TLE214x, TLE214xA EXCALIBUR LOW-NOISE HIGH-SPEED PRECISION OPERATIONAL AMPLIFIERS

SLOS183C - FEBRUARY 1997 - REVISED JUNE 2006

Low Noise

10 Hz . . . 15 nV/√Hz 1 kHz . . . 10.5 nV/√Hz

- 10000-pF Load Capability
- 20-mA Min Short-Circuit Output Current
- 27-V/us Min Slew Rate
- High Gain-Bandwidth Product . . . 5.9 MHz
- Low V_{IO} ... 500 μV Max at 25°C

- Single or Split Supply . . . 4 V to 44 V
- Fast Settling Time 340 ns to 0.1% 400 ns to 0.01%
- Saturation Recovery . . . 150 ns
- Large Output Swing
 V_{CC} + 0.1 V to V_{CC} 1 V

description

The TLE214x and TLE214xA devices are high-performance, internally compensated operational amplifiers built using Texas Instruments complementary bipolar Excalibur process. The TLE214xA is a tighter offset voltage grade of the TLE214x. Both are pin-compatible upgrades to standard industry products.

The design incorporates an input stage that simultaneously achieves low audio-band noise of $10.5 \text{ nV/}\sqrt{\text{Hz}}$ with a 10-Hz 1/f corner and symmetrical 40-V/ μ s slew rate typically with loads up to 800 pF. The resulting low distortion and high power bandwidth are important in high-fidelity audio applications. A fast settling time of 340 ns to 0.1% of a 10-V step with a 2-k Ω /100-pF load is useful in fast actuator/positioning drivers. Under similar test conditions, settling time to 0.01% is 400 ns.

The devices are stable with capacitive loads up to 10 nF, although the 6-MHz bandwidth decreases to 1.8 MHz at this high loading level. As such, the TLE214x and TLE214xA are useful for low-droop sample-and-holds and direct buffering of long cables, including 4-mA to 20-mA current loops.

The special design also exhibits an improved insensitivity to inherent integrated circuit component mismatches as is evidenced by a $500-\mu V$ maximum offset voltage and $1.7-\mu V/^{\circ}C$ typical drift. Minimum common-mode rejection ratio and supply-voltage rejection ratio are 85 dB and 90 dB, respectively.

Device performance is relatively independent of supply voltage over the $\pm 2\text{-V}$ to $\pm 22\text{-V}$ range. Inputs can operate between $V_{CC_-} - 0.3$ to $V_{CC_+} - 1.8$ V without inducing phase reversal, although excessive input current may flow out of each input exceeding the lower common-mode input range. The all-npn output stage provides a nearly rail-to-rail output swing of $V_{CC_-} - 0.1$ to $V_{CC_+} - 1$ V under light current-loading conditions. The device can sustain shorts to either supply since output current is internally limited, but care must be taken to ensure that maximum package power dissipation is not exceeded.

Both versions can also be used as comparators. Differential inputs of $V_{CC\pm}$ can be maintained without damage to the device. Open-loop propagation delay with TTL supply levels is typically 200 ns. This gives a good indication as to output stage saturation recovery when the device is driven beyond the limits of recommended output swing.

Both the TLE214x and TLE214xA are available in a wide variety of packages, including both the industry-standard 8-pin small-outline version and chip form for high-density system applications. The C-suffix devices are characterized for operation from 0° C to 70° C, I-suffix devices from -40° C to 105° C, and M-suffix devices over the full military temperature range of -55° C to 125° C.



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TLE2141 AVAILABLE OPTIONS

	PACKAGED DEVICES								
TA	V _{IO} max AT 25°C	SMALL OUT- LINE [†] (D)	CERAMIC DIP (JG)	PLASTIC DIP (P)					
0°C to 70°C	500 μV 900 μV	TLE2141ACD TLE2141CD	_	TLE2141ACP TLE2141CP					
-40°C to 105°C	500 μV 900 μV	TLE2141AID TLE2141ID	_	TLE2141AIP TLE2141IP					
-55°C to 125°C	500 μV 900 μV	— TLE2141MD	TLE2141AMJG TLE2141MJG	_ _					

The D packages are available taped and reeled. Add R suffix to device type (e.g., TLE2141ACDR).

TLE2142 AVAILABLE OPTIONS

			PACKA	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)
2004 7000	750 μV	TLE2142ACD	_	_	TLE2142ACP	_	_
0°C to 70°C	1200 μV	TLE2142CD	_	_	TLE2142CP	TLE2142CPWLE	_
4000 4 40500	750 μV	TLE2142AID	_	_	TLC2142AIP	_	_
-40°C to 105°C	1200 μV	TLE2142ID	_	_	TLC2142IP	_	_
5500 / 40500	750 μV	TLE2142AMD	TLE2142AMFK	TLE2142AMJG	_	_	TLE2142AMU
-55°C to 125°C	1200 μV	TLE2142MD	TLE2142MFK	TLE2142MJG	_	_	TLE2142MU

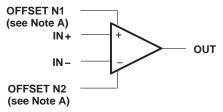
[†] The D packages are available taped and reeled. Add R suffix to device type (e.g., TLC2142ACDR).

TLE2144 AVAILABLE OPTIONS

	V _{IO} max AT 25°C	PACKAGED DEVICES								
TA		SMALL OUTLINE† (DW)	CHIP CARRIER (FK)	CERAMIC DIP (J)	PLASTIC DIP (N)					
0°C to 70°C	1.5 mV 2.4 mV	— TLE2144CDW			TLE2144ACN TLE2144CN					
-40°C to 105°C	1.5 mV 2.4 mV	— TLE2144IDW			TLE2144AIN TLE2144IN					
-55°C to 125°C	1.5 mV 2.5 mV	— TLE2144MDW	TLE2144AMFK TLE2144MFK	TLE2144AMJ TLE2144MJ						

[†] The DW packages are available taped and reeled. Add R suffix to device type (e.g., TLE2144CDWR).

symbol



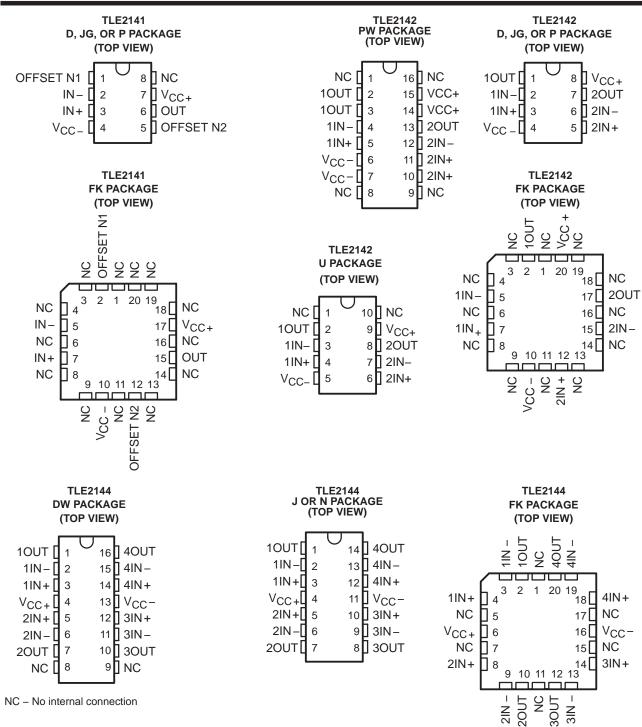
NOTES: A. OFFSET N1 AND OFFSET N2 are only availiable on the TLE2241x devices.



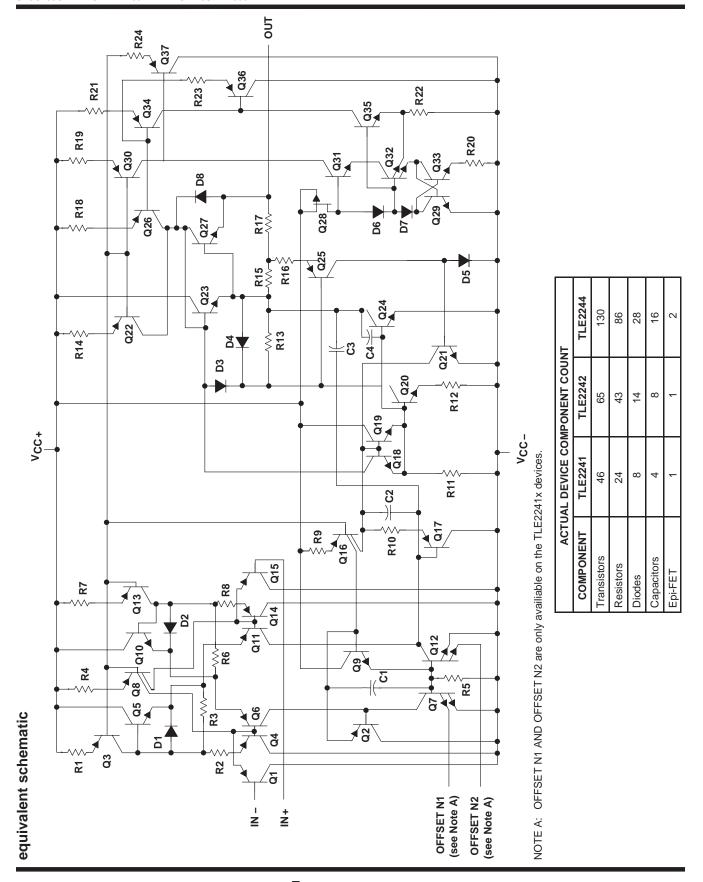
[‡] The PW packages are available left-ended taped and reeled. Add LE the suffix to device type (e.g., TLC2142CPWLE).

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

Supply voltage, V _{CC+} (see Note 1)		22 V
Input voltage range, V _I (any input)		
Input current, I _I (each input)		±1 mA
Output current, IO		±80 mA
Total current into V _{CC+}		
Total current out of V _{CC} - · · · · · · · · · · · · · · · · · · ·		
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):		
	DW package	
	N package	
	P package	
	PW package	
Package thermal impedance, θ_{JC} (see Notes 4 and 5):		
	J package	
	JG package	
	U package	
Operating free-air temperature range, T _A : 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	seconds: J or JG package	300°C

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

NOTES: 1. All voltage values, except differential voltages, are with respect to the midpoint between V_{CC+} and V_{CC+}.

- 2. Differential voltages are at IN+ with respect to IN –. Excessive current flows, if input, are brought below V_{CC-} 0.3 V.
- 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 SUFFI		I SUFFIX		M SUFFIX		LINUT
		MIN	MAX	MIN	MAX	MIN	MAX	UNIT
Supply voltage, V _{CC±}		±2	±22	±2	±22	22 ±2 ±22 \		V
Common made insulting Vis	V _{CC} = 5 V	0	2.9	0	2.7	0	2.7	
Common-mode input voltage, V _{IC}	V _{CC±} = ±15 V	-15	12.9	-15	12.7	-15	12.7	V
Operating free-air temperature, TA		0	70	-40	105	-55	125	°C



TLE2141C electrical characteristics at specified free-air temperature, $V_{CC} = 5 \text{ V}$ (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	- +	Τl	_E2141(TL	E2141A	С	LINUT
	FARAMETER	TEST CONDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
\/	lanut affact valtage		25°C		225	1400		200	1000	
VIO	Input offset voltage		Full range			1700			1300	μV
αΛΙΟ	Temperature coefficient of input offset voltage	$V_0 = 2.5 \text{ V}$ $R_S = 50 \Omega$,	Full range		1.7			1.7		μV/°C
	land of all and an armount	V _{IC} = 2.5 V	25°C		8	100		8	100	A
lio	Input offset current		Full range			150			150	nA
	Innut hing gurrant		25°C		-0.8	-2		-0.8	-2	^
IB	Input bias current		Full range			-2.1			-2.1	μΑ
Vion	Common-mode input	R _S = 50 Ω	25°C	0 to 3	-0.3 to 3.2		0 to 3	-0.3 to 3.2		٧
VICR	voltage range	NS = 30 22	Full range	0 to 2.9			0 to 2.9			V
		I _{OH} = –150 μA	25°C	3.9	4.1		3.9	4.1		
		ΙΟΗ = - 130 μΑ	Full range	3.8			3.8			
Vон	High-level output voltage	I _{OH} = -1.5 mA	25°C	3.8	4		3.8	4		V
VOH	r light-level output voltage	10H = - 1.5 IIIA	Full range	3.7			3.7			
		I _{OH} = –15 mA	25°C	3.2	3.7		3.2	3.7		
		10H = = 13 111A	Full range	3.2			3.2			
		I _{OL} = 150 μA	25°C		75	125		75	125	
		10L = 130 μΑ	Full range			150			150	mV
VOL	Low-level output voltage	I _{OL} = 1.5 mA	25°C		150	225		150	225	111 V
I VOL	Low level output voltage	10L = 1.5 m/A	Full range			250			250	
		I _{OL} = 15 mA	25°C		1.2	1.6		1.2	1.6	V
		10L = 10 m/A	Full range			1.7			1.7	V
AVD	Large-signal differential	$V_{CC} = \pm 2.5 \text{ V}, R_L = 2 \text{ k}\Omega,$	25°C	50	220		50	220		V/mV
AVD	voltage amplification	V _O = 1 V to -1.5 V	Full range	25			25			V/IIIV
rį	Input resistance		25°C		70			70		MΩ
ci	Input capacitance		25°C		2.5			2.5		pF
z _O	Open-loop output impedance	f = 1 MHz	25°C		30			30		Ω
CMDD	Common-mode rejection	V V min B 50.0	25°C	85	118		85	118		2
CMRR	ratio	$V_{IC} = V_{ICR}min, R_S = 50 \Omega$	Full range	80			80			dB
le - :	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$	25°C	90	106		90	106		40
ksvr	ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$R_S = 50 \Omega$	Full range	85			85			dB
loc	Supply current	$V_O = 2.5 \text{ V}$, No load,	25°C		3.4	4.4		3.4	4.4	mA
Icc		V _{IC} = 2.5 V	Full range			4.6			4.6	111/4

[†] Full range is 0°C to 70°C.



TLE2141C operating characteristics, V_{CC} = 5 V, T_A = 25°C

	DADAMETED		IDITIONIO	Т	LE21410	;	TL	E2141A	3	LINUT
	PARAMETER	TEST COM	NDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_1 = 2 k\Omega, \uparrow$		45			45		\// -
SR-	Negative slew rate	C _L = 500 pF†,			42			42		V/μs
	Ontillian Cara	$A_{VD} = -1$,	To 0.1%		0.16			0.16		_
t _S	Settling time	2.5-V step	To 0.01%		0.22			0.22		μs
V	Englished and the order of the configuration	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->4/15
Vn	Equivalent input noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√ Hz
V	Peak-to-peak equivalent input	f = 0.1 Hz to 1 Hz	Z		0.48			0.48		.,,
V _N (PP)	noise voltage	f = 0.1 Hz to 10	Hz		0.51			0.51		μV
	F	f = 10 Hz			1.92			1.92		- A / /II=
l _n	Equivalent input noise current	f = 1 kHz			0.5			0.5		pA/√Hz
THD + N	Total harmonic distortion plus noise	$V_O = 1 \text{ V to 3 V},$ $A_{VD} = 2,$	_		0.0052%		(0.0052%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega^{\dagger}$,	$C_L = 100 pF^{\dagger}$		5.9			5.9		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega^{\dagger}$, f = 100 kHz	$C_L = 100 \text{ pF}^{\dagger}$,		5.8			5.8		MHz
B _{OM}	Maximum output-swing bandwidth	$V_{O(PP)} = 2 V,$ $A_{VD} = 1,$	$R_L = 2 k\Omega^{\dagger}$, $C_L = 100 pF^{\dagger}$		660			660		kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF [†]		57°			57°		

[†] R_L and C_L terminated to 2.5 V.

TLE2141C electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = ± 15 V (unless otherwise noted)

	PARAMETER	TEST CON	DITIONS	T. †	Т	LE21410		TL	E2141A	С	
	PARAMETER	TEST CON	DITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
				25°C		200	900		175	500	.,
VIO	Input offset voltage			Full range			1300			800	μV
αΝΙΟ	Temperature coefficient of input offset voltage	V _{IC} = 0,	$R_S = 50 \Omega$,	Full range		1.7			1.7		μV/°C
		$V_{O} = 0$,	25°C		7	100		7	100	
lio	Input offset current			Full range			150			150	nA
1	Innut bing gurrant			25°C		-0.7	-1.5		-0.7	-1.5	^
I _{IB}	Input bias current			Full range			-1.6			-1.6	μА
	Common-mode input			25°C	-15 to 13	-15.3 to 13.2		-15 to 13	-15.3 to 13.2		
VICR	voltage range	R _S = 50 Ω		Full range	-15 to 12.9	-15.3 to 13.1		-15 to 12.9	-15.3 to 13.1		V
		450 4		25°C	13.8	14.1		13.8	14.1		
		$I_{O} = -150 \mu\text{A}$		Full range	13.7			13.7			
\	Maximum positive peak	15		25°C	13.7	14		13.7	14		V
VOM+	output voltage swing	$I_{O} = -1.5 \text{ mA}$		Full range	13.6			13.6			_ v
		I _O = -15 mA		25°C	13.1	13.7		13.1	13.7		
		10 = - 12 IIIY		Full range	13			13			\bot
		Jo - 150 A		25°C	-14.7	-14.9		-14.7	-14.9		
		ΙΟ = 150 μΑ		Full range	-14.6			-14.6			
V	Maximum negative peak output voltage	I _O = 1.5 mA		25°C	-14.5	-14.8		-14.5	-14.8		V
VOM-	swing	IO = 1.5 IIIA		Full range	-14.4			-14.4			V
	· ·	la - 15 m A		25°C	-13.4	-13.8		-13.4	-13.8		
		$I_O = 15 \text{ mA}$		Full range	-13.3			-13.3			
۸. ۰۰	Large-signal differential	Vo - +10 V		25°C	100	450		100	450		V/mV
AVD	voltage amplification	$V_0 = \pm 10 \text{ V}$		Full range	75			75			V/IIIV
rį	Input resistance	$R_L = 2 k\Omega$		25°C		65			65		MΩ
cį	Input capacitance			25°C		2.5			2.5		pF
z _o	Open-loop output impedance	f = 1 MHz		25°C		30			30		Ω
OMBB	Common-mode)/)/ main	D 500	25°C	85	108		85	108		10
CMRR	rejection ratio	$V_{IC} = V_{ICR}min$	RS = 50 Ω	Full range	80			80			dB
ksvr	Supply-voltage rejection ratio	$V_{CC\pm} = \pm 2.5 \text{ V t}$ $R_S = 50 \Omega$	o ±15 V,	25°C	90	106		90	106		dB
	$(\Delta V_{CC\pm}/\Delta V_{IO})$	1.2 - 00 22	T	Full range	85			85			
loc	Short-circuit output	V _O = 0	$V_{ID} = 1 V$	25°C	-25	-50		-25	-50		mA
los	current	v0 - v	$V_{ID} = -1 V$	200	20	31		20	31		шл
Icc	Supply current	V _O = 0,	No load	25°C		3.5	4.5		3.5	4.5	mA
.00	Cappiy Carrotte	1.0 – 0,	110 1000	Full range			4.7			4.7	111/5

[†] Full range is 0°C to 70°C.



TLE2141C operating characteristics, $V_{CC\pm}$ = ± 15 V, T_A = $25^{\circ}C$

	DADAMETED	7507.001	DITIONS	TL	E21410	;	TL	E2141A	С	LINIT
	PARAMETER	TEST CON	IDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_L = 2 k\Omega$,	27	45		27	45		\// -
SR-	Negative slew rate	$C_L = 500 pF$		27	42		27	42		V/μs
	On Winner Conn	$A_{VD} = -1$,	To 0.1%		0.34			0.34		_
t _S	Settling time	10-V step	To 0.01%		0.4			0.4		μs
.,	Englished to describe a self-	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->4/\(\frac{11-}{11-}\)
v _n	Equivalent input noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
.,	Peak-to-peak equivalent input	f = 0.1 Hz to 1 Hz	<u>z</u>		0.48			0.48		.,
V _{N(PP)}	noise voltage	f = 0.1 Hz to 10 l	Hz		0.51			0.51		μV
		f = 10 Hz			1.89			1.89		- A / (11 -
^I n	Equivalent input noise current	f = 1 kHz			0.47			0.47		pA/√Hz
THD + N	Total harmonic distortion plus noise	V _O (PP) = 20 V, A _{VD} = 10,	$R_L = 2 k\Omega$, f = 10 kHz		0.01%			0.01%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega$,	C _L = 100 pF		6			6		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega$, f = 100 kHz	C _L = 100 pF,		5.9			5.9		MHz
B _{OM}	Maximum output-swing bandwidth	V _O (PP) = 20 V, A _{VD} = 1,	$R_L = 2 k\Omega$, $C_L = 100 pF$		668			668		kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega$,	C _L = 100 pF		58°			58°		

TLE2142C electrical characteristics at specified free-air temperature, $V_{CC} = 5 \text{ V}$ (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	. +	ΤL	E21420	;	TL	E2142A	С	LINUT
	FARAWILTER	TEST CONDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
\/	lanut affact valtage		25°C		220	1900		200	1500	
VIO	Input offset voltage		Full range			2200			1800	μV
αΛΙΟ	Temperature coefficient of input offset voltage	$V_{O} = 2.5 \text{ V}, R_{S} = 50 \Omega,$	Full range		1.7			1.7		μV/°C
	loger to March accompany	V _{IC} = 2.5 V	25°C		8	100		8	100	^
lio	Input offset current		Full range			150			150	nA
	Input bigg gurrent		25°C		-0.8	-2		-0.8	-2	μΑ
IB	Input bias current		Full range			-2.1			-2.1	μА
\/	Common-mode input	D- 50.0	25°C	0 to 3	-0.3 to 3.2		0 to 3	-0.3 to 3.2		V
VICR	voltage range	R _S = 50 Ω	Full range	0 to 2.9			0 to 2.9			V
		I _{OH} = -150 μA	25°C	3.9	4.1		3.9	4.1		
		ΙΟΗ = – 150 μΑ	Full range	3.8			3.8			
\/	High-level output voltage	lou - 15 mA	25°C	3.8	4		3.8	4		V
VOH	r ligh-level output voltage	I _{OH} = –1.5 mA	Full range	3.7		3.7		, v		
		I _{OH} = –15 mA	25°C	3.4	3.7		3.4	3.7		
		10H = - 13 111A	Full range	3.4			3.4			
		I _{OL} = 150 μA	25°C		75	125		75	125	
		10[- 100 μΑ	Full range			150			150	mV
VOL	Low-level output voltage	I _{OL} = 1.5 mA	25°C		150	225		150	225	111.4
I VOL	20W 10V01 Output Voltage	10L = 1.0 m/t	Full range			250			250	
		I _{OL} = 15 mA	25°C		1.2	1.4		1.2	1.4	V
		10L 10 11#1	Full range			1.5			1.5	,
A _{VD}	Large-signal differential	$V_{CC} = \pm 2.5 \text{ V}, R_L = 2 \text{ k}\Omega,$	25°C	50	220		50	220		V/mV
, VD	voltage amplification	$V_0 = 1 \text{ V to } -1.5 \text{ V}$	Full range	25			25			
rį	Input resistance		25°C		70			70		MΩ
ci	Input capacitance		25°C		2.5			2.5		pF
z _O	Open-loop output impedance	f = 1 MHz	25°C		30			30		Ω
CMRR	Common-mode	$V_{IC} = V_{ICR}$ min, $R_S = 50 \Omega$	25°C	85	118		85	118		dB
CIVIKK	rejection ratio	AIC = AICKIIIIII, KZ = 20 73	Full range	80			80			ub
kova	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$	25°C	90	106		90	106		dB
ksvr	ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$R_S = 50 \Omega$	Full range	85			85			uБ
loo	Supply current	$V_O = 2.5 \text{ V}$, No load,	25°C		6.6	8.8		6.6	8.8	mA
ICC	ogo is 0°C to 70°C	V _{IC} = 2.5 V	Full range			9.2			9.2	111/4

[†] Full range is 0°C to 70°C.



TLE2142C operating characteristics, V_{CC} = 5 V, T_A = 25°C

	DADAMETED		NETICNE	TI	LE21420		TL	E2142A	С	
	PARAMETER	IESI CO	NDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_1 = 2 k\Omega^{\dagger}$,		45			45		\// -
SR-	Negative slew rate	$C_L = 500 \text{ pF}$			42			42		V/μs
	On tilling time	$A_{VD} = -1$,	To 0.1%		0.16			0.16		_
t _S	Settling time	2.5-V step	To 0.01%		0.22			0.22		μs
.,	English at Secret and a contract	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->4/1
V _n	Equivalent input noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
.,	Peak-to-peak equivalent	f = 0.1 Hz to 1 Hz	Z		0.48			0.48		.,
VN(PP)	input noise voltage	f = 0.1 Hz to 10 H	Нz		0.51			0.51		μV
		f = 10 Hz			1.92			1.92		- A / /II=
^I n	Equivalent input noise current	f = 1 kHz			0.5			0.5		pA/√Hz
THD + N	Total harmonic distortion plus noise	$V_O = 1 \text{ V to 3 V},$ $A_{VD} = 2,$		0.0	0052%		0.0	0052%		
B1	Unity-gain bandwidth	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF		5.9			5.9		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega^{\dagger}$, f = 100 kHz	C _L = 100 pF,		5.8			5.8		MHz
B _{OM}	Maximum output-swing bandwidth	$V_{O(PP)} = 2 \text{ V},$ $A_{VD} = 1,$	$R_L = 2 k\Omega^{\dagger},$ $C_L = 100 pF$		660	·		660		kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF		57°			57°		

[†] R_L terminates at 2.5 V.

TLE2142C electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = ± 15 V (unless otherwise noted)

	DADAMETED	TEOT 001	IDITIONS		Т	LE21420	;	TL	E2142A	С	
	PARAMETER	TEST CON	IDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
V	least effect will an			25°C		290	1200		275	750	
VIO	Input offset voltage]		Full range			1600			1200	μV
ανιο	Temperature coefficient of input offset voltage	V _{IC} = 0,	$R_S = 50 \Omega$,	Full range		1.7			1.7		μV/°C
1	land offers accomment	VO = 0		25°C		7	100		7	100	A
lo	Input offset current]		Full range			150			150	nA
1	Innut high ourrent			25°C		-0.7	-1.5		-0.7	-1.5	^
IB	Input bias current			Full range			-1.6			-1.6	μΑ
\/.o.=	Common-mode input	R _S = 50 Ω		25°C	-15 to 13	-15.3 to 13.2		-15 to 13	-15.3 to 13.2		V
VICR	voltage range	KS = 50 22		Full range	-15 to 12.9	-15.3 to 13.1		-15 to 12.9	-15.3 to 13.1		V
		Ι _Ο = –150 μΑ		25°C	13.8	14.1		13.8	14.1		
		1Ο = - 150 μΑ		Full range	13.7			13.7			
Von	Maximum positive peak	$I_{O} = -1.5 \text{ mA}$		25°C	13.7	14		13.7	14		V
V _{OM+}	output voltage swing	10 = - 1.5 IIIA		Full range	13.6			13.6			V
		$I_{O} = -15 \text{ mA}$		25°C	13.3	13.7		13.3	13.7		
		10 = - 13 IIIA		Full range	13.2			13.2			
		ΙΟ = 150 μΑ		25°C	-14.7	-14.9		-14.7	-14.9		
		10 = 100 μ/τ		Full range	-14.6			-14.6			
V _{OM} _	Maximum negative peak	I _O = 1.5 mA		25°C	-14.5	-14.8		-14.5	-14.8		V
VOIVI –	output voltage swing	10 = 1.5 mz		Full range	-14.4			-14.4			V
		I _O = 15 mA		25°C	-13.4	-13.8		-13.4	-13.8		
		10 = 13 1117		Full range	-13.3			-13.3			
A _{VD}	Large-signal differential	V _O = ±10 V		25°C	100	450		100	450		V/mV
AVD	voltage amplification	VO = ±10 V		Full range	75			75			V/111V
rį	Input resistance	$R_L = 2 k\Omega$		25°C		65			65		МΩ
ci	Input capacitance			25°C		2.5			2.5		pF
z _O	Open-loop output impedance	f = 1 MHz		25°C		30			30		Ω
CMRR	Common-mode	V _{IC} = V _{ICR} mii	n,	25°C	85	108		85	108		40
CIVIKK	rejection ratio	$R_S = 50 \Omega$		Full range	80			80			dB
ko:-	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5$	V to ±15 V,	25°C	90	106		90	106		dB
ksvr	ratio (ΔV _{CC±} /ΔV _{IO})	$R_S = 50 \Omega$	_	Full range	85			85			ub
loc	Short circuit cutout current	Vo = 0	V _{ID} = 1 V	25°C	-25	-50		-25	-50		mA
los	Short-circuit output current	V _O = 0	$V_{ID} = -1 V$	25°C	20	31		20	31		111/4
loc	Supply current	V _O = 0,	No load	25°C		6.9	9		6.9	9	mA
ICC	очрріў сипепі	vO = 0,	INU IUau	Full range			9.4			9.4	IIIA

[†] Full range is 0°C to 70°C.



TLE2142C operating characteristics, $V_{CC\pm}$ = ± 15 V, T_A = $25^{\circ}C$

				TI	LE21420	;	TL	E2142A	C	
	PARAMETER	TEST CON	DITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_1 = 2 k\Omega$,	27	45		27	45		.,,
SR-	Negative slew rate	C _L = 500 pF	_	27	42		27	42		V/μs
	0.411	$A_{VD} = -1$,	To 0.1%		0.34			0.34		
t _S	Settling time	10-V step	To 0.01%		0.4			0.4		μs
V	Englished the discount of the configuration	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->4/1
V _n	Equivalent input noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
.,	Peak-to-peak equivalent input	f = 0.1 Hz to 1 Hz	Z		0.48			0.48		.,
V _{N(PP)}	noise voltage	f = 0.1 Hz to 10 H	-lz		0.51			0.51		μV
		f = 10 Hz			1.89			1.89		- A / /I I=
In	Equivalent input noise current	f = 1 kHz			0.47			0.47		pA/√Hz
THD + N	Total harmonic distortion plus noise	V _O (PP) = 20 V, A _{VD} = 10,	$R_L = 2 k\Omega$, f = 10 kHz		0.01%			0.01%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega$,	C _L = 100 pF		6			6		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega_s$, $f = 100 \text{ kHz}$	C _L = 100 pF,		5.9			5.9		MHz
B _{OM}	Maximum output-swing bandwidth	V _{O(PP)} = 20 V, A _{VD} = 1,	$R_L = 2 k\Omega$, $C_L = 100 pF$		668			668		kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega$,	C _L = 100 pF		58°			58°		

TLE2144C electrical characteristics at specified free-air temperature, $V_{CC} = 5 \text{ V}$ (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	T _A †	Τl	_E21440	;	TL	E2144A	С	LINUT
	PARAMETER	TEST CONDITIONS	'A'	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
1/10	Input offeet veltere		25°C		0.5	3.8		0.5	3	m\/
VIO	Input offset voltage		Full range			4.4			3.6	mV
ανιο	Temperature coefficient of input offset voltage	V _O = 2.5 V,	Full range		1.7			1.7		μV/°C
	lanut effect coment	$V_{IC} = 2.5 \text{ V}$ $R_S = 50 \Omega$,	25°C		8	100		8	100	A
lio	Input offset current		Full range			150			150	nA
	Innut hine assument		25°C		-0.8	-2		-0.8	-2	
Iв	Input bias current		Full range			-2.1			-2.1	μΑ
V _{ICR}	Common-mode input	R _S = 50 Ω	25°C	0 to 3	-0.3 to 3.2		0 to 3	-0.3 to 3.2		٧
VICR	voltage range	11/5 = 50 32	Full range	0 to 2.9			0 to 2.9			V
		150	25°C	3.9	4.1		3.9	4.1		
		I _{OH} = -150 μA	Full range	3.8			3.8			
\/o	High-level output	15 m \	25°C	3.8	4		3.8	4		V
VOH	voltage	I _{OH} = -1.5 mA	Full range	3.7			3.7			V
		15 m A	25°C	3.4	3.7		3.4	3.7		
		$I_{OH} = -15 \text{ mA}$	Full range	3.4			3.4			
		I _{OL} = 150 μA	25°C		75	125		75	125	
		ΙΟΓ = 130 μΑ	Full range			150			150	mV
1/01	Low-level output	I _{OL} = 1.5 mA	25°C		150	225		150	225	IIIV
VOL	voltage	10L = 1.5 m/s	Full range			250			250	
		I _{OL} = 15 mA	25°C		1.2	1.6		1.2	1.6	V
		IOL = 13 IIIA	Full range			1.7			1.7	V
Λ. / Γ	Large-signal differential	$V_{CC} = \pm 2.5 \text{ V}, \qquad R_L = 2 \text{ k}\Omega,$	25°C	50	95		50	95		V/mV
AVD	voltage amplification	$V_0 = 1 \text{ V to } -1.5 \text{ V}$	Full range	25			25			V/IIIV
rį	Input resistance		25°C		70			70		ΜΩ
ci	Input capacitance		25°C		2.5			2.5		pF
z _o	Open-loop output impedance	f = 1 MHz	25°C		30			30		Ω
CMRR	Common-mode	$V_{IC} = V_{ICR}min, R_S = 50 \Omega$	25°C	85	118		85	118		dB
CIVIKK	rejection ratio	AIC = AICKIIIIII, KZ = 20 77	Full range	80			80			UD
ksvr	Supply-voltage rejection ratio	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$	25°C	90	106		90	106		dB
	$(\Delta V_{CC\pm}/\Delta V_{IO})$	$R_S = 50 \Omega$	Full range	85			85			
Icc	Supply current	$V_O = 2.5 \text{ V}$, No load,	25°C		13.2	17.6		13.2	17.6	mA
† F	cappy carrent	V _{IC} = 2.5 V	Full range			18.5			18.5	, .

[†] Full range is 0°C to 70°C.



TLE2144C operating characteristics, V_{CC} = 5 V, T_A = 25°C

	DADAMETED	TEOT 001	IDITIONO	TI	_E21440		TL	E2144A	С	
	PARAMETER	TEST CON	NUTTIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_L = 2 k\Omega^{\dagger}$,		45			45		.,,
SR-	Negative slew rate	$C_L = 500 pF$			42			42		V/μs
	0.44141	$A_{VD} = -1$,	To 0.1%		0.16			0.16		
t _S	Settling time	2.5-V step	To 0.01%		0.22			0.22		μs
.,	Equivalent input	$R_S = 20 \Omega$,	f = 10 Hz		15			15		\ //\
Vn	noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
.,	Peak-to-peak equivalent	f = 0.1 Hz to 1 Hz			0.48			0.48		
V _N (PP)	input noise voltage	f = 0.1 Hz to 10 H	Z		0.51			0.51		μV
	Equivalent input	f = 10 Hz			1.92			1.92		a / /
^I n	noise current	f = 1 kHz			0.5			0.5		pA/√Hz
THD + N	Total harmonic distortion plus noise	$V_O = 1 V \text{ to } 3 V,$ $A_{VD} = 2,$	$R_L = 2 k\Omega^{\dagger}$, $f = 10 \text{ kHz}$	0.0	0052%		0.0	0052%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF		5.9			5.9		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega^{\dagger}$, f = 100 kHz	C _L = 100 pF,		5.8			5.8		MHz
BOM	Maximum output-swing bandwidth	$V_{O(PP)} = 2 \text{ V},$ $A_{VD} = 1,$	$R_{L} = 2 k\Omega^{\dagger},$ $C_{L} = 100 pF$		660			660		kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF		57°	·		57°		

[†] R_L terminates at 2.5 V

TLE2144C electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = ± 15 V (unless otherwise noted)

	PARAMETER	TEST CONI	OITIONS	TA [†]	Т	LE21440	;	TL	E2144A	С	
	PARAMETER	TEST CON	SHONS	'A'	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
1/10	Input offeet voltege			25°C		0.6	2.4		0.5	1.5	mV
VIO	Input offset voltage			Full range			3.2			2.4	IIIV
ανιο	Temperature coefficient of input offset voltage	V _{IC} = 0,	$R_S = 50 \Omega$	Full range		1.7			1.7		μV/°C
	Innut offeet ourrent	$V_{O} = 0$		25°C		7	100		7	100	~ ^
lio	Input offset current			Full range			150			150	nA
lin	Input bias current			25°C		-0.7	-1.5		-0.7	-1.5	^
IB	input bias current			Full range			-1.6			-1.6	μΑ
	Common-mode input			25°C	-15 to 13	-15.3 to 13.2		-15 to 13	-15.3 to 13.2		
VICR	voltage range	$R_S = 50 \Omega$		Full range	-15 to 12.9	-15.3 to 13.1		-15 to 12.9	-15 to 13.1		V
				25°C	13.8	14.1		13.8	14.1		
		$I_{O} = -150 \mu\text{A}$		Full range	13.7			13.7			
	Maximum positive peak	1- 45-00		25°C	13.7	14		13.7	14		V
VOM+	output voltage swing	$I_{O} = -1.5 \text{ mA}$		Full range	13.6			13.6			V
		45 4		25°C	13.1	13.7		13.1	13.7		
		$I_{O} = -15 \text{ mA}$		Full range	13			13			
		4504		25°C	-14.7	-14.9		-14.7	-14.9		
		I _O = 150 μA		Full range	-14.6			-14.6			
	Maximum negative	I- 45 mA		25°C	-14.5	-14.8		-14.5	-14.8		V
VOM-	peak output voltage swing	I _O = 1.5 mA		Full range	-14.4			-14.4			V
	g	I - 45 A		25°C	-13.4	-13.8		-13.4	-13.8		
		I _O = 15 mA		Full range	-13.3			-13.3			
_	Large-signal differential	V 140V		25°C	100	170		100	170		\//\/
AVD	voltage amplification	$V_0 = \pm 10 \text{ V}$		Full range	75			75			V/mV
rį	Input resistance	$R_L = 2 k\Omega$		25°C		65			65		$M\Omega$
ci	Input capacitance			25°C		2.5			2.5		pF
z _O	Open-loop output impedance	f = 1 MHz		25°C		30			30		Ω
	Common-mode	., ., .		25°C	85	108		85	108		
CMRR	rejection ratio	$V_{IC} = V_{ICR}min,$	$R_S = 50 \Omega$	Full range	80			80			dB
ksvr	Supply-voltage rejection ratio	$V_{CC\pm} = \pm 2.5 \text{ V to}$	o ±15 V,	25°C	90	106		90	106		dB
	$(\Delta V_{CC\pm}/\Delta V_{IO})$	$R_S = 50 \Omega$		Full range	85			85			
los	Short-circuit output	Vo = 0	V _{ID} = 1 V	2500	-25	-50		-25	-50		m ^
los	current	VO = 0	$V_{ID} = -1 V$	25°C	20	31		20	31		mA
loc	Cumply ourrest		Noloca	25°C		13.8	18		13.8	18	m ^
Icc	Supply current	$V_{O} = 0,$	No load	Full range			18.8			18.8	mA

[†] Full range is 0°C to 70°C.



TLE2144C operating characteristics, $V_{CC\pm}$ = ± 15 V, T_A = $25^{\circ}C$

	DADAMETER	TEST SON	IDITIONS	Т	LE2144C	;	TL	.E2144A	2	
	PARAMETER	TEST CON	IDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_L = 2 k\Omega$,	27	45		27	45		\// -
SR-	Negative slew rate	C _L = 500 pF	_	27	42		27	42		V/μs
	On Winner Conn	$A_{VD} = -1$,	To 0.1%		0.34			0.34		_
t _S	Settling time	10-V step	To 0.01%		0.4			0.4		μs
.,		$R_S = 20 \Omega$,	f = 10 Hz		15			15		\ // (
Vn	Equivalent input noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
.,	Peak-to-peak equivalent input	f = 0.1 Hz to 1 Hz	z		0.48			0.48		.,
V _N (PP)	noise voltage	f = 0.1 Hz to 10 H	Нz		0.51			0.51		μV
		f = 10 Hz			1.89			1.89		A / / ! ! .
l _n	Equivalent input noise current	f = 1 kHz			0.47			0.47		pA/√Hz
THD + N	Total harmonic distortion plus noise	V _O (PP) = 20 V, A _{VD} = 10,			0.01%			0.01%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega$,	C _L = 100 pF		6			6		MHz
	Gain-bandwidth product	$R_L = 2 kΩ$, f = 100 kHz	C _L = 100 pF,		5.9			5.9		MHz
B _{OM}	Maximum output-swing bandwidth	V _{O(PP)} = 20 V, A _{VD} = 1,	$R_L = 2 k\Omega$, $C_L = 100 pF$		668	·		668		kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega$,	C _L = 100 pF		58°			58°		

TLE2141I electrical characteristics at specified free-air temperature, $V_{CC} = 5 \text{ V}$ (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	T, +	Т	LE2141	<u> </u>	TL	E2141A	\ <u></u>	
	FANAIVIETEN	1231 CONDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
Vic	Input offeet voltage		25°C		225	1400		200	1000	μV
VIO	Input offset voltage		Full range			1900			1500	μν
αΝΙΟ	Temperature coefficient of input offset voltage	$V_{O} = 2.5 \text{ V}, \qquad R_{S} = 50 \Omega,$	Full range		1.7			1.7		μV/°C
1	Innut offeet ourrent	V _{IC} = 2.5 V	25°C		8	100		8	100	~ ^
lio	Input offset current		Full range			200			200	nA
	Input bigg gurrent		25°C		-0.8	-2		-0.8	-2	
IB	Input bias current		Full range			-2.2			-2.2	μΑ
\/	Common-mode input	D- 50 0	25°C	0 to 3	-0.3 to 3.2		0 to 3	-0.3 to 3.2		V
VICR	voltage range	R _S = 50 Ω	Full range	0 to 2.7	-0.3 to 2.9		0 to 2.7	-0.3 to 2.9		V
		I _{OH} = -150 μA		3.9	4.1		3.9	4.1		
		$I_{OH} = -1.5 \text{ mA}$	25°C	3.8	4		3.8	4		
\/	High lovel output voltage	I _{OH} = –15 mA		3.2	3.7		3.2	3.7		V
VOH	High-level output voltage	ΙΟΗ = –100 μΑ]	3.8			3.8			V
		$I_{OH} = -1 \text{ mA}$	Full range	3.7			3.7			
		$I_{OH} = -10 \text{ mA}$		3.3			3.3			
		I _{OL} = 150 μA			75	125		75	125	mV
		I _{OL} = 1.5 μA	25°C		150	225		150	225	IIIV
VOL	Low-level output voltage	I _{OL} = 15 mA			1.2	1.6		1.2	1.6	V
VOL.	Low-level output voltage	I _{OL} = 100 μA				175			175	mV
		I _{OL} = 1 mA	Full range			225			225	IIIV
		I _{OL} = 10 mA				1.4			1.4	V
A _{VD}	Large-signal differential	$V_{CC} = \pm 2.5 \text{ V}, R_L = 2 \text{ k}\Omega,$	25°C	50	220		50	220		V/mV
טעיי	voltage amplification	$V_0 = 1 \text{ V to } -1.5 \text{ V}$	Full range	10			10			
rį	Input resistance		25°C		70			70		MΩ
ci	Input capacitance		25°C		2.5			2.5		pF
z ₀	Open-loop output impedance	f = 1 MHz	25°C		30			30		Ω
CNDD	Common-mode	\\\. \\\. \\\. \\. \\. \\. \\. \\. \\.	25°C	85	118		85	118		7.
CMRR	rejection ratio	$V_{IC} = V_{ICR}min, R_S = 50 \Omega$	Full range	80			80			dB
le - :	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$	25°C	90	106		90	106		٦D
ksvr	ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$R_S = 50 \Omega$	Full range	85			85			dB
loo	Supply current	$V_O = 2.5 \text{ V}$, No load,	25°C		3.4	4.4		3.4	4.4	mA
Icc	очрріу сипепі	V _{IC} = 2.5 V	Full range			4.6			4.6	111/4

[†] Full range is –40°C to 105°C.



TLE2141I operating characteristics, V_{CC} = 5 V, T_A = 25°C

	242445			-	ΓLE2141I		TI	LE2141A	.I	
	PARAMETER	TEST CON	IDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_L = 2 k\Omega^{\dagger}$,		45			45		
SR-	Negative slew rate	C _L = 500 pF			42			42		V/μs
	0.00	$A_{VD} = -1$,	To 0.1%		0.16			0.16		
t _S	Settling time	2.5-V step	To 0.01%		0.22			0.22		μs
V	English at Secret and a selection	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->4/\(\bar{\bar{\bar{\bar{\bar{\bar{\bar{
Vn	Equivalent input noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
V	Peak-to-peak equivalent input	f = 0.1 Hz to 1 Hz	<u>.</u>		0.48			0.48		.,
V _N (PP)	noise voltage	f = 0.1 Hz to 10 l	Hz		0.51			0.51		μV
	Emiliated to a decide a sum of	f = 10 Hz			1.92			1.92		pA/√ Hz
In	Equivalent input noise current	f = 1 kHz			0.5			0.5		pA/\Hz
THD + N	Total harmonic distortion plus noise	$V_O = 1 \text{ V to 3 V},$ $A_{VD} = 2,$	$R_L = 2 k\Omega^{\dagger}$, $f = 10 \text{ kHz}$		0.0052%		(0.0052%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega^{\dagger}$,	$C_L = 100 pF^{\dagger}$		5.9			5.9		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega^{\dagger}$ f = 100 kHz	$C_L = 100 \text{ pF}^{\dagger}$,		5.8			5.8		MHz
ВОМ	Maximum output-swing bandwidth	V _O (PP) = 2 V, A _{VD} = 1,	$R_L = 2 k\Omega^{\dagger}$, $C_L = 100 pF^{\dagger}$		660			660		kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF†		57°			57°		

[†]R_L and C_L terminated to 2.5 V.

TLE2141I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$ (unless otherwise noted)

	DADAMETED	TEST CONDITIONS	_ +	Т	LE2141	l	T	LE2141A	1	
	PARAMETER	TEST CONDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
\/	Innut effect voltege		25°C		200	900		175	500	μV
VIO	Input offset voltage		Full range			1500			1000	μν
αΛΙΟ	Temperature coefficient of input offset voltage	V _{IC} = 0, R _S = 50	Ω , Full range		1.7			1.7		μV/°C
1	Input effect ourrent	VO = 0	25°C		7	100		7	100	~ ^
lio	Input offset current		Full range			200			200	nA
	Input bias current		25°C		-0.7	-1.5		-0.7	-1.5	μΑ
IB	input bias current		Full range			-1.7			-1.7	μΑ
VICR	Common-mode input	R _S = 50 Ω	25°C	-15 to 13	-15.3 to 13.2		-15 to 13	-15.3 to 13.2		V
VICR	voltage range	11/5 - 30 12	Full range	-15 to 12.7	-15.3 to 12.9		-15 to 12.7	-15.3 to 12.9		V
		$I_{O} = -150 \mu\text{A}$		13.8	14.1		13.8	14.1		
		$I_{O} = -1.5 \text{ mA}$	25°C	13.7	14		13.7	14		
\/a	Maximum positive peak	$I_{O} = -15 \text{ mA}$		13.1	13.7		13.1	13.7		V
V _{OM+}	output voltage swing	$I_O = -100 \mu\text{A}$		13.7			13.7			٧
		$I_O = -1 \text{ mA}$	Full range	13.6			13.6			
		$I_O = -10 \text{ mA}$		13.1			13.1			
		ΙΟ = 150 μΑ		-14.7	-14.9		-14.7	-14.9		
		I _O = 1.5 mA	25°C	-14.5	-14.8		-14.5	-14.8		
V _{OM} -	Maximum negative peak	$I_O = 15 \text{ mA}$		-13.4	-13.8		-13.4	-13.8		V
VOIVI –	output voltage swing	I _O = 100 μA		-14.6			-14.6			V
		$I_O = 1 \text{ mA}$	Full range	-14.5			-14.5			
		I _O = 10 mA		-13.4			-13.4			
A _{VD}	Large-signal differential	$V_0 = \pm 10 \text{ V}, R_L = 2 \text{ k}$	25°C	100	450		100	450		V/mV
~VD	voltage amplification	VO = ± 10 V, KL = 2 K	Full range	40			40			V/IIIV
rį	Input resistance		25°C		65			65		ΜΩ
ci	Input capacitance		25°C		2.5			2.5		pF
z _O	Open-loop output impedance	f = 1 MHz	25°C		30			30		Ω
OL LDD	Common-mode	V V via B 50	25°C	85	108		85	108		1
CMRR	rejection ratio	$V_{IC} = V_{ICR}$ min, $R_S = 50$	Full range	80			80			₫B
ka. :-	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V}$	∕, 25°C	90	106		90	106		dB
ksvr	ratio (ΔV _{CC±} /ΔV _{IO})	$R_S = 50 \Omega$	Full range	85			85			UD
loc	Short-circuit output	V _O = 0		-25	-50		-25	-50		m ^
los	current	VO = 0 $VID = -1$	1 V 25°C	20	31		20	31		mA
Icc	Supply current	V _O = 0, No load	25°C		3.5	4.5		3.5	4.5	mA
,00	Cappiy Curront	- 0, 140 load	Full range			4.7			4.7	шд

[†]Full range is -40°C to 105°C.



TLE2141I operating characteristics, $V_{CC\pm}$ = ± 15 V, T_A = $25^{\circ}C$

	24244555		DITIONS	TI	_E2141I		TL	E2141A	I	
	PARAMETER	TEST CON	DITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_L = 2 k\Omega$,	27	45		27	45		\// -
SR-	Negative slew rate	C _L = 500 pF	_	27	42		27	42		V/μs
	On title on the on	$A_{VD} = -1$,	To 0.1%		0.34			0.34		_
t _S	Settling time	10-V step	To 0.01%		0.4			0.4		μs
	English at the standard self-	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->4/\(\frac{11-}{11-}\)
V _n	Equivalent input noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
	Peak-to-peak equivalent input	f = 0.1 Hz to 1 Hz	z		0.48			0.48		
VN(PP)	noise voltage	f = 0.1 Hz to 10	Hz		0.51			0.51		μV
		f = 10 Hz			1.89			1.89		- A / (11 -
l _n	Equivalent input noise current	f = 1 kHz			0.47			0.47		pA/√Hz
THD + N	Total harmonic distortion plus noise	V _O (PP) = 20 V, A _{VD} = 10,	$R_L = 2 k\Omega$, f = 10 kHz		0.01%			0.01%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega$,	C _L = 100 pF		6			6		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega$, f = 100 kHz	C _L = 100 pF,		5.9			5.9		MHz
ВОМ	Maximum output-swing bandwidth	V _O (PP) = 20 V, A _{VD} = 1,	$R_L = 2 k\Omega$, $C_L = 100 pF$		668			668		kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega$,	C _L = 100 pF		58°			58°		

TLE2142I electrical characteristics at specified free-air temperature, $V_{CC} = 5 \text{ V}$ (unless otherwise noted)

	PARAMETER	TEST CON	DITIONS	T. †	Т	LE2142I		TL	E2142A	AI .	LINUT
	PARAMETER	TEST CON	DITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
1/1-	Input offeet veltage			25°C		220	1900		220	1500	\/
VIO	Input offset voltage			Full range			2400			2000	μV
αΛΙΟ	Temperature coefficient of input offset voltage	V _O = 2.5 V,	$R_S = 50 \Omega$,	Full range		1.7			1.7		μV/°C
	land effect comment	V _{IC} = 2.5 V		25°C		8	100		8	100	A
lio	Input offset current			Full range			200			200	nA
	Innut bing gurrant			25°C		-0.8	-2		-0.8	-2	^
IB	Input bias current			Full range			-2.2			-2.2	μА
Vion	Common-mode input	R _S = 50 Ω		25°C	0 to 3	-0.3 to 3.2		0 to 3	-0.3 to 3.2		V
VICR	voltage range	NS = 30 22		Full range	0 to 2.7	-0.3 to 2.9		0 to 2.7	-0.3 to 2.9		V
		$I_{OH} = -150 \mu A$			3.9	4.1		3.9	4.1		
		$I_{OH} = -1.5 \text{ mA}$		25°C	3.8	4		3.8	4		
Vон	High-level output voltage	$I_{OH} = -15 \text{ mA}$			3.4	3.7		3.4	3.7		V
VOH	r ligh-level output voltage	I _{OH} = 100 μA			3.8			3.8			V
		I _{OH} = 1 mA		Full range	3.7			3.7			
		I _{OH} = 10 mA			3.5			3.5			
		I _{OI} = 150 μA				75	125		75	125	mV
		$I_{OL} = 1.5 \text{ mA}$		25°C		150	225		150	225	111 V
VOL	Low-level output voltage	$I_{OL} = 15 \text{ mA}$				1.2	1.4		1.2	1.4	V
VOL	Low level output voltage	I _{OL} = 100 μA					175			175	mV
		I _{OL} = 1 mA		Full range			225			225	111 V
		$I_{OL} = 10 \text{ mA}$					1.2			1.2	V
AVD	Large-signal differential	$V_{IC} = \pm 2.5 \text{ V},$	$R_L = 2 k\Omega$,	25°C	50	220		50	220		V/mV
7.00	voltage amplification	$V_0 = 1 \ V \ to -1.$	5 V	Full range	10			10			
rį	Input resistance			25°C		70			70		ΜΩ
ci	Input capacitance			25°C		2.5			2.5		pF
z _O	Open-loop output impedance	f = 1 MHz		25°C		30			30		Ω
CMDC	Common-mode rejection	\/. = \/. = = me!m	D- 50.0	25°C	85	118		85	118		40
CMRR	ratio	$V_{IC} = V_{ICR}min,$	KS = 50 Ω	Full range	80			80			dB
ko:-	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5 \text{ V}$	to ± 15 V,	25°C	90	106		90	106		dB
k _{SVR}	ratio ($\Delta V_{CC\pm} / \Delta V_{IO}$)	$R_S = 50 \Omega$		Full range	85			85			ub
loo	Supply current	$V_0 = 2.5 V$,	No load,	25°C		6.6	8.8		6.6	8.8	mA
Icc	очрріу сипспі	V _{IC} = 2.5 V		Full range			9.2			9.2	111/

[†] Full range is -40° C to 105° C.



TLE2142I operating characteristics, V_{CC} = 5 V, T_A = 25°C

	DADAMETED		DITIONS		TLE2142I		Т	LE2142A		
	PARAMETER	TEST CON	DITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_1 = 2 k\Omega^{\dagger}$,		45			45)// -
SR-	Negative slew rate	$C_L = 500 pF$			42			42		V/μs
	Cattling times	$A_{VD} = -1$,	To 0.1%		0.16			0.16		
t _S	Settling time	2.5-V step	To 0.01%		0.22			0.22		μs
.,	Equivalent input noise	$R_S = 20 \Omega$,	f = 10 Hz		15			15		nV/√ Hz
v _n	voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nv/√HZ
V	Peak-to-peak equivalent	f = 0.1 Hz to 1 Hz	<u>z</u>		0.48			0.48		
V _{N(PP)}	input noise voltage	f = 0.1 Hz to 10 H	łz		0.51			0.51		μV
	Equivalent input noise	f = 10 Hz			1.92			1.92		- A / /II-
^I n	current	f = 1 kHz			0.5			0.5		pA/√Hz
THD + N	Total harmonic distortion plus noise	$V_O = 1 \text{ V to 3 V},$ $A_{VD} = 2,$	_		0.0052%			0.0052%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF		5.9			5.9		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega^{\dagger}$, $f = 100 \text{ kHz}$	C _L = 100 pF,		5.8			5.8		MHz
B _{OM}	Maximum output-swing bandwidth	V _{O(PP)} = 2 V, A _{VD} = 1,	$R_L = 2 k\Omega^{\dagger}$, $C_L = 100 pF$		660			660		kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF		57°			57°		

[†]R_L terminates at 2.5 V.

TLE2142I electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = ± 15 V (unless otherwise noted)

	DADAMETED	TEST CO	NDITIONS	- +	1	LE2142		T	LE2142I		
	PARAMETER	1231 00	NDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
, , , , , , , , , , , , , , , , , , ,	leaved affect with an			25°C		290	1200		275	750	
VIO	Input offset voltage			Full range			1800			1400	μV
αΛΙΟ	Temperature coefficient of input offset voltage	V _{IC} = 0,	$R_S = 50 \Omega$,	Full range		1.7			1.7		μV/°C
	lead offers and a second	$V_{O} = 0$		25°C		7	100		7	100	A
lio	Input offset current			Full range			200			200	nA
	Leaved biles assumed			25°C		-0.7	-1.5		-0.7	-1.5	
IB	Input bias current			Full range			-1.7			-1.7	μΑ
Vion	Common-mode input	Po - 50 O		25°C	-15 to 13	-15.3 to 13.2		-15 to 13	-15.3 to 13.2		V
VICR	voltage range	R _S = 50 Ω		Full range	-15 to 12.7	-15.3 to 12.9		-15 to 12.7	-15.3 to 12.9		V
		$I_{O} = -150 \mu\text{A}$	1		13.8	14.1		13.8	14.1		
		$I_{O} = -1.5 \text{ mA}$	1	25°C	13.7	14		13.7	14		
.,	Maximum positive peak	$I_O = -15 \text{ mA}$			13.3	13.7		13.3	13.7		V
VOM+	output voltage swing	$I_{O} = -100 \mu$ A	1		13.7			13.7			V
		$I_O = -1 \text{ mA}$		Full range	13.6			13.6			
		$I_0 = -10 \text{ mA}$			13.3			13.3			
		$I_0 = 150 \mu\text{A}$			-14.7	-14.9		-14.7	-14.9		
		$I_0 = 1.5 \text{ mA}$		25°C	-14.5	-14.8		-14.5	-14.8		
\/	Maximum negative peak	$I_O = 15 \text{ mA}$			-13.4	-13.8		-13.4	-13.8		V
VOM-	output voltage swing	$I_0 = 100 \mu\text{A}$			-14.6			-14.6			V
		$I_O = 1 \text{ mA}$		Full range	-14.5			-14.5			
		$I_O = 10 \text{ mA}$			-13.4			-13.4			
۸	Large-signal differential	V- 140 V	D. 240	25°C	100	450		100	450		V/mV
AVD	voltage amplification	$V_0 = \pm 10 \text{ V},$	K[= 2 K12	Full range	40			40			V/IIIV
rį	Input resistance			25°C		65			65		$M\Omega$
ci	Input capacitance			25°C		2.5			2.5		pF
z _O	Open-loop output impedance	f = 1 MHz		25°C		30			30		Ω
CMDD	Common-mode rejection	V _{IC} = V _{ICR} m	in	25°C	85	108		85	108		10
CMRR	ratio	$R_S = 50 \Omega$		Full range	80			80			dB
le - :	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5$	V to ±15 V,	25°C	90	106		90	106		40
k _{SVR}	ratio ($\Delta V_{CC\pm} / \Delta V_{IO}$)	$R_S = 50 \Omega$		Full range	85			85			dB
	Oh ant almosts a street assess	\/- 0	V _{ID} = 1 V	0500	-25	-50		-25	-50		^
los	Short-circuit output current	VO = 0	V _{ID} = -1 V	25°C	20	31		20	31		mA
	0		No lead	25°C		6.9	9		6.9	9	4
ICC	Supply current	$V_{O} = 0,$	No load	Full range			9.4			9.4	mA

[†]Full range is -40°C to 105°C.



TLE2142I operating characteristics, $V_{CC\pm}$ = ± 15 V, T_A = $25^{\circ}C$

	DADAMETED	TEOT CON	IDITIONS	Т	LE2142I		TL	.E2142A	I	LINUT
	PARAMETER	TEST CON	IDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	AVD = -1	$R_1 = 2 k\Omega$	30	45		30	45		.,,
SR-	Negative slew rate	$C_L = 500 pF$	_	30	42		30	42		V/μs
	Outilian Car	$A_{VD} = -1$,	To 0.1%		0.34			0.34		_
t _S	Settling time	10-V step	To 0.01%		0.4			0.4		μs
.,	Employees the set of the continues	$R_S = 20 \Omega$,	f = 10 Hz		15			15		~\//\
Vn	Equivalent input noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
.,	Peak-to-peak equivalent input	f = 0.1 Hz to 1 H	z		0.48			0.48		.,
V _{N(PP)}	noise voltage	f = 0.1 Hz to 10 H	Нz		0.51			0.51		μV
	Emiliated transfer to some of	f = 10 Hz			1.89			1.89		A / /II-
^I n	Equivalent input noise current	f = 1 kHz			0.47			0.47		pA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 20 \text{ V},$ $A_{VD} = 10,$	$R_L = 2 k\Omega$, f = 10 kHz		0.01%			0.01%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega$,	C _L = 100 pF		6			6		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega$, f = 100 kHz	C _L = 100 pF,		5.9			5.9		MHz
B _{OM}	Maximum output-swing bandwidth	V _{O(PP)} = 20 V, A _{VD} = 1,	$R_L = 2 k\Omega$, $C_L = 100 pF$		668			668		kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega$,	C _L = 100 pF		58°			58°		

TLE2144I electrical characteristics at specified free-air temperature, $V_{CC} = 5 \text{ V}$ (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	- +	T	LE2144I		TL	.E2144A	VI	
	PARAMETER	TEST CONDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
1/1-	land effect with an		25°C		0.5	3.8		0.5	3	mV
VIO	Input offset voltage		Full range			4.8			4	IIIV
αΛΙΟ	Temperature coefficient of input offset voltage	$V_{IC} = 0$, $R_S = 50 \Omega$,	Full range		1.7			1.7		μV/°C
lio.	Input offset current	VO = 0	25°C		8	100		8	100	nA
IIO	input onset current		Full range			200			200	IIA
lup	Input bias current		25°C		-0.8	-2		-0.8	-2	μΑ
IIB	input bias current		Full range			-2.2			-2.2	μΑ
Vien	Common-mode input	R _S = 50 Ω	25°C	0 to 3	-0.3 to 3.2		0 to 3	-0.3 to 3.2		V
VICR	voltage range	NS = 30 22	Full range	0 to 2.7	-0.3 to 2.9		0 to 2.7	-0.3 to 2.9		٧
		I _{OH} = -150 μA		3.9	4.1		3.9	4.1		
		$I_{OH} = -1.5 \text{ mA}$	25°C	3.8	4		3.8	4		
. ,	High-level	I _{OH} = -15 mA		3.4	3.7		3.4	3.7		.,
VOH	output voltage	ΙΟΗ = 100 μΑ		3.8			3.8			V
		I _{OH} = 1 mA	Full range	3.7			3.7			
		I _{OH} = 10 mA		3.5			3.5			
		I _{OL} = 150 μA			75	125		75	125	mV
		$I_{OL} = 1.5 \mu\text{A}$	25°C		150	225		150	225	IIIV
\/-·	Low-level	I_{OL} = 15 mA			1.2	1.6		1.2	1.6	V
VOL	output voltage	$I_{OL} = 100 \mu\text{A}$				175			175	m\/
		I _{OL} = 1 mA	Full range			225			225	mV
		$I_{OL} = 10 \text{ mA}$				1.4			1.4	V
Λ. σ	Large-signal differential	$V_{IC} = \pm 2.5 \text{ V}, \qquad R_L = 2 \text{ k}\Omega,$	25°C	50	95		50	95		V/mV
AVD	voltage amplification	$V_0 = 1 \text{ V to } -1.5 \text{ V}$	Full range	10			10			V/IIIV
rį	Input resistance		25°C		70			70		$M\Omega$
ci	Input capacitance		25°C		2.5			2.5		pF
z _O	Open-loop output impedance	f = 1 MHz	25°C		30			30		Ω
CMRR	Common-mode	\/ \/ \main \ \Do \ \forage \(\text{Po} \)	25°C	85	118		85	118		J.
CMRR	rejection ratio	$V_{IC} = V_{ICR} min$, $R_S = 50 \Omega$	Full range	80			80			dB
ksvr	Supply-voltage rejection ratio	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$	25°C	90	106		90	106		dB
	$(\Delta V_{CC\pm}/\Delta V_{IO})$	$R_S = 50 \Omega$	Full range	85			85			
Icc	Supply current	$V_O = 2.5 \text{ V}$, No load,	25°C		13.2	17.6		13.2	17.6	mA
† Full ron	age in 40°C to 40°C	$V_{IC} = 2.5 \text{ V}$	Full range			18.4			18.4	, .

[†]Full range is -40°C to 105°C.



TLE2144I operating characteristics, V_{CC} = 5 V, T_A = 25°C

	DADAMETED	TEST COL	IDITIONS	Т	LE2144	I	TI	_E2144A	I	LINUT
	PARAMETER	TEST CO	NDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_1 = 2 k\Omega^{\dagger}$,		45			45		\// -
SR-	Negative slew rate	$C_L = 500 pF$			42			42		V/μs
	Cattliantina	$A_{VD} = -1$,	To 0.1%		0.16			0.16		
t _S	Settling time	2.5-V step	To 0.01%		0.22			0.22		μs
.,	Emiliate de la contraction de	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->4/\(\frac{11-}{11-}\)
Vn	Equivalent input noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
.,	Peak-to-peak equivalent input	f = 0.1 Hz to 1 Hz	Z		0.48			0.48		.,
V _{N(PP)}	noise voltage	f = 0.1 Hz to 10 H	-lz		0.51			0.51		μV
	Emiliate the state of the same of	f = 10 Hz			1.92			1.92		- A / /I I=
^I n	Equivalent input noise current	f = 10 kHz			0.5			0.5		pA/√Hz
THD + N	Total harmonic distortion plus noise	$V_O = 1 \text{ V to 3 V},$ $A_{VD} = 2,$	$R_L = 2 k\Omega^{\dagger}$, $f = 10 \text{ kHz}$	0.	0052%		0.	0052%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF		5.9			5.9		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega^{\dagger}$, $f = 100 \text{ kHz}$	C _L = 100 pF,		5.8			5.8		MHz
B _{OM}	Maximum output-swing bandwidth	V _{O(PP)} = 2 V, A _{VD} = 1,	$R_L = 2 k\Omega^{\dagger}$, $C_L = 100 pF$		660	_	_	660	_	kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF		57°			57°		

[†]R_L terminates at 2.5 V

TLE2144I electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = ± 15 V (unless otherwise noted)

	PARAMETER	TEST CONE	OITIONS	T. †	Т	LE2144I		TI	LE2144A	Л	LINUT
	PARAMETER	TEST CONE	DITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
\/. ~	logest effect veltere			25°C		0.6	2.4		0.5	1.5	m\/
VIO	Input offset voltage			Full range			3.2			2.8	mV
αΛΙΟ	Temperature coefficient of input offset voltage	V _{IC} = 0,	R _S = 50 Ω,	Full range		1.7			1.7		μV/°C
	land effect some	V _O = 0	0 ,	25°C		7	100		7	100	- 4
lo	Input offset current			Full range			200			200	nA
l.=	Input bias current			25°C		-0.7	-1.5		-0.7	-1.5	μА
IIB	input bias current			Full range			-1.7			-1.7	μΑ
	Common-mode input	D 500		25°C	-15 to 13	-15.3 to 13.2		-15 to 13	-15.3 to 13.2		V
VICR	voltage range	R _S = 50 Ω		Full range	-15 to 12.7	-15.3 to 12.9		-15 to 12.7	-15.3 to 12.9		V
		$I_{O} = -150 \mu\text{A}$			13.8	14.1		13.8	14.1		
		$I_{O} = -1.5 \text{ mA}$		25°C	13.7	14		13.7	14		
.,	Maximum positive peak	$I_{O} = -15 \text{ mA}$			13.1	13.7		13.1	13.7		.,
V _{OM+}	output voltage swing	$I_O = -100 \mu A$			13.7			13.7			V
		$I_O = -1 \text{ mA}$		Full range	13.6			13.6			
		$I_O = -10 \text{ mA}$			13.1			13.1			
		ΙΟ = 150 μΑ			-14.7	-14.9		-14.7	-14.9		
		I _O = 1.5 mA		25°C	-14.5	-14.8		-14.5	-14.8		
.,	Maximum negative	I _O = 15 mA			-13.4	-13.8		-13.4	-13.8		.,
VOM-	peak output voltage swing	I _O = 100 μA			-14.6			-14.6			V
	owing .	I _O = 1 mA		Full range	-14.5			-14.5			
		I _O = 10 mA			-13.4			-13.4			
	Large-signal differential	V 140V	D 010	25°C	100	170		100	170		1//1/
AVD	voltage amplification	$V_0 = \pm 10 \text{ V},$	$R_L = 2 k\Omega$	Full range	40			40			V/mV
rį	Input resistance			25°C		65			65		$M\Omega$
cį	Input capacitance			25°C		2.5			2.5		pF
z _O	Open-loop output impedance	f = 1 MHz		25°C		30			30		Ω
OMBB	Common-mode	V V main	D 50.0	25°C	85	108		85	108		-10
CMRR	rejection ratio	$V_{IC} = V_{ICR}min$	$R_S = 50 \Omega$	Full range	80			80			dB
ksvr	Supply-voltage rejection ratio	$V_{CC\pm} = \pm 2.5 \text{ V to}$	±15 V,	25°C	90	106		90	106		dB
	$(\Delta V_{CC\pm}/\Delta V_{IO})$	$R_S = 50 \Omega$		Full range	85			85			
loc	Short-circuit output	V _O = 0	V _{ID} = 1 V	25°C	-25	-50		-25	-50		mA
los	current	VO = 0	$V_{ID} = -1 V$	200	20	31		20	31		шл
ICC	Supply current	V _O = 0,	No load	25°C		13.8	18		13.8	18	mA
-00		- 0 - 0,		Full range			18.8			18.8	

[†]Full range is -40°C to 105°C.



TLE2144I operating characteristics, $V_{CC\pm}$ = ± 15 V, T_A = $25^{\circ}C$

	DADAMETED	TEOT 001	IDITIONS	Т	LE2144I		TL	E2144A	I	
	PARAMETER	TEST CON	NUTTIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_L = 2 k\Omega$,	27	45		27	45		\// -
SR-	Negative slew rate	C _L = 500 pF	_	27	42		27	42		V/μs
	Cattling time	$A_{VD} = -1$,	To 0.1%		0.34			0.34		
t _S	Settling time	10-V step	To 0.01%		0.4			0.4		μs
,,	Equivalent input	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->4/\ -
V _n	noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
,,	Peak-to-peak equivalent	f = 0.1 Hz to 1 H	z		0.48			0.48		.,
VN(PP)	input noise voltage	f = 0.1 Hz to 10	Hz		0.51			0.51		μV
	Equivalent input	f = 10 Hz			1.89			1.89		- A / /I I=
^I n	noise current	f = 1 kHz			0.47			0.47		pA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 20 \text{ V},$ $A_{VD} = 10,$			0.01%			0.01%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega$,	C _L = 100 pF		6			6		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega$, f = 100 kHz	C _L = 100 pF,		5.9			5.9		MHz
B _{OM}	Maximum output-swing bandwidth	$V_{O(PP)} = 20 \text{ V},$ $A_{VD} = 1,$	$R_L = 2 k\Omega$, $C_L = 100 pF$		668		_	668	_	kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega$,	C _L = 100 pF		58°			58°		

TLE2141M electrical characteristics at specified free-air temperature, $V_{CC} = 5 \text{ V}$ (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	T. †	TL	E2141N	/I	TL	E2141A	M	UNIT
	FARAMETER	TEST CONDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNII
\/	lanut affact valtage		25°C		225	1400		200	1000	
VIO	Input offset voltage		Full range			2100			1700	μV
αΛΙΟ	Temperature coefficient of input offset voltage	$V_{O} = 2.5 \text{ V}$ $R_{S} = 50 \Omega$,	Full range		1.7			1.7		μV/°C
	land offert accomment	V _{IC} = 2.5 V	25°C		8	100		8	100	A
lio	Input offset current		Full range			250			250	nA
l.s	Input bias current		25°C		-0.8	-2		-0.8	-2	μА
I _{IB}	input bias current		Full range			-2.3			-2.3	μΑ
	Common-mode input	D- 500	25°C	0 to 3	-0.3 to 3.2		0 to 3	-0.3 to 3.2		V
VICR	voltage range	$R_S = 50 \Omega$	Full range	0 to 2.7	-0.3 to 2.9		0 to 2.7	-0.3 to 2.9		V
		I _{OH} = -150 μA		3.9	4.1		3.9	4.1		
		$I_{OH} = -1.5 \text{ mA}$	25°C	3.8	4		3.8	4		
	High-level output	$I_{OH} = -15 \text{ mA}$		3.2	3.7		3.2	3.7		V
VOH	voltage	I _{OH} = -100 μA		3.75			3.75			V
		$I_{OH} = -1 \text{ mA}$	Full range	3.65			3.65			
		$I_{OH} = -10 \text{ mA}$		3.25			3.25			
		I _{OL} = 150 μA			75	125		75	125	mV
		I _{OL} = 1.5 μA	25°C		150	225		150	225	IIIV
\/o:	Low-level output	I _{OL} = 15 mA			1.2	1.4		1.2	1.4	V
VOL	voltage	I _{OL} = 100 μA				200			200	mV
		I _{OL} = 1 mA	Full range			250			225	IIIV
		$I_{OL} = 10 \text{ mA}$				1.25			1.25	V
۸. ه	Large-signal differential	$V_{IC} = \pm 2.5 \text{ V}, \qquad R_L = 2 \text{ k}\Omega,$	25°C	50	220		50	220		V/mV
AVD	voltage amplification	$V_0 = 1 \text{ V to } -1.5 \text{ V}$	Full range	5			5			V/IIIV
rį	Input resistance		25°C		70			70		MΩ
ci	Input capacitance		25°C		2.5			2.5		pF
z _O	Open-loop output impedance	f = 1 MHz	25°C		30			30		Ω
CNDD	Common-mode	V V min D - 50.0	25°C	85	118		85	118		40
CMRR	rejection ratio	$V_{IC} = V_{ICR}$ min, $R_S = 50 \Omega$	Full range	80			80			dB
le	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$	25°C	90	106		90	106		40
ksvr	ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$R_S = 50 \Omega$	Full range	85			85			dB
loc	Supply current	$V_O = 2.5 \text{ V}$, No load,	25°C		3.4	4.4		3.4	4.4	mA
Icc	очрріу сипепі	V _{IC} = 2.5 V	Full range			4.6			4.6	111/1

[†] Full range is –55°C to 125°C.



TLE2141M operating characteristics, V_{CC} = 5 V, T_A = 25°C

				Т	LE2141N	Л	TI	E2141A	М	
	PARAMETER	TEST CON	IDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_L = 2 k\Omega^{\dagger}$,		45			45		
SR-	Negative slew rate	C _L = 500 pF			42			42		V/μs
	On till a ser il ser a	$A_{VD} = -1$,	To 0.1%		0.16			0.16		_
t _S	Settling time	2.5-V step	To 0.01%		0.22			0.22		μs
M	Carrieral and inner transfer continue	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->//\
Vn	Equivalent input noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
V	Peak-to-peak equivalent input	f = 0.1 Hz to 1 Hz			0.48			0.48		
V _{N(PP)}	noise voltage	f = 0.1 Hz to 10 H	-lz		0.51			0.51		μV
		f = 10 Hz			1.92			1.92		- A / /II-
In	Equivalent input noise current	f = 1 kHz			0.5			0.5		pA/√Hz
THD + N	Total harmonic distortion plus noise	$V_O = 1 \text{ V to 3 V},$ $A_{VD} = 2,$	$R_L = 2 k\Omega^{\dagger}$, $f = 10 kHz$		0.0052%			0.0052%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF [†]		5.9			5.9		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega^{\dagger}$, $f = 100 \text{ kHz}$	$C_L = 100 pF^{\dagger}$,		5.8			5.8		MHz
B _{OM}	Maximum output-swing bandwidth	V _{O(PP)} = 2 V, A _{VD} = 1	$R_L = 2 k\Omega^{\dagger}$,		660			660		kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF [†]		57°			57°		

[†]R_L and C_L terminated to 2.5 V.

TLE2141M electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = ± 15 V (unless otherwise noted)

	DADAMETED	TEST CON	DITIONS	- +	Т	LE2141N	И	TL	E2141A	M	
	PARAMETER	IESI CON	DITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
V	land offertualtane			25°C		200	900		175	500	
VIO	Input offset voltage			Full range			1700			1200	μV
ανιο	Temperature coefficient of input offset voltage	., .	D 50 0	Full range		1.7			1.7		μV/°C
1	Input offset surrent	$V_{IC} = 0$,	$R_S = 50 \Omega$	25°C		7	100		7	100	nA
lo	Input offset current]		Full range			250			250	IIA
l.a	Input bias current			25°C		-0.7	-1.5		-0.7	-1.5	^
IB	input bias current			Full range			-1.8			-1.8	μΑ
VICR	Common-mode input	R _S = 50 Ω		25°C	-15 to 13	-15.3 to 13.2		-15 to 13	-15.3 to 13.2		V
VICR	voltage range	1/5 = 30 22		Full range	-15 to 12.7	-15.3 to 12.9		-15 to 12.7	-15.3 to 12.9		V
		$I_{O} = -150 \mu\text{A}$]	13.8	14.1		13.8	14.1		
		$I_{O} = -1.5 \text{ mA}$		25°C	13.7	14		13.7	14		
V _{OM+}	Maximum positive peak	$I_{O} = -15 \text{ mA}$			13.1	13.7		13.1	13.7		V
VOM+	output voltage swing	$I_O = -100 \mu\text{A}$			13.7			13.7			V
		$I_O = -1 \text{ mA}$		Full range	13.6			13.6			
		$I_{O} = -10 \text{ mA}$			13.1			13.1			
		ΙΟ = 150 μΑ			-14.7	-14.9		-14.7	-14.9		
		$I_0 = 1.5 \text{ mA}$		25°C	-14.5	-14.8		-14.5	-14.8		
V _{OM} -	Maximum negative peak	I _O = 15 mA			-13.4	-13.8		-13.4	-13.8		V
VOIVI –	output voltage swing	I _O = 100 μA		1	-14.6			-14.6			v
		I _O = 1 mA		Full range	-14.5			-14.5			
		I _O = 10 mA			-13.4			-13.4			
AVD	Large-signal differential	$V_0 = \pm 10 \text{ V},$	$R_L = 2 k\Omega$	25°C	100	450		100	450		V/mV
, VD	voltage amplification	VO = 10 V,	T 1122	Full range	20			20			
rį	Input resistance			25°C		65			65		MΩ
ci	Input capacitance			25°C		2.5			2.5		pF
z _O	Open-loop output impedance	f = 1 MHz		25°C		30			30		Ω
CMRR	Common-mode	\/ \/ main	D- 50.0	25°C	85	108		85	108		dB
CIVIKK	rejection ratio	$V_{IC} = V_{ICR}min$,	v2 = 20 73	Full range	80			80			ub
kovis	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5 \text{ V}$	to ±15 V,	25°C	90	106		90	106		dB
ksvr	ratio (ΔV _{CC±} /ΔV _{IO})	$R_S = 50 \Omega$		Full range	85			85			ub
loc	Short-circuit output	V _O = 0	$V_{ID} = 1 V$	25°C	-25	-50		-25	-50		mA
los	current	v() = 0	$V_{ID} = -1 V$	20 0	20	31		20	31		IIIA
Icc	Supply current	$V_{O} = 0$,	No load,	25°C		3.5	4.5		3.5	4.5	mA
		V _{IC} = 2.5 V		Full range			4.7			4.7	, \

[†] Full range is -55° C to 125° C.



TLE2141M operating characteristics, $V_{CC\pm}$ = ± 15 V, T_A = $25^{\circ}C$

	242445752		IDITIONS	TL	.E2141N	И	TLI	E2141A	М	
	PARAMETER	TEST CON	IDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_L = 2 k\Omega$,	27	45		27	45)// -
SR-	Negative slew rate	C _L = 100 pF		27	42		27	42		V/μs
	On title on the on	$A_{VD} = -1,$	To 0.1%		0.34			0.34		_
t _S	Settling time	10-V step	To 0.01%		0.4			0.4		μs
	English at the of a standard to the second	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->4/1
Vn	Equivalent input noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
V	Peak-to-peak equivalent input	f = 0.1 Hz to 1 H	z		0.48			0.48		.,,
V _N (PP)	noise voltage	f = 0.1 Hz to 10 l	Hz		0.51			0.51		μV
		f = 10 Hz			1.89			1.89		- A / /I-
^I n	Equivalent input noise current	f = 1 kHz			0.47			0.47		pA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 20 \text{ V},$ $A_{VD} = 10,$	$R_L = 2 k\Omega$, f = 10 kHz		0.01%			0.01%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega$,	C _L = 100 pF		6			6		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega$, f = 100 kHz	C _L = 100 pF,		5.9			5.9		MHz
B _{OM}	Maximum output-swing bandwidth	V _O (PP) = 20 V, A _{VD} = 1,	$R_L = 2 k\Omega$, $C_L = 100 pF$		668			668		kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega$,	C _L = 100 pF		58°			58°		

TLE2142M electrical characteristics at specified free-air temperature, $V_{CC} = 5 \text{ V}$ (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	T _A †	TL	E2142N	/	TL	E2142A	М	
	PARAMETER	TEST CONDITIONS	'A'	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
\/	land effect value		25°C		220	1900		200	1500	
VIO	Input offset voltage		Full range			2600			2200	μV
ανιο	Temperature coefficient of input offset voltage	$V_{O} = 2.5 \text{ V}, \qquad R_{S} = 50 \Omega,$	Full range		1.7			1.7		μV/°C
	lament affact assument	V _{IC} = 2.5 V	25°C		8	100		8	100	^
lio	Input offset current		Full range			200			200	nA
l.s	Input bias current		25°C		-0.8	-2		-0.8	-2	
I _{IB}	input bias current		Full range			-2.3			-2.3	μА
\\\.	Common-mode input	D- 500	25°C	0 to 3	-0.3 to 3.2		0 to 3	-0.3 to 3.2		V
VICR	voltage range	$R_S = 50 \Omega$	Full range	0 to 2.7	-0.3 to 2.9		0 to 2.7	-0.3 to 2.9		V
		I _{OH} = -150 μA		3.9	4.1		3.9	4.1		
		$I_{OH} = -1.5 \text{ mA}$	25°C	3.8	4		3.8	4		
\/	High-level output	I _{OH} = -15 mA		3.4	3.7		3.4	3.7		V
VOH	voltage	I _{OH} = 100 μA		3.75			3.75			V
		I _{OH} = 1 mA	Full range	3.65			3.65			
		I _{OH} = 10 mA		3.45			3.45			
		I _{OL} = 150 μA			75	125		75	125	mV
		I _{OL} = 1.5 mA	25°C		150	225		150	225	IIIV
\/-·	Low-level output	I _{OL} = 15 mA			1.2	1.4		1.2	1.4	V
VOL	voltage	I _{OL} = 100 μA				200			200	mV
		I _{OL} = 1 mA	Full range			250			250	mv
		I _{OL} = 10 mA				1.25			1.25	V
Δ	Large-signal differential	$V_{IC} = \pm 2.5 \text{ V}, \qquad R_L = 2 \text{ k}\Omega,$	25°C	50	220		50	220		\//ma\/
AVD	voltage amplification	$V_0 = 1 \text{ V to } -1.5 \text{ V}$	Full range	5			5			V/mV
rį	Input resistance		25°C		70			70		$M\Omega$
ci	Input capacitance		25°C		2.5			2.5		pF
z _O	Open-loop output impedance	f = 1 MHz	25°C		30			30		Ω
OVE	Common-mode	V V who B 50.0	25°C	85	118		85	118		.15
CMRR	rejection ratio	$V_{IC} = V_{ICR}min$, $R_S = 50 \Omega$	Full range	80			80			dB
	Supply-voltage rejec-	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$	25°C	90	106		90	106		
ksvr	tion ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)		Full range	85			85			dB
	Complex assumes at	V _O = 2.5 V, No load,	25°C		6.6	8.8		6.6	8.8	^
Icc	Supply current	V _{IC} = 2.5 V	Full range			9.2			9.2	mA

[†] Full range is – 55°C to 125°C.



TLE2142M operating characteristics, V_{CC} = 5 V, T_A = 25°C

	DADAMETED	TEST SON	DITIONS		TLE2142M		Т	LE2142A	/I	
	PARAMETER	TEST CON	DITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_1 = 2 k\Omega^{\dagger}$,		45			45		.,,
SR-	Negative slew rate	$C_L = 500 pF$	_		42			42		V/μs
	0-1111-1-11-1	$A_{VD} = -1$,	To 0.1%		0.16			0.16		
t _S	Settling time	2.5-V step	To 0.01%		0.22			0.22		μs
.,	Equivalent input noise volt-	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->4/1
Vn	age	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
	Peak-to-peak equivalent	f = 0.1 Hz to 1 Hz	<u>z</u>		0.48			0.48		.,
VN(PP)	input noise voltage	f = 0.1 Hz to 10 H	łz		0.51			0.51		μV
	Equivalent input noise cur-	f = 10 Hz			1.92			1.92		A / /II
^I n	rent	f = 1 kHz			0.5			0.5		pA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O} = 1 \text{ V to 3 V},$ $A_{VD} = 2,$	$R_L = 2 k\Omega^{\dagger}$, $f = 10 \text{ kHz}$		0.0052%			0.0052%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF		5.9			5.9		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega^{\dagger}$, f = 100 kHz	C _L = 100 pF		5.8			5.8		MHz
B _{OM}	Maximum output-swing bandwidth	$V_{O(PP)} = 2 V,$ $A_{VD} = 1,$	$R_L = 2 k\Omega^{\dagger}$, $C_L = 100 pF$		660			660		kHz
φm	Phase margin	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF		57°			57°		

[†]R_L terminates at 2.5 V.

TLE2142M electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = ± 15 V (unless otherwise noted)

	DADAMETED	TEST COL	NDITIONS	TA [†]	Т	LE2142N	1	TL	E2142A	M	
	PARAMETER	TEST COI	NDITIONS	'A'	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
\/. ~	Innut offeet velters			25°C		290	1200		275	750	\/
VIO	Input offset voltage]		Full range			2000			1600	μV
ανιο	Temperature coefficient of input offset voltage		_	Full range		1.7			1.7		μV/°C
		$V_{IC} = 0$,	$R_S = 50 \Omega$	25°C		7	100		7	100	
lio	Input offset current			Full range			250			250	nA
	Leaved It is a summer to	1		25°C		-0.7	-1.5		-0.7	-1.5	
lΒ	Input bias current			Full range			-1.8			-1.8	μΑ
V	Common-mode input	R _S = 50 Ω		25°C	-15 to 13	-15.3 to 13.2		-15 to 13	-15.3 to 13.2		V
VICR	voltage range	NS = 30 22		Full range	-15 to 12.7	-15.3 to 12.9		-15 to 12.7	-15.3 to 12.9		V
		$I_{O} = -150 \mu\text{A}$			13.8	14.1		13.8	14.1		
		$I_{O} = -1.5 \text{ mA}$		25°C	13.7	14		13.7	14		
\/o.,	Maximum positive peak	$I_O = -15 \text{ mA}$			13.3	13.7		13.3	13.7		V
V _{OM+}	output voltage swing	$I_{O} = -100 \mu\text{A}$]	13.7			13.7			V
		$I_O = -1 \text{ mA}$		Full range	13.6			13.6			
		$I_O = -10 \text{ mA}$			13.3			13.3			
		I _O = 150 μA]	-14.7	-14.9		-14.7	-14.9		
		$I_0 = 1.5 \text{ mA}$		25°C	-14.5	-14.8		-14.5	-14.8		
	Maximum negative peak	$I_O = 15 \text{ mA}$			-13.4	-13.8		-13.4	-13.8		V
VOM-	output voltage swing	$I_{O} = 100 \mu A$			-14.6			-14.6			V
		$I_O = 1 \text{ mA}$		Full range	-14.5			-14.5			
		$I_O = 10 \text{ mA}$			-13.4			-13.4			
_	Large-signal differential		D 010	25°C	100	450		100	450		\//\/
AVD	voltage amplification	$V_0 = \pm 10 \text{ V},$	$K\Gamma = 5 \text{ K}\Omega$	Full range	20			20			V/mV
rį	Input resistance			25°C		65			65		MΩ
ci	Input capacitance			25°C		2.5			2.5		pF
z _o	Open-loop output impedance	f = 1 MHz		25°C		30			30		Ω
OMBE	Common-mode rejection	V _{IC} = V _{ICR} m	in,	25°C	85	108		85	108		-ID
CMRR	ratio	$R_S = 50 \Omega$		Full range	80			80			dB
	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5$	V to ±15 V,	25°C	90	106		90	106		.15
ksvr	ratio ($\Delta V_{CC} \pm /\Delta V_{IO}$)	$R_S = 50 \Omega$		Full range	85			85			dB
	Chart since it autout access	., 0	V _{ID} = 1 V	0500	-25	-50		-25	-50		Λ
los	Short-circuit output current	V _O = 0	V _{ID} = -1 V	25°C	20	31		20	31		mA
la r	Cumply ourroat	$V_{O} = 0$,	No load,	25°C		6.9	9		6.9	9	A
Icc	Supply current	$V_{IC} = 2.5 \text{ V}$		Full range			9.4			9.4	mA

[†] Full range is -55°C to 125°C.



TLE214x, TLE214xA EXCALIBUR LOW-NOISE HIGH-SPEED PRECISION OPERATIONAL AMPLIFIERS SLOS183C - FEBRUARY 1997 - REVISED JUNE 2006

TLE2142M operating characteristics, $V_{CC\pm}$ = ± 15 V, T_A = $25^{\circ}C$

				TI	_E2142N	1	TL	E2142AI	VI	
	PARAMETER	TEST CON	IDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$R_1 = 2 k\Omega$	$A_{VD} = -1$,	27	45		27	45		.,,
SR-	Negative slew rate	C _L = 100 pF		27	42		27	42		V/μs
	O WE IT	$A_{VD} = -1$,	To 0.1%		0.34			0.34		
t _S	Settling time	10-V step	To 0.01%		0.4			0.4		μs
V	Employees the set of the continues	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->4/1
V _n	Equivalent input noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
.,	Peak-to-peak equivalent input	f = 0.1 Hz to 1 H	lz		0.48			0.48		.,
VN(PP)	noise voltage	f = 0.1 Hz to 10 Hz			0.51			0.51		μV
		f = 10 Hz			1.89			1.89		A / /II
In	Equivalent input noise current	f = 1 kHz			0.47			0.47		pA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 20 \text{ V},$ $A_{VD} = 10,$	$R_L = 2 k\Omega$, f = 10 kHz		0.01%			0.01%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega$,	C _L = 100 pF		6			6		MHz
	Gain-bandwidth product	$R_L = 2 kΩ$, f = 100 kHz	C _L = 100 pF,		5.9			5.9		MHz
B _{OM}	Maximum output-swing bandwidth	$V_{O(PP)} = 20 \text{ V},$ $A_{VD} = 1,$	$R_L = 2 k\Omega$, $C_L = 100 pF$		668			668		kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega$,	C _L = 100 pF		58°			58°		

TLE214x, TLE214xA EXCALIBUR LOW-NOISE HIGH-SPEED PRECISION OPERATIONAL AMPLIFIERS SLOS183C - FEBRUARY 1997 - REVISED JUNE 2006

TLE2144M electrical characteristics at specified free-air temperature, $V_{CC} = 5 \text{ V}$ (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	T. †	TL	E2144N	1	TLE2144AM			LINUT
	PARAMETER	TEST CONDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
V. 0	Input offeet voltege		25°C		0.5	3.8		0.5	3	mV
VIO	Input offset voltage		Full range			5.2			4.4	IIIV
αΝΙΟ	Temperature coefficient of input offset voltage	$V_{O} = 2.5 \text{ V}, R_{S} = 50 \Omega,$	Full range		1.7			1.7		μV/°C
1	Input offset current	V _{IC} = 2.5 V	25°C		8	100		8	100	nA
lio	input onset current		Full range			250			250	IIA
lin	Input bias current		25°C		-0.8	-2		-0.8	-2	μΑ
IIB	input bias current		Full range			-2.3			-2.3	μΛ
V:	Common-mode input	B 50 O	25°C	0 to 3	-0.3 to 3.2		0 to 3	-0.3 to 3.2		V
VICR	voltage range	R _S = 50 Ω	Full range	0 to 2.7	-0.3 to 2.9		0 to 2.7	-0.3 to 2.9		V
		I _{OH} = -150 μA		3.9	4.1		3.9	4.1		
		I _{OH} = -1.5 mA	25°C	3.8	4		3.8	4		
V	High-level output	I _{OH} = -15 mA		3.4	3.7		3.4	3.7		V
VOH	voltage	I _{OH} = 100 μA		3.75			3.75			V
		I _{OH} = 1 mA	Full range	3.65			3.65			
		I _{OH} = 10 mA		3.45			3.45			
		I _{OL} = 150 μA			75	125		75	125	mV
		I _{OL} = 1.5 μA	25°C		150	225		150	225	IIIV
V	Low-level output	I _{OL} = 15 mA			1.2	1.6		1.2	1.6	V
VOL	voltage	I _{OL} = 100 μA				200			200	mV
		I _{OL} = 1 mA	Full range			250			250	mv
		I _{OL} = 10 mA				1.45			1.45	V
Δ	Large-signal differential	$V_{IC} = \pm 2.5 \text{ V}, \qquad R_L = 2 \text{ k}\Omega,$	25°C	50	95		50	95		\//m\/
AVD	voltage amplification	$V_0 = 1 \text{ V to } -1.5 \text{ V}$	Full range	5			5			V/mV
rį	Input resistance		25°C		70			70		МΩ
ci	Input capacitance		25°C		2.5			2.5		pF
z _O	Open-loop output impedance	f = 1 MHz	25°C		30			30		Ω
CNDD	Common-mode	V V min D - 50.0	25°C	85	118		85	118		40
CMRR	rejection ratio	$V_{IC} = V_{ICR}min$, $R_S = 50 \Omega$	Full range	80			80			dB
ksvr	Supply-voltage rejection ratio	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$ RS = 50 Ω	25°C	90	106		90	106		dB
	$(\Delta V_{CC\pm}/\Delta V_{IO})$	1/2 - 00 75	Full range	85			85			
Icc	Supply current	$V_O = 2.5 \text{ V}$, No load,	25°C		13.2	17.6		13.2	17.6	mA
.00	CL-A	V _{IC} = 2.5 V	Full range			18.4			18.4	

[†]Full range is -55°C to 125°C.



TLE2144M operating characteristics, V_{CC} = 5 V, T_A = 25°C

	DADAMETED	TEOT 001	IDITIONS	TI	_E2144N	/I	TL	E2144A	М	LINUT
	PARAMETER	IESI COI	NDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_1 = 2 k\Omega^{\dagger}$,		45			45		\// -
SR-	Negative slew rate	C _L = 500 pF			42		42			V/μs
	Ontillian Con-	$A_{VD} = -1$,	To 0.1%		0.16			0.16		_
t _S	Settling time	2.5-V step	To 0.01%		0.22			0.22		μs
.,	Emilyate at the other water with an	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->///
Vn	Equivalent input noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
.,	Peak-to-peak equivalent input	f = 0.1 Hz to 1 Hz	z		0.48			0.48		.,
V _N (PP)	noise voltage	f = 0.1 Hz to 10 H	Нz		0.51			0.51		μV
	Emiliated the desired and a second	f = 10 Hz			1.92			1.92		- A / /II=
^I n	Equivalent input noise current	f = 1 kHz			0.5			0.5		pA/√Hz
THD + N	Total harmonic distortion plus noise	$V_O = 1 \text{ V to 3 V},$ $A_{VD} = 2,$	$R_L = 2 k\Omega^{\dagger}$, $f = 10 \text{ kHz}$	0.	0052%		0.0	0052%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF		5.9			5.9		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega^{\dagger}$, f = 100 kHz	C _L = 100 pF,		5.8			5.8		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 2 V$, $A_{VD} = 1$	$R_L = 2 k\Omega^{\dagger}$,		660			660		kHz
φm	Phase margin	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF		57°	·		57°		

[†] RL terminates at 2.5 V

TLE214x, TLE214xA EXCALIBUR LOW-NOISE HIGH-SPEED PRECISION OPERATIONAL AMPLIFIERS SLOS183C - FEBRUARY 1997 - REVISED JUNE 2006

TLE2144M electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = ± 15 V (unless otherwise noted)

	PARAMETER	TEST CON	DITIONS	T _A †	Т	LE2144N	Л	TL	.E2144A	М	UNIT
	TANAMETER	1231 00141	DITIONS	'A'	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
\/	land effect welters			25°C		0.6	2.4		0.5	1.5	mV
VIO	Input offset voltage			Full range			4			3.2	IIIV
ανιο	Temperature coefficient of input offset voltage			Full range		1.7			1.7		μV/°C
	lead offert summed	$V_{IC} = 0,$	$R_S = 50 \Omega$	25°C		7	100		7	100	^
ΙO	Input offset current			Full range			250			250	nA
1	lanut bina aumant			25°C		-0.7	-1.5		-0.7	-1.5	^
I _{IB}	Input bias current			Full range			-1.8			-1.8	μΑ
	Common-mode input			25°C	-15 to 13	-15.3 to 13.2		-15 to 13	-15.3 to 13.2		
VICR	voltage range	$R_S = 50 \Omega$		Full range	-15 to 12.7	-15.3 to 12.9		-15 to 12.7	-15.3 to 12.9		V
		ΙΟ = – 150 μΑ			13.8	14.1		13.8	14.1		
		$I_{O} = -1.5 \text{ mA}$		25°C	13.7	14		13.7	14		
	Maximum positive peak	$I_{O} = -15 \text{ mA}$			13.1	13.7		13.1	13.7		
V _{OM+}	output voltage swing	$I_{O} = -100 \mu\text{A}$			13.7			13.7			V
		$I_O = -1 \text{ mA}$		Full range	13.6			13.6			
		$I_{O} = -10 \text{ mA}$		1	13.1			13.1			
		ΙΟ = 150 μΑ			-14.7	-14.9		-14.7	-14.9		
		I _O = 1.5 mA		25°C	-14.5	-14.8		-14.5	-14.8		V
	Maximum negative	I _O = 15 mA			-13.4	-13.8		-13.4	-13.8		
V_{OM-}	peak output voltage swing	ΙΟ = 100 μΑ			-14.6			-14.6			
	Swilly	I _O = 1 mA		Full range	-14.5			-14.5			
		I _O = 10 mA			-13.4			-13.4			
	Large-signal differential			25°C	100	170		100	170		
AVD	voltage amplification	$V_0 = \pm 10 \text{ V},$	$R_L = 2 k\Omega$	Full range	20			20			V/mV
rį	Input resistance			25°C		65			65		MΩ
ci	Input capacitance			25°C		2.5			2.5		pF
z _O	Open-loop output impedance	f = 1 MHz		25°C		30			30		Ω
	Common-mode		_	25°C	85	108		85	108		
CMRR	rejection ratio	$V_{IC} = V_{ICR}min$,	$R_S = 50 \Omega$	Full range	80			80			dB
ksvr	Supply-voltage rejection ratio	$V_{CC\pm} = \pm 2.5 \text{ V to}$ $R_S = 50 \Omega$	o ±15 V,	25°C	90	106		90	106		dB
	$(\Delta V_{CC\pm}/\Delta V_{IO})$	172 - 30 22	•	Full range	85			85			
loc	Short-circuit output	V _O = 0	V _{ID} = 1 V	25°C	-25	-50		-25	-50		mA
los	current	VO = 0	$V_{ID} = -1 V$	25 0	20	31		20	31		111/4
loc	Supply current	$V_{O} = 0,$	No load,	25°C		13.8	18		13.8	18	m^
ICC	Supply current	V _{IC} = 2.5 V		Full range			18.8			18.8	mA

[†]Full range is -55°C to 125°C



TLE214x, TLE214xA EXCALIBUR LOW-NOISE HIGH-SPEED PRECISION OPERATIONAL AMPLIFIERS SLOS183C - FEBRUARY 1997 - REVISED JUNE 2006

TLE2144M operating characteristics, $V_{CC\pm}$ = ± 15 V, T_A = $25^{\circ}C$

	24244555	TEOT 001	DITIONS	Т	LE2144N	/	TL	E2144AI	VI	
	PARAMETER	TEST CON	DITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$R_1 = 2 k\Omega$	$A_{VD} = -1$,	27	45		27 45			
SR-	Negative slew rate	C _L = 100 pF	,,	27	42		27	42		V/μs
	0.00	$A_{VD} = -1$,	To 0.1%		0.34			0.34		
t _S	Settling time	10-V step	To 0.01%	.4				.4		μs
		$R_S = 20 \Omega$,	f = 10 Hz		15			15		
V _n	Equivalent input noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√Hz
	Peak-to-peak equivalent input	f = 0.1 Hz to 1 Hz			0.48			0.48		
VN(PP)	noise voltage	f = 0.1 Hz to 10 Hz		0.51			0.51		μV	
		f = 10 Hz			1.89			1.89		
^I n	Equivalent input noise current	f = 10 kHz			0.47			0.47		pA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 20 \text{ V},$ $A_{VD} = 10,$	$R_L = 2 k\Omega$, f = 10 kHz		0.01%			0.01%		
B ₁	Unity-gain bandwidth	$R_L = 2 k\Omega$,	C _L = 100 pF		6			6		MHz
	Gain-bandwidth product	$R_L = 2 k\Omega$, f = 100 kHz	C _L = 100 pF,		5.9			5.9		MHz
ВОМ	Maximum output-swing bandwidth	$V_{O(PP)} = 20 \text{ V},$ $A_{VD} = 1,$	$R_L = 2 k\Omega$, $C_L = 100 pF$		668			668		kHz
φm	Phase margin at unity gain	$R_L = 2 k\Omega$,	C _L = 100 pF		58°			58°		

TLE214x, TLE214xA EXCALIBUR LOW-NOISE HIGH-SPEED PRECISION OPERATIONAL AMPLIFIERS SLOS183C - FEBRUARY 1997 - REVISED JUNE 2006

TLE2141Y electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V, T_A = 25°C (unless otherwise noted)

	DADAMETED	TEST COL	IDITIONS	Т	LE2141\	′	
	PARAMETER	TEST CON	IDITIONS	MIN	TYP	MAX	UNIT
VIO	Input offset voltage				200	1000	μV
l _{IO}	Input offset current	$V_{IC} = 0,$ $V_{O} = 0$	$R_S = 50 \Omega$,		7	100	nA
I _{IB}	Input bias current	-			-0.7	-1.5	μΑ
VICR	Common-mode input voltage range	R _S = 50 Ω		-15 to 13	-15.3 to 13.2		٧
		$I_{O} = -150 \mu\text{A}$		13.8	14.1		
VOM+	Maximum positive peak output voltage swing	$I_{O} = -1.5 \text{ mA}$		13.7	14		V
		$I_{O} = -15 \text{ mA}$		13.3	13.7		
		ΙΟ = 150 μΑ		-14.7	-14.9		
VOM-	Maximum negative peak output voltage swing	I _O = 1.5 mA		-14.5	-14.8		V
		I _O = 15 mA		-13.4	-13.8		
AVD	Large-signal differential voltage amplification	$V_0 = \pm 10 \text{ V},$	$R_L = 2 k\Omega$	100	450		V/mV
rį	Input resistance				65		МΩ
Cį	Input capacitance				2.5		pF
z ₀	Open-loop output impedance	f = 1 MHz			30		Ω
CMRR	Common-mode rejection ratio	V _{IC} = V _{ICR} min,	$R_S = 50 \Omega$	80	108		dB
ksvr	Supply-voltage rejection ratio (ΔV _{CC±} /ΔV _{IO})	$V_{CC\pm} = \pm 2.5 \text{ V t}$ $R_S = 50 \Omega$	o ±15 V,	85	106	_	dB
IOS	Short-circuit output current	V _O = 0	V _{ID} = 1 V V _{ID} = -1 V	-25 20	-50 31		mA
Icc	Supply current	V _O = 0,	No load		3.5	4.5	mA

TLE214x, TLE214xA EXCALIBUR LOW-NOISE HIGH-SPEED PRECISION OPERATIONAL AMPLIFIERS SLOS183C - FEBRUARY 1997 - REVISED JUNE 2006

TLE2142Y electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V, T_A = $25^{\circ}C$

	DADAMETER	TEST COL	IDITIONS	Т	LE2142\	′	
	PARAMETER	TEST CON	NDITIONS	MIN	TYP	MAX	UNIT
V _{IO}	Input offset voltage				150	875	μV
I _{IO}	Input offset current	$V_{IC} = 0,$ $V_{O} = 0$	$R_S = 50 \Omega$,		7	100	nA
I _{IB}	Input bias current	VO = 0			-0.7	-1.5	μΑ
VICR	Common-mode input voltage range	R _S = 50 Ω		-15 to 13	-15.3 to 13.2		٧
		$I_{O} = -150 \mu\text{A}$		13.8	14.1		
V _{OM+}	Maximum positive peak output voltage swing	$I_{O} = -1.5 \text{ mA}$		13.7	14		V
		$I_{O} = -15 \text{ mA}$		13.3	13.7		
		I _O = 150 μA		-14.7	-14.9		
VOM-	Maximum negative peak output voltage swing	I _O = 1.5 mA		-14.5	-14.8		V
		I _O = 15 mA		-13.4	-13.8		
A _{VD}	Large-signal differential voltage amplification	$V_0 = \pm 10 \text{ V},$	$R_L = 2 k\Omega$	100	450		V/mV
rį	Input resistance				65		MΩ
ci	Input capacitance				2.5		pF
z ₀	Open-loop output impedance	f = 1 MHz			30		Ω
CMRR	Common-mode rejection ratio	V _{IC} = V _{ICR} min,	$R_S = 50 \Omega$	80	108		dB
ksvr	Supply-voltage rejection ratio (ΔV _{CC±} /ΔV _{IO})	$V_{CC\pm} = \pm 2.5 \text{ V t}$ RS = 50 Ω	o ±15 V,	85	106		dB
1	Chart sire it autout surrent	V- 0	V _{ID} = 1 V	-25	-50		A
los	Short-circuit output current	V _O = 0	V _{ID} = -1 V	20	31	·	mA
Icc	Supply current	$V_{O} = 0$,	No load		6.9	9	mA

TLE214x, TLE214xA EXCALIBUR LOW-NOISE HIGH-SPEED PRECISION OPERATIONAL AMPLIFIERS SLOS183C - FEBRUARY 1997 - REVISED JUNE 2006

TLE2144Y electrical characteristics at $V_{CC\pm}$ = ± 15 V, T_A = 25°C (unless otherwise noted)

	DADAMETED	TEST CONDITIO	ONE	Т	LE2144Y	1	
	PARAMETER	TEST CONDITIO	JNS	MIN	TYP	MAX	UNIT
VIO	Input offset voltage				0.3	1.8	mV
I _{IO}	Input offset current	$V_{IC} = 0$, $V_{O} = 0$	$R_S = 50 \Omega$,		7	100	nA
I _{IB}	Input bias current				-0.7	-1.5	μΑ
VICR	Common-mode input voltage range	R _S = 50 Ω		-15 to 13	-15.3 to 13.2		٧
		$I_{O} = -150 \mu\text{A}$		13.8	14.1		
V _{OM+}	Maximum positive peak output voltage swing	$I_{O} = -1.5 \text{ mA}$		13.7	14		V
		$I_{O} = -15 \text{ mA}$		13.3	13.7		
		ΙΟ = 150 μΑ		-14.7	-14.9		
VOM-	Maximum negative peak output voltage swing	I _O = 1.5 mA		-14.5	-14.8		V
		I _O = 15 mA		-13.4	-13.8		
AVD	Large-signal differential voltage amplification	$V_0 = \pm 10 \text{ V},$	$R_L = 2 k\Omega$	100	450		V/mV
rį	Input resistance				65		$M\Omega$
ci	Input capacitance				2.5		pF
z _o	Open-loop output impedance	f = 1 MHz			30		Ω
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}min,$	$R_S = 50 \Omega$	80	108		dB
ksvr	Supply-voltage rejection ratio (ΔV _{CC±} /ΔV _{IO})	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$	Rs = 50 Ω	85	106		dB
	Object of the standard comment		V _{ID} = 1 V	-25	-50		^
los	Short-circuit output current	VO = 0	V _{ID} = -1 V	20	31		mA
Icc	Supply current	$V_{O} = 0$,	No load		13.8	18	mA

Table of Graphs

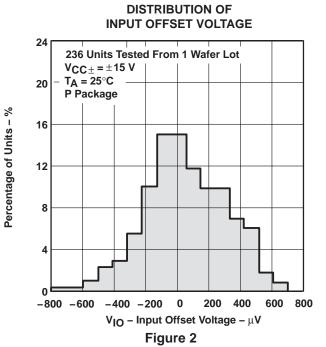
				FIGURE
V _{IO}	Input offset voltage		Distribution	1, 2, 3
I _{IO}	Input offset current		vs Free-air temperature	4
I _{IB}	Input bias current		vs Common-mode input voltage vs Free-air temperature	5 6
V _{OM+}	Maximum positive pe	eak output voltage	vs Supply voltage vs Free-air temperature vs Output current vs Settling time	7 8 9 11
V _{OM} -	Maximum negative p	eak output voltage	vs Supply voltage vs Free-air temperature vs Output current vs Settling time	7 8 10 11
VO(PP)	Maximum peak-to-pe	eak output voltage	vs Frequency	12
Vон	High-level output vol	tage	vs Output current	13
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A _{VD}	Large-signal differen	tial voltage amplification	vs Frequency vs Free-air temperature	15 16
z _O	Closed-loop output in	mpedance	vs Frequency	17
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CMRR	Common-mode rejec	ction ratio	vs Frequency vs Free-air temperature	19 20
ksvr	Supply-voltage rejec	tion ratio	vs Frequency vs Free-air temperature	21 22
Icc	Supply current		vs Supply voltage vs Free-air temperature	23 24
٧n	Equivalent input nois	se voltage	vs Frequency	25
V _n	Input noise voltage		Over a 10-second period	26
In	Noise current		vs Frequency	27
THD + N	Total harmonic distor	tion plus noise	vs Frequency	28
SR	Slew rate		vs Free-air temperature vs Load capacitance	29 30
		Noninverting large signal	vs Time	31
	Pulse response	Inverting large signal	vs Time	32
	,	Small signal	vs Time	33
B ₁	Unity-gain bandwidth))	vs Load capacitance	34
	Gain margin		vs Load capacitance	35
φm	Phase margin		vs Load capacitance	36
	Ψm Phase margin		vs Frequency	15



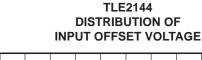
TLE2141

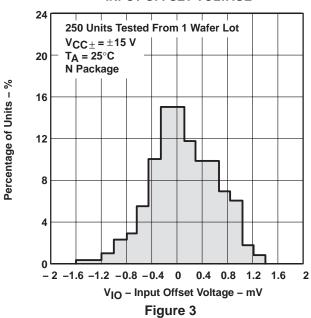
TYPICAL CHARACTERISTICS

DISTRIBUTION OF INPUT OFFSET VOLTAGE 24 236 Units Tested From 1 Wafer Lot $V_{CC\pm} = \pm 15 V$ T_A = 25°C P Package 20 Percentage of Units – % 16 12 8 -800 -400 400 800 V_{IO} – Input Offset Voltage – μV Figure 1

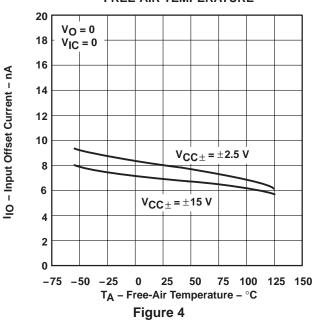


TLE2142





INPUT OFFSET CURRENT[†] vs FREE-AIR TEMPERATURE

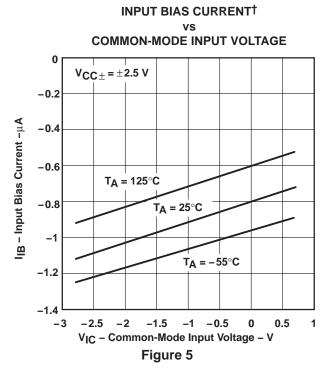


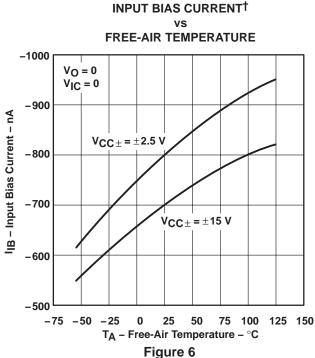
[†] Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.



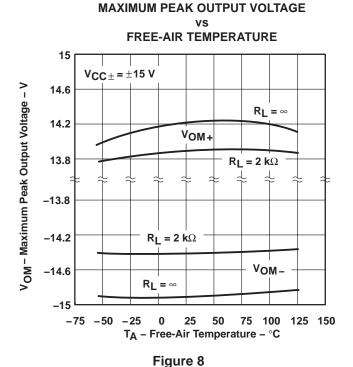
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TYPICAL CHARACTERISTICS



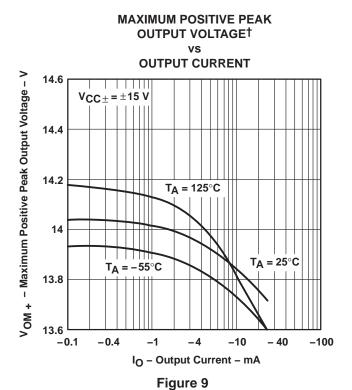


MAXIMUM PEAK OUTPUT VOLTAGE SUPPLY VOLTAGE 24 $R_L = 2 k\Omega$ T_A = 25°C V_{OM} - Maximum Peak Output Voltage - V 18 12 V_{OM+} 6 0 - 6 VOM--12 -18 - 24 0 3 12 15 21 24 V_{CC±} - Supply Voltage - V



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





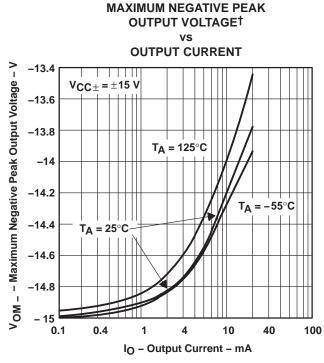
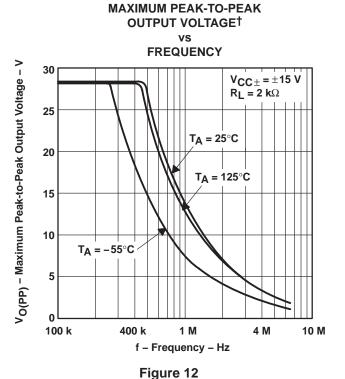


Figure 10

MAXIMUM PEAK OUTPUT VOLTAGE vs **SETTLING TIME** 12.5 $A_{VD} = -1$ $V_{CC\pm} = \pm 15 V$ 10 V_{OM} - Maximum Peak Output Voltage - V $T_A = 25^{\circ}C$ 7.5 0.1% 0.01% 5 2.5 Rising 0 **Falling** -2.50.01% -5 0.1% -7.5-10 -12.5 0 100 200 300 400 500 t_S - Settling Time - ns Figure 11

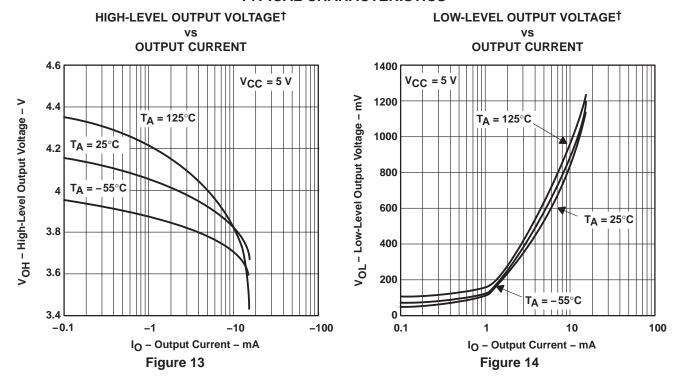


[†]Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

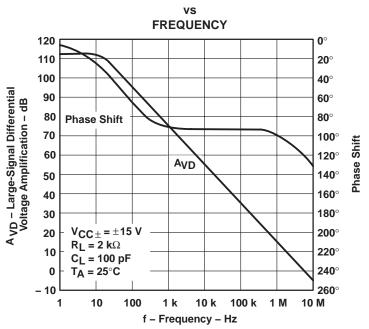


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TYPICAL CHARACTERISTICS



LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT





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

LARGE-SIGNAL DIFFERENTIAL **VOLTAGE AMPLIFICATION**†

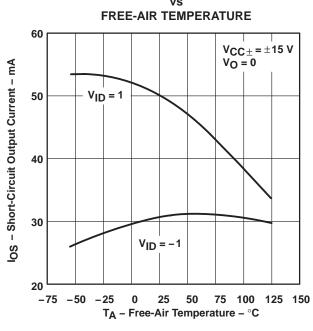
FREE-AIR TEMPERATURE 140 V_{CC±} = ±15 V $V_O = \pm 10 \text{ V}$ $R_L = 10 \text{ k}\Omega$ A VD – Large-Signal Differential Voltage Amplification – dB 120 $R_L = 2 k\Omega$ 100 80 -75 -50 -25 0 25 50 75 100 125 150 T_A – Free-Air Temperature – $^{\circ}C$

Figure 16

CLOSED-LOOP OUTPUT IMPEDANCE FREQUENCY 100 **30** Ω z_0- Closed-Loop Output Impedance – Ω 10 $A_{VD} = 100$ 0.1 $A_{VD} = 10$ $A_{VD} = 1$ 0.01 0.001 10 k 100 k 1 k 10 M f - Frequency - Hz

Figure 17

SHORT-CIRCUIT OUTPUT CURRENT[†]



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



COMMON-MODE REJECTION RATIO FREQUENCY 140 $V_{CC\pm} = \pm 15 V$ CMRR - Common-Mode Rejection Ratio - dB T_A = 25°C 120 100 80 60 40 20 n 100 1 k 10 k 100 k 1 M f - Frequency - Hz

Figure 19

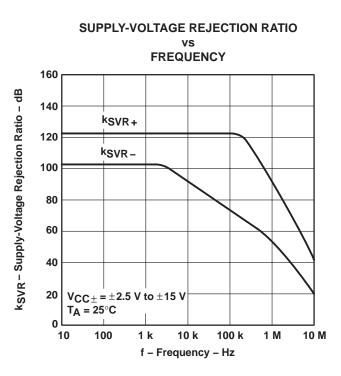


Figure 21

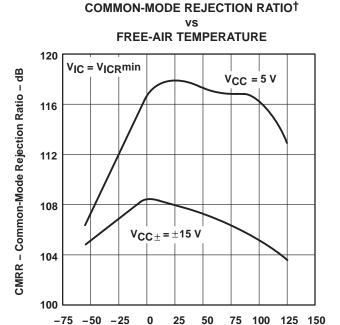


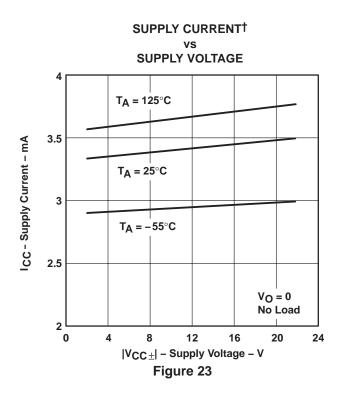
Figure 20

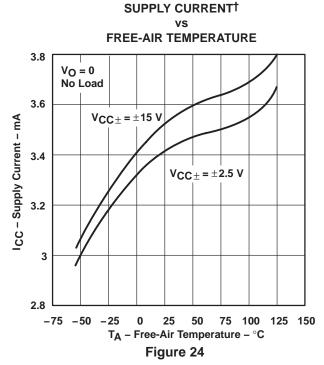
T_A - Free-Air Temperature - °C

SUPPLY-VOLTAGE REJECTION RATIO† VS FREE-AIR TEMPERATURE 110 VCC± = ±2.5 V to ±15 V VCC± = ±2.5 V to ±15 V 104 100 -75 -50 -25 0 25 50 75 100 125 150 TA - Free-Air Temperature - °C

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





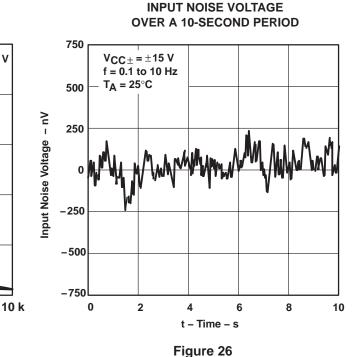


EQUIVALENT INPUT NOISE VOLTAGE[†] vs **FREQUENCY** 250 $V_{CC\pm} = \pm 15 \text{ V}$ Vn - Equivalent Input Noise Voltage - nV/√Hz $R_S = 20 \Omega$ 200 $T_{\mbox{\scriptsize A}} = -55^{\circ} \mbox{\scriptsize C}$

 $T_{\Delta} = 125^{\circ}C$

10

T_A = 25°C





100

f - Frequency - Hz

1 k

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

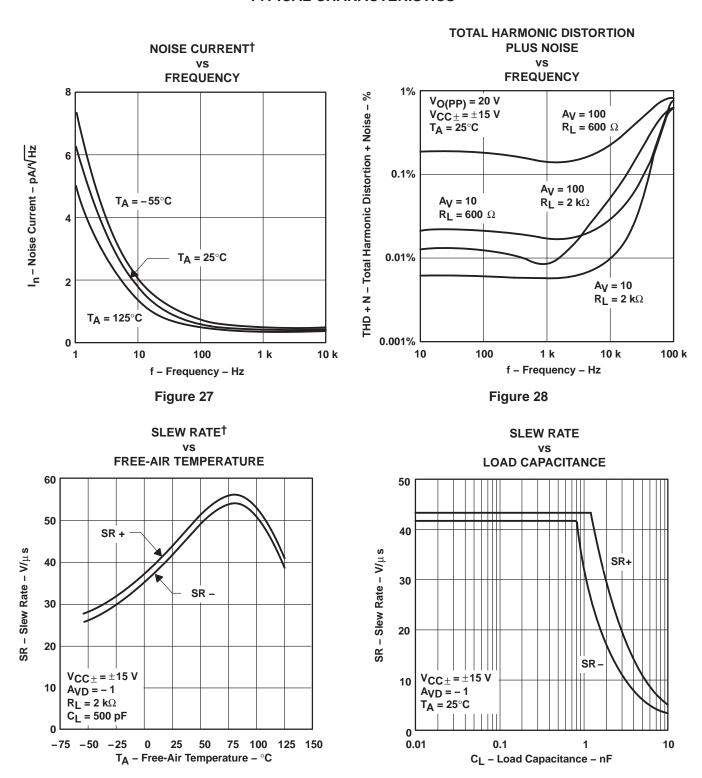


150

100

50

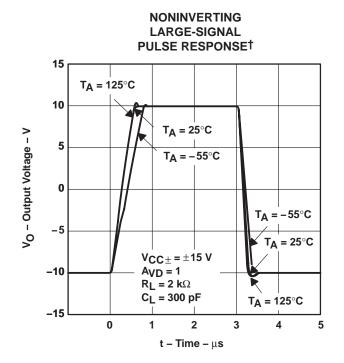
1

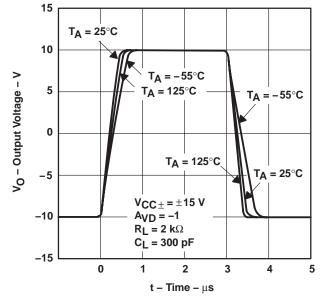


[†] Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

Figure 29







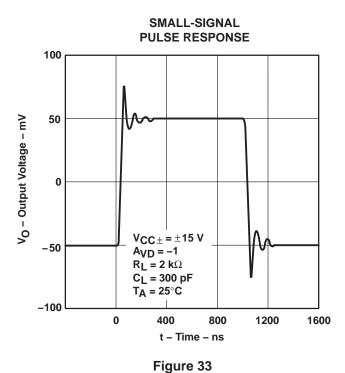
INVERTING

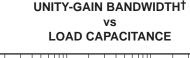
LARGE-SIGNAL

PULSE RESPONSE†

Figure 31







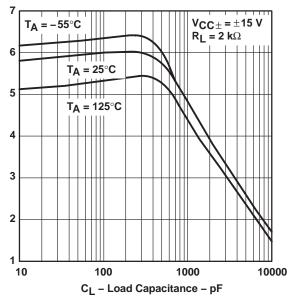


Figure 34

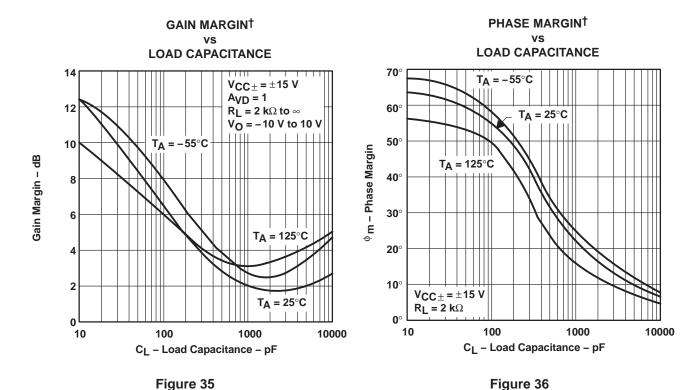
[†]Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.



- Unity-Gain Bandwidth - MHz

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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 offset voltage nulling

The TLE2141 series offers external null pins that can be used to further reduce the input offset voltage. If this feature is desired, connect the circuit of Figure 37 as shown. If external nulling is not needed, the null pins may be left unconnected.

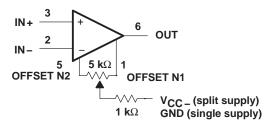


Figure 37. Input Offset Voltage Null Circuit





PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
5962-9321603Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
5962-9321603QHA	ACTIVE	CFP	U	10	1	TBD	A42 SNPB	N / A for Pkg Type
5962-9321603QPA	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
5962-9321604Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
5962-9321604QHA	ACTIVE	CFP	U	10	1	TBD	A42 SNPB	N / A for Pkg Type
5962-9321604QPA	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
5962-9321605Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
5962-9321605QCA	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
5962-9321606Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
5962-9321606QCA	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
TLE2141ACD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2141ACDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2141ACP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2141ACPE4	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2141AID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2141AIDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2141AIDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2141AIDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2141AIP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2141AIPE4	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2141CD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2141CDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2141CDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2141CDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2141CP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2141CPE4	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2141ID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2141IDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2141IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM





18-Sep-2008

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan ⁽²⁾	Lead/Ball Finish	n MSL Peak Temp ⁽³⁾
TLE2141IDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2141IP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2141IPE4	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2141MD	ACTIVE	SOIC	D	8	75	TBD	CU NIPDAU	Level-1-220C-UNLIM
TLE2141MDR	ACTIVE	SOIC	D	8	2500	TBD	CU NIPDAU	Level-1-220C-UNLIM
TLE2142ACD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2142ACDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2142ACDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2142ACDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2142ACP	OBSOLETE	PDIP	Р	8		TBD	Call TI	Call TI
TLE2142AID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2142AIDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2142AIDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2142AIDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2142AIP	OBSOLETE	PDIP	Р	8		TBD	Call TI	Call TI
TLE2142AMD	ACTIVE	SOIC	D	8	75	TBD	CU NIPDAU	Level-1-220C-UNLIM
TLE2142AMDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2142AMDR	ACTIVE	SOIC	D	8	2500	TBD	CU NIPDAU	Level-1-220C-UNLIM
TLE2142AMDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2142AMFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
TLE2142AMJG	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
TLE2142AMJGB	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
TLE2142AMUB	ACTIVE	CFP	U	10	1	TBD	A42 SNPB	N / A for Pkg Type
TLE2142CD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2142CDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2142CDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIN
TLE2142CDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2142CP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2142CPE4	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2142CPWLE	OBSOLETE	TSSOP	PW	16		TBD	Call TI	Call TI





om 18-Sep-2008

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽
TLE2142CPWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIN
TLE2142CPWRG4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIN
TLE2142ID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIN
TLE2142IDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIN
TLE2142IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIN
TLE2142IDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIN
TLE2142IP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2142IPE4	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2142MD	ACTIVE	SOIC	D	8	75	TBD	CU NIPDAU	Level-1-220C-UNLIN
TLE2142MDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLII
TLE2142MDR	ACTIVE	SOIC	D	8	2500	TBD	CU NIPDAU	Level-1-220C-UNLII
TLE2142MDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLII
TLE2142MFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
TLE2142MJGB	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
TLE2142MUB	ACTIVE	CFP	U	10	1	TBD	A42 SNPB	N / A for Pkg Type
TLE2144ACN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2144ACNE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2144AIN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2144AINE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2144AMFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
TLE2144AMJB	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
TLE2144CDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLII
TLE2144CDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLII
TLE2144CDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLII
TLE2144CDWRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLII
TLE2144CN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2144CNE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2144IDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLII
TLE2144IDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS &	CU NIPDAU	Level-1-260C-UNLII





i.com 18-Sep-2008

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
						no Sb/Br)		
TLE2144IDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2144IDWRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2144IN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2144INE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLE2144MDW	ACTIVE	SOIC	DW	16	40	TBD	CU NIPDAU	Level-1-220C-UNLIM
TLE2144MDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLE2144MFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
TLE2144MJB	ACTIVE	CDIP	J	14	1	TBD	A42 SNPB	N / A for Pkg Type
TLE2144MN	OBSOLETE	PDIP	N	14	•	TBD	Call TI	Call TI

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

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

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

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

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

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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OTHER QUALIFIED VERSIONS OF TLE2141, TLE2141A, TLE2142A, TLE2142A, TLE2142AM, TLE2142AM, TLE2144A, TLE2144AAM, TLE2144AM; TLE214AM; TLE21AM; TLE21AM;

• Enhanced Product: TLE2141-EP

• Military: TLE2141M, TLE2141AM

NOTE: Qualified Version Definitions:



PACKAGE OPTION ADDENDUM

18-Sep-2008

 Enhanced Product - Supports Defense, Aerospace and Medical Ag

• Military - QML certified for Military and Defense Applications

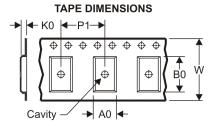




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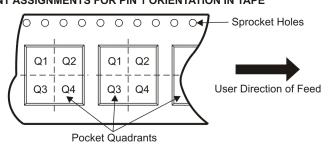
TAPE AND REEL INFORMATION





	Dimension designed to accommodate the component width
	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

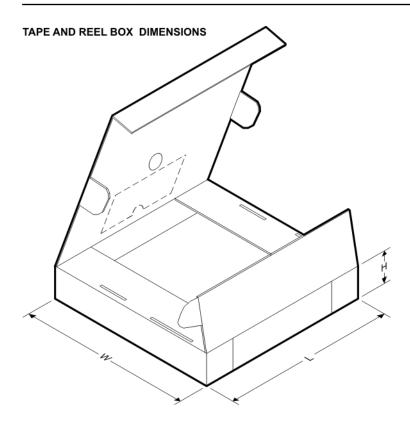
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TLE2141AIDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2141CDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2141IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2142ACDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2142AIDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2142CDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2142CPWR	TSSOP	PW	16	2000	330.0	12.4	7.0	5.6	1.6	8.0	12.0	Q1
TLE2142IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2144CDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
TLE2144IDWR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1





*All dimensions are nominal

All difficultions are norminal							
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLE2141AIDR	SOIC	D	8	2500	346.0	346.0	29.0
TLE2141CDR	SOIC	D	8	2500	346.0	346.0	29.0
TLE2141IDR	SOIC	D	8	2500	346.0	346.0	29.0
TLE2142ACDR	SOIC	D	8	2500	346.0	346.0	29.0
TLE2142AIDR	SOIC	D	8	2500	346.0	346.0	29.0
TLE2142CDR	SOIC	D	8	2500	346.0	346.0	29.0
TLE2142CPWR	TSSOP	PW	16	2000	346.0	346.0	29.0
TLE2142IDR	SOIC	D	8	2500	346.0	346.0	29.0
TLE2144CDWR	SOIC	DW	16	2000	346.0	346.0	33.0
TLE2144IDWR	SOIC	DW	16	2000	346.0	346.0	33.0

14 LEADS SHOWN



NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package is hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
- E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

PW (R-PDSO-G**)

14 PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



NOTES: A. All linear dimensions are in millimeters.

B. This drawing is subject to change without notice.

C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.

D. Falls within JEDEC MO-153

FK (S-CQCC-N**)

28 TERMINAL SHOWN

LEADLESS CERAMIC CHIP CARRIER



NOTES: 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 metal lid.
- D. The terminals are gold plated.
- E. Falls within JEDEC MS-004



D (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
- Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AA.



DW (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE



NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
- D. Falls within JEDEC MS-013 variation AA.



P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE



NOTES: A. All linear dimensions are in inches (millimeters).

- B. This drawing is subject to change without notice.
- C. Falls within JEDEC MS-001

For the latest package information, go to $http://www.ti.com/sc/docs/package/pkg_info.htm$

JG (R-GDIP-T8)

CERAMIC DUAL-IN-LINE



NOTES: 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.
- E. Falls within MIL STD 1835 GDIP1-T8

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



NOTES:

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



U (S-GDFP-F10)

CERAMIC DUAL FLATPACK



NOTES:

- 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-F10 and JEDEC MO-092AA



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