absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC+} (see Note 1) . . . . 22 V
Supply voltage, V_{CC-} (see Note 1) . . . . – 22 V
Input voltage, V_I . . . . $V_{CC\pm}$
Duration of output short circuit . . . . unlimited
Differential input current (see Note 2) . . . . ±25 mA
Continuous power dissipation . . . . See Dissipation Rating Table
Operating free-air temperature range: OP27A, OP27C, OP37A, OP37C . . . . – 55°C to 125°C
OP27E, OP27G, OP37E, OP37G . . . . – 25°C to 85°C
Storage temperature range . . . . – 65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: JG or FK package . . . . 300°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds : P package . . . . 260°C

NOTES: 1. All voltage values are with respect to the midpoint between V_{CC+} and V_{CC-} unless otherwise noted.
2. The inputs are protected by back-to-back diodes. Current-limiting resistors are not used in order to achieve low noise. Excessive input current will flow if a differential input voltage in excess of approximately ± 0.7 V is applied between the inputs unless some limiting resistance is used.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 85°C$ POWER RATING	$T_A = 125°C$ POWER RATING
JG	1050 mW	8.4 mW/°C	546 mW	210 mW
FK	1375 mW	11.0 mW/°C	715 mW	275 mW
P	1000 mW	8.0 mW/°C	520 mW	N/A

recommended operating conditions

		OP27A, OP37A			OP27C, OP37C			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC+}		4	15	22	4	15	22	V
Supply voltage, V_{CC-}		–4	–15	–22	–4	–15	–22	V
Common-mode input voltage, V_{IC}	$V_{CC\pm} = \pm 15$ V, $T_A = 25°C$	± 11			±11			V
	$V_{CC\pm} = \pm 15$ V, $T_A = –55°C$ to 125°C	±10.3			±10.2			
Operating free-air temperature, T_A		–55		125	–55		125	°C

electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm 15$ V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A †	OP27A, OP37A			OP27C, OP37C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	$V_O = 0$, $V_{IC} = 0$, $R_S = 50\ \Omega$, See Note 3	25°C		10	25		30	100	µV
			Full range			60			300	
α_{VIO}	Average temperature coefficient of input offset voltage		Full range		0.2	0.6		0.4	1.8	µV/°C
	Long-term drift of input offset voltage	See Note 4			0.2	1		0.4	2	µV/mo
I_{IO}	Input offset current	$V_O = 0$, $V_{IC} = 0$	25°C		7	35		12	75	nA
			Full range			50			135	
I_{IB}	Input bias current	$V_O = 0$, $V_{IC} = 0$	25°C		±10	±40		±15	±80	nA
			Full range			±60			±150	
V_{ICR}	Common-mode input voltage range		25°C	11 to –11			11 to –11			V
			Full range	10.3 to –10.3			10.5 to –10.5			
V_{OM}	Peak output voltage swing	$R_L \geq 2\ k\Omega$		±12	±13.8		±11.5	±13.5		V
		$R_L \geq 0.6\ k\Omega$		±10	±11.5		±10	±11.5		
		$R_L \geq 2\ k\Omega$	Full range	±11.5			10.5			
A_{VD}	Large-signal differential voltage amplification	$R_L \geq 2\ k\Omega$, $V_O = \pm 10$ V		1000	1800		700	1500		V/mV
		$R_L \geq 1\ k\Omega$, $V_O = \pm 10$ V		800	1500			1500		
		$R_L \geq 0.6\ k\Omega$, $V_O = \pm 1$ V, $V_{CC\pm} = \pm 4$ V		250	700		200	500		
		$R_L \geq 2\ k\Omega$, $V_O = \pm 10$ V	Full range	600			300			
$r_{i(CM)}$	Common-mode input resistance				3			2		GΩ
r_o	Output resistance	$V_O = 0$, $I_O = 0$	25°C		70			70		Ω
CMRR	Common-mode rejection ratio	$V_{IC} = \pm 11$ V	25°C	114	126		100	120		dB
		$V_{IC} = \pm 10$ V	Full range	110			94			
k_{SVR}	Supply voltage rejection ratio	$V_{CC\pm} = \pm 4$ V to ±18 V	25°C	100	120		94	118		dB
		$V_{CC\pm} = \pm 4.5$ V to ±18 V	Full range	96			86			

† Full range is – 55°C to 125°C.

NOTES: 3. Input offset voltage measurements are performed by automatic test equipment approximately 0.5 seconds after applying power.
4. Long-term drift of input offset voltage refers to the average trend line of offset voltage versus time over extended periods after the first 30 days of operation. Excluding the initial hour of operation, changes in V_{IO} during the first 30 days are typically 2.5 µV (see Figure 3).

recommended operating conditions

		MIN	NOM	MAX	UNIT
Supply voltage, V_{CC+}		4	15	22	V
Supply voltage, V_{CC-}		–4	–15	–22	V
Common-mode input voltage, V_{IC}	$V_{CC\pm} = \pm15$ V, $T_A = 25°C$	±11			V
	$V_{CC\pm} = \pm15$ V, $T_A = -55°C$ to 125°C	±10.5			
Operating free-air temperature, T_A		–25		85	°C

electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm15$ V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	OP27E, OP37E			OP27G, OP37G			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	$V_O = 0$, $V_{IC} = 0$, $R_S = 50\ \Omega$, See Note 3	25°C		10	25		30	100	µV
			Full range			60			220	
αV_{IO}	Average temperature coefficient of input offset voltage		Full range		0.2	0.6		0.4	1.8	µV/°C
	Long-term drift of input offset voltage	See Note 4			0.2	1		0.4	2	µV/mo
I_{IO}	Input offset current	$V_O = 0$, $V_{IC} = 0$	25°C		7	35		12	75	nA
			Full range			50			135	
I_{IB}	Input bias current	$V_O = 0$, $V_{IC} = 0$	25°C		±10	±40		±15	±80	nA
			Full range			±60			±150	
V_{ICR}	Common-mode input voltage range		25°C	11 to –11			11 to –11			V
			Full range	10.3 to –10.3			10.5 to –10.5			
V_{OM}	Peak output voltage swing	$R_L \geq 2\ k\Omega$		±12	±13.8		±11.5	±13.5		V
		$R_L \geq 0.6\ k\Omega$		±10	±11.5		±10	±11.5		
		$R_L \geq 2\ k\Omega$	Full range	±11.5			10.5			
A_{VD}	Large-signal differential voltage amplification	$R_L \geq 2\ k\Omega$, $V_O = \pm10$ V		1000	1800		700	1500		V/mV
		$R_L \geq 1\ k\Omega$, $V_O = \pm10$ V		800	1500			1500		
		$R_L \geq 0.6\ k\Omega$, $V_O = \pm1$ V, $V_{CC\pm} = \pm 4$ V		250	700		200	500		
		$R_L \geq 2\ k\Omega$, $V_O = \pm 10$ V	Full range	600			450			
$r_{i(CM)}$	Common-mode input resistance				3			2		GΩ
r_o	Output resistance	$V_O = 0$, $I_O = 0$	25°C		70			70		Ω
CMRR	Common-mode rejection ratio	$V_{IC} = \pm11$ V	25°C	114	126		100	120		dB
		$V_{IC} = \pm10$ V	Full range	110			96			
k_{SVR}	Supply voltage rejection ratio	$V_{CC\pm} = \pm 4$ V to ±18 V	25°C	100	120		94	118		dB
		$V_{CC\pm} = \pm 4.5$ V to ±18 V	Full range	96			90			

† Full range is – 25°C to 85°C.

NOTES: 3. Input offset voltage measurements are performed by automatic test equipment approximately 0.5 seconds after applying power.

4. Long-term drift of input offset voltage refers to the average trend line of offset voltage versus time over extended periods after the first 30 days of operation. Excluding the initial hour of operation, changes in V_{IO} during the first 30 days are typically 2.5 µV (see Figure 3).

OP27 operating characteristics over operating free-air temperature range, $V_{CC\pm} = \pm15$ V

PARAMETER		TEST CONDITIONS		OP27A, OP27E			OP27C, OP27G			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew rate	$A_{VD} \geq 1$,	$R_L \geq 2$ kΩ	1.7	2.8		1.7	2.8		V/µs
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10 Hz, See Figure 34	$R_S = 20$ Ω,		0.08	0.18		0.09	0.25	µV
V_n	Equivalent input noise voltage	f = 10 Hz,	$R_S = 20$ Ω		3.5	5.5		3.8	8	nV/√Hz
		f = 30 Hz,	$R_S = 20$ Ω		3.1	4.5		3.3	5.6	
		f = 1 kHz,	$R_S = 20$ Ω		3	3.8		3.2	4.5	
I_n	Equivalent input noise current	f = 10 Hz,	See Figure 35		1.5	4		1.5		pA/√Hz
		f = 30 Hz,	See Figure 35		1	2.3		1		
		f = 1 kHz,	See Figure 35		0.4	0.6		0.4	0.6	
	Gain-bandwidth product	f = 100 kHz		5	8		5	8		MHz

OP37 operating characteristics over operating free-air temperature range, $V_{CC\pm} = \pm15$ V

PARAMETER		TEST CONDITIONS		OP37A, OP37E			OP37C, OP37G			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew rate	$A_{VD} \geq 5$,	$R_L \geq 2$ kΩ	11	17		11	17		V/µs
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10 Hz, See Figure 34	$R_S = 20$ Ω,		0.08	0.18		0.09	0.25	µV
V_n	Equivalent input noise voltage	f = 10 Hz,	$R_S = 20$ Ω		3.5	5.5		3.8	8	nV/√Hz
		f = 30 Hz,	$R_S = 20$ Ω		3.1	4.5		3.3	5.6	
		f = 1 kHz,	$R_S = 20$ Ω		3	3.8		3.2	4.5	
I_n	Equivalent input noise current	f = 10 Hz,	See Figure 35		1.5	4		1.5		pA/√Hz
		f = 30 Hz,	See Figure 35		1	2.3		1		
		f = 1 kHz,	See Figure 35		0.4	0.6		0.4	0.6	
	Gain-bandwidth product	f = 10 kHz		45	63		45	63		MHz
		$A_V \geq 5$,	f = 1 MHz		40			40		

TYPICAL CHARACTERISTICS

Table of Graphs

			FIGURE
V_{IO}	Input offset voltage	vs Temperature	1
ΔV_{IO}	Change in input offset voltage	vs Time after power on vs Time (long-term drift)	2 3
I_{IO}	Input offset current	vs Temperature	4
I_{IB}	Input bias current	vs Temperature	5
V_{ICR}	Common-mode input voltage range	vs Supply voltage	6
V_{OM}	Maximum peak output voltage	vs Load resistance	7
$V_{O(PP)}$	Maximum peak-to-peak output voltage	vs Frequency	8, 9
A_{VD}	Differential voltage amplification	vs Supply voltage vs Load resistance vs Frequency	10 11 12, 13, 14
CMRR	Common-mode rejection ratio	vs Frequency	15
k_{SVR}	Supply voltage rejection ratio	vs Frequency	16
SR	Slew rate	vs Temperature vs Supply voltage vs Load resistance	17 18 19
ϕ_m	Phase margin	vs Temperature	20, 21
ϕ	Phase shift	vs Frequency	12, 13
V_n	Equivalent input noise voltage	vs Bandwidth vs Source resistance vs Supply voltage vs Temperature vs Frequency	22 23 24 25 26
I_n	Equivalent input noise current	vs Frequency	27
	Gain-bandwidth product	vs Temperature	20, 21
I_{OS}	Short-circuit output current	vs Time	28
I_{CC}	Supply current	vs Supply voltage	29
	Pulse response	Small signal Large signal	30, 32 31, 33

TYPICAL CHARACTERISTICS†

INPUT OFFSET VOLTAGE OF REPRESENTATIVE INDIVIDUAL UNITS vs FREE-AIR TEMPERATURE

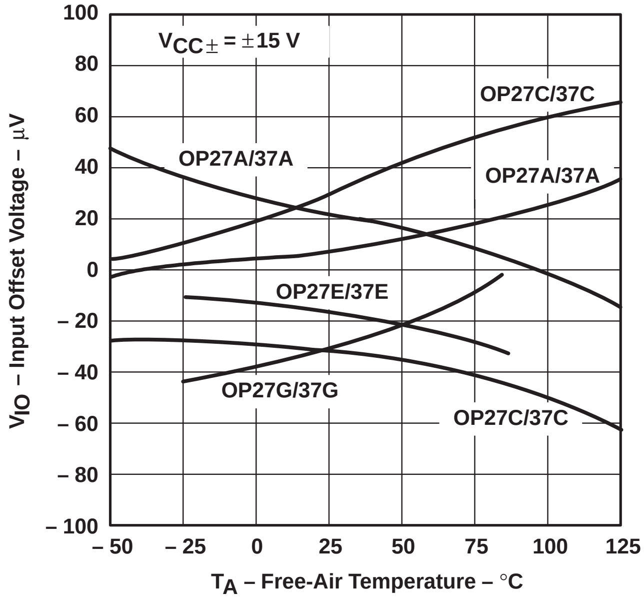

Figure 1

WARM-UP CHANGE IN INPUT OFFSET VOLTAGE vs ELAPSED TIME

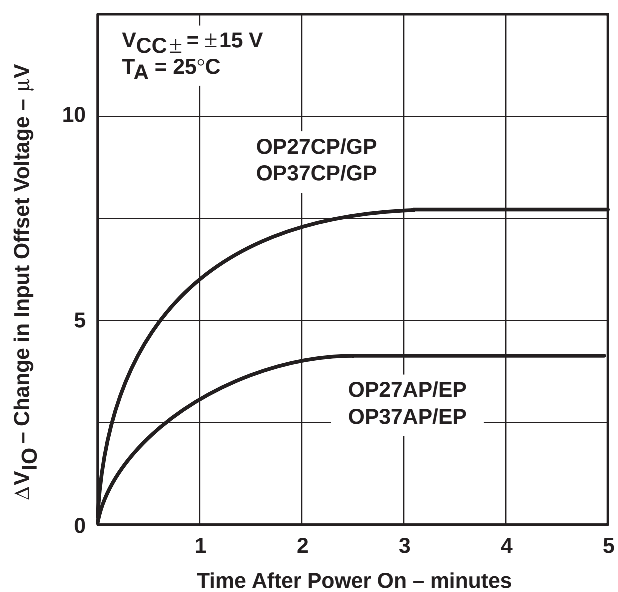

Figure 2

LONG-TERM DRIFT OF INPUT OFFSET VOLTAGE OF REPRESENTATIVE INDIVIDUAL UNITS

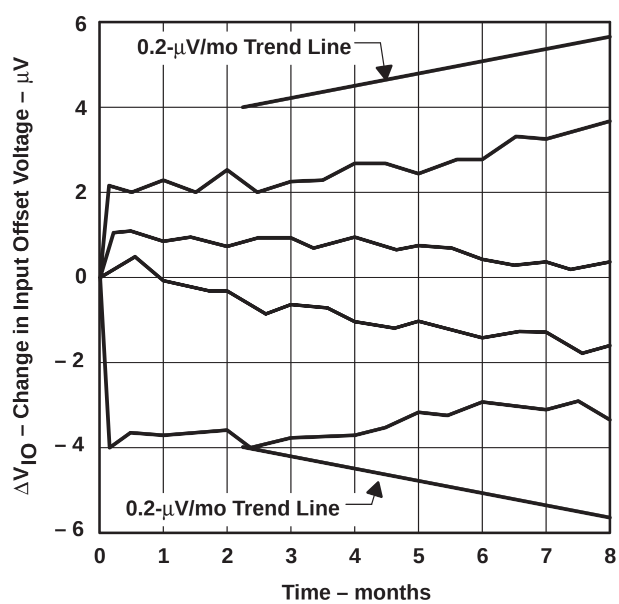

Figure 3

† Data for temperatures below – 25°C and above 85°C are applicable to the OP27A, OP27C, OP37A, and OP37C only.

TYPICAL CHARACTERISTICS†

INPUT OFFSET CURRENT vs FREE-AIR TEMPERATURE

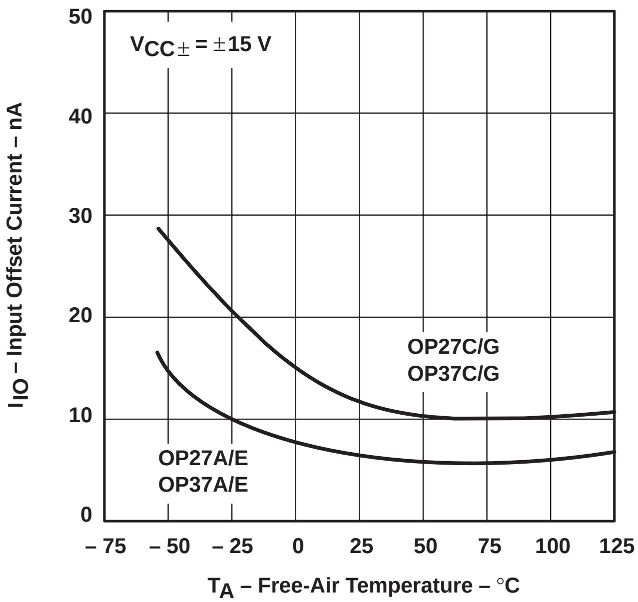

Figure 4

INPUT BIAS CURRENT vs FREE-AIR TEMPERATURE

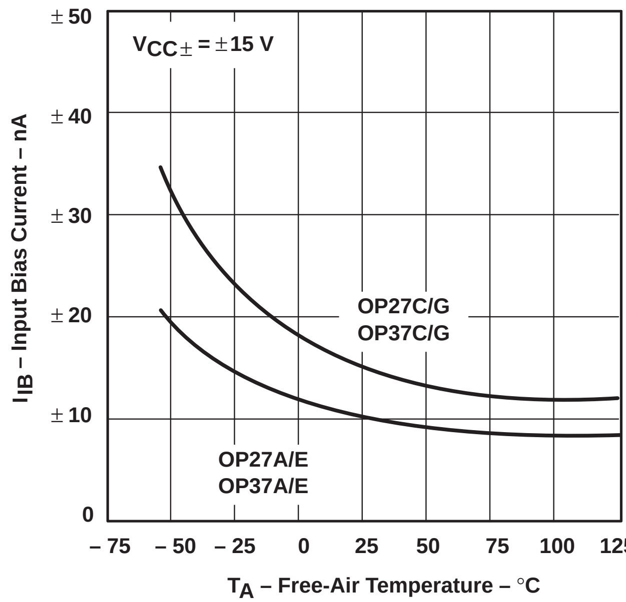

Figure 5

COMMON-MODE INPUT VOLTAGE RANGE LIMITS vs SUPPLY VOLTAGE

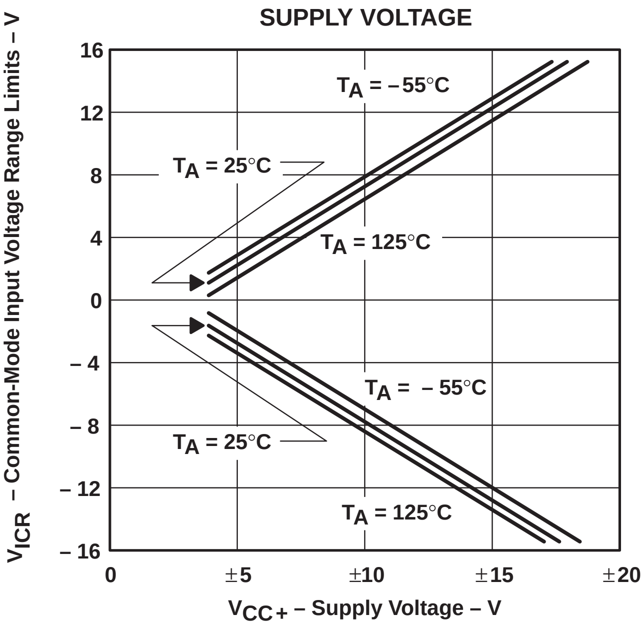

Figure 6

MAXIMUM PEAK OUTPUT VOLTAGE vs LOAD RESISTANCE

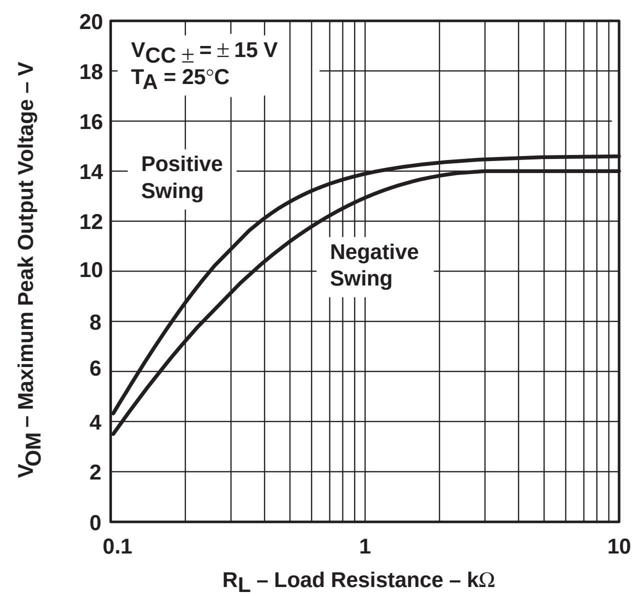

Figure 7

† Data for temperatures below – 25°C and above 85°C are applicable to the OP27A, OP27C, OP37A, and OP37C only.

TYPICAL CHARACTERISTICS

OP27
MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE vs FREQUENCY

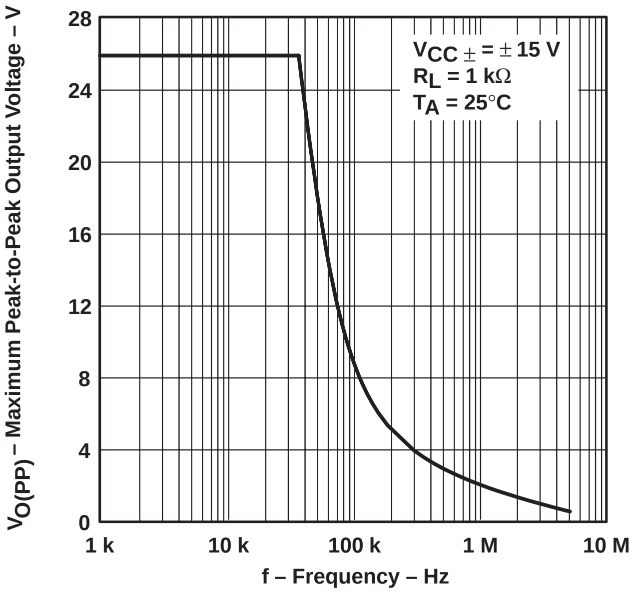

Figure 8

OP37
MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE vs FREQUENCY

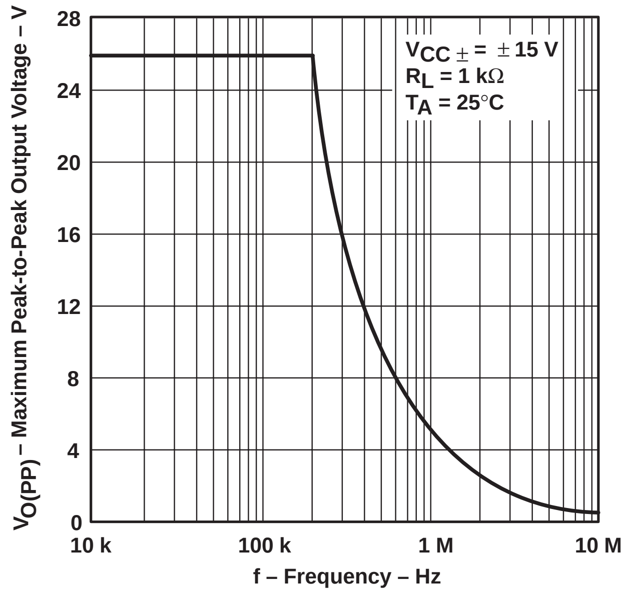

Figure 9

OP27A, OP27E, OP37A, OP37E
LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION vs TOTAL SUPPLY VOLTAGE

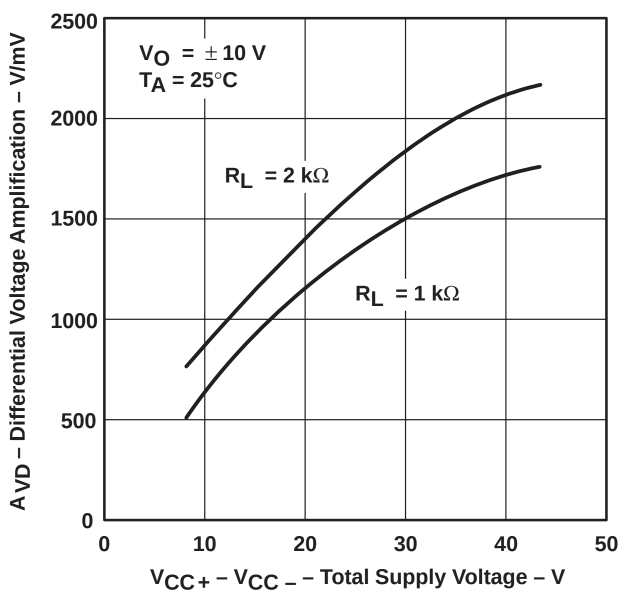

Figure 10

OP27A, OP27E, OP37A, OP37E
LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION vs LOAD RESISTANCE

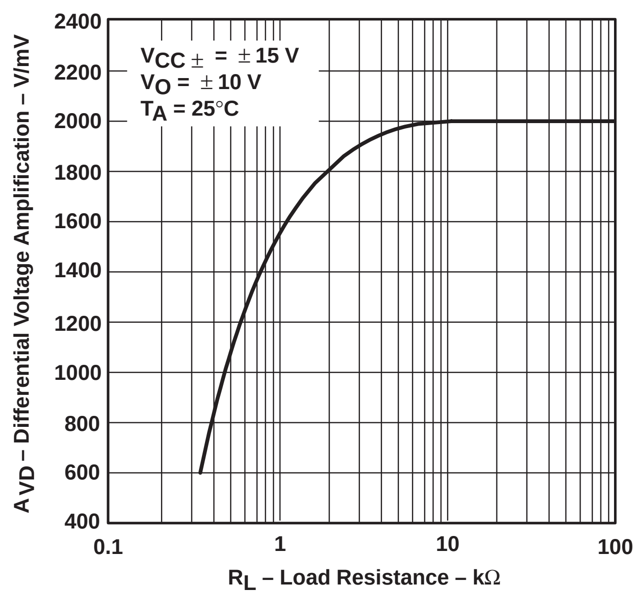

Figure 11

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TYPICAL CHARACTERISTICS

**OP27
LARGE-SIGNAL DIFFERENTIAL
VOLTAGE AMPLIFICATION AND PHASE SHIFT
vs
FREQUENCY**

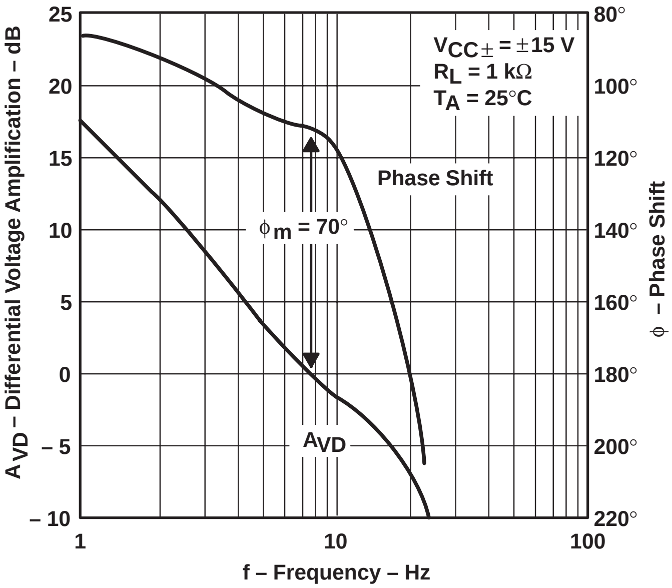

Figure 12

**OP37
LARGE-SIGNAL DIFFERENTIAL
VOLTAGE AMPLIFICATION AND PHASE SHIFT
vs
FREQUENCY**

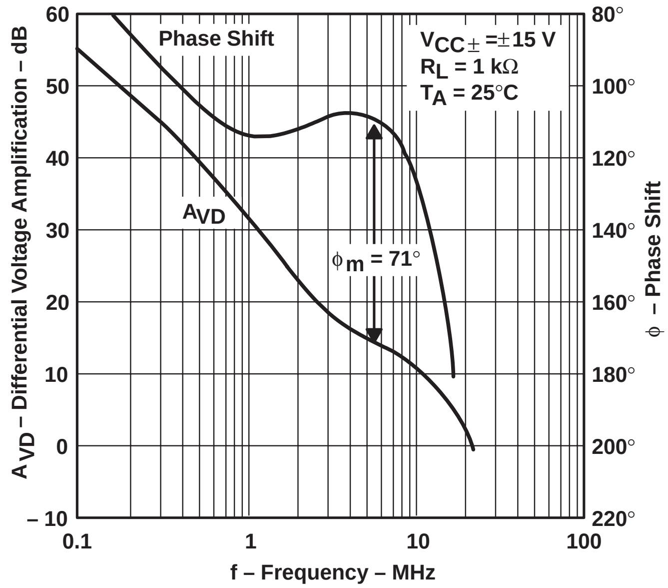

Figure 13

**OP27A, OP27E, OP37A, OP37E
LARGE-SIGNAL
DIFFERENTIAL VOLTAGE AMPLIFICATION
vs
FREQUENCY**

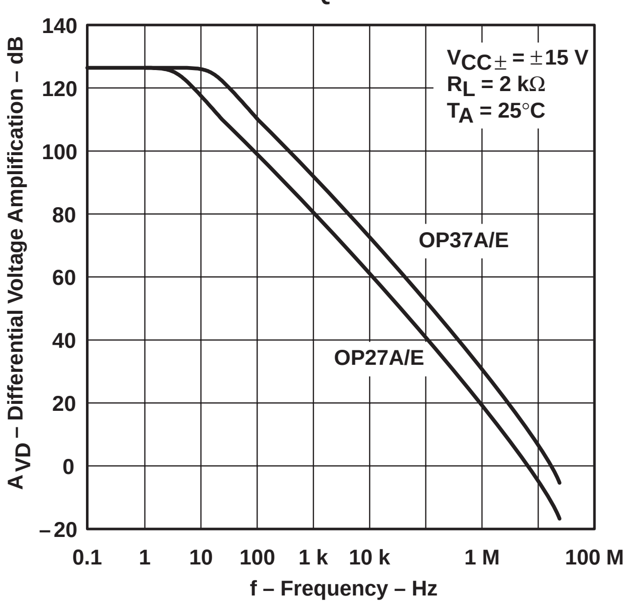

Figure 14

**OP27A, OP27E, OP37A, OP37E
COMMON-MODE REJECTION RATIO
vs
FREQUENCY**

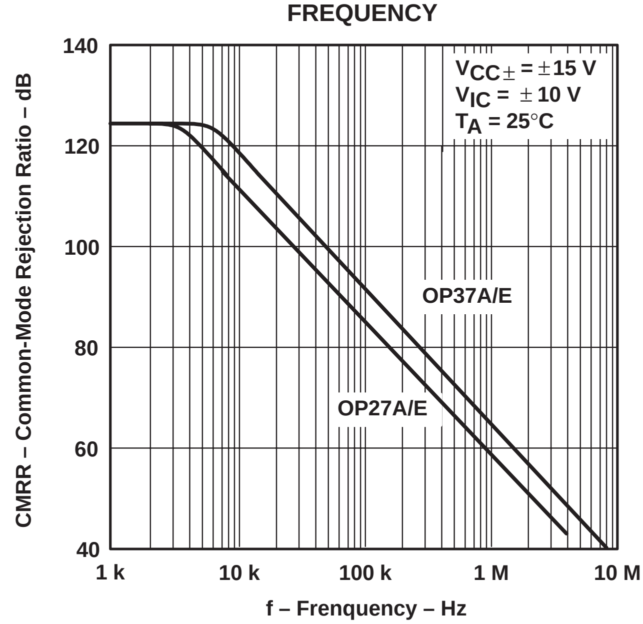

Figure 15

TYPICAL CHARACTERISTICS†

SUPPLY VOLTAGE REJECTION RATIO
vs
FREQUENCY

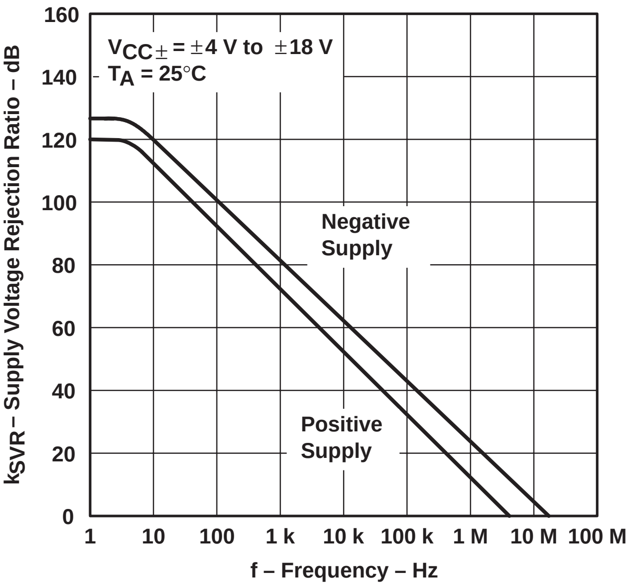

Figure 16

SLEW RATE
vs
FREE-AIR TEMPERATURE

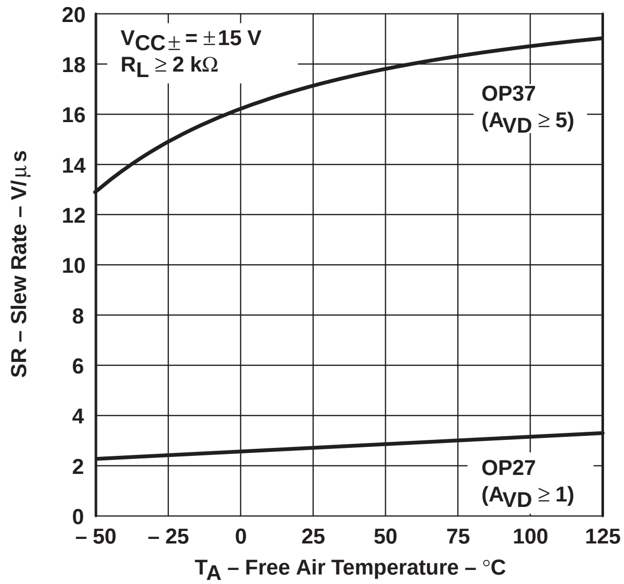

Figure 17

OP37
SLEW RATE
vs
SUPPLY VOLTAGE

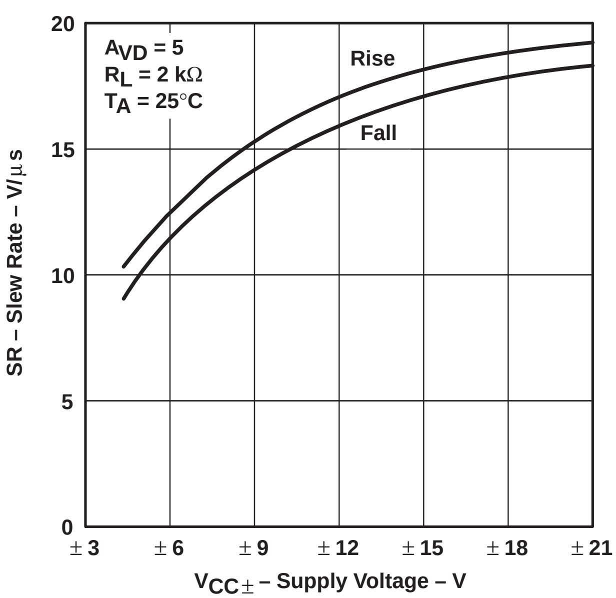

Figure 18

OP37
SLEW RATE
vs
LOAD RESISTANCE

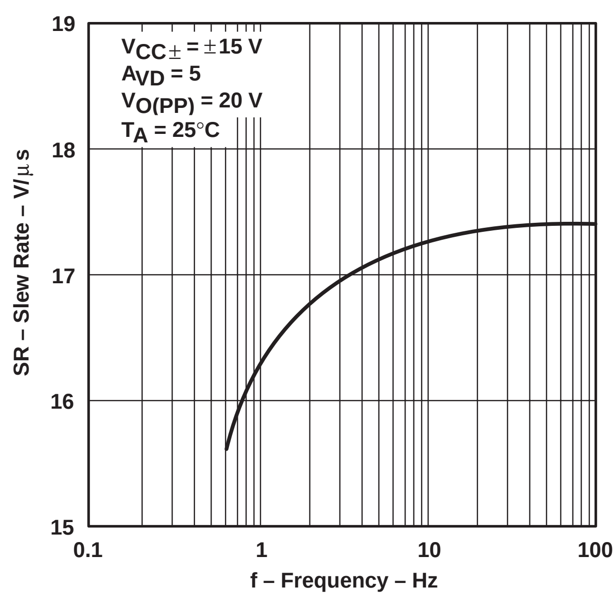

Figure 19

† Data for temperatures below – 25°C and above 85°C are applicable to the OP27A, OP27C, OP37A, and OP37C only.

TYPICAL CHARACTERISTICS†

OP27
PHASE MARGIN AND GAIN-BANDWIDTH PRODUCT vs FREE-AIR TEMPERATURE

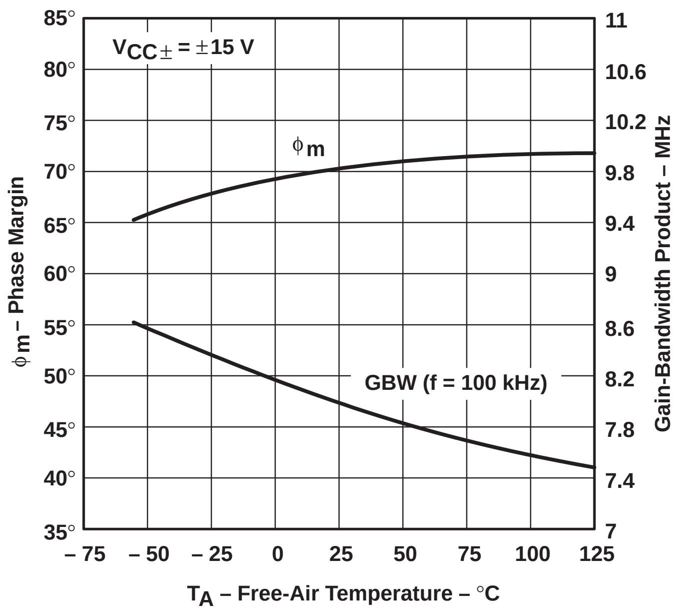

Figure 20

OP37
PHASE MARGIN AND GAIN-BANDWIDTH PRODUCT vs FREE-AIR TEMPERATURE

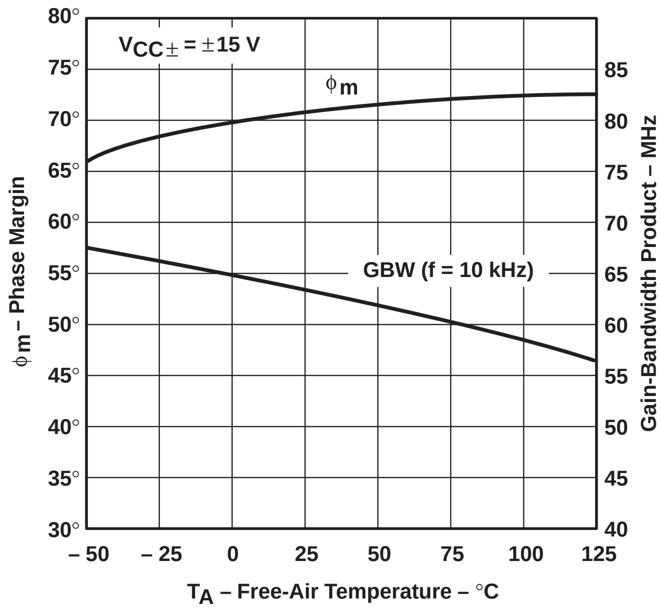

Figure 21

EQUIVALENT INPUT NOISE VOLTAGE vs BANDWIDTH

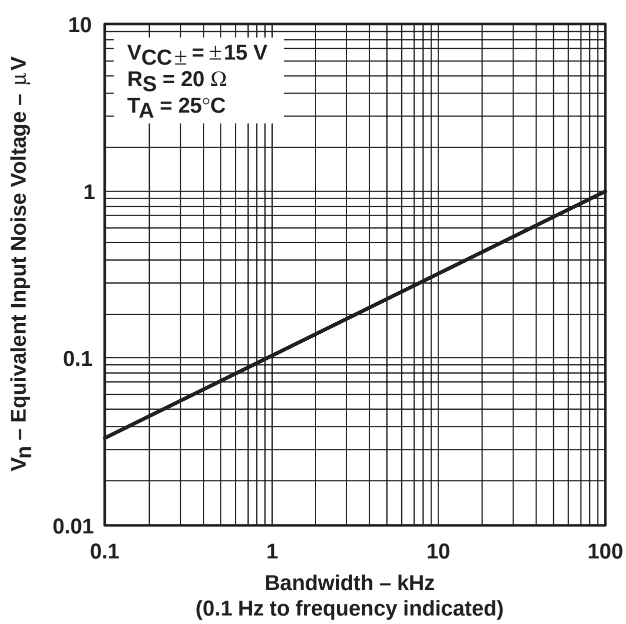

Figure 22

TOTAL EQUIVALENT INPUT NOISE VOLTAGE vs SOURCE RESISTANCE

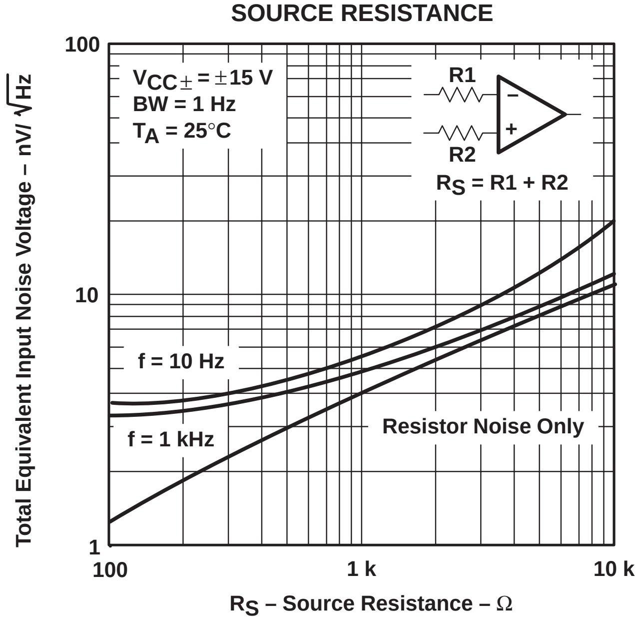

Figure 23

† Data for temperatures below – 25°C and above 85°C are applicable to the OP27A, OP27C, OP37A, and OP37C only.

TYPICAL CHARACTERISTICS†

OP27A, OP27E, OP37A, OP37E
EQUIVALENT INPUT NOISE VOLTAGE vs TOTAL SUPPLY VOLTAGE

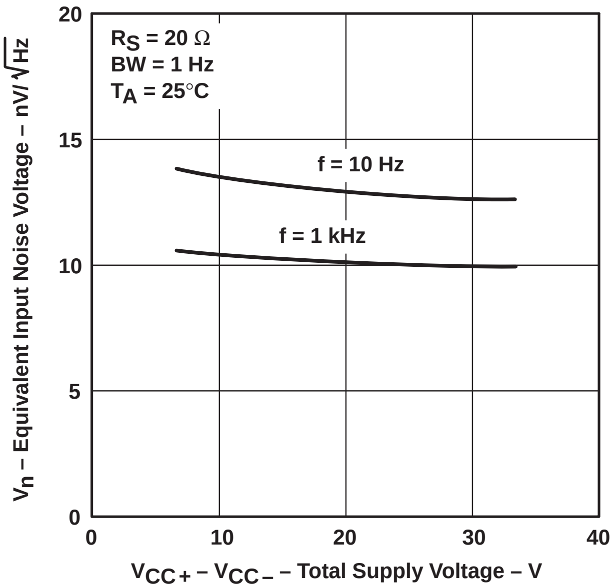

Figure 24

OP27A, OP27E, OP37A, OP37E
EQUIVALENT INPUT NOISE VOLTAGE vs FREE-AIR TEMPERATURE

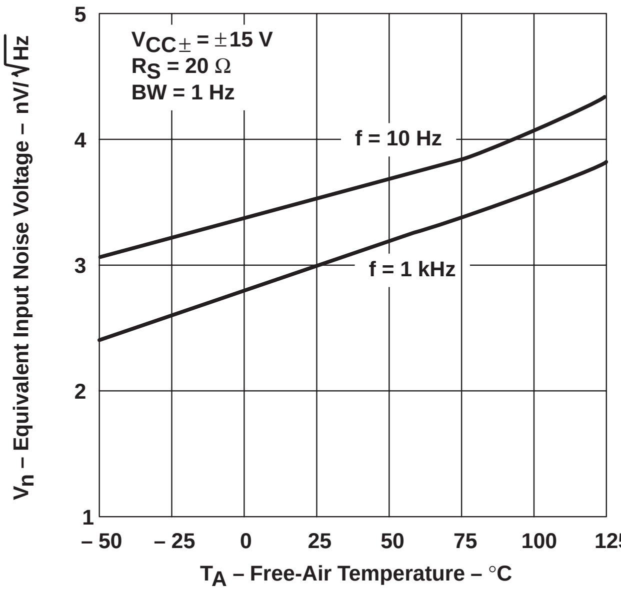

Figure 25

OP27A, OP27E, OP37A, OP37E
EQUIVALENT INPUT NOISE VOLTAGE vs FREQUENCY

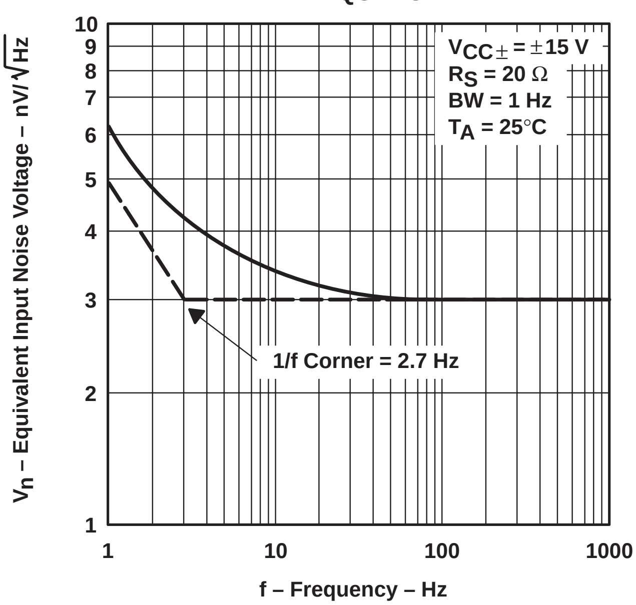

Figure 26

EQUIVALENT INPUT NOISE CURRENT vs FREQUENCY

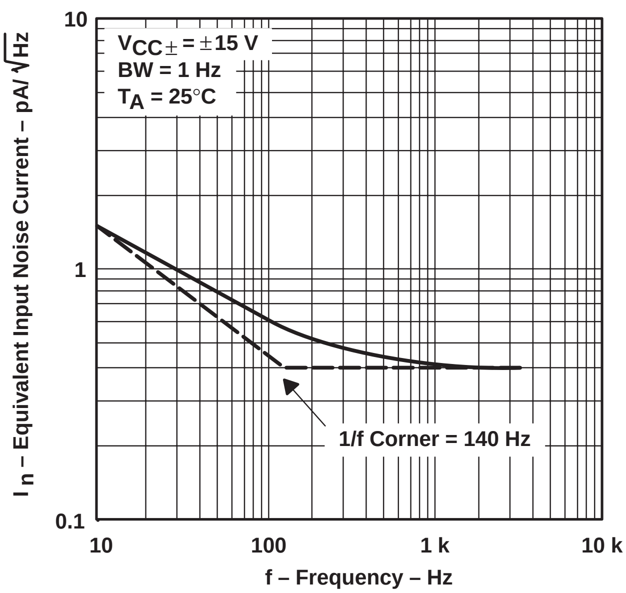

Figure 27

† Data for temperatures below – 25°C and above 85°C are applicable to the OP27A, OP27C, OP37A, and OP37C only.

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