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- Direct Upgrades to TL05x, TL07x, and **TL08x BiFET Operational Amplifiers**
- Greater Than 2× Bandwidth (10 MHz) and  $3\times$  Slew Rate (45 V/µs) Than TL08x
- **On-Chip Offset Voltage Trimming for Improved DC Performance**
- Wider Supply Rails Increase Dynamic Signal Range to ±19 V

#### description

The TLE208x series of JFET-input operational amplifiers more than double the bandwidth and triple the slew rate of the TL07x and TL08x families of BiFET operational amplifiers. The TLE208x also have wider supply-voltage rails, increasing the dynamic-signal range for BiFET circuits to  $\pm 19$  V. On-chip zener trimming of offset voltage yields precision grades for greater accuracy in dc-coupled applications. The TLE208x are pin-compatible with lower performance BiFET operational amplifiers for ease in improving performance in existing designs.

BiFET operational amplifiers offer the inherently higher input impedance of the JFET-input transistors, without sacrificing the output drive associated with bipolar amplifiers. This makes these amplifiers better suited for interfacing with high-impedance sensors or very low level ac signals. They also feature inherently better ac response than bipolar or CMOS devices having comparable power consumption.

Because BiFET operational amplifiers are designed for use with dual power supplies, care must be taken to observe common-mode input-voltage limits and output voltage swing when operating from a single supply. DC biasing of the input signal is required and loads should be terminated to a virtual ground node at mid-supply. Texas Instruments TLE2426 integrated virtual ground generator is useful when operating BiFET amplifiers from single supplies.

The TLE208x are fully specified at ±15 V and ±5 V. For operation in low-voltage and/or single-supply systems, Texas Instruments LinCMOS™ families of operational amplifiers (TLC- and TLV-prefix) are recommended. When moving from BiFET to CMOS amplifiers, particular attention should be paid to slew rate and bandwidth requirements and output loading.

For BiFET circuits requiring low noise and/or tighter dc precision, the TLE207x offer the same ac response as the TLE208x with more stringent dc and noise specifications.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

LinCMOS is a trademark of Texas Instruments



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#### **TLE2081 AVAILABLE OPTIONS**

			PACKAGED	DEVICES		CHIP	
TA	V <sub>IO</sub> max AT 25°C	SMALL OUTLINE (D)	CHIP CARRIER (FK)	CERAMIC DIP (JG)	PLASTIC DIP (P)	FORM (Y)	
0°C to 70°C	3 mV 6 mV	TLE2081ACD TLE2081CD	_	_	TLE2081ACP TLE2081CP	— TLE2081Y	
-40°C to 85°C	3 mV 6 mV	TLE2081AID TLE2081ID	_	_	TLE2081AIP TLE2081IP		
-55°C to 125°C	5°C to 125°C 3 mV 6 mV		TLE2081AMFK TLE2081MFK	TLE2081AMJG TLE2081MJG	_	_	

<sup>†</sup> The D packages are available taped and reeled. Add R suffix to device type (e.g., TLE2081ACDR).

#### **TLE2082 AVAILABLE OPTIONS**

		1				
			PACKAGED	DEVICES		
TA	V <sub>IO</sub> max AT 25°C	SMALL CHIP CERAMIC OUTLINE CARRIER DIP (D) (FK) (JG)		PLASTIC DIP (P)	CHIP FORM (Y)	
0°C to 70°C	4 mV 7 mV	TLE2082ACD TLE2082CD	_	_	TLE2082ACP TLE2082CP	_
-40°C to 85°C	4 mV 7 mV	TLE2082AID TLE2082ID	_	_	TLE2082AIP TLE2082IP	TLE2082Y
-55°C to 125°C	4 mV 7 mV	TLE2082AMD TLE2082MD	TLE2082AMFK TLE2082MFK	TLE2082AMJG TLE2082MJG	TLE2082AMP TLE2082MP	

<sup>&</sup>lt;sup>‡</sup> The D packages are available taped and reeled. Add R suffix to device type (e.g., TLE2082ACDR).

#### **TLE2084 AVAILABLE OPTIONS**

			PACKAGED	DEVICES		CHIP
TA	V <sub>IO</sub> max AT 25°C	SMALL OUTLINE (DW)	CHIP CARRIER (FK)	CERAMIC DIP (J)	PLASTIC DIP (N)	FORM (Y)
0°C to 70°C	4 mV 7 mV	TLE2084ACDW TLE2084CDW	_	_	TLE2084ACN TLE2084CN	— TLE2084Y
-55°C to 125°C	4 mV 7 mV	_	TLE2084AMFK TLE2084MFK	TLE2084AMJ TLE2084MJ		

<sup>†</sup> The DW packages are available taped and reeled. Add R suffix to device type (e.g., TLE2084ACDWR).



<sup>‡</sup> Chip forms are tested at  $T_A = 25^{\circ}C$  only.

<sup>‡</sup> Chip forms are tested at  $T_A = 25$ °C only.

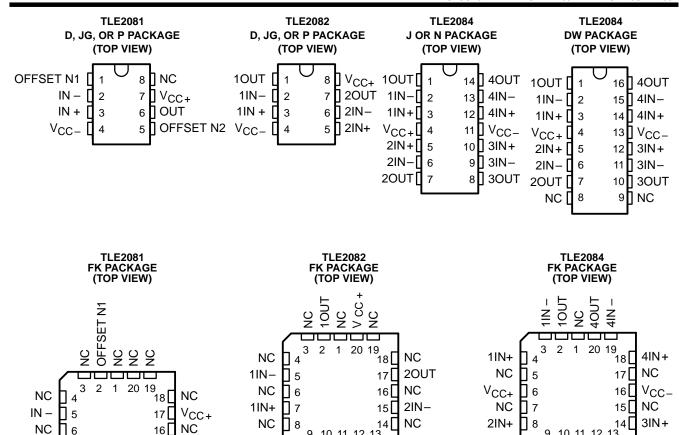
<sup>‡</sup> Chip forms are tested at  $T_A = 25^{\circ}C$  only.

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10 11 12 13

NC 30UT 3IN -

**20UT** 



10 11 12 13

VCC -ZIN +

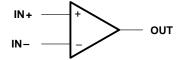
NC - No internal connection

П 6

IN+

NC

#### symbol



16

15 **[** 

10 11 12 13

 $\frac{8}{2}$ 2 VCC

OFFSET

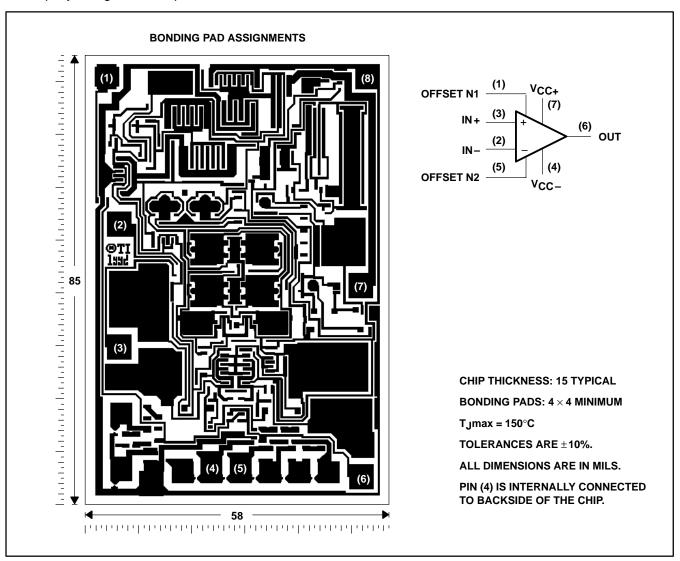
OUT

NC

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#### TLE2081Y chip information

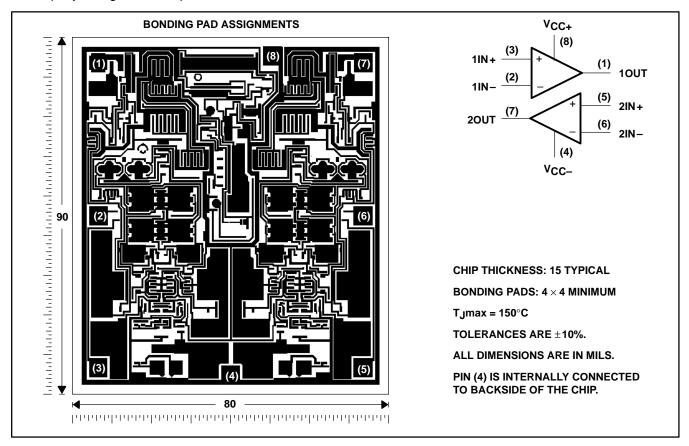
This chip, when properly assembled, displays characteristics similar to the TLE2081. Thermal compression or ultrasonic bonding may be used on the doped-aluminum bonding pads. Chips may be mounted with conductive epoxy or a gold-silicon preform.





#### **TLE2082Y chip information**

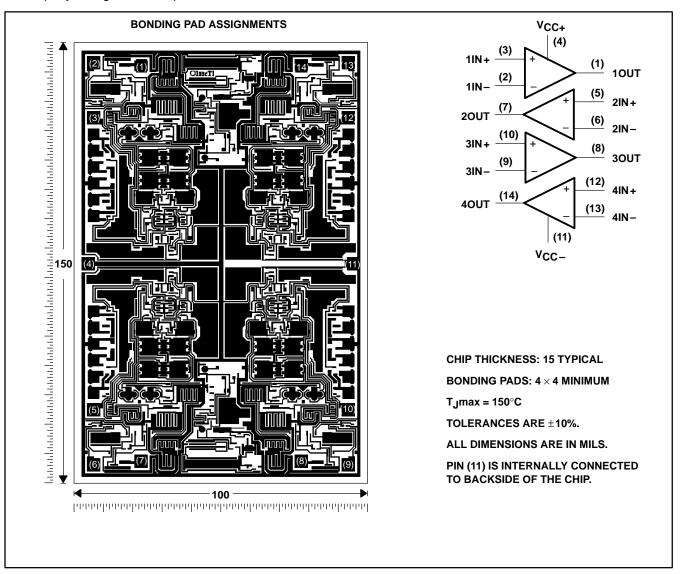
This chip, when properly assembled, displays characteristics similar to the TLE2082. Thermal compression or ultrasonic bonding may be used on the doped-aluminum bonding pads. Chips may be mounted with conductive epoxy or a gold-silicon preform.



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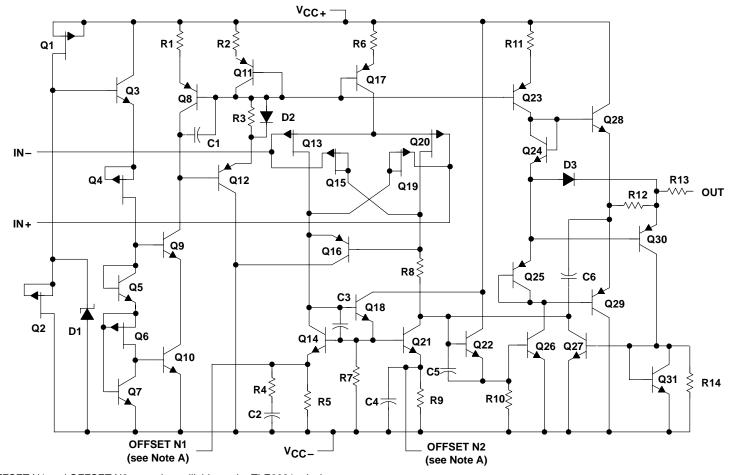
#### TLE2084Y chip information

This chip, when properly assembled, displays characteristics similar to the TLE2084. 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.





### equivalent schematic (each channel)



NOTE A: OFFSET N1 and OFFSET N2 are only available on the TLE2081x devices.

ACTU	AL DEVICE CO	MPONENT COU	NT
COMPONENT	TLE2081	TLE2082	TLE2084
Transistors	33	57	114
Resistors	25	37	74
Diodes	8	5	10
Capacitors	6	11	22

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

Supply voltage, V <sub>CC+</sub> (see Note 1)	19 V
Supply voltage, V <sub>CC</sub> (see Note 1)	19 V
Differential input voltage range, V <sub>ID</sub> (see Note 2)	
Input voltage range, V <sub>I</sub> (any input)	V <sub>CC+</sub> to V <sub>CC-</sub>
Input current, I <sub>I</sub> (each input)	
Output current, I <sub>O</sub> (each output)	
Total current into V <sub>CC+</sub>	
Total current out of V <sub>CC</sub>	
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 <sub>A</sub> : C suffix	0°C to 70°C
I suffix	
M suffix	–55°C to 125°C
Storage temperature range	65°C to 150°C
Case temperature for 60 seconds: FK package	
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: DW or N paci	kage 260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J package .	300°C

<sup>†</sup> 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 VCC+ and VCC-.
  - 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	$T_A \le 25^{\circ}C$ POWER RATING	DERATING FACTOR ABOVE T <sub>A</sub> = 25°C	T <sub>A</sub> = 70°C POWER RATING	T <sub>A</sub> = 85°C POWER RATING	T <sub>A</sub> = 125°C POWER RATING
D	725 mW	5.8 mW/°C	464 mW	377 mW	145 mW
DW	1025 mW	8.2 mW/°C	656 mW	533 mW	205 mW
FK	1375 mW	11.0 mW/°C	880 mW	715 mW	275 mW
J	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
N	1150 mW	9.2 mW/°C	736 mW	598 mW	230 mW
Р	1000 mW	8.0 mW/°C	640 mW	344 mW	200 mW

#### recommended operating conditions

		c su	FFIX	I SUF	FIX	M SU	FFIX	UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	ONIT
Supply voltage, V <sub>CC±</sub>		±2.25	±19	±2.25	±19	±2.25	±19	V
Common mode input voltage V	$V_{CC\pm} = \pm 5 \text{ V}$	-0.9	5	-0.8	5	-0.8	5	V
Common-mode input voltage, V <sub>IC</sub>	$V_{CC\pm} = \pm 15 \text{ V}$	-10.9	15	-10.8	15	-10.8	15	V
Operating free-air temperature, TA		0	70	-40	85	-55	125	°C



# TLE2081C electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 5$ V (unless otherwise noted)

	DADAMETED	TEST CO	MOITIONS	- +	TI	E2081	С	TL	E2081A	C	UNIT
	PARAMETER	1231 00	ONDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNII
V <sub>IO</sub>	Input offset voltage			25°C		0.34	6		0.3	3	mV
۷IO	input onset voltage	V <sub>IC</sub> = 0,	$V_{O} = 0$ ,	Full range			8			5	111 V
αVIO	Temperature coefficient of input offset voltage	R <sub>S</sub> = 50 Ω		Full range		3.2	29		3.2	29	μV/°C
lio	Input offset current			25°C		5	100		5	100	nA
lio	input onset current	$V_{IC} = 0$ ,	$V_{O} = 0$ ,	Full range			1.4			1.4	ША
lin	Input bias current	See Figure 4		25°C		15	175		15	175	nA
IВ	input bias current			Full range			5			5	ША
Vion	Common-mode input	R <sub>S</sub> = 50 Ω		25°C	5 to –1	5 to -1.9		5 to –1	5 to –1.9		٧
VICR	voltage range	NS = 30 22		Full range	5 to -0.9			5 to -0.9			V
		ΙΟ = -200 μΑ		25°C	3.8	4.1		3.8	4.1		
		10 = -200 μΑ		Full range	3.7			3.7			
V.	Maximum positive peak	I <sub>O</sub> = -2 mA		25°C	3.5	3.9		3.5	3.9		V
VOM+	output voltage swing	10 = -2 111A		Full range	3.4			3.4			V
		$I_{O} = -20 \text{ mA}$		25°C	1.5	2.3		1.5	2.3		
		10 = -20 IIIA		Full range	1.5			1.5			
		ΙΟ = 200 μΑ		25°C	-3.5	-4.2		-3.5	-4.2		
		10 = 200 μΑ		Full range	-3.4			-3.4			
V0	Maximum negative peak	I <sub>O</sub> = 2 mA		25°C	-3.7	-4.1		-3.7	-4.1		V
VOM-	output voltage swing	10 = 2 IIIA		Full range	-3.6			-3.6			V
		I <sub>O</sub> = 20 mA		25°C	-1.5	-2.4		-1.5	-2.4		
		10 = 20 IIIA		Full range	-1.5			-1.5			
			R <sub>L</sub> = 600 Ω	25°C	80	91		80	91		
			NC = 000 32	Full range	79			79			
AVD	Large-signal differential	V <sub>O</sub> = ± 2.3 V	R <sub>L</sub> = 2 kΩ	25°C	90	100		90	100		dB
~VD	voltage amplification	VO = ± 2.5 V	N_ = 2 KS2	Full range	89			89			uБ
			R <sub>L</sub> = 10 kΩ	25°C	95	106		95	106		
			KC = 10 K22	Full range	94			94			
rį	Input resistance	V <sub>IC</sub> = 0		25°C		1012			1012		Ω
<u>.</u>	Innut conscitores	VIC = 0,	Common mode	25°C		11			11		~F
ci	Input capacitance	See Figure 5	Differential	25°C		2.5			2.5		pF
z <sub>o</sub>	Open-loop output impedance	f = 1 MHz		25°C		80			80		Ω
CMDD	Common-mode	V <sub>IC</sub> = V <sub>ICR</sub> mi	n,	25°C	70	89		70	89		dD
CMRR	rejection ratio	$V_O = 0$ ,	$R_S = 50 \Omega$	Full range	68			68			dB
ko:-	Supply-voltage rejection	V <sub>CC±</sub> = ±5 V		25°C	82	99		82	99		40
ksvr	ratio( $\Delta V_{CC\pm}/\Delta V_{IO}$ )	$V_{O} = 0,$	$R_S = 50 \Omega$	Full range	80			80			dB

<sup>†</sup> Full range is 0°C to 70°C.



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# TLE2081C electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 5$ V (unless otherwise noted) (continued)

	PARAMETER	TEST CO	TEST CONDITIONS		TLE2081C			TL	E2081A	C	UNIT	
	PARAINETER	TEST CONDITIONS		T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	ONIT	
1	Cupply ourrent	V = - 0	No load	25°C	1.35	1.6	2.2	1.35	1.6	2.2	mA	
ICC	Supply current $V_O = 0$ ,		No load	Full range			2.2			2.2	IIIA	
laa	Short-circuit output	Va = 0	V <sub>ID</sub> = 1 V	25°C		-35			-35		mA	
los	OS current $V_0 = 0$		$V_{ID} = -1 V$	25 C		45			45		IIIA	

<sup>†</sup> Full range is 0°C to 70°C.

## TLE2081C operating characteristics at specified free-air temperature, $V_{\mbox{CC}\pm}$ = $\pm 5$ V

	DADAMETED	TEST 001	IDITIONO		Т	LE2081	С	TL	E2081A	'C	
	PARAMETER	TEST CO	MULLIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
				25°C		35			35		
SR+	Positive slew rate	V <sub>O</sub> (PP) = ±2.3	3 V,	Full range	23			23			V/μs
		$A_{VD} = -1,$ $C_{L} = 100 \text{ pF,}$	See Figure 1	25°C		38			38		
SR-	Negative slew rate	, , , , , , , , , , , , , , , , , , ,		Full range	23			23			V/μs
t <sub>S</sub>	Settling time	$A_{VD} = -1$ , 2-V step,	To 10 mV	25°C		0.25			0.25		μs
'S	Setting time	$R_L = 1 \text{ k}\Omega$ , $C_L = 100 \text{ pF}$	To 1 mV	25 0		0.4			0.4		μο
٧n	Equivalent input noise		f = 10 Hz	25°C		28			28		nV/√ <del>Hz</del>
٧n	voltage		f = 10 kHz	25 C		11.6			11.6		NV/ VHZ
V	Peak-to-peak equivalent	$R_S = 20 \Omega$ , See Figure 3	f = 10 Hz to 10 kHz	25°C		6			6		\/
VN(PP)	input noise voltage		f = 0.1 Hz to 10 Hz	25 0		0.6			0.6		μV
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA/√ <del>Hz</del>
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 5 \text{ V},$ f = 1  kHz, $R_{S} = 25 \Omega$		25°C	(	0.013%		(	0.013%		
B <sub>1</sub>	Unity-gain bandwidth		$R_L = 2 kΩ$ , See Figure 2	25°C		9.4			9.4		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 4 V$ , $R_L = 2 k\Omega$ ,	$A_{VD} = -1$ , $C_{L} = 25 pF$	25°C		2.8			2.8		MHz
φm	Phase margin at unity gain		$R_L = 2 kΩ$ , See Figure 2	25°C		56°			56°		

<sup>†</sup> Full range is 0°C to 70°C.



# TLE2081C electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 15$ V (unless otherwise noted)

No. 1 Input offset voltage		DADAMETED	TEST CO	NDITIONS	_ +	Т	LE20810	;	TL	E2081A	С	LINUT
No   Input offset votation   No   Input offset votation   Res   So Ω   No   So Ω   So Ω   So Ω   No   No   No   No   No   No   No		PARAMETER	IESI CO	MUITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
Temperature coefficient   No	V10	Input offset voltage			25°C		0.49	6		0.47	3	m\/
No	۷IO	input onset voltage		$V_O = 0$ ,	Full range			8			5	IIIV
In   In   In   In   In   In   In   In	ανιο		$R_S = 50 \Omega$		Full range		3.2	29		3.2	29	μV/°C
No   No   No   No   No   No   No   No	l. a	loguet offeet europet			25°C		6	100		6	100	Λ
Input bias current   Full range   5   5   5   5   5   5   5   5   5	ΙΟ	input offset current	V <sub>IC</sub> = 0,	$V_{O} = 0$ ,	Full range			1.4			1.4	ΠA
Vicr Voltage range  Nome and the part of	1	longet biog gurrant		_	25°C		20	175		20	175	~ ^
VCR         Common-mode input voltage range         AS = 50 Ω         25°C   10   11   11.9   11.	ΙΒ	input bias current			Full range			5			5	ΠA
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $						15	15		15	15		
Vomaly on the proper of the prope					25°C							
VOM+         Maximum positive peak output voltage swing         IO = −200 μA         25°C   13.8   14.1   13.8   14.1   13.8   14.1   13.8   14.1   13.7   13.8   14.1   13.4	VICR		$R_S = 50 \Omega$			-	-11.9			-11.9		٧
Nome the state of the state o		voltage range			Full range							
$ \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$					I ull range							
$ \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$					25°C	13.8	14.1		13.8	14.1		
$ \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$			$I_{O} = -200 \mu A$		Full range				13.7	-		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Maximum positive peak				13.5	13.9		13.5	13.9		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	VOM+		$I_O = -2 \text{ mA}$		Full range	13.4			13.4			V
VOM - VOM							12.3			12.3		
$ V_{OM-} = W_{OM-} = W_{$			$I_{O} = -20 \text{ mA}$									
$ \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$					_		-14.2		-	-14.2		
$ \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$			I <sub>O</sub> = 200 μA									
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Maximum pogativo poak					-14			-14		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	VOM-		$I_O = 2 \text{ mA}$									V
$ \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$		, ,					-124			-124		
$ \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$			$I_O = 20 \text{ mA}$									
$ \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$							96			96		
$ \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$				$R_L = 600 \Omega$					-			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Lorgo signal difforantial					109			109		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	AVD		$V_0 = \pm 10 \text{ V}$	$R_L = 2 k\Omega$						100		dB
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							118			118		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$				$R_L = 10 \text{ k}\Omega$			110					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	r:	Innut resistance	V <sub>1</sub> 0 = 0		<del>                                     </del>	J-1	1012		<u> </u>	1012		0
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	'1	input resistance	VIC = 0	Common	25 0		10			10		32
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	cį	Input capacitance		mode								pF
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			Ŭ.	Differential	25°C		2.5			2.5		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	z <sub>o</sub>		f = 1 MHz		25°C		80			80		Ω
rejection ratio $V_O = 0$ , $R_S = 50 \Omega$ Full range 79 79  Supply-voltage rejection $V_{CC\pm} = \pm 5 \text{ V to } \pm 15 \text{ V}$ , $25^{\circ}\text{C}$ 82 99 82 99  dB	CMDD	Common-mode	V <sub>IC</sub> = V <sub>ICR</sub> mi	VIC = VICRmin,		80	98		80	98		dB
key/p dataset species 100± = 1 to = 10 ty	CIVIER	rejection ratio	$V_0 = 0,$	$R_S = 50 \Omega$	Full range	79			79			ub
USVK ratio (A)/a a (A)/a ) 1/a 0 De 50.0	kovis				25°C	82	99		82	99		dР
VO = 0, $VO = 0$ , $VO =$	^SVR	ratio ( $\Delta V_{CC\pm}/\Delta V_{IO}$ )	$V_{O} = 0,$	$R_S = 50 \Omega$	Full range	80			81			uБ

<sup>†</sup>Full range is 0°C to 70°C.



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# TLE2081C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15$ V (unless otherwise noted) (continued)

	PARAMETER	TEST CO	TEST CONDITIONS		TLE2081C			TL	E2081A	С	UNIT
	FARAMETER		TEST CONDITIONS		MIN	TYP	MAX	MIN	TYP	MAX	UNIT
la a	Supply ourrent	Va = 0	No load	25°C	1.35	1.7	2.2	1.35	1.7	2.2	mA
ICC	Supply current $V_O = 0$ ,		NO IOAU	Full range			2.2			2.2	IIIA
	Short-circuit output	V- 0	V <sub>ID</sub> = 1 V	0500	-30	-45		-30	-45		A
los	OS current $V_O = 0$		$V_{ID} = -1 V$	25°C	30	48	·	30	48	·	mA

<sup>†</sup> Full range is 0°C to 70°C.

## TLE2081C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

	DADAMETED	TEST COM	DITIONS	_ +	Т	LE20810	;	TI	E2081A	С	LIAUT
	PARAMETER	TEST CON	DITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
				25°C	30	40		30	40		
SR+	Positive slew rate	V <sub>O(PP)</sub> = 10 V,	$A_{VD} = -1$ , $C_{I} = 100 \text{ pF}$ ,	Full range	27			27			V/μs
		$R_L = 2 k\Omega$ , See Figure 1	CL = 100 pr,	25°C	30	45		30	45		
SR-	Negative slew rate	3		Full range	27			27			V/μs
t <sub>S</sub>	Settling time	$A_{VD} = -1$ , 10-V step,	To 10 mV	25°C		0.4			0.4		μs
is	Octuing unic	$R_L = 1 k\Omega$ , $C_L = 100 pF$	To 1 mV	25 0		1.5			1.5		μσ
Vn	Equivalent input noise		f = 10 Hz	25°C		28			28		nV√ <del>Hz</del>
v n	voltage		f = 10 kHz	25 0		11.6			11.6		110 1112
V	Peak-to-peak	$R_S = 20 \Omega$ , See Figure 3	f = 10 Hz to 10 kHz	25°C		6			6		μV
VN(PP)	equivalent input noise voltage		f = 0.1 Hz to 10 Hz	25 0		0.6			0.6		μν
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA /√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 20 \text{ V},$ f = 1  kHz, $R_{S} = 25 \Omega$	$A_{VD} = 10,$ $R_L = 2 k\Omega,$	25°C		0.008%			0.008%		
B <sub>1</sub>	Unity-gain bandwidth	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L = 2 kΩ$ , See Figure 2	25°C	8	10		8	10		MHz
ВОМ	Maximum output- swing bandwidth	$V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$	$A_{VD} = -1$ , $C_L = 25 pF$	25°C	478	637		478	637		kHz
фm	Phase margin at unity gain	$V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$	$R_L = 2 kΩ$ , See Figure 2	25°C		57°			57°		

<sup>†</sup> Full range is 0°C to 70°C.



# TLE2081I electrical characteristics at specified free-air temperature, $\rm V_{CC\pm}=\pm5~V$ (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	- +	Т	LE2081		TL	E2081A	.I	UNIT	
	PARAMETER	TEST CO	NDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNII
VIO	Input offset voltage			25°C		0.34	6		0.3	3	mV
VIO	mpar onser voltage	V <sub>IC</sub> = 0,	$V_O = 0$ ,	Full range			7.6			5.6	111.4
αΝΙΟ	Temperature coefficient of input offset voltage	$R_S = 50 \Omega$ ,		Full range		3.2	29		3.2	29	μV/°C
lio	Input offset current			25°C		5	100		5	100	pА
ΙΙΟ	input onset current	$V_{IC} = 0$ ,	$V_{O} = 0$ ,	Full range			5			5	nA
lв	Input bias current	See Figure 4		25°C		15	175		15	175	pА
אוי	input bias current			Full range			10			10	nA
V. 0.5	Common-mode input	Rs = 50 Ω		25°C	5 to –1	5 to -1.9		5 to –1	5 to -1.9		٧
VICR	voltage range	NS = 30 22		Full range	5 to -0.8			5 to -0.8			V
		Ι <sub>Ο</sub> = -200 μΑ		25°C	3.8	4.1		3.8	4.1		
		ΙΟ = -200 μΑ		Full range	3.7			3.7			
\/ <b>014</b>	Maximum positive peak	$I_{O} = -2 \text{ mA}$		25°C	3.5	3.9		3.5	3.9		V
VOM+	output voltage swing	10 = -2 111A		Full range	3.4			3.4			V
		$I_{O} = -20 \text{ mA}$		25°C	1.5	2.3		1.5	2.3		
		10 = -20 IIIA		Full range	1.5			1.5			
		ΙΟ = 200 μΑ		25°C	-3.8	-4.2		-3.8	-4.2		
		ΙΟ = 200 μΑ		Full range	-3.7			-3.7			
\/ <b>014</b>	Maximum negative peak	IO = 2 mA		25°C	-3.5	-4.1		-3.5	-4.1		V
VOM-	output voltage swing	IO = 2 IIIA		Full range	-3.4			-3.4			V
		la 20 m/		25°C	-1.5	-2.4		-1.5	-2.4		
		$I_O = 20 \text{ mA}$		Full range	-1.5			-1.5			
			D. 600.0	25°C	80	91		80	91		
			$R_L = 600 \Omega$	Full range	79			79			
۸	Large-signal differential	V <sub>O</sub> = ± 2.3 V	$R_1 = 2 k\Omega$	25°C	90	100		90	100		dB
AVD	voltage amplification	V() = ± 2.3 V	KL = 2 K22	Full range	89			89			иБ
		1	Di = 10 k0	25°C	95	106		95	106		
			$R_L = 10 \text{ k}\Omega$	Full range	94			94			
rį	Input resistance	V <sub>IC</sub> = 0		25°C		1012			1012		Ω
c <sub>i</sub>	Input capacitance	V <sub>IC</sub> = 0, See Figure 5	Common mode	25°C		11			11		pF
•		See Figure 5	Differential	25°C		2.5			2.5		
z <sub>O</sub>	Open-loop output impedance	f = 1 MHz		25°C		80			80		Ω
CMDD	Common-mode	VIC = VICRmi	in,	25°C	70	89		70	89		1.0
CMRR	rejection ratio	$V_O = 0$ ,	$R_S = 50 \Omega$	Full range	68			68			dB
	Supply-voltage rejection	V <sub>CC±</sub> = ±5 V	to ±15 V,	25°C	82	99		82	99		٦.L
ksvr	ratio ( $\Delta V_{CC\pm}/\Delta V_{IO}$ )	$V_{O} = 0$ ,	$R_S = 50 \Omega$	Full range	80			80			dB

<sup>†</sup> Full range is –40°C to 85°C.



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#### TLE2081I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 5$ V (unless otherwise noted) (continued)

	PARAMETER	TEST CO	NDITIONS	- +	Т	LE2081		TL	.E2081A	<b>d</b>	UNIT
	PARAIVIETER	1231 00	NDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
la a	Supply ourront	Va = 0	No load	25°C	1.35	1.6	2.2	1.35	1.6	2.2	mA
Icc	Supply current	$V_{O} = 0,$	NO load	Full range			2.2			2.2	IIIA
laa	Short-circuit output	Vo = 0	V <sub>ID</sub> = 1 V	25°C		-35			-35		mA
los	current	ΛO = 0	V <sub>ID</sub> = −1 V	25 C		45			45		IIIA

<sup>†</sup>Full range is -40°C to 85°C.

## TLE2081I operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 5~V$

	DADAMETED	TEST 60	UDITIONS		TI	LE2081		TL	.E2081A	.l	LINUT
	PARAMETER	I IEST CO	NDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
				25°C		35			35		
SR+	Positive slew rate	V <sub>O(PP)</sub> = ±2.	3 V,	Full range	22			22			V/µs
		$A_{VD} = -1,$ $C_{L} = 100 \text{ pF},$	See Figure 1	25°C		38			38		
SR-	Negative slew rate			Full range	22			22			V/µs
t <sub>s</sub>	Settling time	$A_{VD} = -1$ , 2-V step,	To 10 mV	25°C		0.25			0.25		μs
'S	Cetting time	$R_L = 1 \text{ k}\Omega$ , $C_L = 100 \text{ pF}$	To 1 mV	20 0		0.4			0.4		μο
٧ <sub>n</sub>	Equivalent input noise		f = 10 Hz	25°C		28			28		nV/√ <del>Hz</del>
٧n	voltage		f = 10 kHz	25 0		11.6			11.6		110/ 1112
V	Peak-to-peak equivalent	$R_S = 20 \Omega$ , See Figure 3	f = 10 Hz to 10 kHz	25°C		6			6		μV
V <sub>N(PP)</sub>	input noise voltage		f = 0.1 Hz to 10 Hz	25 C		0.6			0.6		μν
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 5 \text{ V},$ f = 1  kHz, $R_{S} = 25 \Omega$	$A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$	25°C	0	.013%		0	.013%		
B <sub>1</sub>	Unity-gain bandwidth	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L = 2 k\Omega$ , See Figure 2	25°C		9.4			9.4		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 4 V$ , $R_L = 2 k\Omega$ ,		25°C		2.8			2.8		MHz
φm	Phase margin at unity gain	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L$ = 2 kΩ, See Figure 2	25°C		56°			56°		

<sup>†</sup>Full range is -40°C to 85°C.



# TLE2081I electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 15$ V (unless otherwise noted)

	DADAMETED	TEST CO	NDITIONS	T +	Т	LE2081		TI	_E2081A	N .	UNIT
	PARAMETER	IESI CO	NDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNII
VIO	Input offset voltage			25°C		0.49	6		0.47	3	mV
۷IO	input onset voltage	$V_{IC} = 0$ ,	$V_O = 0$ ,	Full range			7.6			5.6	IIIV
αΛΙΟ	Temperature coefficient of input offset voltage	$R_S = 50 \Omega$ ,		Full range		3.2	29		3.2	29	μV/°C
1	lanut offeet europa			25°C		6	100		6	100	pА
liO	Input offset current	$V_{IC} = 0$ ,	$V_0 = 0$ ,	Full range			5			5	nA
l.s	Input bias current	See Figure 4	-	25°C		20	175		20	175	pА
İΙΒ	input bias current			Full range			10			10	nA
VICR	Common-mode input	Rs = 50 Ω		25°C	15 to –11	15 to -11.9		15 to –11	15 to –11.9		٧
VICK	voltage range	1/5 = 50 22		Full range	15 to -10.8			15 to –10.8			V
		Ι∩ = −200 μΑ		25°C	13.8	14.1		13.8	14.1		
		10 = 200 μΑ		Full range	13.7			13.7			
V <sub>OM+</sub>	Maximum positive peak	$I_O = -2 \text{ mA}$		25°C	13.5	13.9		13.5	13.9		V
VOIVI+	output voltage swing	10 - 2111A		Full range	13.4			13.4			V
		$I_{O} = -20 \text{ mA}$		25°C	11.5	12.3		11.5	12.3		
		10 - 2011/1		Full range	11.5			11.5			
		ΙΟ = 200 μΑ		25°C	-13.8	-14.2		-13.8	-14.2		
		10 = 200 μΑ		Full range	-13.7			-13.7			
Vora	Maximum negative peak	IO = 2 mA		25°C	-13.5	-14		-13.5	-14		V
VOM-	output voltage swing	10 - 2 111/4		Full range	-13.4			-13.4			V
		I <sub>O</sub> = 20 mA		25°C	-11.5	-12.4		-11.5	-12.4		
		10 = 20 11174		Full range	-11.5			-11.5			
			R <sub>L</sub> = 600 Ω	25°C	80	96		80	96		
			11 - 000 32	Full range	79			79			
A <sub>VD</sub>	Large-signal differential	V <sub>O</sub> = ± 10 V	R <sub>L</sub> = 2 kΩ	25°C	90	109		90	109		dB
, vD	voltage amplification	1,0-= 10,1	TYL - 2 1(32	Full range	89			89			QD.
			R <sub>L</sub> = 10 kΩ	25°C	95	118		95	118		
			11 - 10 122	Full range	94			94			
rį	Input resistance	VIC = 0		25°C		1012			1012		Ω
ci	Input capacitance	V <sub>IC</sub> = 0, See Figure 5	Common mode	25°C		7.5			7.5		pF
		Sec rigule 5	Differential	25°C		2.5			2.5		
z <sub>o</sub>	Open-loop output impedance	f = 1 MHz		25°C		80			80		Ω
	Common-mode	V <sub>IC</sub> = V <sub>ICR</sub> mi	n,	25°C	80	98		80	98		
CMRR	rejection ratio	$V_O = 0$ , $R_S = 50 \Omega$		Full range	79			79			dB
keve	Supply-voltage rejection	$V_{CC\pm} = \pm 5 \text{ V}$		25°C	82	99		82	99		dB
ksvr	ratio ( $\Delta V_{CC\pm}/\Delta V_{IO}$ )	$V_{O} = 0$ ,	$R_S = 50 \Omega$	Full range	80			80			ב

<sup>†</sup> Full range is –40°C to 85°C.



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# TLE2081I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15$ V (unless otherwise noted) (continued)

	PARAMETER	TEST CO	NDITIONS	- +	T	LE20811		TL	.E2081A	7	UNIT
	PARAIVIETER	1231 00	NDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
la a	Cupply ourront	Va = 0	No load	25°C	1.35	1.7	2.2	1.35	1.7	2.2	mΛ
Icc	Supply current	$V_{O} = 0$ ,	NO load	Full range			2.2			2.2	mA
Γ.	Short-circuit output	V 0	V <sub>ID</sub> = 1 V	0500	-30	-45		-30	-45		A
los	current	$V_O = 0$	V <sub>ID</sub> = −1 V	25°C	30	48		30	48		mA

<sup>†</sup>Full range is -40°C to 85°C.

### TLE2081I operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

	D. D. L. METED		DITIONS	_ +	Т	LE2081		TL	.E2081A	.I	
	PARAMETER	TEST CON	IDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
				25°C	30	40		30	40		
SR+	Positive slew rate	$V_{O(PP)} = \pm 10 \ A_{VD} = -1,$	/, 	Full range	24			24			V/μs
		$C_{I} = 100 \text{ pF},$	See Figure 1	25°C	30	45		30	45		
SR-	Negative slew rate			Full range	24			24			V/μs
t <sub>S</sub>	Settling time	$A_{VD} = -1$ , 10-V step,	To 10 mV	25°C		0.4			0.4		μs
's	Setting time	$R_L = 1 k\Omega$ , $C_L = 100 pF$	To 1 mV	25 0		1.5			1.5		μδ
V <sub>n</sub>	Equivalent input noise		f = 10 Hz	25°C		28			28		nV/√ <del>Hz</del>
٧n	voltage		f = 10 kHz	25 0		11.6			11.6		11 0 / 11 12
Vauces	Peak-to-peak equivalent	$R_S = 20 \Omega$ , See Figure 3	f = 10 Hz to 10 kHz	25°C		6			6		μV
VN(PP)	input noise voltage		f = 0.1 Hz to 10 Hz	25 0		0.6			0.6		μν
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA/√ <del>Hz</del>
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 20 \text{ V},$ f = 1  kHz, $R_{S} = 25 \Omega$	$A_{VD} = 10,$ $R_L = 2 k\Omega,$	25°C	0	.008%		0	.008%		
B <sub>1</sub>	Unity-gain bandwidth	$V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$	$R_L = 2 k\Omega$ , See Figure 2	25°C	8	10		8	10		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$	$A_{VD} = -1$ , $C_{L} = 25 pF$	25°C	478	637		478	637		kHz
фm	Phase margin at unity gain	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L$ = 2 kΩ, See Figure 2	25°C		57°			57°		

<sup>†</sup>Full range is -40°C to 85°C.



# TLE2081M electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 5$ V (unless otherwise noted)

	DADAMETED	TEST CONDITIONS		_ +	ΤL	E2081N	1	TL	E2081A	М	UNIT
	PARAMETER	1231 CO	NDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
V <sub>IO</sub>	Input offset voltage			25°C		0.34	6		0.3	3	mV
VIO	input onset voltage	VIC = 0	$V_O = 0$ ,	Full range			11.2			8.2	111 V
αγιο	Temperature coefficient of input offset voltage	$R_S = 50\Omega$		Full range		3.2	29*		3.2	29*	μV/°C
lio	Input offset current			25°C		5	100		5	100	pА
10	input onset current	V <sub>IC</sub> = 0,	$V_O = 0$ ,	Full range			20			20	nA
Iв	Input bias current	See Figure 4		25°C		15	175		15	175	pА
пр	Input blue outront			Full range			65			65	nA
V	Common-mode input	D- 500		25°C	5 to –1	5 to -1.9		5 to –1	5 to -1.9		V
VICR	voltage range	R <sub>S</sub> = 50 Ω		Full range	5 to -0.8			5 to -0.8			V
		ΙΟ = -200 μΑ		25°C	3.8	4.1		3.8	4.1		
		10 = -200 μΑ		Full range	3.6			3.6			
V <sub>OM+</sub>	Maximum positive peak	I <sub>O</sub> = -2 mA		25°C	3.5	3.9		3.5	3.9		V
VOINI+	output voltage swing	10 - 21117		Full range	3.3			3.3			V
		$I_{O} = -20 \text{ mA}$		25°C	1.5	2.3		1.5	2.3		
		10 - 2011//		Full range	1.4			1.4			
		ΙΟ = 200 μΑ		25°C	-3.8	-4.2		-3.8	-4.2		
		ισ = 200 μ. τ		Full range	-3.6			-3.6			
V <sub>OM</sub> -	Maximum negative peak	IO = 2 mA		25°C	-3.5	-4.1		-3.5	-4.1		V
VOIVI—	output voltage swing	10 = 2 11.7.		Full range	-3.3			-3.3			•
		I <sub>O</sub> = 20 mA		25°C	-1.5	-2.4		-1.5	-2.4		
		10 = 20 11//		Full range	-1.4			-1.4			
			R <sub>L</sub> = 600 Ω	25°C	80	91		80	91		
				Full range	78	-		78			
AVD	Large-signal differential	V <sub>O</sub> = ± 2.3 V	R <sub>L</sub> = 2 kΩ	25°C	90	100		90	100		dB
7.VD	voltage amplification			Full range	88			88			32
			R <sub>L</sub> = 10 kΩ	25°C	95	106		95	106		
				Full range	93			93			
rį	Input resistance	VIC = 0		25°C		1012			1012		Ω
c <sub>i</sub>	Input capacitance	V <sub>IC</sub> = 0, See Figure 5	Common mode	25°C		11			11		pF
		Joo Figure 3	Differential	25°C		2.5			2.5		
z <sub>O</sub>	Open-loop output impedance	f = 1 MHz		25°C		80			80		Ω
CMRR	Common-mode	VIC = VICRmi		25°C	70	89		70	89		dB
CIVIKK	rejection ratio	$V_O = 0$ ,	$R_S = 50 \Omega$	Full range	68			68			ub
kovo	Supply-voltage rejection	V <sub>CC±</sub> = ±5 V	to ±15 V,	25°C	82	99		82	99		dB
ksvr	ratio ( $\Delta V_{CC\pm}/\Delta V_{IO}$ )	$V_{O} = 0$ ,	$R_S = 50 \Omega$	Full range	80			80			uВ

<sup>\*</sup>On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested. † Full range is -55°C to 125°C.



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# TLE2081M electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 5$ V (unless otherwise noted) (continued)

	PARAMETER	TEST CO	NDITIONS	- +	TL	.E2081N	1	TL	E2081A	М	UNIT
	PARAIVIETER	1231 00	NDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
la a	Supply ourrant	\/a = 0	No load	25°C	1.35	1.6	2.2	1.35	1.6	2.2	m ^
ICC	Supply current	$V_{O} = 0$ ,	NO load	Full range			2.2			2.2	mA
laa	Short-circuit output	\/a = 0	V <sub>ID</sub> = 1 V	25°C		-35			-35		mA
los	current	ΛO = 0	V <sub>ID</sub> = −1 V	25 C		45			45		IIIA

<sup>†</sup> Full range is -55°C to 125°C.

## TLE2081M operating characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 5~\text{V}$

	DADAMETED	TEST COL	IDITIONS	_ +	Т	LE2081I	И	TL	.E2081A	M	UNIT
	PARAMETER	TEST CON	IDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNII
				25°C		35			35		
SR+	Positive slew rate	V <sub>O(PP)</sub> = ±2.3	V,	Full range	20*			20*			V/μs
		AVD = -1, $C_1 = 100 \text{ pF},$	See Figure 1	25°C		38			38		
SR-	Negative slew rate			Full range	20*			20*			V/μs
t <sub>s</sub>	Settling time	$A_{VD} = -1$ , 2-V step,	To 10 mV	25°C		0.25			0.25		μs
'S	Cetting time	$R_L = 1 \text{ k}\Omega$ , $C_L = 100 \text{ pF}$	To 1 mV	20 0		0.4			0.4		μο
Vn	Equivalent input noise		f = 10 Hz	25°C		28			28		nV/√ <del>Hz</del>
٧n	voltage	]	f = 10 kHz	25 0		11.6			11.6		IIV/ VIIZ
)/=.	Peak-to-peak	$R_S = 20 \Omega$ , See Figure 3	f = 10 Hz to 10 kHz	25°C		6			6		μV
VN(PP)	equivalent input noise voltage		f = 0.1 Hz to 10 Hz	25 C		0.6			0.6		μν
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA/√ <del>Hz</del>
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 5 \text{ V},$ f = 1  kHz, $R_{S} = 25 \Omega$	$A_{VD} = 10,$ $R_L = 2 k\Omega,$	25°C	(	).013%		(	0.013%		
B <sub>1</sub>	Unity-gain bandwidth	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L = 2 kΩ$ , See Figure 2	25°C		9.4			9.4		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 4 \text{ V},$ $R_L = 2 \text{ k}\Omega$ ,	$A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$	25°C		2.8			2.8		MHz
фm	Phase margin at unity gain	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L = 2 kΩ$ , See Figure 2	25°C		56°			56°		

<sup>\*</sup>On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.



<sup>†</sup> Full range is -55°C to 125°C.

# TLE2081M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15$ V (unless otherwise noted)

	DADAMETED	TEST CON	DITIONS		T	LE2081N	1	TL	E2081A	М	LINIT
	PARAMETER	TEST CON	CHOILING	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
VIO	Input offset voltage			25°C		0.49	6		0.47	3	mV
۷۱٥	input onset voltage	V <sub>IC</sub> = 0,	$V_O = 0$ ,	Full range			11.2			8.2	111 V
αΝΙΟ	Temperature coefficient of input offset voltage	R <sub>S</sub> = 50 Ω		Full range		3.2	29*		3.2	29*	μV/°C
lio.	Input offcot current			25°C		6	100		6	100	pА
IIO	Input offset current	$V_{IC} = 0$ ,	$V_0 = 0$ ,	Full range			20			20	nA
lin	Input bias current	See Figure 4		25°C		20	175		20	175	pА
<sup>I</sup> IB	input bias current			Full range			65			65	nA
V. 0.7.	Common-mode input	Po - 50 O		25°C	15 to –11	15 to -11.9		15 to –11	15 to -11.9		٧
VICR	voltage range	R <sub>S</sub> = 50 Ω		Full range	15 to -10.8			15 to –10.8			V
		ΙΟ = -200 μΑ		25°C	13.8	14.1		13.8	14.1		
		10 = 200 μ/ι		Full range	13.6			13.6			
V <sub>OM+</sub>	Maximum positive peak	$I_{O} = -2 \text{ mA}$		25°C	13.5	13.9		13.5	13.9		V
VOIVI+	output voltage swing	10 - 2111/4		Full range	13.3			13.3			V
		$I_{O} = -20 \text{ mA}$		25°C	11.5	12.3		11.5	12.3		
		10 = 20 11.71		Full range	11.4			11.4			
		ΙΟ = 200 μΑ		25°C	-13.8	-14.2		-13.8	-14.2		
		10 = 200 μ/ ι		Full range	-13.6			-13.6			
V <sub>OM</sub> -	Maximum negative peak	IO = 2 mA		25°C	-13.5	-14		-13.5	-14		V
VOIVI—	output voltage swing	10 - 2 111/1		Full range	-13.3			-13.3			v
		I <sub>O</sub> = 20 mA		25°C	-11.5	-12.4		-11.5	-12.4		
		10 - 20 11171		Full range	-11.4			-11.4			
			R <sub>L</sub> = 600 Ω	25°C	80	96		80	96		
			11 - 000 32	Full range	78			78			
A <sub>VD</sub>	Large-signal differential	V <sub>O</sub> = ± 10 V	R <sub>L</sub> = 2 kΩ	25°C	90	109		90	109		dB
7.VD	voltage amplification	10-110	- L 1/22	Full range	88			88			u.D
			R <sub>L</sub> = 10 kΩ	25°C	95	118		95	118		
			TKL = 10 K22	Full range	93			93			
rį	Input resistance	VIC = 0		25°C		1012			1012		Ω
c <sub>i</sub>	Input capacitance	V <sub>IC</sub> = 0, See Figure 5	Common mode	25°C		7.5			7.5		pF
		Soo i iguio o	Differential	25°C		2.5			2.5		
z <sub>o</sub>	Open-loop output impedance	f = 1 MHz		25°C		80			80		Ω
CMRR	Common-mode	VIC = VICRMIN	,	25°C	80	98		80	98		dB
CIVINK	rejection ratio	$V_O = 0$ ,	$R_S = 50 \Omega$	Full range	78			78			ub
kova	Supply-voltage rejection	$V_{CC\pm} = \pm 5 \text{ V to}$		25°C	82	99		82	99		4D
ksvr	ratio ( $\Delta V_{CC\pm}/\Delta V_{IO}$ )	$V_{O} = 0,$	$R_S = 50 \Omega$	Full range	80			80			dB

<sup>\*</sup>On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested. † Full range is -55°C to 125°C.



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## TLE2081M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15$ V (unless otherwise noted)(continued)

	PARAMETER	TEST CON	DITIONS	- +	TL	.E2081N	1	TL	E2081A	М	UNIT
	PARAMETER	TEST CON	DITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
	Cumply ourront	V 0	No load	25°C	1.35	1.7	2.2	1.35	1.7	2.2	mΛ
'CC	Supply current	$V_0 = 0,$	NO IOAU	Full range			2.2			2.2	mA
Ι.	Short-circuit output	v 0	V <sub>ID</sub> = 1 V	0500	-30	-45		-30	-45		A
los	current	$V_O = 0$	$V_{ID} = -1 V$	25°C	30	48		30	48		mA

<sup>†</sup> Full range is -55°C to 125°C.

### TLE2081M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

	DADAMETED	TEST 601	IDITIONS	_ +	Т	LE2081	M	TL	E2081A	M	UNIT
	PARAMETER	TEST COM	NDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNII
				25°C	30	40		30	40		
SR+	Positive slew rate	V <sub>O(PP)</sub> = 10 V,	Dr. 3ko	Full range	22			22			V/µs
		$A_{VD} = -1,$ $C_{I} = 100 \text{ pF},$		25°C	30	45		30	45		
SR-	Negative slew rate			Full range	22			22			V/μs
t <sub>s</sub>	Settling time	$A_{VD} = -1$ , 10-V step,	To 10 mV	25°C		0.4			0.4		μs
۱S	Settling time	$R_L = 1 k\Omega$ , $C_L = 100 pF$	To 1 mV	25 0		1.5			1.5		μο
V <sub>n</sub>	Equivalent input noise		f = 10 Hz	25°C		28			28		nV/√ <del>Hz</del>
٧n	voltage		f = 10 kHz	25 0		11.6			11.6		IIV/ VIIZ
Varion	Peak-to-peak	$R_S = 20 \Omega$ , See Figure 3	f = 10 Hz to 10 kHz	25°C		6			6		μV
VN(PP)	equivalent input noise voltage		f = 0.1 Hz to 10 Hz	23 0		0.6			0.6		μν
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 20 \text{ V},$ f = 1  kHz, $R_{S} = 25 \Omega$	$A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$	25°C		0.008%			0.008%		
В1	Unity-gain bandwidth	$V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$	$R_L = 2 k\Omega$ , See Figure 2	25°C	8*	10		8*	10		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$	$A_{VD} = -1$ , $C_L = 25 pF$	25°C	478*	637		478*	637		kHz
φm	Phase margin at unity gain	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L = 2 k\Omega$ , See Figure 2	25°C		57°			57°		

<sup>\*</sup>On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.



<sup>†</sup> Full range is -55°C to 125°C.

## TLE2081Y electrical characteristics at $V_{CC\pm}$ = $\pm 15$ V, $T_A$ = $25^{\circ}C$

	DADAMETED	TEOT OF	MOITIONS		Т	LE2081	′	
	PARAMETER	lesi co	ONDITIONS	•	MIN	TYP	MAX	UNIT
VIO	Input offset voltage	V <sub>IC</sub> = 0,	V <sub>O</sub> = 0,	R <sub>S</sub> = 50 Ω		0.49	6	mV
lιο	Input offset current	1/ 0	\/- O	Can Figure 4		6	100	1
I <sub>IB</sub>	Input bias current	V <sub>IC</sub> = 0,	$V_O = 0$ ,	See Figure 4		20	175	pΑ
VICR	Common-mode input voltage range	R <sub>S</sub> = 50 Ω			15 to –11	15 to 11.9		V
		I <sub>O</sub> = -200 μA			13.8	14.1		
V <sub>OM+</sub>	Maximum positive peak output voltage swing	$I_O = -2 \text{ mA}$			13.5	13.9		V
	output voltage swing	$I_{O} = -20 \text{ mA}$			11.5	12.3		
		ΙΟ = 200 μΑ			-13.8	-14.2		
$V_{OM-}$	Maximum negative peak output voltage swing	$I_O = 2 \text{ mA}$			-13.5	-14		V
	voltago ovillig	$I_O = 20 \text{ mA}$			-11.5	-12.4		
			$R_{L} = 600$	Ω	80	96		
$A_{VD}$	Large-signal differential voltage amplification	$V_0 = \pm 10 \text{ V}$	$R_L = 2 k\Omega$	2	90	109		dB
			$R_{L} = 10 \text{ k}$	Ω	95	118		
rį	Input resistance	VIC = 0				1012		Ω
۵.	Innut conscitones	Via O Cao Figuro F	Common	mode		7.5		~F
ci	Input capacitance	V <sub>IC</sub> = 0, See Figure 5	Differentia	al		2.5		pF
z <sub>o</sub>	Open-loop output impedance	f = 1 MHz				80		Ω
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}min,$	$V_{O} = 0$ ,	$R_S = 50 \Omega$	80	98		dB
ksvr	Supply-voltage rejection ratio $(\Delta V_{CC\pm}/\Delta V_{IO})$	$V_{CC\pm}=\pm 5 \text{ V to } \pm 15 \text{ V},$	V <sub>O</sub> = 0,	$R_S = 50 \Omega$	82	99		dB
ICC	Supply current	$V_{O} = 0,$	No load		1.35	1.7	2.2	mA
	Chart aircuit autaut aurrent	V- 0	V <sub>ID</sub> = 1 V		-30	-45		A
los	Short-circuit output current	VO = 0	V <sub>ID</sub> = −1	V	30	48		mA

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# TLE2082C electrical characteristics at specified free-air temperature, $\rm V_{CC\pm}$ = $\pm 5$ V (unless otherwise noted)

	DADAME	ren	TEST CONDITIONS		- +	Τl	E2082	С	TL	E2082A	C	UNIT
	PARAMET	IER	TEST COI	RUITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNII
V <sub>IO</sub>	Input offset vo	oltage			25°C		0.9	6		0.65	4	mV
V10	input onset vo	ладе	$V_{IC} = 0$ ,	$V_O = 0$ ,	Full range			8.1			5.1	IIIV
ανιο	Temperature of input offset		R <sub>S</sub> = 50 Ω		Full range		2.3	25		2.3	25	μV/°C
lio.	Input offset cu	ırrent			25°C		5	100		5	100	pА
110	input onset of	ment	$V_{IC} = 0$ ,	$V_{O} = 0$ ,	Full range			1.4			1.4	nA
I <sub>IB</sub>	Input bias cur	rent	See Figure 4		25°C		15	175		15	175	pA
чв	Input bias cui	TOTAL			Full range			5			5	nA
VICR	Common-mod	de input	Rs = 50 Ω		25°C	5 to –1	5 to –1.9		5 to –1	5 to –1.9		٧
VICK	voltage range		11.5 - 00 12		Full range	5 to -0.9			5 to -0.9			v
			I <sub>O</sub> = -200 μA		25°C	3.8	4.1		3.8	4.1		
			10 = 200 μΑ		Full range	3.7			3.7			
V <sub>OM+</sub>	Maximum pos		$I_{O} = -2 \text{ mA}$		25°C	3.5	3.9		3.5	3.9		V
VOIVI+	output voltage	e swing	10 = 211,71		Full range	3.4			3.4			·
			$I_{O} = -20 \text{ mA}$		25°C	1.5	2.3		1.5	2.3		
			.0		Full range	1.5			1.5			
			ΙΟ = 200 μΑ		25°C	-3.8	-4.2		-3.8	-4.2		
			10		Full range	-3.7			-3.7			
VOM-	Maximum neg		I <sub>O</sub> = 2 mA		25°C	-3.5	-4.1		-3.5	-4.1		V
· Oivi-	output voltage	e swing	-0		Full range	-3.4			-3.4			
			I <sub>O</sub> = 20 mA		25°C	-1.5	-2.4		-1.5	-2.4		
			.0	1	Full range	-1.5			-1.5			
				$R_L = 600 \Omega$	25°C	80	91		80	91		
				_	Full range	79			79			
A <sub>VD</sub>	Large-signal		V <sub>O</sub> = ± 2.3 V	R <sub>L</sub> = 2 kΩ	25°C	90	100		90	100		dB
'	voltage amplit	fication			Full range	89			89			
				R <sub>L</sub> = 10 kΩ	25°C	95	106		95	106		
				_	Full range	94			94			
rį	Input resistan	ce	VIC = 0		25°C		10 <sup>12</sup>			10 <sup>12</sup>		Ω
c <sub>i</sub>	Input	Common mode	V <sub>IC</sub> = 0,	See Figure 5	25°C		11			11		pF
<u> </u>	capacitance	Differential	_		25°C		2.5			2.5		·
z <sub>O</sub>	Open-loop ou	tput impedance	f = 1 MHz		25°C		80			80		Ω
CMRR	Common-mod	de rejection ratio	VIC = VICRmi	n,	25°C	70	89		70	89		dB
		-,	$V_{O} = 0,$	$R_S = 50 \Omega$	Full range	68			68			
ksvr	Supply-voltag	•	$V_{CC\pm} = \pm 5 \text{ V}$		25°C	82	99		82	99		dB
LOVIN	ratio(∆V <sub>CC±</sub>		V <sub>O</sub> = 0,	$R_S = 50 \Omega$	Full range	80			80			
Icc	Supply curren		$V_{O} = 0$ ,	No load	25°C	2.7	2.9	3.9	2.7	2.9	3.9	mA
	(both channel	S)			Full range			3.9			3.9	

<sup>†</sup> Full range is 0°C to 70°C.



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# TLE2082C electrical characteristics at specified free-air temperature, $\rm V_{CC\pm}$ = $\pm 5$ V (unless otherwise noted) (continued)

	PARAMETER	TEST COL	NDITIONS	-	Τι	E20820	;	TL	E2082A	С	UNIT
	PARAMETER	TEST COI	NDITIONS	TA	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
	Crosstalk attenuation	$V_{IC} = 0$ ,	$R_L = 2 k\Omega$	25°C		120			120		dB
	Short-circuit output current	Va = 0	V <sub>ID</sub> = 1 V	25°C		-35			-35		mΛ
los	Short-circuit output current	VO = 0	V <sub>ID</sub> = -1 V	25 C		45			45		mA

## TLE2082C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 5~V$

	DADAMETED	TEST 00	NDITIONS	_ +	TL	E20820	;	TL	E2082A	С	
	PARAMETER	l lesi co	NDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
				25°C		35			35		
SR+	Positive slew rate	$V_{O(PP)} = \pm 2.3$	V,	Full range	22			22			V/μs
		$A_{VD} = -1$ , $C_{L} = 100 pF$ ,		25°C		38			38		
SR-	Negative slew rate			Full range	22			22			V/μs
	Cattling time	$A_{VD} = -1$ , 2-V step,	To 10 mV	25°C		0.25			0.25		:
t <sub>S</sub>	Settling time	$R_L = 1 \text{ k}\Omega$ , $C_L = 100 \text{ pF}$	To 1 mV	25.0		0.4			0.4		μs
V	Equivalent input noise		f = 10 Hz	25°C		28			28		->//s/I-
V <sub>n</sub>	voltage		f = 10 kHz	25 C		11.6			11.6		nV/√Hz
V	Peak-to-peak equivalent	$R_S = 20 \Omega$ , See Figure 3	f = 10 Hz to 10 kHz	25°C		6			6		\/
V <sub>N(PP)</sub>	input noise voltage		f = 0.1Hz to 10 Hz	25 C		0.6			0.6		μV
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 5 \text{ V},$ f = 1  kHz, $R_{S} = 25 \Omega$	$A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$	25°C	0	.013%		0	.013%		
B <sub>1</sub>	Unity-gain bandwidth	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L = 2 k\Omega$ , See Figure 2	25°C		9.4			9.4		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 4 V$ , $R_L = 2 k\Omega$ ,	$A_{VD} = -1$ , $C_L = 25 pF$	25°C		2.8			2.8		MHz
фm	Phase margin at unity gain	$V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$	$R_L = 2 k\Omega$ , See Figure 2	25°C		56°			56°		

<sup>†</sup> Full range is 0°C to 70°C.

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# TLE2082C electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 15$ V (unless otherwise noted)

	PARAMETER		TEST CO	NDITIONS	T. †	Т	LE20820	2	TL	E2082A	С	UNIT
	PARAMETER	•	TEST CO	NDITIONS	TAT	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
V <sub>IO</sub>	Input offset volta	ine			25°C		1.1	7		0.7	4	mV
۷IO	input onset voita	ige	$V_{IC} = 0$ ,	$V_O = 0$ ,	Full range			8.1			5.1	IIIV
αVIO	Temperature coe of input offset vo		$R_S = 50 \Omega$		Full range		2.4	25		2.4	25	μV/°C
lio	Input offset curre	ant			25°C		6	100		6	100	pА
lo lo	input onset curre	71 IL	V <sub>IC</sub> = 0,	$V_{O} = 0$ ,	Full range			1.4			1.4	nA
lв	Input bias currer	n+	See Figure 4		25°C		20	175		20	175	pА
שוי	Input bias currer				Full range			5			5	nA
\ <i>\(\cdot\)</i>	Common-mode	input	D- 500		25°C	15 to –11	15 to -11.9		15 to –11	15 to -11.9		V
VICR	voltage range		R <sub>S</sub> = 50 Ω		Full range	15 to -10.9			15 to –10.9			٧
			lo = 200 !! A		25°C	13.8	14.1		13.8	14.1		
			$I_{O} = -200 \mu A$		Full range	13.6			13.6			
V	Maximum positiv	/e peak	lo - 2 m/		25°C	13.5	13.9		13.5	13.9		V
VOM+	output voltage s	wing	$I_O = -2 \text{ mA}$		Full range	13.4			13.4			V
			J- 20 m A		25°C	11.5	12.3		11.5	12.3		
			$I_{O} = -20 \text{ mA}$		Full range	11.5			11.5			
			l- 000 A		25°C	-13.8	-14.2		-13.8	-14.2		
			I <sub>O</sub> = 200 μA		Full range	-13.7			-13.7	•		
	Maximum negat	ive peak			25°C	-13.5	-14		-13.5	-14		.,
VOM-	output voltage s	wing	$I_O = 2 \text{ mA}$		Full range	-13.4			-13.4			V
					25°C	-11.5	-12.4		-11.5	-12.4		
			$I_O = 20 \text{ mA}$		Full range	-11.5			-11.5			
				D: 000.0	25°C	80	96		80	96		
				$R_L = 600 \Omega$	Full range	79			79	•		
Δ	Large-signal diffe	erential	\/- \ 40\/	D. O.Iro	25°C	90	109		90	109		40
AVD	voltage amplifica		$V_0 = \pm 10 \text{ V}$	$R_L = 2 k\Omega$	Full range	89			89			dB
				D 4010	25°C	95	118		95	118		
				$R_L = 10 \text{ k}\Omega$	Full range	94			94			
rį	Input resistance		V <sub>IC</sub> = 0		25°C		1012			1012		Ω
cį	Input capacitance	Common mode	V <sub>IC</sub> = 0, See Figure 5		25°C		7.5			7.5		pF
		Differential	200 . Iguio 0		25°C		2.5			2.5		
z <sub>o</sub>	Open-loop outpuimpedance	ut	f = 1 MHz		25°C		80			80		Ω
CMRR	Common-mode		V <sub>IC</sub> = V <sub>ICR</sub> m		25°C	80	98		80	98		dB
OWINT	rejection ratio		$V_O = 0$ ,	$R_S = 50 \Omega$	Full range	79			79			ub
kova	Supply-voltage r		V <sub>CC±</sub> = ±5 V		25°C	82	99		82	99		dB
ksvr	ratio (ΔV <sub>CC±</sub> /Δ\	/IO)	$V_{O} = 0$ ,	$R_S = 50 \Omega$	Full range	81			81			uБ

<sup>†</sup> Full range is 0°C to 70°C.



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## TLE2082C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15$ V (unless otherwise noted) (continued)

	PARAMETER	TEST CO	NDITIONS		Τι	E20820	;	TL	E2082A	С	UNIT
	PARAMETER	1231 00	NDITIONS	TA	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
	Supply current			25°C	2.7	3.1	3.9	2.7	3.1	3.9	
ICC	(both channels)	$V_{O} = 0$ ,	No load	Full			3.9			3.9	mA
	(2011 01141111010)			range			5.9			5.9	
	Crosstalk attenuation	$V_{IC} = 0$ ,	$R_L = 2 k\Omega$	25°C		120			120		dB
	Short-circuit output current	\/a = 0	V <sub>ID</sub> = 1 V	25°C	-30	-45		-30	-45		mA
los	Short-circuit output current	VO = 0	V <sub>ID</sub> = −1 V	25 C	30	48		30	48		IIIA

## TLE2082C operating characteristics at specified free-air temperature, $V_{\mbox{CC}\pm}$ = $\pm 15~\mbox{V}$

	DADAMETED	TEST COL	NDITIONS	_ +	TL	E20820	;	TL	E2082A	С	UNIT
	PARAMETER	1551 CO	NDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNII
				25°C	28	40		28	40		
SR+	Positive slew rate	$V_{O(PP)} = 10 \text{ V},$ $R_L = 2 \text{ k}\Omega,$	$A_{VD} = -1$ ,	Full range	25			25			V/μs
		See Figure 1	CL = 100 pr,	25°C	30	45		30	45		
SR-	Negative slew rate	, and the second		Full range	25			25			V/μs
	Settling time	$A_{VD} = -1$ , 10-V step,	To 10 mV	25°C		0.4			0.4		
t <sub>S</sub>	Settling time	$R_L = 1 k\Omega$ , $C_L = 100 pF$	To 1 mV	25 C		1.5			1.5		μs
V	Equivalent input noise		f = 10 Hz	25°C		28			28		->4/1
Vn	voltage		f = 10 kHz	25.0		11.6			11.6		nV/√Hz
	Peak-to-peak equivalent	R <sub>S</sub> = 20 $\Omega$ , See Figure 3	f = 10 Hz to 10 kHz			6			6		.,
V <sub>N(PP)</sub>	input noise voltage		f = 0.1 Hz to 10 Hz	25°C		0.6			0.6		μV
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 20 \text{ V},$ f = 1  kHz, $R_{S} = 25 \Omega$	$A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$	25°C	0	.008%		C	0.008%		
B <sub>1</sub>	Unity-gain bandwidth	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L = 2 k\Omega$ , See Figure 2	25°C	8	10		8	10		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$	$A_{VD} = -1$ , $C_L = 25 pF$	25°C	478	637	·	478	637		kHz
φm	Phase margin at unity gain	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L = 2 k\Omega$ , See Figure 2	25°C		57°			57°		

<sup>†</sup> Full range is 0°C to 70°C.

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## TLE2082I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 5$ V (unless otherwise noted)

	PARAME <sup>*</sup>	TED	TEST CO	NDITIONS		Т	LE2082	I	TL	E2082	AI	UNIT
	PARAIVIE	IEK	TEST COI	NUTTONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
V <sub>IO</sub>	Input offset vo	oltage			25°C		0.9	7		0.65	4	mV
۷IO	input onset vo	ntage		$V_O = 0$ ,	Full range			8.5			5.5	111 V
ανιο	Temperature of input offset		R <sub>S</sub> = 50 Ω		Full range		2.4	25		2.4	25	μV/°C
lıc	Input offset cu	ırrent			25°C		5	100		5	100	pА
lio	input onset co	intent	V <sub>IC</sub> = 0,	$V_{O} = 0$ ,	Full range			5			5	nA
I <sub>IB</sub>	Input bias cur	rent	See Figure 4		25°C		15	175		15	175	pА
'ID	Input blue out				Full range			10	,		10	nA
	Common-mod	de input			25°C	5 to –1	5 to –1.9		5 to –1	5 to –1.9		
VICR	voltage range	•	$R_S = 50 \Omega$		Full range	5 to -0.8			5 to -0.8			V
			ΙΟ = -200 μΑ		25°C	3.8	4.1		3.8	4.1		
			10 = -200 μΑ		Full range	3.7			3.7			
V0.4	Maximum pos	sitive peak	$I_{O} = -2 \text{ mA}$		25°C	3.5	3.9		3.5	3.9		V
VOM+	output voltage	swing	10 = -2 IIIA		Full range	3.4			3.4			V
			$I_{O} = -20 \text{ mA}$		25°C	1.5	2.3		1.5	2.3		
			10 = 20 IIIA		Full range	1.5			1.5			
			ΙΟ = 200 μΑ		25°C	-3.8	-4.2		-3.8	-4.2		
			10 = 200 μ/ι		Full range	-3.7			-3.7			
VOM-	Maximum neg		IO = 2 mA		25°C	-3.5	-4.1		-3.5	-4.1		V
· Olvi –	output voltage	eswing	.0 =		Full range	-3.4			-3.4			•
			I <sub>O</sub> = 20 mA		25°C	-1.5	-2.4		-1.5	-2.4		
			.0	i	Full range	-1.5			-1.5			
				R <sub>L</sub> = 600 Ω	25°C	80	91		80	91		
					Full range	79			79			
AVD	Large-signal o		V <sub>O</sub> = ± 2.3 V	R <sub>L</sub> = 2 kΩ	25°C	90	100		90	100		dB
	voltage amplif	rication			Full range	89			89			
				R <sub>L</sub> = 10 kΩ	25°C	95	106		95	106		
					Full range	94	10		94	10		
r <sub>i</sub>	Input resistan	1	VIC = 0		25°C		10 <sup>12</sup>			10 <sup>12</sup>		Ω
ci	Input capacitance	Common mode	V <sub>IC</sub> = 0,		25°C		11			11		pF
		Differential	See Figure 5		25°C		2.5		-	2.5		
<sup>z</sup> o	Open-loop ou	tput impedance	f = 1 MHz		25°C		80			80		Ω
CMRR	Common-mod	de rejection ratio	$V_{IC} = V_{ICR}^{mi}$ $V_{O} = 0$ ,	in, $R_S = 50 \Omega$	25°C Full range	70 68	89		70 68	89		dB
	Supply-voltag	e rejection ratio	V <sub>CC±</sub> = ±5 V	to ±15 V,	25°C	82	99		82	99		į
KSVR	$(\Delta V_{CC}^{\pm}/\Delta V_{IC}^{\pm})$	•	$V_0 = 0$ ,	$R_S = 50 \Omega$	Full range	80			80			dB
	Supply curren	ıt	V- 0	No los-	25°C	2.7	2.9	3.9	2.7	2.9	3.9	, ^
lcc	(both channel		$V_{O} = 0,$	No load	Full range			3.9			3.9	mA

<sup>†</sup> Full range is -40°C to 85°C.



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# TLE2082I electrical characteristics at specified free-air temperature, $\rm V_{CC\pm}=\pm5~V$ (unless otherwise noted) (continued)

	PARAMETER	TEST COL	NDITIONS	-	Т	LE2082	1	TL	.E2082A	1	UNIT
	PARAMETER	TEST COI	NDITIONS	TA	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
	Crosstalk attenuation	$V_{IC} = 0$ ,	$R_L = 2 k\Omega$	25°C		120			120		dB
	Short-circuit output current	Va = 0	V <sub>ID</sub> = 1 V	25°C		-35			-35		mΛ
los	Short-circuit output current	VO = 0	V <sub>ID</sub> = -1 V	25 0		45			45		mA

## TLE2082I operating characteristics at specified free-air temperature, $\rm V_{CC\pm}$ = $\pm5~V$

	DADAMETED	TEST 00	NDITIONS	_ +	Т	LE2082		TL	.E2082A	.I	LINUT
	PARAMETER	I IESI CO	NDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
				25°C		35			35		
SR+	Positive slew rate	$V_{O(PP)} = \pm 2.3$		Full range	20			20			V/μs
		$A_{VD} = -1,$ $C_{I} = 100 \text{ pF},$		25°C		38			38		
SR-	Negative slew rate			Full range	20			20			V/μs
	Settling time	$A_{VD} = -1$ , 2-V step,	To 10 mV	25°C		0.25			0.25		:
t <sub>S</sub>	Setting time	$R_L = 1 \text{ k}\Omega$ , $C_L = 100 \text{ pF}$	To 1 mV	25 C		0.4			0.4		μs
V	Equivalent input noise		f = 10 Hz	25°C		28			28		nV/√ <del>Hz</del>
Vn	voltage		f = 10 kHz	25 C		11.6			11.6		nv/∀HZ
V	Peak-to-peak equivalent	R <sub>S</sub> = 20 $\Omega$ , See Figure 3	f = 10 Hz to 10 kHz	25°C		6			6		μV
V <sub>N(PP)</sub>	input noise voltage		f = 0.1 Hz to 10 Hz	25 C		0.6			0.6		μν
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 5 \text{ V},$ f = 1  kHz, $R_{S} = 25 \Omega$	$A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$	25°C	0	.013%		0	.013%		
B <sub>1</sub>	Unity-gain bandwidth	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L = 2 k\Omega$ , See Figure 2	25°C		9.4			9.4		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 4 V$ , $R_L = 2 k\Omega$ ,	$A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$	25°C		2.8	·		2.8	·	MHz
φm	Phase margin at unity gain	$V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$	$R_L = 2 k\Omega$ , See Figure 2	25°C		56°			56°		

<sup>†</sup> Full range is 40°C to 85°C.

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# TLE2082I electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 15$ V (unless otherwise noted)

	PARAMETER	•	TEST CO	NDITIONS	T. +	T	LE2082	l	TI	LE2082A	NI	UNIT
	PARAMETER	ζ.	1531 CO	MULIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNII
\/·•	Input offset volts	200			25°C		1.1	7		0.7	4	mV
VIO	Input offset volta	age	$V_{IC} = 0$ ,	$V_O = 0$ ,	Full range			8.5			5.5	IIIV
αVIO	Temperature coo		$R_S = 50 \Omega$		Full range		2.4	25		2.4	25	μV/°C
l	land effect com				25°C		6	100		6	100	pА
10	Input offset curre	ent	V <sub>IC</sub> = 0,	$V_{\Omega} = 0$ ,	Full range			5			5	nA
l	Input bias currer	~4	See Figure 4		25°C		20	175		20	175	pА
İΒ	input bias currer	IL			Full range			10			10	nA
	Common-mode	input	B 50.0		25°C	15 to –11	15 to –11.9		15 to –11	15 to –11.9		.,
VICR	voltage range	•	R <sub>S</sub> = 50 Ω		Full range	15 to -10.8			15 to –10.8			<b>V</b>
			I <sub>O</sub> = -200 μA		25°C	13.8	14.1		13.8	14.1		
			10 = -200 μΑ		Full range	13.7			13.7			
	Maximum positi	ve peak	1- 2-mA		25°C	13.5	13.9		13.5	13.9		V
√OM+	output voltage s	wing	$I_O = -2 \text{ mA}$		Full range	13.4			13.4			V
					25°C	11.5	12.3		11.5	12.3		
			$I_0 = -20 \text{ mA}$		Full range	11.5			11.5			
			I 000 A		25°C	-13.8	-14.2		-13.8	-14.2		
			ΙΟ = 200 μΑ		Full range	-13.7			-13.7			
,	Maximum negat	ive peak			25°C	-13.5	-14		-13.5	-14		.,
OM-	output voltage s	wing	$I_O = 2 \text{ mA}$		Full range	-13.4			-13.4			V
					25°C	-11.5	-12.4		-11.5	-12.4		
			$I_O = 20 \text{ mA}$		Full range	-11.5			-11.5			
					25°C	80	96		80	96		
				$R_L = 600 \Omega$	Full range	79			79			
	Large-signal diff	erential		<b>D</b> 010	25°C	90	109		90	109		
4VD	voltage amplifica		$V_0 = \pm 10 \text{ V}$	$R_L = 2 k\Omega$	Full range	89			89			dB
				D 4010	25°C	95	118		95	118		
				$R_L = 10 \text{ k}\Omega$	Full range	94			94			
ï	Input resistance		V <sub>IC</sub> = 0	•	25°C		1012			1012		Ω
- Pi	Input capacitance	Common mode	V <sub>IC</sub> = 0,	See Figure 5	25°C		7.5			7.5		pF
		Differential			25°C		2.5			2.5		
<sup>z</sup> o	Open-loop outpoil impedance	ut	f = 1 MHz		25°C		80			80		Ω
CMRR	Common-mode		VIC = VICRM		25°C	80	98		80	98		dB
	rejection ratio		$V_O = 0$ ,	$R_S = 50 \Omega$	Full range	79			79			ub
(0) (=	Supply-voltage	rejection	V <sub>CC±</sub> = ±5 V	to ±15 V,	25°C	82	99		82	99		40
SVR	ratio (ΔV <sub>CC±</sub> /Δ'	V <sub>IO</sub> )	$V_0 = 0$ ,	$R_S = 50 \Omega$	Full range	80			80			dB

<sup>†</sup> Full range is –40°C to 85°C.



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# TLE2082I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15$ V (unless otherwise noted) (continued)

	PARAMETER	TEST CO	NDITIONS	_	Т	LE2082I		TL	.E2082A	Ţ	UNIT
	PARAIVIETER	1231 00	NDITIONS	TA	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
	Supply current			25°C	2.7	3.1	3.9	2.7	3.1	3.9	
ICC	Supply current (both channels)	V <sub>O</sub> = 0,	No load	Full range			3.9			3.9	mA
	Crosstalk attenuation	$V_{IC} = 0$ ,	$R_L = 2 k\Omega$	25°C		120			120		dB
	Short-circuit output current	V 0	V <sub>ID</sub> = 1 V	25°C	-30	-45		-30	-45		mA
los	Short-circuit output current	VO = 0	$V_{ID} = -1 V$	25 C	30	48		30	48		IIIA

## TLE2082I operating characteristics at specified free-air temperature, $V_{\mbox{CC}\pm}$ = $\pm 15~\mbox{V}$

	PARAMETER	TEST CO	NDITIONS	- +	Т	LE2082	ı	ΤL	E2082A	VI	UNIT
	PARAMETER	1251 CO	NDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNII
				25°C	28	40		28	40		
SR+	Positive slew rate	$V_{O(PP)} = 10 \text{ V},$ $R_L = 2 \text{ k}\Omega,$	$A_{VD} = -1$ ,	Full range	22			22			V/μs
		See Figure 1	CL = 100 pr,	25°C	30	45		30	45		
SR-	Negative slew rate	·		Full range	22			22			V/μs
	Settling time	$A_{VD} = -1$ , 10-V step,	To 10 mV	25°C		0.4			0.4		
t <sub>S</sub>	Setting time	$R_L = 1 k\Omega$ , $C_L = 100 pF$	To 1 mV	25 0		1.5			1.5		μs
V	Equivalent input noise		f = 10 Hz	25°C		28			28		nV/√ <del>Hz</del>
V <sub>n</sub>	voltage		f = 10 kHz	25-0		11.6			11.6		nv/√Hz
	Peak-to-peak equivalent	$R_S = 20 \Omega$ , See Figure 3	f = 10 Hz to 10 kHz	0500		6			6		
VN(PP)	input noise voltage		f = 0.1 Hz to 10 Hz	25°C		0.6			0.6		μV
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 20 \text{ V},$ f = 1  kHz, $R_{S} = 25 \Omega$	$A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$	25°C	0	.008%		C	0.008%		
B <sub>1</sub>	Unity-gain bandwidth	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L = 2 k\Omega$ , See Figure 2	25°C	8	10		8	10		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$	$A_{VD} = -1$ , $C_L = 25 pF$	25°C	478	637		478	637		kHz
фm	Phase margin at unity gain	$V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$	$R_L = 2 k\Omega$ , See Figure 2	25°C		57°			57°		

<sup>†</sup>Full range is -40°C to 85°C.

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# TLE2082M electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 5$ V (unless otherwise noted)

	PARAME	TED	TEST COL	NDITIONS	<b>-</b> . +	ΤL	E2082	И	TLI	E2082A	M	UNIT
	PARAME	IEK	1231 601	NUTTIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
V <sub>IO</sub>	Input offset vo	oltage			25°C		0.9	7		0.65	4	mV
VIO	input onset vi	Jitage	$V_{IC} = 0$ ,	$V_O = 0$ ,	Full range			9.5			6.5	IIIV
ανιο	Temperature of input offset		Rs=50Ω		Full range		2.3	25*		2.3	25*	μV/°C
1.0	Innut offeet of	urrant			25°C		5	100		5	100	pA
110	Input offset co	urrent	$V_{IC} = 0$ ,	$V_0 = 0$ ,	Full range			20			20	nA
1.5	Input bias cui	ront	See Figure 4		25°C		15	175		15	175	pA
IВ	iriput bias cui	Territ			Full range			60			60	nA
Vion	Common-mo	de input	Rs = 50 Ω		25°C	5 to –1	5 to –1.9		5 to –1	5 to -1.9		٧
VICR	voltage range	•	115 = 30 12		Full range	5 to -0.8			5 to -0.8			v
			ΙΟ = -200 μΑ		25°C	3.8	4.1		3.8	4.1		
			10 = 200 μΑ		Full range	3.6			3.6			
V <sub>OM+</sub>	Maximum pos		$I_{O} = -2 \text{ mA}$		25°C	3.5	3.9		3.5	3.9		V
VOIVI+	output voltage	e swing	10 - 2111/1		Full range	3.3			3.3			, l
			$I_{O} = -20 \text{ mA}$		25°C	1.5	2.3		1.5	2.3		
			.0 -0		Full range	1.4			1.4			
			ΙΟ = 200 μΑ		25°C	-3.8	-4.2		-3.8	-4.2		
			<u> </u>		Full range	-3.6			-3.6			
V <sub>OM</sub> -	Maximum ne	-	I <sub>O</sub> = 2 mA		25°C	-3.5	-4.1		-3.5	-4.1		V
- OIVI	output voltage	e swing			Full range	-3.3			-3.3			
			I <sub>O</sub> = 20 mA		25°C	-1.5	-2.4		-1.5	-2.4		
			<u> </u>		Full range	-1.4			-1.4			
				R <sub>L</sub> = 600 Ω	25°C	80	91		80	91		
				_	Full range	78			78			
AVD	Large-signal		V <sub>O</sub> = ± 2.3 V	$R_1 = 2 k\Omega$	25°C	90	100		90	100		dB
'	voltage ampli	fication	~	_	Full range	88			88			
				R <sub>I</sub> = 10 kΩ	25°C	95	106		95	106		
				_	Full range	93			93			
rį	Input resistar	ice	VIC = 0		25°C		10 <sup>12</sup>			1012		Ω
ci	Input capaci-	Common mode	V <sub>IC</sub> = 0,	See Figure 5	25°C		11			11		pF
٩	tance	Differential	VIC = 0,	Coorigato	25°C		2.5			2.5		P.
z <sub>O</sub>	Open-loop ou	ıtput impedance	f = 1 MHz		25°C		80			80		Ω
CMRR	Common-mo	de rejection ratio	V <sub>IC</sub> = V <sub>ICR</sub> mi	n,	25°C	70	89		70	89		dB
Civilati	John 1011-1110	ac rejection ratio	$V_O = 0$ ,	$R_S = 50 \Omega$	Full range	68			68			GD.
ksvr		ge rejection ratio	$V_{CC\pm} = \pm 5 \text{ V}$		25°C	82	99		82	99		dB
"SVK	(ΔVCC± /ΔVI	O)	$V_{O} = 0,$	$R_S = 50 \Omega$	Full range	80			80			45

<sup>\*</sup>On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested. † Full range is -55°C to 125°C.



# TLE2082M electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 5$ V (unless otherwise noted) (continued)

	PARAMETER	TEST CO	NDITIONS	T. †	TL	.E2082N	1	TL	E2082A	M	UNIT
	PARAMETER	1231 00	NDITIONS	TA <sup>†</sup>	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
	Supply current			25°C	2.7	2.9	3.6	2.7	2.9	3.6	
ICC	(both channels)	$V_{O} = 0$ ,	No load	Full			3.6			3.6	mA
	(Sour Griannicio)			range			3.0			3.0	
	Crosstalk attenuation	$V_{IC} = 0$ ,	$R_L = 2 k\Omega$	25°C		120			120		dB
	Short-circuit output current	\\ 0	V <sub>ID</sub> = 1 V	25°C		-35			-35		mA
los	Short-circuit output current	VO = 0	V <sub>ID</sub> = -1 V	25 0		45			45		IIIA

<sup>†</sup> Full range is –55°C to 125°C.

## TLE2082M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 5~V$

	PARAMETER	TEST CON	IDITIONS	<b>-</b> .+	TL	E2082	И	TLI	E2082A	М	UNIT
	PARAMETER	1231 CON	ADITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
				25°C		35			35		
SR+	Positive slew rate	$V_{O(PP)} = \pm 2.3$ $A_{VD} = -1$ ,	V,	Full range	18*			18*			V/μs
		$C_{i} = 100 \text{ pF},$	See Figure 1	25°C		38			38		
SR-	Negative slew rate			Full range	18*			18*			V/μs
	Cattling time	$A_{VD} = -1$ , 2-V step,	To 10 mV	25°C		0.25			0.25		
t <sub>S</sub>	Settling time	$R_L = 1 \text{ k}\Omega$ , $C_L = 100 \text{ pF}$	To 1 mV	25 C		0.4			0.4		μs
V	Equivalent input noise		f = 10 Hz	25°C		28			28		nV/√ <del>Hz</del>
٧ <sub>n</sub>	voltage		f = 10 kHz	25 C		11.6			11.6		nv/√HZ
V	Peak-to-peak equivalent	$R_S = 20 \Omega$ , See Figure 3	f = 10 Hz to 10 kHz	25°C		6			6		
V <sub>N(PP)</sub>	input noise voltage		f = 0.1 Hz to 10 Hz	25*C		0.6			0.6		μV
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 5 \text{ V},$ f = 1  kHz, $R_{S} = 25 \Omega$	$A_{VD} = 10,$ $R_L = 2 k\Omega,$	25°C	0	.013%		0	.013%		
В <sub>1</sub>	Unity-gain bandwidth	$V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$	$R_L = 2 k\Omega$ , See Figure 2	25°C		9.4			9.4		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 4 V$ , $R_L = 2 k\Omega$ ,	$A_{VD} = -1$ , $C_L = 25 pF$	25°C		2.8			2.8		MHz
φm	Phase margin at unity gain	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L = 2 kΩ$ , See Figure 2	25°C		56°			56°		

<sup>\*</sup>On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.



<sup>†</sup> Full range is -55°C to 125°C.

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## TLE2082M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15$ V (unless otherwise noted)

$ \begin{array}{ c c c c c c c c c } \hline \textbf{PARAMETER} & \textbf{TEST CONDITIONS} & \textbf{T_AT} & \textbf{MIN} & \textbf{TYP} & \textbf{MAX} & \textbf{MIN} & \textbf{TYP} & \textbf{MAX} \\ \hline \textbf{V}_{IO} & \textbf{Input offset voltage} & \textbf{V}_{IC} = 0, & \textbf{V}_{O} = 0, \\ \hline \textbf{X}_{VIO} & \textbf{Temperature coefficient of input offset current} \\ \hline \textbf{I}_{IO} & \textbf{Input offset current} \\ \hline \textbf{I}_{IO} & \textbf{Input offset current} \\ \hline \textbf{I}_{ID} & \textbf{Input bias current} \\ \hline \textbf{V}_{IC} = 0, & \textbf{V}_{O} = 0, \\ \hline \textbf{See Figure 4} & \textbf{Z5}^{\circ}C & \textbf{G} & \textbf{100} & \textbf{G} & \textbf{100} \\ \hline \textbf{Full range} & \textbf{Z2} & \textbf{Z2} & \textbf{Z2} & \textbf{Z2} \\ \hline \textbf{Z5}^{\circ}C & \textbf{Z0} & \textbf{175} & \textbf{Z0} & \textbf{175} \\ \hline \textbf{Full range} & \textbf{G5} & \textbf{G5} & \textbf{G5} \\ \hline \textbf{Full range} & \textbf{G5} & \textbf{G5} & \textbf{G5} \\ \hline \textbf{Full range} & \textbf{G5} & \textbf{G5} & \textbf{G5} \\ \hline \textbf{Full range} & \textbf{G5} & \textbf{G5} & \textbf{G5} \\ \hline \textbf{Full range} & \textbf{G5} & \textbf{G5} & \textbf{G5} \\ \hline \textbf{Full range} & \textbf{G5} & \textbf{G5} & \textbf{G5} \\ \hline \textbf{Full range} & \textbf{G5} & \textbf{G5} & \textbf{G5} \\ \hline \textbf{G5} & \textbf{G5} & \textbf{G5} \\ \hline \textbf{Full range} & \textbf{G5} & \textbf{G5} & \textbf{G5} \\ \hline G5$	mV  μV/°C  pA  nA  pA  v
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	μV/°C  pA  nA  pA  nA
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	μV/°C  pA  nA  pA  nA
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	pA nA pA nA
$\begin{array}{ c c c c }\hline I_{ID} & Input offset current \\ \hline I_{IB} & Input bias current \\ \hline \\ V_{ICR} & Common-mode input voltage range \\ \hline \\ V_{OM+} & Maximum positive peak output voltage swing \\ \hline \\ V_{OM+} & I_{O} = -200  \muA \\ \hline \\ V_{OM+} & I_{O} = -$	nA pA nA
$V_{ICR} = 0, \\ See Figure 4 \\ V_{ICR} = 0, \\ See Figure 4 \\ See Channel 4 \\ See Figure 4 \\ See Channel$	pA nA V
$V_{ICR}  \begin{array}{c} \text{Light bias current} \\ \text{Vicr} \\ \text{Vicr} \\ \text{Voltage range} \\ \end{array}  \begin{array}{c} \text{Rs} = 50  \Omega \\ \\ \text{Rs} = 50  \Omega \\ \end{array}  \begin{array}{c} \text{Sinch put bias current} \\ \text{Full range} \\ \text{Voltage range} \\ \end{array}  \begin{array}{c} 15 & 15 & 15 & 15 & 15 & 15 & 15 & 15 $	nA V
$V_{ICR} \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	V
$V_{ICR}  \begin{array}{c} \text{Common-mode input} \\ \text{Voltage range} \end{array}  \begin{array}{c} R_{S} = 50  \Omega \end{array}  \begin{array}{c} 25^{\circ}\text{C} & \text{to to} \\ -11 & -11.9 \\ \end{array}  \begin{array}{c} 15 \\ \text{to} \\ -10.8 \\ \end{array}  \begin{array}{c} 15 \\ -10.8 \\ \end{array} \\ -10.8 \\ \end{array}$	
$V_{OM} + \begin{array}{c} V_{OM} \\ V_{OM$	
$VOM + \begin{tabular}{ l l l l l l l l l l l l l l l l l l l$	V
$V_{OM+} \begin{tabular}{l l l l l l l l l l l l l l l l l l l $	٧
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	V
$  I_{O} = -20 \text{ mA} $ Full range   13.3	·
$I_{O} = -20 \text{ mA}$ Full range 11.4 11.4 $I_{O} = 200  \mu\text{A}$ Full range -13.6 -13.6 $I_{O} = 200  \mu\text{A}$ Full range -13.6 -13.6 $25^{\circ}\text{C} -13.5 -14 -13.5 -14$	
Full range   11.4   11.4   11.4   $1.4 = $	
$I_O = 200  \mu A$ Full range $-13.6$ $-13.6$ $-13.6$ $-13.5$ $-14$ $-13.5$ $-14$	
Full range   -13.6	
IVOM Maximum negative poak IIO = 2 mA	
V()  -	V
output voltage swing Full range -13.3 -13.3	V
25°C -11.5 -12.4 -11.5 -12.4	
I <sub>O</sub> = 20 mA Full range -11.4 -11.4	
$R_L = 600 \Omega$ $25^{\circ}C$ $80$ $96$ $80$ $96$	
Full range 78 78	
Large-signal differential Va L40 V B. 340 25°C 90 109 90 109	dB
AVD $\begin{array}{c} \text{Large-signal differential} \\ \text{Voltage amplification} \end{array}$ $\begin{array}{c} \text{V}_{\text{O}} = \pm \ 10 \ \text{V} \\ \text{Full range} \end{array}$ $\begin{array}{c} \text{88} \\ \text{88} \end{array}$	uБ
Bt. 40 to 25°C 95 118 95 118	
$R_L = 10 \text{ k}\Omega$ Full range 93 93	
$r_i$ Input resistance $V_{IC} = 0$ $25^{\circ}C$ $10^{12}$ $10^{12}$	Ω
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	pF
Differential 25°C 2.5 2.5	
Zo Open-loop output impedance f = 1 MHz 25°C 80 80	Ω
CMRR Common-mode rejection V <sub>IC</sub> = V <sub>ICR</sub> min, 25°C 80 98 80 98	dB
ratio $V_O = 0$ , $R_S = 50 \Omega$ Full range 78 78	ub
Supply-voltage rejection $V_{CC\pm} = \pm 5 \text{ V to } \pm 15 \text{ V},$ $25^{\circ}\text{C}$ 82 99 82 99	dB
kSVR ratio ( $\Delta$ V <sub>CC±</sub> / $\Delta$ V <sub>IO</sub> ) $\Delta$ V <sub>O</sub> = 0, R <sub>S</sub> = 50 $\Omega$ Full range 80 80	uВ

<sup>\*</sup>On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.



<sup>†</sup> Full range is –55°C to 125°C.

# TLE2082M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15$ V (unless otherwise noted) (continued)

	PARAMETER	TEST CO	NDITIONS	T. T	TL	.E2082N	1	TLI	E2082A	М	UNIT
	FARAWETER	1231 00	NDITIONS	TA <sup>†</sup>	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
	Supply current			25°C	2.7	3.1	3.6	2.7	3.1	3.6	
ICC	(both channels)	$V_{O} = 0$ ,	No load	Full			3.6			3.6	mA
	(com ona.molo)			range			5.0			3.0	
	Crosstalk attenuation	$V_{IC} = 0$ ,	$R_L = 2 k\Omega$	25°C		120			120		dB
	Short-circuit output	\/- 0	V <sub>ID</sub> = 1 V	0500	-30	-45		-30	-45		^
los	current	VO = 0	$V_{ID} = -1 V$	25°C	30	48		30	48		mA

<sup>†</sup> Full range is –55°C to 125°C.

## TLE2082M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

	DADAMETED	TEOT 001	UDITIONIO	_ +	TL	.E2082N	/	TL	E2082A	М	LINUT
	PARAMETER	TEST COI	NDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
				25°C	28	40		28	40		
SR+	Positive slew rate	$V_{O(PP)} = 10 \text{ V},$ $R_{I} = 2 \text{ k}\Omega,$	$A_{VD} = -1$ ,	Full range	20			20			V/μs
		See Figure 1	CL = 100 pr,	25°C	30	45		30	45		
SR-	Negative slew rate	Ü		Full range	20			20			V/μs
	Settling time	$A_{VD} = -1$ , 10-V step,	To 10 mV	25°C		0.4			0.4		μs
t <sub>S</sub>	Setting time	$R_L = 1 k\Omega$ , $C_L = 100 pF$	To 1 mV	23 C		1.5			1.5		μο
\ <u></u>	Equivalent input noise		f = 10 Hz	25°C		28			28		nV/√ <del>Hz</del>
Vn	voltage		f = 10 kHz	23 C		11.6			11.6		IIV/∀⊓Z
Vaura	Peak-to-peak equivalent	$R_S = 20 \Omega$ , See Figure 3	f = 10 Hz to 10 kHz	25°C		6			6		\/
VN(PP)	input noise voltage		f = 0.1 Hz to 10 Hz	25 0		0.6			0.6		μV
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 20 \text{ V},$ f = 1  kHz, $R_{S} = 25 \Omega$	$A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$	25°C	0	.008%		0	.008%		
B <sub>1</sub>	Unity-gain bandwidth	$V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$	$R_L = 2 k\Omega$ , See Figure 2	25°C	8*	10		8*	10		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$	$A_{VD} = -1$ , $C_L = 25 pF$	25°C	478*	637		478*	637		kHz
φm	Phase margin at unity gain	$V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$	$R_L = 2 k\Omega$ , See Figure 2	25°C		57°			57°		

<sup>\*</sup>On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.



<sup>†</sup> Full range is –55°C to 125°C.

## TLE208x, TLE208xA, TLE208xY EXCALIBUR HIGH-SPEED JFET-INPUT OPERATIONAL AMPLIFIERS SLOS182B – FEBRUARY 1997 – REVISED JUNE 2001

## TLE2082Y electrical characteristics at $V_{CC\pm}$ = $\pm 15$ V, $T_A$ = $25^{\circ}C$

	DADAMETED			OT CONDITIO	210	Т	LE2082Y	′	
	PARAMETER		l les	ST CONDITIO	JNS	MIN	TYP	MAX	UNIT
VIO	Input offset voltage		V <sub>IC</sub> = 0,	V <sub>O</sub> = 0,	R <sub>S</sub> = 50 Ω		1.1	6	mV
l <sub>IO</sub>	Input offset current		\/·~ 0	\/- 0	Coo Figure 4		6	100	pА
I <sub>IB</sub>	Input bias current		$V_{IC} = 0$ ,	V <sub>O</sub> = 0,	See Figure 4		20	175	pА
VICR	Common-mode input voltage	range	R <sub>S</sub> = 50 Ω			15 to -11	15 to 11.9		V
V <sub>OM+</sub>	Maximum positive peak outpo	ut voltage swing	$I_O = -200 \mu\text{A}$ $I_O = -2 \text{mA}$			13.8 13.5	14.1 13.9		V
VOM+	waximum positive peak outp	at voltage swing	$I_0 = -20 \text{ mA}$			11.5	12.3		v
			I <sub>O</sub> = 200 μA			-13.8	-14.2		
VOM-	Maximum negative peak outp	out voltage swing	I <sub>O</sub> = 2 mA			-13.5	-14		V
			I <sub>O</sub> = 20 mA			-11.5	-12.4		
				R <sub>L</sub> = 600 £	2	80	96		
$A_{VD}$	Large-signal differential volta	ge amplification	$V_0 = \pm 10 \text{ V}$	$R_L = 2 k\Omega$		90	109		dB
				$R_L = 10 \text{ k}\Omega$	2	95	118		
rį	Input resistance		VIC = 0				1012		Ω
ci	Input capacitance	Common mode Differential	V <sub>O</sub> = 0,	See Figure	: 5		7.5 2.5		pF
z <sub>o</sub>	Open-loop output impedance		f = 1 MHz				80		Ω
CMRR	Common-mode rejection ratio	)	V <sub>IC</sub> = V <sub>ICR</sub> min,	V <sub>O</sub> = 0,	R <sub>S</sub> = 50 Ω	80	98		dB
ksvr	Supply-voltage rejection ratio	(ΔV <sub>CC±</sub> /ΔV <sub>IO</sub> )	$V_{CC\pm} = \pm 5 \text{ V to}$ Rs = 50 $\Omega$		V <sub>O</sub> = 0,	82	99		dB
ICC	Supply current (both channel	s)	V <sub>O</sub> = 0,	No load		2.7	3.1	3.9	mA
los	Short-circuit output current		V <sub>O</sub> = 0	V <sub>ID</sub> = 1 V		-30	-45		mA
105	Short-choun output current		1 10 - 0	$V_{ID} = -1 V$	′	30	48		ША



# TLE2084C electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 5$ V (unless otherwise noted)

	PARAMETER	TEST CO	NOTIONS	- +	T	LE2084	С	TL	E2084A	C	UNIT
	PARAMETER	IESI CC	ONDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNII
VIO	Input offset voltage			25°C		-1.6	7		-0.5	4	mV
۷IO		$V_{IC} = 0$ ,	$V_O = 0$ ,	Full range			9.1			6.1	IIIV
ανιο	Temperature coefficient of input offset voltage	$R_S = 50 \Omega$		Full range		10.1	30		10.1	30	μV/°C
lio	Input offset current			25°C		15	100		15	100	pА
10	input onset current	V <sub>IC</sub> = 0,	$V_O = 0$ ,	Full range			1.4			1.4	nA
I <sub>IB</sub>	Input bias current	See Figure 4		25°C		20	175		20	175	pА
·ID				Full range			5			5	nA
V	Common-mode input	D- 500		25°C	5 to –1	5 to -1.9		5 to –1	5 to -1.9		V
VICR	voltage range	$R_S = 50 \Omega$		Full range	5 to -0.9			5 to -0.9			V
		I <sub>O</sub> = -200 μA		25°C	3.8	4.1		3.8	4.1		
		10 = -200 μΑ		Full range	3.7			3.7			
V <sub>OM+</sub>	Maximum positive peak	$I_{O} = -2 \text{ mA}$		25°C	3.5	3.9		3.5	3.9		V
VOIVI+	output voltage swing	10 - 211174		Full range	3.4			3.4			v
		$I_{O} = -20 \text{ mA}$		25°C	1.5	2.3		1.5	2.3		
		10 - 20117		Full range	1.5			1.5			
		ΙΟ = 200 μΑ		25°C	-3.8	-4.2		-3.8	-4.2		
		Ü 11 ji		Full range	-3.7			-3.7			
V <sub>OM</sub> -	Maximum negative peak output voltage swing	IO = 2 mA		25°C	-3.5	-4.1		-3.5	-4.1		V
· · · · ·	output voitage swing			Full range	-3.4			-3.4	0.1		
		I <sub>O</sub> = 20 mA		25°C	-1.5	-2.4		-1.5	-2.4		
			i	Full range	-1.5	0.4		-1.5	0.4		
			$R_L = 600 \Omega$	25°C	80 79	91		80 79	91		
	Lorgo signal differential			Full range 25°C	90	100		90	100		
AVD	Large-signal differential voltage amplification	$V_0 = \pm 2.3 \text{ V}$	$R_L = 2 k\Omega$	Full range	89	100		89	100		dB
	gp			25°C	95	106		95	106		
			$R_L = 10 \text{ k}\Omega$	Full range	94	100		94	100		
rį	Input resistance	V <sub>IC</sub> = 0	ı	25°C		1012			1012		Ω
-1		$V_{IC} = 0$ ,	Common mode	25°C		11			11		
ci	Input capacitance	See Figure 5	Differential	25°C		2.5			2.5		pF
z <sub>0</sub>	Open-loop output impedance	f = 1 MHz		25°C		80			80		Ω
	Common-mode	V <sub>IC</sub> = V <sub>ICR</sub> mi	n.	25°C	70	89		70	89		
CMRR	rejection ratio	$V_0 = 0$	$R_S = 50 \Omega$	Full range	68			68			dB
	Supply-voltage rejection	V <sub>CC±</sub> = ±5 V		25°C	82	99		82	99		
ksvr	ratio (ΔV <sub>CC±</sub> /ΔV <sub>IO</sub> )	$V_0 = 0$ ,	$R_S = 50 \Omega$	Full range	80			80			dB
	Supply current	V 6	Nalaad	25°C	5.2	6.3	7.5	5.2	6.3	7.5	^
ICC	(four amplifiers)	$V_{O} = 0,$	No load	Full range			7.5			7.5	mA
a <sub>X</sub>	Crosstalk attenuation	$V_{IC} = 0$ ,	R <sub>L</sub> = 2 kΩ	25°C		120			120		dB

<sup>†</sup> Full range is 0°C to 70°C.



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# TLE2084C electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 5$ V (unless otherwise noted) (continued)

П	PARAMETER	TEST C	ONDITIONS	_ +	T	LE2084	С	TL	E2084A	C	UNIT	1
	PARAMETER	lESI C	ONDITIONS	TAT	MIN	TYP	MAX	MIN	TYP	MAX	UNII	
Γ.	Short-circuit output	V 0	V <sub>ID</sub> = 1 V	0500		-35			-35		^	1
lo	S current	VO = 0	$V_{ID} = -1 V$	25°C		45			45		mA	l

<sup>†</sup> Full range is 0°C to 70°C.

## TLE2084C operating characteristics at specified free-air temperature, $V_{\mbox{CC}\pm}$ = $\pm5$ V

	DADAMETED	TEST 00	NOTIONO	_	TL	E20840	;	TL	E2084A	С	UNIT
	PARAMETER	I IEST CO	NDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNII
				25°C		35			35		
SR+	Positive slew rate	$V_{O(PP)} = \pm 2.3$ $A_{VD} = -1$ ,	V,	Full range	22			22			V/μs
		$A_{VD} = -1$ , $C_{L} = 100 \text{ pF}$ ,	See Figure 1	25°C		38			38		
SR-	Negative slew rate			Full range	22			22			V/μs
t <sub>S</sub>	Settling time	$A_{VD} = -1$ , 2-V step,	To 10 mV	25°C		0.25			0.25		μs
'S	Settling time	$R_L = 1 \text{ k}\Omega$ , $C_L = 100 \text{ pF}$	To 1 mV	25 0		0.4			0.4		μο
v <sub>n</sub>	Equivalent input noise		f = 10 Hz	25°C		28			28		nV/√ <del>Hz</del>
٧n	voltage		f = 10 kHz	23 C		11.6			11.6		11 07 11 12
\/\.\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Peak-to-peak equivalent	$R_S = 20 \Omega$ , See Figure 3	f = 10 Hz to 10 kHz	25°C		6			6		μV
VN(PP)	input noise voltage		f = 0.1Hz to 10 Hz	25 0		0.6			0.6		μν
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA/√ <del>Hz</del>
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 5 \text{ V},$ f = 1  kHz, $R_{S} = 25 \Omega$	$A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$	25°C	0	.013%		0	.013%		
B <sub>1</sub>	Unity-gain bandwidth	$V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$	$R_L = 2 k\Omega$ , See Figure 2	25°C		9.4			9.4		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 4 V$ , $R_L = 2 k\Omega$ ,	$A_{VD} = -1$ , $C_L = 25 pF$	25°C		2.8			2.8		MHz
φm	Phase margin at unity gain	$V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$	$R_L = 2 k\Omega$ , See Figure 2	25°C		56°		-	56°		

<sup>†</sup>Full range is 0°C to 70°C.

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# TLE2084C electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 15$ V (unless otherwise noted)

	DADAMETED	TEST CO	ONDITIONS	TLE2084C		TI	E2084A	С	UNIT		
	PARAMETER	1ESI CC	PNDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNII
1/10	Input offset voltage			25°C		-1.6	7		-0.5	4	mV
VIO		V <sub>IC</sub> = 0,	$V_{O} = 0$ ,	Full range			9.1			6.1	IIIV
ανιο	Temperature coefficient of input offset voltage	$R_S = 50 \Omega$		Full range		10.1	30		10.1	30	μV/°C
lio.	Input offset current			25°C		15	100		15	100	pА
lo	Input offset current	$V_{IC} = 0$ ,	$V_{O} = 0$ ,	Full range			1.4			1.4	nA
lin.	Input bias current	See Figure 4		25°C		25	175		25	175	pА
IB	input bias current			Full range			5			5	nA
Vion	Common-mode input	R <sub>S</sub> = 50 Ω		25°C	15 to –11	15 to -11.9		15 to –11	15 to -11.9		V
VICR	voltage range	115 = 30 12		Full range	15 to -10.9			15 to -10.9			V
		I <sub>O</sub> = -200 μA		25°C	13.8	14.1		13.8	14.1		
		10 = -200 μΑ		Full range	13.7			13.7			
V <sub>OM+</sub>	Maximum positive peak	I <sub>O</sub> = -2 mA		25°C	13.5	13.9		13.5	13.9		V
VOM+	output voltage swing	10 = -2111A		Full range	13.4			13.4			V
		$I_0 = -20 \text{ mA}$		25°C	11.5	12.3		11.5	12.3		
		10 = -20 IIIA		Full range	11.5	-		11.5			
		I <sub>O</sub> = 200 μA		25°C	-13.8	-14.2		-13.8	-14.2		
	Maximum nagativa	10 - 200 μ/ (		Full range	-13.7			-13.7			
V <sub>OM</sub> -	Maximum negative peak output voltage	IO = 2 mA		25°C	-13.7	-14		-13.7	-14		V
- OIVI —	swing	10 = 11.21		Full range	-13.6			-13.6			
		I <sub>O</sub> = 20 mA		25°C	-11.5	-12.4		-11.5	-12.4		
		0		Full range	-11.5			-11.5			
			R <sub>L</sub> = 600 Ω	25°C	80	96		80	96		
				Full range	79			79			
AVD	Large-signal differential	V <sub>O</sub> = ± 10 V	R <sub>L</sub> = 2 kΩ	25°C	90	109		90	109		dB
\ \b	voltage amplification	ľ		Full range	89			89			
			$R_{\parallel} = 10 \text{ k}\Omega$	25°C	95	118		95	118		
			_	Full range	94	10		94	10		
rį	Input resistance	VIC = 0		25°C		1012			1012		Ω
cį	Input capacitance	V <sub>IC</sub> = 0,	Common mode	25°C		7.5			7.5		pF
		See Figure 5	Differential	25°C		2.5			2.5		•
z <sub>o</sub>	Open-loop output impedance	f = 1 MHz		25°C		80			80		Ω
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICRmi}$ $V_{O} = 0$ ,	n, $R_S = 50 \Omega$	25°C Full range	80 79	98		80 79	98		dB
le=. :-	Supply-voltage rejection	V <sub>CC±</sub> = ±5 V	to ±15 V,	25°C	82	99		82	99		40
ksvr	ratio ( $\Delta V_{CC\pm}/\Delta V_{IO}$ )	$V_0 = 0$ ,	$R_S = 50 \Omega$	Full range	81			81			dB
Icc	Supply current (four amplifiers)	V <sub>O</sub> = 0,	No load	25°C	5.2	6.5	7.5	5.2	6.5	7.5	mA
			D 010	Full range		400	7.5		400	7.5	.15
a <sub>X</sub>	Crosstalk attenuation	$V_{IC} = 0$ ,	$R_L = 2 k\Omega$	25°C		120			120		dB

<sup>†</sup> Full range is 0°C to 70°C.



### TLE208x, TLE208xA, TLE208xY EXCALIBUR HIGH-SPEED JFET-INPUT OPERATIONAL AMPLIFIERS

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# TLE2084C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15$ V (unless otherwise noted) (continued)

	PARAMETER TEST CONDI		ONDITIONS	- +	TLE2084C			TL	С	UNIT	
	PARAIVIETER	1231 00	JNDITIONS	IA'	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
	Short-circuit output	V 0	V <sub>ID</sub> = 1 V	0500	-30	-45		-30	-45		^
los	current	VO = 0	$V_{ID} = -1 V$	25°C	30	48		30	48		mA

<sup>†</sup>Full range is 0°C to 70°C.

## TLE2084C operating characteristics at specified free-air temperature, $V_{\mbox{CC}\pm}$ = $\pm 15~\mbox{V}$

	DADAMETED	TEST 601	UDITIONS	_ +	TLE2084C			TL	С	LINUT	
	PARAMETER	TEST COM	NDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
				25°C	25	40		25	40		
SR+	Positive slew rate	V <sub>O(PP)</sub> = 10 V,	$A_{VD} = -1$ ,	Full range	22			22			V/μs
		$R_L = 2 k\Omega$ , See Figure 1	CL = 100 pF,	25°C	30	45		30	45		
SR-	Negative slew rate	3		Full range	25			25			V/μs
t <sub>S</sub>	Settling time	$A_{VD} = -1$ , 10-V step,	To 10 mV	25°C		0.4			0.4		μs
is	Settling time	$R_L = 1 k\Omega$ , $C_L = 100 pF$	To 1 mV	25 0		1.5			1.5		μο
v <sub>n</sub>	Equivalent input noise		f = 10 Hz	25°C		28			28		nV/√ <del>Hz</del>
٧n	voltage		f = 10 kHz	25 0		11.6			11.6		IIV/ VIIZ
	Peak-to-peak equivalent	Rs = $20 \Omega$ , See Figure 3	f = 10 Hz to 10 kHz	0500		6			6		.,
V <sub>N(PP)</sub>	input noise voltage		f = 0.1 Hz to 10 Hz	25°C		0.6			0.6		μV
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA/√ <del>Hz</del>
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 20 \text{ V},$ f = 1 kHz, R <sub>S</sub> = 25 $\Omega$	$A_{VD} = 10,$ $R_L = 2 k\Omega,$	25°C	0	.008%		0	.008%		
B <sub>1</sub>	Unity-gain bandwidth	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L = 2 kΩ$ , See Figure 2	25°C	8	10		8	10		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$	$A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$	25°C	478	637		478	637		kHz
фm	Phase margin at unity gain	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L = 2 kΩ$ , See Figure 2	25°C		57°			57°		

<sup>†</sup> Full range is 0°C to 70°C.



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### TLE2084M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 5$ V (unless otherwise noted)

	DADAMETER	TEST OF	NULTIONS	_ +	.† TLE2084M		TL	E2084A	М	LIAUT	
	PARAMETER	TEST CO	ONDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
VIO	Input offset voltage			25°C		-1.6	7		-0.5	4	mV
VIO		$V_{IC} = 0$ ,	$V_O = 0$ ,	Full range			12.5			9.5	IIIV
αVIO	Temperature coefficient of input offset voltage	$R_S = 50 \Omega$		Full range		10.1	30*		10.1	30*	μV/°C
ΙΙΟ	Input offset current			25°C		15	100		15	100	pА
טוי	input onset current	$V_{IC} = 0$ ,	$V_{O} = 0$ ,	Full range			20			20	nA
I <sub>IB</sub>	Input bias current	See Figure 4		25°C		20	175		20	175	pА
.ID	mpat blad darrollt			Full range		_	65			65	nA
Vion	Common-mode input	R <sub>S</sub> = 50 Ω		25°C	5 to -1	5 to -1.9		5 to –1	5 to -1.9		V
VICR	voltage range	KS = 50 12		Full range	5 to -0.8			5 to -0.8			V
		Ja - 200 uA		25°C	3.8	4.1		3.8	4.1		
		$I_{O} = -200 \mu\text{A}$		Full range	3.6			3.6			
V <sub>OM+</sub>	Maximum positive peak	I <sub>O</sub> = -2 mA		25°C	3.5	3.9		3.5	3.9		٧
VOIVI+	output voltage swing	10 - 21114		Full range	3.3			3.3			v
		$I_{O} = -20 \text{ mA}$		25°C	1.5	2.3		1.5	2.3		
		10 = 20 HIA		Full range	1.4			1.4			
		ΙΟ = 200 μΑ		25°C	-3.8	-4.2		-3.8	-4.2		
	Maximum negative	.0 = 200 μ, τ		Full range	-3.6			-3.6			
V <sub>OM</sub> -	peak output voltage	I <sub>O</sub> = 2 mA		25°C	-3.5	-4.1		-3.5	-4.1		V
- OIVI	swing	.0		Full range	-3.3	-		-3.3			
		I <sub>O</sub> = 20 mA		25°C	-1.5	-2.4		-1.5	-2.4		
		<u> </u>	1	Full range	-1.4			-1.4			
			R <sub>L</sub> = 600 Ω	25°C	80	91		80	91		
				Full range	78			78			
AVD	Large-signal differential voltage amplification	V <sub>O</sub> = ± 2.3 V	$R_L = 2 k\Omega$	25°C	90	100		90	100		dB
	voltage amplification		_	Full range	88	400		88	400		
			$R_L = 10 \text{ k}\Omega$	25°C	95	106		95	106		
_	. Lamata and Catalana	., .	_	Full range	93	1012		93	1012		-
rį	Input resistance	V <sub>IC</sub> = 0		25°C		1012			1012		Ω
ci	Input capacitance	V <sub>IC</sub> = 0, See Figure 5	Common mode	25°C		11			11		pF
	0	See rigure 3	Differential	25°C		2.5			2.5		
z <sub>O</sub>	Open-loop output impedance	f = 1 MHz		25°C		80			80		Ω
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}^{mi}$ $V_{O} = 0$ ,	n, $R_S = 50 \Omega$	25°C Full range	70 68	89		70 68	89		dB
	Supply-voltage rejec-	V <sub>CC±</sub> = ±5 V	to ±15 V,	25°C	82	99		82	99		
ksvr	tion ratio ( $\Delta V_{CC\pm}/\Delta V_{IO}$ )	$V_0 = 0$ ,	$R_S = 50 \Omega$	Full range	80	-		80			dB
	Supply current	V 6	No. 1 J	25°C	5.2	6.3	7.5	5.2	6.3	7.5	^
ICC	(four amplifiers)	$V_{O} = 0,$	No load	Full range			7.5			7.5	mA
a <sub>X</sub>	Crosstalk attenuation	$V_{IC} = 0$ ,	$R_L = 2 k\Omega$	25°C		120			120		dB

<sup>\*</sup>On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested. † Full range is -55°C to 125°C.



### TLE208x, TLE208xA, TLE208xY EXCALIBUR HIGH-SPEED JFET-INPUT OPERATIONAL AMPLIFIERS

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# TLE2084M electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 5$ V (unless otherwise noted) (continued)

PARAMETER		TEST CO	TEST CONDITIONS		TLE2084M			TLE2084AM			UNIT
	PARAWEIER	1551 66	SNOTTIONS	TA	MIN	TYP	MAX	MIN	TYP	MAX	UNII
Ι.	Short-circuit output	V 0	V <sub>ID</sub> = 1 V	0500		-35			-35		A
los	current	$V_O = 0$	V <sub>ID</sub> = −1 V	25°C		45			45		mA

## TLE2084M operating characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 5~\text{V}$

	DADAMETED	TEST CONDITIONS		+	TL	E2084N	/	TL	E2084A	М	
	PARAMETER	IEST CON	IDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
				25°C		35			35		
SR+	Positive slew rate	$V_{O(PP)} = \pm 2.3$ $A_{VD} = -1$ ,	V,	Full range	18*			18*			V/µs
		AVD = -1, $C_1 = 100 \text{ pF}$ ,	See Figure 1	25°C		38			38		
SR-	Negative slew rate			Full range	18*			18*			V/μs
t <sub>S</sub>	Settling time	$A_{VD} = -1$ , 2-V step,	To 10 mV	25°C		0.25			0.25		μs
٠s	Columny time	$R_L = 1 \text{ k}\Omega$ , $C_L = 100 \text{ pF}$	To 1 mV	20 0		0.4			0.4		μο
v <sub>n</sub>	Equivalent input noise		f = 10 Hz	25°C		28			28		nV/√ <del>Hz</del>
٧n	voltage	f = 10 kHz	f = 10 kHz	25 0		11.6			11.6		IIV/\IIZ
Varras	Peak-to-peak equivalent	$R_S = 20 \Omega$ , See Figure 3	f = 10 Hz to 10 kHz	25°C		6			6		μV
VN(PP)	input noise voltage		f = 0.1 Hz to 10 Hz	25°C		0.6			0.6		μν
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 5 \text{ V},$ f = 1  kHz, $R_{S} = 25 \Omega$	$A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$	25°C	0	.013%		0	.013%		
В1	Unity-gain bandwidth	$V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$	$R_L = 2 kΩ$ , See Figure 2	25°C		9.4			9.4		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 4 \text{ V},$ $R_L = 2 \text{ k}\Omega$ ,	$A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$	25°C		2.8			2.8		MHz
φm	Phase margin at unity gain	V <sub>I</sub> = 10 mV, C <sub>L</sub> = 25 pF,	$R_L = 2 kΩ$ , See Figure 2	25°C		56°			56°		

<sup>\*</sup>On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.

<sup>†</sup> Full range is -55°C to 125°C.

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# TLE2084M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15$ V (unless otherwise noted)

	DADAMETED	TEST CO	NULTIONS	_ +	TLE2084M		1	TL	.E2084A	М	LINIT
	PARAMETER	TEST CO	ONDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
VIO	Input offset voltage			25°C		-1.6	7		-0.5	4	mV
VIO		$V_{IC} = 0$ ,	$V_O = 0$ ,	Full range			12.5			7.5	111 V
αVIO	Temperature coefficient of input offset voltage	$R_S = 50 \Omega$		Full range		10.1	30*		10.1	30*	μV/°C
lio	Input offset current			25°C		15	100		15	100	pА
ΙΟ	input onset current	$V_{IC} = 0$ ,	$V_O = 0$ ,	Full range			20			20	nA
I <sub>IB</sub>	Input bias current	See Figure 4		25°C		25	175		25	175	pА
'IB	Input blue durient			Full range			65			65	nA
Vion	Common-mode input	Po - 50 O		25°C	15 to –11	15 to -11.9		15 to –11	15 to -11.9		V
VICR	voltage range	$R_S = 50 \Omega$		Full range	15 to -10.8			15 to -10.8			V
		I <sub>O</sub> = -200 μA		25°C	13.8	14.1		13.8	14.1		
		10 = -200 μΑ		Full range	13.6			13.6			
V014	Maximum positive peak	I <sub>O</sub> = -2 mA		25°C	13.5	13.9		13.5	13.9		V
VOM+	output voltage swing	10 = -2111A		Full range	13.3			13.3			V
		I <sub>O</sub> = -20 mA		25°C	11.5	12.3		11.5	12.3		
		10 = 20 HIA		Full range	11.4			11.4			
		ΙΟ = 200 μΑ		25°C	-13.8	-14.2		-13.8	-14.2		
		.0 = 200 μ. τ		Full range	-13.6			-13.6			
VOM-	Maximum negative peak	I <sub>O</sub> = 2 mA		25°C	-13.5	-14		-13.5	-14		V
- OIVI	output voltage swing	0		Full range	-13.3	-		-13.3			-
		I <sub>O</sub> = 20 mA		25°C	-11.5	-12.4		-11.5	-12.4		
		Ŭ	1	Full range	-11.4			-11.4			
			$R_1 = 600 \Omega$	25°C	80	96		80	96		
				Full range	78			78			
AVD	Large-signal differential voltage amplification	V <sub>O</sub> = ± 10 V	R <sub>L</sub> = 2 kΩ	25°C	90	109		90	109		dB
	voltage amplification		_	Full range	88	440		88	440		
			$R_L = 10 \text{ k}\Omega$	25°C	95	118		95	118		
_	Tamat mas Satara as	\ <u>'</u> 0	_	Full range	93	4012		93	4012		-
rį	Input resistance	V <sub>IC</sub> = 0		25°C	<u> </u>	1012			1012		Ω
ci	Input capacitance	V <sub>IC</sub> = 0, See Figure 5	Common mode	25°C		7.5			7.5		pF
		See Figure 5	Differential	25°C		2.5			2.5		•
z <sub>o</sub>	Open-loop output impedance	f = 1 MHz		25°C		80			80		Ω
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}^{mi}$ $V_{O} = 0$ ,	n, $R_S = 50 \Omega$	25°C Full range	80 78	98		80 78	98		dB
1	Supply-voltage rejection	V <sub>CC±</sub> = ±5 V	to ±15 V,	25°C	82	99		82	99		70
ksvr	ratio ( $\Delta V_{CC\pm}/\Delta V_{IO}$ )	$V_{O} = 0$ ,	$R_S = 50 \Omega$	Full range	80			80			dB
la a	Supply current	V 0	No load	25°C	5.2	6.5	7.5	5.2	6.5	7.5	^
Icc	(four amplifiers)	$V_{O} = 0,$	No load	Full range			7.5			7.5	mA
a <sub>X</sub>	Crosstalk attenuation	$V_{IC} = 0$ ,	$R_L = 2 k\Omega$	25°C		120			120		dB

<sup>\*</sup>On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.



<sup>†</sup> Full range is –55°C to 125°C.

### TLE208x, TLE208xA, TLE208xY EXCALIBUR HIGH-SPEED JFET-INPUT OPERATIONAL AMPLIFIERS

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# TLE2084M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15$ V (unless otherwise noted) (continued)

	PARAMETER TEST CONDITIONS		ONDITIONS	_	TLE2084M			TL	М	UNIT	
	PARAMETER	1231 00	JNDITIONS	IA	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
	Short-circuit output	V 0	V <sub>ID</sub> = 1 V	0500	-30	-45		-30	-45		^
los	current	V <sub>O</sub> = 0	$V_{ID} = -1 V$	25°C	30	48		30	48		mA

## TLE2084M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

	PARAMETER	TEST CONDITIONS TAT		-+	TLE2084M			TLE2084AM			UNIT
	PARAMETER	I IESI CON	IDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	UNII
				25°C	25	40		25	40		
SR+	Positive slew rate	V <sub>O(PP)</sub> = 10 V,		Full range	17			17			V/µs
		$A_{VD} = -1,$ $C_{I} = 100 \text{ pF},$	See Figure 1	25°C	30	45		30	45		
SR-	Negative slew rate			Full range	20			20			V/µs
t <sub>S</sub>	Settling time	$A_{VD} = -1$ , 10-V step,	To 10 mV	25°C		0.4			0.4		μs
'S	Cetting time	$R_L = 1 k\Omega$ , $C_L = 100 pF$	To 1 mV	20 0		1.5			1.5		μο
v <sub>n</sub>	Equivalent input noise		f = 10 Hz	25°C		28			28		nV/√ <del>Hz</del>
▼n	voltage		f = 10 kHz	20 0		11.6			11.6		110/ 1112
\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Peak-to-peak equivalent	$R_S = 20 \Omega$ , See Figure 3	f = 10 Hz to 10 kHz	25°C		6			6		μV
VN(PP)	input noise voltage		f = 0.1 Hz to 10 Hz	23 0		0.6			0.6		μν
In	Equivalent input noise current	V <sub>IC</sub> = 0,	f = 10 kHz	25°C		2.8			2.8		fA /√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 20 \text{ V},$ f = 1  kHz, $R_{S} = 25 \Omega$	$A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$	25°C	0	.008%		0	.008%		
B <sub>1</sub>	Unity-gain bandwidth	$V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$	$R_L = 2 kΩ$ , See Figure 2	25°C	8*	10		8*	10		MHz
Вом	Maximum output-swing bandwidth	$V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$	$A_{VD} = -1,$ $C_{L} = 25 pF$	25°C	478*	637		478*	637		kHz
φm	Phase margin at unity gain	$V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$	$R_L = 2 kΩ$ , See Figure 2	25°C		57°			57°		

<sup>\*</sup>On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.

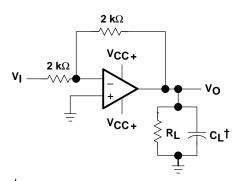
<sup>†</sup> Full range is -55°C to 125°C.

# TLE208x, TLE208xA, TLE208xY EXCALIBUR HIGH-SPEED JFET-INPUT OPERATIONAL AMPLIFIERS SLOS182B - FEBRUARY 1997 - REVISED JUNE 2001

# TLE2084Y electrical characteristics at $V_{CC\pm}$ = $\pm15$ V, $T_{A}$ = $25^{\circ}C$ (unless otherwise noted)

	DADAMETED	TEOT 00	NIDITIONO	Т	LE2084Y	′	
	PARAMETER	lesi co	ONDITIONS	MIN	TYP	MAX	UNIT
VIO	Input offset voltage	$V_{IC} = 0,$ $R_S = 50 \Omega$	V <sub>O</sub> = 0,			7	mV
I <sub>IO</sub>	Input offset current	V <sub>IC</sub> = 0,	V <sub>O</sub> = 0,		15	100	pА
I <sub>IB</sub>	Input bias current	See Figure 4			25	175	pА
VICR	Common-mode input voltage range	R <sub>S</sub> = 50 Ω		15 to –11	15 to 11.9		V
		$I_{O} = -200 \mu\text{A}$		13.8	14.1		
V <sub>OM+</sub>	Maximum positive peak output voltage swing	$I_O = -2 \text{ mA}$		13.5	13.9		V
		$I_0 = -20 \text{ mA}$		11.5	12.3		
		ΙΟ = 200 μΑ		-13.8	-14.2		
$V_{OM-}$	Maximum negative peak output voltage swing	$I_O = 2 \text{ mA}$		-13.5	-14		V
		I <sub>O</sub> = 20 mA		-11.5	-12.4		
			$R_L = 600 \Omega$	80	96		
$A_{VD}$	Large-signal differential voltage amplification	$V_0 = \pm 10 \text{ V}$	$R_L = 2 k\Omega$	90	109		dB
			$R_L = 10 \text{ k}\Omega$	95	118		
rį	Input resistance	V <sub>IC</sub> = 0			1012		Ω
۵.	lanut conscitance	V <sub>IC</sub> = 0,	Common mode		7.5		
Cį	Input capacitance	See Figure 5	Differential		2.5		pF
z <sub>o</sub>	Open-loop output impedance	f = 1 MHz	-		80		Ω
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}min,$ $R_S = 50 \Omega$	$V_O = 0$ ,	80	98		dB
ksvr	Supply-voltage rejection ratio (ΔV <sub>CC±</sub> /ΔV <sub>IO</sub> )	$V_{CC\pm} = \pm 5 \text{ V to } \pm 1$ R <sub>S</sub> = 50 $\Omega$	$5 \text{ V, V}_{O} = 0,$	82	99		dB
ICC	Supply current (four amplifiers)	V <sub>O</sub> = 0,	No load	5.2	6.5	7.5	mA
loo	Short circuit output current	Vo = 0	V <sub>ID</sub> = 1 V	-30	-45		mA
los	Short-circuit output current	1\/\(\sigma = 0\)	$V_{ID} = -1 V$	30	48		IIIA

#### PARAMETER MEASUREMENT INFORMATION



† Includes fixture capacitance

Figure 1. Slew-Rate Test Circuit

† Includes fixture capacitance

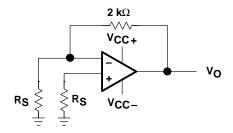
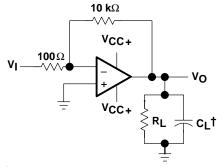


Figure 3. Noise-Voltage Test Circuit



† Includes fixture capacitance

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

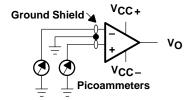


Figure 4. Input-Bias and Offset-**Current Test Circuit** 

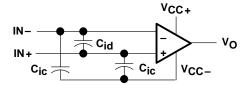


Figure 5. Internal Input Capacitance

#### 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 TLE208x and TLE208xA, 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.



SLOS182B - FEBRUARY 1997 - REVISED JUNE 2001

#### **TYPICAL CHARACTERISTICS**

### **Table of Graphs**

			FIGURE
V <sub>IO</sub>	Input offset voltage	Distribution	6, 7, 8
αVIO	Input offset voltage temperature coefficient	Distribution	9, 10, 11
I <sub>IO</sub>	Input offset current	vs Free-air temperature	12 – 15
I <sub>IB</sub>	Input bias current	vs Free-air temperature vs Supply voltage	12 – 15 16
VICR	Common-mode input voltage range	vs Free-air temperature	17
$V_{ID}$	Differential input voltage	vs Output voltage	18, 19
V <sub>OM+</sub>	Maximum positive peak output voltage	vs Output current vs Free-air temperature vs Supply voltage	20, 21 24, 25 26
V <sub>OM</sub> -	Maximum negative peak output voltage	vs Output current vs Free-air temperature vs Supply voltage	22, 23 24, 25 26
V <sub>O(PP)</sub>	Maximum peak-to-peak output voltage	vs Frequency	27
٧o	Output voltage	vs Settling time	28
AVD	Large-signal differential voltage amplification	vs Load resistance vs Free-air temperature	29 30, 31
A <sub>VD</sub>	Small-signal differential voltage amplification	vs Frequency	32, 33
CMRR	Common-mode rejection ratio	vs Frequency vs Free-air temperature	34 35
ksvr	Supply-voltage rejection ratio	vs Frequency vs Free-air temperature	36 37
Icc	Supply current	vs Supply voltage vs Free-air temperature vs Differential input voltage	38, 39, 40 41, 42, 43 44 – 49
los	Short-circuit output current	vs Supply voltage vs Elapsed time vs Free-air temperature	50 51 52
SR	Slew rate	vs Free-air temperature vs Load resistance vs Differential input voltage	53, 54 55 56
V <sub>n</sub>	Equivalent input noise voltage	vs Frequency	57
Vn	Input-referred noise voltage	vs Noise bandwidth frequency Over a 10-second time interval	58 59
	Third-octave spectral noise density	vs Frequency bands	60
THD + N	Total harmonic distortion plus noise	vs Frequency	61, 62
B <sub>1</sub>	Unity-gain bandwidth	vs Load capacitance	63
	Gain-bandwidth product	vs Free-air temperature vs Supply voltage	64 65
	Gain margin	vs Load capacitance	66
фm	Phase margin	vs Free-air temperature vs Supply voltage vs Load capacitance	67 68 69

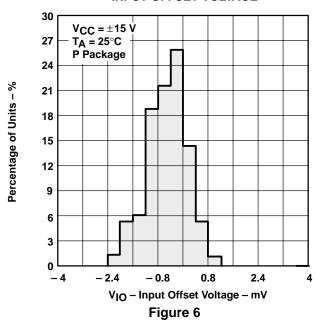


#### TYPICAL CHARACTERISTICS

### **Table of Graphs (Continued)**

			FIGURE
	Noninverting large-signal pulse response	vs Time	70
	Small-signal pulse response	vs Time	71
z <sub>O</sub>	Closed-loop output impedance	vs Frequency	72
a <sub>X</sub>	Crosstalk attenuation	vs Frequency	73

# DISTRIBUTION OF TLE2081 INPUT OFFSET VOLTAGE



# DISTRIBUTION OF TLE2082 INPUT OFFSET VOLTAGE

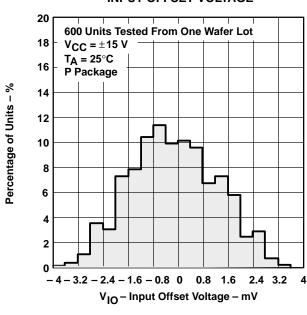
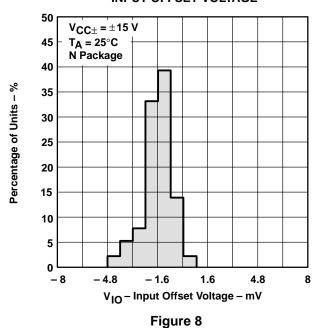


Figure 7

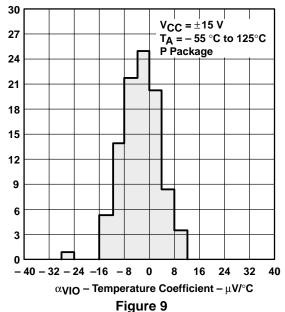
#### TYPICAL CHARACTERISTICS

Percentage of Amplifiers – %

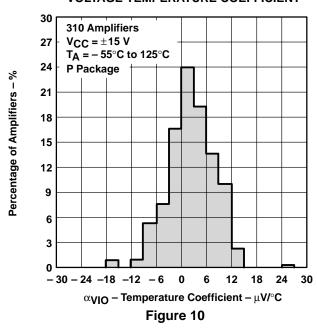
# DISTRIBUTION OF TLE2084 INPUT OFFSET VOLTAGE



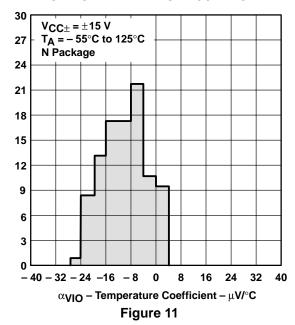
# DISTRIBUTION OF TLE2081 INPUT OFFSET VOLTAGE TEMPERATURE COEFFICIENT



# DISTRIBUTION OF TLE2082 INPUT OFFSET VOLTAGE TEMPERATURE COEFFICIENT



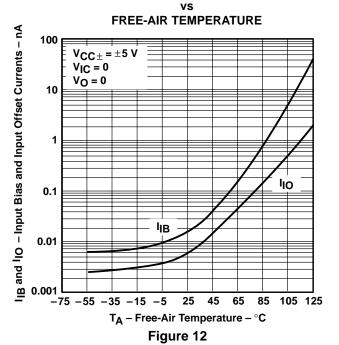
# DISTRIBUTION OF TLE2084 INPUT OFFSET VOLTAGE TEMPERATURE COEFFICIENT



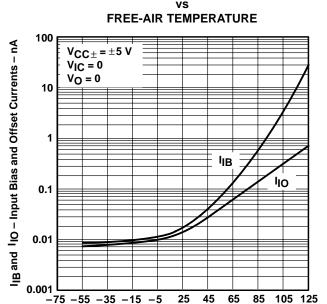


Percentage of Amplifiers – %

#### **TLE2081 AND TLE2082** INPUT BIAS CURRENT AND INPUT OFFSET CURRENT

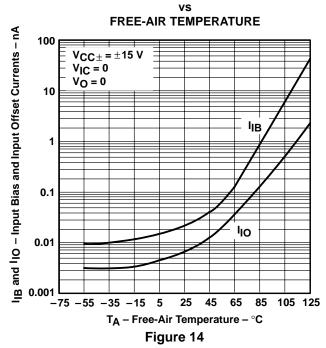


#### **TLE2084** INPUT BIAS CURRENT AND INPUT OFFSET CURRENT



# Figure 13

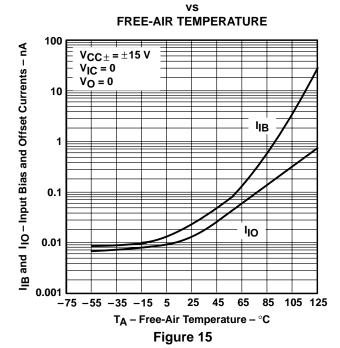
#### **TLE2081 AND TLE2082** INPUT BIAS CURRENT AND INPUT OFFSET CURRENT



#### **TLE2084** INPUT BIAS CURRENT AND INPUT OFFSET CURRENT

25 45 65 85

T<sub>A</sub> - Free-Air Temperature - °C



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



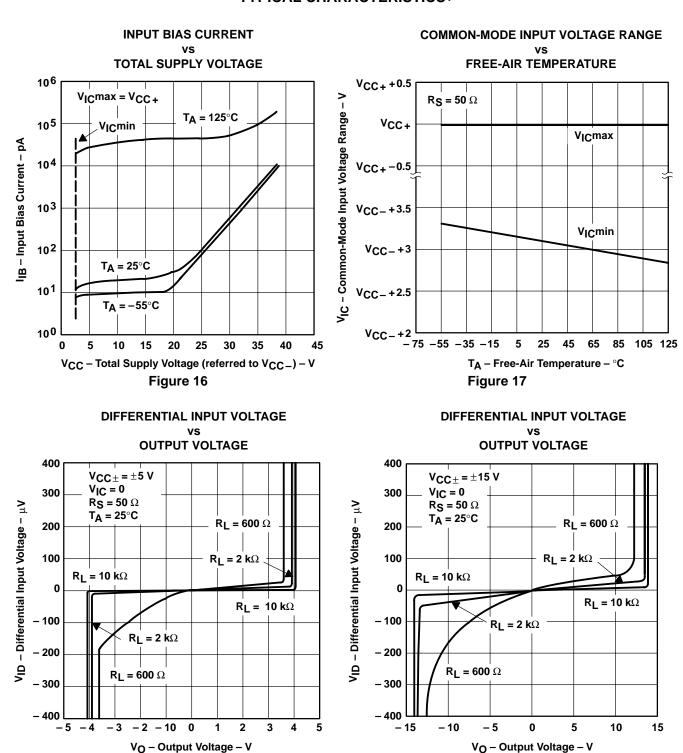
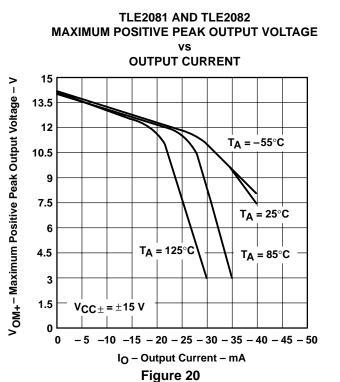


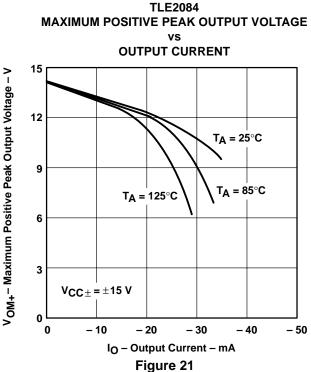
Figure 18



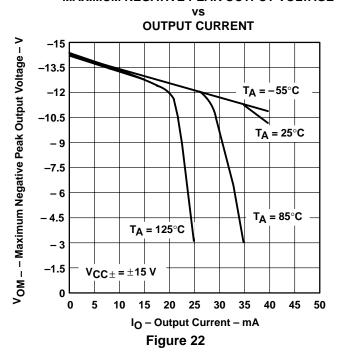
Figure 19

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

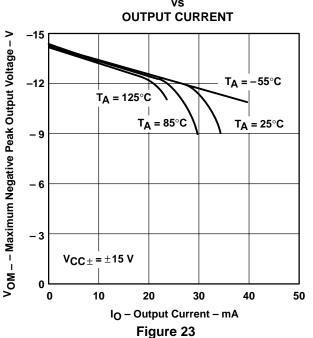




TLE2081 AND TLE2082
MAXIMUM NEGATIVE PEAK OUTPUT VOLTAGE



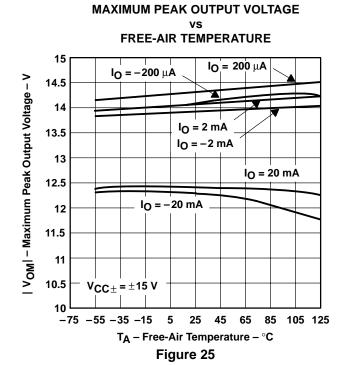
# TLE2084 MAXIMUM NEGATIVE PEAK OUTPUT VOLTAGE



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



#### **MAXIMUM PEAK OUTPUT VOLTAGE** FREE-AIR TEMPERATURE $I_0 = -200 \,\mu A$ V<sub>OM</sub> - Maximum Peak Output Voltage - V $I_0 = -2 \text{ mA}$ 3 2 $I_0 = -20 \text{ mA}$ 1 $V_{CC\pm} = \pm 5 V$ - 1 $I_0 = 20 \text{ mA}$ - 2 - 3 $I_0 = 2 \text{ mA}$ $I_0 = 200 \,\mu A$ -75 -55 -35 -15 5 25 45 85 105 125 65 $T_A$ – Free-Air Temperature – $^{\circ}$ C Figure 24



#### **SUPPLY VOLTAGE** 25 T<sub>A</sub> = 25°C 20 V<sub>OM</sub> - Maximum Peak Output Voltage - V $I_0 = -200 \, \mu A$ 15 $I_0 = -2 \text{ mA}$ 10 5 $I_O = -20 \text{ mA}$ 0 I<sub>O</sub> = 20 mA - 5 -10 $I_0 = 2 \text{ mA}$ -15 $I_0 = 200 \mu A$ - 20

7.5 10 12.5 15 17.5 20 22.5 25

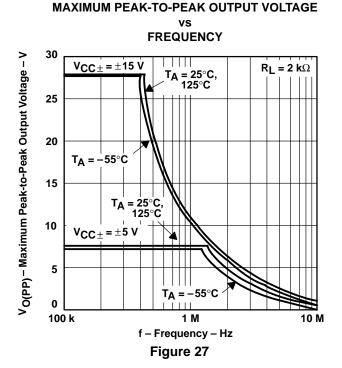
|V<sub>CC±</sub>| – Supply Voltage – V Figure 26

- 25

0

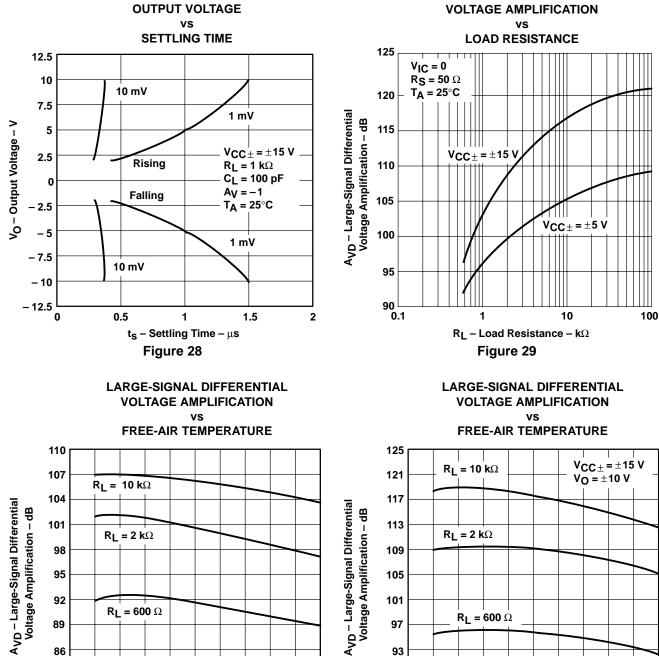
2.5

**MAXIMUM PEAK OUTPUT VOLTAGE** 



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





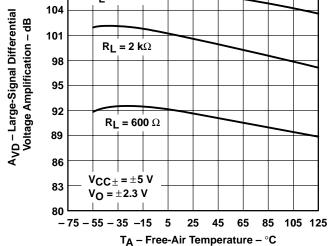
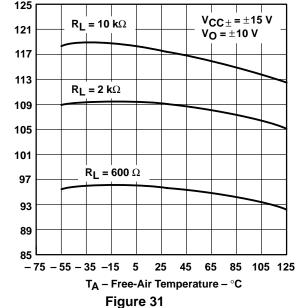


Figure 30



LARGE-SIGNAL DIFFERENTIAL

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



#### TYPICAL CHARACTERISTICS

# SMALL-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT

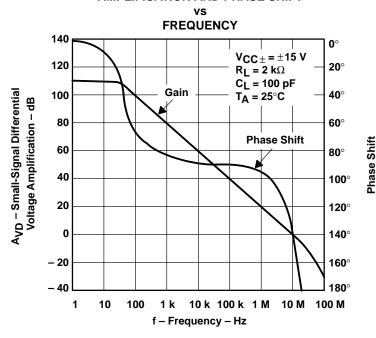


Figure 32

# SMALL-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT

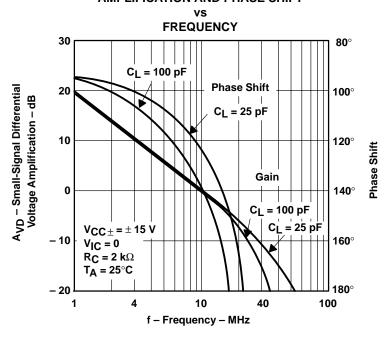
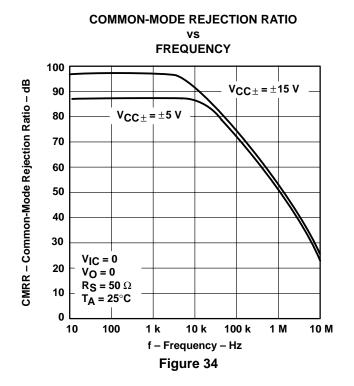
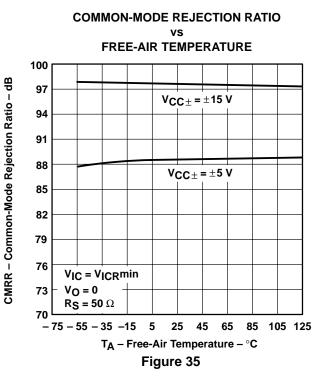
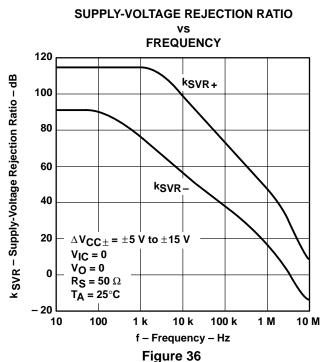


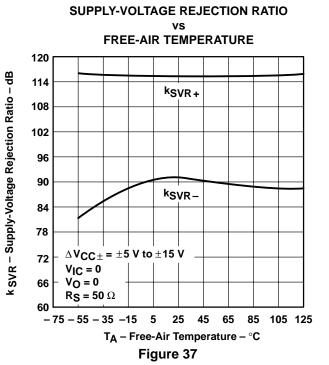
Figure 33





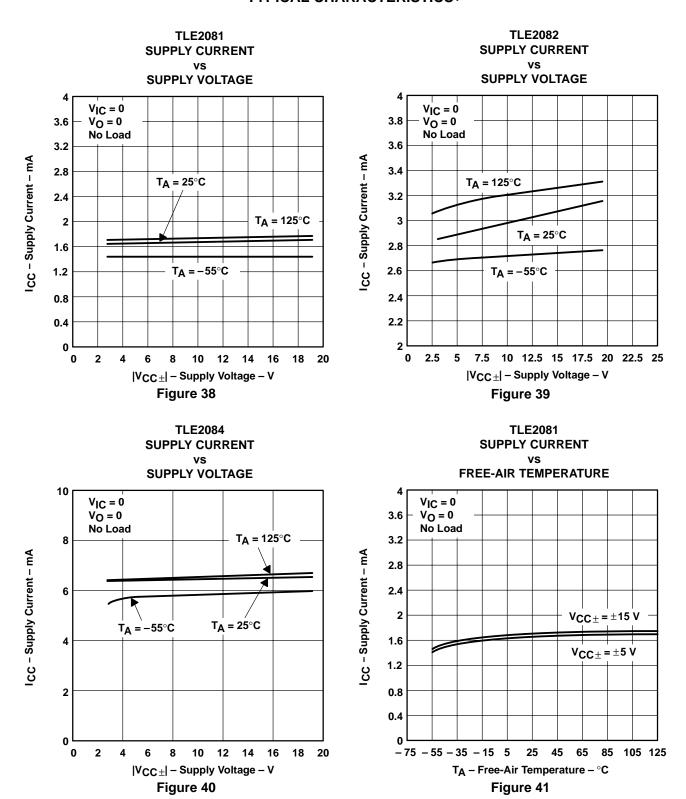






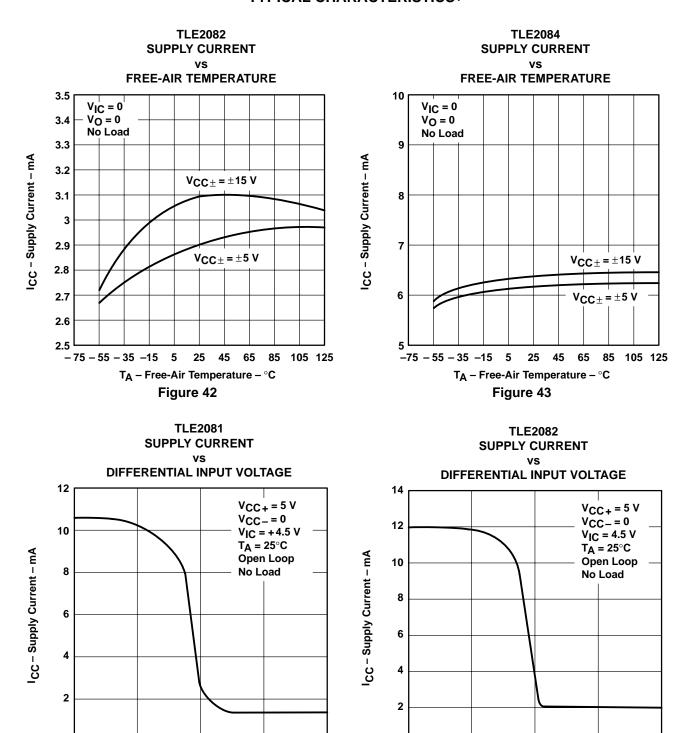
<sup>†</sup> Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.





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





0.5

V<sub>ID</sub> - Differential Input Voltage - V

Figure 44



0

**–** 0.5

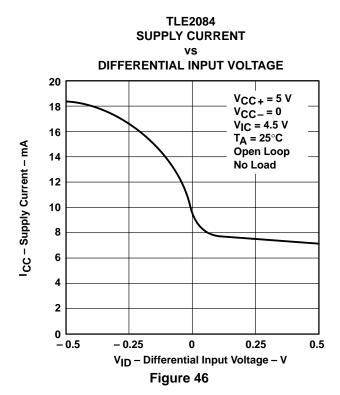
VID - Differential Input Voltage - V

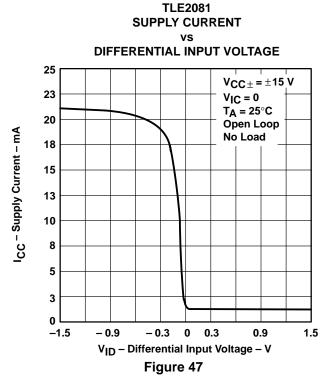
Figure 45

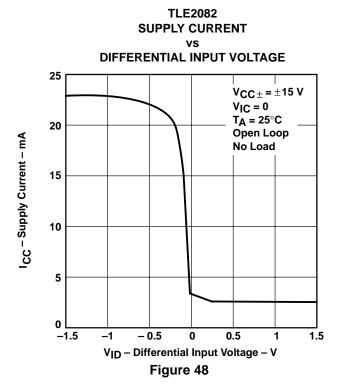
-0.5

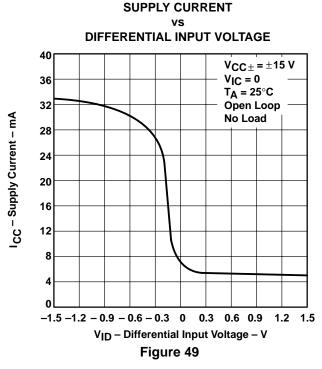
<sup>†</sup> Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

#### TYPICAL CHARACTERISTICS

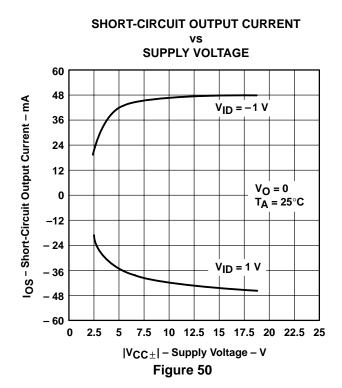


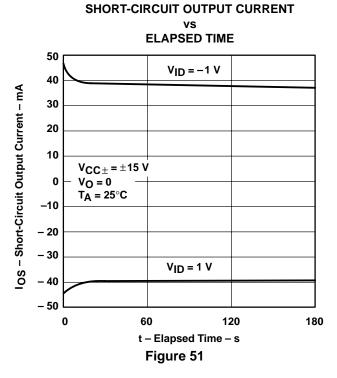


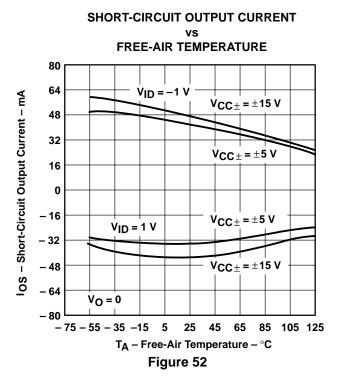


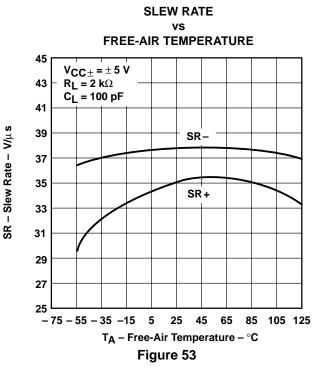


**TLE2084** 



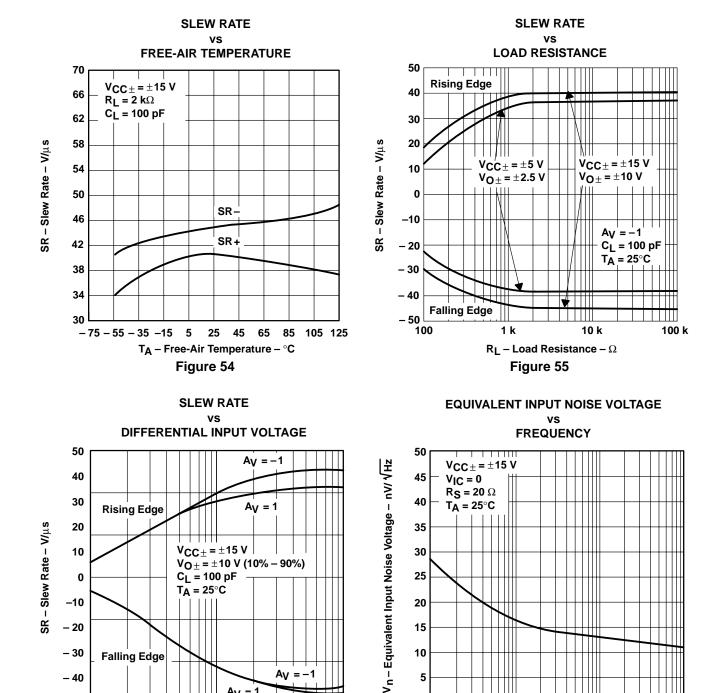






<sup>†</sup> Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.





A<sub>V</sub> =

 $A_V = 1$ 

V<sub>ID</sub> - Differential Input Voltage - V

Figure 56

- 20

- 30

- 40

- 50 0.1

**Falling Edge** 



15

10

5

n

10

100

f - Frequency - Hz

Figure 57

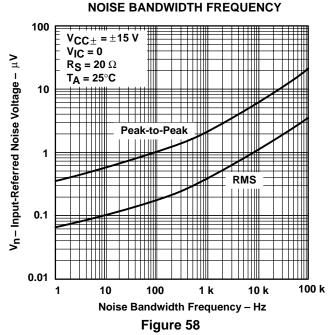
1 k

10 k

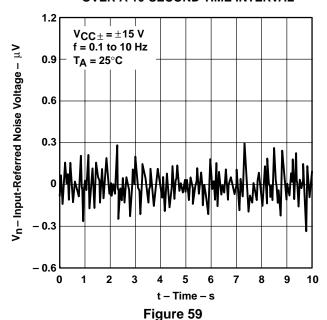
<sup>†</sup> Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

#### TYPICAL CHARACTERISTICS

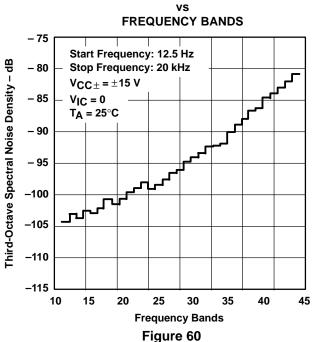
# INPUT-REFERRED NOISE VOLTAGE vs



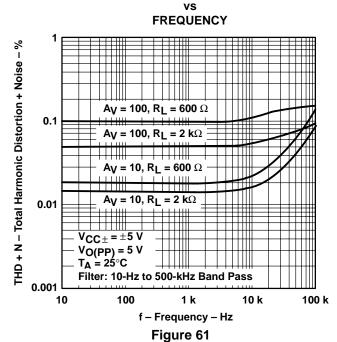
# INPUT-REFERRED NOISE VOLTAGE OVER A 10-SECOND TIME INTERVAL



### THIRD-OCTAVE SPECTRAL NOISE DENSITY



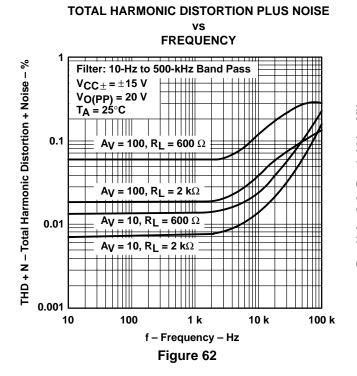
### TOTAL HARMONIC DISTORTION PLUS NOISE

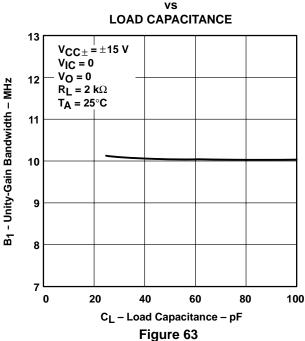


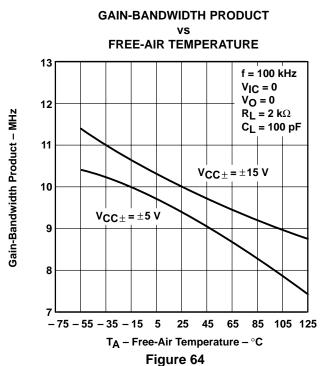


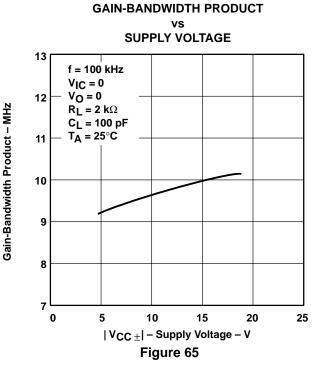
**UNITY-GAIN BANDWIDTH** 

#### TYPICAL CHARACTERISTICS<sup>†</sup>



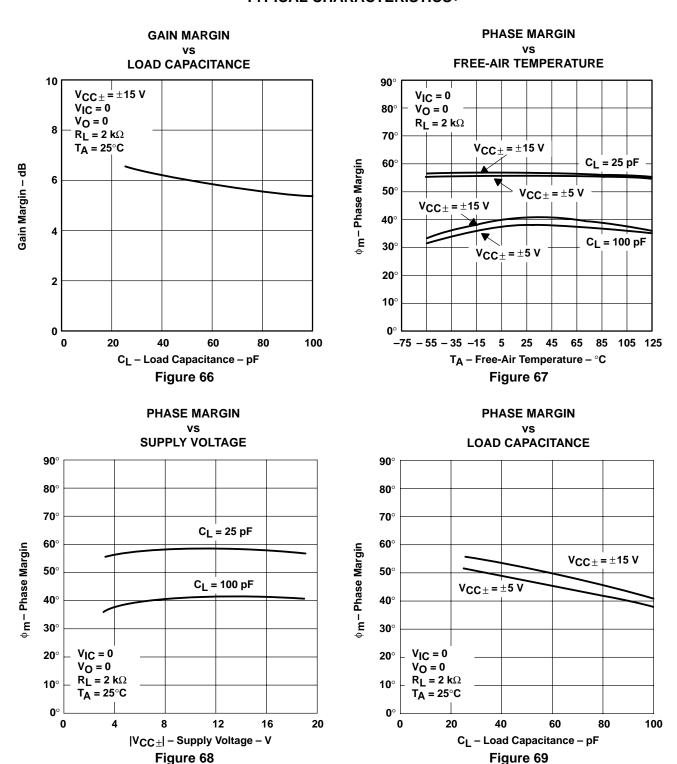






† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

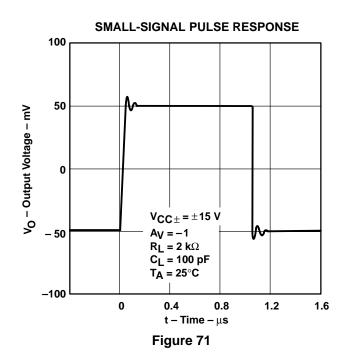




<sup>†</sup> Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.



#### **NONINVERTING LARGE-SIGNAL PULSE RESPONSE** 15 T<sub>A</sub> = 25°C, 125°C 10 $T_{\Delta} = -55^{\circ}C$ V<sub>O</sub> - Output Voltage - V T<sub>A</sub> = -55°C 5 0 $T_A = 25^{\circ}C$ 125°C $V_{CC\pm} = \pm 15 \text{ V}$ $A_V = 1$ - 10 $R_L = 2 k\Omega$ C<sub>L</sub> = 100 pF -150 5 $\textbf{t-Time}-\mu\textbf{s}$



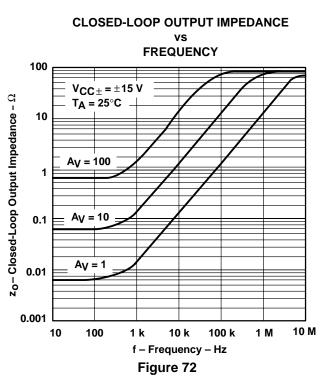
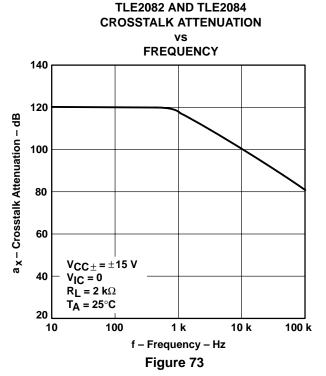


Figure 70



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



#### **APPLICATION INFORMATION**

#### input characteristics

The TLE208xA, and TLE208xB are specified with a minimum and a maximum input voltage that if exceeded at either input could cause the device to malfunction. Because of the extremely high input impedance and resulting low bias current requirements, the TLE208x, TLE208xA, and TLE208xB are well suited for low-level signal processing; however, leakage currents on printed-circuit boards and sockets can easily exceed bias current requirements and cause degradation in system performance. It is good practice to include guard rings around inputs (see Figure 74). These guards should be driven from a low-impedance source at the same voltage level as the common-mode input.

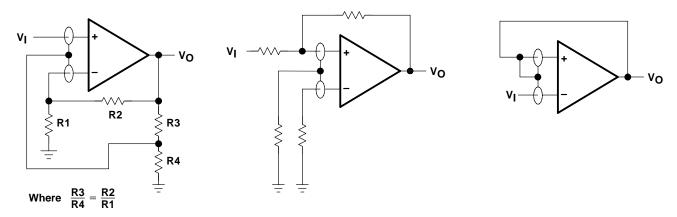


Figure 74. Use of Guard Rings

#### TLE2081 input offset voltage nulling

The TLE2061 series offers external null pins that can be used to further reduce the input offset voltage. The circuit of Figure 75 can be connected as shown if the feature is desired. When external nulling is not needed, the null pins may be left unconnected.

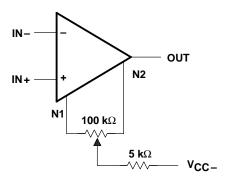


Figure 75. Input Offset Voltage Nulling



SLOS182B - FEBRUARY 1997 - REVISED JUNE 2001

#### **APPLICATION INFORMATION**

#### macromodel information

Macromodel information provided was derived using  $PSpice^{TM}$  Parts<sup>TM</sup> model generation software. The Boyle macromodel (see Note 4) and subcircuit in Figure 58 were generated using the TLE208x typical electrical and operating characteristics at  $T_A = 25^{\circ}C$ . 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).

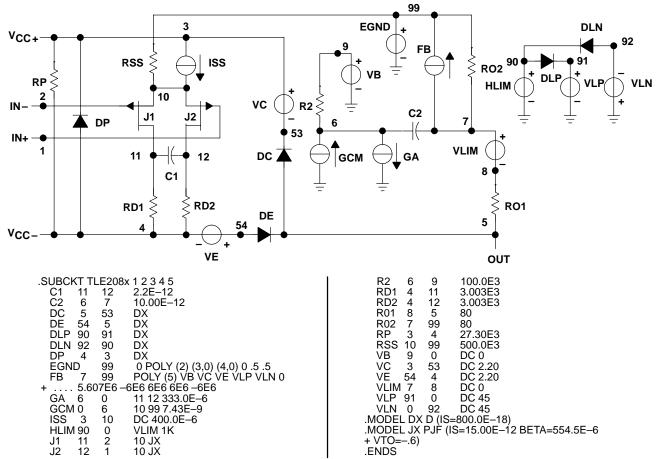


Figure 76. Boyle Macromodel and Subcircuit

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#### **PACKAGING INFORMATION**

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead/Ball Finish (6)	MSL Peak Temp	Op Temp (°C)	p (°C) Device Marking (4/5)	Samples
TLE2081ACD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	2081AC	Sample
TLE2081ACDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	2081AC	Samples
TLE2081ACDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	2081AC	Samples
TLE2081ACDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	2081AC	Samples
TLE2081ACP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	TLE2081AC	Samples
TLE2081AID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	2081AI	Samples
TLE2081AIP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	TLE2081AI	Samples
TLE2081CD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	2081C	Samples
TLE2081CDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	2081C	Samples
TLE2081CDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	2081C	Samples
TLE2081CP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	TLE2081CP	Samples
TLE2081CPE4	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	TLE2081CP	Samples
TLE2081ID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	20811	Samples
TLE2081IDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	20811	Samples
TLE2081IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		20811	Samples
TLE2081IP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2081IP	Samples
TLE2082ACD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	2082AC	Samples



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Orderable Device	Status	Package Type	-	Pins	_	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	<b>Device Marking</b>	Samples
	(1)		Drawing		Qty	(2)	(6)	(3)		(4/5)	
TLE2082ACDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	2082AC	Samples
TLE2082ACDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2082AC	Samples
TLE2082ACDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2082AC	Samples
TLE2082ACP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2082AC	Samples
TLE2082ACPE4	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2082AC	Samples
TLE2082AID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	2082AI	Samples
TLE2082AIDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	2082AI	Samples
TLE2082AIDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2082AI	Samples
TLE2082AIDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2082AI	Samples
TLE2082AIP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2082AI	Samples
TLE2082AIPE4	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2082AI	Samples
TLE2082CD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	2082C	Samples
TLE2082CDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	2082C	Samples
TLE2082CDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2082C	Samples
TLE2082CDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2082C	Samples
TLE2082CP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2082CP	Samples
TLE2082CPE4	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2082CP	Samples
TLE2082ID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	20821	Samples





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Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
TLE2082IDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	20821	Samples
TLE2082IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		20821	Samples
TLE2082IDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		20821	Samples
TLE2082IP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2082IP	Samples
TLE2082IPE4	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2082IP	Samples
TLE2084ACDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	TLE2084AC	Samples
TLE2084ACDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	TLE2084AC	Sample
TLE2084ACN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	TLE2084ACN	Sample
TLE2084CDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	TLE2084C	Sample
TLE2084CDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	TLE2084C	Sample
TLE2084CDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		TLE2084C	Sample
TLE2084CN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2084CN	Sample
TLE2084CNE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2084CN	Sample
TLE2084IDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLE2084I	Sample
TLE2084IDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLE2084I	Sample

<sup>(1)</sup> The marketing status values are defined as follows: **ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.



#### PACKAGE OPTION ADDENDUM

17-Mar-2017

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

- (3) MSL, Peak Temp. The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.
- (4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.
- (5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.
- (6) Lead/Ball Finish Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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### PACKAGE MATERIALS INFORMATION

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#### TAPE AND REEL INFORMATION





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

#### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



#### \*All dimensions are nominal

ali dimensions are nominal												1
Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TLE2081ACDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2081CDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2081IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2081IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2082ACDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2082AIDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2082AIDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2082CDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2082IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2084CDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1

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\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLE2081ACDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2081CDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2081IDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2081IDR	SOIC	D	8	2500	367.0	367.0	38.0
TLE2082ACDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2082AIDR	SOIC	D	8	2500	367.0	367.0	38.0
TLE2082AIDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2082CDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2082IDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2084CDWR	SOIC	DW	16	2000	367.0	367.0	38.0

## D (R-PDSO-G8)

#### PLASTIC SMALL OUTLINE



NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AA.



## D (R-PDSO-G8)

## PLASTIC SMALL OUTLINE



NOTES:

- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



SMALL OUTLINE INTEGRATED CIRCUIT



Images above are just a representation of the package family, actual package may vary. Refer to the product data sheet for package details.

4040000-2/H





SOIC



#### NOTES:

- 1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing
- per ASME Y14.5M.

  2. This drawing is subject to change without notice.

  3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
- 4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.
- 5. Reference JEDEC registration MS-013.



SOIC



#### NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOIC



#### NOTES: (continued)

- 8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
- 9. Board assembly site may have different recommendations for stencil design.



## P (R-PDIP-T8)

### PLASTIC DUAL-IN-LINE PACKAGE



NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Falls within JEDEC MS-001 variation BA.



## N (R-PDIP-T\*\*)

### PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
- The 20 pin end lead shoulder width is a vendor option, either half or full width.



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