



CMOS Micro-Power Comparator plus Voltage Follower

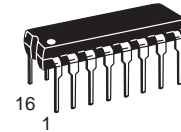
The MC14578 is an analog building block consisting of a very-high input impedance comparator. The voltage follower allows monitoring the noninverting input of the comparator without loading.

Four enhancement-mode MOSFETs are also included on chip. These FETs can be externally configured as open-drain or totem-pole outputs. The drains have on-chip static-protecting diodes. Therefore, the output voltage must be maintained between V_{SS} and V_{DD} .

The chip requires one external component. A $3.9\text{ M}\Omega \pm 10\%$ resistor must be connected from the R_{bias} pin to V_{DD} . This circuit is designed to operate in smoke detector systems that comply with UL217 and UL268 specifications.

- Applications:
 - Pulse Shapers
 - Line-Powered Smoke Detectors
 - Threshold Detectors
 - Liquid/Moisture Sensors
 - Low-Battery Detectors
 - CO Detector and Micro Interface
- Operating Voltage Range: 3.5 to 14 V
- Operating Temperature Range: -30° to 70°C
- Input Current (IN + Pin): $\pm 1\text{ pA}$ @ 25°C (DIP Only)
- Quiescent Current: $10\text{ }\mu\text{A}$ @ 25°C
- Electrostatic Discharge (ESD) Protection Circuitry on All Pins

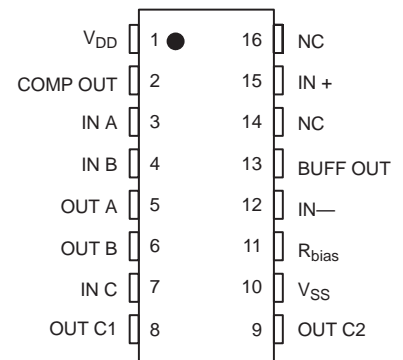
MC14578



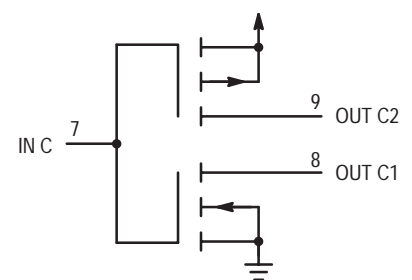
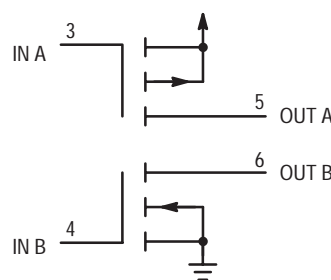
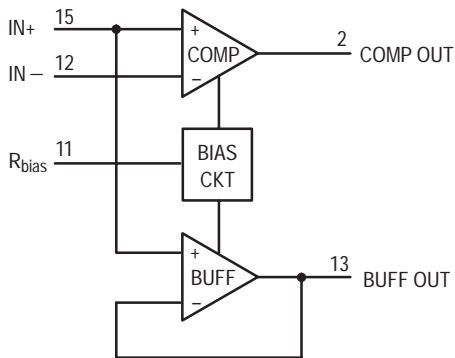
**P SUFFIX
PLASTIC DIP
CASE 648-08**

ORDERING INFORMATION
MC14578P PLASTIC DIP

PIN ASSIGNMENT



LOGIC DETAIL



PIN 1 = V_{DD}
PIN 10 = V_{SS}
PINS 14, 16 = NO CONNECTION



MAXIMUM RATINGS* (Voltages Referenced to V_{SS})

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage	- 0.5 to +14	V
V_{in}	DC Input Voltage	-0.5 to $V_{DD} + 0.5$	V
V_{out}	DC Output Voltage	-0.5 to $V_{DD} + 0.5$	V
I_{in}	DC Input Current, Except IN +	± 10	mA
I_{in}	DC Input Current, IN +	± 1.0	mA
I_{out}	DC Output Current, per Pin	± 25	mA
I_{DD}	DC Supply Current, V_{DD} and V_{SS} Pins	± 50	mA
P_D	Power Dissipation, per Package	500	mW
T_{stg}	Storage Temperature	- 65 to +150	$^{\circ}C$
T_L	Lead Temperature (10-Second Soldering)	260	$^{\circ}C$

*Maximum Ratings are those values beyond which damage to the device may occur.

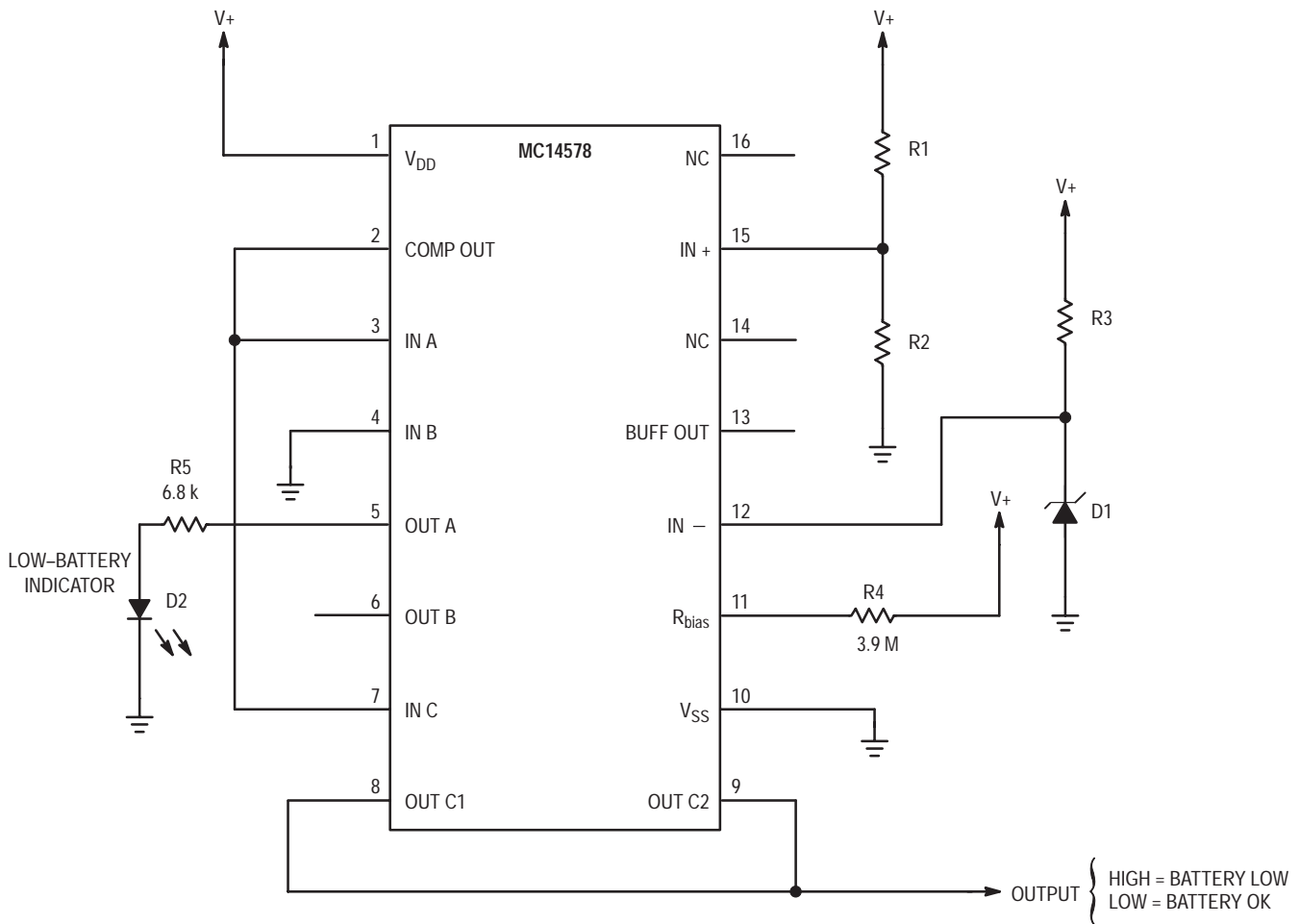
This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range $V_{SS} \leq (V_{in} \text{ or } V_{out}) \leq V_{DD}$.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V_{SS} or V_{DD}). Unused outputs must be left open.

ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS} , $R_{bias} = 3.9\text{ M}\Omega$ to V_{DD} , $T_A = -30^\circ$ to 70°C Unless Otherwise Indicated)

Symbol	Parameter	Test Condition	V_{DD} V	Guaranteed Limit	Unit
V_{DD}	Power Supply Voltage Range		—	3.5 to 14.0	V
V_{IL}	Maximum Low-Level Input Voltage, MOSFETs Wired as Inverters; i.e., IN A tied to IN B, OUT A to OUT B, OUT C1 to OUT C2.	$V_{out} = 9.0\text{ V}$, $ I_{out} < 1\ \mu\text{A}$	10.0	2.0	V
V_{IH}	Minimum High-Level Input Voltage, MOSFETs Wired as Inverters; i.e., IN A tied to IN B, OUT A to OUT B, OUT C1 to OUT C2.	$V_{out} = 1.0\text{ V}$, $ I_{out} < 1\ \mu\text{A}$	10.0	8.0	V
V_{IO}	Comparator Input Offset Voltage	$T_A = 25^\circ\text{C}$, Over Common Mode Range	10.0	± 50	mV
		$T_A = 0^\circ$ to 50°C , Over Common Mode Range	3.5 to 14.0	± 75	
V_{CM}	Comparator Common Mode Voltage Range		3.5 to 14.0	0.7 to $V_{DD} - 1.5$	V
V_{OL}	Maximum Low-Level Comparator Output Voltage	IN +: $V_{in} = V_{SS}$, IN -: $V_{in} = V_{DD}$, $I_{out} = 30\ \mu\text{A}$	10.0	0.5	V
V_{OH}	Minimum High-Level Comparator Output Voltage	IN +: $V_{in} = V_{DD}$, IN -: $V_{in} = V_{SS}$, $I_{out} = -30\ \mu\text{A}$	10.0	9.5	V
V_{OO}	Buffer Amp Output Offset Voltage	$R_{load} = 10\text{ M}\Omega$ to V_{DD} or V_{SS} , Over Common Mode Range	—	± 100	mV
V_{OL}	Maximum Low-Level Output Voltage, MOSFETs Wired as Inverters; i.e., IN A tied to IN B, OUT A to OUT B, OUT C1 to OUT C2.	OUT C1, OUT C2: $I_{out} = 1.1\text{ mA}$	10.0	0.5	V
		OUT A, OUT B: $I_{out} = 270\ \mu\text{A}$	10.0	0.5	V
V_{OH}	Minimum High-Level Output Voltage, MOSFETs Wired as Inverters; i.e., IN A tied to IN B, OUT A to OUT B, OUT C1 to OUT C2.	OUT C1, OUT C2: $I_{out} = -1.1\text{ mA}$	10.0	9.5	V
		OUT A, OUT B: $I_{out} = 270\ \mu\text{A}$	10.0	9.5	V
I_{in}	Maximum Input Leakage Current IN + (DIP Only) IN + (DIP Only) IN + (SOG), IN A, IN B, IN C, IN -	$T_A = 25^\circ\text{C}$, 40% R.H., $V_{in} = V_{SS}$ or V_{DD}	10.0	± 1.0	pA
		$T_A = 50^\circ\text{C}$, $V_{in} = V_{SS}$ or V_{DD}	10.0	± 6.0	
		$V_{in} = V_{SS}$ or V_{DD}	10.0	± 40	nA
I_{OZ}	Maximum Off-State MOSFET Leakage Current	IN A, IN C: $V_{in} = V_{DD}$, OUT A, OUT C2: $V_{out} = V_{SS}$ or V_{DD}	10.0	± 100	nA
		IN B, IN C: $V_{in} = V_{SS}$, OUT B, OUT C1: $V_{out} = V_{SS}$ or V_{DD}	10.0	± 100	
I_{DD}	Maximum Quiescent Current	$T_A = 25^\circ\text{C}$ IN A, IN B, IN C: $V_{in} = V_{SS}$ or V_{DD} , $ V_{IN+} - V_{IN-} = 100\text{ mV}$, $I_{out} = 0\ \mu\text{A}$	10.0	10	μA
C_{in}	Maximum Input Capacitance IN + Other Inputs	$f = 1\text{ kHz}$	—	5.0	pF
			—	15	

APPLICATIONS INFORMATION



NOTE: IN + and IN - have very high input impedance. Interconnect to these pins should be as short as possible.

Figure 1. Low-Battery Detector

EXAMPLE VALUES

Near the switchpoint, the comparator output in the circuit of Figure 1 may chatter or oscillate. This oscillation appears on the signal labelled OUTPUT. In some cases, the oscillation in the transition region will not cause problems. For example, an MPU reading OUTPUT could sample the signal two or three times to ensure a solid level is attained. But, in a low battery detector, this probably is not necessary.

To eliminate comparator chatter, hysteresis can be added as shown in Figure 2. The circuit of Figure 2 requires slightly more operating current than the Figure 1 arrangement.

R1	R2	R3	Nominal Trip Point
470 kΩ	1.3 MΩ	20 kΩ	4.08 V
820 kΩ	1.2 MΩ	39 kΩ	5.05 V
1.2 MΩ	1.2 MΩ	62 kΩ	6.00 V

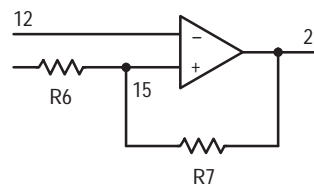
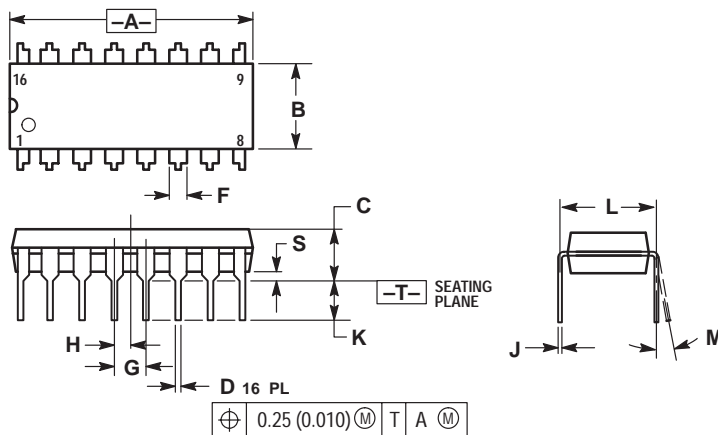


Figure 2. Adding Hysteresis

PACKAGE DIMENSIONS



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
 5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0°	10°	0°	10°
S	0.020	0.040	0.51	1.01


- | | |
|----------------|---------------------|
| STYLE 1: | STYLE 2: |
| PIN 1. CATHODE | PIN 1. COMMON DRAIN |
| 2. CATHODE | 2. COMMON DRAIN |
| 3. CATHODE | 3. COMMON DRAIN |
| 4. CATHODE | 4. COMMON DRAIN |
| 5. CATHODE | 5. COMMON DRAIN |
| 6. CATHODE | 6. COMMON DRAIN |
| 7. CATHODE | 7. COMMON DRAIN |
| 8. CATHODE | 8. COMMON DRAIN |
| 9. ANODE | 9. GATE |
| 10. ANODE | 10. SOURCE |
| 11. ANODE | 11. GATE |
| 12. ANODE | 12. SOURCE |
| 13. ANODE | 13. GATE |
| 14. ANODE | 14. SOURCE |
| 15. ANODE | 15. GATE |
| 16. ANODE | 16. SOURCE |

**CASE 648-08
ISSUE R**

NOTES

NOTES

Mfax is a trademark of Motorola, Inc.

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

How to reach us:

USA/EUROPE/Locations Not Listed: Motorola Literature Distribution; P.O. Box 5405, Denver, Colorado 80217.
1-303-675-2140 or 1-800-441-2447

JAPAN: Motorola Japan Ltd.; SPS, Technical Information Center, 3-20-1, Minami-Azabu, Minato-ku, Tokyo 106-8573 Japan.
81-3-3440-3569

ASIA/PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Centre, 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong. 852-26668334

Customer Focus Center: 1-800-521-6274

Mfax™: RMFAX0@email.sps.mot.com – TOUCHTONE 1-602-244-6609
Motorola Fax Back System – US & Canada ONLY 1-800-774-1848
– <http://sps.motorola.com/mfax/>

HOME PAGE: <http://motorola.com/sps/>



SUNSTAR商斯达实业集团是集研发、生产、工程、销售、代理经销、技术咨询、信息服务等为一体的高科技企业，是专业高科技电子产品生产厂家，是具有 10 多年历史的专业电子元器件供应商，是中国最早和最大的仓储式连锁规模经营大型综合电子零部件代理分销商之一，是一家专业代理和分销世界各大品牌 IC 芯片和电子元器件的连锁经营综合性国际公司。在香港、北京、深圳、上海、西安、成都等全国主要电子市场设有直属分公司和产品展示展销窗口门市部专卖店及代理分销商，已在全国范围内建成强大统一的供货和代理分销网络。我们专业代理经销、开发生产电子元器件、集成电路、传感器、微波光电元器件、工控机/DOC/DOM 电子盘、专用电路、单片机开发、MCU/DSP/ARM/FPGA 软件硬件、二极管、三极管、模块等，是您可靠的一站式现货配套供应商、方案提供商、部件功能模块开发配套商。专业以现代信息产业（计算机、通讯及传感器）三大支柱之一的传感器为主营业务，专业经营各类传感器的代理、销售生产、网络信息、科技图书资料及配套产品设计、工程开发。我们的专业网站——中国传感器科技信息网（全球传感器数据库）www.SENSOR-IC.COM 服务于全球高科技生产商及贸易商，为企业科技产品开发提供技术交流平台。欢迎各厂商互通有无、交换信息、交换链接、发布寻求代理信息。欢迎国外高科技传感器、变送器、执行器、自动控制产品厂商介绍产品到中国，共同开拓市场。本网站是关于各种传感器-变送器-仪器仪表及工业自动化大型专业网站，深入到工业控制、系统工程计 测量、自动化、安防报警、消费电子等众多领域，把最新的传感器-变送器-仪器仪表买卖信息，最新技术供求，最新采购商，行业动态，发展方向，最新的技术应用和市场资讯及时的传递给广大科技开发、科学研究、产品设计人员。本网站已成功为石油、化工、电力、医药、生物、航空、航天、国防、能源、冶金、电子、工业、农业、交通、汽车、矿山、煤炭、纺织、信息、通信、IT、安防、环保、印刷、科研、气象、仪器仪表等领域从事科学研究、产品设计、开发、生产制造的科技人员、管理人员、和采购人员提供满意服务。我们公司专业生产、代理、经销、销售各种传感器、变送器、敏感元器件、开关、执行器、仪器仪表、自动化控制系统：专业从事设计、生产、销售各种传感器、变送器、各种测控仪表、热工仪表、现场控制器、计算机控制系统、数据采集系统、各类环境监控系统、专用控制系统应用软件以及嵌入式系统开发及应用等工作。如热敏电阻、压敏电阻、温度传感器、温度变送器、湿度传感器、湿度变送器、气体传感器、气体变送器、压力传感器、压力变送、称重传感器、物（液）位传感器、物（液）位变送器、流量传感器、流量变送器、电流（压）传感器、溶氧传感器、霍尔传感器、图像传感器、超声波传感器、位移传感器、速度传感器、加速度传感器、扭距传感器、红外传感器、紫外传感器、火焰传感器、激光传感器、振动传感器、轴角传感器、光电传感器、接近传感器、干簧管传感器、继电器传感器、微型电泵、磁敏（阻）传感器、压力开关、接近开关、光电开关、色标传感器、光纤传感器、齿轮测速传感器、时间继电器、计数器、计米器、温控仪、固态继电器、调压模块、电磁铁、电压表、电流表等特殊传感器。同时承接传感器应用电路、产品设计和自动化工程项目。

更多产品请看本公司产品专用销售网站：

商斯达中国传感器科技信息网：<http://www.sensor-ic.com/>

商斯达工控安防网：<http://www.pc-ps.net/>

商斯达电子元器件网：<http://www.sunstare.com/>

商斯达微波光电产品网：[HTTP://www.rfoe.net/](http://www.rfoe.net/)

商斯达消费电子产品网：<http://www.icasic.com/>

商斯达军工产品网：<http://www.junpinic.com/>

商斯达实业科技产品网：<http://www.sunstars.cn/> 传感器销售热线：

地址：深圳市福田区福华路福庆街鸿图大厦 1602 室

电话：0755-83607652 83376489 83376549 83370250 83370251 82500323

传真：0755-83376182 (0) 13902971329 MSN: SUNS888@hotmail.com

邮编：518033 E-mail: szss20@163.com QQ: 195847376

深圳赛格展销部：深圳华强北路赛格电子市场 2583 号 电话：0755-83665529 25059422

技术支持：0755-83394033 13501568376

欢迎索取免费详细资料、设计指南和光盘；产品凡多，未能尽录，欢迎来电查询。

北京分公司：北京海淀区知春路 132 号中发电子大厦 3097 号

TEL: 010-81159046 82615020 13501189838 FAX: 010-62543996

上海分公司：上海市北京东路 668 号上海赛格电子市场 D125 号

TEL: 021-28311762 56703037 13701955389 FAX: 021-56703037

西安分公司：西安高新开发区 20 所(中国电子科技集团导航技术研究所)

西安劳动南路 88 号电子商城二楼 D23 号

TEL: 029-81022619 13072977981 FAX:029-88789382