BURR - BROWN®

OPA4243

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Quad OPERATIONAL AMPLIFIER
*Micro*POWER, Single-Supply

FEATURES

- MICRO-SIZE, TSSOP PACKAGE
- SINGLE-SUPPLY OPERATION
- WIDE SUPPLY RANGE: 2.2V to 36V
- LOW QUIESCENT CURRENT: 45μA/chan
- WIDE BANDWIDTH: 430kHz
- WIDE INPUT/OUTPUT SWING

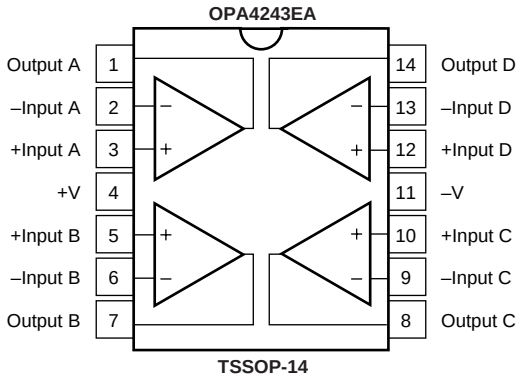
APPLICATIONS

- LCD DISPLAY DRIVERS
- BATTERY POWERED SYSTEMS
- PORTABLE EQUIPMENT
- PCMCIA CARDS
- BATTERY PACKS AND POWER SUPPLIES
- CONSUMER PRODUCTS

DESCRIPTION

The OPA4243 is a four-channel op amp specifically designed for high density, space-limited applications, such as LCD bias drivers, PCMCIA cards, battery-packs and portable instruments. In addition to small size, this part features wide output swing, very low quiescent current, and low bias current. Other features include unity gain stability and the best speed power ratio available. Power supplies in the range of 2.2V to 36V (±1.1V to ±18V) can be used.

Each channel uses completely independent circuitry for lowest crosstalk and freedom from interaction, even when overloaded. In addition, the amplifier is free from output inversion when the inputs are driven to the rail. The OPA4243EA is supplied in the miniature TSSOP-14 surface mount package. Specifications apply from –40°C to +85°C. However, as the extensive typical performance curves indicate, the OPA4243 can be used over the full –55°C to +125°C range. A SPICE macromodel is available for design analysis.



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SPECIFICATIONS: V_S = +2.6V to +36V

Boldface limits apply over the specified temperature range, **T_A = –40°C to +85°C**

At T_A = +25°C, R_L = 20kΩ connected to ground, unless otherwise noted.

PARAMETER		CONDITIONS	OPA4243EA MIN	OPA4243EA TYP(1)	OPA4243EA MAX	UNITS
OFFSET VOLTAGE						
Input Offset Voltage	V_{OS}	V_S = ±7.5V, V_{CM} = 0		±2	±5	mV
Over Temperature					**±6**	mV
vs Temperature	dV_{OS}/dT	**T_A = –40°C to +85°C**		**±2.5**		µV/°C
vs Power Supply	PSRR	V_S = +2.6V to +36V		2.5	100	µV/V
Over Temperature		V_S = +2.6V to +36V			**100**	µV/V
Channel Separation				140		dB
INPUT BIAS CURRENT						
Input Bias Current	I_B	V_{CM} = V_S/2		–10	–25	nA
Input Offset Current	I_{OS}	V_{CM} = V_S/2		±1	±10	nA
NOISE						
Input Noise Voltage, f = 0.1 to 10Hz				0.4		µVp-p
Input Noise Voltage Density, f = 1kHz	e_n			22		nV/√Hz
Current Noise Density, f = 1kHz	i_n			40		fA/√Hz
INPUT VOLTAGE RANGE						
Common-Mode Voltage Range	V_{CM}		0		(V+) – 0.9	V
Common-Mode Rejection	CMRR	V_S = ±18V, V_{CM} = –18V to +17.1V	82	104		dB
Over Temperature		V_S = ±18V, V_{CM} = –18V to +17.1V	**82**			dB
INPUT IMPEDANCE						
Differential				10^6 || 2		Ω || pF
Common-Mode				10^9 || 2		Ω || pF
OPEN-LOOP GAIN						
Open-Loop Voltage Gain	A_{OL}	V_O = 0.5V to (V+) – 0.9	86	104		dB
Over Temperature		V_O = 0.5V to (V+) – 0.9	**86**			dB
FREQUENCY RESPONSE						
Gain-Bandwidth Product	GBW			430		kHz
Slew Rate	SR	G = 1		–0.1, ±0.16		V/µs
Setting Time, 0.01%		10V Step		150		µs
Overload Recovery Time		V_{IN} • Gain = V_S		8		µs
OUTPUT						
Voltage Output, Positive	V_O	A_{OL} ≥ 80dB, R_L = 20kΩ to V_S/2	(V+) – 0.9	(V+) – 0.75		V
Over Temperature		A_{OL} ≥ 80dB, R_L = 20kΩ to V_S/2	**(V+) – 0.9**	(V+) – 0.75		V
Voltage Output, Negative		A_{OL} ≥ 80dB, R_L = 20kΩ to V_S/2	0.5	0.2		V
Over Temperature		A_{OL} ≥ 80dB, R_L = 20kΩ to V_S/2	**0.5**	**0.2**		V
Voltage Output, Positive		A_{OL} ≥ 80dB, R_L = 20kΩ to Ground		(V+) – 0.75		V
Over Temperature		A_{OL} ≥ 80dB, R_L = 20kΩ to Ground		(V+) – 0.75		V
Voltage Output, Negative		A_{OL} ≥ 80dB, R_L = 20kΩ to Ground		0.1		V
Over Temperature		A_{OL} ≥ 80dB, R_L = 20kΩ to Ground		0.1		V
Short-Circuit Current	I_{SC}			–25, +12		mA
Capacitive Load Drive	C_{LOAD}			See Typical Curve		
POWER SUPPLY						
Specified Voltage Range	V_S	**Over Temperature**	**+2.6**		**+36**	V
Minimum Operating Voltage				+2.2		V
Quiescent Current	I_O	I_O = 0		45	60	µA
Over Temperature		I_O = 0			**70**	µA
TEMPERATURE RANGE						
Specified Range			–40		85	°C
Operating Range			–55		125	°C
Storage Range			–65		150	°C
Thermal Resistance	θ_{JA}					
TSSOP-14 Surface Mount				100		°C/W

NOTE: (1) V_S = +15V.

ABSOLUTE MAXIMUM RATINGS[1]

Supply Voltage, V+ to V–	36V
Input Voltage Range[2]	(V–) – 0.3V to (V+) + 0.3V
Input Current[2]	10mA
Output Short-Circuit[3]	Continuous
Operating Temperature	–55°C to +125°C
Storage Temperature	–65°C to +150°C
Junction Temperature	150°C
Lead Temperature (soldering, 10s)	300°C
ESD Capability	2000V

NOTES: (1) Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. (2) Inputs are diode-clamped to the supply rails and should be current-limited to 10mA or less if input voltages can exceed rails by more than 0.3V. (3) Short-circuit to ground, one amplifier per package.

ELECTROSTATIC DISCHARGE SENSITIVITY

This integrated circuit can be damaged by ESD. Burr-Brown recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

PACKAGE/ORDERING INFORMATION

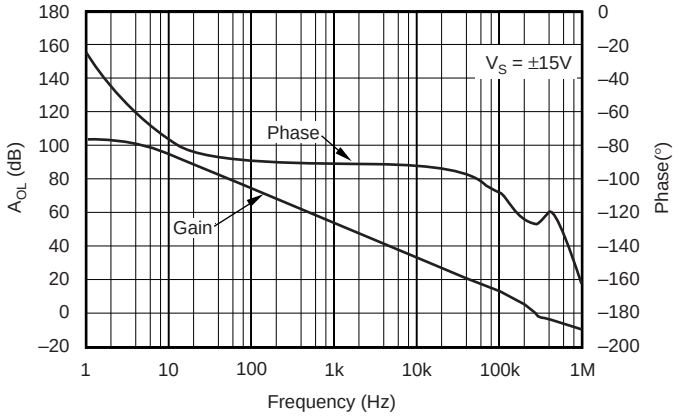
PRODUCT	PACKAGE	PACKAGE DRAWING NUMBER	SPECIFIED TEMPERATURE RANGE	PACKAGE MARKING	ORDERING NUMBER[1]	TRANSPORT MEDIA
OPA4243EA	TSSOP-14	357	–40°C to +85°C	OPA4243EA	OPA4243EA/250	Tape and Reel
"	"	"	"	"	OPA4243EA/2K5	Tape and Reel

NOTE: (1) Models with a slash (/) are available only in Tape and Reel in the quantities indicated (e.g., /2K5 indicates 2500 devices per reel). Ordering 2500 pieces of “OPA4243EA” will get a single 2500-piece Tape and Reel.

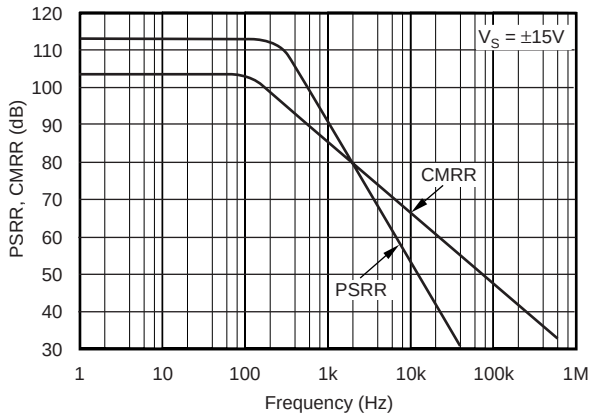
TYPICAL PERFORMANCE CURVES

At T_A = +25°C, R_L = 20kΩ connected to ground, unless otherwise noted.

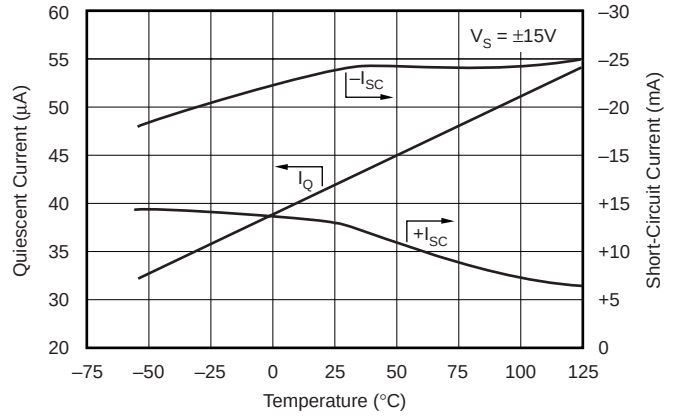
OPEN-LOOP GAIN AND PHASE vs FREQUENCY



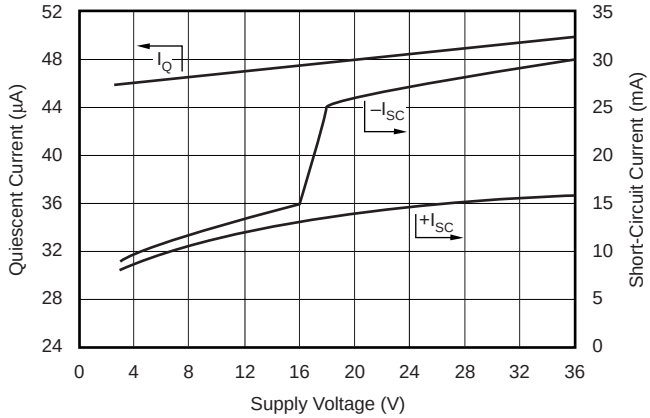
POWER SUPPLY AND COMMON-MODE REJECTION RATIO vs FREQUENCY



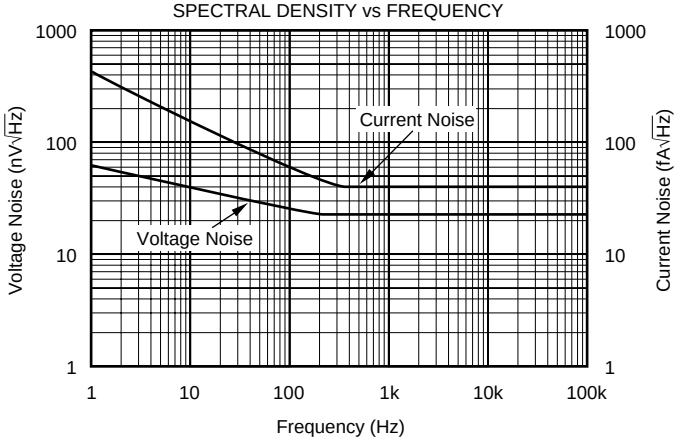
QUIESCENT CURRENT vs TEMPERATURE



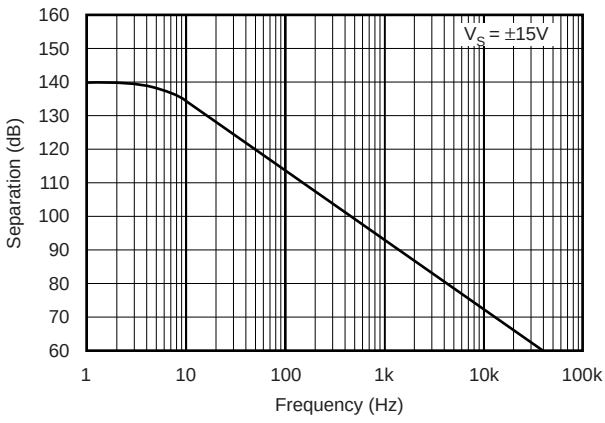
QUIESCENT CURRENT AND SHORT-CIRCUIT vs SUPPLY VOLTAGE



INPUT VOLTAGE AND CURRENT NOISE SPECTRAL DENSITY vs FREQUENCY



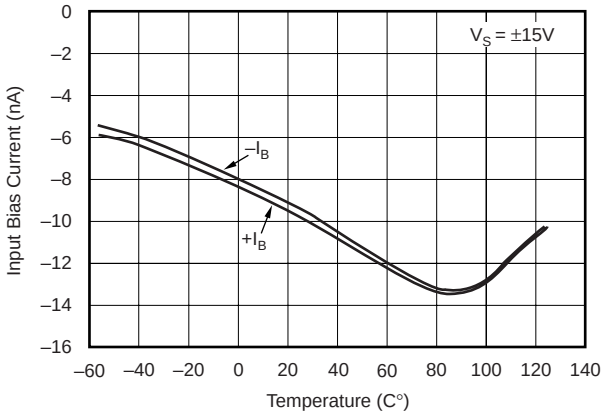
CHANNEL SEPARATION



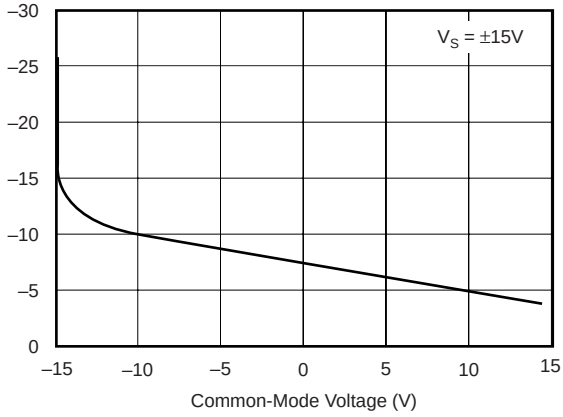
TYPICAL PERFORMANCE CURVES (Cont.)

At T_A = +25°C, R_L = 20kΩ connected to ground, unless otherwise noted.

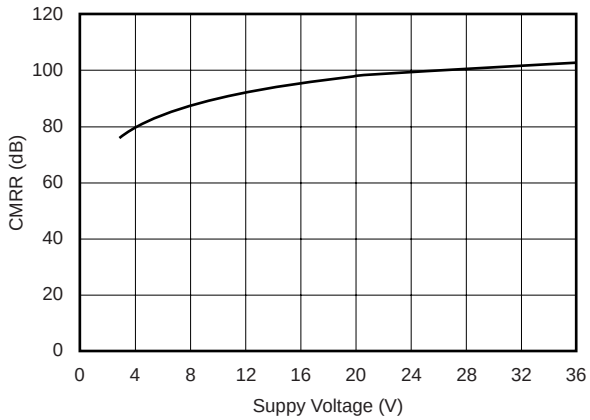
INPUT BIAS CURRENT vs TEMPERATURE



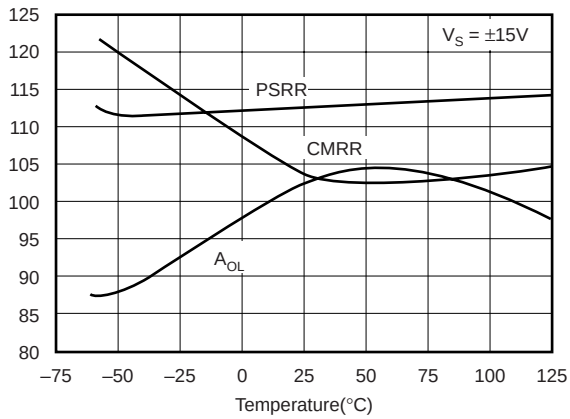
INPUT BIAS CURRENT
vs INPUT COMMON-MODE VOLTAGE



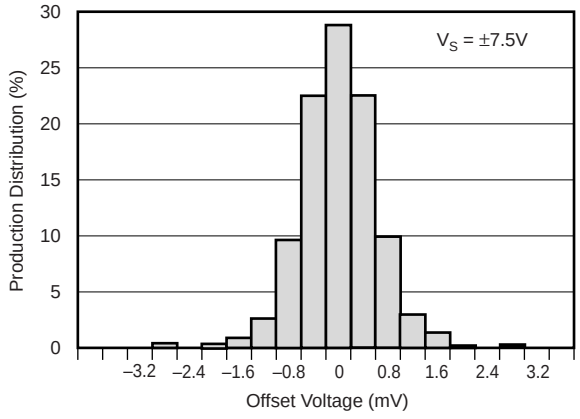
COMMON-MODE REJECTION
vs SUPPY VOLTAGE



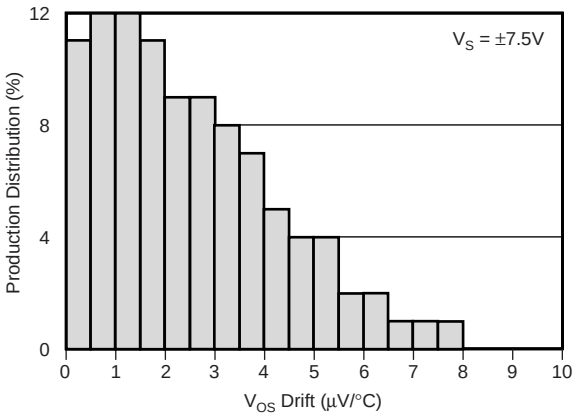
A_{OL}, CMRR, PSRR vs TEMPERATURE



OFFSET VOLTAGE PRODUCTION DISTRIBUTION



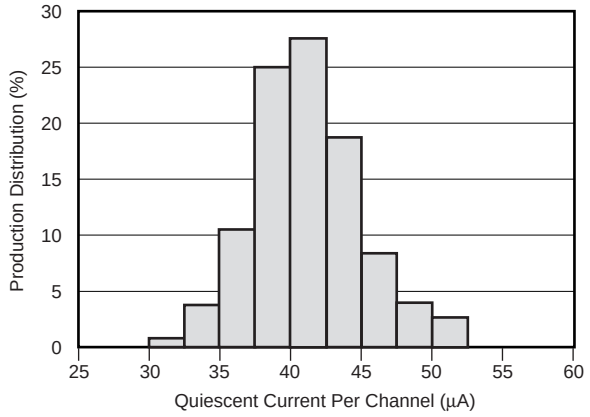
OFFSET VOLTAGE DRIFT
PRODUCTION DISTRIBUTION



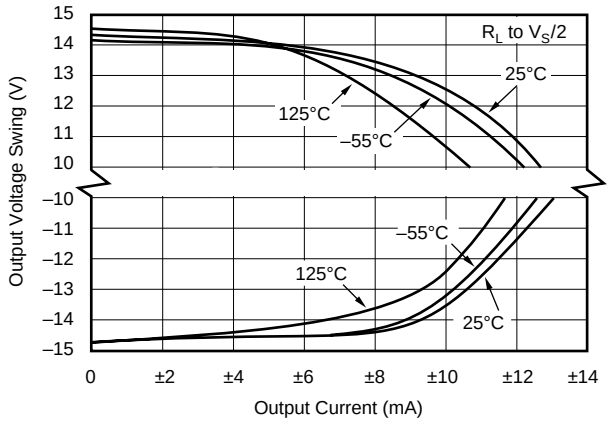
TYPICAL PERFORMANCE CURVES (Cont.)

At T_A = +25°C, R_L = 20kΩ connected to ground, unless otherwise noted.

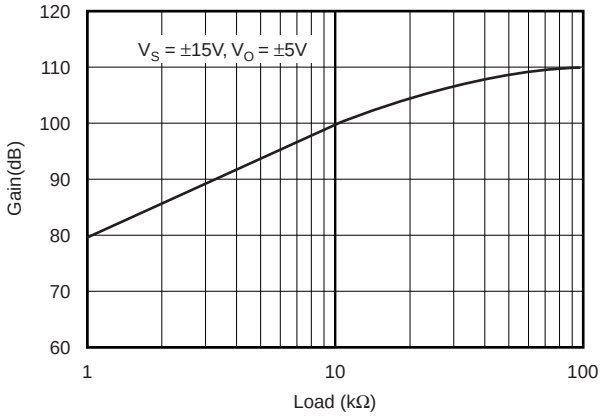
QUIESCENT CURRENT
PRODUCTION DISTRIBUTION



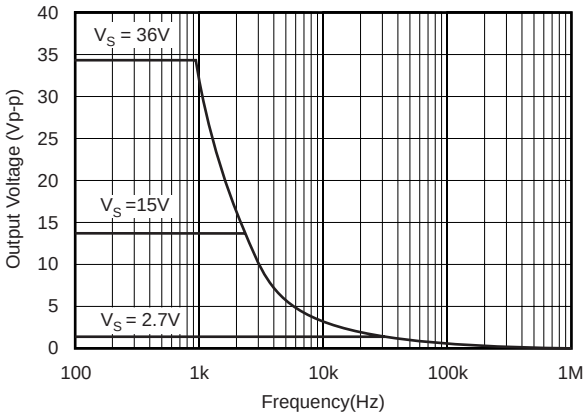
OUTPUT VOLTAGE SWING vs OUTPUT CURRENT



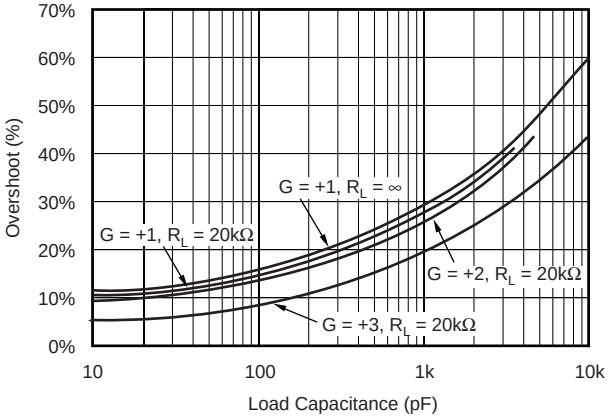
OPEN-LOOP GAIN vs LOAD RESISTANCE



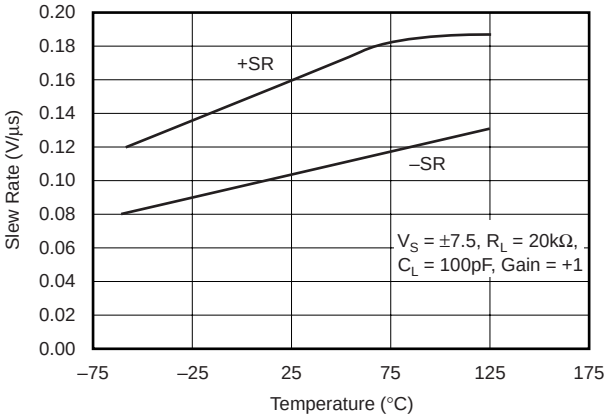
MAXIMUM OUTPUT VOLTAGE vs FREQUENCY



SMALL-SIGNAL OVERSHOOT
vs LOAD CAPACITANCE



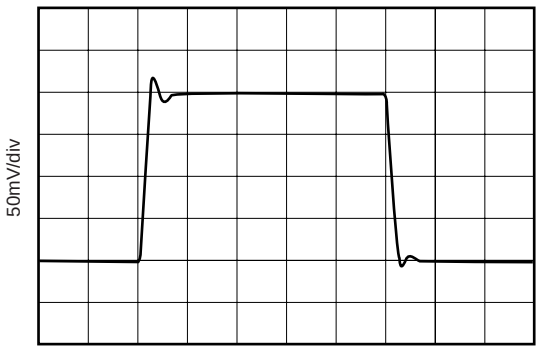
SLEW RATE vs TEMPERATURE



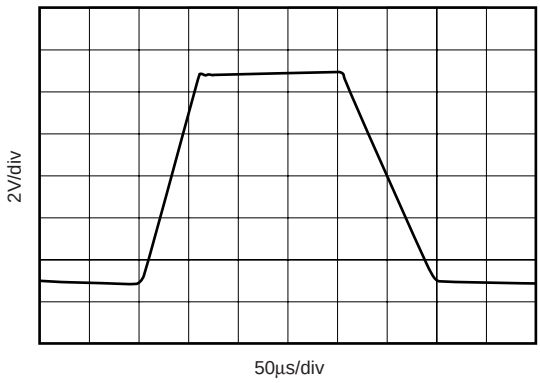
TYPICAL PERFORMANCE CURVES (Cont.)

At T_A = + 25°C, R_L = 20kΩ connected to ground, unless otherwise noted.

SMALL-SIGNAL STEP RESPONSE
(V_S = ±7.5V, G = +1, R_L = 20kΩ, C_L = 100pF)



LARGE-SIGNAL STEP RESPONSE
(V_S = ± 7.5, G = +1, R_L = 20kΩ, C_L = 100pF)



APPLICATION INFORMATION

The OPA4243 is unity-gain stable and suitable for a wide range of general-purpose applications. The power supply pins should be bypassed with 0.01µF ceramic capacitors.

OPERATING VOLTAGE

The OPA4243 can operate from single supply (2.2V to 36V) or dual supplies (±1.1V to ±18V) with excellent performance. Unlike most op amps which are specified at only one supply voltage, the OPA4243 is specified for real world applications; a single set of specifications applies throughout the 2.6V to 36V supply range. This allows the designer to have the same assured performance at any supply voltage within this range.

In addition, many key parameters are guaranteed over the specified temperature range, –40°C to +85°C. Most behaviors remain unchanged throughout the full operating voltage range. Parameters, which vary significantly with operating voltage or temperature, are shown in the typical performance curves.

PRINTED CIRCUIT BOARD LAYOUT

See Burr-Brown Application Note AB-132 for specific PC board layout recommendations.

INPUT PROTECTION

Rail-to-rail input signals will not cause damage or invert the output of the OPA4243. To protect against ESD and excessive input voltage (beyond the supply rails) the OPA4243 includes diodes from the input terminals to the power supply rails. Normally, these diodes are reversed biased and have negligible effect on circuit operation. However, if the input voltage is allowed to exceed the supply voltages by enough to forward bias these diodes (generally, 0.3V to 0.6V) excessive input current could flow. If this condition could occur (for example, if an input signal is applied when the op amp supply voltage is zero), care should be taken to limit the input current to less than 10mA to avoid damage. An input signal beyond the supplies, with power applied, can cause an unexpected output inversion.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
OPA4243EA/250	ACTIVE	TSSOP	PW	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	-40 to 85	OPA 4243EA	Samples
OPA4243EA/2K5	ACTIVE	TSSOP	PW	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	-40 to 85	OPA 4243EA	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

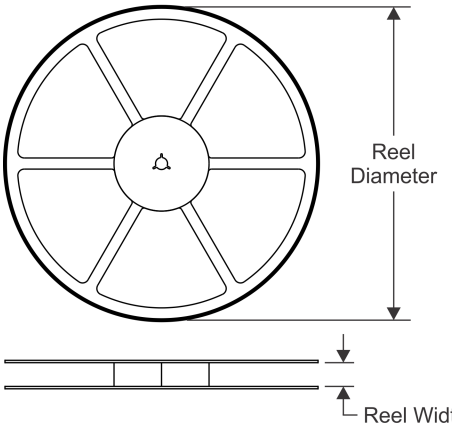
(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

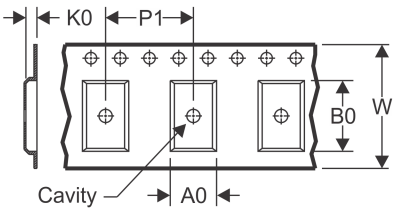
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

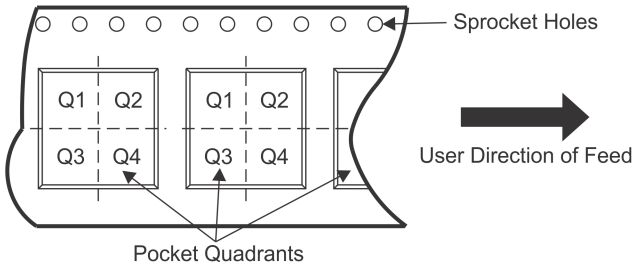


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

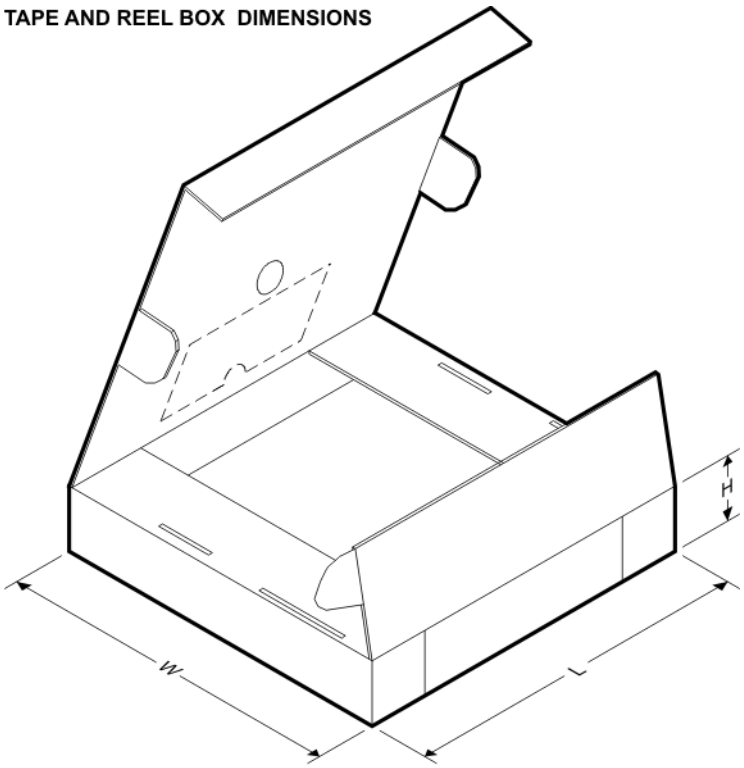
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
OPA4243EA/250	TSSOP	PW	14	250	180.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
OPA4243EA/2K5	TSSOP	PW	14	2500	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
OPA4243EA/250	TSSOP	PW	14	250	210.0	185.0	35.0
OPA4243EA/2K5	TSSOP	PW	14	2500	367.0	367.0	35.0

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