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- 2× Bandwidth (2 MHz) of the TL06x and TL03x Operational Amplifiers
- Low Supply Current . . . 290 μA/Ch Typ
- On-chip Offset Voltage Trimming for Improved DC Performance
- High Output Drive, Specified into 100-Ω Loads
- Lower Noise Floor Than Earlier
 Generations of Low-Power BiFETs

description

The TLE206x series of low-power JFET-input operational amplifiers doubles the bandwidth of the earlier generation TL06x and TL03x BiFET families without significantly increasing power consumption. Texas Instruments Excalibur process also delivers a lower noise floor than the TL06x and TL03x. On-chip zener trimming of offset voltage yields precision grades for dc-coupled applications. The TL206x devices are pin-compatible with other Texas Instruments BiFETs; they can be used to double the bandwidth of TL06x and TL03x circuits or to reduce power consumption of TL05x, TL07x, and TL08x circuits by nearly 90%.

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 them better suited for interfacing with high-impedance sensors or low-level ac signals. They also feature inherently better ac response than bipolar or CMOS devices having comparable power consumption. The TLE206x family features a high-output-drive circuit capable of driving $100-\Omega$ loads at supplies as low as ± 5 V. This makes them uniquely suited for driving transformer loads in modems and other applications requiring good ac characteristics, low power, and high output drive.

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 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 TLE206x 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-prefixes) are recommended. When moving from BiFET to CMOS amplifiers, particular attention should be paid to slew rate and bandwidth requirements and output loading. The Texas Instruments TLV2432 and TLV2442 CMOS operational amplifiers are excellent choices to consider.



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.



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TLE2061 AVAILABLE OPTIONS

			PACKAC	GED DEVICES			
TA	V _{IO} max AT 25°C	SMALL OUTLINE† (D)	CHIP CARRIER (FK)	CERAMIC DIP (JG)	PLASTIC DIP (P)	TSSOP‡ (PW)	CERAMIC FLAT PACK (U)
	500 μV	_	_	_	_	_	_
0°C to 70°C	1.5 mV	TLE2061ACD	_	_	TLE2061ACP	_	_
	3 mV	TLE2061CD	_	- TLE2061CP TLE2061CPWLE		TLE2061CPWLE	_
	500 μV	_	_	_	_	_	_
-40°C to 85°C	1.5 mV	TLE2061AID	_	_	TLE2061AIP	_	_
	3 mV	TLE2061ID	_	_	TLE2061IP	_	_
	500 μV	_	_	TLE2061BMJG	_	_	_
-55°C to 125°C	1.5 mV	TLE2061AMD	TLE2061AMFK	TLE2061AMJG	_	_	TLE2061AMU
	3 mV	TLE2061MD	TLE2061MFK	TLE2061MJG	_	_	TLE2061MU

[†] The D packages are available taped and reeled. Add R suffix to device type (e.g., TLE2061ACDR). Chips are tested at 25°C.

TLE2062 AVAILABLE OPTIONS

	TELEZUOZ AVAILABLE OF HONO									
		·	PACKAGED D	EVICES		·				
TA	V _{IO} max AT 25°C SMALL OUTLINE [†] (D)		CHIP CARRIER CERAMIC DIP (FK) (JG)		PLASTIC DIP (P)	CERAMIC FLAT PACK (U)				
0°C to 70°C	1 mV 2 mV 4 mV	TLE2062BCD TLE2062ACD TLE2062CD		1 1 1	TLE2062BCP TLE2062ACP TLE2062CP	_ _ _				
-40°C to 85°C	1 mV 2 mV 4 mV	TLE2062BID TLE2062AID TLE2062ID	1 1 1		TLE2062BIP TLE2062AIP TLE2062IP	 - 				
-55°C to 125°C	1 mV 2 mV 4 mV	TLE2062BMD TLE2062AMD TLE2062MD	— TLE2062AMFK TLE2062MFK	TLE2062BMJG TLE2062AMJG TLE2062MJG	_ _ _	— TLE2062AMU TLE2062MU				

[†] The D packages are available taped and reeled. Add R suffix to device type (e.g., TLE2062ACDR).

TLE2064 AVAILABLE OPTIONS

			PACKAGED D	EVICES		
TA	V _{IO} max AT 25°C	SMALL OUTLINET (D)	CHIP CARRIER CERAMIC DIP (J)		PLASTIC DIP (N)	CERAMIC FLAT PACK (W)
0°C to 70°C	2 mV 4 mV 6 mV	TLE2064ACD TLE2064CD	_	_	TLE2064BCN TLE2064ACN TLE2064CN	_
-40°C to 85°C	2 mV 4 mV 6 mV	TLE2064AID TLE2064ID	_	_	TLE2064BIN TLE2064AIN TLE2064IN	ı
-55°C to 125°C	2 mV 4 mV 6 mV	— TLE2064AMD TLE2064MD	TLE2064BMFK TLE2064AMFK TLE2064MFK	TLE2064BMJ TLE2064AMJ TLE2064MJ	_	— TLE2064AMW TLE2064MW

[†] The D packages are available taped and reeled. Add R suffix to device type, (e.g., TLE2064ACDR).

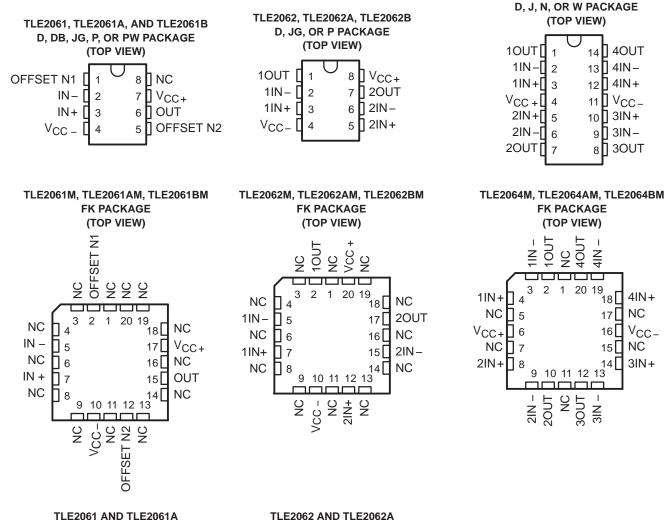


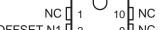
[‡] The PW package is available left-end taped and reeled (indicated by the LE suffix on the device type (e.g., TLE2061CPWLE).

TLE206x, TLE206xA, TLE206xB **EXCALIBUR JFET-INPUT HIGH-OUTPUT-DRIVE μPOWER OPERATION**

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TLE2064, TLE2064A, TLE2064B





9 NC OFFSET N1 [2 8 V_{CC+} IN- [3 7 OUT IN+∏ 4 6 OFFSET N2 5 V_{CC-}

U PACKAGE

(TOP VIEW)

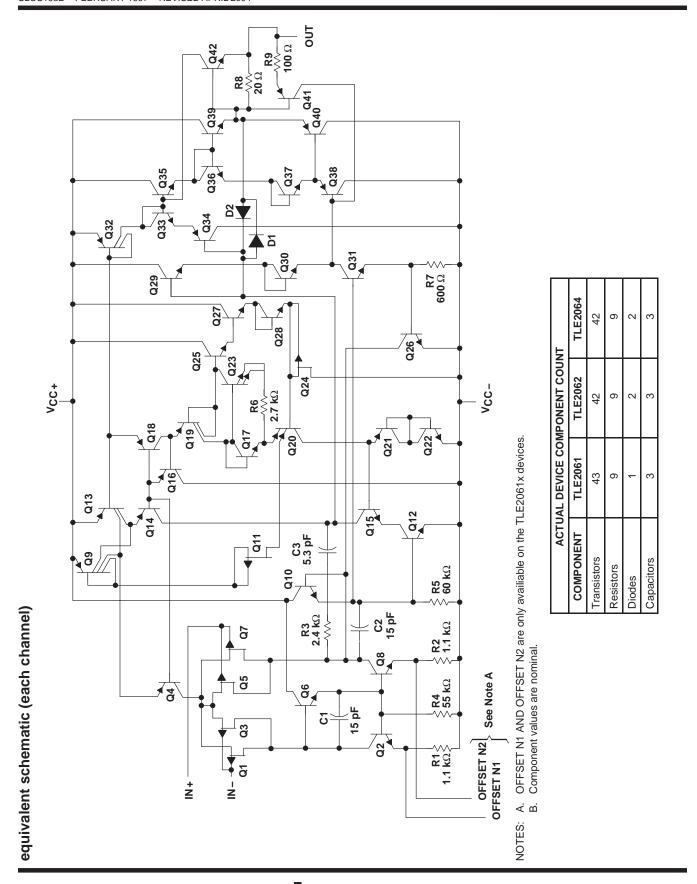
TLE2062 AND TLE2062A U PACKAGE (TOP VIEW)

NC [10 NC 10UT [] 2 9 V_{CC+} 1IN- 3 8 20UT 1IN+ [] 4 7 2IN-6 2IN+ V_{CC}-5

NC - No internal connection

Template Release Date: 7–11–94

TLE206x, TLE206xA, TLE206xB EXCALIBUR JFET-INPUT HIGH-OUTPUT-DRIVE POWER OPERATIONAL AMPLIFIERS SLOS193B - FEBRUARY 1997 - REVISED APRIL 2004





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

Supply voltage, V_{CC+} (see Note 1) Supply voltage, V_{CC-} Differential input voltage, V_{ID} (see Note 2) Input voltage range, V_{I} (any input) Input current, I_{I} (each input) Output current, I_{O} Total current into V_{CC+} Total current out of V_{CC-}		19 V ±38 V ±VCC ±1 mA ±80 mA
Duration of short-circuit current at (or below) 25°C (see	e Note 3)	unlimited
Package thermal impedance, θ _{JA} (see Notes 4 and 5)		
37. (D package (14-pin)	
	N package	
	P package	
	PW package	
Package thermal impedance, θ_{JC} (see Notes 4 and 5)		
	J package	
	JG package	
	U package	
	W package	
Operating free-air temperature range, TA: C suffix		
Storage temperature range		
Case temperature for 60 seconds: FK package		
Lead temperature 1,6 mm (1/16 inch) from case for 10		
Lead temperature 1,6 mm (1/16 inch) from case for 60		
	g	

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

- NOTES: 1. All voltage values, except differential voltages, are with respect to the midpoint between V_{CC+} and V_{CC+}.
 - 2. Differential voltages are at IN+ with respect to IN-.
 - 3. The output may be shorted to either supply. Temperature and/or supply voltages must be limited to ensure that the maximum dissipation rating is not exceeded.
 - 4. Maximum power dissipation is a function of $T_J(max)$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(max) T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
 - 5. The package thermal impedance is calculated in accordance with JESD 51-7 (plastic) or MIL-STD-883 Method 1012 (ceramic).

recommended operating conditions

		C SUFFIX		I SUFFIX		M SUFFIX		LINUT
		MIN	MAX	MIN	MAX	MIN	MAX	UNIT
Supply voltage, V _{CC±}		±3.5	±18	±3.5	±18	±3.5	5 ±18 V	
Common mode involvedtone V	$V_{CC\pm} = \pm 5 \text{ V}$	-1.6	4	-1.6	4	-1.6	4	
Common-mode input voltage, V_{IC} $V_{CC\pm} = \pm 15 \text{ V}$		-11	13	-11	13	-11	13	V
Operating free-air temperature, TA		0 70 -40 85 -55 12		125	°C			



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TLE2061C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

	PARAMETER		TEST CONI	DITIONS	T _A †	TL	.E20610 E2061A E2061B	С	UNIT
						MIN	TYP	MAX	
		TI 500040			25°C		0.8	3.1	
		TLE2061C			Full range			4	
,,	land effect college	TI F0004 A O	1		25°C		0.6	2.6	
VIO	Input offset voltage	TLE2061AC			Full range			3.5	mV
		TI F0004D0			25°C		0.5	1.9	
		TLE2061BC	\/ O	D- 50.0	Full range			2.4	
α VIO	Temperature coefficient of input offse	et voltage	$V_{IC} = 0$,	$R_S = 50 \Omega$	Full range		6		μV/°C
	Input offset voltage long-term drift (se	ee Note 4)			25°C		0.04		μV/mo
1	Input offeet ourrent				25°C		1		pА
lio	Input offset current]		Full range			0.8	nA
1	Input bigg gurrant		1		25°C		3		рА
I _{IB}	Input bias current				Full range			2	nA
						-1.6	-2		
					25°C	to 4	to 6		V
V_{ICR}	Common-mode input voltage range					-	0		
					Full range	-1.6 to			V
						4			-
			D 4010		25°C	3.5	3.7		
,,	Mariana and the same at a second control		$R_L = 10 \text{ k}\Omega$		Full range	3.3			.,
VOM+	Maximum positive peak output voltage	ge swing	D 400 G		25°C	2.5	3.1		V
			$R_L = 100 \Omega$		Full range	2			
			D 4010		25°C	-3.7	-3.9		
l.,	Mariana		$R_L = 10 \text{ k}\Omega$		Full range	-3.3			.,
VOM-	Maximum negative peak output volta	ige swing	D 400.0		25°C	-2.5	-2.7		V
			$R_L = 100 \Omega$		Full range	-2			
			10011	D 4010	25°C	15	80		
			$V_0 = \pm 2.8 \text{ V},$	$R_L = 10 \text{ k}\Omega$	Full range	2			
1.	Laure simulations of the fe	PC C	V 6: 61	D 400.0	25°C	0.75	45		
AVD	Large-signal differential voltage ampl	litication	$V_0 = 0 \text{ to } 2 \text{ V},$	$R_L = 100 \Omega$	Full range	0.5			V/mV
			V 04 514	D 400 0	25°C	0.5	3		
			$V_0 = 0 \text{ to } -2 \text{ V},$	$R_L = 100 \Omega$	Full range	0.25			
rį	Input resistance				25°C		1012		Ω
ci	Input capacitance				25°C		4		pF
z _O	Open-loop output impedance		IO = 0		25°C		280		Ω
OMDE	Common made with the self-		V V	D 500	25°C	65	82		40
CMRR	Common-mode rejection ratio		$V_{IC} = V_{ICR}min$	KS = 20 12	Full range	65			dB
	Complements and action and action	/A1/1	$V_{CC\pm} = \pm 5 \text{ V to}$	±15 V,	25°C	75	93		40
ksvr	Supply-voltage rejection ratio (ΔV _{CC}	±/ΔVIO)	$R_S = 50 \Omega$	·	Full range	75			dB

[†] Full range is 0°C to 70°C.

NOTE 6: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150$ °C extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.



TLE2061C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted) (continued)

PARAMETER		TEST CONDITIONS	T _A †	TLE2061C TLE2061AC TLE2061BC			UNIT
				MIN	TYP	MAX	
	Complex compant		25°C		280	325	4
ICC	Supply current	$V_O = 0$, No load	Full range			350	μΑ
ΔlCC	Supply-current change over operating temperature range		Full range		29		μΑ

[†] Full range is 0°C to 70°C.

TLE2061C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 5~V$

	PARAMETER		TEST CONDITIONS		TLE2061C TLE2061AC TLE2061BC			UNIT
					MIN	TYP	MAX	
SR	Claurate et unit, agin (ess Figure 1)	D. 40 kO	C 100 pF	25°C	2.2	3.4		1////
SK	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$,	$C_L = 100 pF$	Full range	2.1			V/μs
	Facilitation of the section of the s	f = 10 Hz,	$R_S = 20 \Omega$	2500		59	100	nV/√ Hz
Vn	Equivalent input noise voltage (see Figure 2)	f = 1 kHz	$R_S = 20 \Omega$	25°C		43	60	nv/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10	Hz	25°C		1.1		μV
In	Equivalent input noise current	f = 1 kHz		25°C		1		fA/√Hz
THD	Total harmonic distortion	$A_{VD} = 2$, $V_{O(PP)} = 2 V$,	f = 10 kHz, $R_L = 10 \text{ k}\Omega$	25°C		0.025%		
	11 % · 1 1 · 10 / F · 0	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	0500		1.8		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 100 \Omega$,	C _L = 100 pF	25°C		1.3		MHz
	O will at	0.1%		0500		5		
t _S	Settling time	0.01%		25°C		10		μs
ВОМ	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ	25°C		140		kHz
φ.	Phono margin at unity gain (and Figure 2)	$R_L = 10 \text{ k}\Omega$	C _L = 100 pF	25°C		58°		
Φm	Phase margin at unity gain (see Figure 3)	$R_L = 100 \Omega$	C _L = 100 pF	25°C		75°		

[†] Full range is 0°C to 70°C.



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TLE2061C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted)

	PARAMETER		TEST CO	NDITIONS	T _A †	TL	LE20610 E2061A E2061B	С	UNIT
						MIN	TYP	MAX	
		TI F00040			25°C		0.6	3	
		TLE2061C			Full range			3.9	
\/	Innut effect veltage	TI F2064 A C			25°C		0.5	1.5	m\/
V _{IO}	Input offset voltage	TLE2061AC			Full range			2.5	mV
		TLE2061BC			25°C		0.3	0.5	
		TLLZ001BC	\/10 = 0	$R_S = 50 \text{ k}\Omega$	Full range			1	
αΛΙΟ	Temperature coefficient of input off	set voltage	$V_{IC} = 0,$	KS = 50 K22	Full range		6		μV/°C
	Input offset voltage long-term drift	(see Note 4)			25°C		0.04		μV/mo
li o	Input offset ourrent				25°C		2		pА
lio	Input offset current				Full range			1	nA
l.s	Input hige current				25°C		4		pА
IB	Input bias current				Full range			3	nA
					25°C	–11 to 13	-12 to 16		V
VICR	Common-mode input voltage range	e			Full range	-11 to 13			V
			R _L = 10 kΩ		25°C	13.2	13.7		
V	Maximum positive peak output volt	ago ewing	KL = 10 K22		Full range	13			V
V _{OM+}	waximum positive peak output voit	age swing	R _L = 600 Ω		25°C	12.5	13.2		V
			KL = 600 22		Full range	12			
			R _L = 10 kΩ		25°C	-13.2	-13.7		
Va.,	Maximum pagativa paak autput va	Itaaa awina	KL = 10 K22		Full range	-13			V
VOM-	Maximum negative peak output vo	ilage Swirig	B 600 O		25°C	-12.5	-13		٧
			$R_L = 600 \Omega$		Full range	-12			
			$V_{O} = \pm 10 \text{ V},$	$R_I = 10 \text{ k}\Omega$	25°C	30	230		
			ν _O = ± 10 ν,	KL = 10 K22	Full range	20			
Λ. σ	Lorgo pignal differential voltage om	nlification	\/o = 0 to 8 \/	R _L = 600 Ω	25°C	25	100		V/mV
AVD	Large-signal differential voltage am	ipiliication	$V_0 = 0 \text{ to } 8 \text{ V},$	KL = 600 22	Full range	10			V/IIIV
			$V_0 = 0 \text{ to } -8 \text{ V},$	P 600 O	25°C	3	25		
			νO = 0 t0 - 8 v,	KL = 000 22	Full range	1			
rį	Input resistance				25°C		1012		Ω
ci	Input capacitance				25°C		4		pF
z _O	Open-loop output impedance		IO = 0		25°C		280		Ω
CMRR	Common-mode rejection ratio		V _{IC} = V _{ICR} min	Ro = 50 O	25°C	72	90		dB
CIVILLY	Common-mode rejection ratio		VIC - VICRIIIII	1/2 - 20 22	Full range	70			מט
kovo	Supply-voltage rejection ratio (ΔV _C)	$V_{CC\pm} = \pm 5 \text{ V to}$	±15 V,	25°C	75	93		dB
ksvr	Cappiy voltage rejection ratio (AV)	,C±/Δ v IO/	$R_S = 50 \Omega$		Full range	75			שט

[†] Full range is 0°C to 70°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150$ °C extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.



TLE2061C electrical characteristics at specified free-air temperature, $V_{CC\,\pm}$ = ± 15 V (unless otherwise noted) (continued)

PARAMETER		TEST CONDITIONS	T _A †	TLE2061C TLE2061AC TLE2061BC			UNIT
				MIN	TYP	MAX	
	Complex compant		25°C		290	350	4
ICC	Supply current	$V_O = 0$, No load	Full range			375	μΑ
ΔICC	Supply-current change over operating temperature range		Full range		34		μΑ

[†]Full range is 0°C to 70°C.

TLE2061C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

	PARAMETER		TEST CONDITIONS			TLE2061C TLE2061AC TLE2061BC		
					MIN	TYP	MAX	
CD	Clausesta et units main (and Figure 4)	D. 4010	C: 400 = E	25°C	2.6	3.4		1//
SR	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$,	$C_L = 100 pF$	Full range	2.5			V/μs
V	Facilitated in advantage of the Control of the Cont	f = 10 Hz,	$R_S = 20 \Omega$	0500		70	100	\//
V _n	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	$R_S = 20 \Omega$	25°C		40	60	nV/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10	Hz	25°C		1.1		μV
In	Equivalent input noise current	f = 1 kHz		25°C		1.1		fA/√Hz
THD	Total harmonic distortion	$A_{VD} = 2$, $V_{O(PP)} = 2 V$,	f = 10 kHz, $R_L = 10 \text{ k}\Omega$	25°C		0.025%		
_		$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	2700		2		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF	25°C		1.5		MHz
	Ostilla a dasa	0.1%		0500		5		_
t _S	Settling time	0.01%		25°C		10		μs
BOM	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ	25°C		40		kHz
Α.	Phono margin at unity gain (and Figure 2)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	25°C		60°		
Φm	Phase margin at unity gain (see Figure 3)	$R_L = 600 \Omega$,	$C_L = 100 pF$	25°C		70°		

[†] Full range is 0°C to 70°C.



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TLE2061I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

	PARAMETER		TEST CONDITIONS	T _A †		I,TLE20 E2061BI	61AI	UNIT
					MIN	TYP	MAX	
		TLE2061I		25°C		8.0	3.1	
		TLE20011		Full range			4.4	
V. 0	Input offset voltege	TI E2061 AI		25°C		0.6	2.6	mV
VIO	Input offset voltage	TLE2061AI		Full range			3.9	IIIV
		TLE2061BI		25°C		0.5	1.9	
		TEE2001BI	$V_{IC} = 0,$ $R_S = 50 \Omega$	Full range			2.7	
αΝΙΟ	Temperature coefficient of input or	ffset voltage	$R_S = 50 \Omega$	Full range		6		μV/°C
	Input offset voltage long-term drift	(see Note 4)		25°C		0.04		μV/mo
	lanut offeet current			25°C		1		pА
IIO	Input offset current			Full range			2	nA
	lament bina arramant			25°C		3		pA
IB	Input bias current			Full range			4	nA
,,	On an annual state of the state			25°C	-1.6 to 4	-2 to 6		V
VICR	Common-mode input voltage rang	ge		Full range	-1.6 to 4			V
			B 4010	25°C	3.5	3.7		
l.,			$R_L = 10 \text{ k}\Omega$	Full range	3.1			.,
VOM+	Maximum positive peak output vo	Itage swing		25°C	2.5	3.1	3.1	V
			$R_L = 100 \Omega$	Full range	2			
			D 4010	25°C	-3.7	-3.9		
l.,			$R_L = 10 \text{ k}\Omega$	Full range	-3.1			.,
VOM-	Maximum negative peak output ve	oltage swing	D 400 0	25°C	-2.5	-2.7		V
			$R_L = 100 \Omega$	Full range	-2			
			$V_0 = \pm 2.8 \text{ V},$	25°C	15	80		
			$V_O = \pm 2.8 \text{ V},$ $R_L = 10 \text{ k}\Omega$	Full range	2			
١.		1161 41	$V_{\Omega} = 0$ to 2 V.	25°C	0.75	45		.,, .,
AVD	Large-signal differential voltage a	mplification	$V_O = 0 \text{ to } 2 \text{ V},$ $R_L = 100 \Omega$	Full range	0.5			V/mV
			$V_{O} = 0 \text{ to } -2 \text{ V},$	25°C	0.5	3		
			$R_L = 100 \Omega$	Full range	0.25			
rį	Input resistance			25°C		1012		Ω
ci	Input capacitance			25°C		4		pF
z _O	Open-loop output impedance		IO = 0	25°C		280		Ω
			V _{IC} = V _{ICR} min,	25°C	65	82		
CMRR	Common-mode rejection ratio		$R_S = 50 \Omega$	Full range	65			dB
	Owner to the second second second	(4) ()	$V_{CC\pm} = \pm 5 \text{ V to } \pm 15 \text{ V},$	25°C	75	93		-15
ksvr	Supply-voltage rejection ratio (ΔV	CC±/∆VIO)	$R_S = 50 \Omega$	Full range	65			dB
				25°C		280	325	
ICC	Supply current		$V_{O} = 0$,	Full range			350	μΑ
Δl _{CC}	Supply-current change over operatemperature range	ating	No load	Full range		29		μΑ
	· · · · · · · · · · · · · · · · · · ·							

[†] Full range is -40°C to 85°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150^{\circ}C$ extrapolated to $T_A = 25^{\circ}C$ using the Arrhenius equation and assuming an activation energy of 0.96 eV.



TLE2061I operating characteristics at specified free-air temperature, $\rm V_{CC\pm}$ = $\pm 5~\rm V$

	PARAMETER	TEST CO	NDITIONS	T _A †	1	TLE2061I TLE2061A TLE2061B	I	UNIT
					MIN	TYP	MAX	
CD	Clause rate at waits rain (and Figure 4)	D. 401-0	C: 400 = E	25°C	2.2	3.4		Mar
SR	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	Full range	1.7			V/μs
,,	Faviralent input pains valtage (and Figure 2)	f = 10 Hz,	$R_S = 20 \Omega$	0500		59	100	->4/ -
V _n	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	$R_S = 20 \Omega$	25°C		43	60	nV/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10	Hz	25°C		1.1		μV
In	Equivalent input noise current	f = 1 kHz		25°C		1		fA/√Hz
THD	Total harmonic distortion	$A_{VD} = 2$, $V_{O(PP)} = 2 V$,	f = 10 kHz, $R_L = 10 \text{ k}\Omega$	25°C		0.025%		
		$R_L = 10 \text{ k}\Omega$	C _L = 100 pF	0500		1.8		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 100 \Omega$	C _L = 100 pF	25°C		1.3		MHz
	0	0.1%				5		
t _S	Settling time	0.01%		25°C		10		μs
ВОМ	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ	25°C		140		kHz
4	Phase marrie et unit, main (and Figure 2)	$R_L = 10 \text{ k}\Omega$	C _L = 100 pF	0500		58°		
Φm	Phase margin at unity gain (see Figure 3)	$R_L = 100 \Omega$	C _L = 100 pF	25°C		75°		

[†]Full range is -40°C to 85°C.

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TLE2061I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted)

No N		PARAMETER		TEST CONDITIONS	T _A †		61I, TLE2061. LE2061BI	Al	UNIT
Vio Input offset voltage TLE2061A TLE2061B					,	MIN	TYP	MAX	
Vo			TI FOOCAL		25°C		0.6	3	
TLE2061Al TLE2061Bl TLE			1LE20611		Full range			4.3	
TLE2061BI TLE			TI F000441	1	25°C		0.5	1.5	.,
TLE2061BI Caylor Temperature coefficient of input offset voltage Full range Full rang)	Input offset voltage	TLE2061AI		Full range			2.9	mV
Full range 1.3			T. T	1	25°C		0.3	0.5	
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$			TLE2061BI		Full range			1.3	
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$			offset	$V_{IC} = 0,$ $R_S = 50 \Omega$	Full range		6		μV/°C
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		Input offset voltage long-term dr (see Note 4)	ift]	25°C		0.04		μV/mo
$I_{IB} I_{IDID} $				1	25°C		2		pА
$ \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	1	Input offset current			Full range			3	nA
$V_{ICR} \text{Common-mode input voltage range} \\ V_{ICR} \text{Common-mode input voltage range} \\ V_{OM+} \text{Maximum positive peak output voltage swing} \\ V_{OM+} \text{Maximum positive peak output voltage swing} \\ V_{OM-} \text{Maximum negative peak output voltage} \\ V_{OM-} Ma$				1	25°C		4		рА
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		Input bias current			Full range			5	nA
$V_{OM+} \text{Maximum positive peak output voltage swing} \begin{array}{c ccccccccccccccccccccccccccccccccccc$					25°C	-11 to 13	-12 to 16		V
$V_{OM+} \text{Maximum positive peak output voltage swing} \begin{array}{ c c c c c }\hline R_L = 10 \text{ k}\Omega & \hline & Full range & 13 \\\hline R_L = 600 \ \Omega & \hline & 25^{\circ}C & 12.5 & 13.2 \\\hline Full range & 12 \\\hline & & & & & & & & & & & & & \\\hline & & & &$	CR	Common-mode input voltage rai	nge		Full range	-11 to 13			V
$V_{OM+} = \begin{array}{c ccccccccccccccccccccccccccccccccccc$					25°C	13.2	13.7		
$N_{\text{NOM-}} = N_{\text{Nom}} = N_$				$R_L = 10 \text{ k}\Omega$	Full range	13			
$V_{OM-} = V_{OM-} = V_{O$)M+	Maximum positive peak output v	oltage swing		25°C	12.5	13.2		V
$V_{OM-} \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$				$R_L = 600 \Omega$	Full range	12			
$VOM- \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$					25°C	-13.2	-13.7		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		Maximum negative peak output	voltage	$R_L = 10 \text{ k}\Omega$	Full range	-13			
$A_{VD} \text{Large-signal differential voltage amplification} \begin{array}{c ccccccccccccccccccccccccccccccccccc$			····		25°C	-12.5	-13		V
$AVD \text{Large-signal differential voltage amplification} \begin{array}{ c c c c c }\hline VO = 10 \text{ k}\Omega \\\hline R_L = 10 \text{ k}\Omega \\\hline \hline VO = 0 \text{ to } 8 \text{ V}, \\ R_L = 600 \Omega \\\hline \hline VO = 0 \text{ to } -8 \text{ V}, \\ R_L = 600 \Omega \\\hline \end{array} \begin{array}{ c c c c c }\hline Full \text{ range} & 20 \\\hline \hline \hline Full \text{ range} & 25^{\circ}\text{C} & 25 & 100 \\\hline \hline Full \text{ range} & 10 \\\hline \hline \hline VO = 0 \text{ to } -8 \text{ V}, \\ R_L = 600 \Omega \\\hline \hline \hline Full \text{ range} & 10 \\\hline \hline \hline \hline Full \text{ range} & 10 \\\hline \hline \hline \hline Full \text{ range} & 10 \\\hline \hline \hline \hline \hline Full \text{ range} & 10 \\\hline \hline \hline \hline \hline Full \text{ range} & 10 \\\hline \hline \hline \hline \hline Full \text{ range} & 10 \\\hline \hline \hline \hline \hline \hline \hline Full \text{ range} & 10 \\\hline \hline \hline$				$R_L = 600 \Omega$	Full range	-12			
$ \text{AVD} \text{Large-signal differential voltage amplification} \begin{array}{lllll} \text{RL} = 10 \text{ k}\Omega & \text{Full range} & 20 \\ \hline V_{\text{O}} = 0 \text{ to 8 V,} \\ \text{RL} = 600 \Omega & \text{Full range} & 10 \\ \hline V_{\text{O}} = 0 \text{ to -8 V,} \\ \text{RL} = 600 \Omega & \text{Full range} & 10 \\ \hline \end{array} \begin{array}{llll} \text{25°C} & 3 & 25 \\ \hline \text{Full range} & 01 \\ \hline \end{array} \begin{array}{llll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{llll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{llll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{lllll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{lllll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{lllll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{llllll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{lllllll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{lllllllll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{llllllllll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{llllllllll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{llllllllllll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{llllllllllll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{llllllllllllllll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{llllllllllllllll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{llllllllllllllll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{llllllllllllllllll} \text{Full range} & 01 \\ \hline \end{array} \begin{array}{lllllllllllllllllllllllllllllllllll$				Vo = ±10 V.	25°C	30	230		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				$R_L = 10 \text{ k}\Omega$	Full range	20			
$R_{L} = 600 \Omega \qquad \qquad Full range \qquad 10$ $V_{O} = 0 \text{ to } -8 \text{ V,}$ $R_{L} = 600 \Omega \qquad \qquad 25^{\circ}\text{C} \qquad 3 \qquad 25$ $Full range \qquad 01$ $r_{i} \qquad \text{Input resistance} \qquad \qquad 25^{\circ}\text{C} \qquad 10^{12}$ $c_{i} \qquad \text{Input capacitance} \qquad \qquad 25^{\circ}\text{C} \qquad 4$ $z_{O} \qquad \text{Open-loop output impedance} \qquad \qquad _{O} = 0 \qquad 25^{\circ}\text{C} \qquad 280$ $CMRR \qquad \text{Common-mode rejection ratio} \qquad \qquad VIC = VICR^{min},$ $VIC = VICR^{min},$ $VIC = VICR^{min},$				$V_0 = 0 \text{ to } 8 \text{ V}$	25°C	25	100		
$V_{RL} = 600 \Omega$ Full range 01	D	Large-signal differential voltage	amplification	$R_L = 600 \Omega$	Full range	10			V/mV
$R_L^* = 600 \Omega$ Full range 01 r_i Input resistance 25°C 10 ¹² c_i Input capacitance 25°C 4 z_0 Open-loop output impedance Io = 0 25°C 280 CMRR Common-mode rejection ratio VIC = VICRMin, 25°C 72 90				$V_0 = 0 \text{ to } -8 \text{ V}$	25°C	3	25		
c_i Input capacitance $25^{\circ}C$ 4 c_i Open-loop output impedance c_i				$R_L = 600 \Omega$	Full range	01			
c_i Input capacitance $25^{\circ}C$ 4 z_0 Open-loop output impedance $I_0 = 0$ $25^{\circ}C$ 280 CMRR Common-mode rejection ratio $V_{IC} = V_{IC}R^{min}$, $25^{\circ}C$ 72 90		Input resistance			25°C		1012		Ω
z_0 Open-loop output impedance $I_0 = 0$ 25°C 280 CMRR Common-mode rejection ratio $V_{IC} = V_{IC}R^{min}$, $25^{\circ}C$ 72 90		Input capacitance			25°C		4		pF
CMRR Common-mode rejection ratio VIC = VICRMin, 25°C 72 90		Open-loop output impedance		IO = 0	25°C		280		Ω
CMRR Common-mode rejection ratio $R_S = 50 \Omega$ Full range 65				VIC = VICPMIN.	25°C	72	90		
- -	1RR	Common-mode rejection ratio		$R_S = 50 \Omega$	Full range	65			dB
$V_{CC\pm} = \pm 5 \text{ V to } \pm 15 \text{ V}, 25^{\circ}\text{C}$ 75 93				$V_{CC+} = \pm 5 \text{ V to } \pm 15 \text{ V}.$	25°C	75	93		
k _{SVR} Supply-voltage rejection ratio (Δ V _{CC±} / Δ V _{IO}) $R_S = 50 \Omega$ Full range 65	VR	Supply-voltage rejection ratio (Δ	ΛCC∓\∇ΛIO)		Full range	65			dB
25°C 290 350					25°C		290	350	_
I_{CC} Supply current $V_{O} = 0$, Full range 375	2	Supply current		$V_{O} = 0$,	Full range			375	μΑ
Supply-current change over operating temperature range No load Full range 34			rating	No load			34		μА

[†]Full range is -40°C to 85°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150^{\circ}C$ extrapolated to $T_A = 25^{\circ}C$ using the Arrhenius equation and assuming an activation energy of 0.96 eV.



TLE2061I operating characteristics at specified free-air temperature, $V_{\mbox{CC}\pm}$ = $\pm 15~\mbox{V}$

	PARAMETER	TEST CO	NDITIONS	T _A †	Т	TLE2061I LE2061A LE2061B		UNIT
					MIN	TYP	MAX	
0.0	Observator of write projectors Figure 4)	D 4010	0 400 - 5	25°C	2.6	3.4		\// -
SR	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	Full range	2.1			V/μs
.,	Forming lead in order to the configuration (see Figure 6)	f = 10 Hz,	$R_S = 20 \Omega$	0500		70	100	\ // (
Vn	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	$R_S = 20 \Omega$	25°C		40	60	nV/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10	Hz	25°C		1.1		μV
In	Equivalent input noise current	f = 1 kHz		25°C		1.1		fA/√Hz
THD	Total harmonic distortion	$A_{VD} = 2$, $V_{O(PP)} = 2 V$,	f = 10 kHz, $R_L = 10 \text{ k}\Omega$	25°C		0.025%		
	11 % · · · · · · · · · · · · · · · · · ·	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	2502		2		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF	25°C		1.5		MHz
	Ostilla a flas	0.1%		0500		5		_
t _S	Settling time	0.01%		25°C		10		μs
ВОМ	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ	25°C		40		kHz
φ.	Phone margin at unity gain (one Figure 2)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	25°C		60°		
Φm	Phase margin at unity gain (see Figure 3)	$R_L = 600 \Omega$,	$C_L = 100 pF$	25°C		70°		

[†] Full range is –40°C to 85°C.

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TLE2061M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

	PARAMETER		TEST CONDITIONS	T _A †	TL	E2061N E2061A E2061B	M	UNIT
					MIN	TYP	MAX	
				25°C		0.8	3.1	
		TLE2061M		Full range			6	
.,			1	25°C		0.6	2.6	.,
VIO	Input offset voltage	TLE2061AM		Full range			4.6	mV
		TI F0004DM]	25°C		0.5	1.9	
		TLE2061BM	V 0 D - 50 O	Full range			3.1	
ανιο	Temperature coefficient of input offs	set voltage	$V_{IC} = 0$, $R_S = 50 \Omega$	Full range		6		μV/°C
	Input offset voltage long-term drift (see Note 4)		25°C		0.04		μV/mo
1	longit offect current			25°C		1		pА
lio	Input offset current			Full range			15	nA
l	Input bigg ourrent			25°C		3		pА
I _{IB}	Input bias current			Full range			30	nA
				25°C	-1.6 to 4	-2 to 6		V
VICR	Common-mode input voltage range			Full range	-1.6 to 4			V
				25°C	3.5	3.7		
			$R_L = 10 \text{ k}\Omega$	Full range	3			
.,				25°C	2.5	3.6		.,
VOM+	Maximum positive peak output volta	age swing	$R_L = 600 \Omega$	Full range	2			V
				25°C	2.5	3.1		
			R _L = 100 Ω	Full range	2			
			D 4010	25°C	-3.5	-3.9		
			$R_L = 10 \text{ k}\Omega$	Full range	-3			
V	Maximum negative peak	FK and JG	D 000 O	25°C	-2.5	-3.5		V
V _{OM} -	output voltage swing	packages	$R_L = 600 \Omega$	Full range	-2			V
		D and P	D. 400 O	25°C	-2.5	-2.7		
		packages	R _L = 100 Ω	Full range	-2			
			V- 100V D. 4010	25°C	15	80		
			$V_{O} = \pm 2.8 \text{ V}, \qquad R_{L} = 10 \text{ k}\Omega$	Full range	2			
			V- 040 0 5 V D. 600 0	25°C	1	65		
		FK and JG	$V_O = 0 \text{ to } 2.5 \text{ V}, R_L = 600 \Omega$	Full range	0.5			
Avr	Large-signal differential	packages	Vo = 0 to 25 VP: = 600 0	25°C	1	16		V/mV
AVD	voltage amplification		$V_0 = 0 \text{ to } -2.5 \text{ V,R}_L = 600 \Omega$	Full range	0.5			V/IIIV
			Vo = 0 to 2 V	25°C	0.75	45		
		D and P	$V_O = 0 \text{ to } 2 \text{ V}, R_L = 100 \Omega$	Full range	0.5			
		packages	kages $V_{0} = 0 \text{ to } -2 \text{ V}$ $R_{1} = 100 \Omega$ 25°	25°C	0.5	3		
			10 - 0 to 2 v, 1\(\(\begin{array}{cccccccccccccccccccccccccccccccccccc	Full range	0.25			

[†] Full range is -55°C to 125°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150$ °C extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.



TLE2061M electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = ± 5 V (unless otherwise noted) (continued)

	PARAMETER	TEST CONDITIONS	T _A †	TLE2061M TLE2061AM TLE2061BM			UNIT
				MIN	TYP	MAX	
rį	Input resistance		25°C		10 ¹²		Ω
ci	Input capacitance		25°C		4		pF
z _O	Open-loop output impedance	IO = 0	25°C		280		Ω
CMDD	Common mode valuation ratio	V _{IC} = V _{ICR} min,	25°C	65	82		10
CMRR	Common-mode rejection ratio	$R_S = 50 \Omega$	Full range	60			dB
kov ro	Supply-voltage rejection ratio ($\Delta V_{CC+}/\Delta V_{IO}$)	$V_{CC\pm} = \pm 5 \text{ V to } \pm 15 \text{ V,}$	25°C	75	93		dB
ksvr	Supply-voltage rejection ratio (Av CC ±/Av (O)	$R_S = 50 \Omega$	Full range	65			uБ
	Output to the second of		25°C		280	325	
ICC	Supply current	$V_O = 0$, No load	Full range			350	μΑ
Δlcc	Supply-current change over operating temperature range	VO = 0, NO load	Full range		39		μΑ

[†]Full range is -55°C to 125°C.

TLE2061M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V, T_A = 25°C

	PARAMETER	TEST CON	NDITIONS	ΤĹ	LE2061N .E2061A .E2061B	M	UNIT
				MIN	TYP	MAX	
SR	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$,	$C_{L} = 100 pF$		3.4		V/μs
,,	Fruit related installation (and Figure 2)	f = 10 Hz,	$R_S = 20 \Omega$		59		->//\
Vn	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	$R_S = 20 \Omega$		43		nV/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10	Hz		1.1		μV
In	Equivalent input noise current	f = 1 kHz			1		fA/√Hz
THD	Total harmonic distortion	$A_{VD} = 2$, $V_{O(PP)} = 2 V$,	f = 10 kHz, $R_L = 10 \text{ k}\Omega$		0.025%		
		$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF		1.8		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF		1.3		MHz
	O utility of	0.1%			5		
t _S	Settling time	0.01%			10		μs
Вом	Maximum output-swing bandwidth	$A_{VD} = 1$,	$R_L = 10 \text{ k}\Omega$		140		kHz
_	Phase margin of unity gain (see Figure 2)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF		58°		
Φm	Phase margin at unity gain (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF		75°		

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TLE2061M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted)

	PARAMETER		TEST CONDITIONS	T _A †		1M ,TLE2061. LE2061BM	AM	UNIT
				,,	MIN	TYP	MAX	
		TI FOOCANA		25°C		0.6	3	
		TLE2061M		Full range			6	
\/	lanut effect valtage	TI FOOCAANA		25°C		0.5	1.5	>/
VIO	Input offset voltage	TLE2061AM		Full range			3.6	mV
		TLE2061BM		25°C		0.3	0.5	
		TLLZUGTBINI]	Full range			1.7	
αVIO	Temperature coefficient of inpuvoltage	ut offset	$V_{IC} = 0,$ RS = 50 Ω	Full range		6		μV/°C
	Input offset voltage long-term (see Note 4)	drift		25°C		0.04		μV/mo
li o	Input offeet current			25°C		2		pА
liO	Input offset current			Full range			20	nA
l.a	Input bigg ourrant			25°C		4		pА
IB	Input bias current			Full range			40	nA
V. 0.D	Common-mode input voltage i	ango		25°C	-11 to 13	-12 to 16		V
VICR	Common-mode input voltage i	ange		Full range	-11 to 13			V
			R _L = 10 kΩ	25°C	13	13.7		
Vor	Maximum positive peak output	t voltage	KL = 10 K22	Full range	12.5			V
VOM+	swing		P 600 O	25°C	12.5	13.2		V
			R _L = 600 Ω	Full range	12			
			$R_{I} = 10 \text{ k}\Omega$	25°C	-13	-13.7		
V	Maximum negative peak output	ıt voltage	K_ = 10 K22	Full range	-12.5			V
V _{OM} -	swing		P 600 O	25°C	-12.5	-13		V
			R _L = 600 Ω	Full range	-12			
			$V_{O} = \pm 10 \text{ V},$	25°C	30	230		
			$R_L = 10 \text{ k}\Omega$	Full range	20			
۸	Large-signal differential voltag	е	$V_{O} = 0 \text{ to } 8 \text{ V},$	25°C	25	100		V/mV
AVD	amplification		R _L = 600 Ω	Full range	7			V/IIIV
			$V_{O} = 0 \text{ to } -8 \text{ V},$	25°C	3	25		
			$R_L = 600 \Omega$	Full range	1			
rį	Input resistance			25°C		1012		Ω
ci	Input capacitance			25°C		4		pF
z _O	Open-loop output impedance		IO = 0	25°C		280		Ω
			V _{IC} = V _{ICR} min,	25°C	72	90		
CMRR	Common-mode rejection ratio		$R_S = 50 \Omega$	Full range	65			dB
	Supply-voltage rejection ratio		$V_{CC\pm} = \pm 5 \text{ V to } \pm 15 \text{ V},$	25°C	75	93		10
ksvr	$(\Delta V_{CC\pm}/\Delta V_{IO})$		$R_S = 50 \Omega$	Full range	65			dB

[†] Full range is -55°C to 125°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150$ °C extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.



TLE2061M electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = ± 15 V (unless otherwise noted) (continue)

PARAMETER		TEST CONDITIONS	T _A †	TLE206	UNIT		
				MIN	TYP	MAX	
	Supply current VO = 0, N		25°C		290	350	
ICC		$V_{\Omega} = 0$, No load	Full range			375	μΑ
ΔlCC	Supply-current change over operating temperature range	VO = 0, 140 loau	Full range		46		μА

[†] Full range is –55°C to 125°C.

TLE2061M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

	PARAMETER	TEST COI	NDITIONS	T _A †	Τl	LE2061M LE2061AN LE2061BN	VI	UNIT
					MIN	TYP	MAX	
CD	Claurate et unit regia (see Figure 4)	D. 401-0	C: 400 = F	25°C	2	3.4		Miss
SR	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	Full range	1.8			V/μs
.,	Forming last investoral solutions (see Figure 8)	f = 10 Hz,	$R_S = 20 \Omega$	25°C		70		->///
Vn	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	$R_S = 20 \Omega$	25°C		40		nV/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10	Hz	25°C		1.1		μV
In	Equivalent input noise current	f = 1 kHz		25°C		1.1		fA/√Hz
THD	Total harmonic distortion	$A_{VD} = 2$, $V_{O(PP)} = 2 V$,	$f = 10 \text{ kHz},$ $R_L = 10 \text{ k}\Omega$	25°C		0.025%		
_	11 % · · · · · · · · · · · · · · · · · ·	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	25°C		2		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF	25°C		1.5		MHz
	O Will at	0.1%		25°C		5		
t _S	Settling time	0.01%		25°C		10		μs
ВОМ	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ	25°C		40		kHz
	Phone margin at unity gain (one Figure 2)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	25°C		60°		
φm	Phase margin at unity gain (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF	25°C		70°		

[†]Full range is –55°C to 125°C.

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TLE2061Y electrical characteristics at $V_{CC\pm}$ = ±15 V, T_A = 25°C (unless otherwise noted)

	DADAMETED	TEGT COMPLETIONS	Т	LE2061\	1	
	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
VIO	Input offset voltage			0.6	3	mV
ανιο	Input offset voltage long-term drift (see Note 4)], , , ,		0.04		μV/mo
I _{IO}	Input offset current	$V_{IC} = 0$, $R_S = 50 \Omega$		2		pА
I _{IB}	Input bias current			4		pА
VICR	Common-mode input voltage range		-11 to 13	-12 to 16		V
,,		R _L = 10 kΩ	13.2	13.7		.,
VOM+	Maximum positive peak output voltage swing	R _L = 600 Ω	12.5	13.2		V
,,		R _L = 10 kΩ	-13.2	-13.7		.,
VOM-	Maximum negative peak output voltage swing	R _L = 600 Ω	-12.5	- 13		V
		$V_{O} = \pm 10 \text{ V}, \qquad R_{L} = 10 \text{ k}\Omega$	30	230		
A _{VD}	Large-signal differential voltage amplification	$V_{O} = 0 \text{ to } 8 \text{ V}, R_{L} = 600 \Omega$	25	100		V/mV
		$V_{O} = 0 \text{ to } - 8 \text{ V}, R_{L} = 600 \Omega$	3	25		
rį	Input resistance			1012		Ω
ci	Input capacitance			4		pF
z _O	Open-loop output impedance	IO = 0		280		Ω
CMRR	Common-mode rejection ratio	$R_S = 50 \Omega$, $V_{IC} = V_{ICR}$ min	72	90		dB
k _{SVR}	Supply-voltage rejection ratio ($\Delta V_{CC}/\Delta V_{IO}$)	$V_{CC\pm} = \pm 5 \text{ V to } \pm 15 \text{ V},$ RS = 50 Ω	75	93		dB
ICC	Supply current	$V_O = 0$, No load		290	350	μΑ

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150$ °C extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLE2061Y operating characteristics at $V_{CC\pm}$ = ± 15 V, T_A = $25^{\circ}C$

				1	TLE2061\	(
	PARAMETER	TEST CO	NDITIONS	MIN	TYP	MAX	UNIT
SR	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	2.6	3.4		V/μs
.,	Emiliadas tienatas isas adtas a ferma ()	f = 10 Hz,	$R_S = 20 \Omega$		70		\ //\ <u>!</u>
v _n	Equivalent input noise voltage (see Figure 2)	f = 1 kHz	$R_S = 20 \Omega$		40		nV/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10	Hz		1.1		μV
In	Equivalent input noise current	f = 1 Hz			1.1		fA/√Hz
THD	Total harmonic distortion	A _{VD} = 2, V _{O(PP)} = 2 V,	$f = 10 \text{ kHz},$ $R_L = 10 \text{ k}\Omega$		0.025%		
		$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF		2		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF		1.5		MHz
	Outlier of the co	0.1%			5		
t _S	Settling time	0.01%			10		μs
Вом	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ		40		kHz
4	Phase margin at unity gain (see Figure 2)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF		60°		
φm	Phase margin at unity gain (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF		70°]



TLE2062C electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = ± 5 V (unless otherwise noted)

	PARAMETER		TEST CON	DITIONS	T _A †	TL	E20620 E2062A E2062B	С	UNIT
						MIN	TYP	MAX	
		TI F00000			25°C		1	5	
		TLE2062C			Full range			5.9	
l.,		TI F000040	1		25°C		0.9	4	.,
VIO	Input offset voltage	TLE2062AC			Full range			4.9	mV
1		TI F0000D0	1		25°C		0.7	3	
		TLE2062BC	\/ 0	D- 50.0	Full range			3.9	
ανιο	Temperature coefficient of input	offset voltage	$V_{IC} = 0$,	$R_S = 50 \Omega$	Full range		6		μV/°C
	Input offset voltage long-term dri	ft (see Note 4)	1		25°C		0.04		μV/mo
	land offert comment		1		25°C		1		pА
ΙΟ	Input offset current				Full range			0.8	nA
	lanut bina aumant]		25°C		3		pА
I _{IB}	Input bias current				Full range			2	nA
						-1.6	-2		
					25°C	to 4	to		V
VICR	Common-mode input voltage rar	nge				-1.6	6		
					Full range	to			V
					_	4			
			$R_{\parallel} = 10 \text{ k}\Omega$		25°C	3.5	3.7		
V _{OM+}	Maximum positive peak output v	oltage swing			Full range	3.3			V
OW!		0 0	R _L = 100 Ω		25°C	2.5	3.1		
					Full range	2			
			R _L = 10 kΩ		25°C	-3.7	-3.9		
V _{OM} _	Maximum negative peak output v	voltage swing			Full range	-3.3			V
OWI-	3 1 2	3	R _L = 100 Ω		25°C	-2.5	-2.7		
					Full range	-2			
			$V_{O} = \pm 2.8 \text{ V},$	$R_{I} = 10 \text{ k}\Omega$	25°C	15	80		
					Full range	2			
A _{VD}	Large-signal differential voltage a	amplification	$V_0 = 0 \text{ to } 2 \text{ V},$	R _L = 100 Ω	25°C	0.75	45		V/mV
7.00	_a.gc e.g. a. ae.e. ae.				Full range	0.5			.,
			$V_0 = 0 \text{ to } -2 \text{ V},$	R _L = 100 Ω	25°C	0.5	3		
			10 0 10 2 1,		Full range	0.25	4.0		
rį	Input resistance				25°C		1012		Ω
ci	Input capacitance				25°C		4		pF
z ₀	Open-loop output impedance		IO = 0		25°C		560		Ω
CMRR	Common-mode rejection ratio		V _{IC} = V _{ICR} min,	$R_S = 50 \Omega$	25°C	65	82		dB
					Full range	65			
ksvr	Supply-voltage rejection ratio (Δ\	VCC+/\DVIO)	$V_{CC\pm} = \pm 5 \text{ V to}$	± 15 V,	25°C	75	93		dB
	, , , , , , , , , , , , , , , , , , ,	10,	$R_S = 50 \Omega$		Full range	75			

[†]Full range is 0°C to 70°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150 \, ^{\circ}\text{C}$ extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.



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TLE2062C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted) (continued)

PARAMETER		TEST CONDITIONS		T _A †	TL TL TL	UNIT		
					MIN	TYP	MAX	
	I _{CC} Supply current		25°C		560	620		
ICC		Supply current $V_O = 0$,	No load	Full range			635	μΑ
Δlcc	Supply-current change over operating temperature range		140 load	Full range		26		μА

[†] Full range is 0°C to 70°C.

TLE2062C operating characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 5~\text{V}$

	PARAMETER		TEST CONDITIONS		TLE2062C TLE2062AC TLE2062BC			UNIT
					MIN	TYP	MAX	
SR	Clausesta et units sein (een Figure 1)	D. 10 kg	C: 100 pF	25°C	2.2	3.4		1////
SK	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$	C _L = 100 pF	Full range	2.1			V/μs
.,	Facilitation of a sign of the section of the sectio	f = 10 Hz,	$R_S = 20 \Omega$	25°C		59	100	~\//\
Vn	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	$R_S = 20 \Omega$	25°C		43	60	nV/√ Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10) Hz	25°C		1.1		μV
In	Equivalent input noise current	f = 1 kHz		25°C		1		fA/√Hz
THD	Total harmonic distortion	$V_{O(PP)} = 2 V,$ $A_{VD} = 2,$	$R_L = 10 \text{ k}\Omega$, $f = 10 \text{ kHz}$	25°C	(0.025%		
	Heiter and a head width (and Floring O)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	25°C		1.8		N41.1-
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 100 \Omega$,	C _L = 100 pF	25°C		1.3		MHz
	0.00	0.1%		25°C		5		
	Settling time	0.01%		25°C		10		μs
ВОМ	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ	25°C		140		kHz
	Phone margin of unity gain (and Figure 3)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	25°C		58°		
Φm	Phase margin at unity gain (see Figure 3)	$R_L = 100 \Omega$,	C _L = 100 pF	25°C		75°		

[†] Full range is 0°C to 70°C.



TLE2062C electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = ± 15 V (unless otherwise noted)

	PARAMETER		TEST CO	NDITIONS	T _A †	TL	_E20620 E2062A E2062B	С	UNIT
						MIN	TYP	MAX	
		TI FOOCOC			25°C		0.9	4	
		TLE2062C			Full range			4.9	
\ \ \ \ -	land offert veltage	TI F0000A0			25°C		0.8	2	\/
VIO	Input offset voltage	TLE2062AC			Full range			2.9	mV
		TI FOOCODO			25°C		0.5	1	
		TLE2062BC	\/ 0	D- 50.0	Full range			1.9	
ανιο	Temperature coefficient of input o	ffset voltage	$V_{IC} = 0$,	$R_S = 50 \Omega$	Full range		6		μV/°C
	Input offset voltage long-term drift	(see Note 4)			25°C		0.04		μV/mo
	lament offers assument				25°C		2		pА
lio	Input offset current				Full range			1	nA
	Input bing gurrent				25°C		4		pА
IB	Input bias current				Full range			3	nA
						-11	-12		
					25°C	to 13	to 16		V
V _{ICR}	Common-mode input voltage rang	ge					10		
					Full range	–11 to			V
						13			-
			5 4010		25°C	13.2	13.7		
l , ,			$R_L = 10 \text{ k}\Omega$		Full range	13			.,
VOM+	Maximum positive peak output vo	Itage swing	D 000 0		25°C	12.5	13.2		V
			$R_L = 600 \Omega$		Full range	12			
			5 4010		25°C	-13.2	-13.7		
ļ.,			$R_L = 10 \text{ k}\Omega$		Full range	-13			.,
VOM-	Maximum negative peak output v	oltage swing	-		25°C	-12.5	-13		V
			$R_L = 600 \Omega$		Full range	-12			
				5 (5) 5	25°C	30	230		
			$V_0 = \pm 10 \text{ V},$	$R_L = 10 \text{ k}\Omega$	Full range	20			
١.			.,		25°C	25	100		
AVD	Large-signal differential voltage a	mplification	$V_0 = 0 \text{ to } 8 \text{ V},$	$R_L = 600 \Omega$	Full range	10			V/mV
			.,		25°C	3	25		
			$V_{O} = 0 \text{ to } -8 \text{ V},$	$R_L = 600 \Omega$	Full range	1			
rį	Input resistance				25°C		1012		Ω
ci	Input capacitance				25°C		4		pF
z _O	Open-loop output impedance		IO = 0		25°C		560		Ω
	0			D 500	25°C	72	90		.15
CMRR	Common-mode rejection ratio		$V_{IC} = V_{ICR}min,$	$K_S = 50 \Omega$	Full range	70			dB
la sa	Complementary of the control of the	/^/ >	$V_{CC\pm} = \pm 5 \text{ V to}$	± 15 V,	25°C	75	93		40
ksvr	Supply-voltage rejection ratio (ΔV	CC±/∆VIO)	$R_S = 50 \Omega$		Full range	75			dB

[†] Full range is 0°C to 70°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150 °C extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.



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TLE2062C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted) (continued)

PARAMETER		TEST CONDITIONS	T _A †	TL TL TL	С	UNIT	
				MIN	TYP	MAX	
	CC Supply current		25°C		625	690	
ICC		V∩ = 0 V. No load	Full range			715	μΑ
Δlcc	Supply-current change over operating temperature range	V _O = 0 V, No load	Full range		36		μΑ

[†] Full range is 0°C to 70°C.

TLE2062C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

	PARAMETER		TEST CONDITIONS		TLE2062C TLE2062AC TLE2062BC			UNIT
					MIN	TYP	MAX	
CD.	Class note at waits and (and Figure 4)	D. 401-0	O: 400 = E	25°C	2.6	3.4		Mina
SR	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$,	$C_L = 100 pF$	Full range	2.5			V/μs
.,	Forming land in red as in small and (see Figure 6)	f = 10 Hz,	$R_S = 20 \Omega$	25°C		70	100	
Vn	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	$R_S = 20 \Omega$	25°C		40	60	nV/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10	Hz	25°C		1.1		μV
In	Equivalent input noise current	f = 1 kHz		25°C		1.1		fA/√ Hz
THD	Total harmonic distortion	$V_{O(PP)} = 2 V,$ $A_{VD} = 2,$	$R_L = 10 kΩ$, f = 10 kHz	25°C	(0.025%		
	Heiter and hearth idd. (and Elever C)	$R_L = 10 \text{ k}\Omega$,	C _L = 10 0 pF	25°C		2		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF	25°C		1.5		MHz
	0.00	0.1%		25°C		5		
	Settling time	0.01%		25°C		10		μS
Вом	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ	25°C		40		kHz
	Phone margin of unity gain (and Figure 2)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	25°C		60°		
φm	Phase margin at unity gain (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF	25°C		70°		

[†] Full range is 0°C to 70°C.



TLE2062I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

	PARAMETER		TEST CON	DITIONS	τ _A †	TL	LE2062I E2062A E2062B	AI.	UNIT
						MIN	TYP	MAX	
		TI FOOCOL			25°C		1	5	
		TLE2062I			Full range			6.3	
	hamat affact and to be	TI F0000 A I]		25°C		0.9	4	
VIO	Input offset voltage	TLE2062AI			Full range			5.3	mV
		TI FOOCODI]		25°C		0.7	3	
		TLE2062BI	\/ 0	D- 50.0	Full range			4.3	
ανιο	Temperature coefficient of input of	offset voltage	$V_{IC} = 0$,	$R_S = 50 \Omega$	Full range		6		μV/°C
	Input offset voltage long-term drift	ft (see Note 4)	1		25°C		0.04		μV/mo
	Name of the state		1		25°C		1		pA
liO	Input offset current				Full range			2	nA
	Lament his a summent]		25°C		3		pА
IB	Input bias current				Full range			4	nA
						-1.6	-2		
					25°C	to	to		V
VICR	Common-mode input voltage ran	ge				4	6		
					Full range	-1.6 to			V
					1 4.11 14.11.90	4			·
					25°C	3.5	3.7		
l.,			$R_L = 10 \text{ k}\Omega$		Full range	3.1			.,
V _{OM+}	Maximum positive peak output vo	oltage swing			25°C	2.5	3.1		V
			$R_L = 100 \Omega$		Full range	2			
					25°C	-3.7	-3.9		
			$R_L = 10 \text{ k}\Omega$		Full range	-3.1			
VOM-	Maximum negative peak output v	oltage swing	_		25°C	-2.5	-2.7		V
			$R_L = 100 \Omega$		Full range	-2			
					25°C	15	80		
			$V_0 = \pm 2.8 \text{ V},$	$R_L = 10 \text{ k}\Omega$	Full range	2			
1.		110	V 0: 5V	B	25°C	0.75	45		.,, .,
AVD	Large-signal differential voltage a	amplification	$V_0 = 0 \text{ to } 2 \text{ V},$	$R_L = 100 \Omega$	Full range	0.5			V/mV
				5 /00 -	25°C	0.5	3		
			$V_0 = 0 \text{ to } -2 \text{ V},$	$K_L = 100 \Omega$	Full range	0.25			
rį	Input resistance				25°C		1012		Ω
Cį	Input capacitance				25°C		4		pF
z _O	Open-loop output impedance		IO = 0		25°C		560		Ω
				D	25°C	65	82		
CMRR	Common-mode rejection ratio		$V_{IC} = V_{ICR}min,$	$KS = 50 \Omega$	Full range	65			dB
le = 1 :-	Cumply voltage releasing and - (4)	/ /A\/:-\	$V_{CC\pm} = \pm 5 \text{ V to}$	± 15 V,	25°C	75	93		٩D
ksvr	Supply-voltage rejection ratio (Δ\	(CC∓\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	$R_S = 50 \Omega$		Full range	65			dB

[†] Full range is -40° C to 85° C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at TA = 150 °C extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.



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TLE2062I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted) (continued)

PARAMETER		TEST CONDITIONS		T _A †	TL TL	UNIT		
					MIN	TYP	MAX	
	ICC Supply current ΔICC Supply-current change over operating temperature range			25°C		560	620	
ICC		y current $V_{O} = 0$,	No load	Full range			640	μΑ
Δlcc		VO = 0,	No load	Full range		54		μА

[†] Full range is -40° C to 85° C.

TLE2062I operating characteristics at specified free-air temperature, $V_{CC\,\pm}$ = $\pm5~V$

	PARAMETER		TEST CONDITIONS		TLE2062I TLE2062AI TLE2062BI			UNIT
					MIN	TYP	MAX	
SR	Clausesta et units sein (een Figure 1)	D. 10 kg	C: 100 pF	25°C	2.2	3.4		1///
SK	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$	C _L = 100 pF	Full range	1.7			V/μs
.,	Facilitation of a sign of the section of the sectio	f = 10 Hz,	$R_S = 20 \Omega$	25°C		59	100	~\//\
Vn	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	$R_S = 20 \Omega$	25°C		43	60	nV/√ Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10) Hz	25°C		1.1		μV
In	Equivalent input noise current	f = 1 kHz		25°C		1		fA/√Hz
THD	Total harmonic distortion	$V_{O(PP)} = 2 V,$ $A_{VD} = 2,$	$R_L = 10 \text{ k}\Omega$, f = 10 kHz	25°C	(0.025%		
	Heiter and a head width (and Floring O)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	25°C		1.8		N41.1-
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 100 \Omega$,	C _L = 100 pF	25°C		1.3		MHz
	0.00	0.1%		25°C		5		
	Settling time	0.01%		25°C		10		μs
ВОМ	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ	25°C		140		kHz
	Phone margin of unity gain (and Figure 3)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	25°C		58°		
Φm	Phase margin at unity gain (see Figure 3)	$R_L = 100 \Omega$,	C _L = 100 pF	25°C		75°		

[†] Full range is –40°C to 85°C.



TLE2062I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted)

	PARAMETER		TEST CON	DITIONS	T _A †	TL	LE2062I .E2062A .E2062B	AI.	UNIT
						MIN	TYP	MAX	
		TI FORGOI			25°C		0.9	4	
		TLE2062I			Full range			5.3	
.,		TI F000041]		25°C		0.8	2	.,
VIO	Input offset voltage	TLE2062AI			Full range			3.3	mV
		TI FOOODI]		25°C		0.5	1	
		TLE2062BI	., .	D 50.0	Full range			2.3	
ανιο	Temperature coefficient of input of	offset voltage	$V_{IC} = 0$,	$R_S = 50 \Omega$	Full range		6		μV/°C
	Input offset voltage long-term drit	ft (see Note 4)	1		25°C		0.04		μV/mo
	Land offerd summed]		25°C		2		pА
liO	Input offset current				Full range			3	nA
	lanut bias sumari]		25°C		4		pA
IB	Input bias current				Full range			5	nA
						-11	-12		
					25°C	to	to		V
VICR	Common-mode input voltage ran	ige				13	16		
					Full range	-11 to			V
					i dii rango	13			v
					25°C	13.2	13.7		
			$R_L = 10 \text{ k}\Omega$		Full range	13			
VOM+	Maximum positive peak output vo	oltage swing	_		25°C	12.5	13.2		V
			$R_L = 600 \Omega$		Full range	12			
					25°C	-13.2	-13.7		
			$R_L = 10 \text{ k}\Omega$		Full range	-13			
VOM-	Maximum negative peak output v	oltage swing			25°C	-12.5	-13		V
			$R_L = 600 \Omega$		Full range	-12			
					25°C	30	230		
			$V_0 = \pm 10 \text{ V},$	$R_L = 10 \text{ k}\Omega$	Full range	20			
					25°C	25	100		
AVD	Large-signal differential voltage a	amplification	$V_0 = 0 \text{ to } 8 \text{ V},$	$R_L = 600 \Omega$	Full range	10			V/mV
					25°C	3	25		
			$V_0 = 0 \text{ to } -8 \text{ V},$	$R_L = 600 \Omega$	Full range	1			
rį	Input resistance		İ		25°C		1012		Ω
ci	Input capacitance		İ		25°C		4		pF
z _O	Open-loop output impedance		IO = 0		25°C		560		Ω
				_	25°C	72	90		-
CMRR	Common-mode rejection ratio		$V_{IC} = V_{ICR}min,$	$R_S = 50 \Omega$	Full range	65			dB
			$V_{CC\pm} = \pm 5 \text{ V to}$	± 15 V.	25°C	75	93		
ksvr	Supply-voltage rejection ratio (Δ\	√CC∓∖∇ΛIO)	$R_S = 50 \Omega$	· · · · · ·	Full range	65			dB

[†]Full range is –40°C to 85°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150 °C extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.



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TLE2062I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted) (continued)

PARAMETER		TEST	TEST CONDITIONS		TL TL	UNIT		
					MIN	TYP	MAX	
	ICC Supply current			25°C		625	690	
ICC		Supply current $V_O = 0$,	No load	Full range			720	μΑ
ΔICC	Supply-current change over operating temperature range	7 0 - 0,	ino load	Full range		74		μΑ

[†]Full range is -40°C to 85°C.

TLE2062I operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

	PARAMETER		TEST CONDITIONS		TLE2062I TLE2062AI TLE2062BI			UNIT
					MIN	TYP	MAX	
CD.	Clausesta at units main (and Figure 4)	D: 401:0	C: 400 = F	25°C	2.6	3.4		Missa
SR	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$,	$C_L = 100 pF$	Full range	2.1			V/μs
.,	Forming lead in and a size on the section (see Figure 0)	f = 10 Hz,	$R_S = 20 \Omega$	25°C		70	100	~> //s/ -
Vn	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	$R_S = 20 \Omega$	25°C		40	60	nV/√ Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10	0 Hz	25°C		1.1		μV
In	Equivalent input noise current	f = 1 kHz		25°C		1.1		fA/√Hz
THD	Total harmonic distortion	$V_{O(PP)} = 2 V,$ $A_{VD} = 2,$	$R_L = 10 \text{ k}\Omega$, f = 10 kHz	25°C	(0.025%		
		$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	25°C		2		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF	25°C		1.5		MHz
	O uti ii	0.1%		25°C		5		
	Settling time	0.01%		25°C		10		μs
ВОМ	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ	25°C		40		kHz
	Dhoop marsin at unity agin (aga Figure 2)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	25°C		60°		
φm	Phase margin at unity gain (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF	25°C		70°		
	·	•	<u>'</u>					

[†] Full range is –40°C to 85°C.



TLE2062M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 5~V$

	PARAMETER		TEST COND	ITIONS	T _A †	TLI	.E2062N E2062A E2062B	М	UNIT
						MIN	TYP	MAX	
		TI FOOCOM			25°C		1	5	
		TLE2062M			Full range			7	
.,	logest offert veltere	TI FOOCOANA]		25°C		0.9	4	\/
V _{IO}	Input offset voltage	TLE2062AM			Full range			6	mV
		TI FOOCODM]		25°C		0.7	3	
		TLE2062BM	\/ O	D- 50.0	Full range			5	
αVIO	Temperature coefficient of input of	ffset voltage	V _{IC} = 0,	$R_S = 50 \Omega$	Full range		6		μV/°C
	Input offset voltage long-term drif	t (see Note 4)			25°C		0.04		μV/mo
1	Input offeet ourrent				25°C		1		рА
lio	Input offset current				Full range			15	nA
1	longst bigg gurrant				25°C		3		pА
I _{IB}	Input bias current				Full range			30	nA
.,					25°C	-1.6 to 4	-2 to 6		V
VICR	CR Common-mode input voltage range				Full range	-1.6 to 4			V
					25°C	3.5	3.7		
	Maximum positive peak output voltage swing		$R_L = 10 \text{ k}\Omega$		Full range	3			
		FK and JG			25°C	2.5	3.6		.,
VOM+		packages	$R_L = 600 \Omega$		Full range	2			V
		D and P	5 100 0		25°C	2.5	3.1		
		packages	$R_L = 100 \Omega$		Full range	2			
			D 4010		25°C	-3.5	-3.9		
			$R_L = 10 \text{ k}\Omega$		Full range	-3			
.,	Maximum negative peak output	FK and JG	D 000 0		25°C	-2.5	-3.5		.,
VOM-	voltage swing	packages	$R_L = 600 \Omega$		Full range	-2			V
		D and P	D 400.0		25°C	-2.5	-2.7		
		packages	$R_L = 100 \Omega$		Full range	-2			
					25°C	15	80		
			$V_0 = \pm 2.8 \text{ V},$	$R_L = 10 \text{ k}\Omega$	Full range	2			
			V 01.55V	D 000.0	25°C	1	65		
		FK and JG	$V_O = 0 \text{ to } 2.5 \text{ V},$	$R_L = 600 \Omega$	Full range	0.5			
	Large-signal differential voltage	packages	V 01 05:	D 000 0	25°C	1	16		\// ₁ \// ₁
	amplification		$V_0 = 0 \text{ to } -2.5 \text{ V},$	$R_L = 600 \Omega$	Full range	0.5			V/mV
			V 01 311	D 400.0	25°C	0.75	45		
		D and P	$V_O = 0$ to 2 V, R_I	$R_L = 100 \Omega$	Full range	0.5			
	pa	packages	V 01 011	D 400.0	25°C	0.5	3		
	,g.	$V_0 = 0 \text{ to } -2 \text{ V},$	$R_L = 100 \Omega$	Full range	0.25				

[†]Full range is -55°C to 125°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150 °C extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.



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TLE2062M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	T _A †	TLE2062M TLE2062AM TLE2062BM			UNIT
				MIN	TYP	MAX	
rį	Input resistance		25°C		10 ¹²		Ω
ci	Input capacitance		25°C		4		pF
z ₀	Open-loop output impedance	IO = 0	25°C		560		Ω
OMBB	Occurred made misself as notice	V _{IC} = V _{ICR} min	25°C	65	65 82		4D
CMRR	Common-mode rejection ratio	$R_S = 50 \Omega$,	Full range	60			dB
	Ourselessed to an activation activated to the contract of the	$V_{CC} \pm = \pm 5 \text{ V to } \pm 15 \text{ V},$	25°C	75	93		-ID
ksvr	Supply-voltage rejection ratio (ΔV _{CC±} /ΔV _{IO})	$R_S = 50 \Omega$	Full range	65			dB
			25°C		560	620	
ICC	Supply current (two amplifiers)	Va O No lood	Full range			650	μΑ
ΔlCC	Supply-current change over operating temperature range (two amplifiers)	$V_0 = 0$, No load	Full range	_	72	_	μА

[†] Full range is –55°C to 125°C.

TLE2062M operating characteristics at specified free-air temperature, T_A = 25°C, $V_{CC\pm}$ = ± 5 V

			-	-	_		
	PARAMETER	TEST CO	NDITIONS	TLE2062M TLE2062AM TLE2062BM			UNIT
				MIN	TYP	MAX	
SR	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF		3.4		V/µs
,,	.	f = 10 Hz, R _S = 20 Ω		Ω 59			->4/1
Vn	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	$R_S = 20 \Omega$		43		nV/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10) Hz		1.1		μV
In	Equivalent input noise current	f = 1 kHz			1 1		
THD	Total harmonic distortion	$V_{O(PP)} = 2 V,$ $A_{VD} = 2,$	$R_L = 10 kΩ$, f = 10 kHz	0	.025%		
_	11::	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF		1.8		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF		1.3		MHz
	Outlibration	0.1%			5		_
	Settling time	0.01%			10		μs
ВОМ	Maximum output-swing bandwidth	$A_{VD} = 1$,	$R_L = 10 \text{ k}\Omega$		140		kHz
4	Phase margin at unity gain (see Figure 3)	$R_L = 10 \text{ k}\Omega$,	$C_L = 100 pF$		58°		
φm	Filase margin at unity gain (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF	75°			

TLE2062M electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = ± 15 V (unless otherwise noted)

	PARAMETER		TEST CON	DITIONS	T _A †	TL	E2062N E2062A E2062B	М	UNIT
						MIN	TYP	MAX 4 6 2 4 1 3 20 40	
		TI 5000014			25°C		0.9	4	
		TLE2062M			Full range			6	
l.,		TI 50000 414	1		25°C		0.8	2	.,
VIO	Input offset voltage	TLE2062AM			Full range			4	mV
		TI FOOODNA	1		25°C		0.5	1	
		TLE2062BM	\/ O	D- 50.0	Full range			3	
ανιο	Temperature coefficient of input	t offset voltage	set voltage (see Note 4) $V_{IC} = 0, \qquad R_S = 50 \ \Omega$ $E = 0 \ \Omega$ $E = 0, \qquad R_S = 50 \ \Omega$	Full range		6		μV/°C	
	Input offset voltage long-term d	rift (see Note 4)		25°C		0.04		μV/mo	
				25°C		2		pА	
ΙΟ	Input offset current			Full range			20	nA	
	Land Programmed		1		## A Second Seco		4		pA
IB	Input bias current				Full range			40	nA
						-11	-12		
					25°C	to 13	to 16		V
VICR	Common-mode input voltage ra	ange				-	10		
					Full range	-11 to			V
						13			-
			D 4010		25°C	13	13.7		
.,	Mandana and Managarah and and		$R_L = 10 \text{ K}\Omega$		Full range	12.5			.,
V _{OM+}	Maximum positive peak output	voitage swing	D 000 0		25°C	12.5	13.2		V
			RΓ = 600 Ω		Full range	11			
			D 4010		25°C	-13	-13.7		
l.,			$R_L = 10 \text{ k}\Omega$		Full range	-12.5			.,
VOM-	Maximum negative peak output	t voltage swing	D 000 0		25°C	-12.5	-13		V
			$R_L = 600 \Omega$		Full range	-11			
			V 140V	D 4010	25°C	30	230		
			$V_0 = \pm 10 \text{ V},$	$R_L = 10 \text{ k}\Omega$	Full range	20			
١.		1161	., ., .,	D 000 0	25°C	25	100		.,, .,
AVD	Large-signal differential voltage	amplification	$V_0 = 0 \text{ to } 8 \text{ V},$	$R_L = 600 \Omega$	Full range	7			V/mV
			V 045 634	D 000 0	25°C	3	25		
			$V_0 = 0 \text{ to } -8 \text{ V},$	KΓ = 600 Ω	Full range	1			
rį	Input resistance				25°C		1012		Ω
ci	Input capacitance				25°C		4		pF
z _O	Open-loop output impedance		IO = 0		25°C		560		Ω
CMDD	Common made releasing ratio		V V	Da 50.0	25°C	72	90		40
CMRR	Common-mode rejection ratio		$V_{IC} = V_{ICR}min,$	KS = 20 Ω	Full range	65			aB
kovis	Supply voltage rejection ratio /	A\/oo : /A\/:o\	$V_{CC\pm} = \pm 5 \text{ V to}$	± 15 V,	25°C	75	93		dР
ksvr	Supply-voltage rejection ratio (A	zvCC∓/ΔvIO)	$R_S = 50 \Omega$		Full range	65			pF

[†] Full range is –55°C to 125°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at T_A = 150 °C extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.



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TLE2062M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted)

PARAMETER		TEST	TLE2062M TLE2062AM TLE2062BM	TA† TLE2062AM TLE2062BM MIN TYP MAX 25°C 625 690 Full range 730			UNIT	
					T _A † TLE2062AM TLE2062BM UN MIN TYP MAX			
	- Cupply gurrant			25°C		625	690	
ICC	Supply current	$V_{O} = 0$	No load	Full range			730	μΑ
Δlcc	Supply-current change over operating temperature range	VO = 0,	ino load	Full range		97		μА

[†]Full range is -55°C to 125°C.

TLE2062M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

	PARAMETER	TEST COI	NDITIONS	T _A †	TLE2062M TLE2062AM TLE2062BM		М	UNIT
					MIN	TYP	MAX	
0.0	Olemante et militare in (a.e. Firman 4)	D 4010	0 400 - 5	25°C	2	3.4		\// -
SR	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$	$C_L = 100 pF$	Full range	1.8			V/μs
.,	Forming land in and a single state of the second	f = 10 Hz,	$R_S = 20 \Omega$	25°C	70		->4/15	
V _n	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	$R_S = 20 \Omega$	25°C		40		nV/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10) Hz	25°C	1.1		μV	
In	Equivalent input noise current	f = 1 kHz		25°C	1.1		fA/√Hz	
THD	Total harmonic distortion	$V_{O(PP)} = 2 V,$ $A_{VD} = 2,$	$R_L = 10 kΩ$, f = 10 kHz	25°C	0	.025%		
		$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	25°C		2		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF	25°C		1.5		MHz
	0.00	0.1%		25°C		5		
	Settling time	0.01%		25°C		10		μs
BOM	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ	25°C		40		kHz
	Dhoos marain at unity gain (and Figure 2)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	25°C		60°		
φm	Phase margin at unity gain (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF	25°C		70°		

[†] Full range is –55°C to 125°C.



TLE2062Y electrical characteristics at $V_{CC\pm}$ = ±15 V, T_A = 25°C (unless otherwise noted)

	PARAMETER	TEST CON	DITIONS	Т	LE2062\	′	UNIT
	FARAMETER	TEST CON	DITIONS	MIN	TYP	MAX	UNII
VIO	Input offset voltage				0.9	4	mV
αΛΙΟ	Input offset voltage long-term drift (see Note 4)		D 500		0.04		μV/mo
IIO	Input offset current	V _{IC} = 0,	$R_S = 50 \Omega$		2		pA
I _{IB}	Input bias current				4		pA
VICR	Common-mode input voltage range			-11 to 13	-12 to 16		٧
,,		$R_L = 10 \text{ k}\Omega$		13.2	13.7		.,
V _{OM+}	Maximum positive peak output voltage swing	$R_L = 600 \Omega$		12.5	13.2		V
.,		R _L = 10 kΩ		-13.2	-13.7		.,
VOM-	Maximum negative peak output voltage swing	$R_L = 600 \Omega$		-12.5	-13		V
		$V_0 = \pm 10 \text{ V},$	$R_L = 10 \text{ k}\Omega$	30	230		
A _{VD}	Large-signal differential voltage amplification	$V_0 = 0 \text{ to } 8 \text{ V},$	$R_L = 600 \Omega$	25	100		V/mV
		$V_0 = 0 \text{ to } -8 \text{ V},$	$R_L = 600 \Omega$	3	25		
rį	Input resistance				1012		Ω
ci	Input capacitance				4		pF
z _O	Open-loop output impedance	IO = 0			560		Ω
CMRR	Common-mode rejection ratio	V _{IC} = V _{ICR} min,	$R_S = 50 \Omega$	72	90		dB
ksvr	Supply-voltage rejection ratio (ΔV _{CC} /ΔV _{IO})	$V_{CC\pm} = \pm 5 \text{ V to } \pm $ RS = 50 Ω	15 V,	75	93		dB
Icc	Supply current	V _O = 0,	No load		625	690	μΑ

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150\,^{\circ}C$ extrapolated to T_A = 25 °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLE2062Y operating characteristics at $V_{CC\pm}$ = ± 15 V, T_A = $25^{\circ}C$

	PARAMETER	TEST CO	NDITIONS	TI	_E2062\	<u> </u>	LINUT
	FANAMETER	1231 001	NDITIONS	MIN	TYP	MAX	UNIT
SR	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	2.6	3.4	4	V/μs
.,	Eminated involved in solutions (see Figure 0)	f = 10 Hz,	$R_S = 20 \Omega$		70		->4/\ -
V _n	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	$R_S = 20 \Omega$		40		nV/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10 H	łz		1.1		μV
In	Equivalent input noise current	f = 1 Hz			1.1		fA/√Hz
THD	Total harmonic distortion	$V_{O(PP)} = 2 V,$ $A_{VD} = 2,$	R_L = 10 kΩ, f = 10 kHz	0	.025%		
		$R_L = 10 \text{ k}\Omega$	C _L = 100 pF		2		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF		1.5		MHz
	Outlier day	0.1%			5		_
	Settling time	0.01%			10		μS
Вом	Maximum output-swing bandwidth	$A_{VD} = 1$,	$R_L = 10 \text{ k}\Omega$		40		kHz
	Dhoop markin at unity sain (and Figure 2)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF		60°		
φm	Phase margin at unity gain (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF		70°		

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TLE2064C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

	PARAMETER		TEST CONI	DITIONS	TA [†]	TL	LE20640 E2064A E2064B	С	UNIT
						MIN	TYP	MAX	
					25°C		1.2	7	
		TLE2064C			Full range			7.9	
l.,	land Markerland	TI 5000440	1		25°C		1.2	6	
VIO	Input offset voltage	TLE2064AC			Full range			6.9	mV
		TI FOOCADO	1		25°C		0.8	3.5	
		TLE2064BC	V: - 0	D - 50.0	Full range			4.4	
ανιο	Temperature coefficient of input offs	set voltage	$V_{IC} = 0$,	$R_S = 50 \Omega$	25°C		6		μV/°C
	Input offset voltage long-term drift (see Note 4)			Full range		0.04		μV/mo
l. o	Input offset current				25°C		1		рА
lio	input onset current				Full range			8.0	nA
lin.	Input bias current				25°C		3		pA
IIB	input bias current				Full range			2	nA
						-1.6	-2		
					25°C	to 4	to		V
VICR	Common-mode input voltage range	e					6		
					Full range	-1.6 to			V
					. un range	4			·
			D 4010		25°C	3.5	3.7		
	Nancias na citiva na ale autoraturale		$R_L = 10 \text{ k}\Omega$		Full range	3.3			V
VOM+	Maximum positive peak output volt	age swing	D 400.0		25°C	2.5	3.1		V
			$R_L = 100 \Omega$		Full range	2			
			D: 40 kO		25°C	-3.7	-3.9		
V	Maximum nagativa nagle autaut val	togo oving	$R_L = 10 \text{ k}\Omega$		Full range	-3.3			V
VOM-	Maximum negative peak output vol	tage swing	B 100 O		25°C	-2.5	-2.7		V
			$R_L = 100 \Omega$		Full range	-2			
			V _O = ±2.8 V,	R _L = 10 kΩ	25°C	15	80		
			VO = ±2.6 V,	K[= 10 K22	Full range	2			
A	Lorgo signal differential voltage em	plification	$V_0 = 0 \text{ to } 2 \text{ V},$	R _L = 100 Ω	25°C	0.75	45		V/mV
AVD	Large-signal differential voltage am	piliication	VO = 0 to 2 V,	KL = 100 22	Full range	0.5			V/IIIV
			$V_0 = 0 \text{ to } -2 \text{ V},$	Pr = 100 O	25°C	0.5	3		
			ν () = 0 t0 -2 V,	ı√ = 100 75	Full range	0.15			
rį	Input resistance				25°C		1012		Ω
ci	Input capacitance				25°C		4		pF
z _O	Open-loop output impedance		IO = 0		25°C		560		Ω
CMRR	Common-mode rejection ratio		Ro = 50 O	25°C	65	82		dB	
CIVINI	Common-mode rejection ratio		VIC - VICRIIIIII,	118 - 50 22	Full range	65			מט
kovo	Supply-voltage rejection ratio (ΔV _C		$V_{CC\pm} = \pm 5 \text{ V to}$	±15 V,	25°C	75	93		dB
ksvr	Cappiy-voltage rejection ratio (Δν)	.U± /△ v IU/	$R_S = 50 \Omega$		Full range	75			שט

[†] Full range is 0°C to 70°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150$ °C extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.



TLE2064C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted) (continued)

PARAMETER		TEST CON	IDITIONS	T _A †	TI TL TL	С	UNIT				
					MIN	TYP	MAX				
lcc	Complete company (form a graphitically)			25°C		1.12	1.3	A			
ICC	Supply current (four amplifiers)	V = = 0	\/ 0	Vo = 0	\/o = 0	No load	Full range			1.3	mA
ΔICC	Supply-current change over operating temperature range (four amplifiers)	$V_O = 0$,	NO load	Full range		52		μΑ			
V _{O1} /V _{O2}	Crosstalk attenuation	$A_{VD} = 1000,$	f = 1 kHz	25°C		120		dB			

[†] Full range is 0°C to 70°C.

TLE2064C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 5~V$

	PARAMETER	TEST CON	IDITIONS	T _A †	TL	TLE2064C TLE2064AC TLE2064BC		UNIT
					MIN	TYP	MAX	
SR	Class rate at units rain (and Figure 4)	D. 40 kO	C 100 pF	25°C	2.2	3.4		1///
SK	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$,	$C_L = 100 pF$	Full range	2.1			V/μs
.,	Family alout insult a size walters (see Figure 2)	f = 10 Hz,	$R_S = 20 \Omega$	0500		59	100	->4/\(\frac{1}{1-1}\)
Vn	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	$R_S = 20 \Omega$	25°C		43	60	nV/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10 H	lz	25°C	1.1			μV
In	Equivalent input noise current	f = 1 kHz		25°C	1			fA/√Hz
THD	Total harmonic distortion	$A_{VD} = 2$, $V_{O(PP)} = 2 V$,	$f = 10 \text{ kHz},$ $R_L = 10 \text{ k}\Omega$	25°C	0	.025%		
		$R_L = 10 \text{ k}\Omega$	C _L = 100 pF			1.8		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 100 \Omega$	C _L = 100 pF	25°C		1.3		MHz
	O Will of	ε = 0.1%		0500		5		
t _S	Settling time	ε = 0.01%		25°C		10		μs
Вом	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ	25°C	140			kHz
4	Phone margin at unity sain (one Figure 2)	$R_L = 10 \text{ k}\Omega$	C _L = 100 pF	2500				
φm	Phase margin at unity gain (see Figure 3)	$R_L = 100 \Omega$	C _L = 100 pF	25°C		75°		

[†] Full range is 0°C to 70°C.



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TLE2064C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted)

	PARAMETER		TEST CON	DITIONS	T _A †	TL	_E20640 E2064A E2064B	С	UNIT
						MIN	1IN TYP MAX 0.9 6. 0.9 4. 0.7 6 0.04 2 4 -11 -12 to to 13 16 -11 to 13 3.2 13.7 13 2.5 13.2 12 3.2 -13.7 13 2.5 -13 -12 30 230 20 25 100	MAX	
					25°C		0.9	6	
		TLE2064C			Full range			6.9	
			1		25°C		0.9	4	
VIO	Input offset voltage	TLE2064AC			Full range			4.9	mV
			1		25°C		0.7	2	
		TLE2064BC	., .		Full range			4	
αVIO	Temperature coefficient of input o	ffset voltage	$V_{IC} = 0$,	$R_S = 50 \Omega$	25°C		6		μV/°C
	Input offset voltage long-term drift	t (see Note 4)	1		Full range		0.04		μV/mo
			1		25°C		2		pА
ΙΟ	Input offset current				Full range			1	nA
			1		25°C		4		pА
lΒ	Input bias current							3	nA
					25°C	-11 to 13	to		V
VICR	Common-mode input voltage rang				Full range	-11 to 13			V
					25°C	13.2	13.7		
			$R_L = 10 \text{ k}\Omega$		Full range	13			
VOM+	Maximum positive peak output vo	iltage swing			25°C	12.5	13.2		V
			$R_L = 600 \Omega$		Full range	12			
					25°C	-13.2	-13.7		
.,			$R_L = 10 \text{ k}\Omega$		Full range	-13			.,
V _{OM} -	Maximum negative peak output v	oitage swing	D 200 0		25°C	-12.5	-13		V
			$R_L = 600 \Omega$		Full range	-12			
				D 4010	25°C	30	230		
			$V_0 = \pm 10 \text{ V},$	$R_L = 10 \text{ k}\Omega$	Full range	20			
	Lange size of different following		N 04-01	D 000 0	25°C	25	100		\//\/
AVD	Large-signal differential voltage a	mplification	$V_0 = 0 \text{ to } 8 \text{ V},$	$R_L = 600 \Omega$	Full range	10			V/mV
			V- 01- 01	D: 000.0	25°C	3	25		
			$V_0 = 0 \text{ to } -8 \text{ V},$	KΓ = 000 Ω	Full range	1			
rį	Input resistance				25°C		1012		Ω
cį	Input capacitance				25°C		4		pF
z _o	Open-loop output impedance		I _O = 0		25°C		560		Ω
CMDD	Common made releasing reli-		V V	D- 500	25°C	72	90		4D
CMRR	Common-mode rejection ratio		$V_{IC} = V_{ICR}min$	KS = 20 73	Full range	70			dB
k :-	Cupply voltage rejection retire (4)/	/A\/:-\	$V_{CC\pm} = \pm 5 \text{ V to}$	±15 V,	25°C	75	93		4D
ksvr	Supply-voltage rejection ratio (ΔV	CC±/\(\text{\text{\text{\text{\text{\text{\text{\text{CC}}}}}}}	$R_S = 50 \Omega$		Full range	75			dB

[†]Full range is 0°C to 70°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150$ °C extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.



TLE2064C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted) (continued)

	PARAMETER		IDITIONS	T _A †	TL TL TL	UNIT		
					MIN	TYP	MAX	
loo	Supply ourrent (four amplifiers)			25°C		1.25	1.4	mA
Icc	Supply current (four amplifiers)	$V_{O} = 0$,	No load	Full range			1.5	IIIA
ΔICC	Supply-current change over operating temperature range (four amplifiers)	VO = 0,	No load	Full range		72		μΑ
V _{O1} /V _{O2}	Crosstalk attenuation	$A_{VD} = 1000,$	f = 1 kHz	25°C		120		dB

[†] Full range is 0°C to 70°C.

TLE2064C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

PARAMETER		TEST CONDITIONS		T _A †	TLE2064C TLE2064AC TLE2064BC			UNIT	
					MIN	TYP	MAX		
SR	Slew rate at unity gain (see Figure 1)	R _L = 10 kΩ,	C _L = 100 pF	25°C	2.6	3.4		V/μs	
				Full range	2.5				
Vn	Equivalent input noise voltage (see Figure 2)	f = 10 Hz,	$R_S = 20 \Omega$	0500		70	100	nV/√ Hz	
		f = 1 kHz,	$R_S = 20 \Omega$	25°C		40	60		
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10 H	lz	25°C		1.1		μV	
In	Equivalent input noise current	f = 1 kHz		25°C		1		fA/√Hz	
THD	Total harmonic distortion	$A_{VD} = 2,$ $V_{O(PP)} = 2 V,$	$f = 10 \text{ kHz},$ $R_L = 10 \text{ k}\Omega$	25°C	0	.025%			
		$R_L = 10 \text{ k}\Omega$	C _L = 100 pF			2		MHz	
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 600 \Omega$	C _L = 100 pF	25°C		1.5			
t _S	Settling time	ε = 0.1%		0500	5		_		
		ε = 0.01%		25°C		10		μs	
Вом	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ	25°C		40		kHz	
φ _m	Phase margin at unity gain (see Figure 3)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	25°C		50°			
		R _L = 600 Ω,	C _L = 100 pF			70°			

[†] Full range is 0°C to 70°C.

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TLE2064I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

PARAMETER			TEST CONDITIONS		T _A †	TLE2064I TLE2064AI TLE2064BI			UNIT
						MIN	TYP	MAX	
		TI 500041		R _S = 50 Ω	25°C		1.2	7	mV
	Input offset voltage	TLE2064I			Full range			8.3	
V _{IO}		TLE2064AI			25°C		1.2	6	
					Full range			7.3	
		TLE2064BI			25°C		0.8	3.5	
					Full range			4.8	
αΛΙΟ	Temperature coefficient of input of	coefficient of input offset voltage		NS = 30 22	25°C		6		μV/°C
	Input offset voltage long-term drif		Full range			0.04		μV/mo	
I _{IO}	Input offset current		25°C			1		pА	
10			Full range				2	nA	
I _{IB}	Input bias current		25°C			3		pA	
ID	mpat blas carrent				Full range			4	nA
	Common-mode input voltage range				25°C	-1.6	-2		V
						to 4	to 6		
VICR						-1.6			
					Full range	to			V
						4			
	Maximum positive peak output voltage swing		R _L = 10 kΩ		25°C	3.5	3.7		V
V _{OM+}					Full range	3.1			
VOM+			R _L = 100 Ω		25°C	2.5	3.1		
					Full range	2			
	Maximum negative peak output voltage swing		R _L = 10 kΩ		25°C	-3.7	-3.9		
V _{OM} -		oltage swing	K_ = 10 K22		Full range	-3.1			V
VOIVI –	Maximum negative peak output voltage swing		R _L = 100 Ω		25°C	-2.5	-2.7		
			TKL = 100 32		Full range	-2			
	Large-signal differential voltage amp	mplification	$V_0 = \pm 2.8 \text{ V},$	$R_L = 10 \text{ k}\Omega$	25°C	15	80		V/mV
					Full range	2			
AVD			$V_0 = 0 \text{ to } 2 \text{ V},$	$R_L = 100 \Omega$	25°C	0.75	45		
A V D					Full range	0.5			
			$V_0 = 0 \text{ to } -2 \text{ V},$	$R_L = 100 \Omega$	25°C	0.5	3		
					Full range	0.15			
rį	Input resistance				25°C		1012		Ω
ci	Input capacitance				25°C		4		pF
z ₀	Open-loop output impedance		IO = 0		25°C		560		Ω
CMRR	Common-mode rejection ratio		$V_{IC} = V_{ICR}min$, $R_S = 50 \Omega$		25°C	65	82		dB
J			· IC = · ICKIIIII,	2 - 00 32	Full range	65			
ksvr	Supply-voltage rejection ratio (ΔV _{CC±} /ΔV _{IO})		$V_{CC\pm} = \pm 5 \text{ V to } \pm 15 \text{ V},$ $R_S = 50 \Omega$		25°C	75	93		dB
† Full range is 40°C to 95°C		CO±,4+10)			Full range	65			

[†]Full range is -40°C to 85°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150$ °C extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.



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TLE2064I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted) (continued)

PARAMETER		TEST CONDITIONS		T _A †	T TI TI	.I	UNIT	
					MIN	TYP	MAX	
laa	Supply current (four amplifiers)			25°C		1.12	1.3	m ^
Icc		$V_{O} = 0$, No load	No load	Full range			1.3	mA
ΔICC	Supply-current change over operating temperature range (four amplifiers)	VO = 0,	No load	Full range		108		μΑ
V _{O1} /V _{O2}	Crosstalk attenuation	$A_{VD} = 1000,$	f = 1 kHz	25°C		120		dB

[†] Full range is –40°C to 85°C.

TLE2064I operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

	PARAMETER		TEST CONDITIONS		TLE2064I TLE2064AI TLE2064BI			UNIT
					MIN	TYP	MAX	
SR	Claus rate at unity gain (and Figure 1)	D: 10 kg	C: 100 pF	25°C	2.2	3.4		Muo
SK	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$	C _L = 100 pF	Full range	1.7			V/μs
.,	Facilitation of points welfants (see Figure 2)	f = 10 Hz,	$R_S = 20 \Omega$	0500		59	100	-> // /1-
Vn	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	f = 1 kHz,	25°C		43	60	nV/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10) Hz	25°C		1.1		μV
In	Equivalent input noise current	f = 1 kHz		25°C		1		fA/√Hz
THD	Total harmonic distortion	$A_{VD} = 2$, $V_{O(PP)} = 2 V$,	f = 10 kHz, $R_L = 10 \text{ k}\Omega$	25°C	0	.025%		
		$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	0500		1.8		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 100 \Omega$,	C _L = 100 pF	25°C		1.3		MHz
	0.48	ε = 0.1%		0500		5		
t _S	Settling time	ε = 0.01%		25°C		10		μs
ВОМ	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ	25°C		140		kHz
4	Phone margin at units gain (and Figure 2)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	2500		58°		
Φm	Phase margin at unity gain (see Figure 3)	$R_L = 100 \Omega$,	C _L = 100 pF	25°C		75°		

[†]Full range is – 40°C to 85°C.

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TLE2064I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted)

	PARAMETER		TEST CONI	DITIONS	T _A †	T TI TI	UNIT			
						MIN	TYP	MAX		
		TI 500041			25°C		0.9	6		
		TLE20641			Full range			7.3		
V	Innut offert valte se	TI F0064A1	1		25°C		0.9	4	\/	
VIO	Input offset voltage	TLE2064AI			Full range			5.3	mV	
		TLE2064BI	1		25°C		0.7	2		
		TLL2004BI	V _{IC} = 0,	$R_S = 50 \Omega$	Full range			3.3		
αΛΙΟ	Temperature coefficient of input offs	set voltage	VIC = 0,	118 = 30 22	25°C		6		μV/°C	
	Input offset voltage long-term drift (see Note 4)				Full range		0.04		μV/mo
IIO	Input offset current				25°C		2		pА	
10	input onset current		<u> </u>		Full range			3	nA	
I _{IB}	Input bias current				25°C		4		pА	
пр	input sias dancin				Full range			5	nA	
					0500	-11	-12		.,	
					25°C	to 13	to 16		V	
VICR	Common-mode input voltage range)				-11	10			
					Full range	to			V	
					J	13				
			R _L = 10 kΩ		25°C	13.2	13.7			
V _{OM+}	Maximum positive peak output volta	ane swinn	KL = 10 K22		Full range	13			V	
VOM+	waxiinum positive peak output void	age swing	R _L = 600 Ω		25°C	12.5	13.2		V	
			TKL = 000 32		Full range	12				
			R _L = 10 kΩ		25°C	-13.2	-13.7			
V _{OM} _	Maximum negative peak output vol	tage swing	11 - 10 122		Full range	-13			V	
VOIVI-	Maximum negative peak eatput ver	ago ownig	R _L = 600 Ω		25°C	-12.5	-13		·	
					Full range	-12				
			$V_0 = \pm 10 \text{ V},$	R _L = 10 kΩ	25°C	30	230			
					Full range	20				
AVD	Large-signal differential voltage am	plification	$V_0 = 0 \text{ to } 8 \text{ V},$	R _L = 600 Ω	25°C	25	100		V/mV	
140					Full range	10			.,	
			$V_0 = 0 \text{ to } -8 \text{ V},$	$R_1 = 600 \Omega$	25°C	3	25			
			,		Full range	1	1010		-	
ri	Input resistance				25°C		1012		Ω	
ci	Input capacitance				25°C		4		pF	
z _O	Open-loop output impedance		IO = 0		25°C		560		Ω	
CMRR	Common-mode rejection ratio		$V_{IC} = V_{ICR}min$	$R_S = 50 \Omega$	25°C	72	90		dB	
	•				Full range	65				
ksvr	Supply-voltage rejection ratio (ΔV _C	C± /ΔVIO)	$V_{CC\pm} = \pm 5 \text{ V to } = \pm 5 \text{ V}$	±15 V,	25°C	75	93		dB	
	ne is = 40°C to 85°C		$R_S = 50 \Omega$		Full range	65				

[†] Full range is – 40°C to 85°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150$ °C extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.



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TLE2064I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$ (unless otherwise noted) (continued)

PARAMETER		TEST CONDITIONS		T _A †	T TI TI	.I	UNIT	
					MIN	TYP	MAX	
loo	Supply ourrent (four amplifiers)		No load	25°C		1.25	1.4	mA
ICC	Supply current (four amplifiers)	$V_{O} = 0$		Full range			1.5	MA
ΔICC	Supply-current change over operating temperature range (four amplifiers)	VO = 0,	No load	Full range		148		μΑ
V _{O1} /V _{O2}	Crosstalk attenuation	$A_{VD} = 1000,$	f = 1 kHz	25°C		120		dB

[†] Full range is – 40°C to 85°C.

TLE2064I operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm\,15~V$

	PARAMETER		ONDITIONS	T _A †	TLE2064I TLE2064AI TLE2064BI			UNIT
					MIN	TYP	MAX	
SR	Clay rate at unity gain (and Eigure 1)	D 10 kO	C: - 100 pF	25°C	2.6	3.4		Muo
SK	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF	Full range	2.1			V/μs
.,	Facilitate time to a cine welltone (and Figure 2)	f = 10 Hz,	$R_S = 20 \Omega$,	0500		70	100	->11/1 1-
Vn	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	$R_S = 20 \Omega$	25°C		40	60	nV/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to	10 Hz	25°C		1.1		μV
In	Equivalent input noise current	f = 1 kHz		25°C		1.1		fA/√Hz
THD	Total harmonic distortion	$A_{VD} = 2$, $R_L = 10 \text{ k}\Omega$	f = 10 kHz, V _O (PP) = 2 V,	25°C	0	.025%		
_		$R_L = 10 \text{ k}\Omega$	C _L = 100 pF			2		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 600 \Omega$	C _L = 100 pF	25°C		1.5		MHz
	0	ε = 0.1%				5		
t _S	Settling time	ε = 0.01%		25°C		10		μs
Вом	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ	25°C		40		kHz
_	Phase marrie of units main (and Figure 2)	$R_L = 10 \text{ k}\Omega$	C _L = 100 pF	0500		60°		
Φm	Phase margin at unity gain (see Figure 3)	$R_L = 600 \Omega$	C _L = 100 pF	25°C		70°		

[†] Full range is – 40°C to 85°C.

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TLE2064M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

	PARAMETER		TEST COND	OITIONS	T _A †	ΤL	LE2064I .E2064A .E2064B	M	UNIT
						MIN	TYP	MAX	
		TLE2064M			25°C		1.2	7	
		TLE2004IVI			Full range			9	
V. 0	Input offeet voltege	TLE2064AM			25°C		1.2	6	mV
VIO	Input offset voltage	TLE2004AIVI]		Full range			8	IIIV
		TLE2064BM			25°C		0.8	3.5	
		TLL2004DIVI	V _{IC} = 0,	$R_S = 50 \Omega$	Full range			5.5	
αVIO	Temperature coefficient of input of	offset voltage	VIC = 0,	NS = 30 22	25°C		6		μV/°C
	Input offset voltage long-term drif	t (see Note 4)			Full range		0.04		μV/mo
lio	Input offset current				25°C		1		pА
IIO	input onset current				Full range			15	nA
lin	Input bias current				25°C		3		pА
ΙΒ	input bias current				Full range			30	nA
				25°C	-1.6 to 4	-2 to 6		V	
VICR	VICR Common-mode input voltage range				Full range	-1.6 to 4			V
					25°C	3.5	3.7		
			$R_L = 10 \text{ k}\Omega$		Full range	3			
l.,	Maximum positive peak output	FK and J			25°C	2.5	3.6		.,
V _{OM+}	voltage swing	packages	$R_L = 600 \Omega$		Full range	2			V
		D and N	D 400.0		25°C	2.5	3.1		
		packages	$R_L = 100 \Omega$		Full range	2			
			D 4010		25°C	-3.5	-3.9		
			$R_L = 10 \text{ k}\Omega$		Full range	-3			
\/	Maximum negative peak output	FK and J	D: 000.0		25°C	-2.5	-3.5		.,
VOM-	voltage swing	packages	$R_L = 600 \Omega$		Full range	-2			V
		D and N	P: - 100 O		25°C	-2.5	-2.7		
		packages	R _L = 100 Ω		Full range	-2			
			\/o - +2.9.\/	D 10 kO	25°C	15	80		
		_	$V_0 = \pm 2.8 \text{ V},$	$R_L = 10 \text{ k}\Omega$	Full range	2			
A.	Large-signal differential voltage	FK and J	J	_	25°C	1	65		V/mV
AVD	amplification				Full range	0.5			V/IIIV
	' '	packages			25°C	1	16		
				IVE = 000 73	Full range	0.5			

[†] Full range is – 55°C to 125°C.

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150$ °C extrapolated to $T_A = 25$ °C using the Arrhenius equation and assuming an activation energy of 0.96 eV.



TLE206x, TLE206xA, TLE206xB EXCALIBUR JFET-INPUT HIGH-OUTPUT-DRIVE μPOWER OPERATIONAL AMPLIFIERS SLOS193B – FEBRUARY 1997 – REVISED MAY 2004

TLE2064M electrical characteristics at specified free-air temperature, V_{CC^\pm} = ± 5 V (unless otherwise noted) continued)

	PARAMETER		TEST CONDITIONS		T _A †	TLE2064M TLE2064AM TLE2064BM			UNIT
						MIN	TYP	MAX	
			V- 04-0V	D: 400.0	25°C	0.75	45		
A	Large-signal differential voltage	D and N	$V_0 = 0 \text{ to } 2 \text{ V},$	RL = 100 22	Full range	0.25			\//ma\/
AVD	amplification	packages	V 04- 0V	D 400.0	25°C	0.4	3		V/mV
			$V_0 = 0 \text{ to } -2 \text{ V},$	$R_L = 100 \Omega$	Full range	0.15			
rį	Input resistance				25°C		1012		Ω
Cį	Input capacitance				25°C		4		pF
z ₀	Open-loop output impedance		IO = 0		25°C		560		Ω
OMBB	0		V V min	D 500	25°C	65	82		.ID
CMRR	Common-mode rejection ratio		$V_{IC} = V_{ICR}min$	$RS = 50 \Omega$	Full range	60			dB
	0 1 10 11 11 11 11		$V_{CC\pm} = \pm 5 \text{ V to}$	±15 V,	25°C	75	93		15
ksvr	Supply-voltage rejection ratio (ΔV	CC∓ /∇/IO)	$R_S = 50 \Omega$		Full range	65			dB
	0 1				25°C		1.12	1.3	
lcc	Supply current (four amplifiers)		Vo = 0	No load	Full range			1.3	mA
ΔICC	Supply-current change over operatemperature range (four amplifier		$V_0 = 0,$	NO IUau	Full range		144		μΑ
V _{O1} /V _{O2}	Crosstalk attenuation		$A_{VD} = 1000,$	f = 1 kHz	25°C		120		dB

[†] Full range is –55°C to 125°C.

TLE2064M operating characteristics, $V_{CC\pm}$ = ± 5 V, T_A = 25°C

	PARAMETER		TEST CONDITIONS			TLE2064M TLE2064AM TLE2064BM		
				MIN	TYP MAX			
SR	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$,	$C_L = 100 pF$		3.4		V/μs	
	For the plant input point relies weltons (see Figure 2)	f = 10 Hz,	$R_S = 20 \Omega$		59		->4/\	
V _n	Equivalent input noise voltage (see Figure 2)	f = 1 kHz	$R_S = 20 \Omega$		43		nV/√Hz	
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10) Hz		1.1		μV	
In	Equivalent input noise current	f = 1 kHz			1		fA/√Hz	
THD	Total harmonic distortion	$A_{VD} = 2,$ $V_{O(PP)} = 2 V,$	f = 10 kHz, $R_L = 10 \text{ k}\Omega$		0.025%			
	11: 11: 1: 11: 11: 11: 11: 11: 11: 11:	$R_L = 10 \text{ k}\Omega$	C _L = 100 pF		1.8			
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF		1.3		MHz	
	0.00	ε = 0.1%			5			
t _S	Settling time	ε = 0.01%			10		μs	
Вом	Maximum output-swing bandwidth	A _{VD} = 1,	R _L = 10 kΩ		140		kHz	
4	Dhoop margin at units gain (and Figure 2)	$R_L = 10 \text{ k}\Omega$	C _L = 100 pF		58°			
Φm	Phase margin at unity gain (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF		75°			

TLE206xA, TLE206xB EXCALIBUR JFET-INPUT HIGH-OUTPUT-DRIVE µPOWER OPERATIONAL AMPLIFIERS

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TLE2064M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted)

	PARAMETER		TEST CON	DITIONS	T _A †	TLI	.E2064M E2064AN E2064BN		UNIT
						MIN	TYP	MAX	
		TLE2064M			25°C		0.9	6	
		I LE2064IVI			Full range			8	
\/. c	Input offset voltage	TLE2064AM]		25°C		0.9	4	mV
VIO	input onset voitage	TLL2004AW]		Full range			6	1117
		TLE2064BM			25°C		0.7	2	
		TEEZOOTBIVI]		Full range			4	
αVIO	Temperature coefficient of input	offset voltage	$V_{IC} = 0$,	$R_S = 50 \Omega$	25°C		6		μV/°C
	Input offset voltage long-term dr (see Note 4)	ift			Full range		0.04		μV/mo
l. o	Input offset current]		25°C		2		pА
lio	input onset current				Full range			20	nA
lin	Input bias current]		25°C		4		рА
IΒ	input bias current				Full range			40	nA
					25°C	-11 to 13	-12 to 16		V
VICR	Common-mode input voltage ra	nge			Full range	-11 to 13			V
			D 4010		25°C	13	13.7		
.,	Manager and the second		$R_L = 10 \text{ k}\Omega$		Full range	12.5			١ ,,
V _{OM+}	Maximum positive peak output v	ottage swing	D 600.0		25°C	12.5	13.2		V
			$R_L = 600 \Omega$		Full range	12			
			D. 10 kg		25°C	-13	-13.7		
V	Maximum pagativa pagk autput	voltogo owing	$R_L = 10 \text{ k}\Omega$		Full range	-12.5			V
VOM-	Maximum negative peak output	voltage swing	B 600 O		25°C	-13	-13		V
			R _L = 600 Ω		Full range	-12.5			
			$V_0 = \pm 10 \text{ V},$	R _L = 10 kΩ	25°C	30	230		
			VO = ± 10 V,	T(_ = 10 K22	Full range	20			
AVO	Large-signal differential voltage	amplification	$V_0 = 0 \text{ to } 8 \text{ V},$	R _L = 600 Ω	25°C	25	100		V/mV
AVD	Large-signal differential voltage	amplification	VO = 0 10 0 V,	11 = 000 22	Full range	7			V/111V
			$V_0 = 0 \text{ to } -8 \text{ V},$	R _L = 600 O	25°C	3	25		
			.U=010 0 V,	. ·L = 000 22	Full range	1			
rį	Input resistance				25°C		10 ¹²		Ω
cį	Input capacitance				25°C		4		pF
z _o	Open-loop output impedance		IO = 0		25°C		560		Ω
CMRR	Common-mode rejection ratio		V _{IC} = V _{ICR} min, Rs	Re = 50 O	25°C	72	90		dB
J			· IC · ICK······		Full range	65			
ksvr	Supply-voltage rejection ratio (∆	Vcc+/ΔV10)	$V_{CC\pm} = \pm 5 \text{ V to}$	±15 V,	25°C	75	93		dB
JVK	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	00± · = · 10/	$R_S = 50 \Omega$		Full range	65			

[†]Full range is – 55°C to 125°C.



NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150^{\circ}$ C extrapolated to $T_A = 25^{\circ}$ C using the Arrhenius equation and assuming an activation energy of 0.96 eV.

TLE206x, TLE206xA, TLE206xB EXCALIBUR JFET-INPUT HIGH-OUTPUT-DRIVE μPOWER OPERATIONAL AMPLIFIERS SLOS193B – FEBRUARY 1997 – REVISED MAY 2004

TLE2064M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted) (continued)

PARAMETER		TEST CONDITIONS		T _A †	TI TL TL	M	UNIT	
					MIN	TYP	MAX	
la a	Supply current (four amplifiers)			25°C		1.25	1.4	mΛ
Icc		$V_O = 0$, No load		Full range			1.5	mA
ΔICC	Supply-current change over operating temperature range (four amplifiers)	VO = 0,	No load	Full range		194		μΑ
V _{O1} /V _{O2}	Crosstalk attenuation	$A_{VD} = 1000,$	f = 1 kHz	25°C		120		dB

[†] Full range is – 55°C to 125°C.

TLE2064M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

	PARAMETER		IDITIONS	T _A †	TLE2064M TLE2064AM TLE2064BM			UNIT
					MIN	TYP	MAX	
CD	Claurate et units main (ann Figure 4)	D: 40 kg	C: 400 = E	25°C	2.6	3.4		\//
SR	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$	C _L = 100 pF	Full range	1.8			V/μs
, ,	Facilitate time to a cine college (and Figure 0)	f = 10 Hz,	$R_S = 20 \Omega$	0500		70		->4/1
V _n	Equivalent input noise voltage (see Figure 2)	f = 1 kHz,	$R_S = 20 \Omega$	25°C		40		nV/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10	Hz	25°C		1.1		μV
In	Equivalent input noise current	f = 1 kHz		25°C		1.1		fA/√Hz
THD	Total harmonic distortion	$A_{VD} = 2$, $V_{O(PP)} = 2 V$,	f = 10 kHz, $R_L = 10 \text{ k}\Omega$	25°C	0	.025%		
_		$R_L = 10 \text{ k}\Omega$,	C _L = 100 pF			2		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF	25°C		1.5		MHz
	0.00	ε = 0.1%		0500		5		
t _S	Settling time	ε = 0.01%		25°C		10		μs
ВОМ	Maximum output-swing bandwidth	$A_{VD} = 1$,	R _L = 10 kΩ	25°C		40		kHz
4	Phone margin at unity gain (one Figure 2)	$R_L = 10 \text{ k}\Omega$	C _L = 100 pF	2500		60°		
Φm	Phase margin at unity gain (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF	25°C		70°		

[†] Full range is – 55°C to 125°C.

TLE206xA, TLE206xB EXCALIBUR JFET-INPUT HIGH-OUTPUT-DRIVE LIPOWER OPERATIONAL AMPLIFIERS

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TLE2064Y electrical characteristics at $V_{CC\pm}$ = ± 15 V, T_A = 25°C (unless otherwise noted)

	DADAMETED	TEST SON	DITIONS	Т	LE2064\	1	
	PARAMETER	TEST CONI	SNOTTIC	MIN	TYP	MAX	UNIT
VIO	Input offset voltage				0.9	6	mV
∞VIO	Input offset voltage long-term drift (see Note 4)],, ,	D 50.0		0.04		μV/mo
I _{IO}	Input offset current	$V_{IC} = 0,$	$R_S = 50 \Omega$		2		рΑ
I _{IB}	Input bias current				4		pA
VICR	Common-mode input voltage range			-11 to 13	-12 to 16		٧
	Markey and the second section of the second section	R _L = 10 kΩ		13.2	13.7		
V _{OM+}	Maximum positive peak output voltage swing	R _L = 600 Ω		12.5	13.2		V
V	Marian an acative medical autout valtage avoice	R _L = 10 kΩ		-13.2	-13.7		V
VOM-	Maximum negative peak output voltage swing	R _L = 600 Ω		12.5	13		V
		$V_0 = \pm 10 \text{ V},$	$R_L = 10 \text{ k}\Omega$	30	230		
AVD	Large-signal differential voltage amplification	$V_0 = 0 \text{ to } 8 \text{ V},$	$R_L = 600 \Omega$	25	100		V/mV
		$V_0 = 0 \text{ to } -8 \text{ V},$	$R_L = 600 \Omega$	3	25		
rį	Input resistance				1012		Ω
cį	Input capacitance				4		pF
z ₀	Open-loop output impedance	IO = 0			560		Ω
CMRR	Common-mode rejection ratio	$R_S = 50 \Omega$, $V_{IC} = V_{ICR}min$,		72	90		dB
ksvR	Supply-voltage rejection ratio (ΔV _{CC±} /ΔV _{IO})	$V_{CC\pm} = \pm 5 \text{ V to } = 100 \text{ M}$ RS = 50 Ω	±15 V,	75	93		dB
Icc	Supply current	$V_{O} = 0$,	No load		1.25	1.4	mA
V _{O1} /V _{O2}	Crosstalk attenuation	$A_{VD} = 1000,$	f = 1 kHz		120		dB

NOTE 4: Typical values are based on the input offset voltage shift observed through 168 hours of operating life test at $T_A = 150^{\circ}C$ extrapolated to $T_A = 25^{\circ}C$ using the Arrhenius equation and assuming an activation energy of 0.96 eV.

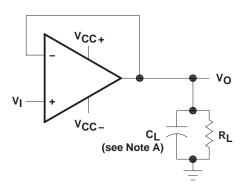
TLE2064Y operating characteristics at $V_{CC\pm}$ = ± 15 V, T_A = $25^{\circ}C$

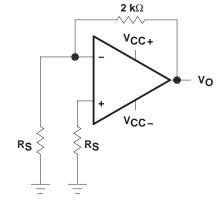
				TL	E2064Y		
	PARAMETER	TEST CON	IDITIONS	MIN	TYP	MAX	UNIT
SR	Slew rate at unity gain (see Figure 1)	$R_L = 10 \text{ k}\Omega$,	$C_L = 100 pF$	2.6	3.4		V/μs
\/	Equivalent input paige valtage (see Figure 2)	f = 10 Hz,	$R_S = 20 \Omega$		70		->///\/\-
Vn	Equivalent input noise voltage (see Figure 2)	f = 1 kHz	$R_S = 20 \Omega$		40		nV/√Hz
V _{N(PP)}	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 10	Hz		1.1		μV
In	Equivalent input noise current	f = 1 kHz			1.1		fA/√Hz
THD	Total harmonic distortion	$A_{VD} = 2$, $V_{O(PP)} = 2 V$,	f = 10 kHz, $R_L = 10 \text{ k}\Omega$		0.025%		
	H '	$R_L = 10 \text{ k}\Omega$	$C_L = 100 pF$		2		
B ₁	Unity-gain bandwidth (see Figure 3)	$R_L = 600 \Omega$,	$C_L = 100 pF$		1.5		MHz
	Couling time	ε = 0.1%			5		
t _S	Settling time	ε = 0.01%			10		μs
ВОМ	Maximum output-swing bandwidth	$A_{VD} = 1$,	$R_L = 10 \text{ k}\Omega$		40		kHz
4	Phone margin of unity goin (one Figure 2)	$R_L = 10 \text{ k}\Omega$	$C_L = 100 pF$		60°		
Φm	Phase margin at unity gain (see Figure 3)	$R_L = 600 \Omega$,	C _L = 100 pF		70°		



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PARAMETER MEASUREMENT INFORMATION

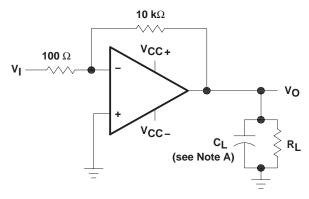




NOTE A: C_L includes fixture capacitance.

Figure 1. Slew-Rate Test Circuit

Figure 2. Noise-Voltage Test Circuit



NOTE A: C_L includes fixture capacitance.

Figure 3. Unity-Gain Bandwidth and Phase-Margin Test Circuit

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 TLE206x, TLE2064xA, and TLE206xB, accurate measurement of the bias current 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 into the socket and a second test that measures both the socket leakage and the device input bias current is performed. The two measurements are then subtracted algebraically to determine the bias current of the device.

TYPICAL CHARACTERISTICS

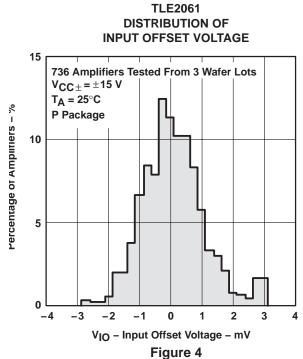
Table of Graphs

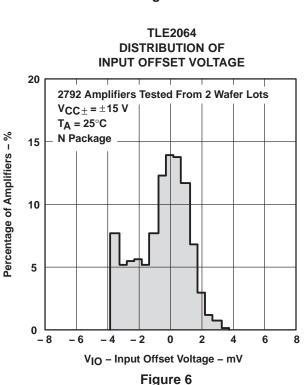
			FIGURE
V _{IO}	Input offset voltage	Distribution	4, 5, 6
I _{IB}	Input bias current	vs Common-mode input voltage vs Free-air temperature	7 8
lio	Input offset current	vs Free-air temperature	8
VICR	Common-mode input voltage	vs Free-air temperature	9
V _{OM}	Maximum peak output voltage	vs Output current vs Supply voltage	10, 11 12, 13, 14
V _{O(PP)}	Maximum peak-to-peak output voltage	vs Frequency vs Load resistance	15, 16 17
AVD	Large-signal differential voltage amplification	vs Frequency vs Free-air temperature	18 19
IOS	Short-circuit output current	vs Elasped time vs Free-air temperature	20 21
z _o	Output impedance	vs Frequency	22, 23
CMRR	Common-mode rejection ratio	vs Frequency	24
ICC	Supply current	vs Supply voltage vs Free-air temperature	25, 26, 27 28, 29, 30
	Voltage-follower small-signal pulse response	vs Time	31, 32
	Voltage-follower large-signal pulse response	vs Time	33, 34
	Noise voltage (referred to input)	0.1 to 10 Hz	35
Vn	Equivalent input noise voltage	vs Frequency	36
THD	Total harmonic distortion	vs Frequency	37, 38
B ₁	Unity-gain bandwidth	vs Supply voltage vs Free-air temperature	39 40
φm	Phase margin	vs Supply voltage vs Load capacitance vs Free-air temperature	41 42 43
	Phase shift	vs Frequency	18

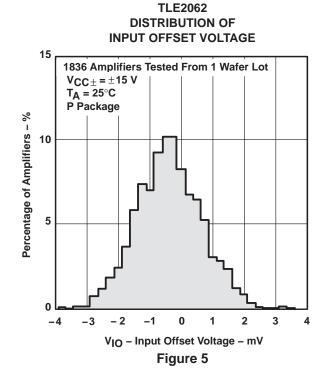


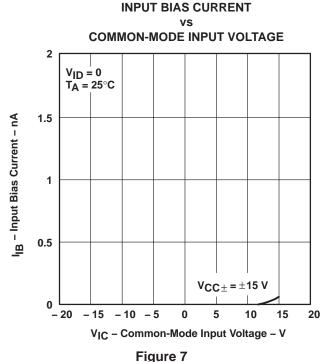
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TYPICAL CHARACTERISTICS



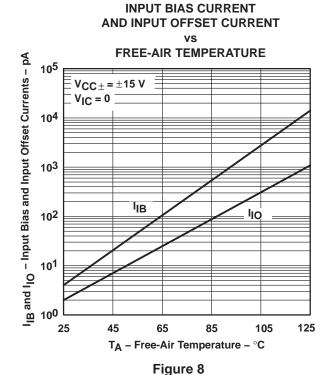


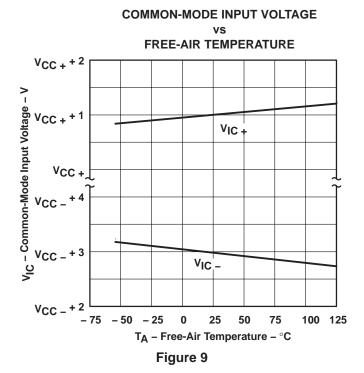




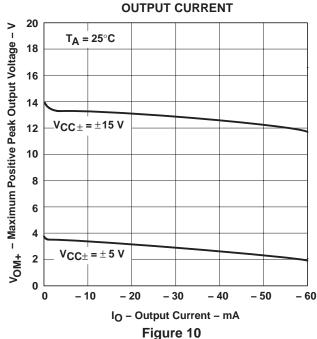


TYPICAL CHARACTERISTICS[†]

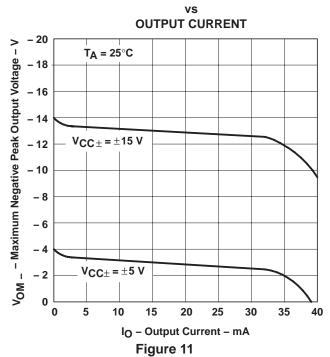




MAXIMUM POSITIVE PEAK OUTPUT VOLTAGE



MAXIMUM NEGATIVE PEAK OUTPUT VOLTAGE



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



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TYPICAL CHARACTERISTICS

MAXIMUM PEAK OUTPUT VOLTAGE SUPPLY VOLTAGE 20 $R_I = 10 \text{ k}\Omega$ V_{OM} - Maximum Peak Output Voltage - V $T_A = 25^{\circ}C$ 15 V_{OM} + 10 5 0 - 5 - 10 V_{OM} -- 15 - 20 2 10 12 20

Figure 12

 $|V_{CC\pm}|$ – Supply Voltage – V

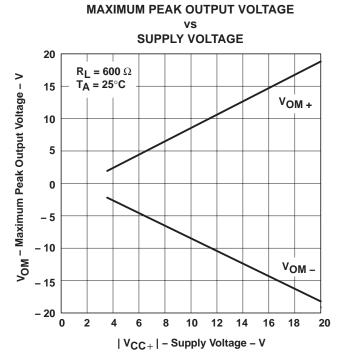
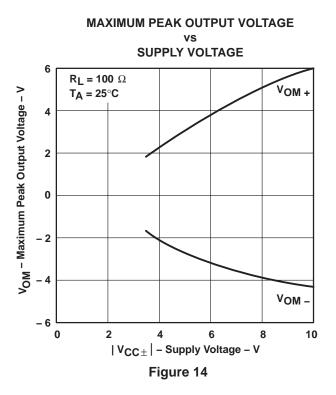
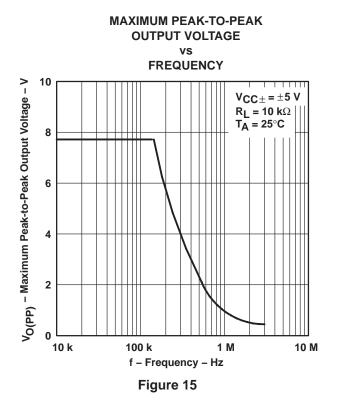
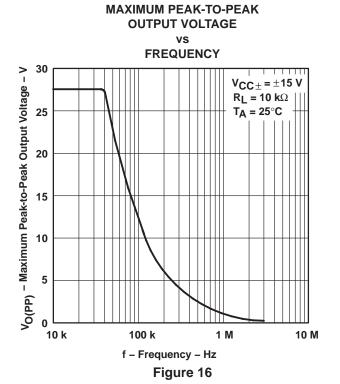


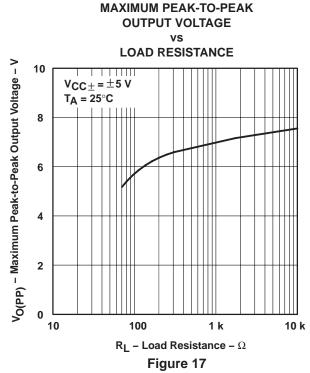
Figure 13



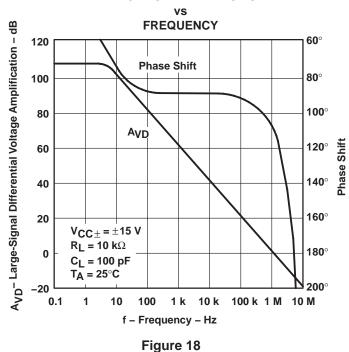


TYPICAL CHARACTERISTICS[†]

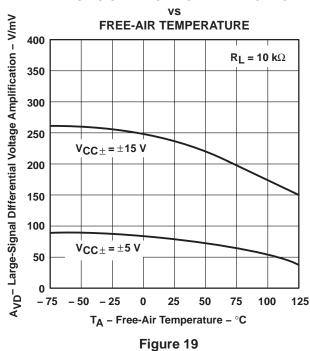




LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT



LARGE-SIGNAL VOLTAGE AMPLIFICATION



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



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TYPICAL CHARACTERISTICS[†]

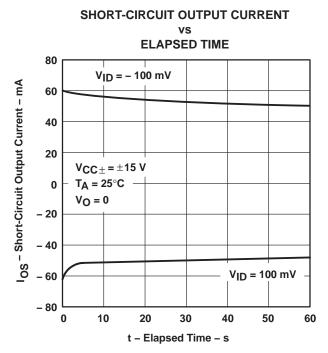


Figure 20

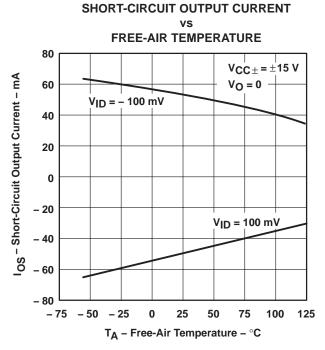
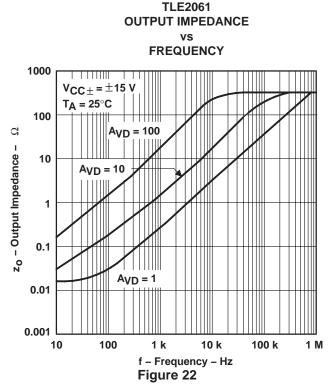
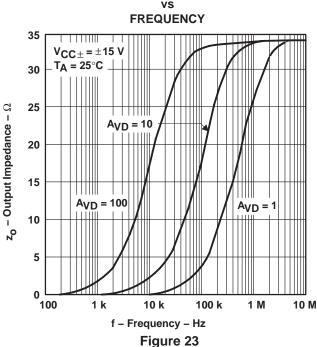


Figure 21

TLE2062 AND TLE2064

OUTPUT IMPEDANCE

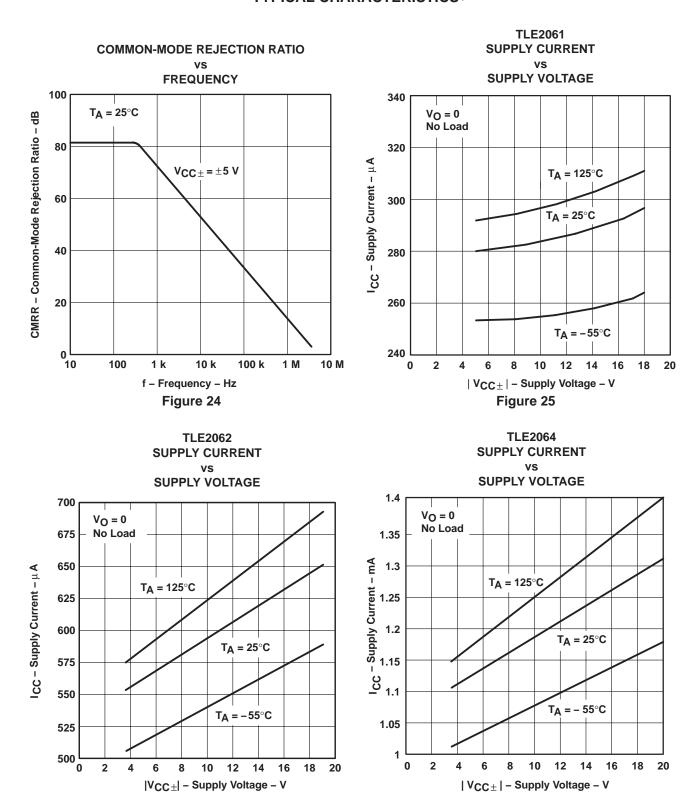




[†] Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.



TYPICAL CHARACTERISTICS[†]



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

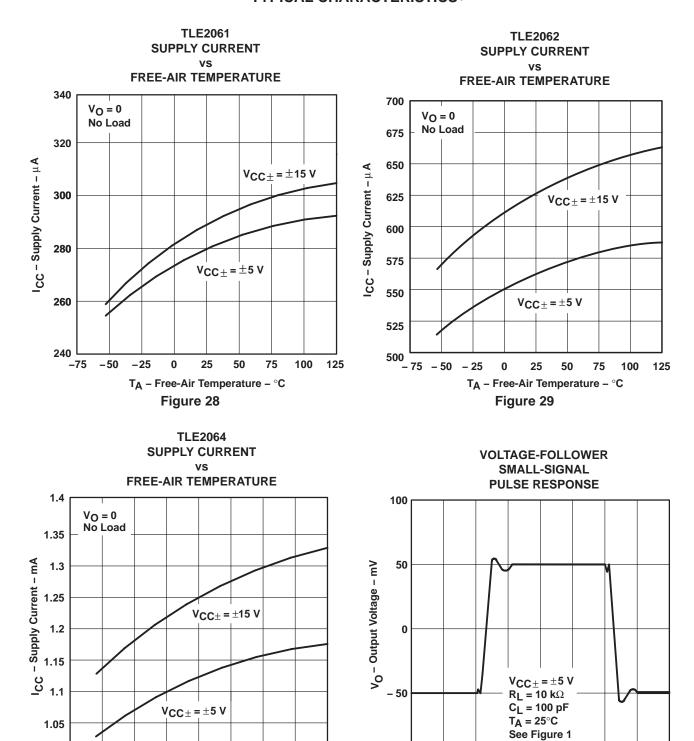
Figure 26



Figure 27

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TYPICAL CHARACTERISTICS[†]



125

- 50

- 25

- 75

25

T_A – Free-Air Temperature – °C Figure 30

50

75

100



- 100

0

0.5

1

t - Time - μs

Figure 31

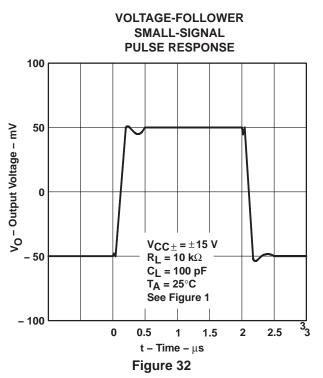
1.5

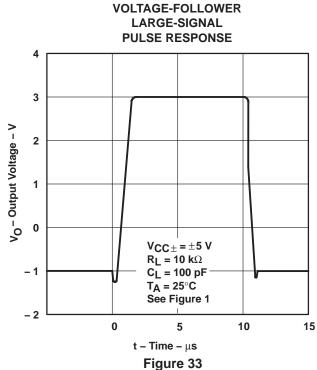
2

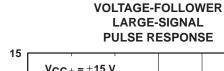
2.5

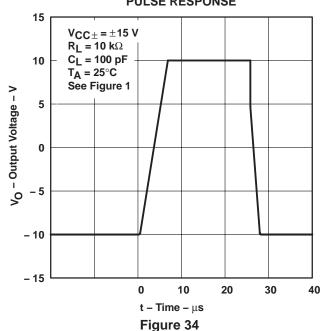
[†] Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

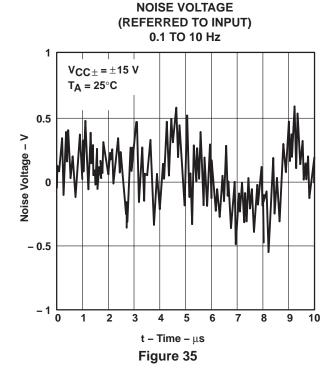
TYPICAL CHARACTERISTICS





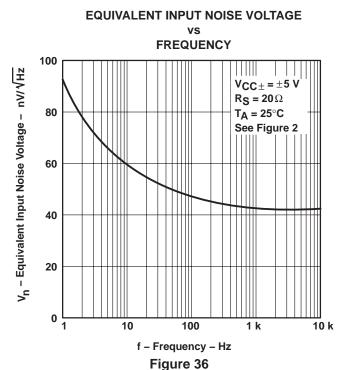


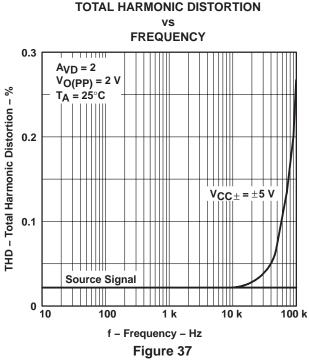


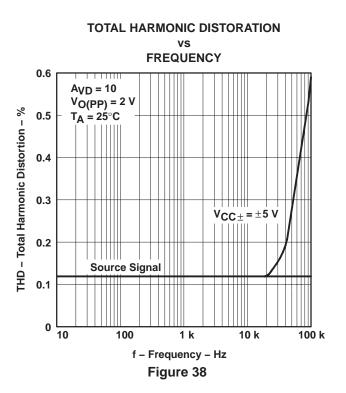


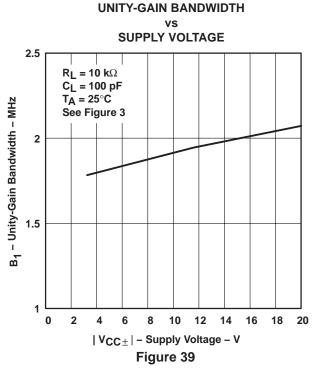
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TYPICAL CHARACTERISTICS

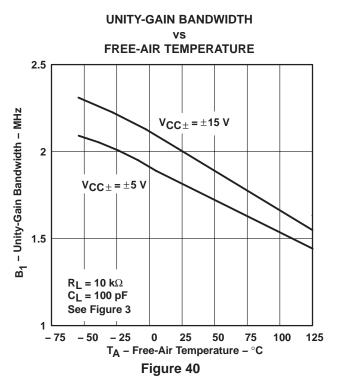


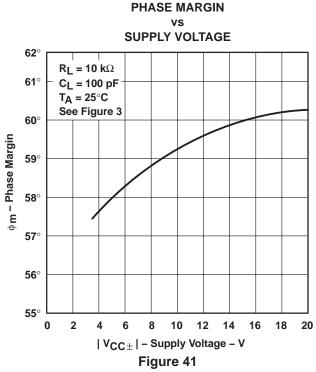


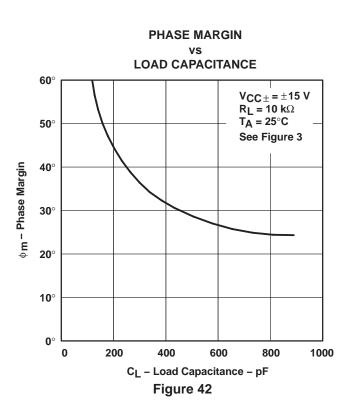


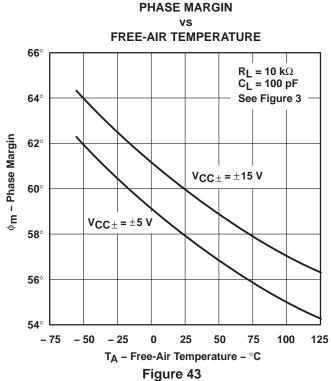


TYPICAL CHARACTERISTICS[†]









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



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APPLICATION INFORMATION

input characteristics

The TLE206xA, TLE206xA, and TLE206xB 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 TLE206x, TLE206xA, and TLE206xB 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 44). These guards should be driven from a low-impedance source at the same voltage level as the common-mode input.

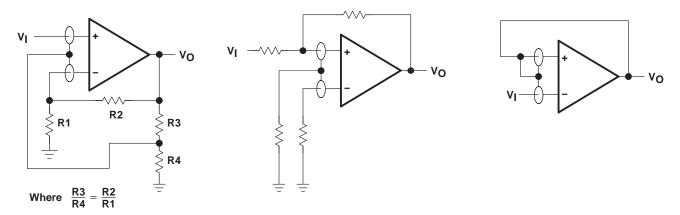


Figure 44. Use of Guard Rings

TLE2061 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 45 can be connected as shown if the feature is desired. When external nulling is not needed, the null pins may be left unconnected.

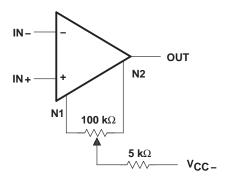


Figure 45. Input Offset Voltage Nulling

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APPLICATION INFORMATION

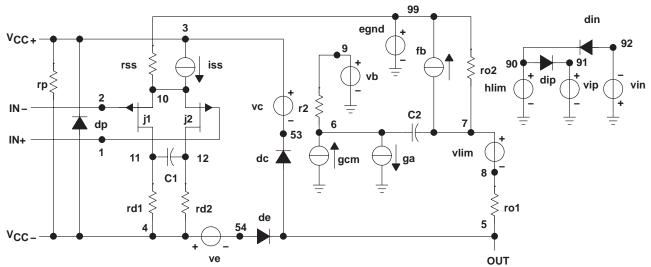
macromodel information

Macromodel information provided was derived using Microsim Parts™, the model generation software used with Microsim PSpice™. The Boyle macromodel (see Note 5) and the subcircuit in Figure 46 were generated using the TLE206x typical electrical and operating characteristics at 25°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 5: 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).



```
.subckt TLE2062 1 2 3 4 5
                                                         rd1
                                                                 11 5.305E3
 c1
      11 12 1.457E-12
                                                         rd2
                                                                 12 5.305E3
                                                               4
 с2
          7 15.00E-12
                                                         r01
                                                               8
                                                                  5
                                                                    280
          53 dx
 dc
       5
                                                         r02
                                                               7
                                                                 99 280
 de
      54
           5
             dx
                                                               3
                                                                  4 113.2E3
                                                         rp
 dlp 90
          91 dx
                                                              10
                                                                 99
                                                         rss
                                                                    3.922E6
 dln 92
          90 dx
                                                                  0 dc 0
                                                         vb
                                                              9
 dp
       4
          3
             dx
                                                              3
                                                                 53 dc 2
                                                         VC
          0 poly (2) (3,0) (4,0) 0 .5 .5
 egnd 99
                                                         ve
                                                              54
                                                                  4 dc 2
       7 99 poly (5) vb vc ve vlp
 fb
                                                              7
                                                                  8 dc 0
                                                         vlim
  vln 0 4.357E6 -4E6 4E6 4E6 -4E6
                                                              91 0 dc 50
                                                         vlp
          0 11 12 188.5E-6
 ga
       6
                                                         vln
                                                              0
                                                                 92 dc 50
 gcm
       Ω
          6 10 99 3.352E-9
                                                       .model dx D(Is=800.0E-18)
 iss
       3
          10 dc 51.00E-6
                                                                  PJF(Is=2.000E-12 Beta = 423E-6)
                                                       .model jx
          0 vlim 1k
 hlim 90
                                                       + Vto = -1)
          2 10 jx
 j1
    11
                                                       .ends
      12
           1 10 jx
 ί2
           9 100.0E3
 r2
       6
```

Figure 46. Boyle Macromodel and Subcircuit

PSpice and Parts are trademarks of MicroSim Corporation.





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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9080701M2A	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 9080701M2A TLE2061MFKB	Samples
5962-9080701MPA	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9080701MPA TLE2061M	Samples
5962-9080702Q2A	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 9080702Q2A TLE2061 AMFKB	Samples
5962-9080702QPA	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9080702QPA TLE2061AM	Samples
5962-9080703QPA	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9080703QPA TLE2061BM	Samples
5962-9080801MPA	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9080801MPA TLE2062M	Samples
5962-9080803QPA	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9080803QPA TLE2062BM	Samples
5962-9080901M2A	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 9080901M2A TLE2064 MFKB	Samples
5962-9080901MCA	ACTIVE	CDIP	J	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9080901MC A TLE2064MJB	Samples
5962-9080902M2A	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 9080902M2A TLE2064A MFKB	Samples
5962-9080902MDA	ACTIVE	CFP	W	14	25	Non-RoHS & Non-Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9080902MD A TLE2064AMWB	Samples
5962-9080903Q2A	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 9080903Q2A TLE2064 BMFKB	Samples





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Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9080903QCA	ACTIVE	CDIP	J	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9080903QC A TLE2064BMJB	Samples
TLE2061ACD	OBSOLETE	SOIC	D	8		TBD	Call TI	Call TI	0 to 70	2061AC	
TLE2061ACP	ACTIVE	PDIP	Р	8	50	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	TLE2061AC	Samples
TLE2061ACPE4	ACTIVE	PDIP	Р	8	50	TBD	Call TI	Call TI	0 to 70		Samples
TLE2061AID	OBSOLETE	SOIC	D	8		TBD	Call TI	Call TI	-40 to 85	2061AI	
TLE2061AIP	ACTIVE	PDIP	Р	8	50	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	TLE2061AI	Samples
TLE2061AMFKB	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 9080702Q2A TLE2061 AMFKB	Samples
TLE2061AMJGB	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9080702QPA TLE2061AM	Samples
TLE2061BMJGB	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9080703QPA TLE2061BM	Samples
TLE2061CD	OBSOLETE	SOIC	D	8		TBD	Call TI	Call TI	0 to 70	2061C	
TLE2061CDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	2061C	Samples
TLE2061CDRG4	ACTIVE	SOIC	D	8	2500	TBD	Call TI	Call TI	0 to 70		Samples
TLE2061CP	ACTIVE	PDIP	Р	8	50	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	TLE2061CP	Samples
TLE2061ID	OBSOLETE	SOIC	D	8		TBD	Call TI	Call TI	-40 to 85	20611	
TLE2061IDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	20611	Samples
TLE2061IP	ACTIVE	PDIP	Р	8	50	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	TLE2061IP	Samples
TLE2061MD	OBSOLETE	SOIC	D	8		TBD	Call TI	Call TI	-55 to 125	2061M	
TLE2061MDG4	OBSOLETE		D	8		TBD	Call TI	Call TI	-55 to 125	2061M	
TLE2061MFKB	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 9080701M2A TLE2061MFKB	Samples
TLE2061MJGB	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9080701MPA TLE2061M	Samples





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Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
TLE2062ACD	OBSOLETE	SOIC	D	8		TBD	Call TI	Call TI	0 to 70	2062AC	
TLE2062ACDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	2062AC	Samples
TLE2062AIDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	2062AI	Samples
TLE2062AMD	OBSOLETE	SOIC	D	8		TBD	Call TI	Call TI	-55 to 125	2062AM	
TLE2062AMDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	2062AM	Samples
TLE2062AMJG	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	TLE2062 AMJG	Samples
TLE2062BMJG	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	TLE2062 BMJG	Samples
TLE2062BMJGB	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9080803QPA TLE2062BM	Samples
TLE2062CD	OBSOLETE	SOIC	D	8		TBD	Call TI	Call TI	0 to 70	2062C	
TLE2062CDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	2062C	Samples
TLE2062CDRG4	ACTIVE	SOIC	D	8	2500	TBD	Call TI	Call TI	0 to 70		Samples
TLE2062CP	ACTIVE	PDIP	Р	8	50	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	TLE2062CP	Samples
TLE2062ID	OBSOLETE	SOIC	D	8		TBD	Call TI	Call TI	-40 to 85	20621	
TLE2062IDR	ACTIVE	SOIC	D	8	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	20621	Samples
TLE2062IP	ACTIVE	PDIP	Р	8	50	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	TLE2062IP	Samples
TLE2062MFKB	OBSOLETE	LCCC	FK	20		TBD	Call TI	Call TI		5962- 9080801M2A TLE2062MFKB	
TLE2062MJG	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	TLE2062MJG	Samples
TLE2062MJGB	ACTIVE	CDIP	JG	8	50	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9080801MPA TLE2062M	Samples
TLE2064ACD	OBSOLETE	SOIC	D	14		TBD	Call TI	Call TI	0 to 70	2064AC	
TLE2064ACDR	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM		2064AC	Samples
TLE2064ACN	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type		TLE2064ACN	Samples





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Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Sample
TLE2064AID	OBSOLETE	SOIC	D	14		TBD	Call TI	Call TI	-40 to 85	2064AI	
TLE2064AIDR	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM		2064AI	Samples
TLE2064AMD	OBSOLETE	SOIC	D	14		TBD	Call TI	Call TI	-55 to 125	2064AM	
TLE2064AMDG4	OBSOLETE	SOIC	D	14		TBD	Call TI	Call TI		2064AM	
TLE2064AMDR	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	2064AM	Samples
TLE2064AMDRG4	OBSOLETE	SOIC	D	14		TBD	Call TI	Call TI		2064AM	
TLE2064AMFKB	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 9080902M2A TLE2064A MFKB	Samples
TLE2064AMJ	ACTIVE	CDIP	J	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	TLE2064AMJ	Sample
TLE2064AMWB	ACTIVE	CFP	W	14	25	Non-RoHS & Non-Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9080902MD A TLE2064AMWB	Sample
TLE2064BMFKB	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 9080903Q2A TLE2064 BMFKB	Sample
TLE2064BMJ	ACTIVE	CDIP	J	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	TLE2064BMJ	Sample
TLE2064BMJB	ACTIVE	CDIP	J	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9080903QC A TLE2064BMJB	Sample
TLE2064CDR	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	TLE2064C	Sample
TLE2064CDRG4	ACTIVE	SOIC	D	14	2500	TBD	Call TI	Call TI	0 to 70		Sample
TLE2064CN	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	TLE2064CN	Sample
TLE2064CNE4	ACTIVE	PDIP	N	14	25	TBD	Call TI	Call TI	0 to 70		Sample
TLE2064ID	OBSOLETE	SOIC	D	14		TBD	Call TI	Call TI	-40 to 85	TLE2064I	
TLE2064IDR	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLE2064I	Sample



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Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
TLE2064IN	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	TLE2064IN	Samples
TLE2064INE4	ACTIVE	PDIP	N	14	25	TBD	Call TI	Call TI	-40 to 85		Samples
TLE2064MD	OBSOLETE	SOIC	D	14		TBD	Call TI	Call TI	-55 to 125	TLE2064M	
TLE2064MDG4	OBSOLETE	SOIC	D	14		TBD	Call TI	Call TI		T2064M	
TLE2064MDR	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	TLE2064M	Samples
TLE2064MFKB	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 9080901M2A TLE2064 MFKB	Samples
TLE2064MJ	ACTIVE	CDIP	J	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	TLE2064MJ	Samples
TLE2064MJB	ACTIVE	CDIP	J	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9080901MC A TLE2064MJB	Samples

⁽¹⁾ 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.

(2) RoHS: TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(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.

PACKAGE OPTION ADDENDUM

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(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF TLE2061, TLE2061A, TLE2061AM, TLE2061M, TLE2062A, TLE2062AM, TLE2062AM, TLE2062AM, TLE2064AM, TLE2064AM, TLE2064AM.

• Catalog: TLE2061A, TLE2061, TLE2062A, TLE2062, TLE2064A, TLE2064

Military: TLE2061M, TLE2061AM, TLE2062M, TLE2062AM, TLE2064AM

NOTE: Qualified Version Definitions:

- Catalog TI's standard catalog product
- Military QML certified for Military and Defense Applications



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TAPE AND REEL INFORMATION



TAPE DIMENSIONS + K0 - P1 - B0 W Cavity - A0 -

A0	Dimension designed to accommodate the component width
В0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing		SPQ	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TI F0004 ODD	0010			0500	(mm)	`			0.4	0.0	40.0	04
TLE2061CDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2061IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2062ACDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2062AIDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2062AMDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2062CDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2062IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2064ACDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
TLE2064AIDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
TLE2064AMDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
TLE2064CDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
TLE2064IDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
TLE2064MDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1



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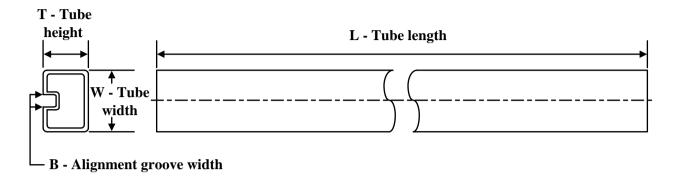
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLE2061CDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2061IDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2062ACDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2062AIDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2062AMDR	SOIC	D	8	2500	350.0	350.0	43.0
TLE2062CDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2062IDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2064ACDR	SOIC	D	14	2500	350.0	350.0	43.0
TLE2064AIDR	SOIC	D	14	2500	350.0	350.0	43.0
TLE2064AMDR	SOIC	D	14	2500	350.0	350.0	43.0
TLE2064CDR	SOIC	D	14	2500	350.0	350.0	43.0
TLE2064IDR	SOIC	D	14	2500	350.0	350.0	43.0
TLE2064MDR	SOIC	D	14	2500	350.0	350.0	43.0



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TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
5962-9080701M2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-9080702Q2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-9080901M2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-9080902M2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-9080902MDA	W	CFP	14	25	506.98	26.16	6220	NA
5962-9080903Q2A	FK	LCCC	20	55	506.98	12.06	2030	NA
TLE2061ACP	Р	PDIP	8	50	506	13.97	11230	4.32
TLE2061AIP	Р	PDIP	8	50	506	13.97	11230	4.32
TLE2061AMFKB	FK	LCCC	20	55	506.98	12.06	2030	NA
TLE2061CP	Р	PDIP	8	50	506	13.97	11230	4.32
TLE2061IP	Р	PDIP	8	50	506	13.97	11230	4.32
TLE2061MFKB	FK	LCCC	20	55	506.98	12.06	2030	NA
TLE2062CP	Р	PDIP	8	50	506	13.97	11230	4.32
TLE2062IP	Р	PDIP	8	50	506	13.97	11230	4.32
TLE2064ACN	N	PDIP	14	25	506	13.97	11230	4.32
TLE2064AMFKB	FK	LCCC	20	55	506.98	12.06	2030	NA
TLE2064AMWB	W	CFP	14	25	506.98	26.16	6220	NA
TLE2064BMFKB	FK	LCCC	20	55	506.98	12.06	2030	NA
TLE2064CN	N	PDIP	14	25	506	13.97	11230	4.32
TLE2064IN	N	PDIP	14	25	506	13.97	11230	4.32
TLE2064MFKB	FK	LCCC	20	55	506.98	12.06	2030	NA

CERAMIC DUAL IN-LINE PACKAGE



- 1. All linear dimensions are in millimeters. Any 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 package can be hermetically sealed with a ceramic lid using glass frit.

- 4. Index point is provided on cap for terminal identification. 5. Falls within MIL STD 1835 GDIP1-T8



CERAMIC DUAL IN-LINE PACKAGE



W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only.
- E. Falls within MIL STD 1835 GDFP1-F14



8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

This image is a representation of the package family, actual package may vary. Refer to the product data sheet for package details.



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CERAMIC DUAL IN LINE PACKAGE



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

4040083-5/G





CERAMIC DUAL IN LINE PACKAGE



- 1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
- 2. This drawing is subject to change without notice.
- 3. This package is hermitically sealed with a ceramic lid using glass frit.
- His package is remitted by sealed with a ceramic its using glass mit.
 Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
 Falls within MIL-STD-1835 and GDIP1-T14.



CERAMIC DUAL IN LINE PACKAGE



D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- 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 AB.



D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- 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



- 1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. 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 .006 [0.15] per side.
- 4. This dimension does not include interlead flash.
- 5. Reference JEDEC registration MS-012, variation AA.



SMALL OUTLINE INTEGRATED CIRCUIT



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.



SMALL OUTLINE INTEGRATED CIRCUIT



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



- 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



- 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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