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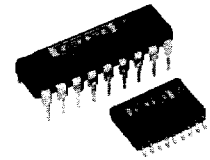


DAC7541

www.burr-brown.com/databook/DAC7541.html

Low Cost 12-Bit CMOS Four-Quadrant Multiplying DIGITAL-TO-ANALOG CONVERTER

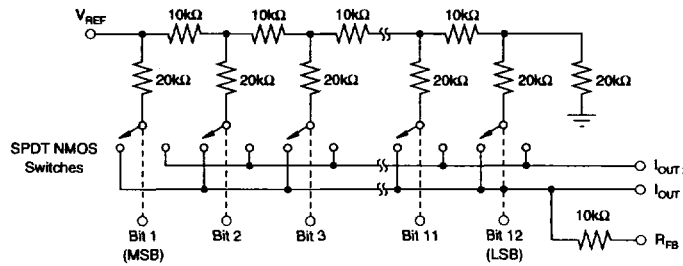
FEATURES

- FULL FOUR-QUADRANT MULTIPLICATION
- 12-BIT END-POINT LINEARITY
- DIFFERENTIAL LINEARITY ±1/2LSB MAX OVER TEMPERATURE
- MONOTONICITY GUARANTEED OVER TEMPERATURE
- TTL-/CMOS-COMPATIBLE
- SINGLE +5V TO +15V SUPPLY
- LATCH-UP RESISTANT
- 7521/7541/7541A REPLACEMENT
- PACKAGES: Plastic DIP, Plastic SOIC
- LOW COST

DESCRIPTION

The Burr-Brown DAC7541A is a low cost 12-bit, four-quadrant multiplying digital-to-analog converter. Laser-trimmed thin-film resistors on a monolithic CMOS circuit provide true 12-bit integral and differential linearity over the full specified temperature range.

DAC7541A is a direct, improved pin-for-pin replacement for 7521, 7541, and 7541A industry standard parts. In addition to a standard 18-pin plastic package, the DAC7541A is also available in a surface-mount plastic 18-pin SOIC.



Digital Inputs (DTL-/TTL-/CMOS-compatible)
Logic: A switch is closed to $I_{OUT\,1}$ for its digital input in a "HIGH" state.

Switches shown for digital inputs "HIGH".

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Internet: http://www.burr-brown.com/ • FAXLine: (800) 548-6133 (US/Canada Only) • Cable: BBRCORP • Telex: 066-6491 • FAX: (520) 889-1510 • Immediate Product Info: (800) 548-6132

SPECIFICATIONS

ELECTRICAL

At +25°C, $+V_{DD}$ = +12V or +15V, V_{REF} = +10V, $V_{PIN\,1} = V_{PIN\,2}$ = 0V, unless otherwise specified.

PARAMETER	DAC7541A GRADE	T_A = +25°C	$T_A = T_{MAX}, T_{MIN}$[1]	UNITS	TEST CONDITIONS/COMMENTS
ACCURACY					
Resolution	All	12	12	Bits	
Relative Accuracy	J	±1	±1	LSB max	±1LSB = ±0.024% of FSR.
	K	±1/2	±1/2	LSB max	±1/2LSB = ±0.012% of FSR.
Differential Non-linearity	J	±1	±1	LSB max	All grades guaranteed monotonic to 12 bits,
	K	±1/2	±1/2	LSB max	T_{MIN} to T_{MAX}.
Gain Error	J	±6	±8	LSB max	Measured using internal R_{FB} and includes effect
	K	±1	±3	LSB max	of leakage current and gain T.C.
					Gain error can be trimmed to zero.
Gain Temperature Coefficient (ΔGain/ΔTemperature)	ALL		5	ppm/°C max	Typical value is 2ppm/°C.
Output Leakage Current: Out_1 (Pin 1)	J, K	±5	±10	nA max	All digital inputs = 0V.
Out_2 (Pin 2)	J, K	±5	±10	nA max	All digital inputs = V_{DD}.
REFERENCE INPUT					
Voltage (Pin 17 to GND)	All	−10/+10	−10/+10	V min/max	
Input Resistance (Pin 17 to GND)	All	7-18	7-18	kΩ min/max	
					Typical input resistance = 11kΩ.
					Typical input resistance temperature coefficient is −50ppm/°C.
DIGITAL INPUTS					
V_{IH} (Input HIGH Voltage)	All	2.4	2.4	V min	
V_{IL} (Input LOW Voltage)	All	0.8	0.8	V max	
I_{IN} (Input Current)	All	±1	±1	µA max	Logic inputs are MOS gates.
					I_{IN} typ (25°C) = 1nA
C_{IN} (Input Capacitance)[2]	All	8	8	pF max	V_{IN} = 0V
POWER SUPPLY REJECTION					
ΔGain/ΔV_{DD}	All	±0.01	±0.02	% per % max	V_{DD} = +11.4V to +16V
POWER SUPPLY					
V_{DD} Range	All	+5 to +16	+5 to +16	V min to V max	Accuracy is not guaranteed over this range.
I_{DD}	All	2	2	mA max	All digital inputs V_{IL} or V_{IH}.
	All	100	500	µA max	All digital inputs 0V or V_{DD}.

NOTES: (1) Temperature ranges are: = 0°C to + 70°C for JP, KP, JU and KU versions. (2) Guaranteed by design but not production tested.

AC PERFORMANCE CHARACTERISTICS

These characteristics are included for design guidance only and are not production tested.
V_{DD} = +15V, V_{REF} = +10V except where stated, $V_{PIN\,1} = V_{PIN\,2}$ = 0V, output amp is OPA606 except where stated.

PARAMETER	DAC7541A GRADE	T_A = +25°C	$T_A = T_{MAX}, T_{MIN}$[1]	UNITS	TEST CONDITIONS/COMMENTS
PROPAGATION DELAY (from Digital Input change to 90% of final Analog Output)	All	100	—	ns typ	Out_1 Load = 100Ω, C_{EXT} = 13pF. Digital Inputs = 0V to V_{DD} or V_{DD} to 0V.
DIGITAL-TO-ANALOG GLITCH IMPULSE	All	1000	—	nV-s typ	V_{REF} = 0V, all digital inputs 0V to V_{DD} or V_{DD} to 0V. Measured using OPA606 as output amplifier.
MULTIPLYING FEEDTHROUGH ERROR (V_{REF} to Out_1)	All	1.0	—	mVp-p max	V_{REF} = ±10V, 10kHz sine wave.
OUTPUT CURRENT SETTLING TIME	All	0.6	—	µs typ	To 0.01% of Full Scale Range. Out_1 Load = 100Ω, C_{EXT} = 13pF.
	All	1.0	—	µs max	Digital Inputs: 0V to V_{DD} or V_{DD} to 0V.
OUTPUT CAPACITANCE					
$C_{OUT\,1}$ (Pin 1)	All	100	100	pF max	Digital Inputs = V_{IH}
$C_{OUT\,2}$ (Pin 2)	All	60	60	pF max	Digital Inputs = V_{IH}
$C_{OUT\,1}$ (Pin 1)	All	70	70	pF max	Digital Inputs = V_{IL}
$C_{OUT\,2}$ (Pin 2)	All	100	100	pF max	Digital Inputs = V_{IL}

NOTE: (1) Temperature ranges are: = 0°C to + 70°C for JP, KP, JU and KU versions.

ABSOLUTE MAXIMUM RATINGS[1]

V_{DD} (Pin 16) to Ground	+17V
V_{REF} (Pin 17) to Ground	+25V
V_{RFB} (Pin 18) to Ground	±25V
Digital Input Voltage (pins 4-15) to Ground	–0.4V, V_{DD}
$V_{PIN\,1}$, $V_{PIN\,2}$ to Ground	–0.4V, V_{DD}
Power Dissipation (any Package):	
To +75°C	450mW
Derates above +75°C	–6mW/°C
Lead Temperature (soldering, 10s)	+300°C
Storage Temperature: Plastic Package	+125°C

NOTE: (1) Stresses above those listed above may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other condition above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTROSTATIC DISCHARGE SENSITIVITY

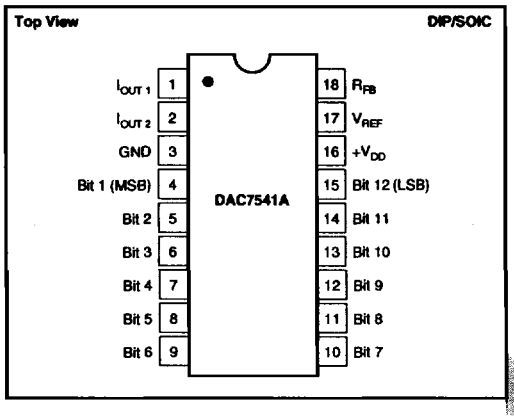
The DAC7541A is an ESD (electrostatic discharge) sensitive device. The digital control inputs have a special FET structure, which turns on when the input exceeds the supply by 18V, to minimize ESD damage. However, permanent damage may occur on unconnected devices subject to high energy electrostatic fields. When not in use, devices must be stored in conductive foam or shunts. The protective foam should be discharged to the destination socket before devices are removed.

BURN-IN SCREENING

Burn-in screening is an option available for the models in the Ordering Information table. Burn-in duration is 160 hours at the indicated temperature (or equivalent combination of time and temperature).

All units are tested after burn-in to ensure that grade specifications are met. To order burn-in, add "-BI" to the base model number.

PIN CONNECTIONS



PACKAGE INFORMATION

PRODUCT	PACKAGE	PACKAGE DRAWING NUMBER[1]
DAC7541JP	Plastic DIP	218
DAC7541KP	Plastic DIP	218
DAC7541JU	Plastic SOIC	219
DAC7541KU	Plastic SOIC	219
DAC7541JP-BI	Plastic DIP	218
DAC7541KP-BI	Plastic DIP	218

NOTE: (1) For detailed drawing and dimension table, please see end of data sheet, or Appendix C of Burr-Brown IC Data Book.

ORDERING INFORMATION

PRODUCT	PACKAGE	TEMPERATURE RANGE	RELATIVE ACCURACY (LSB)	GAIN ERROR (LSB)
DAC7541AJP	Plastic DIP	0°C to +70°C	±1	±6
DAC7541AKP	Plastic DIP	0°C to +70°C	±1/2	±1
DAC7541AJU	Plastic SOIC	0°C to +70°C	±1	±6
DAC7541AKU	Plastic SOIC	0°C to +70°C	±1/2	±1
BURN-IN SCREENING OPTION See text for details.				
PRODUCT	**PACKAGE**	**TEMPERATURE RANGE**	**RELATIVE ACCURACY (LSB)**	**BURN-IN TEMP. (160 Hours)[1]**
DAC7541AJP-BI	Plastic DIP	0°C to +70°C	±1	+85°C
DAC7541AKP-BI	Plastic DIP	0°C to +70°C	±1/2	+85°C