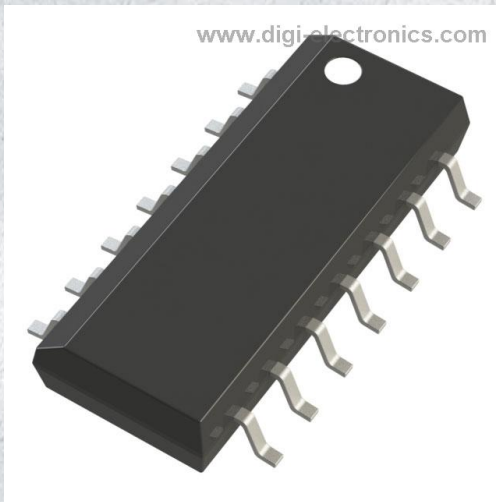


# CMP04FSZ Datasheet



<https://www.DiGi-Electronics.com>

DiGi Electronics Part Number	CMP04FSZ-DG
Manufacturer	<a href="#">Analog Devices Inc.</a>
Manufacturer Product Number	CMP04FSZ
Description	IC COMPARATOR 4 GEN PUR 14SOIC
Detailed Description	Comparator General Purpose CMOS, DTL, ECL, MOS , Open-Collector, TTL 14-SOIC

This model CMP04FSZ is available at DiGi Electronics.

DiGi Electronics offers a global database of semiconductor and electronic component datasheets.

We welcome your inquiries regarding pricing, lead time, or other product-related questions.

 [Request a Quote](#)

 [Datasheet Search](#)



Tel: +00 852-30501935

RFQ Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)

DiGi is a global authorized distributor of electronic components.

## Purchase and inquiry

Manufacturer Product Number:

CMP04FSZ

Series:

-

Type:

General Purpose

Output Type:

CMOS, DTL, ECL, MOS, Open-Collector, TTL

Voltage - Input Offset (Max):

1mV @ 5V

Current - Output (Typ):

16mA @ 5V

CMRR, PSRR (Typ):

100dB CMRR, 100dB PSRR

Hysteresis:

-

Package / Case:

14-SOIC (0.154", 3.90mm Width)

Supplier Device Package:

14-SOIC

Manufacturer:

Analog Devices Inc.

Product Status:

Active

Number of Elements:

4

Voltage - Supply, Single/Dual ( $\pm$ ):

3.3V ~ 36V,  $\pm$ 1.65V ~ 18V

Current - Input Bias (Max):

0.1 $\mu$ A @ 5V

Current - Quiescent (Max):

3mA

Propagation Delay (Max):

-

Operating Temperature:

-40°C ~ 85°C

Mounting Type:

Surface Mount

Base Product Number:

CMP04

## Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8542.39.0001

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99



# Quad Low Power, Precision Comparator

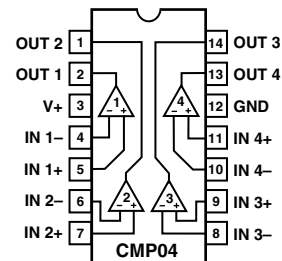
## CMP04

### FEATURES

**High Gain: 200 V/mV Typ**  
**Single- or Dual-Supply Operation**  
**Input Voltage Range Includes Ground**  
**Low Power Consumption (1.5 mW/Comparator)**  
**Low Input Bias Current: 100 nA Max**  
**Low Input Offset Current: 10 nA Max**  
**Low Offset Voltage: 1 mV Max**  
**Low Output Saturation Voltage: 250 mV @ 4 mA**  
**Logic Output Compatible with TTL, DTL, ECL, MOS, and CMOS**  
**Directly Replaces LM139/LM239/LM339 Comparators**

### PIN CONNECTIONS

#### 14-Lead SOIC



### GENERAL DESCRIPTION

Four precision independent comparators comprise the CMP04. Performance highlights include a very low offset voltage, low output saturation voltage, and high gain in a single-supply design. The input voltage range includes ground for single-supply operation and  $V^-$  for split supplies. A low power supply current of 2 mA, which is independent of supply voltage, makes this the preferred comparator for precision applications requiring minimal power consumption. Maximum logic interface flexibility is offered by the open-collector TTL output.

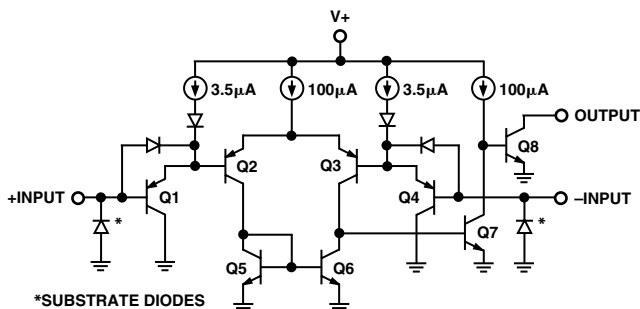


Figure 1. Simplified Schematic (1/4 CMP04)

### TYPICAL INTERFACE

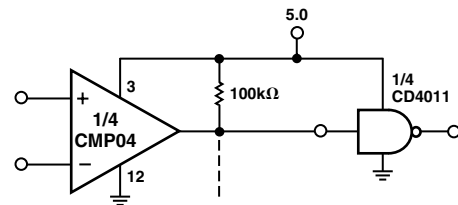


Figure 2a. Driving CMOS

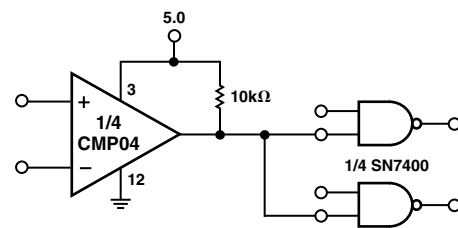


Figure 2b. Driving TTL

Rev. E

[Document Feedback](#)

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.  
 Tel: 781.329.4700 ©2018 Analog Devices, Inc. All rights reserved.  
[Technical Support](#) [www.analog.com](http://www.analog.com)

# CMP04—SPECIFICATIONS

## ELECTRICAL CHARACTERISTICS (@ $V_+ = 5\text{ V}$ , $T_A = 25^\circ\text{C}$ , unless otherwise noted.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input Offset Voltage	$V_{OS}$	$R_S = 0\ \Omega$ , $R_L = 5.1\ \text{k}\Omega$ , $V_O = 1.4\ \text{V}^1$		0.4	1	mV
Input Offset Current	$I_{OS}$	$I_{IN(+)} - I_{IN(-)}$ , $R_L = 5.1\ \text{k}\Omega$ , $V_O = 1.4\ \text{V}$		2	10	nA
Input Bias Current	$I_B$	$I_{IN(+)}$ or $I_{IN(-)}$		25	100	nA
Voltage Gain	$A_V$	$R_L \geq 15\ \text{k}\Omega$ , $V_+ = 15\ \text{V}^2$	80	200		V/mV
Large Signal Response Time	$t_r$	$V_{IN} = \text{TTL Logic Swing}$ , $V_{REF} = 1.4\ \text{V}^3$ $V_{RL} = 5\ \text{V}$ , $R_L = 5.1\ \text{k}\Omega$		300		ns
Small Signal Response Time	$t_r$	$V_{IN} = 100\ \text{mV Step}^3$ , $5\ \text{mV Overdrive}$ $V_{RL} = 5\ \text{V}$ , $R_L = 5.1\ \text{k}\Omega$		1.3		$\mu\text{s}$
Input Voltage Range	CMVR	Note 4	0		$V_+ - 1.5$	V
Common-Mode Rejection Ratio	CMRR	Notes 2, 5	80	100		dB
Power Supply Rejection Ratio	PSRR	$V_+ = 5\ \text{V to } 18\ \text{V}^2$	80	100		dB
Saturation Voltage	$V_{OL}$	$V_{IN(-)} \geq 1\ \text{V}$ , $V_{IN(+)} = 0$ , $I_{SINK} \leq 4\ \text{mA}$		250	400	mV
Output Sink Current	$I_{SINK}$	$V_{IN(-)} \geq 1\ \text{V}$ , $V_{IN(+)} = 0$ , $V_O \leq 1.5\ \text{V}$	6	16		mA
Output Leakage Current	$I_{LEAK}$	$V_{IN(+)} \geq 1\ \text{V}$ , $V_{IN(-)} = 0$ , $V_O = 30\ \text{V}$		0.1	100	nA
Supply Current	$I_+$	$R_L = \infty$ , All Comps $V_+ = 30\ \text{V}$		0.8	2.0	mA

### NOTES

<sup>1</sup>At output switch point,  $V_O = 1.4\ \text{V}$ ,  $R_S = 0\ \Omega$  with  $V_+$  from  $5\ \text{V}$ , and over the full input common-mode range ( $0\ \text{V}$  to  $V_+ - 1.5\ \text{V}$ ).

<sup>2</sup>Guaranteed by design.

<sup>3</sup>Sample tested.

<sup>4</sup>The input common-mode voltage or input signal voltage should not be allowed to go negative by more than  $0.3\ \text{V}$ . The upper end of the common-mode voltage range is  $V_+ - 1.5\ \text{V}$ , but either or both inputs can go to  $30\ \text{V}$  without damage.

<sup>5</sup> $R_L \geq 15\ \text{k}\Omega$ ,  $V_+ = 15\ \text{V}$ ,  $V_{CM} = 1.5\ \text{V}$  to  $13.5\ \text{V}$ .

Specifications subject to change without notice.

### ABSOLUTE MAXIMUM RATINGS<sup>1</sup>

Supply Voltage	+36 V or $\pm 18\ \text{V}$
Differential Input Voltage	36 V dc
Input Voltage	-0.3 V to +36 V
Operating Temperature Range	
CMP04FSZ	-40°C to +85°C
Junction Temperature ( $T_J$ )	-65°C to +150°C
Storage Temperature Range	-65°C to +150°C
Input Current ( $V_{IN} < -3.0\ \text{V}$ )	50 mA
Output Short Circuit to GND	Continuous
Lead Temperature (Soldering, 60 sec)	300°C

Package Type	$\theta_{JA}^2$	$\theta_{JC}$	Unit
14-Lead SOIC	120	36	$^\circ\text{C}/\text{W}$

### NOTES

<sup>1</sup>Absolute maximum ratings apply to both DICE and packaged parts, unless otherwise noted. Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those listed in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

<sup>2</sup> $\theta_{JA}$  is specified for worst-case mounting conditions, i.e.,  $\theta_{JA}$  is specified for device soldered to printed circuit board for SOIC package.

### CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the CMP04 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.



# ELECTRICAL CHARACTERISTICS (@ $V_+ = 5\text{ V}$ , $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ for CMP04FSZ, unless otherwise noted.)

Parameter	Symbol	Conditions	CMP04FSZ <sup>1</sup>			Unit
			Min	Typ	Max	
Input Offset Voltage	$V_{OS}$	$R_S = 0\ \Omega$ , $R_L = 5.1\ \text{k}\Omega$ $V_O = 1.4\ \text{V}^2$		1	2	mV
				1	2	mV
Input Offset Current	$I_{OS}$	$I_{IN(+)} - I_{IN(-)}$ $R_L = 5.1\ \text{k}\Omega$ $V_O = 1.4\ \text{V}$		4	20	nA
				4	20	nA
				4	20	nA
				4	20	nA
Input Bias Current	$I_B$	$I_{IN(+)}$ or $I_{IN(-)}$		40	200	nA
Voltage Gain	$A_V$	$R_L \geq 15\ \text{k}\Omega$ , $V_+ = 15\ \text{V}^3$	70	125		V/mV
Large Signal Response Time	$t_r$	$V_{IN} = \text{TTL Logic Swing}$ $V_{REF} = 1.4\ \text{V}^4$		300		ns
				300		ns
				300		ns
Small Signal Response Time	$t_r$	$V_{IN} = 100\ \text{mV Step}^4$ 5 mV Overdrive $V_{RL} = 5\ \text{V}$ , $R_L = 5.1\ \text{k}\Omega$		1.3		$\mu\text{s}$
				1.3		$\mu\text{s}$
				1.3		$\mu\text{s}$
				1.3		$\mu\text{s}$
Input Voltage Range	CMVR	Note 5	0		$V_+ - 1.5$	V
Common-Mode Rejection Ratio	CMRR	Notes 1, 3	60	100		dB
Power Supply Rejection Ratio	PSRR	$V_+ = 5\ \text{V}$ to 18 V	80	100		dB
Saturation Voltage	$V_{OL}$	$V_{IN(-)} \geq 1\ \text{V}$ , $V_{IN(+)} = 0$ , $I_{SINK} \leq 4\ \text{mA}$		250	700	mV
				250	700	mV
Output Sink Current	$I_{SINK}$	$V_{IN(-)} \geq 1\ \text{V}$ , $V_{IN(+)} = 0$ , $V_O \leq 1.5\ \text{V}$	5	16		mA
			5	16		mA
Output Leakage Current	$I_{LEAK}$	$V_{IN(+)} \geq 1\ \text{V}$ , $V_{IN(-)} = 0$ , $V_O = 30\ \text{V}$		0.1	200	nA
				0.1	200	nA
Supply Current	$I_+$	$R_L = \infty$ , All Comps $V_+ = 30\ \text{V}$		1.2	3.0	mA
				1.2	3.0	mA

## NOTES

<sup>1</sup> $R_L \geq 15\ \text{k}\Omega$ ,  $V_+ = 15\ \text{V}$ ,  $V_{CM} = 1.5\ \text{V}$  to 13.5 V.<sup>2</sup>At output switch point,  $V_O = 1.4\ \text{V}$ ,  $R_S = 0\ \Omega$  with  $V_+$  from 5 V; and over the full input common-mode range (0 V to  $V_+ - 1.5\ \text{V}$ ).<sup>3</sup>Guaranteed by design.<sup>4</sup>Sample tested.<sup>5</sup>The input common-mode voltage or input signal voltage should not be allowed to go negative by more than 0.3 V. The upper end of the common-mode voltage range is  $V_+ - 1.5\ \text{V}$ , but either or both inputs can go to +30 V without damage.

Specifications subject to change without notice.

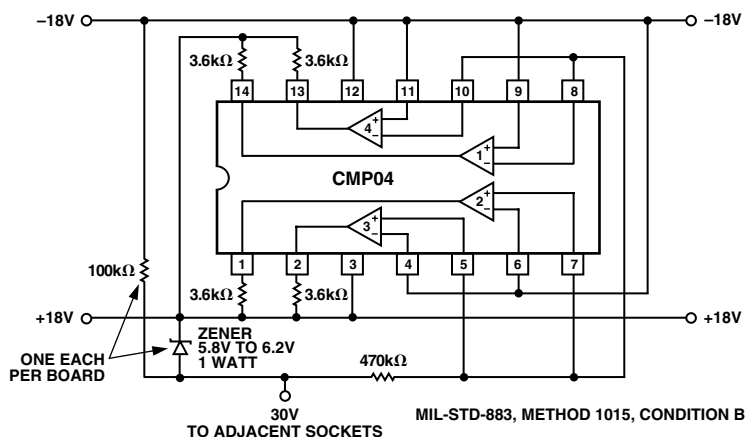
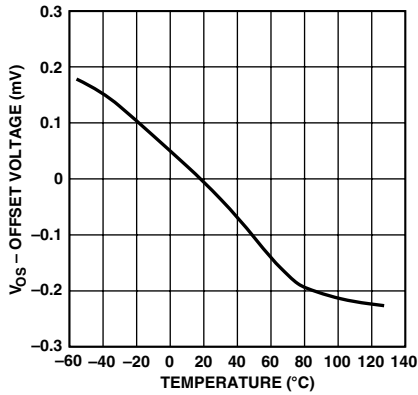
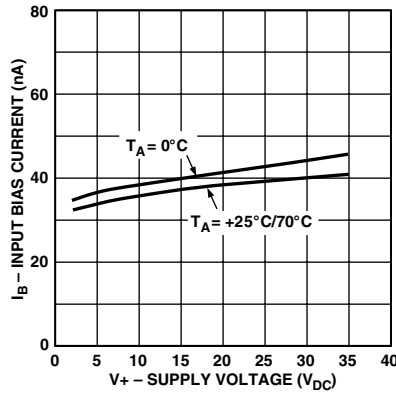


Figure 3. Burn-In Circuit

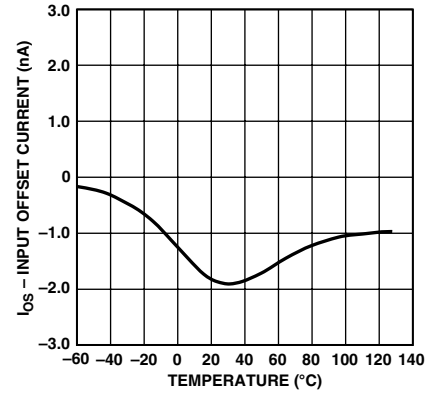
# CMP04—Typical Performance Characteristics



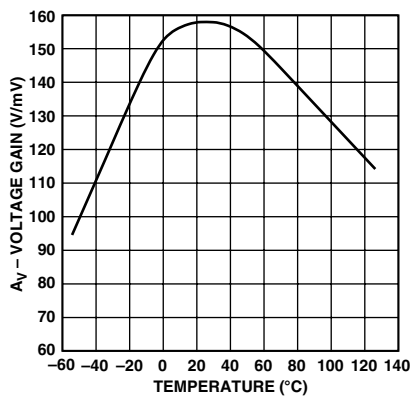
TPC 1. Offset Voltage vs. Temperature



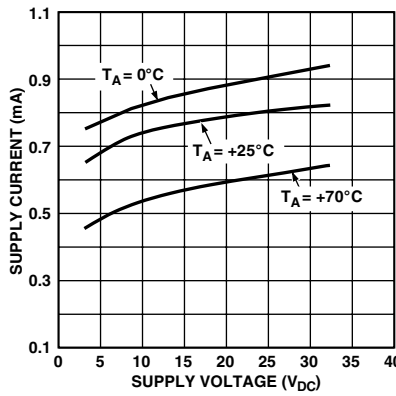
TPC 2. Input Bias Current vs. V+ and Temperature



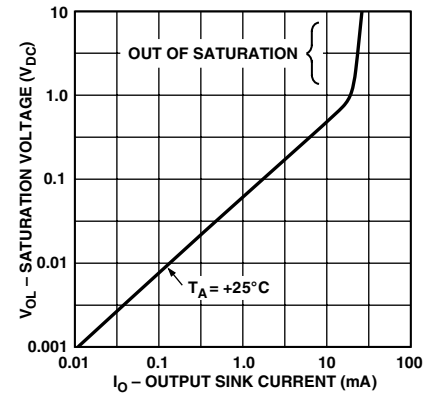
TPC 3. Input Offset Current vs. Temperature



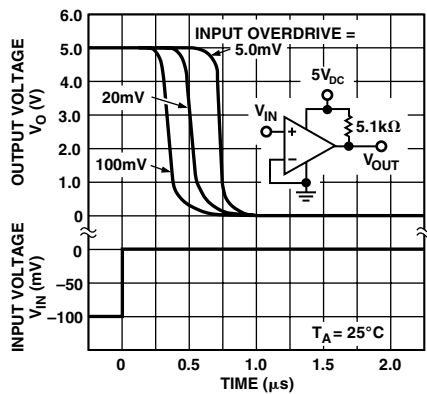
TPC 4. Voltage Gain vs. Temperature



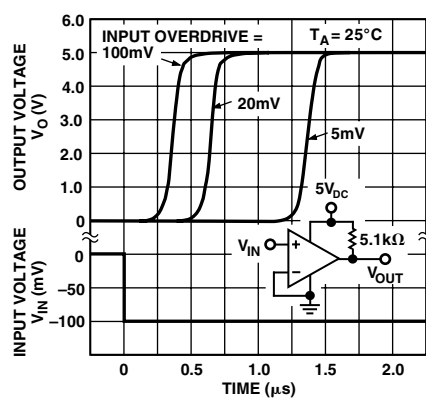
TPC 5. Supply Current vs. Supply Voltage



TPC 6. Output Voltage vs. Output Current and Temperature



TPC 7. Response Time for Various Input Overdrives—Negative Transition



TPC 8. Response Time for Various Input Overdrives—Positive Transition

# CMP04

## TYPICAL APPLICATIONS

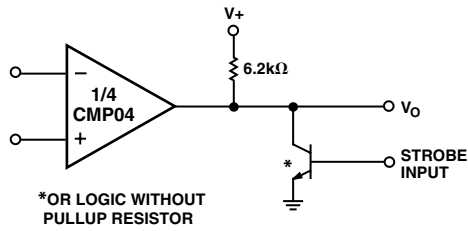


Figure 4. Output Strobing

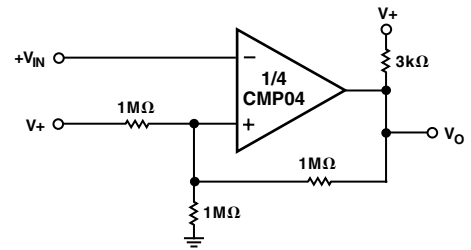


Figure 7. Inverting Comparator with Hysteresis

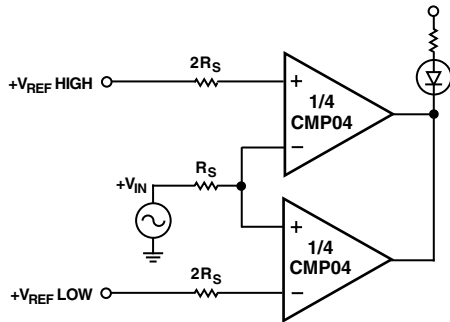


Figure 5. Limit Comparator

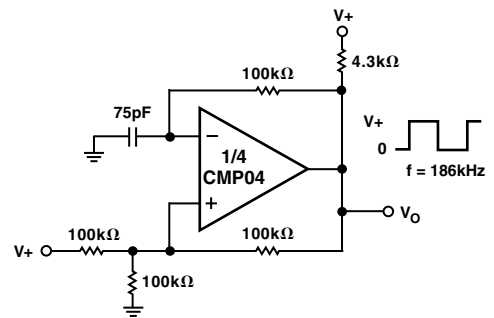


Figure 8. Square Wave Oscillator

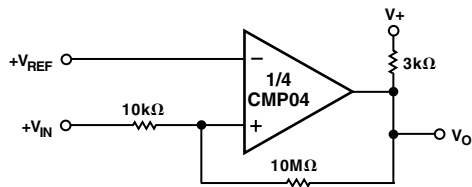


Figure 6. Noninverting Comparator with Hysteresis

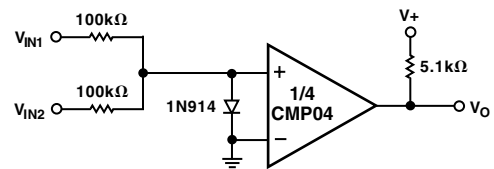


Figure 9. Comparing Input Voltages of Opposite Polarity

# CMP04

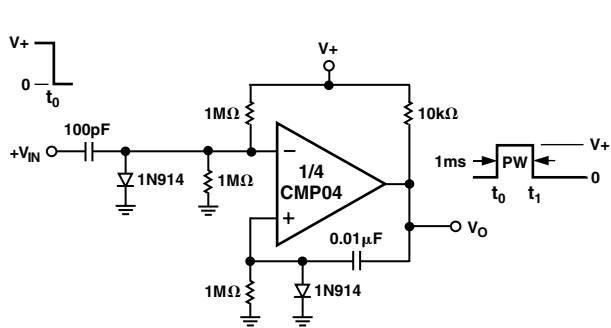


Figure 10. One-Shot Multivibrator

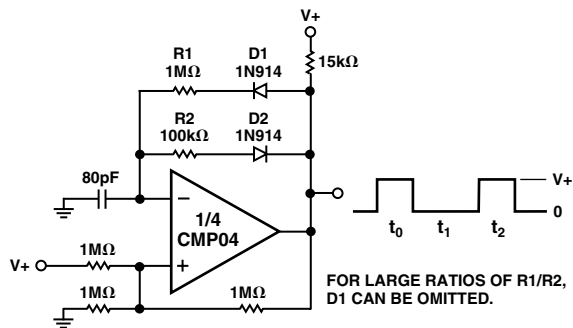


Figure 12. Pulse Generator

FOR LARGE RATIOS OF R1/R2, D1 CAN BE OMITTED.

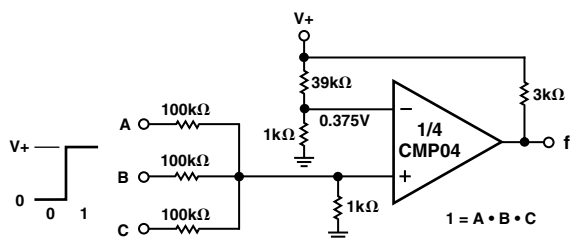


Figure 11. AND Gate

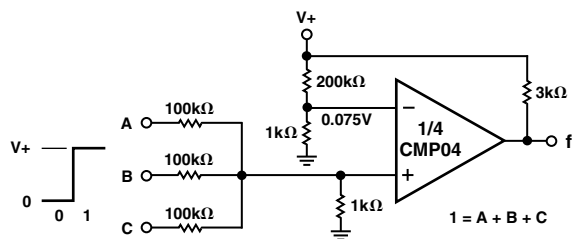


Figure 13. OR Gate

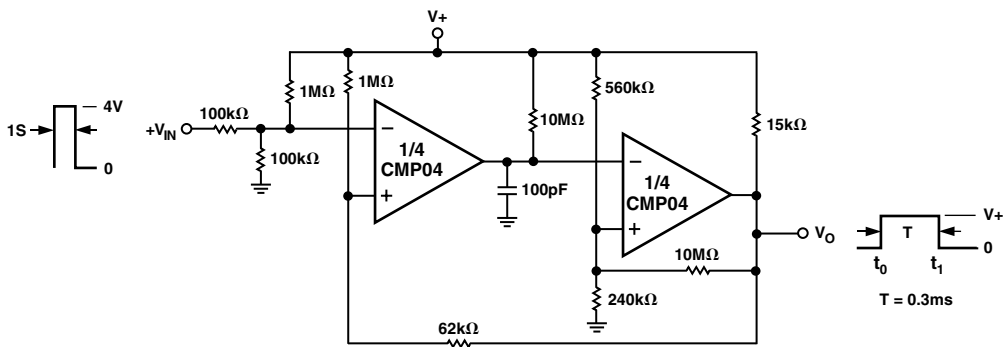


Figure 14. One-Shot Multivibrator with Input Lockout

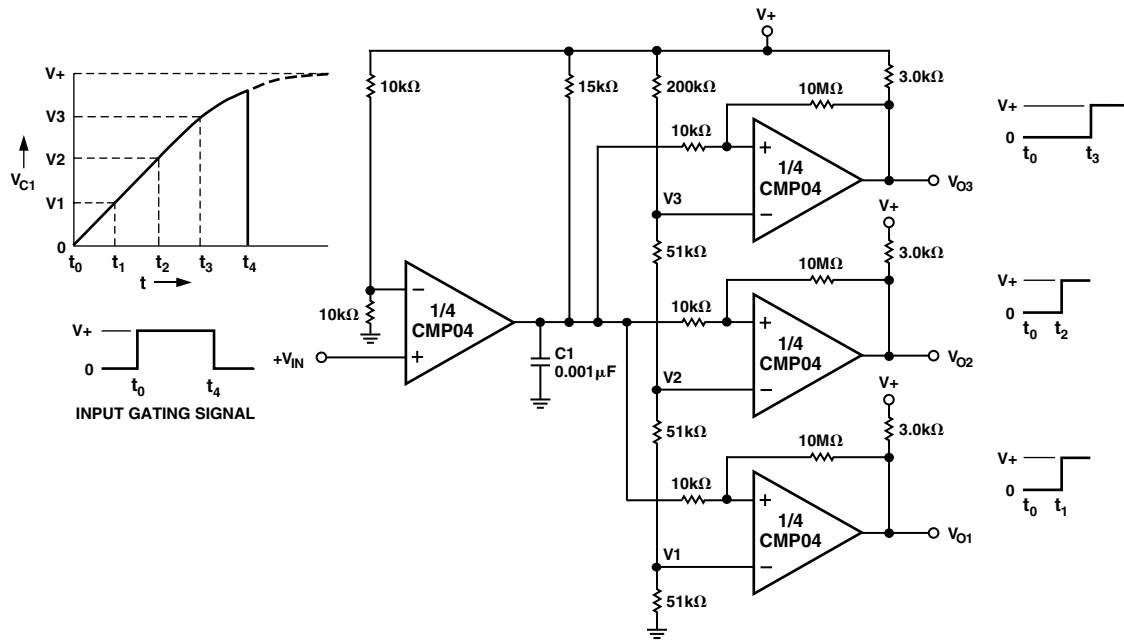
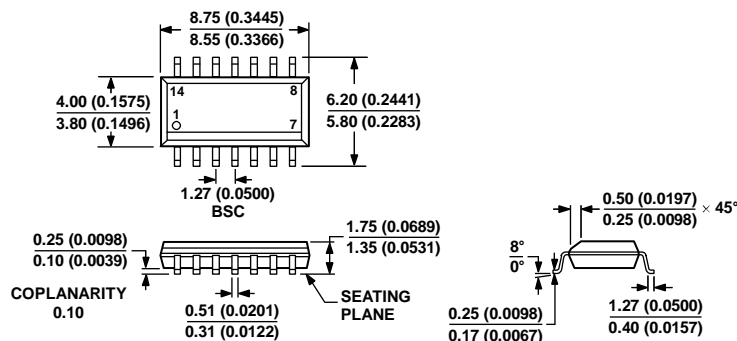


Figure 15. Time Delay Generator

**OUTLINE DIMENSIONS**



COMPLIANT TO JEDEC STANDARDS MS-012-AB  
 CONTROLLING DIMENSIONS ARE IN MILLIMETERS; INCH DIMENSIONS  
 (IN PARENTHESES) ARE ROUNDED-OFF MILLIMETER EQUIVALENTS FOR  
 REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN.

Figure 16. 14-Lead Standard Small Outline Package [SOIC\_N]  
 Narrow Body  
 (R-14)

Dimensions shown in millimeters and (inches)

06/06/06-A

**ORDERING GUIDE**

Model <sup>1</sup>	T <sub>A</sub> = 25°C, V <sub>OS</sub>	Temperature Range	Package Description	Package Option
CMP04FSZ	1 mV	-40°C to +85°C	14-Lead Standard Small Outline Package [SOIC_N]	R-14
CMP04FSZ-REEL	1 mV	-40°C to +85°C	14-Lead Standard Small Outline Package [SOIC_N]	R-14

<sup>1</sup> Z = RoHS Compliant Part.

**REVISION HISTORY**

**10/2018—Rev. D to Rev. E**

Changed CMP04FS and CMP04F to CMP04FSZ .... Throughout  
 Updated Outline Dimensions.....8  
 Moved Ordering Guide .....8  
 Changes to Ordering Guide.....8

Changes to Features ..... 1  
 Changes to Pin Connections ..... 1  
 Changes to Absolute Maximum Ratings.....2  
 Changes to Ordering Guide .....2  
 Changes to Electrical Characteristics .....3  
 Removal of Dice Characteristics, Wafer Test Limits, and Typical  
 Electrical Characteristics Sections ..... 4  
 Changes to TPCs 2, 5, and 6 .....4  
 Updated Outline Dimensions..... 8

**3/2003—REV. C to REV. D**

Renumbered TPCs and Figures..... Global  
 Deletion of 14-Lead CERDIP and 14-Lead PDIP  
 Information ..... Global

## OUR CERTIFICATE

DiGi provide top-quality products and perfect service for customer worldwide through standardization, technological innovation and continuous improvement. DiGi through third-party certification, we strictly control the quality of products and services. Welcome your RFQ to

Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)



Tel: +00 852-30501935

RFQ Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)

DiGi is a global authorized distributor of electronic components.