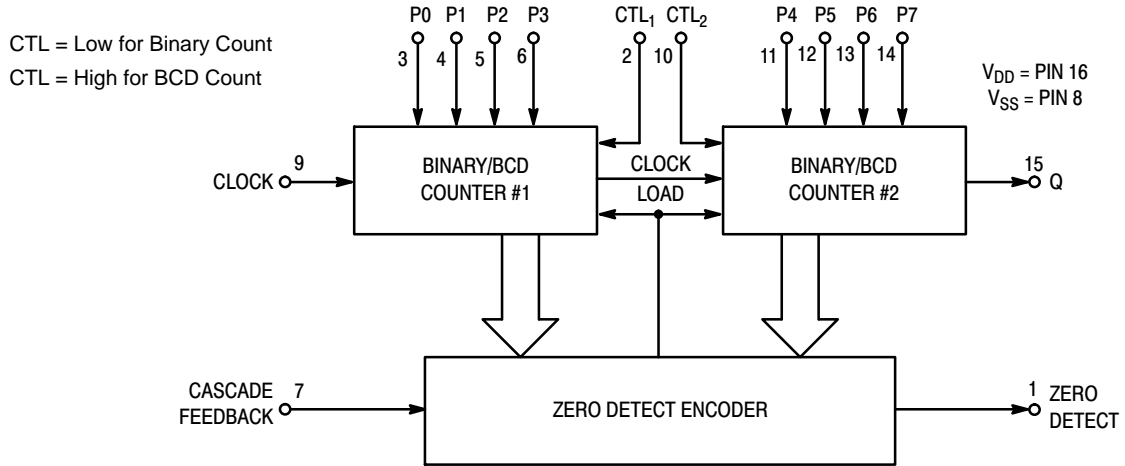


# MC14569B

## BLOCK DIAGRAM



## ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
MC14569BDWG	SOIC-16 WB (Pb-Free)	47 Units / Rail
MC14569BDWR2G	SOIC-16 WB (Pb-Free)	1000 Units / Tape & Reel
NLV14569BDWR2G*	SOIC-16 WB (Pb-Free)	1000 Units / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

# MC14569B

## ELECTRICAL CHARACTERISTICS (Voltages Referenced to V<sub>SS</sub>)

Characteristic	Symbol	V <sub>DD</sub> Vdc	- 55° C		25° C			125° C		Unit
			Min	Max	Min	Typ (Note 2)	Max	Min	Max	
Output Voltage V <sub>in</sub> = V <sub>DD</sub> or 0	"0" Level V <sub>OL</sub>	5.0	-	0.05	-	0	0.05	-	0.05	Vdc
		10	-	0.05	-	0	0.05	-	0.05	
15		-	0.05	-	0	0.05	-	0.05		
V <sub>in</sub> = 0 or V <sub>DD</sub>	"1" Level V <sub>OH</sub>	5.0	4.95	-	4.95	5.0	-	4.95	-	Vdc
		10	9.95	-	9.95	10	-	9.95	-	
		15	14.95	-	14.95	15	-	14.95	-	
Input Voltage (V <sub>O</sub> = 4.5 or 0.5 Vdc) (V <sub>O</sub> = 9.0 or 1.0 Vdc) (V <sub>O</sub> = 13.5 or 1.5 Vdc)	"0" Level V <sub>IL</sub>	5.0	-	1.5	-	2.25	1.5	-	1.5	Vdc
		10	-	3.0	-	4.50	3.0	-	3.0	
		15	-	4.0	-	6.75	4.0	-	4.0	
(V <sub>O</sub> = 0.5 or 4.5 Vdc) (V <sub>O</sub> = 1.0 or 9.0 Vdc) (V <sub>O</sub> = 1.5 or 13.5 Vdc)	"1" Level V <sub>IH</sub>	5.0	3.5	-	3.5	2.75	-	3.5	-	Vdc
		10	7.0	-	7.0	5.50	-	7.0	-	
		15	11	-	11	8.25	-	11	-	
Output Drive Current (V <sub>OH</sub> = 2.5 Vdc) (V <sub>OH</sub> = 4.6 Vdc) (V <sub>OH</sub> = 9.5 Vdc) (V <sub>OH</sub> = 13.5 Vdc)	Source I <sub>OH</sub>	5.0	-3.0	-	-2.4	-4.2	-	-1.7	-	mAdc
		5.0	-0.64	-	-0.51	-0.88	-	-0.36	-	
		10	-1.6	-	-1.3	-2.25	-	-0.9	-	
		15	-4.2	-	-3.4	-8.8	-	-2.4	-	
(V <sub>OL</sub> = 0.4 Vdc) (V <sub>OL</sub> = 0.5 Vdc) (V <sub>OL</sub> = 1.5 Vdc)	Sink I <sub>OL</sub>	5.0	0.64	-	0.51	0.88	-	0.36	-	mAdc
		10	1.6	-	1.3	2.25	-	0.9	-	
		15	4.2	-	3.4	8.8	-	2.4	-	
Input Current	I <sub>in</sub>	15	-	±0.1	-	±0.00001	±0.1	-	±1.0	μAdc
Input Capacitance (V <sub>in</sub> = 0)	C <sub>in</sub>	-	-	-	-	5.0	7.5	-	-	pF
Quiescent Current (Per Package)	I <sub>DD</sub>	5.0	-	5.0	-	0.005	5.0	-	150	μAdc
		10	-	10	-	0.010	10	-	300	
		15	-	20	-	0.015	20	-	600	
Total Supply Current (Notes 3 & 4) (Dynamic plus Quiescent, Per Package) (C <sub>L</sub> = 50 pF on all outputs, all buffers switching)	I <sub>T</sub>	5.0	I <sub>T</sub> = (0.58 μA/kHz) f + I <sub>DD</sub> I <sub>T</sub> = (1.20 μA/kHz) f + I <sub>DD</sub> I <sub>T</sub> = (1.95 μA/kHz) f + I <sub>DD</sub>							μAdc
		10								
		15								

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

2. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

3. The formulas given are for the typical characteristics only at 25°C.

4. To calculate total supply current at loads other than 50 pF:

$$I_T(C_L) = I_T(50 \text{ pF}) + (C_L - 50) \text{ Vfk}$$

where: I<sub>T</sub> is in μA (per package), C<sub>L</sub> in pF, V = (V<sub>DD</sub> - V<sub>SS</sub>) in volts, f in kHz is input frequency, and k = 0.001.

# MC14569B

## SWITCHING CHARACTERISTICS (C<sub>L</sub> = 50 pF, T<sub>A</sub> = 25°C)

Characteristic	Symbol	V <sub>DD</sub> Vdc	All Types			Unit
			Min	Typ (Note 5)	Max	
Output Rise Time	t <sub>TLH</sub>	5.0	–	100	200	ns
		10	–	50	100	
		15	–	40	80	
Output Fall Time	t <sub>THL</sub>	5.0	–	100	200	ns
		10	–	50	100	
		15	–	40	80	
Turn-On Delay Time Zero Detect Output  Q Output	t <sub>PLH</sub>	5.0	–	420	700	ns
		10	–	175	300	
		15	–	125	250	
		5.0	–	675	1200	ns
		10	–	285	500	
		15	–	200	400	
Turn-Off Delay Time Zero Detect Output  Q Output	t <sub>PHL</sub>	5.0	–	380	600	ns
		10	–	150	300	
		15	–	100	200	
		5.0	–	530	1000	ns
		10	–	225	400	
		15	–	155	300	
Clock Pulse Width	t <sub>WH</sub>	5.0	300	100	–	ns
		10	150	45	–	
		15	115	30	–	
Clock Pulse Frequency	f <sub>cl</sub>	5.0	–	3.5	2.1	MHz
		10	–	9.5	5.1	
		15	–	13.0	7.8	
Clock Pulse Rise and Fall Time	t <sub>TLH</sub> , t <sub>THL</sub>	5.0	NO LIMIT			μs
		10				
		15				

5. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

## SWITCHING WAVEFORMS

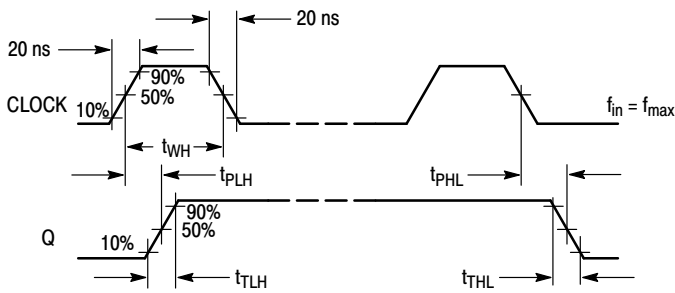


Figure 1.

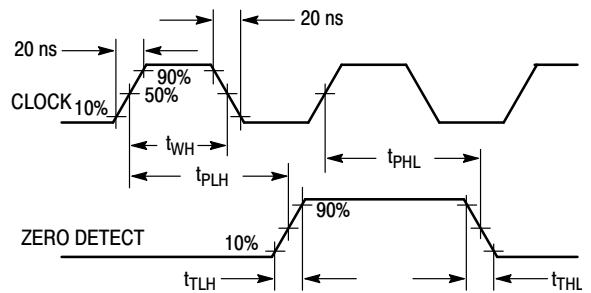


Figure 2.

# MC14569B

## PIN DESCRIPTIONS

### INPUTS

**P0, P1, P2, P3 (Pins 3, 4, 5, 6)** – Preset Inputs. Programmable inputs for the least significant counter. May be binary or BCD depending on the control input.

**P4, P5, P6, P7 (Pins 11, 12, 13, 14)** – Preset Inputs. Programmable inputs for the most significant counter. May be binary or BCD depending on the control input.

**Clock (Pin 9)** – Preset data is decremented by one on each positive transition of this signal.

### OUTPUTS

**Zero Detect (Pin 1)** – This output is normally low and goes high for one clock cycle when the counter has decremented to zero.

**Q (Pin 15)** – Output of the last stage of the most significant counter. This output will be inactive unless the preset input P7 has been set high.

### CONTROLS

**Cascade Feedback (Pin 7)** – This pin is normally set high. When low, loading of the preset inputs (P0 through P7) is inhibited, i.e., P0 through P7 are “don’t cares.” Refer to Table 1 for output characteristics.

**CTL<sub>1</sub> (Pin 2)** – This pin controls the counting mode of the least significant counter. When set high, counting mode is BCD. When set low, counting mode is binary.

**CTL<sub>2</sub> (Pin 10)** – This pin controls the counting mode of the most significant counter. When set high, counting mode is BCD. When set low, counting mode is binary.

### SUPPLY PINS

**V<sub>SS</sub> (Pin 18)** – Negative Supply Voltage. This pin is usually connected to ground.

**V<sub>DD</sub> (Pin 16)** – Positive Supply Voltage. This pin is connected to a positive supply voltage ranging from 3.0 V to 18 V.

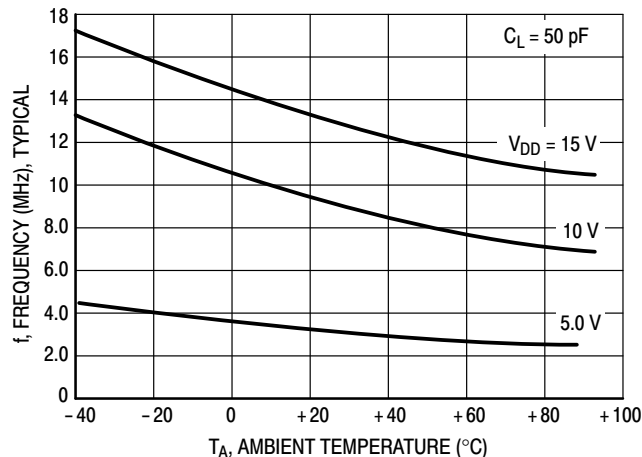
## OPERATING CHARACTERISTICS

The MC14569B is a programmable divide-by-N dual 4-bit down counter. This counter may be programmed (i.e., preset) in BCD or binary code through inputs P0 to P7. For each counter, the counting sequence may be chosen independently by applying a high (for BCD count) or a low (for binary count) to the control inputs CTL<sub>1</sub> and CTL<sub>2</sub>.

The divide ratio N (N being the value programmed on the preset inputs P0 to P7) is automatically loaded into the counter as soon as the count 1 is detected. Therefore, a division ratio of one is not possible. After N clock cycles,

one pulse appears on the Zero Detect output. (See Timing Diagram.) The Q output is the output of the last stage of the most significant counter (See Tables 1 through 5, Mode Controls.)

When cascading the MC14569B to the MC14526B, the Cascade Feedback input, Q, and Zero Detect outputs must be respectively connected to “0”, Clock, and Load of the following counter. If the MC14569B is used alone, Cascade Feedback must be connected to V<sub>DD</sub>.



# MC14569B

**Table 1 Mode Controls** (Cascade Feedback = Low)

Counter Control Values		Divide Ratio	
CTL <sub>1</sub>	CTL <sub>2</sub>	Zero Detect	Q
0	0	256	256
0	1	160	160
1	0	160	160
1	1	100	100

NOTE: Data Preset Inputs (P0–P7) are “Don't Cares” while Cascade Feedback is Low.

**Table 2 Mode Controls** (CTL<sub>1</sub> = Low, CTL<sub>2</sub> = Low, Cascade Feedback = High)

Preset Inputs								Divide Ratio		Comments
P7	P6	P5	P4	P3	P2	P1	P0	Zero Detect	Q	
0	0	0	0	0	0	0	0	256	256	Max Count Illegal State Min Count
0	0	0	0	0	0	0	1	X	X	
0	0	0	0	0	0	1	0	2	X	
0	0	0	0	0	0	1	1	3	X	
•	•	•	•	•	•	•	•	•	X	
•	•	•	•	•	•	•	•	•	X	
•	•	•	•	•	•	•	•	•	X	
0	0	0	0	1	1	1	1	15	X	
0	0	0	1	0	0	0	0	16	X	
•	•	•	•	•	•	•	•	•	X	
•	•	•	•	•	•	•	•	•	X	
•	•	•	•	•	•	•	•	•	X	
0	0	1	0	0	0	0	0	32	X	
•	•	•	•	•	•	•	•	•	X	
•	•	•	•	•	•	•	•	•	X	
•	•	•	•	•	•	•	•	•	X	
0	1	0	0	0	0	0	0	64	X	
•	•	•	•	•	•	•	•	•	X	
•	•	•	•	•	•	•	•	•	X	
•	•	•	•	•	•	•	•	•	X	
0	1	1	1	1	1	1	1	127	X	
1	0	0	0	0	0	0	0	128	128	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
1	0	0	0	1	0	0	0	136	136	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
1	1	1	1	1	1	1	1	255	255	
2 <sup>7</sup>	2 <sup>6</sup>	2 <sup>5</sup>	2 <sup>4</sup>	2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>			Bit Value
128	64	32	16	8	4	2	1			Counting Sequence
Counter #2 Binary				Counter #1 Binary						

Q Output Active  
↓

X = No Output (Always Low)

# MC14569B

**Table 3 Mode Controls** (CTL<sub>1</sub> = High, CTL<sub>2</sub> = Low, Cascade Feedback = High)

Preset Inputs								Divide Ratio		Comments	
P7	P6	P5	P4	P3	P2	P1	P0	Zero Detect	Q		
0	0	0	0	0	0	0	0	160	160	Max Count Illegal State Min Count	
0	0	0	0	0	0	0	1	X	X		
0	0	0	0	0	0	1	0	2	X		
0	0	0	0	0	0	1	1	3	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
0	0	0	0	1	0	0	1	9	X		
0	0	0	1	0	0	0	0	10	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
0	0	0	1	1	0	0	1	19	X		
0	0	1	0	0	0	0	0	20	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
0	0	1	1	0	0	0	0	30	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
0	1	0	0	0	0	0	0	40	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
0	1	0	1	0	0	0	0	50	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
0	1	1	0	0	0	0	0	60	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
0	1	1	1	0	0	0	0	70	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
1	0	0	0	0	0	0	0	80	80	Q Output Active ↓	
•	•	•	•	•	•	•	•	•	•		
•	•	•	•	•	•	•	•	•	•		
•	•	•	•	•	•	•	•	•	•		
•	•	•	•	•	•	•	•	•	•		
1	0	0	1	0	0	0	0	90	90		
•	•	•	•	•	•	•	•	•	•		
•	•	•	•	•	•	•	•	•	•		
•	•	•	•	•	•	•	•	•	•		
1	1	1	1	0	0	0	0	150	150		
•	•	•	•	•	•	•	•	•	•		
•	•	•	•	•	•	•	•	•	•		
•	•	•	•	•	•	•	•	•	•		
1	1	1	1	1	0	0	1	159	159		
80	40	20	10	8	4	2	1				Bit Value
Counter #2 Binary				Counter #1 BCD							

X = No Output (Always Low)

# MC14569B

**Table 4 Mode Controls** (CTL<sub>1</sub> = Low, CTL<sub>2</sub> = High, Cascade Feedback = High)

Preset Values								Divide Ratio		Comments
P7	P6	P5	P4	P3	P2	P1	P0	Zero Detect	Q	
0	0	0	0	0	0	0	0	160	160	Max Count Illegal State Min Count
0	0	0	0	0	0	0	1	X	X	
0	0	0	0	0	0	1	0	2	X	
0	0	0	0	0	0	1	1	3	X	
•	•	•	•	•	•	•	•	•	X	
•	•	•	•	•	•	•	•	•	X	
•	•	•	•	•	•	•	•	•	X	
0	0	0	0	1	1	1	1	15	X	
0	0	0	1	0	0	0	0	16	X	
•	•	•	•	•	•	•	•	•	X	
•	•	•	•	•	•	•	•	•	X	
•	•	•	•	•	•	•	•	•	X	
0	0	0	1	1	1	1	1	31	X	
0	0	1	0	0	0	0	0	32	X	
•	•	•	•	•	•	•	•	•	X	
•	•	•	•	•	•	•	•	•	X	
•	•	•	•	•	•	•	•	•	X	
0	0	1	1	0	0	0	0	48	X	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
0	1	0	0	0	0	0	0	64	X	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
0	1	0	1	0	0	0	0	80	X	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
0	1	1	1	0	0	0	0	112	X	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
1	0	0	0	0	0	0	0	128	128	Q Output Active ↓
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
1	0	0	1	0	0	0	0	144	144	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
•	•	•	•	•	•	•	•	•	•	
1	0	0	1	1	1	1	1	159	159	
2 <sup>7</sup> 128	2 <sup>6</sup> 64	2 <sup>5</sup> 32	2 <sup>4</sup> 16	2 <sup>3</sup> 8	2 <sup>2</sup> 4	2 <sup>1</sup> 2	2 <sup>0</sup> 1			Bit Value
Counter #2 BCD				Counter #1 Binary						Counting Sequence

X = No Output (Always Low)

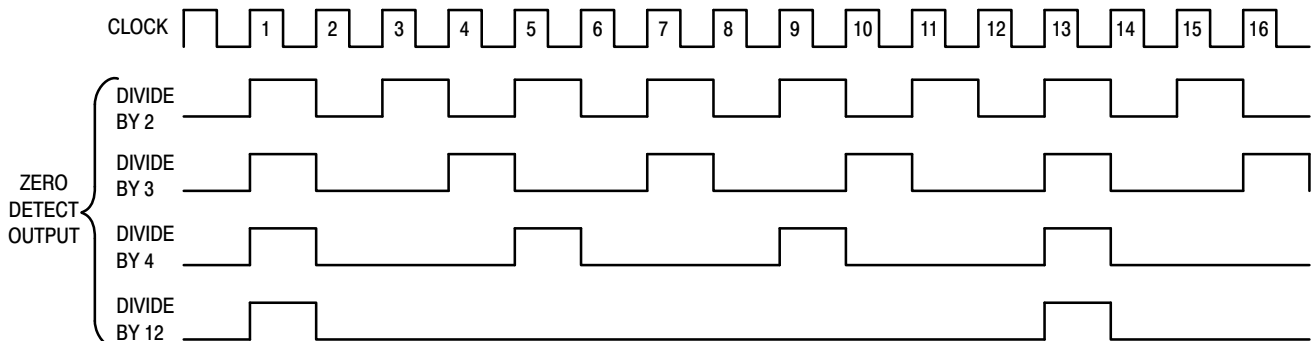
# MC14569B

**Table 5 Mode Controls** (CTL<sub>1</sub> = High, CTL<sub>2</sub> = High, Cascade Feedback = High)

Preset Values								Divide Ratio		Comments	
P7	P6	P5	P4	P3	P2	P1	P0	Zero Detect	Q		
0	0	0	0	0	0	0	0	100	100	Max Count illegal state Min Count	
0	0	0	0	0	0	0	1	X	X		
0	0	0	0	0	0	1	0	2	X		
0	0	0	0	0	0	1	1	3	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
0	0	0	0	1	0	0	1	9	X		
0	0	0	1	0	0	0	0	10	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
0	0	1	1	0	0	0	0	30	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
0	1	0	0	0	0	0	0	40	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
0	1	0	1	0	0	0	0	50	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
0	1	1	1	0	0	0	0	70	X		
•	•	•	•	•	•	•	•	•	X		
•	•	•	•	•	•	•	•	•	X		
1	0	0	0	0	0	0	0	80	80	Q Output Active ↓	
•	•	•	•	•	•	•	•	•	•		
•	•	•	•	•	•	•	•	•	•		
•	•	•	•	•	•	•	•	•	•		
1	0	0	1	0	0	0	0	90	90		
•	•	•	•	•	•	•	•	•	•		
•	•	•	•	•	•	•	•	•	•		
1	0	0	1	1	0	0	1	99	99		
80	40	20	10	8	4	2	1				Bit Value
Counter #2 BCD				Counter #1 BCD							Counting Sequence

X = No Output (Always Low)

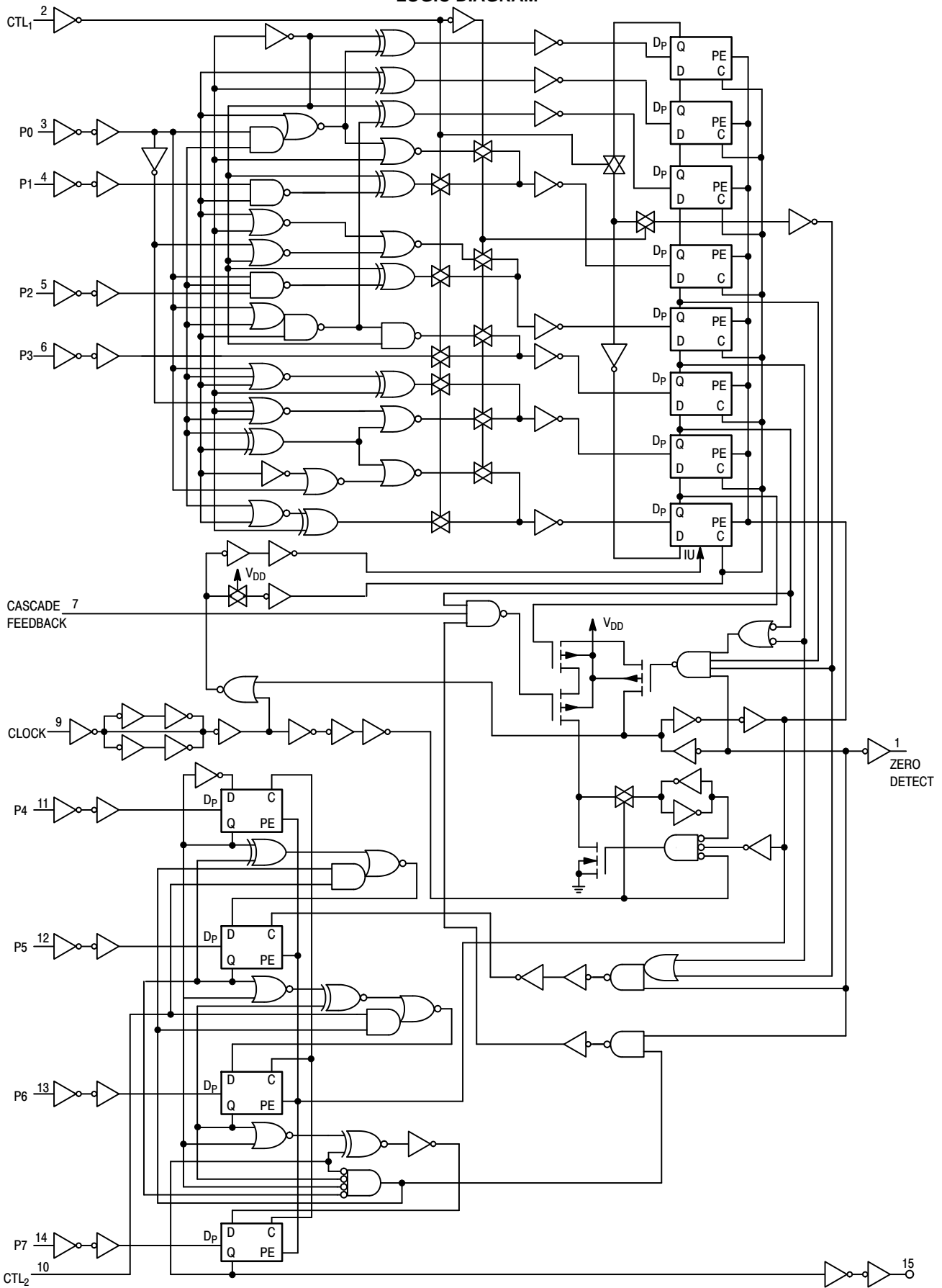
## TIMING DIAGRAM MC14569B





# MC14569B

## LOGIC DIAGRAM



# MC14569B

## TYPICAL APPLICATIONS

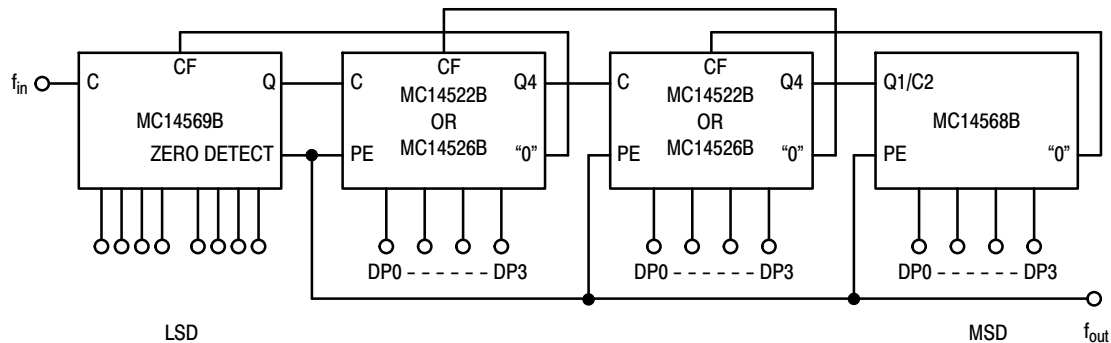
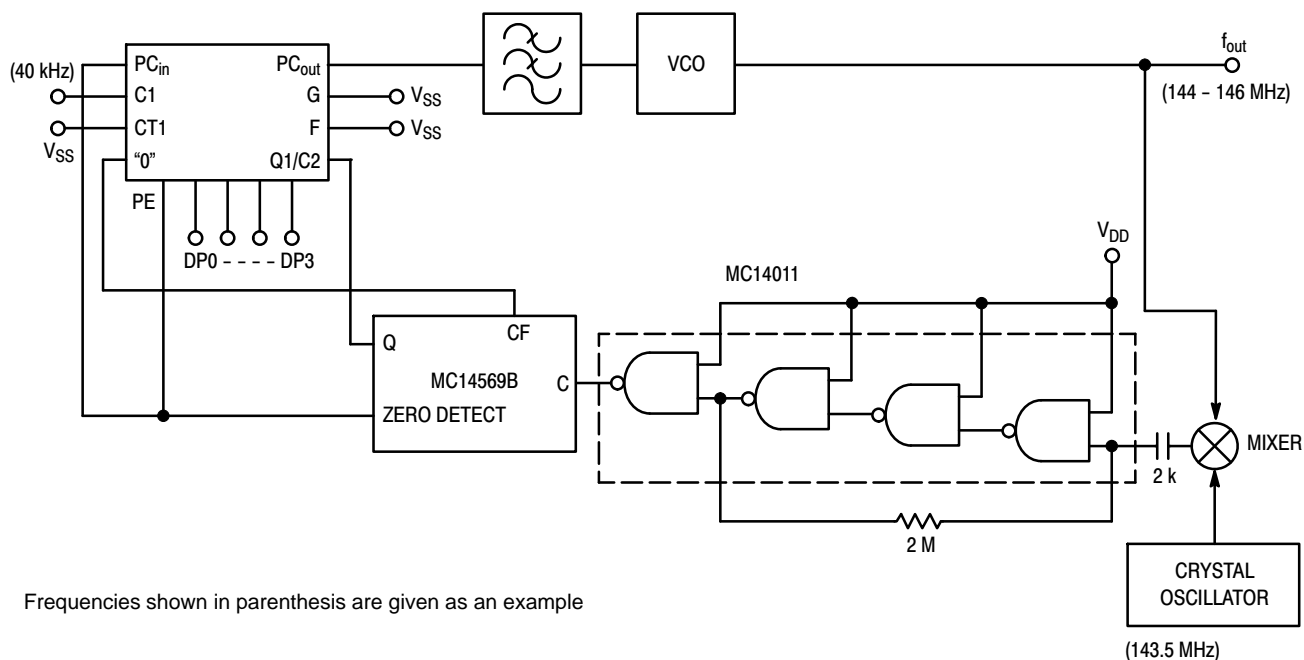


Figure 3. Cascading MC14568B and MC14522B or MC14526B with MC14569B



Frequencies shown in parenthesis are given as an example

Figure 4. Frequency Synthesizer with MC14568B and MC14569B Using a Mixer (Channel Spacing 10 kHz)

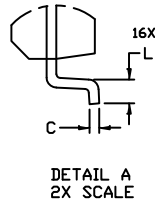
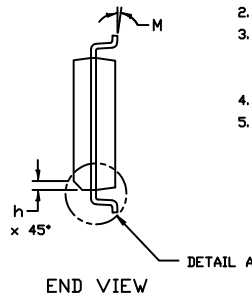
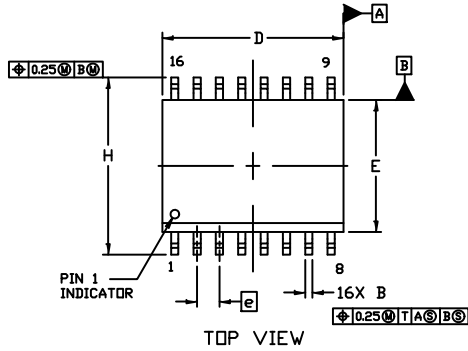
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



1  
SCALE 1:1

SOIC-16 WB  
CASE 751G  
ISSUE E

DATE 08 OCT 2021

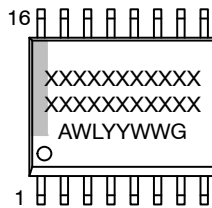


NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
- CONTROLLING DIMENSION: MILLIMETERS
- DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.
- DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
- MAXIMUM MOLD PROTRUSION OR FLASH TO BE 0.15 PER SIDE.

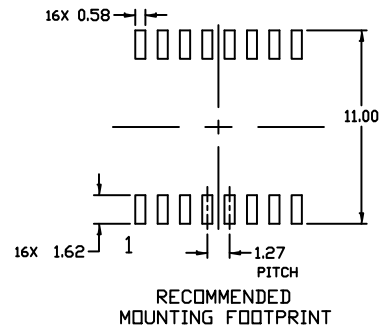
DIM	MILLIMETERS	
	MIN.	MAX.
A	2.35	2.65
A1	0.10	0.25
B	0.35	0.49
C	0.23	0.32
D	10.15	10.45
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.53 REF	
L	0.50	0.90
M	0°	7°

GENERIC MARKING DIAGRAM\*



- XXXXX = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- YY = Year
- WW = Work Week
- G = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



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