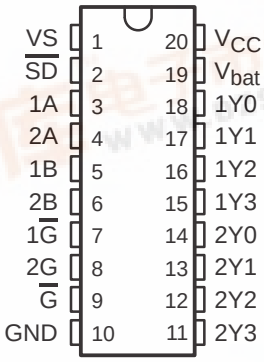
SN74BCT2414
MEMORY DECODER WITH ON-CHIP SUPPLY VOLTAGE MONITOR

SCBS059B – MARCH 1989 – REVISED NOVEMBER 1993

- **BiCMOS Design Substantially Reduces Standby Current**
- **Two Independent 2-Line to 4-Line Decoders or One 3-Line to 8-Line Decoder**
- **Separate Enable Inputs for Easy Cascading**
- **Two Supply Voltage Terminals (V_{CC} and V_{bat})**
- **Built-In Supply-Voltage Monitor for V_{CC}**
- **Automatic Cut Off of Outputs During V_{CC} Fail**
- **Package Options Include Plastic Small-Outline (DW) Packages and Standard Plastic 300-mil DIPs (N)**

DW OR N PACKAGE
(TOP VIEW)



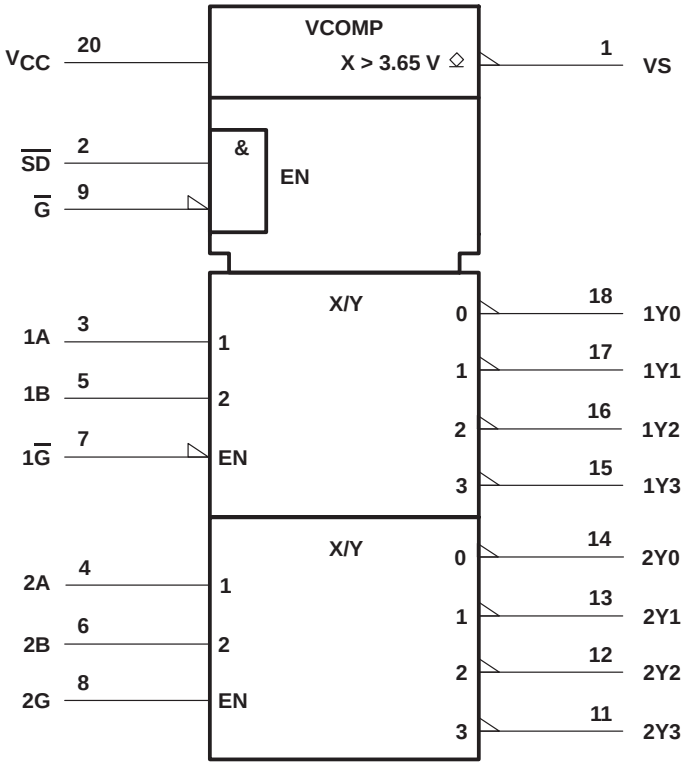
description

The SN74BCT2414 is a decoder specially designed to be used in memory systems with battery backup during power failure. The two independent 2-line to 4-line decoders with separate and common control inputs may be externally cascaded to implement a 3-line to 8-line decoder.

The circuit has two supply voltage inputs: the voltage monitor (bandgap) is powered via the V_{CC} terminal; the internal logic of the circuit is powered via the V_{bat} terminal. In case V_{CC} drops below 3.65 V (nominal), the voltage monitor forces the voltage-control (VS) and decoder outputs (Y) to the high level. VS may be used to disconnect the supply voltage of the memories (V_{bat}) from the system supply. This output is switched off when the on-chip supply voltage monitor detects a power failure.

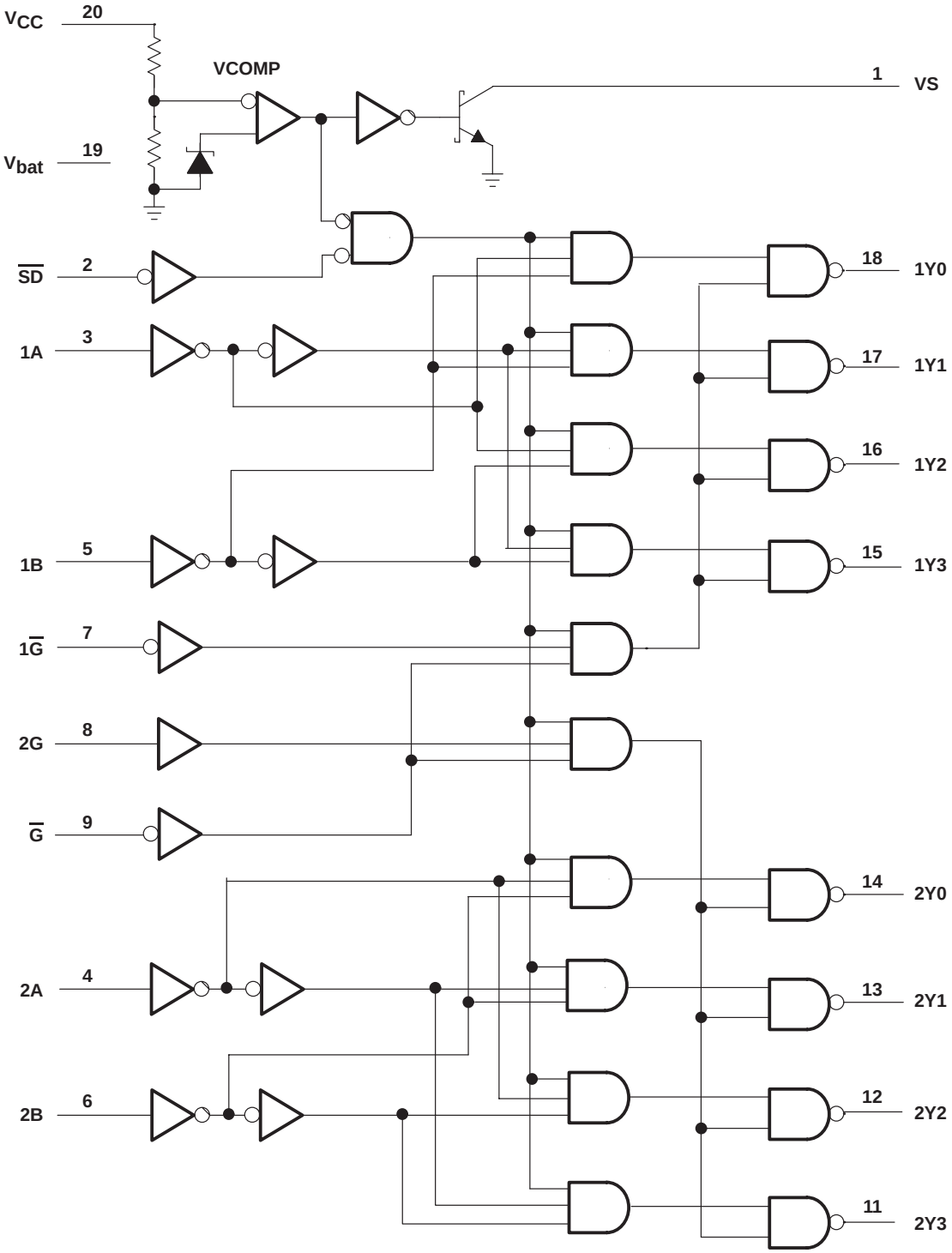
The SN74BCT2414 is characterized for operation from 0°C to 70°C.

logic symbol†



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

logic diagram (positive logic)



FUNCTION TABLES

INPUTS					OUTPUTS			
CONTROL			SELECT					
$\overline{G}$	$1\overline{G}$	$\overline{SD}$	1B	1A	1Y0	1Y1	1Y2	1Y3
H	X	X	X	X	H	H	H	H
X	H	X	X	X	H	H	H	H
X	X	L	X	X	H	H	H	H
L	L	H	L	L	L	H	H	H
L	L	H	L	H	H	L	H	H
L	L	H	H	L	H	H	L	H
L	L	H	H	H	H	H	H	L

INPUTS					OUTPUTS			
CONTROL			SELECT					
$\overline{G}$	2G	$\overline{SD}$	2B	2A	2Y0	2Y1	2Y2	2Y3
H	X	X	X	X	H	H	H	H
X	H	X	X	X	H	H	H	H
X	X	L	X	X	H	H	H	H
L	H	H	L	L	L	H	H	H
L	H	H	L	H	H	L	H	H
L	H	H	H	L	H	H	L	H
L	H	H	H	H	H	H	H	L

NOTE: For a 3-line to 8-line decoder, the following pins must be shorted: $1\overline{G}$ to 2G, 1A to 2A and 1B to 2B.

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

Supply voltage range, V_{bat} . . . . . –0.5 V to 7 V
Supply voltage range, V_{CC} . . . . . –0.5 V to 7 V
Supply voltage V_{CC} with respect to V_{bat} . . . . . –1.5 V
Input voltage range, V_I . . . . . –0.5 V to V_{CC} + 0.5 V
Off-state output voltage range at VS . . . . . –0.5 V to 7 V
Voltage range applied to any Y output in the power-off state . . . . . –0.5 V to 7 V
Voltage applied to any Y output in the power-off state with respect to V_{bat} . . . . . 0.5 V
Operating free-air temperature range . . . . . 0°C to 70°C
Storage temperature range . . . . . –65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability

recommended operating conditions

			MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage		4.5	5	5.5	V
V_{bat}	Supply voltage		4.5	5	5.5	V
V_{IH}	High-level input voltage		2			V
V_{IL}	Low-level input voltage				0.8	V
I_{IK}	Input clamp current				–18	mA
I_{OH}	High-level output current				–400	µA
I_{OL}	Low-level output current	Y outputs			8	mA
		VS outputs			20	
t_t	Input transition time		0		10	ns/V
T_A	Operating free-air temperature		0		70	°C

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

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{IK}		V_{CC} = 4.5 V,	I_I = –18 mA			–1.2	V
V_{OH}		V_{bat} = V_{CC} = 4.5 V	I_{OH} = – 20 µA	4.4			V
			I_{OH} = – 400 µA	3.5			
		V_{bat} = 2 V, V_{CC} = 0,	I_{OH} = – 50 µA	1.8			
V_{OL}	All except VS	V_{bat} = V_{CC} = 4.5 V	I_{OL} = 4 mA			0.4	V
			I_{OL} = 8 mA			0.5	
	VS	V_{bat} = V_{CC} = 4.5 V,	I_{OL} = 20 mA			1	
V_T‡					3.65		V
I_I		V_{bat} = V_{CC} = 5.5 V,	V_I = 5.5 V			100	µA
I_{IH}		V_{bat} = V_{CC} = 5.5 V,	V_I = 2.7 V			±20	µA
I_{IL}		V_{bat} = V_{CC} = 5.5 V,	V_I = 0.5 V			±20	µA
I_{OH}	VS	V_{bat} = 4.5 V,	V_{CC} = 0			1	µA
I_O§		V_{bat} = V_{CC} = 5.5 V,	V_O = 2.25 V	–30		–200	mA
I_{CC}		V_{bat} = V_{CC} = 5.5 V	Outputs high			3	mA
			Outputs low			3	
I_{bat}		V_{bat} = 2.5 V,	V_{CC} = 0		1	10	µA
		V_{bat} = V_{CC} = 5.5 V	Outputs high			20	
			Outputs low			3	mA
C_i		V_{bat} = V_{CC} = 5 V,	V_I = 0 or 3 V		4		pF
C_o	Any Y	V_{bat} = V_{CC} = 0			6.5		pF
	VS				5		

† All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡ This value represents the V_{CC} monitor threshold voltage. Typical range is from 3.5 V to 3.8 V.
§ This output condition has been chosen to produce a current that closely approximates one half of the short-circuit output current, I_{OS}. Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = 25°C			V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX†		UNIT
			MIN	TYP	MAX	MIN	MAX	
t_{PLH}	A or B	Any Y	1	5	10	1	12	ns
t_{PHL}			2	5.8	10	2	12	
t_{PLH}	Any $\overline{G}$	Any Y	1	4.5	9	1	10	ns
t_{PHL}			2	5.5	9	2	11	
t_{PLH}	$\overline{SD}$	Any Y	2	6.5	11	2	12	ns
t_{PHL}			2	6.5	11	2	12	

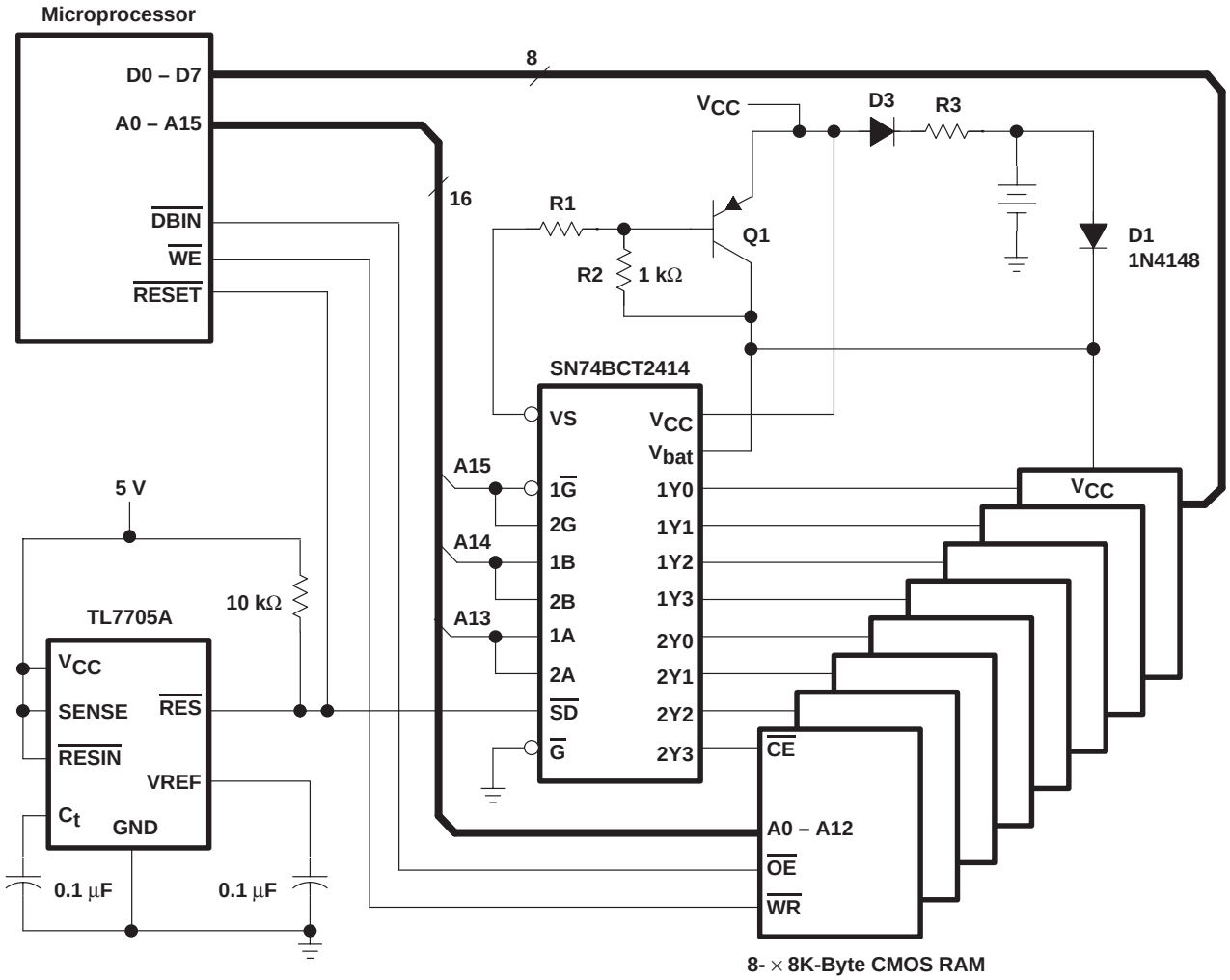
switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = 25°C			V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX†		UNIT
			MIN	TYP	MAX	MIN	MAX	
t_{PLH}	V_{CC}	Any Y	10	25	50	10	250	ns
t_{PHL}			15	45	100	15	250	
t_{PLH}	V_{CC}	VS	10	28	50	10	250	ns
t_{PHL}			20	50	100	20	250	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
NOTE 1: Load circuits and voltage waveforms are shown in Section 1.

APPLICATION INFORMATION

A typical application circuit for a battery-buffered memory in a microcomputer system is shown in Figure 1 which uses the SN74BCT2414. When power fails, the supply-voltage supervisor (TL7705) resets the microcomputer and disables the memory by switching the shutdown input $\overline{SD}$ of the memory decoder to a logic zero. All memory decoder outputs are forced to a logic one. Abnormal write commands from the microprocessor, which may be issued during further voltage breakdown, no longer affect the contents of the memory. When the system supply voltage becomes lower than approximately 3.65 V, the voltage monitor inside the SN74BCT2414 memory decoder disconnects the input buffers of this circuit from the decoding logic internally and keeps all outputs at a logic one. The VS output is also switched off, disconnecting the system supply voltage from the memory circuits. During this low-voltage condition, the memory decoder and the memory circuits are supplied by the battery.



For further information on this device, please contact factory.

Figure 1. Memory System With Battery Backup

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