

OP27—SPECIFICATIONS

ELECTRICAL CHARACTERISTICS (@ $V_S = \pm 15\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise noted.)

Parameter	Symbol	Conditions	OP27A/E			OP27F			OP27C/G			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
INPUT OFFSET VOLTAGE ¹	V_{OS}		10	25		20	60		30	100	μV	
LONG-TERM V_{OS} STABILITY ^{2,3}	V_{OS}/Time		0.2	1.0		0.3	1.5		0.4	2.0	$\mu\text{V}/\text{M}_O$	
INPUT OFFSET CURRENT	I_{OS}		7	35		9	50		12	75	nA	
INPUT BIAS CURRENT	I_B		± 10	± 40		± 12	± 55		± 15	± 80	nA	
INPUT NOISE VOLTAGE ^{3,4}	$e_{n\text{ p-p}}$	0.1 Hz to 10 Hz	0.08	0.18		0.08	0.18		0.09	0.25	$\mu\text{V p-p}$	
INPUT NOISE Voltage Density ³	e_n	$f_o = 10\text{ Hz}$ $f_o = 30\text{ Hz}$ $f_o = 1000\text{ Hz}$	3.5 3.1 3.0	5.5 4.5 3.8		3.5 3.1 3.0	5.5 4.5 3.8		3.8 3.3 3.2	8.0 5.6 4.5	$\text{nV}/\sqrt{\text{Hz}}$ $\text{nV}/\sqrt{\text{Hz}}$ $\text{nV}/\sqrt{\text{Hz}}$	
INPUT NOISE Current Density ^{3,5}	i_n	$f_o = 10\text{ Hz}$ $f_o = 30\text{ Hz}$ $f_o = 1000\text{ Hz}$	1.7 1.0 0.4	4.0 2.3 0.6		1.7 1.0 0.4	4.0 2.3 0.6		1.7 1.0 0.4	0.6	$\text{pA}/\sqrt{\text{Hz}}$ $\text{pA}/\sqrt{\text{Hz}}$ $\text{pA}/\sqrt{\text{Hz}}$	
INPUT RESISTANCE Differential-Mode ⁶ Common-Mode	R_{IN} R_{INCM}		1.3 3	6		0.94 2.5	5		0.7 2	4	$\text{M}\Omega$ $\text{G}\Omega$	
INPUT VOLTAGE RANGE	IVR		± 11.0	± 12.3		± 11.0	± 12.3		± 11.0	± 12.3	V	
COMMON-MODE REJECTION RATIO	CMRR	$V_{CM} = \pm 11\text{ V}$	114	126		106	123		100	120	dB	
POWER SUPPLY REJECTION RATIO	PSRR	$V_S = \pm 4\text{ V}$ to $\pm 18\text{ V}$		1	10		1	10		2	20	$\mu\text{V}/\text{V}$
LARGE-SIGNAL VOLTAGE GAIN	A_{VO}	$R_L \geq 2\text{ k}\Omega$, $V_O = \pm 10\text{ V}$ $R_L \geq 600\ \Omega$, $V_O = \pm 10\text{ V}$	1000 800	1800 1500		1000 800	1800 1500		700 600	1500 1500	V/mV V/mV	
OUTPUT VOLTAGE SWING	V_O	$R_L \geq 2\text{ k}\Omega$ $R_L \geq 600\ \Omega$	± 12.0 ± 10.0	± 13.8 ± 11.5		± 12.0 ± 10.0	± 13.8 ± 11.5		± 11.5 ± 10.0	± 13.5 ± 11.5	V V	
SLEW RATE ⁷	SR	$R_L \geq 2\text{ k}\Omega$	1.7	2.8		1.7	2.8		1.7	2.8	$\text{V}/\mu\text{s}$	
GAIN BANDWIDTH PRODUCT ⁷	GBW		5.0	8.0		5.0	8.0		5.0	8.0	MHz	
OPEN-LOOP OUTPUT RESISTANCE	R_O	$V_O = 0$, $I_O = 0$		70			70			70	Ω	
POWER CONSUMPTION	P_d	V_O		90	140		90	140		100	170	mW
OFFSET ADJUSTMENT RANGE		$R_p = 10\text{ k}\Omega$		± 4.0			± 4.0			± 4.0	mV	

NOTES

¹Input offset voltage measurements are performed ~ 0.5 seconds after application of power. A/E grades guaranteed fully warmed up.

²Long-term input offset voltage stability refers to the average trend line of V_{OS} versus. Time over extended periods after the first 30 days of operation. Excluding the initial hour of operation, changes in V_{OS} during the first 30 days are typically 2.5 μV . Refer to typical performance curve.

³Sample tested.

⁴See test circuit and frequency response curve for 0.1 Hz to 10 Hz tester.

⁵See test circuit for current noise measurement.

⁶Guaranteed by input bias current.

⁷Guaranteed by design.

OP27

TYPICAL ELECTRICAL CHARACTERISTICS (@ $V_S = \pm 15\text{ V}$, $T_A = 25^\circ\text{C}$ unless otherwise noted.)

Parameter	Symbol	Conditions	OP27N Typical	OP27G Typical	OP27GR Typical	Unit
AVERAGE INPUT OFFSET VOLTAGE DRIFT*	TCV_{OS} or TCV_{OSn}	Nulled or Unnulled $R_p = 8\text{ k}\Omega$ to $20\text{ k}\Omega$	0.2	0.3	0.4	$\mu\text{V}/^\circ\text{C}$
AVERAGE INPUT OFFSET CURRENT DRIFT	TCI_{OS}		80	130	180	$\text{pA}/^\circ\text{C}$
AVERAGE INPUT BIAS CURRENT DRIFT	TCI_B		100	160	200	$\text{pA}/^\circ\text{C}$
INPUT NOISE VOLTAGE DENSITY	e_n	$f_o = 10\text{ Hz}$	3.5	3.5	3.8	$\text{nV}/\sqrt{\text{Hz}}$
	e_n	$f_o = 30\text{ Hz}$	3.1	3.1	3.3	$\text{nV}/\sqrt{\text{Hz}}$
	e_n	$f_o = 1000\text{ Hz}$	3.0	3.0	3.2	$\text{nV}/\sqrt{\text{Hz}}$
INPUT NOISE CURRENT DENSITY	i_n	$f_o = 10\text{ Hz}$	1.7	1.7	1.7	$\text{pA}/\sqrt{\text{Hz}}$
	i_n	$f_o = 30\text{ Hz}$	1.0	1.0	1.0	$\text{pA}/\sqrt{\text{Hz}}$
	i_n	$f_o = 1000\text{ Hz}$	0.4	0.4	0.4	$\text{pA}/\sqrt{\text{Hz}}$
INPUT NOISE VOLTAGE SLEW RATE	e_{np-p}	0.1 Hz to 10 Hz	0.08	0.08	0.09	$\mu\text{V p-p}$
	SR	$R_L \geq 2\text{ k}\Omega$	2.8	2.8	2.8	$\text{V}/\mu\text{s}$
GAIN BANDWIDTH PRODUCT	GBW		8	8	8	MHz

NOTE

*Input offset voltage measurements are performed by automated test equipment approximately 0.5 seconds after application of power.

(Continued from page 1)

PSRR and CMRR exceed 120 dB. These characteristics, coupled with long-term drift of 0.2 $\mu\text{V}/\text{month}$, allow the circuit designer to achieve performance levels previously attained only by discrete designs.

Low-cost, high-volume production of OP27 is achieved by using an on-chip Zener zap-trimming network. This reliable and stable offset trimming scheme has proved its effectiveness over many years of production history.

The OP27 provides excellent performance in low-noise, high-accuracy amplification of low-level signals. Applications include stable integrators, precision summing amplifiers, precision voltage-threshold detectors, comparators, and professional audio circuits such as tape-head and microphone preamplifiers.

The OP27 is a direct replacement for 725, OP06, OP07, and OP45 amplifiers; 741 types may be directly replaced by removing the 741's nulling potentiometer.

ABSOLUTE MAXIMUM RATINGS⁴

Supply Voltage	$\pm 22\text{ V}$
Input Voltage ¹	$\pm 22\text{ V}$
Output Short-Circuit Duration	Indefinite
Differential Input Voltage ²	$\pm 0.7\text{ V}$
Differential Input Current ²	$\pm 25\text{ mA}$
Storage Temperature Range	-65°C to $+150^{\circ}\text{C}$
Operating Temperature Range	
OP27A, OP27C (J, Z)	-55°C to $+125^{\circ}\text{C}$
OP27E, OP27F (J, Z)	-25°C to $+85^{\circ}\text{C}$
OP27E, OP27F (P)	0°C to 70°C
OP27G (P, S, J, Z)	-40°C to $+85^{\circ}\text{C}$
Lead Temperature Range (Soldering, 60 sec)	300°C
Junction Temperature	-65°C to $+150^{\circ}\text{C}$

Package Type	θ_{JA} ³	θ_{JC}	Unit
TO 99 (J)	150	18	$^{\circ}\text{C}/\text{W}$
8-Lead Hermetic DIP (Z)	148	16	$^{\circ}\text{C}/\text{W}$
8-Lead Plastic DIP (P)	103	43	$^{\circ}\text{C}/\text{W}$
20-Contact LCC (RC)	98	38	$^{\circ}\text{C}/\text{W}$
8-Lead SO (S)	158	43	$^{\circ}\text{C}/\text{W}$

NOTES

¹For supply voltages less than $\pm 22\text{ V}$, the absolute maximum input voltage is equal to the supply voltage.

²The OP27's inputs are protected by back-to-back diodes. Current limiting resistors are not used in order to achieve low noise. If differential input voltage exceeds $\pm 0.7\text{ V}$, the input current should be limited to 25 mA.

³ θ_{JA} is specified for worst-case mounting conditions, i.e., θ_{JA} is specified for device in socket for TO, Cerdip, and P-DIP packages; θ_{JA} is specified for device soldered to printed circuit board for SO package.

⁴Absolute Maximum Ratings apply to both DICE and packaged parts, unless otherwise noted.

ORDERING INFORMATION¹

$T_A = 25^{\circ}\text{C}$ $V_{OS\text{ Max}}$ (μV)	Package			Operating Temperature Range
	TO-99	CERDIP 8-Lead	Plastic 8-Lead	
25	OP27AJ ^{2,3}	OP27AZ ²		MIL
25	OP27EJ ^{2,3}	OP27EZ	OP27EP	IND/COM
60			OP27FP ³	IND/COM
100		OP27CZ ³		MIL
100	OP27GJ	OP27GZ	OP27GP	XIND
100			OP27GS ⁴	XIND

NOTES

¹Burn-in is available on commercial and industrial temperature range parts in CERDIP, plastic DIP, and TO-can packages.

²For devices processed in total compliance to MIL-STD-883, add /883 after part number. Consult factory for 883 data sheet.

³Not for new design; obsolete April 2002.

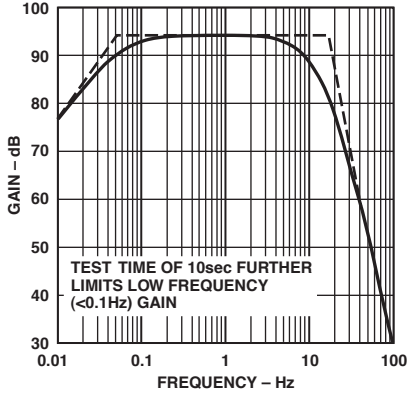
⁴For availability and burn-in information on SO and PLCC packages, contact your local sales office.

CAUTION

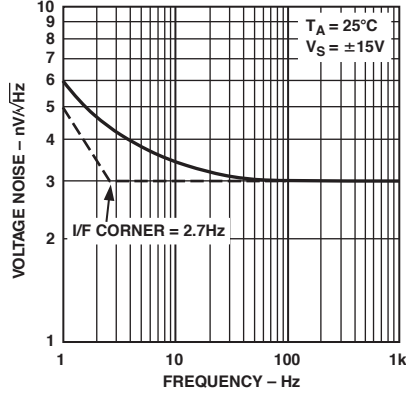
ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the OP27 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high-energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.



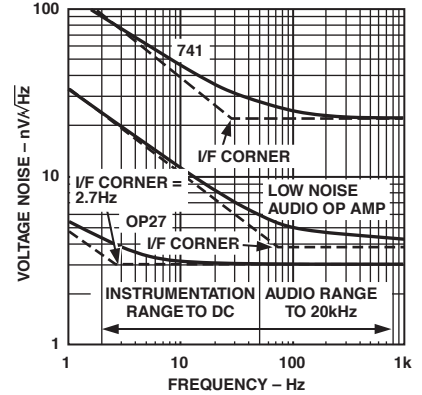
OP27—Typical Performance Characteristics



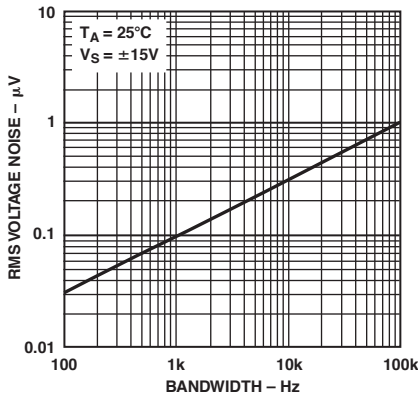
TPC 1. 0.1 Hz to 10 Hz_{p-p} Noise Tester Frequency Response



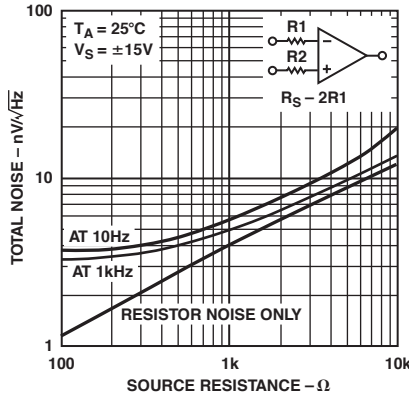
TPC 2. Voltage Noise Density vs. Frequency



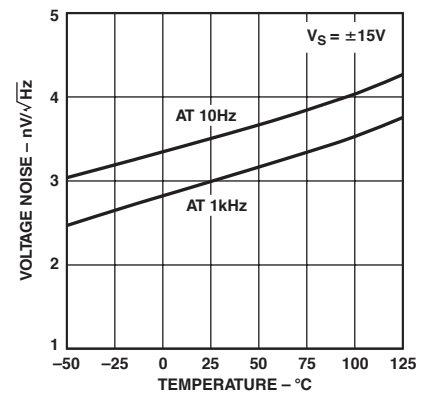
TPC 3. A Comparison of Op Amp Voltage Noise Spectra



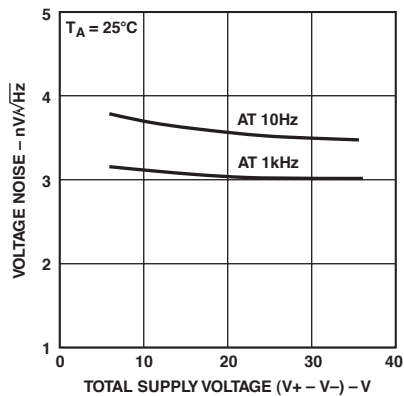
TPC 4. Input Wideband Voltage Noise vs. Bandwidth (0.1 Hz to Frequency Indicated)



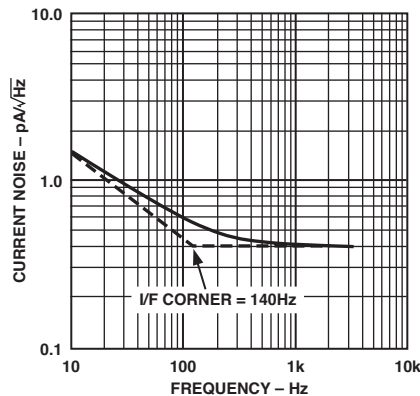
TPC 5. Total Noise vs. Sourced Resistance



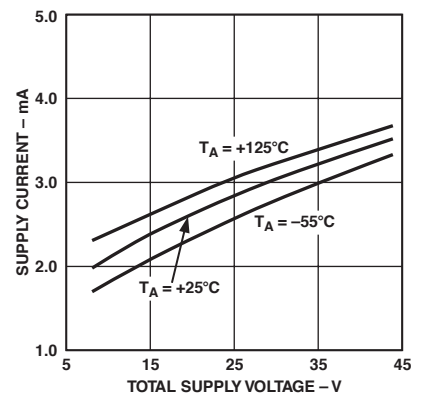
TPC 6. Voltage Noise Density vs. Temperature



TPC 7. Voltage Noise Density vs. Supply Voltage



TPC 8. Current Noise Density vs. Frequency



TPC 9. Supply Current vs. Supply Voltage