

Op Amps and Comparators

Microchip offers several families of Operational Amplifiers (Op Amps), Comparators and Integrated Op Amp/Comparators.

The Op Amp families offer devices that operate with I_Q as low as $1\mu\text{A}$ and GBWP for other devices up to 10MHz. These families offer some of the lowest I_Q for a given GBWP in the industry. Additionally, all families operate on a single supply up to 5.5V and depending on the family, as low as 1.4V. All op amps offer rail-to-rail output with many also offering rail-to-rail input. Many of the families have been designed to minimize V_{OS} resulting in offsets as low as $150\mu\text{V}$.

The TC prefixed Comparator families all operate from 1.8V to 5.5V with V_{OS} below 5mV. Select devices offer programmable hysteresis, on-board V_{REF} and a shutdown select pin. In addition, combined packaged Op Amps and Comparators are offered for those space constrained designs.

The MCP prefixed Comparator family operates from 1.6V to 5.5V with V_{OS} below 6.5mV. I_Q is typically 600nA. The MCP6546 series will allow a 10V output voltage.

Features:

- Single Supply
- Small Packaging: SOT-23, MSOP, TSSOP
- -40°C to 85°C Temperature Range

For Select Products:

- $V_{OS} < 150\mu\text{V}$ Maximum
- $I_Q < 1\mu\text{A}$
- V_{DD} Down to 1.4V
- Programmable Hysteresis
- On-board V_{REF}
- Shutdown Select pins
- Op Amp and Comparator in one package
- Rail-to-Rail Input and Output
- Unity Gain Stable
- Comparator with 10V Output

Related Tools:

Available at www.microchip.com

- Spice Macromodel
- FilterLab® Software



Related Applications Notes:

- AN682 Using Single Supply Operational Amplifiers in Embedded Systems
- AN684 Single Supply Temperature Sensing with Thermocouples
- AN685 Thermistors in Single Supply Temperature Sensing Circuits
- AN699 Anti-Aliasing, Analog Filters for Data Acquisition Systems
- AN722 Operational Amplifier Topologies and DC Specifications
- AN723 Operational Amplifier AC Specifications and Applications

Additional Information:

- Microchip's web site: www.microchip.com
- Microchip's *Technical Library CD-ROM*, Order No. DS00161
- *Analog Interface Handbook*, Order No. DS00207
- *Product Line Card*, Order No. DS00148
- *Analog Design Pack CD-ROM*, Order No. DS51205
- More than 112 Application Notes available:
 - *Embedded Control Handbook*, Order No. DS00092
 - *Embedded Control Handbook, Volume 2, Math Library*, Order No. DS00167
 - *Embedded Control Handbook Update 2000*, Order No. DS00711



MICROCHIP
Linear Analog ICs

OPERATIONAL AMPLIFIERS (Temperature Range -40°C to +85°C)

Product	# / Pkg	GBWP	I _q Typ.	V _{OS} Max	Operating Voltage	Features	# Pins/Package
MCP601	1	2.8 MHz	230µA	2mV	2.7V to 5.5V	Rail-to-Rail output	8P, 8SN, 8ST, 50T
MCP602	2	2.8 MHz	230µA	2mV	2.7V to 5.5V	Rail-to-Rail output	8P, 8SN, 8ST
MCP603	1	2.8 MHz	230µA	2mV	2.7V to 5.5V	Chip Select, Rail-to-Rail output	8P, 8SN, 8ST
MCP604	4	2.8 MHz	230µA	2mV	2.7V to 5.5V	Rail-to-Rail output	14P, 14SL, 14ST
MCP6021	1	10 MHz	1.1 mA	500µV	2.5V to 5.5V	Rail-to-Rail input/output	8P, 8SN, 8ST,
MCP6022	2	10 MHz	1.1 mA	500µV	2.5V to 5.5V	Rail-to-Rail input/output	8P, 8SN, 8ST
MCP6023	1	10 MHz	1.1 mA	500µV	2.5V to 5.5V	Chip Select, Rail-to-Rail output	8P, 8SN, 8ST
MCP6024	4	10 MHz	1.1 mA	500µV	2.5V to 5.5V	Rail-to-Rail input/output	14P, 14SL, 14ST

OPERATIONAL AMPLIFIER Products - Micro Power Precision (Temperature Range -40°C to +85°C)

MCP606	1	155 kHz	19µA	250µV	2.5V to 5.5V	Rail-to-Rail output	8P, 8SN, 8ST, 50T
MCP607	2	155 kHz	19µA	250µV	2.5V to 5.5V	Rail-to-Rail output	8P, 8SN, 8ST
MCP608	1	155 kHz	19µA	250µV	2.5V to 5.5V	Chip Select, Rail-to-Rail output	8P, 8SN, 8ST
MCP609	4	155 kHz	19µA	250µV	2.5V to 5.5V	Rail-to-Rail output	14P, 14SL, 14ST
MCP616	1	190 kHz	19µA	150µV	2.3V to 5.5V	Rail-to-Rail output	8P, 8SN, 8MS
MCP617	2	190 kHz	19µA	150µV	2.3V to 5.5V	Rail-to-Rail output	8P, 8SN, 8MS
MCP618	1	190 kHz	19µA	150µV	2.3V to 5.5V	Chip Select, Rail-to-Rail output	8P, 8SN, 8MS
MCP619	4	190 kHz	19µA	150µV	2.3V to 5.5V	Rail-to-Rail output	14P, 14SL, 14ST

OPERATIONAL AMPLIFIER Products - Micro Power, Rail-to-Rail Input/Output (Temperature Range -40°C to +85°C)

TC1029	2	90 kHz	6µA	1.5mV	1.8V to 5.5V	Rail-to-Rail input/output	8P, 8MS, 8SN
TC1030	4	90 kHz	5µA	1.5mV	1.8V to 5.5V	Shutdown pins, Rail-to-Rail input/output	16QR
TC1034	1	90 kHz	6µA	1.5mV	1.8V to 5.5V	Rail-to-Rail input/output	50T
TC1035	1	90 kHz	6µA	1.5mV	1.8V to 5.5V	Shutdown pins, Rail-to-Rail input/output	60T
MCP6041	1	14 kHz	600nA	3mV	1.4V to 5.5V	Rail-to-Rail input/output	8P, 8SN, 8MS, 50T
MCP6042	2	14 kHz	600nA	3mV	1.4V to 5.5V	Rail-to-Rail input/output	8P, 8SN, 8MS
MCP6043	1	14 kHz	600nA	3mV	1.4V to 5.5V	Shutdown pins, Rail-to-Rail input/output	8P, 8SN, 8MS, 60T
MCP6044	4	14 kHz	600nA	3mV	1.4V to 5.5V	Rail-to-Rail input/output	14P, 14SL, 14ST

OPERATIONAL AMPLIFIER Products - Micro Power, Precision, Rail-to-Rail Input/Output (Temperature Range -40°C to +85°C)

MCP6031 ¹	1	14 kHz	800nA	250µV	1.8V to 5.5V	Rail-to-Rail input/output	8P, 8MS, 8SN
MCP6032 ¹	2	14 kHz	800nA	250µV	1.8V to 5.5V	Rail-to-Rail input/output	8P, 8MS, 8SN
MCP6033 ¹	1	14 kHz	800nA	250µV	1.8V to 5.5V	Chip Select, Rail-to-Rail input/output	8P, 8MS, 8SN
MCP6034 ¹	4	14 kHz	800nA	250µV	1.8V to 5.5V	Rail-to-Rail input/output	14P, 14SL, 14ST
MCP6131 ¹	1	90 kHz	800nA	250µV	1.8V to 5.5V	G > 10, Rail-to-Rail input/output	8P, 8MS, 8SN
MCP6132 ¹	2	90 kHz	800nA	250µV	1.8V to 5.5V	G > 10, Rail-to-Rail input/output	8P, 8MS, 8SN
MCP6133 ¹	1	90 kHz	800nA	250µV	1.8V to 5.5V	G > 10, Chip Select, R-R I/O	8P, 8MS, 8SN
MCP6134 ¹	4	90 kHz	800nA	250µV	1.8V to 5.5V	G > 10, Rail-to-Rail input/output	14P, 14SL, 14ST

LINEAR/MIXED SIGNAL Products - Comparators, Rail-to-Rail Input/Output (Temperature Range -40°C to +85°C)

Product	# / Pkg	V _{REF} (V)	I _q Typ.	V _{OS} Max	Operating Voltage	Features	# Pins/Package
TC1025 ²	2	-	8µA	5mV	1.8V to 5.5V		8P, 8MS, 8SN
TC1027 ²	4	1.2V	18µA	5mV	1.8V to 5.5V	On-board V _{REF}	16P, 16QR, 16SL
TC1028 ²	2	1.2V	10µA	5mV	1.8V to 5.5V	Shutdown pins, On-board V _{REF}	8MS
TC1031 ²	1	1.2V	6µA	5mV	1.8V to 5.5V	On-board V _{REF} , Prog. Hyst, Shutdown pin	8MS
TC1037 ²	1	-	4µA	5mV	1.8V to 5.5V		50T
TC1038 ²	1	-	4µA	5mV	1.8V to 5.5V	Shutdown pin	60T
TC1039 ²	1	1.2V	6µA	5mV	1.8V to 5.5V	On-board V _{REF}	60T
TC1040 ²	2	1.2V	10µA	5mV	1.8V to 5.5V	On-board V _{REF} , Shutdown pin	8MS
TC1041 ²	2	1.2V	10µA	5mV	1.8V to 5.5V	On-board V _{REF} , Programmable Hysteresis	8MS
MCP6541 ²	1	-	600nA	6.5mV	1.6V to 5.5V	Hysteresis 3mV	8P, 8MS, 8SN
MCP6542 ²	2	-	600nA	6.5mV	1.6V to 5.5V	Hysteresis 3mV	8P, 8MS, 8SN
MCP6543 ²	1	-	600nA	6.5mV	1.6V to 5.5V	Hysteresis 3mV, Chip Select	8P, 8MS, 8SN
MCP6544 ²	4	-	600nA	6.5mV	1.6V to 5.5V	Hysteresis 3mV	14P, 14SL, 14ST
MCP6546 ²	1	-	600nA	6.5mV	1.6V to 5.5V	Hysteresis 3mV, 10V Output	8P, 8MS, 8SN
MCP6547 ²	2	-	600nA	6.5mV	1.6V to 5.5V	Hysteresis 3mV, 10V Output	8P, 8MS, 8SN
MCP6548 ²	1	-	600nA	6.5mV	1.6V to 5.5V	Hysteresis 3mV, 10V Output, Chip Select	8P, 8MS, 8SN
MCP6549 ²	4	-	600nA	6.5mV	1.6V to 5.5V	Hysteresis 3mV, 10V Output	14P, 14SL, 14ST

LINEAR/MIXED SIGNAL Products - Integrated Devices (Temperature Range -40°C to +85°C)

Product	#Op Amps/Pkg.	#Comp/Pkg.	I _q Typ.	V _{REF} Max	Operating Voltage	Features	# Pins/Package
TC1026	1	1	12µA	1.2	1.8V to 5.5V	On-board V _{REF}	8P, 8MS, 8SN
TC1043	2	2	16µA	1.2	1.8V to 5.5V	On-board V _{REF} shutdown pin	16QR

Note 1. Devices to be released Spring 2002. Parameters may change upon release.

Note 2. All Comparators have rail-to-rail inputs and outputs.

Package Key: P = PDIP SN = 150 mil SOIC SL = 14 & 16 pin SOIC ST = TSSOP MS = MSOP OT = SOT-23 QR = QSOP

Visit our web site at www.microchip.com for additional product information and your local sales office.

Microchip Technology Inc. • 2355 W. Chandler Blvd. • Chandler, AZ 85224-6199 • (480) 792-7200 • FAX (480) 792-9210

Information subject to change. The Microchip name and logo, the Microchip logo, and FilterLab are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries. All other trademarks are the property of their respective owners. © 2001, Microchip Technology Incorporated. Printed in the U.S.A. All rights reserved. 11/01 DS21691A

