conditions

	SN54S <sup>†</sup>			SN74S <sup>†</sup>			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, $V_{CC}$	4.5	5	5.5	4.75	5	5.25	V
High-level output current, $I_{OH}$			-2			-6.5	mA
Low-level output current, $I_{OL}$			16			16	mA
Operating free-air temperature	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS <sup>†</sup>	MIN	TYP <sup>‡</sup>	MAX	UNIT
$V_{IH}$ High-level input voltage		2			V
$V_{IL}$ Low-level input voltage				0.8	V
$V_{IK}$ Input clamp voltage	$V_{CC} = \text{MIN}$ , $I_I = -18 \text{ mA}$			-1.2	V
$V_{OH}$ High-level output voltage	$V_V = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $V_{IL} = 0.8 \text{ V}$ , $I_{OH} = \text{MAX}$	2.4	3.1		V
$V_{OL}$ Low-level output voltage	$V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $V_{IL} = 0.8 \text{ V}$ , $I_{OL} = \text{MAX}$			0.5	V
$I_{OZH}$ Off-state output current, high-level voltage applied	$V_{CC} = \text{MAX}$ , $V_{IH} = 2 \text{ V}$ , $V_O = 2.4 \text{ V}$			50	$\mu\text{A}$
$I_{OZL}$ Off-state output current, low-level voltage applied	$V_{CC} = \text{MAX}$ , $V_{IH} = 2 \text{ V}$ , $V_O = 0.5 \text{ V}$			-50	$\mu\text{A}$
$I_I$ Input current at maximum input voltage	$V_{CC} = \text{MAX}$ , $V_I = 5.5 \text{ V}$			1	mA
$I_{IH}$ High-level input current	$V_{CC} = \text{MAX}$ , $V_I = 2.7 \text{ V}$			25	$\mu\text{A}$
$I_{IL}$ Low-level input current	$V_{CC} = \text{MAX}$ , $V_I = 0.5 \text{ V}$			-0.25	mA
$I_{OS}$ Short-circuit output current <sup>§</sup>	$V_{CC} = \text{MAX}$	-30		-100	mA
$I_{CC}$ Supply current	$V_{CC} = \text{MAX}$ , See Note 2		75	100	mA

## switching characteristics over recommended ranges of $T_A$ and $V_{CC}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	SN54S <sup>†</sup>			SN74S <sup>†</sup>			UNIT
		MIN	TYP <sup>‡</sup>	MAX	MIN	TYP <sup>‡</sup>	MAX	
$t_{a(A)}$ Access time from address	$C_L = 30 \text{ pF}$ , See Note 3	45	75		45	70	ns	
$t_{a(S)}$ Access time from chip select		20	40		20	35	ns	
$tp_{XZ}$ Output disable time	$C_L = 5 \text{ pF}$ , See Note 3	15	35		15	30	ns	

<sup>†</sup>For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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

<sup>§</sup>Not more than one output should be shorted at a time and duration of the short-circuit should not exceed one second.

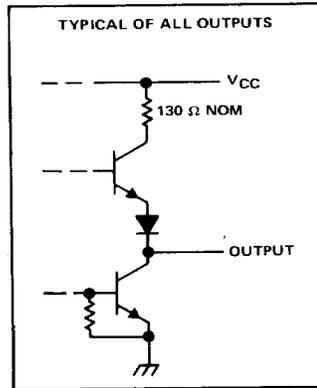
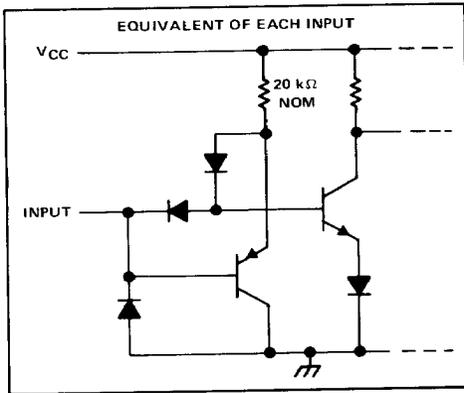
NOTES: 1. Voltage values are with respect to network ground terminal.

2. With outputs open and enable (G) inputs grounded,  $I_{CC}$  is measured first by selecting a word that contains the maximum number of high-level outputs, then by selecting a word that contains the maximum number of low-level inputs.

3. Load circuits and voltage waveforms are shown in Section 1.

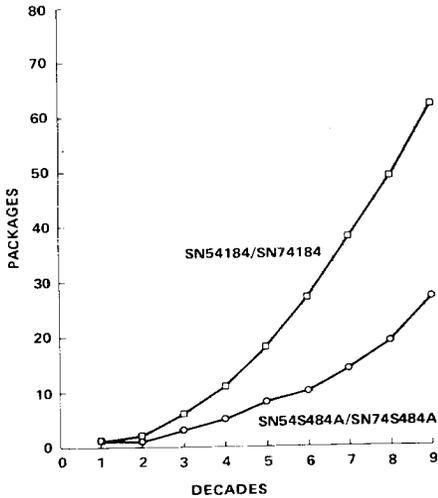
# SN54S484A, SN54S485A, SN74S484A, SN74S485A BCD-TO-BINARY AND BINARY-TO-BCD CONVERTERS

## schematics of inputs and outputs

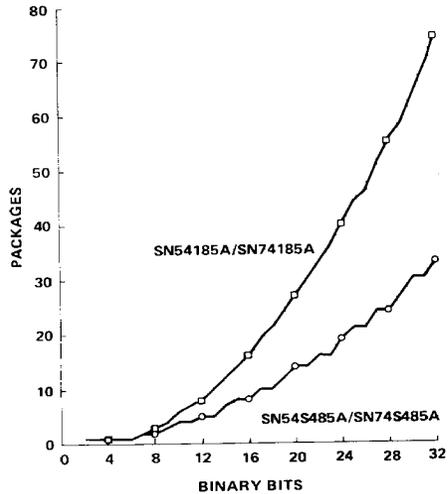


## TYPICAL APPLICATION DATA

PACKAGES REQUIRED  
vs  
DECADES OF CONVERSION



PACKAGES REQUIRED  
vs  
BINARY BITS OF CONVERSION

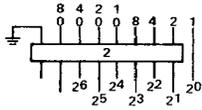


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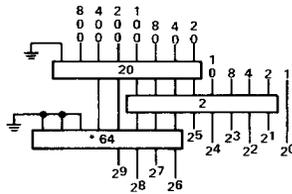
RAMS

# SN54S484A, SN74S484A BCD-TO-BINARY AND BINARY-TO-BCD CONVERTERS

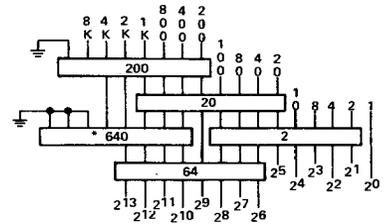
## TYPICAL APPLICATION DATA SN54S484A, SN74S484A



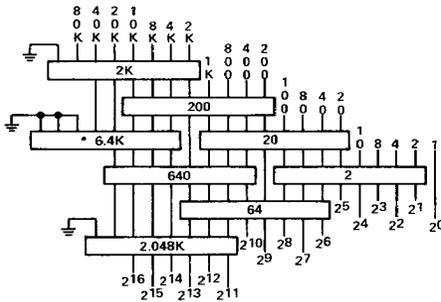
2-DECADE-  
BCD-TO-BINARY  
CONVERTER



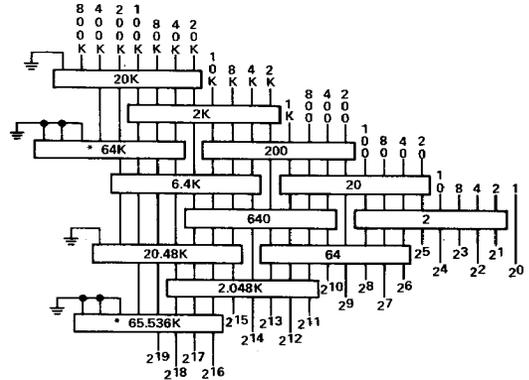
3-DECADE-  
BCD-TO-BINARY  
CONVERTER



4-DECADE-  
BCD-TO-BINARY  
CONVERTER



5-DECADE-  
BCD-TO-BINARY  
CONVERTER



6-DECADE-BCD-TO-BINARY  
CONVERTER

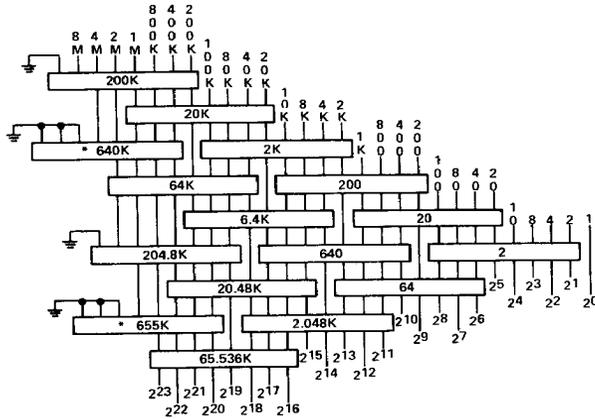
\*SN54184A/SN74184A can be used.  
K =  $10^3$ , M =  $10^6$

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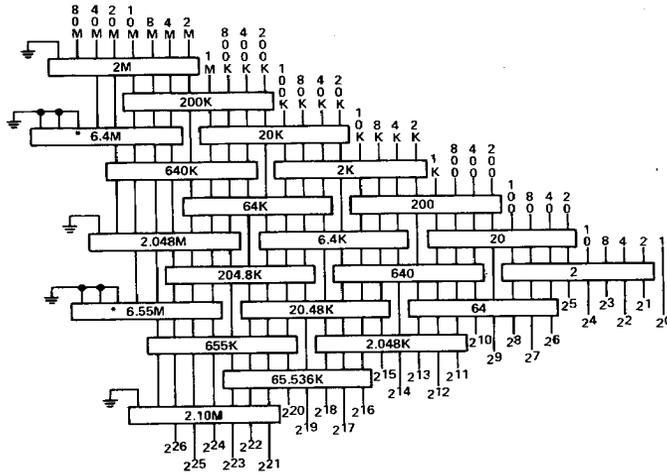
RAMS

**SN54S484A, SN74S484A**  
**BCD-TO-BINARY AND BINARY-TO-BCD CONVERTERS**

**TYPICAL APPLICATION DATA**  
**SN54S484A, SN74S484A**



**7-DECADE BCD-TO-BINARY  
 CONVERTER**



**8-DECADE BCD-TO-BINARY  
 CONVERTER**

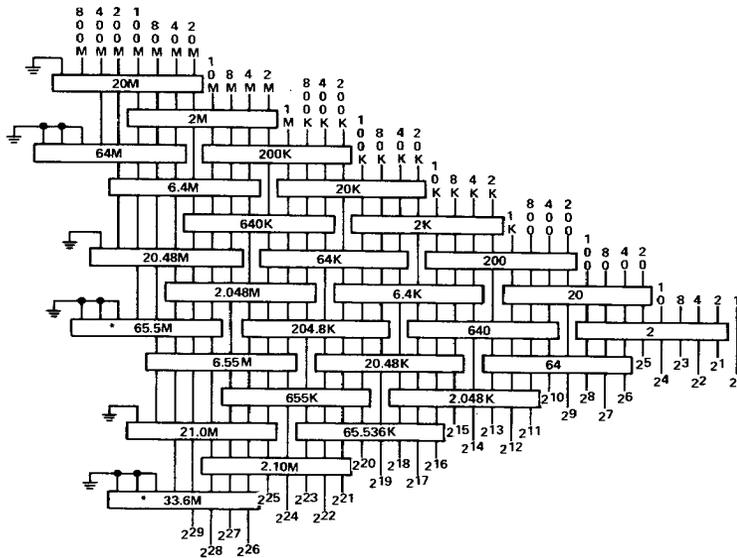
\*SN54184A/SN74184A can be used.  
 K =  $10^3$ , M =  $10^6$

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**RAMS**

**SN54S484A, SN54S485A, SN74S484A, SN74S485A**  
**BCD-TO-BINARY AND BINARY-TO-BCD CONVERTERS**

**TYPICAL APPLICATION DATA**  
**SN54S484A, SN74S484A**



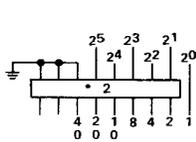
**9-DECADE-BCD-TO-BINARY  
 CONVERTER**

\*SN54184A/SN74184A can be used.  
 K =  $10^3$ , M =  $10^6$

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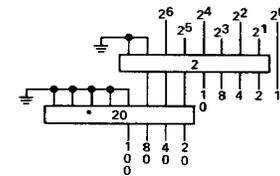
**RAMS**

**TYPICAL APPLICATION DATA**  
**SN54S485A, SN74S485A**

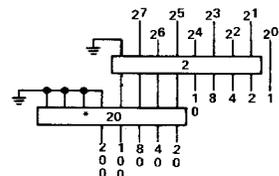


**6-BIT-BINARY-TO-BCD  
 CONVERTER**

\*SN54185A/SN74185A can be used.  
 K =  $10^3$ , M =  $10^6$



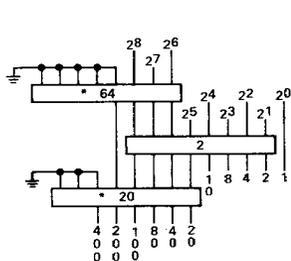
**7-BIT-BINARY-TO-BCD  
 CONVERTER**



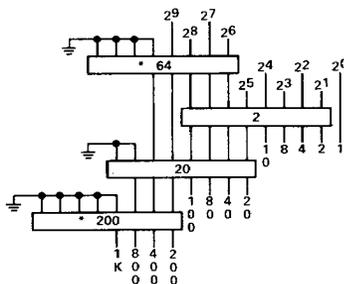
**8-BIT-BINARY-TO-BCD  
 CONVERTER**

# SN54S485A, SN74S485A BCD-TO-BINARY AND BINARY-TO-BCD CONVERTERS

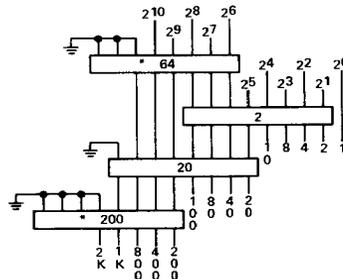
## TYPICAL APPLICATION DATA SN54S485A, SN74S485A



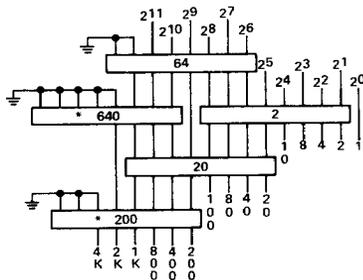
9-BIT-BINARY-TO-BCD  
CONVERTER



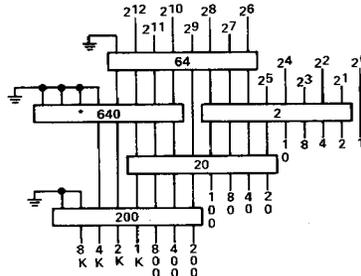
10-BIT-BINARY-TO-BCD  
CONVERTER



11-BIT-BINARY-TO-BCD  
CONVERTER



12-BIT-BINARY-TO-BCD  
CONVERTER



13-BIT-BINARY-TO-BCD  
CONVERTER

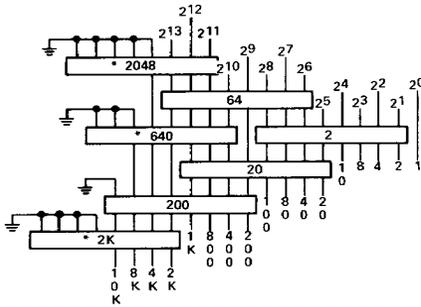
\*SN54185A/SN74185A can be used.  
K =  $10^3$ , M =  $10^6$

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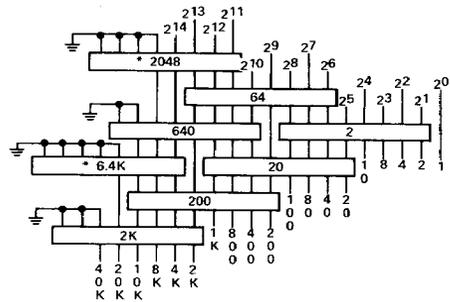
RAMS

**SN54S485A, SN74S485A**  
**BCD-TO-BINARY AND BINARY-TO-BCD CONVERTERS**

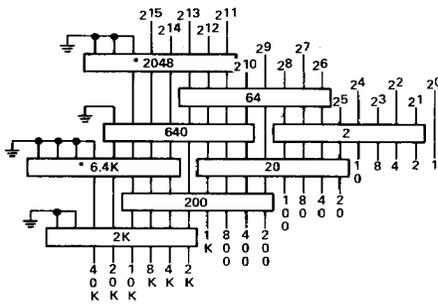
**TYPICAL APPLICATION DATA**  
**SN54S485A, SN74S485A**



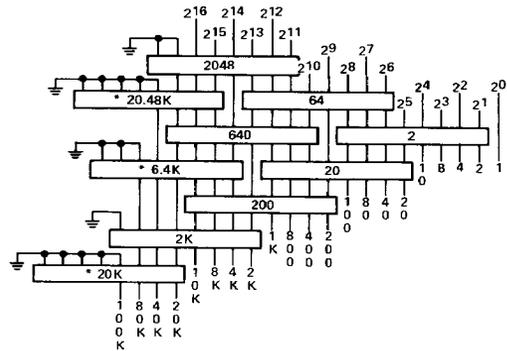
**14-BIT-BINARY-TO-BCD  
 CONVERTER**



**15-BIT-BINARY-TO-BCD  
 CONVERTER**



**16-BIT-BINARY-TO-BCD  
 CONVERTER**



**17-BIT-BINARY-TO-BCD  
 CONVERTER**

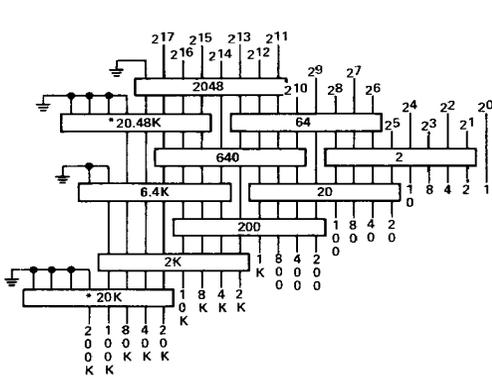
\*SN54185A/SN74185A can be used.  
 K =  $10^3$ , M =  $10^6$

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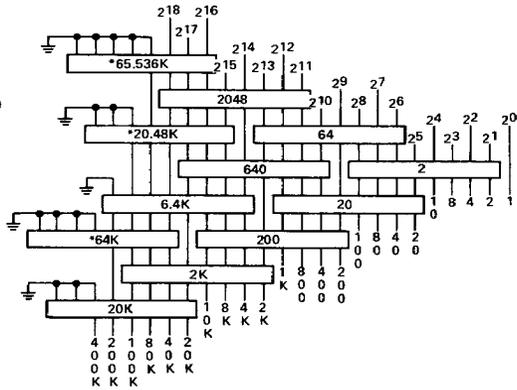
**RAMS**

**SN54S485A, SN74S485A  
BCD-TO-BINARY AND BINARY-TO-BCD CONVERTERS**

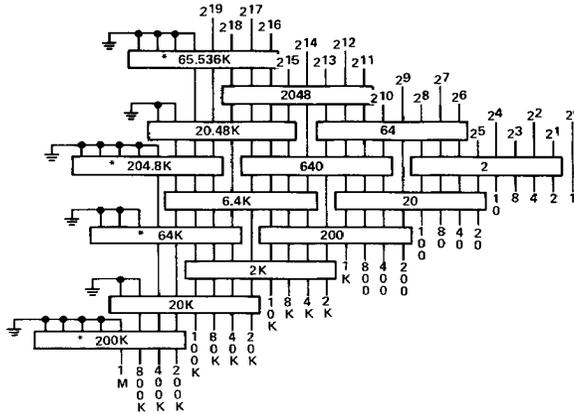
**TYPICAL APPLICATION DATA  
SN54S485A, SN74S485A**



**18-BIT-BINARY-TO-BCD  
CONVERTER**



**19-BIT-BINARY-TO-BCD  
CONVERTER**



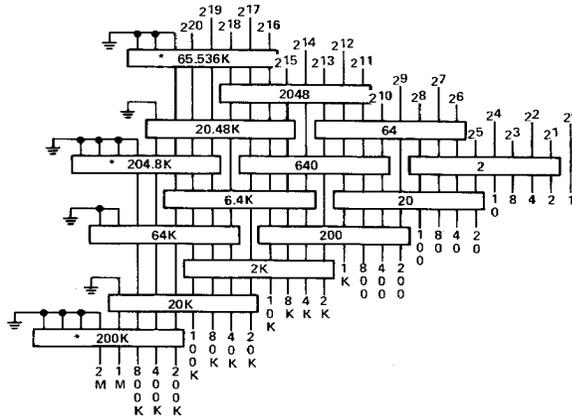
**20-BIT-BINARY-TO-BCD CONVERTER**

\*SN54185A/SN74185A can be used.  
K = 10<sup>3</sup>, M = 10<sup>6</sup>

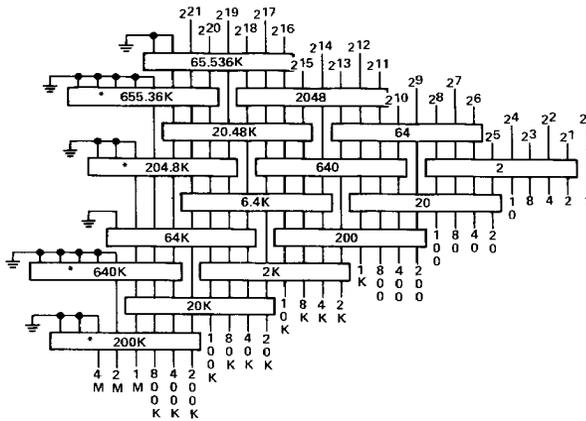
**5  
RAMS**

**SN54S485A, SN74S485A  
BCD-TO-BINARY AND BINARY-TO-BCD CONVERTERS**

**TYPICAL APPLICATION DATA  
SN54S485A, SN74S485A**



**21-BIT-BINARY-TO-BCD CONVERTER**



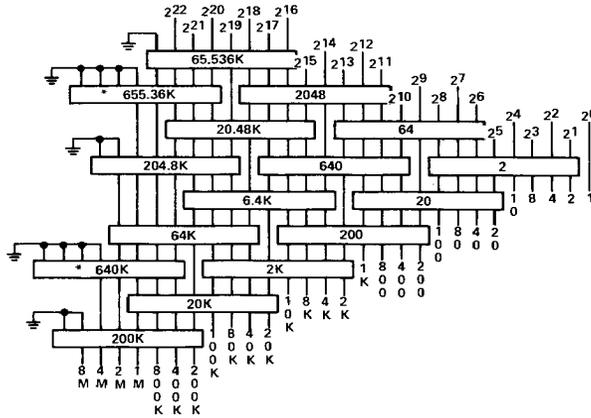
**22-BIT-BINARY-TO-BCD CONVERTER**

\*SN54185A/SN74185A can be used.  
K =  $10^3$ , M =  $10^6$

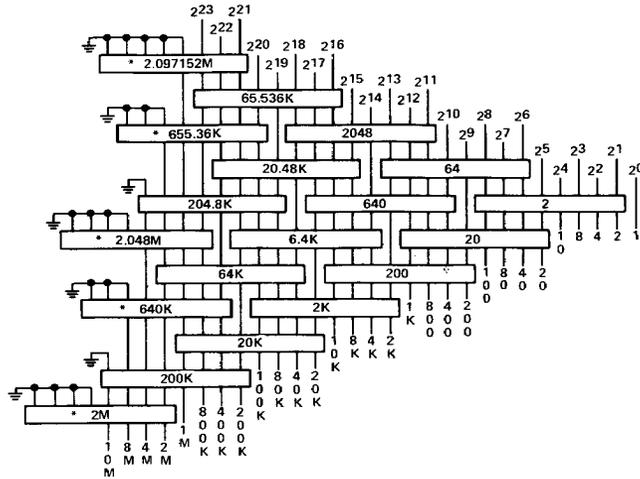
**5  
RAMS**

# SN54S485A, SN74S485A BCD-TO-BINARY AND BINARY-TO-BCD CONVERTERS

## TYPICAL APPLICATION DATA SN54S485A, SN74S485A



23-BIT-BINARY-TO-BCD CONVERTER



24-BIT-BINARY-TO-BCD CONVERTER

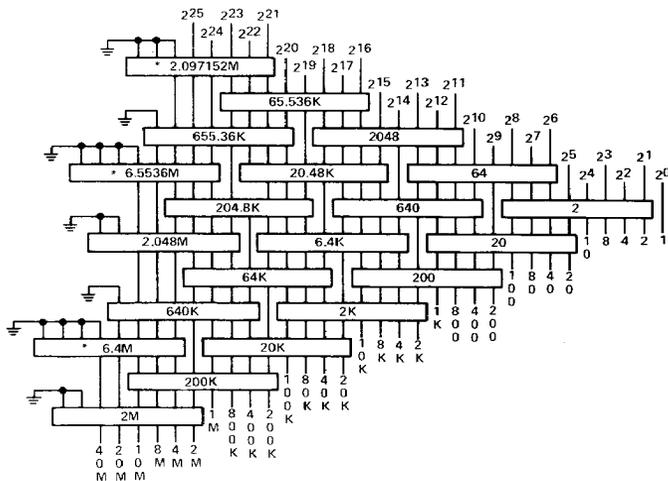
\*SN54185A/SN74185A can be used.  
K =  $10^3$ , M =  $10^6$

**5**  
**RAMS**

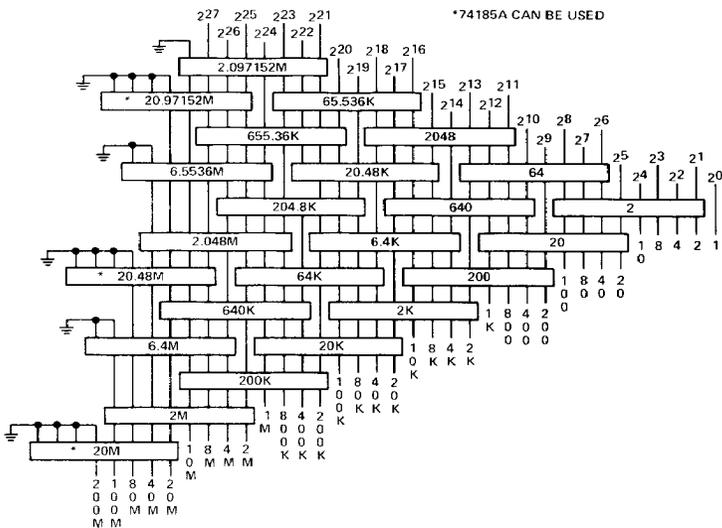


**SN54S485A, SN74S485A  
BCD-TO-BINARY AND BINARY-TO-BCD CONVERTERS**

**TYPICAL APPLICATION DATA  
SN54S485A, SN74S485A**



**27-BIT-BINARY-TO-BCD CONVERTER**



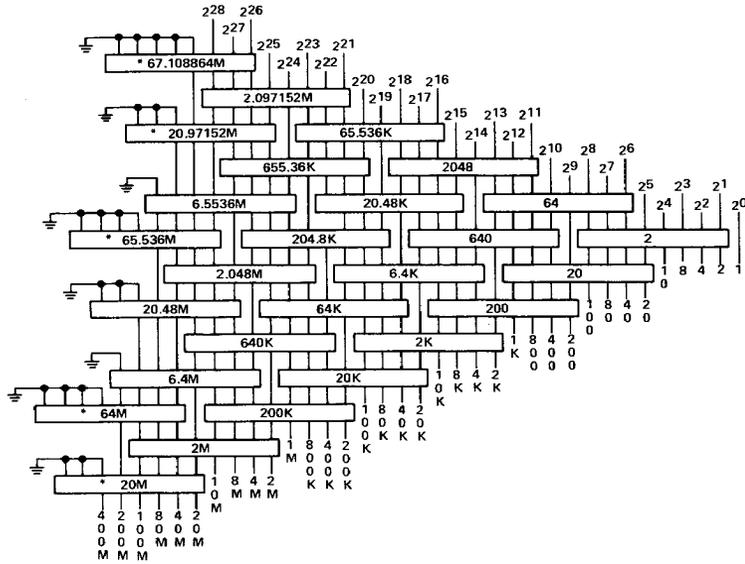
**28-BIT-BINARY-TO-BCD CONVERTER**

\*SN54185A, SN74185A can be used.  
K  $10^3$ , M  $10^6$

**5  
RAMS**

**SN54S485A, SN74S485A**  
**BCD-TO-BINARY AND BINARY-TO-BCD CONVERTERS**

**TYPICAL APPLICATION DATA**  
**SN54S485A, SN74S485A**



**29-BIT-BINARY-TO-BCD CONVERTER**

\*SN54185A/SN74185A can be used.  
 K =  $10^3$ , M =  $10^6$

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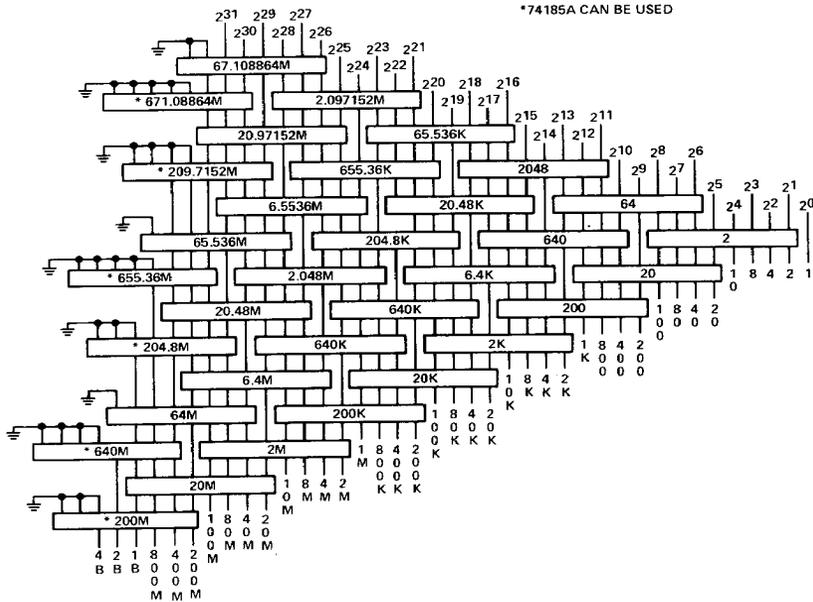
**RAMS**





# SN54S485A, SN74S485A BCD-TO-BINARY AND BINARY-TO-BCD CONVERTERS

## TYPICAL APPLICATION DATA SN54S485A, SN74S485A



**32-BIT-BINARY-TO-BCD CONVERTER**

\*SN54185A/SN74185A can be used.  
K = 10<sup>3</sup>, M = 10<sup>6</sup>



**RAMS**