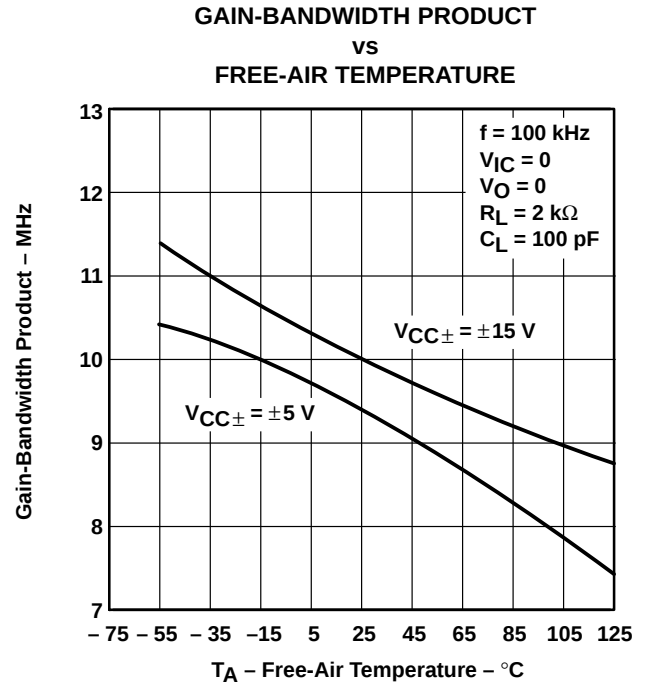
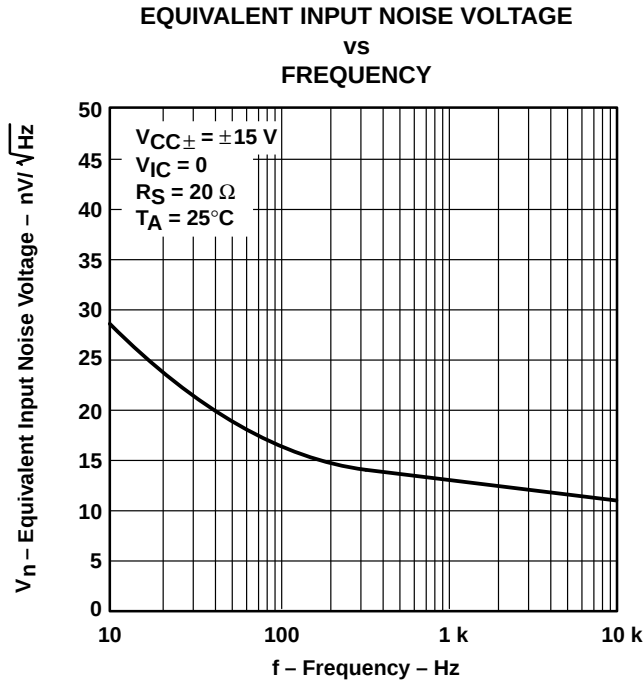


TLE2072, TLE2072A, TLE2072Y EXCALIBUR LOW-NOISE HIGH-SPEED JFET-INPUT DUAL OPERATIONAL AMPLIFIERS

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- 40-V/ μ s Slew Rate Typ
- Low Noise
17 nV/ $\sqrt{\text{Hz}}$ Max at $f = 10 \text{ kHz}$
11.6 nV/ $\sqrt{\text{Hz}}$ Typ at $f = 10 \text{ kHz}$
- High Gain-Bandwidth Product . . . 10 MHz
- $\pm 30\text{-mA}$ Minimum Short-Circuit Output Current

- Wide Supply Range . . . $\pm 2.25 \text{ V}$ to $\pm 19 \text{ V}$
- Input Range Includes the Positive Supply
- Macromodel Included
- Fast Settling Time Using 10-V Step
400 ns to 10 mV Typ
1.5 μ s to 1 mV Typ



description

The TLE2072 and TLE2072A are low-noise, high-performance, internally compensated JFET-input dual operational amplifiers built using Texas Instruments complementary bipolar Excalibur process. These devices combine low noise with outstanding output drive capability, high slew rate, and wide bandwidth.

AVAILABLE OPTIONS

T_A	$V_{IO\text{max}}$ AT 25°C	PACKAGED DEVICES				CHIP FORM (Y)
		SMALL OUTLINE (D)	CHIP CARRIER (FK)	CERAMIC DIP (JG)	PLASTIC DIP (P)	
0°C to 70°C	3.5 mV 6 mV	TLE2072ACD TLE2072CD	—	—	TLE2072ACP TLE2072CP	— TLE2072Y
-40°C to 85°C	3.5 mV 6 mV	TLE2072AID TLE2072ID	—	—	TLE2072AIP TLE2072IP	—
-55°C to 125°C	3.5 mV 6 mV	—	TLE2072AMFK TLE2072MFK	TLE2072AMJG TLE2072MJG	—	—

The D packages are available taped and reeled. Add R suffix to device type (e.g., TLE2072ACDR). Chip-form versions are tested at $T_A = 25^\circ\text{C}$. For chip-form orders, contact your local TI sales office.

TLE2072, TLE2072A, TLE2072Y

EXCALIBUR LOW-NOISE HIGH-SPEED

JFET-INPUT DUAL OPERATIONAL AMPLIFIERS

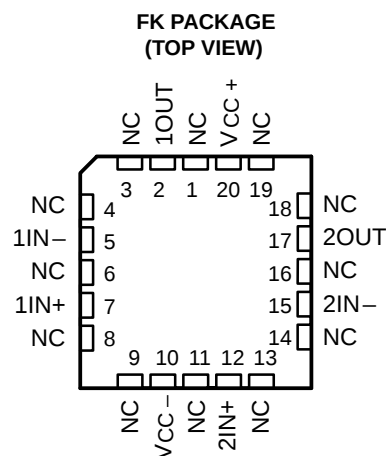
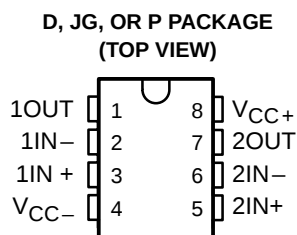
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description (continued)

The design features a $28\text{-V}/\mu\text{s}$ minimum slew rate, which results in a high-power bandwidth. A low audio-band noise of $28\text{ nV}/\sqrt{\text{Hz}}$ is typical with a $55\text{ nV}/\sqrt{\text{Hz}}$ maximum at 10 Hz. Settling time to 0.1% of a 10-V step (1-k Ω /100-pF load) is approximately 400 ns. Gain-bandwidth product is typically 10 MHz with an 8 MHz minimum. As such, the TLE2072 and TLE2072A offer significant speed and noise advantages at a low 1.5-mA typical supply current per channel.

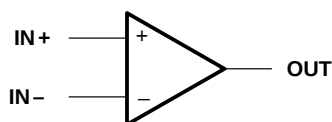
The input current characteristics traditionally associated with JFET-input amplifiers have been maintained. Input offset voltage is graded to a 6 mV and 3.5 mV maximum for the TLE2072 and TLE2072A, respectively. Typically, temperature coefficient of input offset voltage is $2.4\text{ }\mu\text{V}/^\circ\text{C}$ and typical CMRR and k_{SVR} are 98 dB and 99 dB, respectively. Device performance is relatively independent of supply voltage over the wide $\pm 2.25\text{-V}$ to $\pm 19\text{-V}$ range. The input common-mode voltage range extends from the positive supply down to $V_{\text{CC-}} + 4\text{ V}$ without significant degradation to dynamic performance. Maximum peak output voltage swing is from $V_{\text{CC+}} - 1\text{ V}$ to $V_{\text{CC-}} + 1\text{ V}$ under light current loading conditions. The output is capable of sourcing and sinking currents to at least 30 mA and can sustain shorts to either supply. Care must be taken to ensure that maximum power dissipation is not exceeded.

Both the TLE2072 and TLE2072A are available in a wide variety of packages, including both the industry-standard 8-pin small-outline version and chip form for high-density system applications. The C-suffix devices are characterized for operation from 0°C to 70°C , the I-suffix devices over the -40°C to 85°C range, and the M-suffix devices over the full military temperature range of -55°C to 125°C .



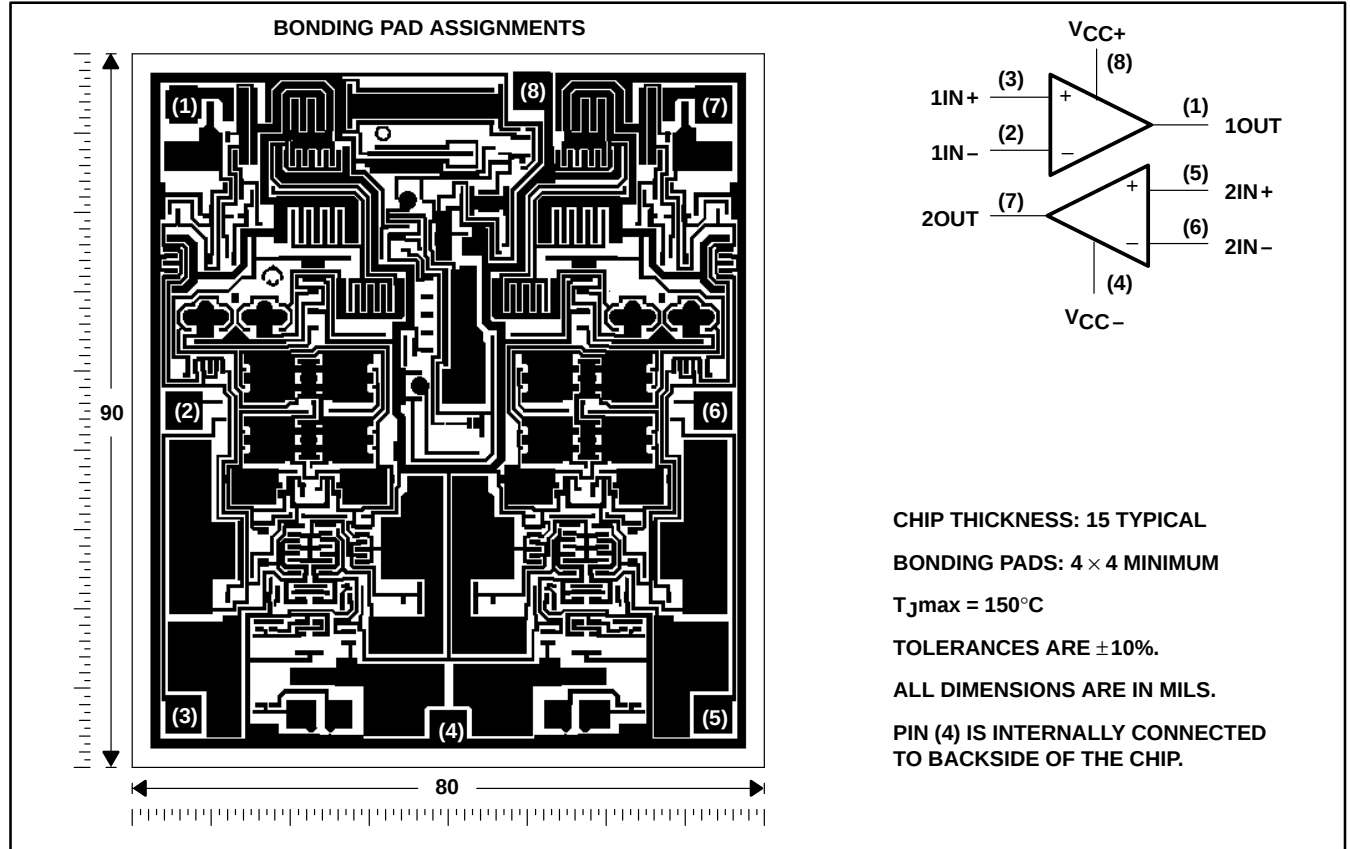
NC – No internal connection

symbol



TLE2072Y chip information

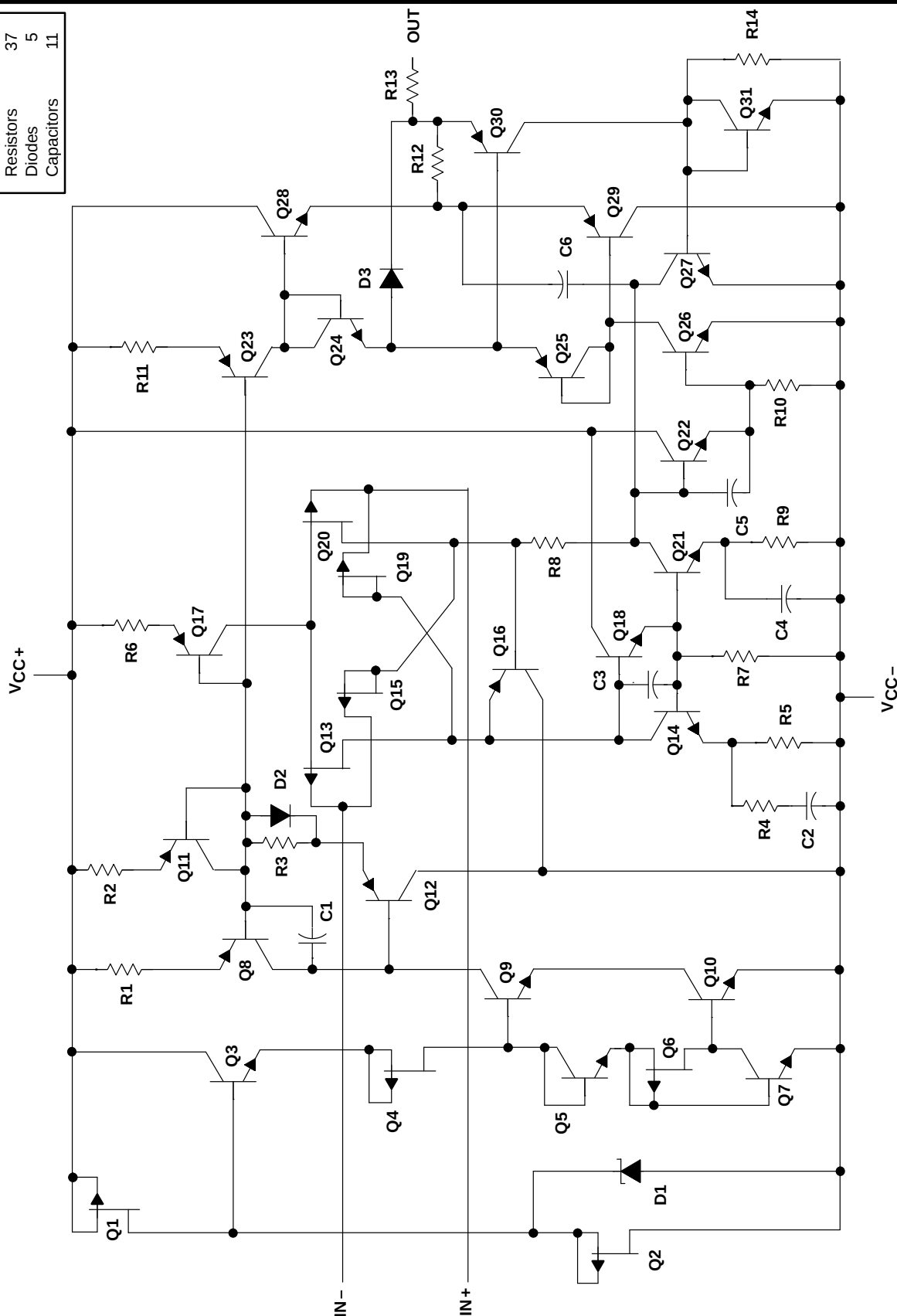
This chip, when properly assembled, displays characteristics similar to the TLE2072. Thermal compression or ultrasonic bonding may be used on the doped-aluminum bonding pads. Chips may be mounted with conductive epoxy or a gold-silicon preform.



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ACTUAL DEVICE COMPONENT COUNT	
Transistors	57
Resistors	37
Diodes	5
Capacitors	11

equivalent schematic (each channel)



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

Supply voltage, V_{CC+} (see Note 1)	19 V
Supply voltage, V_{CC-} (see Note 1)	–19 V
Differential input voltage range, V_{ID} (see Note 2)	V_{CC+} to V_{CC-}
Input voltage range, V_I (any input)	V_{CC+} to V_{CC-}
Input current, I_I (each input)	±1 mA
Output current, I_O (each output)	±80 mA
Total current into V_{CC+}	160 mA
Total current out of V_{CC-}	160 mA
Duration of short-circuit current at (or below) 25°C (see Note 3)	unlimited
Continuous total dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A : C suffix	0°C to 70°C
I suffix	–40°C to 85°C
M suffix	–55°C to 125°C
Storage temperature range	–65°C to 150°C
Case temperature for 60 seconds: FK package	260°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or P package	260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: JG package	300°C

[†] Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. All voltage values except differential voltages are with respect to the midpoint between V_{CC+} and V_{CC-} .
2. Differential voltages are at $IN+$ with respect to $IN-$.
3. The output can be shorted to either supply. Temperatures and/or supply voltages must be limited to ensure that the maximum dissipation rate is not exceeded.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 85^\circ\text{C}$ POWER RATING	$T_A = 125^\circ\text{C}$ POWER RATING
D	725 mW	5.8 mW/°C	464 mW	377 mW	145 mW
FK	1375 mW	11.0 mW/°C	880 mW	715 mW	275 mW
JG	1050 mW	8.4 mW/°C	672 mW	546 mW	210 mW
P	1000 mW	8.0 mW/°C	640 mW	344 mW	200 mW

recommended operating conditions

		C SUFFIX		I SUFFIX		M SUFFIX		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
Supply voltage, $V_{CC\pm}$		±2.25	±19	±2.25	±19	±2.25	±19	V
Common-mode input voltage, V_{IC}	$V_{CC\pm} = \pm 5\text{ V}$	–0.9	5	–0.8	5	–0.8	5	V
	$V_{CC\pm} = \pm 15\text{ V}$	–10.9	15	–10.8	15	–10.8	15	
Operating free-air temperature, T_A		0	70	–40	85	–55	125	°C

TLE2072, TLE2072A, TLE2072Y
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electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm 5$ V (unless otherwise noted)

PARAMETER	TEST CONDITIONS	$T_A^\dagger$	TLE2072C			TLE2072AC			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO} Input offset voltage	$V_{IC} = 0, V_O = 0, R_S = 50 \Omega$	25°C		0.9	6		0.65	3.5	mV
		Full range			7.8			5.3	
α_{VIO} Temperature coefficient of input offset voltage		Full range		2.3	25		2.3	25	$\mu V/^\circ C$
I_{IO} Input offset current	$V_{IC} = 0, V_O = 0,$ See Figure 4	25°C		5	100		5	100	pA
		Full range			1.4			1.4	nA
I_{IB} Input bias current		25°C		15	175		15	175	pA
		Full range			5			5	nA
V_{ICR} Common-mode input voltage range	$R_S = 50 \Omega$	25°C	5 to -1	5 to -1.9		5 to -1	5 to -1.9		V
		Full range	5 to -0.9			5 to -0.9			
V_{OM+} Maximum positive peak output voltage swing	$I_O = -200 \mu A$	25°C	3.8	4.1		3.8	4.1		V
		Full range	3.7			3.7			
	$I_O = -2 \text{ mA}$	25°C	3.5	3.9		3.5	3.9		
		Full range	3.4			3.4			
	$I_O = -20 \text{ mA}$	25°C	1.5	2.3		1.5	2.3		
		Full range	1.5			1.5			
V_{OM-} Maximum negative peak output voltage swing	$I_O = 200 \mu A$	25°C	-3.8	-4.2		-3.8	-4.2		V
		Full range	-3.7			-3.7			
	$I_O = 2 \text{ mA}$	25°C	-3.5	-4.1		-3.5	-4.1		
		Full range	-3.4			-3.4			
	$I_O = 20 \text{ mA}$	25°C	-1.5	-2.4		-1.5	-2.4		
		Full range	-1.5			-1.5			
A_{VD} Large-signal differential voltage amplification	$V_O = \pm 2.3 \text{ V}$	$R_L = 600 \Omega$	25°C	80	91	80	91		dB
			Full range	79		79			
		$R_L = 2 \text{ k}\Omega$	25°C	90	100	90	100		
			Full range	89		89			
		$R_L = 10 \text{ k}\Omega$	25°C	95	106	95	106		
			Full range	94		94			
r_i Input resistance	$V_{IC} = 0$	25°C		10^{12}			10^{12}		Ω
c_i Input capacitance	$V_{IC} = 0,$ See Figure 5	Common mode	25°C		11		11		pF
		Differential	25°C		2.5		2.5		
z_o Open-loop output impedance	$f = 1 \text{ MHz}$	25°C		80			80		Ω
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICRmin}, V_O = 0, R_S = 50 \Omega$	25°C	70	89		70	89		dB
		Full range	68			68			
k_{SVR} Supply-voltage rejection ratio ($\Delta V_{CC\pm} / \Delta V_{IO}$)	$V_{CC\pm} = \pm 5 \text{ V to } \pm 15 \text{ V}, V_O = 0, R_S = 50 \Omega$	25°C	82	99		82	99		dB
		Full range	80			80			
I_{CC} Supply current (both channels)	$V_O = 0, \text{ No load}$	25°C	2.7	2.9	3.6	2.7	2.9	3.6	mA
		Full range			3.6			3.6	

† Full range is 0°C to 70°C.



TLE2072, TLE2072A, TLE2072Y
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electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm 5$ V (unless otherwise noted)
(continued)

PARAMETER		TEST CONDITIONS		$T_A^\dagger$	TLE2072C			TLE2072AC			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
a_x	Crosstalk attenuation	$V_{IC} = 0$, $R_L = 2\text{ k}\Omega$		25°C		120			120		dB
I_{OS}	Short-circuit output current	$V_O = 0$	$V_{ID} = 1\text{ V}$	25°C		–35			–35		mA
			$V_{ID} = -1\text{ V}$			45			45		

operating characteristics at specified free-air temperature, $V_{CC\pm} = \pm 5$ V

PARAMETER		TEST CONDITIONS		T _A †	TLE2072C			TLE2072AC			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
SR +	Positive slew rate	V _{O(PP)} = ±2.3 V, A _{VD} = −1, R _L = 2 kΩ, C _L = 100 pF, See Figure 1		25°C	35			35			V/μs
				Full range	22			22			
SR −	Negative slew rate			25°C	38			38			V/μs
				Full range	22			22			
t _s	Settling time	A _{VD} = −1, 2-V step, R _L = 1 kΩ, C _L = 100 pF	To 10 mV	25°C	0.25			0.25			μs
			To 1 mV		0.4			0.4			
V _n	Equivalent input noise voltage	R _S = 20 Ω, See Figure 3	f = 10 Hz	25°C	28 55			28 55			nV/√Hz
	f = 10 kHz		11.6 17			11.6 17					
V _{N(PP)}	Peak-to-peak equivalent input noise voltage		f = 10 Hz to 10 kHz	25°C	6			6			μV
			f = 0.1 Hz to 10 Hz		0.6			0.6			
I _n	Equivalent input noise current	V _{IC} = 0, f = 10 kHz	25°C	2.8			2.8			fA/√Hz	
THD + N	Total harmonic distortion plus noise	V _{O(PP)} = 5 V, f = 1 kHz, R _S = 25 Ω	A _{VD} = 10, R _L = 2 kΩ,	25°C	0.013%			0.013%			
B ₁	Unity-gain bandwidth	V _I = 10 mV, C _L = 25 pF,	R _L = 2 kΩ, See Figure 2	25°C	9.4			9.4			MHz
B _{OM}	Maximum output-swing bandwidth	V _{O(PP)} = 4 V, R _L = 2 kΩ ,	A _{VD} = −1, C _L = 25 pF	25°C	2.8			2.8			MHz
φ _m	Phase margin at unity gain	V _I = 10 mV, C _L = 25 pF,	R _L = 2 kΩ, See Figure 2	25°C	56°			56°			

[†] Full range is 0°C to 70°C.

TLE2072, TLE2072A, TLE2072Y
EXCALIBUR LOW-NOISE HIGH-SPEED
JFET-INPUT DUAL OPERATIONAL AMPLIFIERS

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

PARAMETER	TEST CONDITIONS	$T_A^\dagger$	TLE2072C			TLE2072AC			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO} Input offset voltage	$V_{IC} = 0, V_O = 0,$ $R_S = 50\ \Omega$	25°C	1.1	6		0.7	3.5		mV
		Full range			7.8			5.3	
α_{VIO} Temperature coefficient of input offset voltage		Full range	2.4	25		2.4	25		$\mu V/^\circ C$
I_{IO} Input offset current	$V_{IC} = 0, V_O = 0,$ See Figure 4	25°C	6	100		6	100		pA
		Full range		1.4			1.4		nA
I_{IB} Input bias current		25°C	20	175		20	175		pA
		Full range		5			5		nA
V_{ICR} Common-mode input voltage range	$R_S = 50\ \Omega$	25°C	15 to -11	15 to -11.9		15 to -11	15 to -11.9		V
		Full range	15 to -10.9			15 to -10.9			
V_{OM+} Maximum positive peak output voltage swing	$I_O = -200\ \mu A$	25°C	13.8	14.1		13.8	14.1		V
		Full range	13.6			13.6			
	$I_O = -2\ mA$	25°C	13.5	13.9		13.5	13.9		
		Full range	13.4			13.4			
	$I_O = -20\ mA$	25°C	11.5	12.3		11.5	12.3		
		Full range	11.5			11.5			
V_{OM-} Maximum negative peak output voltage swing	$I_O = 200\ \mu A$	25°C	-13.8	-14.2		-13.8	-14.2		V
		Full range	-13.7			-13.7			
	$I_O = 2\ mA$	25°C	-13.5	-14		-13.5	-14		
		Full range	-13.4			-13.4			
	$I_O = 20\ mA$	25°C	-11.5	-12.4		-11.5	-12.4		
		Full range	-11.5			-11.5			
A_{VD} Large-signal differential voltage amplification	$V_O = \pm 10\ V$	$R_L = 600\ \Omega$	25°C	80	96	80	96		dB
			Full range	79		79			
		$R_L = 2\ k\Omega$	25°C	90	109	90	109		
			Full range	89		89			
		$R_L = 10\ k\Omega$	25°C	95	118	95	118		
			Full range	94		94			
r_i Input resistance	$V_{IC} = 0$	25°C	10^{12}			10^{12}			Ω
c_i Input capacitance	$V_{IC} = 0,$ See Figure 5	Common mode	25°C	7.5		7.5			pF
		Differential	25°C	2.5		2.5			
z_o Open-loop output impedance	$f = 1\ MHz$	25°C	80			80			Ω
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICRmin}, V_O = 0,$ $R_S = 50\ \Omega$	25°C	80	98		80	98		dB
		Full range	79			79			
k_{SVR} Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$V_{CC\pm} = \pm 5\ V$ to $\pm 15\ V,$ $V_O = 0, R_S = 50\ \Omega$	25°C	82	99		82	99		dB
		Full range	81			81			
I_{CC} Supply current (both channels)	$V_O = 0,$ No load	25°C	2.7	3.1	3.6	2.7	3.1	3.6	mA
		Full range			3.6			3.6	

† Full range is 0°C to 70°C.



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

PARAMETER	TEST CONDITIONS	$T_A^\dagger$	TLE2072C			TLE2072AC			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
a_x Crosstalk attenuation	$V_{IC} = 0$, $R_L = 2\text{ k}\Omega$	25°C	120			120			dB
I_{OS} Short-circuit output current	$V_O = 0$	$V_{ID} = 1\text{ V}$	25°C	-30	-45	25°C	-30	-45	mA
		$V_{ID} = -1\text{ V}$	25°C	30	48	25°C	30	48	

operating characteristics at specified free-air temperature, $V_{CC\pm} = \pm 15$ V

PARAMETER		TEST CONDITIONS		T _A [†]	TLE2072C			TLE2072AC			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
SR +	Positive slew rate	V _{O(PP)} = 10 V, A _{VD} = −1, C _L = 100 pF, R _L = 2 kΩ, See Figure 1		25°C	28	40		28	40		V/μs
				Full range	25			25			
SR −	Negative slew rate			25°C	30	45		30	45		V/μs
				Full range	25			25			
t _s	Settling time	A _{VD} = −1, 10-V step, R _L = 1 kΩ, C _L = 100 pF	To 10 mV	25°C	0.4			0.4			μs
			To 1 mV		1.5			1.5			
V _n	Equivalent input noise voltage	R _S = 20 Ω, See Figure 3	f = 10 Hz	25°C	28	55		28	55		nV/√Hz
			f = 10 kHz		11.6	17		11.6	17		
V _{N(PP)}	Peak-to-peak equivalent input noise voltage		f = 10 Hz to 10 kHz	25°C	6			6			μV
			f = 0.1 Hz to 10 Hz		0.6			0.6			
I _n	Equivalent input noise current	V _{IC} = 0,	f = 10 kHz	25°C	2.8			2.8			fA/√Hz
THD + N	Total harmonic distortion plus noise	V _{O(PP)} = 20 V, f = 1 kHz, R _S = 25 Ω	A _{VD} = 10, R _L = 2 kΩ,	25°C	0.008%			0.008%			
B ₁	Unity-gain bandwidth	V _I = 10 mV, C _L = 25 pF,	R _L = 2 kΩ, See Figure 2	25°C	8	10		8	10		MHz
B _{OM}	Maximum output-swing bandwidth	V _{O(PP)} = 20 V, R _L = 2 kΩ,	A _{VD} = −1, C _L = 25 pF	25°C	478	637		478	637		kHz
φ _m	Phase margin at unity gain	V _I = 10 mV, C _L = 25 pF,	R _L = 2 kΩ, See Figure 2	25°C	57°			57°			

† Full range is 0°C to 70°C .

TLE2072, TLE2072A, TLE2072Y
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electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm 5$ V (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T_A †	TLE2072I			TLE2072AI			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO} Input offset voltage	$V_{IC} = 0, V_O = 0,$ $R_S = 50\ \Omega$	25°C		0.9	6		0.65	3.5	mV
		Full range			9.1			6.4	
α_{VIO} Temperature coefficient of input offset voltage		Full range		2.4	25		2.4	25	$\mu V/^\circ C$
I_{IO} Input offset current	$V_{IC} = 0, V_O = 0,$ See Figure 4	25°C		5	100		5	100	pA
		Full range			5			5	nA
I_{IB} Input bias current		25°C		15	175		15	175	pA
		Full range			10			10	nA
V_{ICR} Common-mode input voltage range	$R_S = 50\ \Omega$	25°C	5 to -1	5 to -1.9		5 to -1	5 to -1.9		V
		Full range	5 to -0.8			5 to -0.8			
V_{OM+} Maximum positive peak output voltage swing	$I_O = -200\ \mu A$	25°C	3.8	4.1		3.8	4.1		V
		Full range	3.7			3.7			
	$I_O = -2\ mA$	25°C	3.5	3.9		3.5	3.9		
		Full range	3.4			3.4			
	$I_O = -20\ mA$	25°C	1.5	2.3		1.5	2.3		
		Full range	1.5			1.5			
V_{OM-} Maximum negative peak output voltage swing	$I_O = 200\ \mu A$	25°C	-3.8	-4.2		-3.8	-4.2		V
		Full range	-3.7			-3.7			
	$I_O = 2\ mA$	25°C	-3.5	-4.1		-3.5	-4.1		
		Full range	-3.4			-3.4			
	$I_O = 20\ mA$	25°C	-1.5	-2.4		-1.5	-2.4		
		Full range	-1.5			-1.5			
A_{VD} Large-signal differential voltage amplification	$V_O = \pm 2.3\ V$	$R_L = 600\ \Omega$	25°C	80	91	80	91		dB
			Full range	79		79			
		$R_L = 2\ k\Omega$	25°C	90	100	90	100		
			Full range	89		89			
		$R_L = 10\ k\Omega$	25°C	95	106	95	106		
			Full range	94		94			
r_i Input resistance	$V_{IC} = 0$	25°C		10^{12}			10^{12}		Ω
c_i Input capacitance	$V_{IC} = 0,$ See Figure 5	Common mode	25°C		11		11		pF
		Differential	25°C		2.5		2.5		
z_o Open-loop output impedance	$f = 1\ MHz$	25°C		80			80		Ω
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICRmin}, V_O = 0,$ $R_S = 50\ \Omega$	25°C	70	89		70	89		dB
		Full range	68			68			
k_{SVR} Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$V_{CC\pm} = \pm 5\ V$ to $\pm 15\ V,$ $V_O = 0, R_S = 50\ \Omega$	25°C	82	99		82	99		dB
		Full range	80			80			
I_{CC} Supply current (both channels)	$V_O = 0,$ No load	25°C	2.7	2.9	3.6	2.7	2.9	3.6	mA
		Full range			3.6			3.6	

† Full range is $-40^\circ C$ to $85^\circ C$.



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electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm 5$ V (unless otherwise noted)
(continued)

PARAMETER		TEST CONDITIONS		T _A [†]	TLE2072I			TLE2072AI			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
a _x	Crosstalk attenuation	V _{IC} = 0, R _L = 2 kΩ		25°C	120			120			dB
I _{OS}	Short-circuit output current	V _O = 0	V _{ID} = 1 V	25°C	−35			−35			mA
			V _{ID} = −1 V		45			45			

operating characteristics at specified free-air temperature, $V_{CC\pm} = \pm 5$ V

PARAMETER		TEST CONDITIONS		T _A [†]	TLE2072I		TLE2072AI		UNIT
					MIN	TYP	MAX	MIN	
SR+	Positive slew rate	V _{O(PP)} = ±2.3 V, A _{VD} = −1, R _L = 2 kΩ, C _L = 100 pF, See Figure 1		25°C	35		35		V/μs
	Full range			20		20			
SR−	Negative slew rate			25°C	38		38		V/μs
	Full range			20		20			
t _s	Settling time	A _{VD} = −1, 2-V step, R _L = 1 kΩ, C _L = 100 pF	To 10 mV	25°C	0.25		0.25		μs
		To 1 mV	0.4		0.4				
V _n	Equivalent input noise voltage	R _S = 20 Ω, See Figure 3	f = 10 Hz	25°C	28	55	28	55	nV/√Hz
	f = 10 kHz		11.6		17	11.6	17		
V _{N(PP)}	Peak-to-peak equivalent input noise voltage		f = 10 Hz to 10 kHz	25°C	6		6		μV
			f = 0.1 Hz to 10 Hz		0.6		0.6		
I _n	Equivalent input noise current	V _{IC} = 0, f = 10 kHz	25°C	2.8		2.8		fA/√Hz	
THD + N	Total harmonic distortion plus noise	V _{O(PP)} = 5 V, f = 1 kHz, R _S = 25 Ω	A _{VD} = 10, R _L = 2 kΩ,	25°C	0.013%		0.013%		
B ₁	Unity-gain bandwidth	V _I = 10 mV, C _L = 25 pF,	R _L = 2 kΩ, See Figure 2	25°C	9.4		9.4		MHz
B _{OM}	Maximum output-swing bandwidth	V _{O(PP)} = 4 V, R _L = 2 kΩ ,	A _{VD} = −1, C _L = 25 pF	25°C	2.8		2.8		MHz
φ _m	Phase margin at unity gain	V _I = 10 mV, C _L = 25 pF,	R _L = 2 kΩ, See Figure 2	25°C	56°		56°		

† Full range is 40°C to 85°C.

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

PARAMETER	TEST CONDITIONS	$T_A^\dagger$	TLE2072I			TLE2072AI			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO} Input offset voltage	$V_{IC} = 0, V_O = 0,$ $R_S = 50\ \Omega$	25°C	1.1	6		0.7	3.5		mV
		Full range		9.1			6.4		
α_{VIO} Temperature coefficient of input offset voltage		Full range	2.4	25		2.4	25		$\mu V/^\circ C$
I_{IO} Input offset current	$V_{IC} = 0, V_O = 0,$ See Figure 4	25°C	6	100		6	100		pA
		Full range		5			5		nA
I_{IB} Input bias current		25°C	20	175		20	175		pA
		Full range		10			10		nA
V_{ICR} Common-mode input voltage range	$R_S = 50\ \Omega$	25°C	15 to -11	15 to -11.9		15 to -11	15 to -11.9		V
		Full range	15 to -10.8			15 to -10.8			
V_{OM+} Maximum positive peak output voltage swing	$I_O = -200\ \mu A$	25°C	13.8	14.1		13.8	14.1		V
		Full range	13.7			13.7			
	$I_O = -2\ mA$	25°C	13.5	13.9		13.5	13.9		
		Full range	13.4			13.4			
	$I_O = -20\ mA$	25°C	11.5	12.3		11.5	12.3		
		Full range	11.5			11.5			
V_{OM-} Maximum negative peak output voltage swing	$I_O = 200\ \mu A$	25°C	-13.8	-14.2		-13.8	-14.2		V
		Full range	-13.7			-13.7			
	$I_O = 2\ mA$	25°C	-13.5	-14		-13.5	-14		
		Full range	-13.4			-13.4			
	$I_O = 20\ mA$	25°C	-11.5	-12.4		-11.5	-12.4		
		Full range	-11.5			-11.5			
A_{VD} Large-signal differential voltage amplification	$V_O = \pm 10\ V$	$R_L = 600\ \Omega$	25°C	80	96	80	96		dB
			Full range	79		79			
		$R_L = 2\ k\Omega$	25°C	90	109	90	109		
			Full range	89		89			
		$R_L = 10\ k\Omega$	25°C	95	118	95	118		
			Full range	94		94			
r_i Input resistance	$V_{IC} = 0$	25°C	10^{12}			10^{12}			Ω
c_i Input capacitance	$V_{IC} = 0,$ See Figure 5	Common mode	25°C	7.5		7.5			pF
		Differential	25°C	2.5		2.5			
z_o Open-loop output impedance	$f = 1\ MHz$	25°C	80			80			Ω
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICRmin}, V_O = 0,$ $R_S = 50\ \Omega$	25°C	80	98		80	98		dB
		Full range	79			79			
k_{SVR} Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$V_{CC\pm} = \pm 5\ V$ to $\pm 15\ V,$ $V_O = 0,$ $R_S = 50\ \Omega$	25°C	82	99		82	99		dB
		Full range	80			80			
I_{CC} Supply current (both channels)	$V_O = 0,$ No load	25°C	2.7	3.1	3.6	2.7	3.1	3.6	mA
		Full range			3.6			3.6	

† Full range is $-40^\circ C$ to $85^\circ C$.



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

PARAMETER	TEST CONDITIONS	$T_A^\dagger$	TLE2072I			TLE2072AI			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
a_x Crosstalk attenuation	$V_{IC} = 0$, $R_L = 2\text{ k}\Omega$	25°C	120			120			dB
I_{OS} Short-circuit output current	$V_O = 0$	$V_{ID} = 1\text{ V}$	-30	-45		-30	-45		mA
		$V_{ID} = -1\text{ V}$	30	48		30	48		

operating characteristics at specified free-air temperature, $V_{CC\pm} = \pm 15$ V

PARAMETER		TEST CONDITIONS		T _A [†]	TLE2072I			TLE2072AI			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
SR+	Positive slew rate	V _{O(PP)} = ±10 V, A _{VD} = −1, R _L = 2 kΩ, C _L = 100 pF, See Figure 1		25°C	28	40		28	40		V/μs
	Full range			22		22					
SR−	Negative slew rate			25°C	30	45		30	45		V/μs
	Full range			22		22					
t _s	Settling time	A _{VD} = −1, 10-V step, R _L = 1 kΩ, C _L = 100 pF	To 10 mV	25°C	0.4		0.4		μs		
			To 1 mV		1.5		1.5				
V _n	Equivalent input noise voltage	R _S = 20 Ω, See Figure 3	f = 10 Hz	25°C	28	55		28	55	nV/√Hz	
	f = 10 kHz		11.6		17		11.6	17			
V _{N(PP)}	Peak-to-peak equivalent input noise voltage		f = 0 Hz to 10 kHz	25°C	6		6		μV		
			f = 0.1 Hz to 10 Hz		0.6		0.6				
I _n	Equivalent input noise current	V _{IC} = 0, f = 10 kHz	25°C	2.8		2.8		fA/√Hz			
THD + N	Total harmonic distortion plus noise	V _{O(PP)} = 20 V, A _{VD} = 10, f = 1 kHz, R _S = 25 Ω	25°C	0.008%		0.008%					
B ₁	Unity-gain bandwidth	V _I = 10 mV, C _L = 25 pF, R _L = 2 kΩ, See Figure 2	25°C	8	10		8	10	MHz		
B _{OM}	Maximum output-swing bandwidth	V _{O(PP)} = 20 V, R _L = 2 kΩ, A _{VD} = −1, C _L = 25 pF	25°C	478	637		478	637	kHz		
φ _m	Phase margin at unity gain	V _I = 10 mV, C _L = 25 pF, R _L = 2 kΩ, See Figure 2	25°C	57°		57°					

† Full range is -40°C to 85°C.

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electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm 5$ V (unless otherwise noted)

PARAMETER	TEST CONDITIONS	$T_A^\dagger$	TLE2072M			TLE2072AM			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO} Input offset voltage	$V_{IC} = 0, V_O = 0,$ $R_S = 50 \Omega,$	25°C		0.9	6		0.65	3.5	mV
		Full range			10.5			8	
α_{VIO} Temperature coefficient of input offset voltage		Full range		2.3	25*		2.3	25*	$\mu V/^\circ C$
I_{IO} Input offset current	$V_{IC} = 0, V_O = 0,$ See Figure 4	25°C		5	100		5	100	pA
		Full range			20			20	nA
I_{IB} Input bias current		25°C		15	175		15	175	pA
		Full range			65			65	nA
V_{ICR} Common-mode input voltage range	$R_S = 50 \Omega$	25°C	5 to -1	5 to -1.9		5 to -1	5 to -1.9		V
		Full range	5 to -0.8			5 to -0.8			
V_{OM+} Maximum positive peak output voltage swing	$I_O = -200 \mu A$	25°C	3.8	4.1		3.8	4.1		V
		Full range	3.6			3.6			
	$I_O = -2 \text{ mA}$	25°C	3.5	3.9		3.5	3.9		
		Full range	3.3			3.3			
	$I_O = -20 \text{ mA}$	25°C	1.5	2.3		1.5	2.3		
		Full range	1.4			1.4			
V_{OM-} Maximum negative peak output voltage swing	$I_O = 200 \mu A$	25°C	-3.8	-4.2		-3.8	-4.2		V
		Full range	-3.6			-3.6			
	$I_O = 2 \text{ mA}$	25°C	-3.5	-4.1		-3.5	-4.1		
		Full range	-3.3			-3.3			
	$I_O = 20 \text{ mA}$	25°C	-1.5	-2.4		-1.5	-2.4		
		Full range	-1.4			-1.4			
A_{VD} Large-signal differential voltage amplification	$V_O = \pm 2.3 \text{ V}$	$R_L = 600 \Omega$	25°C	80	91	80	91		dB
			Full range	78		78			
		$R_L = 2 \text{ k}\Omega$	25°C	90	100	90	100		
			Full range	88		88			
		$R_L = 10 \text{ k}\Omega$	25°C	95	106	95	106		
			Full range	93		93			
r_i Input resistance	$V_{IC} = 0$	25°C		10^{12}		10^{12}			Ω
c_i Input capacitance	$V_{IC} = 0,$ See Figure 5	Common mode	25°C	11		11			pF
		Differential	25°C	2.5		2.5			
z_o Open-loop output impedance	$f = 1 \text{ MHz}$	25°C		80		80			Ω
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICRmin},$ $V_O = 0, R_S = 50 \Omega$	25°C	70	89		70	89		dB
		Full range	68			68			

*On products compliant to MIL-STD-883, Class B, this parameter is not production tested.

† Full range is $-55^\circ C$ to $125^\circ C$.



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electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm 5$ V (unless otherwise noted)
(continued)

PARAMETER		TEST CONDITIONS		T _A [†]	TLE2072M			TLE2072AM			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
k _{SVR}	Supply-voltage rejection ratio (ΔV _{CC±} /ΔV _{IO})	V _{CC±} = ±5 V to ±15 V, V _O = 0, R _S = 50 Ω		Full range	80			80			dB
I _{CC}	Supply current (both channels)	V _O = 0,	No load	25°C	2.7	2.9	3.6	2.7	2.9	3.6	mA
				Full range	3.6			3.6			
a _x	Crosstalk attenuation	V _{IC} = 0,	R _L = 2 kΩ	25°C	120			120			dB
I _{OS}	Short-circuit output current	V _O = 0	V _{ID} = 1 V	25°C	–35			–35			mA
			V _{ID} = –1 V		45			45			

operating characteristics at specified free-air temperature, $V_{CC\pm} = \pm 5$ V

PARAMETER		TEST CONDITIONS		T _A †	TLE2072M			TLE2072AM			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
SR +	Positive slew rate	V _{O(PP)} = ±2.3 V, A _{VD} = −1, R _L = 2 kΩ, C _L = 100 pF, See Figure 1		25°C	35			35			V/μs
				Full range	18*			18*			
SR −	Negative slew rate			25°C	38			38			V/μs
				Full range	18*			18*			
t _s	Settling time	A _{VD} = −1, 2-V step, R _L = 1 kΩ, C _L = 100 pF	To 10 mV	25°C	0.25			0.25			μs
			To 1 mV		0.4			0.4			
V _n	Equivalent input noise voltage	R _S = 20 Ω, See Figure 3	f = 10 Hz	25°C	28	55*	28	55*	nV/√Hz		
			f = 10 kHz		11.6	17*	11.6	17*			
V _{N(PP)}	Peak-to-peak equivalent input noise voltage		f = 10 Hz to 10 kHz	25°C	6			6			μV
			f = 0.1 Hz to 10 Hz		0.6			0.6			
I _n	Equivalent input noise current	V _{IC} = 0, f = 10 kHz	25°C	2.8			2.8			fA/√Hz	
THD + N	Total harmonic distortion plus noise	V _{O(PP)} = 5 V, f = 1 kHz, R _S = 25 Ω	A _{VD} = 10, R _L = 2 kΩ,	25°C	0.013%			0.013%			
B ₁	Unity-gain bandwidth	V _I = 10 mV, C _L = 25 pF,	R _L = 2 kΩ, See Figure 2	25°C	9.4			9.4			MHz
B _{OM}	Maximum output-swing bandwidth	V _{O(PP)} = 4 V, R _L = 2 kΩ ,	A _{VD} = −1, C _L = 25 pF	25°C	2.8			2.8			MHz
φ _m	Phase margin at unity gain	V _I = 10 mV, C _L = 25 pF,	R _L = 2 kΩ, See Figure 2	25°C	56°			56°			

*On products compliant to MIL-STD-883, Class B, this parameter is not production tested.

† Full range is –55°C to 125°C.

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

PARAMETER	TEST CONDITIONS	T_A †	TLE2072M			TLE2072AM			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO} Input offset voltage	$V_{IC} = 0, V_O = 0,$ $R_S = 50\ \Omega$	25°C	1.1	6		0.7	3.5		mV
		Full range		10.5			8		
α_{VIO} Temperature coefficient of input offset voltage		Full range	2.4	25*		2.4	25*		$\mu V/^\circ C$
I_{IO} Input offset current	$V_{IC} = 0, V_O = 0,$ See Figure 4	25°C	6	100		6	100		pA
		Full range		20			20		nA
I_{IB} Input bias current		25°C	20	175		20	175		pA
		Full range		65			65		nA
V_{ICR} Common-mode input voltage range	$R_S = 50\ \Omega$	25°C	15 to –11	15 to –11.9		15 to –11	15 to –11.9		V
		Full range	15 to –10.8			15 to –10.8			
V_{OM+} Maximum positive peak output voltage swing	$I_O = -200\ \mu A$	25°C	13.8	14.1		13.8	14.1		V
		Full range	13.6			13.6			
	$I_O = -2\ mA$	25°C	13.5	13.9		13.5	13.9		
		Full range	13.3			13.3			
	$I_O = -20\ mA$	25°C	11.5	12.3		11.5	12.3		
		Full range	11.4			11.4			
V_{OM-} Maximum negative peak output voltage swing	$I_O = 200\ \mu A$	25°C	–13.8	–14.2		–13.8	–14.2		V
		Full range	–13.6			–13.6			
	$I_O = 2\ mA$	25°C	–13.5	–14		–13.5	–14		
		Full range	–13.3			–13.3			
	$I_O = 20\ mA$	25°C	–11.5	–12.4		–11.5	–12.4		
		Full range	–11.4			–11.4			
A_{VD} Large-signal differential voltage amplification	$V_O = \pm 10\ V$	$R_L = 600\ \Omega$	25°C	80	96	80	96		dB
			Full range	78		78			
		$R_L = 2\ k\Omega$	25°C	90	109	90	109		
			Full range	89		89			
		$R_L = 10\ k\Omega$	25°C	95	118	95	118		
			Full range	93		93			
r_i Input resistance	$V_{IC} = 0$	25°C	10^{12}			10^{12}			Ω
c_i Input capacitance	$V_{IC} = 0,$ See Figure 5	Common mode	25°C	7.5		7.5			pF
		Differential	25°C	2.5		2.5			
z_o Open-loop output impedance	$f = 1\ MHz$	25°C	80			80			Ω
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICRmin}, V_O = 0,$ $R_S = 50\ \Omega$	25°C	80	98		80	98		dB
		Full range	78			78			
k_{SVR} Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$V_{CC\pm} = \pm 5\ V\ to\ \pm 15\ V,$ $V_O = 0, R_S = 50\ \Omega$	25°C	82	99		82	99		dB
		Full range	80			80			

*On products compliant to MIL-STD-883, Class B, this parameter is not production tested.

† Full range is –55°C to 125°C.



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

PARAMETER	TEST CONDITIONS	$T_A^\dagger$	TLE2072M			TLE2072AM			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
I_{CC} Supply current (both channels)	$V_O = 0$, No load	25°C	2.7	3.1	3.6	2.7	3.1	3.6	mA
		Full range			3.6			3.6	
a_x Crosstalk attenuation	$V_{IC} = 0$, $R_L = 2$ k Ω	25°C	120			120			dB
I_{OS} Short-circuit output current	$V_O = 0$	$V_{ID} = 1$ V	–30	–45		–30	–45		mA
		$V_{ID} = -1$ V	30	48		30	48		

operating characteristics at specified free-air temperature, $V_{CC\pm} = \pm 15$ V

PARAMETER		TEST CONDITIONS		T _A [†]	TLE2072M			TLE2072AM			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
SR +	Positive slew rate	V _{O(PP)} = 10 V, A _{VD} = −1, R _L = 2 kΩ, C _L = 100 pF, See Figure 1		25°C	28	40		28	40		V/μs
				Full range	20		20				
SR −	Negative slew rate			25°C	30	45		30	45		V/μs
				Full range	20		20				
t _s	Settling time	A _{VD} = −1, 10-V step, R _L = 1 kΩ, C _L = 100 pF	To 10 mV	25°C	0.4		0.4		μs		
			To 1 mV		1.5		1.5				
V _n	Equivalent input noise voltage	R _S = 20 Ω, See Figure 3	f = 10 Hz	25°C	28	55*	28	55*	nV/√Hz		
			f = 10 kHz		11.6	17*	11.6	17*			
V _{N(PP)}	Peak-to-peak equivalent input noise voltage		f = 10 Hz to 10 kHz	25°C	6		6		μV		
			f = 0.1 Hz to 10 Hz		0.6		0.6				
I _n	Equivalent input noise current	V _{IC} = 0, f = 10 kHz	25°C	2.8		2.8		fA/√Hz			
THD + N	Total harmonic distortion plus noise	V _{O(PP)} = 20 V, A _{VD} = 10, f = 1 kHz, R _L = 2 kΩ, R _S = 25 Ω	25°C	0.008%		0.008%					
B ₁	Unity-gain bandwidth	V _I = 10 mV, R _L = 2 kΩ, C _L = 25 pF, See Figure 2	25°C	8*	10	8*	10	MHz			
B _{OM}	Maximum output-swing bandwidth	V _{O(PP)} = 20 V, A _{VD} = −1, R _L = 2 kΩ, C _L = 25 pF	25°C	478*	637	478*	637	kHz			
φ _m	Phase margin at unity gain	V _I = 10 mV, R _L = 2 kΩ, C _L = 25 pF, See Figure 2	25°C	57°		57°					

*On products compliant to MIL-STD-883, Class B, this parameter is not production tested.

† Full range is –55°C to 125°C.

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electrical characteristics at $V_{CC\pm} = \pm 15\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	TLE2072Y			UNIT
		MIN	TYP	MAX	
V_{IO} Input offset voltage	$V_{IC} = 0$, $V_O = 0$, $R_S = 50\ \Omega$		1.1	6	mV
I_{IO} Input offset current	$V_{IC} = 0$, $V_O = 0$, See Figure 4		6	100	pA
I_{IB} Input bias current			20	175	pA
V_{ICR} Common-mode input voltage range	$R_S = 50\ \Omega$	15 to -11	15 to 11.9		V
V_{OM+} Maximum positive peak output voltage swing	$I_O = -200\ \mu\text{A}$	13.8	14.1		V
	$I_O = -2\text{ mA}$	13.5	13.9		
	$I_O = -20\text{ mA}$	11.5	12.3		
V_{OM-} Maximum negative peak output voltage swing	$I_O = 200\ \mu\text{A}$	-13.8	-14.2		V
	$I_O = 2\text{ mA}$	-13.5	-14		
	$I_O = 20\text{ mA}$	-11.5	-12.4		
A_{VD} Large-signal differential voltage amplification	$V_O = \pm 10\text{ V}$	$R_L = 600\ \Omega$	80	96	dB
		$R_L = 2\text{ k}\Omega$	90	109	
		$R_L = 10\text{ k}\Omega$	95	118	
r_i Input resistance	$V_{IC} = 0$		10^{12}		Ω
c_i Input capacitance	$V_{IC} = 0$, See Figure 5	Common mode	7.5		pF
		Differential	2.5		
z_o Open-loop output impedance	$f = 1\text{ MHz}$		80		Ω
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICRmin}$, $V_O = 0$, $R_S = 50\ \Omega$	80	98		dB
k_{SVR} Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$V_{CC\pm} = \pm 5\text{ V to } \pm 15\text{ V}$, $V_O = 0$, $R_S = 50\ \Omega$	82	99		dB
I_{CC} Supply current (both channels)	$V_O = 0$, No load	2.7	3.1	3.6	mA
I_{OS} Short-circuit output current	$V_O = 0$	$V_{ID} = 1\text{ V}$	-30	-45	mA
		$V_{ID} = -1\text{ V}$	30	48	

PARAMETER MEASUREMENT INFORMATION

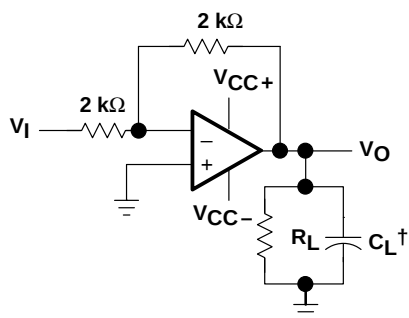


Figure 1. Slew-Rate Test Circuit

† Includes fixture capacitance

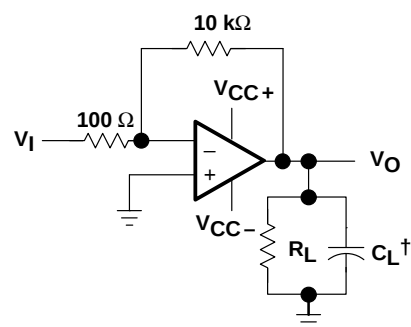


Figure 2. Unity-Gain Bandwidth and Phase-Margin Test Circuit

PARAMETER MEASUREMENT INFORMATION

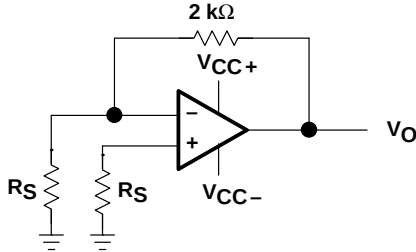


Figure 3. Noise-Voltage Test Circuit

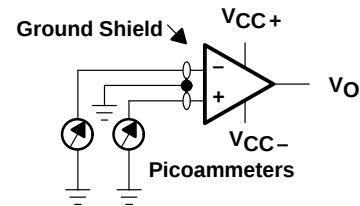


Figure 4. Input-Bias and Offset-Current Test Circuit

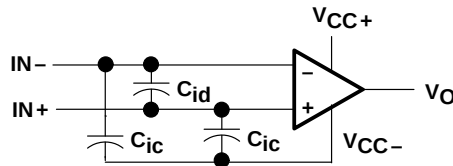


Figure 5. Internal Input Capacitance

typical values

Typical values presented in this data sheet represent the median (50% point) of device parametric performance.

input bias and offset current

At the picoampere bias-current level typical of the TLE2072 and TLE2072A, accurate measurement of the bias becomes difficult. Not only does this measurement require a picoammeter, but test socket leakages can easily exceed the actual device bias currents. To accurately measure these small currents, Texas Instruments uses a two-step process. The socket leakage is measured using picoammeters with bias voltages applied but with no device in the socket. The device is then inserted in the socket and a second test is performed that measures both the socket leakage and the device input bias current. The two measurements are then subtracted algebraically to determine the bias current of the device.

TYPICAL CHARACTERISTICS

Table of Graphs

			FIGURE
V_{IO}	Input offset voltage	Distribution	6
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I_{IB}	Input bias current	vs Free-air temperature vs Supply voltage	8, 9 10
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V_{ID}	Differential input voltage	vs Output voltage	12, 13

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Table of Graphs (Continued)

			FIGURE
V_{OM+}	Maximum positive peak output voltage	vs Output current	14
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V_O	Output voltage	vs Settling time	20
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		vs Frequency	24, 25
CMRR	Common-mode rejection ratio	vs Frequency	26
		vs Free-air temperature	27
k_{SVR}	Supply-voltage rejection ratio	vs Frequency	28
		vs Free-air temperature	29
I_{CC}	Supply current	vs Supply voltage	30
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I_{OS}	Short-circuit output current	vs Supply voltage	34
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V_n	Equivalent input noise voltage	vs Frequency	41
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		Over a 10-second time interval	43
	Third-octave spectral noise density	vs Frequency bands	44
THD + N	Total harmonic distortion plus noise	vs Frequency	45, 46
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	Gain-bandwidth product	vs Free-air temperature	48
		vs Supply voltage	49
	Gain margin	vs Load capacitance	50
ϕ_m	Phase margin	vs Free-air temperature	51
		vs Supply voltage	52
		vs Load capacitance	53
	Phase shift	vs Frequency	24, 25
	Large-signal pulse response, noninverting	vs Time	54
	Small-signal pulse response	vs Time	55
z_O	Closed-loop output impedance	vs Frequency	56
a_x	Crosstalk attenuation	vs Frequency	57

TYPICAL CHARACTERISTICS†

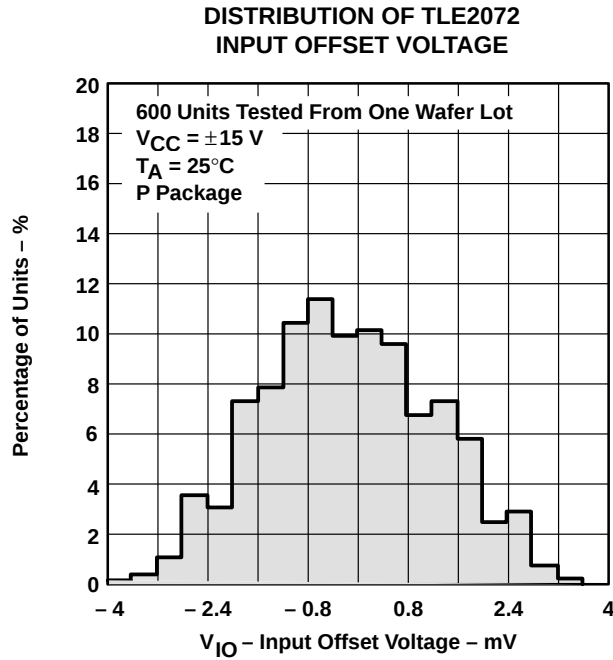


Figure 6

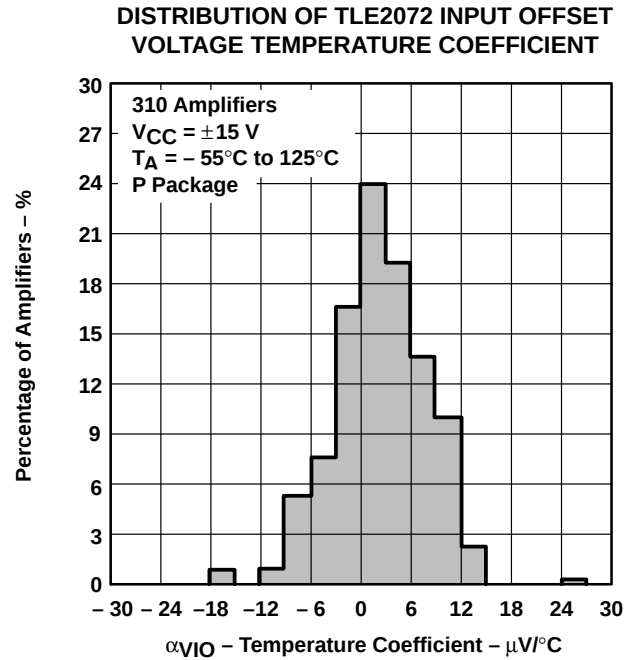


Figure 7

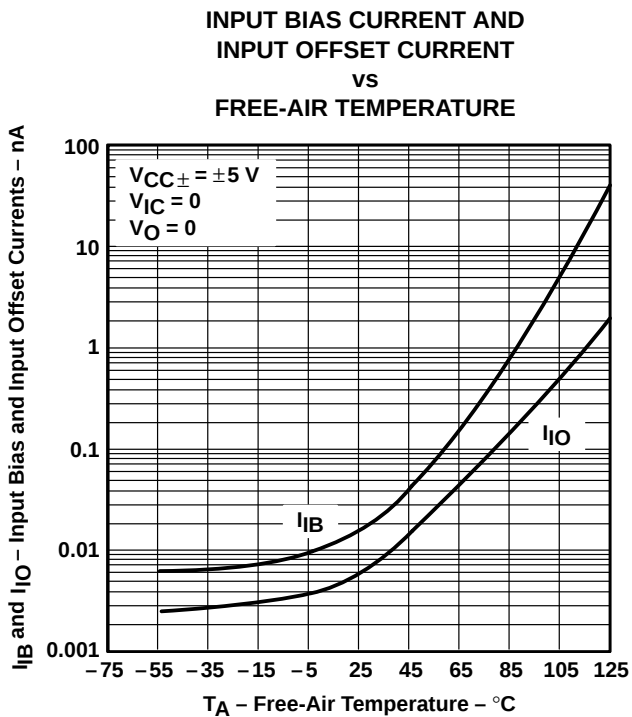


Figure 8

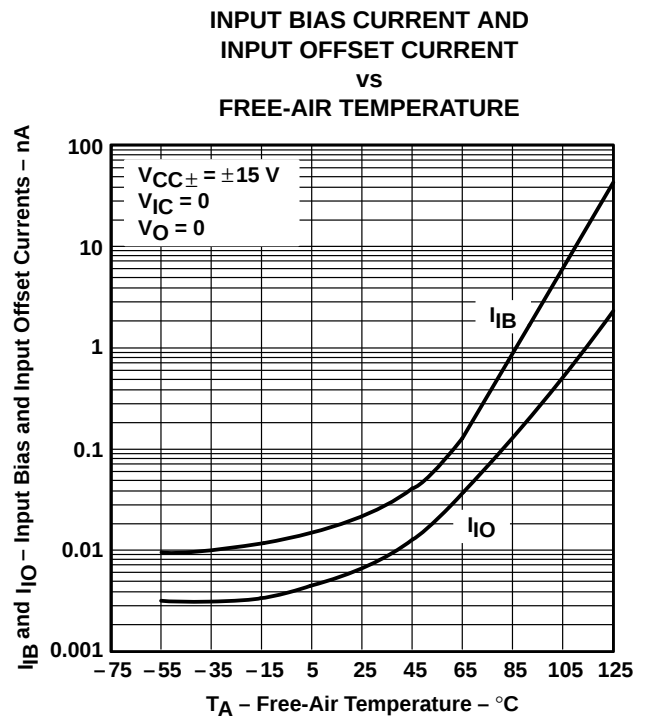
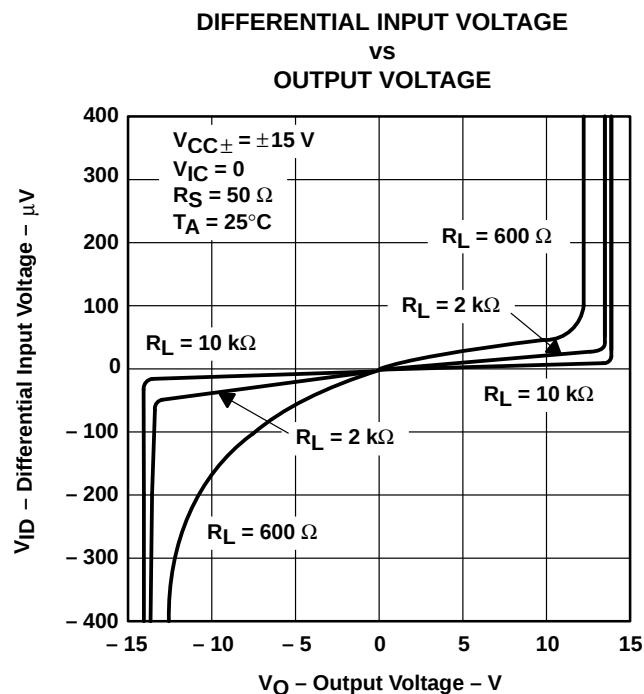
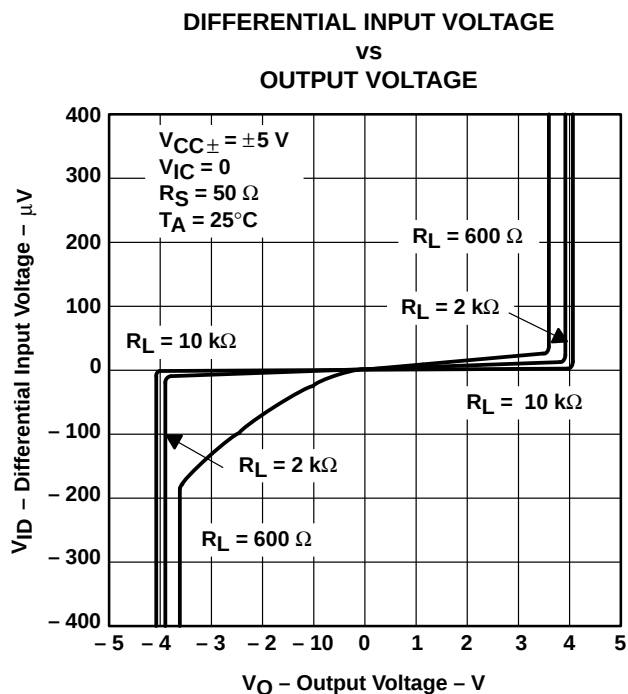
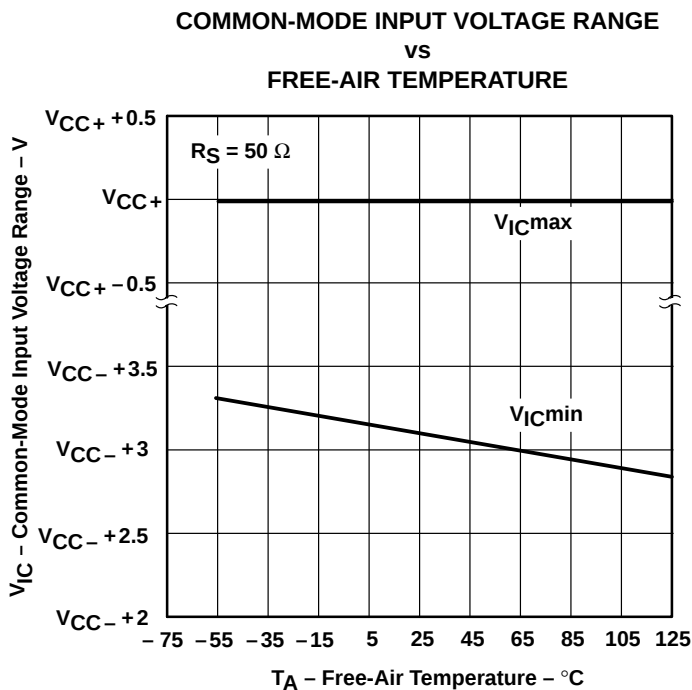
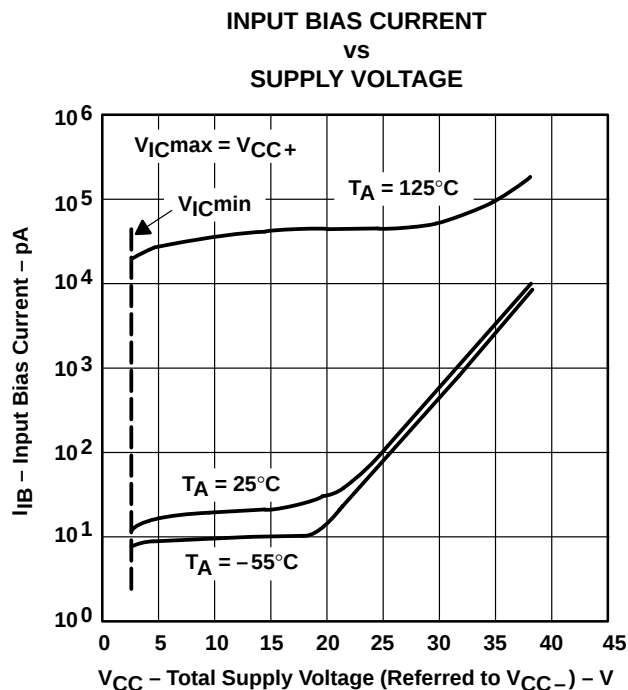


Figure 9

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†



† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†

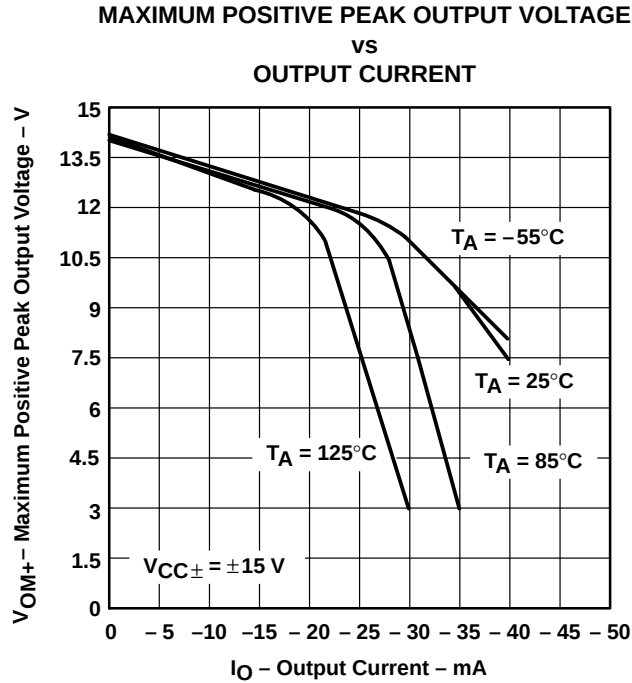


Figure 14

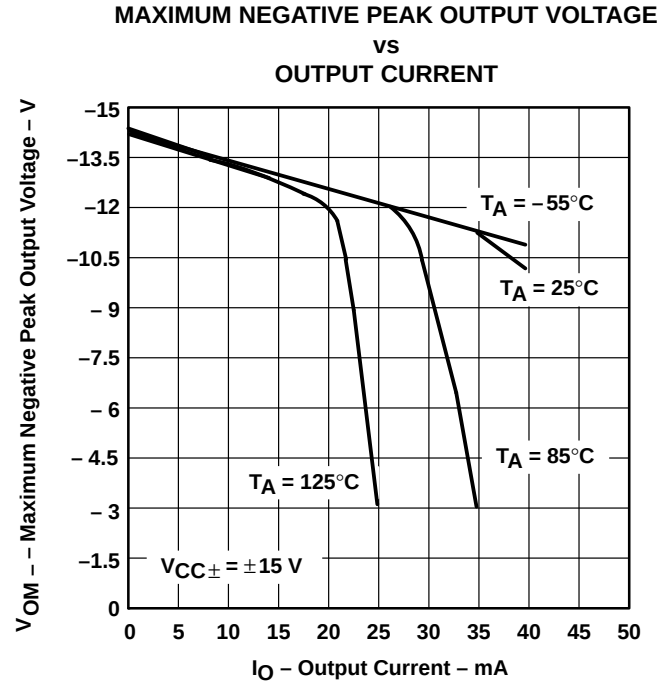


Figure 15

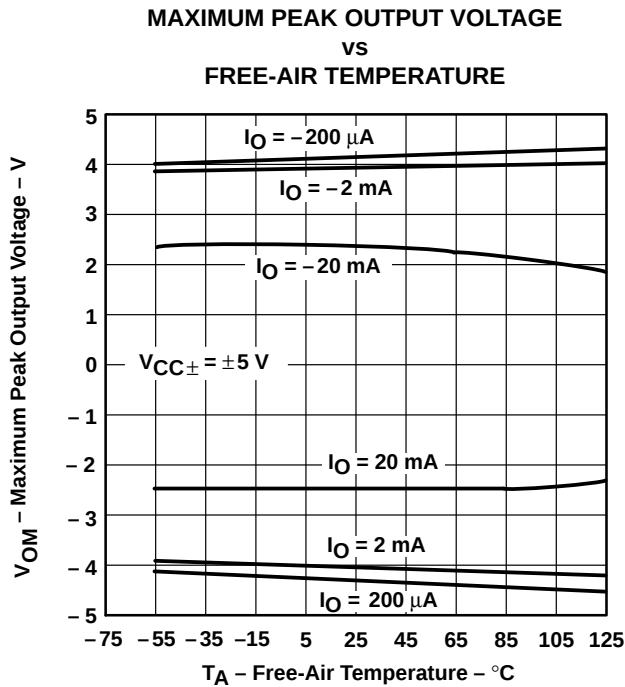


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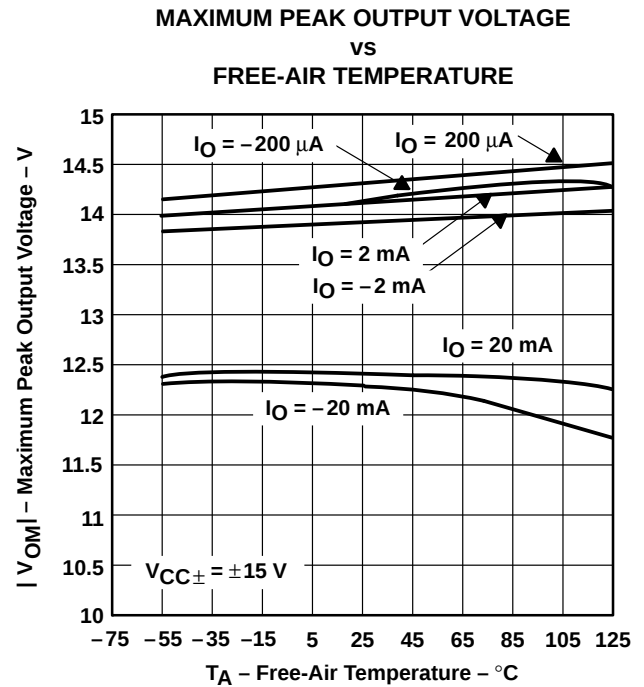


Figure 17

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†

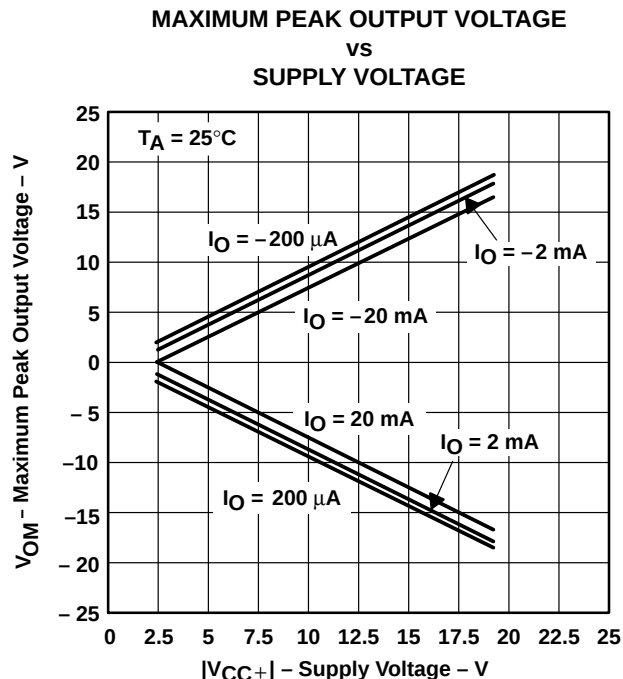


Figure 18

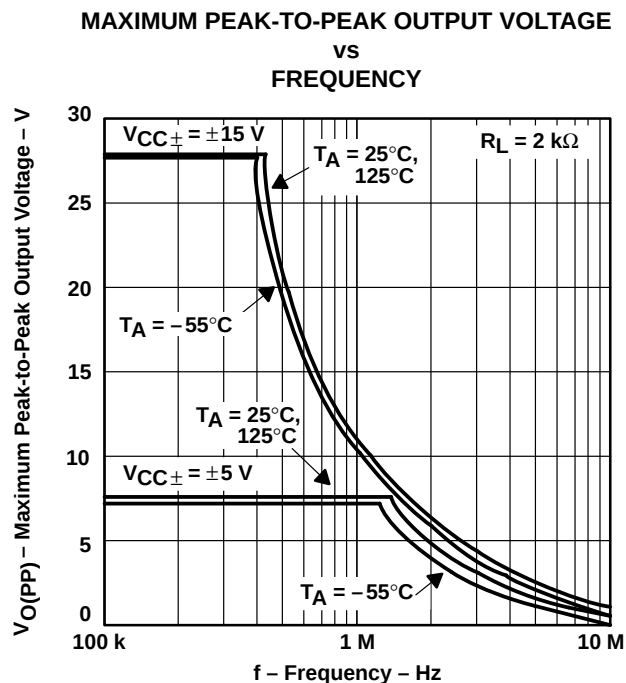


Figure 19

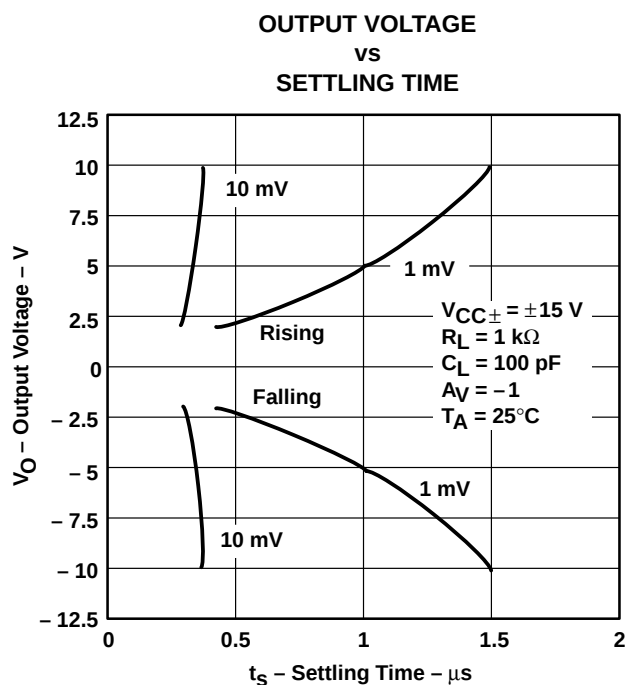


Figure 20

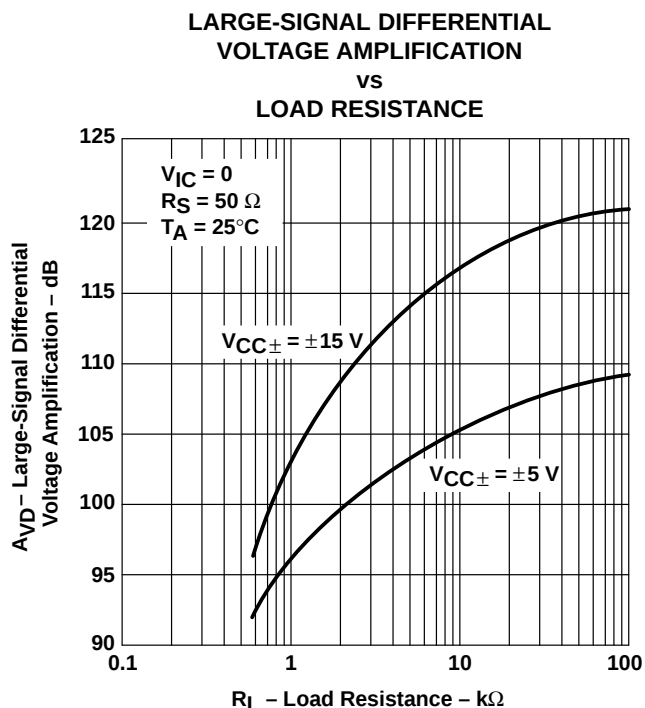


Figure 21

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†

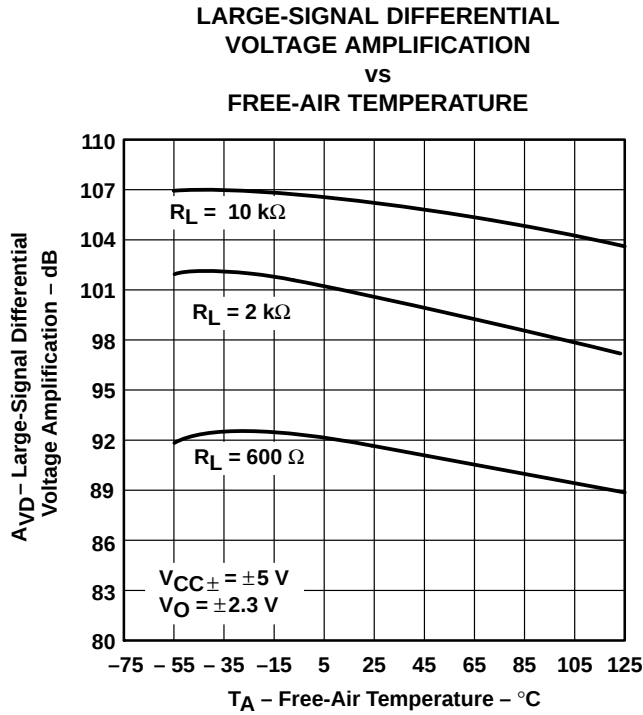


Figure 22

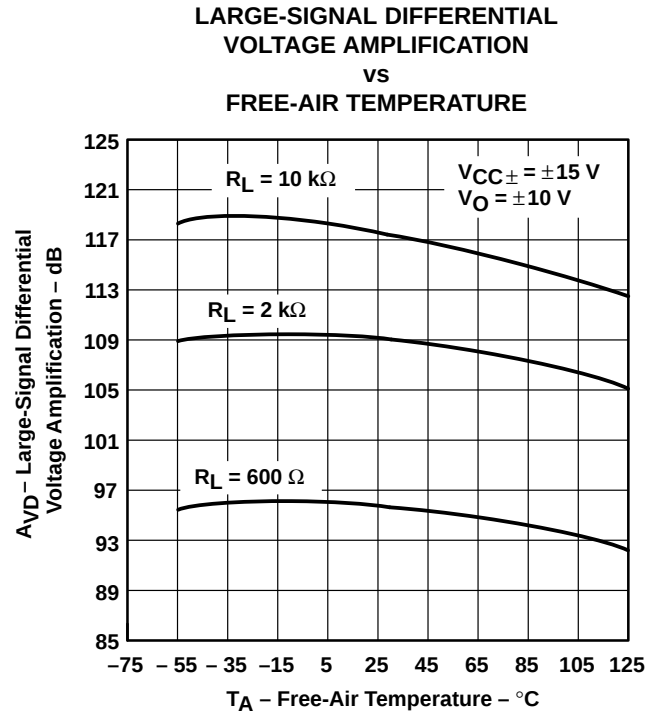


Figure 23

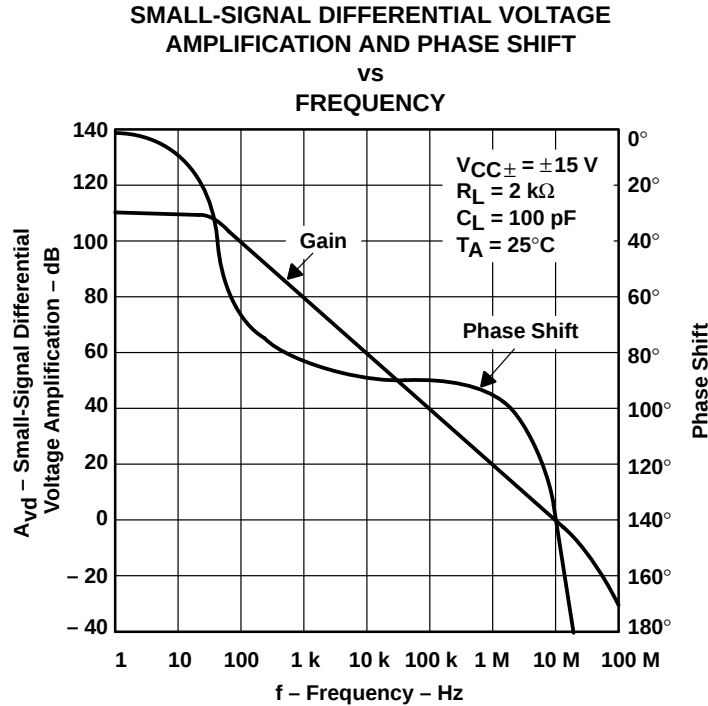


Figure 24

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

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SMALL-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT

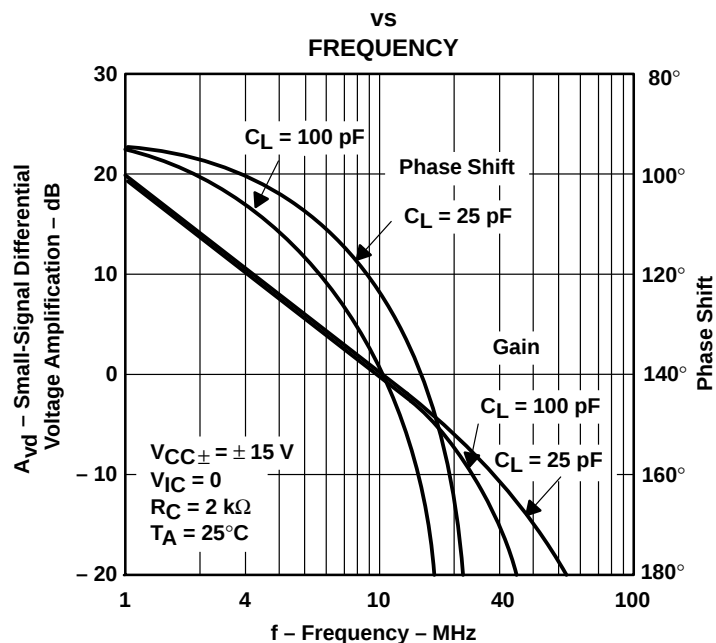


Figure 25

COMMON-MODE REJECTION RATIO

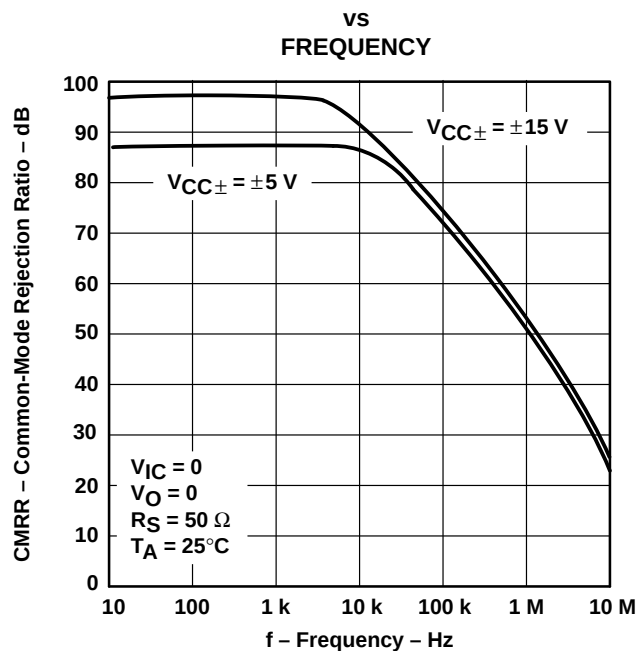


Figure 26

COMMON-MODE REJECTION RATIO

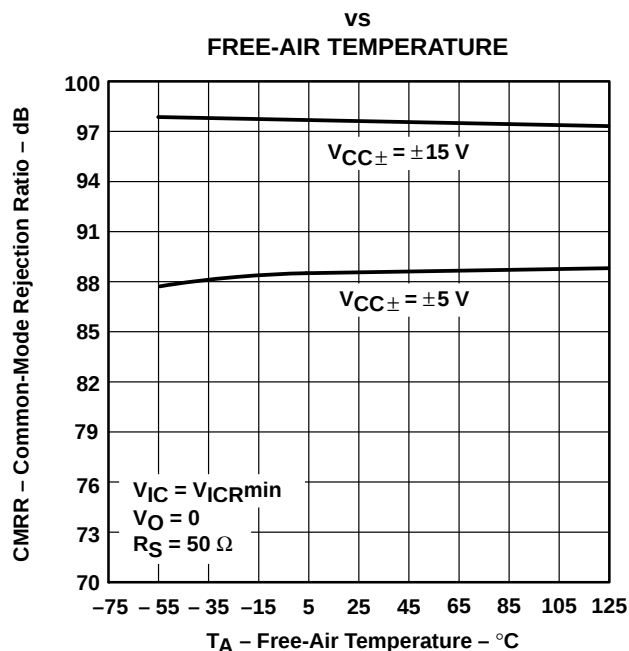


Figure 27

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†

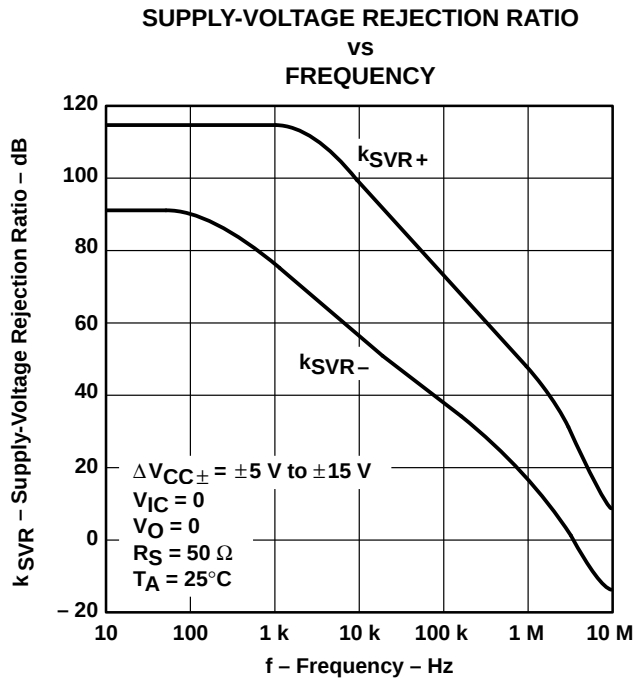


Figure 28

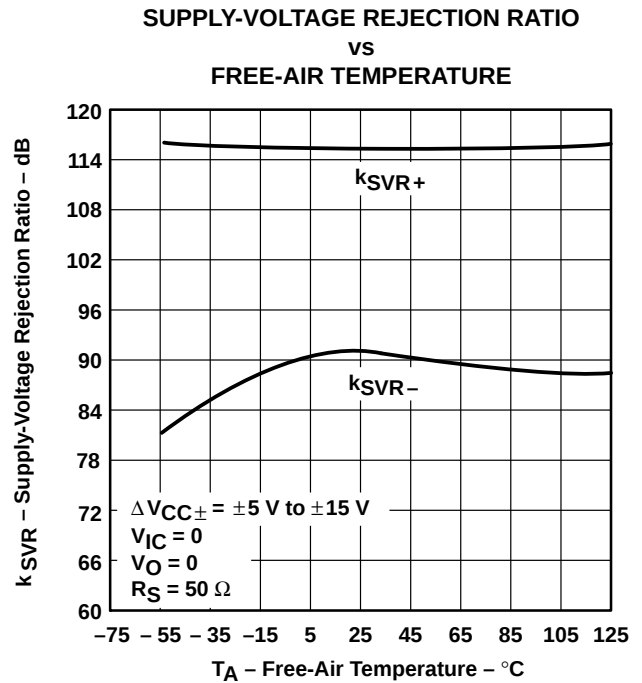


Figure 29

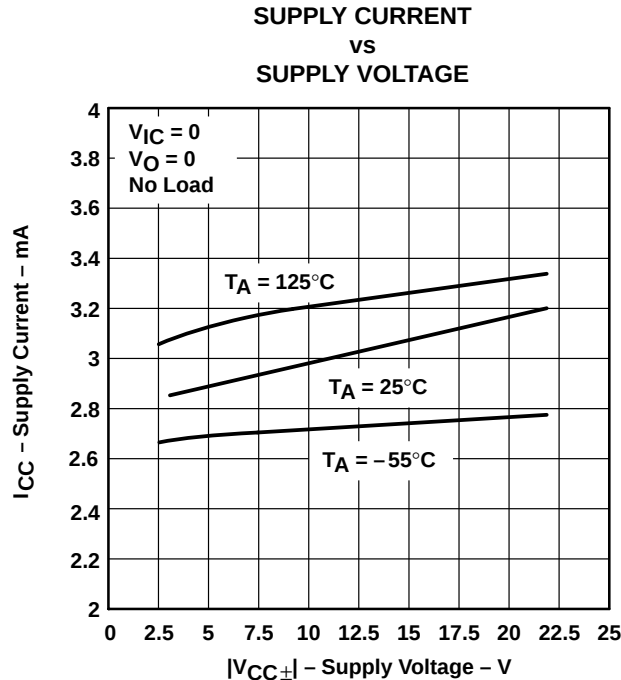


Figure 30

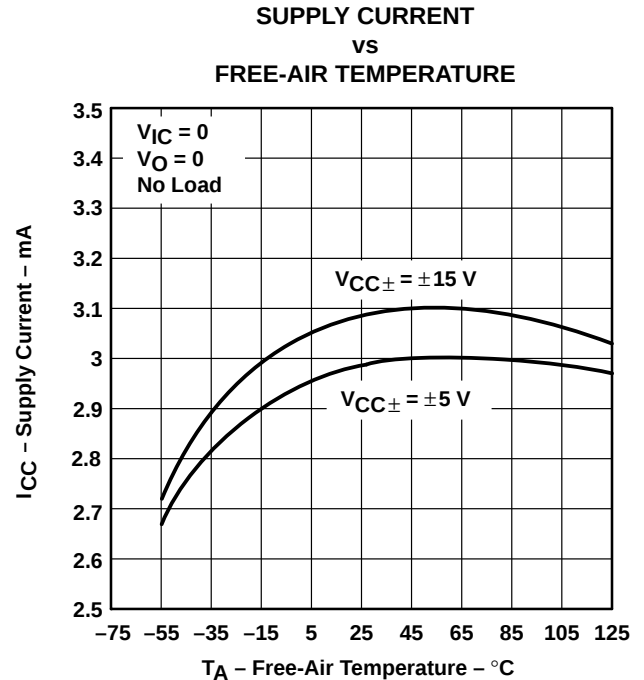


Figure 31

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

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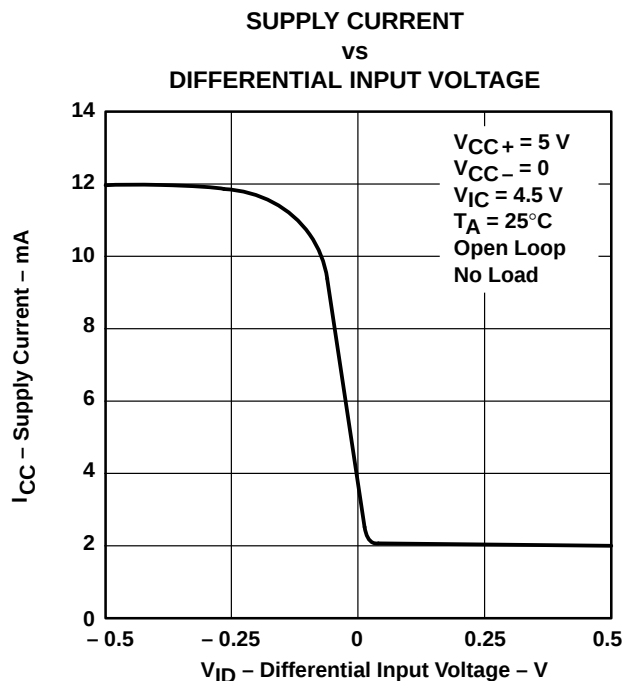


Figure 32

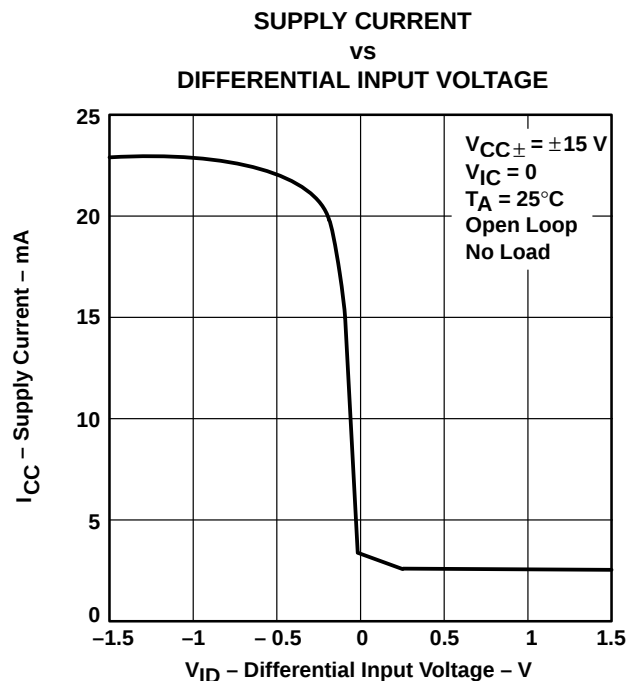


Figure 33

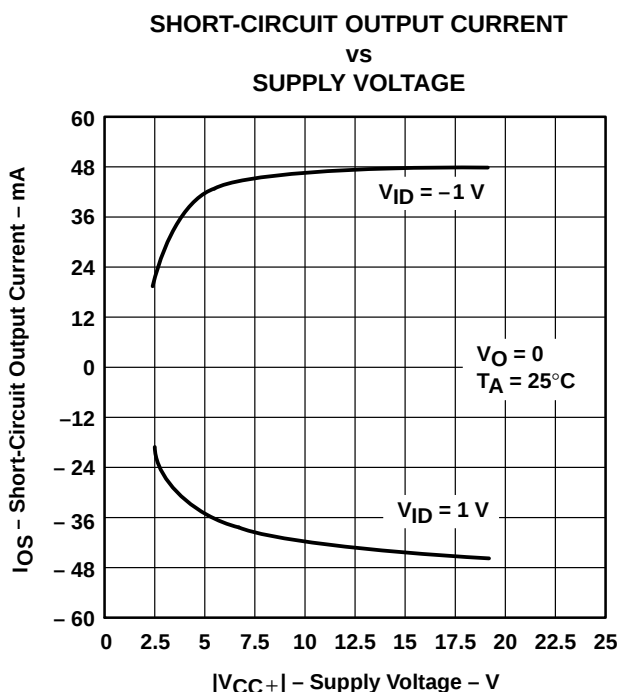


Figure 34

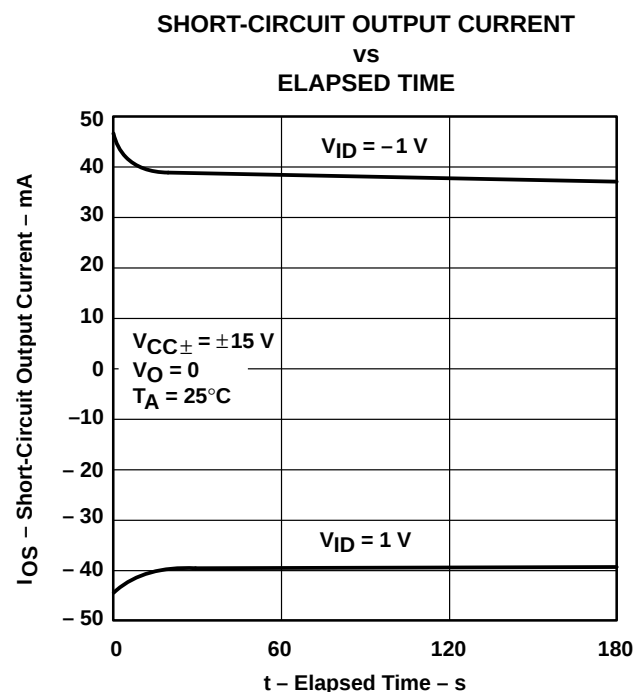


Figure 35

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†

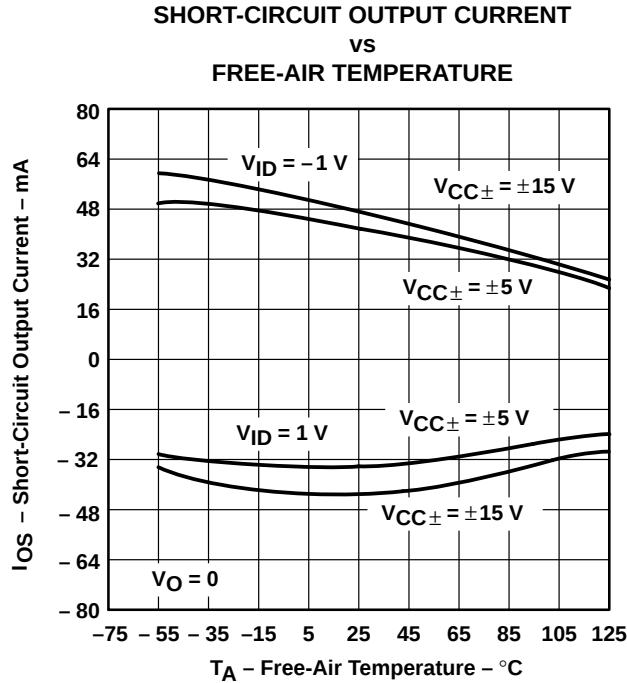


Figure 36

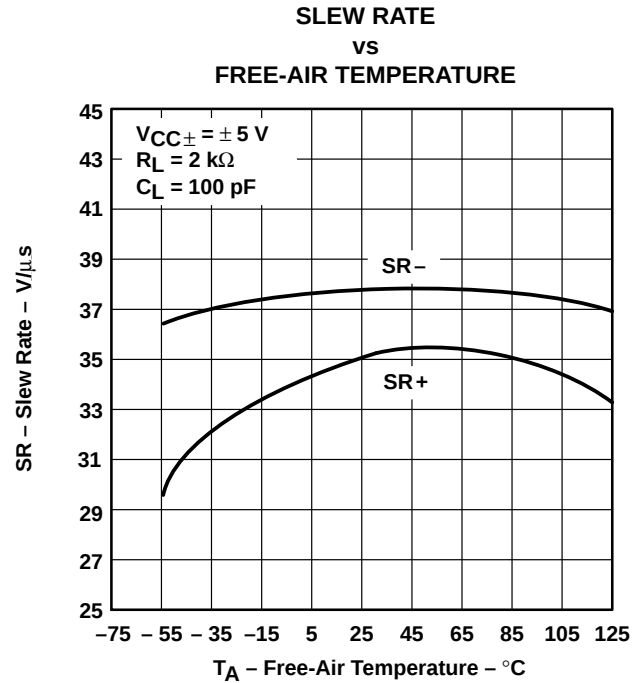


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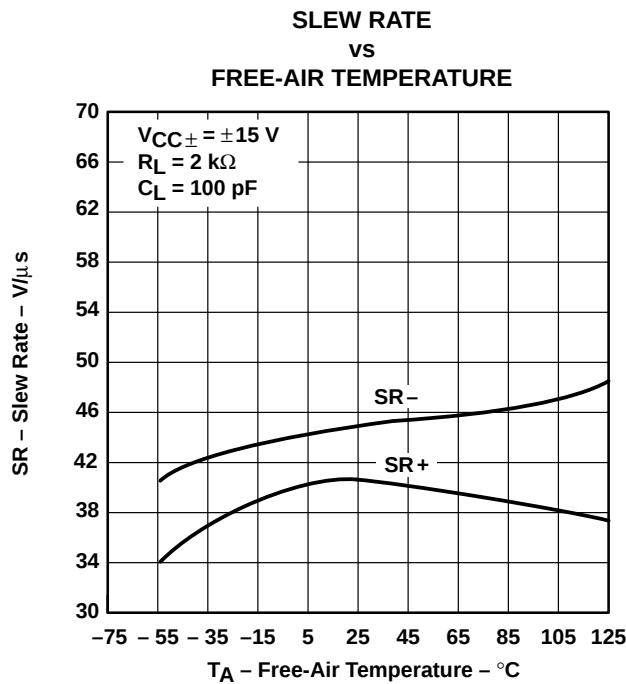


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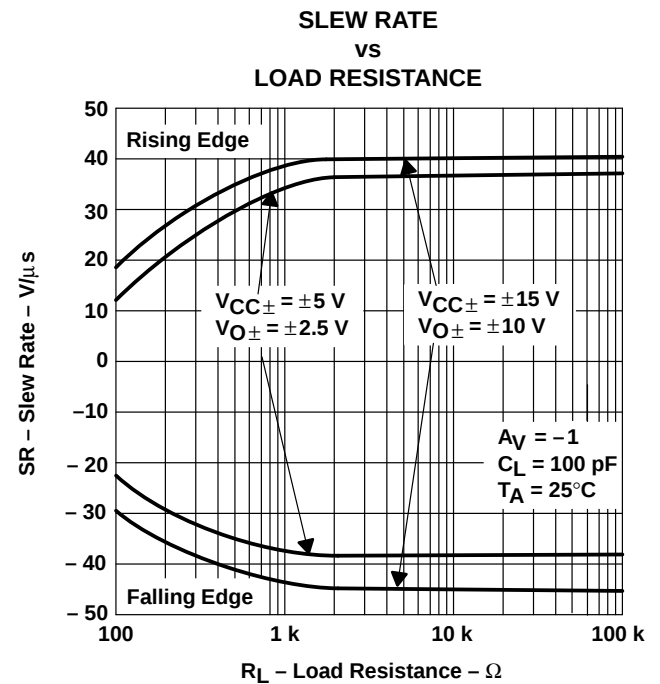


Figure 39

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

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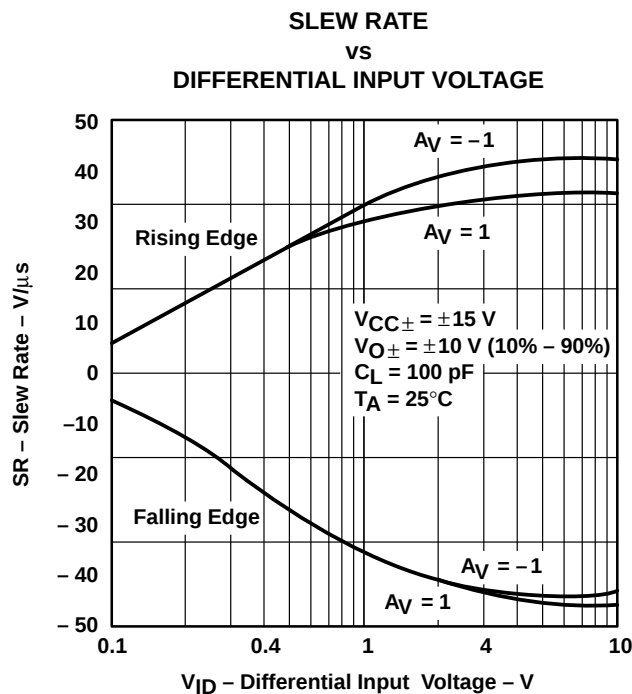


Figure 40

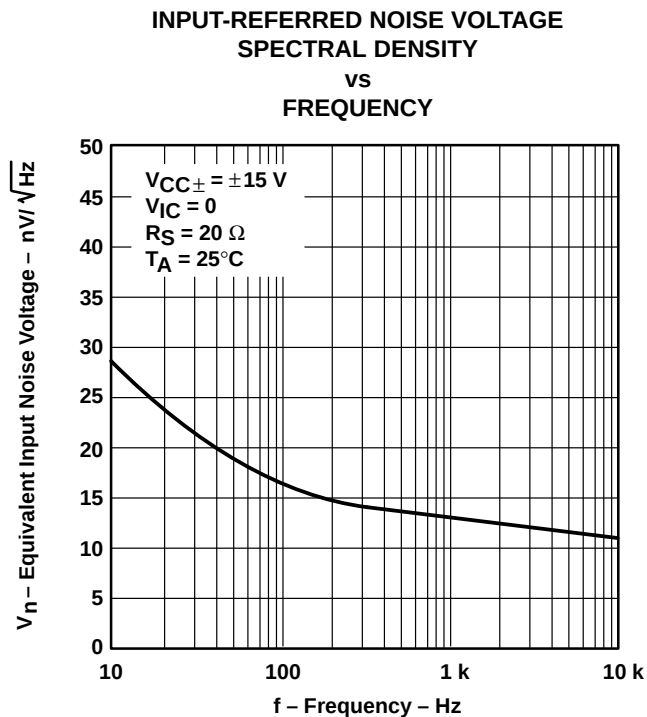


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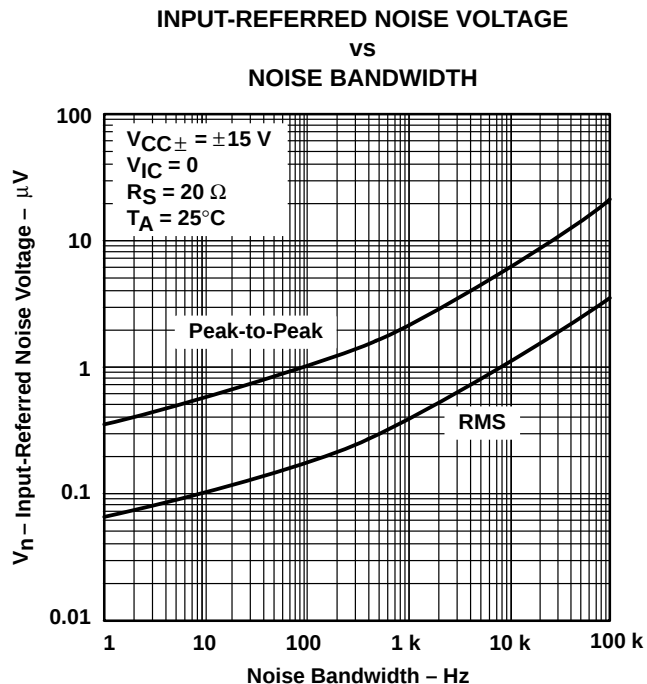


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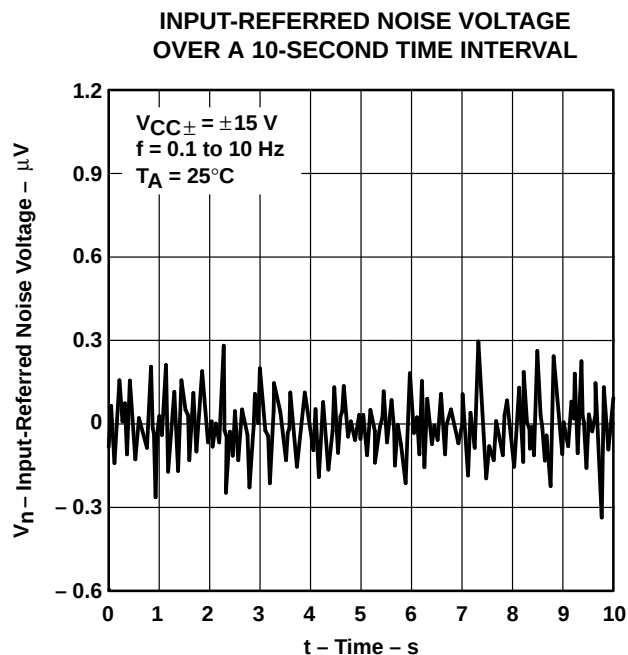


Figure 43

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS

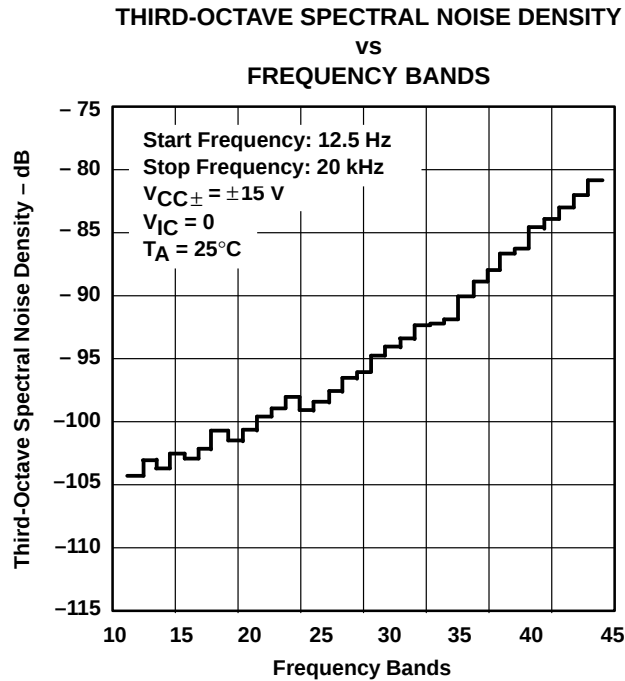


Figure 44

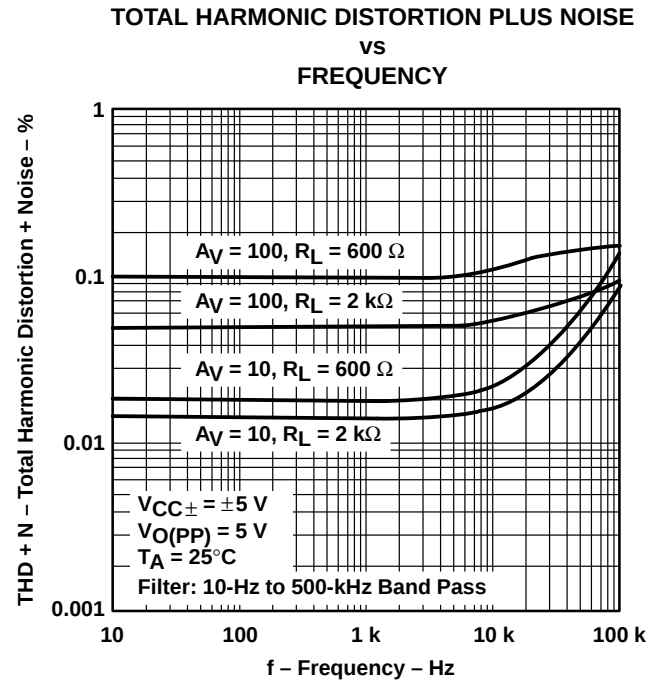


Figure 45

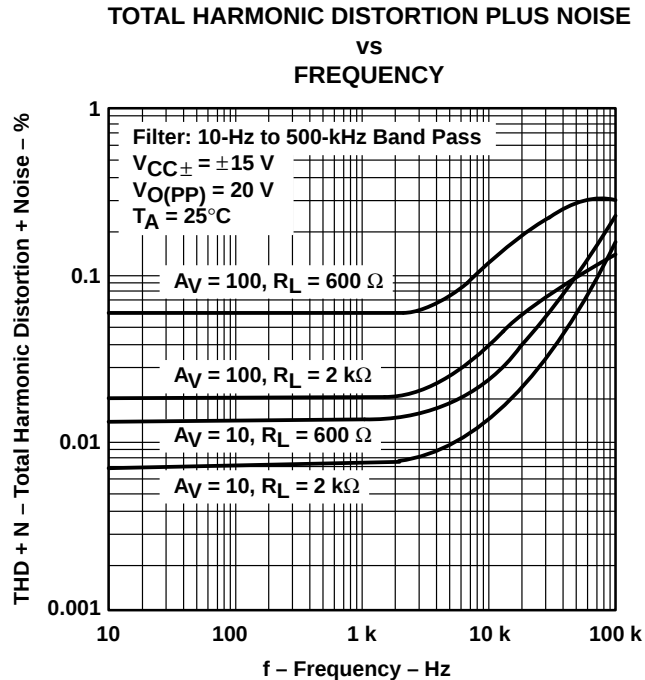


Figure 46

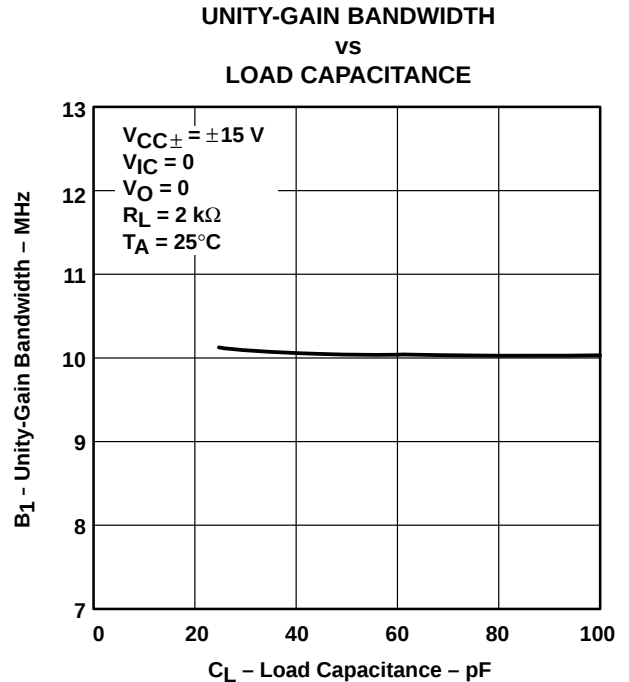


Figure 47

TLE2072, TLE2072A, TLE2072Y
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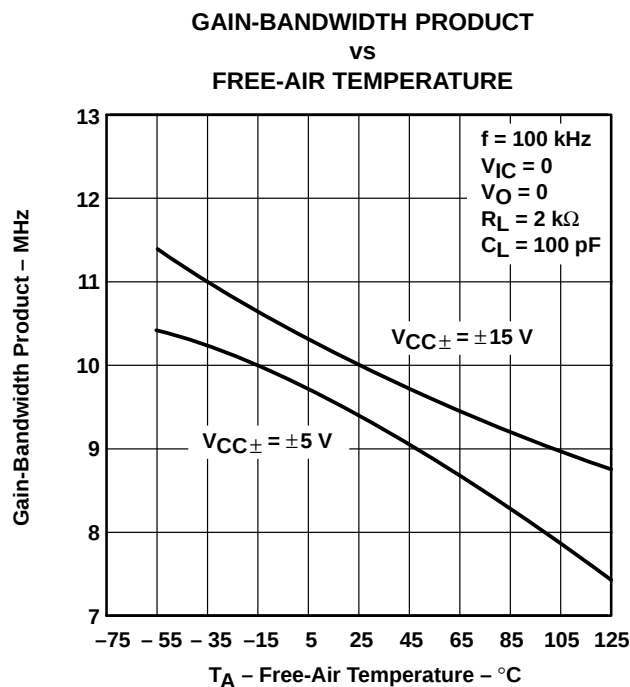


Figure 48

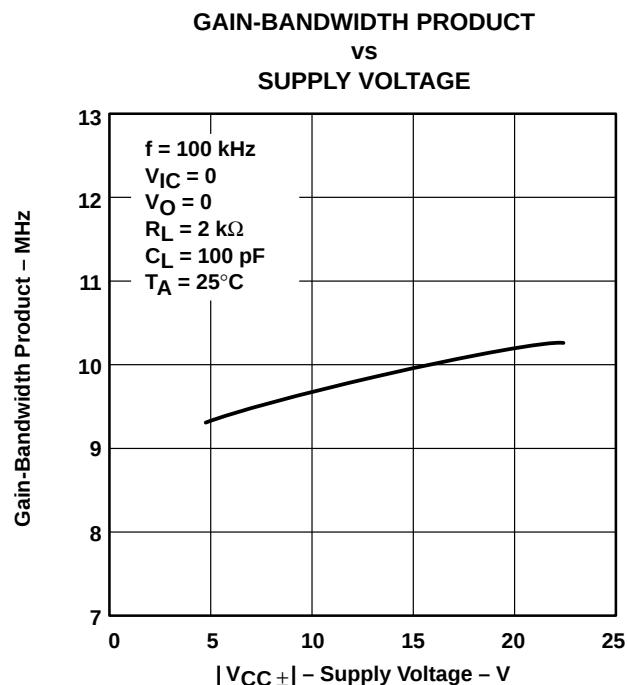


Figure 49

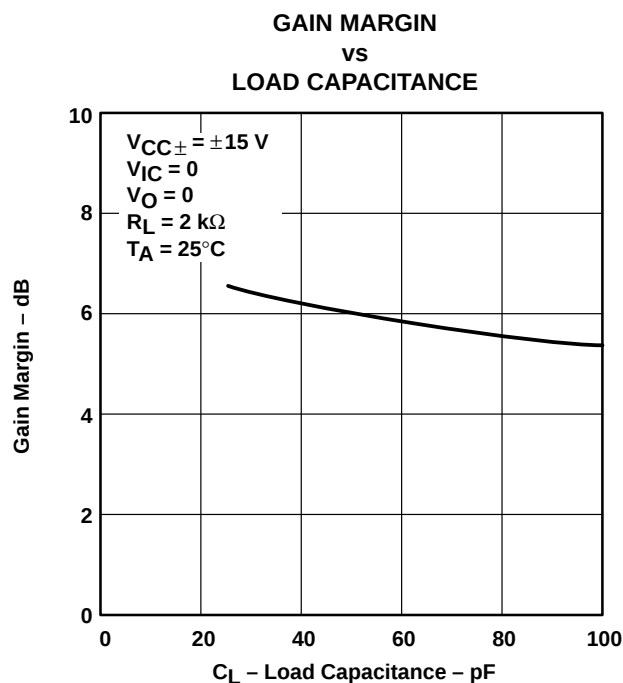


Figure 50

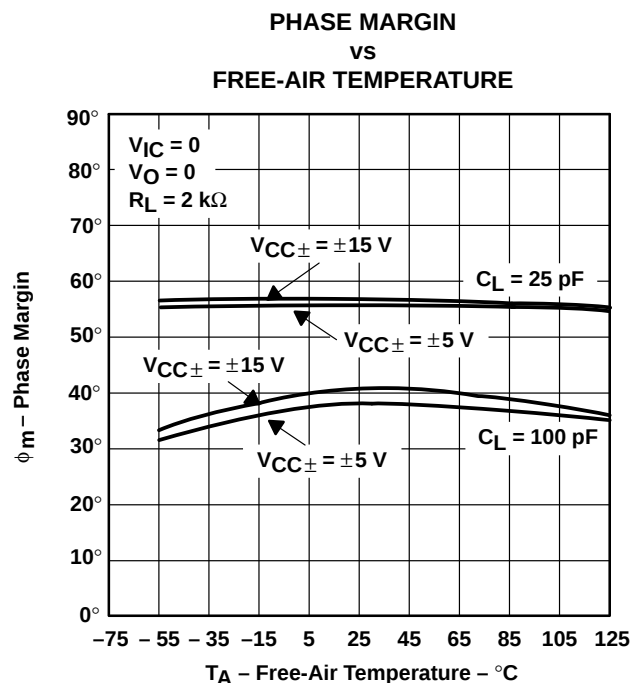


Figure 51

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†

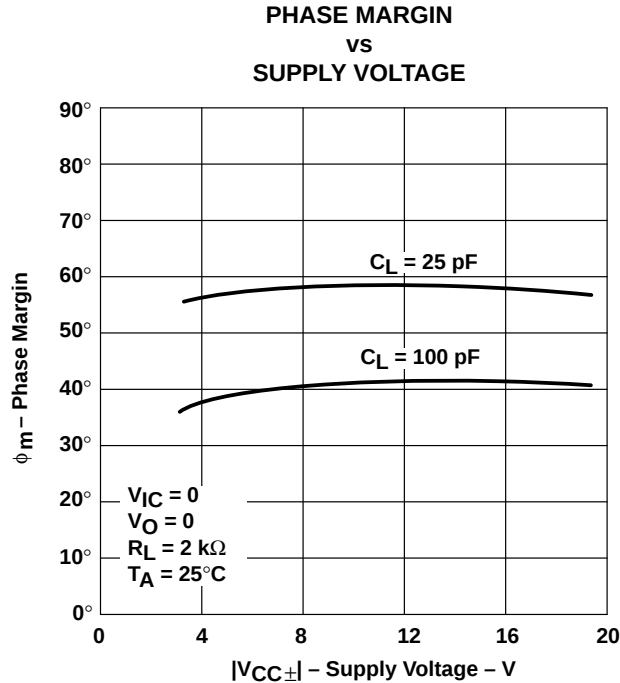


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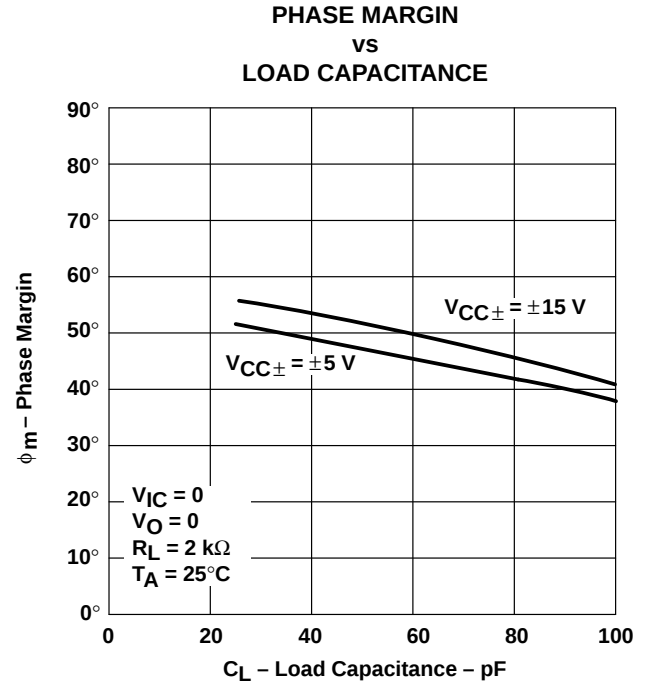


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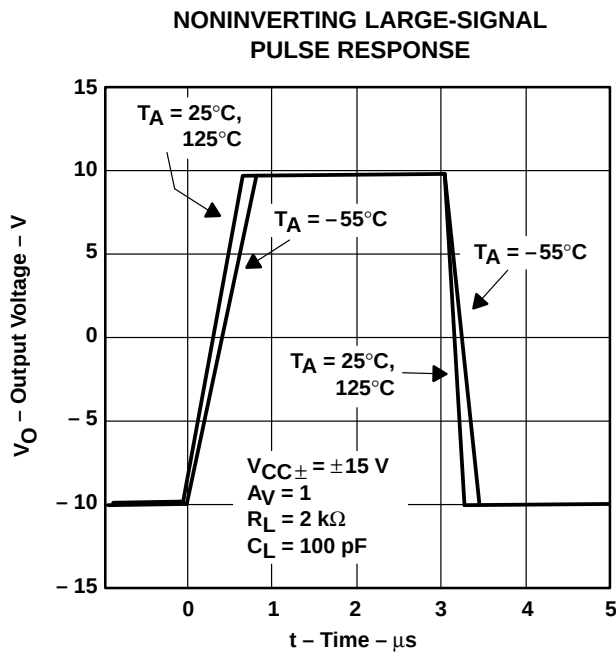


Figure 54

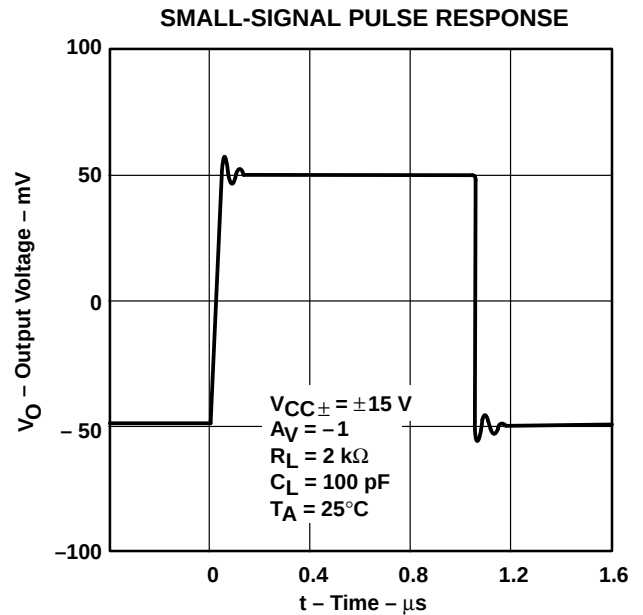


Figure 55

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

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JFET-INPUT DUAL OPERATIONAL AMPLIFIERS

SLOS124A – JUNE 1993 – REVISED AUGUST 1994

TYPICAL CHARACTERISTICS†

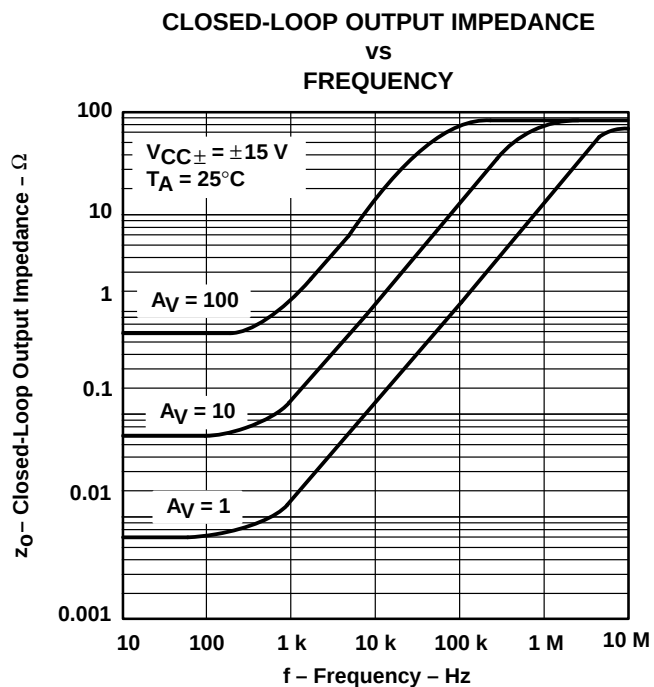


Figure 56

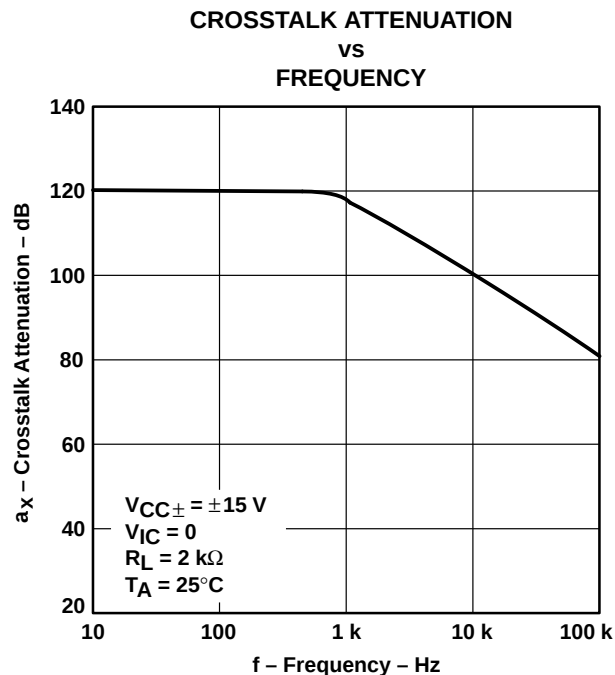


Figure 57

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

APPLICATION INFORMATION

macromodel information

Macromodel information provided was derived using *PSpice™ Parts™* model generation software. The Boyle macromodel (see Note 4) and subcircuit in Figure 58 were generated using the TLE2072 typical electrical and operating characteristics at $T_A = 25^\circ\text{C}$. Using this information, output simulations of the following key parameters can be generated to a tolerance of 20% (in most cases):

- Maximum positive output voltage swing
- Maximum negative output voltage swing
- Slew rate
- Quiescent power dissipation
- Input bias current
- Open-loop voltage amplification
- Unity-gain frequency
- Common-mode rejection ratio
- Phase margin
- DC output resistance
- AC output resistance
- Short-circuit output current limit

NOTE 4: G.R. Boyle, B.M. Cohn, D. O. Pederson, and J. E. Solomon, "Macromodeling of Integrated Circuit Operational Amplifiers", *IEEE Journal of Solid-State Circuits*, SC-9, 353 (1974).

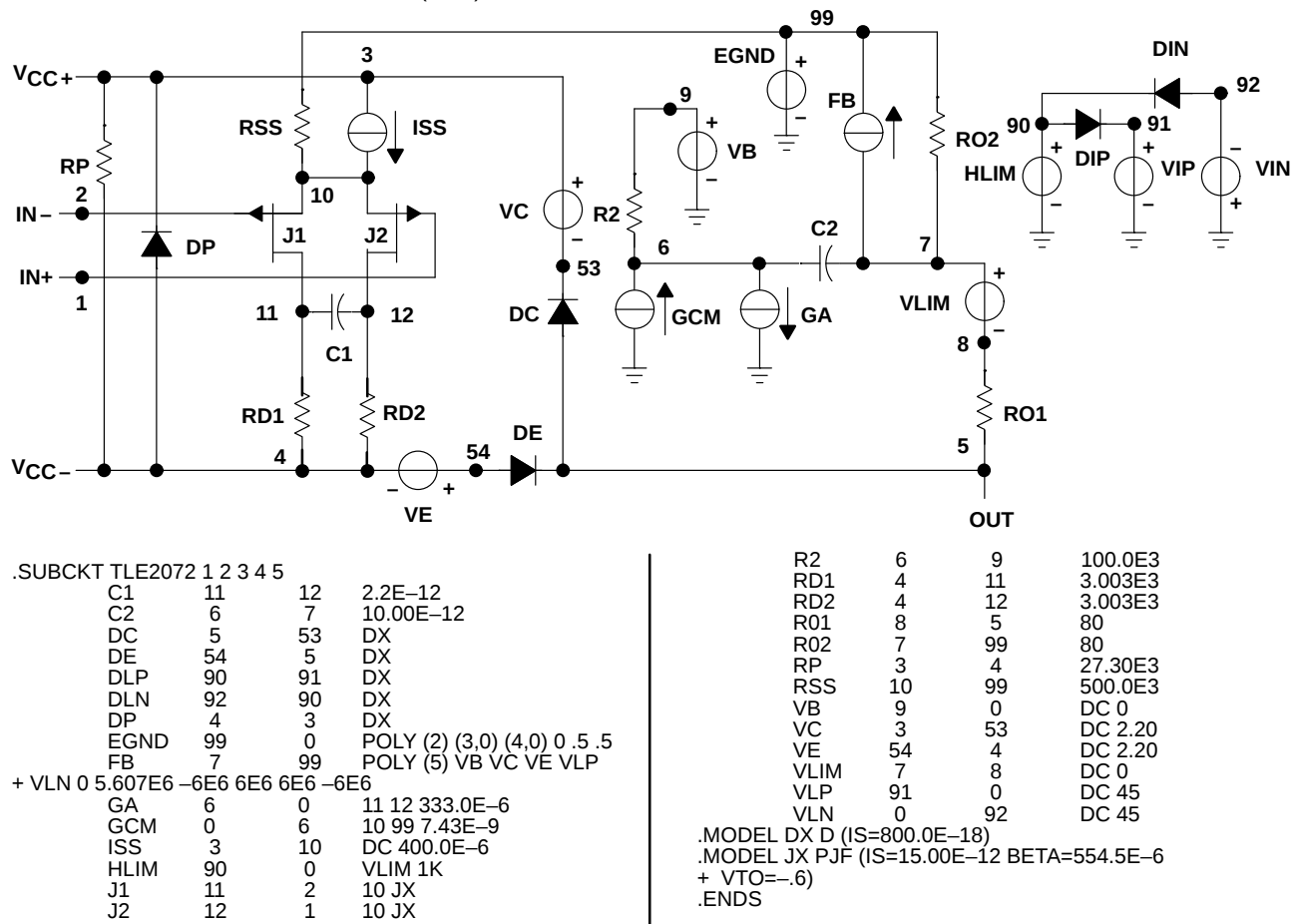


Figure 58. Boyle Macromodel and Subcircuit

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