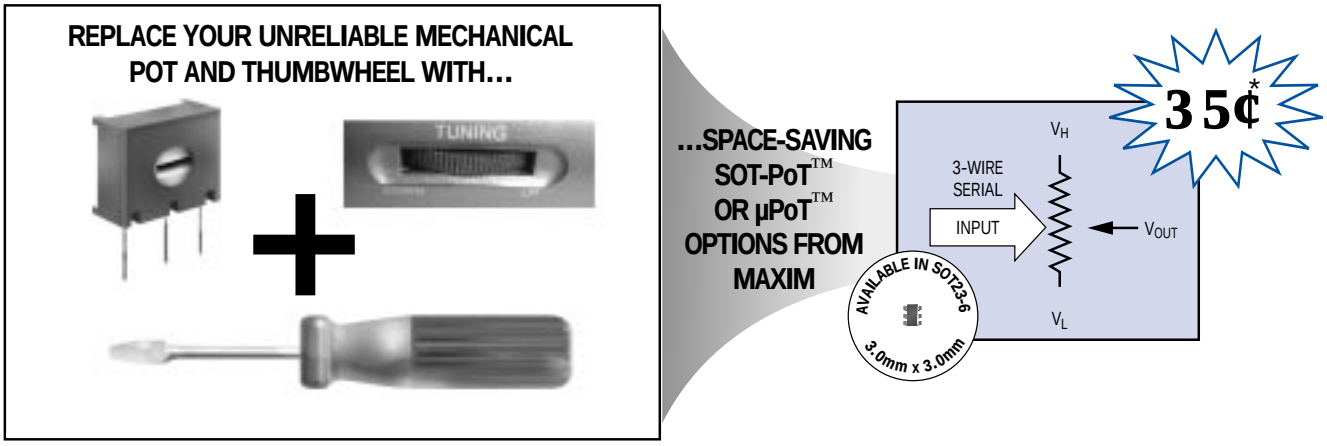
First SOT23 Digital Potentiometer Costs Only 35¢*!

Ideal for Adjustable LCD Bias Supplies and Portable Equipment



The MAX5160/MAX5161 are linear-taper digital potentiometers with fixed end-to-end resistance and a 32-tap wiper contact. In the past, the higher cost of digital potentiometers prevented their use as replacements for mechanical potentiometers, which become dirty and unreliable over time. But Maxim's new devices, with their low 35¢ price tag and miniature size, are the ideal solution for hand-held equipment with adjustable LCD bias supplies. The MAX5161, in a 3mm x 3mm SOT23-6 package, uses 70% less board space than similar devices offered in an 8-pin SO. Three different resistance versions are available: MAX516_N at 200kΩ, MAX516_M at 100kΩ, and MAX516_L at 50kΩ.

- **No Screwdrivers**
- **No Moving Parts**
- **Simplifies Assembly**
- **Increases Reliability**
- **Low 5ppm/°C Tempco**
- **Space-Saving SOT23-6/µMAX Packages**
- **+2.7V to +5.5V Single-Supply Operation**
- **≤1LSB DNL, ≤1/2LSB INL**
- **Consumes Just 10µA**
- **3-Wire Serial Interface**

Select from Two Package Options

µPoT™
SOT-PoT™

Part	Pin-Package	Pin Configuration
MAX5160	8-µMAX	Three-terminal potentiometer
MAX5161	6-SOT23	Two-terminal variable resistor

* MAX5161 50k factory direct price, FOB USA.
µPoT and SOT-PoT are trademarks of Maxim Integrated Products.

ANALOG DESIGN GUIDE

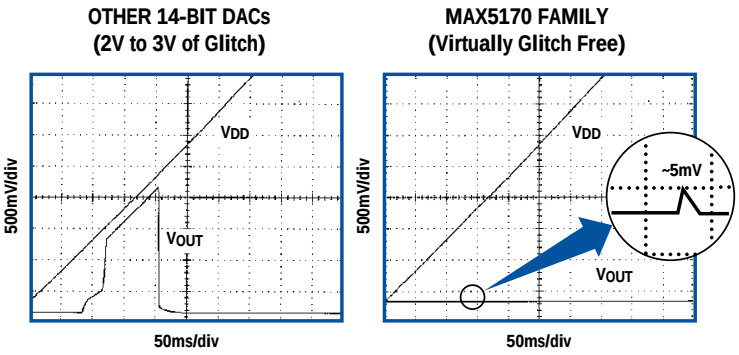
MAXIM

NEW Best 14-Bit DACs Offer 1LSB INL and Minimal Power-Up Glitch

Tiny QSOP-16 is Ideal for Industrial and Portable Applications

Unlike DACs that generate an undesirable voltage glitch at the output upon power-up, Maxim's MAX5170–MAX5177 incorporate a proprietary on-chip circuit that keeps the output voltage virtually "glitch free." Typical output voltage glitches on other DACs can be as high as 2V to 3V, whereas Maxim's new DACs limit glitch to just a few millivolts.

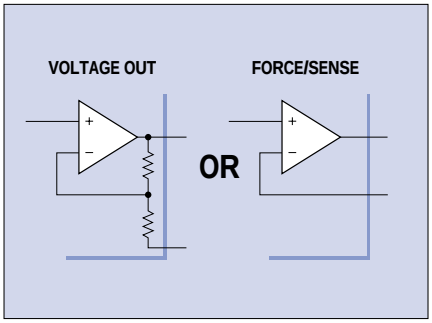
V_{OUT} vs. V_{DD} Power-Up



- **≤1LSB INL and DNL**
- **<600µA Supply Current**
- **3µA Pin-Programmable Shutdown**
- **+3V or +5V Single-Supply Operation**
- **Programmable Power-On Reset to 0V or Midscale**
- **SPI™/QSPI™/MICROWIRE™ 3-Wire Serial Interface**
- **16-Pin QSOP Package**

Choose from 12- or 14-Bit Resolution, +3V or +5V Supply, and V_{OUT} or Force/Sense Versions

Part	Resolution (Bits)	Supply Voltage (V)	Output Configuration	Price† ($)
MAX5170	14	+5	Voltage Out	4.36
MAX5171	14	+5	Force/Sense	4.36
MAX5172	14	+3	Voltage Out	4.36
MAX5173	14	+3	Force/Sense	4.36
MAX5174	12	+5	Voltage Out	3.15
MAX5175	12	+5	Force/Sense	3.15
MAX5176	12	+3	Voltage Out	3.15
MAX5177	12	+3	Force/Sense	3.15



†1000 pc., FOB USA.
SPI and QSPI are trademarks of Motorola, Inc.
MICROWIRE is a trademark of National Semiconductor Corp.

NEW Low-Cost, Low-Power, Serial DACs

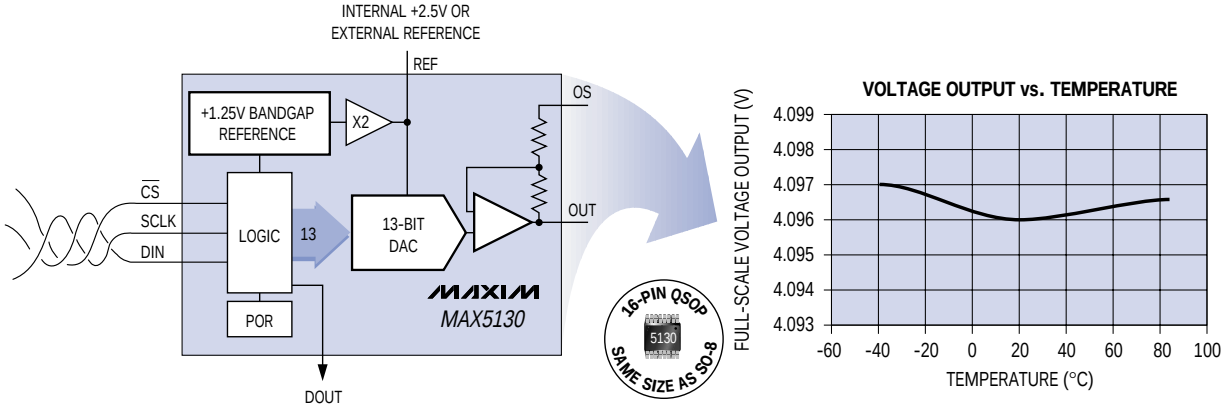
Maxim now offers a line of low-cost serial-interface DACs for designers of cost-sensitive applications who need guaranteed monotonicity but can't afford high-end DACs. Unlike other low-cost DACs, these offer low power and come in space-saving packages.

Part	Resolution (Bits)	No. of DACs	Supply Voltage (V)	DNL (LSB)	INL (LSB)	Supply Current (mA)	Pin-Package	Price† ($)
MAX5541	16	1	+5	1	16	2.0	8-SO	4.50
MAX5544	14	1	+5	1	8	2.0	8-SO	4.20
MAX5104	12	2	+5	1	4	0.6	16-QSOP	3.75
MAX5302	12	1	+5	1	4	0.4	8-µMAX	2.50
MAX5304	10	1	+5	1	4	0.4	8-µMAX	1.75

†1000 pc., FOB USA.

MAXIM

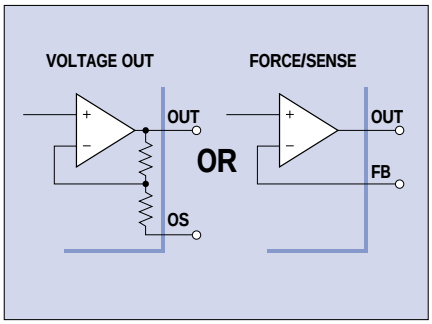
12- and 13-Bit DACs with the Best On-Chip Precision Reference—10ppm/°C Guaranteed



Choose from 12- or 13-Bit Resolution, 3V or 5V Supply, and Voltage Out or Force/Sense Versions

Part	Resolution (Bits)	Supply Voltage (V)	Output Configurations	Price† ($)
MAX5120	12	+5	Voltage Out	3.80
MAX5121	12	+3	Voltage Out	3.80
MAX5122	12	+5	Force/Sense	3.80
MAX5123	12	+3	Force/Sense	3.80
MAX5130	13	+5	Voltage Out	4.62
MAX5131	13	+3	Voltage Out	4.62
MAX5132	13	+5	Force/Sense	4.62
MAX5133	13	+3	Force/Sense	4.62

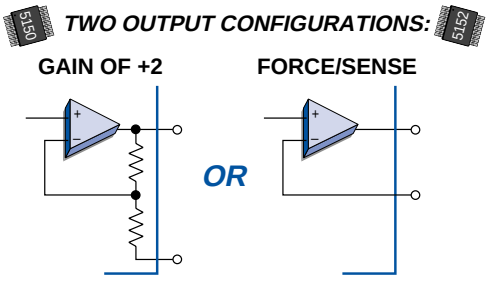
†1000 pc., FOB USA.



- **10ppm/°C Guaranteed Tempco**
- **13-Bit DNL and 1/2LSB INL**
- **+3V or +5V Single-Supply Operation**
- **Low 600µA max Supply Current**
- **SPI/QSPI/MICROWIRE 3-Wire Serial Interface**
- **Programmable Power-On Reset to 0V or Midscale**
- **3µA Pin-Programmable Shutdown Mode**
- **Minimal Output Voltage "Glitch" During Power-Up**

World's First 13-Bit, VOUT Dual DACs Fit in the Space of an SO-8!

Multifunctional, Low Power, QSOP-16 Package



- **Two 13-Bit, Dual VOUT DACs**
- **+2.7V or +5V Single-Supply Operation**
- **Separate Reference Voltage Inputs for Each DAC**
- **Draws Only 250µA per DAC**
- **3-Wire SPI/QSPI/MICROWIRE-Compatible Serial Interface**
- **Individual DAC Power-Down Control**

Maxim Offers Both 13-Bit and 12-Bit Versions

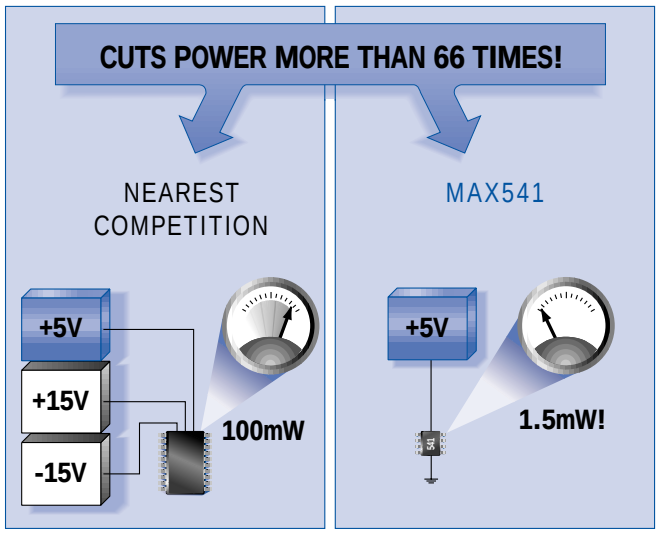
Part	Resolution (Bits)	Supply Voltage (V)	Output Configuration
MAX5150	13	+5	Gain of +2
MAX5151	13	+2.7 to +3.6	Gain of +2
MAX5152	13	+5	Force/Sense
MAX5153	13	+2.7 to +3.6	Force/Sense

Part	Resolution (Bits)	Supply Voltage (V)	Output Configuration
MAX5154	12	+5	Gain of +2
MAX5155	12	+2.7 to +3.6	Gain of +2
MAX5156	12	+5	Force/Sense
MAX5157	12	+2.7 to +3.6	Force/Sense

16-Bit VOUT DAC in an 8-Pin SO!

- **High Accuracy**
  - **INL ≤ ±1LSB (max)**
  - **DNL ≤ ±1LSB (max)**
- **Small Package: 8-Pin DIP/SO**
- **Low Power**
  - **Single +5V Supply**
  - **0.3mA Supply Current**
- **High Resolution: 38µV per LSB**

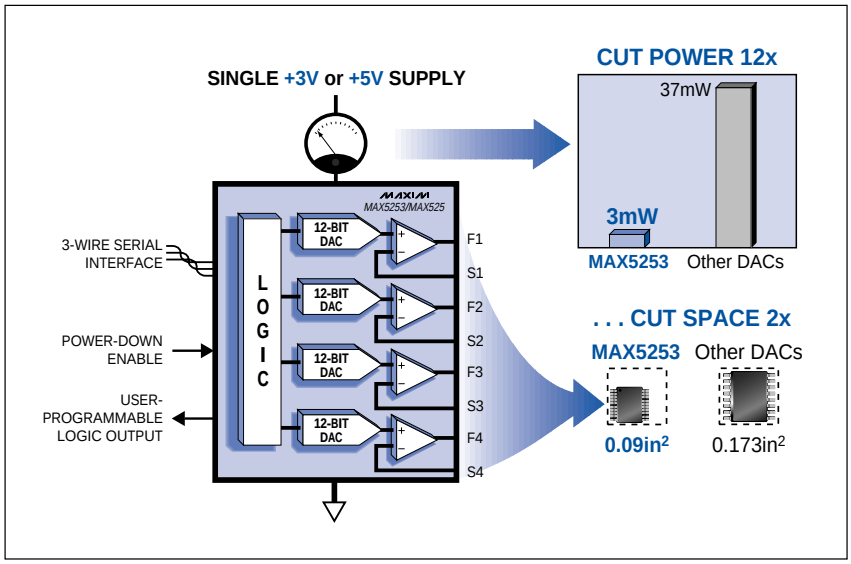
Ideal for industrial and instrumentation applications, the single +5V supply MAX541 DAC features low power, 16-bit accuracy with no adjustments, Schmitt trigger inputs for direct optocoupler interfacing, a 3-wire serial interface, and power-on reset. The 14-pin MAX542 has Kelvin sense connections for simplified layout requirements, and internal feedback resistors for bipolar operation (with an external op amp). For 14-bit applications, request the pin-compatible MAX544/MAX545.



Part	Resolution (Bits)	INL (LSB)	Pin-Package	Force/Sense Connections
MAX541	16	1, 2, or 4	8-pin DIP/SO	—
MAX542	16	1, 2, or 4	14-pin DIP/SO	Yes
MAX544	14	0.5 or 1	8-pin DIP/SO	—
MAX545	14	0.5 or 1	14-pin DIP/SO	Yes

MAXIM

Smallest and Lowest Power 12-Bit, Voltage-Output Quad DACs



- **Single +5V Operation (MAX525) Single +3V Operation (MAX5253)**
- **Separate Force and Sense Pins**
- **Ultra-Low Power Dissipation: <1mW per DAC (MAX5253)**
- **Power-Down Mode: 20µA max**

The +5V MAX525 combines four precision, voltage-output, 12-bit serial DACs in a 20-pin DIP or SSOP package. Simply connect the force and sense pins to get a Rail-to-Rail® output with no external components. Use the separate force and sense pins with external components to implement an emitter follower for high currents, protection circuitry, or a constant current source.

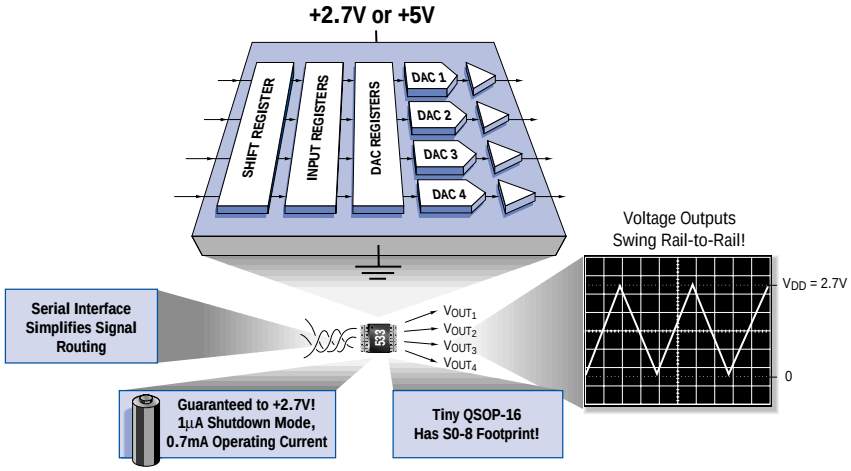
For single +3V operation, use the MAX5253.

Rail-to-Rail is a registered trademark of Nippon Motorola, Ltd.

Lowest Power, Quad 8-Bit DACs Have SO-8 Footprint!

Ideal for Portable and Battery-Powered Applications

The MAX533 and MAX534 quad 8-bit DACs with rail-to-rail output buffers are guaranteed to operate from a +2.7V (MAX533) or +5V (MAX534) single supply. They are the smallest, lowest power devices of this type available.



- **Smallest Size: 16-Pin QSOP**
- **Lowest Power: 0.5mW per DAC (MAX533)**
- **Asynchronous Load and Clear Inputs**
- **Power-On Reset**

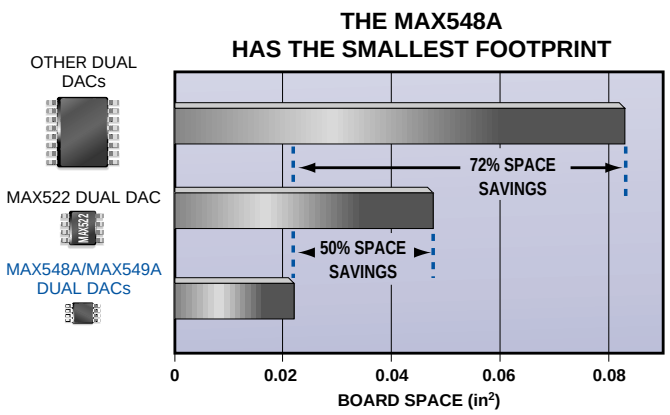
MAXIM

µMAX DACs: World's Smallest DAC Package

(continued on next page)

World's Smallest, Lowest Power 8-Bit DACs Operate Down to +2.5V

The MAX548A/MAX549A/MAX550A are low-power, 8-bit single and dual DACs available in ultra-small 8-pin µMAX packages. They operate from a +2.5V to +5.5V single supply and require only 75µA operating current per DAC (V_{DD} = 2.5V, including reference current). This combination of ultra-small size and low power makes these devices well suited for portable and other space- or power-constrained digital adjustment applications. The MAX548A/MAX549A/MAX550A are controlled via a 3-wire serial interface that is compatible with SPI/QSPI and MICROWIRE. Each features a shutdown mode that reduces the supply current to below 1µA.

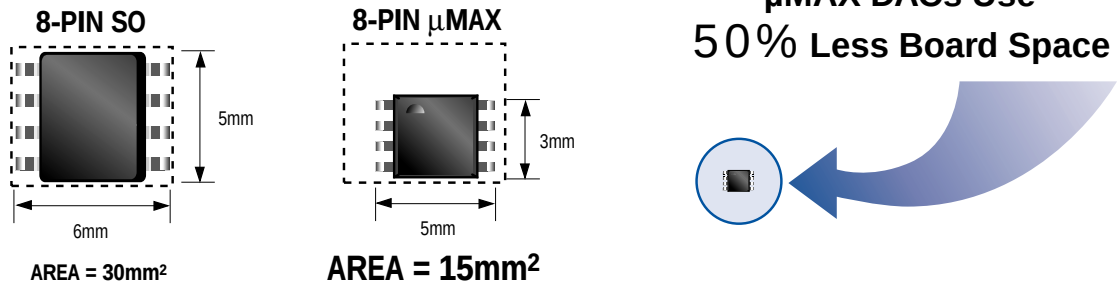


- **8-Pin µMAX or DIP Package**
- **Single (MAX550A) and Dual (MAX548A/MAX549A) Versions**
- **Operate from +2.5V to +5.5V Single Supply**
- **Consume < 0.2mW (MAX550A, V_{DD} = 2.5V)**
- **1µA Shutdown Mode**
- **3-Wire Serial Interface**
- **Power-On Reset Clears All DAC Latches**

Part	µMAX Package	Reference	No. of DACs	Asynchronous Load Input	Double-Buffered Input
MAX548A	✓	$V_{REF} = V_{DD}$	2	✓	✓
MAX549A*	✓	EXT	2	—	✓
MAX550A*	✓	EXT	1	✓	✓

*The MAX549A and MAX550A are double-buffered pin- and software-compatible enhanced versions that directly replace the MAX549B and MAX550B.

The µMAX Advantage



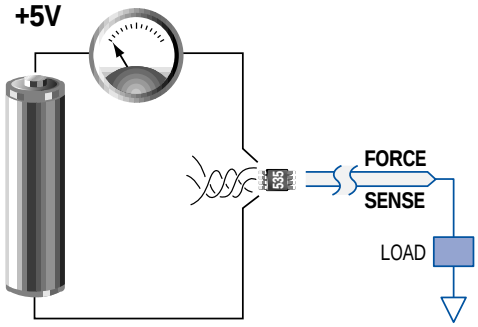
µMAX DACs: World's Smallest DAC Package

(continued from previous page)

Smallest, Lowest Power 13-Bit V_{OUT} DAC Has Configurable Output

Drives 5kΩ Loads or 4–20mA Loops

- **Single +5V Operation**
- **Low Power Dissipation: 1.5mW**
- **4µA Power-Down Mode**
- **Rail-to-Rail Output**
- **3-Wire Serial Interface**
- **16µs Settling Time**



The MAX535 is the smallest, lowest power 13-bit voltage-output DAC available. The device operates from a single +5V supply and draws only 300µA of current (excluding the reference current). Several features make it ideal for industrial and instrumentation applications, including a space-saving 8-pin µMAX package, a rail-to-rail output, and a power-on reset function that resets the DAC output to 0V.

Part	Resolution (Bits)	Supply Voltage (V)	8-Pin µMAX
MAX535	13	+5	✓
MAX5351	13	+3.3	✓
MAX5352	12	+5	✓
MAX5353	12	+3.3	✓
MAX5354	10	+5	✓
MAX5355	10	+3.3	✓

The user has access to the negative input of the output buffer amplifier and can configure the output to provide gain (using two external resistors) or to drive 4–20mA loops. The amplifier's output and negative input terminals can also be used as force and sense pins for remote sensing applications.

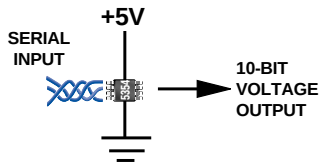
In power-down mode, the reference input is high impedance, allowing minimal current consumption even when the external reference remains active. This reduces the supply current to 10µA in power-sensitive high-resolution applications.

Smallest Low-Power 10-Bit DACs Fit in 8-Pin µMAX

Drives 5kΩ Loads or 4–20mA Loops

- **+5V (MAX5354) or +3.3V (MAX5355) Operation**
- **10-Bit Resolution**
- **Low 300µA Supply Current**
- **Pin-Compatible 12-Bit Upgrades: MAX5352/MAX5353 (see table above)**

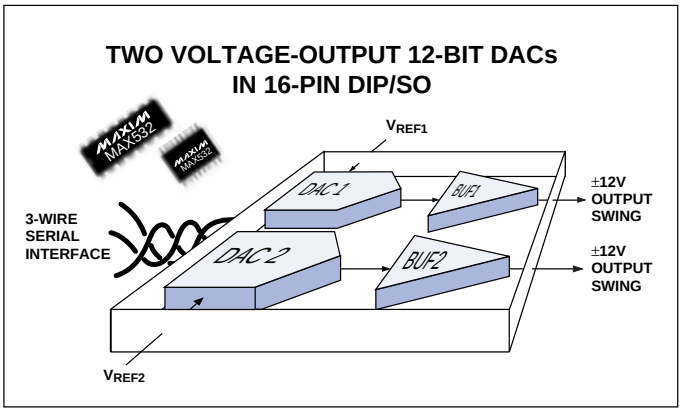
REPLACE YOUR 8-BIT AND 10-BIT DACs WITH THE SMALLEST DAC AVAILABLE



For general-purpose 10-bit applications, the +5V MAX5354 and the +3.3V MAX5355 single voltage-output DACs provide true 10-bit accuracy (±1LSB INL and DNL) while using the least amount of board space—0.02in^2. Features include power-on reset, a 10µs settling time, and a rail-to-rail output swing.

Dual, Serial V_{OUT} MDAC Has ±12V Output Swings

The MAX532 combines two precision, voltage-output 12-bit DACs with a fast 3-wire serial interface and ±10mA output amplifiers. The 6MHz serial interface frees microprocessor pins and minimizes the number of package pins, so the MAX532 uses less board space than parallel-interface parts. This dual multiplying DAC (MDAC) comes in small 16-pin DIP and SO packages. The MAX532 achieves full specified 12-bit performance (±1/2LSB max integral nonlinearity over temperature) without external trims.



The serial interface minimizes digital-noise feedthrough from the MAX532's logic pins to its analog outputs, and simplifies optocoupler-isolated or transformer-isolated applications. Its interface is SPI, QSPI, and MICROWIRE compatible. A serial output (DOUT) allows cascading of two or more MAX532s.

Applications include digital offset/gain adjustment, ATE, machine control, and waveform reconstruction. A and B grades are available.

World's First 2-Wire, 8-Bit DACs Save µP I/O Lines!

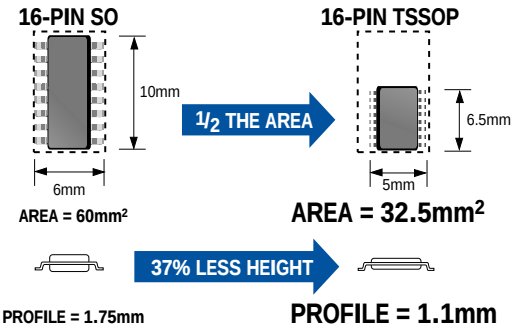
The MAX517–MAX521 single +5V, 8-bit DACs feature a 2-wire interface that allows multiple DACs and other devices (including 2-wire EEPROMs) on the same bus. The MAX517/MAX518 are single and dual DACs available in an 8-pin package. The dual MAX519 allows up to 15 additional DACs on the bus. The MAX520 is an ultra-low-power quad DAC, requiring only 4µA supply current, and the MAX521 is an octal DAC in a small 24-pin SSOP package.

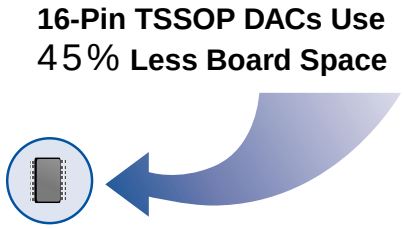
- **Simple 2-Wire Interface**
- **+5V Single Supply**
- **Rail-to-Rail Outputs**
- **10µA Shutdown Mode**
- **I²C™ Compatible**

I²C is a trademark of Philips Corp.

Device	No. of DACs	No. of Reference Inputs	Pin-Package
MAX521	8	5	20-DIP, 24-SO/SSOP
MAX520	4	4	16-DIP/SO
MAX519	2	2	16-DIP/SO
MAX518	2	0 (V_{REF} = V_{DD})	8-DIP/SO
MAX517	1	1	8-DIP/SO

8-Bit DACs Now Offered in Small, Low-Profile TSSOP Package





Maxim now offers an 8-bit, single-channel, current-output DAC (MX7524) and an 8-bit, triple-channel, voltage-output DAC (MAX512) in tiny TSSOP packages. The TSSOP package reduces thickness and footprint by as much as 45%.

The industry-standard MX7524 is now smaller and thinner than ever in its new 16-pin TSSOP package.

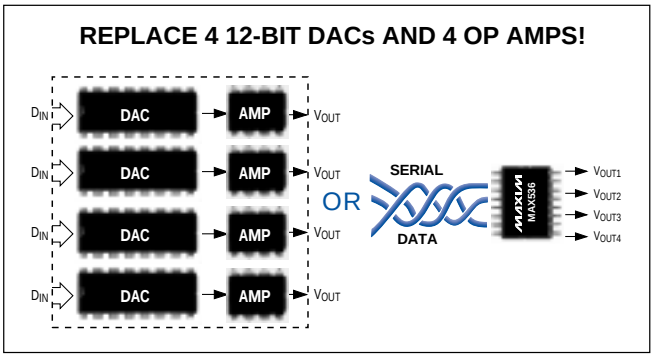
The MAX512/MAX513 low-power, single-supply, triple DACs are also smaller and thinner than before. They offer an independently programmable 1µA shutdown mode that allows the user to shut down any one of the three DACs independently. These SPI/QSPI/MICROWIRE-compatible, 3-wire serial-interface devices have a maximum operating frequency of 5MHz. All these features now come in a 16-pin TSSOP package for the +5V supply MAX512, or a 16-pin QSOP for the +3V MAX513.

Part	Resolution (Bits)	No. of DACs	New Package		Old Package**	
			Pin-Package	Dimensions (mm)*	Pin-Package	Dimensions (mm)*
MAX512	8	3	16-TSSOP	5 x 6.5 x 1.1	14-SO	6 x 8.75 x 1.75
MAX513	8	3	16-QSOP	5 x 6 x 1.7	14-SO	6 x 8.75 x 1.75
MX7524	8	1	16-TSSOP	5 x 6.5 x 1.1	16-SO	6 x 10 x 1.75

* See Maxim's website or data book for exact dimensions and tolerances.
** Also available.

Quad 12-Bit DACs: Fastest, Smallest, Most Accurate

- **1LSB Total Unadjusted Error**
- **3µs Settling Time**
- **16-Pin SO Package**
- **Serial (MAX536/MAX537) or Parallel (MAX526/MAX527) Versions**
- **Low Noise (50µVRMS)**
- **Power-On Reset**
- **±5V Operation (MAX527/MAX537)**



First 10-Bit V_{OUT} DACs Draw Only 150µA from a Single +5V Supply!

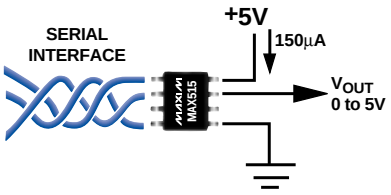
Upgrade Your 8-Bit DAC to 10 Bits—Free!†

With the MAX503/MAX504/MAX515 low-power 10-bit DACs you can upgrade performance without increasing cost. These devices provide four times the accuracy of 8-bit devices yet are aggressively priced to compete with 8-bit solutions. The MAX503/MAX504/MAX515 operate with a single +5V supply and draw as little as 150µA supply current (MAX515). Other features include rail-to-rail voltage outputs, an on-board reference (MAX503/MAX504), serial or parallel interface (see table below), and power-on reset. In addition, pin-compatible 12-bit upgrades are available for applications requiring greater accuracy.

Feature	MAX503	MAX504	MAX515
Supply Voltage (V)	+5 or ±5	+5 or ±5	+5
Reference	Internal	Internal	External
Interface	Parallel	Serial	Serial
Pin-Package	24-SSOP/Narrow DIP	14-SO/DIP	8-SO/DIP
Pin-Compatible 12-Bit Upgrade	MAX530	MAX531	MAX539

† MAX515 priced from $2.50/1000 pc., FOB USA.

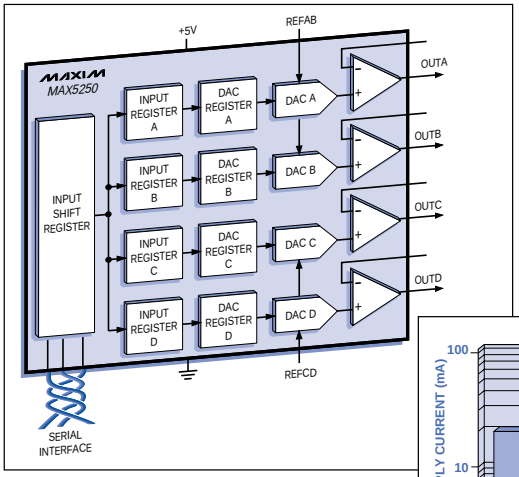
8-PIN SO SAVES SPACE!



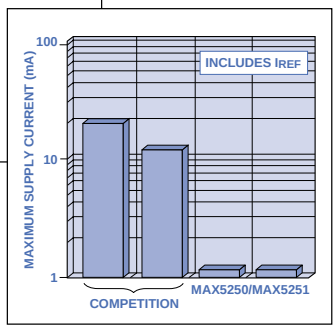
Lowest Power 10-Bit Quad DACs Draw 90% Less Current

+3V/+5V DACs for Process Control, Instrumentation, and Communications

- **+3V (MAX5251) and +5V (MAX5250) Operation**
- **10-Bit Quad DAC in 20-Pin SSOP**
- **20µs Settling Time**
- **3µA Power-Down Mode**
- **Power-On Reset**
- **Rail-to-Rail Outputs**



20-PIN SSOP



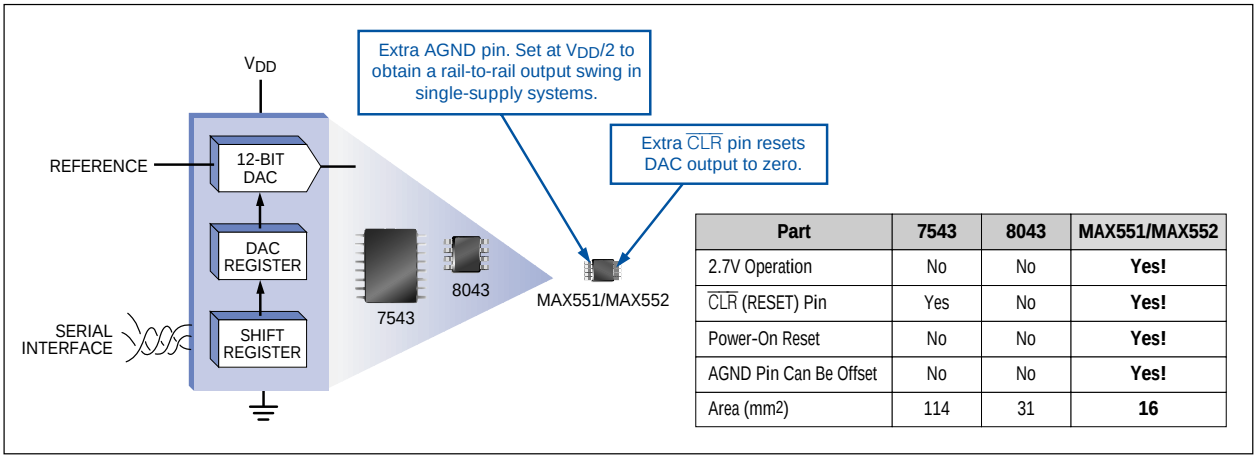
The serial MAX5250/MAX5251 are the lowest power 10-bit quad DACs available (MAX5251: 3mW, +3V; MAX5250: 6mW, +5V). They are also the smallest (SSOP-20). These devices have many features that simplify programming and implementation: rail-to-rail outputs, access to the amplifier's negative input for varied output configurations, a programmable logic output, and a data output for daisy-chaining.

MAXIM

World's Smallest 12-Bit Current-Output DACs Cut Space by 48%!

Low-Power 2.7V and 5V DACs in µMAX-10 Package

Maxim's MAX551/MAX552 current-output DACs replace existing solutions in half the board space! At the same time, they add two extra pins: a $\overline{CLR}$ input, which resets the DAC output to zero, and an AGND pin, which can be offset to allow a rail-to-rail output swing with a single-supply op amp at the DAC output. The devices fit in Maxim's proprietary 10-pin µMAX package, which is approximately half the size of an 8-pin SO.



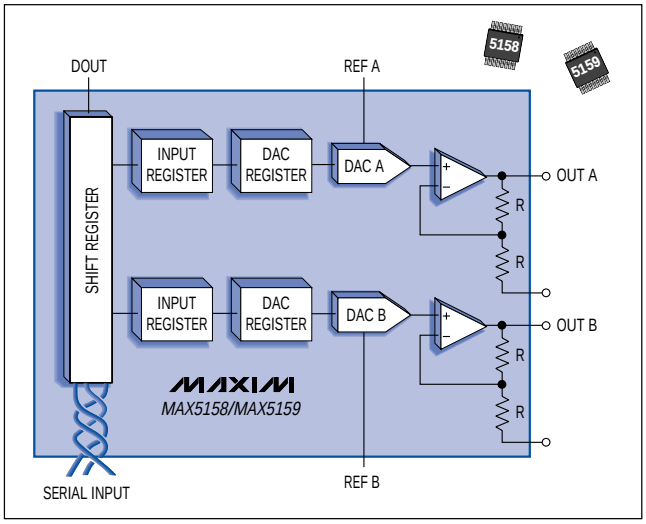
Part	7543	8043	MAX551/MAX552
2.7V Operation	No	No	**Yes!**
$\overline{CLR}$ (RESET) Pin	Yes	No	**Yes!**
Power-On Reset	No	No	**Yes!**
AGND Pin Can Be Offset	No	No	**Yes!**
Area (mm2)	114	31	**16**

Smallest 10-Bit, V_{OUT} Dual DACs Draw Less than 250µA per DAC

+2.7V and +5V Devices Save Space and Power in Portable Systems

MAX5158/MAX5159:

- **10-Bit Dual DACs Reduce Component Count**
- **+2.7V (MAX5159) or +5V (MAX5158) Operation**
- **1µA Shutdown Mode**
- **Asynchronous CLEAR Pin Resets DACs to Zero**
- **QSOP-16 Provides Smallest Package Option**
- **Separate Reference Voltage Inputs**
- **Serial-Data Output Pin for Daisy-Chaining**

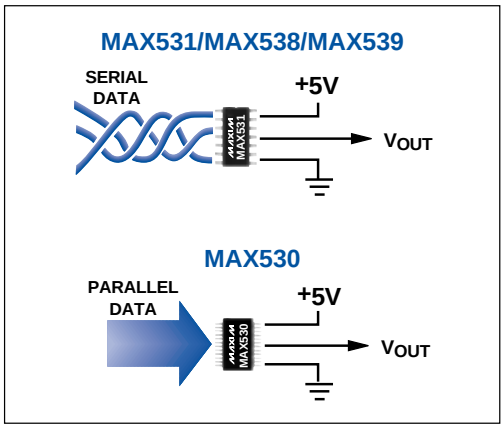


12-Bit “µDAC”s Offer Small Size and Lowest Power

µDACs™ Offer:

- **µPower:**
  - **Single +5V and ±5V (MAX530/MAX531) Operation**
  - **160µA Supply Current (MAX538/MAX539)**
- **µSize:**
  - **Complete 1-Chip Solution**
  - **8-Pin SO (MAX538/MAX539), 14-Pin SO (MAX531) or 24-Pin SSOP (MAX530)**
- **Rail-to-Rail Voltage Output**
- **4-Quadrant Multiplication**
- **Internal 2.048V Reference (MAX530/MAX531)**

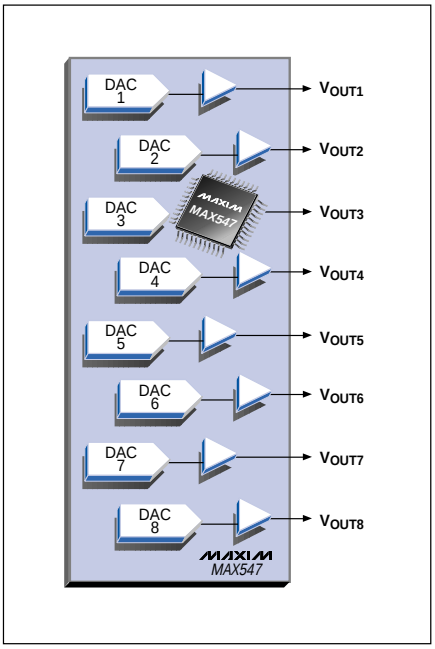
µDAC is a trademark of Maxim Integrated Products.



Fit 8 13-Bit DACs and 8 Op Amps in Less than 0.5in²

- **One IC Replaces 8 Op Amps and 8 DACs**
- **Guaranteed 13 Bits Monotonic over Temperature**
- **Unipolar and Bipolar Output Ranges from ±5V Supplies**
- **Double-Buffered, High-Speed Digital Inputs**

Multichannel high-performance solutions are now easier to design and fit in a smaller space than before—thanks to Maxim’s MAX547. Each of the eight independent DACs in the MAX547 can be configured for either a bipolar or unipolar output range, and each guarantees full 13-bit performance without adjustments. Settling to ±½LSB in 5µs, voltage outputs swing ±4.5V with ±5V supplies. All converter outputs are automatically reset to analog ground on power-up by internal reset circuitry. An external command to the asynchronous $\overline{CLR}$ input also resets the outputs. The digital inputs are double buffered, enabling independent or simultaneous updates via the parallel high-speed microcontroller interface. The MAX547 comes in 44-pin PLCC or plastic flatpack packages and in commercial or extended-industrial temperature ranges.



Single D/A Converters

Part Number	Resolution (Bits)	Output Type*	Settling Time (µs)	Reference**	Data-Bus Interface (Bits)	Supply Voltage (V)	Features	Price† 1000-up ($)
MX7224	8	V	5	Ext	µP/8	+12 to +15 & -5	Single or dual supplies	2.95
MAX517	8	V	6	Ext	Serial, 2-wire	+5	2-wire interface	2.10
MAX550A	8	V	***	Ext	Serial	+2.5 to +5.5	8-pin µMAX, +2.5V, <0.7mW (upgrade to MAX550B)	1.45
MX7523	8	I	0.15	MDAC	Logic	+15	Low-cost 8-bit DAC	2.60
MAX7624	8	I	0.25	MDAC	µP/8	+12 to +15	Improved MX7524	2.26
MAX5480	8	I	0.4	MDAC	µP/8	+5	Low-cost MDAC in 16-pin QSOP	1.35
MX7524	8	I	0.4	MDAC	µP/8	+5 to +15	Low-cost 8-bit DAC	1.95
MAX5304	10	V	10	Ext	Serial	+5	Low cost	1.70
MAX5354	10	V	10	Ext	Serial	+5	+5V, 10-bit, 8-pin µMAX	2.70
MAX5355	10	V	10	Ext	Serial	+3.3	+3.3V, 10-bit, 8-pin µMAX	2.90
MAX503	10	V	25	Int/MDAC	µP/8	+5 or ±5	Low-power, complete DAC	2.95
MAX504	10	V	25	Int/MDAC	Serial	+5 or ±5	Serial version of MAX503	2.80
MAX515	10	V	25	Ext	Serial	+5	Low power, 8-pin DIP/SO	2.50
MX7520	10	I	0.5	MDAC	Logic	+15	Low-cost 10-bit DAC	2.80
MX7530	10	I	0.5	MDAC	Logic	+15	Low-cost 10-bit DAC	2.80
MX7533	10	I	0.6	MDAC	Logic	+15	Low-cost 10-bit DAC	2.84
MAX501	12	V	5	MDAC	µP/8	±12 to ±15	4-quadrant multiplying DAC	5.65
MAX502	12	V	5	MDAC	µP/12	±12 to ±15	4-quadrant multiplying DAC	5.65
MAX507	12	V	5	Int	µP/12	±12 to ±15	Complete 12-bit DAC with reference	7.65
MAX508	12	V	5	Int	µP/8	±12 to ±15	Complete 12-bit DAC with reference	7.65
MX7845	12	V	5	MDAC	µP/12	±15	4-range, 4-quadrant multiplying DAC	6.26
MX7245	12	V	10	Int	µP/12	±15 or +12 to +15	Single or dual supplies with reference	8.33
MX7248	12	V	10	Int	µP/8	±15 or +12 to +15	8-bit interface MX7245	8.33
MAX5302	12	V	14	Ext	Serial	+5	Low cost	2.45
MAX5352	12	V	14	Ext	Serial	+5	+5V, 12-bit, 8-pin µMAX, 1.5mW	4.20
MAX5353	12	V	14	Ext	Serial	+3.3	+3.3V, 12-bit, 8-pin µMAX, 0.9mW	4.20
MAX5120	12	V	20	Int	Serial	+5	Complete 12-bit DAC with reference	3.80
MAX5121	12	V	20	Int	Serial	+3	Complete 12-bit DAC with reference	3.80
MAX5122	12	V	20	Int	Serial	+5	12-bit force/sense DAC with reference	3.80
MAX5123	12	V	20	Int	Serial	+3	12-bit force/sense DAC with reference	3.80
MAX530	12	V	25	Int/MDAC	µP/8	+5 or ±5	Low-power, flexible output range	5.45
MAX531	12	V	25	Int/MDAC	Serial	+5 or ±5	Serial version of MAX530	5.45
MAX538	12	V	25	Ext	Serial	+5	8-pin DIP/SO, low power, 0 to 2V output	4.85
MAX539	12	V	25	Ext	Serial	+5	8-pin DIP/SO, low power, 0 to 5V output	4.85
MAX5539	12	V	25	Ext	Serial	+5	Isolated version of MAX539	††
MAX5174	12	V	40	Ext	Serial	+5	No internal reference	3.15
MAX5175	12	V	40	Ext	Serial	+5	Force/sense DAC	3.15
MAX5176	12	V	40	Ext	Serial	+3	No internal reference	3.15
MAX5177	12	V	40	Ext	Serial	+3	Force/sense DAC	3.15
MX7521	12	I	0.5	MDAC	Logic	+15	Low-cost 12-bit DAC	5.00
MX7531	12	I	0.5	MDAC	Logic	+15	Low-cost 12-bit DAC	5.08
MX7541A	12	I	0.6	MDAC	Logic	+15	12-bit data bus	4.05
MAX543	12	I	1	MDAC	Serial	+5 to +15	12-bit multiplying DAC in 8-pin DIP/SO	4.80
MAX551	12	I	1	MDAC	Serial	+5	Smallest current-output DAC, reset pin	3.95
MAX552	12	I	1	MDAC	Serial	+2.7 to +3.6	Smallest current-output DAC, reset pin	3.95
MAX5543	12	I	1	MDAC	Serial	+5 to +15	Isolated version of MAX543	††
MX7541	12	I	1	MDAC	Logic	+15	12-bit data bus	5.07
MX7545A	12	I	1	MDAC	µP/12	+5 to +15	Improved MX7545	6.03
MX7548	12	I	1	MDAC	µP/8	+5 to +15	8-bit data bus with latches	6.06
MX7542	12	I	2	MDAC	µP/4	+5	4-bit data bus with latches	7.52
MX7543	12	I	2	MDAC	Serial	+5	12-bit multiplying DAC	4.25
MX7545	12	I	2	MDAC	µP/12	+5 to +15	12-bit data bus with latches	5.00

* V = voltage, I = current.

** MDAC = 4-quadrant multiplying capability, Int = internal reference, Ext = external reference.

***Settling time depends on internal resistive ladder and external load impedance.

† Prices provided are for design guidance and are for the lowest-grade commercial temperature parts (FOB USA). International prices will differ due to local duties, taxes, and exchange rates. Prices are subject to change. Not all packages are offered in 1k increments, and some may require minimum order quantities.

†† Future product—contact factory for pricing and availability. Specifications are preliminary.

Single D/A Converters (continued)

Part Number	Resolution (Bits)	Output Type*	Settling Time (µs)	Reference**	Data-Bus Interface (Bits)	Supply Voltage (V)	Features	Price† 1000-up ($)
MAX535	13	V	20	Ext	Serial	+5	+5V, 13-bit, 8-pin µMAX, 1.5mW	4.95
MAX5130	13	V	20	Int	Serial	+5	13-bit upgrade to MAX5120	4.62
MAX5131	13	V	20	Int	Serial	+3	13-bit upgrade to MAX5121	4.62
MAX5132	13	V	20	Int	Serial	+5	13-bit upgrade to MAX5122	4.62
MAX5133	13	V	20	Int	Serial	+3	13-bit upgrade to MAX5123	4.62
MAX5351	13	V	20	Ext	Serial	+3.3	+3.3V, 13-bit, 8-pin µMAX, 0.9mW	5.50
MAX544	14	V	***	Ext	Serial	+5	+5V, 14-bit, low power, 8-pin SO	7.90
MAX545	14	V	***	Ext	Serial	+5	+5V, unipolar or bipolar, low power, 14-pin DIP/SO	7.90
MAX5170	14	V	40	Ext	Serial	+5	14-bit upgrade to MAX5130/MAX5174	4.36
MAX5171	14	V	40	Ext	Serial	+5	14-bit upgrade to MAX5132/MAX5175	4.36
MAX5172	14	V	40	Ext	Serial	+3	14-bit upgrade to MAX5131/MAX5176	4.36
MAX5173	14	V	40	Ext	Serial	+3	14-bit upgrade to MAX5133/MAX5177	4.36
MAX5544	14	V	***	Ext	Serial	+5	+5V, 14-bit, low cost	4.20
MX7534	14	I	1.5	MDAC	µP/8	+12 to +15	Double-buffered inputs	13.37
MX7535	14	I	1.5	MDAC	µP/8 or 14	+12 to +15	Double-buffered inputs	15.00
MX7536	14	I	1.5	MDAC	µP/8 or 14	+12 to +15	No external resistors needed	14.66
MX7538	14	I	1.5	MDAC	µP/14	+12 to +15	Low-cost 14-bit DAC	8.88
MAX541	16	V	***	Ext	Serial	+5	+5V, 16-bit, low power, 8-pin DIP/SO	9.95
MAX542	16	V	***	Ext	Serial	+5	+5V, 16-bit, unipolar or bipolar, low power, 14-pin DIP/SO	9.95
MAX5541	16	V	***	Ext	Serial	+5	+5V, 16-bit, low cost	4.50

Multiple D/A Converters

Part Number	Resolution (Bits)	Output Type*	Settling Time (µs)	Reference**	Data-Bus Interface (Bits)	Supply Voltage (V)	Features	Price† 1000-up ($)
DUAL								
MAX518	8	V	6	Int (V_{DD})	Serial, 2-wire	+5	2-wire interface, 8-pin SO	2.25
MAX519	8	V	6	Ext	Serial, 2-wire	+5	2-wire interface, separate reference inputs	2.35
MAX522	8	V	70	MDAC	Serial	+2.7 to +5.5	Low-power dual in 8-pin SO	2.25
MAX548A	8	V	***	Int (V_{DD})	Serial	+2.5 to +5.5	+2.5V, 8-pin µMAX, low power	1.65
MAX549A	8	V	***	Ext	Serial	+2.5 to +5.5	+2.5V, 8-pin µMAX, low power (upgrade to MAX549B)	1.65
MX7528	8	I	0.18	MDAC	µP/8	+5 to +15	Data latches for both DACs	2.11
MX7628	8	I	0.35	MDAC	µP/8	+12 to +15	Data latches for both DACs	3.80
MAX5158	10	V	8	Ext	Serial	+5	Low-power, dual DAC in QSOP-16	3.39
MAX5159	10	V	8	Ext	Serial	+2.7 to +3.6	Low-power, dual DAC in QSOP-16	3.39
MAX532	12	V	4	MDAC	Serial	±12 to ±15	16-pin DIP/SO	8.45
MX7837	12	V	4	Ext	µP/8	±12 to ±15	Dual V_{OUT} DAC with 8-bit data bus	12.18
MX7847	12	V	4	Ext	µP/12	±12 to ±15	Dual V_{OUT} DAC with 12-bit data bus	12.18
MAX5104	12	V	12	Ext	Serial	+5	Low cost, dual	3.75
MAX5154	12	V	12	Ext	Serial	+5	Low-power, dual DAC in QSOP-16	6.15
MAX5155	12	V	15	Ext	Serial	+2.7 to +3.6	Low-power, dual DAC in QSOP-16	6.15
MAX5156	12	V	15	Ext	Serial	+5	Low-power, dual, force/sense, QSOP-16	6.15
MAX5157	12	V	18	Ext	Serial	+2.7 to +3.6	Low-power, dual, force/sense, QSOP-16	6.15
MX7537	12	I	1.5	MDAC	µP/8	+12 to +15	Dual DAC with 8-bit data bus	11.23
MX7547	12	I	1.5	MDAC	µP/12	+12 to +15	Dual DAC with 12-bit data bus	11.40

* V = voltage, I = current.

** MDAC = 4-quadrant multiplying capability, Int = internal reference, Ext = external reference.

*** Settling time depends on internal resistive ladder and external load impedance.

† Prices provided are for design guidance and are for the lowest-grade commercial temperature parts (FOB USA.) International prices will differ due to local duties, taxes, and exchange rates. Prices are subject to change. Not all packages are offered in 1k increments, and some may require minimum order quantities.

Multiple D/A Converters (continued)

Part Number	Resolution (Bits)	Output Type*	Settling Time (µs)	Reference**	Data-Bus Interface (Bits)	Supply Voltage (V)	Features	Price† 1000-up ($)
DUAL (continued)								
MAX5150	13	V	16	Ext	Serial	+5	Low-power, dual DAC in QSOP-16	7.95
MAX5151	13	V	20	Ext	Serial	+2.7 to +3.6	Low-power, dual DAC in QSOP-16	7.95
MAX5152	13	V	18	Ext	Serial	+5	Low-power, dual, force/sense, QSOP-16	7.95
MAX5153	13	V	22	Ext	Serial	+2.7 to +3.6	Low-power, dual, force/sense, QSOP-16	7.95
TRIPLE								
MAX512	8	V	60	MDAC	Serial	+5 or ±5	Low power with shutdown, 14-pin narrow SO	2.85
MAX513	8	V	70	MDAC	Serial	+2.7 to ±3.6	For 3V systems	2.85
QUAD								
MAX500	8	V	4	Ext	Serial	+12 to +15 & -5	16-pin DIP/SO, three reference inputs	5.70
MX7225	8	V	4	Ext	µP/8	+12 to +15 & -5	Double buffered, separate reference inputs	9.26
MX7226	8	V	4	Ext	µP/8	+12 to +15 & -5	Single buffered, one reference input	6.50
MAX505	8	V	6	MDAC	µP/8	+5 or ±5	Rail-to-Rail outputs, separate reference inputs	5.95
MAX506	8	V	6	MDAC	µP/8	+5 or ±5	Rail-to-Rail outputs, one reference input	6.10
MAX509	8	V	6	MDAC	Serial	+5 or ±5	Rail-to-Rail outputs, four reference inputs	5.35
MAX510	8	V	6	MDAC	Serial	+5 or ±5	Rail-to-Rail outputs, one reference input	5.19
MAX533	8	V	6	Ext	Serial	+2.7 to +3.6	+2.7V, low power (1.9mW), serial, 16-pin QSOP	2.80
MAX534	8	V	6	Ext	Serial	+5	Low-power, +5V, quad DAC in 16-pin QSOP	2.80
MAX520	8	V	***	Ext	Serial, 2-wire	+5	2-wire interface, separate reference inputs	3.50
MAX5250	10	V	10	Ext	Serial	+5	+5V, 1mW/DAC, serial, 20µA power-down, 20-pin DIP/SSOP	4.95
MAX5251	10	V	10	Ext	Serial	+3 to +3.6	+3V, 0.6mW/DAC, serial, 20µA power-down	4.95
MAX526	12	V	3	Ext	µP/8	+12 to +15 & -5	Quad voltage-output DAC, available in DIP/SO	19.44
MAX527	12	V	3	Ext	µP/8	±5	±5V version of MAX526	16.56
MAX536	12	V	3	Ext	Serial	+12 to +15 & -5	Serial version of MAX526	15.95
MAX537	12	V	3	Ext	Serial	±5	Serial version of MAX527	15.95
MAX5253	12	V	16	Ext	Serial	+3 to +3.6	+3V, 0.6mW/DAC, serial, 20µA power-down	11.35
MAX525	12	V	20	Ext	Serial	+5	1mW/DAC, serial, 20µA power-down, 20-pin DIP/SSOP	9.70
MAX514	12	I	1	MDAC	Serial	+5	Quad current-output DAC, available in DIP/SO	14.25
OCTAL								
MAX528	8	V	5	Ext	Serial	+5 to +15, +15 & -5, or +5 & -15	µP-selected buffered and unbuffered output	6.90
MAX529	8	V	5	Ext	Serial	+5 or ±5	MAX528 with single +5V supply	5.65
MX7228	8	V	5	Ext	µP/8	+5 to +15 & -5 or +15	Single or dual supplies	11.95
MAX521	8	V	6	Ext	Serial, 2-wire	+5	2-wire interface, five reference inputs	4.95
MAX547	13	V	5	Ext	µP/13	±5	Unipolar or bipolar, four reference inputs	29.60

Digital Potentiometers

Part Number	Tap Position	Supply Voltage Range (V)	Resistor Values (kΩ)	I/O	Features	Price† 1000-up ($)
MAX5160	32	+2.7 to +5.5	50, 100, 200	3-wire serial	Low power, 8-pin µMAX	0.77
MAX5161	32	+2.7 to +5.5	50, 100, 200	2-wire serial	Low cost, 6-pin SOT	0.66‡

* V = voltage, I = current.

** MDAC = 4-quadrant multiplying capability, Int = internal reference, Ext = external reference.

*** Settling time depends on internal resistive ladder and external load impedance.

‡ 2500 pc. factory-direct price, FOB USA.

† Prices provided are for design guidance and are for the lowest-grade, commercial temperature parts (FOB USA). International prices will differ due to local duties, taxes, and exchange rates. Prices are subject to change. Not all packages are offered in 1k increments, and some may require minimum order quantities.