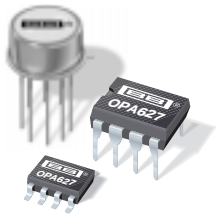
BURR - BROWN®



OPA627
OPA637

Precision High-Speed *Difet*® OPERATIONAL AMPLIFIERS

FEATURES

- VERY LOW NOISE: 4.5nV/√Hz at 10kHz
- FAST SETTLING TIME:
  OPA627—550ns to 0.01%
  OPA637—450ns to 0.01%
- LOW V_{OS}: 100μV max
- LOW DRIFT: 0.8μV/°C max
- LOW I_B: 5pA max
- OPA627: Unity-Gain Stable
- OPA637: Stable in Gain ≥ 5

APPLICATIONS

- PRECISION INSTRUMENTATION
- FAST DATA ACQUISITION
- DAC OUTPUT AMPLIFIER
- OPTOELECTRONICS
- SONAR, ULTRASOUND
- HIGH-IMPEDANCE SENSOR AMPS
- HIGH-PERFORMANCE AUDIO CIRCUITRY
- ACTIVE FILTERS

DESCRIPTION

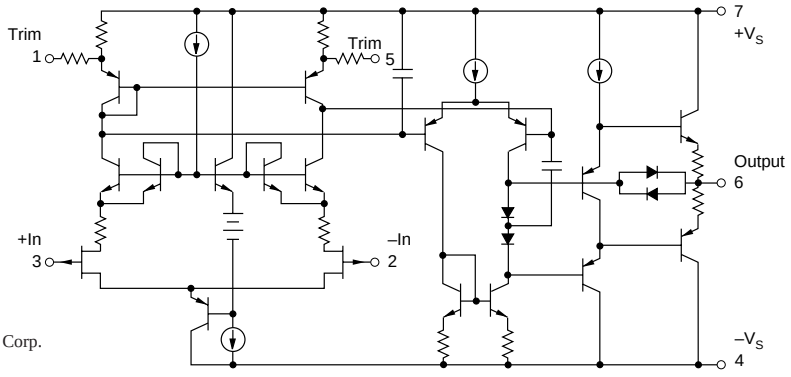
The OPA627 and OPA637 ***Difet*** operational amplifiers provide a new level of performance in a precision FET op amp. When compared to the popular OPA111 op amp, the OPA627/637 has lower noise, lower offset voltage, and much higher speed. It is useful in a broad range of precision and high speed analog circuitry.

The OPA627/637 is fabricated on a high-speed, dielectrically-isolated complementary NPN/PNP process. It operates over a wide range of power supply voltage—±4.5V to ±18V. Laser-trimmed ***Difet*** input circuitry provides high accuracy and low-noise performance comparable with the best bipolar-input op amps.

High frequency complementary transistors allow increased circuit bandwidth, attaining dynamic performance not possible with previous precision FET op amps. The OPA627 is unity-gain stable. The OPA637 is stable in gains equal to or greater than five.

Difet fabrication achieves extremely low input bias currents without compromising input voltage noise performance. Low input bias current is maintained over a wide input common-mode voltage range with unique cascode circuitry.

The OPA627/637 is available in plastic DIP, SOIC and metal TO-99 packages. Industrial and military temperature range models are available.



Difet®, Burr-Brown Corp.

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SBOS165

SPECIFICATIONS

ELECTRICAL

At T_A = +25°C, and V_S = ±15V, unless otherwise noted.

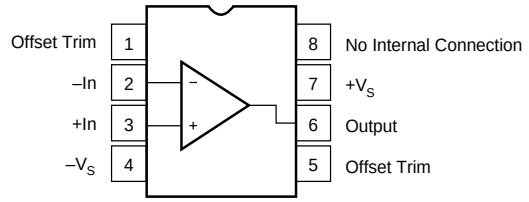
PARAMETER	CONDITIONS	OPA627BM, BP, SM OPA637BM, BP, SM MIN	TYP	MAX	OPA627AM, AP, AU OPA637AM, AP, AU MIN	TYP	MAX	UNITS
OFFSET VOLTAGE [1]								
Input Offset Voltage			40	100		130	250	µV
AP, BP, AU Grades			100	250		280	500	µV
Average Drift			0.4	0.8		1.2	2	µV/°C
AP, BP, AU Grades			0.8	2		2.5		µV/°C
Power Supply Rejection	V_S = ±4.5 to ±18V	106	120		100	116		dB
INPUT BIAS CURRENT [2]								
Input Bias Current	V_{CM} = 0V		1	5		2	10	pA
Over Specified Temperature	V_{CM} = 0V			1			2	nA
SM Grade	V_{CM} = 0V			50				nA
Over Common-Mode Voltage	V_{CM} = ±10V		1			2		pA
Input Offset Current	V_{CM} = 0V		0.5	5		1	10	pA
Over Specified Temperature	V_{CM} = 0V			1			2	nA
SM Grade				50				nA
NOISE								
Input Voltage Noise								
Noise Density: f = 10Hz			15	40		20		nV/√Hz
f = 100Hz			8	20		10		nV/√Hz
f = 1kHz			5.2	8		5.6		nV/√Hz
f = 10kHz			4.5	6		4.8		nV/√Hz
Voltage Noise, BW = 0.1Hz to 10Hz			0.6	1.6		0.8		µVp-p
Input Bias Current Noise								
Noise Density, f = 100Hz			1.6	2.5		2.5		fA/√Hz
Current Noise, BW = 0.1Hz to 10Hz			30	60		48		fAp-p
INPUT IMPEDANCE								
Differential			10^{13} || 8			*		Ω || pF
Common-Mode			10^{13} || 7			*		Ω || pF
INPUT VOLTAGE RANGE								
Common-Mode Input Range		±11	±11.5		*	*		V
Over Specified Temperature		±10.5	±11		*	*		V
Common-Mode Rejection	V_{CM} = ±10.5V	106	116		100	110		dB
OPEN-LOOP GAIN								
Open-Loop Voltage Gain	V_O = ±10V, R_L = 1kΩ	112	120		106	116		dB
Over Specified Temperature	V_O = ±10V, R_L = 1kΩ	106	117		100	110		dB
SM Grade	V_O = ±10V, R_L = 1kΩ	100	114					dB
FREQUENCY RESPONSE								
Slew Rate: OPA627	G = –1, 10V Step	40	55		*	*		V/µs
OPA637	G = –4, 10V Step	100	135		*	*		V/µs
Settling Time: OPA627 0.01%	G = –1, 10V Step		550			*		ns
0.1%	G = –1, 10V Step		450			*		ns
OPA637 0.01%	G = –4, 10V Step		450			*		ns
0.1%	G = –4, 10V Step		300			*		ns
Gain-Bandwidth Product: OPA627	G = 1		16			*		MHz
OPA637	G = 10		80			*		MHz
Total Harmonic Distortion + Noise	G = +1, f = 1kHz		0.00003			*		%
POWER SUPPLY								
Specified Operating Voltage			±15			*		V
Operating Voltage Range		±4.5		±18	*		*	V
Current			±7	±7.5		*	*	mA
OUTPUT								
Voltage Output	R_L = 1kΩ	±11.5	±12.3		*	*		
Over Specified Temperature		±11	±11.5		*	*		V
Current Output	V_O = ±10V		±45			*		mA
Short-Circuit Current		±35	+70/–55	±100	*	*	*	mA
Output Impedance, Open-Loop	1MHz		55			*		Ω
TEMPERATURE RANGE								
Specification: AP, BP, AM, BM, AU		–25		+85	*		*	°C
SM		–55		+125				°C
Storage: AM, BM, SM		–60		+150	*		*	°C
AP, BP, AU		–40		+125	*		*	°C
θ_{J-A}: AM, BM, SM			200			*		°C/W
AP, BP			100			*		°C/W
AU			160					°C/W

* Specifications same as "B" grade.

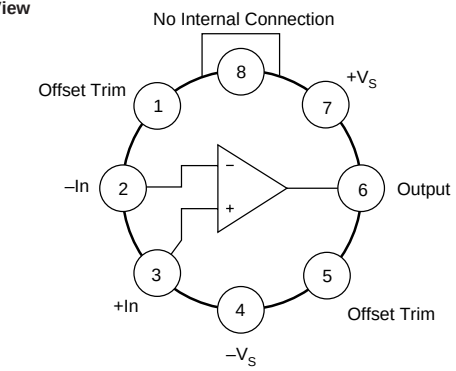
NOTES: (1) Offset voltage measured fully warmed-up. (2) High-speed test at T_J = +25°C. See Typical Performance Curves for warmed-up performance.

PIN CONFIGURATIONS

Top View **DIP/SOIC**



Top View **TO-99**



Case connected to $-V_S$.

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.

ABSOLUTE MAXIMUM RATINGS(1)

Supply Voltage	±18V
Input Voltage Range	$+V_S$ + 2V to $-V_S$ – 2V
Differential Input Range	Total V_S + 4V
Power Dissipation	1000mW
Operating Temperature	
M Package	–55°C to +125°C
P, U Package	–40°C to +125°C
Storage Temperature	
M Package	–65°C to +150°C
P, U Package	–40°C to +125°C
Junction Temperature	
M Package	+175°C
P, U Package	+150°C
Lead Temperature (soldering, 10s)	+300°C
SOIC (soldering, 3s)	+260°C

NOTE: (1) Stresses above these ratings may cause permanent damage.

PACKAGE/ORDERING INFORMATION

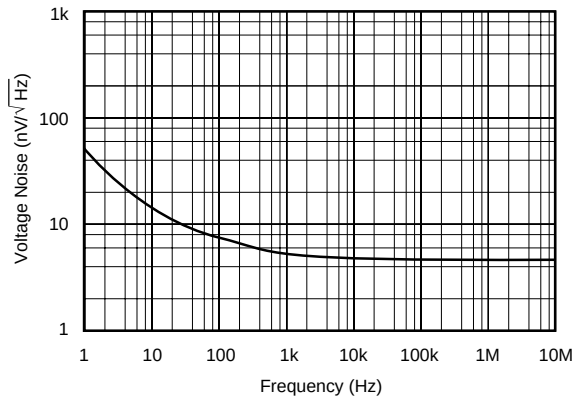
PRODUCT	PACKAGE	PACKAGE DRAWING NUMBER(1)	TEMPERATURE RANGE
OPA627AP	Plastic DIP	006	–25°C to +85°C
OPA627BP	Plastic DIP	006	–25°C to +85°C
OPA627AU	SOIC	182	–25°C to +85°C
OPA627AM	TO-99 Metal	001	–25°C to +85°C
OPA627BM	TO-99 Metal	001	–25°C to +85°C
OPA627SM	TO-99 Metal	001	–55°C to +125°C
OPA637AP	Plastic DIP	006	–25°C to +85°C
OPA637BP	Plastic DIP	006	–25°C to +85°C
OPA637AU	SOIC	182	–25°C to +85°C
OPA637AM	TO-99 Metal	001	–25°C to +85°C
OPA637BM	TO-99 Metal	001	–25°C to +85°C
OPA637SM	TO-99 Metal	001	–55°C to +125°C

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

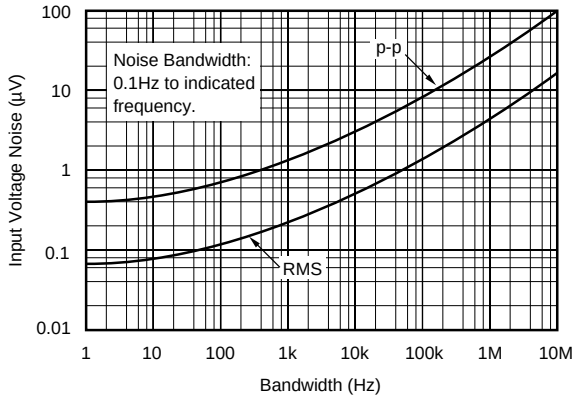
TYPICAL PERFORMANCE CURVES

At T_A = +25°C, and V_S = ±15V, unless otherwise noted.

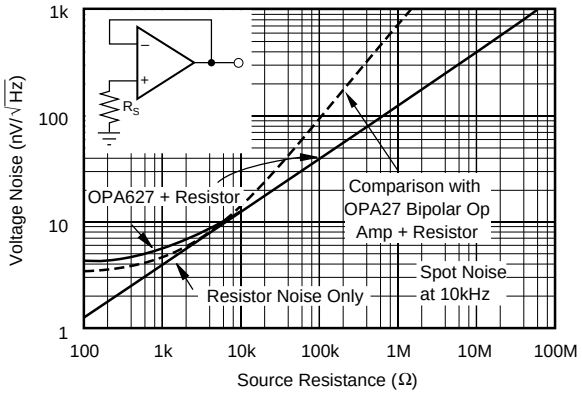
INPUT VOLTAGE NOISE SPECTRAL DENSITY



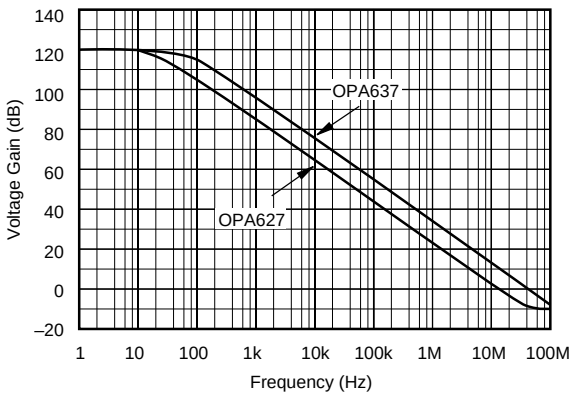
TOTAL INPUT VOLTAGE NOISE vs BANDWIDTH



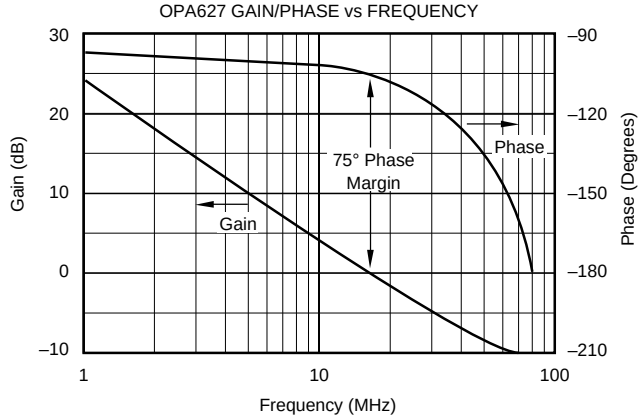
VOLTAGE NOISE vs SOURCE RESISTANCE



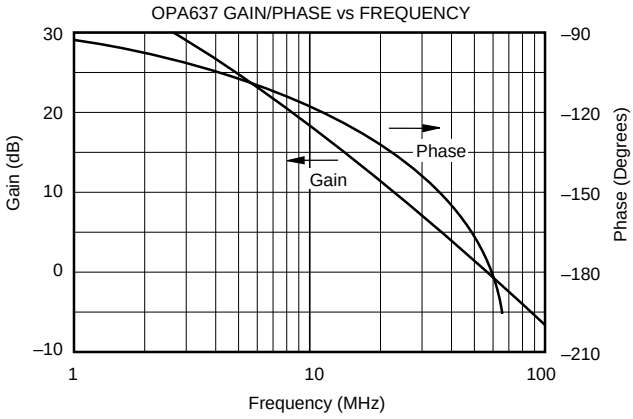
OPEN-LOOP GAIN vs FREQUENCY



OPA627 GAIN/PHASE vs FREQUENCY



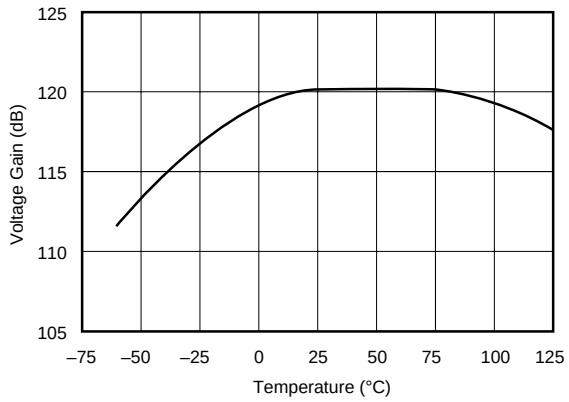
OPA637 GAIN/PHASE vs FREQUENCY



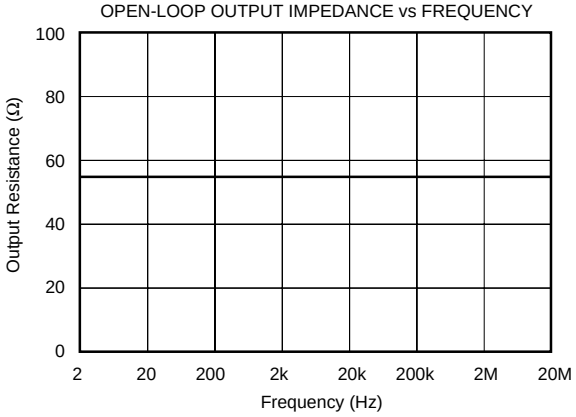
TYPICAL PERFORMANCE CURVES (CONT)

At T_A = +25°C, and V_S = ±15V, unless otherwise noted.

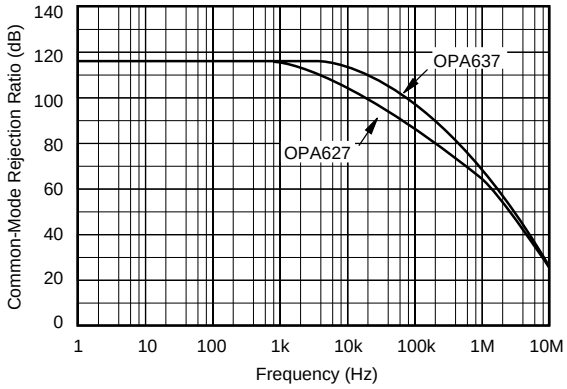
OPEN-LOOP GAIN vs TEMPERATURE



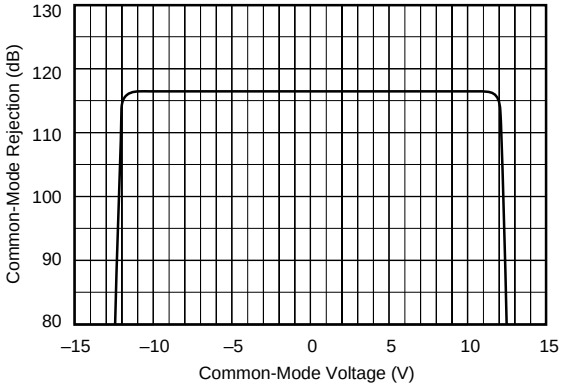
OPEN-LOOP OUTPUT IMPEDANCE vs FREQUENCY



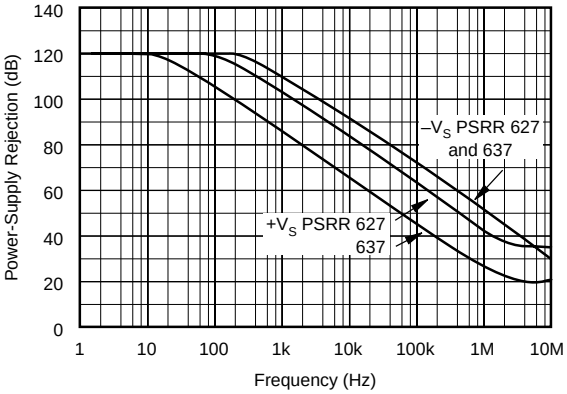
COMMON-MODE REJECTION vs FREQUENCY



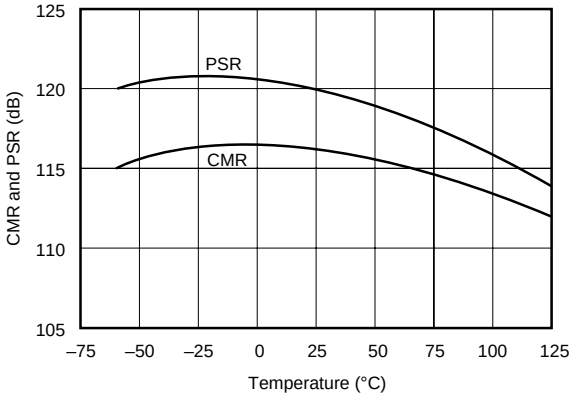
COMMON-MODE REJECTION vs
INPUT COMMON MODE VOLTAGE



POWER-SUPPLY REJECTION vs FREQUENCY



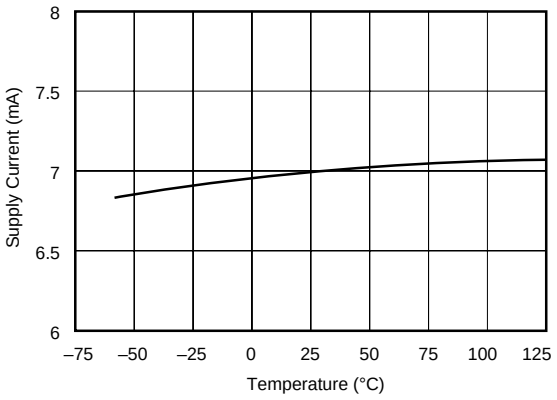
POWER-SUPPLY REJECTION AND COMMON-MODE
REJECTION vs TEMPERATURE



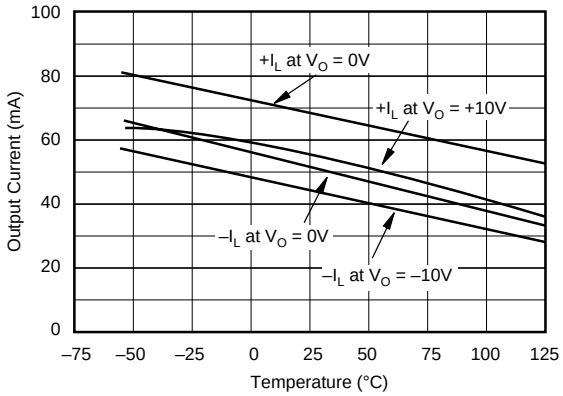
TYPICAL PERFORMANCE CURVES (CONT)

At T_A = +25°C, and V_S = ±15V, unless otherwise noted.

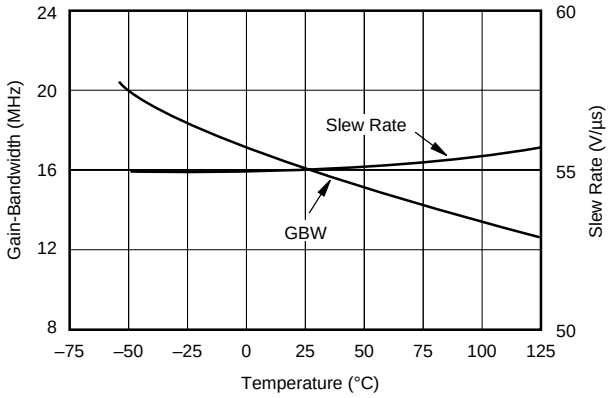
SUPPLY CURRENT vs TEMPERATURE



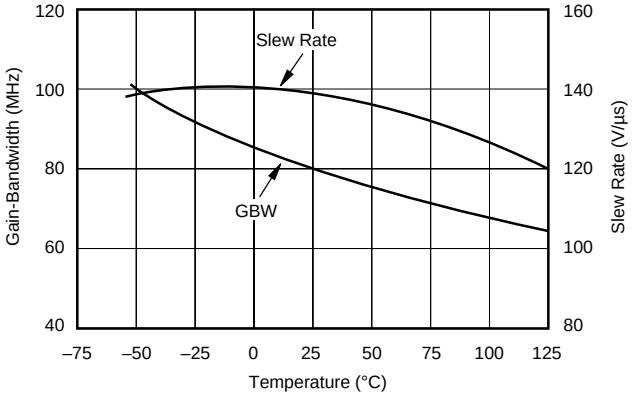
OUTPUT CURRENT LIMIT vs TEMPERATURE



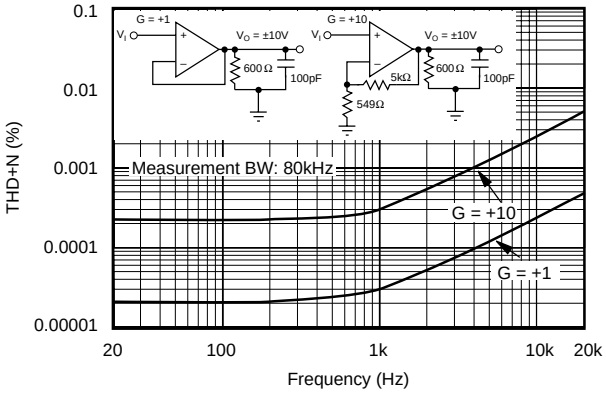
OPA627 GAIN-BANDWIDTH AND SLEW RATE vs TEMPERATURE



OPA637 GAIN-BANDWIDTH AND SLEW RATE vs TEMPERATURE



OPA627 TOTAL HARMONIC DISTORTION + NOISE vs FREQUENCY



OPA637 TOTAL HARMONIC DISTORTION + NOISE vs FREQUENCY